WATER RESOURCES

OF THE

TWEED AND BRUNSWICK VALLEYS

SURVEY OF THIRTY N.S.W. RIVER VALLEYS

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WATER RESOURCES OF THE TWEED AND BRUNSWICK VALLEYS

PREFACE

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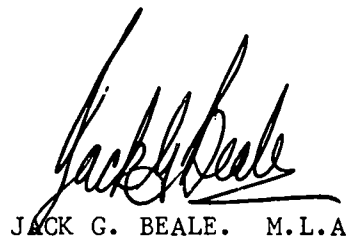
In accordance with the policy of the New South Wales Liberal-Country Party Government announced prior to its election to office at the May, 1965 State Elections, I directed the Water Conservation and Irrigation Commission to undertake a survey of the State's water resources on an individual valley basis to enable the formulation of a balanced and soundly based programme of water conservation.

The survey, which will be completed this year, involves the preparation of twenty five separate reports covering thirty major river valleys of the State. The survey represents the largest and most comprehensive study of its type ever undertaken in Australia.

In the survey, studies are being made of the physiography, climate, groundwater potential and surface water resources of each valley. In addition to reviewing current water requirements, assessments are being undertaken of possible future water development.

Reports are being prepared progressively and those issued to date have covered eleven valleys. This report on the water resources of the Tweed and Brunswick Valleys is the ninth report to be issued.



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WATER RESOURCES OF THE TWEED AND BRUNSWICK RIVER VALLEYS

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WATER RESOURCES OF THE TWEED AND BRUNSWICK RIVER VALLEYS

1. INTRODUCTION.

All civilizations, past and present, have been dependent on adequate water supplies for their continued existence and agricultural growth. Where possible, early civilizations established their villages near large streams in the hope that the natural streamflows would be sufficient for their domestic and irrigation requirements and in the main, these hopes were fulfilled. However the growth of present day development has been such that it is normally not possible to satisfy current industrial or large area irrigation requirements in the absence of large regulating dams on the streams.

Huge demands are made on water for domestic, industrial and agricultural purposes. In the production of one ton of paper about 60 tons of water are used; one ton of steel requires about 300 tons of water and a ton of food requires an average of about 1,000 tons of water.

It has been estimated that the total amount of water on Earth is about 320 million cubic miles. It is difficult to envisage the magnitude of this resource particularly when it is realised that one cubic mile is equivalent to about a million million gallons.

However the usefulness of this resource is very limited as about 97.2 percent is in the oceans and is too saline for consumptive use and a further 2 percent lies frozen in the polar regions. Furthermore as underground water comprises over 99.5 percent of the remaining 0.8 percent the amount of surface water contained in lakes and streams approximates to only 0.004 percent of the total volume of water on Earth.

The gross water resources of any country is normally considered to be the total amount of precipitation, in the forms of rainfall or snow, which falls on the land. The surface water resources are usually regarded as the amounts of water in rivers and lakes and underground water resources as water in the interstices and joints in underground strata. Sub-artesian water or water which will flow at the surface when tapped by a bore or well is nevertheless classified as underground water.

Australia has the least average annual rainfall of all the continents, the average being only about 1½ feet whereas Africa, Asia, Europe and North America all receive about 2 feet and South America records an average of almost 4½ feet.

When losses due to evaporation, transpiration and seepage are subtracted from the average rainfalls of the continents, a comparison of the remainders or surface water resources indicates the relatively low water resources of the Australian continent.

The average annual surface water resources of the Australian mainland have been assessed at about 240 million acre feet which is equivalent to less than a depth of 2 inches over the continent. Corresponding annual values for the other continents are about 7 inches in Africa, 9 inches in Asia and Europe, 11 inches in North America and about 19 inches in South America.

As there are no areas on the Australian continent which are permanently covered by snow, streamflows in Australia are largely dependent upon the occurrence of runoff producing storms. As a result Australian streams tend to exhibit a greater variability in flow than those in the other continents.

The total surface water resources of the Tweed and Brunswick Valleys have been estimated at 360,000 acre feet per annum and 200,000 acre feet per annum respectively.

The average annual rainfalls over the Tweed and Brunswick Valleys are 65 inches and 68 inches respectively. The surface water resources are therefore equivalent to respective runoffs for the Tweed and Brunswick Valleys of 24 percent and 29 percent.

On a square mile basis the surface water resources of both the Tweed and Brunswick Valleys are more than double the average for coastal basins in New South Wales and about nine times the average for the total area of the State. The outstanding feature of the streamflow regimes in the valleys is the normally good persistence of streamflows.

2. PHYSIOGRAPHIC FEATURES.

The boundaries of the Tweed and Brunswick River Valleys, adopted for the purposes of this report, are shown at Figure 1. The overall catchment areas of the Tweed and Brunswick Rivers are 430 square miles and 190 square miles respectively.

The Tweed River Valley comprises the catchment area of the North, Middle and South Arms of the Tweed River and includes minor local catchments between the Tweed River and the Queensland-New South Wales Border. The Brunswick River Valley covers the catchment area of the three arms of the Brunswick River and includes minor coastal catchments between the Brunswick and Tweed Rivers.

The Tweed River Valley is somewhat different from the majority of other coastal catchments in the State, in that its drainage pattern is reasonably symmetrical, the main stream being fed by three major tributaries.

The North Arm of the Tweed River rises in the Lamington Plateau area near Mounts Merino and Worendo in the McPherson Range at elevations of up to 3,700 feet above sea level and flows generally easterly to Murwillumbah, joining the Tweed River about five miles downstream of that town. Other tributaries of the North Arm, which drain sections of the McPherson Range, are Crystal and Dungay Creeks which rise near Springbrook and Mount Cougal respectively.

The Middle Arm of the Tweed River has its headwaters in the extreme western section of the valley along the Tweed Range which extends from the Lamington Plateau to Loft's Pinnacle. The catchment boundary in this section follows precipitous cliffs and mountainous terrain at elevations of from 3,000 feet to 3,600 feet and the area is largely inaccessible. Several creeks draining this region converge near the village of Tyalgum and flow due easterly to Murwillumbah where the river channel turns to the north east, finally entering the South Pacific Ocean at Tweed Heads.

The South Arm of the Tweed River Valley rises near Loft's Pinnacle in the south western sector of the valley at elevations of up to 3,000 feet and flows in a north easterly direction, being joined firstly by Byrrill

Creek and secondly by Doon Doon Creek about two miles upstream of Uki. The upper catchments of Doon Doon Creek and the South Arm are characterised by mountainous terrain at elevations of from 2,000 to 3,000 feet. Notable peaks in this area are Mount Burrell (Blue Nob) and Mount Mathieson.

At Uki the South Arm is joined by Rolands and Smith's Creeks both of which drain catchments of lower elevation than the other South Arm tributaries. The South Arm joins the Middle Arm about three miles from Murwillumbah thereby forming the Tweed River.

The outstanding topographic landmark in the Tweed Valley is Mount Warning which is located in the centre of the Upper Tweed Catchment midway between the Middle and South Arms. The imposing spire of this mountain rises to an elevation of about 3,800 feet; the adjacent terrain falling away rapidly to about 200 feet above sea level in a distance of about 2 to 3 miles.

Above Murwillumbah the main streamsand their tributaries flow through valleys in which the areas of alluvial flats are severely restricted. The mountainous nature of the terrain is much in evidence and the rivers, in their middle and upper reaches are actively engaged in eroding wider and deeper valleys into the uplands.

Below Murwillumbah, the Tweed occupies a broad open valley flowing in a north easterly direction and finally parallel to the coast, before breaking through the sandy coastline at Tweed Heads. In the lower reaches, abrupt changes from rich alluvial flats and red clay loam to barren sandy heath and dune, produce marked contrasts within relatively small areas.

Between the Tweed River and the Queensland Border several minor creeks such as Cobaki and Bilumbil Creeks drain into extensive tidal areas which are contiguous with the lower reaches of the Tweed River near Tweed Heads.

The distribution of generalised land slopes in the Tweed and Brunswick Valleys is shown at Figure 2. The predominant terrain of the Tweed River Valley can be classed as hilly to mountainous. Land slopes in excess of 8 degrees occur over about 60 percent of the valley, whilst undulating to hilly areas, with slopes between 3 degrees and 8 degrees, occur over a further 20 percent. Areas of mostly flat land with slopes of less than 3 degrees comprise only about 20 percent of the valley's area. These flat

areas are confined to the plain adjoining the lower reaches of the Tweed River and limited areas along the lower sections of the major tributaries.

In common with the Tweed River the Brunswick River has three main tributaries, the North, Middle and South Arms which join at its mouth at Brunswick Heads. The Brunswick River (Middle Arm) drains a reasonably steep catchment at elevations of up to 2,000 feet before entering the flat coastal valley near Mullumbimby. The North Arm commences at an elevation of about 1,400 feet and initially flows easterly, finally turning due south near the coast before joining the Brunswick River. The South Arm flows north, parallel to the coast and drains the predominantly marshy coastal strip between Byron Bay and Brunswick Heads.

Between the Tweed and Brunswick Rivers there are several minor coastal catchments, which are characteristically low lying and swampy. In these catchments extensive drainage works have been undertaken to enable swampy areas to be reclaimed. In this category are included the catchments of Burringbar and Cudgera Creeks and Cudgen Lake.

Due to the effects of littoral currents along the shoreline these creeks seldom enter the sea directly, tending to run parallel to the coast before breaking through the coastal dunes to the sea.

Land slopes in the Brunswick Valley are predominantly flat to undulating, about 40 percent of the valley being classed as flat, with land slopes less than 3 degrees, and a further 25 percent being classed as undulating to hilly, with land slopes between 3 and 8 degrees.

The flat to undulating areas in the valley extend from the coast to the foothills of the divide between the Tweed and Brunswick Valleys. The most extensive areas of flat land occur in the northern sector near Cudgen Lake and in the southern coastal section between Mullumbimby and Byron Bay. Hilly to steep areas in the valley, with land slopes between 8 and 15 degrees, occupy about 20 percent of the valley whilst rugged or mountainous areas make up a further 15 percent.

Mountainous areas in the Brunswick Valley are confined to the central western boundary of the valley in the headwaters of the Brunswick River and Burringbar Creek.

The main rural activities in the Tweed and Brunswick Valleys are intensive dairying and the production of sugar cane and bananas. Dairying is mainly undertaken for the production of cream for use in butter manufacture. The remaining skim milk is used in pig-raising, an activity which is practised regularly in association with dairying. A minor secondary activity associated with dairying is the production of beef cattle.

Intensive cultivation of bananas and sugar cane is undertaken in the valleys and the major percentage of the New South Wales production of these crops is grown in this sector of the State. Other crops grown in the valleys include lucerne and vegetables; whilst pineapples and other tropical fruits are grown in relatively minor quantities the crops constitute practically the whole of the State's production.

3. CLIMATIC FEATURES.

Rainfall

The entire drainage area of the Tweed and Brunswick Rivers is very well watered, the annual median rainfall being everywhere in excess of 55 inches. (The median is that rainfall equalled or exceeded on 50 percent of occasions). Highest annual rainfall occurs along the range forming the northern boundary of the drainage area where the annual median rainfalls are generally above 70 inches and are higher than 100 inches around Springbrook. Annual medians exceeding 65 inches occur along the coastal fringe and along the ranges which form the remaining boundaries of the drainage area. The driest part of the river basins is along the valleys of the middle reaches of the Tweed River in the vicinity of Uki where the annual median is about 55 inches. The distribution of annual median rainfalls over the catchment is shown at Figure 3 whilst the distribution of monthly median rainfalls is shown at Figures 4 to 15.

These basins experience a distinct wet period from December to April during which over 60 percent of the annual rainfall is received. Median rainfalls for each of these months exceed 4½ inches generally and are greater than 6 inches in each month over the higher rainfall areas. The months June to November are relatively dry receiving about 30 percent of the annual rainfall. August, which receives only about 4½ percent of the annual rainfall, is the driest month although the median everywhere exceeds

1 inch and is higher than 2 inches over the coastal fringe and in the vicinity of Springbrook.

Monthly and annual rainfalls recorded at Cedar Glen, Robert's Plateau, Springbrook, Tallebudgera, Bangalow, Byron Bay, Condong, Cudgen Plantation, Limpinwood, Mullumbimby, Murwillumbah, Nimbin, Tweed Heads, Uki and Tomewin are given in appendices 1 to 15 respectively.

Extremely heavy rain may occur over the river basins when a depression is located off the Queensland Coast near Brisbane. Under these conditions falls of 10 inches in 24 hours are not uncommon. The highest total recorded during a 24 hour period ending 9 a.m. was 20.00 inches on 6th February 1931 at Tomewin. These depressions are experienced on an average of about once every second year, usually in the months of February and March.

Monthly totals exceeding 18 inches can occur throughout the region during the warmer months of the year. Totals exceeding 35 inches for most stations have occurred in the wettest months of February and March. The highest monthly total on record for a station in or near the area occurred in February 1954 when 70.38 inches was recorded at Springbrook near the northern boundary of the drainage area.

The tables at Appendix 16 show on a monthly and annual basis for Cedar Glen, Robert's Plateau, Springbrook, Tallebudgera, Bangalow, Byron Bay, Condong, Cudgen Plantation, Limpinwood, Mullumbimby, Murwillumbah, Nimbin, Tweed Heads, Uki and Tomewin the following data:-

(1) The maximum and minimum rainfalls

(2) The 10th, 30th, 50th, 70th and 90th percentiles.

(A rainfall observation less than the 10th percentile can be expected once in ten years on the average. Similarly, a rainfall observation less than the 70th percentile can be expected seven times in ten years, or alternatively, a rainfall observation greater than the 70th percentile can be expected on an average of three years in ten).

Although the individual months may record very low totals on occasions, it is unusual for dry spells to persist for more than a few months. In the dry season from June to November, on an average of nine out of ten years, at

least 14 inches of rain are received even in the driest parts of the catchment. In the wet months more than about 28 inches are received on 90 percent of occasions. The corresponding median values for the above periods are approximately 22 and 46 inches respectively over the drier parts of the river basins.

Minimum recorded rainfalls for periods up to 12 months at Byron Bay, Condong, Mullumbimby, Tweed Heads and Tomewin are shown in the tables at Appendix 17. These tables indicate the minimum cumulative rainfalls commencing in any month of the year and continuing for up to twelve months, which have occurred at the selected rainfall stations.

Temperature.

The temperature regime of the lower parts of the valleys is represented by the figures for Condong at Table 1. No temperature recordings are available for the higher parts of the drainage area. However, averages would be about eight to ten degrees cooler above the 2,000 feet contour than those quoted for Condong.

TABLE 1.

CONDONG (Elevation 16 feet)

Average Temperature (^{o}F) based on 30 years of record

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Average Maximum	85.7	85.0	83.0	79.9	75.0	71.1	70.7	72.9	76.9	80.3	83.1	85.3	79.1
Average Minimum	65.8	65.3	62.6	57.2	50.9	46.2	44.3	44.5	49.7	55.7	60.8	64.2	55.6
Average Daily	75.8	75.1	72.8	68.6	63.0	58.6	57.5	58.7	63.3	68.0	72.0	74.8	67.3
Highest on Record 112.0^{o}F.						Lowest on Record 24.0^{o}F.							

The drainage area generally experiences warm to hot weather during the months October to April with average maxima from the mid seventies to the mid eighties. On the coastal fringe conditions would usually be tempered by a cooling north easterly sea breeze during the afternoon. During the remainder of the year, days are mild to warm over most of the drainage area. In the summer months very hot conditions can occur throughout the region when north-westerly winds bring dry hot air from Central Australia. Temperatures

over 90 degrees occur frequently while temperatures exceeding 100 degrees occur on an average of about 3 days per year.

Average minima away from the coast are in general about 15 degrees cooler than the summer values. On occasions of clear skies and light winds very low overnight temperatures occur. Apart from the coastal strip where the temperatures below freezing (32°F) are extremely rare, all places in the area can expect extreme temperatures as low as 25°F. while extreme temperatures lower than 20 degrees would be expected to occur over the high ground above 2,000 feet.

Frosts.

The immediate coastal strip is practically frost free. Away from the coast, however, frosts occur several times each winter and are occasionally quite severe. Condong averages about eight frosts per season in the months June to August. On the average about one of these frosts is severe. Similar frequencies could be expected over the lower valleys of the river basins. Over the higher parts of the drainage area above 2,000 feet over 20 frosts per year can be expected.

Sunshine.

Estimates of the average duration of bright sunshine in hours per day for the drainage area are shown in Table 2. These estimates are based on cloud observations. In winter the duration of bright sunshine over the Tweed and Brunswick Valleys is similar to that experienced west of the Divide. In summer, the greater cloudiness of the northern New South Wales coast results in sunshine durations considerably lower than durations over the western river basins.

TABLE 2

Estimated Average Duration of Bright Sunshine
in Hours per Day

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
8.1	7.3	7.3	7.3	6.7	6.5	7.1	7.7	8.0	8.3	8.3	8.7	7.7

Evaporation.

Estimates of average monthly and annual evaporation (from a sunken pan) for the region together with estimates of the standard deviation are shown in Table 3.

TABLE 3

Estimated Average Monthly and Annual Evaporation in Inches for the Tweed and Brunswick River Valleys.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Evaporation	5.2	3.8	3.7	3.0	2.8	2.4	2.0	3.0	3.8	4.8	6.0	6.5	47.0
Standard Deviation	1.2	0.8	0.7	0.5	0.5	0.4	0.4	0.6	0.8	0.9	1.2	1.2	5.3

Wind.

Strong winds occur over the Tweed and Brunswick River Valleys from time to time associated with one of the following conditions:-

(1) Strong east to south east winds associated with a deep depression centred off the coast near Brisbane. These depressions often originate as tropical cyclones and may still be of cyclonic intensity when they affect the valleys. Under these conditions wind speeds may exceed 60 miles per hour on the coast but are somewhat less inland.

(2) Violent squalls associated with severe local storms such as thunderstorms or frontal squalls. Gusts under these conditions could exceed 95 miles per hour.

Table 4 gives the extreme wind gust likely to be experienced in the catchment for various return periods.

TABLE 4

Estimated Extreme Wind Gusts to be Expected for Given Return Periods

Return Period (years)	10	20	50	100
Extreme Wind Gust Equalled or Exceeded (Miles per hour)	80	85	90	95

4. GROUNDWATER POTENTIAL.

The distribution of geological formations in the Tweed and Brunswick Valleys is shown at Figure 16. Geologically and physiographically the valleys of these rivers are dominated by the central igneous complex of Mount Warning and the associated volcanic rocks, which occur along almost the entire length of the divide forming the western boundary of the valleys.

The volcanic rocks are believed to be remnants of an ancient shield volcano centred about Mount Warning. The amphitheatre-like nature of the upper Tweed Valley has resulted from the erosion of the inner part of the shield around the volcanic centre, so that the outer remnants form an almost continuous rim rising to heights of the order of 3,000 feet in a series of near vertical cliffs.

The Mount Warning complex has been intruded along a zone of weakness between the ancient Palaeozoic basement rocks in the eastern part of the valley, and the Mesozoic sediments which outcrop mainly in the western part of the Tweed catchment.

Discontinuous small alluvial deposits have been built up in the middle reaches of the various streams, but there are extensive alluvial flats along the Tweed River and its various arms, from the vicinity of Murwillumbah to the coast, and also along the Brunswick River near Mullumbimby. Near the coast even the small streams have built up low lying, rather swampy flats, whilst along the coast, immediately behind the present beaches, there are areas of windblown dune sand and raised beaches.

Because of the high rainfall normally enjoyed in this area and the relative reliability of many of the streams (a number of which are spring fed from groundwater stored in the volcanic rocks), there is less reliance on groundwater than in most other parts of the State. Records of bores and wells in these valleys number less than two dozen, but it is known that there are many shallow wells on soakages in the higher country, and on the river flats, which provide domestic and stock supplies.

In the absence of bore data in some parts, it is possible to make inferences on the basis of experience in adjoining valleys in order to provide a more complete picture of the groundwater potential.

It is convenient to discuss the groundwater potential of this area under three sub-headings, based on the nature of the strata and openings in the rock in which the groundwater is stored, viz. Jointed Rocks, which contain water in cracks, joints and fractures in otherwise impervious strata; Porous Rocks, such as sandstones, which contain water in the pore spaces between the cemented sand grains; and Unconsolidated Deposits, in which water is stored in sands or gravels associated with river deposited alluvium, or in accumulations of beach and dune sands near the coastline.

Jointed Rocks.

Strata of Silurian age occupy a considerable area in these valleys, the main outcrops being east of a line through Mount Warning. Much of the country underlain by these rocks has a high relief and the more elevated parts are occupied by State Forests, only the areas of more subdued relief being farmed.

Slates, quartzites, phyllites and greywackes are the most common rock types. The strike of these rocks is essentially meridional with dips of the order of 40 to 50 degrees. The quartzites and greywackes are the harder strata in this formation and they are usually well jointed, the quartzites in particular being often quite strongly fractured.

Bores on topographically good sites which encounter the harder strata can be expected to yield useful stock supplies from depths of the order of 100 feet. With the prevailing high rainfall the salinity of the groundwater should be low, but experience elsewhere suggests that some waters may be unfit for domestic or garden use.

The only recorded analysis of water from a bore in these strata indicates a total salinity of 178 parts per hundred thousand which would render the water unsuitable for most crops and for domestic use. However the presence of two aquifers, one in shallow alluvium and the deeper one in quartzite, leaves room for doubt as to the reliability of the sample.

The Triassic Chillingham Volcanics do not appear to have been exploited for groundwater, but in view of their nature it seems probable that bores in them, located at suitable sites, would yield useful supplies for stock and domestic use.

The volcanic rocks, which cap much of the higher ground, have been little exploited for groundwater supplies except in the case of the Lismore Basalt and its equivalents which underlie some of the richest dairying country. In the main, the basalts occur as remnants of flows, but where such remnants cover appreciable areas, bores can usually be relied on to yield supplies of 500 - 1,000 gallons per hour of fresh, but hard water from depths less than 100 feet. Wells also have proved successful, usually at depths less than 20 feet, but a tendency for such shallow supplies to cut out in dry spells, makes such sources less reliable than bores.

As mentioned earlier, many springs have their origin in the jointed volcanic rocks and these often provide useful stock supplies, as well as maintaining a flow in a number of streams during periods with below normal rainfall.

Porous Rocks.

The only rocks within this group occur in the Triassic and Jurassic strata of the Clarence-Moreton Basin. These beds are located in hilly country in the upper reaches of the three arms of the Tweed River. There are no records of bores in these strata, but in adjacent valleys results suggest that porous and permeable sandstones are rare.

The Triassic-Jurassic formations include fine grained sandstones, siltstones, shales and conglomerates. These strata are largely impervious and the outcome of boring in them is considered to be somewhat speculative. There are no records of bores in these rocks, but experience elsewhere suggests that stock supplies should usually be obtainable within a depth of 150 feet.

The shales, sandstones and coal seams which comprise the Walloon Coal Measures are expected to contain some minor aquifers. However, results of bores in adjoining areas indicate that the water is commonly brackish, with a total salinity in excess of 300 parts per hundred thousand. Such waters are useful only for stock watering.

Unconsolidated Deposits

Shallow alluvial deposits of limited extent occur in the middle reaches of the main streams and their tributaries. Wells can be expected to yield supplies suitable for stock watering, domestic use and limited irrigation. However there is doubt as to the ability of such wells to maintain yields in excess of 1,000 gallons per hour through dry spells, because of the steep gradients of most of the streams, and the resulting tendency of water levels in the alluvium to fluctuate markedly with seasonal conditions.

The main areas of alluvial flats occur in the vicinity of Murwillumbah and thence downstream to Tweed Heads, and near Mullumbimby on the Brunswick River. Both rivers are tidal throughout the length of these flats, and it seems likely that the alluvium is, at least partly, of estuarine origin. The occurrence of marine shells in some of the strata encountered in wells supports this contention. Other areas of alluvial flats occur on the minor coastal streams, and all are low lying with extensive systems of drains.

Broad natural levees are developed along the banks of the streams and the best groundwater supplies are normally obtained from wells sited on these levees. Behind the levees there is a gradual deterioration in the water quality, and towards the coast the groundwater may become quite brackish. There is also a tendency for the salt content to increase with depth.

Yields are very variable, the highest recorded being 2,000 gallons per hour from a shallow (11 feet deep) well upstream of Murwillumbah. It is considered possible that supplies suitable for limited irrigation could be obtained, particularly at the upstream ends of the main flats, but there has been little recourse to groundwater supplies because of the good rainfall which is normally experienced.

Along the coast behind the beaches there are areas of sand which have been built up either as raised beaches or by wind action. The vegetation is mainly low scrub, giving the impression of poor heathland. Some parts are low lying and swampy and contain accumulations of decayed vegetable matter. Such conditions often produce peaty acid water, and the occurrence of sulphuretted hydrogen is not unusual, this being due to the presence of sulphide producing bacteria in anaerobic conditions.

These sand beds occur over quite a large total area, but individually they are of limited size. Locally however, single spearpoints provide useful supplies for stock, domestic and garden use and it is possible to obtain worthwhile irrigation supplies from batteries of spearpoints. One such installation near Tweed Heads is reputed to be capable of yielding 8,000 gallons per hour of good quality water.

5. STREAM GAUGING STATIONS.

Streamflow results from the precipitation of atmospheric moisture, which is carried over the land masses by weather systems. After subtracting losses due to evaporation, transpiration and deep seepage from the total amount of precipitation, the remainder which appears as flow in stream channels is normally termed runoff.

If a complete understanding existed of the various factors involved in the rainfall runoff process it would be possible to estimate runoff, or streamflow, by analysis of rainfall records. However, despite intensive research, no reliable method has yet been devised of estimating streamflows.

from rainfall in the absence of any streamflow information. Nevertheless various approximate methods are currently employed to extend streamflow records using concurrent streamflow and rainfall information. Obviously, this method necessitates the collection of streamflow records over a lengthy period if satisfactory results are to be obtained.

It is therefore apparent that the most essential element in water resources investigations is streamflow measurement.

Streamflow measurement involves two basic steps, the first being the measurement of river level, or gauge height, in relation to a constant datum and the second being the correlation of the measured height with stream discharge.

River levels are generally obtained by visual observation of the level of the water surface on a graduated scale or staff gauge which is usually erected either on the stream bank or on bridge piers. As these measurements only indicate the water level at the time of readings it is desirable to record the continuous variation of river height between the times of actual readings. This may be obtained by means of a continuous record which is produced by a float or pressure actuated recorder.

Current meters are employed to measure flow velocities across stream channels and this data is used in conjunction with survey methods to compute streamflows in cubic feet per second or cusecs.

Graphical relations are established between gauge heights and measured discharges for each stream gauging station and, in stable channels, these relations tend to remain relatively constant. These relationships are used to estimate streamflows during periods when gauge heights, but not measured discharges, are obtained at the streamflow station thereby allowing continuous gauge height records to be converted to continuous streamflow records.

Streamflows are normally given in terms of cusecs, one cusec flowing for one day being approximately equal to two acre feet or the volume of water which would cover one acre to a depth of two feet. Another unit which is frequently employed in catchment yield investigations is inches depth over the area of the catchment.

Although regular measurement of streamflows in the Tweed Valley did not commence until 1947 flood levels at Murwillumbah were recorded from 1928 to

date. These records have been utilised to indicate the general pattern of streamflow variation, particularly under flood conditions, during earlier years.

In 1947 gauging stations were installed on the North Arm at Boat Harbour and on the Middle Arm at Eungella. Further stations were installed on the South Arm at Braeside in 1951 and at Kunghur in 1954. In 1957 the original station at Boat Harbour was discontinued in lieu of a more suitable location a short distance upstream, this latter station being designated Boat Harbour II. Streamflow records for the gauging station on the Brunswick River at Durrumbul commenced in 1954.

The density of the stations in the combined Tweed-Brunswick River Valleys is relatively high in comparison with the remainder of the State, being over 9 stations per 1,000 square miles. Corresponding densities for coastal New South Wales and Australia are 4.0 and 0.5 stations respectively.

The five gauging stations currently in operation in the Tweed-Brunswick Valleys are located so as to measure the runoff from more than half of the total catchment and thereby provide reasonable data for use in the investigation of water resource proposals.

It is intended to expand the existing network to eleven stations so as to provide adequate basic data for all types of water resources investigations likely to be required for the valleys.

As extensive areas of the Tweed and Brunswick Valleys are subject to tidal influence it is not possible to adequately measure runoff from the total area of the valleys. It is estimated that runoffs could be measured from not more than about two thirds of the total catchment and therefore the proposed network of eleven stations should provide an adequate coverage of streamflows in the valleys for normal water resources purposes.

The locations of existing and discontinued streamflow stations in the Tweed and Brunswick Valleys are shown in Figure 17 and relevant operational details of each station are given in Table 5.

TABLE 5

Stream	Station	Catchment Area (Sq.Miles)	Type of Gauging Station	Period of Operation
Middle Arm (Tweed River)	Eungella	82	Float recorder	1947 to date
South Arm (Tweed River)	Braeside	115	Staff gauge	1951 to date
North Arm (Tweed River)	Boat Harbour *	48	Staff gauge	1947 to 1957
North Arm (Tweed River)	Boat Harbour II	43	Float recorder	1957 to date
South Arm (Tweed River)	Kunghur	19	Pressure recorder	1954 to date
Brunswick River	Durrumbul	13	Staff gauge	1954 to date

* Discontinued Station.

6. CATCHMENT YIELDS.

The regular measurement of streamflows within the Tweed and Brunswick Valleys has provided a considerable volume of hydrologic data for estimation of water yields from various sub-catchments in the valleys. The water yield from natural catchments varies considerably, being dependent on factors such as rainfall, topography, geology and vegetation in addition to the main factor of catchment area.

The relationship between these factors and the long term water yield of a catchment is extremely complex and therefore the continuous measurement of streamflow over a period of many years is a desirable prerequisite for the estimation of catchment yields.

The stream gauging station in the Tweed-Brunswick Valleys with the longest period of record is that located on the Middle Arm of the Tweed River at Eungella. Over the eighteen year period commencing in 1948 the average flow of the Middle Arm at this station has been 159,000 acre feet per annum which is equivalent to an average rate of flow of 218 cusecs (81,500 gallons per minute).

The next longest continuous period of streamflow record in the valleys was obtained at the gauging station located on the South Arm of the Tweed River at Braeside. The average annual flow at this station over a period of

thirteen complete years was 173,000 acre feet which corresponds to an average discharge of 237 cusecs (88,600 gallons per minute).

Records of streamflow for the North Arm of the Tweed River at Boat Harbour and Boat Harbour II indicate that the average flows have been at the rates of 173 cusecs (64,700 gallons per minute) and 113 cusecs (42,300 gallons per minute) over respective periods of nine and seven years. The different average discharges at these stations can be attributed, in addition to the difference in catchment areas, to variations in climatic conditions over the respective periods of record.

On the South Arm of the Tweed River at Kunghur the average annual flow over a period of three complete years of record has been 29,700 acre feet which is equivalent to 41 cusecs (15,300 gallons per minute).

Streamflow records for the Brunswick River at Durrumbul indicate that over the eight complete years of record available for this station the average annual yield has been 43,200 acre feet corresponding to an average flow of 59 cusecs (22,100 gallons per minute).

To enable comparisons to be made of the yields from various streams over the respective periods of records, the average annual yields for the six gauging stations in the Tweed and Brunswick Valleys are listed in Table 6.

TABLE 6.

Stream	Station	Complete Years of Computed Record	Average Annual Yield over Period of Complete Years of Record		
			Acre Feet Per Annum	Cusecs	Gallons Per Minute
Middle Arm (Tweed River)	Eungella	18	159,000	218	81,500
South Arm (Tweed River)	Braeside	13	173,000	237	88,600
North Arm (Tweed River)	Boat Harbour *	9	126,000	173	64,700
North Arm (Tweed River)	Boat Harbour II	7	82,300	113	42,300
South Arm (Tweed River)	Kunghur	3	29,700	41	15,300
Brunswick River	Durrumbul	8	43,200	59	22,100

* Discontinued Station.

Details of monthly maximum, minimum and mean flows for the gauging stations listed in Table 6 are tabulated in Appendices 18 to 23 inclusive.

7. AVERAGE ANNUAL RUNOFF.

In comparison with many other valleys in the State, streamflow records for the Tweed and Brunswick Valleys are of relatively short durations. The current estimates of the long term average annual surface water resources of the valleys has therefore been based on approximate streamflow correlations with the nearby Clarence River Valley for which streamflow records are available from 1922.

These correlations indicate that the average annual surface water resources of the Tweed and Brunswick Valleys are 360,000 acre feet and 200,000 acre feet respectively.

On a square mile of catchment area basis the runoff of the Tweed Valley is more than double the average runoff for coastal New South Wales and nearly nine times the average for the State. As the average runoff per square mile for the Brunswick Valley is some 25 percent greater than the Tweed Valley the comparisons are even more marked; the runoff per unit area of the Brunswick Valley being over 2½ times that of coastal New South Wales and over eleven times the average for the total area of the State.

In the following Table 7 the estimated long term average annual runoffs of the Tweed and Brunswick Valleys are compared with the corresponding averages for the adjoining Richmond and Clarence Valleys.

TABLE 7.

River Valley	Catchment Area in Square Miles	Estimated Long Term Average Annual Runoff		
		Acre Feet	Acre Feet per Square Mile	Percentage Runoff
Tweed	430	360,000	840	24%
Brunswick	190	200,000	1,050	29%
Richmond	2,680	1,600,000	600	22%
Clarence	8,750	4,000,000	460	20%

Previous estimates of the long term average annual runoffs for the Tweed and Brunswick Valleys were given in the 1963 publication "Review of Australia's Water Resources" as 390,000 acre feet and 220,000 acre feet respectively. These estimates were based on periods of records covering thirteen and four years respectively for the Tweed and Brunswick Valleys. However the current estimates are based on respective periods of eighteen and eight years and therefore are considered to be more reliable than the earlier assessments.

Whilst the percentage runoffs for the four valleys listed in Table 7 are of similar orders there is a definite increase with reduction in catchment area. The yields per square mile also follow a similar trend, the highest runoff occurring from the smallest Brunswick Valley and the lowest runoff from the extensive Clarence Valley. Such variations are in accord with hydrologic experience; the yield per square mile normally decreases with increases in catchment area in most valleys in New South Wales.

8. VARIABILITY OF STREAMFLOWS.

Available records for the stream gauging stations in the Tweed and Brunswick Valleys indicate that the surface water resources of these valleys, in common with the majority of streams in the State, exhibit a high degree of variability. However as the longest period of record at any streamflow station in either of the valleys is only eighteen years, it is likely that the variability illustrated by the available records will become considerably greater as the period of data collection increases.

Annual flows of the Middle Arm at Eungella over a period of 18 years have varied from 16 percent to over 200 percent of the mean annual flow. Similar variations are shown by the streamflow records for the South Arm at Braeside and the North Arm at Boat Harbour, the minimum annual flows being about 20 percent and the maximum annual flows about 220 percent of the mean.

Variations in annual flows of the Brunswick River at Durrumbul have not been quite as marked as in the Tweed Valley. Over a period of eight complete years the annual streamflows at Durrumbul have varied from 25 percent to nearly 200 percent of the mean annual flow.

As expected the monthly variations in streamflows exhibit a much greater variability than the annual discharges. The minimum monthly flows recorded at the stations at Eungella, Braeside, Boat Harbour and Durrumbul are all less than one percent of the mean monthly flow and the recorded maximum monthly flows at all of these stations are about 1,000 percent of the mean.

Graphs depicting monthly streamflow variations for the Middle Arm at Eungella, the North Arm at Boat Harbour II and the Brunswick River at Durrumbul are appended at Figure 18. Similar graphs of monthly streamflows for the South Arm of the Tweed River at Kunghur and Braeside are shown at Figure 19. These figures illustrate the high degree of variability, both in magnitude and sequence, of streamflows in the valleys and do not indicate that any regular periodic trend occurs in runoff.

Mean monthly rainfall in the Tweed and Brunswick Valleys shows a marked variation throughout the year with high falls occurring in the summer months from January to March and the lowest falls in the months of August and September. The average monthly rainfalls for Limpinwood, Murwillumbah and Mullumbimby are shown at Figure 20. Rainfall recorded at Limpinwood can be considered representative of the upper Tweed Catchment, Murwillumbah representative of the lower Tweed Valley and the station at Mullumbimby representative of the Brunswick Valley.

As indicated at Figure 20 rainfall at all of the selected stations shows a gradual variation between the periods of high and low rainfall. This seasonal variation which is characteristic of the rainfall of the upper North Coast of New South Wales, is particularly marked at Limpinwood where the maximum average monthly rainfall of 1,070 points in March is nearly five times the minimum average monthly rainfall in September of 221 points.

Mean monthly streamflows in the Tweed and Brunswick Valleys exhibit distributions throughout the year similar to the average monthly rainfalls. The distributions of mean monthly flows for the streamflow stations located on the Middle Arm of the Tweed River at Eungella and on the Brunswick River at Durrumbul are shown at Figure 21.

The highest average monthly flows recorded at Eungella occurred in March and the lowest in September, the ratio of the maximum to the minimum mean monthly flow being about 15 to 1. Whilst the records indicate that

discharges during the month of July tend to be higher than expected from the rainfall pattern this minor variation is attributed to the occurrence of minor floods during July and the relatively short period of record in comparison with rainfall records.

Mean monthly discharges of the Brunswick River at Durrumbul follow a generally similar pattern to the rainfall recorded at Mullumbimby, the highest flows occurring in January to March and the lowest flows in September and October. However the monthly distribution as shown at Figure 21 does not indicate a gradual variation throughout the year. It is likely that the somewhat uneven distribution of monthly flows at Durrumbul as indicated at Figure 21 is partially due to the relatively short period of available record at this station.

As mean monthly discharges are computed by averaging daily and instantaneous flows over each month, the variability of instantaneous flows at any station cannot be less than monthly flows and is generally much greater. Extreme variability of instantaneous flows is exhibited by all stations in the Tweed and Brunswick Valleys.

Major floods occurred in the valleys in February 1954 and February 1956. An indication of the variation in recorded maximum, minimum and mean instantaneous discharges at stations in the Tweed and Brunswick Valleys is given at Table 8.

TABLE 8.

Stream	Station	Period of Computed Records	Recorded Discharges		
			Maximum	Minimum	Mean
Middle Arm (Tweed River)	Eungella	1947 to date	50,000 cusecs (18,700,000 g.p.m.)	0	218 cusecs (81,500 g.p.m.)
South Arm (Tweed River)	Braeside	1951 to date	130,000 cusecs (49,000,000 g.p.m.)	0.2 (75 g.p.m.)	237 cusecs (88,600 g.p.m.)
North Arm (Tweed River)	Boat Harbour	1947 to 1957	41,300 cusecs (15,000,000 g.p.m.)	0	173 cusecs (64,600 g.p.m.)
North Arm (Tweed River)	Boat Harbour II	1957 to date	26,500 cusecs (9,900,000 g.p.m.)	0	113 cusecs (42,300 g.p.m.)
South Arm (Tweed River)	Kunghur	1954 to date	10,200 cusecs (3,800,000 g.p.m.)	0.1 (37 g.p.m.)	41 cusecs (15,300 g.p.m.)
Brunswick River	Durrumbul	1954 to date	5,700 cusecs (2,100,000 g.p.m.)	0.6 cusecs (225 g.p.m.)	59 cusecs (22,100 g.p.m.)

9. PERSISTENCE OF STREAMFLOWS.

Streamflows in the Tweed and Brunswick Valleys continue for extended periods of time after the cessation of rainfall. This indicates that groundwater flow into the stream channels is relatively high and persists for substantial periods.

An indication of the persistence of flows in any stream can be obtained from examination of flow duration curves. These curves show the percentages of time that discharges varied from the minimum flow up to the maximum flow or any other selected intermediate discharge. A flow duration curve may show either the percentages of time that discharges were equal to or greater than any specific flow or alternatively the percentages of time that flows were equal to or less than any selected discharge. In this report all flow duration curves and flow duration statistics indicate the percentages of time that flows were equal to or greater than any selected flow.

The flow duration curve for the North Arm of the Tweed River at Boat Harbour II is given at Figure 22 and the frequencies of flow at this station are shown in the following Table 9.

TABLE 9.

% of Time Flow Equalled or Exceeded	Corresponding Flows	
	Cusecs	Gals./Min.
10	190	71,000
30	67	25,000
50	38	14,200
70	21	7,900
90	6.5	2,400
98	0	0
100	0	0

The duration curve of discharge for the South Arm (Tweed River) at Braeside is appended at Figure 23 and flow frequency statistics for this station, applicable to a period of record of fourteen years, are shown in the following Table 10.

TABLE 10.

% of Time Flow Equalled or Exceeded	Corresponding Flows	
	Cusecs	Gals./Min.
20	170	63,600
30	98	36,700
50	46	17,200
70	24	9,000
90	6.5	2,400
100	0	0

The flow duration curve for the Middle Arm of the Tweed River at Eungella, applicable to a period of eighteen years of record commencing in 1947, is appended at Figure 24. Flow frequency statistics for this station are given in Table 11.

TABLE 11.

% of Time Flow Equalled or Exceeded	Corresponding Flows	
	Cusecs	Gals./Min.
10	350	131,000
30	90	33,700
50	43	16,100
70	21	7,900
90	6	2,200
100	0	0

The flow duration curve for the South Arm of the Tweed River at Kunghur, computed for an overall period of record of eleven years, is appended at Figure 25. Flow frequency data for this station is given in the following Table 12.

TABLE 12.

% of Time Flow Equalled or Exceeded	Corresponding Flows	
	Cusecs	Gals./Min.
10	53	19,800
30	18	6,700
50	10	3,700
70	4.5	1,700
90	1.5	560
100	0	0

The duration curve of discharge for the Brunswick River at Durrumbul is given at Figure 26. Flow frequency statistics, applicable to an overall period of eleven years of record commencing in 1954, are shown in Table 13.

TABLE 13.

% of Time Flow Equalled or Exceeded	Corresponding Flows	
	Cusecs	Gals./Min.
10	108	40,400
30	30	11,200
50	13	4,900
70	5.5	2,100
90	2.5	940
100	0	0

For comparative purposes flow duration curves for the foregoing stations have been replotted in the form of duration curves of flow per square mile and are shown at Figure 27.

Reference to Figure 27 shows that based on available records the station located on the Brunswick River at Durrumbul exhibits the best flow persistence of the five stations in the valleys. As the station at Durrumbul has the least catchment area (13 square miles) of all the stations and as yields normally increase as the catchment area is reduced this result is to be expected.

However the duration curve of flow per square mile for the North Arm of the Tweed River at Boat Harbour II exhibits a flow persistence in the low range (below 0.5 cusecs per square mile) far greater than any of the other tributaries of the Tweed River and not much less than that of the station on the Brunswick River at Durrumbul. The contribution to streamflow in the North Arm from groundwater sources therefore appears to be much greater than in other sections of the Tweed Valley.

10. OCCURRENCE OF FLOODING

The Tweed and Brunswick Valleys have been subject to frequent severe floods during the past forty years. Prior to January 1964, the critical height of the Tweed River at Murwillumbah or the level at which overbank flow commenced in the southern section of the town was fourteen feet on the Murwillumbah Power Station gauge. However as a result of levees, construction of which were commenced in January 1964 and completed in July 1965, the critical flood height at Murwillumbah has been increased to fifteen feet on the Power Station gauge.

Since 1928 eighteen floods have exceeded fourteen feet on the Murwillumbah gauge. However only one, that of June 1967 has occurred since the construction of the levees. The highest recorded flood occurred in February 1954 when a peak height of 19 feet 10 inches was reached.

Of the eighteen floods which have occurred since 1928, eleven have occurred during the months of January to March inclusive, the month with the highest flood frequency being February when six severe floods occurred. Over the period of available record no severe floods, exceeding the critical height at Murwillumbah, have occurred during the months from July to December inclusive. The distribution of floods exceeding fourteen feet on the Murwillumbah Power Station

gauge over the period from January 1929 to June 1967 inclusive is appended at Figure 28.

The highest recorded flood on the North Arm of the Tweed River at Boat Harbour (stations I and II) occurred in February 1956 when a peak discharge of 41,300 cusecs was recorded. The highest peak flow on the South Arm of the Tweed River at Braeside of 130,000 cusecs also occurred during this flood.

The maximum recorded peak flow on the Middle Arm of the Tweed River at Eungella of 50,000 cusecs occurred during the major storm of Feburary 1954 when low lying areas in the town of Murwillumbah were inundated. However local information indicates that the February 1945 flood at this station was even higher than in 1954. On the Brunswick River at Durrumbul the maximum recorded flow occurred in February 1961 when a peak discharge of 5,700 cusecs was recorded. However flood level information is not available at this station for floods prior to November 1954 and it is likely that earlier flood data would substantially exceed that recorded in February 1961.

Details of the recorded maximum discharges at Boat Harbour, Eungella, Braeside and Durrumbul are given in Table 14.

TABLE 14.

Stream	Station	Catchment Area (Sq.Miles)	Peak Discharge		
			Date	(Cusecs)	(Cusecs/ Sq.Mile)
Tweed River North Arm	Boat Harbour	48	Feb. 1956	41,300	860
Tweed River Middle Arm	Eungella	82	Feb. 1954	50,000	610
Tweed River South Arm	Braeside	115	Feb. 1956	130,000	1,130
Brunswick River	Durrumbul	13	Feb. 1961	5,700	438

Reference to Table 14 indicates that the maximum runoff per square mile increased in proportion to catchment area whereas it can normally be expected that the highest runoff per square mile would occur from the smallest catchment. This variation from the normal can be attributed to variations in rainfall intensity and distribution over the various catchments during each particular flood event.

The June 1967 Flood.

Heavy rainfall occurred over the Tweed and Brunswick Valleys during June 1967. At Murwillumbah the monthly total of more than 29 inches was about 45 percent of the average annual rainfall.

The heaviest rainfalls were recorded during the period from 10th to 14th June in association with the occurrence of a tropical depression in the vicinity of the two valleys. In this period, a total rainfall of about 18 inches was recorded at Murwillumbah whilst at Tweed Heads and Mullumbimby about 13 inches were received. As a result of these rains, floods or substantial rises occurred in all streams in the two valleys on 12th June 1967.

Preliminary information indicates that on the North Arm of the Tweed River at Boat Harbour a peak discharge of 28,000 cusecs was reached. This flow is the highest that has occurred at the station since it was relocated at its current position in 1957. However it is considerably less than the peak flow of 41,300 cusecs which occurred at the original station in February 1956.

Substantial flows also occurred in the Middle and South Arms of the Tweed River at Eungella and Braeside respectively. At Eungella the estimated peak discharge of 41,000 cusecs was only about 9,000 cusecs less than the peak of the February 1954 flood, which is the highest that has occurred at the station since its establishment in 1947. Although the estimated peak discharge of 34,000 cusecs at Braeside in the June 1967 flood is the highest recorded at the station since May 1963, it is considerably less than the February 1956 peak discharge of 130,000 cusecs.

Flooding also occurred in the Brunswick River in June 1967 and at Durrumbul the estimated peak discharge of 3,600 cusecs in this flood is the highest flow recorded since February 1961.

A more direct comparison of the peak flows at Boat Harbour, Eungella, Braeside and Durrumbul in the June 1967 flood can be made on a catchment area basis. The highest peak flow per square mile of catchment area at these stations occurred at Boat Harbour where the peak discharge was equivalent to 650 cusecs per square mile compared with about 500 cusecs per square mile at Eungella, 300 cusecs per square mile at Braeside and 280 cusecs per square mile at Durrumbul.

The Tweed River at Murwillumbah reached its peak on 12th June 1967 at a height of 16 feet 2½ inches on the Power Station gauge. This flood, which was the first to overtop the levee system at Murwillumbah since its construction in July 1965, is the seventh highest to occur since 1928.

11. DROUGHT PERIODS

The term "drought" does not appear to have any universally accepted definition. In general it is considered as a period of rainfall deficiency at any location.

An area is considered to be under drought conditions when the soil moisture is insufficient for the requirements of the majority of crops during the growing season or when water shortages for domestic, industrial or municipal purposes are experienced. A diminished or exhausted rate of streamflow is normally a prime indicator of drought conditions.

A graph depicting annual rainfalls recorded at Murwillumbah and Mullumbimby the former being considered to be representative of the general climatic conditions in the Tweed Valley and the latter representative of the Brunswick Valley, is appended at Figure 29. This graph shows that the lowest calendar year rainfalls at Murwillumbah and Mullumbimby were 29.20 inches and 26.46 inches in 1902 and 1915 respectively.

The most prolonged period of below average falls occurred in the period from 1910 to 1920 and this appears to be the most critical period for the Tweed and Brunswick Valleys. As shown at Figure 29 other periods of below average rainfall have occurred, particularly from 1939 to 1944; however these periods are of shorter duration and have been relieved by the occurrence of above average rainfalls in following years.

Since the commencement of regular recording of streamflows in the Tweed and Brunswick Valleys in June 1947 the minimum flow over any twelve month period at the majority of stations occurred from July 1964 to June 1965. However on the South Arm of the Tweed River at Braeside the minimum twelve monthly flow occurred from April 1957 to March 1958 inclusive. The minimum twelve monthly flows and their percentages of the respective mean annual flows are shown in Table 15.

TABLE 15.

Stream	Station	Minimum Twelve Monthly Flow		
		Period	Acre Feet	Percentage of Mean Annual Flow
Tweed River North Arm	Boat Harbour (Stations I and II)	July 1964 to June 1965	8,100	10%
Tweed River Middle Arm	Eungella	July 1964 to June 1965	12,700	8%
Tweed River South Arm	Braeside	April 1957 to March 1958	17,800	10%
Brunswick River	Durrumbul	July 1964 to June 1965	2,800	7%

At the gauging station located on the North Arm of the Tweed River at Boat Harbour there have been a number of periods of zero flow experienced since June 1947, the most prolonged being in the months of January to March 1952 when no flow occurred on 57 days. However the total percentage of time during which no flow occurred at this station is equivalent to only 2 percent.

Since the commencement of regular recording of flows on the Middle Arm of the Tweed River at Eungella in June 1947 there have been only 20 days during which no flow was experienced. At the stations on the South Arm of the Tweed River at Braeside and on the Brunswick River at Durrumbul there have been no periods of zero flow since the commencement of records. The minimum flow recorded at both of these stations was 0.2 cusecs, this flow having occurred at Braeside for three day periods in February 1952 and April 1965 and at Durrumbul for 13 days in October 1960.

12. THE 1964-1965 DROUGHT

From June 1964 to May 1965 the Tweed and Brunswick River Valleys, in common with many other valleys in the State, experienced a period of extremely low rainfall. Over this twelve month period the total rainfall recorded at Tweed Heads was only 27.59 inches or only 15 percent more than the lowest twelve monthly rainfall since 1887, the minimum being 24.00 inches which occurred from October 1901 to September 1902.

At Murwillumbah the total rainfall from June 1964 to May 1965 was only 31.13 inches which is the second lowest on record at this location since 1890. At Mullumbimby the twelve monthly rainfall was only 34.88 inches which is also the second lowest on record at this station since 1899. The minimum twelve

monthly rainfall recorded at Byron Bay since 1893 was 37.76 inches, from January to December 1932, and the total rainfall from June 1964 to May 1965 exceeded this by only 10 percent.

The recorded monthly rainfalls at Tweed Heads, Murwillumbah, Mullumbimby and Byron Bay over the period from June 1964 to June 1967 are shown in Table 16.

TABLE 16.

Month	Rainfall (Points)			
	Tweed Heads	Murwillumbah	Mullumbimby	Byron Bay
June 1964	123	91	89	99
July 1964	111	182	177	126
August 1964	163	83	73	138
September 1964	238	249	165	293
October 1964	200	192	301	218
November 1964	136	390	780	563
December 1964	253	349	401	325
January 1965	728	693	286	387
February 1965	214	269	300	763
March 1965	100	54	84	203
April 1965	295	266	595	574
May 1965	198	295	237	424
June 1965	873	810	1,047	1,233
July 1965	2,120	1,379	1,101	937
August 1965	447	436	384	340
September 1965	357	161	191	267
October 1965	148	165	415	353
November 1965	162	176	191	181
December 1965	1,630	1,029	1,054	906
January 1966	64	76	98	189
February 1966	481	669	745	659
March 1966	248	150	334	199
April 1966	631	352	477	773
May 1966	350	174	260	448
June 1966	1,208	779	759	491
July 1966	149	19	54	86
August 1966	659	579	606	668
September 1966	295	207	138	175
October 1966	446	353	563	418
November 1966	413	514	785	379
December 1966	512	351	582	536
January 1967	1,361	1,194	894	909
February 1967	498	401	489	312
March 1967	1,573	1,672	1,671	2,080
April 1967	479	430	750	618
May 1967	864	511	634	587
June 1967	2,498	2,979	2,371	1,904
Totals June 1964 to June 1967	21,225	18,679	20,081	19,761
Totals June 1964 to May 1965	2,759	3,113	3,488	4,113

As indicated in Table 16 the drought conditions in the Tweed and Brunswick River Valleys were partially alleviated by the occurrence of above average rainfalls in June 1965 when an average of more than eight inches was recorded over the valleys. These rains were followed by further heavy falls in July 1965 when over twenty inches occurred at Tweed Heads and the average over the valleys exceeded ten inches.

The lowest recorded flows in the Tweed and Brunswick River Valleys over a twelve monthly period occurred in the 1957-58, 1960-61 and 1964-65 drought periods. The minimum twelve monthly flows at the stations at Eungella, Braeside and Durrumbul in each of these droughts are shown in Table 17 in acre feet and as percentages of mean annual flows.

TABLE 17.

Minimum Twelve Monthly Flows					
Eungella		Braeside		Durrumbul	
Period	Flow (Ac.Ft.)	Period	Flow (Ac.Ft.)	Period	Flow (Ac.Ft.)
July 1964- June 1965	12,700 8%	Apr. 1957- Mar. 1958	17,800 10%	July 1964- June 1965	2,800 6%
Apr. 1957- Mar. 1958	14,800 9%	July 1964- June 1965	18,300 11%	Apr. 1957- Mar. 1958	5,200 12%
Jan. 1960- Dec. 1960	25,700 16%	Jan. 1960- Dec. 1960	34,600 20%	Feb. 1960- Jan. 1961	15,600 36%

Table 17 indicates that at Eungella and Braeside similar minimum twelve monthly flows occurred in the 1957-1958 and 1964-1965 drought periods. However at Durrumbul in the Brunswick Valley the minimum twelve monthly flow in the 1957-1958 drought period was more than 80% greater than the minimum flow during the 1964-1965 drought.

The third most severe period during 1960-1961 cannot be regarded as a severe drought period as the twelve monthly flows at Eungella, Braeside and Durrumbul were equivalent to 16 percent, 20 percent and 36 percent of the respective mean annual flows.

All streams in the valleys experienced extremely low flows during the period from July 1964 to June 1965. A comparison of the minimum thirty day and sixty day flows at Boat Harbour, Eungella, Braeside and Durrumbul are given in Table 18.

TABLE 18.

Stream	Station	Minimum Total Flow During 1964/65 (Acre Feet)	
		30 Days	60 Days
Tweed River North Arm	Boat Harbour II	1.4 55	9.8 180
Tweed River Middle Arm	Eungella	48 174	510 552
Tweed River South Arm	Braeside	48 34	345 174
Brunswick River	Durrumbul	28	68

The 1964-1965 drought ended with the occurrence of medium floods in mid July 1965 when maximum flows of over 26,000 cusecs were recorded at both Boat Harbour II and Eungella. As previously indicated in Table 14 the peak flow at Boat Harbour II was the highest since records commenced in April 1957.

On the South Arm of the Tweed River peak flows during July 1965 were about 3,900 cusecs and 18,800 cusecs at Kunghur and Braeside respectively. At Durrumbul on the Brunswick River the peak flow during this flood was 3,200 cusecs which was the highest flow recorded at this station since May 1963.

A further period of low rainfall was experienced in many areas of the Tweed and Brunswick Valleys from August to November 1965. However, in the period from December 1965 to June 1967 inclusive, rainfall has been adequate for most agricultural purposes.

13. WATER REQUIREMENTS FOR CURRENT DEVELOPMENT.

Intensive dairying and the production of sugar cane and bananas are the main rural activities in the Tweed and Brunswick Valleys. Secondary rural industries are pig-raising and the growing of tropical fruits.

The area authorised for irrigation by license under the Water Act has increased from 51 acres at June 1944 to 1,982 acres at June 1966 and the total number of irrigation licenses has increased from 8 in 1944 to 208 in 1966. The variation in total number of irrigation licenses and corresponding areas over the twenty-two year period from 1944 to 1966 is indicated at Figure 30.

The foregoing licenses and areas are applicable to the total catchment of the Tweed and Brunswick Valleys and include the intermediate catchments of Cudgera and Cudgen Creeks.

The variation in the total area authorised for irrigation increased at a relatively constant rate of about 50 acres per year from June 1944 to June 1954 at which date a total area of about 520 acres was licensed. However since 1954 the overall area has increased at an average rate of more than 120 acres per annum although the data available from 1964 to date indicates that this rate is lessening.

The average irrigable area applicable to each license has increased from about 6½ acres at June 1944 to about 9½ acres at June 1966.

At the end of June 1966 there was a total of 24 licenses in the valleys for the diversion of up to 8,134 gallons per minute for industrial and town and stock water supply purposes.

There are no major water conservation storages constructed in the valleys although the Tweed Shire Council has constructed a weir type barrage across the South Arm of the Tweed River for water supply to the town of Murwillumbah. The estimated storage upstream of the barrage is about 740 acre feet (200 million gallons) and the total capacity of the pumps which draw from this storage is about 13.5 cusecs (5,000 gallons per minute).

Water supply to the town of Tyalgum is obtained by means of pumping from the storage provided by a small weir on the Middle Arm of the Tweed River near the town. The amount of water obtained approximates 20,000 gallons per day (0.04 cusecs).

The Mullumbimby Municipal Council controls a relatively small hydro-electric and water supply storage on the headwaters of Wilson's Creek in the Richmond River Valley. Flows can be diverted by means of this scheme from Wilson's Creek to the Brunswick Valley at a maximum licensed rate of 20 cusecs (7,500 gallons per minute).

The capacity of the diversion storage is 30 million gallons which is equivalent to less than three days operation at the full licensed capacity and therefore the provision of flows by the scheme is restricted during periods of low flow.

The estimated maximum requirements in the Tweed and Brunswick Valleys under present conditions for irrigation under license, water supply and riparian usage (not including transmission losses) are given in Table 19.

TABLE 19.

Requirement	Tweed Valley (Acre Feet per Annum)	Brunswick Valley (Acre Feet per Annum)
Irrigation under license (2 feet per season per acre)	2,400	1,600
Town, commercial and stock water supplies	13,900	1,800
Riparian Usage	2,600	600
Totals	18,900	4,000

As indicated in Table 19 the demand for irrigation in the Tweed and Brunswick Valleys represents only about one sixth of the estimated maximum total demand exclusive of transmission losses. The distribution of the areas authorised for irrigation on the various tributaries in the valleys at 30th June, 1966 together with the estimated total demands (including town and industrial water supplies and riparian usage but excluding transmission losses) are given in Table 20.

TABLE 20

Stream	Area Authorised for Irrigation at 30th June 1966 (Acres)	Total Demand	
		Average Cusecs	Acre Feet Per Annum
Tweed River North Arm and tributaries	161	6.3	4,600
Tweed River Middle Arm and tributaries	175	1.8	1,300
Tweed River South Arm and tributaries	90	14.4	10,500
Bilumbil and Duroby Creeks	205	0.6	440
Piggabeen and Cobaki Creeks	103	0.3	220
Cudgera Creek and tributaries	66	0.2	150
Mooball Creek and tributaries	345	2.1	1,530
Cudgen Lake catchment	70	1.3	950
Brunswick River Main Arm	164	1.3	950
Brunswick River, North and South Arms	148	0.6	440
Miscellaneous tributaries	455	2.5	1,820
Totals	1,982	31.4	22,900

14. POSSIBLE IRRIGATION DEVELOPMENT

Although the Tweed and Brunswick Valleys are situated in an area of relatively high rainfall, requests have been made by local organisations for the construction of storages to supply irrigation water for development of the highly fertile lands, for stock and domestic supplies to rural areas and domestic and industrial supplies to towns in the valleys.

The primary use of irrigation water would be for the growing of pastures and fodder crops for dairying and beef cattle on the flats and for bananas, tropical fruit and vegetables on the higher red volcanic soils. Production from dairy herds is adversely affected by a shortage of green fodder in dry periods mainly during winter and spring. Continuity of output could be maintained if water supplies were available for the irrigation of appropriate areas on each farm.

Due to the relatively steep topography of the valleys the construction of farm dams has been somewhat limited. However the temporal pattern of rainfall is such that farm dams can be constructed economically in areas of suitable topography and it is anticipated that some water supplies for future development will be provided by these works.

With the exception of the Main Arm of the Tweed River where substantial areas of irrigable flats adjoin the stream, the valleys are narrow and the flats of limited extent.

Downstream of Murwillumbah there are extensive areas of flats devoted to dairying and the growing of sugar-cane. Much of this lower area is subject to inundation to varying depths in times of flood which normally restricts cultivation to the more elevated sections except where areas are protected by levees.

The Tweed River is subject to tidal influence and is saline to a distance of about five miles upstream of Murwillumbah. Unless a barrage is constructed near the mouth irrigation supplies along this section of river would have to be conveyed by pipeline. Supplies to properties above the tidal limit could be obtained by pumping from the streams.

Areas of potential irrigation from the Tweed River and its tributaries are listed in Table 21.

TABLE 21.

Stream	Approximate Area Suitable for Irrigation
Tweed River North Arm	900 acres
Tweed River Middle Arm	1,500 acres
Tweed River South Arm	900 acres
Doon Doon Creek	200 acres
Tweed River below tidal limit	10,500 acres
Total	14,000 acres

In the Brunswick Basin a total area of approximately 8,600 acres is considered suitable for development under irrigation. A dissection of this area to the various streams and tributaries within the basin is shown in Table 22.

TABLE 22

Stream	Approximate Area Suitable for Irrigation
Cudgen Creek and Tributaries	2,400 acres
Cudgera Creek and Tributaries	3,500 acres
Brunswick River - North Arm	750 acres
Brunswick River - Middle Arm	1,350 acres
Brunswick River - South Arm	600 acres
Total	8,600 acres

15. INVESTIGATION OF DAM SITES

A number of apparently good sites for storage dams exist on the several branches of the Tweed River above Murwillumbah. During 1941 sites were examined on the North, Middle and South Arms. However having regard to the then existing limited area authorised for irrigation and the availability of streamflow to meet the demand, the provision of storages was not considered to be justified.

In 1948 the Richmond-Tweed Flood Mitigation Committee considered, inter alia, proposals for the construction of flood mitigation storages on the North, Middle and South Arms of the Tweed River and on Doon Doon Creek. Details of these storage proposals, including their location, catchment areas, heights and capacities are indicated in Table 23.

TABLE 23

Stream	Dam Site	Catchment Area (Sq.Miles)	Approximate Height of Dam (Feet)	Estimated Capacity (Acre Feet)
Tweed River (North Arm)	Chillingham Dam Site	24	105	19,000
Tweed River (Middle Arm)	Rocky Cutting Dam Site	80	110	33,000
Tweed River (South Arm)	Terragon Dam Site	60	115	46,000
Doon Doon Creek	Doon Doon Creek Dam Site	23	100	17,000

Locations of the dam sites are shown at Figure 31.

The Richmond-Tweed Flood Mitigation Committee concluded that no further consideration should be given to providing flood relief by flood control dams at that stage in view of their high estimated costs and the disadvantage which would follow their construction by virtue of the relatively large area which would be submerged within the four storages (3,500 acres). Furthermore even though some flood reduction could be expected from construction of the storages, the Committee was of the opinion that the released floodwaters would obstruct the drainage of the downstream flats.

During September 1952 the Richmond-Tweed Regional Committee requested that arrangements be made for a full investigation to be carried out in connection with the proposal to construct a dam at Rocky Cutting on the Middle Arm of the Tweed River (See Table 23). The purpose of this proposal was to provide domestic, stock and irrigation requirements for the lower river as well as a water supply for the towns of Murwillumbah, Condong, Tumbulgum, Chinderah, Tweed Heads, Cudgen, Kingscliff and Fingal.

The maximum possible capacity of a dam on the Rocky Cutting site would be about 33,000 acre feet because of the existence of a low saddle; however it possesses the largest catchment area of the four sites examined by the Richmond-Tweed Flood Mitigation Committee, and would serve the largest area of irrigable land (12,000 acres) subject to the provision of works which would enable irrigation of the 10,000 acres along the tidal sections of river.

Inspections and limited surveys only have been carried out at the dam sites to date. In order to make an economic assessment of all sites it would be necessary to carry out topographical surveys, foundation drilling, location and testing of suitable construction materials and road relocation surveys.

Streamflow records indicate that the riparian and current irrigation requirements of landholders along the Tweed River as well as those of towns and villages could be largely satisfied by construction of a storage of 13,500 acre feet capacity on the Middle Arm at Rocky Cutting and a small storage of about 1,000 acre feet capacity on the North Arm at Chillingham. Natural flows in the South Arm and Doon Doon Creek are sufficient to supply estimated requirements from these streams except in severe dry periods.

Whilst no detailed investigations have yet been carried out of storage sites in the Brunswick Valley, available information indicates that suitable sites exist for storages which would provide an assured supply of water for likely irrigation development.

16. ACKNOWLEDGMENTS.

The Water Conservation and Irrigation Commission acknowledges the assistance provided by the Director, Bureau of Meteorology, in supplying the section on Climatic Features, the Rainfall Statistical Data and the Median Rainfall Maps for inclusion in this report; and by the New South Wales Department of Public Works in providing details of existing town water supplies.

CEDAR GLEN RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1918	566	286	179	334	176	46	35	209	29	135	313	272	2580
1919	49	116	779	130	795	62	35	87	12	167	44	160	2436
1920	874	189	252	279	159	259	445	171	277	461	298	N.R.	
1921	301	114		NO RECORDS		738	784	63	197	178	110	1662	
1922	N.R.	725	88	14	332	148	430	63	198	107	202	286	
1923	134	327	194	769	20	309	151	294	196	85	93	583	3155
1924	353	307	283	257	49	550	370	202	193	386	304	462	3716
1925	403	273	1222	168	543	676	69	187	117	82	795	387	4922
1926	260	38	82	145	277	413	89	117	120	120	112	926	2699
1927	1641	414	402	211	0	181	60	10	109	302	565	211	4106
1928	622	2281	127	1164	134	244	214	35	0	187	150	405	5563
1929	756	642	1108	578	30	800	65	148	50	332	125	232	4866
1930	620	315	397	335	690	715	69	91	117	602	143	158	4252
1931	241	1525	1106	430	305	84	170	94	104	86	550	412	5107
1932	58	241	165	565	213	55	53	63	276	275	225	230	2419
1933	1002	255	51	450	129	71	270	27	324	220	574	657	4030
1934	631	678	136	785	351	95	372	252	230	257	223	386	4396
1935	513	367	136	211	219	0	320	98	353	588	124	588	3517

CEDAR GLEN RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1936	370	282	557	70	281	176	183	26	78	164	210	546	2943
1937	179	230	595	111	37	271	160	268	45	447	444	814	3601
1938	992	428	380	284	701	28	197	175	89	281	305	230	4090
1939	373	156	1555	304	132	191	120	239	46	292	305	433	4146
1940	257	612	518	141	78	86	7	49	86	216	404	707	3161
1941	617	334	597	107	259	210	32	93	9	36	276	132	2702
1942	297	733	353	188	240	126	245	63	147	855	335	785	4367
1943	462	293	83	143	113	128	19	132	231	753	693	826	3876
1944	885	220	150	44	189	83	249	220	193	143	349	268	2993
1945	497	741	194	151	406	1021	314	190	223	66	509	220	4532
1946	846	572	1034	197	27	8	6	50	337	288	89	296	3750
1947	1711	229	1059	378	180	70	36	67	320	232	468	857	5607
1948	442	197	645	69	359	995	142	85	417	10	294	199	3854
1949	366	859	686	85	143	376	205	31	137	1257	244	265	4654
1950	500	1196	397	251	71	1701	875	106	95	469	607	325	6593
1951	1666	218	718	227	75	513	6	86	67	146	88	484	4294
1952	45	268	651	254	352	452	62	580	40	465	161	206	3536
1953	437	585	664	172	177	0	90	175	7	231	212	298	3048

CEDAR GLEN RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1954	163	3489	183	123	317	136	1032	259	226	575	300	180	6983
1955	236	153	1420	525	425	118	133	52	189	383	43	1041	4718
1956	551	1523	385	467	543	256	166	30	49	154	112	689	4925
1957	242	482	352	132	0	144	299	249	11	428	139	150	2628
1958	452	566	142	339	15	926	43	301	117	298	149	403	3751
1959	805	513	586	54	108	14	267	41	289	613	576	612	4478
1960	174	374	174	67	200	100	121	146	13	NO	RECORDS		
1961	335	843	145	305	141	206	178	227	169	677	610	689	4525
1962	682	339	506	238	64	62	865	263	176	196	134	995	4520

Appendix 1
Sheet 3

ROBERTS PLATEAU RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1917	1030	375	519	60	120	0	0	282	338	221	1270	594	4809
1918	810	421	840	530	453	42	57	351	167	17	352	296	4336
1919	65	88	1172	436	1388	205	63	120	18	153	66	324	4098
1920	1879	346	394	551				NO RECORDS					
1921	688	130	1453	714	287	976	1333	205	577	242	139	2069	8813
1922	410	1707	48	10	931	230	509	121	305	193	245	511	5220
1923	278	334	378	1695	36	451	456	540	240	101	126	888	5523
1924	112	240	82	465	0	867	1093	356	235	411	582	231	4674
1925	648	541	2961	451	755	1770	127	366	108	95	1022	429	9273
1926	492	23	242	401	677	664	164	159	266	133	153	1690	5064
1927	2690	478	767	349	6	242	76	38	253	345	1026	618	6888
1928	1191	3723	233	2472	338	338	405	143	0	208	130	486	9667
1929	1283	1138	1650	1096	83	1513	89	99	54	457	154	206	7822
1930	1824	578	574					NO RECORDS					
1931								NO RECORDS					
1932								NO RECORDS					
1933	1384	351	272	667	215	290	555	131	443	879	1112	720	7019
1934	1135	1179	250	1498	451	145	732	374	289	462	340	619	7474

ROBERTS PLATEAU RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1935	718	744	205	296	177	35	550	229	352	654	96	597	4653
1936	581	423	804	145	477	281	238	49	187	194	244	552	4175
1937	234	404	1270	188	65	359	346	406	48	492	664	656	5132
1938	1805	581	775	478	1254	92	285	276	130	323	347	75	6421
1939	447	302	2606	618	300	307	129	464	69	458	309	526	6535
1940	440	764	1049	235	119	178	16	72	165	206	418	1037	4699
1941	1007	412	648	200	466	273	71	53	22	53	401	187	3793
1942	322	1159	357	427	356	357	600	58	172	860	818	1307	6793
1943	610	482	111	226	162	190	31	209	416	724	961	1180	5302
1944	952	401	359	127	263	128	377	414	317	183	375	264	4160
1945	572	1017	428	274	510	1548	514	232	290	140	416	193	6134
1946	1406	1710	1949	340			NO	RECORDS				236	
1947	2885	591	995	295	392	78	65	105	399	250	539	859	7453
1948	533	263	1154	128	584	1360	196	81	383	90	439	323	5534
1949	402	974	1309	180	250	407	266	55	292	1187	310	228	5860
1950	930						NO	RECORDS					
1951							NO	RECORDS					
1952					506	638	114	732	93	565	277	205	

ROBERTS PLATEAU RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1953	689	935	1094				NO RECORDS					215	
1954	351	4241	345	199	548	242		NO RECORDS					
1955	342	417	1834	63	594	383	276	55	226	307	59	1025	5581
1956	1266	1407	768	546	975	458	249	77	78	193	131	761	6909
1957	449	744	368	42	10	301	289	249	22	373	272	252	3371
1958	492	501	450	465	98	1428	55	485	203	448	224	536	5385
1959	894	925	959	110	174	64	350	46	426	754	814	671	6187
1960							NO RECORDS						
1961							NO RECORDS						
1962							NO RECORDS						
1963	NO RECORDS		1990	398	NO RECORDS			277	181	267	577	586	

Appendix 3
Sheet 1

SPRINGBROOK RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1915	692	1470	125	149	975	138	334	422	144	22	160	536	5167
1916	714	1539	554	3480	524	437	180	289	949	1215	1697	1622	13200
1917	1078	1395	1768	346	257	83	45	309	758	183	3240	1226	10688
1918	2405	1002	1959	770	720	0	42	456	208	161	285	528	8536
1919	320	251	2342	841	2532	271	173	46	25	269	187	785	8042
1920	4145	1039	785	1172	876	653	1378	75	549	838	995	627	13132
1921	1989	535	3755	2057	742	1127	2190	271	1058	260	405	2228	16617
1922	957	3742	575	164	924	295	692	78	791	122	190	708	9238
1923	412	429	896	3386	50	358	415	583	291	103	94	970	7987
1924	835	1061	575	301	298	1664	1456	494	172	410	1163	618	9047
1925	1894	911	6087	962	1867	2519	76	548	113	233	1335	974	17519
1926	708	231	769	1198	856	1111	221	140	441	279	51	2537	8542
1927	6228	897	1852	706	19	391	73	32	766	598	2115	1566	15243
1928	2201	5337	732	3446	766	361	602	260	4	161	330	656	14856
1929	1592	1604	2185	1907	397	1664	153	184	113	1250	161	295	11505
1930	3032	1317	1538	971	2658	2762	290	482	150	1008	486	430	15124
1931	1181	4881	3516	1691	901	204	280	490	272	390	1225	1698	16729
1932	239	739	372	1147	1072	187	122	73	1176	619	903	159	6808

SPRINGBROOK RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1933	993	544	884	2080	391	555	1031	86	878	688	1500	1420	11050
1934	1156	2543	860	2417	2210	130	952	216	492	727	813	1204	13720
1935	774	1177	909	725	405	84	923	752	631	782	164	765	8091
1936	819	692	2331	365	1003	316	370	32	237	334	250	724	7473
1937	427	1842	3585	388	120	478	678	891	30	617	2952	919	12927
1938	3971	1844	2716	801	2400	556	503	359	117	685	381	141	14474
1939	1399	587	4332	1316	656	317	361	456	56	976	860	710	12026
1940	861	965	2947	628	352	604	22	483	198	456	359	1623	9498
1941	2293	1403	1722	1132	977	583	82	69	52	101	1373	325	10112
1942	459	4826	850	690	479	475	324	NO	RECORDS	1108	951	2950	
1943	1247	1363	741	550	521	208	33	240	663	888	1805	1934	10193
1944	2987	485	1372	136	366	260	933	581	483	126	1075	308	9112
1945	530	2140	889	1028	901	2932	1001	172	500	488	683	803	12067
1946	1208	3849	4591	1416	197	20	24	63	666	331	492	235	13092
1947	6646	2613	3214	1241	927	79	22	205	635	286	933	1503	18304
1948	1498	629	3357	885	1439	2266	157	360	1092	4	668	525	12880
1949	1109	1424	3597	455	495	593	352	69	385	1333	1158	333	11303
1950	2329	3974	2151	1010	151	2478	4316	418	653	1127	1275	1462	21344

SPRINGBROOK RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1951	4490	1310	2792	323	368	879	23	127	152	419	98	313	11294
1952	264	1138	1178	931	575	1091	263	1088	283	690	185	324	8010
1953	1838	4883	2403	340	225	0	103	440	190	636	227	406	11691
1954	1468	7038	696	291	1229	367	3231	505	799	1989	471	605	18689
1955	723	1526	4421	2572	2347	615	393	0	380	507	221	2606	16311
1956	2601	4644	3080	741	1422	864	160	48	127	175	170	1505	15537
1957	1806	1403	625	181	20	358	566	583	70	377	458	315	6762
1958	842	847	1098	1428	236	2485	29	739	508	471	314	1014	10011
1959	2123	2609	2922	491	507	249	663	201	702	886	1939	803	14095
1960	538	1424	1180	454	799	110	330	95	27	450	735	620	6762
1961	1533	2116	787	953	631	NR	432	422	592	1891	1841	1369	
1962	2698	966	1741	897	340	179	2313	1546	389	224	816	2961	15070
1963	2952	1165	3216	1225	2271	216	13	381	303	563	1012	1194	14511
1964	644	2081	2795	1379	766	77	331	164	610	409	645	367	10268

Appendix 4
Sheet 1

TALLEBUDGERA RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1899			NO RECORDS			387	1035	555	677	150	100	681	
1900	837	335	353	68	2021	514	915	99	440	31	383	233	6229
1901	377	680	1944	505	933	581	154	600	171	587	239	47	6818
1902	447	563	53	107	9	39	130	95	181	429	305	239	2597
1903	479	616	518	304	1444	253	1447	250	317	581	624	376	7209
1904	414	105	1416	1802	930	65	132	127	172	425	140	196	5924
1905	664	688	562	1488	680	72	20	92	120	449	338	516	5689
1906	766	1271	1495	137	1296	262	28	376	718	574	410	1199	8532
1907	1197	1033	1009	243	902	577	167	466	0	109	408	652	6763
1908	573	1157	2005	549	352	15	97	1139	153	115	440	434	7029
1909	192	501	283	688	100	238	301	234	393	418	510	772	4630
1910	1253	572	957	559	122	845	45	55	779	153	435	1100	6875
1911	1308	366	463	480	22	15	361	390	40	219	172	90	3926
1912	152	297	785	159	60	631	254	149	60	324	274	356	3501
1913	682	937	582	1110	792	551	580	0	350	25	130	510	6249
1914	200	534	804	129	425	530	322	214	168	517	408	559	4810
1915	575	812	0	150	589	55	272	285	170	0	338	185	3431
1916	470	828	170	1373	145	419	190	195	516	655	362	787	6110

Appendix 4
Sheet 2

TALLEBUDGERA RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1917	952	468	720	80	167	105	15	95	815	165	2304	940	6826
1918	1335	530	795	460	570	40	40	265	175	98	605	210	5123
1919	75	205	1000	615	2230	140	100	100	10	272	25	345	5117
1920	2135	485	500	530	445	640	980	160	505	319	680	630	8009
1921	1645	360	1764	1620	599	987	1381	84	698	221	522	1144	11025
1922	280	1834	417	0	589	112	981	73	478	135	42	260	5201
1923	222	263	319	1794	0	319	360	551	217	69	79	714	4907
1924	266	1497	213	257	155	923	926	231	178	234	641	140	5661
1925	1235	245	1518	344	950	525	55	339	0	98	896	1109	7314
1926	505	40	452	985	377	825	77	100	299	221	57	914	4852
1927	2410	244	1458	609	0	258	47	20	517	565	1268	857	8253
1928	1028	3279	424	2693	333	287	344	234	5	144	211	557	9539
1929	358	1042	1137	1138	263	632	55	85	88	465	208	225	5696
1930	987	326	615	702	1574	1391	99	270	140	319	234	330	6987
1931	630	2999	1588	934	581	142	198	247	85	204	603	1020	9231
1932	134	741	235	683	812	140	40	48	451	371	286	67	4008
1933	1208	356	332	1268	201	427	371	17	456	282	597	604	6119
1934	665	1232	187	1181	958	74	631	205	251	339	512	674	6909

Appendix 4
Sheet 3

TALLEBUDGERA RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1935	670	517	539	514	281	26	243	197	436	675	97	397	4592
1936	501	283	649	72	641	205	216	48	120	79	163	302	3279
1937	346	738	1725	250	5	411	243	370	26	505	1250	589	6458
1938	1082	921	818	501	1972	1056	193	153	39	281	175	51	7242
1939	529	144	2499	678	348	230	97	235	21	559	331	264	5935
1940	677	544	1256	178	84	263	0	310	111	128	360	1693	5604
1941	1300	381	1190	491	610	298	94	31	45	35	450	132	5057
1942	133	1919	206	354	233	396	369	111	21	700	617	1144	6203
1943	550	457	227	218	188	100	18	84	676	642	1114	1291	5565
1944	1350	110	414	100	250	143	646	302	185	99	280	106	3985
1945	278	643	623	629	342	1452	462	103	176	249	478	225	5660
1946	787	1220	1438	699	52	0	6	72	390	299	306	490	5759
1947	2520	1612	1502	802	442	25	29	188	343	172	633	759	9027
1948	997	300	1377	597	626	1531	95	219	661	0	474	102	6979
1949	824	1008	1309	193	213	441	215	21	171	842	193	169	5599
1950	655	1693	889	537	38	949	1622	325	137	330	405	357	7937
1951	2611	455	1094	128	295	867	0	72	118	190	41	223	6094
1952	67	352	1242	701	513	1408	179	503	174	388	106	256	5889

Appendix 4
Sheet 4

TALLEBUDGERA RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1953	996	3286	1254	116	162	0	59	313	61	437	458	521	7663
1954	525	4389	460	229	1071	129	1023	338	401	1435	446	213	10659
1955	235	323	1584	780	1423	228	166	33	206	348	82	2319	7727
1956	806	3564	917	686	916	1834	88	14	90	96	89	908	10008
1957	711	800	226	205	13	127	432	620	36	167	323	390	4050
1958	594	566	727	887	117	1349	26	1001	214	138	210	445	6274
1959	697	904	1665	267	101	181	438	129	457	457	1005	497	6798
1960	597	753	642	268	468	81	124	55	15	282	517	372	4174
1961	647	1130	287	401	490	225	315	216	319	910	2064	1075	8079
1962	1135	1026	901	449	337	112	1359	1096	290	119	263	1216	8303
1963	918	545	1571	749	1363	87	0	289	145	311	420	711	7109
1964	436	1208	1027	559	510	87	159	109	259	165	237	410	5166

Appendix 5
Sheet 1

BANGALOW RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1900	186	450	317	157	1496	1066	832	47	399	23	243	410	5626
1901	187	859	1451	368	895	928	419	318	426	311	77	106	6345
1902	428	1095	429	790	194	195	220	234	79	387	273	271	4595
1903	415	503	664	265	1028	896	785	369	484	444	1039	277	7169
1904	NO RECORDS												
1905	501	529	549	1549	1450	91	35	131	87	424	180	589	6115
1906	469	1360	768	NO RECORDS									
1907	1022	915	1767	174	688	654	72	10	10	93	557	524	6486
	CLOSED AT END OF 1907. REOPENED 1937												
1937	NO RECORDS											374	
1938	1412	1077	1411	506	2665	518	770	442	132	149	236	83	9401
1939	530	185	2650	633	511	184	453	314	171	776	295	153	6855
1940	287	593	1089	325	468	465	125	434	27	254	594	1230	5891
1941	1128	1003	684	902	797	540	231	40	91	13	164	139	5732
1942	286	1588	439	641	367	229	398	68	77	829	526	1036	6484
1943	691	653	297	349	1418	92	27	170	320	482	942	947	6388
1944	2418	142	512	70	162	404	897	791	420	76	283	363	6538
1945	272	651	397	893	762	2338	953	229	184	347	465	412	7903

Appendix 5
Sheet 2

BANGALOW RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1946	977	1457	1099	768	168	62	0	95	314	395	90	532	5957
1947	1617	1330	1380	1129	572	41	27	205	351	208	579	753	8192
1948	668	289	1061	911	712	1799	78	268	866	45	304	238	7239
1949	695	641	1300	849	843	588	245	220	195	1023	412	300	7311
1950	309	1331	886	1043	350	1943	2005	597	255	769	791	447	10726
1951	2108	571	836	247	489	1323	58	34	69	284	80	314	6413
1952	169	955	989	798	367	737	571	995	265	311	126	174	6457
1953	1455	2763	1049	137	351	9	268	283	155	317	87	278	7152
1954	477	3279	312	297	1277	295	1199	668	779	732	376	224	9915
1955	1297	523	1233	1171	826	492	247	22	148	354	55	1897	8265
1956	960	2639	763	517	849	522	139	202	80	182	99	1026	7978
1957	1139	551	679	131	46	207	659	885	33	442	177	202	5151
1958	654	659	1014	1973	56	1444	0	1311	181	303	235	379	8209
1959	1577	676	1341	544	443	467	998	328	905	657	1263	625	9824
1960	453	653	736	402	533	330	233	67	40	194	376	274	4291
1961	1167	1562	629	651	747	437	280	453	456	562	555	1007	8506
1962	2307	344	1402	1495	889	223	2059	809	113	136	141	1473	11391
1963	1185	402	1560	1218	1990	914	71	551	92	336	916	762	9997
1964	499	1432	1545	784	671	283	151	80	329	187	467	289	6717

Appendix 6
Sheet 1

BYRON BAY RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1892						NO RECORDS						540	
1893	1119	3605	1132	430	146	1244	453	1012	71	564	555	417	10748
1894	1511	655	1641	355	1194	225	61	189	694	432	348	1722	9027
1895	3526	1019	339	479	355	117	93	205	229	171	212	733	7478
1896	406	1749	403	2372	453	191	275	136	374	100	1387	759	6470
1897	71	540	867	105	444	1431	542	339	429	416	464	1531	7179
1898	1352	1346	1059	563	462	699	432	478	374	529	325	696	8315
1899	797	920	141	467	798	411	1562	1380	999	406	187	972	9040
1900	635	678	651	172	1421	1015	758	17	376	93	426	304	6546
1901	158	794	1737	448	962	966	424	622	379	496	124	150	7260
1902	480	951	696	1113	339	237	318	394	131	623	245	458	5985
1903	556	410	746	144	840	800	845	532	468	626	1095	361	7423
1904	246	122	1654	1664	1385	98	502	244	98	276	265	168	6722
1905	449	367	839	1716	1911	128	31	203	74	455	214	818	7205
1906	747	1352	1412	231	620	551	30	406	352	1032	379	1837	8949
1907	1291	1296	2570	139	1151	1317	55	78	20	160	942	724	9743
1908	573	1526	1152	1146	1097	268	364	2022	152	99	644	679	9722
1909	290	1111	690	1038	154	231	716	517	438	204	618	454	6461

Appendix 6
Sheet 2

BYRON BAY RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1910	1335	450	2002	1342	443	877	37	158	376	391	781	889	9081
1911	1943	465	688	405	311	175	277	697	39	559	184	237	5980
1912	278	586	1108	354	758	715	1493	226	110	425	674	264	6991
1913	964	1435	623	1074	1271	1497	1462	4	444	136	240	270	9420
1914	215	357	1361	193	808	1819	1412	758	491	876	162	718	9170
1915	306	680	60	101	1066	199	656	505	154	57	384	295	4463
1916	268	1317	422	1156	517	489	435	335	1011	1184	687	843	8664
1917	409	835	1216	742	898	141	53	542	756	365	1880	278	8115
1918	995	232	579	1096	482	205	237	352	432	61	229	610	5510
1919	336	550	1337	1551	1772	451	395	437	32	389	97	592	7939
1920	1608	602	305	791	1120	452	855	196	617	426	729	379	8080
1921	1586	306	487	765	1588	1367	1149	335	568	210	98	1199	9658
1922	398	1198	500	105	550	452	1136	161	629	225	27	239	5620
1923	162	968	337	1331	47	204	132	329	90	51	161	545	4357
1924	672	480	355	307	343	1592	1000	236	167	353	632	244	6381
1925	1810	386	2231	589	1548	602	231	807	77	245	1336	1030	10892
1926	659	11	1167	575	387	1259	294	183	207	131	62	596	5531
1927	2848	869	656	621	100	590	20	273	643	233	1237	1084	9174

BYRON BAY RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1928	933	1618	310	958	554	269	432	268	14	192	99	380	6027
1929	842	1226	1152	845	524	270	650	288	223	482	122	321	6945
1930	1124	256	2020	835	1412	1436	519	498	129	189	74	481	8973
1931	223	1968	1436	933	552	420	280	395	58	336	599	1320	8520
1932	94	170	137	509	728	527	126	150	579	329	304	123	3776
1933	1045	336	914	1613	681	505	920	107	722	245	704	535	8327
1934	489	1202	330	857	1788	100	1242	187	393	359	646	1189	8782
1935	713	568	900	523	1009	247	459	197	496	352	165	237	5866
1936	539	203	725	368	1515	199	385	60	466	335	119	919	5833
1937	410	1074	1686	422	42	563	906	575	59	1250	2005	353	9345
1938	1012	1576	1000	459	2033	488	879	469	118	187	311	57	8589
1939	510	198	2375	919	380	195	494	243	142	1356	289	185	7286
1940	367	547	1003	665	713	605	144	523	100	249	249	764	5929
1941	1169	920	862	910	862	487	190	104	118	40	251	209	6122
1942	280	1793	414	756	489	584	432	188	144	788	448	803	7119
1943	546	860	498	460	1648	528	16	310	280	452	849	1237	7684
1944	2239	121	190	286	216	578	1146	758	506	101	395	183	6719
1945	305	992	488	1343	989	2693	589	260	217	376	461	514	9227

Appendix 6
Sheet 4

BYRON BAY RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1946	976	1413	871	678	109	33	1	180	291	472	158	499	5681
1947	1326	1227	1436	1373	766	45	79	351	486	204	614	972	8879
1948	752	162	963	583	543	1833	113	205	912	21	379	600	7066
1949	521	557	1066	977	625	614	359	401	151	1015	93	197	6576
1950	276	1207	749	933	359	1696	1829	593	195	700	896	398	9831
1951	1795	390	649	261	457	1339	131	33	171	285	60	381	5952
1952	95	1042	1060	766	323	957	413	741	385	358	113	209	6462
1953	1027	2483	843	206	390	56	353	365	213	355	65	139	6495
1954	419	3350	220	399	1048	262	1300	668	941	688	504	163	9962
1955	717	429	902	712	1016	517	397	35	129	334	65	2145	7398
1956	901	2201	622	412	649	884	110	283	52	181	149	855	7299
1957	1105	486	862	178	48	267	958	1026	61	308	170	344	5813
1958	386	476	783	2093	103	1279	62	1107	267	369	272	402	7599
1959	1100	600	1062	345	599	585	1091	285	950	727	1087	1087	9518
1960	372	513	829	409	397	398	300	84	41	248	441	341	4373
1961	1057	1388	562	478	994	413	270	491	405	457	818	910	8243
1962	1734	495	943	1349	774	105	1749	817	139	238	156	1144	9643
1963	737	438	984	934	1447	866	69	701	180	342	719	982	8399
1964	565	1236	2009	833	706	99	126	138	293	218	563	325	7111

Appendix 7
Sheet 1

CONDONG RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1887	1633	1217	3305	404	876	85	1171	1541	154	62	396	474	11318
1888	351	2144	229	252	104	247	40	61	340	327	90	679	4864
1889	276	137	993	1036	621	23	1672	1231	318	434	605	898	8244
1890	2319	2044	4074	1609	616	574	115	21	433	137	320	560	12822
1891	1928	655	986	280	1309	1142	336	954	618	262	451	306	9227
1892	517	167	2775	2127	929	927	248	132	526	912	378	589	10227
1893	1485	4106	1568	399	405	1231	293	505	158	284	437	31	10902
1894	2145	935	2851	394	334	389	15	109	493	498	355	928	9446
1895	3371	406	269	371	169	20	31	151	293	220	169	804	6274
1896	485	1789	748	158	310	162	289	72	110	106	1990	600	6819
1897	243	485	851	155	551	556	757	155	504	219	256	1669	6401
1898	1026	1938	2183	340	339	735	172	480	322	277	217	465	8494
1899	788	581	296	446	310	399	1296	700	585	273	288	904	6866
1900	498	350	303	73	1292	453	1102	115	394	15	319	468	5382
1901	223	753	1418	525	856	639	181	588	144	358	247	127	6059
1902	457	376	103	210	56	42	156	75	135	454	341	324	2729
1903	723	487	634	340	852	637	1004	229	461	461	472	232	6532
1904	442	110	1466	1765	1111	62	213	177	177	365	147	749	6784

Appendix 7
Sheet 2

CONDONG RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1905	669	565	731	994	971	75	22	144	141	412	239	375	5338
1906	645	1481	1647	75	1226	344	9	495	647	953	322	907	8751
1907	771	1066	1575	220	943	1325	139	146	1	84	539	541	7350
1908	501	1083	1179	418	343	20	127	1214	155	108	497	230	5875
1909	203	435	434	696	178	189	381	182	270	349	426	725	4468
1910	1416	619	1684	616	123	898	16	51	622	327	703	928	8003
1911	1924	1043	611	549	106	24	398	470	52	296	110	285	5868
1912	130	370	1042	214	128	995	414	192	107	365	372	220	4549
1913	511	1514	708	988	878	779	474	0	356	82	140	362	6792
1914	452	681	1224	187	489	728	513	224	338	898	200	506	6440
1915	772	686	31	44	662	54	210	295	130	10	241	533	3668
1916	460	1071	200	807	223	230	158	259	531	741	424	761	5865
1917	798	649	871	133	233	55	38	120	418	179	2111	570	6175
1918	1398	231	622	583	567	31	39	294	210	139	476	494	5084
1919	237	152	1517	533	1975	254	88	58	13	201	220	321	5569
1920	1876	424	489	697	673	409	1012	175	448	434	424	673	7734
1921	1174	282	1268	1110	1164	940	1756	188	651	158	155	1305	10151
1922	267	1560	445	45	505	212	771	114	558	123	141	636	5377

Appendix 7
Sheet 3

CONDONG RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1923	162	136	540	1926	36	249	279	413	167	55	42	625	4630
1924	411	898	370	167	288	974	1167	171	245	382	511	289	5873
1925	1292	241	2296	427	1022	1008	86	429	31	140	688	823	8483
1926	379	14	577	1169	372	701	125	119	197	206	49	1006	4914
1927	2267	350	811	247	8	227	5	12	579	400	864	640	6410
1928	1010	1910	350	1590	416	275	233	231	0	107	133	542	6797
1929	803	1095	1274	1542	322	776	80	94	42	624	184	235	7071
1930	942	350	804	514	1255	1419	113	563	94	237	241	325	6857
1931	420	2708	1392	915	388	22	157	267	217	302	629	780	8197
1932	156	377	249	826	539	246	14	46	469	271	220	71	3484
1933	1435	318	224	1446	304	372	574	10	338	365	887	587	6860
1934	639	1370	395	1372	1223	60	815	147	276	289	629	778	7993
1935	518	694	451	534	380	31	456	245	638	501	154	392	4994
1936	362	235	752	78	824	168	109	38	156	174	167	579	3642
1937	347	927	1858	141	51	373	351	448	25	638	1522	513	7194
1938	1298	1123	1189	540	1711	624	240	228	78	368	156	66	7621
1939	612	219	2471	698	202	185	162	244	44	486	325	220	5868
1940	380	529	1314	229	116	337	32	355	71	187	170	1305	5025

CONDONG RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1941	1381	542	1045	610	456	278	39	31	69	21	247	122	4841
1942	221	2109	245	448	253	269	321	108	91	781	526	1156	6528
1943	510	700	312	465	264	87	19	130	490	827	1131	1224	6159
1944	1647	213	424	94	221	130	701	532	233	135	499	159	4988
1945	331	994	715	616	477	2334	715	108	228	324	274	310	7426
1946	696	1551	1460	728	45	4	3	22	314	505	123	178	5629
1947	2059	1601	1609	239	462	18	17	151	302	218	529	810	8015
1948	842	508	1514	930	339	1500	64	231	565	35	351	284	7163
1949	678	977	1632	204	418	502	353	24	186	714	604	133	6425
1950	644	2273	950	627	90	1280	1518	265	184	469	584	417	9301
1951	2101	568	1100	196	373	708	6	88	77	184	23	381	5805
1952	79	602	1361	580	435	1211	191	698	107	379	134	356	6133
1953	1126	3079	1494	219	163	4	86	303	107	422	271	450	7724
1954	525	3592	314	243	972	240	1173	327	349	1032	492	225	9484
1955	408	408	1695	813	1733	232	173	31	140	432	108	1645	7818
1956	693	4098	1037	557	1032	645	79	37	26	91	78	825	9198
1957	1055	802	484	271	9	114	458	482	54	240	326	167	4462
1958	335	466	829	994	54	1267	25	1108	281	167	324	602	6452

CONDONG RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1959	889	1103	1905	428	178	189	505	165	645	528	861	776	8172
1960	446	778	683	493	310	86	163	46	6	365	540	277	4193
1961	634	1300	376	473	528	210	309	179	212	661	1126	975	6983
1962	1534	370	1133	700	465	85	1345	903	200	101	244	1442	8522
1963	958	608	1811	871	1626	223	1	289	303	194	655	894	8433

Appendix 8
Sheet 1

CUDGEN PLANTATION RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1885	434	639	546	324	400	318	101	37	189	121	216	765	4090
1886	1053	467	208	256	986	1372	726	173	720	665	1296	786	8708
1887	1103	951	1422	583	871	48	528	768	250	201	372	476	7573
1888	125	1696	538	371	213	376	165	63	326	330	94	558	4855
1889							NO RECORDS						
1890							NO RECORDS						
1891	2311	770	748	616	1309	519	316	741	499	349	304	282	8764
1892	233	84	1974	1662	676	640	166	185	712	1022	446	593	8393
1893	865	2372	912	508	118	979	368	668	198	348	162	336	7834
1894	2071	1140	2039	385	364	225	6	239	734	433	245	1014	8895
1895	2254	814	445	387	216	5	84	54	271	120	373	852	5875
1896	686	1791	745	142	233	131	282	25	88	230	1526	1066	6945
1897	322	390	1002	88	561	823	570	119	368	230	404	1022	5899
1898	1146	1350	1236	710	420	682	230	399	412	200	231	126	7142
1899	453	638	137	501	457	459	1022	1013	885	206	141	727	6639
1900	198	370	527	116	1235	668	1277	120	520	0	338	369	5738
1901	202	856	1069	573	742	782	223	665	262	371	203	154	6102
1902	475	563	309	367	100	124	174	342	158	379	326	298	3615

CUDGEN PLANTATION RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1903	830	303	421	496	839	446	1091	310	266	544	695	461	6702
1904	519	59	1671	1724	1063	83	213	191	151	339	144	355	6512
1905	420	556	981	1059	1154	87	17	156	148	593	149	577	5897
1906	677	897	1442	153	652	480	11	334	726	1120	250	1038	7780
1907	653	906	2150	174	1367	1457	208	165	2	70	426	567	8145
1908	996	1496	1650	555	750	38	225	1235	221	115	561	422	8264
1909	370	532	438	829	142	306	429	251	224	163	339	692	4715
1910	1112	511	1733	815	234	860	21	182	420	261	582	669	7400
1911	1219	608	725	394	135	49	280	498	71	394	95	212	4680
1912	131	359	1022	239	327	678	317	180	101	431	480	305	4570
1913	675	1147	613	1040	863	876	1086	19	548	83	192	574	7716
1914	322	539	1157	204	574	996	660	344	411	500	367	421	6495
1915	332	443	21	36	895	94	399	301	162	42	321	224	3270
1916	359	714	240	898	187	367	242	379	841	641	410	781	6059
1917	593	545	500	334	430	106	27	226	627	170	1712	734	6004
1918	1618	249	466	688	607	63	67	410	264	140	537	629	5738
1919	209	327	1189	930	1554	296	246	119	9	222	180	325	5606
1920	1636	389	442	590	925	464	965	208	536	342	430	475	7402

Appendix 8
Sheet 3

CUDGEN PLANTATION RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1921	1142	230	1078	1470	975	1044	1223	175	645	246	247	1169	9644
1922	206	1662	412	54	581	243	919	88	594	311	156	483	5709
1923	267	828	448	1883	28	242	224	533	123	54	109	609	5348
1924	215	687	302	219	529	1186	836	139	202	260	718	343	5636
1925	1028	418	1735	277	1175	818	115	448	55	163	1062	801	8095
1926	442	22	1020	851	436	1126	138	108	393	161	65	865	5627
1927	2071	500	973	499	34	371	83	34	473	538	1203	1023	7802
1928	1028	1996	306	1478	599	279	160	249	8	116	101	556	6876
1929	466	1382	1536	1179	800	413	82	128	83	346	107	292	6814
1930	975	344	900	861	1488	1404	338	520	135	414	233	347	7959
1931	397	2368	1283	869	521	150	162	384	104	641	884	881	8644
1932	154	446	268	711	537	460	89	36	549	272	639	50	4211
1933	1084	368	530	1545	501	644	629	43	586	204	572	722	7428
1934	565	1344	479	1084	1662	92	972	260	520	389	473	555	8395
1935	651	754	703	502	585	81	306	134	573	609	175	372	5445
1936	355	412	624	215	1065	308	323	59	246	223	228	363	4421
1937	337	1001	2450	286	90	420	699	683	34	728	1532	304	8564
1938	806	955	1004	372	1839	666	472	326	75	346	135	21	7017

Appendix 8
Sheet 4

CUDGEN PLANTATION RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1939	333	160	2636	571	561	232	285	176	20	723	739	478	6914
1940	314	764	1097	347	265	511	100	571	65	218	302	808	5362
1941	1334	836	910	685	494	649	134	32	139	60	402	111	5786
1942	201	1384	325	595	332	418	283	102	53	662	530	1144	6029
1943	546	932	317	404	569	201	28	200	273	719	876	1153	6218
1944	1717	133	355	98	214	246	1032	657	206	147	378	99	5282
1945	199	687	937	778	912	1488	438	120	301	393	364	475	7092
1946	913	1029	1085	701	168	23	6	48	419	459	162	175	5188
1947	1580	1180	1305	1210	654	19	18	446	479	257	452	643	8243
1948	1219	302	1731	838	611	1760	163	325	808	0	524	219	8500
1949	396	904	1288	519	462	723	290	82	198	986	382	146	6376
1950	473	1627	634	966	129	1160	1660	466	194	356	538	274	8477
1951	2166	687	713	186	643	884	24	19	134	158	32	247	5893
1952	102	1105	1799	638	364	927	292	696	137	533	74	392	7059
1953	1173	2876	1165	126	268	14	179	440	217	299	186	752	7695
1954	484	3209	426	415	1306	316	745	709	549	1152	451	221	9983
1955	530	196	1001	888	865	342	371	30	323	397	76	2112	7131
1956	764	3864	872	308	552	673	78	64	124	76	118	858	8351

CUDGEN PLANTATION RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1957	1132	886	619	333	13	180	813	672	44	214	357	322	5585
1958	531	609	813	1177	66	1156	67	943	258	171	387	416	6594
1959	948	478	1213	385	305	299	600	244	783	680	766	668	7369
1960	NO RECORDS												

Appendix 9
Sheet 1

LIMPINWOOD RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1928	NO RECORDS		187	2295	357	253	412	160	0	195	156	415	
1929	1707	1269	1383	1211	183	974	33	77	49	559	263	276	7984
1930	1672	538	842	485	1555	1735	173	287	174	497	169	249	8376
1931	529	2775	1978	1169	505	121	184	218	113	237	486	1141	9456
1932	157	646	242	906	527	133	48	90	742	532	772	53	4848
1933	857	305	180	1295	186	296	799	18	467	583	994	813	6793
1934	670	1196	304	1714	693	233	633	180	382	292	627	856	7780
1935	994	933	449	672	450	5	397	475	433	777	153	1127	6865
1936	679	380	1246	161	274	234	122	30	186	136	239	500	4187
1937	241	830	1627	136	75	490	307	566	186	120	1752	872	7202
1938	2856	748	1595	783	1480	156	352	487	26	405	268	237	9393
1939	632	258	2612	670	256	102	101	500	0	547	451	305	6434
1940	679	562					NO RECORDS						
1941	1525	558	922	650	546				NO RECORDS				
1942							NO RECORDS						
1943			NO RECORDS		225	95	26	207	417	761	669	1551	
1944	2259	263	451	45	205	109	575	475	282	149	522	N.R.	
1945	N.R.	1134	347			NO RECORDS				402	295	440	

LIMPINWOOD RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1946	664	1570	1638					NO RECORDS					
1947								NO RECORDS					
1948	NO	RECORDS	1036	510	1298	1729	80	78	658		NO	RECORDS	
1949								NO RECORDS					
1950								NO RECORDS					
1951								NO RECORDS					
1952	N.R.	499	1036	473	268	700	128	757	169	441	165	196	
1953	1157	1596	1782	162	131	5	54	301	40	444	123	397	6192
1954	747	3945	227	277	671	224	1806	320	410	760	218	625	10230
1955	517	583	2325	1513	1031	176	229	48	135	596	78	1482	8713
1956	1242	3000	1400	542	1050	514	116	29	66	166	126	1008	9259
1957	838	765	486	73	40	148	325	319	18	272	246	32	3562
1958	563	600	657	903	146	1456	0	626	93	274	195	1058	6571
1959	1020	1723	1382	517	190	63	362	120	427	617	1697	659	8777
1960	345	671	363	201	283	120	73	96	16	311	581	219	3279
1961	511	1657	464	434	224	284	400	190	156	1001	870	815	7006
1962	1326	351	1325	655	259	37	1132	585	125	86	238	1888	8007
1963	1069	524	2636	670	1300	75	0	95	201	285	810	702	8367
1964	160	760	991	735	321	0	249	155	209	169	225	179	4153

Appendix 10
Sheet 1

MULLUMBIMBY RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1899	758	961	279	539	609	404	1636	1207	758	347	113	973	8584
1900	392	462	401	101	1588	702	1199	67	402	16	275	374	5979
1901	158	794	1737	448	962	772	304	445	379	496	124	124	6743
1902	479	587	304	462	61	133	192	184	185	540	241	390	3758
1903	561	374	1019	293	1136	896	1120	399	552	490	624	491	7955
1904	464	109	2961	1745	1072	81	280	174	100	357	154	472	7969
1905	691	455	590	2114	1326	77	0	219	70	530	262	464	6798
1906	651	1430	1072	91	923	312	0	447	549	813	308	1192	7788
1907	1181	1157	1999	235	879	841	65	110	12	98	607	683	7867
1908	523	1010	890	400	471	60	314	1288	78	191	468	304	5997
1909	131	524	494	520	138	181	342	137	434	177	311	387	3776
1910	1407	778	1682	578	134	1266	44	117	523	263	602	781	8175
1911	1584	659	528	668	147	32	226	513	42	448	116	195	5158
1912	430	373	693	137	196	866	646	125	87	334	469	211	4567
1913	593	998	616	1302	1085	827	838	0	312	70	210	130	6981
1914	190	590	1044	96	776	750	542	318	297	885	145	596	6229
1915	296	474	54	112	604	50	186	254	108	40	223	245	2646
1916	162	895	139	804	268	193	104	202	487	777	446	512	4989

MULLUMBIMBY RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1917	507	587	956	197	312	102	23	196	498	186	1608	422	5594
1918	1159	185	477	727	470	66	110	441	163	53	255	449	4555
1919	128	218	1760	1216	1656	224	94	110	15	218	131	358	6128
1920	1503	380	286	739	411	323	841	92	438	462	553	376	6404
1921	1381	153	658	926	1221	1020	1198	225	523	110	107	971	8493
1923	185	1589	375	57	445	182	1068	144	594	159	33	341	5172
1923	210	321	346	1928	5	218	188	434	170	122	87	540	4569
1924	525	673	335	296	417	1119	800	187	60	542	622	575	6151
1925	1522	383	2371	406	1438	859	141	626	32	154	1580	1031	10543
1926	827	50	600	1574	578	996	205	163	289	81	47	796	6206
1927	3467	744	863	278	15	390	36	131	701	480	1634	764	9503
1928	1161	1449	333	1103	454	250	384	208	39	197	99	235	5912
1929	1139	1493	1372	1734	475	925	145	105	116	827	135	311	8777
1930	1248	320	1526	842	1040	1489	295	341	104	298	254	369	8126
1931	322	2611	1367	1260	390	141	172	269	78	204	747	1391	8952
1932	96	282	109	578	671	497	76	78	447	213	383	117	3547
1933	979	386	533	2286	434	505	687	22	522	335	996	651	8336
1934	456	1374	492	890	1551	87	1123	267	302	281	767	616	8206

MULLUMBIMBY RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1935	746	559	615	615	395	66	465	270	806	350	184	416	5487
1936	585	262	929	239	942	178	198	11	190	292	121	676	4623
1937	624	1080	2476	265	19	456	530	616	34	964	1771	457	9292
1938	1188	924	1165	623	2604	453	485	338	137	211	209	177	8514
1939	420	99	2695	765	325	194	250	249	138	840	367	244	6586
1940	285	514	1115	416	282	342	82	360	22	193	424	1139	5174
1941	1425	948	1252	715	513	377	124	36	36	19	297	172	5914
1942	261	2152	580	774	419	320	353	96	98	862	496	910	7321
1943	516	776	198	401	788	155	0	180	425	461	1131	1100	6131
1944	1798	133	385	76	201	272	706	570	298	69	388	392	5288
1945	342	896	597	962	765	1618	785	172	220	322	285	540	7504
1946	776	1475	1149	719	85	8	0	96	364	240	156	285	5353
1947	1938	1366	1168	932	611	14	36	226	248	177	631	636	7983
1948	626	331	1356	761	915	1850	54	154	800	12	414	267	7540
1949	526	661	1288	515	542	485	242	112	223	1084	98	145	5921
1950	519	1796	861	642	104	1608	2311	371	253	575	747	422	10209
1951	2359	387	1002	219	451	1070	26	46	70	199	29	239	6097
1952	113	889	859	596	360	900	461	946	240	327	118	320	6129

Appendix 10
Sheet 4

MULLUMBIMBY RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1953	1168	3223	1097	97	220	5	133	340	145	377	147	264	7216
1954	533	3705	313	307	1169	218	986	530	770	838	378	268	10015
1955	1486	496	1122	926	1297	316	203	29	194	403	81	2339	8892
1956	977	3726	956	446	1076	555	80	100	103	222	69	956	9266
1957	1508	588	476	212	24	159	695	633	16	458	209	605	5583
1958	437	525	1056	1579	50	1159	24	1546	220	240	264	521	7621
1959	1478	813	1642	289	243	390	743	297	772	639	1174	780	9260
1960	416	588	669	371	485	120	172	53	32	314	670	273	4163
1961	1051	1419	480	474	745	272	259	273	228	450	690	899	7240
1962	1825	394	1111	972	515	103	1936	1027	148	165	207	1343	9746
1963	1069	473	1869	1295	1899	516	5	342	229	230	1074	610	9611
1964	295	1278	1686	819	494	89	177	73	165	301	780	401	6558

Appendix 11
Sheet 1

MURWILLUMBAH RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1890	2319	2044	3567	1433	499	388	101	36	364	138	308	549	11746
1891	1379	409	939	295	1596	747	290	738	449	366	362	506	8076
1892						NO RECORDS							
1893	1426	4278	1258	581	116	1336	251	601	143	280	487	55	10812
1894	1822	885	2713	517	272	301	6	112	328	582	322	946	8806
1895	3693	785	194	414	162	0	21	96	274	242	191	754	6826
1896	431	2240	500	187	205	111	255	47	112	46	1718	674	6526
1897	210	279	941	6	358	618	803	177	445	206	298	1418	5759
1898	1496	1587	1911	291	396	751	165	358	333	321	244	340	8193
1899	901	692	293	528	281	359	1049	660	532	274	265	913	6747
1900	448	284	243	119	1291	445	1026	96	356	11	457	373	5149
1901	255	625	1681	504	784	458	120	410	321	366	193	59	5776
1902	466	413	144	167	63	36	148	68	136	520	370	389	2920
1903	668	458	649	456	780	702	807	228	561	478	491	218	6496
1904	444	93	1081	1494	1131	43	231	90	127	303	159	562	5758
1905	513	553	816	1128	828	62	18	145	131	367	293	433	5287
1906	763	1482	1324	119	1391	334	5	503	583	N.R.	333	N.R.	
1907						NO RECORDS							
1908	501	1083	1179	418	343	20	127	1214	153	1608	497	230	7373

Appendix 11
Sheet 2

MURWILLUMBAH RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1909						NO RECORDS							
1910	1536	518	1313	600	160	978	16	41	435	309	607	927	7440
1911	2318	1053	538	545	82	6	543	435	81	279	120	282	6282
1912	123	485	1259	215	100	1123	414	186	125	413	449	194	5086
1913	559	1593	756	1242	818	696	374	0	378	154	126	270	6966
1914	348	684	1107	162	519	638	492	224	328	922	225	445	6094
1915	696	699	22	67	620	53	191	305	157	4	197	374	3385
1916	384	1066	152	1122	262	206	140	255	537	714	545	907	6290
1917	812	679	945	110	242	55	28	108	651	177	2186	584	6577
1918	1077	168	499	534	567	53	33	232	157	74	428	435	4257
1919	216	180	1515	518	2099	172	55	42	16	197	241	400	5651
1920	2244	358	394	675	554	374	952	160	526	476	357	606	7676
1921	1416	216	1522	1085	1045	973	1742	238	581	161	209	1504	10692
1922	260	2032	456	50	549	180	596	51	392	159	87	598	5410
1923	151	134	327	1858	0	285	219	348	110	38	41	616	4127
1924	449	784	362	205	260	890	1108	141	249	271	457	250	5426
1925	1285	418	2552	414	1178	1123	107	364	26	101	784	946	9298
1926	435	83	535	1608	352	883	171	126	223	227	44	1172	5859

MURWILLUMBAH RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1927	2724	430	1120	339	2	219	22	9	627	423	1564	670	8149
1928	1005	2397	244	1901	527	247	342	181	0	152	141	247	7384
1929	956	1176	1444	1481	254	268	785	103	34	686	179	208	7574
1930	893	356	890	582	1545	1725	31	562	88	297	227	303	7499
1931	502	2934	1635	1221	320	16	144	338	197	181	815	893	9196
1932	156	246	190	1104	460	186	52	35	479	338	252	80	3578
1933	1357	423	241	1464	279	342	542	10	314	423	1210	640	7245
1934	668	1337	391	1777	1143	53	838	241	189	282	636	735	8290
1935	478	829	455	504	401	15	435	239	546	367	150	558	4977
1936	478	425	811	70	770	212	112	32	179	186	164	617	4056
1937	332	915	1845	137	37	359	309	481	29	829	1705	565	7543
1938	1598	1316	1470	441	1750	417	251	189	86	278	121	40	7957
1939	618	235	2464	640	255	215	126	236	29	495	314	155	5782
1940	405	515	1179	181	154	310	26	261	40	203	190	1058	4522
1941	1440	569	1125	521	401	300	28	35	67	17	271	105	4879
1942	211	2452	221	397	232	204	308	67	51	746	531	1159	6579
1943	501	497	321	316	177	75	10	88	344	799	1078	1105	5311
1944	1646	234	476	105	176	120	668	565	204	99	498	170	4961
1945	313	824	426	766	521	2231	755	61	173	325	211	316	6922

MURWILLUMBAH RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1946	634	1582	1357	641	41	3	6	38	316	384	159	199	5360
1947	2268	1271	1354	679	390	29	17	97	247	194	530	887	7963
1948	772	527	1365	486	692	1485	50	163	583	0	371	264	6758
1949	742	817	1587	193	245	513	276	36	168	751	668	146	6142
1950	767	2058	1165	458	67	1081	1770	224	229	481	625	354	9279
1951	1952	428	1116	253	338	694	0	90	87	160	23	419	5560
1952	65	616	1285	486	414	867	149	566	117	360	93	261	5279
1953	1161	2641	1285	148	155	0	112	256	50	354	378	455	6995
1954	518	3352	304	270	823	245	1139	316	337	1003	546	213	9066
1955	454	373	1650	864	1837	225	156	23	162	419	283	1865	8311
1956	722	3831	1054	538	1011	547	119	48	48	196	94	868	9076
1957	1027	728	294	243	16	135	469	535	41	226	242	146	4102
1958	336	583	949	1081	50	1621	26	1185	279	154	364	948	7576
1959	1032	1399	1939	419	195	246	513	120	628	556	964	811	8822
1960	434	813	700	346	367	101	193	58	24	319	498	306	4159
1961	627	1260	476	563	480	245	405	228	229	781	1158	957	7409
1962	1514	575	1152	527	445	74	1323	968	203	114	239	1721	8855
1963	953	727	2214	918	1710	208	3	263	293	210	756	926	9181
1964	644	1004	1447	627	550	91	182	83	249	192	390	349	5808

Appendix 12
Sheet 1

NIMBIN RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1924			NO RECORDS			1320	607	271	100	276	571	635	
1925	832	439	2935	595	1167	1173	99	413	31	82	1138	543	9447
1926	826	81	349	534	631	500	174	149	131	93	30	1120	4618
1927	2156	575	986	612	0	335	52	0	347	320	1666	871	7920
1928	822	1695	304	1030	592	530	583	197	15	104	29	570	6471
1929	1107	503	1951	686	296	1318	231	100	85	495	130	398	7300
1930	1037	313	674	824	903	1283	35	304	57	338	68	249	6085
1931	484	3893	1099	1386	302	120	172	216	88	99	616	965	9440
1932	178	347	338	664	678	121	51	88	478	378	337	253	3911
1933	647	445	349	1781	418	769	704	12	461	446	964	813	7809
1934	724	1109	425	1557	2059	99	508	126	137	194	279	806	8023
1935	801	931	401	185	277	31	428	165	427	370	108	585	4709
1936	701	380	848	279	588	229	108	0	192	249	70	882	4526
1937	620	777	1065	262	35	601	451	470	31	568	1050	683	6613
1938	1801	605	1267	1321	1422	99	442	313	127	229	342	275	8243
1939	724	147	2445	557	405	178	212	262	189	634	274	440	6467
1940	112	758	789	220	171	252	25	204	27	202	497	951	4208
1941	1298	706	613	562	522	603	98	34	17	38	202	143	4836

Appendix 12
Sheet 2

NIMBIN RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1942	459	1195	541	368	166	155	298	39	56	901	245	1392	5815
1943	704	733	142	334	341	24	10	240	349	626	454	1265	5222
1944	1464	265	378	95	137	285	672	373	209	150	396	324	4748
1945	246	569	480	604	561	1929	455	80	241	369	254	478	6266
1946	857	1655	1604	585	125	15	1	65	325	235	95	217	5779
1947	1714	814	977	609	460	46	15	83	198	203	497	776	6392
1948	763	197	1411	494	631	1529	47	134	628	30	361	377	6602
1949	439	922	1951	355	414	426	167	104	144	800	197	166	6085
1950	449	1464	1105	682	72	1619	1285	405	352	671	667	454	9225
1951	2459	380	1316	410	180	894	0	31	96	209	69	225	6269
1952	204	987	663	378	235	290	244	570	146	528	109	331	4685
1953	907	2611	1162	128	165	0	231	214	26	265	135	405	6249
1954	410	2654	339	252	949	193	1164	412	536	466	266	306	7947
1955	786	500	1684	1434	620	270	140	34	164	353	100	1513	7598
1956	956	3132	838	447	371	327	83	46	54	155	101	967	7477
1957	745	662	472	45	2	149	428	651	4	385	137	217	3897
1958	523	469	416	1221	51	1439	12	715	227	226	190	607	6096
1959	1724	1384	1022	162	262	248	696	240	484	475	1167	447	8311

NIMBIN RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1960	296	466	714	273	322	146	157	66	40	176	390	321	3367
1961	793	1203	446	540	370	161	260	238	314	592	492	604	6013
1962	2079	578	977	1025	418	98	1782	259	179	104	185	1381	9065
1963	964	660	1591	682	1299	397	24	295	101	252	829	540	7634
1964	358	952	1502	686	487	90	127	105	108	220	531	330	5496

Appendix 13
Sheet 1

TWEED HEADS RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1887	965	1013	1295	597	663	367	470	769	257	107	286	530	7319
1888	204	1984	337	444	76	256	108	91	262	344	233	426	4765
1889	98	308	1020	1280	563	54	842	657	425	471	723	647	7088
1890	2108	1762	2005	1254	582	348	315	10	424	100	304	318	9530
1891	1212	587	610	428	1350	498	270	554	569	472	189	399	7138
1892	429	76	1843	1382	602	543	190	186	468	1021	449	354	7543
1893	1244	2840	791	594	179	948	312	841	239	165	212	58	8423
1894	1834	1079	2198	412	401	236	0	163	734	451	275	877	8660
1895	2080	994	607	314	275	35	40	51	250	170	446	549	5811
1896	610	1547	579	167	277	71	361	61	274	0	1347	810	6104
1897	203	302	843	101	327	804	585	143	439	206	425	1134	5512
1898	1413	1677	1329	607	286	633	185	395	345	357	132	118	7477
1899	750	516	130	508	317	479	902	947	1069	164	99	451	6332
1900	528	164	352	94	1494	735	1325	82	370	46	378	435	6003
1901	204	928	1629	820	1410	891	173	580	236	338	174	55	7438
1902	326	262	236	246	54	161	219	116	122	440	163	365	2710
1903	601	165	452	688	262	564	1276	389	357	653	589	150	6146
1904	487	110	1729	2231	1385	28	371	273	170	537	175	238	7734

TWEED HEADS RAINFALL STATISTICS.
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1905	475	565	855	1178	1773	65	0	50	66	906	344	1150	7427
1906	1776	2372	3468	341	1037	462	48	434	403	1085	213	928	12567
1907	641	854	1497	409	679	904	141	131	0	77	271	544	6148
1908	490	1185	1835	438	815	12	202	1228	176	69	394	418	7262
1909	229	371	293	805	87	280	420	308	231	273	389	434	4120
1910	1212	450	1776	906	202	1018	31	158	439	262	612	852	7918
1911	1309	885	687	340	122	23	398	444	105	479	57	162	5011
1912	176	345	1210	386	379	527	657	164	115	448	273	139	4819
1913	584	908	485	934	714	867	945	5	491	99	179	446	6657
1914	372	677	1439	436	934	935	585	378	581	530	312	358	7537
1915	257	643	20	99	722	103	469	266	197	25	260	318	3379
1916	309	671	213	1056	112	330	226	250	575	771	232	775	5520
1917	809	611	570	353	378	81	30	198	485	172	2388	536	6611
1918	1682	470	497	662	483	55	50	300	264	122	243	138	4966
1919	78	392	1528	650	1599	287	169	160	10	240	72	290	5475
1920	1558	426	301	494	664	387	960	152	616	174	449	428	6609
1921	1241	386	1344	1541	767	972	1158	77	514	156	315	1066	9537
1922	229	1417	520	44	482	279	827	82	458	151	143	338	4970

TWEED HEADS RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1923	330	730	427	1803	16	242	346	508	118	40	149	730	5439
1924	296	954	252	423	500	1224	724	196	318	289	1045	396	6617
1925	997	130	1825	358	1365	599	82	354	77	159	1147	698	7791
1926	483	63	715	947	373	909	154	104	491	140	91	992	5462
1927	2129	462	1341	638	23	369	40	23	395	711	1142	1176	8449
1928	1265	2280	350	1704	382	240	150	267	0	158	118	331	7245
1929	434	1147	1281	1261	646	565	71	125	56	339	158	355	6438
1930	824	391	950	773	1400	1321	143	631	148	298	183	365	7427
1931	486	2794	1369	1109	496	140	231	298	105	452	772	997	9249
1932	83	547	217	713	843	305	128	67	606	393	558	49	4509
1933	866	302	484	1457	263	508	543	42	448	210	579	846	6548
1934	593	1640	234	1242	1797	125	728	192	278	568	538	892	8827
1935	584	585	728	400	437	24	314	174	444	732	104	281	4807
1936	475	253	697	186	1042	280	225	65	182	234	147	449	4235
1937	327	950	2537	263	105	423	487	468	19	535	1538	420	8072
1938	819	694	939	554	1392	835	420	238	33	451	145	33	6553
1939	296	226	2352	606	568	194	242	236	9	786	765	338	6618
1940	369	442	1084	198	166	460	74	313	60	166	217	753	4302

Appendix 13
Sheet 4

TWEED HEADS RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1941	1162	748	1552	561	576	373	86	7	123	65	255	77	5585
1942	180	1920	297	507	349	409	243	143	53	720	832	1104	6757
1943	581	695	487	435	603	208	20	85	355	924	908	1183	6484
1944	1609	87	448	173	183	261	1193	444	182	155	289	107	5131
1945	188	804	1067	921	621	1432	314	103	348	761	338	452	7349
1946	739	1008	1050	787	93	40	5	71	383	480	126	153	4935
1947	1812	1395	1171	924	615	27	23	353	382	197	395	472	7766
1948	1043	230	1202	808	499	1741	160	287	851	0	500	155	7476
1949	411	746	1069	348	371	659	262	40	83	833	129	148	5099
1950	521	1736	771	677	83	1043	1556	476	103	285	644	400	8295
1951	2401	507	916	154	512	1093	7	50	142	181	54	281	6298
1952	106	715	1741	691	299	870	189	614	260	570	69	187	6311
1953	928	3347	1316	73	281	0	220	383	148	294	314	789	8093
1954	351	3478	430	160	1263	267	979	661	568	1219	502	394	10272
1955	432	259	1289	848	927	240	459	18	240	361	30	1918	7021
1956	765	3536	538	392	653	531	76	28	65	94	172	937	7787
1957	889	526	435	343	9	173	579	569	49	252	291	174	4289
1958	329	429	496	1154	217	1165	30	843	264	130	273	517	5847

Appendix 13
Sheet 5

TWEED HEADS RAINFALL STATISTICS

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1959	1238	585	1191	367	208	362	504	88	552	598	764	518	6975
1960	518	672	886	266	346	97	150	37	1	388	419	217	3997
1961	676	869	408	283	691	163	217	201	322	492	1366	1125	6813
1962	1162	873	1168	541	540	112	1116	453	225	152	288	703	7333
1963	829	503	2076	836	1237	380	13	282	108	163	570	804	7801
1964	212	1658	1220	534	474	123	111	163	238	200	136	253	5322

Appendix 14
Sheet 1

UKI RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1923	213	95	528	1525	10	190	307	513	153	239	67	533	4373
1924	236	520	501	234	216	800	914	235	56	406	580	252	4950
1925	876	308	2404	552	793	1199	79	412	36	80	1216	1768	9723
1926	655	2	688	884	461	644	255	107	101	103	67	900	4867
1927	2623	581	1108	227	0	143	25	20	546	387	1133	538	7331
1928	708	2122	113	1426	196	300	387	128	0	178	61	142	5761
1929	1001	965	1376	1223	127	915	37	136	27	796	138	291	7032
1930	1171	307	651	450	1232	1903	37	238	39	336	173	120	6657
1931	532	2347	1397	1106	283	0	115	237	64	44	459	851	7435
1932	182	220	312	944	443	153	15	61	428	214	245	117	3334
1933	1102	307	212	1505	315	302	717	25	445	346	956	672	6904
1934	567	1319	274	1319	828	40	683	126	117	368	338	686	6665
1935	420	669	362	320	300	90	370	185	595	267	108	554	4240
1936	531	353	784	108	496	304	77	2	146	85	96	592	3574
1937	364	876	1344	135	34				NO RECORDS				
1938						NO RECORDS							
1939						NO RECORDS							
1940	298	624	1030	305	165	383	19	279	5	168	331	1335	4942

Appendix 14
Sheet 2

UKI RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1941	1384	640	845	480	752	170	30	68	27	14	487	132	5029
1942	370	2594	363	437	164	249	418	64	177	720	544	1574	7674
1943	500	569	402	148	305	36	14	203	451	798	1302	1251	5979
1944	1653	191	399	114	186	199	543	546	253	142	369	416	5011
1945	435	917	549	489	477	2160	694	116	198	250	295	419	6999
1946	687	1721	1493	648	56	0	0	52	411	343	215	N.R.	

TOMEWIN RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1913	688	1247	745	1330	926	693	455	0	347	90	150	628	7299
1914	523	1109	1280	334	624	725	444	244	337	750	452	552	7374
1915	637	1055	7	42	887	90	226	317	128	6	104	413	3912
1916	517	1073	202	2011	259	284	130	219	676	905	746	908	7930
1917	1066	810	1144	145	194	28	29	167	682	152	2456	940	7813
1918	1604	557	1120	571	516	15	19	309	238	71	348	351	5719
1919	89	127	1799	605	2244	204	105	68	13	282	146	444	6126
1920	3547	488	487	538	579	440	786	163	420	580	617	691	9336
1921	1194	312	1889	1284	709	1095	1531	137	782	243	403	1321	10900
1922	288	1910	483	35	442	164	584	36	457	52	68	547	5066
1923	178	147	386	1790	50	243	234	310	153	50	41	610	4192
1924	453	828	439	236	170	705	1219	249	143	309	571	401	5723
1925	1360	412	2510	372	1044	1019	64	189	87	185	1172	1024	9438
1926	551	41	528	1112	414	884	80	86	249	236	79	1336	5596
1927	3444	484	1228	307	11	214	21	34	596	435	1778	853	9405
1928	996	3513	333	1836	356	142	420	208	0	126	192	627	8749
1929	1068	1108	1285	1444	260	689	96	104	55	564	152	195	7020
1930	1303	388	1035	568	1684	1739	135	334	127	610	205	305	8433

TOMEWIN RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1931	756	3778	1589	1134	445	76	184	329	160	213	765	1036	10465
1932	209	467	227	961	649	161	63	16	580	549	499	38	4419
1933	1518	420	363	1456	318	508	607	19	486	380	1108	775	7958
1934	788	1917	450	1682	1397	72	764	194	374	212	738	1052	9640
1935	539	695	542	627	319	36	562	265	613	690	155	623	5666
1936	516	386	1033	131	752	216	166	18	135	150	258	609	4370
1937	410	1120	2761	171	51	252	317	412	20	811	2302	641	9268
1938	1754	1637	1347	522	1865	541	197	209	53	459	185	153	8922
1939	706	253	2457	610	328	267	150	328	35	440	310	335	6219
1940	369	600	1511	246	148	244	18	389	111	159	301	1281	5377
1941	1609	435	1315	560	436	322	72	17	41	55	848	108	5818
1942	210	3283	322	549	324	332	519	74	87	880	469	1525	8574
1943	658	844	384	273	308	119	17	108	413	843	1411	1288	6666
1944	2024	228	626	156	201	183	759	361	276	127	461	176	5578
1945	450	1014	708	762	502	2288	1031	90	246	426	357	412	8286
1946	831	2051	1954	985	114	6	6	38	432	303	345	306	7371
1947	3866	1865	2142	945	517	29	20	178	385	276	536	1015	11774
1948	917	541	1863	597	1103	1692	60	259	863	0	501	387	8783

Appendix 15
Sheet 2

Appendix 15
Sheet 3

TOMEWIN RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1949	1175	992	1934	303	401	564	387	24	289	990	498	181	7738
1950	1252	2976	1596	831	78	1230	2694	372	340	710	716	687	13482
1951	2816	761	1909	216	347	843	9	146	149	249	74	298	7817
1952	162	746	1065	670	405	1210	208	747	215	542	131	341	6442
1953	1431	4473	1641	250	161	0	81	382	133	412	281	560	9805
1954	935	3718	569	394	1043	208	1775	259	372	1670	742	348	12033
1955	566	648	2414	1861	2514	343	402	21	239	590	90	2626	12314
1956	1450	5596	1566	645	1233	881	107	33	121	151	160	1208	13151
1957	1261	883	356	206	19	158	560	506	100	321	299	174	4843
1958	904	618	758	1090	72	1799	24	1580	442	273	353	632	8545
1959	1353	1546	2640	523	262	172	652	160	553	758	1550	938	11107
1960	638	1069	885	562	551	129	247	66	20	568	579	452	5766
1961	1011	1527	608	650	691	274	459	243	405	1296	2442	1253	10859
1962	2047	547	1448	718	334	140	1622	1114	423	223	496	1677	10789
1963	1384	1020	2848	1045	1915	147	11	384	222	465	753	1341	11535
1964	608	1379	1818	776	N.R.	39	282	93	383	293	511	363	

STATISTICAL RAINFALL DATA
(Points)

Station	Rainfall Statistic	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Cedar Glen (Period 41 years)	Minimum	45	38	51	44	0	0	6	10	0	10	43	132	2419
	10%	140	164	129	73	21	17	22	30	11	83	90	164	2642
	30%	320	271	190	144	96	84	64	65	74	166	147	252	3528
	50%	452	339	397	227	177	176	151	106	117	275	276	403	4090
	70%	621	596	647	334	291	336	226	205	194	403	371	598	4522
	90%	1000	1458	1108	575	543	901	372	267	323	664	601	851	5472
	Maximum	1711	3489	1555	1164	795	1701	1032	580	417	1257	795	1041	6983
Roberts Plateau (Period 33 years)	Minimum	65	23	48	10	0	0	0	38	0	17	59	75	3371
	10%	252	174	149	61	20	51	41	51	22	92	108	198	4123
	30%	447	402	361	190	164	193	97	85	137	193	228	323	4860
	50%	610	482	767	349	300	301	266	159	235	250	347	552	5534
	70%	996	760	1038	475	475	442	399	281	302	455	519	710	6741
	90%	1637	1316	1760	1337	957	1479	679	444	422	818	1024	1256	8417
	Maximum	2885	3723	2961	2472	1388	1770	1333	540	577	1187	1270	2069	9667
Springbrook (Period 48 years)	Minimum	239	231	125	136	19	0	13	0	4	4	51	141	5167
	10%	425	530	575	280	148	79	24	48	50	120	161	307	7406
	30%	830	966	894	532	384	214	144	136	166	276	305	527	9420
	50%	1227	1379	1810	914	731	364	330	280	382	453	656	744	11598
	70%	2146	1843	2833	1230	941	626	620	464	632	686	1031	1211	14209
	90%	3988	4668	3813	2432	2279	2479	1529	740	885	1136	1818	1963	16808
	Maximum	6646	7038	6087	3480	2658	2932	4316	1546	1176	1989	3240	2961	21344

STATISTICAL RAINFALL DATA
(Points)

Station	Rainfall Statistic	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Tallebudgera (Period 63 years)	Minimum	67	40	0	0	0	0	0	14	0	0	25	47	3279
	10%	195	244	226	121	44	32	19	39	21	86	85	116	4025
	30%	483	396	470	259	203	127	89	99	118	165	237	261	5572
	50%	664	616	804	514	425	258	179	197	175	282	383	445	6119
	70%	980	1022	1252	688	623	529	340	282	338	424	504	713	7021
	90%	1344	1885	1634	1331	1399	1232	981	532	603	650	961	1144	8829
	Maximum	2611	4389	2499	2693	2230	1834	1622	1139	815	1435	2304	2319	11025
Bangalow (Period 33 years)	Minimum	169	142	297	70	46	9	0	10	10	13	55	83	4291
	10%	221	311	349	145	164	74	27	36	36	57	83	145	5341
	30%	458	555	667	353	448	240	128	139	91	197	178	275	6393
	50%	691	659	989	641	688	467	247	268	181	317	295	379	6855
	70%	1161	1091	1287	884	848	720	641	440	327	438	514	618	8149
	90%	1912	2219	1554	1384	1478	1657	1119	855	661	773	932	1152	9964
	Maximum	2418	3279	2650	1973	2665	2338	2059	1311	905	1023	1263	1897	11391
Byron Bay (Period 72 years)	Minimum	71	11	60	101	42	33	1	4	14	21	27	57	3776
	10%	230	212	316	182	148	109	54	90	58	99	94	184	5638
	30%	409	480	623	412	452	260	227	202	138	224	183	325	6492
	50%	665	737	862	605	665	497	405	332	248	347	336	506	7348
	70%	1029	1202	1070	920	995	723	662	499	433	434	614	804	8676
	90%	1696	1710	1722	1347	1538	1434	1283	792	714	770	1043	1196	9653
	Maximum	3526	3605	2570	2093	2033	2693	1829	2022	1011	1356	2005	2145	10892

STATISTICAL RAINFALL DATA
(Points)

Station	Rainfall Statistic	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Condong (Period 77 years)	Minimum	79	14	31	44	8	4	1	0	0	10	23	31	2729
	10%	234	218	265	139	83	24	16	31	40	84	120	165	4533
	30%	448	428	555	260	274	164	87	114	137	185	220	324	5866
	50%	645	681	950	493	416	269	191	179	217	296	325	541	6532
	70%	1020	1090	1408	698	669	638	408	295	345	418	495	756	7730
	90%	1925	2116	1961	1387	1232	1215	1168	698	580	719	862	1036	9330
	Maximum	3371	4106	4074	2127	1975	2334	1756	1541	651	1032	2111	1669	12822
Cudgen (Period 72 years)	Minimum	102	22	21	36	13	5	6	19	2	0	32	21	3270
	10%	201	236	307	145	121	53	25	36	58	78	103	160	4690
	30%	393	477	524	346	331	241	158	127	151	201	215	342	5866
	50%	579	700	886	513	556	419	281	232	260	320	365	480	6758
	70%	1028	960	1103	782	755	678	441	400	474	416	474	722	7697
	90%	1631	1762	1734	1201	1217	1159	1007	692	718	707	882	1023	8545
	Maximum	2311	3864	2636	1883	1839	1760	1660	1235	885	1152	1712	2112	9983
Limpinwood (Period 23 years)	Minimum	157	258	180	73	40	0	0	18	0	86	78	32	3279
	10%	192	323	233	146	97	5	13	29	17	126	124	103	3798
	30%	536	586	468	444	197	106	104	95	71	272	219	282	6461
	50%	747	760	1246	670	283	156	229	190	156	405	263	659	7202
	70%	1059	1254	1556	879	642	274	360	320	207	557	618	869	8374
	90%	1693	2910	2497	1426	1408	1263	999	577	453	770	1416	1346	9431
	Maximum	2856	3945	2636	1714	1555	1735	1806	626	742	1001	1752	1888	10230

STATISTICAL RAINFALL DATA
(Points)

Station	Rainfall Statistic	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Mullumbimby (Period 66 years)	Minimum	96	50	54	57	5	5	0	0	12	12	29	117	2646
	10%	178	208	299	109	78	64	24	51	33	70	95	190	4563
	30%	439	456	528	374	363	178	125	126	104	197	159	322	5915
	50%	608	624	876	587	489	321	234	213	220	299	291	453	6664
	70%	1157	960	1146	817	870	687	525	341	377	457	547	634	7982
	90%	1541	1651	1793	1575	1360	1131	1121	628	626	830	1091	1052	9355
	Maximum	3467	3726	2961	2286	2604	1850	2311	1546	806	1084	1771	2339	10543
Murwillumbah (Period 69 years)	Minimum	65	83	22	6	0	0	0	0	0	0	23	40	2920
	10%	216	234	241	137	63	20	17	36	34	74	120	146	4257
	30%	454	458	476	339	242	120	107	90	125	194	225	303	5758
	50%	668	692	1054	517	390	247	191	181	204	297	322	455	6747
	70%	1077	1083	1313	641	554	513	414	261	333	413	498	754	7576
	90%	1952	2397	1911	1464	1291	1123	952	566	546	751	1078	1105	9181
	Maximum	3693	4278	3567	1901	2099	2231	1770	1214	651	1608	2186	1865	11746
Nimbin (Period 40 years)	Minimum	112	81	142	45	0	0	0	0	4	30	29	143	3367
	10%	251	270	340	164	53	32	12	31	26	94	69	218	4240
	30%	552	478	474	359	243	147	87	84	86	202	136	330	5581
	50%	774	684	843	559	388	261	173	181	145	258	270	509	6267
	70%	941	976	1145	682	580	521	428	261	237	428	481	797	7562
	90%	1793	2519	1924	1379	1145	1427	703	464	476	633	1041	1250	8990
	Maximum	2459	3893	2935	1781	2059	1929	1782	715	628	901	1666	1513	9447

STATISTICAL RAINFALL DATA
(Points)

Station	Rainfall Statistic	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Tweed Heads (Period 78 years)	Minimum	78	63	20	44	9	0	0	5	0	0	30	33	2710
	10%	201	220	289	166	92	39	29	40	47	76	103	136	4488
	30%	371	448	497	380	295	204	142	104	136	165	182	318	5565
	50%	584	674	901	547	497	364	228	197	258	287	288	427	6614
	70%	939	966	1291	806	668	564	462	361	397	471	449	699	7430
	90%	1691	2014	1836	1263	1386	1020	962	634	570	772	922	1070	8470
	Maximum	2401	3536	3468	2231	1797	1741	1556	1228	1069	1219	2388	1918	12567
Uki (Period 20 years)	Minimum	182	2	113	108	0	0	14	2	0	14	61	117	3334
	10%	215	105	218	117	22	36	15	20	7	48	67	121	3641
	30%	424	307	374	309	189	158	37	80	44	150	148	328	4944
	50%	549	575	538	484	302	274	185	132	131	244	334	546	5870
	70%	963	843	827	1057	472	566	409	236	236	361	527	801	6970
	90%	1626	2324	1395	1497	824	1833	715	503	536	788	1208	1550	7650
	Maximum	2623	2594	2404	1525	1232	2160	914	546	595	798	1302	1768	9723
Tomewin (Period 51 years)	Minimum	89	41	7	35	11	0	6	0	0	0	41	38	3912
	10%	226	265	338	159	73	30	18	19	36	58	93	177	4888
	30%	560	545	558	357	290	160	81	88	131	213	237	395	6182
	50%	917	844	1120	597	414	252	208	194	246	321	452	623	7930
	70%	1323	1171	1592	951	666	614	483	309	408	566	657	939	9364
	90%	2042	3467	2448	1637	1627	1226	1181	407	610	873	1522	1333	11726
	Maximum	3866	5596	2848	2011	2514	2288	2694	1580	863	1670	2456	2626	13482

MINIMUM RAINFALL RECORDED IN PERIODS OF UP TO TWELVE MONTHS COMMENCING IN THE MONTH INDICATED

(Points)

Station	Number of Months	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Byron Bay	1	71	11	60	101	42	33	1	4	14	21	27	57
	2	264	307	161	226	142	34	133	98	141	193	204	401
	3	401	597	692	493	143	214	153	258	302	491	428	729
	4	910	813	1270	821	323	436	313	513	618	653	1076	1704
	5	1638	1391	1383	1001	614	806	680	722	898	1218	1733	1865
	6	2165	2197	1588	1292	853	967	912	1002	1381	1958	2027	2702
	7	2291	2347	1817	1649	1014	1399	1156	1666	2354	2571	2863	3130
	8	2441	2836	1988	1861	1559	1679	2198	2683	2661	2914	3292	3420
	9	3020	3007	2200	2142	2231	2467	2815	2990	3004	3540	3447	3749
	10	3349	3219	2933	2561	2711	3019	3122	3333	4169	3672	3776	3839
	11	3653	3682	3339	3748	3066	3326	3465	4330	4301	4001	3866	3890
	12	3776	4252	4379	4397	3373	3669	4576	4462	4630	4091	3917	4051
Condong	1	79	14	31	44	8	4	1	0	0	10	23	31
	2	298	479	75	192	49	7	17	52	85	97	222	343
	3	782	689	369	308	52	29	139	121	195	390	483	784
	4	1146	745	411	459	74	301	160	232	459	611	895	1063
	5	1202	787	567	499	388	438	311	490	680	1191	1310	1273
	6	1244	943	642	674	884	685	529	711	1243	1668	1520	1329
	7	1400	1018	777	1128	1016	807	750	1434	1812	1878	1576	1371
	8	1475	1153	1231	1424	1194	1028	1440	2400	2022	1934	1618	1527
	9	1610	1607	1572	1793	1484	2072	2581	2610	2078	1976	1774	1602
	10	2064	1948	1896	2094	2241	3156	2791	2666	2120	2132	1849	1737
	11	2405	2272	2619	2553	3283	3391	2847	2708	2276	2207	1984	2191
	12	2729	2995	2782	3546	3497	3486	2889	2864	2351	2342	2438	2532

MINIMUM RAINFALL RECORDED IN PERIODS OF UP TO TWELVE MONTHS COMMENCING IN THE MONTH INDICATED

(Points)

Station	Number of Months	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mullumbimby	1	96	50	54	57	5	5	0	0	12	12	29	117
	2	346	391	166	236	93	8	72	72	55	128	243	320
	3	487	594	662	322	93	104	142	91	298	410	381	696
	4	936	795	820	455	189	366	215	344	524	580	905	1218
	5	1540	1067	1006	795	553	592	370	560	650	1064	1251	1532
	6	1590	1480	1260	940	793	792	609	696	1253	1410	1677	2017
	7	1776	1734	1368	1317	949	1061	722	1502	1812	2330	2140	2150
	8	2030	1842	1408	1464	1234	1268	1611	2066	2434	2588	2274	2342
	9	2138	1882	1631	1728	1835	1883	2252	2642	2630	2770	2466	2526
	10	2178	2105	1876	1984	2353	2302	3056	3138	3029	2962	2650	2711
	11	2401	2350	2038	2879	2906	3106	3324	3331	3181	3146	2835	2774
	12	2646	2512	2933	3018	3352	3374	3517	3435	3383	3331	2919	2997
Tweed Heads	1	78	63	20	44	9	0	0	5	0	0	30	33
	2	406	498	119	300	133	45	50	38	77	189	178	216
	3	824	610	536	354	138	115	116	187	276	397	395	555
	4	1019	798	697	574	209	181	263	359	520	577	700	879
	5	1124	959	916	715	592	546	434	527	700	973	1053	1125
	6	1285	1178	1032	897	821	909	613	707	1184	1391	1299	1179
	7	1504	1294	1154	1135	1198	986	793	1422	1627	1637	1353	1340
	8	1620	1416	1594	1521	1351	1166	1536	2207	1873	1691	1514	1559
	9	1742	1856	1757	1886	1733	1642	2380	2453	1927	1852	1733	1675
	10	2182	2019	2122	2303	2125	2804	2626	2507	2088	2071	1849	1797
	11	2345	2384	2675	2646	2858	3492	2680	2668	2307	2187	1971	2237
	12	2710	2985	2888	3104	3546	3571	2841	2887	2423	2309	2411	2400

MINIMUM RAINFALL RECORDED IN PERIODS OF UP TO TWELVE MONTHS
COMMENCING IN THE MONTH INDICATED
(Points)

Station	Number of Months	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tomewin	1	89	41	7	35	11	0	6	0	0	0	41	38
	2	216	533	49	222	120	12	44	58	96	91	338	318
	3	711	1010	581	367	126	50	130	113	238	523	534	567
	4	1741	1211	739	396	164	390	185	465	651	783	915	1258
	5	2126	1394	1101	563	596	507	572	916	932	986	1326	2293
	6	2586	1945	1209	1007	899	818	925	1078	1224	1378	2607	2736
	7	2603	2053	1622	1315	1081	1262	1087	1485	1835	2657	2777	3270
	8	2711	2466	1703	1616	1550	1440	1552	1871	2810	2827	3409	3471
	9	3124	2758	1807	2213	1956	1567	2455	3120	2980	3461	3643	3789
	10	3395	2862	2220	2493	2083	2619	3354	3290	3685	3695	3953	3941
	11	3499	3275	2737	2654	3061	3597	3524	3954	4152	4005	4106	3947
	12	3912	3792	3193	3096	3647	3767	4229	4188	4462	4158	4156	4051

TWEED RIVER AT BOAT HARBOUR (NORTH ARM)

LOCATION:	Latitude 28°19' Longitude 153°21'
PERIOD OF ESTABLISHMENT:	May 1947 to March 1957
COMPLETE YEARS OF COMPUTED RECORDS:	9
ZERO OF GAUGE:	35.58 Assumed Datum.
CATCHMENT AREA:	48 Square Miles.
CONTROL:	Timber Weir.
EQUIPMENT:	Staff Gauge, range 0 to 20 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 48
	(b) Maximum observation in cusecs : 3,791
	(c) Minimum observation in cusecs : 0
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	41,300 cusecs
MEAN DAILY DISCHARGE FOR 9 YEARS:	173 cusecs.
MEAN ANNUAL DISCHARGE FOR 9 YEARS:	126,000 acre feet.
REMARKS:	Discontinued in 1957.

Appendix 18
Sheet 2

TWEED RIVER AT BOAT HARBOUR (NORTH ARM)

Year 1947

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	..	..	..	..
May	..	..	..	..
June	91	40	55	3,270
July	40	28	34	2,100
Aug.	40	22	27	1,704
Sept.	46	22	31	1,844
Oct.	51	17	28	1,708
Nov.	53	13	22	1,336
Dec.	359	40	118	7,306
Total	..	..	..	..

Year 1948

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	265	40	85	5,274
Feb.	68	40	51	2,978
Mar.	1675	40	303	18,794
Apr.	494	58	106	6,378
May	4000	58	395	24,536
June	4600	58	345	20,726
July	103	49	65	4,024
Aug.	55	33	45	2,788
Sept.	1065	27	129	7,764
Oct.	123	31	50	3,080
Nov.	123	23	33	1,960
Dec.	68	22	30	1,830
Total	..	..	..	100,132

Year 1949

Jan.	662	17	55	3,396
Feb.	295	21	78	4,366
Mar.	2700	79	496	30,760
Apr.	415	58	114	6,858
May	103	49	63	3,878
June	977	49	109	6,554
July	63	33	44	2,730
Aug.	33	22	28	1,750
Sept.	40	22	26	1,538
Oct.	3000	17	139	8,612
Nov.	79	24	37	2,240
Dec.	49	22	28	1,744
Total	..	..	..	74,426

Year 1950

Jan.	94	13	43	2,650
Feb.	2800	30	694	38,882
Mar.	2500	138	516	32,008
Apr.	250	91	167	10,046
May	91	44	61	3,772
June	8460	44	339	20,364
July	6070	79	765	47,450
Aug.	590	68	173	10,724
Sept.	116	58	79	4,738
Oct.	310	60	110	6,794
Nov.	620	68	153	9,150
Dec.	526	91	161	9,994
Total	..	..	..	196,572

TWEED RIVER AT BOAT HARBOUR (NORTH ARM)

Year 1951

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	10200	91	793	49,148
Feb.	1117	62	182	10,184
Mar.	7310	53	427	26,464
Apr.	125	27	50	2,996
May	32	22	27	1,660
June	1205	22	74	4,410
July	32	20	26	1,596
Aug.	20	15	17	1,034
Sept.	15	12	13	786
Oct.	22	12	13	832
Nov.	12	1.8	8	453
Dec.	5	0.3	1.7	103
Total	..	..	..	99,666

Year 1952

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	2	0	0.9	54
Feb.	2	0	0.1	6.4
Mar.	1790	0	72	4,492
Apr.	83	6	20	1,178
May	18	6	10	642
June	2940	5	225	13,552
July	48	22	34	2,128
Aug.	954	22	99	6,150
Sept.	48	15	26	1,536
Oct.	58	8	30	1,830
Nov.	15	3	8	476
Dec.	8	3	6	356
Total	..	..	..	32,400

Year 1953

Jan.	1180	8	94	5,830
Feb.	10200	48	934	52,288
Mar.	27300	103	777	48,202
Apr.	253	91	126	7,574
May	129	58	77	4,768
June	58	39	50	2,976
July	39	15	32	2,004
Aug.	103	8	14	892
Sept.	30	8	10	608
Oct.	58	0	9	574
Nov.	15	0	6	380
Dec.	15	0	4	242
Total	..	..	..	126,338

Year 1954

Jan.	306	0	44	2,748
Feb.	30000	48	1212	67,862
Mar.	854	69	173	10,746
Apr.	69	30	39	2,338
May	735	22	87	5,404
June	187	39	81	4,838
July	11800	48	677	42,002
Aug.	463	48	79	4,872
Sept.	80	39	49	2,960
Oct.	2250	58	362	22,424
Nov.	558	91	166	9,962
Dec.	558	27	79	4,902
Total	..	..	..	181,058

TWEED RIVER AT BOAT HARBOUR (NORTH ARM)

Year 1955

Month	Discharge in Cusecs			Discharge for Month Acre Fett
	Max.	Min.	Mean	
Jan.	53	12	26	1,634
Feb.	408	22	78	4,372
Mar.	23800	62	782	48,476
Apr.	39200	72	689	41,330
May	3490	110	361	22,362
June	140	72	109	6,528
July	390	53	77	4,800
Aug.	53	38	41	2,514
Sept.	170	32	41	2,448
Oct.	268	38	51	3,168
Nov.	41	27	36	2,152
Dec.	5020	27	288	17,850
Total	..	..	..	157,634

Year 1956

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1520	32	240	14,854
Feb.	41300	125	1192	69,164
Mar.	1345	140	419	25,968
Apr.	462	32	130	7,784
May	19000	68	500	30,988
June	680	28	89	5,336
July	90	28	49	3,022
Aug.	28	18	21	1,300
Sept.	18	11	13	762
Oct.	11	6.5	8.9	553
Nov.	6.5	0	5.6	338
Dec.	995	0	45	2,782
Total	..	..	..	162,851

Year 1957

Jan.	526	11	77	4,764
Feb.	635	22	154	8,646
Mar.	206	28	61	3,784
Apr.	..	..	..	..
May	..	..	..	..
June	..	..	..	..
July	..	..	..	..
Aug.	..	..	..	..
Sept.	..	..	..	..
Oct.	..	..	..	..
Nov.	..	..	..	..
Dec.	..	..	..	..
Total	..	..	..	..

TWEED RIVER AT BOAT HARBOUR II
(NORTH ARM)

LOCATION:	Latitude 28°19' Longitude 153°20'
PERIOD OF ESTABLISHMENT:	April 1957 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	7
ZERO OF GAUGE:	R.L. 3.49 Assumed Datum.
CATCHMENT AREA:	43 Square Miles.
CONTROL:	Gravel Bar.
EQUIPMENT:	Automatic Recorder (Float type) installed April 1957. Staff gauge, range 0 to 25 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 85 (b) Maximum observation in cusecs : 1,253 (c) Minimum observation in cusecs : 1.33
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	26,500 cusecs.
MEAN DAILY DISCHARGE FOR 7 YEARS:	113 cusecs.
MEAN ANNUAL DISCHARGE FOR 7 YEARS:	82,300 acre feet.

TWEED RIVER AT BOAT HARBOUR II
(NORTH ARM)

Year 1957

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	53	18	32	1,898
May	18	10	12	770
June	33	8	12	722
July	70	8	16	1,008
Aug.	82	8	21	1,306
Sept.	37	8	15	902
Oct.	15	3	4.9	304
Nov.	70	2.5	12	722
Dec.	2.5	1.0	1.7	103
Total	..	..	..	..

Year 1958

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	8.0	1.0	2.9	181
Feb.	94	4.0	18	1,002
Mar.	142	6.5	38	2,378
Apr.	522	28	127	7,630
May	82	18	41	2,524
June	19640	18	346	20,774
July	43	5.5	13.7	848
Aug.	1010	4.2	106	6,579
Sept.	43	18	26	1,536
Oct.	27	11	18	1,100
Nov.	11	5	8	448
Dec.	34	5	13	826
Total	..	..	..	45,826

Year 1959

Jan.	1680	19	130	8,076
Feb.	21800	31	645	36,104
Mar.	No Record			
Apr.	No Record			7,500*
May	132	38	49	3,060
June	80	24	35	2,160
July	1010	18	55	3,426
Aug.	30	15	20	1,234
Sept.	218	18	45	2,708
Oct.	589	34	86	5,352
Nov.	4230	88	425	25,498
Dec.	872	13	68	4,198
Total	..	..	..	..

Year 1960

Jan.	225	7	19	1,194
Feb.	176	9	27	1,524
Mar.	899	40	97	6,034
Apr.	82	30	50	3,010
May	160	12	26	1,596
June	29	12	17	1,006
July	23	9	12	774
Aug.	14	6	8.5	530
Sept.	6	3	4	256
Oct.	144	2	6.8	422
Nov.	236	4	17.6	1,056
Dec.	37	6	12.9	802
Total	..	..	..	18,204

* Estimated.

TWEED RIVER AT BOAT HARBOUR II
(NORTH ARM)

Year 1961

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	391	5	58	3,608
Feb.	5680	15	244	13,660
Mar.	170	35	63	3,886
Apr.	154	38	74	4,414
May	146	31	53	3,302
June	415	35	84	5,028
July	820	23	57	3,580
Aug.	49	14	29	1,818
Sept.	28	10	13	792
Oct.	1740	8	117	7,274
Nov.	7300	20	300	18,022
Dec.	940	123	251	15,540
Total	..	..	..	80,924

Year 1962

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	3140	123	486	30,120
Feb.	560	70	147	8,210
Mar.	1250	39	218	13,500
Apr.	1020	99	216	13,000
May	150	27	54	3,340
June	35	17	26	1,570
July	17520	17	319	19,800
Aug.	4100	40	182	11,300
Sept.	76	32	51	3,040
Oct.	40	20	26	1,600
Nov.	121	20	27	1,600
Dec.	3860	20	300	18,600
Total	..	..	..	125,680

Year 1963

Jan.	12560	94	500	31,000
Feb.	925	115	195	10,900
Mar.	25850	138	956	59,300
Apr.	3980	108	303	18,200
May	25600	111	751	46,500
June	105	43	63	3,790
July	43	20	26	1,630
Aug.	83	12	18	1,150
Sept.	31	12	16	948
Oct.	65	16	20	1,200
Nov.	415	19	43	2,570
Dec.	1680	34	139	8,600
Total	..	..	..	185,788

Year 1964

Jan.	96	12	36	2,240
Feb.	1110	31	180	10,500
Mar.	5350	84	343	21,300
Apr.	2360	85	258	15,500
May	1530	35	87	5,400
June	420	28	65	3,880
July	251	20	34	2,120
Aug.	35	10	14	883
Sept.	123	10	15	910
Oct.	29	8.5	13	801
Nov.	154	8.5	16	950
Dec.	16	1.0	5.8	361
Total	..	..	..	64,845

TWEED RIVER AT BOAT HARBOUR II
(NORTH ARM)

Year 1965					Year 1966				
Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	94	0.5	6.1	380	Jan.	39	14	21	1,300
Feb.	17	5.5	9.3	521	Feb.	59	11	17.6	986
Mar.	4.7	1.5	2.7	168	Mar.	45	8	13.6	846
Apr.	1.5	0.75	0.98	58	Apr.	52	5.5	12.4	748
May	15	0.75	4.4	272	May	14	5.5	9	556
June	105	1.5	12.0	717	June	4490	8	109	6,346
July	26500	4.0	589	36,500					
Aug.	178	17	38	2,350					
Sept.	66	15	36	2,140					
Oct.	32	8.5	15.9	985					
Nov.	10	3	5.6	333					
Dec.	1582	10	165	10,200					
Total	..	..	..	54,624	Total	..	..	..	..

TWEED RIVER AT EUNGELLA (MIDDLE ARM)

LOCATION:	Latitude 28°22' Longitude 153°18'
PERIOD OF ESTABLISHMENT:	May 1947 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	18
ZERO OF GAUGE:	R.L. 43.56 Assumed Datum.
CATCHMENT AREA:	82 Square Miles.
CONTROL:	Rock Bar.
EQUIPMENT:	Automatic Recorder (Float type) installed May 1947. Staff gauge, range 0 to 20 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 96 (b) Maximum observation in cusecs : 7,976 (c) Minimum observation in cusecs : 0.27
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	50,000 cusecs.
MEAN DAILY DISCHARGE FOR 18 YEARS:	218 cusecs.
MEAN ANNUAL DISCHARGE FOR 18 YEARS:	159,000 acre feet.

TWEED RIVER AT EUNGELLA (MIDDLE ARM)

Year 1947

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	..	..	..	..
May	..	..	..	..
June	70	27	45	2,720
July	27	14	21	1,308
Aug.	34	10	16	954
Sept.	42	10	17	1,008
Oct.	42	4	11	678
Nov.	156	4	35	2,110
Dec.	1120	34	417	25,876
Total	..	..	..	..

Year 1948

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	511	42	105	6,474
Feb.	198	34	73	4,224
Mar.	3190	42	634	39,328
Apr.	5800	34	182	10,900
May	11700	51	738	45,780
June	25300	34	919	55,168
July	107	42	65	4,058
Aug.	42	20	32	1,966
Sept.	1230	14	130	7,816
Oct.	270	10	53	3,292
Nov.	51	4	16	968
Dec.	51	4	14	860
Total	..	..	..	180,834

Year 1949

Jan.	383	4	49	3,018
Feb.	850	10	195	10,926
Mar.	10000	198	1656	102,644
Apr.	850	27	233	13,996
May	324	27	99	6,116
June	850	51	162	9,694
July	324	20	72	4,492
Aug.	51	14	25	1,556
Sept.	42	14	24	1,414
Oct.	10800	7	279	17,300
Nov.	511	20	83	4,956
Dec.	60	10	29	1,802
Total	..	..	..	177,914

Year 1950

Jan.	10000	4	340	21,094
Feb.	3010	27	592	23,132
Mar.	2830	245	740	45,852
Apr.	810	94	344	20,652
May	156	94	122	7,546
June	24700	34	1154	69,212
July	2470	138	985	61,078
Aug.	1700	42	296	18,356
Sept.	156	51	96	5,778
Oct.	1070	70	317	19,632
Nov.	1070	34	343	20,554
Dec.	1290	94	301	18,658
Total	..	..	..	331,544

TWEED RIVER AT EUNGELLA
(MIDDLE ARM)

Year 1951

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	23900	70	1461	90,590
Feb.	2560	94	463	25,932
Mar.	10600	42	795	49,276
Apr.	70	27	44	2,664
May	324	20	42	2,590
June	2380	34	230	13,796
July	51	20	33	2,034
Aug.	20	14	17	1,048
Sept.	14	7	9.4	566
Oct.	34	4	12	770
Nov.	4	1	2	110
Dec.	245	0	61	3,810
Total	..	..	..	193,186

Year 1952

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	107	1	21	1,330
Feb.	296	0	33	1,939
Mar.	890	20	91	5,638
Apr.	176	27	74	4,458
May	156	20	53	3,274
June	1860	10	143	8,574
July	60	20	30	1,842
Aug.	1470	20	212	13,154
Sept.	70	10	32	1,922
Oct.	547	20	132	8,184
Nov.	27	7	14	838
Dec.	14	1	4	266
Total	..	..	..	51,419

Year 1953

Jan.	1620	1	103	6,402
Feb.	7400	20	1217	68,162
Mar.	4500	82	642	39,820
Apr.	176	51	106	6,374
May	198	20	53	3,286
June	20	10	15	876
July	51	7	15	896
Aug.	270	7	18	1,108
Sept.	34	10	13	772
Oct.	42	4	16	964
Nov.	34	1	7	436
Dec.	14	0	2	138
Total	..	..	..	129,234

Year 1954

Jan.	810	0	61	3,796
Feb.	50000	70	2056	115,128
Mar.	1290	51	146	9,054
Apr.	60	27	40	2,398
May	930	20	195	11,898
June	547	34	161	9,640
July	13200	60	984	61,004
Aug.	1410	51	176	10,912
Sept.	324	34	116	6,966
Oct.	4820	107	591	36,634
Nov.	383	34	82	4,882
Dec.	477	27	57	3,518
Total	..	..	..	275,830

TWEED RIVER AT EUNGELLA
(MIDDLE ARM)

Year 1955

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	245	14	43	2,688
Feb.	477	34	105	5,894
Mar.	35100	42	1666	103,268
Apr.	34700	176	1177	70,596
May	4000	34	488	30,286
June	94	20	41	2,452
July	198	14	49	3,046
Aug.	51	34	37	2,304
Sept.	34	14	25	1,476
Oct.	970	14	70	4,360
Nov.	70	4	30	1,812
Dec.	3550	1	347	21,518
Total	..	..	..	249,700

Year 1956

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	4630	51	678	42,022
Feb.	46100	176	2068	119,964
Mar.	3550	445	1115	69,106
Apr.	1350	156	407	24,414
May	7400	51	487	30,200
June	477	27	86	5,164
July	138	34	54	3,344
Aug.	34	20	26	1,590
Sept.	20	10	16	952
Oct.	14	7	10	608
Nov.	10	2	6	334
Dec.	1470	2	100	6,210
Total	..	..	..	303,908

Year 1957

Jan.	1290	10	155	9,582
Feb.	1230	51	256	14,346
Mar.	1030	49	112	6,932
Apr.	No	Records		3,950*
May	No	Records		1,430*
June	No	Records		1,340*
July	73	5.7	16	998
Aug.	588	3	42	2,614
Sept.	49	0.6	7.5	447
Oct.	26	0.2	1.6	100
Nov.	66	1.3	10.9	657
Dec.	4.0	0.6	1.3	82
Total	..	..	..	42,478*

Year 1958

Jan.	12	1.3	4.5	282
Feb.	112	4	19	1,051
Mar.	131	4	29	1,804
Apr.	1100	26	166	9,948
May	80	12	32	1,998
June	19000	12	552	33,140
July	103	18	45	2,768
Aug.	2080	18	129	7,978
Sept.	49	15	25	1,494
Oct.	80	5.7	20	1,224
Nov.	9.7	4.0	6.6	399
Dec.	545	5.7	37	2,264
Total	..	..	..	64,350

* Estimated.

TWEED RIVER AT EUNGELLA
(MIDDLE ARM)

Year 1959

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	6080	26	326	20,212
Feb.	28500	73	1106	61,914
Mar.	15800	54	739	45,810
Apr.	1250	66	223	13,358
May	197	44	62	3,818
June	60	30	39	2,362
July	1645	26	84	5,208
Aug.	44	18	28	1,708
Sept.	783	26	59	3,462
Oct.	756	18	67	4,062
Nov.	17000	54	652	39,108
Dec.	783	44	82	5,108
Total	..	..	..	206,130

Year 1960

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	350	22	42	2,632
Feb.	378	15	65	3,760
Mar.	1330	39	148	9,176
Apr.	87	22	40	2,392
May	186	9.7	30	1,856
June	66	15	20	1,210
July	54	12	19	1,184
Aug.	94	7.5	14.1	873
Sept.	9.7	3.0	4.8	285
Oct.	66	2.0	6.0	373
Nov.	406	3.0	19.1	1,149
Dec.	80	4	14	851
Total	..	..	..	25,741

Year 1961

Jan.	452	4.0	59	3,677
Feb.	15300	15	444	24,872
Mar.	730	34	90	5,568
Apr.	1880	44	167	10,016
May	244	34	68	4,232
June	867	34	133	7,956
July	610	18	45	2,794
Aug.	121	18	40	2,498
Sept.	34	15	22	1,334
Oct.	2830	12	243	15,042
Nov.	5600	34	182	10,916
Dec.	1690	54	267	16,558
Total	..	..	..	105,463

Year 1962

Jan.	14100	66	694	43,000
Feb.	1170	66	174	9,760
Mar.	6480	54	376	23,300
Apr.	4450	94	364	21,900
May	220	44	68	4,230
June	44	26	30	1,820
July	24400	26	580	35,900
Aug.	680	44	100	6,190
Sept.	66	18	39	2,330
Oct.	18	12	16	1,000
Nov.	73	12	13.8	828
Dec.	1980	10	129	7,970
Total	..	..	..	158,228

TWEED RIVER AT EUNGELLA (MIDDLE ARM)

Year 1963					Year 1964				
Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	6620	80	552	34,200	Jan.	131	18	37	2,290
Feb.	680	346	405	22,700	Feb.	2290	44	234	13,550
Mar.	13400	270	706	43,750	Mar.	3800	66	430	26,700
Apr.	NO RECORDS			26,000*	Apr.	2830	112	401	24,100
May	NO RECORDS			64,000*	May	1330	54	108	6,700
June	112	54	73	4,410	June	436	34	62	3,740
July	66	26	37	2,320	July	220	26	38	2,350
Aug.	66	18	29	1,800	Aug.	80	12	17.9	1,110
Sept.	54	12	18.1	1,090	Sept.	197	15	24	1,430
Oct.	80	12	20	1,220	Oct.	26	7.5	13.2	816
Nov.	783	12	101	6,040	Nov.	296	7.5	24	1,440
Dec.	2080	44	192	11,900	Dec.	94	3.0	12	718
Total	..	..	..	219,430*	Total	..	..	..	84,944

Year 1965					Year 1966				
Jan.	174	3.0	17.3	1,070	Jan.	44	12	24	1,490
Feb.	80	7.5	25	1,390	Feb.	66	12	27	1,520
Mar.	7.5	3.0	4.9	294	Mar.	73	12	26	1,590
Apr.	10	2.0	3.6	216	Apr.	121	5.7	20	1,230
May	34	3.0	10	622	May	44	5.7	13.9	860
June	163	2.0	20	1,220	June	3480	7.5	134	8,060
July	26300	5.5	769	47,700					
Aug.	505	18	54	3,340					
Sept.	185	18	54	3,240					
Oct.	44	10	19.1	1,180					
Nov.	10	3	6.1	364					
Dec.	NO RECORDS			16,000*					
Total	..	..	..	76,636*	Total	..	..	..	..

* Estimated.

TWEED RIVER AT KUNGHUR (SOUTH ARM)

LOCATION:	Latitude 28°28' Longitude 153°15'
PERIOD OF ESTABLISHMENT:	August 1954 to date.
COMPLETE YEARSOF COMPUTED RECORDS:	3
ZERO OF GAUGE:	R.L. 69.96 Assumed Datum.
CATCHMENT AREA:	19 Square Miles.
CONTROL:	Rock Bar.
EQUIPMENT:	Automatic Recorder (pressure type) installed August 1954 Staff Gauge, range 0 to 20 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 77 (b) Maximum observation in cusecs : 160 (c) Minimum observation in cusecs : 0.32
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	10,200 cusecs.
MEAN DAILY DISCHARGE FOR 3 YEARS:	41 cusecs.
MEAN ANNUAL DISCHARGE FOR 3 YEARS:	29,700 acre feet.

TWEED RIVER AT KUNGHUR
(SOUTH ARM)

Year 1954

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	..	..	..	..
May	..	..	..	..
June	..	..	..	..
July	..	..	..	..
Aug.	No Records			
Sept.	No Records			
Oct.	No Records			
Nov.	90	5.5	13	776
Dec.	11	5.5	10.3	641
Total	..	..	..	..

Year 1955

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1690	9	24	1,470
Feb.	256	9	25	1,420
Mar.	6620	7	174	10,800
Apr.	5580	23	221	13,300
May	730	23	70	4,370
June	123	16	29	1,720
July	16	4.2	13	810
Aug.	No Records			
Sept.	No Records			
Oct.	No Records			
Nov.	No Records			
Dec.	No Records			
Total	..	..	..	..

Year 1956

Jan.	No Records			
Feb.	No Records			
Mar.	580	39	113	6,980
Apr.	94	20	35	2,080
May	2800	10	83	5,170
June	293	4.2	19.5	1,170
July	13	4.2	7.0	434
Aug.	4.2	1.5	3.8	234
Sept.	1.5	1.5	1.5	90
Oct.	1.5	1.0	1.3	82
Nov.	1.0	0.3	0.5	29
Dec.	1150	0.3	37	2,280
Total	..	..	..	..

Year 1957

Jan.	No Records			
Feb.	No Records			
Mar.	No Records			
Apr.	16	4.2	13	780
May	4.2	1.5	1.8	110
June	4.2	1.0	2.8	166
July	50	1.0	5.5	340
Aug.	955	1.5	28	1,744
Sept.	55	10	18.4	1,106
Oct.	47	6.0	17.0	1,060
Nov.	152	1.0	7.6	454
Dec.	1.2	0.6	1.1	70
Total	..	..	..	..

TWEED RIVER AT KUNGHUR
(SOUTH ARM)

Year 1958

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1.2	1.2	1.2	74
Feb.	16	0.3	1.1	59
Mar.	69	0.3	6.1	376
Apr.	750	1.2	40	2,430
May	13.0	3.0	5.7	354
June	1690	3.0	95	5,700
July	20	3.0	5.7	354
Aug.	1263	3.0	42	2,600
Sept.	85	3.0	10	604
Oct.	8	3.0	4.3	266
Nov.	3	1.2	2.6	155
Dec.		No	Records	
Total	..	..	..	..

Year 1959

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.		No	Records	
Feb.		No	Records	
Mar.	2060	10	142	8,810
Apr.	94	11.5	30	1,800
May	20	11.5	12.9	802
June	16	3	9.9	596
July	580	6	40	2,460
Aug.	10	1.5	4.1	254
Sept.	480	4.2	24	1,410
Oct.	259	8	23	1,428
Nov.	2800	10	128	7,710
Dec.	94	8	12.1	748
Total	..	..	..	..

Year 1960

Jan.		No	Records	
Feb.		No	Records	
Mar.	730	10	59	3,670
Apr.	29	4.2	9	566
May	210	4.2	16	998
June	20	4.2	8	473
July	6	4.2	4.7	296
Aug.	6	4.2	4.9	308
Sept.	4.2	0.6	1.2	72
Oct.	2.1	0.1	0.3	20
Nov.	34	0.3	2.0	123
Dec.	10	1.0	3.3	205
Total	..	..	..	..

Year 1961

Jan.	540	2.1	36	2,250
Feb.	6620	3.0	116	6,500
Mar.	310	6.0	22	1,350
Apr.	400	8.0	22	1,320
May	113	6.0	13	822
June	180	6.0	25	1,520
July		No	Records	
Aug.	138	4.0	16	988
Sept.	113	4.0	11	682
Oct.	910	4.0	35	2,170
Nov.	166	4.0	17.4	1,040
Dec.	2640	6.0	62	3,840
Total	..	..	..	..

TWEED RIVER AT KUNGHUR
(SOUTH ARM)

Year 1962

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	3000	13.0	180	11,100
Feb.	364	13.0	33	1,850
Mar.	1050	13.0	82	5,050
Apr.	2280	16.0	130	7,810
May	540	13.0	38	2,370
June	13	8.0	9.8	586
July	5460	13.0	168	10,400
Aug.	440	10.0	32	1,970
Sept.	94	6.0	13.4	804
Oct.	16.0	3.5	8.0	495
Nov.	6.0	1.5	3.2	194
Dec.	1600	1.5	74	4,590
Total	..	..	..	47,219

Year 1963

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1525	19.0	80	4,950
Feb.	645	13.0	46	2,550
Mar.	No Records			
Apr.	1150	13.0	70	4,190
May	1020	14.0	190	11,800
June	328	11.0	29	1,720
July	42	11.0	17.5	1,080
Aug.	18	6.0	8.5	526
Sept.	6.0	2.0	3.2	192
Oct.	126	3.0	5.7	356
Nov.	820	4.0	31	1,848
Dec.	328	8.0	24	1,500
Total	..	..	..	..

Year 1964

Jan.	85	3.0	6.4	398
Feb.	600	11.0	59	3,412
Mar.	3000	18.0	142	8,790
Apr.	975	26	105	6,334
May	580	22	31	1,896
June	48	8	17	1,018
July	42	6	11.4	706
Aug.	18	3	6.6	410
Sept.	8	3	4.5	270
Oct.	2	1	1.6	102
Nov.	76	1.5	5.6	339
Dec.	6	0.5	1.9	119
Total	..	..	..	23,794

Year 1965

Jan.	276	1.0	6.1	380
Feb.	225	0.4	11.9	668
Mar.	0.8	0.2	0.4	25
Apr.	6.0	0.4	0.9	52
May	4.5	0.2	1.8	114
June	382	0.4	22	1,340
July	3880	2.4	139	8,640
Aug.	540	4.5	24	1,460
Sept.	47	4.5	11.6	694
Oct.	14	4.5	8.9	552
Nov.	6.0	0.4	2.9	176
Dec.	400	6.0	62	3,850
Total	..	..	..	17,951

TWEED RIVER AT KUNGHUR
(SOUTH ARM)

Year 1966

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	14	4.5	7.2	445
Feb.	930	1.6	13.8	770
Mar.	4.5	1.6	2.6	161
Apr.	150	0.8	5.3	316
May	3.2	0.8	1.8	113
June	3040	0.4	74	4,440
Total	..	..	..	..

TWEED RIVER AT BRAESIDE
(SOUTH ARM)

LOCATION:	28°24' Latitude 153°20' Longitude
PERIOD OF ESTABLISHMENT:	August 1951 to date
COMPLETE YEARS OF COMPUTED RECORDS:	13
ZERO OF GAUGE:	R.L. 27.98 Assumed Datum
CATCHMENT AREA:	115 Square Miles
CONTROL:	Rock Bar
EQUIPMENT:	Staff Gauge range 0 to 20 feet
CURRENT METER OBSERVATIONS:	(a) Number obtained : 102
	(b) Maximum observation in cusecs : 2,370
	(c) Minimum observation in cusecs : 0.27
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	130,000 cusecs
MEAN DAILY DISCHARGE FOR 13 YEARS:	237 cusecs
MEAN ANNUAL DISCHARGE FOR 13 YEARS:	173,000 acre feet

TWEED RIVER AT BRAESIDE
(SOUTH ARM)

Year 1951

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	..	..	..	..
May	..	..	..	..
June	..	..	..	..
July	..	..	..	..
Aug.	..	..	..	..
Sept.	20	13	17	1,028
Oct.	28	5.4	13.9	864
Nov.	7.8	2.0	4.0	2,421
Dec.	118	2.0	9.8	608
Total	..	..	..	..

Year 1952

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	5.4	0.5	2.6	161
Feb.	200	0.5	18.8	1,089
Mar.	855	20	115	7,132
Apr.	132	24	50	3,012
May	118	20	47	2,912
June	4840	16	185	11,114
July	49	24	34	2,118
Aug.	1970	28	235	14,584
Sept.	49	22	34	2,048
Oct.	435	15	73	4,552
Nov.	28	7.8	13.3	801
Dec.	33	3.3	9.7	603
Total	..	..	..	50,126

Year 1953

Jan.	832	5.4	66	4,091
Feb.	7500	7.8	1383	77,461
Mar.	5230	78	684	42,378
Apr.	242	55	108	6,476
May	87	33	48	2,980
June	33	20	26	1,556
July	78	16	25	1,542
Aug.	70	10.4	16.4	1,022
Sept.	40	10.4	14.7	879
Oct.	43	5.4	14.3	884
Nov.	16	2.0	5.9	352
Dec.	49	3.3	10.2	733
Total	..	..	..	140,354

Year 1954

Jan.	71	1.5	22	1,349
Feb.	70000	25	2426	135,836
Mar.	1900	50	280	17,384
Apr.	70	31	41	2,456
May	1130	22	209	12,948
June	434	44	122	7,338
July	16000	44	1011	62,710
Aug.	1340	92	201	12,436
Sept.	365	65	141	8,432
Oct.	5000	136	538	33,326
Nov.	365	65	151	9,048
Dec.	168	31	69	4,290
Total	..	..	..	307,553

TWEED RIVER AT BRAESIDE
(SOUTH ARM)

Year 1955

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	810	21	114	7,080
Feb.	395	65	148	8,314
Mar.	51000	78	1293	80,140
Apr.	38000	65	1473	88,370
May	4020	155	470	29,136
June	255	79	142	8,536
July	180	45	72	4,456
Aug.	51	39	43	2,670
Sept.	58	33	40	2,416
Oct.	155	15	37	2,320
Nov.	33.5	6.2	12	728
Dec.	8400	4.7	465	28,829
Total	..	..	..	262,995

Year 1956

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	5035	47	553	34,294
Feb.	130000	No Records		
Mar.	2605	258	877	54,346
Apr.	6100	107	285	17,078
May	6100	62	518	32,086
June	1017	40	117	6,994
July	116	35	54	3,332
Aug.	40	20.7	29	1,796
Sept.	25	13.5	19	1,130
Oct.	20.8	6.5	11.4	704
Nov.	13.5	3.0	6.4	385
Dec.	3700	2.5	214	13,284
Total	..	..	..	..

Year 1957

Jan.	1715	16	228	13,696
Feb.	565	75	247	13,846
Mar.	337	50	108	6,666
Apr.	75	25	35	2,122
May	25	13.5	16.5	1,020
June	30	13.5	14.8	887
July	82	10.5	27.4	1,700
Aug.	360	10.5	57	3,526
Sept.	68	8.7	23	1,393
Oct.	147	5.0	17.7	1,100
Nov.	275	6.0	35.8	2,146
Dec.	3.0	1.5	2.6	161
Total	..	..	..	48,263

Year 1958

Jan.	8.5	1.5	4.3	288
Feb.	25	4.5	8.3	463
Mar.	350	5	48	2,978
Apr.	2525	21	288	17,282
May	107	21	46	2,850
June	2565	25	509	30,534
July	171	34	71	4,382
Aug.	6900	34	605	37,524
Sept.	126	30	44	2,612
Oct.	45	10	25	1,564
Nov.	21	8	12	708
Dec.	147	8	23	1,454
Total	..	..	..	102,639

TWEED RIVER AT BRAESIDE
(SOUTH ARM)

Year 1959

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	3130	10	381	23,638
Feb.	18400	89	950	53,180
Mar.	20000	61	2585	160,278
Apr.	1750	89	406	24,370
May	112	52	67	4,166
June	64	32	45	2,698
July	500	32	130	8,060
Aug.	102	28	43	2,646
Sept.	850	36	132	7,900
Oct.	650	41	119	7,408
Nov.	2815	70	447	26,802
Dec.	308	68	110	6,820
Total	..	..	..	327,966

Year 1960

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	399	33	63	3,802
Feb.	103	23	42	2,442
Mar.	1090	49	207	12,392
Apr.	122	33	51	3,058
May	803	19	84	5,226
June	93	23	41	2,458
July	36	16	22	1,392
Aug.	24	9	13	814
Sept.	9	5	6	376
Oct.	24	3	7	432
Nov.	156	5	19	1,130
Dec.	72	3	17	1,040
Total	..	..	..	34,562

Year 1961

Jan.	520	3	79	4,910
Feb.	11800	16	611	34,214
Mar.	399	49	115	7,158
Apr.	408	68	161	9,632
May	418	61	121	7,524
June	965	68	231	13,878
July	625	33	77	4,788
Aug.	316	33	68	4,224
Sept.	112	29	40	2,400
Oct.	1360	25	223	13,850
Nov.	470	43	130	7,802
Dec.	1610	61	303	18,756
Total	..	..	..	129,136

Year 1962

Jan.	4590	38	717	44,456
Feb.	520	82	178	9,976
Mar.	1250	82	310	19,210
Apr.	10400	103	678	40,708
May	645	60	157	9,758
June	60	38	47	2,820
July	28900	38	1095	67,860
Aug.	1970	60	243	15,052
Sept.	68	38	51	3,056
Oct.	35	16	28	1,708
Nov.	26	10	17.1	1,028
Dec.	6900	13	615	38,144
Total	..	..	..	253,776

TWEED RIVER AT BRAESIDE
(SOUTH ARM)

Year 1963

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	8800	85	741	45,900
Feb.	1970	68	260	14,500
Mar.	20200	98	1380	85,600
Apr.	6300	98	522	31,300
May	110000	229	2820	175,000
June	222	98	136	8,160
July	122	45	77	4,780
Aug.	68	26	38	2,360
Sept.	38	10	18	1,060
Oct.	117	13	26	1,590
Nov.	1480	13	129	7,730
Dec.	1010	61	207	12,890
Total	..	..	..	390,870

Year 1964

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	520	15	70	4,290
Feb.	2805	57	384	22,300
Mar.	1450	104	490	30,400
Apr.	2445	148	558	33,500
May	1820	68	188	11,600
June	520	54	106	6,370
July	252	25	50	3,120
Aug.	33	12	20	1,260
Sept.	56	12	23	1,410
Oct.	25	8	13	822
Nov.	300	12	40	2,410
Dec.	104	5	17	1,090
Total	..	..	..	118,572

Year 1965

Jan.	168	4	30	1,890
Feb.	490	6	71	3,970
Mar.	6	1.5	3	196
Apr.	11	0.2	4.1	246
May	40	3	11.3	724
June	570	2	62	3,690
July	18800	14	592	36,700
Aug.	1220	18	104	6,430
Sept.	170	22	75	4,500
Oct.	31	10	19	1,160
Nov.	42	2	6	386
Dec.	1430	67	392	24,300
Total	..	..	..	84,192

Year 1966

Jan.	67	20	32	1,980
Feb.	465	14	75	4,210
Mar.	28	10	15	980
Apr.	600	3.5	47	2,850
May	48	11	21	1,310
June	8700	12	380	22,800
Total	..	..	..	..

BRUNSWICK RIVER AT DURRUMBUL

LOCATION:	Latitude 28°32' Longitude 153°27'
PERIOD OF ESTABLISHMENT:	November 1954 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	8
ZERO OF GAUGE:	R.L. 38.70 Assumed Datum
CATCHMENT AREA:	13 Square Miles.
CONTROL:	Rock Bar.
EQUIPMENT:	Staff Gauge, range 0 to 10 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 74
	(b) Maximum observation in cusecs : 2,201
	(c) Minimum observation in cusecs : 0.48
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	5,700 cusecs.
MEAN DAILY DISCHARGE FOR 8 YEARS:	59 cusecs.
MEAN ANNUAL DISCHARGE FOR 8 YEARS:	43,200 acre feet.

BRUNSWICK RIVER AT DURRUMBUL

Year 1954

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	..	..	..	..
May	..	..	..	..
June	..	..	..	..
July	..	..	..	..
Aug.	..	..	..	..
Sept.	..	..	..	..
Oct.	..	..	..	..
Nov.	420	10	42	2,546
Dec.	10	6.1	7.9	491
Total	..	..	..	..

Year 1955

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	3380	4.8	130	8,086
Feb.	222	18	49	2,738
Mar.	4180	18	242	14,994
Apr.	3130	26	184	11,018
May	3580	22	219	13,594
June	26	14	17	1,032
July	18	7.4	10.6	658
Aug.	6.1	3.6	4.9	301
Sept.	3.6	3.1	3.4	206
Oct.	7.4	2.8	3.3	203
Nov.	3.6	2.5	3.2	195
Dec.	3580	2.5	345	21,399
Total	..	..	..	74,424

Year 1956

Jan.		No Records		
Feb.	4380	24	676	39,232
Mar.	267	104	147	9,102
Apr.	510	74	140	8,398
May		No Records		
June	705	16	86	5,132
July	149	5.5	36	2,243
Aug.	22	3.7	5.3	329
Sept.	39	3.4	6.5	388
Oct.	4.4	2.3	3.3	206
Nov.	2.2	1.9	2.0	121
Dec.	55	1.9	9.1	562
Total	..	..	..	..

Year 1957

Jan.	390	5.2	6.8	4,246
Feb.	46	15	22	1,250
Mar.	46	3.7	12.4	766
Apr.	28	3.7	9.2	554
May	8	2.6	3.4	213
June	1.2	1.1	1.1	68
July	18	1.1	3.9	241
Aug.	110	3.4	18.5	1,148
Sept.	60	11	28	1,766
Oct.	4.8	1.0	2.3	143
Nov.	28	1.2	3.1	186
Dec.	33	0.7	3.8	236
Total	..	..	..	10,817

BRUNSWICK RIVER AT DURRUMBUL

Year 1958

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1.1	1.1	1.1	68
Feb.	1.3	1.2	1.2	70
Mar.	33	1.1	8.3	518
Apr.	1210	5.9	87	5,242
May	16	4.8	8.2	507
June	860	4.8	72	4,325
July	32	8	14	868
Aug.	3580	8	164	10,138
Sept.	14	8	9.7	583
Oct.	8	3.9	5.9	365
Nov.	1.8	1.6	1.7	101
Dec.	1.8	1.4	1.6	98
Total	..	..	..	22,883

Year 1959

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	3580	1.8	167	10,380
Feb.	820	55	169	9,488
Mar.	1485	60	286	17,740
Apr.	238	28	66	3,938
May	28	15	21	1,318
June	15	8	11	676
July	143	5.2	49	3,042
Aug.	50	15	26	1,594
Sept.	268	23	68	4,060
Oct.	82	41	55	3,436
Nov.	1235	20	120	7,228
Dec.	74	20	44	2,750
Total	..	..	..	65,650

Year 1960

Jan.	78	27	42	2,606
Feb.	65	30	43	2,474
Mar.	78	50	58	3,568
Apr.	60	32	48	2,858
May	35	17	26	1,592
June	29	12	22	1,326
July	15	6.6	9.9	611
Aug.	5.5	1.2	2.9	182
Sept.	0.9	0.3	0.5	28
Oct.	2.0	0.2	0.7	40
Nov.	10	1.2	5.6	339
Dec.	7.7	0.6	1.9	120
Total	..	..	..	15,744

Year 1961

Jan.	330	3.5	36	2,246
Feb.	5700	4.4	146	8,178
Mar.	58	22	37	2,282
Apr.	35	16	24	1,432
May	940	17	74	4,578
June		No Records		
July		No Records		
Aug.		No Records		
Sept.		No Records		
Oct.		No Records		
Nov		No Records		
Dec.		No Records		
Total	..	..	..	..

BRUNSWICK RIVER AT DURRUMBUL

Year 1962

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	3580	20	407	25,212
Feb.	59	20	31	1,740
Mar.	330	20	67	4,136
Apr.	82	20	32	1,910
May	40	17	24	1,472
June	25	5	11	670
July		No Records		
Aug.		No Records		
Sept.	22	7	9.5	570
Oct.	7	1	4.6	286
Nov.	3.5	1	1.7	100
Dec.	330	1	81	5,028
Total	..	..	..	..

Year 1963

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1260	22	251	15,582
Feb.	97	12	39	2,194
Mar.	2500	12	268	16,598
Apr.	1260	56	197	11,834
May	3320	25	403	25,000
June	25	20	24	1,430
July	20	10	15	920
Aug.	20	10	12	762
Sept.	20	10	10.3	620
Oct.	10	5	7.5	466
Nov.	300	5	58	3,474
Dec.	300	18	52	3,242
Total	..	..	..	82,122

Year 1964

Jan.	18	3	6.3	392
Feb.	390	10	94	5,630
Mar.	1260	22	287	17,800
Apr.	740	49	201	12,100
May	420	10	62	3,840
June	300	3	46	2,742
July	3	1	1.7	106
Aug.	3	1	1.8	114
Sept.	3	1	1.3	80
Oct.	3	1	1.26	78
Nov.	14	1	5.6	336
Dec.	6	1	3.9	244
Total	..	..	..	43,462

Year 1965

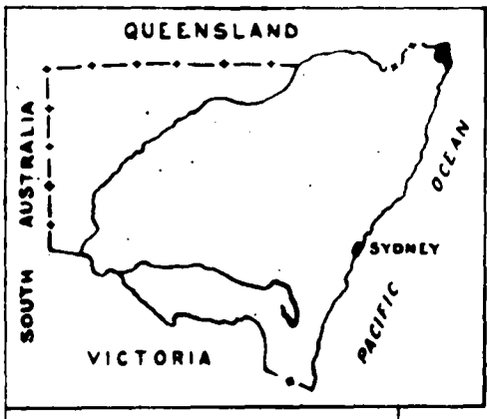
Jan.	14	1	2	148
Feb.	6	1	2.9	162
Mar.	1	0.6	0.99	60
Apr.	6	1	4.9	298
May	6	1	2.7	164
June	71	1	17.3	1,040
July	3200	6	377	23,000
Aug.	31	22	28.5	1,766
Sept.	22	6	12	728
Oct.	31	3	11	698
Nov.	6	1	3.7	214
Dec.	97	6	33	2,070
Total	..	..	..	30,348

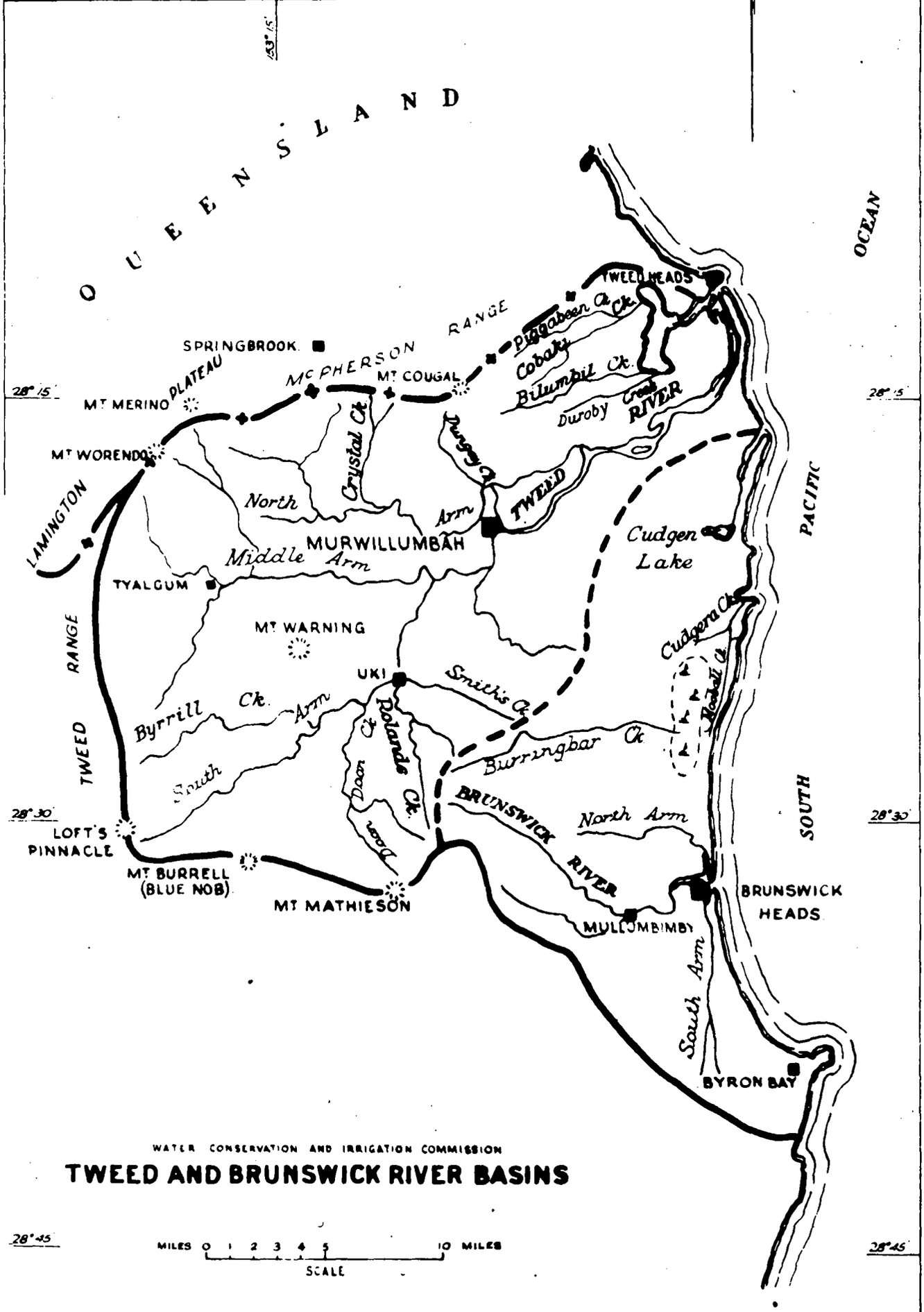
BRUNSWICK RIVER AT DURRUMBUL

Year 1966

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	14	3	6.5	406
Feb.	71	3	17.2	964
Mar.	10	1	3.6	222
Apr.	6	1	2.9	172
May	8	3	5.3	328
June	500	3	55	3,290
Total	..	..	..	..

FIGURE 1.





WATER CONSERVATION AND IRRIGATION COMMISSION

TWEED AND BRUNSWICK RIVER BASINS

FIGURE 2

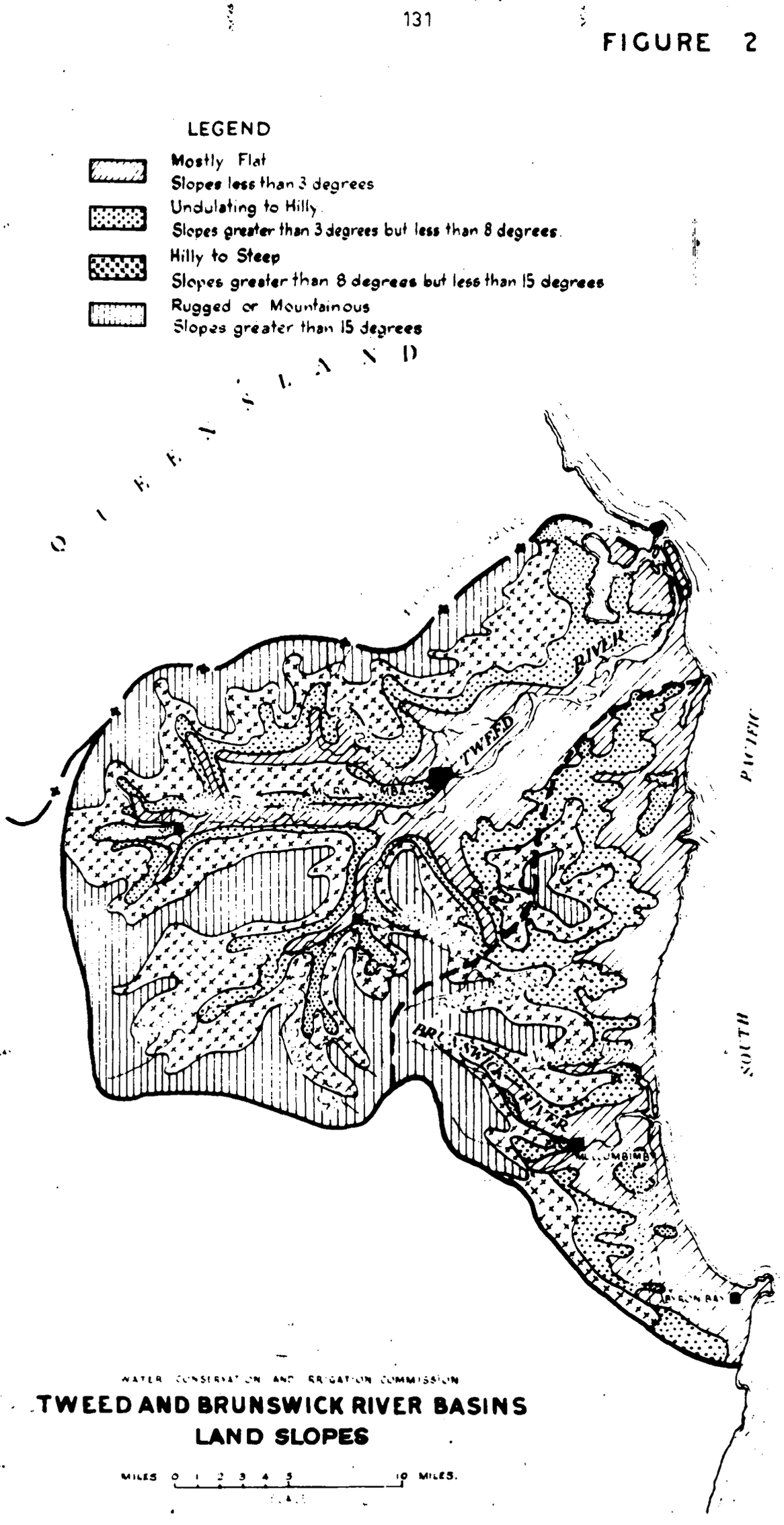
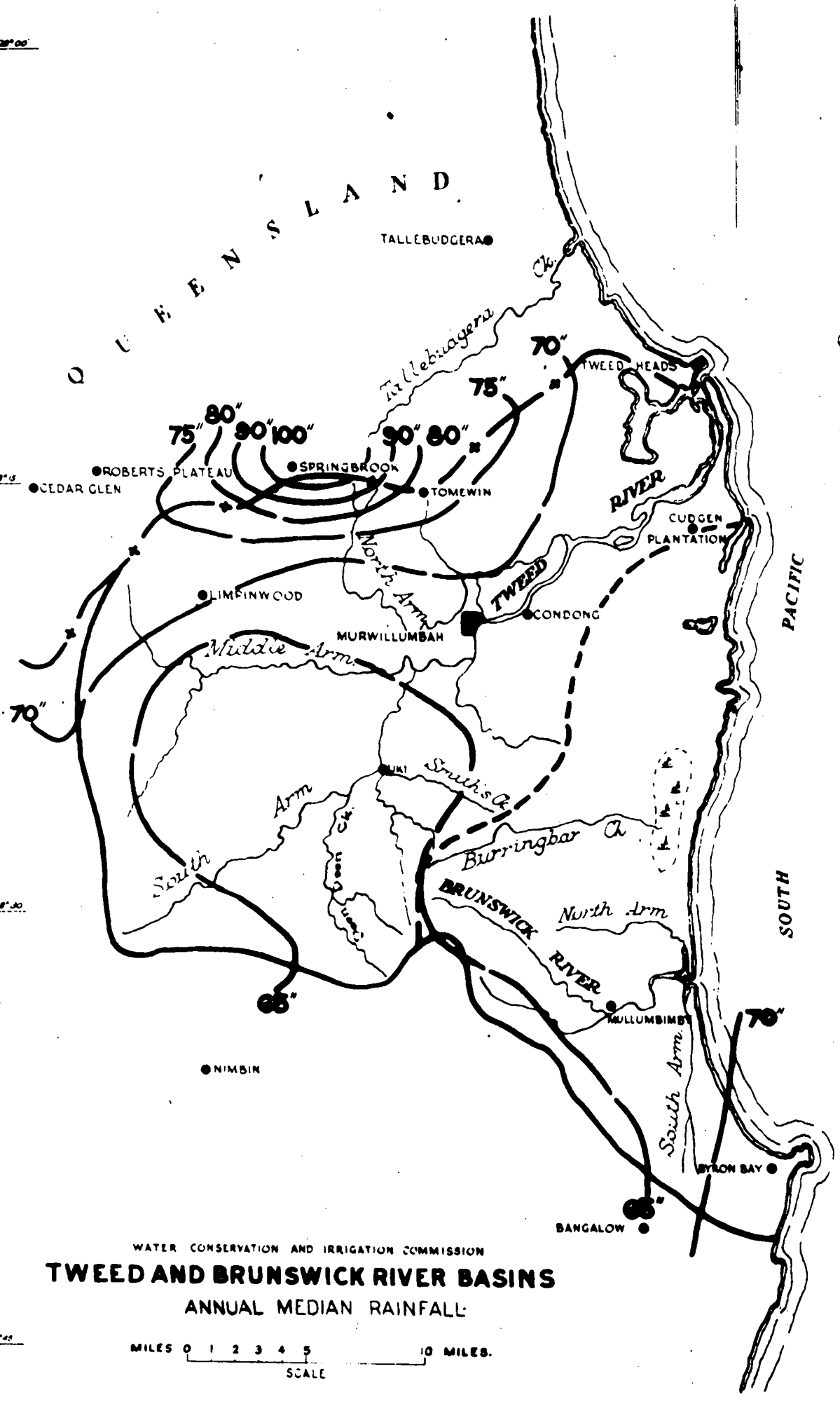

LEGEND
Mostly Flat
Slopes less than 3 degrees
Undulating to Hilly
Slopes greater than 3 degrees but less than 8 degrees
Hilly to Steep
Slopes greater than 8 degrees but less than 15 degrees
Rugged or Mountainous
Slopes greater than 15 degrees
QUEENSLAND
PACIFIC OCEAN
SOUTH
TWEED RIVER
MURWILLUMBAH
BRUNSWICK RIVER
BYRON BAY
WATER CONSERVATION AND IRRIGATION COMMISSION
TWEED AND BRUNSWICK RIVER BASINS
LAND SLOPES
MILES 0 1 2 3 4 5 10 MILES.

FIGURE 3



WATER CONSERVATION AND IRRIGATION COMMISSION

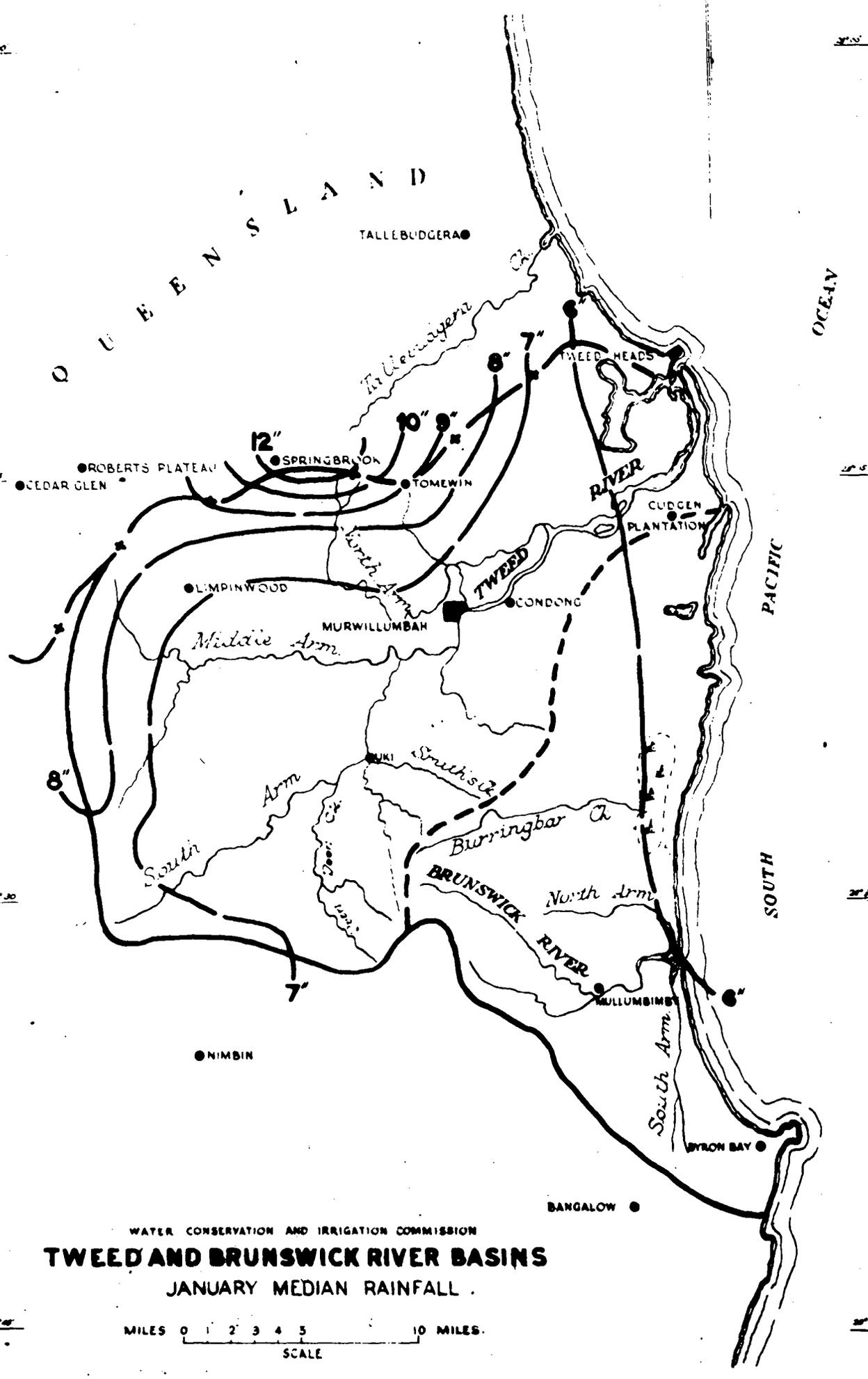
TWEED AND BRUNSWICK RIVER BASINS

ANNUAL MEDIAN RAINFALL

MILES 0 1 2 3 4 5 10 MILES.

SCALE

FIGURE 4



WATER CONSERVATION AND IRRIGATION COMMISSION

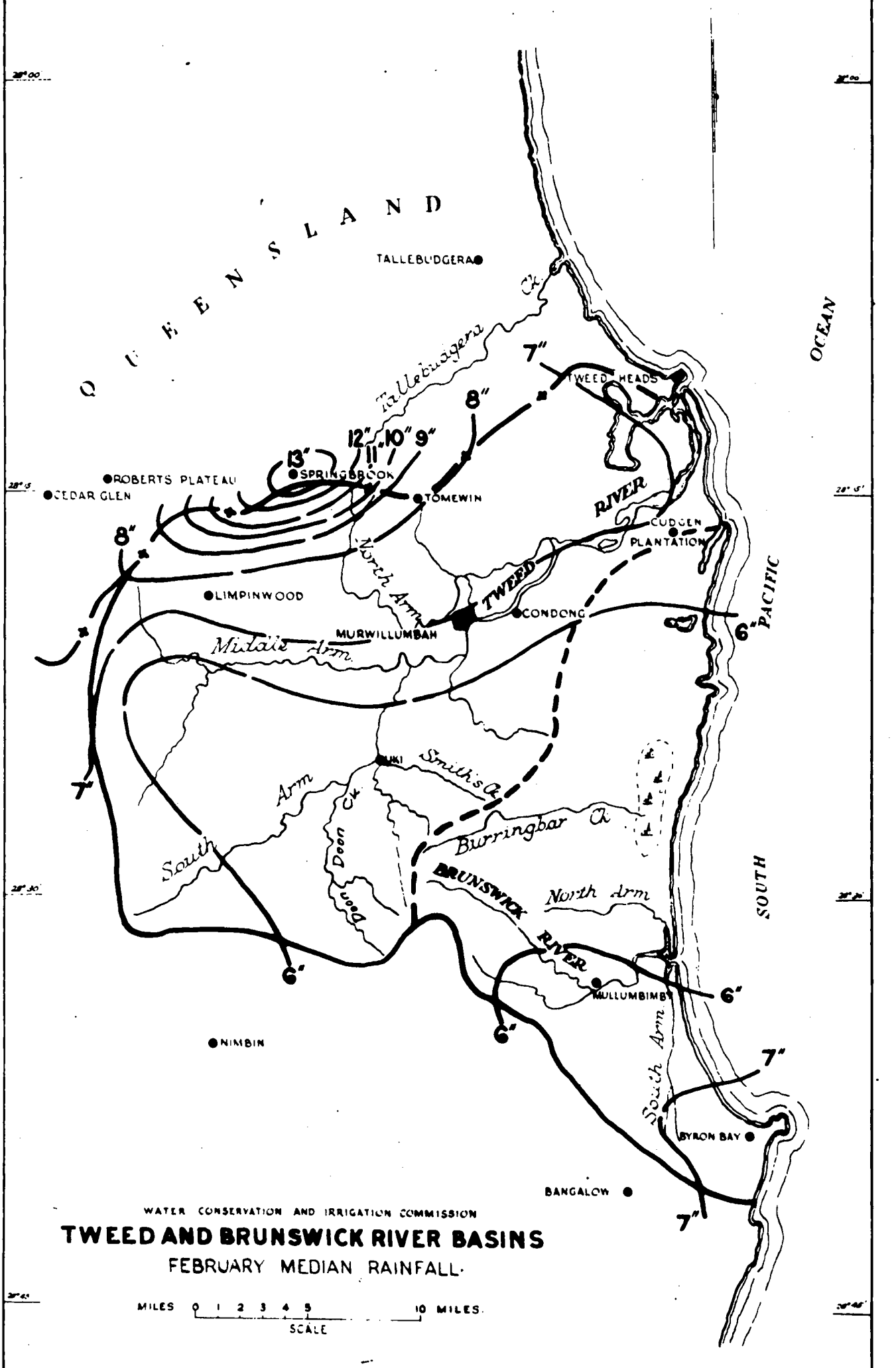
TWEED AND BRUNSWICK RIVER BASINS

JANUARY MEDIAN RAINFALL.

MILES 0 1 2 3 4 5 10 MILES.

SCALE

FIGURE 5



WATER CONSERVATION AND IRRIGATION COMMISSION

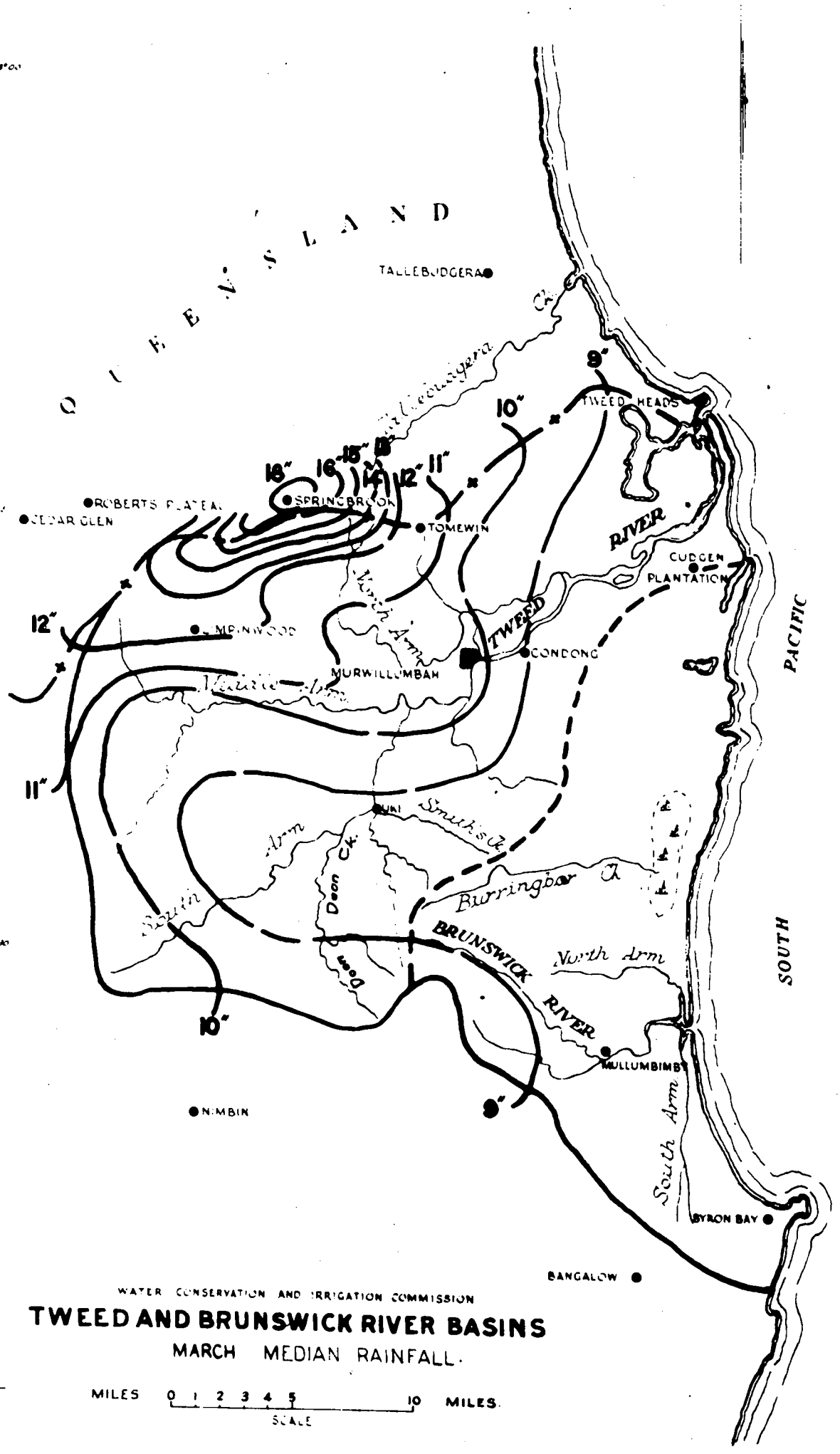
TWEED AND BRUNSWICK RIVER BASINS

FEBRUARY MEDIAN RAINFALL.

MILES 0 1 2 3 4 5 10 MILES.

SCALE

FIGURE 6



WATER CONSERVATION AND IRRIGATION COMMISSION

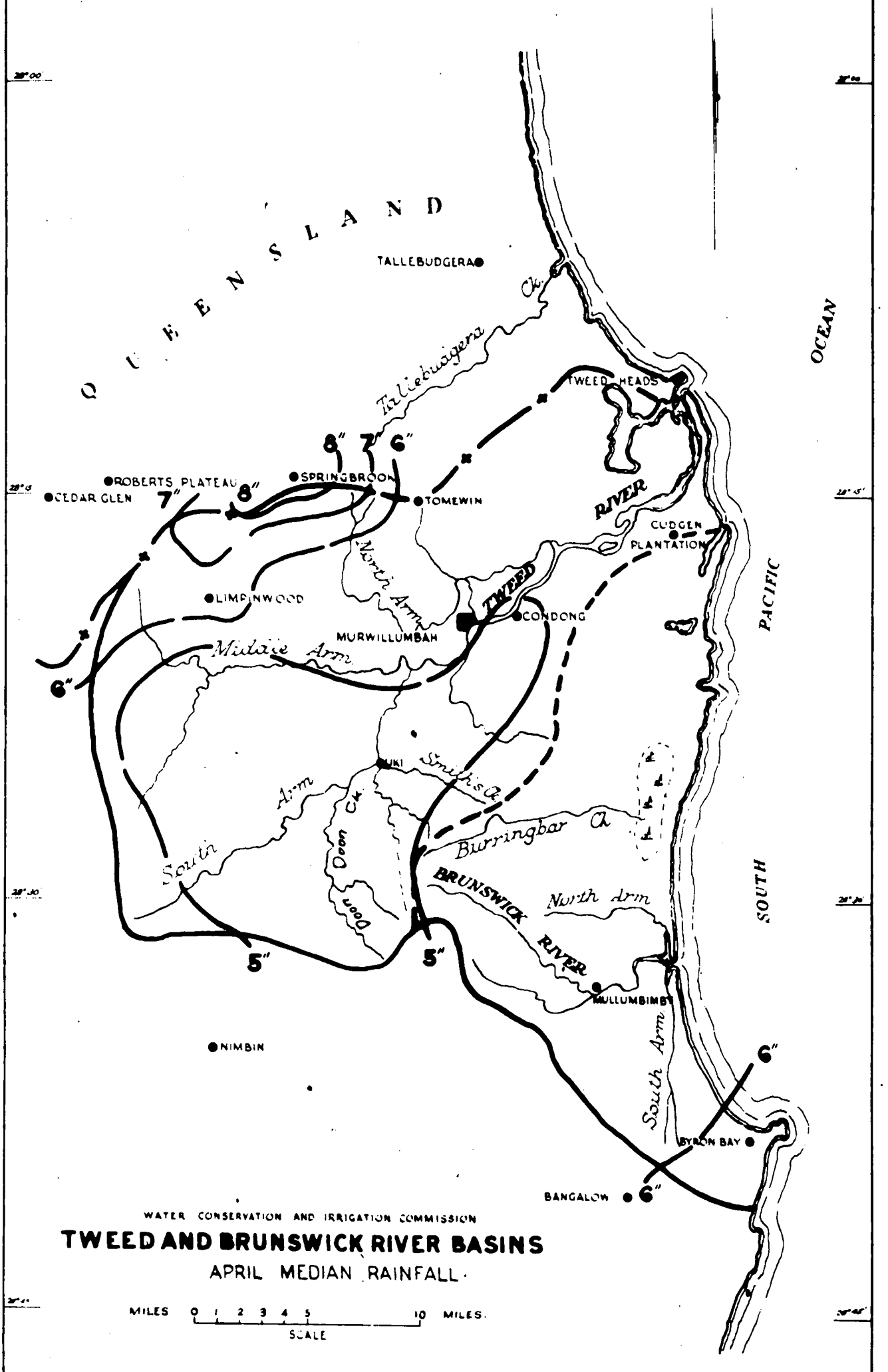
TWEED AND BRUNSWICK RIVER BASINS

MARCH MEDIAN RAINFALL.

MILES 0 1 2 3 4 5 10 MILES.

SCALE

FIGURE 7



WATER CONSERVATION AND IRRIGATION COMMISSION

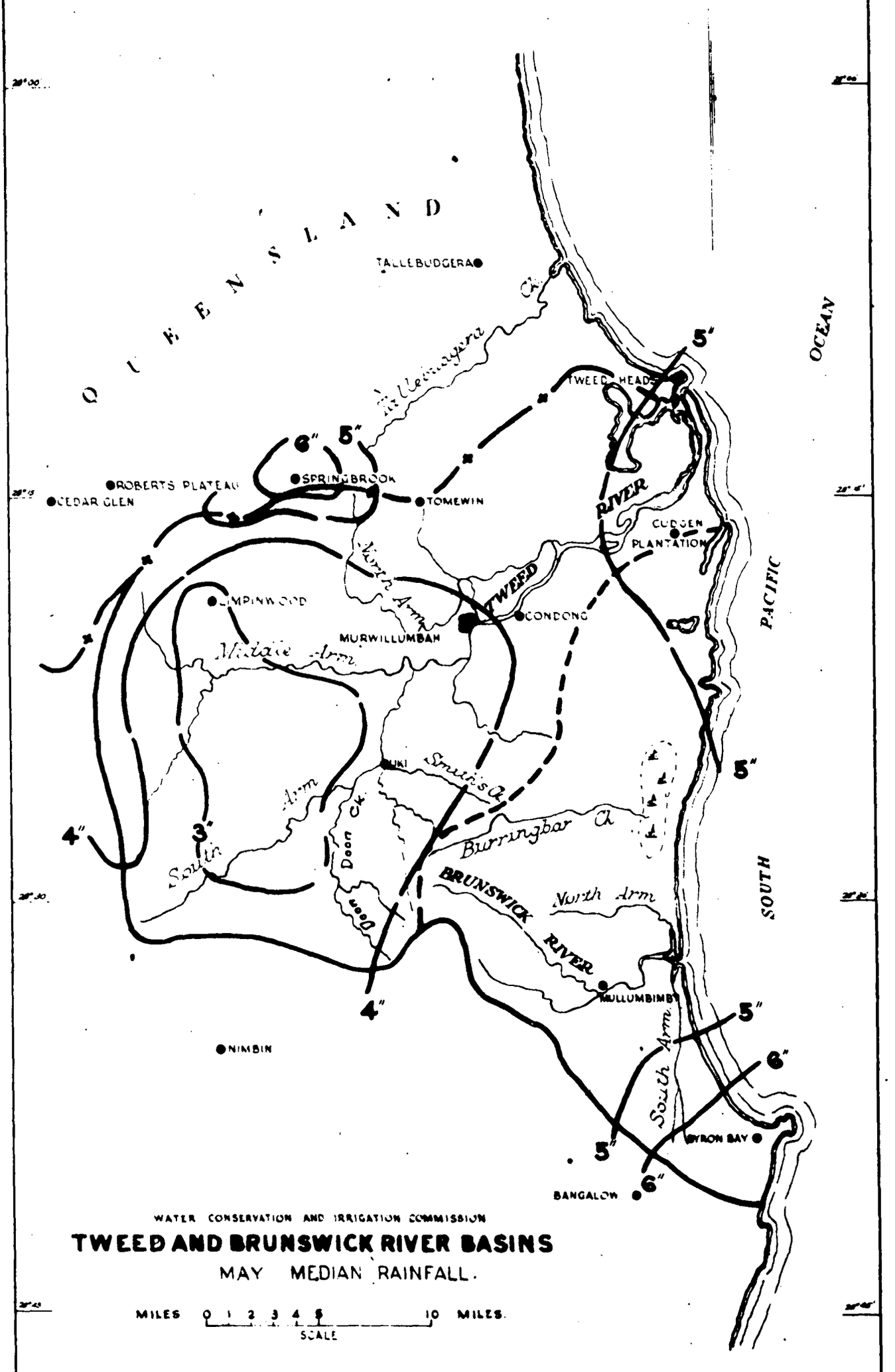
TWEED AND BRUNSWICK RIVER BASINS

APRIL MEDIAN RAINFALL.

MILES 0 1 2 3 4 5 10 MILES.

SCALE

FIGURE 8



WATER CONSERVATION AND IRRIGATION COMMISSION

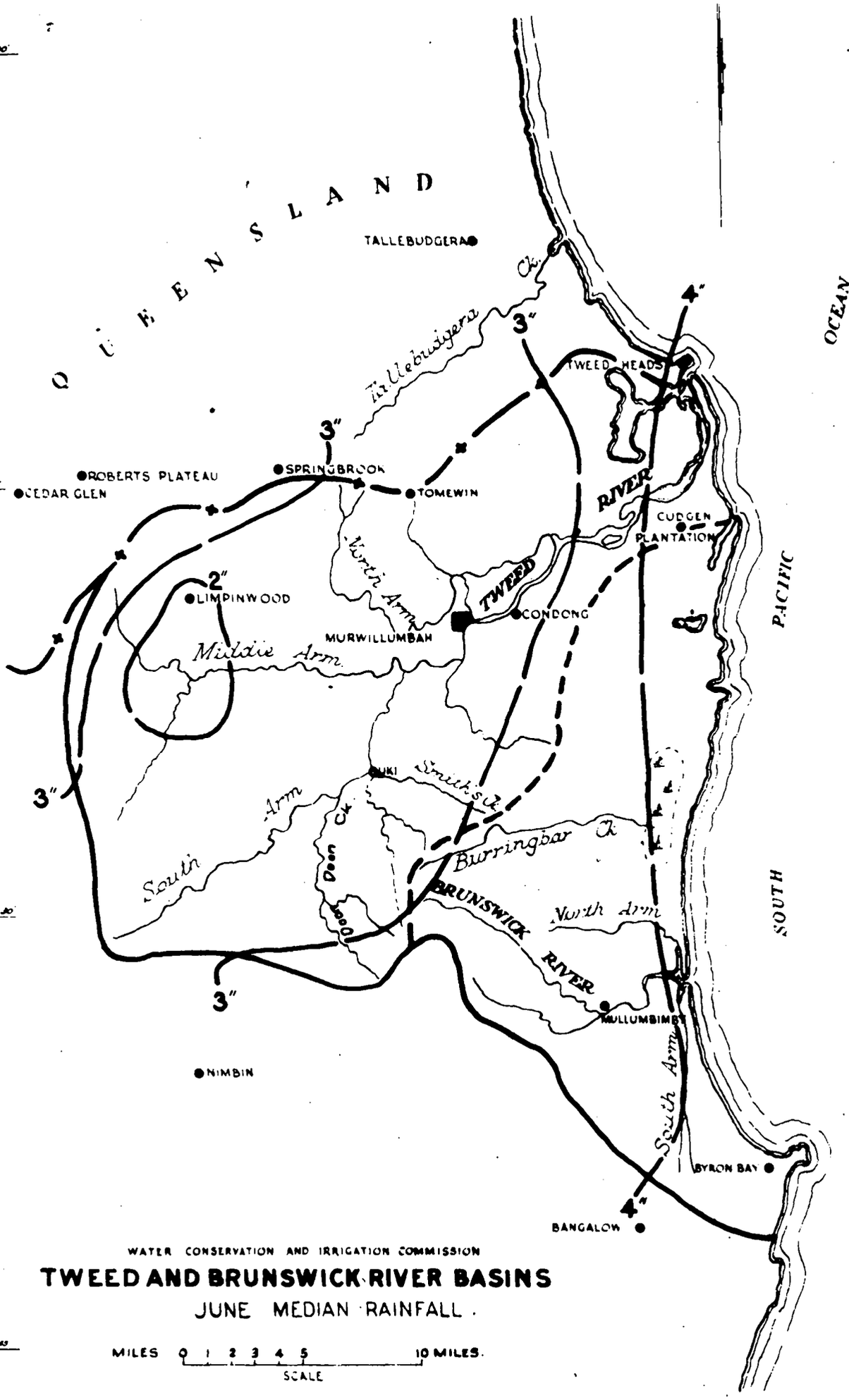
TWEED AND BRUNSWICK RIVER BASINS

MAY MEDIAN RAINFALL.

MILES 0 1 2 3 4 5 10 MILES.

SCALE

FIGURE 9



WATER CONSERVATION AND IRRIGATION COMMISSION

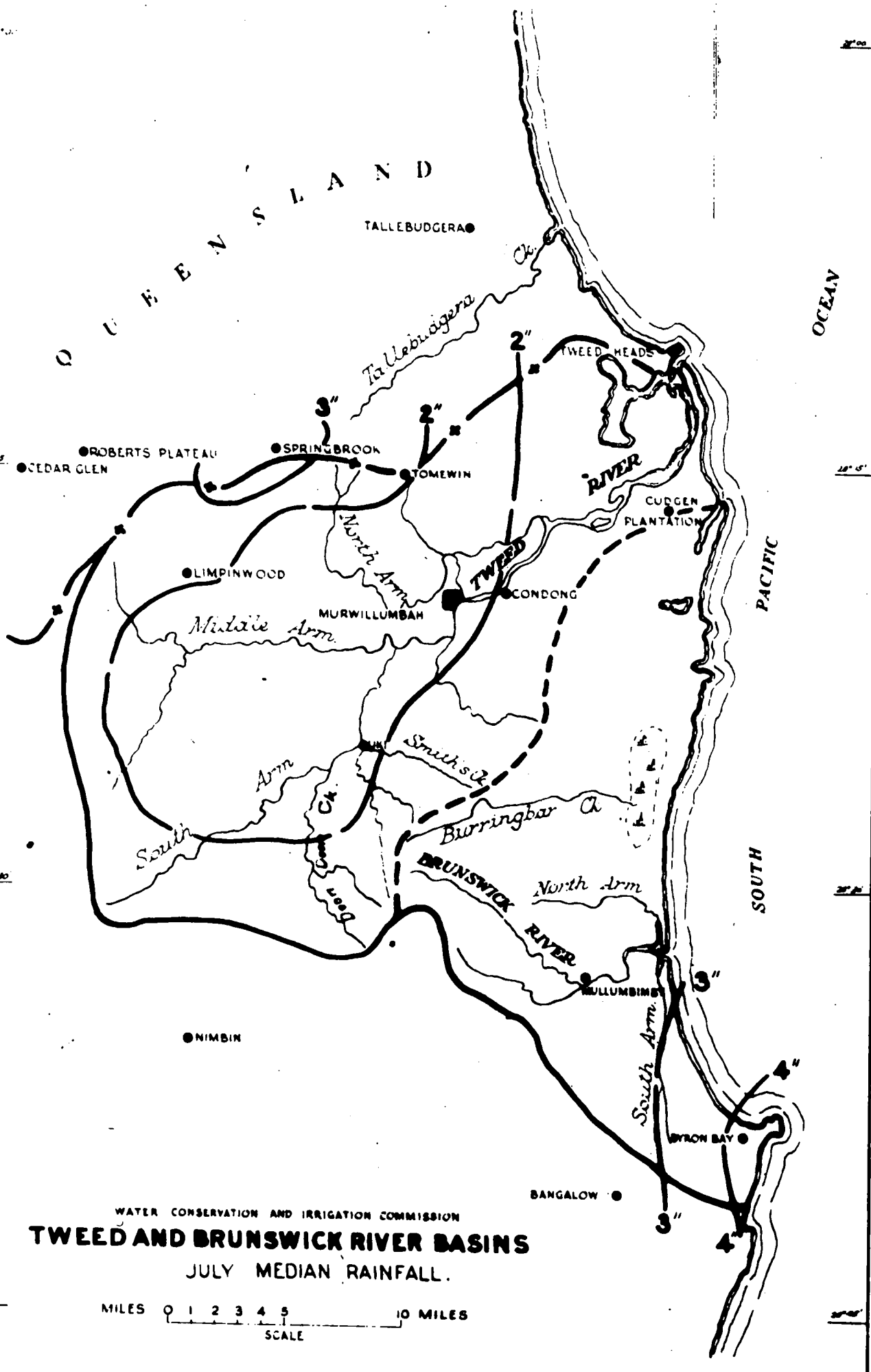
TWEED AND BRUNSWICK RIVER BASINS

JUNE MEDIAN RAINFALL.

MILES 0 1 2 3 4 5 10 MILES.

SCALE

FIGURE 10



WATER CONSERVATION AND IRRIGATION COMMISSION

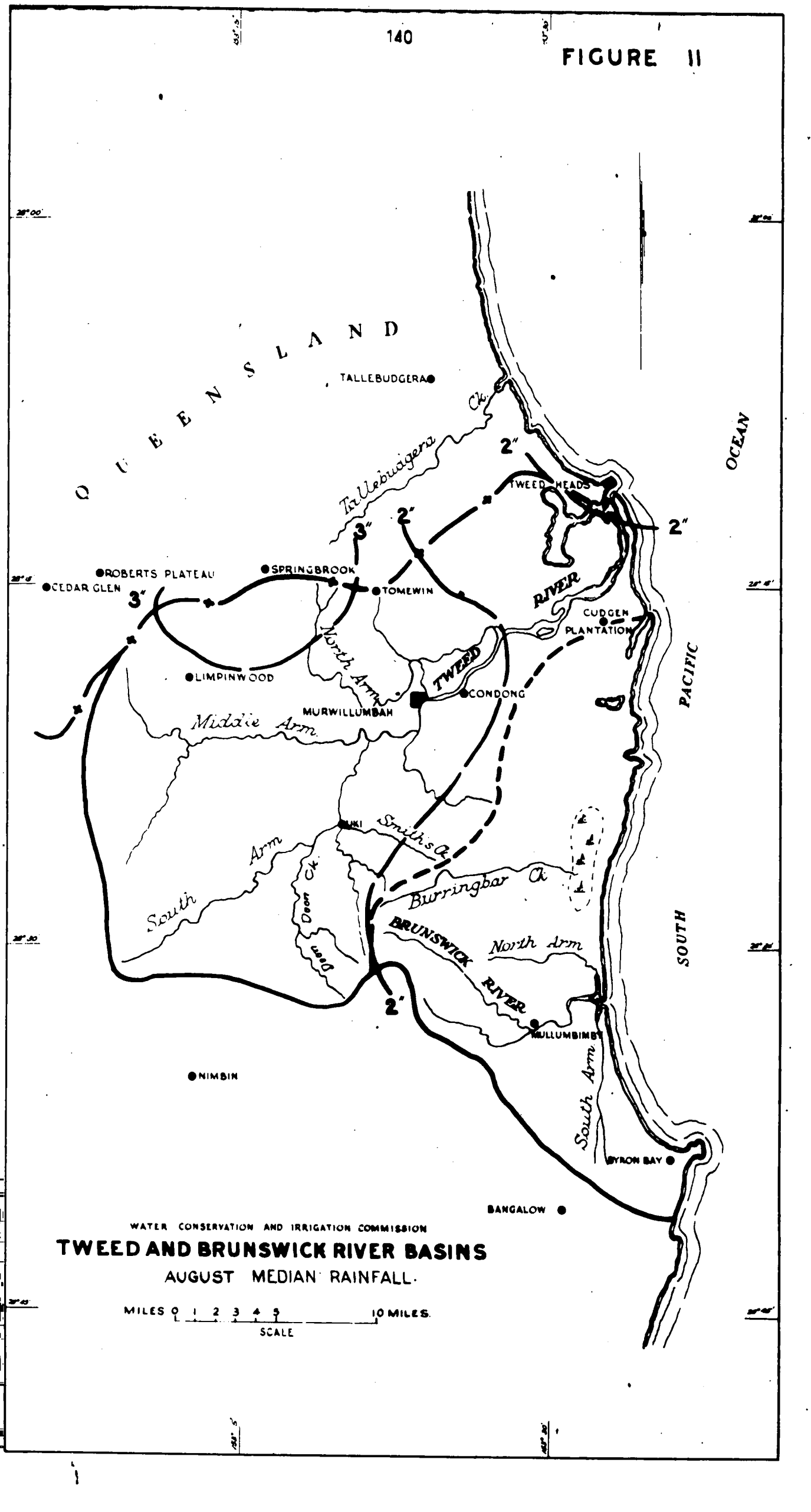
TWEED AND BRUNSWICK RIVER BASINS

JULY MEDIAN RAINFALL.

MILES 0 1 2 3 4 5 10 MILES

SCALE

FIGURE 11



WATER CONSERVATION AND IRRIGATION COMMISSION

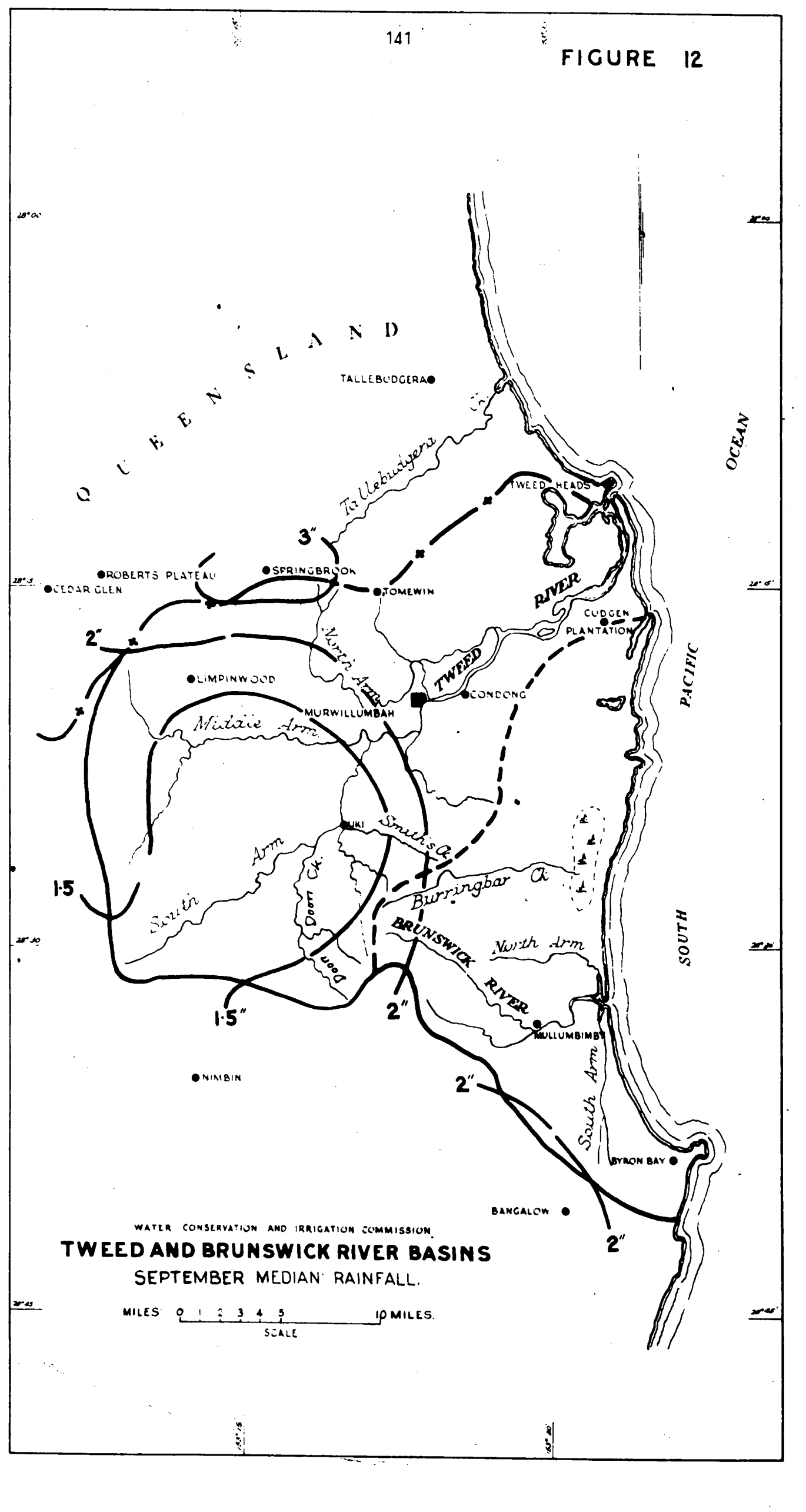
TWEED AND BRUNSWICK RIVER BASINS

AUGUST MEDIAN RAINFALL.

MILES 0 1 2 3 4 5 10 MILES.

SCALE

FIGURE 12



WATER CONSERVATION AND IRRIGATION COMMISSION.

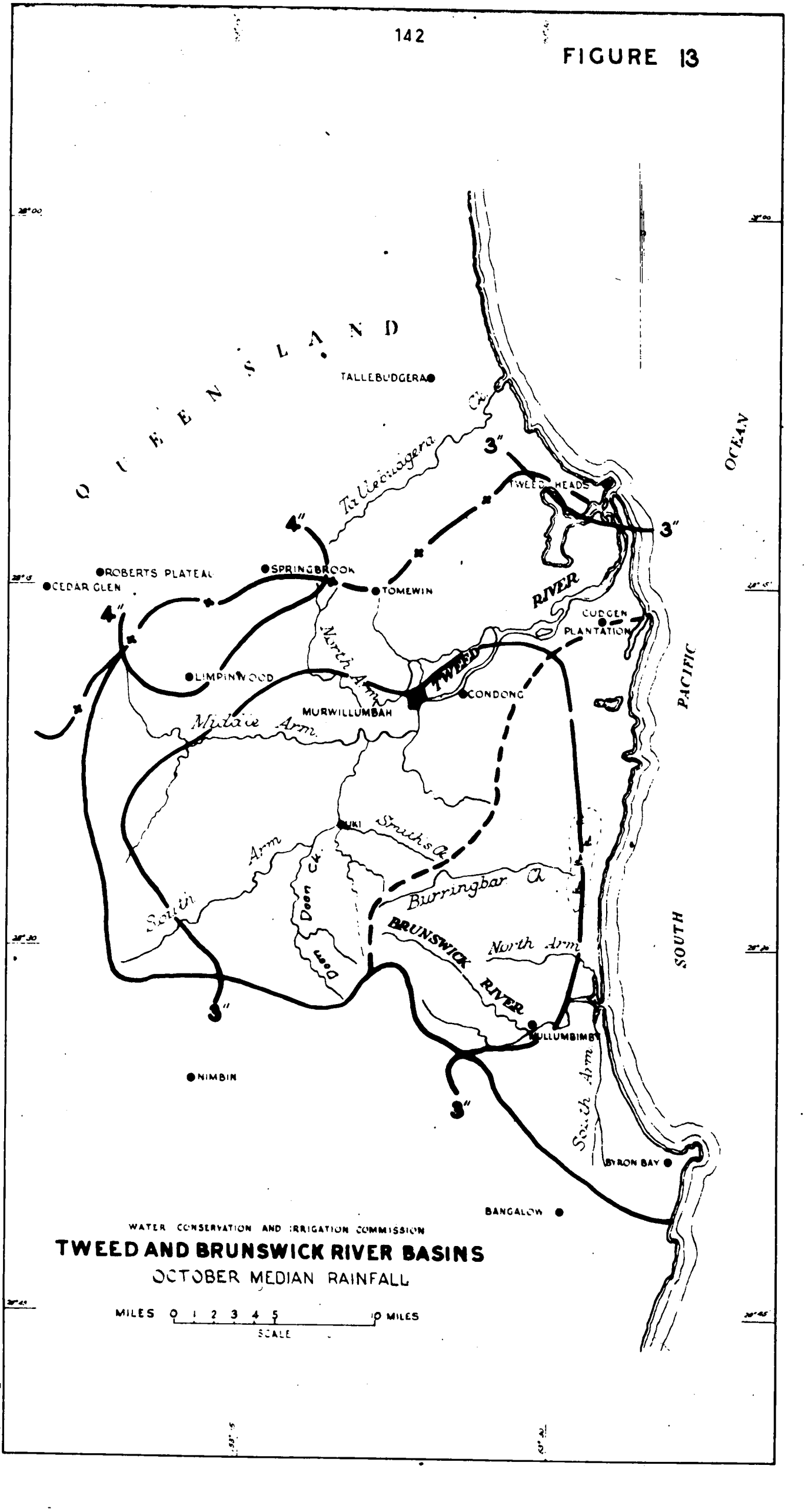
TWEED AND BRUNSWICK RIVER BASINS

SEPTEMBER MEDIAN RAINFALL.

MILES 0 1 2 3 4 5 10 MILES.

SCALE

FIGURE 13



WATER CONSERVATION AND IRRIGATION COMMISSION

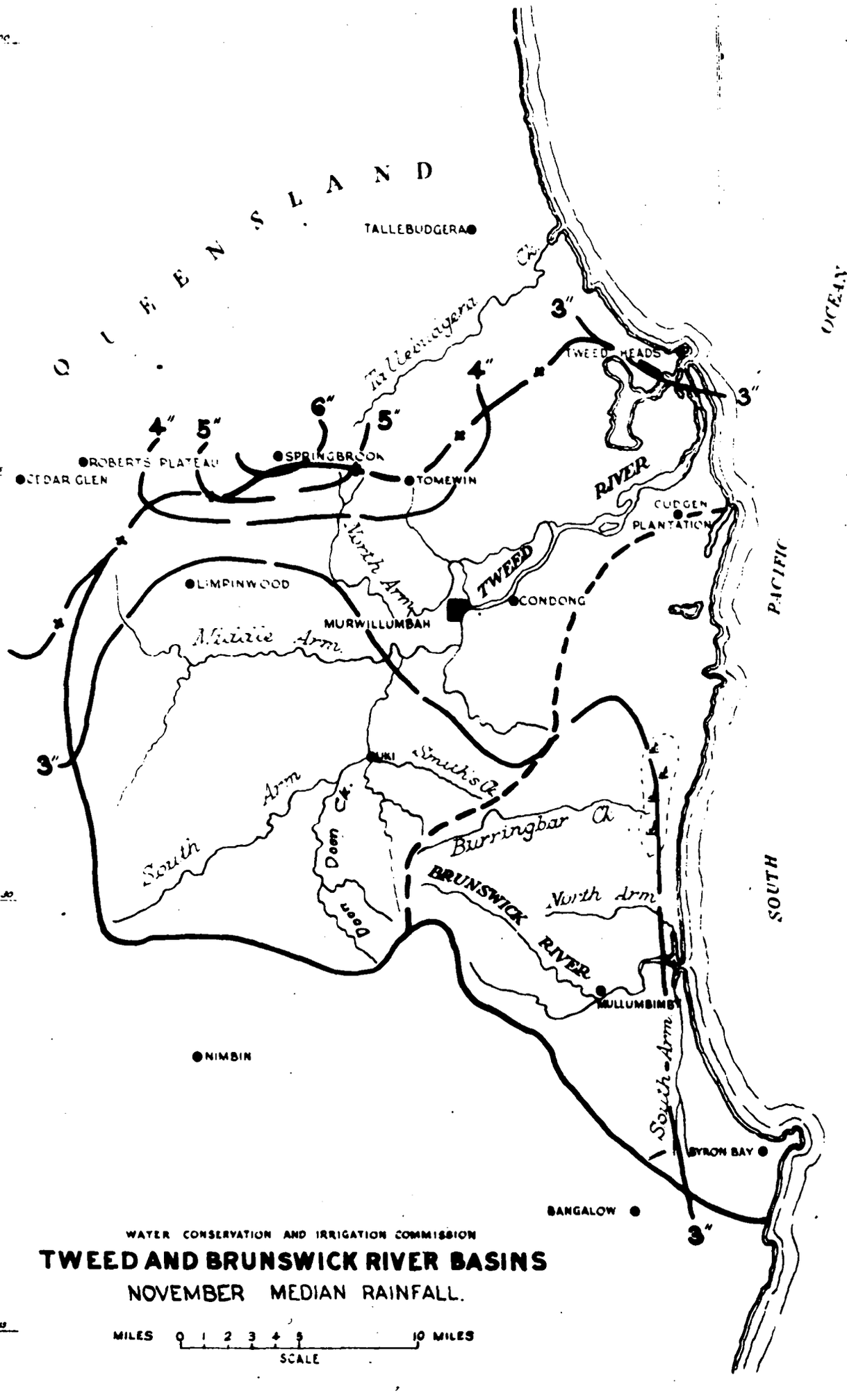
TWEED AND BRUNSWICK RIVER BASINS

OCTOBER MEDIAN RAINFALL

MILES 0 1 2 3 4 5 10 MILES

SCALE

FIGURE 14



WATER CONSERVATION AND IRRIGATION COMMISSION

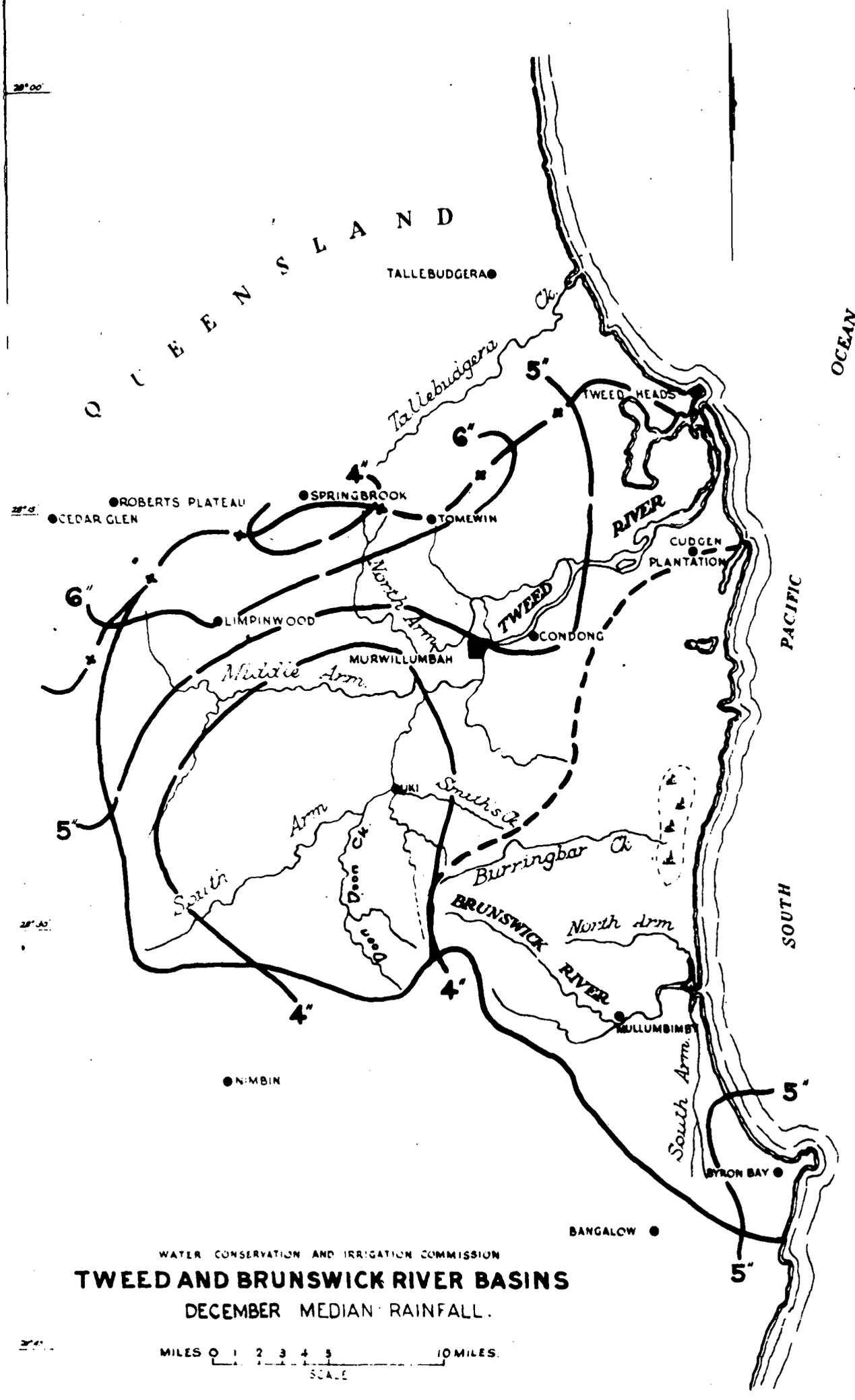
TWEED AND BRUNSWICK RIVER BASINS

NOVEMBER MEDIAN RAINFALL.

MILES 0 1 2 3 4 5 10 MILES

SCALE

FIGURE 15



WATER CONSERVATION AND IRRIGATION COMMISSION

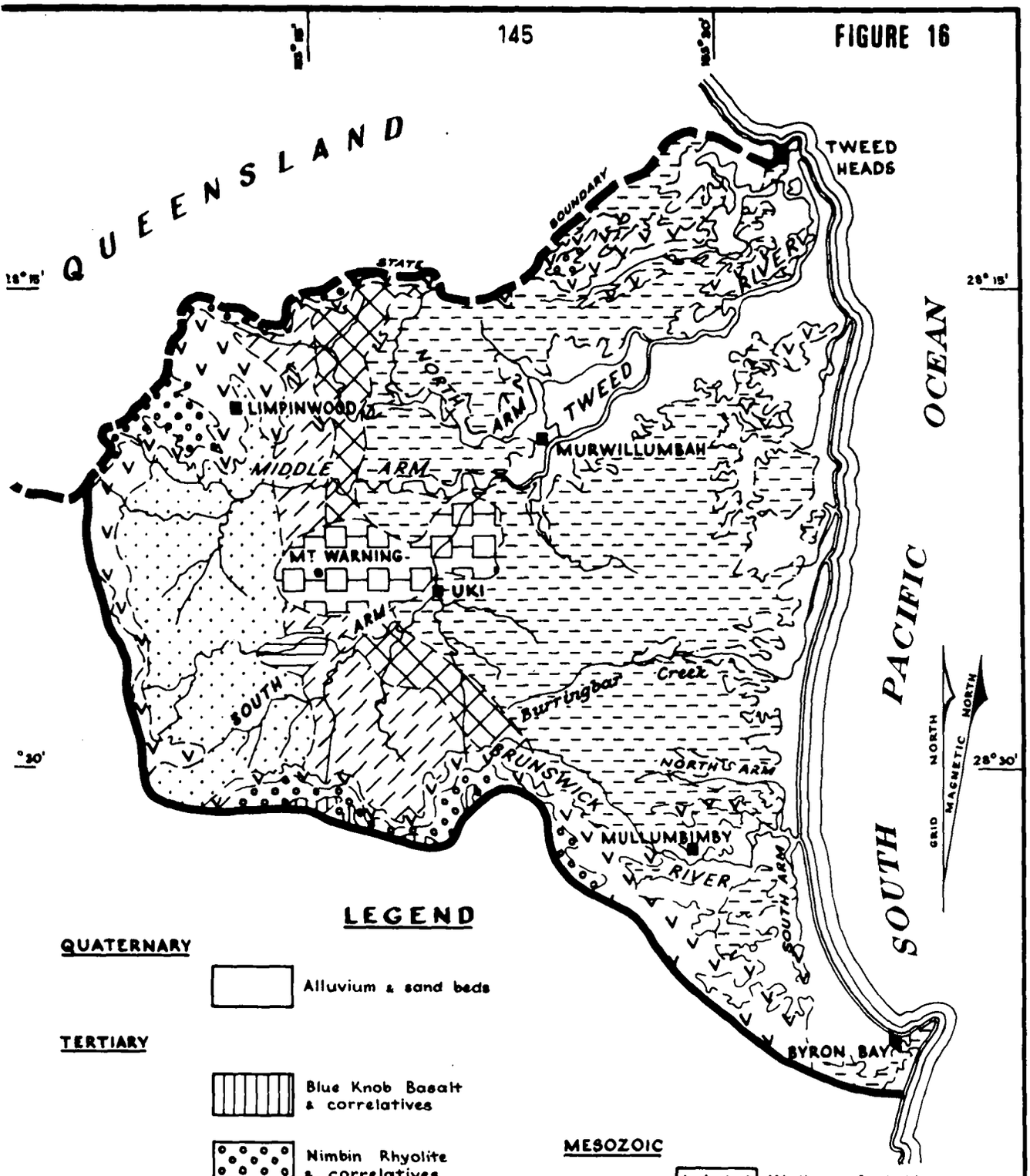
TWEED AND BRUNSWICK RIVER BASINS

DECEMBER MEDIAN RAINFALL.

MILES 0 1 2 3 4 5 10 MILES

SCALE

FIGURE 16



LEGEND

QUATERNARY

- Alluvium & sand beds

TERTIARY

- Blue Knob Basalt & correlatives
- Nimbin Rhyolite & correlatives
- Lismore Basalt & correlatives
- Gabbro & Diorite with ring dykes
- Intrusive Dolerite & Basalt
- Intrusive Trachyte & Rhyolite

MESOZOIC

- JURASSIC — Walloon Coal Measures shale, sandstone, coal
- TRIASSIC – JURASSIC — Sandstone, siltstone, conglomerates, claystone
- TRIASSIC — Chillingham Volcanics rhyolite, tuff, claystone

PALAEOZOIC

- SILURIAN — Greywacke, slate, phyllite, quartzite

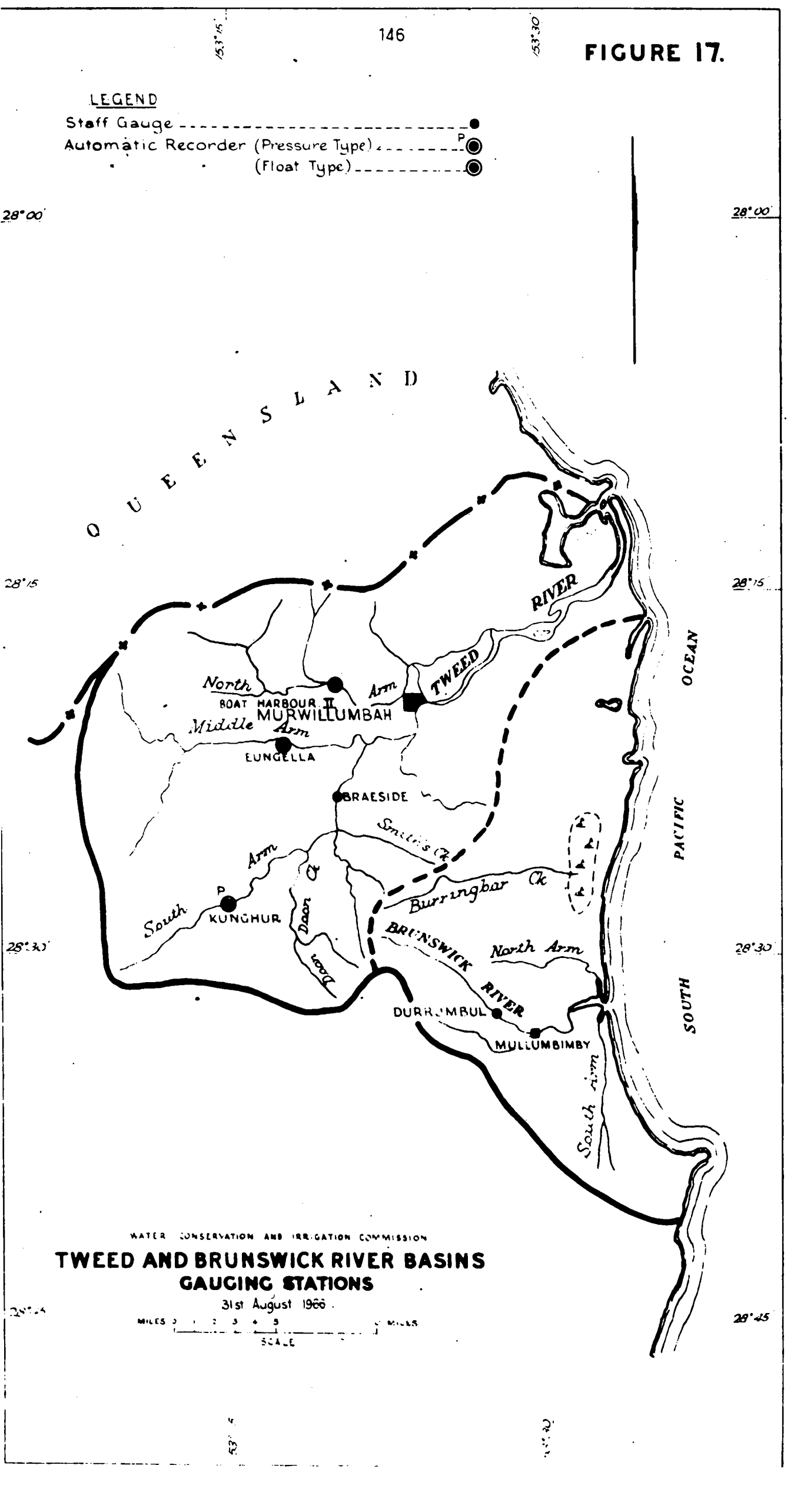
WATER CONSERVATION AND IRRIGATION COMMISSION

TWEED AND BRUNSWICK RIVER VALLEYS

GEOLOGICAL FORMATIONS

SCALE: 4 3 2 1 0 4 8 MILES

FIGURE 17.



WATER CONSERVATION AND IRRIGATION COMMISSION

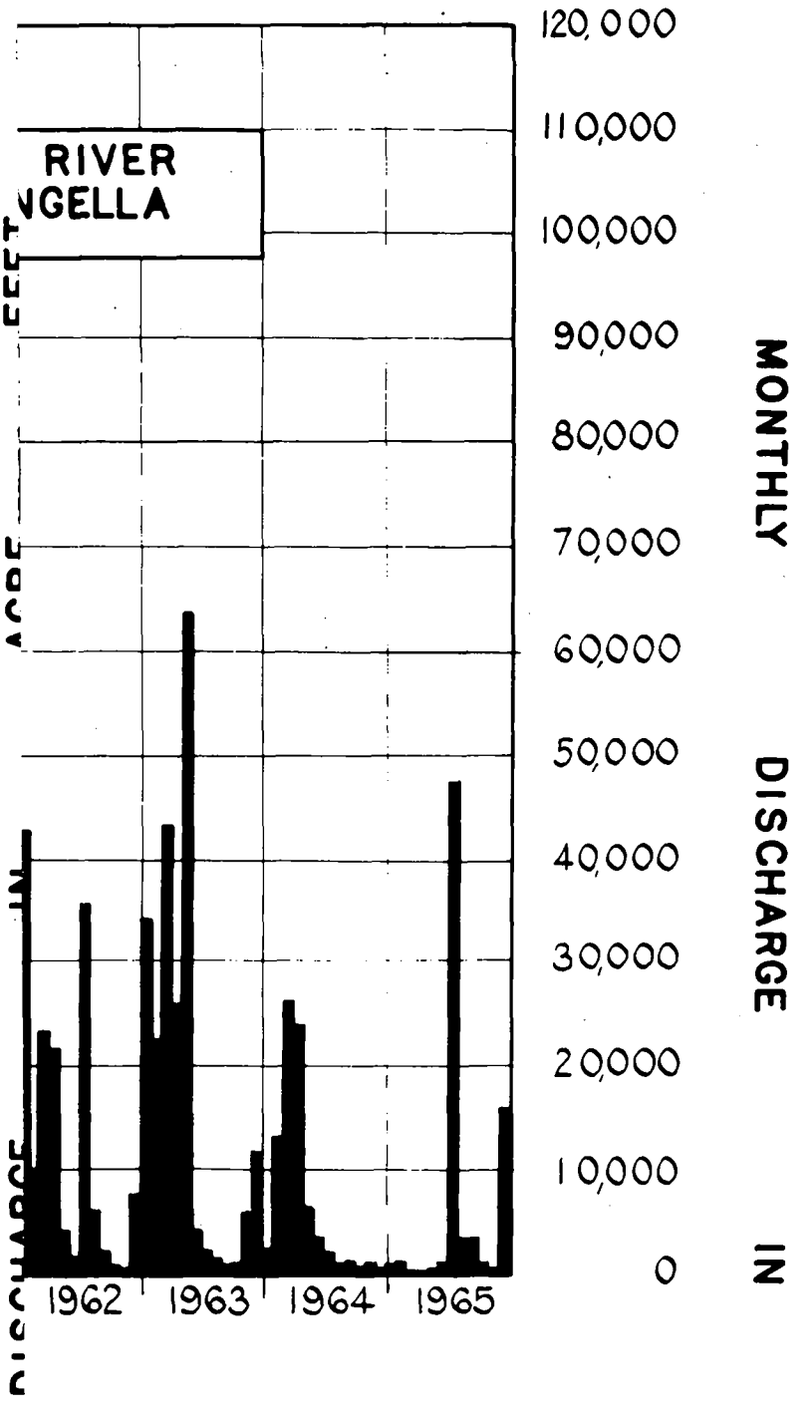
TWEED AND BRUNSWICK RIVER BASINS
GAUGING STATIONS

31st August 1966.

MILES 0 1 2 3 4 5 MILES

SCALE

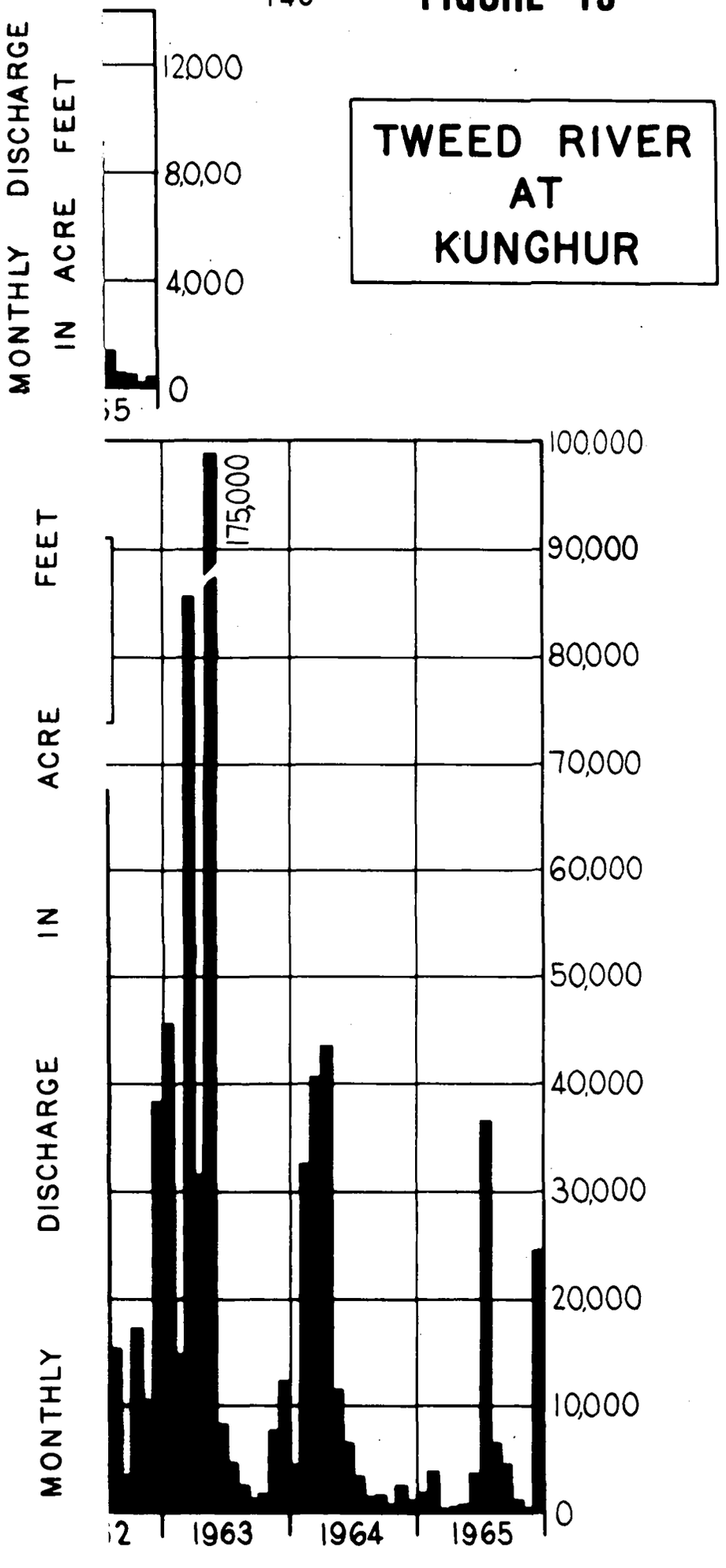
FIGURE 18



AT EUNGELLA

TWEED AT DURRUMBUL.

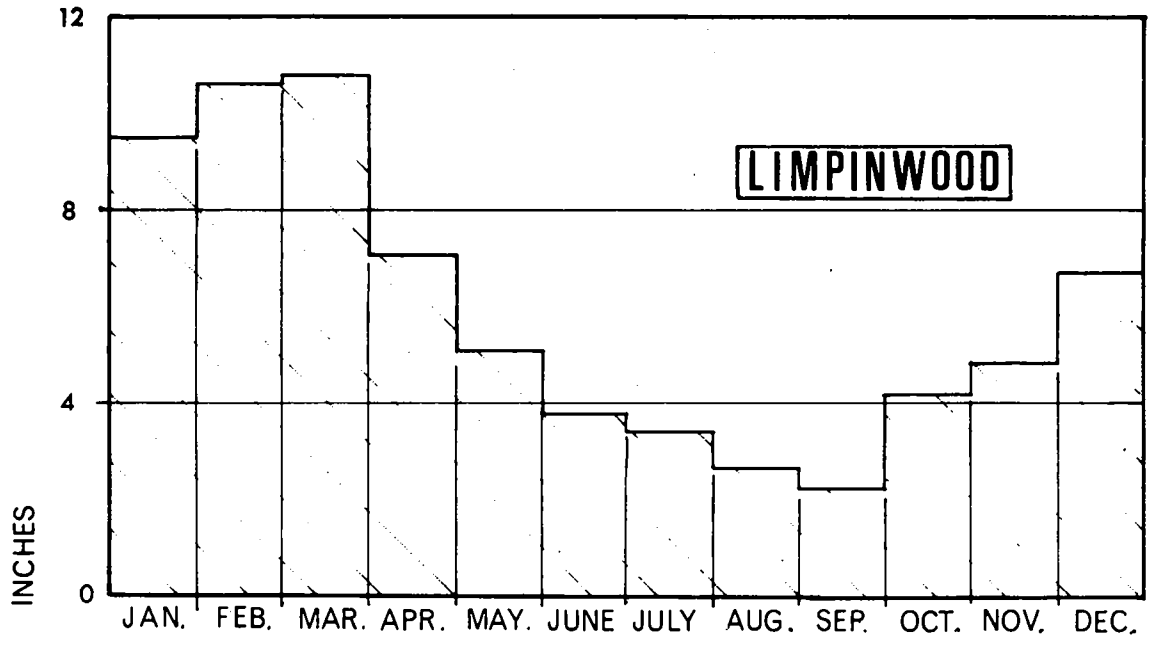
FIGURE 19

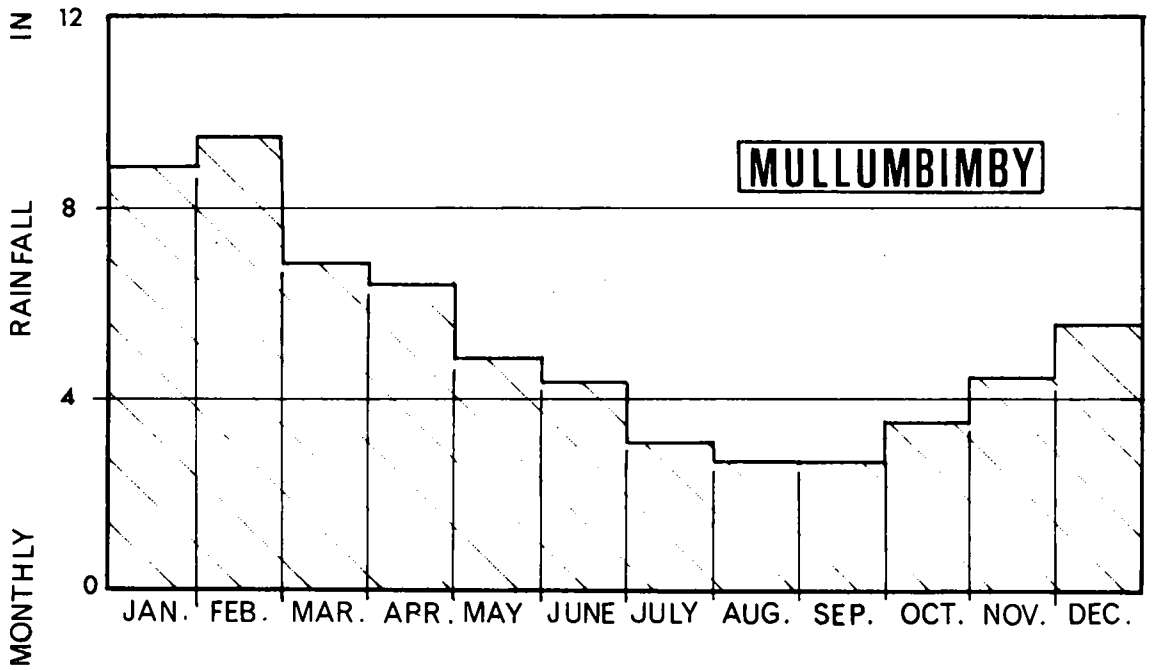


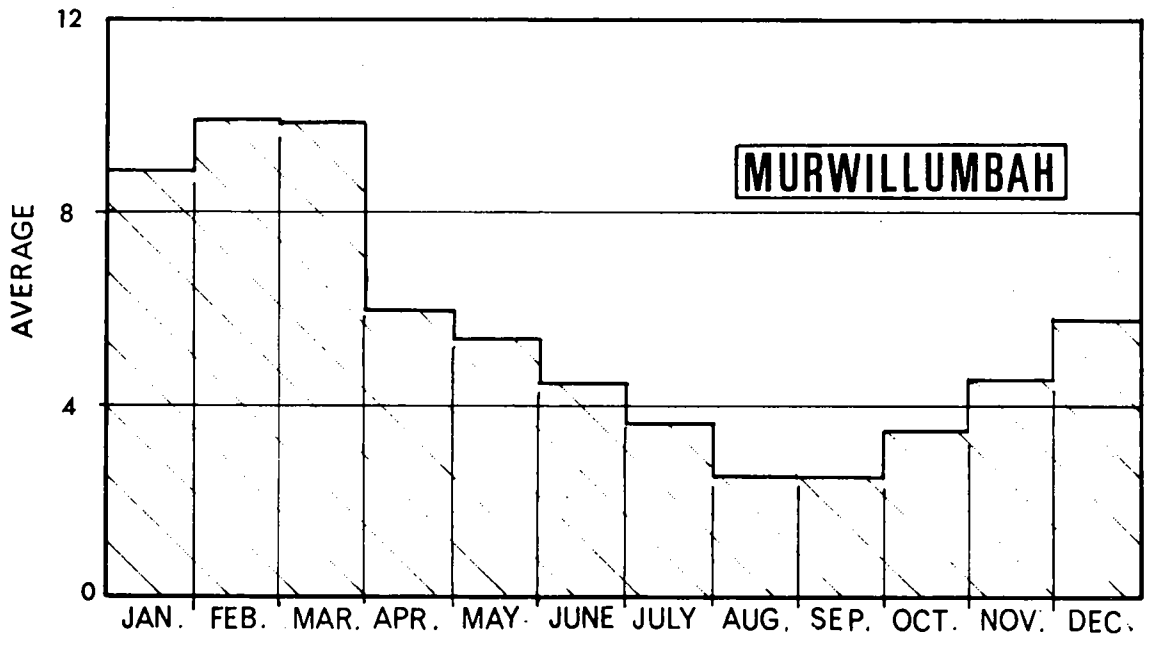
SCHARGE

TR AT BRAESIDE

FIGURE 20

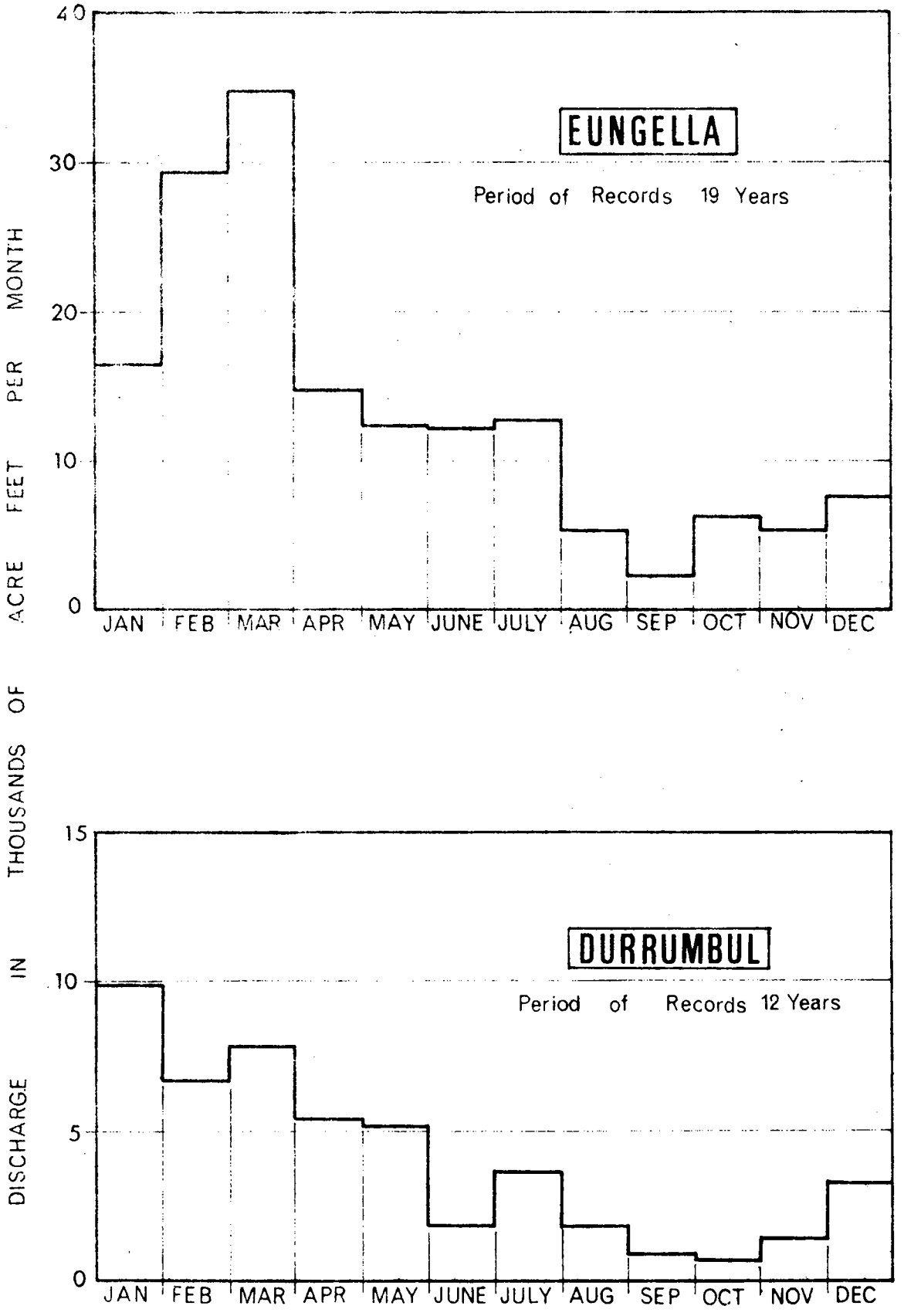






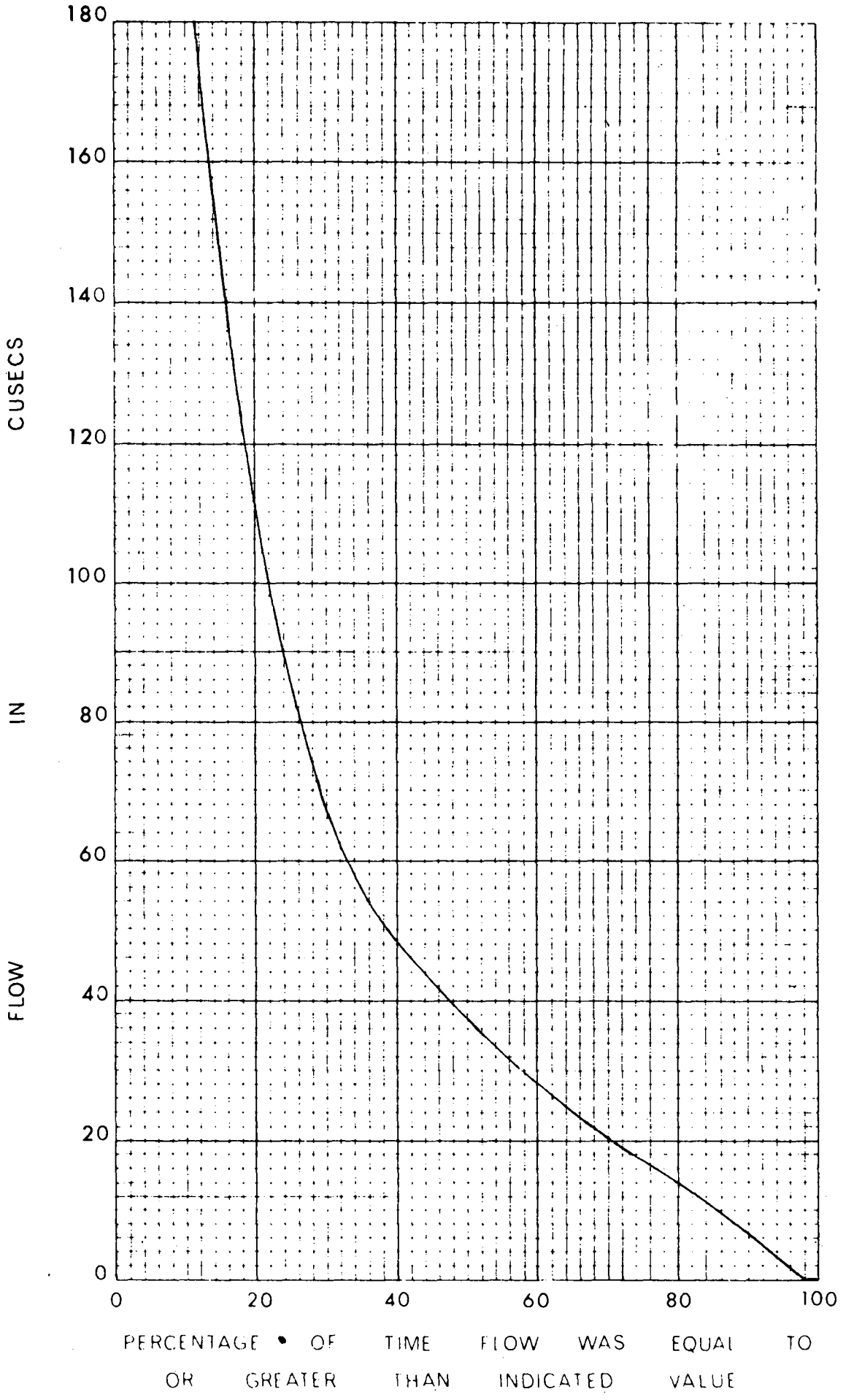
DISTRIBUTION OF AVERAGE MONTHLY RAINFALLS AT LIMPINWOOD MULLUMBIMBY & MURWILLUMBAH

FIGURE 21



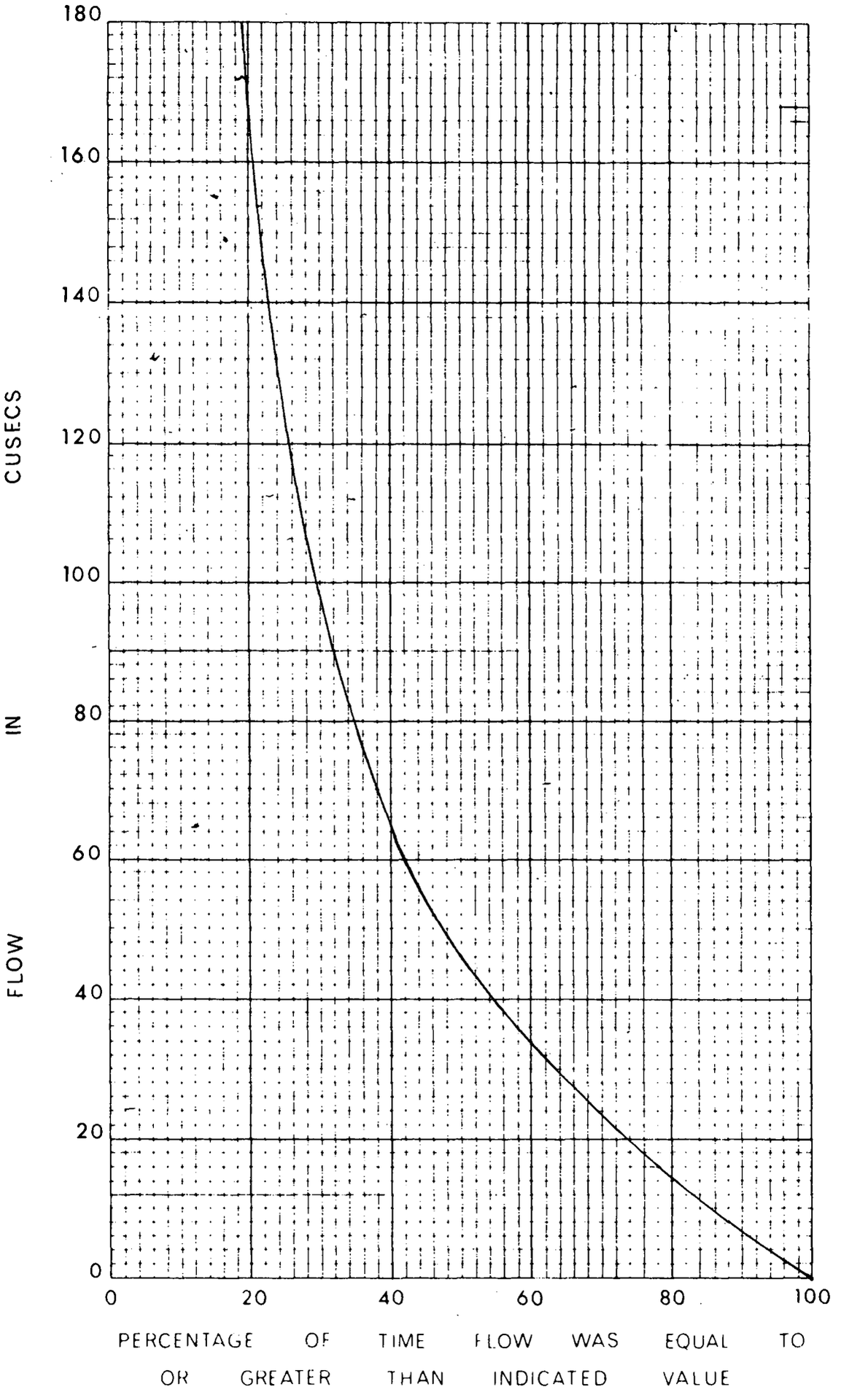
AVERAGE MONTHLY DISCHARGES FOR EUNGELLA & DURRUMBUL

FIGURE 22



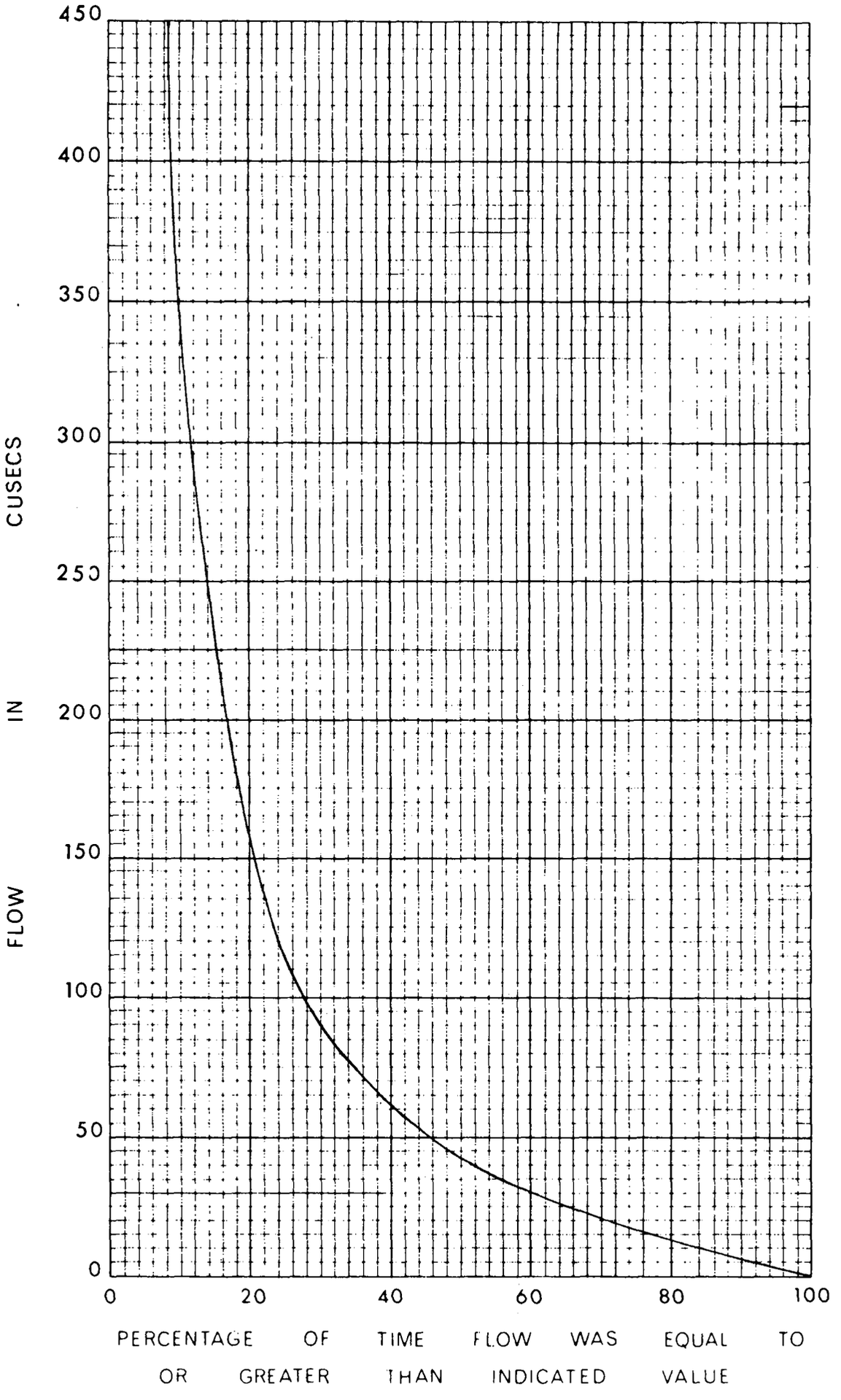
FLOW DURATION CURVE FOR TWEED RIVER AT BOAT HARBOUR II (NORTH ARM)

FIGURE 23



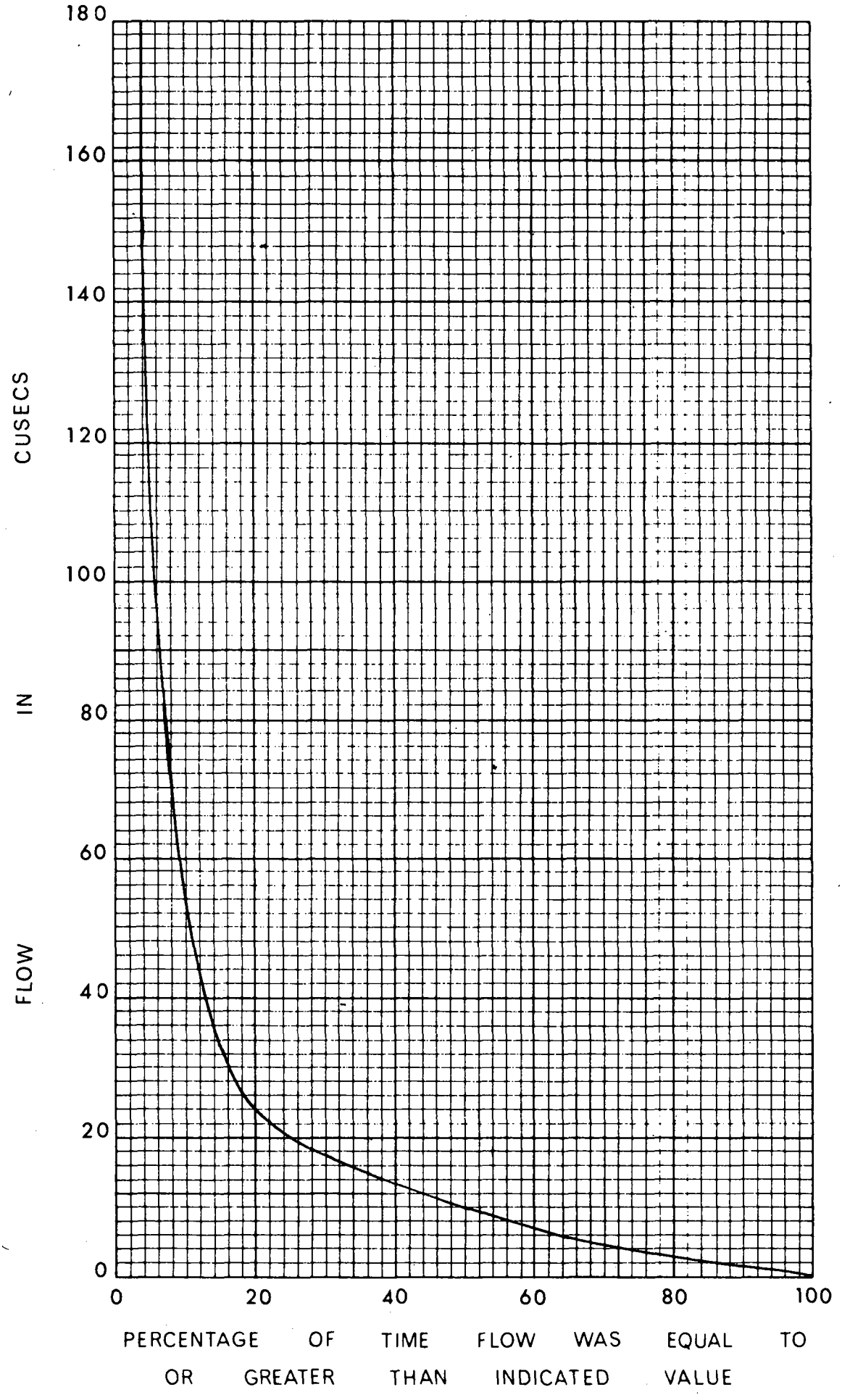
FLOW DURATION CURVE FOR TWEED RIVER AT BRAESIDE (SOUTH ARM)

FIGURE **24**



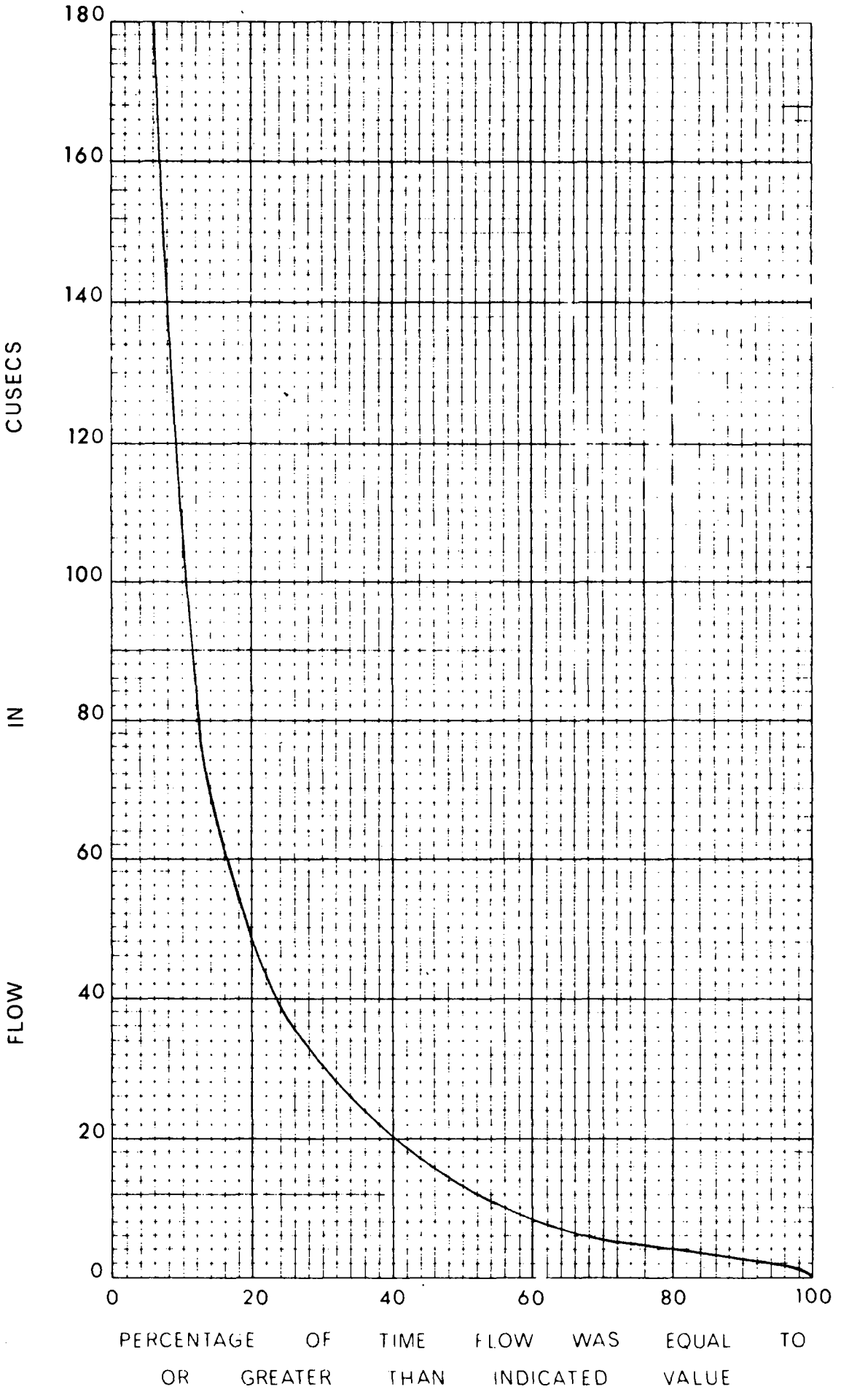
FLOW DURATION CURVE FOR TWEED RIVER AT EUNGELLA (MIDDLE ARM)

FIGURE 25



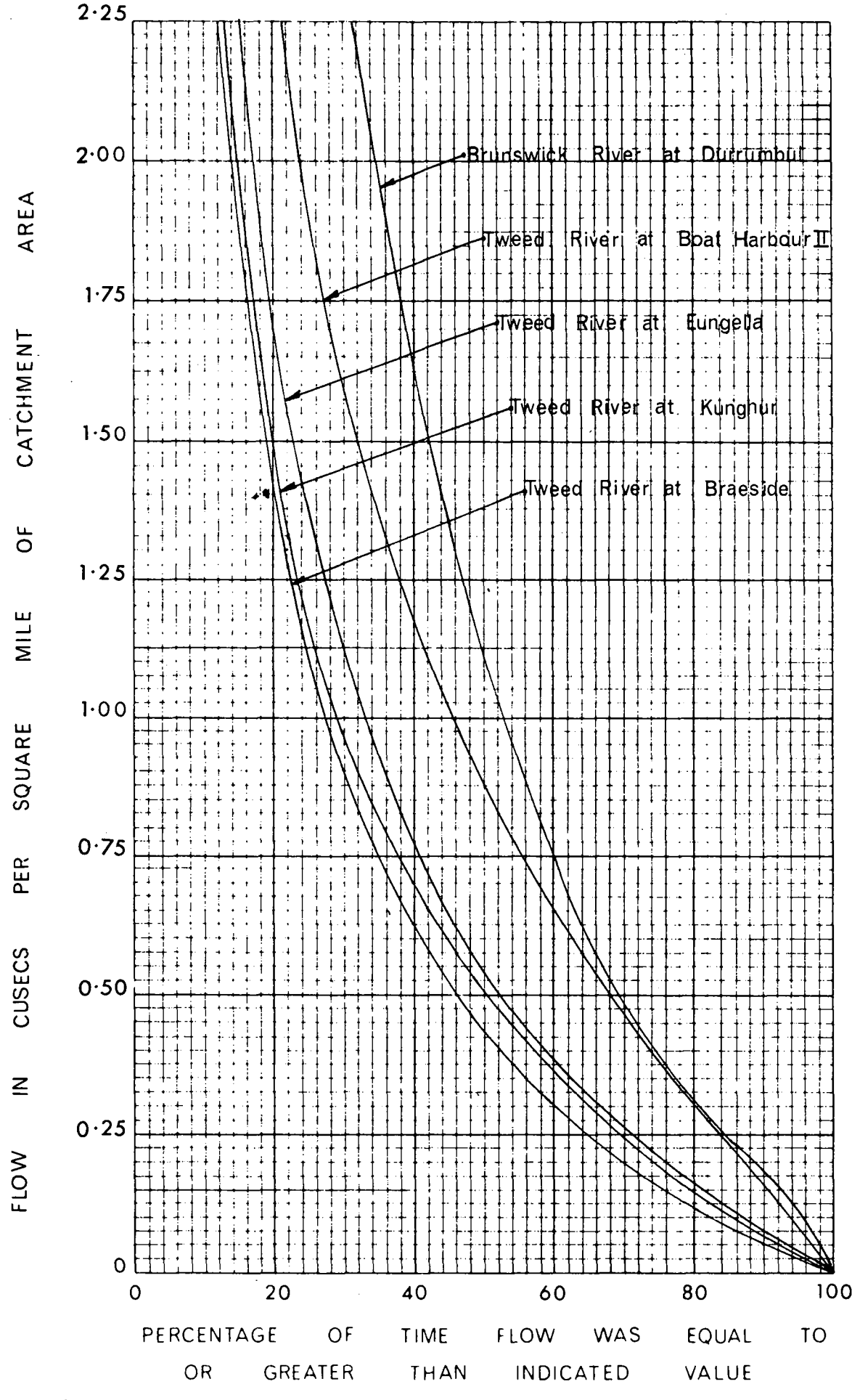
FLOW DURATION CURVE FOR TWEED RIVER AT KUNGHUR (SOUTH ARM)

FIGURE 26



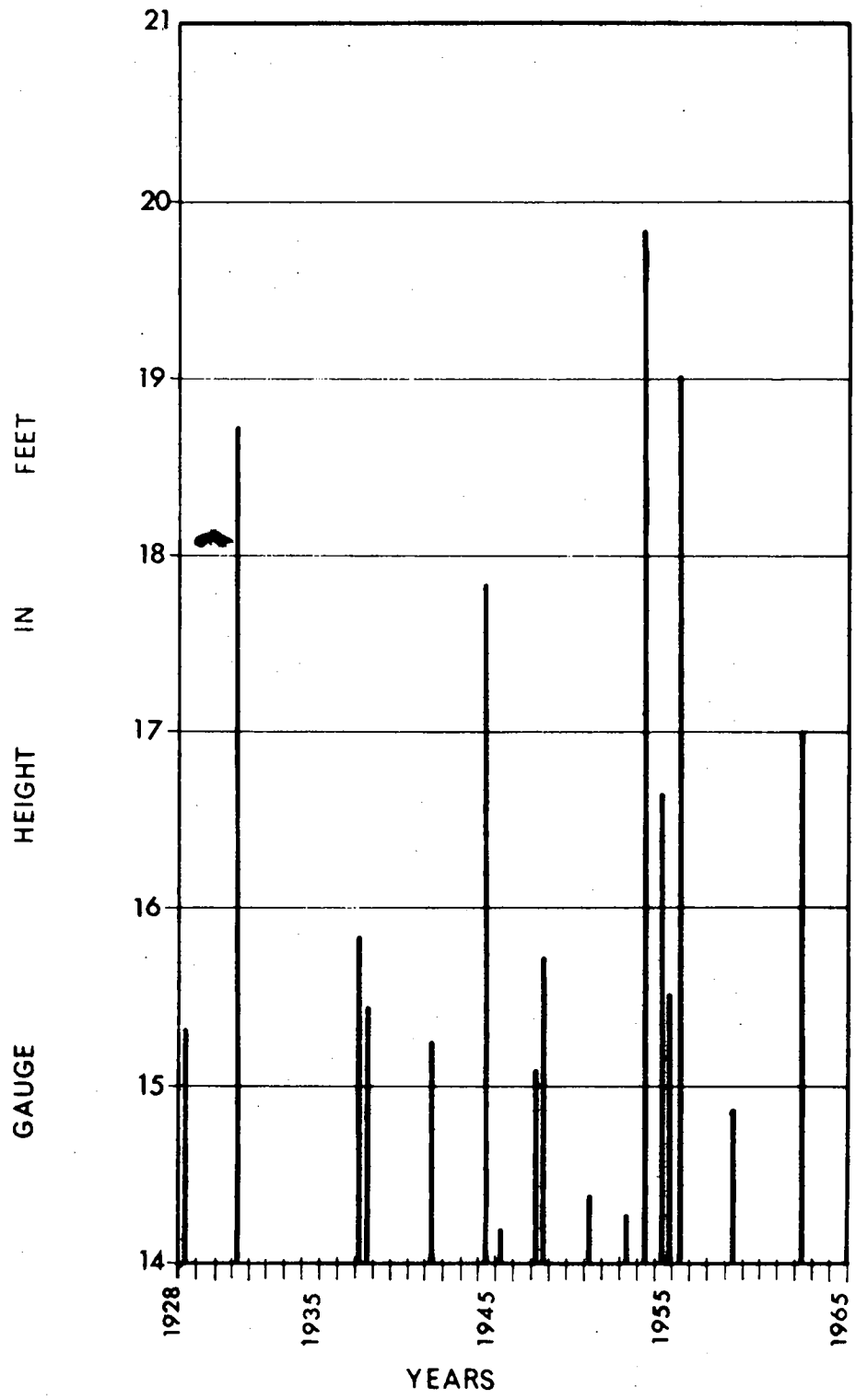
FLOW DURATION CURVE FOR BRUNSWICK RIVER AT DURRUMBUL

FIGURE 27



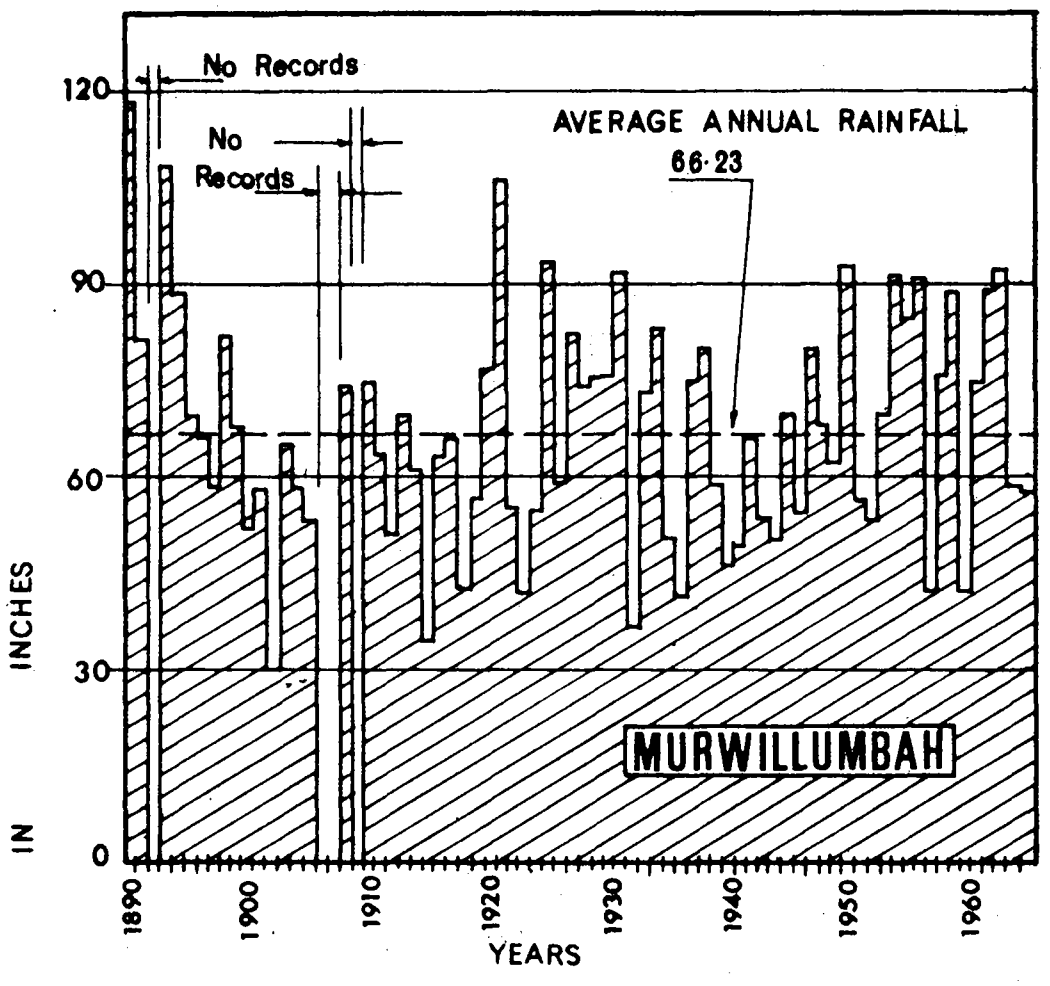
FLOW DURATION CURVES FOR TWEED AND BRUNSWICK RIVER VALLEYS

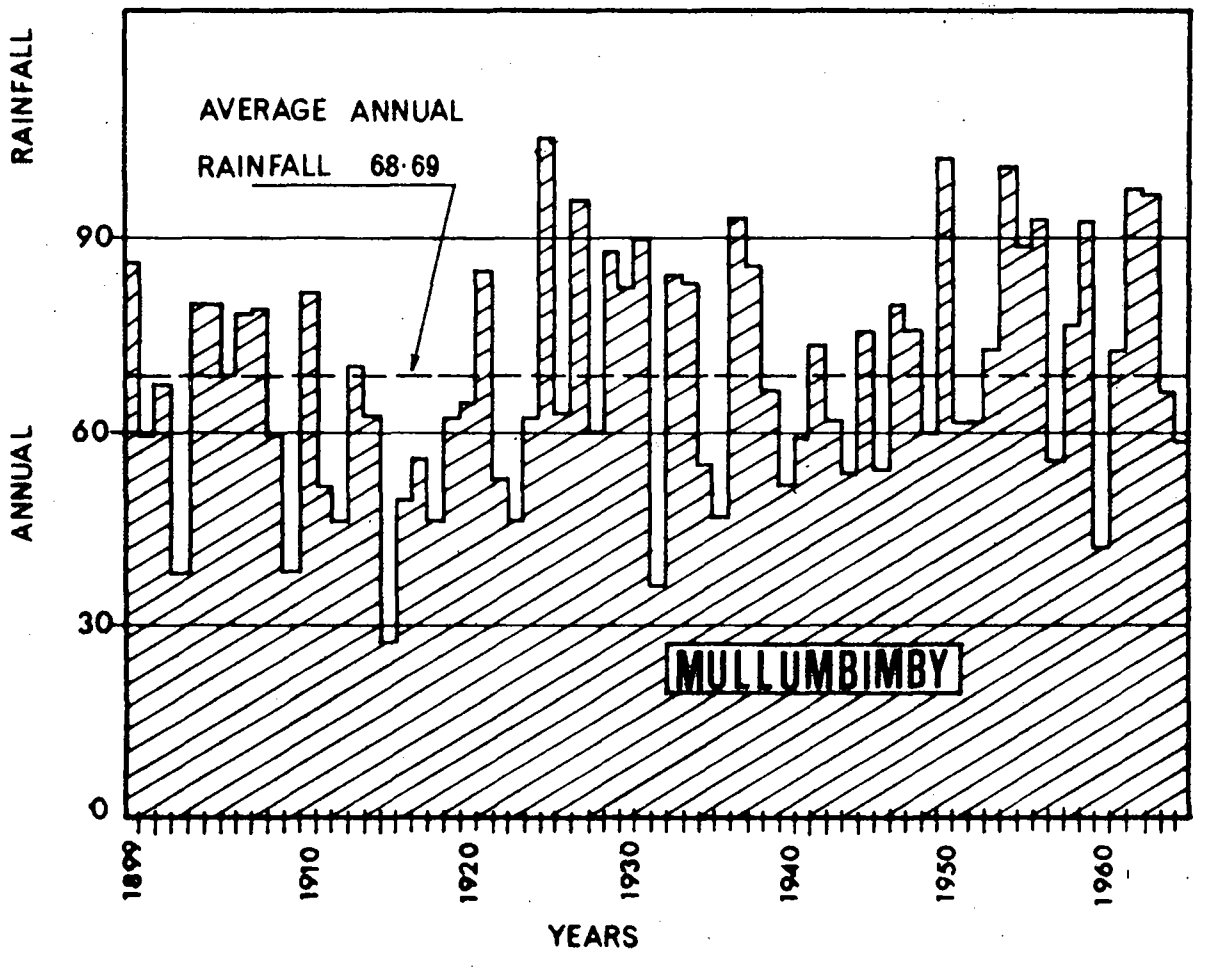
FIGURE 28



FLOOD PEAKS EXCEEDING 14 FEET AT MURWILLUMBAH POWER STATION

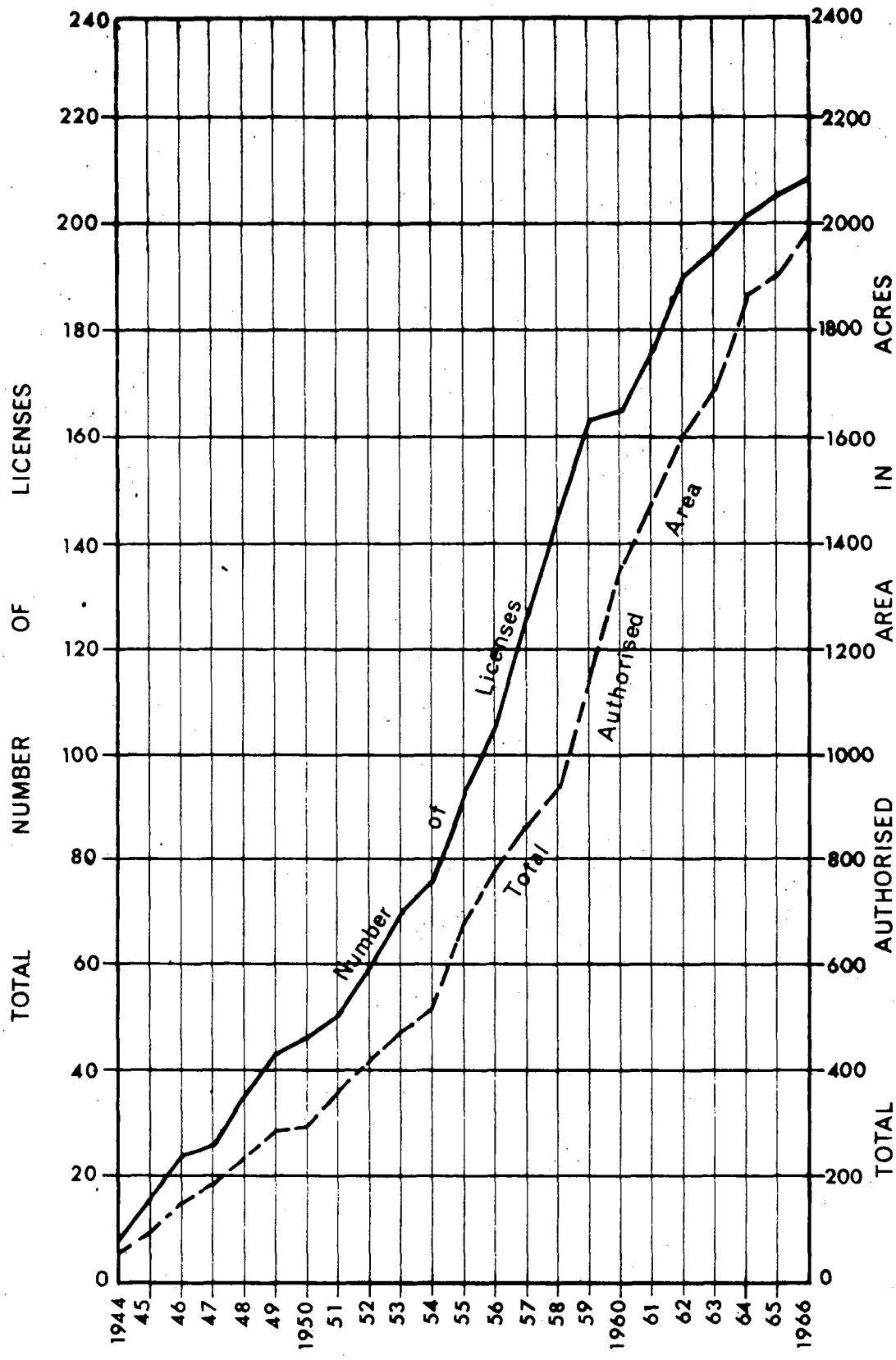
FIGURE 29





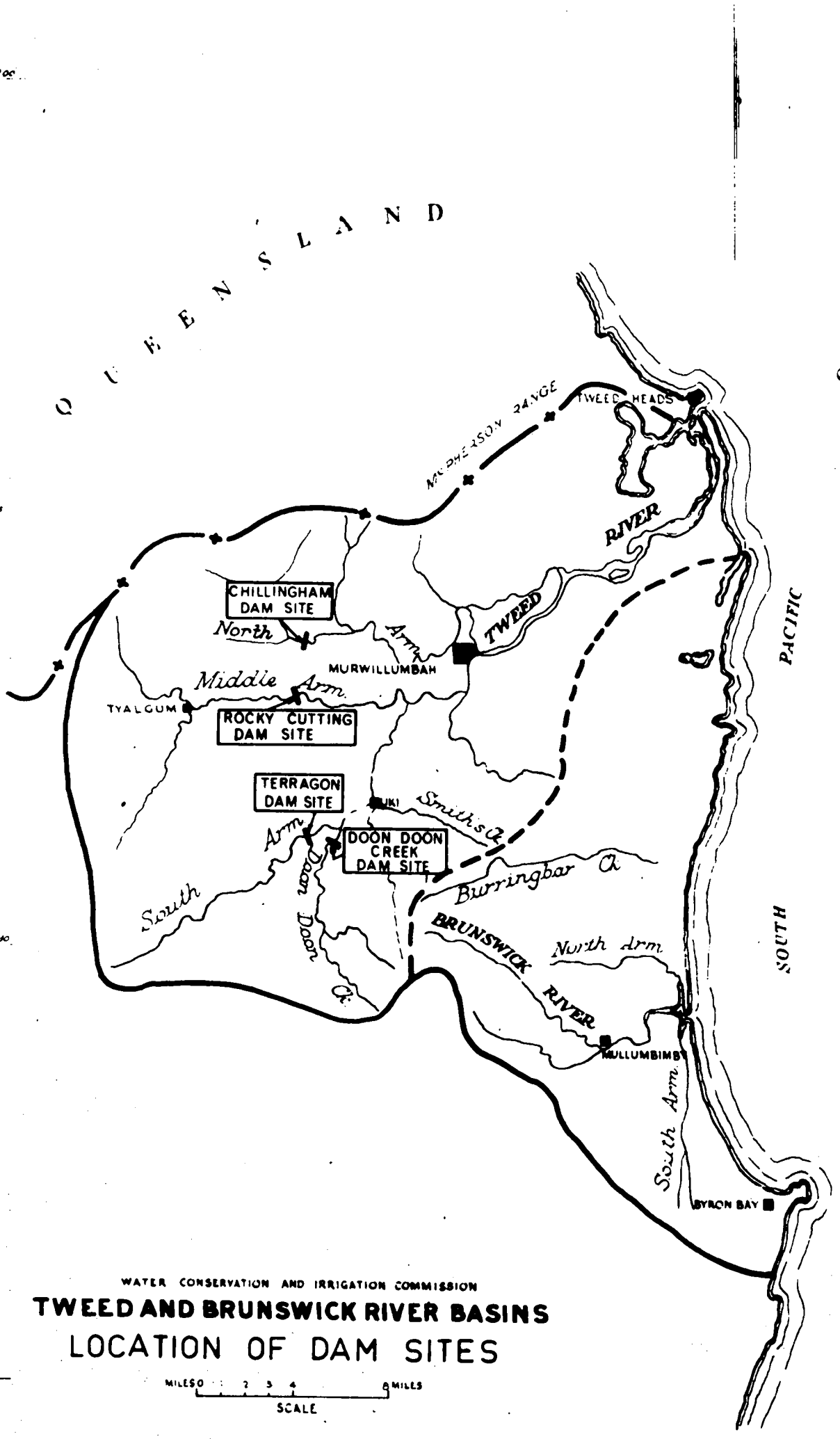
ANNUAL RAINFALLS AT MURWILLUMBAH & MULLUMBIMBY

FIGURE 30



TWEED & BRUNSWICK RIVER VALLEYS
AREA AUTHORISED FOR IRRIGATION
&
TOTAL NUMBER OF LICENSES
AT
30th JUNE FOR EACH YEAR INDICATED

FIGURE 31



WATER CONSERVATION AND IRRIGATION COMMISSION

TWEED AND BRUNSWICK RIVER BASINS

LOCATION OF DAM SITES

MILES 0 1 2 3 4 5 MILES

SCALE