WATER RESOURCES

OF THE

UPPER HUNTER VALLEY

SURVEY OF THIRTY TWO N.S.W. RIVER VALLEYS

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WATER RESOURCES OF THE UPPER HUNTER VALLEY

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 is the largest and most comprehensive study of its type ever undertaken, has recently been expanded to cover the Murray and Darling Basins in their entirety. It involves the preparation of twenty eight reports covering thirty two major river valleys of the State.

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 nineteen major valleys and a number of minor valleys. This report on the water resources of the Upper Hunter Valley is the fifteenth to be issued.

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WATER RESOURCES OF THE UPPER HUNTER VALLEY

1. INTRODUCTION

With the exception of the air he breathes, water is the most important natural resource required for the welfare of man. In the international sphere the water resources of a nation are of prime importance to national prosperity and the welfare of a community is dependent to a large extent on the proper development and use of available water resources.

Water conservation in Australia, as in other major nations, is therefore a service of prime national importance, increasing living standards and overall national wealth.

It has been estimated that the total volume of water on Earth, in all its forms, is of the order of 320 million cubic miles. As one cubic mile is equivalent to about a million million gallons, the magnitude of this resource is difficult to visualise.

However the usefulness of this resource is very limited as about 97.2 percent is in the oceans and a further 2 percent is stored in the polar icecaps. Since underground water comprises over 99.5 percent of the remaining 0.8 percent the amount of fresh water contained in lakes and streams approximates to only 0.004 percent of the total volume of water on Earth.

Modern communities, particularly in large cities, make huge demands on water supplies for domestic, industrial and agricultural purposes. In the production of a ton of steel about 300 tons of water are used; about 2½ tons of water are required to grow the grain for and produce a loaf of bread and a ton of paper requires about 60 tons of water. Furthermore it has been estimated that over thirty tons of water are required to produce the normal daily food requirement of an adult.

Water demands for irrigation purposes are much greater than for domestic or industrial uses. Annual requirements of crops are usually of the order of two to three feet depth, and during droughts it is necessary to supply the majority of this requirement by irrigation. The relative magnitude of this demand can be assessed when it is realised that a depth of three feet over only one acre is equivalent to over 800,000 gallons (more than 3,500 tons).

The gross water resources of any country are usually considered to be the combined total amounts of precipitation, consisting of rain, hail or snow,

which fall on the land. The surface water resources are normally regarded as the amounts of water in rivers and lakes.

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

However the natural processes of evaporation, transpiration and seepage deplete the gross water resources of all countries. When these losses are subtracted from continental precipitations, the residuals (or surface water resources), show that Australia has a comparative runoff much less than indicated by the average rainfalls.

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

The Australian continent has a relatively flat and low topography and therefore no areas are permanently snow covered. As a result streamflows in Australia are mainly dependent on the occurrence of runoff producing storms and therefore tend to exhibit greater variability in flow than those of other continents.

Flow records obtained for streams in New South Wales show that there are few perennial streams in the State; the majority of streams have either ceased to flow or have been reduced to an insignificant discharge during the periods of records. In addition historical data indicates that more severe droughts occurred prior to the implementation of the present extensive system of measurement of the flows of streams in this State.

The prolonged duration of severe droughts in Australia makes it imperative that water conservation dams be constructed if assured water supplies are to be maintained over the full period of each drought.

This report on the Water Resources of the Upper Hunter Valley deals with the Hunter River catchment above Maitland. A previous report "The Water Resources of the Lower Hunter Valley", the fourth in the current water resources series being prepared by the Water Conservation and Irrigation Commission, was issued in August 1966 and dealt with the Hunter River catchment below Maitland.

The surface water resources of the Upper Hunter Valley have been assessed as averaging about 800,000 acre feet per annum. As the average rainfall over the valley is of the order of 26 inches the surface water resources represent a runoff of about 8 percent.

On a square mile basis the surface water resources of the Upper Hunter Valley are about 25 percent greater than the average for the State but are only about one third of the average for coastal basins in New South Wales.

2. PHYSIOGRAPHIC FEATURES

In this report the Upper Hunter Valley is defined as the catchment area of the Hunter River above the city of Maitland. The extent of the valley and the locations of its principal towns and features are shown at Figure 1. The valley has an area of 6,750 square miles and includes a wide variety of topography.

Along the north-eastern boundary rise the rugged Mount Royal Range and the high plateau of the Barrington Tops. In this deeply dissected country the Hunter River and many of its headwater tributaries have their sources at elevations of up to 5,000 feet. The main tributaries in the northern part of this area are Omadale Brook, Moonan Brook and Stewarts Brook which flow in a general north-west direction to join the Hunter River flowing in a south-west direction. These streams flow swiftly down through deep narrow valleys with steep side slopes.

Soils of the area have been derived mostly from basalt and limestone, and they support rough upland pastures which are of considerable value for grazing purposes.

From the southern part of the Mount Royal Range, Rouchel Brook, Bowmans Creek (Foy Brook), Glennies Creek (Fal Brook) and Glendon Brook radiate out from the mountains in westerly to southerly directions. These tributaries flow through deep precipitous valleys separated by steep narrow ridges which fall away to lower broken hills, until they emerge onto the valley plains bordering the Hunter River. The upper parts of the catchments of these streams are mostly forested while the lower parts include rich pasture areas.

The Liverpool Range, a part of the Great Dividing Range, with elevations from a little over 2,000 feet to almost 4,000 feet forms the northern boundary and is the watershed between the coastal Hunter River system and the inland

Namoi River system. The range comprises a line of hills formed of basalt which has flowed over the sandstone underlying the Merriwa Plateau, and includes volcanic remnants in the form of prominent nobs and peaks.

Towards the eastern end of the range Pages Creek has its source, from where it flows in a south-east direction to join the Hunter River in its headwater region. The Pages River rises near the town of Murrurundi and, with its eastern tributary the Isis River, flows through hills and undulating grassed valleys to join the Hunter River a few miles upstream from Aberdeen.

Glenbawn Dam is located about six miles upstream of the junction of the Hunter and Pages Rivers and was completed in May, 1958, with an irrigation capacity of 185,000 acre feet and a total capacity of 293,000 acre feet.

Further to the west Dart Brook and its tributary Kingdon Ponds traverse similar country to the Pages River, passing near the town of Scone to join the Hunter River about five miles downstream from Aberdeen. In their lower reaches both the Pages River and Dart Brook flow through a region of alluvial flats bordering the Hunter River. This region has been formed by the tributaries as well as the main river.

South of the basalt foothills of the Liverpool Range and north of the Goulburn River lies an area of wide valleys and rolling ridges called the Merriwa Plateau. Wybong Creek, Gungal Creek, Merriwa Creek, Bow Creek, the Krui River and Munmurra Creek cross this plateau in a southerly direction to join the Goulburn River. The plateau slopes up gradually to the Great Dividing Range in the west, but the catchment boundary is not readily distinguishable from the rolling north-south ridges on either side. Merriwa, Cassilis and Sandy Hollow are the main population centres of the area which includes valuable pastures and some wheat growing areas.

The area south of the Goulburn River and the middle reaches of the Hunter River is of sandstone plateau type, dissected by canyons having steep sided valleys bordered by cliffs. Except for occasional small areas of rich alluvial flats the area is overlain by poor sandy soil covered with woodland and scrub.

The tributaries in this area all flow in a general northerly direction and include Wollar Creek, Bylong Creek, Widden Brook and Baerami Creek which join the Goulburn River; and Greigs Creek, Doyles Creek and Wollombi Brook which join the Hunter River. In the extreme west of this sandstone country are some small areas of undulating grassed land used for grazing, while in the east there are cleared areas in the catchment of Wollombi Brook and its tributaries which are also used for grazing. The area is sparsely settled, with most of its population situated close to the plains adjoining the main river.

The Hunter Valley Plain encompasses the lowest parts of the valley and extends to the sea. In the region covered by this report the plain includes the areas west of Maitland and around Cessnock, Broke, Singleton, Denman, Muswellbrook and Scone; most of it being less than 500 feet above sea level. The Hunter River meanders through rich alluvial soils which are bordered by open undulating grassed land at the foot of the surrounding hills and scarps. The lower reaches of many of the tributaries cross the plain to join the main river, and they also have produced rich alluvial soils which form extensions of the zone bordering the Hunter. From Maitland to Singleton the Hunter River bed slope is about 2 feet per mile, from Singleton to Denman it increases to about 4 feet per mile, and from there to Glenbawn it is between 6 and 7 feet per mile.

At places the Hunter Valley Plain reaches a width of twenty-five miles, but generally its width increases from around two miles in the upper parts to around fifteen miles towards Maitland. Agriculture in the area includes general grazing, particularly in conjunction with intensive fattening on the rich alluvial flats. Other high value pursuits include dairying, fodder growing, vegetable growing and viticulture. Many coalmines are located in the eastern part of the area; and the large coal burning power station at Liddell is at present under construction.

On Figure 2 are shown generalised land slopes over the Upper Hunter Valley. About 42 percent of the valley is rugged or mountainous with land slopes of 15 degrees or more. This rugged land is located around the boundaries of the valley, and there are extensive areas along the Mount Royal Range and in the southern sandstone tableland region.

In most cases there is a zone of hilly to steep country, with slopes between 8 and 15 degrees, at the foot of the rugged mountains; the area of such land in the valley comprises 18 percent to the total.

Undulating to hilly land with land slopes between 3 and 8 degrees, and mostly flat land with slopes less than 3 degrees, each comprise about 20 percent of the valley. Such land mostly occurs in the Hunter Valley Plain and in the Merriwa Plateau. Particularly large areas of mostly flat land occur around Scone and also in the lower part of the valley around Singleton. The Merriwa Plateau is mostly undulating, and such topography extends to its western boundary where there is a lower area between the sandstone ridges of the south and the Liverpool Range to the north.

The original vegetation of the Upper Hunter Valley has been largely cleared from the good quality flat and undulating land, which is now used for either cultivation or grazing. The remaining natural timber is confined in the main to

the rugged, sandstone country forming the southern border of the valley and to a lesser extent, in the vicinity of the Mount Royal Range. These areas contain good stands of hardwood timbers and a little softwood and support a sawmilling industry that is particularly active around Singleton. The principal hardwood species include Ironbark and White Box with some standings of Silver Top Ash.

The extensive flat and undulating land downstream of Singleton has been mostly cleared of natural vegetation and supports a large dairying and fodder cropping industry. A variety of scrublands and grasslands mostly occurs on the uncleared flat country.

3. CLIMATIC FEATURES

Annual median rainfall over the Upper Hunter Basin exceeds 20 inches over the whole drainage area and a small part of the region along the south east boundary has an annual median of greater than 40 inches. (The median rainfall is that rainfall experienced or exceeded on 50 percent of occasions). The distribution of annual median rainfall over the region is shown at Figure 3 whilst the distributions of monthly median rainfalls are shown at Figures 4 to 15.

The months December to April tend to be relatively wet while the months June to September are relatively dry. The distribution of rainfall throughout the year, however, is rather uniform compared with the yearly rainfall distributions over river basins on the north coast of New South Wales. Monthly median rainfall in general exceeds one inch over most of the region in all months of the year.

Annual rainfalls recorded at Plashett, Scone, Singleton, Wingen, Wollar and Muswellbrook are given in Appendix 1 and annual rainfalls for Cassilis, Cessnock, Denman, Lochinvar, Kindarun and Merriwa are given in Appendix 2.

Heavy rain may occur over the catchment at any time of the year but more particularly in the warmer months. Falls of 5 inches or more in 24 hours have been recorded at most stations in the catchment. The highest total on record for a station in the region for a 24 hour period ending 9.a.m. is 8.70 inches at Cranbourne on the 24th February 1955.

Monthly totals exceeding 6 inches have occurred in all months of the year and most stations in the region have experienced a monthly total of at least 14 inches. Notably high monthly totals on record for the region are 21.82 inches at Maitland East in June 1950 and 20.11 inches at Cranbourne in February, 1955.

The tables at Appendix 3 show on a monthly and annual basis for Cassilis, Lochinvar, Merriwa, Muswellbrook, Plashett, Scone, Singleton, Wingen and Wollar, 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 value can be expected once every ten years on the average. Similarly a rainfall observation less than the 70th percentile can be expected in seven years out of ten on the average or alternatively a rainfall observation greater than the 70th percentile can be expected on an average of three years in ten).

Minimum recorded rainfalls at Cassilis, Lochinvar, Merriwa, Muswellbrook, Plashett, Scone, Singleton and Wingen are shown in the tables at Appendix 4. These tables indicate the minimum cumulative rainfalls commencing in any month of the year and continuing for up to 12 months, which have occurred at the selected stations.

Dry spells lasting six months or more occur on occasions throughout the region. However, on 90 percent of occasions at least 5½ inches are received in the six cooler months of the year (May to October). In the six warmer months of the year (November to April) on 90 percent of occasions, more than about 7 inches are received. Dry conditions can be expected in the summer months on an average of about once in eight years.

Temperature

The average monthly and yearly temperatures for selected stations are listed in Tables 1 to 4 as follows:-

(1) Cessnock (Table 1) representative of the eastern section of the region.

(2) Jerry's Plains and Scone (Tables 2 and 3) representative of the central areas of the region.

(3) Dalkeith (Table 4) representative of the western portion of the region above 1,000 feet.

TABLE 1

Cessnock (Elevation 40ft)

Average Temperature (°F) Based on 19 Years of Record

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Average Maximum	86.9	86.0	83.0	75.7	70.1	69.2	63.5	66.5	72.9	77.5	82.0	85.5	76.1
Average Minimum	62.7	62.0	58.8	52.4	45.1	40.3	38.5	40.8	45.0	50.8	56.5	59.7	51.0
Average Daily	74.8	74.0	70.9	64.1	51.6	52.3	51.0	53.7	58.9	64.1	69.3	72.6	63.6
Highest on Record 114.5							Lowest on Record 21.0						

TABLE 2

Jerry's Plains (Elevation 150 ft)

Average Temperature (°F) Based on 29 Years of Record

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Average Maximum	90.9	90.1	85.7	77.8	70.7	64.6	63.6	67.8	74.7	81.7	87.6	90.6	78.8
Average Minimum	62.1	61.6	58.5	51.1	44.2	40.2	38.5	39.4	43.8	49.5	55.1	59.5	50.3
Average Daily	76.5	75.9	72.1	64.5	57.4	52.4	51.0	53.6	59.3	65.6	71.4	75.1	64.6
Highest on Record 120.5							Lowest on Record 19.0						

TABLE 3

Scone (Elevation 680 ft)

Average Temperature (°F) Based on 25 Years of Record

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Average Maximum	91.0	88.6	84.6	76.4	69.1	62.7	61.7	65.8	72.8	79.7	85.4	58.8	77.2
Average Minimum	61.5	60.7	56.5	49.1	42.6	38.9	37.0	38.5	42.4	49.1	54.2	58.1	49.0
Average Daily	76.3	74.7	70.5	62.7	55.9	50.8	49.3	52.1	57.6	64.4	69.8	73.5	63.1
Highest on Record 115.4							Lowest on Record 19.0						

TABLE 4

Dalkeith (Elevation 1,373 ft)
Average Temperature (°F) Based on 30 Years of Record

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Average Maximum	85.7	84.2	79.5	71.5	64.3	58.5	57.4	60.8	67.7	74.6	80.1	83.8	72.3
Average Minimum	60.9	60.3	56.1	48.7	41.7	37.4	35.7	36.9	41.1	47.7	53.8	58.6	48.2
Average Daily	73.3	72.2	67.8	60.1	53.0	47.9	46.5	48.9	54.4	61.1	66.9	71.2	60.3
Highest on Record 109.5							Lowest on Record 17.5						

Hot weather is experienced in the region from October to April with average maxima ranging from the high seventies to the low nineties. During the remainder of the year daytime temperatures are mild to warm. In the summer months very hot conditions occur when north-westerly winds bring hot dry air from Central Australia. Temperatures over 90°F. occur frequently while temperatures exceeding 100°F. are not uncommon.

Average winter minima are in general about 20 degrees cooler than the summer values. On occasions of clear skies and light winds very low overnight temperatures occur. Extreme temperatures lower than 21°F. have been experienced throughout the region.

Frosts

Frost frequencies vary from about 15 per year over the lower valleys in the east of the region to more than 45 per year on the average over the higher parts of the region. The frost season usually extends from May to September. However, severe frosts are mostly confined to the months June, July and August. Frosts have occurred over the higher parts of the catchment as early as the end of March and as late as mid-November.

Sunshine

Estimates of the average number of hours of bright sunshine per day in each month for the eastern and western sections of the region are shown in Table 5. These estimates are based on cloud observations.

TABLE 5

Average Duration of Bright Sunshine in Hours per Day

Area	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Eastern Section	8.9	8.1	7.4	6.3	5.8	5.5	6.4	6.8	7.7	8.1	8.4	8.4	7.3
Western Section	9.4	8.5	7.7	7.0	6.1	5.8	6.8	7.3	8.0	8.5	9.2	9.2	7.8

Evaporation

Estimates of the average monthly and annual evaporation (from an Australian Standard Evaporation tank) together with an estimate of the standard deviation for the eastern and western sections of the region are shown in Table 6.

TABLE 6

Estimated Average Monthly and Annual Evaporation in Inches for the Upper Hunter Valley

Area		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Eastern Section	Evaporation	6.3	5.0	5.0	3.2	2.3	1.6	1.4	2.3	3.1	4.1	5.9	6.1	46.3
	Standard Deviation	0.8	0.7	0.6	0.5	0.3	0.3	0.2	0.3	0.4	0.6	0.9	1.0	3.8
Western Section	Evaporation	7.5	5.0	6.0	3.8	2.5	1.7	1.6	2.4	3.3	4.3	6.2	7.6	51.9
	Standard Deviation	1.2	1.1	1.0	0.6	0.4	0.3	0.2	0.4	0.6	0.9	1.2	1.3	6.0

Wind

Strong winds occur over the Upper Hunter Valley on occasions. They are usually associated with one of the following meteorological conditions:-

(1) Strong easterly winds associated with deep depressions off the coast of New South Wales north of the catchment. Winds caused by this condition moderate rapidly inland from the coast however the unsheltered eastern parts of the catchment may experience wind speeds of the order of 45 miles per hour under these conditions.

(2) Violent squalls associated with severe local storms such as thunderstorm or frontal squalls. The strongest gusts in the valley would be expected under these conditions.

Table 7 gives the estimated extreme wind gust likely to be experienced at any point in the catchment for various return periods.

TABLE 7

Estimated Extreme Wind Gusts to be Expected for Given Return Periods

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

4. GROUNDWATER POTENTIAL

Groundwater in the Upper Hunter Valley is not uniformly distributed, and there is considerable variation in available yield and quality. Within the valley the depth necessary to obtain a groundwater supply may vary from less than 10 feet to over 500 feet, yields may range from soakages to more than 30,000 gallons per hour, and quality from near rainwater to as saline as seawater. Consequently, it becomes a matter of common observation that, although a given district may experience somewhat uniform rainfall conditions, there are marked variations in groundwater occurrence, quality and yield from area to area within the district, sometimes over very short distances. These circumstances can be explained only by considering the geology of the area, for the geological conditions exercise the dominant control on the nature of the groundwater storage, the rate at which the water can be extracted, and the quality of the water.

The map at Figure 16 shows the generalized geology of the Upper Hunter catchment area. The main rock formations range in age from Carboniferous (280–345 million years old), through Permian (230 - 280 million years) Triassic (180 - 230 million years) and Jurassic (135 - 180 million years) mostly as sedimentary rocks, then basaltic lavas of Tertiary age (Pliocene epoch, 2 - 13 million years) and lastly, alluvial unconsolidated formations, mainly Pleistocene to Recent (from 2 million years to the present). The groundwater conditions will be discussed on the basis of three geological divisions, namely: jointed rocks which contain water in cracks, joints and fractures; porous rocks containing water in pore spaces between the individual grains; and unconsolidated deposits where water is held in porous sands and gravels forming part of the river and creek flats.

Jointed Rocks

Rocks of Carboniferous Age. The great majority of the area lying north and east of the railway from Maitland to Murrurundi is occupied by rocks of Carboniferous age. Although mapped as one unit for present purposes, numerous rock types are involved, e.g. shales, mudstones, sandstones, conglomerates, limestones, glacial beds, tuffs, breccias, lavas and so on. However, they are very ancient rocks and any original porosity has been obliterated by intense folding movements to which they have been subjected. Consequently, the rocks themselves are more or less impervious, but groundwater is contained in systems of joints and fractures imposed on them by folding and faulting. Because of the restricted size and frequency of openings afforded by the joints and fractures the yields available from bores on favourable sites in these rocks are mostly quite low, usually between 100 and 300 gallons per hour, and rarely more than about 800 gallons per hour. Owing to the composition of the host rocks, the water quality tends to be generally hard and too saline for domestic or garden use, but quite good for stock purposes.

There is considerable topographic relief in the area occupied by the Carboniferous rocks, and in normal seasons creeks, dams and springs provide adequate stock water. Consequently, relatively little boring has been undertaken. However, bores on favourable sites are usually successful at depths between 50 and 100 feet, and it should be rarely necessary to drill as deep as 150 feet. Where bores have been unsuccessful, it is usually because they have been poorly sited, or not drilled to a sufficient depth, or both.

Rocks of Permian Age. Although, as shown on the map, it is usual to divide the Permian rocks in the Upper Hunter region into four broad groups, for present purposes it is convenient to discuss them in conjunction because they are to some extent similar from the viewpoint of their groundwater potential. They consist of a more or less conformable series of sedimentary rock groups, each comprised largely of sandstones, shales and conglomerates. The oldest group, the Lower Marine Series (now termed the Dalwood Group) was, as the name implies, deposited under marine conditions. Next is the Lower Coal Measures (Greta Coal Measures) containing important coal seams and deposited mainly under brackish water conditions. Overlying these is the

Upper Marine Series (Maitland Group), again of marine deposition, and then the Upper Coal Measures (Newcastle Coal Measures and Tomago Coal Measures), mainly of brackish water deposition.

Although quite old, these rocks have not suffered the intense folding that is evident in the Carboniferous rocks. Consequently, for the most part they are only gently folded, and the sediments still retain some porosity. This, of course, gives a much more intimate contact between the water and the host rock than in the case of the fractured Carboniferous rocks. It is here, too, that the brackish and marine conditions of original deposition are significant, because as the original clays, silts, sands and gravels were subsequently compacted and consolidated into rock they inevitably retained some of the salts from the waters in which they were deposited. And even now, as groundwater slowly inches its way through the porous zones, it is still leaching out these salts. It is to be expected then, that groundwater extracted from rocks of Permian age in the Upper Hunter region will be of poor quality, and this indeed is often the case.

It is characteristic of bores in the Upper or Lower Marine Series that they yield, at best, brackish water, and at worst, water too salty for any stock. Brackish water is also often obtained from bores in the Upper or Lower Coal Measures. The latter waters are usually rather acid and high in sulphate content because of the chemical breakdown of the finely disseminated iron sulphides (iron pyrites) commonly associated with coal-bearing formations.

Further evidence of the deleterious effects of the Permian formations is given in dry periods by the marked deterioration in the quality of many creek waters draining catchments of these rocks, e.g. Doctors Creek at Singleton. Again, they are also responsible for the fact that where they flank the alluvial flats in the main valley, and many of its tributaries, they cause a relatively saline zone to extend into the groundwater contained in the alluvial flats.

Although porous zones occur at various horizons in the Permian rocks, they are by no means free yielding. Yields from bores sometimes exceed 1,000 gallons per hour, but for the most part they are less than 500 gallons per hour. Bores on reasonable sites generally obtain supplies at depths between 80 and 200 feet, but in some cases depths of as much as 400 feet have been necessary to obtain a sufficient stock supply.

Tertiary Basalts. The basalts within the Upper Hunter catchment are the remnants of enormous outpourings of basaltic lavas in late Tertiary time. Their main development is to the north-west of the catchment where the Liverpool Range basalts cap the Oxley Basin, but there are also other fairly extensive remnants, such as along the Mount Royal Range, where they overlie Carboniferous rocks.

In general, basalt is a reasonably favourable rock-type from which to obtain groundwater. Opportunity for groundwater storage is given by the joint systems (usually polygonal) which develop as a result of stresses as the lava-flow cools, by the weathering of "frothy" phases of the lava (pumice and vesicular or "honey-comb" basalt), or by weathered zones between successive lava flows. The rock is rather prone to weathering, and because of decomposition of the rock minerals, which are rich in lime and magnesia, groundwater obtained from basalts is characteristically hard.

Basalts normally accept groundwater recharge quite readily, but, by the same token, they also allow the groundwater to drain away quite readily, particularly in areas of appreciable surface relief. In such areas, springs (i.e. escaping groundwater) are common, and the water level in bores and wells fluctuates considerably with seasonal conditions. If the seasonal conditions are bad enough, (e.g. a few years of below average rainfall), bores and wells may fail until the next wet season.

All of the abovementioned principles are well in evidence in the basaltic areas within the Upper Hunter catchment. On the basis of these principles it is evident that best results will normally be obtained by siting bores or wells in order to have the advantage of as much catchment as possible, i.e.at the base of slopes, or in drainage depressions or valleys. In such locations, bores in the Liverpool Range basalts usually obtain stock-water supplies at less than 100 feet. On elevated sites, which should be avoided if possible (both from the groundwater potential viewpoint and because basalt is hard and costly to drill), bores sometimes fail to obtain sufficient water, some being abandoned at depths of 400 - 500 feet.

Porous Rocks

Rocks of Triassic and Jurassic Age. It is also convenient to consider the rocks of these two geological periods together because the Jurassic rocks

overlie the Triassic conformably, and both consist mainly of sandstones with some sandy shales and shales. The Triassic rocks have their main development south of the Goulburn River where sandstones of Upper Triassic age (Narrabeen Group) form a plateau-like area which has been dissected so deeply by the north-flowing tributaries of the Goulburn River, e.g. Widden Brook, Baerami Creek, etc., that the underlying Permian rocks are exposed at the base of their valleys. The dissected "plateau" area of sandstones is poor country and largely undeveloped, so that little attempt to obtain groundwater by boring has been made. Stock-water supplies, generally tending to be brackish, have been obtained in the same formation in other parts of the Sydney Basin (a major geological structural basin, of which this area is part) and there is reasonable expectation of similar potential in this area, provided bore sites are not close to the entrenched valleys. However, bore depths of 150 - 400 feet may be necessary.

The Triassic rocks also occur north of the Goulburn River, but here they and the overlying Jurassic rocks are dipping gently northwards (generally at the order of 2 - 5 degrees) and constitute the southern rim of the structure known as the Oxley Basin. While the Triassic rocks appear to have potential only for stock-water supplies in this area, the Jurassic are rather more significant because they contain some quite free-yielding porous zones in the sandstones. In fact these Jurassic sandstones are stratigraphically equivalent to the "Pilliga Beds" which contain some of the major water-bearing formations in the Great Artesian Basin, although they are not quite as favourable here. Nevertheless, they contain good quality water, even to the extent of being suitable for town water supply. It may be noted that they were originally deposited under fresh-water conditions.

Water for stock has been obtained from many bores in the Jurassic sandstones at depths usually between 140 and 450 feet. At Merriwa, two town bores yielded 3,000 and 8,000 gallons per hour from aquifers in the sandstones at 420 and 524 feet, respectively. At Cassilis, a town bore 70 feet deep yielded 2,300 gallons per hour.

The unfortunate feature about the Jurassic sandstones is that, being in the Oxley Basin structure, they dip northwards under the Liverpool Range basalts. This means that not only do the water bearing horizons become deeper with

distance northwards, but, because of the basalts, the land surface also becomes more elevated. On the lower slopes of the Liverpool Range basalts, some bores have been drilled through the basalts into the underlying sandstones, their depths varying from 400 to as much as 900 feet, and have obtained useful stock supplies. However, it is evident that further northwards boring would require too great a depth and be too expensive to warrant penetrating to the sandstones. In any event, shallower water can often be obtained in such areas from the basalt itself.

Tertiary to Recent Unconsolidated Formations

Unconsolidated formations of alluvial origin are by far the most important source of groundwater within the Upper Hunter catchment, in terms of both quality and yield.

Alluvium consists of clays, silts, sands and gravels deposited in valleys after being transported by water action. The weathering and erosion of rocks in the catchment provide the source material, and consequently the nature of the rocks determines the nature of the alluvium. Examples of this are (i) coarse basaltic gravels in valleys draining the Liverpool Range area, e.g. Krui River, Merriwa and Halls Creeks, and Munmurra and Dart Brooks, (ii) the sands in the valleys draining from the southern and western elevated sandstone country, e.g. Goulburn River, Baerami and Martindale Creeks, and (iii) the varied rock types in the gravels in valleys draining from catchments east and north of the Hunter River, e.g. Pages River, and in the Hunter itself. Such variation in the nature of the water-bearing material must be taken into account when considering the most satisfactory means of extracting the water.

The groundwater resources of part of the alluvium of the Upper Hunter drainage system (from Glenbawn Dam to the confluence with the Goulburn River) have been investigated in some detail. This section of the Hunter has one of the most intensive utilizations of groundwater for irrigation in New South Wales. In 1953, of some 500 wells, 204 were being used for the irrigation of 3,858 acres, mostly of lucerne for dairying purposes.

Test boring has shown the alluvium to be relatively shallow, usually of the order of 40 - 60 feet, but, even so, wells rarely penetrate the full thickness of water bearing gravel. In general, wells 25 - 40 feet deep yield

between 10,000 and 30,000 gallons per hour over most of the above section of the valley, which includes the important tributaries of Pages River, Kingdon Ponds and Dart Brook. However, yields in the Muswellbrook - Denman section of the valley are notably poor. While further development of groundwater for irrigation and town-water supply purposes is quite possible in the Upper Hunter system, the situation is not without a number of problems. These include the fluctuations in water level (and thus available storage) with seasonal conditions, and the likelihood of inducing the intrusion of saline water from fringe areas influenced by drainage from Permian rocks flanking the valley. Consequently, periodic observations of water table levels and water quality are being maintained.

Martindale and Baerami Creeks, Widden Brook and similar tributary streams drain from the south into the Hunter and Goulburn Rivers. Their valleys are carved into a sandstone (Triassic) plateau and hence the alluvium in them is predominantly sandy. Consequently it is found that, because of the difficulty of controlling sand entry, wells are often not a satisfactory means of exploiting the groundwater. In Martindale Creek valley, artificially packed screened bores coped with this problem and yields of up to 20,000 gallons per hour were obtained from bores in fine sandy alluvium 40 -45 feet deep. Batteries of spearpoints in both the alluvium and the sandy creek beds have obtained irrigation supplies in such drainage systems.

The Wollombi Brook area is somewhat similar to the above tributaries but is more extensive. Its catchment extends into rocks of Permian age, and this introduces salinity problems as in the main Hunter Valley. The alluvium is predominantly sandy and, where the method is practicable, batteries of spearpoints are again usually more successful than wells, yields up to about 12,000 gallons per hour being obtained. However, there is often a sufficient development of gravels for wells to be satisfactory and yields range up to about 9,000 gallons per hour.

The northern tributaries of the Goulburn River are very different in character for they drain the Liverpool Range basalts. Where there is a reasonable development of alluvium, e.g. Merriwa Creek valley, irrigation supplies of the order of 10,000 gallons per hour have been obtained from wells in the basalt gravels. In a few instances, screened bores have been utilized

and obtained up to 16,000 gallons per hour. However, one difficulty in such valleys is that their gradients are usually relatively steep so that groundwater levels are markedly affected by long term variations in climatic conditions.

In the valley of the Goulburn River, the alluvium is mainly dissected into a series of alternating large "pockets" by the broad meanders of the river. A difficulty here is that the river is mostly deeply entrenched into the alluvium, so that the water level in the alluvium is considerably deeper than in the Hunter Valley. Whilst sand entry often causes difficulty with the operation of wells, yields of up to about 20,000 gallons per hour are obtained.

In the area from the confluence with the Goulburn, downstream to about Maitland, the alluvium is generally more restricted in extent than in the upstream section of the Hunter, but reasonably located wells have fair prospects of yielding between 8,000 and 20,000 gallons per hour. Where the alluvium is more extensive, as in the Singleton area, some of it is quite shallow and only the deeper sections yield substantial supplies.

Summary of Groundwater Occurrence in the Upper Hunter Valley

It is evident that the alluvial formations afford practically the only significant source of large supplies of good quality groundwater within the Upper Hunter River catchment area. The most intensive use of groundwater from the alluvium is in the area from Glenbawn Dam to the confluence with the Goulburn River, including adjacent sections of the Pages River, Kingdon Ponds, and Dart Brook. Wells in this area having depths of 25 to 40 feet generally yield between 10,000 and 30,000 gallons per hour. However, yields in the zone from Muswellbrook to Mangoola are notably poor. Except in some of the tributaries, wells rarely penetrate the full thickness of water-bearing formations (usually 40 - 60 feet) and larger yields, particularly in drought periods, could often be obtained by deepening. In the case of the tributaries mentioned above it is to be expected that, because of the relatively steep gradients of their valleys, the groundwater levels will vary considerably with seasonal conditions, and in prolonged droughts there will be a marked reduction in available supplies.

The major tributaries draining southwards from the Liverpool Range into the Goulburn River also suffer from marked diminution of groundwater supplies in drought periods, but nevertheless afford useful irrigation supplies from wells. Tributaries draining northwards into the Goulburn and Hunter Rivers

characteristically contain very sandy alluvial formations which often require special techniques, such as batteries of spearpoints or artificially packed screened bores, to successfully extract the groundwater contained in them.

Reasonably favourable groundwater conditions prevail in the alluvium of the main valley as far downstream as Maitland, but the area of alluvium is generally more restricted than upstream of Denman. Where it is more extensive, such as in the Singleton area, some of it tends to be quite shallow (20 - 25 feet) in places, and generally only the deep zones (30 - 50 feet) yield substantial supplies.

A particularly important feature of the Upper Hunter Valley is that it is carved into a sedimentary rock series (Permian age) which affords poor conditions with regard to both yield and quality of groundwater. Consequently, attempts to obtain water for irrigation or town supply from the rock formations underlying the alluvium are doomed to failure. It is for this reason that the Water Conservation and Irrigation Commission has consistently advised against such proposals. Where boring has been undertaken in these rocks, groundwater yields are generally less than 500 gallons per hour and the quality is almost invariably brackish, and sometimes too saline even for sheep. While bores on reasonable sites may obtain water supplies at depths between 80 and 200 feet, in some cases depths of over 400 feet have been necessary to obtain an adequate stock-water supply.

The great majority of the area lying north and east of the railway from Maitland to Murrurundi is occupied by ancient rocks (Carboniferous age) which have been subject to considerable folding. The rocks themselves are impervious, but the fracture systems imposed on them when they were folded can contain useful supplies of groundwater. However, as regards both yield and quality, such supplies are generally suitable only for stock use.

The sedimentary rocks of Triassic age which form the "plateau" areas south of the Goulburn and Hunter Rivers, and which then extend under the Liverpool Range, also have a generally poor groundwater potential. Supplies are normally suitable and sufficient only for stock purposes and bore depths of as much as 450 feet have sometimes been necessary to obtain them. However, sandwiched between these rocks and the basalts of the Liverpool Range, north of the Goulburn River, is a younger sedimentary rock formation of Jurassic age

which contains zones of porous sandstones. The latter contain good quality water, and in some cases supplies encountered in bores have been sufficient for small towns, e.g. Merriwa and Cassilis. Such bores have ranged to over 500 feet in depth, and, because of large pumping lifts and other factors, are not generally a practicable proposition for irrigation projects.

The basalts of the Liverpool Range and associated areas are reasonably favourable rock-types for groundwater for stock purposes but drilling conditions are often difficult. In elevated areas, it is not uncommon to find that bores yield satisfactory supplies in normal seasons but fail in prolonged dry seasons. Consequently, it is of marked advantage to site bores where they have benefit of as much catchment as possible, e.g. in drainage depressions or at the base of slopes.

In brief, the groundwater potential of the great majority of the area within the Upper Hunter River catchment is confined to stock-water supplies, and in some parts it may be difficult to obtain even these. Only in the alluvial infill of the valleys and to a lesser extent, the porous sandstones in the Merriwa - Cassilis districts, is there appreciable potential for groundwater suitable and sufficient for irrigation or town supply.

5. STREAM GAUGING STATIONS

Streamflow originates in the precipitation of atmospheric moisture which is mainly evaporated from the oceans and is carried over the land masses by weather systems. Runoff is generally recognised to be that component of precipitation which appears as flow in streams after evaporation, transpiration and deep seepage losses have been satisfied.

In most areas of New South Wales rainfall records have been obtained for relatively long periods of time. Therefore, it could be expected that if satisfactory estimates were available to be made of losses due to evaporation transpiration and deep seepage, the remainder of the precipitation, or runoff, could be reliably assessed. However, despite intensive research, no suitable method has yet been formulated of relating runoff and rainfall for any catchment to a satisfactory degree of accuracy in the absence of any streamflow information.

In water resources and other hydrologic investigations it is therefore essential to have basic streamflow data available in order to enable satisfactory results and conclusions to be obtained. In addition, it is most desirable that these streamflow records cover as long a period as possible.

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

River heights are normally measured by visual observation of the water surface on a graduated scale or staff gauge, or alternatively by means of a continuous record produced by a float or pressure actuated recorder. Individual measurements of stream discharge are obtained by the use of a current meter to measure flow velocities in conjunction with survey methods to determine the area of effective flow. The combination of flow velocities, in feet per second, and effective discharge areas, in square feet, gives the discharge of the stream in cubic feet per second or cusecs.

The measurement of streamflows in the Upper Hunter Valley commenced in November 1891 when a staff gauge station was installed at Singleton. The next stations to be established were at Belmore Bridge (Maitland), Muswellbrook, and Rosemount in 1906, followed by stations on the Wollombi Brook at Warkworth in 1908, the Hunter River at Moonan Flat in 1911, and on the Goulburn River at Coggan in 1912. Whilst the Belmore Bridge gauge is one of the earliest gauges established in the Hunter Valley, it was not until 1958 when the Water Conservation and Irrigation Commission took over control of the gauge, that continuous flow records were kept. Prior to this the gauge was operated primarily for flood recording purposes. Details of recorded flows and flood heights for this station are listed in the previously issued report No.4, entitled "Water Resources of the Lower Hunter Valley".

A number of additional stream gauging stations have since been established and at the present time the Water Conservation and Irrigation Commission is operating a total of 52 stations in the valley. These stations, which include the original station at Singleton, have been strategically located so as to measure the runoff from the entire Upper Hunter Valley.

and to provide data of an acceptable standard of accuracy for use in the investigation of future water resources proposals in the valley.

The current density of gauging stations in the Upper Hunter Valley is 8.0 stations per thousand square miles which is over 1½ times the average density for coastal New South Wales.

The Commission intends to expand this network with the provision of an additional nine gauging stations. Proposals also include the improvement of the standard of recording at several of the existing stations by installation of automatic stream height recorders and improved stream channel controls.

The locations of all existing and discontinued stream gauging stations in the Upper Hunter Valley are shown at Figure 17 and relevant details concerning each station are given in Table 8 hereunder and on page 23.

TABLE 8

Stream	Station	Catchment Area (Square Miles)	Type of Gauge	Period of Operation
Omadale Brook	Roma	40.	Pressure Recorder	1940 to date
Moonan Brook	Moonan Brook	38	Pressure Recorder	1940 to date
Hunter River	Moonan Flat	290	Staff Gauge	1911 to date
Hunter River	Moonan Dam Site	295	Float Recorder	1940 to date
Stewarts Brook	Windemere	70	Staff Gauge	1946 to date
Stewarts Brook	Cloverdale*	71	Staff Gauge	1934 to 1946
Hunter River	Belltrees*	457	Staff Gauge	1955 to 1958
Hunter River	Glenbawn	500	Float Recorder	1940 to date
Rouchel Brook	Upper Rouchel	95	Staff Gauge	1950 to date
Rouchel Brook	Rouchel Brook	149	Float Recorder	1934 to 1951 (1959 to date
Pages River	Blandford	110	Pressure Recorder	1960 to date
Isis River	Lower Timor	120	Pressure Recorder	1963 to date
Isis River	Waverley*	171	Pressure Recorder	1959 to 1963
Pages River	Cronins*	400	Staff Gauge	1934 to 1952
Pages River	Gundy Recorder	403	Float Recorder	1958 to date
Pages River	Gundy Bridge	404	Staff Gauge	1956 to date
Pages River	Gundy*	404	Pressure Recorder	1952 to 1955
Hunter River	Aberdeen	1,300	Staff Gauge	1959 to date
Dart Brook	Dalmore*	114	Pressure Recorder	1953 to 1958
Kingdon Ponds	Camyr Allyn*	113	Pressure Recorder	1953 to 1958
Dart Brook	Aberdeen	320	Staff Gauge	1959 to date
Hunter River	Muswellbrook	1,630	Float Recorder	1906 to date
Hunter River	Denman	1,750	Staff Gauge	1959 to date
Hunter River	Ravenswood*	5,620	Staff Gauge	1922 to 1930
Goulburn River	Ulan	59	Pressure Recorder	1956 to date
Krui River	Neverfail	226	Pressure Recorder	1954 to date
Bylong Creek	Bylong	263	Staff Gauge	1960 to date

TABLE 8 (cont...)

Stream	Station	Catchment Area (Square Miles)	Type of Gauge	Period of Operation
Goulburn River	Coggan	1,290	Staff Gauge	1912 to date
Merriwa Creek	U/S Valences Creek	264	Pressure Recorder	1963 to date
Goulburn River	Kerrabee	1,850	Remote Indicator	1940 to date
Widden Brook	Widden	283	Staff Gauge	1954 to date
Baerami Creek	Baerami	125	Staff Gauge	1960 to date
Halls Creek	Gungal	84	Staff Gauge	1962 to date
Goulburn River	Sandy Hollow	2,640	Pressure Recorder	1953 to date
Wybong Creek	Wybong	257	Pressure Recorder	1955 to date
Goulburn River	Rosemount*	3,150	Staff Gauge	1906 to 1924
Saddlers Creek	Bowfield	30	Pressure Recorder	1956 to date
Salwater Creek	Plashett	16	Float Recorder	1956 to date
Gardiners Creek	Antiene	5.5	Float Recorder	1968 to date
Maidswater Creek	Liddell Site 4.	2.2	Float Recorder	1968 to date
Tinkers Creek North Arm	Liddell Site 2	4.2	Float Recorder	1968 to date
Tinkers Creek South Arm	Liddell Site 1	2.5	Float Recorder	1968 to date
McMahons Creek	Liddell Site 5	0.4	Float Recorder	1968 to date
Gardiners Creek	Liddell	30	Float Recorder	1959 to date
Bowmans Creek	Ravensworth	79	Float Recorder	1956 to date
York Creek	Ravensworth	5	Pressure Recorder	1958 to date
Swamp Creek	Ravensworth	7	Float Recorder	1958 to date
Fal Brook	The Rocks*	88	Pressure Recorder	1944 to 1963
Glennies Creek	Middle Falbrook	171	Float Recorder	1956 to date
Deep Creek	Pokolbin Site 4	2	Float Recorder	1963 to date
Deep Creek	Pokolbin Site 3	10	Float Recorder	1961 to date
Middle Creek	Pokolbin Site 2	3	Float Recorder	1961 to date
First Creek	Pokolbin Site 1	6	Float Recorder	1961 to date
Congewai Creek	Dam Site*	14	Staff Gauge	1948 to 1963
Congewai Creek	Eglinford	33	Pressure Recorder	1948 to date
Wollombi Brook (North Arm)	Hanging Rock	150	Float Recorder	1958 to date
Wollombi Brook	Wollombi Dam Site	401	Float Recorder	1958 to date
Wollombi Brook	Paynes Crossing*	400	Staff Gauge	1940 to 1949
Wollombi Brook	Fordwich*	495	Staff Gauge	1946 to 1949
Wollombi Brook	Bulga	615	Float Recorder	1949 to date
Wollombi Brook	Warkworth	670	Staff Gauge	1908 to date
Hunter River	Singleton	6,350	Manometer Servo Pressure Recorder	1891 to date
Glendon Brook	Glendon Brook	106	Pressure Recorder	1964 to date
Glendon Brook	Mitchell Flat*	184	Staff Gauge	1954 to 1955
Hunter River	Greta	6,690	Manometer Servo Pressure Recorder	1961 to date
Hunter River	Walka Intake*	6,745	Staff Gauge	1908 to 1957
Hunter River	Belmore Bridge	6,750	Staff Gauge	1906 to date

*Discontinued Stations.

6. CATCHMENT YIELDS

Since the installation of the first gauging station in the Upper Hunter Valley, in 1891 at Singleton, a large volume of data has been obtained of the runoff, or water yield, at various points in the valley. The water yield from a natural catchment is dependent on many factors including annual rainfall, catchment area, topography and geology. In addition other significant factors which affect the volume of runoff as a result of a particular storm are rainfall intensity, vegetal cover and soil moisture conditions.

Furthermore it should be noted that a valid comparison of recorded yields at two gauging stations can only be made if the records at the stations are contemporaneous (i.e. the records cover the same period of time). Obviously, the longer the period of record at a station the more representative the recorded flows are of long term flow conditions.

For comparative purposes recorded yields at selected gauging stations in the valley, over the respective periods of available records, are given in Table 9. Details of recorded monthly maximum, minimum and mean flows for all gauging stations shown in Table 9, with the exception of the station located on the Hunter River at Belmore Bridge, are given in Appendices 5 to 21 inclusive. (Streamflow statistics for the Hunter River at Belmore Bridge have been previously published in report No. 4 "Water Resources of the Lower Hunter Valley").

In the case of yields shown for the Hunter River at Glenbawn, the yield for post-Glenbawn conditions compared with that in the period of records prior to Glenbawn has been much lower. This has been caused by the relatively low natural runoff which has occurred since completion of the dam.

The stream gauging stations in the valley with reasonable long term records are located on the Goulburn River at Coggan (56 years), the Hunter River at Muswellbrook (61 years) and Singleton (70 years). Over the periods of available records the average flows at Coggan, Muswellbrook and Singleton have been 99 cusecs, 430 cusecs and 984 cusecs respectively.

Although the catchment area above Muswellbrook (1,630 square miles) is only about 26 percent greater than at Coggan (1,290 square miles) the water yield has been more than four times as great.

TABLE 9.

Stream	Station	Complete Years of Computed Records	Average Annual Yield over period of Complete years of Record		
			Acre Feet per Annum	Cusecs	Gallons Per Minute
Omadale Brook	Roma	28	31,000	42	15,700
Hunter River	Moonan Dam Site	27	111,000	152	56,800
Hunter River	Pre Glenbawn	17	192,000	263	98,400
	Post Glenbawn	11	122,000	167	62,500
Rouchel Brook	Upper Rouchel	18	60,000	82	30,700
Pages River	Gundy	9	64,000	88	33,000
Dart Brook	Aberdeen	9	31,000	43	16,000
Hunter River	Muswellbrook	61	314,000	430	161,000
Goulburn River	Coggan	56	72,000	99	37,000
Goulburn River	Kerrabee	28	134,000	184	68,800
Goulburn River	Sandy Hollow	14	211,000	289	108,000
Wybong Creek	Wybong	10	39,700	54	20,200
Gardiners Creek	Liddell	7	7,200	10	3,700
Bowmans Creek	Ravensworth	11	9,030	12	4,500
Glennies Creek	Middle Falbrook	11	62,000	85	31,800
Congewai Creek	Eglinford	20	29,000	39	14,600
Wollombi Brook	Hanging Rock	9	34,300	47	17,600
Hunter River	Singleton	70	719,000	984	368,000
Hunter River	Belmore Bridge	11	750,000	1,028	384,000

7. AVERAGE ANNUAL RUNOFF

Estimates of the long term average annual runoffs from selected sub-catchments in the Upper Hunter Valley have been prepared using the long term streamflow records for the Hunter River at Singleton. The estimates indicate that the average annual surface water resources of the Upper Hunter Valley, above Maitland, are of the order of 800,000 acre feet (217,000 million gallons), equivalent to a continuous rate of 1,100 cusecs (410,000 gallons per minute).

The estimated long term average annual runoffs for selected sections of the Upper Hunter Valley, the entire Hunter Valley and the adjoining Manning, Peel and Talbragar Valleys are given in Table 10. For comparative purposes the long term runoff per square mile of catchment and percentage runoffs are shown in Table 10 for the respective catchments..

TABLE 10

Basin	Catchment Area in Square Miles	Estimated Long Term Average Annual Runoff		
		Acre Feet per Annum	Acre Feet per Annum per Square Mile	Percentage Runoff
Entire Hunter Valley	7,900	1,330,000	168	11%
Hunter River Above Maitland	6,750	800,000	119	8%
Hunter River between Goulburn River junction and Maitland	1,960	300,000	153	10%
Hunter River above Goulburn River junction	1,770	320,000	181	12%
Goulburn River above Hunter River junction	3,020	180,000	60	5%
Manning Valley	3,250	1,800,000	554	23%
Peel Valley	1,800	260,000	145	9%
Talbragar Valley	1,800	79,000	44	3%

Reference to Table 10 indicates that the lowest water yielding section of the Upper Hunter Valley is the Goulburn River catchment, which although its area is 45 percent of the total Upper Hunter Valley, yields only 23 percent of the total long term runoff.

Due to varying geologic and hydrologic conditions in a river basin the long term runoff per unit area tends to decrease with an increase in area. Therefore it could be expected that the runoff per unit area of the Goulburn River catchment (3,020 square miles) would be somewhat less than that of the Hunter River catchment above the Goulburn River Junction (1,770 square miles). However the runoff per square mile of the Hunter River catchment is more than three times that of the Goulburn River and this ratio is much higher than could be expected on an area basis, indicating the influence of other factors such as rainfall and topography.

As shown in Table 10 the estimated long term average annual runoff of the entire Hunter Valley is 1,330,000 acre feet per annum. A previous estimate of the long term average annual runoff was given in the 1963 publication "Review of Australia's Water Resources" as 1,250,000 acre feet per annum. This estimate was based on 61 years of records at Singleton as compared to the 70 years now available.

On a square mile of catchment area basis the water resources of the Upper Hunter Valley are about 25 percent greater than the average for New South Wales, and about a third of the average for the New South Wales coastal region.

Reference to Table 10 shows that the long term runoffs per square mile of any section of the Upper Hunter Valley are substantially below the estimated runoff of the relatively large coastal Manning River Basin and approximate that of the inland Peel River Basin. However all runoffs per square mile within the catchment, including the Goulburn River catchment, are substantially greater than the runoffs within the adjoining Talbragar Valley. This result may be attributed to the lower annual rainfall and less frequent runoff producing storms in the Talbragar Valley.

8. VARIABILITY OF STREAMFLOWS

Examination of available streamflow records indicates that in the Hunter Valley streamflows are subject to a high degree of variability. Of the gauging stations with reasonably long period records, the most marked variation occurs on the Goulburn River at Coggan, where the annual flow has varied from about 1,000 percent to 3 percent of the long term average annual flow. This large variation in flow is typical of the Goulburn River and its tributaries.

The least variation of annual flow has been recorded for Rouchel Brook at Upper Rouchel where the annual flow ranged from 280 percent to 10 percent of the average annual flow. This smaller variation of flow is more characteristic of the Hunter River in its upper reaches. Other regions of high annual rainfall, which also exhibit much less variation in annual flows than the Goulburn River catchment, are the Wollombi and Glendon Brooks and Bowmans Creek catchment areas. The maximum and minimum variations of annual flows for these regions are from about 550 percent to 3 percent.

As expected monthly flows exhibit an even greater degree of variability, the greatest and least variations again occurring at the Coggan and Upper Rouchel gauging stations respectively. At Coggan the monthly flow has varied from a minimum of zero to a maximum of about fifty-two times the average monthly flow. Figures 18, 19 and 20 show the monthly streamflow variations at gauging stations on the Hunter River at Singleton, Muswellbrook and Moonan Dam Site and on the Goulburn River at Coggan.

As in the majority of streams in the State there is extreme variability between maximum and minimum instantaneous flows. The highest recorded flood at Singleton occurred in February 1955 when the peak discharge was estimated to be 443,000 cusecs (166 million gallons per minute). During the same flood the peak discharge at Belmore Bridge (Maitland) was estimated to be 365,000 cusecs (137 million gallons per minute). A total of 597 days of no flow has been experienced at Singleton since the installation of the gauging station in 1891.

Streamflow records for the gauging stations in the valley indicate that the main streams have ceased flowing for extended periods. One of the most severe droughts on record commenced in 1939. During this drought the Hunter River at Singleton and Muswellbrook and the Goulburn River at Coggan ceased flowing for 138, 117 and 144 consecutive days respectively.

An indication of the variation in instantaneous streamflows at selected gauging stations in the valley is given at Table 11 which shows the maximum, minimum and mean discharges for these stations over the periods of computed records. From the table it can be seen that, at some time during the period of records, flow has ceased at each of the selected stations.

TABLE 11

Stream	Station	Years of Computed Records	Recorded Discharges		
			Maximum	Minimum	Mean
Omadale Brook	Roma	28	2,800 cusecs (1,050,000 gpm)	0	42 cusecs (15,700 gpm)
Hunter River	Moonan Dam Site	27	25,000 cusecs (9,350,000 gpm)	0	152 cusecs (56,800 gpm)
Hunter River	Downstream Glenbawn Dam (Pre Glenbawn)	17	41,000 cusecs (15,300,000 gpm)	0	263 cusecs (98,400 gpm)
	Downstream Glenbawn Dam (Post Glenbawn)	11	3,200 cusecs (1,200,000 gpm)	0	167 cusecs (62,500 gpm)
Rouchel Brook	Upper Rouchel	18	25,900 cusecs (9,680,000 gpm)	0	82 cusecs (30,700 gpm)
Pages River	Gundy	9	12,300 cusecs (4,600,000 gpm)	0	88 cusecs (33,000 gpm)
Dart Brook	Aberdeen	9	8,560 cusecs (3,200,000 gpm)	0	43 cusecs (16,000 gpm)
Hunter River	Muswellbrook	61	140,000 cusecs (52,400,000 gpm)	0	430 cusecs (161,000 gpm)
Goulburn River	Coggan	56	140,000 cusecs (52,400,000 gpm)	0	99 cusecs (37,000 gpm)
Goulburn River	Kerrabee	28	153,000 cusecs (57,200,000 gpm)	0	184 cusecs (68,800 gpm)
Goulburn River	Sandy Hollow	14	180,000 cusecs (67,300,000 gpm)	0	289 cusecs (108,000 gpm)
Wybong Creek	Wybong	10	19,000 cusecs (7,100,000 gpm)	0	54 cusecs (20,200 gpm)
Gardiners Creek	Liddell	7	5,530 cusecs (2,070,000 gpm)	0	10 cusecs (3,700 gpm)
Bowmans Creek	Ravensworth	11	3,500 cusecs (1,310,000 gpm)	0	12 cusecs (4,500 gpm)
Glennies Creek	Middle Falbrook	11	32,100 cusecs (12,000,000 gpm)	0	85 cusecs (31,800 gpm)
Congewai Creek	Eglinford	20	5,925 cusecs (2,220,000 gpm)	0	39 cusecs (14,600 gpm)
Wollombi Brook	Hanging Rock	9	19,100 cusecs (7,140,000 gpm)	0	47 cusecs (17,600 gpm)
Hunter River	Singleton	70	443,000 cusecs (166,000,000 gpm)	0	984 cusecs (368,000 gpm)
Hunter River	Belmore Bridge	11	365,000 cusecs (137,000,000 gpm)	0	1,028 cusecs (384,000 gpm)

9. PERSISTENCE OF STREAMFLOWS

Flow duration curves are graphs indicating the relative occurrences of flows of various magnitudes at a stream gauging station. These curves show the percentage of time that flows were equal to or greater than (or alternatively were equal to or less than) any selected discharge. The flow duration curves and data given in this report correspond to the percentages of time that flows were equal to or greater than any selected flow.

Using daily average flow data, flow duration curves have been developed for ten selected stations in the Upper Hunter Valley, these curves being shown at Figures 21 to 25 inclusive.

Whilst the flow duration curves given at Figures 21 to 25 indicate the persistence of flow at a certain station they do not facilitate a ready comparison of the relative runoff characteristics of the various sections of the valley. To permit these comparisons to be made the flow duration curves for four of the stations have been replotted in the form of duration curves of flow per square mile and are shown at Figure 26. The stations selected for this comparison are the Goulburn River at Coggan and the Hunter River at Moonan Dam Site, Muswellbrook and Singleton.

When comparing flow duration curves for different catchments two main factors should be kept in mind. Firstly, the length of records on which the curves are based are likely to affect the position of the curves, as the records may contain excessive periods of either high or low stream discharges. Secondly, runoffs per square mile generally increase with decrease in catchment area, and this characteristic should be reflected in the duration curves of flow per square mile.

Examination of the curves shows the poor persistence of flows in the Goulburn River at Goggan, the flow duration curve being generally similar to that for Omadale Brook at Roma, yet the catchment area above Coggan is 32 times that above Roma. Further, on the basis of flows per square mile of catchment, the flows of the Goulburn River at Coggan have been approximately one fifth of those of the Hunter River at Muswellbrook.

The Hunter River at Moonan Dam Site, Rouchel Brook at Upper Rouchel and Omadale Brook at Roma all exhibit good persistence of flows. Since these streams have much of their catchments in the higher rainfall region of the Mount Royal Range this result is to be expected.

Records for Wybong Creek at Wybong, Glennies Creek at Middle Falbrook, Bowmans Creek at Ravensworth and Wollombi Brook at Hanging Rock cover periods of fourteen years or less. Accordingly, the flow duration curves for these stations have been influenced to a greater extent by the low flows which have prevailed since 1964 than those for which a considerably longer period of records is available.

Nevertheless it would appear that Bowmans Creek at Ravensworth exhibits poor flow persistence due to relatively rapid infiltration of flows into the channel alluvium. Wollombi Brook at Hanging Rock also exhibits poor flow persistence but in this instance it is apparently due to the thin soil cover and rock nature of the catchment which results in rapid runoff during and after storms.

The average annual flow at Muswellbrook is equalled or exceeded during 19 percent of the time, while the flow equalled or exceeded 50 percent of the time (median flow) is approximately one third of the average. Periods of no flow occurred during about 2 percent of the total time. These characteristics are typical of New South Wales coastal streams and exhibit a high degree of variability compared with streams in many other countries.

At Singleton the flow duration curve is affected by the poor contribution from the Goulburn Valley. Again the average annual flow is equalled or exceeded 19 percent of the time, but the flow equalled or exceeded 50 percent of the time is almost one quarter of the average.

Table 12 shows flow frequency statistics for the streamflow stations located on the Goulburn River at Coggan and the Hunter River at Moonan Dam Site, Muswellbrook and Singleton.

TABLE 12

Stream and Station	% of Time Flow Equalled or Exceeded	Corresponding Flow	
		Cusecs	Gals./Min.
Hunter River at Mocnan Dam Site	10	304	114,000
	30	125	46,700
	50	68	25,400
	70	35	13,100
	90	10	3,740
	95	4	1,500
	100	0	0
Hunter River at Muswellbrook	10	830	310,000
	30	280	105,000
	50	145	54,200
	70	65	24,300
	90	13	4,900
	95	4	1,500
	98	0	0
	100	0	0
Hunter River at Singleton	10	2,120	793,000
	30	500	187,000
	50	225	84,100
	70	100	37,400
	90	20	7,500
	95	7	2,600
	100	0	0
Goulburn River at Coggan	10	120	44,900
	30	37	13,800
	50	15	5,600
	70	7	2,600
	90	2	750
	95	1	370
	100	0	0

10. OCCURRENCE OF FLOODING

The Hunter River like many other streams in New South Wales has been subjected to floods of considerable magnitude on many occasions. The damage caused by floods is due to the depth, area and period of inundation, the velocity of flow, and the quantity of sediment and debris transported. In addition to causing damage to crops, agricultural land, buildings, roads and railways, floods also result in interruptions to services and communications and the loss of livestock and human life.

In the Upper Hunter Valley the greatest concentration of flood losses has occurred in urban areas such as Singleton but extensive damage has also been sustained in the agricultural regions particularly along the river flats.

Detailed records of floods have only been collected in comparatively recent years. For many earlier floods the peak height and occasionally a description of the event is the only useful information on record, such information being usually limited to a few key towns. Records of rainfall cover a longer period but again are limited by the extent of settlement and the network of rain gauges.

Since 1953 the number of continuous water level recorders operating in the Upper Hunter Valley has increased considerably and these have provided more detailed information of recent flood hydrographs. The last two decades has also seen the installation of many more rainfall gauges and pluviographs and more detailed recording of the extent of flooding and flood damages.

However, relatively long term records of maximum flood levels are available at several stream gauging stations in the valley.

Since the depth and areal extent of flooding are closely related to the gauge heights occurring in a flood these records provide a considerable amount of information. Figure 27 shows the number of occasions a gauge height of 25 feet has been equalled or exceeded at Dunolly Bridge in Singleton over the period from 1891. Information for floods at Belmore Bridge in Maitland is included in Report No. 4 "Water Resources of the Lower Hunter Valley".

Prior to the construction of levees the critical flood height on the Dunolly Bridge gauge was adopted as 37 feet; at 40 feet overbank flow occurred to cut the Warkworth Road, and at a gauge height of 42 feet, water entered the main section of the town at Singleton. Since 1963, a levee bank has been constructed, providing the commercial centre of the town with protection against flood waters for gauge heights up to approximately 45 feet.

It has been common for more than one flood to occur in a single year; there being five floods exceeding 25 feet in 1950. Since 1892 there have been 43 floods exceeding 25 feet at Singleton, these floods have occurred in 28 of the 75 years. In addition, ten of the floods at Singleton since 1892 have exceeded a gauge height of 40 feet.

Floods have occurred in all months of the year although the months from January to August account for nearly 90 percent of the total and include all major floods. The months of highest frequency of occurrence of flooding have been February, March, June and July while spring and early summer have been relatively free of floods.

Generally, floods have resulted from the occurrence of well developed tropical cyclones with at least several consecutive days of rain. The Wollombi Brook has been a major contributor to floods under these conditions since its catchment is exposed to air masses of maritime origin, while the Goulburn catchment, being further inland, has received much less rainfall. Cyclones have occurred at any time during the year, but they have been more prevalent during the warmer months of February and March.

The highest recorded flood at Singleton and numerous other centres within the valley occurred in February, 1955 when the maximum flood levels were higher than any previously recorded in the history of modern settlement of the valley. The maximum gauge height recorded at Singleton during this flood was 47 feet 9½ inches, at which height the maximum discharge was estimated to be about 443,000 cusecs. The flood volume at Singleton has been estimated at about 1.3 million acre feet or nearly 1.8 times the mean annual discharge for Singleton.

The runoff from the Goulburn River catchment was particularly high during this flood and provided a major contribution to inundation along the Hunter River below its confluence with the Goulburn River. At Kerrabee a maximum gauge height of 52 feet 3 inches was recorded, and the maximum discharge was estimated to be 153,000 cusecs. The flood volume was estimated to be about 360,000 acre feet for the 3 day period from midnight on 23rd February 1955.

The storm which produced this record flood was unusual. A large mass of warm humid air which originated over the East Indies, moved across Australia via Darwin and southern Queensland where it was joined by another stream of humid tropical air from the Pacific. These masses of warm humid air were lifted by cool southerly air from an anticyclone moving east off the

south coast of Australia and as a result heavy storm rains occurred over a large area of New South Wales. Recorded rainfalls in the Upper Hunter Valley ranged from 17 inches generally along the northern part of the Goulburn catchment to 9 inches over the headwaters of the Hunter River and 9 to 12 inches over the Wollombi catchment.

Details of the four highest floods at selected gauging stations within the valley are shown in Table 13.

TABLE 13

Location	Date of Flood Peak Flow	Maximum Flood Height (Ft.In.)	Maximum Estimated Discharge (Cusecs)	Total Flood Volume (Acre Feet)	Duration of Flood (Days)
Hunter River at Muswellbrook	24.2.1955	33- 5	140,000	460,000	8
	15.5.1913	30- 7	65,000	204,000	5
	15.1.1910	29- 6½	57,800	n.a.	n.a.
	1.7.1913	29- 5	57,000	n.a.	n.a.
Goulburn River at Coggan	24.2.1955	45- 5	140,000	290,000	3
	6.2.1950	24- 6	61,600	89,900	5
	2.7.1920	23- 0	56,100	172,000	7
	9.3.1956	22- 0	55,000	62,800	3
Wollombi Brook at Warkworth	25.2.1955	33- 3	161,000	n.a.	8
	18.6.1949	40- 7½	154,000	425,000	5
	18.6.1930	36- 6	92,300	336,000	4
	15.5.1913	36- 0	90,000	237,000	4
Hunter River at Singleton	25.2.1955	47-9½	443,000	1,290,000	6
	16.5.1913	46- 6	180,000	701,000	4
	18.6.1930	45- 6	152,000	698,000	7
	18.6.1949	45- 1½	143,000	534,000	5

* n.a. - Records not available

Reference to Table 13 shows that the highest flood flow at all of the four selected stations occurred during the February 1955 flood. At Muswellbrook, Coggan and Singleton the maximum discharge during this flood was more than double the next highest flow recorded over the entire period of available records.

The most recent flood in the valley occurred in January 1968 when peak gauge heights of 23 feet 6 inches, 20 feet 6 inches and 11 feet 4 inches were recorded at Singleton, Muswellbrook and Coggan respectively. A peak discharge of approximately 45,000 cusecs corresponding to a gauge height of 29 feet 1 inch was recorded at Maitland, this being the highest gauge height since 1964. The resulting increase in Glenbawn Dam storage was approximately 45,000 acre feet.

11. DROUGHT PERIODS

As yet no specific definition of the term "drought" has been generally accepted although there is no doubt that a drought is considered to be an extended period of below normal rainfall at a certain location. However the criteria adopted in determining if a region is experiencing a drought vary with geographical location, normal rainfall and crop requirements. For example a period of twelve months with low rainfalls may be classed as a drought on a coastal catchment whereas such conditions may be normal on an inland catchment.

Normally a region is assessed as being under drought conditions when the soil moisture content is less than the requirements for the majority of crops during the growing season or water shortages for domestic, industrial or municipal purposes are experienced. The main indication of a drought is a much reduced rate of streamflow resulting from below average precipitation.

Diagrams showing the annual rainfalls recorded at Muswellbrook, Merriwa and Singleton are appended as Figures 28, 29 and 30 respectively. These stations may be regarded as being typical of the headwaters of the Hunter River, the headwaters of the Goulburn River, and the plains of the middle reaches of the valley respectively. These rainfall records indicate that the valley generally experienced very low rainfall during the following periods: 1874 to 1885, 1935 to 1941 and 1964 to 1967. As indicated at Figures 28 to 30 other shorter sequences of low rainfall have occurred but these periods have been relieved to some extent by the occurrence of reasonable rainfalls in either the preceding or following years.

Since the commencement of regular recording of streamflows of the Hunter River at Singleton the lowest flow over any twelve month period occurred from November 1939 to October 1940 inclusive, when the total flow was only 23,400 acre feet. This is equivalent to a discharge of approximately 32 cusecs which is about 3 percent of the mean annual flow. A comparison of the four lowest twelve monthly flows at Singleton is shown in Table 14.

TABLE 14

Period	Twelve Monthly Streamflow at Singleton		
	Total Volume in Acre Feet	Average Flow	
		Cusecs	Gallons per Minute
November 1939 to October 1940	23,400	32	12,000
March 1941 to February 1942	38,500	53	19,700
March 1966 to February 1967	48,100	66	24,600
July 1946 to June 1947	64,200	88	32,900

Available records indicate that all major streams in the Upper Hunter catchment have ceased to flow on a number of occasions. Over the period of available records the Hunter River at Singleton has ceased flowing for a total of 597 days, and the longest continuous period of zero flow was 138 days, which occurred from 24th May 1940 to the 8th October, 1940.

At Muswellbrook several periods of no flow have been experienced since 1907, the most prolonged being from November 1941 to March 1942. The lowest twelve monthly flow at this station occurred from November 1939 to October 1940 inclusive when only 15,800 acre feet, or an average of 22 cusecs was recorded.

At the Coggan gauging station which was established in 1912, a total of 680 days of zero flow has been recorded. Whilst the longest period of 144 consecutive days of zero flow was experienced in 1942, the lowest twelve monthly flow of 1,340 acre feet occurred from March 1925 to February 1926 inclusive. This is equivalent to an average flow of about 2 cusecs or 680 gallons per minute.

In Table 15, the minimum discharges for 30 consecutive days and also 6 and 12 consecutive months are given for six selected stream gauging stations.

TABLE 15

Location	Minimum Discharges (Acre Feet)		
	30 Days	Six Months	Twelve Months
Hunter River at Moonan Dam Site	1	3,020	11,900
Hunter River at Muswellbrook	0	3,470	15,800
Hunter River at Singleton	0	718	23,400
Goulburn River at Coggan	0	104	1,340
Glennies Creek at Middle Falbrook	0	65	1,820
Wollombi Brook at Hanging Rock	0	45	540

12. THE 1964 - 1965 DROUGHT

From July 1964 to December 1967 the Upper Hunter Valley, in common with many areas of the State, experienced extremely low rainfalls. The minimum twelve monthly rainfall for Singleton of 11.62 inches for the period ending June 1965 is the lowest ever recorded, the next lowest of 12.17 inches and 12.77 inches having been recorded in the twelve monthly periods ending August 1919 and March 1940 respectively.

The recorded monthly rainfalls for the stations at Scone, Singleton, Cassilis, Cessnock and Merriwa over the period from July 1964 to December 1968 inclusive are shown in Table 16.

TABLE 16

Month	Rainfall in Points				
	Scone	Singleton	Cassilis	Cessnock	Merriwa
July 1964	110	41	116	35	90
August 1964	79	82	62	175	81
September 1964	202	166	238	162	191
October 1964	266	314	304	298	292
November 1964	8	44	73	59	46
December 1964	75	123	106	224	92
January 1965	56	72	22	65	184
February 1965	5	51	76	76	81
March 1965	27	4	11	16	8
April 1965	99	133	115	214	103
May 1965	70	41	28	47	53
June 1965	36	91	53	154	52
July 1965	200	396	120	424	145
August 1965	102	58	129	58	71
September 1965	120	66	152	120	113
October 1965	254	366	341	371	442
November 1965	38	44	52	62	62
December 1965	451	333	600	490	479
January 1966	52	67	8	138	41
February 1966	87	212	156	221	169
March 1966	207	182	331	184	401
April 1966	69	54	21	106	17
May 1966	66	127	43	118	36
June 1966	157	154	97	120	99
July 1966	42	9	74	34	56
August 1966	201	184	246	206	218
September 1966	112	82	191	70	132
October 1966	483	235	471	193	256
November 1966	462	373	312	262	382
December 1966	198	209	138	311	339
January 1967	143	150	69	276	91
February 1967	180	229	120	275	165
March 1967	347	448	371	411	333
April 1967	133	112	94	112	82
May 1967	124	123	113	110	115
June 1967	273	430	302	661	262
July 1967	52	78	32	98	29
August 1967	231	455	151	496	187
September 1967	188	245	114	290	109
October 1967	481	234	164	337	344
November 1967	61	75	28	59	63
December 1967	72	105	77	68	61
January 1968	1052	1050	860	902	841
February 1968	116	169	74	130	53
March 1968	170	269	260	436	233
April 1968	24	30	16	38	72
May 1968	654	437	375	346	377
June 1968	49	34	55	79	51
July 1968	72	68	64	67	125
August 1968	364	233	313	333	169
September 1968	100	85	159	26	140
October 1968	51	41	51	12	32
November 1968	102	77	68	58	63
December 1968	404	423	293	368	61
Annual Rainfalls 1965	1458	1655	1699	2097	1793
Annual Rainfalls 1966	2136	1888	2088	1963	2146
Annual Rainfalls 1967	2285	2684	1635	3193	1841
Annual Rainfalls 1968	3158	2916	2588	2795	2217
Minimum Twelve Monthly Rainfall during 1964-1968	1033 July 1964 -June 1965	1162 July 1964 -June 1965	1189 Oct.1964 -Sept.1965	1525 July 1964 -June 1965	1240 Sept.1964 -Aug.1965
Average Annual Rainfall over Period of Records	2460	2757	2340	2897	2290

As can be seen from Table 16 the total rainfall for 1965 was well below the recorded annual average.

During this period streamflows rapidly decreased and many streams ceased to flow for extended periods. Extremely dry conditions continued through 1966 and into 1967 and the Hunter River at Singleton ceased flowing for twenty-four consecutive days from the 29th July 1966 to the 21st August 1966. The Goulburn River at Coggan was one of the few streams in the valley which did not cease to flow during this drought. However extended periods of very low flow were experienced at this station and from 12th March 1965 to the 12th April, 1965, thirty two consecutive days of flows not exceeding 1.5 cusecs were recorded.

The longest period of no flow recorded at any station in the valley was for Bowmans Creek at Ravensworth when from the 22nd December 1965 to the 7th March 1967, 440 consecutive days of no flow were recorded.

The minimum twelve monthly flow of the Hunter River at Singleton, during the 1964–67 drought, occurred in the period March 1966 to February 1967 and was about 48,000 acre feet, which represents only about 7% of the long term annual flow at Singleton.

Details of the minimum twelve monthly flows at Moonan Dam Site, Muswellbrook, Coggan, Middle Falbrook, Hanging Rock and Singleton during the 1964–67 drought are given in Table 17.

TABLE 17

Stream	Station	Minimum Twelve Monthly Flow During 1964–67 Drought				
		Acre Feet	Period	Average Discharge		Percentage of Annual Average Flow
				Cusecs	Gals./Min.	
Hunter River	Moonan Dam Site	11,900	Sept.1965 -Aug.1966	16	6,000	11%
Hunter River	Muswellbrook	58,680	Mar.1966- Feb.1967	80	29,900	19%
Goulburn River	Coggan	5,333	Dec. 1964 -Nov.1965	7	2,600	7%
Glennies Creek	Middle Falbrook	1,820	Nov. 1965 -Oct.1966	2.5	1,000	3%
Wollombi Brook	Hanging Rock	540	Jan.1966 -Dec.1966	0.7	260	1.5%
Hunter River	Singleton	48,060	Mar. 1966 -Feb.1967	66	24,700	7%

Reference to Table 15 on Page 38 indicates that the minimum twelve monthly flows recorded during the 1964–1967 drought at the gauging stations at Moonan Dam Site, Middle Falbrook and Hanging Rock were the minimum flows which have been registered since the commencement of reliable records at these stations.

Details of the minimum 30 day, three monthly, and six monthly flows during the 1964 - 1967 drought are given in Table 18.

TABLE 18

Stream	Station	Minimum Total Flow During 1964-1967 Drought (Acre Feet)		
		30 Days	Three Months	Six Months
Hunter River	Moonan Dam Site	76	890	3,019
Hunter River	Muswellbrook	1,752	6,390	26,370
Goulburn River	Coggan	90	457	1,343
Glennies Creek	Middle Falbrook	0	0	72
Wollombi Brook	Hanging Rock	0	11	74
Hunter River	Singleton	43	2,980	8,702

As indicated in Tables 17 and 18 the flow at Muswellbrook during the 1964-1967 drought was substantially greater than flows at other locations and this was primarily due to release of water from Glenbawn Dam. These releases enabled holdings fronting the Hunter River to obtain water supplies which would not have been available if Glenbawn Dam had not been constructed.

At the commencement of the drought, in July 1964, the volume of water stored in Glenbawn Dam was about 185,000 acre feet and this water including inflows to the dam, was gradually released, at rates varying from about 50 cusecs up to more than 300 cusecs, during the drought period up to September 1966.

There is no doubt that these releases from Glenbawn Dam alleviated the drought difficulties of landholders adjacent to the Hunter River to an appreciable extent whereas areas located at some distance from the River were experiencing a major drought.

Despite the fact that reasonably high rainfalls occurred during October and November 1966, streamflows were persistently low and in the December 1966-January 1967 period the Hunter River at Singleton ceased flowing for a total of nine days even though an average flow of over 100 cusecs was being released from Glenbawn Dam.

It was not until March 1967 that the prolonged period of low flow in the Upper Hunter Valley ended with the occurrence of a minor flood. Peak discharges of 7,106 cusecs (2,657,000 gals./min.), 4,440 cusecs (1,660,000 gals./min.) and

9,650 cusecs (3,608,000 gals./min.) were recorded at Muswellbrook, Coggan and Singleton respectively during this flood. Furthermore in August, September and October 1967 comparatively heavy rainfalls were experienced in the Upper Hunter Valley; the three monthly falls at Scone, Singleton, Cessnock and Merriwa being over 9 inches, 9 inches, 11 inches and 6 inches respectively. These rainfalls resulted in medium rises in the majority of streams in the Upper Hunter Valley during the latter part of 1967.

Heavy rainfalls in January 1968 resulted in medium floods in most parts of the valley. Peak heights of 23 feet 6 inches, 20 feet 6 inches and 11 feet 4 inches were recorded at Singleton, Muswellbrook and Coggan. At Maitland, the gauge height of 29 feet 1 inch which was recorded in this flood was the highest gauge height registered at the station since the commencement of the drought in 1964.

Further good rainfalls occurred in May, August and December 1968 and maintained streamflows throughout the valley at reasonable levels during 1968.

13. WATER REQUIREMENTS FOR CURRENT DEVELOPMENT

In the Upper Hunter Valley, the area authorised for irrigation has increased from 6,240 acres in 1944 to 40,150 acres at 30th June 1969. This represents about a sixfold increase in a period of 26 years. At the present time, the irrigated areas are mostly devoted to pastures and lucerne which provide feed for fattening stock, woolgrowing and dairying. During dry periods, these irrigated lands are of increased importance in maintaining livestock condition and numbers. Smaller but nevertheless important areas are irrigated for fruit and vegetable growing.

The authorised area per license has increased by about 100 percent during the last 26 years, ranging from about 18 acres per license in 1944 to about 37 acres per license in 1969. The graph at Figure 31 indicates the relationship between area authorised for irrigation and the number of licenses issued and shows the rapid increase in both the number of licenses and the area authorised for irrigation during the years from 1965 to 1968; an increase probably influenced by the occurrence of the 1964 to 1967 drought.

There was a total of 32 licenses for water supply purposes including stock, industrial and town water supply at 30th June 1969 and the total capacity of pumps installed amounted to 15,312 gallons per minute, excluding cooling water requirements for the Liddell Power Station which are drawn from surplus flows in the Hunter River.

The principal users of water for this purpose are the town of Muswellbrook with a capacity of 5,300 gallons per minute, and various mining and industrial users with a total pumping capacity of 8,787 gallons per minute covered by 22 licenses. In addition stock water supplies were covered by 7 licenses with an installed pumping capacity of 425 gallons per minute.

The Electricity Commission of New South Wales has constructed an earth dam on Gardiners Creek with a total capacity of about 122,000 acre feet for cooling water purposes for the Liddell Power Station. A conditional license to pump from the Hunter River to this storage at a maximum rate of about 200 cusecs during periods of excess flows in the Hunter River, has been granted to the Electricity Commission. The conditions of the license are broadly that the pumps shall not be operated when flows of the Hunter River at Liddell and Singleton are less than 60 cusecs and 85 cusecs respectively from October to April and 40 cusecs and 50 cusecs respectively from May to September.

The estimated maximum requirements in the Upper Hunter Valley under present conditions, for irrigation under license, water supply and riparian usage (not including transmission losses or Liddell Power Station requirements) are given in Table 19.

TABLE 19

Requirement	Estimated Maximum Demand	
	Cusecs	Gallons per Minute
Irrigation under license (40,160 acres at 2 feet per 8 month season)	166	62,000
Town, Stock and domestic, and industrial water supplies	40	15,000
Riparian Usage	80	30,000
Totals	286	107,000

As indicated in Table 19, there is a considerable demand for irrigation in the Upper Hunter Valley, the irrigation demand representing about 58 percent of the estimated maximum total demand exclusive of transmission losses.

The areas authorised for irrigation at the 30th June 1969 on the various major streams and their tributaries in the Upper Hunter Valley and the estimated total demands for each tributary and selected sections of the Upper Hunter River (including town and industrial water supplies and riparian usage but excluding transmission losses and Liddell Power Station requirements) are shown in Table 20.

TABLE 20

Stream	Area Authorised for Irrigation at 30.6.1969 (Acres)	Estimated Total Maximum Requirements	
		Cusecs	Gallons per Minute
Hunter Valley above Glenbawn Dam	1,261	13	5,000
Rouchel Brook and Tributaries	465	4	1,500
Pages River and Tributaries	649	9	3,500
Dart Brook and Tributaries	768	7	2,500
Hunter River between Glenbawn and Goulburn River Junction	9,984	69	25,500
Goulburn River and Tributaries above Kerrabee	3,611	41	15,500
Goulburn River and Tributaries below Kerrabee	2,006	24	9,000
Fal Brook and Tributaries	1,537	9	3,500
Wollombi Brook and Tributaries	1,678	12	5,000
Glendon Brook and Tributaries	926	77	2,500
Hunter River between Goulburn River Junction and Maitland	14,869	68	25,000
Minor Tributaries of the Hunter River between Glenbawn and Maitland	2,406	23	8,500
Totals	40,160	286	107,000

It should be noted that the foregoing requirements given in Tables 19 and 20 do not include any allowance for transmission losses due to evaporation from the stream surface and seepage into the bed and banks of the channels. Such losses may be of substantial magnitudes during drought periods, and are directly related to groundwater conditions and flow levels within the streams and consequently may widely depend on antecedent meteorological conditions.

14. POSSIBLE IRRIGATION DEVELOPMENT

Lands topographically suitable for irrigation in the Upper Hunter Valley occur mainly in high level terraces composed of fertile permeable soils with good under-drainage. The provision of regulated flows in the streams will permit the intensification of existing development as well as enable additional areas to be brought under irrigation. While the most extensive areas of irrigable land are those bordering the Hunter River substantial areas also exist along the tributaries.

An assessment of irrigable areas from ground surveys and aerial photography indicates that a total area of about 150,000 acres of riparian lands could be economically irrigated. This is approximately four times the area at present authorised for irrigation in the valley. Of this area 60,000 acres are on the Hunter River and 90,000 acres on tributaries. The distribution of these areas is shown in Table 21.

Location	Approximate Area Suitable for Irrigation (Acres)
Hunter River and Tributaries above Glenbawn Dam	3,000
Pages River	6,000
Hunter River and Tributaries between Glenbawn Dam and Goulburn River	30,000
Goulburn River above Kerrabee	28,000
Goulburn River below Kerrabee	25,000
Fal Brook	3,000
Wollombi Brook	17,000
Glendon Brook	2,000
Hunter River and Tributaries between Goulburn River and Maitland	36,000
Total Area	150,000

Prior to completion of Glenbawn Dam a number of schemes were investigated to determine the most economic use to which the additional water provided by the dam could be put. The proposed Abermusden Irrigation District took its name from the three towns of Aberdeen, Muswellbrook and Denman which all lie within an area of fertile river flats extending downstream from near Scone to the junction of the Hunter and Goulburn Rivers. The area finally examined comprised a total of 109,000 acres in 250 holdings of which 28,000 acres were considered suitable for irrigation. These lands extended from the sites of Glenbawn and Brushy Dams past the towns of Aberdeen and Muswellbrook to the town of Denman and lie on either side of the river.

Alternative means of supply by pressure pipeline, gravitating channels and pumping from the river to farm boundaries were considered but all proved too costly for the schemes to be attractive.

Other smaller schemes considered included the Dart Brook-Kingdon Ponds area which provided for the sub-division into 54 farms of 2,400 acres of land contained in large holdings south of Scone, and the Mount Segenhoe area comprising the sub-division into 25 farms of about 4,000 acres of high land between Scone and Aberdeen east of the Great Northern Railway line. In both cases water would be supplied either by pipeline direct from Glenbawn Dam or by pumping from the Hunter River at Aberdeen. Both these schemes were discarded on account of the high capital cost involved.

A further scheme for providing an irrigation supply by pipeline to 11 holdings comprising an area of 766 acres immediately downstream of

Glenbawn Dam was also investigated. Although costs of this proposal were lower than for the more remote schemes owing to the shorter lengths of pipeline involved they were still too high for the scheme to be attractive to the majority of the landholders.

The Committee of Investigation appointed by the Government to enquire into the proposals concluded that water could be pumped by individual irrigators from wells or from the river and distributed under pressure for spray irrigation at much lower cost than would be possible under any proposals of the Abermusden and related schemes for supplying water direct from Glenbawn Dam or by pumping from the river.

In many areas within the Upper Hunter Valley, the topography is suitable for the construction of farm dams. In addition, due to the temporal rainfall pattern, farm dams could provide an economic source of water for supplemental irrigation in these areas.

Some development of farm dams has occurred in the valley for irrigation purposes and it is expected that a number of additional storages will be constructed to provide significant supplies of water for irrigation in the future.

15. INVESTIGATIONS OF DAM SITES

The Hunter Valley is recognised as an important centre of primary production in the State of New South Wales. A very high potential for development is possible from the extensive irrigable lands within the valley.

In order to further develop this potential the Commission recently completed investigations of a storage dam on the Paterson River at Lostock in the Lower Hunter adjacent to the eastern boundary of the Upper Hunter Catchment. This dam, which is currently under construction by contract, will have a capacity of 16,000 acre feet and will provide dependable irrigation supplies to an area of 11,600 acres within the Paterson River Valley.

Irrigation in the Upper Hunter Valley has reached the stage where further substantial development can only take place when more dependable supplies are made available in the streams by the provision of regulating storages.

Investigations have been made into the feasibility of constructing dams on all major tributaries of the Hunter River upstream of Maitland. Several of the proposals are for dual purpose storages, combining the functions of irrigation and flood mitigation.

There are many topographically suitable dam sites on tributaries of the Upper Hunter where foundation conditions provided by the prevailing rock types throughout the valley generally favour the construction of earth and rockfill dams rather than concrete dams. The locations of sites which have been considered for storages are shown at Figure 31.

A list of the storage proposals showing details of the catchment area contributing to each site, tentative storage volumes and their purpose is given in Table 22.

TABLE 22

River	Dam Site	Catchment Area Square Miles	Tentative Storage Acre Feet	Purpose of Storage
Pages River	Brushy	420	95,000	Irrigation and Flood Mitigation
Goulburn River	Kerrabee	1,850	620,000	Irrigation and Flood Mitigation
Rouchel Brook	Upper	42	5,000	Irrigation
	Lower	149	36,000	Irrigation and Flood Mitigation
Foy Brook	Foy Brook	75	33,000	Irrigation and Flood Mitigation
Fal Brook (Glennies Creek)	Fal	88	50,000	Irrigation
Carrow Brook	Carrow Brook	21	5,000	Irrigation
Wollombi Brook	Warkworth	670	400,000	Irrigation and Flood Mitigation
Wollombi Brook	Wollombi	375	70,000	Irrigation
Congewai Creek	Congewai	14	8,000	Irrigation
Glendon Brook	Glendon Brook	180	90,000	Flood Mitigation

The actual stage of investigations reached at each of the sites is summarised in Table 23.

TABLE 23

River and Dam Site	Stage of Investigations
Pages River Brushy Dam Site	Storage capacity, dam site and road deviation surveys completed. Shafts and bores sunk through overburden- no core drilling. Preliminary investigation of inter-connecting tunnel to Glenbawn Storage.
Goulburn River Kerrabee Dam Site	Preliminary investigations sufficient for preparation of comparative cost estimates only. Surveys carried out for storage capacity, dam site grid and road deviations. Reconnaissance sampling of earth materials and laboratory testing. Foundation drilling commenced, but not completed.
Rouchel Brook Upper and Lower Sites	Tentative dam sites selected, gauging station established at lower site. Cross sections surveyed at Upper Site.
Foy Brook Foy Brook Dam Site	Tentative Dam site selected. Gauging station established
Fal Brook (Glennies Creek) Fal Dam Site	At Fal Dam Site foundation drilling has been completed while geological and agricultural investigations are well advanced. Materials investigations are in progress. Surveys and hydrological investigations have been made but extensions to these are required.
Carrow Brook Dam Site	At Carrow Brook Dam Site surveys and geological investigations have been completed.
Wollombi Brook Warkworth Dam Site	All investigations comprising dam site and capacity surveys, geological surveys, foundation exploration by drill holes and shafts, sampling and testing of foundation materials, borrow areas and quarry sites have been completed.
Wollombi Dam Site	Selection of dam site and assessment of potential from contour plans only. Gauging station established.
Congewai Creek Congewai Dam Site	Possible dam sites selected and cross sections surveyed. Preliminary hydrographic investigations to determine the potential of the site carried out.
Glendon Brook Glendon Brook Dam Site	Dam site surveyed and reconnaissance made of cultivated lands upstream of the dam site. Gauging station established.

In addition to the dam sites shown in the tables very preliminary investigations have been carried out of sites on the Hunter River upstream of Glenbawn Dam and on Martindale, Wybong, Bylong and Wattagan Creeks and their tributaries where requests have been made for storages at various times. No field investigations have been carried out and assessments of the potential of possible storages at these sites were made with the assistance of aerial photographs and available contour maps.

The site first selected for construction of a storage on the Upper Hunter River was at Moonan Flat, upstream of Glenbawn, but subsequent investigations proved Glenbawn to be a preferable site and the dam was accordingly built at the latter location.

A dual purpose storage, principally for water conservation but including a small flood mitigation content, has been proposed for the Pages River at the Brushy Dam Site.

The purposes of this proposed storage are to satisfy irrigation requirements along the Pages River as well as contribute to the regulated flow in the Hunter River below the confluence of the streams. An alternative proposal to construct a small diversion dam further upstream on the Pages River with an interconnecting tunnel 2½ miles long to the existing Glenbawn Storage has also received preliminary consideration.

The proposed Rouchel Brook and Foy Brook storages are planned to supply irrigation requirements downstream of the dam sites, and if sufficient capacity is available, to provide flood retention storage as well. Two sites are under consideration on Rouchel Brook - an upstream site which would command the maximum amount of irrigable land but would have limited flood storage, and a downstream site mainly for flood mitigation purposes.

The Congewai Creek storage would provide a small regulated flow for irrigation and possible industrial purposes downstream.

Kerrabee Dam on the Goulburn River is intended as a major conservation storage incorporating some flood mitigation facility. Further investigations on the upper Goulburn River are required however, before the site is finally selected for dam construction on this stream.

On Wollombi Brook, an irrigation storage was first proposed at the Wollombi site for the purpose of supplying irrigation requirements along the stream for a distance of 38 miles to its junction with the Hunter River. Subsequently, following severe flooding in the Hunter Valley the Warkworth site, being more favourably located for a flood mitigation storage, was chosen for initial investigation. The investigation of this site has been completed.

Fal and Carrow Brook Dam sites are being investigated for storages on Fal Brook (also known as Glennies Creek). Investigation has shown that the Carrow Brook Dam Site compares unfavourably with the Fal Dam Site and therefore all investigations are now being directed towards completion of feasibility studies for the latter proposal. Field investigations are well advanced and office studies are continuing with a view to completing the work at an early date.

The Commission's short-term programme of water conservation work in the Upper Hunter Valley tentatively provides for the construction of a storage on Fal Brook (Glennies Creek) within the next few years while its long-term programme envisages the construction of storages on the Pages and Goulburn Rivers and on Rouchel, Foy and Wollombi Brooks and of small conservation storages and weirs on other tributaries of the Hunter River which are considered necessary and found to be justified by cost-benefit studies.

16. ACKNOWLEDGEMENTS

The Water Conservation and Irrigation Commission wishes to acknowledge the assistance given in the preparation of this report by the Director, Commonwealth Bureau of Meteorology, in providing the section on Climatic Features, the Rainfall Statistical Data and the Median Rainfalls Maps; and by the New South Wales Public Works Department and the Forestry Commission for providing the information on water supply schemes and timber resources respectively.

ANNUAL RAINFALL
(Points)

Year	Plashett	Scone	Singleton	Wingen	Wollar	Muswellbrook	Year
1871						1482	1871
1872						2356	1872
1873						2956	1873
1874						2259	1874
1875		2278				1896	1875
1876		*				1934	1876
1877		1416		1569		1331	1877
1878		2530		3040		1899	1878
1879		3214		3640		2337	1879
1880		1660		1926		1465	1880
1881		2195		2539		1978	1881
1882		1399	1698	2371		1421	1882
1883		2384	*	2707		2404	1883
1884		*	1966	2286		1834	1884
1885		1985	2396	2363		1870	1885
1886		2500	2922	3116		2638	1886
1887		3540	4975	4989		3790	1887
1888		1009	1591	1232		1068	1888
1889		3059	3761	3068		3400	1889
1890		3128	4408	4398		3914	1890
1891		2774	2837	3839		2776	1891
1892		3246	4454	3661		3286	1892
1893		3383	4983	3572		3695	1893
1894		2400	2781	2466		2559	1894
1895		2485	2845	2809		2382	1895
1896		2356	3023	2246		2540	1896
1897		2025	2489	2327		2183	1897
1898		2270	3414	2802		2626	1898
1899		2198	2902	2805		2254	1899
1900		2264	3172	2738		2355	1900
1901		1621	2191	1925		1975	1901
1902		1729	2053	2147	1907	1847	1902
1903	2873	2648	3691	2829	2590	2704	1903
1904	2707	2385	3329	2691	2716	3089	1904
1905	1307	1629	1755	1746	1866	1313	1905
1906	1929	1823	2282	1881	2062	1935	1906
1907	1465	2024	2130	2704	2051	2020	1907
1908	3078	2463	3036	3320	2109	2395	1908
1909	3041	2884	2933	2821	3197	2687	1909
1910	2319	2419	2466	2834	2183	2403	1910
1911	2939	3004	3136	3397	2423	2779	1911
1912	2618	2157	2597	2266	1576	2388	1912
1913	2844	3083	3166	3573	2190	2787	1913
1914	2474	3102	3028	2711	2398	2945	1914
1915	1349	1731	1926	2190	1757	1884	1915
1916	2820	3427	2644	3767	3441	2844	1916
1917	2240	2788	2513	3127	2380	2305	1917
1918	1150	1270	1596	1648	1637	1712	1918
1919	1080	1563	1652	1681	629	1534	1919
1920	2689	3195	2748	3380	2691	2647	1920
1921	2901	3856	4330	3648	2358	3903	1921
1922	1355	1887	2141	1911	507	1971	1922
1923	1210	1835	2506	1699	*	1753	1923
1924	2555	2885	3243	3010	*	3108	1924
1925	1741	1584	2365	1411	1425	1819	1925
1926	2450	3046	3396	3257	2985	3390	1926
1927	1927	2326	2648	2363	1748	2397	1927
1928	1718	2928	2562	3263	2096	2584	1928
1929	1862	2484	2886	2499	1670	2418	1929
1930	2541	2366	3172	2228	2402	2592	1930

* Incomplete Records.

ANNUAL RAINFALL
(Points)

Year	Plashett	Scone	Singleton	Wingen	Wollar	Muswellbrook	Year
1931	2452	2878	3235	2790	2547	3329	1931
1932	1971	2587	2199	2595	2117	2408	1932
1933	2001	2611	2339	3044	2405	2395	1933
1934	2699	2693	3178	2959	3062	2543	1934
1935	1664	1721	1704	1614	1866	1485	1935
1936	1693	1918	2290	2487	2098	1971	1936
1937	2299	2112	3013	2175	*	2046	1937
1938	1358	1654	1840	2006	1909	1570	1938
1939	1041	1820	2010	2146	1440	1630	1939
1940	1597	1566	1837	1612	1172	1518	1940
1941	1598	1845	1771	2347	1868	1534	1941
1942	2054	2671	2919	3213	2401	2587	1942
1943	2422	2340	2771	2851	1953	2540	1943
1944	1205	1935	1498	2487	1489	1562	1944
1945	2273	3270	2680	3227	2555	2908	1945
1946	1363	1786	2286	1860	1174	1864	1946
1947	2192	2613	2454	3205	2979	2528	1947
1948	2429	2819	2652	2973	2433	2990	1948
1949	3316	3336	4016	4602	3430	3631	1949
1950	4533	4318	4806	5098	4745	4361	1950
1951	2267	2394	2756	2532	1716	2602	1951
1952	2596	2746	2961	2974	2057	2877	1952
1953	1914	2606	2447	2502	1774	2290	1953
1954	2896	3100	3275	3184	2937	2953	1954
1955	3780	3981	3611	4297	3646	3678	1955
1956	3263	3159	3017	3283	3125	3034	1956
1957	1141	1381	1383	1693	1435	1317	1957
1958	2640	2552	2294	3285	3013	2022	1958
1959	2980	2783	3390	3598	2147	2365	1959
1960	2365	2648	2309	2511	2349	2582	1960
1961	2679	2828	2671	2859	2474	2951	1961
1962	3000	3303	3316	3502	2415	2978	1962
1963	3389	3784	3720	3961	*	3291	1963
1964	2465	2337	2690	2595	2170	2471	1964
1965	1623	1458	1655	1450	1684	1795	1965
1966	*	2136	1888	2357	2263	1938	1966
1967	1623	2285	2684	3029	1679	2509	1967
1968	*	3158	2916	3520	*	2839	1968

* Incomplete Records.

ANNUAL RAINFALL
(Points)

Year	Cassilis	Cessnock	Denman	Lochinvar	Kindarun	Merriwa	Year
1871	2365						1871
1872	2325						1872
1873	2809						1873
1874	2824						1874
1875	2504						1875
1876	2135						1876
1877	1109						1877
1878	2568						1878
1879	3090						1879
1880	2000						1880
1881	1935						1881
1882	1851					1796	1882
1883	1558		1950			1703	1883
1884	*		1250			1190	1884
1885	1877		1344			2120	1885
1886	2980		2400			3017	1886
1887	3771		4021			3141	1887
1888	1107		1120			647	1888
1889	3581		3124			2893	1889
1890	3413		3226			2805	1890
1891	3397		2355			2813	1891
1892	3354		2968			3457	1892
1893	3035		3082			2874	1893
1894	2589		2518			2601	1894
1895	2384		2289			2601	1895
1896	2283		2494	2342		1939	1896
1897	1965		1929	2341		2683	1897
1898	2749		2824	3972		2610	1898
1899	1926		1894	3551		1779	1899
1900	2106		2554	3269		2161	1900
1901	1647		1806	2008		1474	1901
1902	1818		1555	2232		1577	1902
1903	2325	2919	2791	3575		2571	1903
1904	2846	2853	3008	2950		3334	1904
1905	1512	1900	1092	2050		1363	1905
1906	2075	2015	1900	2308		2183	1906
1907	1723	1979	1504	*		1556	1907
1908	2351	*	2652	*		2376	1908
1909	2838	*	3018	*		2653	1909
1910	2406	*	2376	*		2221	1910
1911	2728	3642	2508	2971		2501	1911
1912	1637	3049	1913	3719		1960	1912
1913	2429	3555	2210	4009		2485	1913
1914	2461	3555	2274	3228	3183	2312	1914
1915	1184	2340	1410	1797	1572	1276	1915
1916	3186	3115	2474	2371	2770	3390	1916
1917	2549	2960	1688	2158	2925	2041	1917
1918	1436	1792	923	1471	1646	1487	1918
1919	1286	1922	1069	1969	1768	1228	1919
1920	2930	2600	2681	2585	2802	2645	1920
1921	2966	4293	2781	4335	3615	3083	1921
1922	1337	2619	1514	2700	2263	1302	1922
1923	1257	2207	1313	1843	1921	1651	1923
1924	2226	2746	2960	3207	2888	2738	1924
1925	1311	2182	1429	3022	2042	1399	1925
1926	3350	3600	2434	3373	3471	3176	1926
1927	2115	2789	1885	3222	2799	2127	1927
1928	2676	2280	2126	2652	2560	2676	1928
1929	2027	3793	2064	4067	2566	1764	1929
1930	2238	3098	2732	3323	3147	2582	1930

* Incomplete Records

ANNUAL RAINFALL
(Points)

Year	Cassilis	Cessnock	Denman	Lochinvar	Kindarun	Merriwa	Year
1931	2717	3490	2815	3883	3079	2656	1931
1932	2047	2497	2405	2199	2079	2239	1932
1933	2407	2427	2210	2320	2893	2570	1933
1934	2785	3450	2800	3199	3400	2874	1934
1935	1543	1555	1957	1757	1952	1886	1935
1936	2321	2484	1777	2173	2318	2058	1936
1937	1855	2651	1714	2786	2593	1422	1937
1938	1570	2315	1408	1936	2118	1478	1938
1939	1938	1875	1264	1947	1978	1514	1939
1940	1312	2113	1610	1839	1828	1528	1940
1941	2083	1798	1517	1620	2074	1854	1941
1942	2441	2776	2304	2555	2866	2337	1942
1943	2097	3062	1979	3668	2572	1760	1943
1944	1749	1390	1374	1481	1463	1764	1944
1945	2614	2958	2549	2615	2775	2914	1945
1946	1414	2140	1280	2240	2040	1496	1946
1947	2876	2912	2278	2953	3044	2570	1947
1948	2366	3241	2502	3096	3161	2882	1948
1949	2650	5450	3291	4574	4677	2907	1949
1950	5045	5471	4431	5847	5713	4546	1950
1951	1994	3534	1995	2855	2775	1881	1951
1952	2666	3226	2646	3337	3334	2475	1952
1953	2052	2568	2239	2000	2201	1879	1953
1954	2353	3631	3151	3469	3556	2846	1954
1955	4141	4114	3681	3460	3970	3690	1955
1956	3564	3900	2927	3510	3442	2964	1956
1957	1526	2190	1142	1630	1208	1455	1957
1958	2867	2976	2648	2642	2736	2844	1958
1959	2787	3789	2596	3706	4094	2399	1959
1960	2236	2708	2269	2470	2830	2385	1960
1961	2438	3257	2743	2968	4071	2908	1961
1962	2340	3599	2720	4189	3938	2356	1962
1963	3556	4287	3580	4259	4748	3679	1963
1964	2149	2810	2264	2531	3232	2253	1964
1965	1699	2097	1570	1964	2006	1793	1965
1966	2088	1963	1653	*	1904	2146	1966
1967	1635	3193	1988	3604	3357	1841	1967
1968	2588	2795	*	*	2907	2217	1968

* Incomplete Records

STATISTICAL RAINFALL DATA
(Points)

Station	Rainfall Statistic	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Cassilis (Period 78 years)	Minimum	8	0	4	0	0	7	0	0	2	24	6	0	1107
	10%	73	19	18	27	21	31	44	53	33	47	35	62	1406
	30%	164	73	70	92	51	86	80	101	86	107	97	124	1985
	50%	233	171	149	124	99	140	151	147	122	171	176	201	2345
	70%	305	326	283	217	187	224	209	207	189	215	275	278	2688
	90%	519	592	469	376	325	391	362	318	330	358	442	503	3358
	Maximum	753	1385	1095	608	783	640	683	529	748	629	978	926	5045
Lochinvar (Period 52 years)	Minimum	0	0	0	30	0	0	0	0	0	0	0	0	1471
	10%	69	25	49	40	0	4	8	0	23	6	7	44	1769
	30%	121	135	141	134	57	83	58	33	68	63	97	148	2236
	50%	236	207	218	210	116	149	131	93	139	157	145	229	2820
	70%	347	311	378	257	260	266	273	169	220	278	283	415	3324
	.90%	492	770	715	688	792	595	479	312	432	459	483	611	4050
	Maximum	1075	1430	936	1414	1226	1923	896	1128	782	896	707	991	5847
Merriwa (Period 81 years)	Minimum	0	0	0	0	0	0	0	0	0	0	0	0	647
	10%	60	23	22	20	19	29	24	41	36	29	26	57	1429
	30%	160	77	65	89	46	74	75	83	74	90	86	143	1831
	50%	225	158	135	122	89	128	122	125	108	160	161	221	2356
	70%	313	305	258	218	156	201	194	186	174	224	248	328	2664
	90%	530	647	435	352	290	368	385	310	299	331	395	507	3070
	Maximum	1082	1251	1018	588	741	617	692	545	757	596	744	855	4546

STATISTICAL RAINFALL DATA
(Points)

Station	Rainfall Statistic	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Muswellbrook (Period 78 years)	Minimum	1	0	11	2	0	0	0	1	12	6	0	4	1068
	10%	90	25	30	34	21	32	38	33	38	38	32	72	1559
	30%	183	80	69	90	58	85	79	95	84	92	93	145	2142
	50%	260	199	173	134	90	142	167	124	119	165	173	259	2540
	70%	336	335	308	213	182	251	228	186	180	248	269	333	2804
	90%	543	543	495	427	384	492	428	313	382	358	402	504	3423
	Maximum	949	1487	984	755	1033	1014	763	840	677	521	807	885	4361
Plashett (Period 62 years)	Minimum	7	0	0	0	0	0	0	0	0	0	0	0	1041
	10%	52	0	21	26	0	29	23	13	24	27	28	55	1239
	30%	141	77	85	80	31	70	58	56	61	83	82	145	1850
	50%	210	154	138	136	71	105	109	106	110	160	182	225	2342
	70%	303	290	261	207	143	189	201	176	174	249	288	340	2680
	90%	520	574	449	418	346	432	332	291	353	317	449	536	3067
	Maximum	832	1548	802	689	1126	973	684	764	632	684	796	877	4533
Scone (Period 69 years)	Minimum	20	0	0	1	3	4	10	2	9	12	4	0	1009
	10%	97	26	21	27	28	36	36	40	50	43	35	88	1629
	30%	180	84	81	87	70	86	88	94	83	113	115	147	2024
	50%	243	166	175	143	94	140	140	137	135	161	180	253	2419
	70%	342	322	282	207	168	242	209	181	186	221	274	349	2788
	90%	506	508	515	417	315	417	445	317	421	357	426	509	3270
	Maximum	851	681	900	650	787	767	666	606	634	479	600	861	4318

STATISTICAL RAINFALL DATA
(Points)

Station	Rainfall Statistic	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Singleton (Period 81 years)	Minimum	16	0	5	29	0	8	12	3	0	2	3	9	1383
	10%	52	19	63	47	20	44	26	25	33	34	38	65	1784
	30%	182	141	105	100	61	100	82	84	88	113	113	183	2355
	50%	273	186	215	185	116	150	189	124	140	173	210	273	2748
	70%	355	363	386	254	201	270	268	192	218	258	329	367	3076
	90%	571	678	579	519	493	475	470	292	417	388	467	627	3753
	Maximum	1090	1419	1314	962	970	1396	966	789	656	619	748	880	4983
Wingen (Period 88 years)	Minimum	3	0	0	0	0	0	0	0	0	13	2	10	1232
	10%	49	19	23	33	29	37	50	46	45	63	47	77	1698
	30%	163	117	110	110	75	98	99	109	96	154	115	154	2358
	50%	275	222	181	157	127	185	184	159	145	197	204	238	2764
	70%	365	428	320	240	200	263	232	213	223	295	307	381	3190
	90%	642	644	571	461	404	478	427	413	449	453	494	541	3678
	Maximum	980	1769	849	791	725	875	677	787	772	645	617	853	5098
Wollar (Period 59 years)	Minimum	0	0	0	0	0	0	0	0	0	0	0	0	507
	10%	45	11	16	6	0	22	17	40	0	18	0	10	1435
	30%	129	60	74	67	54	72	81	95	68	59	69	71	1868
	50%	237	183	117	147	102	134	139	158	96	167	163	166	2170
	70%	311	282	272	195	155	248	198	216	185	247	272	250	2433
	90%	471	685	438	316	316	418	394	306	295	340	460	485	3125
	Maximum	774	1542	884	646	452	1039	566	576	535	657	734	904	4745

MINIMUM RAINFALL RECORDED IN CONSECUTIVE PERIODS 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.
Cassilis	1	8	0	4	0	0	7	0	0	2	24	6	0
	2	8	49	10	16	40	56	50	49	56	46	7	74
	3	69	50	72	121	70	110	164	152	78	85	81	122
	4	103	85	153	130	159	257	202	218	215	292	251	183
	5	138	248	194	265	280	288	297	326	320	460	288	292
	6	305	257	289	428	341	319	463	482	472	547	351	308
	7	388	406	486	474	493	485	613	618	597	548	386	411
	8	484	589	565	584	644	643	722	722	625	583	484	422
	9	658	701	617	691	751	782	868	723	641	693	577	598
	10	709	807	724	798	890	916	869	758	746	702	733	772
	11	885	1034	831	937	994	938	904	1059	755	994	885	823
	12	1107	1067	970	1025	995	1009	1091	1068	1031	1168	1038	999
Lochinvar	1	0	0	0	30	0	0	0	0	0	0	0	0
	2	10	22	38	38	10	0	0	15	25	0	0	0
	3	95	207	38	80	40	0	52	50	90	60	68	10
	4	280	240	223	191	70	90	82	90	233	128	118	120
	5	342	412	334	307	275	90	90	308	352	295	228	373
	6	447	445	335	404	318	90	382	380	477	540	481	412
	7	455	701	605	672	569	400	400	630	701	698	520	447
	8	713	828	809	711	679	400	650	739	875	698	555	455
	9	909	1011	894	849	786	650	739	958	948	867	563	713
	10	1071	1198	1050	924	894	739	958	958	1061	875	821	909
	11	1296	1265	1125	1023	1015	958	958	1214	1172	1133	1017	1071
	12	1471	1348	1224	1166	1268	958	1218	1310	1311	1257	1179	1437

MINIMUM RAINFALL RECORDED IN CONSECUTIVE PERIODS 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.
Merriwa	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	49	42	0	7	28	10	8	30	12	21	96	86
	3	75	65	56	104	38	91	135	114	35	96	141	113
	4	90	98	124	134	114	180	181	192	233	184	253	177
	5	127	154	154	154	190	234	259	285	351	388	356	177
	6	179	184	174	419	295	278	468	469	429	491	411	184
	7	209	204	439	462	474	483	499	548	535	520	418	292
	8	229	469	482	504	557	551	634	671	581	527	526	348
	9	494	512	524	572	588	707	737	827	588	635	582	559
	10	537	554	592	603	781	810	834	834	696	691	750	721
	11	579	622	623	868	884	933	841	942	752	885	950	829
	12	647	653	888	1056	1027	940	949	989	929	1064	960	1030
Muswellbrook	1	1	0	0	2	0	0	0	1	12	6	0	4
	2	13	8	52	30	31	38	22	68	45	42	88	83
	3	141	144	96	85	62	82	87	100	90	193	197	178
	4	235	148	151	188	98	133	121	137	264	300	284	252
	5	239	209	251	278	149	211	158	305	326	378	296	394
	6	380	312	316	461	227	399	326	404	404	618	438	423
	7	483	523	499	571	449	539	472	482	671	713	467	480
	8	632	646	614	616	582	577	550	749	786	717	524	694
	9	815	740	659	714	620	655	817	864	910	880	842	824
	10	902	936	752	917	698	922	932	1012	995	993	922	911
	11	975	1067	1079	1029	965	1037	1104	1067	1098	1123	993	976
	12	1068	1211	1313	1247	1080	1209	1163	1176	1257	1210	1119	1127

MINIMUM RAINFALL RECORDED IN CONSECUTIVE PERIODS 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.
Plashett	1	7	0	0	0	0	0	0	0	0	0	0	0
	2	12	10	28	0	33	27	23	9	35	45	83	55
	3	188	67	50	118	53	76	63	56	91	142	137	90
	4	223	67	149	173	106	136	91	96	213	222	221	286
	5	268	260	299	206	136	141	114	224	318	333	372	353
	6	434	348	327	375	141	281	242	357	434	441	421	421
	7	459	430	455	433	310	409	375	517	529	472	421	539
	8	561	574	502	533	438	542	539	612	566	472	625	539
	9	685	660	581	662	571	618	634	711	697	712	625	607
	10	782	739	733	773	632	713	834	711	765	739	690	735
	11	861	847	855	773	727	913	860	865	782	767	818	782
	12	1041	969	1013	868	927	939	887	865	820	895	865	861
Scone	1	20	0	0	1	3	4	10	2	9	12	4	0
	2	54	32	21	14	15	59	17	67	95	35	48	117
	3	88	114	107	47	78	118	106	109	136	112	139	117
	4	187	149	115	114	138	172	124	210	199	338	144	163
	5	257	185	259	189	192	293	225	390	421	410	171	262
	6	293	339	272	371	368	426	405	529	575	437	270	332
	7	466	451	476	491	506	508	544	691	639	536	340	368
	8	578	596	574	513	572	712	823	718	738	606	376	568
	9	715	766	596	577	776	893	828	817	808	642	576	670
	10	874	814	660	781	951	1025	927	887	844	842	678	790
	11	945	814	864	1069	1083	1218	997	923	918	944	798	937
	12	1009	1040	1105	1225	1265	1244	1033	1123	1030	1064	1052	1082

MINIMUM RAINFALL RECORDED IN CONSECUTIVE PERIODS 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.
Singleton	1	16	0	4	29	0	8	9	3	0	2	3	9
	2	25	55	53	67	22	55	31	55	39	57	63	85
	3	122	180	114	113	104	90	80	80	98	135	160	132
	4	260	208	228	226	165	124	105	216	218	265	180	250
	5	301	261	300	309	199	149	264	343	321	438	294	383
	6	392	452	394	472	224	457	454	368	489	593	427	424
	7	624	577	520	511	486	657	553	597	676	707	468	515
	8	749	699	594	628	676	756	893	812	790	782	559	689
	9	871	882	791	896	775	1040	897	926	948	873	921	868
	10	1041	963	938	1088	1087	1115	1030	1030	1039	1114	1013	989
	11	1115	1109	1116	1202	1162	1354	1071	1121	1197	1134	1079	1114
	12	1383	1287	1278	1277	1365	1460	1162	1333	1217	1393	1346	1404
Wingen	1	3	0	0	0	0	0	0	0	0	13	2	10
	2	6	30	30	28	28	27	31	60	56	61	81	51
	3	127	55	35	104	53	140	131	163	104	151	220	155
	4	150	60	121	208	166	246	194	274	240	385	261	238
	5	155	266	228	250	304	371	379	506	413	489	276	373
	6	390	398	295	442	397	476	605	551	517	511	407	385
	7	519	498	471	551	476	687	648	655	683	642	419	481
	8	619	615	601	642	722	806	752	806	769	654	515	610
	9	736	845	695	781	935	910	918	907	882	750	644	710
	10	873	985	826	1044	1031	1076	1004	949	958	879	744	827
	11	1101	1152	1089	1159	1197	1162	1117	1045	1049	979	861	1047
	12	1232	1191	1327	1325	1291	1275	1193	1174	1229	1096	1125	1205

OMADALE BROOK AT ROMA.

LOCATION:	Latitude 31°52' Longitude 151°18'
PERIOD OF ESTABLISHMENT:	June 1940 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	28 years.
ZERO OF GAUGE:	R.L.40.73 Assumed Datum.
CATCHMENT AREA:	40 Square Miles.
CONTROL:	Gravel.
EQUIPMENT:	Pressure Recorder installed June 1940 Staff gauge, range 0 to 10 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 176
	(b) Maximum observation in cusecs : 447
	(c) Minimum observation in cusecs : 0.1
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	2,800 cusecs.
MEAN DAILY DISCHARGE FOR 28 YEARS:	42 cusecs.
MEAN ANNUAL DISCHARGE FOR 28 YEARS:	31,000 acre feet.

OMADALE BROOK AT ROMA

Year 1940

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	..	..	..	..
May	..	..	..	..
June	..	..	..	..
July	6.5	0	3	183
Aug.	18	0	4	230
Sept.	75	0.2	3	218
Oct.	32	1	5	285
Nov.	100	0.2	2	122
Dec.	634	0.5	5.6	345
Total	..	..	..	..

Year 1941

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	314	4.4	30	1,852
Feb.	19	10	19	1,070
Mar.	14	8	11	666
Apr.	19	8	10	604
May	46	8	9	580
June	286	11	42	2,532
July	32	8	15	935
Aug.	44	8	18	1,118
Sept.	10.5	5.8	7	440
Oct.	64	8	19	1,167
Nov.	8	2	4	235
Dec.	6	0	1	77
Total	..	..	..	11,276

Year 1942

Jan.	0.2	0	0.01	1
Feb.	37	0	3	160
Mar.	335	0.2	24	1,466
Apr.	17	3.5	6	365
May	10	2.5	4	277
June	17	3.5	8	485
July	800	7.5	70	4,323
Aug.	100	10	22	1,372
Sept.	17	5.4	9	544
Oct.	1000	4.5	110	6,806
Nov.	314	14	57	3,433
Dec.	17	6.5	7	463
Total	..	..	..	19,695

Year 1943

Jan.	314	9.5	31	1,904
Feb.	9.5	1.5	5	300
Mar.	1.3	0	1	69
Apr.	9.5	1.2	7	121
May	86	1.2	30	1,865
June	86	18	23	1,392
July	33	9.5	20	1,277
Aug.	64	33	49	3,008
Sept.	115	24	50	3,006
Oct.	52	18	29	1,796
Nov.	259	9.5	43	2,572
Dec.	42	18	22	1,359
Total	..	..	..	18,669

Year 1944

Jan.	115	14	51	3,184
Feb.	36	9.5	16	933
Mar.	14	2.5	7	451
Apr.	69	4.5	21	1,293
May	69	4.5	20	1,272
June	16	5.5	8	491
July	47	5.5	28	1,711
Aug.	500	15	69	4,278
Sept.	67	14	28	1,696
Oct.	14	4.5	9	557
Nov.	9.5	1.3	3	216
Dec.	4.5	0	1.4	88
Total	..	..	..	16,170

Year 1945

Jan.	3.5	0	1.3	80
Feb.	18	0	4.1	228
Mar.	2.5	0	1.7	104
Apr.	5.5	0	3.4	201
May	64	3.5	20	1,239
June	1000	6.5	106	6,346
July	183	115	143	8,852
Aug.	140	100	129	7,978
Sept.	135	52	86	5,154
Oct.	52	25	42	2,638
Nov.	86	6.5	22	1,340
Dec.	45	2	8.5	530
Total	..	..	..	34,690

Year 1946

Jan.	4.5	0	1.1	70
Feb.	2.5	0	0.7	40
Mar.	290	0	10	626
Apr.	1370	1.8	54	3,260
May	232	11	29	1,798
June	460	16	103	6,200
July	86	16	38	2,346
Aug.	16	8.3	11	690
Sept.	23	4.6	7	436
Oct.	6.2	2.3	3.7	230
Nov.	5.4	1	3.8	228
Dec.	15	0.5	2	128
Total	..	..	..	16,052

Year 1947

Jan.	0.6	0.3	0.3	19
Feb.	72	0.3	15	868
Mar.	82	6.2	19	1,754
Apr.	72	6.2	12	724
May	18	8.3	10	622
June	72	9.8	17	1,028
July	18	9.8	11	712
Aug.	23	8.3	14	836
Sept.	190	14	31	1,884
Oct.	152	12	29	1,772
Nov.	86	14	24	1,442
Dec.	300	42	111	6,896
Total	..	..	..	18,557

OMADALE BROOK AT ROMA

Year 1948

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	161	14	34	2,118
Feb.	14	3	9	498
Mar.	196	3	12	716
Apr.	41	5	9	512
May	No Records			1,250*
June	No Records			4,450*
July	41	11	24	1,510
Aug.	153	11	24	1,512
Sept.	266	34	78	4,708
Oct.	49	15	27	1,654
Nov.	28	8	10	620
Dec.	No Records			580*
Total	..	..	..	20,128*

Year 1949

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	No Records			1,210*
Feb.	No Records			700*
Mar.	No Records			800*
Apr.	No Records			2,420*
May	No Records			2,370*
June	No Records			6,720*
July	No Records			8,570*
Aug.	No Records			3,770*
Sept.	No Records			8,730*
Oct.	No Records			6,870*
Nov.	106	15	35	2,074
Dec.	No Records			1,530*
Total	..	..	..	45,764*

Year 1950

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	7	0	3	182
Feb.	No Records			1,570*
Mar.	No Records			870*
Apr.	No Records			11,700*
May	No Records			2,470*
June	No Records			35,500*
July	No Records			16,800*
Aug.	No Records			9,340*
Sept.	No Records			3,710*
Oct.	No Records			12,100*
Nov.	321	48	119	7,120
Dec.	94	20	42	2,588
Total	..	..	..	103,950*

Year 1951

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	No Records			3,740*
Feb.	65	24	36	2,014
Mar.	42	18	22	1,386
Apr.	36	12	20	1,220
May	18	12	13	796
June	1450	9	238	14,284
July	1250	56	125	7,634
Aug.	107	40	68	4,196
Sept.	83	26	43	2,592
Oct.	26	14	21	1,310
Nov.	17	10	13	774
Dec.	12	6	7.5	462
Total	..	..	..	40,412*

Year 1952

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	4	0.5	2.1	130
Feb.	36	0	6.7	392
Mar.	26	4	9.6	602
Apr.	No Records			620*
May	No Records			1,940*
June	No Records			4,570*
July	No Records			2,540*
Aug.	No Records			18,300*
Sept.	No Records			3,860*
Oct.	No Records			3,170*
Nov.	No Records			1,110*
Dec.	No Records			860*
Total	..	..	..	38,094*

Year 1953

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	No Records			1,050*
Feb.	No Records			1,350*
Mar.	No Records			1,140*
Apr.	22	4	12	692
May	157	9	51	3,192
June	27	12	18	1,074
July	103	14	32	1,976
Aug.	360	19	45	2,794
Sept.	54	14	27	1,626
Oct.	54	10	17.5	1,084
Nov.	45	4	11	658
Dec.	14	1	4	252
Total	..	..	..	16,888*

Year 1954

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	435	4	21	1,300
Feb.	No Records			3,470*
Mar.	60	8	25	1,532
Apr.	14	4	6	352
May	8	4	5	318
June	116	5	17	1,040
July	130	8	41	2,526
Aug.	46	16	31	1,952
Sept.	No Records			3,800*
Oct.	No Records			5,450*
Nov.	102	34	47	2,834
Dec.	88	12	24	1,496
Total	..	..	..	26,070*

Year 1955

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	88	5	17	1,062
Feb.	2800	8	259	15,956
Mar.	No Records			6,400*
Apr.	230	32	47	2,830
May	124	40	60	3,720
June	146	40	60	3,908
July	90	19	28	1,756
Aug.	86	32	39	2,440
Sept.	52	18	28	1,656
Oct.	314	13	42	2,620
Nov.	154	18	36	2,140
Dec.	270	18	29	1,822
Total	..	..	..	46,310*

* Estimated

OMADALE BROOK AT ROMA

Year 1956

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min	Mean	
Jan.	23	8	15	906
Feb.	975	18	120	6,932
Mar.	775	29	119	7,402
Apr.	70	29	43	2,578
May	1115	44	146	9,070
June	605	70	145	8,712
July	430	60	107	6,620
Aug.	358	44	74	4,608
Sept.	44	29	37	2,194
Oct.	44	23	29	1,778
Nov.	70	18	30	1,798
Dec.	52	13	20	1,222
Total				53,820

Year 1957

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max	Min.	Mean	
Jan.	430	4	18	1,098
Feb	530	4	41	2,284
Mar.	65	18	29	1,806
Apr	52	8	15	888
May	15	8	9.5	590
June	52	8	13	778
July	70	18	26	1,612
Aug	140	23	37	2,304
Sept.	44	18	37	2,198
Oct	16	4	8	508
Nov	4	0.5	2	130
Dec.	29	0.5	2	120
Total				14,316

Year 1958

Jan	455	1.5	15	916
Feb	110	5	18	984
Mar.	14	2	6.6	408
Apr.	7	2	4	246
May	154	4	12	752
June	505	9	72	4,300
July	405	25	62	3,824
Aug.	40	19	24	1,490
Sept.	No Records			2,590*
Oct.	103	29	48	2,978
Nov.	26	11	18	1,052
Dec.	80	7	11	680
Total				20,220*

Year 1959

Jan.	236	7	40	2,492
Feb.	246	22	44	2,436
Mar.	173	29	46	2,876
Apr.	No Records			2,710*
May	No Records			1,350*
June	No Records			2,340*
July	1275	22	79	4,892
Aug.	505	40	106	6,556
Sept.	138	48	61	3,664
Oct	605	40	95	5,886
Nov	475	36	84	5,042
Dec.	360	22	39	2,436
Total				42,680*

Year 1960

Jan	33	12	22	1,328
Feb.	210	9	22	1,298
Mar.	163	19	55	3,420
Apr.	33	16	22	1,336
May	53	12	23	1,418
June	103	11	32	1,896
July	775	36	94	5,800
Aug.	115	44	65	4,060
Sept.	115	32	48	2,854
Oct.	128	22	33	2,026
Nov.	190	4	18	1,088
Dec.	805	4	94	5,836
Total				32,360

Year 1961

Jan	445	21	47	2,936
Feb	114	13	29	1,614
Mar.	102	18	23	1,440
Apr.	44	9	18	1,062
May	44	16	21	1,322
June	360	16	50	3,022
July	90	13	22	1,344
Aug	490	13	86	5,356
Sept	227	29	726	4,376
Oct.	70	16	25	1,538
Nov	227	14	42	2,494
Dec.	114	24	44	2,706
Total				29,210

Year 1962

Jan	940	48	119	7,380
Feb	90	24	40	2,236
Mar.	32	24	30	1,832
Apr	415	18	108	6,506
May	415	29	80	4,936
June	173	29	49	2,914
July	128	29	43	2,668
Aug.	190	32	58	3,598
Sept.	90	24	40	2,418
Oct.	299	18	30	1,882
Nov.	51	14	23	1,390
Dec.	310	11	41	2,540
Total				40,300

Year 1963

Jan	1375	24	83	5,144
Feb	51	11	24	1,342
Mar	287	19	60	3,662
Apr	142	25	47	2,814
May	940	51	176	10,932
June	505	51	114	6,820
July	505	73	142	8,830
Aug.	1010	35	100	6,181
Sept.	310	46	123	7,350
Oct	158	35	74	4,586
Nov	128	26	35	2,080
Dec.	360	20	39	2,436
Total				62,177

* Estimated.

OMADALE BROOK AT ROMA

Year 1964

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	158	14	22	1,376
Feb.	14	8	11	612
Mar.	59	6	8	502
Apr.	360	6	31	1,888
May	45	10	24	1,470
June	287	10	46	2,782
July	190	26	54	3,336
Aug.	940	19	47	2,954
Sept.	44	16	27	1,632
Oct.	91	16	27	1,656
Nov.	29	10	17	1,046
Dec.	25	4	8	508
Total	..	..	..	19,762

Year 1965

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	4	0.5	2.2	134
Feb.	32	0	2.8	158
Mar.	4	0	0.1	9
Apr.	14	0	2.5	151
May	4	1.5	3.3	204
June	19	1.5	4.6	274
July	292	3	31	1,888
Aug.	57	14	18	1,106
Sept.	32	10	19	1,150
Oct.	7	4	6.3	392
Nov.	19	0.5	3.6	217
Dec.	57	3	7.5	465
Total	..	..	..	6,148

Year 1966

Jan.	17	0.2	1.8	114
Feb.	17	0	1.7	95
Mar.	26	0	2.6	160
Apr.	4	0	0.9	52
May	17	0.5	3.7	229
June	128	6.5	18	1,099
July	21	5.9	9.4	586
Aug.	46	4	13	786
Sept.	54	20	2	1,200
Oct.	128	17	35	2,177
Nov.	186	17	39	2,327
Dec.	46	6.5	12	759
Total	..	..	..	9,584

Year 1967

Jan.	29	4.2	7	437
Feb.	29	2.1	5	279
Mar.	87	2.1	27	1,670
Apr.	87	16	39	2,330
May	46	8	15	904
June	415	10	131	7,830
July	144	28	54	3,362
Aug.	625	20	102	6,338
Sept.	316	23	57	3,427
Oct.	580	23	58	3,581
Nov.	42	12	28	1,692
Dec.	23	6	9	579
Total	..	..	..	32,429

Year 1968

Jan.	472	3.5	131	8,144
Feb.	53	13	20	1,170
Mar.	294	9	17	1,062
Apr.	9	3.5	5.5	331
May	351	3.5	40	2,474
June	44	24	35	2,070
July	122	24	51	3,182
Aug.	460	44	122	7,582
Sept.	107	28	666	3,994
Oct.	68	15	23	1,414
Nov.	68	5	14	860
Dec.	39	4	9	577
Total	..	..	..	32,860

HUNTER RIVER AT MOONAN DAM SITE

LOCATION:	Latitude 31°55' Longitude 151°14'
PERIOD OF ESTABLISHMENT:	June 1940 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	27 years.
ZERO OF GAUGE:	R.L. 1259.93 North West Water Conservation Datum.
CATCHMENT AREA:	295 Square Miles
CONTROL:	Rock and Concrete.
EQUIPMENT:	Float recorder installed July 1953. Staff gauge, range 0 to 20 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 183
	(b) Maximum observation in cusecs : 3,063
	(c) Minimum observation in cusecs : 0.14
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	25,000 cusecs
MEAN DAILY DISCHARGE FOR 27 YEARS:	152 cusecs.
MEAN ANNUAL DISCHARGE FOR 27 YEARS:	111,000 acre feet

HUNTER RIVER AT MOONAN DAM SITE

Year 1940

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	..	..	..	..
May	..	..	..	..
June	7	5	4	224
July	13	3	7	412
Aug.	40	3	12	752
Sept.	114	3	10	630
Oct.	104	6	27	1,658
Nov.	143	4	24	1,474
Dec.	11000	1	100	6,180
Total	..	..	..	..

Year 1941

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	596	24	108	6,732
Feb.	104	21	40	2,234
Mar.	360	13	43	2,664
Apr.	402	8	20	1,248
May	70	6	10	648
June	250	32	62	3,730
July	75	28	46	2,880
Aug.	350	17	43	2,692
Sept.	53	24	36	2,146
Oct.	303	21	89	5,434
Nov.	29	4	14	870
Dec.	7	0	1.6	107
Total	..	..	..	31,385

Year 1942

Jan.	8	1	3.7	229
Feb.	200	0	22	1,250
Mar.	870	0	119	7,402
Apr.	111	8	27	1,644
May	23	6	9	536
June	55	12	25	1,522
July	8230	29	419	26,010
Aug.	187	44	85	5,272
Sept.	60	32	40	2,416
Oct.	10800	29	591	36,640
Nov.	2197	57	261	15,672
Dec.	700	13	52	3,230
Total	..	..	..	101,823

Year 1943

Jan.	4770	27	252	15,632
Feb.	32	11	19	1,018
Mar.	9	5	6	390
Apr.	27	7	9	556
May	325	7	76	4,736
June	212	47	70	4,228
July	60	37	44	2,724
Aug.	319	60	157	9,756
Sept.	234	97	123	7,592
Oct.	160	53	86	5,360
Nov.	365	37	91	5,468
Dec.	257	38	70	4,376
Total	..	..	..	61,836

Year 1944

Jan.	2900	27	83	5,160
Feb.	2900	27	70	4,048
Mar.	27	16	20	1,266
Apr.	28	12	16	974
May	307	13	42	2,624
June	47	27	31	1,896
July	581	27	106	6,544
Aug.	6800	47	312	19,344
Sept.	262	63	123	7,354
Oct.	70	25	45	2,788
Nov.	39	6	17	998
Dec.	17	3	8	472
Total	..	..	..	53,468

Year 1945

Jan.	940	2	24	1,476
Feb.	326	2.5	25	1,408
Mar.	26	0.8	5.2	322
Apr.	89	6	10	622
May	183	6	27	1,670
June	8310	13	640	38,370
July	2140	108	236	14,358
Aug.	360	6	141	8,772
Sept.	153	51	79	4,726
Oct.	203	0	49	3,068
Nov.	99	6	25	1,504
Dec.	108	3	18	1,070
Total	..	..	..	77,366

Year 1946

Jan.	99	1	8	518
Feb.	14	0.5	3.6	202
Mar.	259	0	21	1,293
Apr.	4950	0	191	11,482
May	450	36	63	3,932
June	2800	36	304	18,242
July	177	36	93	5,784
Aug.	48	20	30	1,850
Sept.	26	16	20	1,214
Oct.	17	6	11	702
Nov.	1350	0.4	13	795
Dec.	1735	0.4	21	1,302
Total	..	..	..	47,316

Year 1947

Jan.	3	0	1	61
Feb.	407	0	42	2,357
Mar.	153	9	50	3,090
Apr.	190	11	40	2,384
May	108	18	36	2,210
June	276	26	86	5,154
July	130	18	35	2,196
Aug.	108	11	44	2,726
Sept.	3530	36	110	6,586
Oct.	217	26	76	4,640
Nov.	360	26	68	4,102
Dec.	1645	92	327	20,252
Total	..	..	..	55,758

HUNTER RIVER AT MOONAN DAM SITE

Year 1948

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1030	55	150	9,282
Feb.	56	26	38	2,226
Mar.	407	26	63	3,910
Apr.	62	20	34	2,060
May	259	34	78	4,864
June	1080	26	214	12,812
July	215	60	101	6,276
Aug.	566	36	89	5,490
Sept.	2320	89	262	15,714
Oct.	159	44	88	5,464
Nov.	51	18	34	2,036
Dec.	165	9	33	2,036
Total	..	..	..	72,170

Year 1949

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	325	14	75	4,648
Feb.	1600	17	103	5,816
Mar.	610	68	102	6,322
Apr.	2140	43	152	9,126
May	4070	53	144	8,952
June	3130	76	479	28,704
July	7350	106	598	37,076
Aug.	955	123	236	14,614
Sept.	15400	172	540	32,406
Oct.	20900	159	420	26,020
Nov.	1100	101	154	9,270
Dec.	241	57	92	5,706
Total	..	..	..	188,660

Year 1950

Jan.	880	43	73	4,552
Feb.	308	36	106	5,960
Mar.	101	40	59	3,670
Apr.	8320	81	752	45,106
May	810	101	180	11,194
June	9330	26	1978	118,660
July	7030	427	978	60,616
Aug.	3710	290	482	29,862
Sept.	290	147	206	12,346
Oct.	7350	147	568	35,194
Nov.	1870	220	431	25,842
Dec.	299	106	172	10,712
Total	..	..	..	363,714

Year 1951

Jan.	1350	101	258	15,988
Feb.	No Records			14,900*
Mar.	No Records			11,600*
Apr.	No Records			9,300*
May	No Records			8,000*
June	No Records			51,600*
July	No Records			24,900*
Aug.	No Records			15,200*
Sept.	160	91	124	7,430
Oct.	123	50	74	4,566
Nov.	50	21	39	2,352
Dec.	64	11	24	1,504
Total	..	..	..	167,340*

Year 1952

Jan.	36	3.4	9.5	594
Feb.	123	3	22	1,262
Mar.	290	17	43	2,662
Apr.	159	17	54	3,230
May	362	39	111	6,902
June	1430	81	315	18,920
July	500	81	164	10,138
Aug.	9330	275	1235	76,560
Sept.	No Records			14,400*
Oct.	455	123	213	13,228
Nov.	123	59	78	4,676
Dec.	172	36	53	3,274
Total	..	..	..	155,846*

Year 1953

Jan.	172	50	72	4,464
Feb.	395	32	99	5,554
Mar.	112	40	62	3,858
Apr.	50	32	42	2,532
May	4070	81	344	21,302
June	81	50	59	3,568
July	512	50	126	7,820
Aug.	1510	61	174	10,770
Sept.	199	57	92	5,524
Oct.	118	42	59	3,626
Nov.	135	25	42	2,530
Dec.	101	11	20	1,270
Total	..	..	..	72,818

Year 1954

Jan.	880	19	67	4,170
Feb.	4070	19	223	12,476
Mar.	226	32	71	4,384
Apr.	40	25	31	1,844
May	45	22	25	1,534
June	362	22	56	3,336
July	372	30	104	6,436
Aug.	273	32	80	4,990
Sept.	740	32	107	6,428
Oct.	5730	70	309	19,174
Nov.	2140	81	233	14,000
Dec.	No Records			2,920*
Total	..	..	..	81,692*

Year 1955

Jan.	No Records			3,240*
Feb.	25000	40	1356	75,908
Mar.	No Records			
Apr.	1555	73	153	9,768
May	1110	213	406	25,198
June	875	274	405	24,318
July	356	102	215	13,342
Aug.	900	73	186	11,540
Sept.	600	52	147	8,794
Oct.	7030	40	354	21,966
Nov.	925	45	197	11,840
Dec.	1270	80	137	8,478
Total	..	..	..	..

* Estimated.

HUNTER RIVER AT MOONAN DAM SITE

Year 1956

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	650	29	75	4,628
Feb.	10200	70	870	50,444
Mar.	11300	398	928	57,564
Apr.	580	114	213	12,756
May	14900	155	772	47,876
June	9925	290	687	41,228
July	5665	284	577	35,732
Aug.	3830	155	5401	33,559
Sept.	150	89	114	6,838
Oct.	510	57	99	6,154
Nov.	342	57	66	3,974
Dec.	510	57	69	4,300
Total	..	..	..	305,053

Year 1957

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	No Records			2,540*
Feb.	No Records			20,100*
Mar.	98	56	65	3,892
Apr.	145	36	51	3,044
May	41	29	32	2,010
June	116	29	35	2,016
July	342	39	70	4,346
Aug.	380	57	113	7,032
Sept.	142	37	70	4,196
Oct.	37	17	25	1,568
Nov.	21	2.2	8	505
Dec.	37	0.5	4	244
Total	..	..	..	51,583*

Year 1958

Jan.	2030	3	49	3,074
Feb.	1040	13	96	5,380
Mar.	102	10	23	1,440
Apr.	37	13	18	1,088
May	336	13	34	2,134
June	1010	21	136	8,166
July	1250	52	175	10,848
Aug.	357	52	72	4,466
Sept.	12900	52	284	17,046
Oct.	2415	72	176	10,934
Nov.	93	25	45	2,692
Dec.	445	25	54	3,332
Total	..	..	..	70,600

Year 1959

Jan.	555	30	123	7,602
Feb.	1500	52	164	9,182
Mar.	5440	115	236	14,614
Apr.	497	82	153	9,196
May	140	55	68	4,214
June	885	42	98	5,896
July	4745	72	263	16,310
Aug.	2830	93	347	21,490
Sept.	1300	127	181	10,866
Oct.	3770	115	343	21,292
Nov.	4370	152	356	21,364
Dec.	790	63	172	10,690
Total	..	..	..	152,716

Year 1960

Jan.	226	48	70	4,330
Feb.	244	42	76	4,420
Mar.	284	55	104	6,470
Apr.	82	42	55	3,316
May	140	42	69	4,268
June	350	48	111	6,684
July	2525	115	272	16,878
Aug.	850	133	214	13,240
Sept.	526	104	157	9,422
Oct.	471	93	143	8,890
Nov.	425	59	76	4,542
Dec.	4852	44	394	24,462
Total	..	..	..	106,922

Year 1961

Jan.	2305	83	221	13,714
Feb.	220	60	92	5,178
Mar.	178	49	67	4,156
Apr.	210	31	52	3,126
May	116	42	55	3,434
June	1905	42	187	11,192
July	160	49	66	4,118
Aug.	1920	52	292	18,098
Sept.	395	83	176	10,568
Oct.	435	52	83	5,132
Nov.	1550	49	130	7,792
Dec.	765	80	170	10,534
Total	..	..	..	97,042

Year 1962

Jan.	6250	142	540	33,504
Feb.	1580	87	154	8,624
Mar.	91	58	71	4,376
Apr.	1997	50	274	16,432
May	2934	81	284	17,586
June	410	87	139	8,358
July	716	76	145	8,962
Aug.	1155	102	216	13,408
Sept.	478	97	152	9,120
Oct.	3714	57	182	11,260
Nov.	285	21	92	5,524
Dec.	518	16	71	4,412
Total	..	..	..	141,566

Year 1963

Jan.	3630	61	221	13,720
Feb.	263	60	93	5,196
Mar.	1070	47	199	12,310
Apr.	1685	79	159	9,552
May	4070	141	606	37,588
June	1989	194	381	22,854
July	3770	194	482	29,900
Aug.	7660	163	455	28,214
Sept.	7660	188	372	22,328
Oct.	357	116	191	11,872
Nov.	307	86	113	6,788
Dec.	1520	75	166	10,310
Total	..	..	..	210,632

* Estimated.

HUNTER RIVER AT MOONAN DAM SITE

Year 1964

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	658	56	100	6,000
Feb.	57	39	47	2,760
Mar.	170	29	51	3,154
Apr.	2052	26	131	7,870
May	156	52	74	4,560
June	540	56	96	5,732
July	126	56	69	4,256
Aug.	3020	56	327	20,290
Sept.	320	56	141	8,492
Oct.	200	56	69	4,280
Nov.	129	44	68	4,202
Dec.	52	17	28	1,742
Total	..	..	..	73,338

Year 1965

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	281	6	15	926
Feb.	40	3.3	10	576
Mar.	14	1.2	3.6	224
Apr.	35	1.1	5.8	348
May	17	5.4	7.3	454
June	49	6	15	904
July	555	13	63	3,916
Aug.	73	28	37	2,318
Sept.	61	17	32	1,918
Oct.	37	6	15	942
Nov.	32	0	7.5	452
Dec.	139	2.2	23	1,472
Total	..	..	..	14,450

Year 1966

Jan.	14.9	0.2	2.7	166
Feb.	70	0	5.7	321
Mar.	210	0.5	6.7	414
Apr.	12	0.5	3.4	206
May	32	2.3	7.9	489
June	368	9.8	43	2,588
July	20	11	12	772
Aug.	134	8	35	2,170
Sept.	142	37	62	3,742
Oct.	296	44	81	5,016
Nov.	1788	38	103	6,196
Dec.	2558	19	53	3,278
Total	..	..	..	25,358

Year 1967

Jan.	262	6.5	24	1,498
Feb.	74	10	20	1,104
Mar.	3490	10	94	5,832
Apr.	140	33	33	4,436
May	87	20	39	2,446
June	870	25	327	19,624
July	370	67	138	8,570
Aug.	2947	61	175	10,820
Sept.	3337	61	229	13,766
Oct.	4340	46	269	16,676
Nov.	122	29	62	3,710
Dec.	119	19	28	1,738
Total	..	..	..	90,220

Year 1968

Jan.	9010	20	488	30,270
Feb.	167	46	67	3,894
Mar.	1146	40	85	5,248
Apr.	42	24	30	1,798
May	5060	24	256	15,856
June	138	56	84	5,034
July	1490	55	179	11,092
Aug.	5920	109	564	34,978
Sept.	1090	124	239	14,336
Oct.	1920	46	94	5,832
Nov.	99	22	42	2,530
Dec.	580	22	38	2,368
Total	..	..	..	133,236

HUNTER RIVER AT GLENBAWN

LOCATION:	Latitude 32°07' Longitude 150°59'
PERIOD OF ESTABLISHMENT:	February 1940 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	28 years.
ZERO OF GAUGE:	R.L.613.02 Water Conservation Datum
CATCHMENT AREA:	500 square miles.
CONTROL:	Concrete Weir.
EQUIPMENT:	Float recorder, installed August 1958. Staff gauge, range 0 to 40 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 312
	(b) Maximum observation in cusecs : 13,700
	(c) Minimum observation in cusecs : 0
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	41,000 cusecs.
MEAN DAILY DISCHARGE FOR 17 YEARS: (Pre Glenbawn Dam Operation)	263 cusecs.
MEAN ANNUAL DISCHARGE FOR 17 YEARS: (Pre Glenbawn Dam Operation)	192,000 acre feet.
MEAN DAILY DISCHARGE FOR 11 YEARS: (Post Glenbawn Dam Operation)	167 cusecs.
MEAN ANNUAL DISCHARGE FOR 11 YEARS: (Post Glenbawn Dam Operation)	122,000 acre feet.
REMARKS:	Storage in Glenbawn Dam commenced on the 10th May 1958. All flows shown after this date are irrigation releases.

HUNTER RIVER AT GLENBAWN

Year 1940

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	No Records			
Apr.	1100	0	47	2,828
May	26	8	12	740
June	8	7	7	440
July	12	5	8	466
Aug.	35	5	13	828
Sept.	20	0	4	232
Oct.	170	2	31	1,902
Nov.	762	0	32	1,924
Dec.	6680	5	247	15,338
Total	..	..	..	..

Year 1941

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1605	25	274	16,982
Feb.	410	22	75	4,204
Mar.	543	11	56	3,468
Apr.	160	7	18	1,104
May	25	5	9	522
June	340	8	80	4,830
July	129	35	53	3,260
Aug.	149	22	39	2,414
Sept.	58	24	36	2,186
Oct.	643	24	116	7,184
Nov.	31	5	16	972
Dec.	3	0	1	56
Total	..	..	..	47,182

Year 1942

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	0	0	0	0
Feb.	17	0	2	116
Mar.	3210	0	273	16,946
Apr.	208	15	44	2,624
May	25	11	13	816
June	118	19	40	2,370
July	7850	49	717	44,432
Aug.	320	61	133	8,226
Sept.	66	37	48	2,900
Oct.	18400	35	1135	70,340
Nov.	3410	104	374	22,444
Dec.	643	35	94	5,844
Total	..	..	..	177,058

Year 1943

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	3290	38	244	15,114
Feb.	37	13	23	1,314
Mar.	13	5	8	482
Apr.	22	6	12	712
May	1162	8	131	8,142
June	258	63	94	5,664
July	87	60	69	4,240
Aug.	1162	78	301	18,686
Sept.	390	118	182	10,898
Oct.	287	90	134	8,336
Nov.	2310	55	207	12,448
Dec.	287	36	94	5,798
Total	..	..	..	91,834

Year 1944

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1583	35	135	8,396
Feb.	1883	32	126	7,294
Mar.	30	18	23	1,412
Apr.	159	18	24	1,466
May	396	18	73	4,500
June	65	27	38	2,250
July	1185	35	148	9,204
Aug.	5980	43	457	28,320
Sept.	217	60	101	6,088
Oct.	70	27	41	2,550
Nov.	32	8	21	1,244
Dec.	18	0	7	442
Total	..	..	..	73,172

Year 1945

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1185	0	59	3,640
Feb.	333	0	44	2,452
Mar.	122	0.4	13	786
Apr.	70	.6	.16	966
May	445	6	66	4,064
June	10200	20	1176	70,566
July	4122	122	415	25,702
Aug.	333	97	175	10,872
Sept.	170	60	87	5,214
Oct.	242	25	68	4,238
Nov.	113	23	33	1,974
Dec.	97	8	25	1,576
Total	..	..	..	132,050

Year 1946

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	27	1	8	500
Feb.	2	0	1	36
Mar.	141	0	19	1,202
Apr.	13400	13	432	25,912
May	390	78	142	8,808
June	4335	114	493	29,628
July	287	84	144	8,896
Aug.	84	41	59	3,644
Sept.	55	37	45	2,716
Oct.	37	12	26	1,600
Nov.	50	2	11	636
Dec.	2040	0.1	34	2,110
Total	..	..	..	85,688

Year 1947

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	0	0	0	0
Feb.	1900	0	81	4,542
Mar.	185	27	61	3,764
Apr.	287	19	46	2,732
May	60	24	38	2,330
June	232	39	111	6,650
July	111	35	54	3,324
Aug.	90	35	52	3,216
Sept.	4850	50	249	14,932
Oct.	445	48	124	7,690
Nov.	148	48	740	4,442
Dec.	6500	170	714	44,266
Total	..	..	..	97,888

HUNTER RIVER AT GLENBAWN.

Month	Year 1948 Discharge in Cusecs			Discharge for Month Acre Feet	Month	Year 1949 Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	1230	65	306	18,874	Jan.	508	27	105	6,540
Feb.	1185	22	53	3,108	Feb.	1725	22	158	8,830
Mar.	1230	32	72	4,500	Mar.	287	78	130	8,050
Apr.	82	32	46	2,754	Apr.	3370	78	222	13,344
May	257	28	65	4,038	May	796	72	137	8,468
June	1450	32	286	17,174	June	3867	90	831	49,854
July	208	78	116	7,170	July	16600	141	1001	60,108
Aug.	796	40	112	6,966	Aug.	2647	310	634	39,302
Sept.	1290	111	332	19,964	Sept.	11300	388	1104	66,258
Oct.	208	44	112	6,946	Oct.	21700	416	952	59,046
Nov.	78	27	49	2,976	Nov.	1742	263	414	24,822
Dec.	508	22	52	3,230	Dec.	912	200	271	16,802
Total	..	..	..	97,700	Total	..	..	..	361,424

	Year 1950					Year 1951			
Jan.	478	130	205	12,738	Jan.	4604	146	652	40,414
Feb.	912	130	287	16,072	Feb.	416	146	230	12,862
Mar.	548	115	168	10,426	Mar.	200	88	116	7,172
Apr.	16300	143	994	61,644	Apr.	146	88	94	5,626
May	1187	263	392	24,284	May	115	76	92	5,680
June	24800	310	4157	249,400	June	8588	65	1350	80,992
July	9042	809	1697	105,220	July	8150	286	809	50,148
Aug.	4348	446	890	55,164	Aug.	2473	263	394	24,416
Sept.	512	263	357	21,442	Sept.	311	130	186	11,176
Oct.	8477	263	875	54,252	Oct.	147	76	109	6,756
Nov.	2803	310	650	39,030	Nov.	107	38	58	3,496
Dec.	478	163	269	16,668	Dec.	65	25	36	2,234
Total	..	..	..	571,642	Total	..	..	..	250,972

	Year 1952					Year 1953			
Jan.	40	10	19	1,188	Jan.	209	38	85	2,240
Feb.	107	8	27	1,542	Feb.	755	53	174	9,754
Mar.	241	25	64	3,974	Mar.	143	45	81	5,048
Apr.	200	31	68	4,064	Apr.	62	38	52	3,134
May	263	46	135	8,390	May	4443	135	494	30,626
June	1487	107	366	21,958	June	120	87	100	6,028
July	912	107	242	14,978	July	755	87	199	12,346
Aug.	27300	388	2542	157,586	Aug.	1678	83	242	15,012
Sept.	755	165	324	19,434	Sept.	605	95	134	8,038
Oct.	1937	145	261	16,158	Oct.	125	49	74	4,564
Nov.	235	45	89	5,328	Nov.	125	32	52	3,120
Dec.	209	32	53	3,284	Dec.	83	16	27	1,646
Total	..	..	..	257,884	Total	..	..	..	101,576

	Year 1954					Year 1955			
Jan.	1678	19	126	7,782	Jan.	305	40	92	5,688
Feb.	7121	23	442	24,744	Feb.	41000	52	2316	129,696
Mar.	359	35	85	5,276	Mar.	1600	257	659	40,882
Apr.	45	35	40	2,370	Apr.	275	146	218	13,114
May	68	23	31	1,902	May	685	160	259	16,056
June	653	27	81	4,852	June	748	206	320	19,210
July	473	32	113	7,010	July	240	133	172	10,636
Aug.	325	53	104	6,470	Aug.	399	120	197	12,208
Sept.	2334	58	223	13,404	Sept.	175	97	134	8,052
Oct.	7728	72	426	26,404	Oct.	4820	58	411	25,508
Nov.	2133	27	253	15,166	Nov.	1130	86	215	12,894
Dec.	409	85	143	8,870	Dec.	335	97	168	10,388
Total	..	..	..	124,250	Total	..	..	..	304,332

HUNTER RIVER AT GLENBAWN

Year 1956

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	600	39	125	7,754
Feb.	9600	146	1194	69,224
Mar.	6380	434	1040	64,482
Apr.	483	238	312	18,748
May	12800	245	860	53,344
June	7920	364	798	47,880
July	6600	343	624	38,684
Aug.	6700	292	652	40,396
Sept.	275	153	227	13,610
Oct.	632	128	177	10,980
Nov.	231	84	140	8,378
Dec.	218	48	81	5,034
Total	..	..	..	378,514

Year 1957

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	245	32	61	3,808
Feb.	14500	49	674	37,718
Mar.	216	80	124	7,686
Apr.	117	57	66	3,968
May	85	42	49	3,010
June	49	42	45	2,702
July	306	42	119	7,354
Aug.	890	185	394	24,436
Sept.	260	90	125	7,482
Oct.	85	14	59	3,660
Nov.	26	1	12	724
Dec.	9	0	2	92
Total	..	..	..	102,640

Year 1958

Jan.	1130	2.2	38	2,346
Feb.	773	25	108	6,056
Mar.	128	13	29	1,808
Apr.	44	19	29	1,712
May	40	0.1	10	622
June	34	0.3	12	720
July	3	0.2	0.9	55
Aug.	14	0	2.9	180
Sept.	1.7	0.4	0.6	39
Oct.	5	1	1.1	70
Nov.	152	1	48	2,900
Dec.	176	25	79	4,872
Total	..	..	..	21,380

Year 1959

Jan.	100	14	72	4,462
Feb.	675	7	101	5,646
Mar.	630	102	130	8,086
Apr.	537	99	167	10,364
May	111	102	105	6,522
June	102	4	100	5,976
July	106	2	100	6,186
Aug.	104	75	101	6,292
Sept.	107	2	101	6,082
Oct.	106	2	92	5,688
Nov.	783	86	473	28,373
Dec.	800	193	326	20,226
Total	..	..	..	113,903

Year 1960

Jan.	200	100	194	12,000
Feb.	100	85	94	5,440
Mar.	86	52	75	4,655
Apr.	152	86	117	7,036
May	109	79	95	5,906
June	225	53	63	3,786
July	1062	220	473	29,350
Aug.	381	140	287	17,776
Sept.	285	1	96	5,788
Oct.	157	79	115	7,128
Nov.	214	55	153	9,152
Dec.	201	51	104	6,438
Total	..	..	..	114,455

Year 1961

Jan.	1615	8	345	21,370
Feb.	495	90	239	13,372
Mar.	208	204	206	12,758
Apr.	212	47	210	12,578
May	216	212	214	13,264
June	216	11	210	12,598
July	211	200	208	12,902
Aug.	203	1	200	12,374
Sept.	290	2	183	10,964
Oct.	222	20	179	11,116
Nov.	167	0	120	7,228
Dec.	73	21	41	2,518
Total	..	..	..	143,042

Year 1962

Jan.	3200	50	696	43,148
Feb.	380	2	300	16,812
Mar.	221	5	147	9,120
Apr.	2190	0	536	32,162
May	2235	3	523	32,410
June	390	2	207	12,412
July	410	3	257	15,936
Aug.	610	8	239	14,818
Sept.	410	27	221	13,276
Oct.	321	5	209	12,932
Nov.	406	245	320	19,204
Dec.	339	280	322	19,974
Total	..	..	..	242,204

Year 1963

Jan.	358	108	332	20,590
Feb.	325	47	221	12,358
Mar.	185	96	146	9,038
Apr.	112	101	106	6,378
May	2163	1	1022	63,390
June	113	0	42	2,492
July	1020	0	159	9,882
Aug.	1170	102	878	54,438
Sept.	2055	55	915	54,888
Oct.	2055	186	405	25,104
Nov.	490	213	250	15,002
Dec.	258	151	193	11,990
Total	..	..	..	219,542

HUNTER RIVER AT GLENBAWN

Year 1964

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	202	115	157	9,704
Feb.	287	140	201	11,680
Mar.	287	57	189	11,710
Apr.	235	50	162	9,750
May	82	0	49	3,074
June	331	45	144	8,628
July	550	52	220	13,634
Aug.	335	95	185	11,506
Sept.	292	164	204	12,212
Oct.	214	109	165	10,222
Nov.	196	107	130	7,828
Dec.	286	196	247	15,314
Total	..	..	..	125,262

Year 1965

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	331	256	304	18,850
Feb.	324	206	240	13,430
Mar.	378	171	206	12,768
Apr.	198	102	166	9,960
May	153	82	118	7,300
June	215	46	77	4,598
July	50	18	32	2,000
Aug.	60	25	38	2,374
Sept.	501	20	88	5,284
Oct.	267	34	159	9,868
Nov.	353	103	206	12,388
Dec.	300	20	149	9,232
Total	..	..	..	108,052

Year 1966

Jan.	299	217	254	15,776
Feb.	233	192	216	12,088
Mar.	211	38	149	9,242
Apr.	133	89	112	6,732
May	95	56	87	5,376
June	57	15	38	2,284
July	48	22	37	2,324
Aug.	49	28	45	2,776
Sept.	75	16	29	1,762
Oct.	75	14	43	2,664
Nov.	115	13	51	3,078
Dec.	119	32	86	5,344
Total	..	..	..	69,446

Year 1967

Jan.	177	52	131	8,121
Feb.	175	67	150	8,398
Mar.	149	6	55	3,378
Apr.	99	17	51	3,063
May	95	18	52	3,250
June	21	18	19	1,152
July	24	12	14	850
Aug.	14	0	6.7	418
Sept.	4.3	0.6	1.6	93
Oct.	39	0	22	1,353
Nov.	396	12	73	4,348
Dec.	301	115	231	14,308
Total	..	..	..	48,732

Year 1968

Jan.	256	0	46	2,870
Feb.	153	28	86	4,972
Mar.	151	45	91	5,652
Apr.	165	82	125	7,470
May	149	0	50	3,086
June	20	0	15	916
July	222	26	78	4,831
Aug.	1640	48	484	30,034
Sept.	585	100	329	19,746
Oct.	1420	4	393	24,386
Nov.	329	196	252	15,132
Dec.	346	39	205	12,736
Total	..	..	..	131,831

ROUCHEL BROOK AT UPPER ROUCHEL

LOCATION:	Latitude 32°08' Longitude 151°05'
PERIOD OF ESTABLISHMENT:	October 1950 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	18 years.
ZERO OF GAUGE:	R.L.21.22 Assumed Datum.
CATCHMENT AREA:	95 Square miles.
CONTROL:	Gravel.
EQUIPMENT:	Staff gauge, range 0 to 15 feet
CURRENT METER OBSERVATIONS:	(a) Number obtained : 131
	(b) Maximum observation in cusecs : 614
	(c) Minimum observation in cusecs : 0
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	25,900 cusecs.
MEAN DAILY DISCHARGE FOR 18 YEARS:	82 cusecs.
MEAN ANNUAL DISCHARGE FOR 18 YEARS:	60,000 acre feet.

ROUCHEL BROOK AT UPPER ROUCHEL

Year 1950

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	..	..	..	..
May	..	..	..	..
June	..	..	..	..
July	..	..	..	..
Aug.	..	..	..	..
Sept.	..	..	..	..
Oct.	..	..	..	..
Nov.	1590	48	156	9,360
Dec.	68	36	47	2,880
Total	..	..	..	..

Year 1951

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	16100	36	820	50,860
Feb.	154	48	70	3,902
Mar.	93	25	40	2,474
Apr.	30	15	22	1,320
May	25	20	20	1,270
June	6000	20	704	42,236
July	2310	60	192	11,884
Aug.	154	36	60	3,696
Sept.	54	25	31	1,858
Oct.	25	15	19	1,170
Nov.	15	5	10	620
Dec.	10	1.8	4.8	298
Total	..	..	..	121,588

Year 1952

Jan.	1.8	0.4	1.2	75
Feb.	25	0	5.6	326
Mar.	42	5	14	868
Apr.	42	1.8	13	797
May	188	15	34	2,086
June	68	15	29	1,758
July	324	10	60	3,710
Aug.	12300	71	969	60,074
Sept.	71	22	39	2,348
Oct.	45	15	25	1,554
Nov.	15	3.5	7.1	428
Dec.	45	3.5	6.9	425
Total	..	..	..	74,449

Year 1953

Jan.	135	5	31	1,944
Feb.	230	15	66	3,726
Mar	152	9	32	1,964
Apr	188	5	16	928
May	3400	16	285	17,720
June	16	11	13	760
July	122	11	27	1,686
Aug	188	11	32	1,968
Sept.	50	16	20	1,196
Oct.	22	6	15	922
Nov.	42	2.2	7.8	469
Dec.	2.2	0.4	1.1	69
Total	..	..	..	33,352

Year 1954

Jan.	122	2.2	15	933
Feb.	6550	2.2	588	32,906
Mar.	200	9	38	2,354
Apr.	9	6.5	7.3	440
May	9	6.5	7.9	493
June	165	9	24	1,450
July	23	6.5	11	681
Aug.	190	9	37	2,304
Sept.	1560	9	160	9,604
Oct.	870	27	117	7,282
Nov.	500	21	93	5,588
Dec.	58	16	21	1,320
Total	..	..	..	65,355

Year 1955

Jan.	84	11	26	1,608
Feb.	11600	13	592	33,146
Mar.	2270	59	568	35,226
Apr.	115	36	71	4,242
May	337	19	62	3,838
June	130	36	73	4,382
July	36	6	16	968
Aug.	236	6	51	3,184
Sept.	100	19	39	2,332
Oct.	190	9	42	2,582
Nov.	268	4	38	2,306
Dec.	100	9	36	2,202
Total	..	..	..	96,016

Year 1956

Jan.	480	1	39	2,433
Feb.	25900	59	581	33,728
Mar.	6400	72	442	27,436
Apr.	127	35	64	3,822
May	271	72	142	8,784
June	420	62	127	7,640
July	492	44	83	5,132
Aug.	355	44	107	6,650
Sept.	44	21	31	1,850
Oct.	143	21	46	2,874
Nov.	53	10	24	1,412
Dec.	10	10	10	620
Total	..	..	..	102,381

Year 1957

Jan.	292	5	13	786
Feb.	14500	5	386	21,628
Mar.	98	16	28	1,754
Apr.	22	1	9	540
May	12	8	8	512
June	22	4	7	420
July	22	8	11	676
Aug.	814	8	70	4,390
Sept.	80	12	22	1,320
Oct.	12	4	8	496
Nov.	4	0	0.9	55
Dec.	1	0	.03	2
Total	..	..	..	32,579

ROUCHEL BROOK AT UPPER ROUCHEL

Year 1958

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	67	0.5	9	560
Feb.	31	1	11	598
Mar.	12	0.5	1.5	94
Apr.	16	0.5	4	248
May	16	1	6	340
June	54	1	17	1,002
July	216	4	33	2,028
Aug.	16	4	11	664
Sept.	312	8	33	1,996
Oct.	312	8	64	3,960
Nov.	12	1.5	5	286
Dec.	5	0.5	2.25	139
Total	..	..	..	11,915

Year 1959

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	295	0.5	34	2,132
Feb.	110	1.5	19	1,037
Mar.	178	8	26	1,606
Apr.	30	8	14	864
May	12	8	8.6	536
June	650	5	50	3,000
July	990	12	108	6,736
Aug.	3840	12	247	15,348
Sept.	110	18	32	1,942
Oct.	2070	12	194	12,048
Nov.	990	30	140	8,434
Dec.	75	8	23	1,456
Total	..	..	..	55,139

Year 1960

Jan.	12	3	5	350
Feb.	178	1	22	1,272
Mar.	178	12	37	2,338
Apr.	16	7	9	572
May	12	7	8	530
June	203	12	40	2,424
July	650	25	86	5,326
Aug.	330	16	58	3,614
Sept.	98	16	38	2,302
Oct.	66	16	24	1,488
Nov.	12	9	12	714
Dec.	1640	9	147	9,134
Total	..	..	..	30,064

Year 1961

Jan.	550	25	76	4,724
Feb.	66	16	26	1,470
Mar.	25	9	11	704
Apr.	16	7	8.9	534
May	12	6.5	7.7	476
June	650	7	103	6,184
July	25	7	8.9	554
Aug.	1000	7	147	9,092
Sept.	232	34	66	3,978
Oct.	23	17	18	1,138
Nov.	144	9	30	1,790
Dec.	3000	23	301	18,678
Total	..	..	..	49,322

Year 1962

Jan.	2070	59	233	14,456
Feb.	375	34	71	3,970
Mar.	73	17	26	1,614
Apr.	10300	12	537	32,196
May	9700	37	652	40,404
June	78	32	48	2,868
July	1617	32	89	5,514
Aug.	174	32	53	3,286
Sept.	174	22	41	2,448
Oct.	262	19	37	2,310
Nov.	55	21	27	1,634
Dec.	750	17	60	3,706
Total	..	..	..	114,406

Year 1963

Jan.	1210	23	93	5,750
Feb.	65	23	33	1,826
Mar.	11100	23	493	30,560
Apr.	460	30	72	4,300
May	2030	74	300	18,590
June	690	64	193	11,592
July	690	64	153	9,510
Aug.	3480	54	176	10,888
Sept.	8160	23	397	23,824
Oct.	180	36	76	4,710
Nov.	151	29	42	2,542
Dec.	240	23	67	4,158
Total	..	..	..	128,250

Year 1964

Jan.	85	10	17	1,082
Feb.	10	7	8	466
Mar.	165	7	26	1,610
Apr.	1580	4	75	4,490
May	31	17	22	1,338
June	4620	21	312	18,744
July	106	21	37	2,310
Aug.	85	13	20	1,210
Sept.	21	13	15	892
Oct.	26	8	15	956
Nov.	12	2.7	7.4	448
Dec.	2.7	0.3	1.1	70
Total	..	..	..	33,616

Year 1965

Jan.	1.6	0.02	0.5	31
Feb.	2.7	0	1	56
Mar.	0	0	0	0
Apr.	4.5	0	0.2	11
May	2.0	0	0.4	25
June	9.8	0.5	2.5	148
July	500	1	51	3,180
Aug.	11	7.5	8.5	528
Sept.	15	1	5.4	322
Oct.	4.7	0.6	1.5	96
Nov.	1.6	0	0.3	18
Dec.	12	0	2	126
Total	..	..	..	4,541

ROUCHEL BROOK AT UPPER ROUCHEL

Year 1966

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	0	0	0	0
Feb.	23	0	2.0	110
Mar.	4.7	0	0.8	52
Apr.	17	0.02	1.1	66
May	12	1.0	3.8	236
June	180	4.7	20	1,206
July	4.7	2.7	3.5	216
Aug.	51	1.0	8.3	514
Sept.	11	3.5	6.3	384
Oct.	180	3.5	24	1,508
Nov.	54	7.5	19	1,138
Dec.	24	3.8	8	516
Total	..	..	..	5,946

Year 1967

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	11	0.4	2.0	126
Feb.	36	0.7	4.0	225
Mar.	500	1.1	44	2,713
Apr.	410	8	99	5,910
May	74	8	28	1,656
June	2780	17	372	22,334
July	260	25	65	4,028
Aug.	350	30	67	4,130
Sept.	3360	25	173	10,408
Oct.	14250	25	468	29,038
Nov.	75	21	40	2,414
Dec.	41	12	18	1,008
Total	..	..	..	83,992

Year 1968

Jan.	3240	12	233	14,452
Feb.	16	3	9	520
Mar.	150	3	19	1,188
Apr.	11	4	7	425
May	1130	6	52	3,203
June	13	8	9	518
July	94	6	14	886
Aug.	1750	10	196	12,166
Sept.	42	17	23	1,396
Oct.	59	8	15	916
Nov.	13	1	7	411
Dec.	34	1	5	307
Total	..	..	..	36,388

PAGES RIVER AT GUNDY.

LOCATION:	Latitude 150°59' Longitude 32°01'
PERIOD OF ESTABLISHMENT:	September 1958 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	9 years.
ZERO OF GAUGE:	R.L. 741.92 North West Water Conservation Datum.
CATCHMENT AREA:	403 square miles.
CONTROL:	Concrete.
EQUIPMENT:	Float recorder installed September 1958. Staff gauge range 0 to 30 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 109
	(b) Maximum observation in cusecs :5,370
	(c) Minimum observation in cusecs : 0.01
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	12,300 cusecs
MEAN DAILY DISCHARGE FOR 9 YEARS:	88 cusecs
MEAN ANNUAL DISCHARGE FOR 9 YEARS:	64,000 acre feet
REMARKS:	Records from the daily read gauge at Gundy Bridge established in June 1952 are unreliable.

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PAGES RIVER AT GUNDY

Month	Year 1958 Discharge in Cusecs			Discharge for Month Acre Feet	Month	Year 1959 Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	..	..	..	..	Jan.	20	0	11	666
Feb.	..	..	..	..	Feb.	3210	3	123	6,878
Mar.	..	..	..	..	Mar.	1645	18	258	15,988
Apr.	..	..	..	..	Apr.	420	27	77	4,596
May	..	..	..	..	May	54	19	31	1,958
June	..	..	..	..	June	770	17	64	3,844
July	..	..	..	..	July	1620	27	114	7,088
Aug.	..	..	..	..	Aug.	1428	18	104	6,448
Sept.	..	..	..	..	Sept.	480	26	51	3,032
Oct.	12300	26	226	14,032	Oct.		No Records		
Nov.	54	7	15	908	Nov.		No Records		
Dec.	145	6	37	2,306	Dec.	1960	40	121	7,478
Total	..	..	..	..	Total	..	..	..	..

	Year 1960					Year 1961			
Jan.	311	12	35	2,184	Jan.	1160	12	55	3,412
Feb.	450	8	52	3,048	Feb.	128	9	14	764
Mar.	21	7	11	678	Mar.	75	7	16	998
Apr.	11	7	8	506	Apr.	71	7	12	740
May	34	8	14	890	May	13	8	10	624
June	75	14	26	1,542	June	60	8	20	1,186
July	880	33	168	10,426	July	125	8	16	1,022
Aug.	3050	27	154	9,694	Aug.	810	9	80	4,952
Sept.	1230	23	76	4,584	Sept.	58	8	23	1,360
Oct.	605	9	103	6,418	Oct.	360	5	12	722
Nov.	1160	15	75	4,476	Nov.	915	5	60	3,582
Dec.	15750	10	290	18,000	Dec.	691	15	68	4,216
Total	..	..	..	62,446	Total	..	..	..	23,578

	Year 1962					Year 1963			
Jan.	10240	39	366	22,700	Jan.	5780	22	263	16,324
Feb.	5540	31	202	11,320	Feb.	1516	18	70	3,828
Mar.	79	16	34	2,102	Mar.	3010	17	187	11,572
Apr.	401	14	60	3,608	Apr.	1286	43	76	5,598
May	3910	19	200	12,600	May	10780	62	503	31,194
June	980	49	90	5,388	June	4010	119	290	17,384
July	1880	35	73	4,552	July	1167	97	176	10,888
Aug.	1575	29	134	8,318	Aug.	7000	94	314	19,492
Sept.	87	38	56	3,346	Sept.	605	85	148	8,684
Oct.	2660	17	139	8,620	Oct.	199	54	87	5,376
Nov.	156	12	37	2,230	Nov.	232	32	61	3,680
Dec.	139	8	27	1,666	Dec.	222	16	47	2,890
Total	..	..	..	86,450	Total	..	..	..	136,910

	Year 1964					Year 1964			
Jan.	246	10	24	1,492	Jan.	10	2	5	277
Feb.	13	7	8	488	Feb.	9	1	3	180
Mar.	75	8	18	1,092	Mar.	75	1	2	126
Apr.	3770	8	150	9,014	Apr.	17	1	4	218
May	2230	29	100	6,182	May	30	2	4	252
June	9450	39	387	23,246	June	9	3	5	268
July	2040	80	224	13,900	July	9	4	5	324
Aug.	420	49	73	4,506	Aug.	6	3	4	282
Sept.	1500	47	105	6,302	Sept.	7	0.4	3	190
Oct.	1111	47	110	6,828	Oct.	38	0	4	258
Nov.	73	14	35	2,128	Nov.	3	0	1	48
Dec.	111	6	12	724	Dec.	308	0.03	12	780
Total	..	..	..	75,902	Total	..	..	..	3,203

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PAGES RIVER AT GUNDY

Year 1966

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	0.15	0.06	0.08	5
Feb.	0.2	0.1	0.13	7
Mar.	108	0.1	0.6	38
Apr.	0.2	0.1	0.1	62
May	0.35	0.03	0.12	7
June	31	0.1	3	174
July	1.7	0.5	1.1	71
Aug.	165	0.5	10	614
Sept.	46	2.5	9.8	588
Oct.	190	3.7	21	1,274
Nov.	915	6.5	61	3,652
Dec.	492	0.8	18	1,132
Total	..	..	..	7,624

Year 1967

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	16.6	0	3.0	188
Feb.	7.6	0	0.9	52
Mar.	1800	0.1	74	4,594
Apr.	8.5	2.1	4.6	279
May	24.2	1.9	4.2	258
June	350	4	38	2,286
July	66	8	21	1,272
Aug.	1256	8	66	4,100
Sept.	752	8	50	2,984
Oct.	1720	6	114	7,098
Nov.	31	3	13	755
Dec.	6	0	2	145
Total	..	..	..	24,011

Year 1968

Jan.	39500	1.7	1019	63,142
Feb.	114	5.5	48	2,790
Mar.	180	5	15	946
Apr.	20	4	8	460
May	44350	5	510	31,618
June	113	33	44	2,610
July	1248	33	94	5,800
Aug.	9325	35	409	25,346
Sept.	3700	79	195	11,670
Oct.	1520	37	134	8,294
Nov.	82	9	30	1,806
Dec.	310	9	29	1,780
Total	..	..	..	156,262

DART BROOK AT ABERDEEN.

LOCATION:	Latitude 32°10' Longitude 150°57'
PERIOD OF ESTABLISHMENT:	June 1959 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	9 years.
ZERO OF GAUGE:	R.L. 503.20 North West Water Conservation Datum.
CATCHMENT AREA:	320 Square Miles.
CONTROL:	Sand.
EQUIPMENT:	Staff gauge, range 0 to 30 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 69
	(b) Maximum observation in cusecs : 1,030
	(c) Minimum observation in cusecs : 0
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	8,560 cusecs
MEAN DAILY DISCHARGE FOR 9 YEARS:	43 cusecs.
MEAN ANNUAL DISCHARGE FOR 9 YEARS:	31,000 acre feet.

DART BROOK AT ABERDEEN

Year 1959

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	..	..	..	..
May	..	..	..	..
June	..	..	..	..
July	131	13	37	2,304
Aug.	74	6	18	1,158
Sept.	10	1	5	311
Oct.	1057	2	37	2,324
Nov.	1266	17	143	8,560
Dec.	53	2	12	768
Total	..	..	..	..

Year 1960

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	2	0	0.6	35
Feb.	2	0	1.5	85
Mar.	2	0	0.9	52
Apr.	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	45	0	6.3	396
Aug.	37	0.4	5	300
Sept.	24	0.4	2.1	124
Oct.	76	0.4	8.8	552
Nov.	9	0	1.8	106
Dec.	224	0	42	2,590
Total	..	..	..	4,240

Year 1961

Jan.	166	0.1	15	954
Feb.	2	0	0.30	15
Mar.	30	0	1.90	118
Apr.	1	0	0.1	8
May	0	0	0	0
June	0	0	0	0
July	0.1	0	0.05	3
Aug.	23	0	3	188
Sept.	6	0.1	1.3	77
Oct.	0.1	0	0.04	3
Nov.	350	0	26	1,584
Dec.	1756	7	80	4,982
Total	..	..	..	7,932

Year 1962

Jan.	2465	20	156	9,650
Feb.	4935	41	190	10,630
Mar.	41	3	14	886
Apr.	424	1	62	3,704
May	8560	7	335	20,800
June	113	23	55	3,302
July	399	25	49	3,058
Aug.	309	20	61	3,824
Sept.	32	15	21	1,274
Oct.	670	5	40	2,484
Nov.	53	2	12	740
Dec.	32	1	3	174
Total	..	..	..	60,526

Year 1963

Jan.	2230	10	256	15,860
Feb.	302	23	74	1,132
Mar.	1150	13	110	6,820
Apr.	209	17	35	2,084
May	4150	27	446	27,636
June	2150	80	214	12,864
July	110	60	76	4,722
Aug.	1950	48	132	8,194
Sept.	393	48	96	5,796
Oct.	120	28	50	3,086
Nov.	71	25	35	2,098
Dec.	1057	14	63	3,880
Total	..	..	..	94,172

Year 1964

Jan.	10	1	6	374
Feb.	1	1	1	51
Mar.	1	0	0.4	27
Apr.	3335	0	102	6,320
May	1468	17	99	6,116
June	8100	27	418	25,104
July	150	32	66	4,124
Aug.	32	15	23	1,404
Sept.	130	9	25	1,506
Oct.	68	9	24	1,492
Nov.	22	0.3	5	272
Dec.	0.5	0	0.2	12
Total	..	..	..	46,802

Year 1965

Jan.	0	0	0	0
Feb.	0	0	0	0
Mar.	0	0	0	0
Apr.	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	0	0	0	0
Aug.	0	0	0	0
Sept.	0	0	0	0
Oct.	0	0	0	0
Nov.	0	0	0	0
Dec.	120	0	4	274
Total	..	..	..	274

Year 1966

Jan.	0	0	0	0
Feb.	0	0	0	0
Mar.	0	0	0	0
Apr.	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	0	0	0	0
Aug.	0	0	0	0
Sept.	0	0	0	0
Oct.	491	0	8	474
Nov.	1057	0	24	1444
Dec.	0	0	0	0
Total	..	..	..	1,918

DART BROOK AT ABERDEEN

Year 1967					Year 1968				
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.	0	0	0	0	Jan.	7270	0	538	33,336
Feb.	0	0	0	0	Feb.	13	0	5	292
Mar.	2695	0	76	4,708	Mar.	0	0	0	0
Apr.	0	0	0	0	Arp.	0	0	0	0
May	0	0	0	0	May	4950	0	178	11,050
June	90	0	6.4	384	June	7	1.5	3	184
July	27	0	1.6	98	July	1	0.1	0.6	36
Aug.	90	0	4.9	302	Aug.	815	0	82	5,051
Sept.	0	0	0	0	Sept.	43	3	18	1,098
Oct.	270	0	43	2,682	Oct.	1170	1	42	2,610
Nov.	0	0	0	0	Nov.	1	0	0.3	16
Dec.	0	0	0	0	Dec.	0	0	0	0
Total	..	..	..	9,506	Total	..	..	..	53,673

HUNTER RIVER AT MUSWELLBROOK

LOCATION:	Latitude 32°15' Longitude 150°53'
PERIOD OF ESTABLISHMENT:	December 1906 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	61 years.
ZERO OF GAUGE:	R.L.442.08 Water Conservation Datum.
CATCHMENT AREA:	1,630 square miles.
CONTROL:	Sand and gravel.
EQUIPMENT:	Pressure recorder installed May 1952 Float recorder installed May 1960 Staff gauge range 0 to 35 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 503
	(b) Maximum observation in cusecs : 25,100
	(c) Minimum observation in cusecs : 0
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	140,000 cusecs.
MEAN DAILY DISCHARGE FOR 61 YEARS:	430 cusecs.
MEAN ANNUAL DISCHARGE FOR 61 YEARS:	314,000 acre feet
REMARKS:	Between 1928 and 1960 the gauge on Muswellbrook Bridge was discontinued and records were computed for the Hunter River at Muswellbrook Weir which is located approximately ⅓ mile downstream from Muswellbrook Bridge.

HUNTER RIVER AT MUSWELLBROOK

Year 1907

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	24	4	5	300
Feb.	4	4	4	224
Mar.	1350	4	172	10,668
Apr.	27	9	17	1,044
May	1070	4	99	6,146
June	1680	6	595	35,718
July	790	33	255	15,786
Aug.	790	30	158	9,822
Sept.	44	21	27	1,640
Oct.	73	9	18	1,106
Nov.	328	24	66	3,968
Dec.	7750	24	510	31,638
Total	..	..	..	118,060

Year 1908

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	560	24	68	4,222
Feb.	7750	103	1645	95,390
Mar.	23200	223	1569	97,124
Apr.	268	133	188	11,280
May	390	52	133	8,054
June	307	52	203	12,210
July	1295	52	177	10,952
Aug.	8275	223	1436	89,042
Sept.	5140	178	782	46,922
Oct.	223	44	110	6,798
Nov.	1010	24	86	5,174
Dec.	133	21	35	2,144
Total	..	..	..	389,312

Year 1909

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	118	6	24	1,462
Feb.	328	30	93	5,184
Mar.	30	12	20	1,260
Apr.	24	12	13	804
May	24	18	19	1,206
June	268	18	122	7,354
July	223	61	107	6,662
Aug.	2410	61	359	22,234
Sept.	2,500	163	624	37,448
Oct.	840	103	202	12,520
Nov.	238	73	103	6,210
Dec.	2700	73	275	17,020
Total	..	..	..	119,364

Year 1910

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	46000	88	1947	180,736
Feb.	450	148	262	14,696
Mar.	1680	133	319	19,768
Apr.	133	118	127	7,650
May	900	118	183	11,366
June	1680	118	341	20,446
July	2200	208	587	36,394
Aug.	450	133	226	14,034
Sept.	133	73	103	6,180
Oct.	73	61	69	4,262
Nov.	61	38	47	2,842
Dec.	307	33	109	6,732
Total	..	..	..	325,106

Year 1911

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	5225	73	784	48,602
Feb.	1800	287	551	30,852
Mar.	1680	238	482	29,910
Apr.	500	148	210	12,592
May	328	133	166	10,292
June	328	133	178	10,688
July	3700	133	850	52,722
Aug.	16100	178	1191	73,830
Sept.	900	208	400	24,020
Oct.	287	88	163	10,114
Nov.	1900	52	201	12,062
Dec.	15200	38	729	45,232
Total	..	..	..	360,916

Year 1912

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	223	301	77	4,796
Feb.	2700	27	236	13,704
Mar.	223	30	95	5,904
Apr.	193	33	94	5,656
May	500	52	110	6,844
June	450	103	144	8,644
July	6750	118	977	60,552
Aug.	1580	148	430	26,636
Sept.	163	44	92	5,540
Oct.	103	21	37	2,314
Nov.	21	21	21	1,260
Dec.	1010	9	66	4,096
Total	..	..	..	145,946

Year 1913

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1070	12	66	4,114
Feb.	7750	12	504	25,236
Mar.	133	24	55	3,458
Apr.	5981	30	778	46,726
May	65000	73	4026	249,642
June	7590	620	3521	211,278
July	57000	710	2524	156,484
Aug.	680	340	474	29,380
Sept.	470	261	315	18,906
Oct.	470	141	246	15,308
Nov.	365	94	171	10,246
Dec.	117	48	68	4,204
Total	..	..	..	774,982

Year 1914

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	770	18	94	5,832
Feb.	48	9	25	1,392
Mar.	1530	25	183	11,328
Apr.	147	48	93	5,608
May	189	60	93	5,802
June	4600	83	506	30,372
July	2720	261	502	31,116
Aug.	249	141	181	11,238
Sept.	4060	105	394	23,666
Oct.	2540	117	475	29,464
Nov.	2630	189	441	26,442
Dec.	430	25	155	9,602
Total	..	..	..	191,862

HUNTER RIVER AT MUSWELLBROOK

Year 1915

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1170	18	220	13,664
Feb.	141	8	28	1,570
Mar.	8	4	6	348
Apr.	11	6	8	502
May	7220	7	468	28,998
June	930	25	165	9,918
July	11300	71	648	40,166
Aug.	470	117	200	12,398
Sept.	620	25	162	9,712
Oct.	83	9	33	2,020
Nov.	12	8	10	622
Dec.	1390	8	202	12,564
Total	..	..	..	132,482

Year 1916

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	183	35	63	3,926
Feb.	3860	30	383	22,194
Mar.	163	45	45	2,782
Apr.	500	67	154	9,230
May	1510	73	257	15,932
June	2760	96	572	34,356
July	1510	210	506	32,350
Aug.	1740	243	587	36,394
Sept.	656	130	234	14,014
Oct.	4530	202	600	37,254
Nov.	1540	130	310	18,580
Dec.	15700	292	2168	134,384
Total	..	..	..	360,396

Year 1917

Jan.	355	147	242	15,014
Feb.	708	55	199	11,140
Mar.	45	25	45	2,770
Apr.	398	25	65	3,886
May	35	20	26	1,600
June	398	13	59	3,568
July	222	30	70	4,312
Aug.	222	55	104	6,462
Sept.	17000	35	1338	80,280
Oct.	2100	202	497	30,784
Nov.	4440	202	1208	72,470
Dec.	3250	222	1124	69,698
Total	..	..	..	301,984

Year 1918

Jan.	2450	147	496	39,740
Feb.	2450	260	814	45,604
Mar.	260	156	196	12,190
Apr.	138	68	106	6,402
May	95	85	87	5,410
June	85	68	79	4,736
July	237	59	89	5,490
Aug.	1390	129	343	21,252
Sept.	1570	175	418	25,086
Oct.	175	76	110	6,822
Nov.	138	33	53	3,192
Dec.	26	10	13	826
Total	..	..	..	167,750

Year 1919

Jan.	33	10	15	950
Feb.	335	10	28	1,596
Mar.	248	20	86	5,343
Apr.	138	26	59	3,552
May	1740	16	285	17,680
June	737	47	174	10,472
July	676	43	84	5,202
Aug.	317	43	91	5,660
Sept.	521	39	127	7,614
Oct.	117	39	61	3,786
Nov.	39	7	15	896
Dec.	347	2	33	2,032
Total	..	..	..	64,783

Year 1920

Jan.	1123	2	134	8,282
Feb.	1370	3	121	7,010
Mar.	2	0	1	60
Apr.	2	0	1	52
May	10	2	6	372
June	9000	4	445	26,746
July	17500	169	1551	96,160
Aug.	4020	225	707	43,812
Sept.	800	169	322	19,314
Oct.	142	23	59	3,672
Nov.	47	1	10	614
Dec.	16100	0	1427	88,466
Total	..	..	..	294,560

Year 1921

Jan.	347	4	75	4,670
Feb.	74	2	18	1,000
Mar.	23200	4	1037	64,302
Apr.	13500	74	1715	102,918
May	1860	240	642	39,808
June	6740	636	1758	105,464
July	53000	891	6785	420,660
Aug.	2170	800	1281	79,424
Sept.	982	656	754	45,242
Oct.	2040	560	1004	62,250
Nov.	800	347	427	25,564
Dec.	937	197	353	21,872
Total	..	..	..	973,174

Year 1922

Jan.	10900	211	1392	86,304
Feb.	256	117	167	9,370
Mar.	332	74	142	8,796
Apr.	74	39	48	2,860
May	39	39	39	2,418
June	39	39	39	2,340
July	2425	39	392	24,332
Aug.	9000	225	1099	68,164
Sept.	2630	155	566	33,960
Oct.	380	74	148	9,152
Nov.	94	4	28	1,666
Dec.	3775	4	307	19,042
Total	..	..	..	268,404

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HUNTER RIVER AT MUSWELLBROOK

Year 1923					Year 1924				
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.	271	2	32	1,998	Jan.	1900	41	247	15,330
Feb.	7	0	2	110	Feb.	3340	90	486	28,208
Mar.	0	0	0	0	Mar.	122	50	66	4,110
Apr.	169	0	17	1,056	Apr.	2600	76	565	33,924
May	No Records			520*	May	380	122	180	11,598
June	No Records			20,900*	June	500	140	232	13,916
July	No Records			57,400*	July	2120	175	484	30,052
Aug.	No Records			36,500*	Aug.	770	204	320	19,800
Sept.	No Records			33,600*	Sept.	1900	122	273	16,374
Oct.	No Records			7,400*	Oct.	2600	149	463	28,740
Nov.	No Records			7,020*	Nov.	4510	158	1163	69,768
Dec.	No Records			2,780*	Dec.	2870	218	670	41,546
Total	..	..	..	169,284*	Total	..	..	..	313,366

Year 1925					Year 1926				
Jan.	218	170	193	11,972	Jan.	770	13	153	9,482
Feb.	245	67	171	9,784	Feb.	13	2	5	276
Mar.	150	30	48	2,978	Mar.	10900	1	535	33,192
Apr.	50	22	36	2,144	Apr.	1460	85	430	25,802
May	350	19	129	8,018	May	5890	85	1121	69,516
June	1190	26	259	15,584	June	2360	218	751	45,066
July	380	150	227	14,066	July	6450	218	1209	78,942
Aug.	181	150	157	9,726	Aug.	225	142	175	10,982
Sept.	300	155	150	9,022	Sept.	142	111	117	7,078
Oct.	85	13	33	2,058	Oct.	105	67	84	5,232
Nov.	470	35	147	8,810	Nov.	67	52	59	3,590
Dec.	740	59	172	10,698	Dec.	6450	52	608	37,700
Total	..	..	..	104,860	Total	..	..	..	326,858

Year 1927					Year 1928				
Jan.	2840	111	559	34,668	Jan.	2360	80	545	33,792
Feb.	180	105	125	7,006	Feb.	3300	150	662	38,404
Mar.	730	89	145	9,032	Mar.	3000	37	352	21,838
Apr.	12000	111	1553	93,220	Apr.	18500	295	1054	63,278
May	670	135	249	15,434	May	295	150	233	14,472
June	135	100	119	7,184	June	33500	100	3541	212,516
July	100	84	90	5,612	July	41500	530	2498	154,890
Aug.	200	84	108	6,692	Aug.	1950	435	798	49,460
Sept.	89	42	65	3,810	Sept.	435	205	318	19,096
Oct.	78	52	67	4,210	Oct.	470	100	165	10,246
Nov.	1050	42	119	7,186	Nov.	150	37	75	4,488
Dec.	1370	111	254	15,762	Dec.	37	14	27	1,702
Total	..	..	..	209,816	Total	..	..	..	624,182

Year 1929					Year 1930				
Jan.	100	3	20	1,278	Jan.	26	6	14	842
Feb.	3000	1	601	33,640	Feb.	9	2	4	220
Mar.	1430	100	206	12,752	Mar.	210	1	60	3,752
Apr.	177	62	112	6,734	Apr.	69	9	26	1,570
May	62	1	23	1,424	May	210	18	76	4,680
June	470	150	222	13,338	June	46000	69	2493	149,604
July	470	62	149	9,290	July	2050	301	590	36,560
Aug.	650	150	311	19,296	Aug.	367	185	261	16,222
Sept.	47500	235	2678	160,462	Sept.	301	83	147	8,848
Oct.	1430	160	450	27,890	Oct.	435	18	199	12,348
Nov.	400	83	203	12,202	Nov.	185	55	95	5,698
Dec.	83	18	39	2,416	Dec.	101	9	26	1,600
Total	..	..	..	300,722	Total	..	..	..	241,944

* ESTIMATED

HUNTER RIVER AT MUSWELLBROOK.

Year 1931

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	575	6	99	6,150
Feb.	185	3	26	1,494
Mar.	780	6	120	7,430
Apr.	21700	55	1641	98,486
May	27600	210	1505	93,300
June	14000	367	1319	79,180
July	50500	575	3616	224,210
Aug.	610	268	410	254,422
Sept.	367	185	258	15,462
Oct.	185	83	132	8,222
Nov.	400	55	134	8,036
Dec.	2470	55	330	20,450
Total	..	..	..	587,842

Year 1932

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	210	18	78	4,816
Feb.	1750	44	165	9,574
Mar.	2250	34	280	17,342
Apr.	160	69	92	5,532
May	301	69	102	6,364
June	239	83	97	5,800
July	3000	140	523	32,436
Aug.	334	120	211	13,080
Sept.	15700	140	1919	115,184
Oct.	870	210	451	27,996
Nov.	268	101	162	9,728
Dec.	210	44	80	4,938
Total	..	..	..	252,790

Year 1933

Jan.	2050	44	405	25,150
Feb.	400	9	96	5,384
Mar.	40	0	9	582
Apr.	102	24	45	2,694
May	208	30	64	3,952
June	575	60	187	11,208
July	2700	117	727	45,070
Aug.	1210	158	346	21,464
Sept.	1110	88	285	17,090
Oct.	18600	158	1467	90,958
Nov.	4810	234	929	55,776
Dec.	2030	310	584	36,194
Total	..	..	..	315,522

Year 1934

Jan.	620	117	223	13,846
Feb.	2160	208	483	27,030
Mar.	310	88	150	9,264
Apr.	310	74	129	7,726
May	285	74	105	6,518
June	234	88	137	8,252
July	4970	102	371	23,000
Aug.	1550	380	641	39,750
Sept.	24000	310	2287	137,230
Oct.	2030	260	530	32,820
Nov.	1550	158	289	17,332
Dec.	11800	158	1134	70,288
Total	..	..	..	393,056

Year 1935

Jan.	11800	260	882	54,700
Feb.	260	102	167	9,380
Mar.	183	50	83	5,178
Apr.	88	50	61	3,644
May	88,	50	65	4,036
June	60	50	52	3,100
July	158	50	93	5,756
Aug.	137	50	68	4,208
Sept.	158	35	80	4,784
Oct.	1110	18	168	10,382
Nov.	88	1	25	1,496
Dec.	60	0	15	910
Total	..	..	..	107,574

Year 1936

Jan.	365	0	48	2,942
Feb.	296	0	33	1,892
Mar.	3000	24	283	17,576
Apr.	1660	40	250	15,022
May	158	74	91	5,612
June	88	60	70	4,216
July	487	88	238	14,732
Aug.	2290	88	431	26,732
Sept.	234	40	82	4,944
Oct.	40	2	15	922
Nov.	0.5	0.5	0.5	27
Dec.	745	0	138	8,574
Total	..	..	..	103,191

Year 1937

Jan.	870	5	140	8,656
Feb.	1900	3	124	6,938
Mar.	1550	14	165	10,230
Apr.	88	27	49	2,960
May	60	24	40	2,484
June	3100	30	393	23,582
July	1430	183	381	23,638
Aug.	4480	137	579	35,874
Sept.	1720	102	317	19,004
Oct.	208	50	118	7,300
Nov.	700	35	202	12,126
Dec.	850	1	82	5,068
Total	..	..	..	157,860

Year 1938

Jan.	345	2	44	2,742
Feb.	620	21	101	5,666
Mar.	30	2	8.6	532
Apr.	2700	0	227	13,600
May	445	40	100	6,244
June	158	60	86	5,168
July	445	60	111	6,880
Aug.	3100	183	484	30,010
Sept.	260	88	107	7,644
Oct.	445	24	95	5,908
Nov.	1110	27	141	8,470
Dec.	158	0	19	1,178
Total	..	..	..	94,042

HUNTER RIVER AT MUSWELLBROOK.

Year 1939

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	620	0	41	2,528
Feb.	74	0	8	466
Mar.	1780	0	328	20,332
Apr.	620	7	180	10,804
May.	88	40	58	3,604
June	60	30	39	2,320
July	260	30	92	5,722
Aug.	445	60	156	9,664
Sept	2560	30	141	8,488
Oct.	800	102	232	14,458
Nov.	102	14	51	3,062
Dec.	260	0	30	1,482
Total	..	..	..	82,930

Year 1940

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	No Records			2,280*
Feb.	No Records			1*
Mar.	No Records			0*
Apr.	No Records			5,840*
May	No Records			620*
June	8	0	3	166
July	6	1	3	192
Aug.	26	1	11	672
Sept	8	0	1.4	86
Oct.	174	0	28	1,736
Nov.	800	0	69	4,142
Dec.	No Records			30,900*
Total	..	..	..	46,275*

Year 1941

Jan.	No Records			33,200*
Feb.	305	26	114	6,360
Mar.	365	0	80	4,970
Apr.	75	2	20	1,224
May	45	1	10	652
June	550	23	132	7,928
July	275	40	88	5,450
Aug.	186	29	56	3,452
Sept.	75	6	40	2,420
Oct.	800	68	220	13,620
Nov.	230	0	24	1,410
Dec.	0	0	0	0
Total	..	..	..	80,686*

Year 1942

Jan.	0	0	0	0
Feb.	0	0	0	0
Mar.	10500	0	480	29,752
Apr.	1320	8	116	6,980
May	10	3	6	356
June	60	10	29	1,740
July	33600	6	1581	98,028
Aug.	99	54	74	4,600
Sept.	131	42	72	4,336
Oct.	21300	42	1614	100,044
Nov.	5800	123	587	35,194
Dec.	123	30	72	4,472
Total	..	..	..	285,502

Year 1943

Jan.	4770	73	218	13,542
Feb.	84	8	41	2,284
Mar.	8	0	0.6	38
Apr.	8	0	4	212
May	1225	3	289	17,942
June	287	62	135	8,080
July	134	52	86	5,304
Aug.	1450	83	585	36,296
Sept.	420	222	289	17,358
Oct.	252	135	193	11,940
Nov.	3480	102	406	24,384
Dec.	252	148	186	11,546
Total	..	..	..	148,926

Year 1944

Jan.	505	0	140	8,648
Feb.	4080	37	222	12,870
Mar.	52	0	17	1,024
Apr.	37	3	12	730
May	1020	5	81	5,098
June	103	15	41	2,468
July	480	25	137	9,120
Aug.	10500	78	827	51,254
Sept.	650	185	314	18,878
Oct.	185	32	77	4,786
Nov.	37	2	12	700
Dec.	16	0	3	214
Total	..	..	..	115,790

Year 1945

Jan.	367	0	69	4,278
Feb.	1675	16	142	7,968
Mar.	710	0	287	17,778
Apr.	130	1	54	3,244
May	1020	16	216	13,364
June	27000	47	3684	221,070
July	2040	284	587	36,360
Aug.	1290	44	429	26,652
Sept.	735	105	204	12,278
Oct.	403	10	97	6,034
Nov.	199	0.5	53	3,206
Dec.	138	0.1	541	3,353
Total	..	..	..	355,586

Year 1946

Jan.	48	0.1	25	1,510
Feb.	33	0	2.9	163
Mar.	165	0	12	792
Apr.	21300	21	743	44,552
May	287	97	137	8,528
June	5410	97	528	31,650
July	510	138	245	15,166
Aug.	138	74	107	6,596
Sept.	89	24	54	3,222
Oct.	52	2	33	2,074
Nov.	180	1.5	22	1,306
Dec.	1.5	0	1.1	64
Total	..	..	..	115,624

* Estimated.

HUNTER RIVER AT MUSWELLBROOK

Year 1947

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	680	0	31	1,930
Feb.	510	4	84	4,680
Mar.	595	17	116	7,214
Apr.	260	29	62	3,714
May	70	29	50	3,078
June	1470	60	214	12,840
July	156	49	83	5,144
Aug.	208	43	72	4,478
Sept.	2350	54	207	12,424
Oct.	850	54	195	12,054
Nov.	261	48	85	5,096
Dec.	5030	176	947	58,692
Total	..	..	..	131,344

Year 1948

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1840	71	364	22,580
Feb.	361	41	87	5,058
Mar.	5410	71	296	18,378
Apr.	95	32	45	2,718
May	361	32	110	6,612
June	1230	48	383	22,976
July	398	111	178	10,998
Aug.	955	63	154	9,550
Sept.	3830	95	557	33,434
Oct.	361	54	145	8,956
Nov.	63	8	36	2,014
Dec.	176	10	36	2,194
Total	..	..	..	145,468

Year 1949

Jan.	955	32	240	15,116
Feb.	5540	16	439	25,488
Mar.	730	146	287	17,812
Apr.	4200	71	385	23,080
May	1010	115	194	12,066
June	7800	146	1183	71,006
July	33200	232	1629	100,980
Aug.	3970	293	791	49,010
Sept.	6970	473	2060	123,610
Oct.	37300	510	1691	104,844
Nov.	1010	230	362	21,684
Dec.	555	115	222	13,748
Total	..	..	..	578,444

Year 1950

Jan.	680	80	201	12,450
Feb.	11900	40	981	54,948
Mar.	214	115	167	10,364
Apr.	43100	115	2573	154,402
May	2830	270	538	33,354
June	39000	372	8672	520,314
July	27500	1710	5594	346,796
Aug.	10600	1170	2425	150,346
Sept.	1060	404	736	44,138
Oct.	22800	437	1990	123,398
Nov.	9900	595	1832	109,900
Dec.	1120	293	542	33,626
Total	..	..	..	1,594,036

Year 1951

Jan.	23400	317	2041	126,558
Feb.	1010	270	496	27,758
Mar.	317	124	184	11,440
Apr.	157	105	117	7,002
May	145	115	126	7,808
June	18400	124	2967	178,022
July	18400	640	2006	124,362
Aug.	4370	473	856	53,050
Sept.	640	250	357	21,396
Oct.	230	115	169	10,460
Nov.	145	10	80	4,792
Dec.	145	16	62	3,876
Total	..	..	..	576,524

Year 1952

Jan.	134	0.8	45	2,779
Feb.	145	0	34	1,928
Mar.	473	16	112	6,860
Apr.	No Records			
May	790	49	233	14,476
June	5800	145	857	51,424
July	4370	197	520	32,248
Aug.	40200	735	4035	250,172
Sept.	790	250	438	26,264
Oct.	790	213	323	20,044
Nov.	317	108	167	10,032
Dec.	133	37	78	4,806
Total	..	..	..	..

Year 1953

Jan.	372	76	166	10,308
Feb.	1650	9	272	15,226
Mar.	270	50	127	7,860
Apr.	133	19	597	3,582
May	9480	60	1017	33,060
June	197	123	157	9,426
July	1010	168	287	17,818
Aug.	3530	143	481	29,838
Sept.	900	123	257	15,394
Oct.	168	56	118	7,292
Nov.	143	9	66	3,960
Dec.	71	0	22	1,344
Total	..	..	..	155,108

Year 1954

Jan.	6190	1.5	369	22,876
Feb.	35500	71	2540	142,258
Mar.	790	65	295	18,308
Apr.	78	28	51	3,094
May	181	49	105	6,520
June	595	94	164	9,896
July	437	82	175	10,874
Aug.	372	71	180	11,174
Sept.	3580	91	394	23,648
Oct.	17400	35	925	57,344
Nov.	5150	197	817	48,992
Dec.	461	91	247	15,310
Total	..	..	..	370,294

HUNTER RIVER AT MUSWELLBROOK

Year 1955

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	692	17	154	9,602
Feb.	140000	110	8879	497,210
Mar.	7880	530	2030	125,860
Apr.	690	265	421	25,270
May	1520	265	517	32,050
June	1110	400	613	36,780
July	400	265	328	20,320
Aug.	3615	240	537	33,286
Sept.	530	218	305	18,268
Oct.	17000	169	1504	93,224
Nov.	1845	218	440	26,412
Dec.	775	180	337	20,868
Total	..	..	..	939,150

Year 1956

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1030	59	216	13,380
Feb.	21300	345	3418	198,290
Mar.	13400	777	2559	158,652
Apr.	860	370	585	35,080
May	16700	445	1778	110,202
June	20300	777	1889	113,362
July	17200	777	1821	112,886
Aug.	11600	610	1580	97,930
Sept.	610	305	442	26,530
Oct.	1110	252	356	22,044
Nov.	345	196	246	14,784
Dec.	690	74	184	11,456
Total	..	..	..	914,596

Year 1957

Jan.	240	41	108	6,702
Feb.	24800	32	1481	82,958
Mar.	305	109	191	11,840
Apr.	196	79	111	6,664
May	188	74	101	6,246
June	265	99	143	8,580
July	345	169	227	14,050
Aug.	1358	165	377	23,400
Sept.	528	60	166	9,970
Oct.	60	0	30	1,862
Nov.	95	0	9.8	588
Dec.	0	0	0	0
Total	..	..	..	172,860

Year 1958

Jan.	1441	0	53	3,304
Feb.	1773	36	339	18,966
Mar.	94	0	20	1,230
Apr.	27	0	9.6	574
May	124	3	26	1,644
June	528	3	32	1,924
July	528	16	104	6,438
Aug.	209	6	52	3,220
Sept.	14000	22	377	22,626
Oct.	12600	67	385	23,872
Nov.	140	27	57	3,442
Dec.	187	62	107	6,648
Total	..	..	..	93,888

Year 1959

Jan.	288	72	134	8,310
Feb.	5150	115	384	21,524
Mar.	3000	153	292	18,074
Apr.	860	122	250	15,026
May	153	104	124	7,724
June	1190	99	181	10,864
July	2190	161	305	18,918
Aug.	3000	146	379	23,524
Sept.	466	150	213	12,780
Oct.	3615	157	414	25,664
Nov.	3000	538	907	54,414
Dec.	2320	256	491	30,434
Total	..	..	..	247,256

Year 1960

Jan.	288	129	222	13,772
Feb.	230	107	141	8,186
Mar.	230	79	114	7,042
Apr.	135	85	95	5,716
May	111	69	88	5,444
June	288	77	122	7,312
July	1680	310	672	41,686
Aug.	3220	288	488	30,234
Sept.	830	143	211	12,676
Oct.	502	94	209	12,960
Nov.	1130	85	207	12,436
Dec.	8010	94	507	31,420
Total	..	..	..	188,884

Year 1961

Jan.	1465	72	445	27,606
Feb.	510	188	268	14,986
Mar.	456	167	203	12,626
Apr.	230	119	182	10,896
May	206	179	194	12,018
June	1571	170	303	18,210
July	248	164	182	11,282
Aug.	2545	46	452	28,002
Sept.	453	63	282	16,902
Oct.	290	113	185	11,488
Nov.	2622	102	270	16,202
Dec.	3430	134	515	31,932
Total	..	..	..	212,150

Year 1962

Jan.	12600	246	1485	92,078
Feb.	9700	260	852	47,710
Mar.	353	162	224	13,862
Apr.	10200	160	1196	71,738
May	31100	132	1882	116,678
June	1160	194	428	25,692
July	2710	224	473	29,310
Aug.	2153	243	523	32,446
Sept.	666	183	350	20,986
Oct.	2950	160	446	27,630
Nov.	790	307	373	22,386
Dec.	2108	282	393	24,356
Total	..	..	..	524,872

HUNTER RIVER AT MUSWELLBROOK

Year 1963

Month	Discharge in Cusecs			Discharge for Month Acre feet
	Max.	Min.	Mean	
Jan.	9592	355	1085	67,298
Feb.	1490	235	432	24,216
Mar.	9690	199	906	56,156
Apr.	2000	207	350	21,014
May	13900	299	2387	148,022
June	7390	436	1482	88,934
July	1558	312	626	38,800
Aug.	12300	421	1535	95,174
Sept.	10400	313	1707	102,420
Oct.	2457	386	654	40,538
Nov.	614	339	389	23,338
Dec.	2280	263	403	24,968
Total	..	..	..	730,876

Year 1964

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	431	220	254	15,748
Feb.	305	213	250	14,494
Mar.	372	193	262	16,222
Apr.	8780	240	595	35,700
May	4470	155	394	24,460
June	19600	208	1531	91,896
July	2460	316	603	37,410
Aug.	648	204	337	20,912
Sept.	2036	236	350	21,000
Oct.	1100	172	328	20,348
Nov.	240	125	170	10,172
Dec.	276	149	219	13,584
Total	..	..	..	321,946

Year 1965

Jan.	280	196	254	15,768
Feb.	276	184	221	12,384
Mar.	236	157	200	12,416
Apr.	208	146	173	10,418
May	146	74	104	6,444
June	106	35	66	3,952
July	1030	31	87	5,390
Aug.	54	31	39	2,400
Sept.	430	20	72	4,294
Oct.	430	31	142	8,814
Nov.	356	31	175	10,526
Dec.	360	32	152	9,448
Total	..	..	..	102,254

Year 1966

Jan.	284	177	227	14,054
Feb.	226	160	182	10,214
Mar.	226	41	141	8,742
Apr.	126	60	91	5,462
May	102	50	75	4,636
June	214	24	49	2,892
July	75	16	32	1,968
Aug.	66	32	43	2,668
Sept.	47	14	29	1,752
Oct.	448	22	73	4,504
Nov.	1010	14	114	6,826
Dec.	254	35	80	4,938
Total	..	..	..	68,656

Year 1967

Jan.	136	69	108	6,712
Feb.	153	108	135	7,580
Mar.	7106	34	235	14,578
Apr.	395	66	139	8,352
May	108	22	72	4,468
June	2930	15	401	24,060
July	798	56	139	8,616
Aug.	1602	50	197	12,226
Sept.	1155	56	162	9,706
Oct.	13900	61	656	40,702
Nov.	303	63	112	6,710
Dec.	237	103	182	11,306
Total	..	..	..	155,016

Year 1968

Jan.	23500	153	1833	113,600
Feb.	150	90	124	7,218
Mar.	188	80	124	7,724
Apr.	161	78	102	6,092
May	24870	73	787	48,794
June	218	72	103	6,202
July	1102	84	208	12,916
Aug.	9155	172	1232	76,392
Sept.	2800	430	653	39,176
Oct.	2755	236	621	38,518
Nov.	375	188	273	16,406
Dec.	328	166	212	13,158
Total	..	..	..	386,196

GOULBURN RIVER AT COGGAN

LOCATION:	Latitude 32°20' Longitude 150°07'
PERIOD OF ESTABLISHMENT:	October 1912 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	56 years.
ZERO OF GAUGE:	R.L.672.03 North West Water Conservation Datum.
CATCHMENT AREA:	1,290 square miles.
CONTROL:	Gravel.
EQUIPMENT:	Staff gauge, range 0 to 40 feet
CURRENT METER OBSERVATIONS:	(a) Number obtained : 166
	(b) Maximum observation in cusecs :1,320
	(c) Minimum observation in cusecs : 0
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	140,000 cusecs.
MEAN DAILY DISCHARGE FOR 56 YEARS:	99 cusecs
MEAN ANNUAL DISCHARGE FOR 56 YEARS:	72,000 acre feet

Appendix 12
Sheet 2

GOULBURN RIVER AT COGGAN

Year 1913

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	4	0	0	16
Feb.	6	0	0	12
Mar.	10	0	3	176
Apr.	824	4	43	2,580
May	26500	4	513	31,764
June	380	26	88	5,310
July	98	34	60	3,694
Aug.	53	34	39	2,444
Sept.	44	26	31	1,884
Oct.	34	19	27	1,666
Nov.	19	14	16	930
Dec.	14	4	8	508
Total	..	..	..	50,984

Year 1914

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	44	4	8	526
Feb.	9	4	5	262
Mar.	62	4	17	1,074
Apr.	89	9	18	1,098
May	34	9	17	1,068
June	19	14	15	902
July	89	14	25	1,552
Aug.	14	9	12	768
Sept.	19	9	13	780
Oct.	14	9	14	828
Nov.	240	9	42	2,510
Dec.	53	6	20	1,258
Total	..	..	..	12,626

Year 1915

Jan.	80	9	27	1,644
Feb.	19	6	8	474
Mar.	6	4	10	644
Apr.	53	6	16	980
May	89	9	32	1,956
June	19	14	18	1,080
July	59	19	29	1,828
Aug.	44	19	23	1,450
Sept.	26	19	23	1,360
Oct.	26	14	18	1,110
Nov.	9	9	9	540
Dec.	291	4	17	1,080
Total	..	..	..	14,146

Year 1916

Jan.	1260	4	53	3,278
Feb.	2820	4	75	4,346
Mar.	9	4	5	304
Apr.	4	4	4	240
May	9	4	5	304
June	216	14	58	3,500
July	1035	26	116	7,220
Aug.	926	34	122	7,592
Sept.	53	19	36	2,176
Oct.	980	53	177	10,976
Nov.	89	34	54	3,024
Dec.	1090	34	168	1,044
Total	..	..	..	44,004

Year 1917

Jan.	71	19	29	1,776
Feb.	89	14	37	2,082
Mar.	14	14	14	868
Apr.	14	6	11	634
May	14	14	14	868
June	34	14	23	1,372
July	14	14	14	868
Aug.	14	9	13	828
Sept.	700	9	103	6,184
Oct.	155	9	52	3,246
Nov.	558	9	71	4,262
Dec.	739	14	74	4,568
Total	..	..	..	27,556

Year 1918

Jan.	71	19	33	2,068
Feb.	71	19	32	1,782
Mar.	19	14	15	928
Apr.	14	14	14	840
May	14	14	14	868
June	14	9	13	760
July	34	9	14	890
Aug.	89	14	24	1,502
Sept.	26	14	17	1,038
Oct.	26	14	18	1,132
Nov.	34	6	11	656
Dec.	6	4	5	308
Total	..	..	..	12,772

Year 1919

Jan.	4	2	3	204
Feb.	2	2	2	112
Mar.	240	2	13	782
Apr.	4	2	3	156
May	14	2	4	246
June	14	6	7	418
July	9	6	6	396
Aug.	89	6	20	1210
Sept.	14	4	7	402
Oct.	2930	0	53	3306
Nov.	80	0	1	82
Dec.	780	0	29	1808
Total	..	..	..	9,122

Year 1920

Jan.	278	0	45	2,794
Feb.	173	0	10	608
Mar.	0	0	0	0
Apr.	164	0	8	506
May	19	0	1	38
June	9280	4	429	25,752
July	56100	98	2528	156,714
Aug.	205	89	117	7,284
Sept.	194	89	114	6,852
Oct.	98	71	78	4,852
Nov.	127	62	65	3,886
Dec.	5990	53	285	17,640
Total	..	..	..	226,926

GOULBURN RIVER AT COGGAN

Year 1921

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	62	62	62	3,844
Feb.	62	62	62	3,472
Mar.	53	53	53	3,286
Apr.	980	53	106	6,376
May	400	53	95	5,882
June	2930	127	373	22,402
July	45000	84	1791	111,070
Aug.	2280	62	175	10,850
Sept.	62	62	62	3,720
Oct.	53	53	53	3,286
Nov.	108	44	56	3,370
Dec.	194	34	59	3,658
Total	..	..	..	181,216

Year 1922

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	498	53	100	6,182
Feb.	53	34	39	2,200
Mar.	44	26	32	1,964
Apr.	26	26	26	1,560
May	44	26	29	1,808
June	34	34	34	2,040
July	62	34	39	2,436
Aug.	34	34	34	2,108
Sept.	71	34	37	2,282
Oct.	34	26	28	1,740
Nov.	26	9	15	916
Dec.	80	9	25	1,546
Total	..	..	..	26,782

Year 1923

Jan.	53	9	13	786
Feb.	9	9	9	504
Mar.	9	9	9	558
Apr.	9	9	9	540
May	9	9	9	558
June	34	9	20	1,176
July	26	19	21	1,332
Aug.	19	19	19	1,178
Sept.	146	19	61	3,646
Oct.	19	19	19	1,178
Nov.	19	14	16	940
Dec.	14	14	14	868
Total	..	..	..	13,264

Year 1924

Jan.	34	14	18	1,138
Feb.	498	19	64	3,714
Mar.	71	19	23	1,454
Apr.	53	44	47	2,802
May	44	26	29	1,824
June	26	26	26	1,560
July	26	26	26	1,612
Aug.	26	26	26	1,612
Sept.	80	26	32	1,906
Oct.	62	26	32	1,962
Nov.	2280	19	252	15,110
Dec.	14	4	5	282
Total	..	..	..	34,976

Year 1925

Jan.	2	0	1	64
Feb.	232	0	16	890
Mar.	0	0	0	0
Apr.	0	0	0	0
May	2	0	1	80
June	2	2	2	120
July	4	2	3	168
Aug.	6	2	4	232
Sept.	4	2	4	220
Oct.	2	2	2	124
Nov.	4	2	3	164
Dec.	2	0	1	68
Total	..	..	..	2,130

Year 1926

Jan.	46	0	3	160
Feb.	0	0	0	0
Mar.	45000	0	1254	77,776
Apr.	3400	80	290	17,380
May	1810	89	182	11,270
June	216	98	130	7,798
July	118	89	102	6,346
Aug.	89	89	89	5,518
Sept.	155	89	95	5,684
Oct.	108	34	67	4,128
Nov.	34	9	12	718
Dec.	6590	9	212	13,154
Total	..	..	..	149,932

Year 1927

Jan.	197	6	47	2,926
Feb.	20	2	6	328
Mar.	6	2	4	244
Apr.	232	2	31	1,858
May	20	10	13	784
June	14	10	11	640
July	10	10	10	620
Aug.	14	6	10	612
Sept.	10	6	6	384
Oct.	20	4	10	640
Nov.	343	0	30	1,794
Dec.	104	6	18	1,088
Total	..	..	..	11,918

Year 1928

Jan.	163	0	14	880
Feb.	15400	4	962	55,774
Mar.	1450	27	105	6,484
Apr.	254	54	95	5,706
May	45	27	33	2,070
June	45	27	32	1,908
July	200	36	65	4,048
Aug.	90	20	41	2,540
Sept.	20	14	20	1,176
Oct.	14	6	10	604
Nov.	6	1	4	236
Dec.	2	2	2	124
Total	..	..	..	81,550

GOULBURN RIVER AT COGGAN

Year 1929

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	4	1	1	110
Feb.	5250	1	277	15,514
Mar.	54	4	9	520
Apr.	191	4	23	1,384
May	10	6	7	436
June	6	6	6	360
July	6	6	6	372
Aug.	14	6	9	524
Sept.	20	6	8	476
Oct.	265	6	66	4,108
Nov.	191	10	72	4,298
Dec.	54	2	8	476
Total	..	..	..	28,578

Year 1930

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	81	1	6	398
Feb.	4	1	1	66
Mar.	100	1	10	620
Apr.	2	1	1	66
May	4	1	2	146
June	10200	2	250	15,010
July	10	10	10	620
Aug.	250	10	23	1,422
Sept.	37	15	26	1,540
Oct.	528	28	71	4,426
Nov.	37	15	20	1,198
Dec.	21	10	11	684
Total	..	..	..	26,196

Year 1931

Jan.	10	6	8	484
Feb.	10	6	7	384
Mar.	136	6	33	2,022
Apr.	1320	28	97	5,798
May	7930	46	290	17,968
June	2280	73	252	15,094
July	3660	91	328	20,360
Aug.	100	64	78	4,814
Sept.	64	46	51	3,210
Oct.	46	28	38	2,330
Nov.	210	21	31	1,872
Dec.	172	15	56	3,460
Total	..	..	..	77,796

Year 1932

Jan.	15	2	6	374
Feb.	37	2	8	458
Mar.	200	2	32	1,960
Apr.	28	10	16	952
May	15	6	8	492
June	21	10	14	844
July	21	15	17	1,038
Aug.	21	15	17	1,026
Sept.	1590	15	89	5,330
Oct.	82	15	34	2,138
Nov.	190	6	37	2,254
Dec.	15	0	9	540
Total	..	..	..	17,406

Year 1933

Jan.	377	0	22	1,370
Feb.	10	0	2	132
Mar.	10	0	1	44
Apr.	21	4	9	546
May	15	4	8	480
June	21	4	6	390
July	293	6	63	3,932
Aug.	136	15	43	2,664
Sept.	282	15	32	1,932
Oct.	8710	21	265	16,452
Nov.	2600	37	190	11,426
Dec.	136	37	72	4,452
Total	..	..	..	43,820

Year 1934

Jan.	37	10	20	1,270
Feb.	9280	21	490	27,432
Mar.	136	28	68	4,220
Apr.	64	28	37	2,256
May	28	21	22	1,344
June	64	21	25	1,538
July	2820	21	101	6,232
Aug.	230	46	85	5,274
Sept.	4590	55	168	10,094
Oct.	260	37	75	4,640
Nov.	64	28	39	2,328
Dec.	220	21	61	3,788
Total	..	..	..	70,416

Year 1935

Jan.	1140	15	80	4,970
Feb.	250	6	35	1,966
Mar.	10	6	7	412
Apr.	15	6	10	612
May	21	15	16	990
June	21	10	12	742
July	21	10	15	936
Aug.	15	10	13	770
Sept.	163	10	25	1,522
Oct.	55	10	18	1,120
Nov.	10	4	5	304
Dec.	37	0	4	276
Total	..	..	..	14,620

Year 1936

Jan.	37	0	9	522
Feb.	55	0	8	468
Mar.	1450	4	63	3,930
Apr.	15	6	9	536
May	6	4	6	348
June	6	4	5	312
July	315	6	35	2,166
Aug.	591	15	70	4,350
Sept.	21	6	11	646
Oct.	6	4	4	276
Nov.	4	2	3	176
Dec.	338	2	17	1,040
Total	..	..	..	14,770

GOULBURN RIVER AT COGGAN

Year 1937

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	6	0	2	136
Feb.	250	0	39	2,168
Mar.	154	2	17	1,056
Apr.	4	2	3	156
May	10	4	6	352
June	10	4	7	416
July	10	6	7	436
Aug.	15	6	7	444
Sept.	18	4	15	922
Oct.	91	4	13	814
Nov.	15	6	11	644
Dec.	109	2	7	446
Total	..	..	..	7,990

Year 1938

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	2930	2	61	3,772
Feb.	363	2	33	1,824
Mar.	2	2	2	124
Apr.	2	2	2	120
May	21	2	4	244
June	6	4	5	324
July	10	4	5	304
Aug.	73	6	19	1,168
Sept.	37	6	12	728
Oct.	5600	0	168	10,432
Nov.	501	0	24	1,468
Dec.	10	2	4	236
Total	..	..	..	20,744

Year 1939

Jan.	21	4	5	326
Feb.	10	4	5	260
Mar.	220	2	29	1,816
Apr.	230	4	53	3,194
May	15	10	12	720
June	15	4	11	642
July	15	10	13	820
Aug.	293	10	48	2,960
Sept.	21	10	13	752
Oct.	15	10	13	820
Nov.	127	6	19	1,144
Dec.	6	6	6	372
Total	..	..	..	13,826

Year 1940

Jan.	6	4	5	316
Feb.	4	4	4	232
Mar.	6	4	4	252
Apr.	15	6	7	440
May	15	6	8	484
June	109	6	13	800
July	6	6	6	372
Aug.	15	6	7	450
Sept.	15	2	7	398
Oct.	2080	2	41	2,566
Nov.	4590	2	145	8,718
Dec.	9880	10	328	20,330
Total	..	..	..	35,358

Year 1941

Jan.	30200	37	590	36,520
Feb.	73	6	16	900
Mar.	350	6	33	2,044
Apr.	10	2	3	180
May	10	2	3	204
June	10	4	6	376
July	6	4	5	300
Aug.	21	4	5	310
Sept.	21	2	6	338
Oct.	2	2	2	124
Nov.	4	2	2	132
Dec.	2	0	0.5	28
Total	..	..	..	41,456

Year 1942

Jan.	6	0	1	76
Feb.	0	0	0	0
Mar.	0	0	0	0
Apr.	0	0	0	0
May	0	0	0	0
June	127	0	17	1,036
July	5080	6	233	14,476
Aug.	6	6	6	372
Sept.	18	4	7	440
Oct.	820	4	66	4,102
Nov.	2180	4	215	12,934
Dec.	47	6	11	664
Total	..	..	..	34,100

Year 1943

Jan.	10	2.5	4.8	298
Feb.	4	1.5	2.4	137
Mar.	1.5	1.5	1.5	93
Apr.	1.5	1.5	1.5	90
May	38	1.5	7	433
June	4	4	4	240
July	4	4	4	248
Aug.	30	4	5.9	364
Sept.	47	4	6	372
Oct.	4	4	4	248
Nov.	362	4	83	4,952
Dec.	No Records			940*
Total	..	..	..	8,415*

Year 1944

Jan.	No Records			6,000*
Feb.	No Records			1,400*
Mar.	No Records			0*
Apr.	No Records			0*
May	10	2.5	4.7	294
June	5.7	4	4.1	247
July	14	4	6	380
Aug.	960	4	72	4,480
Sept.	500	10	24	1,432
Oct.	10	2.5	4.8	302
Nov.	4	1	1.5	89
Dec.	2.5	0.5	0.8	49
Total	..	..	..	14,673*

* Estimated

GOULBURN RIVER AT COGGAN

Year 1945					Year 1946				
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.	90	0.5	4.4	263	Jan.	73	1	13.6	846
Feb.	195	1	32	1,768	Feb.	6	1.5	37	208
Mar.	160	1	11	678	Mar.	4	1	2.4	148
Apr.	117	4	17	1,024	Apr.	23	1	5.7	339
May	246	4	25	1,556	May	5.7	4	4.3	268
June	5080	8	342	20,558	June	6	4	4	248
July	362	65	104	6,460	July	6	4	5.6	348
Aug.	1320	56	148	9,150	Aug.	4	4	4	248
Sept.	203	30	72	4,318	Sept.	4	2.5	3.1	186
Oct.	73	10	32	1,986	Oct.	38	1	7	420
Nov.	18	4	6.5	392	Nov.	4	1.5	2.5	153
Dec.	56	8	13.9	862	Dec.	151	1	19	1,131
Total	..	..	..	49,015	Total	..	..	..	4,543

Year 1947					Year 1948				
Jan.	126	1.5	12	739	Jan.	238	18	79	4,904
Feb.	700	1	70	3,935	Feb.	379	10	85	4,940
Mar.	178	6	32	1,958	Mar.	2930	30	127	7,806
Apr.	14	2	5	300	Apr.	38	14	20	1,206
May	7.8	1	3	169	May	297	23	62	3,834
June	4	4	4	240	June	3800	18	217	13,022
July	6	4	4.5	284	July	108	47	75	4,624
Aug.	65	4	10	632	Aug.	56	38	44	2,752
Sept.	1590	2.5	65	3,876	Sept.	230	23	62	3,724
Oct.	38	6	14	862	Oct.	65	8	22	1,368
Nov.	56	2.5	16	960	Nov.	8	4	7	448
Dec.	6800	18	384	23,784	Dec.	4	1.5	2.5	156
Total	..	..	..	37,739	Total	..	..	..	48,784

Year 1949					Year 1950				
Jan.	178	2.5	28	1,740	Jan.	4910	6	111	6,886
Feb.	1520	2.5	84	4,664	Feb.	61600	14	1837	102,892
Mar.	230	14	104	6,490	Mar.	218	188	199	12,360
Apr.	820	18	70	4,184	Apr.	31800	148	1619	97,156
May	65	23	36	2,278	May	226	128	148	9,192
June	320	23	82	4,924	June	34200	128	1313	78,786
July	73	47	57	3,538	July	17400	210	1298	80,452
Aug.	320	30	63	3,966	Aug.	23100	195	817	50,628
Sept.	320	65	132	7,936	Sept.	310	153	182	10,916
Oct.	286	73	111	6,886	Oct.	12300	146	832	51,586
Nov.	65	47	54	3,270	Nov.	39400	146	3054	183,250
Dec.	73	10	32	2,014	Dec.	350	134	191	11,872
Total	..	..	..	51,890	Total	..	..	..	695,976

Year 1951					Year 1952				
Jan.	195	116	135	8,340	Jan.	10	2.5	4.7	289
Feb.	110	80	94	5,260	Feb.	10	2.5	4	231
Mar.	146	62	77	4,804	Mar.	51	3.7	12	758
Apr.	68	51	55	3,308	Apr.	62	7	19	1,166
May	68	51	57	3,562	May	26	13	18	1,090
June	98	51	75	4,492	June	122	17	46	2,754
July	374	56	88	5,436	July	296	26	59	3,686
Aug.	167	56	82	5,086	Aug.	17000	56	639	39,588
Sept.	80	46	57	3,462	Sept.	138	61	87	5,206
Oct.	62	41	52	3,228	Oct.	91	43	60	3,704
Nov.	41	13	22	1,326	Nov.	55	26	35	2,102
Dec.	21	5	8	492	Dec.	26	6.5	10	644
Total	..	..	..	48,796	Total	..	..	..	61,218

GOULBURN RIVER AT COGGAN

Year 1953

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	67	11	30	1,888
Feb.	152	6.5	39	2,160
Mar.	67	11	26	1,620
Apr.	21	11	13	780
May	79	26	46	2,860
June	26	26	26	1,560
July	26	21	23	1,452
Aug.	67	16	29	1,776
Sept.	31	16	24	1,430
Oct.	26	16	19	1,232
Nov.	26	3.7	13	800
Dec.	16	2.5	4.1	258
Total	..	..	..	17,816

Year 1954

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	220	3.7	35	2,156
Feb.	8180	16	324	18,140
Mar.	79	21	39	2,460
Apr.	37	21	22	1,332
May	26	21	22	1,342
June	324	21	39	2,326
July	21	21	21	1,302
Aug.	26	16	20	1,252
Sept.	15	10	11	630
Oct.	1650	10	97	6,008
Nov.	1050	30	68	4,076
Dec.	30	10	22	1,370
Total	..	..	..	42,394

Year 1955

Jan.	315	5.3	36	2,216
Feb.	140000	15	5224	292,536
Mar.	No Records			65,000*
Apr.	140	92	115	6,918
May	576	92	145	8,986
June	153	101	119	7,144
July	577	70	111	6,900
Aug.	438	70	124	7,716
Sept.	162	70	93	5,606
Oct.	24700	61	411	25,460
Nov.	194	88	111	6,680
Dec.	104	81	87	5,420
Total	..	..	..	440,582*

Year 1956

Jan.	174	61	81	5,002
Feb.	No Records			83,000*
Mar.	55000	200	2246	139,260
Apr.	2510	200	570	34,170
May	11110	200	842	52,176
June	No Records			65,000*
July	No Records			79,000*
Aug.	20100	325	883	54,756
Sept.	384	204	257	15,390
Oct.	610	96	187	11,608
Nov.	128	81	92	5,516
Dec.	96	40	68	4,222
Total	..	..	..	549,100*

Year 1957

Jan.	156	36	49	3,010
Feb.	381	36	65	3,616
Mar.	80	28	35	2,176
Apr.	52	24	32	1,936
May	21	21	21	1,302
June	21	21	21	1,240
July	36	21	26	1,636
Aug.	52	21	25	1,598
Sept.	58	15	25	1,474
Oct.	15	4	10	604
Nov.	4	2	3.2	192
Dec.	10	2	4.7	292
Total	..	..	..	19,076

Year 1958

Jan.	6650	3	200	12,388
Feb.	2300	19	194	10,848
Mar.	354	13	32	2,010
Apr.	52	13	17	1,030
May	92	13	23	1,436
June	354	19	26	1,570
July	535	19	64	3,944
Aug.	92	19	31	1,928
Sept.	2300	19	101	6,080
Oct.	3225	28	182	11,256
Nov.	28	9	14	852
Dec.	1330	13	80	4,976
Total	..	..	..	58,318

Year 1959

Jan.	1330	13	88	5,476
Feb.	5750	9	267	14,936
Mar.	2850	52	226	14,034
Apr.	490	52	132	7,938
May	52	40	51	3,168
June	78	40	46	2,780
July	No Records			3,500*
Aug.	66	32	39	2,410
Sept.	32	25	26	1,576
Oct.	111	22	32	2,014
Nov.	1480	25	97	5,808
Dec.	79	18	30	1,836
Total	..	..	..	65,476*

Year 1960

Jan.	700	18	43	2,696
Feb.	18	13	14	824
Mar.	13	13	13	806
Apr.	13	9	10	596
May	13	9	10	650
June	11	11	11	660
July	79	11	35	2,126
Aug.	42	13	22	1,370
Sept.	170	13	26	1,568
Oct.	66	13	21	1,314
Nov.	32	6	16	938
Dec.	111	13	30	1,886
Total	..	..	..	15,434

* Estimated.

GOULBURN RIVER AT COGGAN.

Year 1961					Year 1962				
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.	32	9	17	1,072	Jan.	92	19	41	2,562
Feb.	25	4	11	608	Feb.	1470	16	138	7,752
Mar.	183	6	24	1,518	Mar.	16	9	10	640
Apr.	28	9	13	786	Apr.	34	9	17	1,028
May	19	11	13	820	May	204	13	48	2,986
June	19	13	14	864	June	64	17	32	1,916
July	34	13	16	990	July	416	17	42	2,602
Aug.	249	13	63	3,936	Aug.	700	34	81	5,052
Sept.	66	11	21	1,278	Sept.	42	25	30	1,824
Oct.	53	6	12	748	Oct.	66	13	24	1,454
Nov.	950	6	61	3,668	Nov.	18	6	11	634
Dec.	2400	9	225	13,956	Dec.	23	6	10	606
Total	..	..	..	30,244	Total	..	..	..	29,056

Year 1963					Year 1964				
Jan.	10400	13	667	41,338	Jan.	107	23	46	2,872
Feb.	4440	29	305	17,082	Feb.	24	13	17	1,000
Mar.	248	25	50	3,094	Mar.	92	13	37	2,312
Apr.	700	29	49	2,946	Apr.	1330	17	122	7,302
May	7976	96	555	34,438	May	57	20	29	1,826
June	4020	135	472	28,298	June	8810	44	531	31,882
July	156	96	128	7,908	July	120	46	72	4,452
Aug.	1070	80	207	12,852	Aug.	135	36	53	3,288
Sept.	700	80	152	9,144	Sept.	560	40	81	4,844
Oct.	200	52	189	5,534	Oct.	118	30	55	3,400
Nov.	72	35	52	3,104	Nov.	102	12	30	1,802
Dec.	8309	25	538	33,382	Dec.	16	8	10	600
Total	..	..	..	199,120	Total	..	..	..	65,580

Year 1965					Year 1966				
Jan.	9.5	2	3.4	210	Jan.	13	6	7.6	474
Feb.	3.3	2.5	2.6	146	Feb.	9	6	6.6	370
Mar.	2.5	1.5	1.8	109	Mar.	405	4.4	26	1,626
Apr.	7.0	1.5	3.4	202	Apr.	4.4	4.4	4.4	264
May	6.5	4	4.3	268	May	4.4	4.4	4.4	272
June	8.0	6.5	6.8	408	June	4.4	4.4	4.4	264
July	10	8	8.5	528	July	4.4	4.4	4.4	272
Aug.	10	7	7.8	482	Aug.	147	3.5	15	908
Sept.	10	5.5	7.7	464	Sept.	79	8	18	1,052
Oct.	170	5.5	23	1,422	Oct.	700	8	102	6,310
Nov.	32	6	8.2	494	Nov.	1480	9	138	8,266
Dec.	1135	6	114	7,062	Dec.	12	2.2	5	314
Total	..	..	..	11,795	Total	..	..	..	20,392

Year 1967					Year 1968				
Jan.	9	0.7	3.8	238	Jan.	6840	3.5	770	47,728
Feb.	5	2.2	3.3	186	Feb.	46	17	37	2,142
Mar.	4440	2.0	191	11,868	Mar.	26	8	14	892
Apr.	8	6.5	7	426	Apr.	9	9	9	540
May	10	6.5	7	438	May	230	6	49	3,018
June	1070	6.5	87	5,216	June	26	9	17	1,002
July	152	16	40	2,466	July	56	17	20	1,246
Aug.	245	13	44	2,698	Aug.	450	17	131	8,110
Sept.	34	8	16	949	Sept.	41	26	30	1,770
Oct.	30	8	13	778	Oct.	56	9	25	1,540
Nov.	8	5	6	363	Nov.	8	1	4	258
Dec.	5	4	4	259	Dec.	17	1	4	244
Total	..	..	..	25,885	Total	..	..	..	68,490

GOULBURN RIVER AT KERRABEE.

LOCATION:	Latitude 32°25' Longitude 150°19'
PERIOD OF ESTABLISHMENT:	February 1940 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	28 years
ZERO OF GAUGE:	R.L. 487.30 Water Conservation Datum.
CATCHMENT AREA:	1,850 square miles.
CONTROL:	Sand
EQUIPMENT:	Remote indicator installed June 1963 Staff gauge, range 0 to 50 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 177
	(b) Maximum observation in cusecs : 1,900
	(c) Minimum observation in cusecs : 0.05
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	153,000 cusecs.
MEAN DAILY DISCHARGE FOR 28 YEARS:	184 cusecs
MEAN ANNUAL DISCHARGE FOR 28 YEARS:	134,000 acre feet.

GOULBURN RIVER AT KERRABEE

Year 1940

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	1313	0	26	1,556
May	0	0	0	0
June	20	0	3	135
July	0	0	0	0
Aug.	4	0.3	2	130
Sept.	1	0.2	0.4	25
Oct.	2400	0.5	20	1,254
Nov.	3400	0	202	12,100
Dec.	5000	4	290	17,964
Total	..	..	..	..

Year 1941

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	44400	20	1173	72,744
Feb.	916	3	37	2,058
Mar.	200	8	30	1,858
Apr.	5	1	2	114
May	0.3	0.1	0.1	8
June	9	3.5	5	333
July	5.5	1.5	3.6	224
Aug.	11	1.5	3.4	211
Sept.	15	0.2	3.4	205
Oct.	56	0.2	5.7	355
Nov.	5	0	1	61
Dec.	0	0	0	0
Total	..	..	..	78,171

Year 1942

Jan.	0	0	0	0
Feb.	3	0	0.2	12
Mar.	0	0	0	0
Apr.	0.2	0	0.1	5
May	0.9	0.2	0.3	16
June	33	0.8	2.2	132
July	7400	7	408	25,332
Aug.	33	6.5	18	1,133
Sept.	11	4.5	7.4	443
Oct.	1494	4.5	144	8,964
Nov.	3120	2.3	186	11,166
Dec.	120	1.2	11	662
Total	..	..	..	47,865

Year 1943

Jan.	4.5	0.8	1.2	74
Feb.	64	1.5	8	430
Mar.	1.5	0	1	56
Apr.	0	0	0	0
May	11	0	1.6	102
June	4	2.8	3	180
July	2.8	2.8	2.8	168
Aug.	6.5	2.8	3.7	226
Sept.	42	2.8	6.9	416
Oct.	42	1.9	7.2	443
Nov.	571	1.9	47	2,804
Dec.	282	1.9	12	744
Total	..	..	..	5,643

Year 1944

Jan.	945	1.9	71	4,408
Feb.	366	1.5	29	1,682
Mar.	0	0	0	0
Apr.	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	5	1.9	3	184
Aug.	2100	2.3	137	8,480
Sept.	302	2.8	15	928
Oct.	18	0	2	123
Nov.	241	0	4	258
Dec.	0	0	0	0
Total	..	..	..	16,063

Year 1945

Jan.	77	0	3	161
Feb.	1382	0	82	4,580
Mar.	104	0	6	350
Apr.	344	0	19	1,146
May	782	0.6	32	1,960
June	5550	1	480	28,802
July	667	42	121	7,500
Aug.	1866	52	267	16,554
Sept.	595	18	79	4,748
Oct.	37	7	15	940
Nov.	7	1	3.4	202
Dec.	18	1	42	2,620
Total	..	..	..	69,563

Year 1946

Jan.	30	0	3.5	214
Feb.	4	0	0.6	35
Mar.	0	0	0	0
Apr.	0	0	0	0
May	5	0	0.8	50
June	5	2	3.8	228
July	5	2	3.1	191
Aug.	2	0.6	1.0	62
Sept.	1	0.2	0.6	34
Oct.	0	0	0	0
Nov.	0	0	0	0
Dec.	60	0	7.5	467
Total	..	..	..	1,281

Year 1947

Jan.	14	0.2	3.1	195
Feb.	620	0.2	74	4,176
Mar.	152	0.2	20	1,258
Apr.	44	0	1.9	115
May	4	0	0.6	34
June	1	0.3	0.5	32
July	2	0.6	1	61
Aug.	30	0.6	4.9	301
Sept.	1456	2	120	7,232
Oct.	23	2	8.6	536
Nov.	30	0.3	11	630
Dec.	4800	11	478	29,654
Total	..	..	..	44,224

GOULBURN RIVER AT KERRABEE

Year 1948

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	366	4	76	4,704
Feb.	1310	2	120	6,914
Mar.	750	2	66	4,086
Apr.	2	1	1	82
May	168	1	28	1,720
June	2000	2	216	12,954
July	93	30	47	2,924
Aug.	30	17	25	1,578
Sept.	28	17	58	3,498
Oct.	44	0.6	8	521
Nov.	0.6	0.3	0.3	20
Dec.	1	0.3	0.2	13
Total	..	..	..	39,014

Year 1949

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	95	6	26	1,628
Feb.	1100	0	167	9,350
Mar.	385	12	83	5,132
Apr	750	6	63	3,772
May	44	23	30	1,838
June	1120	28	123	7,406
July	67	30	45	2,794
Aug.	1202	38	162	10,078
Sept.	1780	56	344	20,614
Oct.	2177	63	233	14,494
Nov.	246	33	55	3,308
Dec.	44	15	30	1,872
Total	..	..	..	82,286

Year 1950

Jan.	2177	14	136	8,428
Feb.	60600	19	1515	84,868
Mar.	125	44	83	5,158
Apr.	19100	51	1080	64,828
May	297	80	116	7,220
June	24200	80	1413	84,792
July	18400	360	2059	127,660
Aug.	15700	360	1671	103,588
Sept.	1250	156	410	24,634
Oct.	9100	360	1586	98,352
Nov.	31500	360	2830	169,822
Dec.	1400	205	558	34,612
Total	..	..	..	813,962

Year 1951

Jan.	804	157	320	19,858
Feb.	240	80	143	8,022
Mar.	240	80	150	9,322
Apr.	80	65	68	4,076
May	72	51	55	3,434
June	118	51	89	5,368
July	62	54	122	7,574
Aug.	317	65	116	7,174
Sept.	95	65	85	5,092
Oct.	95	26	50	3,126
Nov.	140	17	93	5,584
Dec.	26	3	9	549
Total	..	..	..	79,179

Year 1952

Jan.	9	0	3	160
Feb.	6	0	0.7	43
Mar.	360	3	33	2,070
Apr.	95	14	30	1,800
May	51	17	26	1,596
June	277	26	86	5,184
July	662	38	123	7,600
Aug.	4700	110	866	53,674
Sept.	262	95	185	11,110
Oct.	130	80	83	5,150
Nov.	130	14	56	3,340
Dec.	80	14	21	1,272
Total	.	..	..	92,999

Year 1953

Jan.	80	14	26	1,612
Feb.	80	14	38	2,140
Mar.	80	18	45	2,804
Apr.	38	10	33	1,996
May	80	14	47	2,952
June	10	10	10	600
July	33	14	29	1,816
Aug.	72	8	28	1,714
Sept.	47	12	26	1,552
Oct.	26	12	18	1,132
Nov.	85	12	22	1,302
Dec.	12	9	10	618
Total	.	..	..	20,238

Year 1954

Jan.	2420	20	260	16,122
Feb.	6500	38	1326	74,274
Mar.	165	30	69	4,250
Apr.	32	8	18	1,100
May	32	27	29	1,824
June	670	27	99	5,938
July	42	28	34	2,084
Aug.	38	22	27	1,684
Sept.	22	16	19	1,159
Oct.	2780	16	274	17,003
Nov	895	39	126	7,546
Dec.	39	15	24	1,482
Total	..	..	.	134,466

Year 1955

Jan.	1420	9	105	6,480
Feb	153000	24	6651	372,470
Mar.	6000	230	1496	92,750
Apr.	215	132	167	10,004
May	824	144	207	12,836
June	891	128	195	11,704
July	870	109	157	9,734
Aug.	1250	98	218	13,566
Sept.	157	99	116	6,986
Oct.	20200	76	743	46,058
Nov.	395	116	172	10,342
Dec.	445	98	131	8,142
Total	.	.	..	601,072

GOULBURN RIVER AT KERRABEE

Year 1956

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	275	66	100	6,202
Feb.	No Records			119,000*
Mar.	No Records			200,000*
Apr.	No Records			55,000*
May	12400	370	1222	75,784
June	No Records			93,000*
July	8100	547	1811	112,288
Aug.	No Records			72,000*
Sept.	491	246	308	18,500
Oct.	396	160	228	14,118
Nov.	188	104	146	8,782
Dec.	124	60	86	5,324
Total	..	..	..	780,998*

Year 1957

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	124	35	53	3,284
Feb.	418	35	95	5,316
Mar.	73	35	46	2,862
Apr.	51	35	41	2,452
May	47	31	36	2,238
June	47	35	38	2,292
July	60	43	46	2,878
Aug.	134	39	53	3,260
Sept.	95	15	39	2,334
Oct.	12	3	8	524
Nov.	10	0	3	172
Dec.	68	0	3	192
Total	..	..	..	27,804

Year 1958

Jan.	2350	2	52	3,222
Feb.	4500	36	318	17,812
Mar.	2070	8	81	5,000
Apr.	116	8	28	1,660
May	152	20	28	1,756
June	64	20	22	1,344
July	314	20	65	4,040
Aug.	152	20	30	1,872
Sept.	792	20	95	5,678
Oct.	1800	50	256	15,892
Nov.	51	11	23	1,354
Dec.	1800	10	157	9,726
Total	..	..	..	69,356

Year 1959

Jan.	760	20	131	8,116
Feb.	2950	10	198	11,076
Mar.	2070	68	262	16,244
Apr.	640	68	200	11,994
May	68	51	55	3,434
June	86	51	56	3,362
July	990	33	128	7,948
Aug.	98	33	45	2,810
Sept.	98	26	34	2,018
Oct.	230	20	47	2,902
Nov.	1890	26	159	9,554
Dec.	130	5	35	2,162
Total	..	..	..	81,620

Year 1960

Jan.	1300	5	60	3,738
Feb.	130	10	20	1,180
Mar.	17	7	12	742
Apr.	17	7	11	658
May	28	11	16	1,018
June	17	13	15	874
July	89	13	45	2,772
Aug.	51	28	40	2,450
Sept.	159	22	44	2,628
Oct.	63	17	38	2,370
Nov.	63	10	24	1,438
Dec.	580	17	66	4,114
Total	..	..	..	23,982

Year 1961

Jan.	33	0	10	596
Feb.	680	0	10	580
Mar.	1090	5	38	2,360
Apr.	23	10	13	797
May	17	12	14	876
June	34	14	19	1,180
July	39	13	20	1,238
Aug.	159	17	64	4,008
Sept.	63	10	25	1,523
Oct.	1160	1	34	2,098
Nov.	1370	5	132	7,944
Dec.	7575	10	396	24,560
Total	..	..	..	47,760

Year 1962

Jan.	600	30	72	4,450
Feb.	1830	18	176	9,874
Mar.	18	8	12	741
Apr.	43	11	22	1,348
May	760	11	77	4,796
June	85	30	49	2,920
July	950	30	69	4,262
Aug.	282	43	100	6,176
Sept.	51	28	31	1,868
Oct.	127	13	38	2,331
Nov.	37	5	16	969
Dec.	30	5	14	902
Total	..	..	..	40,637

Year 1963

Jan.	10200	30	1233	76,472
Feb.	2070	50	341	19,094
Mar.	187	30	65	4,024
Apr.	239	43	69	4,134
May	6700	141	861	53,386
June	6250	141	720	43,202
July	400	141	177	10,950
Aug.	1670	106	250	15,530
Sept.	1230	69	226	13,534
Oct.	355	51	100	6,194
Nov.	130	28	55	3,282
Dec.	5375	17	559	34,614
Total	..	..	..	284,416

* Estimated.

Appendix 13
Sheet 5

GOULBURN RIVER AT KERRABEE

Year 1964

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	113	38	54	3,342
Feb.	38	15	23	1,338
Mar.	85	15	29	1,776
Apr.	9325	15	405	24,314
May	99	48	61	3,778
June	13600	48	893	55,570
July	171	82	105	6,528
Aug.	156	60	79	4,872
Sept.	650	53	114	6,868
Oct.	187	46	92	5,702
Nov.	105	13	40	1,424
Dec.	16	4	8	504
Total	..	..	..	116,016

Year 1965

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	7	1	3	169
Feb.	4	2	2	124
Mar.	2	2	2	124
Apr.	11	2	4	218
May	7	2	5	346
June	11	7	8	460
July	16	11	13	788
Aug.	13	6	10	624
Sept.	14	3	9	558
Oct.	19	2	8	514
Nov.	75	2	9	526
Dec.	1830	3	269	16,692
Total	..	..	..	21,143

Year 1966

Jan.	9	0	2.2	138
Feb.	1	0	0.2	10
Mar.	187	0	19	1,164
Apr.	4	1	0.3	20
May	4	1	3.3	196
June	11	4	5.8	348
July	6	5	5.7	356
Aug.	122	6	16	1,020
Sept.	86	11	32	1,908
Oct.	450	11	101	6,266
Nov.	4500	27	310	18,626
Dec.	27	10	14	844
Total	..	..	..	30,896

Year 1967

Jan.	25	0.6	6.4	399
Feb.	0.6	0.1	0.3	20
Mar.	2650	0.1	237	14,702
Apr.	32	4.5	9.2	550
May	8	2.0	4.0	246
June	1590	8	112	6,736
July	195	27	55	3,424
Aug.	195	19	48	3,004
Sept.	29	10	19	1,166
Oct.	61	10	19	1,160
Nov.	18	0	7	432
Dec.	0	0	0	0
Total	..	..	..	31,809

Year 1968

Jan.	4500	0	942	58,436
Feb.	60	20	30	1,768
Mar.	22	14	20	1,128
Apr.	14	9	11	664
May	560	9	95	5,920
June	38	21	28	1,680
July	53	21	27	1,660
Aug.	300	21	88	5,454
Sept.	63	21	35	2,072
Oct.	52	0.8	15	955
Nov.	60	0.1	3	175
Dec.	5	0.1	1.7	107
Total	..	..	..	80,019

GOULBURN RIVER AT SANDY HOLLOW

LOCATION:	Latitude 32°21' Longitude 150°34'
PERIOD OF ESTABLISHMENT:	July 1953 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	14 years.
ZERO OF GAUGE:	R.L.64.00 Assumed Datum.
CATCHMENT AREA:	2,640 square miles.
CONTROL:	Sand.
EQUIPMENT:	Servo Manometer installed September 1966 Staff Gauge, range 0 to 48 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 146
	(b) Maximum observation in cusecs : 9,550
	(c) Minimum observation in cusecs : 0
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	180,000 cusecs.
MEAN DAILY DISCHARGE FOR 14 YEARS:	289 cusecs
MEAN ANNUAL DISCHARGE FOR 14 YEARS:	211,000 acre feet.

GOULBURN RIVER AT SANDY HOLLOW

Year 1954

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	..	..	..	..
May	..	..	..	..
June	..	..	..	..
July	No Records			
Aug.	No Records			
Sept.	No Records			
Oct.	No Records			
Nov.	No Records			
Dec.	176	13	47	2,920
Total	..	..	..	..

Year 1955

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	480	0	54	3,370
Feb.	180000	32	8421	471,558
Mar.	No Records			132,000*
Apr.	No Records			14,200*
May	796	228	359	22,276
June	510	173	241	14,436
July	577	124	207	12,838
Aug.	1260	104	260	16,128
Sept.	340	146	200	11,974
Oct.	23000	173	913	56,580
Nov.	396	146	217	13,032
Dec.	264	100	147	8,130
Total	..	..	..	776,522*

Year 1956

Jan.	228	70	112	6,916
Feb.	34000	146	2924	169,612
Mar.	71000	930	4114	255,080
Apr.	5800	407	1265	75,882
May	14000	540	1242	76,996
June	42000	432	2203	132,190
July	19200	716	2160	133,926
Aug.	19200	602	1912	118,516
Sept.	667	326	528	31,668
Oct.	428	284	328	20,344
Nov.	284	126	184	11,068
Dec.	150	82	109	6,740
Total	..	..	..	1,038,938

Year 1957

Jan.	82	35	54	3,376
Feb.	430	35	91	5,090
Mar.	90	32	43	2,640
Apr.	39	32	39	2,312
May	39	36	38	2,378
June	36	32	33	1,984
July	32	32	32	1,984
Aug.	145	32	43	2,768
Sept	115	22	56	3,338
Oct.	21	5	11	680
Nov.	5	0	1	72
Dec.	5	0	0	10
Total	..	..	..	26,632

Year 1958

Jan.	10500	0	323	20,003
Feb.	4300	81	755	42,322
Mar.	1900	22	122	7,558
Apr.	195	30	49	2,924
May	96	30	46	2,898
June	140	30	34	2,036
July	335	52	110	6,828
Aug.	133	41	63	3,886
Sept.	1600	41	122	7,302
Oct.	3050	54	348	21,560
Nov.	78	12	25	1,528
Dec.	1750	7	149	9,214
Total	..	..	..	128,059

Year 1959

Jan.	530	33	115	7,156
Feb.	5124	19	314	17,560
Mar.	2200	78	315	19,540
Apr.	420	62	180	10,822
May	62	62	62	3,844
June	212	62	77	4,640
July	700	97	177	10,974
Aug.	102	48	64	3,992
Sept.	48	33	40	2,400
Oct.	425	33	81	5,036
Nov.	980	64	219	13,132
Dec.	315	21	75	4,646
Total	..	..	..	103,742

Year 1960

Jan.	830	8	92	5,710
Feb.	120	13	43	2,514
Mar.	64	8	20	1,264
Apr.	21	5	12	745
May	137	7	41	2,554
June	60	43	47	2,818
July	161	43	100	6,194
Aug.	140	70	90	5,580
Sept.	160	37	70	4,184
Oct.	140	20	78	4,882
Nov.	116	7	37	2,232
Dec.	236	28	90	5,582
Total	..	..	..	44,199

Year 1961

Jan.	53	0	13	812
Feb.	20	0	1	50
Mar.	470	3	79	4,902
Apr.	87	5	20	1,216
May	15	15	15	930
June	28	7	16	968
July	96	7	20	1,238
Aug.	236	28	128	7,956
Sept.	231	59	107	6,444
Oct.	75	4	33	2,040
Nov.	1150	9	165	9,906
Dec.	8580	33	488	30,246
Total	..	..	..	66,708

* Estimated.

13657

GOULBURN RIVER AT SANDY HOLLOW

Year 1962

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	291	60	140	8,652
Feb.	850	75	202	11,310
Mar.	60	10	24	1,504
Apr.	60	10	31	1,830
May	3600	21	241	14,946
June	168	46	93	5,608
July	910	33	129	8,004
Aug.	476	75	182	11,274
Sept.	120	46	71	4,236
Oct.	120	21	48	2,968
Nov.	33	2	17	1,008
Dec.	120	2	38	2,370
Total	..	..	.	73,710

Year 1963

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	20000	46	1078	66,850
Feb.	2120	110	451	25,242
Mar.	390	41	94	5,838
Apr.	1110	60	106	6,344
May	6700	260	1129	69,978
June	7000	215	908	54,496
July	266	168	218	13,512
Aug.	1110	127	305	18,884
Sept.	780	127	258	15,500
Oct.	540	90	160	9,904
Nov.	191	61	106	6,346
Dec.	2730	50	403	24,966
Total	..	..	..	317,860

Year 1964

Jan.	108	32	56	3,476
Feb.	40	16	24	1,376
Mar.	75	16	27	1,688
Apr.	9200	16	515	30,894
May	168	50	72	4,456
June	30000	61	2210	129,262
July	450	140	230	14,270
Aug.	166	80	115	7,314
Sept.	320	98	150	9,012
Oct.	194	55	111	6,904
Nov.	118	32	58	3,462
Dec.	26	8	15	914
Total	..	..	..	213.028

Year 1965

Jan.	4	0	0.6	39
Feb.	0	0	0	0
Mar.	0	0	0	0
Apr.	0	0	0	0
May	4	0	0.8	48
June	7	4	4.8	288
July	27	7	16	1,020
Aug.	18	12	12	756
Sept.	27	2	13	784
Oct.	112	0	16	1,016
Nov.	56	0	8.9	538
Dec.	670	0	124	7,720
Total	..	..	..	12,209

Year 1966

Jan.	10	0.3	3	171
Feb.	0.3	0	0.1	4
Mar.	98	0	14	868
Apr.	10	1.5	3	181
May	2.5	0.8	2	122
June	5	4	5	274
July	5	4	5	286
Aug.	56	4	16	962
Sept.	67	11	27	1,644
Oct.	370	11	85	5,286
Nov.	1470	23	258	15,498
Dec.	23	8	15	942
Total	..	..	..	26,238

Year 1967

Jan.	83	0.3	14	870
Feb.	16	0.2	3.4	193
Mar.	1910	0.1	189	11,690
Apr.	24	7	14	858
May	20	4	9	572
June	1100	11	153	9,178
July	365	37	100	6,190
Aug.	1610	27	156	9,698
Sept.	101	27	47	2,798
Oct.	86	19	37	2,298
Nov.	29	0	6.2	372
Dec.	0	0	0	0
Total	..	..	..	44,717

Year 1968

Jan.	3750	0	680	42,140
Feb.	104	20	53	3,074
Mar.	31	13	21	1,286
Apr.	21	7	9	574
May	670	5	121	7,488
June	70	28	45	2,682
July	70	23	35	2,180
Aug.	226	25	91	5,660
Sept.	91	25	50	2,982
Oct.	59	6	27	1,696
Nov.	6	3	4	207
Dec.	4	0	2	126
Total	..	..	..	70.095

WYBONG CREEK AT WYBONG

LOCATION:	Latitude 32°16' Longitude 150°38'
PERIOD OF ESTABLISHMENT:	May 1955 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	10 years
ZERO OF GAUGE:	R.L.69.84 Assumed Datum
CATCHMENT AREA:	257 Square Miles
CONTROL:	Rock Bar.
EQUIPMENT:	Pressure recorder installed December 1962. Staff gauge, range 0 to 30 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 93 (b) Maximum observation in cusecs : 399 (c) Minimum observation in cusecs : 0.05
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	19,000 cusecs
MEAN DAILY DISCHARGE FOR 10 YEARS:	54 cusecs
MEAN ANNUAL DISCHARGE FOR 10 YEARS:	39,700 acre feet

WYBONG CREEK AT WYBONG

Year 1955

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	..	..	..	..
May	..	..	..	..
June	57	41	44	2,620
July	67	29	39	2,412
Aug.	2350	29	85	5,254
Sept.	49	29	36	2,132
Oct.	2820	20	143	8,850
Nov.	790	27	59	3,530
Dec.	345	20	44	2,732
Total	..	..	..	..

Year 1956

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	41	13	22	1,352
Feb.	19000	20	1010	58,580
Mar.	13660	100	616	38,222
Apr.	300	13	94	5,638
May	4310	35	248	15,352
June	6300	35	330	20,452
July	1425	56	215	13,312
Aug.	1120	29	104	6,430
Sept.	192	29	75	4,504
Oct.	345	20	57	3,530
Nov.	35	29	30	1,800
Dec.	35	13	26	1,612
Total	..	..	..	170,784

Year 1957

Jan.	29	13	17	1,024
Feb.	527	13	34	1,914
Mar.	29	13	18	1,120
Apr.	41	10	14	834
May	11	10	10	650
June	11	10	10	630
July	11	10	10	650
Aug.	29	8	13	816
Sept.	29	6.1	13	780
Oct.	6.1	4.2	5.6	348
Nov.	4.2	1.2	2.1	128
Dec.	13	0.5	2.5	156
Total	..	..	..	9,050

Year 1958

Jan.	4880	2	57	3,536
Feb.	2820	6.5	239	13,410
Mar.	6.1	1.2	3.5	214
Apr.	4.2	1.2	2.7	162
May	20	2	4.2	260
June	11	4.2	5.1	308
July	6.1	6.1	6.1	378
Aug.	11	6.1	6.6	408
Sept.	260	6.1	12	720
Oct.	895	4.5	54	3,340
Nov.	6.5	2.1	3.5	210
Dec.	6.5	2.1	3.8	235
Total	..	..	..	23,181

Year 1959

Jan.	125	3.3	13	787
Feb.	155	0.6	9.5	526
Mar.	100	1.3	11	704
Apr.	12	1.3	7.4	446
May	6.5	4.9	5.9	368
June	6.5	4.9	5.1	304
July	100	4.9	15	890
Aug.	6.5	4.9	5.8	361
Sept.	4.9	4.9	4.9	294
Oct.	24	4.9	7.2	445
Nov.	385	6.5	32	1,918
Dec.	6.5	1.3	2.9	172
Total	..	..	..	7,215

Year 1960

Jan.	1.3	0.6	1.0	62
Feb.	6.5	1.3	3.7	214
Mar.	3.3	0.6	1.7	106
Apr.	0.6	0.1	0.2	14
May	1.3	0	0.6	35
June	3.3	1.3	2.6	158
July	24	3.3	13	826
Aug.	15	4.9	7.5	466
Sept.	510	3.3	13	802
Oct.	56	3.3	9.9	617
Nov.	6.5	1.3	4.1	241
Dec.	1005	3.3	45	2,788
Total	..	..	..	6,329

Year 1961

Jan.	12	0.2	4.8	298
Feb.	6.5	0.2	1.7	96
Mar.	12	0.7	4	242
Apr.	No Records			
May	No Records			
June	No Records			
July	No Records			
Aug.	No Records			
Sept.	No Records			
Oct.	No Records			
Nov.	No Records			
Dec.	No Records			
Total	..	..	..	..

Year 1962

Jan.	No Records			
Feb.	No Records			
Mar.	No Records			
Apr.	No Records			
May	No Records			
June	No Records			
July	No Records			
Aug.	No Records			
Sept.	No Records			
Oct.	No Records			
Nov.	No Records			
Dec.	56	3.3	11	692
Total	..	..	..	..

Appendix 15
Sheet 3

WYBONG CREEK AT WYBONG

Year 1963

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	4800	8	477	29,572
Feb.	75	2	18	1,030
Mar.	75	2	15	926
Apr.	24	8	13	770
May	3860	8	165	10,210
June	2700	20	95	5,706
July	66	29	47	2,898
Aug.	555	20	44	2,750
Sept.	950	29	63	3,760
Oct.	125	29	46	2,876
Nov.	125	8	31	1,848
Dec.	510	4.5	42	2,592
Total	..	..	..	64,938

Year 1964

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	13	8	11	796
Feb.	13	4.5	9.6	5,580
Mar.	11	8	9	582
Apr.	2820	10	121	7,282
May	4400	12	498	30,862
June	2660	6.5	120	7,220
July	29	20	28	1,758
Aug.	20	13	16	992
Sept.	380	12	43	2,580
Oct.	41	12	18	1,138
Nov.	19	4.9	8.1	483
Dec.	4.8	2.3	3.5	216
Total	..	..	..	59,489

Year 1965

Jan.	4.9	0.9	2.5	158
Feb.	9.3	0.05	1.5	86
Mar.	0.13	0.05	0.1	7
Apr.	2.1	0.13	0.7	45
May	1.3	0.2	0.8	47
June	1.9	0.2	1	61
July	6.5	1.1	2.4	150
Aug.	5.7	2.1	4.4	272
Sept.	3.3	0.1	1.4	84
Oct.	24	0.1	1.6	100
Nov.	1.3	0.2	0.8	48
Dec.	4550	0.6	71	4,388
Total	..	..	..	5,446

Year 1966

Jan.	0.5	0.2	0.2	14
Feb.	0.2	0.1	0.2	10
Mar.	0.5	0.1	0.4	25
Apr.	0.3	0.1	0.2	11
May	0.1	0.1	0.1	6
June	3	0.1	1.2	69
July	1.4	0.5	1.2	74
Aug.	3	0.4	1.3	78
Sept.	3	0.9	1.9	116
Oct.	488	0.9	15	950
Nov.	3477	4	79	4,750
Dec.	12	2.7	4.2	261
Total	..	..	..	6,364

Year 1967

Jan.	1.5	0	0.7	46
Feb.	0.15	0.15	0.15	8
Mar.	3410	2.2	110	6,842
Apr.	3	0.75	1.7	104
May	7.0	0.5	2.0	125
June		No Records		
July		No Records		
Aug.	72	0	20	1,221
Sept.	5	2.3	4.1	247
Oct.	75	2	17	1,037
Nov.	10	.0	3	175
Dec.	0	0	0	0
Total	..	..	..	..

Year 1968

Jan.	4040	1.7	537	33,268
Feb.	16	4	9	544
Mar.	8	1.7	4.5	287
Apr.	1.7	1.2	1.3	77
May	3590	1.7	86	5,325
June	16	8	10	592
July	16	8	10.5	644
Aug.	266	8	30	1,856
Sept.	16	8	13	776
Oct.	12	1.7	8	470
Nov.	2.8	0.4	1	58
Dec.	54	0.4	7	440
Total	..	..	..	44,337

GARDINERS CREEK AT LIDDELL.

LOCATION:	Latitude 32°24' Longitude 151°01'
PERIOD OF ESTABLISHMENT:	December 1959 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	7 years
ZERO OF GAUGE:	R.L.80.23 Assumed Datum.
CATCHMENT AREA:	30 Square Miles.
CONTROL:	Concrete.
EQUIPMENT:	Float recorder installed October 1966 Staff gauge, range 0 to 15 feet
CURRENT METER OBSERVATIONS:	(a) Number obtained : 73
	(b) Maximum observation in cusecs : 160
	(c) Minimum observation in cusecs : 0.02
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	5,530 cusecs
MEAN DAILY DISCHARGE FOR 7 YEARS:	10 cusecs
MEAN ANNUAL DISCHARGE FOR 7 YEARS:	7,200 acre feet

13662

GARDINERS CREEK AT LIDDELL

Year 1960

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	No Records			
Feb.	10	0.07	0.4	22
Mar.	2	0.17	0.4	25
Apr.	3	0.07	0.4	25
May	0.4	0.07	0.2	12
June	0.5	0.07	0.2	12
July	2.3	0.07	0.5	32
Aug.	2	0.06	0.3	17
Sept.	8	0.04	0.4	25
Oct.	31	0.04	1.2	71
Nov.	21	0.03	0.3	15
Dec.	21	0.06	0.7	42
Total	..	..	..	..

Year 1961

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	211	0.08	1.4	86
Feb.	7.1	0.09	0.4	23
Mar.	2.2	0.10	0.2	13
Apr.	0.8	0.10	0.2	12
May	0.2	0.09	0.2	7
June	0.3	0.06	0.1	6
July	2.3	0.06	0.1	8
Aug.	28	0.06	1.1	69
Sept.	0.3	0.04	0.1	5
Oct.	60	0.03	0.4	24
Nov.	580	0.06	13	787
Dec.	870	0.03	16	1,025
Total	..	..	..	2,065

Year 1962

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	720	0.01	26.3	1,628
Feb.	No Records			
Mar.	0.3	0.02	0.1	4
Apr.	44	0.03	1.1	68
May	No Records			
June	2.5	1.10	1.6	99
July	1970	0.9	22	1,398
Aug.	1040	0.6	9.1	562
Sept.	5.4	0.3	0.8	46
Oct.	48	0.2	1.2	72
Nov.	7.9	0.1	0.4	23
Dec.	1460	0.2	29	1,824
Total	..	..	..	..

Year 1963

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	5530	0.02	110	6,834
Feb.	562	0.9	5	296
Mar.	186	0.8	6	375
Apr.	740	0.1	8	512
May	1790	0.2	62	3,874
June	625	0.2	16	978
July	6	1.1	2	93
Aug.	2270	0.8	31	1,920
Sept.	521	4.7	22	1,346
Oct.	15	0.5	2	102
Nov.	18	0.1	1	43
Dec.	900	0.1	8	579
Total	..	..	..	16,952

Year 1964

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	24	0.2	1.2	73
Feb.	4.9	0.1	0.2	10
Mar.	0.4	0.1	0.2	12
Apr.	1970	0.1	44	2,617
May	745	0.4	8.6	535
June	3795	0.4	102	6,145
July	2.4	0.4	0.7	44
Aug.	1.3	0.5	0.8	46
Sept.	2	0.5	0.6	34
Oct.	141	0.3	1.4	85
Nov.	1.3	0.2	0.2	14
Dec.	0.3	0.2	0.2	13
Total	..	..	..	9,628

Year 1965

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	0.4	0.2	0.2	15
Feb.	0.3	0.1	0.2	11
Mar.	0.2	0.1	0.1	9
Apr.	0.3	0.1	0.1	9
May	0.2	0.1	0.1	9
June	0.1	0.1	0.1	9
July	33	0.1	0.8	47
Aug.	0.3	0.3	0.3	17
Sept.	1490	0.1	3.3	197
Oct.	66	0.1	1	63
Nov.	0.4	0.1	0.2	10
Dec.	240	0.1	1.8	110
Total	..	..	..	506

Year 1966

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	0.1	0.1	0.1	8
Feb.	0.4	0.1	0.2	12
Mar.	No Records			20*
Apr.	0.4	0.02	0.13	8
May	No Records			1*
June	No Records			2*
July	No Records			2*
Aug.	No Records			2*
Sept.	No Records			1*
Oct.	0.8	0.1	0.2	14
Nov.	3.5	0	0.5	29
Dec.	46	0	0.4	26
Total	..	..	..	125*

Year 1967

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1.2	0	0.3	20
Feb.	1.4	0	0.1	8
Mar.	1070	0.1	9	532
Apr.	3.7	0.3	0.7	39
May	1.5	0.2	0.5	30
June	259	0.2	12	734
July	7.5	0.2	1.4	88
Aug.	624	0.2	17	1,040
Sept.	350	0.5	15	923
Oct.	2.4	0.2	0.8	52
Nov.	0.7	0	0.2	12
Dec.	0.7	0	0.2	13
Total	..	..	..	3,521

* Estimated

Appendix 16
Sheet 3

13663

GARDINERS CREEK AT LIDDELL

Year 1968

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	271	0.4	71	4,422
Feb.	37	1.2	10	561
Mar.	1.5	0.2	0.7	43
Apr.	0.9	0.2	0.5	30
May	84	0.1	3	173
June	1.5	0.2	0.6	36
July	1.6	0.3	0.5	32
Aug.	3	0.3	1.3	81
Sept.	1.5	0.3	0.9	56
Oct.	0.7	0.2	0.4	25
Nov.	1.5	0.1	0.3	18
Dec.	No Records			50*
Total	..	..	..	5,527*

* Estimated

13664

BOWMANS CREEK AT RAVENSWORTH

LOCATION:	Latitude 32°24' Longitude 151°03'
PERIOD OF ESTABLISHMENT:	January 1956 to date
COMPLETE YEARS OF COMPUTED RECORDS:	11 years.
ZERO OF GAUGE:	R.L.63.60 Assumed Datum.
CATCHMENT AREA:	79 Square Miles.
CONTROL:	Sand and Gravel
EQUIPMENT:	Float recorder installed March 1956 Staff gauge, range 0 to 15 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 103
	(b) Maximum observation in cusecs : 80
	(c) Minimum observation in cusecs : 0
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	3,500 cusecs
MEAN DAILY DISCHARGE FOR 11 YEARS:	12.4 cusecs
MEAN ANNUAL DISCHARGE FOR 11 YEARS:	9,030 acre feet

BOWMANS CREEK AT RAVENSWORTH.

Year 1956

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	3500	21	255	14,774
Mar.	720	45	116	7,178
Apr.	1410	14	64	3,838
May	897	18	46	2,866
June	640	18	50	2,978
July	81	24	34	2,094
Aug.	130	14	34	2,102
Sept.	14	14	14	840
Oct.	24	1.5	6.6	407
Nov.	1.5	0	0.7	42
Dec.	473	0	6.9	426
Total	..	..	..	.

Year 1957

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	0.5	0	0.03	2
Feb.	785	0	17	970
Mar.	140	0.5	3.8	240
Apr.	2.5	0	0.4	27
May	0.3	0	0.01	0.6
June	0	0	0	0
July	0	0	0	0
Aug.	0.1	0	0.07	4.4
Sept.	1.7	0.1	0.5	31
Oct.	0.9	0	0.3	15
Nov.	0	0	0	0
Dec.	27	0	0.5	29
Total	..	..	..	1,319

Year 1958

Jan.	540	0	12	766
Feb.	140	0.3	12	680
Mar.	4.4	0	0.8	51
Apr.	1.7	0	0.2	10
May	19	0	0.5	30
June	7	0	0.1	6
July	0.9	0	0	2
Aug.	27	0	1.0	63
Sept.	100	0	4.5	268
Oct.	160	0.5	11	667
Nov.	4.3	0	0.2	14
Dec.	21	0	0.3	20
Total	..	..	..	2,577

Year 1959

Jan.	75	0	4.5	276
Feb.	518	0	20	1,132
Mar.	125	0.5	4.7	292
Apr.	1.3	0.3	0.5	27
May	0.5	0.4	0.5	28
June	87	0.2	3.4	202
July	129	1.3	10	626
Aug.	198	0.3	14	830
Sept.	3.3	0	1.0	61
Oct.	325	0	18	1,096
Nov.	373	2.5	36	2,140
Dec.	85	0.1	2.5	154
Total	..	..	..	6,864

Year 1960

Jan.	0.4	0	0.02	1.4
Feb.	0	0	0	0
Mar.	0	0	0	0
Apr.	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	131	0	11	686
Aug.	16	0.3	4.2	259
Sept.	85	0	4.7	284
Oct.	52	0	3.8	236
Nov.	4.5	0	0.3	17
Dec.	13	0	1.4	85
Total	..	..	..	1,568

Year 1961

Jan.	141	0	6	372
Feb.	7.4	0	0.5	26
Mar.	0.4	0	0.06	4
Apr.	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	0	0	0	0
Aug.	175	0	13	827
Sept.	15	1.7	4.9	292
Oct.	4.4	0	0.9	56
Nov.	758	0	36	2,139
Dec.	670	11.1	59	3,682
Total	..	..	..	7,398

Year 1962

Jan.	No Records			
Feb.	No Records			
Mar.	9.10	2.9	4.7	292
Apr.	No Records			
May	No Records			
June	No Records			
July	343	8	32	1,974
Aug.	125	8.5	22	1,344
Sept.	52	5	10	620
Oct.	69	3.1	8	512
Nov.	18	1.3	319	234
Dec.	722	0.7	34	2,136
Total	..	..	.	..

Year 1963

Jan.	861	7.1	60	3,720
Feb.	97	7.1	16	896
Mar.	750	5.6	68	4,198
Apr.	525	8.1	30	1,816
May	826	38	133	8,236
June	478	32	90	5,420
July	155	19	31	1,920
Aug.	736	9.5	43	2,686
Sept.	798	3.2	64	3,850
Oct.	74	21	33	2,034
Nov.	72	16	20	1,232
Dec.	412	4.3	22	1,350
Total	..	..	..	37,358

13666

BOWMANS CREEK AT RAVENSWORTH

Year 1964

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	27	2.7	9	544
Feb.	5	1	2.5	148
Mar.	3.3	0.3	0.9	56
Apr.	425	0.1	23	1,382
May	455	6	29	1,810
June	1347	9.5	81	4,842
July	13	6.9	11	7,028
Aug.	7.7	5.2	6.4	398
Sept.	7.7	3.7	5.1	308
Oct.	21	4.4	7.3	454
Nov.	8.5	1.1	2.9	176
Dec.	1.6	0	0.3	18
Total	..	..	..	17,164

Year 1965

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	0	0	0	0
Feb.	0	0	0	0
Mar.	0	0	0	0
Apr.	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	62	0	9.2	569
Aug.	6.9	0.3	1.6	100
Sept.	1.2	0	0.9	22
Oct.	107	0	2.9	182
Nov.	2.8	0	0.4	24
Dec.	125	0	3.6	290
Total	..	..	..	1,187

Year 1966

Jan.	0	0	0	0
Feb.	0	0	0	0
Mar.	0	0	0	0
Apr.	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	0	0	0	0
Aug.	0	0	0	0
Sept.	0	0	0	0
Oct.	0	0	0	0
Nov.	0	0	0	0
Dec.	0	0	0	0
Total	..	..	..	0

Year 1967

Jan.	0	0	0	0
Feb.	0	0	0	0
Mar.	304	0	13.2	818
Apr.	56	0.7	9	542
May	2.2	0.7	0.8	51
June	373	0.5	77	4,600
July	106	0.6	25	1,522
Aug.	580	7	39	2,430
Sept.	420	15	41	2,448
Oct.	400	13	38	2,336
Nov.	23	0	11	639
Dec.	3	0	0.2	11
Total	..	..	..	15,397

Year 1968

Jan.	490	0	70	4,316
Feb.	7	2	4	238
Mar.	5	1.5	2.7	168
Apr.	2.6	0.6	1.4	84
May	135	0.4	13	838
June	7	1.8	4	244
July	4	1.5	2.4	148
Aug.	102	1.2	28	1,730
Sept.	52	0.6	10	628
Oct.	12	0	2	134
Nov.	0.6	0	0	0
Dec.	16	0	0.1	8
Total	..	..	..	8,536

GLENNIES CREEK AT MIDDLE FALBROOK

LOCATION:	Latitude 32°27' Longitude 151°09'
PERIOD OF ESTABLISHMENT:	January 1956 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	11 years.
ZERO OF GAUGE:	R.L.66.38 Assumed Datum
CATCHMENT AREA	171 Square Miles
CONTROL:	Sand
EQUIPMENT:	Float recorder installed January 1960. Staff gauge, range 2.5 to 30 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 96
	(b) Maximum observation in cusecs : 2,740
	(c) Minimum observation in cusecs : 0
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	32,100 cusecs
MEAN DAILY DISCHARGE FOR 11 YEARS:	85 cusecs
MEAN ANNUAL DISCHARGE FOR 11 YEARS:	62,000 acre feet

GLENNIES CREEK AT MIDDLE FALBROOK

Year 1956

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	26500	24	1176	68,226
Mar.	31600	126	1000	62,020
Apr.	5610	36	322	19,330
May	960	70	169	10,454
June	1520	36	139	8,350
July	195	36	69	4,282
Aug.	660	36	107	6,618
Sept.	24	16	20.8	1,248
Oct.	36	16	27.5	1,704
Nov.	24	0.8	7.9	474
Dec.	195	0.8	16	1,000
Total	..	..	..	..

Year 1957

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	13	0	4	240
Feb.	12100	3.6	360	20,166
Mar.	146	12	41	2,560
Apr.	12	5.6	9	544
May	8	3.6	5.1	318
June	8	3.6	4.3	248
July	8	3.6	5.4	338
Aug.	121	3.6	18	1,106
Sept.	44	2.1	9	536
Oct.	2.1	0	0.3	20
Nov.	0	0	0	0
Dec.	0	0	0	0
Total	..	..	..	26,076

Year 1958

Jan.	110	0	6.3	390
Feb.	85	1	10	570
Mar.	16.5	0	2.2	134
Apr.	16.5	0	2.8	166
May	17	1	5.6	346
June	98	0	11	640
July	85	3.6	19	1,170
Aug.	12	3.6	5	312
Sept.	44	3.6	13	784
Oct.	85	2.1	19	1,208
Nov.	2	0	0.1	7
Dec.	8	0	1	61
Total	..	..	..	5,788

Year 1959

Jan.	146	0	31	1,898
Feb.	3360	8	94	5,244
Mar.	44	12	19	1,202
Apr.	53	8	26	1,552
May	27	8	12	756
June	220	3.6	17	998
July	374	22	63	3,878
Aug.	824	27	81	5,050
Sept.	44	21	28	1,664
Oct.	2500	16	178	11,060
Nov.	2420	42	178	10,680
Dec.	42	3.6	14	874
Total	..	..	..	44,856

Year 1960

Jan.	25	0.3	3.8	235
Feb.	110	0.4	12	668
Mar.	158	13	42	2,588
Apr.	44	5.4	14	826
May	12	2.4	6.4	398
June	110	6.0	29	1,752
July	365	19	62	3,874
Aug.	85	12	37	2,302
Sept.	110	6	29	1,718
Oct.	58	5.5	18	1,086
Nov.	10	0	3.5	208
Dec.	812	0	54	3,352
Total	..	..	..	19,007

Year 1961

Jan.	357	6.5	59	3,678
Feb.	121	8	28	1,592
Mar.	27	4	11	666
Apr.	12	0.7	3.6	216
May	7	2.2	4.1	254
June	874	3	57	3,406
July	11	4.6	6.9	426
Aug.	916	2.2	61	3,794
Sept.	74	7.4	28	1,656
Oct.	22.2	3	8.2	508
Nov.	3750	3	76	4,536
Dec.	4700	25	395	24,488
Total	..	..	..	45,220

Year 1962

Jan.	6600	39	432	26,782
Feb.	1000	27	75	4,194
Mar.	155	17	36	2,244
Apr.	11400	14	652	39,098
May	32100	21	989	61,306
June	95	29	50	2,988
July	1056	24	79	4,894
Aug.	160	20	36	2,228
Sept.	626	14	54	3,228
Oct.	227	19	39	2,436
Nov.	65	1.4	16	972
Dec.	9000	0.7	355	22,022
Total	..	..	..	172,392

Year 1963

Jan.	7950	13	268	16,604
Feb.	1620	16	75	4,226
Mar.	21470	13	1093	67,734
Apr.	5475	60	302	18,110
May	10700	164	897	55,590
June	2685	128	350	20,992
July	752	56	139	8,648
Aug.	4300	44	202	12,516
Sept.	6320	54	438	26,282
Oct.	291	22	90	5,590
Nov.	119	22	60	3,606
Dec.	1100	5	108	6,670
Total	..	..	..	246,568

GLENNIES CREEK AT MIDDLE FALBROOK

Year 1964

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	72	1	12	744
Feb.	11	6	9	524
Mar.	408	0.5	29	1,822
Apr.	2264	0	99	5,942
May	2510	27	111	6,900
June	12200	20	490	29,418
July	45	22	31	1,896
Aug.	21	6	13	824
Sept.	6	1	2	146
Oct.	94	0	12	726
Nov.	38	1	12	734
Dec.	1	0	0.1	10
Total	..	..	..	49,686

Year 1965

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	2	0	0.07	5
Feb.	0	0	0	0
Mar.	0	0	0	0
Apr.	40	0	1	60
May	0	0	0	0
June	0	0	0	0
July	1660	0	67	4,172
Aug.	10	2.1	4.7	284
Sept.	6	0.8	2.7	164
Oct.	4945	0	41	2,556
Nov.	7.5	0	1.3	79
Dec.	77	0	0.5	30
Total	..	..	..	7,350

Year 1966

Jan.	0	0	0	0
Feb.	0	0	0	0
Mar.	0	0	0	0
Apr.	0	0	0	0
May	5.8	0	0.7	42
June	76	1.3	8	486
July	1.7	0	0.7	46
Aug.	14	0	0.6	39
Sept.	14	0	2.1	124
Oct.	140	0	16	971
Nov.	28	0	7.1	428
Dec.	76	0	7.3	453
Total	..	..	..	2,589

Year 1967

Jan.	0	0	0	0
Feb.	87	0	7	400
Mar.	4802	6	157	9,726
Apr.	884	18	147	8,854
May	108	15	32	1,982
June	5945	18	624	37,452
July	666	35	121	7,520
Aug.	13208	46	401	24,858
Sept.	No Records			
Oct.	No Records			
Nov.	84	6	22	1,302
Dec.	17	3	7	432
Total	..	..	..	..

Year 1968

Jan.	8000	3.3	695	43,066
Feb.	66	23	41	2,370
Mar.	454	14	48	2,997
Apr.	17	10	13	785
May	1251	8	76	4,708
June	21	9	14	816
July	28	9	12	748
Aug.	925	9	121	7,484
Sept.	100	2	28	1,660
Oct.	157	0	9	560
Nov.	0	0	0	0
Dec.	71	0	2.7	167
Total	..	..	..	65,361

CONGEWAI CREEK AT EGLINFORD.

LOCATION:	Latitude 32°53' Longitude 151°16'
PERIOD OF ESTABLISHMENT:	May 1948 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	20 years
ZERO OF GAUGE:	R.L. 95.30 Assumed Datum.
CATCHMENT AREA:	33 Square Miles.
CONTROL:	Log in gravel.
EQUIPMENT:	Pressure recorder installed August, 1963. Staff gauge, range 0 to 20 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 108
	(b) Maximum observation in cusecs : 75
	(c) Minimum observation in cusecs : 0
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	5,925 cusecs
MEAN DAILY DISCHARGE FOR 20 YEARS:	39 cusecs
MEAN ANNUAL DISCHARGE FOR 20 YEARS:	29,000 acre feet

13671

CONGEWAI CREEK AT EGLINFORD

Year 1948

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	..	..	..	..
May	..	..	..	..
June	2580	5	245	14,690
July	17	5	8.9	553
Aug.	5	1.3	3.1	195
Sept.	56	1.3	10	604
Oct.	6.5	0.5	2.2	137
Nov.	0.5	0	0.3	19
Dec.	1.3	0	0.2	16
Total	..	..	..	..

Year 1949

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	31	0.2	4.9	305
Feb.	368	1.3	30	1,660
Mar.	2620	17	173	10,722
Apr.	20	8	11	663
May	3040	6.5	59	3,659
June	5850	17	458	27,506
July	1106	17	59	3,688
Aug.	190	16	34	2,134
Sept.	61	21	34	2,050
Oct.	47	20	28	1,745
Nov.	23	15	18	1,117
Dec.	47	12	19	1,207
Total	..	..	..	56,456

Year 1950

Jan.	84	11	24	1,474
Feb.	2160	14	147	8,224
Mar.	538	23	60	3,738
Apr.	41	23	32	1,920
May	39	17	28	1,722
June	5650	14	956	57,394
July	1780	28	217	13,484
Aug.	197	13	47	2,884
Sept.	1900	7	85	5,070
Oct.	24	7	13.9	864
Nov.	1230	4	71	4,274
Dec.	20	4	9.9	616
Total	..	..	..	101,664

Year 1951

Jan.	5000	10	386	23,956
Feb.	112	4	22	1,254
Mar.	835	7	43	2,652
Apr.	13	2.4	5.7	342
May	7	2.4	3.4	208
June	2055	2.4	106	6,348
July	59	4	20	1,268
Aug.	13	2.4	5.6	348
Sept.	4	1.2	1.9	112
Oct.	3.2	0.6	1.6	99
Nov.	0.6	0.1	0.3	17
Dec.	0.2	0.1	0.1	8
Total	..	..	..	36,612

Year 1952

Jan.	0.4	0.4	0.4	24
Feb.	0.4	0.4	0.4	24
Mar.	6	0	0.8	52
Apr.	12	0.4	2.1	124
May	3	0.4	1.1	70
June	160	0.2	10	630
July	1205	0.4	65	4,040
Aug.	5550	15	495	30,706
Sept.	15	4	8	504
Oct.	15	3	5	310
Nov.	5	1.3	2	118
Dec.	7.5	0.2	0.7	42
Total	..	..	..	36,644

Year 1953

Jan.	24	1.3	5.9	368
Feb.	96	1.3	15	824
Mar.	18	5.7	11	705
Apr.	8.8	1.3	4.1	247
May	5500	3.2	327	20,270
June	9	4	6	382
July	4	3	4	266
Aug.	3	3	3	186
Sept.	3	1.3	1.8	106
Oct.	1.3	0.4	0.8	52
Nov.	0.8	0.2	0.5	28
Dec.	0.2	0	0.05	2
Total	..	..	..	23,436

Year 1954

Jan.	6	0	1.2	76
Feb.	5450	0	172	9,638
Mar.	49	3.2	12	746
Apr.	3.2	1.3	2	118
May	3.2	1.3	1.5	96
June	3.2	1.3	1.7	106
July	70	1.3	13	812
Aug.	5.7	1.3	3.4	214
Sept.	7.2	1.3	2.9	176
Oct.	59	1.3	11	702
Nov.	41	3.2	14	856
Dec.	25	0	2.9	178
Total	..	..	..	13,718

Year 1955

Jan.	21	0.6	6	370
Feb.	3860	3.2	359	20,096
Mar.	1013	36	170	10,532
Apr.	3180	14	89	5,360
May	3180	14	94	5,844
June	40	16	26	1,572
July	14	9	10	594
Aug.	8	2.5	4.6	286
Sept.	32	2.5	6.1	368
Oct.	3.4	1.7	2.5	154
Nov.	40	0.9	6.4	388
Dec.	7	2.5	3.7	230
Total	..	..	..	45,794

CONGEWAI CREEK AT EGLINFORD

Year 1956

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	12	0.9	2.2	138
Feb.	1900	3.4	224	13,018
Mar.	5925	35	268	16,614
Apr.	47	12	22	1,298
May	47	9	18	1,138
June	2620	6	116	6,982
July	31	7	15	940
Aug.	160	6	23	1,398
Sept.	5	2.6	3.7	220
Oct.	21	1.8	5.5	338
Nov.	2.6	0.7	1.6	94
Dec.	3	0.5	1.1	68
Total	..	..	..	42,246

Year 1957

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	0.5	0.2	0.4	22
Feb.	1430	0.2	39	2,164
Mar.	15	2.7	6.7	414
Apr.	2.7	0.8	1.5	92
May	0.7	0.5	0.6	34
June	0.5	0.3	0.4	26
July	4.9	0.5	1.2	77
Aug.	114	0.5	11	674
Sept.	18	1.1	3.7	224
Oct.	1	0.2	0.4	25
Nov.	460	0.2	6.3	380
Dec.	0	0	0	0
Total	..	..	..	4,133

Year 1958

Jan.	5.6	0	0.2	14
Feb.	36	0.7	8.5	474
Mar.	18	1.2	5.5	342
Apr.	3.5	0.4	1.5	87
May	3.5	0.7	1.9	119
June	21	0.7	5.7	340
July	11	1.2	4.4	272
Aug.	5.6	1.2	2.8	170
Sept.	1.2	0.7	0.7	43
Oct.	3.5	0.2	1.1	71
Nov.	0.2	0	0.04	2
Dec.	0.7	0	0.4	23
Total	..	..	..	1,957

Year 1959

Jan.	47	0.1	7.4	456
Feb.	1130	3.5	45	2,492
Mar.	49	5.5	15	950
Apr.	32	4.6	10	624
May	4.6	2	2.8	174
June	136	1.2	9.9	592
July	47	5.5	13	808
Aug.	21	2.9	6.8	424
Sept.	21	2.9	6.3	376
Oct.	85	2.9	21	13,144
Nov.	No Records			4,520*
Dec.	No Records			1,780*
Total	..	..	..	26,340*

Year 1960

Jan.	No Records			440*
Feb.	15	3.4	5.9	330
Mar.	35	6.1	11	710
Apr.	6.1	4.7	5.2	310
May	6.1	4.2	4.8	300
June	17	4.2	9.6	574
July	5.6	5.1	5.2	322
Aug.	No Records			260*
Sept.	No Records			180*
Oct.	No Records			200*
Nov.	No Records			100*
Dec.	No Records			2,520*
Total	..	..	..	6,246*

Year 1961

Jan.	No Records			490*
Feb.	No Records			130*
Mar.	No Records			120*
Apr.	No Records			130*
May	No Records			110*
June	No Records			320*
July	No Records			120*
Aug.	157	5.8	25	1,522
Sept.	11	0.8	2.7	162
Oct.	9	0.6	4.3	268
Nov.	60	1.5	16	966
Dec.	255	5.6	33	2,016
Total	..	..	..	6,354*

Year 1962

Jan.	136	7.7	37	2,282
Feb.	2580	10	187	10,472
Mar.	69	9	22	1,384
Apr.	51	13	21	1,282
May	5700	14	356	22,080
June	14	6.2	9	542
July	388	5.6	39	2,434
Aug.	24	7.5	11	688
Sept.	88	5	14	838
Oct.	7.5	5	5.4	338
Nov.	11	1.7	4.1	246
Dec.	1780	1.7	77	4,792
Total	..	..	..	47,378

Year 1963

Jan.	33	4.5	12	722
Feb.	18	3.6	6.8	382
Mar.	2800	4	160	9,950
Apr.	4600	10	403	24,972
May	1330	31	283	17,542
June	700	31	94	5,664
July	47	8	22	1,384
Aug.	430	6.1	18	1,134
Sept.	310	6.1	47	2,850
Oct.	27	8.3	17	1,046
Nov.	14	7.2	9.1	548
Dec.	114	7.2	44	2,728
Total	..	..	..	68,922

* Estimated.

CONGEWAI CREEK AT EGLINFORD

Year 1964

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	43	4.2	13	784
Feb.	39	1.8	12	680
Mar.	24	0.6	2.9	178
Apr.	22	1.5	5.2	320
May	20	2.7	4.9	304
June	610	2.7	145	8,698
July	No Records			630*
Aug.	11	2.1	4	246
Sept.	3.8	1.5	2.6	156
Oct.	2.4	0.6	1.4	90
Nov.	14	0.6	2.9	172
Dec.	0.6	0.2	0.5	31
Total	..	..	..	12,289 *

Year 1965

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	0.2	0.1	0.1	9
Feb.	0.2	0	0.04	2
Mar.	0	0	0	0
Apr.	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	348	0.1	16	970
Aug.	2.7	0.5	1.1	70
Sept.	2.7	0.6	1.4	86
Oct.	60	0.1	6.7	414
Nov.	2.1	0.1	0.6	35
Dec.	64	0.1	17	1,060
Total	..	..	..	2,646

Year 1966

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	2.7	0.1	0.7	44
Feb.	1.4	0	0.2	12
Mar.	1.5	0	0.3	21
Apr.	0.4	0	0.1	5
May	4.2	0.1	1.3	82
June	2.7	0.4	1.1	67
July	0.6	0	0.3	16
Aug.	1.0	0	0.1	7
Sept.	1.3	0	0.5	31
Oct.	0.4	0	0.06	4
Nov.	30	0	3.0	181
Dec.	9.7	0	1.1	68
Total	..	..	..	538

Year 1967

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	3.8	0	0.2	14
Feb.	40	0.3	5.6	315
Mar.	1013	4.2	37	2,290
Apr.	13	2.7	6.9	414
May	3.5	0.2	1.4	90
June	3660	0.2	148	8,882
July	68	3	16	1,015
Aug.	5350	8	149	9,249
Sept.	967	5	50	3,007
Oct.	835	4	32	1,982
Nov.	11	2	5	306
Dec.	3	0.2	0.7	42
Total	..	..	..	27,606

Year 1968

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	3300	0.1	192	11,850
Feb.	8	1.4	5	302
Mar.	57	1.4	18	1,126
Apr.	16	1.8	5	284
May	39	1.4	6	385
June	3	2.2	2.5	137
July	5	1.4	2.6	151
Aug.	108	1	13	820
Sept.	4	1.2	2.5	148
Oct.	1.1	0.3	0.7	41
Nov.	12	0	2.8	170
Dec.	0.3	0	0.2	10
Total	..	..	..	15,424

* Estimated

WOLLOMBI BROOK AT HANGING ROCK

LOCATION:	Latitude 32°54' Longitude 151°09'
PERIOD OF ESTABLISHMENT:	April 1958 to date
COMPLETE YEARS OF COMPUTED RECORDS:	9 years
ZERO OF GAUGE:	R.L. 59.61 Assumed Datum
CATCHMENT AREA:	150 Square Miles.
CONTROL:	Sand
EQUIPMENT:	Float recorder installed May 1958 Staff gauge, range 0 to 35 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 131
	(b) Maximum observation in cusecs : 8,490
	(c) Minimum observation in cusecs : 0
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	19,100 cusecs
MEAN DAILY DISCHARGE FOR 9 YEARS:	47 cusecs
MEAN ANNUAL DISCHARGE FOR 9 YEARS:	34,300 acre feet

WOLLOMBI BROOK AT HANGING ROCK

Year 1958

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	..	..	..	..
May	..	..	..	..
June	22	2	8.3	497
July	15	2	6.5	404
Aug.	3.7	0.3	2.2	139
Sept.	2	0.2	0.7	42
Oct.	2.9	0	1.1	70
Nov.	0	0	0	0
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.	74	9	30	1,854
Apr.	88	8.6	24	1,412
May	No Records			
June	No Records			
July	No Records			
Aug.	92	9	26	1,596
Sept.	55	11	22	1,290
Oct.	462	2.5	99	6,130
Nov.	2200	46	224	13,458
Dec.	530	31	86	5,324
Total	..	..	..	..

Year 1960

Jan.	38	6.2	21	1,310
Feb.	15	6	8.2	473
Mar.	38	6	13	812
Apr.	9.5	3.6	6.5	380
May	10	3	5.3	328
June	38	4.4	10	608
July	16	6	8.3	514
Aug.	7	5	6	372
Sept.	9	3	4.3	260
Oct.	10	1.5	4.5	278
Nov.	5.6	1.2	2.4	144
Dec.	570	1	75	4,630
Total	..	..	..	10,109

Year 1961

Jan.	20	3	11	700
Feb.	10	2	3.4	192
Mar.	6.8	1.2	2.8	172
Apr.	8	1.7	3.1	184
May	4.7	2	2.6	160
June	18	2	7.6	454
July	5	2	2.8	174
Aug.	306	2	69	4,264
Sept.	122	3.5	20	1,228
Oct.	14	3.5	5.2	326
Nov.	364	1.9	79	4,744
Dec.	1595	27	179	11,176
Total	..	..	..	23,774

Year 1962

Jan.	726	59	189	11,710
Feb.	5660	62	409	22,924
Mar.	370	17	62	3,872
Apr.	76	18	33	1,962
May	19100	15	530	32,878
June	42	31	37	2,208
July	853	30	98	6,046
Aug.	131	20	36	2,244
Sept.	35	13	18	1,092
Oct.	17	6	9	540
Nov.	11	4	5.6	338
Dec.	258	4	25	1,532
Total	..	..	..	87,346

Year 1963

Jan.	46	13	22	1,354
Feb.	31	7	13	738
Mar.	1445	8	184	11,386
Apr.	10900	19	445	26,683
May	10600	61	768	47,568
June	606	48	161	9,669
July	171	25	60	3,752
Aug.	540	18	39	2,440
Sept.	425	22	92	5,518
Oct.	133	16	30	1,849
Nov.	23	10	16	992
Dec.	73	7	22	1,364
Total	..	..	..	113,313

Year 1964

Jan.	9	5.3	7.2	448
Feb.	5	2.3	3.4	196
Mar.	23	1.4	4.2	262
Apr.	40	0.8	5.7	346
May	10	6	8	494
June	6350	5	376	22,574
July	30	6	15	900
Aug.	17.6	2.7	6.4	408
Sept.	8	2.7	4.4	263
Oct.	15	0.9	3.6	224
Nov.	19	1	7	416
Dec.	2.2	0.1	0.5	32
Total	..	..	..	26,563

Year 1965

Jan.	0.6	0	0.1	4.3
Feb.	0.1	0	0	0.6
Mar.	0	0	0	0
Apr.	0.1	0	0	0.9
May	0.4	0.05	0.2	14
June	1.1	0.4	0.4	25
July	99	0	8.9	553
Aug.	5	0.8	1.6	97
Sept.	1.4	0.6	0.9	57
Oct.	48	0.1	4.8	297
Nov.	2.2	0.1	0.7	43
Dec.	60	0.3	14	844
Total	..	..	..	1,936

Appendix 20
Sheet 3

WOLLOMBI BROOK AT HANGING ROCK

Year 1966

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1.4	0.01	0.5	33
Feb.	0.3	0	0	2.4
Mar.	0.6	0	0.1	8.8
Apr.	0	0	0	0
May	0.9	0	0.1	5.7
June	0.8	0.4	0.6	36
July	0.6	0.3	0.3	21
Aug.	0.5	0.1	0.3	18
Sept.	0.3	0	0.1	5.7
Oct.	0	0	0	0
Nov.	111	0	6.6	394
Dec.	1.2	0	0.3	17
Total	..	..	..	542

Year 1967

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	6.9	0	0.6	35
Feb.	7.3	0	1.1	64
Mar.	104	3.2	18	1,136
Apr.	4.8	1.8	3.3	200
May	2.1	1.1	1.5	91
June	759	1.2	80	4,784
July	133	13	37	2,316
Aug.	3826	25	265	16,430
Sept.	80	11	64	3,955
Oct.	106	11	18	1,126
Nov.	15	7	13	796
Dec.	7	0	2	130
Total	..	..	..	31,063

Year 1968

Jan.	990	0.1	130	8,080
Feb.	36	18	30	1,676
Mar.	23	8	14	874
Apr.	14	2.8	7	427
May	15	2.6	6	361
June	5	1.6	2.6	156
July	13	4.6	9	552
Aug.	41	1.4	12	760
Sept.	8	1.6	4	249
Oct.	0.3	0	0.1	1
Nov.	0	0	0	0
Dec.	No Records			15*
Total	..	..	..	13,151*

* Estimated

HUNTER RIVER AT SINGLETON

LOCATION:	Latitude 32°33' Longitude 151°09'
PERIOD OF ESTABLISHMENT:	November 1891 to date
COMPLETE YEARS OF COMPUTED RECORDS:	70 years
ZERO OF GAUGE:	R.L.86.80 Water Conservation Datum.
CATCHMENT AREA:	6,350 square miles.
CONTROL:	Sand.
EQUIPMENT:	Staff Gauge, range 0 to 50 feet
CURRENT METER OBSERVATIONS:	(a) Number obtained : 571
	(b) Maximum observation in cusecs : 110,000
	(c) Minimum observation in cusecs : 0
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	443,000 cusecs.
MEAN DAILY DISCHARGE FOR 70 YEARS:	984 cusecs
MEAN ANNUAL DISCHARGE FOR 70 YEARS:	719,000 acre feet
REMARKS:	Prior to 1898 few discharge measurements were taken, and as records during this period are likely to be subject to error, they have not been included in this appendix.

HUNTER RIVER AT SINGLETON

Year 1898

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	26900	360	2337	144,920
Feb.	57560	510	6257	350,400
Mar.	1200	540	757	46,950
Apr.	600	390	462	27,750
May	1900	375	778	48,220
June	18600	435	1971	118,290
July	3830	750	1398	86,670
Aug.	1560	600	873	54,150
Sept.	32700	660	3375	202,480
Oct.	780	450	593	36,750
Nov.	570	230	331	19,846
Dec.	420	152	219	13,572
Total	..	..	..	1,149,998

Year 1899

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	272	140	176	10,894
Feb.	129	93	115	6,426
Mar.	93	83	87	5,406
Apr.	1200	83	376	22,564
May	177	118	146	9,046
June	1620	105	528	31,702
July	9420	540	1435	89,000
Aug.	51800	600	7439	461,220
Sept.	2680	705	1152	69,120
Oct.	1080	480	723	44,820
Nov.	990	420	669	40,170
Dec.	405	242	314	19,476
Total	..	..	..	809,844

Year 1900

Jan.	450	230	295	18,150
Feb.	242	129	190	10,556
Mar.	218	83	130	7,986
Apr.	360	93	193	11,491
May	780	140	294	18,067
June	13600	480	3678	218,784
July	23500	1200	3953	242,977
Aug.	1660	615	1013	62,276
Sept.	735	585	641	38,133
Oct.	585	257	417	25,604
Nov.	375	218	268	15,939
Dec.	840	286	421	25,856
Total	..	..	..	695,821

Year 1901

Jan.	480	140	235	14,480
Feb.	360	93	180	9,970
Mar.	300	55	137	8,392
Apr.	540	129	227	13,490
May	390	218	288	17,682
June	660	190	326	19,400
July	1200	300	685	42,199
Aug.	2370	272	567	34,831
Sept.	1350	272	526	31,300
Oct.	1200	242	432	26,574
Nov.	630	218	359	21,363
Dec.	480	73	211	12,965
Total	..	..	..	252,649

Year 1902

Jan.	218	55	102	6,244
Feb.	73	36	54	2,974
Mar.	480	36	122	7,476
Apr.	64	36	47	2,810
May	83	36	59	3,611
June	93	55	72	4,313
July	165	64	109	6,724
Aug.	360	93	181	11,158
Sept.	390	140	275	16,360
Oct.	1900	165	484	29,743
Nov.	1500	242	513	30,506
Dec.	7760	218	1023	62,841
Total	..	..	..	184,760

Year 1903

Jan.	272	30	79	4,866
Feb.	30	11	19	1,065
Mar.	300	11	31	1,888
Apr.	242	11	45	2,663
May	390	30	104	6,405
June	1380	73	376	22,368
July	300	55	123	7,587
Aug.	3830	242	741	45,579
Sept.	27700	286	2907	172,961
Oct.	9420	900	2835	174,296
Nov.	13600	660	2211	131,532
Dec.	2370	360	749	46,065
Total	..	..	..	617,275

Year 1904

Jan.	720	272	417	25,630
Feb.	21900	93	899	51,701
Mar.	47600	780	4356	267,804
Apr.	34300	1020	3547	210,991
May	1620	690	1065	65,439
June	1020	630	739	43,993
July	60700	645	7115	437,410
Aug.	2260	1020	1433	88,065
Sept.	1290	615	816	48,544
Oct.	1380	630	912	56,069
Nov.	615	390	461	27,425
Dec.	510	315	386	23,737
Total	..	..	..	1,346,808

Year 1905

Jan.	525	272	332	20,381
Feb.	405	300	343	19,037
Mar.	1200	286	405	24,901
Apr.	1900	345	683	40,652
May	720	360	479	29,448
June	1560	435	849	50,507
July	1200	585	729	44,826
Aug.	1200	450	613	37,657
Sept.	1110	450	580	34,504
Oct.	435	300	374	22,993
Nov.	330	286	308	18,306
Dec.	900	242	376	23,122
Total	..	..	..	366,334

HUNTER RIVER AT SINGLETON

Year 1906

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min	Mean	
Jan.	257	177	215	13,244
Feb.	177	105	132	7,337
Mar.	1020	118	314	19,330
Apr.	390	190	255	15,178
May	300	177	203	12,483
June	345	286	310	18,420
July	315	242	277	17,034
Aug.	480	242	312	19,180
Sept.	2750	420	835	49,654
Oct.	1470	345	630	38,758
Nov.	1560	330	548	32,630
Dec.	345	257	293	17,990
Total	..	..	..	261,238

Year 1907

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	300	218	251	15,430
Feb.	510	165	242	13,421
Mar.	1380	165	505	31,022
Apr.	600	272	346	20,411
May	1270	17	209	12,886
June	1870	17	685	40,727
July	850	90	229	14,048
Aug	270	39	117	7,208
Sept.	39	5	30	1,789
Oct.	20	10	15	922
Nov.	1870	10	184	10,966
Dec.	9900	5	570	35,061
Total	..	..	..	203,891

Year 1908

Jan.	1870	20	201	12,456
Feb.	40600	630	5118	296,860
Mar.	42400	670	4156	257,680
Apr.	990	475	560	33,620
May	475	475	475	29,450
June	440	305	360	21,566
July	1760	270	326	20,200
Aug.	14400	475	3147	195,090
Sept.	6300	710	1638	98,300
Oct.	710	475	656	40,670
Nov.	990	120	308	18,486
Dec.	150	90	96	5,940
Total	..	..	..	1,030,318

Year 1909

Jan.	90	90	90	5,580
Feb.	850	90	266	14,908
Mar.	178	5	41	2,548
Apr.	20	10	15	900
May	10	10	10	620
June	207	28	112	6,722
July	270	90	129	8,012
Aug.	1870	60	414	25,660
Sept.	4700	240	1222	73,336
Oct.	1270	178	278	17,202
Nov.	178	39	106	6,342
Dec.	27900	17	2331	144,538
Total	..	..	..	306,368

Year 1910

Jan.	60300	475	7088	439,470
Feb.	1050	240	406	22,744
Mar.	2700	178	709	43,950
Apr.	270	207	248	14,856
May	990	207	448	27,746
June	1150	370	512	30,740
July	1870	270	923	57,228
Aug.	475	370	405	25,110
Sept.	370	240	300	18,018
Oct.	207	90	154	9,538
Nov.	90	17	48	2,850
Dec	178	5	58	3,570
Total	..	..	..	695,820

Year 1911

Jan.	13500	90	1230	76,240
Feb.	3500	850	1418	79,460
Mar.	3800	305	1082	67,060
Apr.	270	178	218	13,096
May	270	178	225	13,980
June	405	270	314	18,870
July	3800	207	1191	73,848
Aug.	18000	240	2106	130,564
Sept.	1700	475	862	51,750
Oct.	590	178	349	21,612
Nov.	990	39	163	9,768
Dec.	9900	270	846	52,424
Total	..	..	..	608,672

Year 1912

Jan.	240	90	144	8,954
Feb.	1870	90	451	26,138
Mar.	1270	90	313	19,408
Apr.	1270	120	261	15,634
May	1270	39	212	13,156
June	710	120	261	15,686
July	14400	90	3020	187,260
Aug.	6300	475	1598	99,080
Sept.	475	90	203	12,172
Oct.	60	28	34	2,126
Nov.	90	17	33	2,012
Dec.	475	17	87	5,416
Total	..	..	..	407,042

Year 1913

Jan.	500	70	125	7,730
Feb.	2800	70	408	22,870
Mar.	690	110	171	10,634
Apr.	6898	110	1193	71,566
May	180000	160	15490	960,360
June	13070	1616	5650	338,972
July	37660	1090	5871	363,994
Aug.	1038	473	717	44,458
Sept.	500	323	394	23,664
Oct.	590	180	296	18,386
Nov.	500	95	199	11,918
Dec.	102	50	64	3,982
Total	..	..	..	1,878,542

HUNTER RIVER AT SINGLETON

Year 1914

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	446	30	84	5,222
Feb.	55	17	28	1,558
Mar.	3440	27	337	20,922
Apr.	260	45	101	6,044
May	110	40	60	3,738
June	6650	50	718	43,076
July	1308	250	465	28,820
Aug.	225	95	142	8,770
Sept.	8070	60	897	53,810
Oct.	8430	151	1324	82,070
Nov.	3910	301	726	43,540
Dec.	690	95	304	18,836
Total	..	..	..	316,406

Year 1915

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	3790	70	786	48,728
Feb.	70	30	59	3,234
Mar.	30	9	15	956
Apr.	55	23	32	1,930
May	13100	20	1489	92,298
June	500	126	217	13,034
July	5432	126	597	36,998
Aug.	420	160	244	15,126
Sept.	655	110	211	12,638
Oct.	143	40	83	5,150
Nov.	40	9	20	1,204
Dec.	1250	7	170	10,554
Total	..	..	..	241,850

Year 1916

Jan.	210	38	87	5,406
Feb.	6900	30	441	25,532
Mar.	230	75	137	8,320
Apr.	430	115	207	12,440
May	1580	75	294	18,240
June	3450	85	547	32,820
July	2650	262	587	36,380
Aug.	2020	350	790	49,580
Sept.	800	130	266	15,940
Oct.	8250	170	1883	116,780
Nov.	1220	210	418	25,080
Dec.	2800	590	3593	222,760
Total	..	..	..	569,278

Year 1917

Jan.	620	200	338	20,980
Feb.	640	130	306	18,366
Mar.	130	38	85	5,292
Apr.	210	30	77	4,600
May	65	30	45	2,782
June	350	26	97	5,826
July	149	60	42	5,708
Aug.	280	85	135	8,382
Sept.	18800	38	2234	134,020
Oct.	2020	210	646	40,088
Nov.	13800	156	2707	162,440
Dec.	7620	350	1748	108,440
Total	..	..	..	516,924

Year 1918

Jan.	3450	280	690	42,780
Feb.	3370	326	1003	56,180
Mar.	326	149	206	12,746
Apr.	176	123	139	8,356
May	176	105	130	8,034
June	123	99	108	6,456
July	350	66	110	6,790
Aug.	1070	218	397	24,628
Sept.	1070	149	418	25,062
Oct.	176	88	134	8,316
Nov.	123	39	80	4,828
Dec.	39	6	20	1,244
Total	..	..	..	205,420

Year 1919

Jan.	23	5	11	662
Feb.	23	13	17	917
Mar.	204	13	80	4,966
Apr.	74	20	36	2,162
May	1870	35	265	16,443
June	1070	88	256	15,345
July	111	66	81	5,018
Aug.	350	66	121	7,500
Sept.	530	56	164	9,862
Oct.	142	39	64	3,984
Nov.	93	8	27	1,640
Dec.	326	8	101	6,298
Total	..	..	..	74,797

Year 1920

Jan.	3396	31	304	18,888
Feb.	2020	39	254	14,748
Mar.	35	6	13	820
Apr.	9	6	7	422
May	51	8	20	1,266
June	13300	12	471	28,286
July	70000	303	8367	518,764
Aug.	2710	218	1048	32,520
Sept.	700	204	508	30,536
Oct.	204	66	152	9,394
Nov.	590	47	131	7,882
Dec.	30500	47	4582	284,130
Total	..	..	..	947,656

Year 1921

Jan.	1580	192	450	27,920
Feb.	197	111	150	8,412
Mar.	11200	111	1833	113,664
Apr.	25500	480	5109	306,548
May	10400	450	3069	190,290
June	7250	1450	3024	181,440
July	77800	2480	14553	906,296
Aug.	3810	1220	2312	143,360
Sept.	1270	930	1148	68,860
Oct.	1580	530	1024	63,480
Nov.	1220	430	700	42,000
Dec.	1580	326	552	34,270
Total	..	..	..	2,086,540

HUNTER RIVER AT SINGLETON

Year 1922

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	13100	480	2510	155,680
Feb.	530	303	389	21,798
Mar.	450	211	344	21,330
Apr.	204	190	197	11,806
May	197	176	183	11,366
June	218	183	199	11,932
July	8000	197	1145	70,980
Aug.	11200	510	2558	158,620
Sept.	14500	402	1800	108,002
Oct.	560	211	339	21,008
Nov.	510	149	262	15,706
Dec.	1220	105	311	19,298
Total	..	..	..	627,526

Year 1923

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min	Mean	
Jan.	257	25	76	4,702
Feb.	49	20	29	1,642
Mar.	690	17	91	5,636
Apr.	136	10	30	1,796
May	100	23	47	2,924
June	3190	22	272	16,294
July	5960	243	789	48,934
Aug.	3520	271	1263	78,332
Sept.	4330	257	814	48,868
Oct.	257	100	159	9,836
Nov.	90	49	63	3,772
Dec.	2440	31	245	15,218
Total	..	..	.	237,954

Year 1924

Jan.	5752	83	785	48,682
Feb.	4090	590	1354	78,526
Mar.	620	136	270	16,774
Apr.	2440	180	692	41,536
May	840	169	303	18,224
June	1250	136	456	27,392
July	3080	136	619	38,400
Aug.	1250	314	893	55,378
Sept.	690	67	229	13,782
Oct.	3410	100	1252	77,638
Nov.	13000	100	3904	234,262
Dec.	7250	285	2598	161,090
Total	..	..	..	811,684

Year 1925

Jan.	1580	180	568	35,240
Feb.	285	136	197	11,036
Mar.	118	49	84	5,176
Apr.	49	29	35	2,088
May	285	23	54	3,370
June	1200	136	395	23,704
July	840	480	568	35,204
Aug.	460	230	354	21,958
Sept.	422	45	209	12,538
Oct.	45	23	33	2,050
Nov.	136	34	69	4,130
Dec.	6550	21	551	34,178
Total	..	..	..	190,672

Year 1926

Jan.	5140	20	883	54,742
Feb.	17	4	10	562
Mar.	81000	3	4322	267,944
Apr.	15500	1300	3841	230,442
May		No Records		
June		No Records		
July		No Records		
Aug.		No Records		
Sept.		No Records		
Oct.	460	56	182	11,262
Nov.		No Records		
Dec.		No Records		
Total	..	..	..	..

Year 1927

Jan.	9740	1060	3071	190,400
Feb.	1150	782	994	55,684
Mar.	725	402	580	35,966
Apr.	37500	217	6105	366,302
May	1780	358	868	53,826
June	358	250	293	17,596
July	240	181	210	13,008
Aug.	181	133	158	9,802
Sept.	220	114	148	8,898
Oct.	185	114	160	9,950
Nov.	6670	85	566	33,970
Dec.	3300	510	1175	72,820
Total	..	..	..	868,222

Year 1928

Jan.	510	430	464	28,756
Feb.	15500	407	2005	112,302
Mar.	2160	620	1045	64,790
Apr.	14500	750	1915	114,906
May	750	540	664	41,150
June	15000	485	3273	196,402
July	18800	750	4137	256,480
Aug.	4220	688	1659	102,862
Sept.	644	167	399	23,972
Oct.	421	146	228	14,108
Nov.	167	113	143	8,578
Dec.	113	81	94	5,856
Total	..	..	..	970,162

Year 1929

Jan.	120	72	90	5,592
Feb.	15300	86	3554	199,032
Mar.	1900	460	948	58,802
Apr.	423	148	263	15,760
May	148	126	139	8,648
June	159	126	142	8,506
July	1148	126	233	14,470
Aug.	1232	198	415	25,726
Sept.	39500	266	4420	265,212
Oct.	14500	215	2598	161,064
Nov.	2450	586	1449	86,924
Dec.	502	56	301	18,634
Total	..	..	..	868,370

HUNTER RIVER AT SINGLETON

Year 1930

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	315	28	85	5,252
Feb.	94	25	48	2,698
Mar.	1230	33	356	22,076
Apr.	852	315	436	26,154
May	282	112	168	10,402
June	152000	94	12920	775,226
July	12200	592	2974	184,380
Aug.	687	539	580	35,964
Sept.	504	130	223	13,410
Oct.	2170	130	481	29,840
Nov.	374	143	203	12,192
Dec.	330	97	134	8,318
Total	..	..	..	1,125,912

Year 1931

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	2035	87	203	12,600
Feb.	171	64	113	6,324
Mar.	452	68	192	11,884
Apr.	55900	163	4905	294,288
May	24200	539	2471	153,214
June	11600	1085	2778	166,672
July	59700	1400	6757	418,940
Aug.	1315	522	891	55,226
Sept.	686	315	468	28,054
Oct.	404	134	240	14,882
Nov.	442	112	207	12,420
Dec.	2035	112	565	35,052
Total	..	..	..	1,209,556

Year 1932

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	198	69	121	7,492
Feb.	1232	69	251	14,564
Mar.	3600	58	485	30,044
Apr.	355	108	167	10,012
May	260	93	130	8,072
June	170	108	122	7,306
July	4810	108	639	39,616
Aug.	355	137	239	14,834
Sept.	10300	126	2483	148,952
Oct.	3410	322	922	57,148
Nov.	389	159	259	15,530
Dec.	322	58	97	5,998
Total	..	..	..	359,568

Year 1933

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	861	37	182	11,306
Feb.	306	29	81	4,528
Mar.	29	17	24	1,484
Apr.	81	22	43	2,604
May	126	31	49	3,014
June	530	49	194	11,674
July	3810	136	1012	62,792
Aug.	3210	178	672	41,686
Sept.	736	120	251	15,072
Oct.	15500	389	2086	129,332
Nov.	7310	478	1801	108,082
Dec.	2830	530	1117	69,252
Total	..	..	..	460,826

Year 1934

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	976	156	351	21,766
Feb.	8130	230	2312	129,490
Mar.	1813	167	450	27,908
Apr.	460	167	235	14,122
May	215	120	155	9,632
June	356	128	187	11,236
July	7310	136	455	28,214
Aug.	6230	736	1832	113,610
Sept.	29300	565	4262	255,728
Oct.	2782	285	768	47,744
Nov.	1075	285	484	29,040
Dec.	7232	285	1437	89,146
Total	..	..	..	777,636

Year 1935

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	6300	468	1374	85,190
Feb.	725	175	365	20,462
Mar.	225	92	157	9,752
Apr.	200	78	93	5,608
May	116	85	99	6,110
June	85	72	78	4,696
July	175	85	131	8,102
Aug.	135	72	97	5,994
Sept.	225	59	97	5,850
Oct.	1637	38	221	13,726
Nov.	175	11	65	3,900
Dec.	92	5	27	1,678
Total	..	..	..	171,068

Year 1936

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	270	4	52	3,236
Feb.	59	13	26	1,494
Mar.	7000	38	825	51,162
Apr.	1750	125	324	19,464
May	175	65	89	5,548
June	135	65	88	5,300
July	785	108	278	17,240
Aug.	3423	125	582	36,102
Sept.	200	48	105	6,280
Oct.	48	2	16	988
Nov.	2	0.5	1	66
Dec.	805	1	110	6,810
Total	..	..	..	153,690

Year 1937

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1975	8	293	18,152
Feb.	212	2	73	4,076
Mar.	1225	21	221	13,686
Apr.	72	18	37	2,246
May	43	15	28	1,718
June	3800	25	538	32,270
July	2232	225	594	36,818
Aug.	2600	135	557	34,534
Sept.	1825	116	429	25,770
Oct.	270	79	153	9,498
Nov.	2050	79	543	32,574
Dec.	2873	33	365	22,658
Total	..	..	..	234,000

HUNTER RIVER AT SINGLETON

Year 1938

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	605	5	72	4,472
Feb.	2691	21	327	18,314
Mar.	54	4	14	858
Apr.	2050	1	282	16,948
May	525	48	137	8,514
June	315	72	133	8,204
July	330	59	104	6,410
Aug.	2415	175	450	27,884
Sept.	345	65	132	7,924
Oct.	1600	33	180	11,142
Nov.	486	33	138	8,256
Dec.	464	0	30	1,858
Total	..	..	..	120,784

Year 1939

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	3	0	0.5	28
Feb.	25	1	4	206
Mar.	3423	1	667	41,332
Apr.	6065	233	763	45,782
May	220	71	115	7,144
June	64	47	56	3,374
July	185	47	81	5,008
Aug.	583	64	184	11,422
Sept.	130	22	53	3,172
Oct.	2369	112	449	27,850
Nov.	315	34	120	7,176
Dec.	43	3	12	716
Total	..	..	..	153,210

Year 1940

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1125	3	138	8,568
Feb.	4	0	59	34
Mar.	3	0	0	6
Apr.	725	0	103	6,176
May	43	0	9	578
June	0	0	0	0
July	0	0	0	0
Aug.	0	0	0	0
Sept.	0	0	0	0
Oct.	27	0	2	140
Nov.	2782	3	298	17,860
Dec.	7700	75	1249	77,406
Total	..	..	..	110,768

Year 1941

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	23600	210	1813	112,436
Feb.	486	62	189	10,584
Mar.	470	31	117	7,226
Apr.	69	10	28	1,662
May	14	2	5	340
June	500	18	131	7,904
July	170	51	78	4,840
Aug.	120	12	37	2,284
Sept.	75	7	29	1,766
Oct.	745	7	154	9,572
Nov.	96	5	22	1,348
Dec.	5.5	0	1	80
Total	..	..	..	160,042

Year 1942

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	0	0	0	0
Feb.	710	0	27	1,525
Mar.	8850	0	869	53,860
Apr.	2220	32	294	17,612
May	28	6	11	678
June	96	7	33	2,006
July	27500	68	2269	140,702
Aug.	580	128	281	17,430
Sept.	128	68	96	5,750
Oct.	48500	41	4053	251,280
Nov.	14300	322	1828	109,700
Dec.	780	57	205	12,676
Total	..	..	..	613,219

Year 1943

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1780	86	482	29,866
Feb.	82	7	27	1,520
Mar.	6	0	3	176
Apr.	12	2	4	256
May	3350	0	823	51,032
June	1390	132	446	25,878
July	168	102	131	8,128
Aug.	1940	96	740	45,848
Sept.	1650	254	519	31,150
Oct.	1100	187	467	28,950
Nov.	4380	116	577	34,618
Dec.	530	109	208	12,874
Total	..	..	..	270,296

Year 1944

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1710	184	367	22,738
Feb.	1540	79	233	14,026
Mar.	69	6	28	1,740
Apr.	54	3	14	862
May	727	0	100	6,220
June	210	59	89	5,374
July	957	59	263	16,302
Aug.	9750	96	1225	75,958
Sept.	1050	212	392	23,554
Oct.	285	19	98	6,050
Nov.	16	0	5	312
Dec.	4.5	0	0.5	30
Total	..	..	..	173,166

Year 1945

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	694	0	53	3,342
Feb.	2815	0	342	19,130
Mar.	1125	1	120	7,420
Apr.	1025	1	110	6,582
May	1760	13	284	17,624
June	31600	58	6053	363,142
July	10800	546	1863	115,486
Aug.	2415	515	1273	78,930
Sept.	1330	272	514	30,840
Oct.	630	128	291	18,032
Nov.	247	48	103	6,202
Dec.	298	37	93	5,770
Total	..	..	..	672,500

HUNTER RIVER AT SINGLETON

Year 1946					Year 1947				
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.	52	0	19	1,176	Jan.	36	0	1.8	111
Feb.	19	0	6	320	Feb.	502	0	68	3,788
Mar.	52	0	10	646	Mar.	615	38	177	10,966
Apr.	48500	16	3979	238,780	Apr.	437	24	95	5,704
May	559	220	322	19,978	May	153	34	65	4,056
June	4970	187	741	44,450	June	546	61	174	10,438
July	600	132	297	18,422	July	85	49	61	3,760
Aug.	132	50	78	4,842	Aug.	114	27	48	2,998
Sept.	50	28	37	2,238	Sept.	2780	70	294	17,628
Oct.	36	0	14	842	Oct.	572	53	166	10,276
Nov.	396	0	32	1,906	Nov.	203	53	94	5,642
Dec.	90	0	15	910	Dec.	9887	153	2744	170,166
Total	..	..	..	334,510	Total	..	..	..	245,533

Year 1948					Year 1949				
Jan.	3015	242	874	54,174	Jan.	1305	71	353	21,922
Feb.	2000	139	407	23,538	Feb.	3610	45	809	45,304
Mar.	1480	168	346	21,444	Mar.	7130	464	1868	115,798
Apr.	203	80	118	7,084	Apr.	3525	153	675	40,496
May	2290	90	452	27,996	May	1958	183	407	25,230
June	7150	102	1655	99,310	June	163000	460	16539	992,340
July	812	177	357	22,114	July	18500	524	2700	167,388
Aug.	572	96	157	9,746	Aug.	6108	825	2064	127,964
Sept.	7150	120	1139	68,366	Sept.	17000	1360	4892	293,558
Oct.	935	83	294	18,218	Oct.	19400	2140	3139	194,624
Nov.	88	36	57	3,438	Nov.	2357	711	1230	73,810
Dec.	119	14	38	2,330	Dec.	1480	445	808	50,112
Total	..	..	..	357,758	Total	..	..	..	2,148,546

Year 1950					Year 1951				
Jan.	3540	372	960	59,536	Jan.	89500	1140	8685	538,450
Feb.	78800	420	6537	366,080	Feb.	10600	1310	4226	236,656
Mar.	700	300	442	27,450	Mar.	1310	620	854	52,250
Apr.	48000	370	4324	259,464	Apr.	570	410	483	29,000
May	2510	490	778	48,262	May	410	332	365	22,648
June	82000	4464	21386	1,283,138	June	7600	370	2360	141,630
July	33700	6095	12213	757,222	July	10200	1015	2349	145,680
Aug.	16700	2740	4307	267,020	Aug.	2280	920	1278	79,230
Sept.	5015	1595	2458	147,450	Sept.	820	332	566	33,984
Oct.	24200	1770	4073	252,530	Oct.	450	156	297	18,390
Nov.	55000	1650	6652	399,124	Nov.	156	98	109	6,544
Dec.	4140	1140	2143	132,880	Dec.	100	40	81	5,058
Total	..	..	..	4,000,156	Total	..	..	..	1,309,520

Year 1952					Year 1953				
Jan.	620	7.5	108	6,672	Jan.	1179	253	491	30,470
Feb.	52	0	9	534	Feb.	2354	167	784	43,922
Mar.	535	30	120	7,450	Mar.	2430	143	412	25,574
Apr.	455	65	200	11,974	Apr.	329	121	169	10,142
May	715	154	351	21,744	May	43500	193	4017	249,084
June	2715	203	720	43,216	June	458	302	384	23,018
July	3770	203	872	54,082	July	1130	260	514	31,844
Aug.	117000	1740	16413	1,017,594	Aug.	2285	260	640	39,704
Sept.	3138	1150	1698	101,852	Sept.	1650	188	437	26,198
Oct.	1150	416	757	46,924	Oct.	188	160	176	10,928
Nov.	789	121	299	17,960	Nov.	260	17	119	7,148
Dec.	911	57	127	7,896	Dec.	30	1	11	668
Total	..	..	..	1,337,898	Total	..	..	..	498,700

HUNTER RIVER AT SINGLETON.

Year 1954

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	4150	2	1152	35,726
Feb.	49100	160	5623	314,896
Mar.	3380	236	779	48,280
Apr.	370	101	197	11,842
May	186	101	139	8,638
June	1170	153	333	19,974
July	1170	169	319	19,790
Aug.	274	153	240	14,860
Sept.	1170	138	252	15,144
Oct.	2050	1170	1456	90,300
Nov.	5560	425	2154	129,260
Dec.	850	186	349	21,652
Total	..	..	..	730,362

Year 1955

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	2480	70	519	32,186
Feb.	442000	186	25298	1,416,700
Mar.	18300	2785	5043	312,656
Apr.	2785	800	1929	115,754
May	6900	230	1560	96,700
June	2660	342	1161	69,652
July	800	230	544	33,762
Aug.	920	230	676	41,920
Sept.	800	480	627	37,640
Oct.	14800	230	2232	138,384
Nov.	3990	500	1039	62,360
Dec.	3290	500	984	60,980
Total	..	..	..	2,418,694

Year 1956

Jan.	2025	55	467	28,940
Feb.	23500	1190	5718	331,638
Mar.	38800	2965	9888	613,072
Apr.	5325	1157	2630	157,790
May	9900	1400	3949	244,860
June	29600	2700	4555	273,300
July	9900	1400	3456	214,276
Aug.	10800	1400	3111	192,906
Sept.	1400	1400	1400	84,000
Oct.	1616	940	1177	72,962
Nov.	940	305	580	34,780
Dec.	1400	305	390	24,198
Total	..	..	..	2,272,722

Year 1957

Jan.	480	160	229	14,216
Feb.	15800	20	1402	78,496
Mar.	800	141	284	17,638
Apr.	291	94	148	8,862
May	141	73	109	6,734
June	94	94	94	5,640
July	240	73	147	9,124
Aug.	2400	73	279	17,322
Sept.	1270	73	338	20,270
Oct.	73	28	52	3,212
Nov.	28	0.2	6.2	385
Dec.	0.2	0	0.3	2
Total	..	..	..	181,900

Year 1958

Jan.	16900	0	437	27,110
Feb.	12050	190	1829	102,432
Mar.	1740	26	236	14,646
Apr.	26	0	6	362
May	87	26	44	2,710
June	167	59	77	4,648
July	320	167	217	13,460
Aug.	167	103	107	6,436
Sept.	1290	167	224	13,432
Oct.	1290	154	680	42,180
Nov.	198	38	60	3,612
Dec.	480	48	221	13,678
Total	..	..	..	244,706

Year 1959

Jan.	1290	2	332	20,586
Feb.	6370	160	960	53,748
Mar.	3700	325	1006	62,390
Apr.	2350	295	843	50,590
May	295	140	213	13,218
June	990	211	246	14,786
July	2710	270	858	53,220
Aug.	4070	245	764	47,390
Sept.	295	222	241	14,482
Oct.	2350	200	784	48,628
Nov.	5700	660	2738	164,328
Dec.	3320	352	946	58,678
Total	..	..	..	602,044

Year 1960

Jan.	485	280	374	22,456
Feb.	542	215	275	15,952
Mar.	455	95	181	11,220
Apr.	110	52	86	5,178
May	225	80	110	6,820
June	200	80	136	8,164
July	2350	250	752	46,638
Aug.	1370	360	557	34,504
Sept.	565	180	262	15,700
Oct.	565	110	303	18,788
Nov.	730	95	202	12,128
Dec.	5800	125	1069	66,282
Total	..	..	..	263,830

Year 1961

Jan.	1280	322	554	34,342
Feb.	425	163	311	17,444
Mar.	1900	168	345	21,416
Apr.	188	130	155	9,282
May	188	168	186	11,556
June	1060	188	368	22,054
July	233	148	202	12,538
Aug.	3800	168	733	45,426
Sept.	1330	159	417	25,036
Oct.	468	159	228	14,122
Nov.	7500	95	1026	61,578
Dec.	8100	342	2571	159,408
Total	..	..	..	434,202

HUNTER RIVER AT SINGLETON

Year 1962

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	10200	468	2917	180,850
Feb.	20600	1140	5571	311,958
Mar.	1650	270	705	43,730
Apr.	12800	250	3433	205,950
May	75000	360	5065	314,000
June	1380	460	840	50,370
July	4600	510	1541	95,530
Aug.	3360	580	1457	90,310
Sept.	1520	360	701	42,050
Oct.	3520	270	614	38,060
Nov.	3520	260	546	32,770
Dec.	9500	280	1314	81,490
Total	..	..	..	1,487,068

Year 1963

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	31500	700	4560	282,740
Feb.	7000	440	1761	98,610
Mar.	15400	350	3536	219,254
Apr.	31500	410	2487	149,200
May	34100	2230	8563	530,930
June	7900	1750	4449	266,920
July	4000	1200	1724	106,866
Aug.	10600	1700	2666	165,270
Sept.	11650	560	3401	204,070
Oct.	4670	630	1559	96,680
Nov.	1140	520	729	43,720
Dec.	2660	390	962	59,640
Total	..	..	..	2,223,900

Year 1964

Jan.	500	65	261	16,190
Feb.	203	120	155	8,972
Mar.	408	140	210	12,996
Apr.	14600	120	1395	83,722
May	6350	202	675	41,866
June	97100	227	7372	442,314
July	1350	670	974	60,420
Aug.	790	295	527	32,680
Sept.	825	370	528	31,656
Oct.	1650	330	589	36,506
Nov.	410	125	238	14,270
Dec.	215	103	156	9,668
Total	..	..	..	791,260

Year 1965

Jan.	215	125	149	9,242
Feb.	215	103	133	7,442
Mar.	114	93	100	6,176
Apr.	175	65	98	5,870
May	114	43	72	4,488
June	57	25	43	2,560
July	790	25	172	10,666
Aug.	162	24	65	4,018
Sept.	95	0	35	2,097
Oct.	1315	54	189	11,722
Nov.	192	31	91	5,434
Dec.	1730	134	467	28,968
Total	..	..	..	98,683

Year 1966

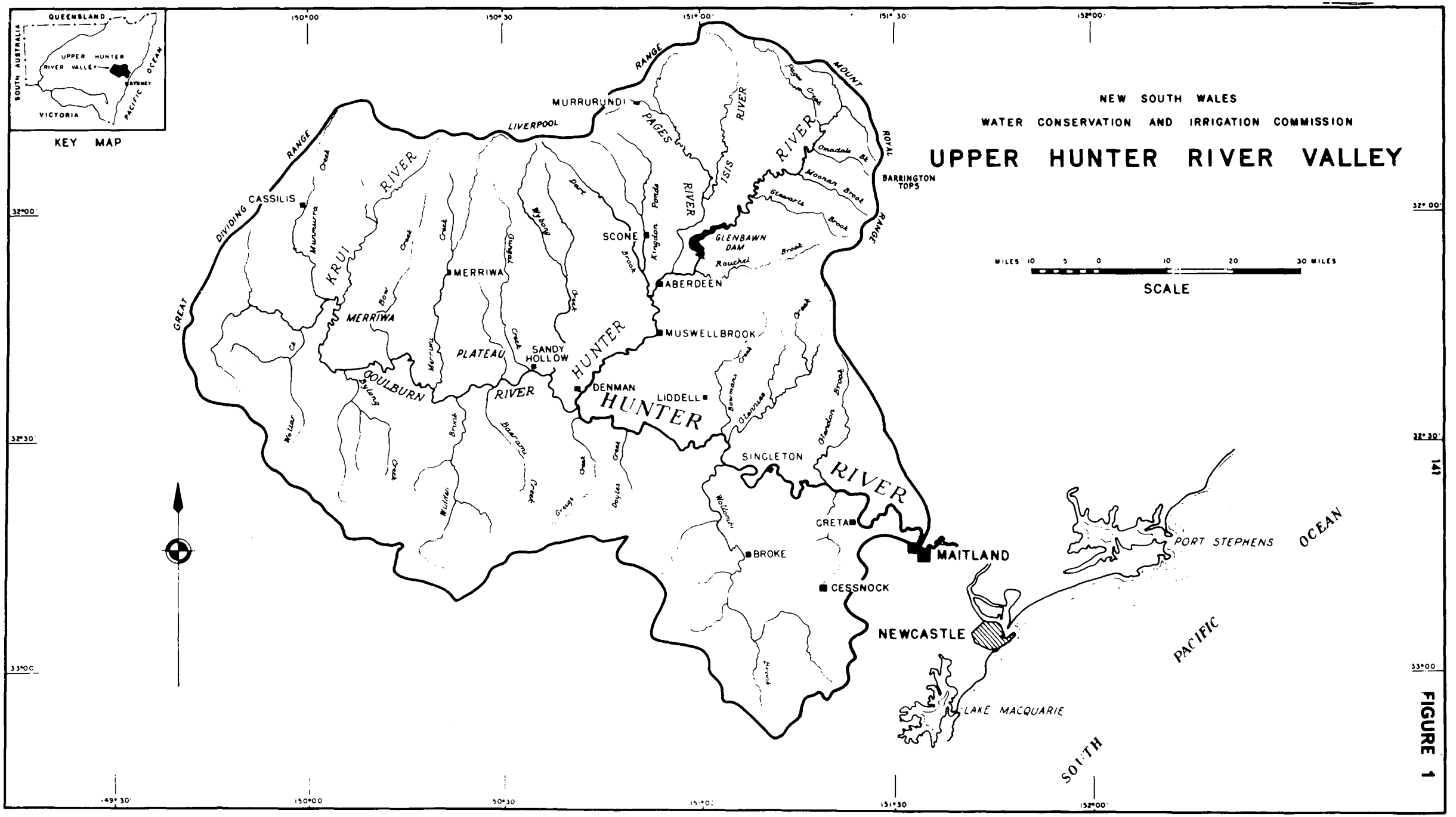
Jan.	168	65	91	5,620
Feb.	103	57	75	4,226
Mar.	114	41	68	4,240
Apr.	49	18	28	1,682
May	49	21	29	1,792
June	103	12	40	2,398
July	14	0	6.4	394
Aug.	65	0	11	702
Sept.	65	0	34	2,028
Oct.	360	0	78	4,842
Nov.	2700	33	379	22,754
Dec.	185	0	43	2,650
Total	..	..	..	53,328

Year 1967

Jan.	110	0	31	1,908
Feb.	81	24	48	2,670
Mar.	9650	58	712	44,170
Apr.	620	63	249	14,928
May	103	50	67	4,136
June	18000	28	1723	103,374
July	3200	190	726	45,040
Aug.	32200	346	2397	148,628
Sept.	10200	120	1314	78,836
Oct.	15433	76	1408	87,330
Nov.	445	0	114	6,846
Dec.	174	25	101	6,266
Total	..	..	..	544,132

Year 1968

Jan.	32700	128	5527	342,640
Feb.	580	133	265	15,376
Mar.	282	108	167	11,358
Apr.	133	38	82	4,946
May	18100	59	1086	67,346
June	502	117	209	12,526
July	463	74	137	8,476
Aug.	3600	68	1246	77,282
Sept.	1260	245	517	31,034
Oct.	1950	90	460	28,492
Nov.	204	55	114	6,862
Dec.	264	60	134	8,286
Total	..	..	..	614,624


KEY MAP
QUEENSLAND
SOUTH AUSTRALIA
VICTORIA
PACIFIC OCEAN
SYDNEY
UPPER HUNTER RIVER VALLEY
NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
UPPER HUNTER RIVER VALLEY
SCALE
MILES 10 5 0 10 20 30 MILES
MURRURUNDI
LIVERPOOL RANGE
GREAT DIVIDING RANGE
MOUNT ROYAL RANGE
BARRINGTON TOPS
CASSILIS
SCONE
MERRIWA
ABERDEEN
GLENBAWN DAM
MUSWELLBROOK
SANDY HOLLOW
DENMAN
LIDDELL
SINGLETON
GRETA
BROKE
MAITLAND
CESSNOCK
NEWCASTLE
PORT STEPHENS
LAKE MACQUARIE
PACIFIC OCEAN
SOUTH
KRUI RIVER
MERRIWA PLATEAU
GOULBURN RIVER
HUNTER RIVER
PAGES RIVER
ISIS RIVER
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150°30
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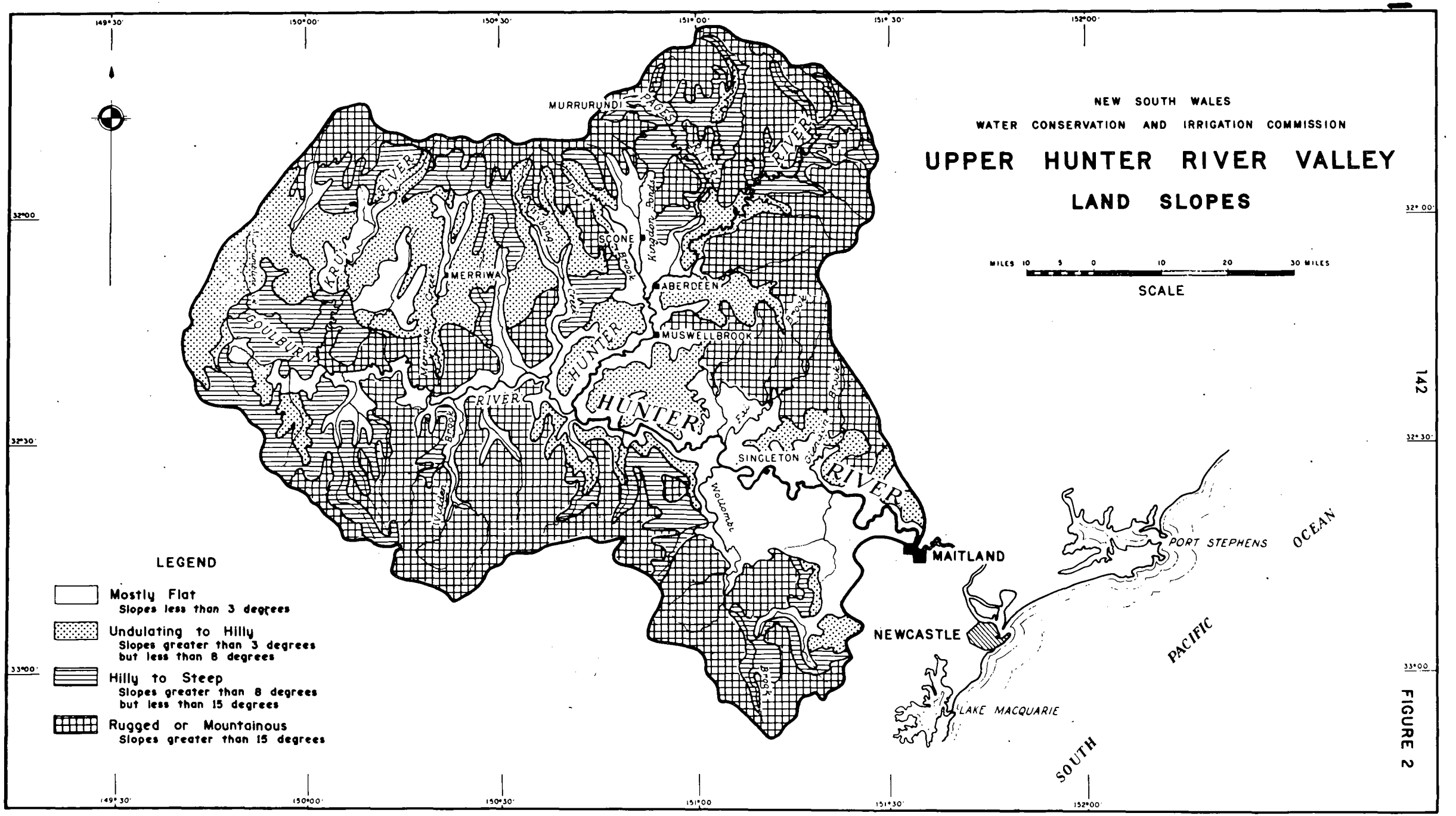
151°30
152°00
32°00
32°30
33°00
149°30

FIGURE 1

141


NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
UPPER HUNTER RIVER VALLEY
LAND SLOPES
MILES 10 5 0 10 20 30 MILES
SCALE
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
MURRURUNDI
SCONE
MERRIWA
ABERDEEN
MUSWELLBROOK
SINGLETON
MAITLAND
NEWCASTLE
PORT STEPHENS
OCEAN
PACIFIC
SOUTH
LAKE MACQUARIE
GOULBURN RIVER
HUNTER RIVER
PAGES RIVER
149°30'
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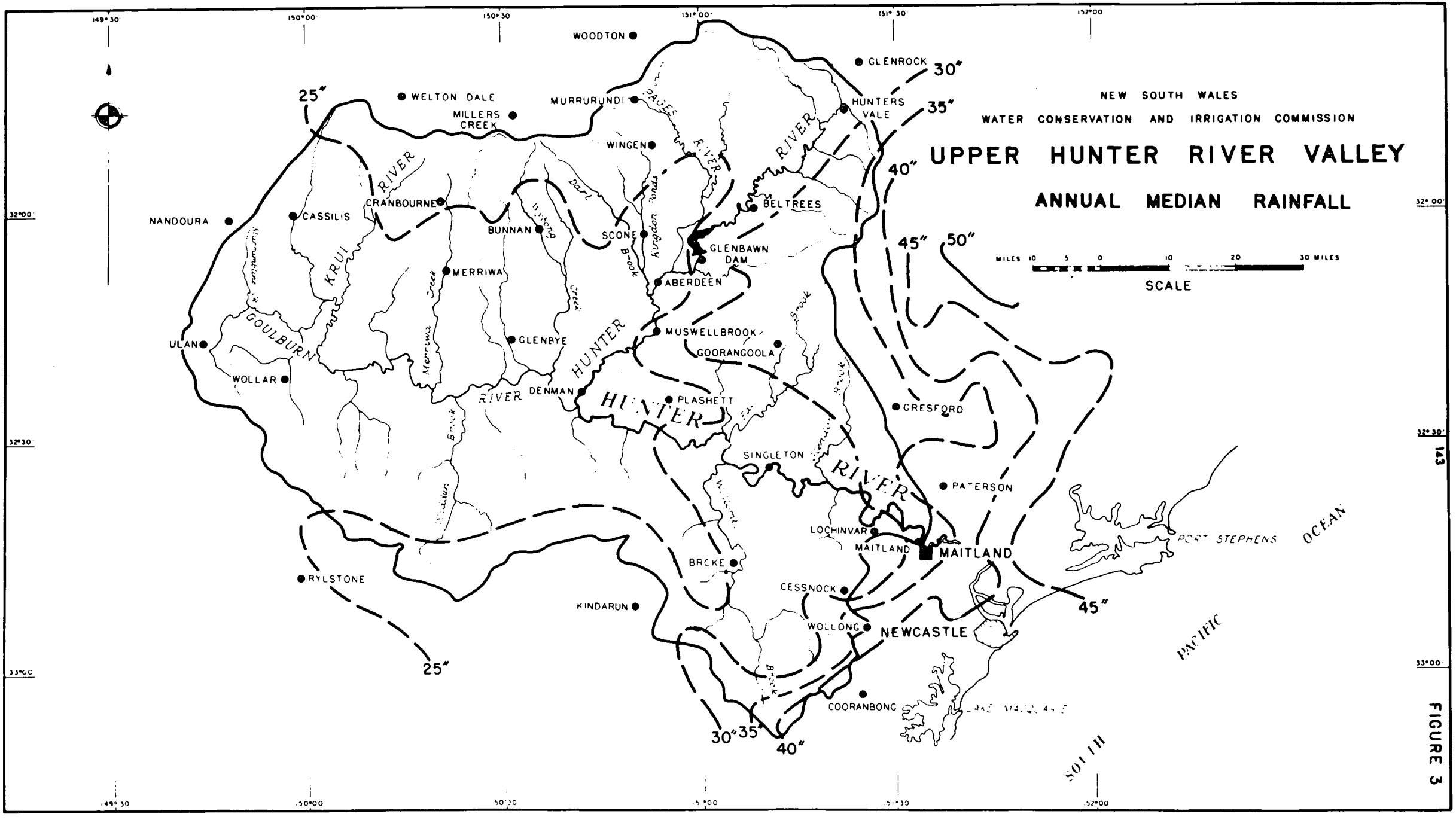
151°00'
151°30'
152°00'
32°00'
32°30'
33°00'
142
FIGURE 2


NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
UPPER HUNTER RIVER VALLEY
ANNUAL MEDIAN RAINFALL
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WOODTON
GLENROCK
WELTON DALE
MILLERS CREEK
MURRURUNDI
HUNTERS VALE
WINGEN
BELTREES
NANDOURA
CASSILIS
CRANBOURNE
BUNNAN
SCONE
GLENBAWN DAM
MERRIWA
ABERDEEN
ULAN
WOLLAR
GLENBYE
MUSWELLBROOK
GOORANGOOLA
DENMAN
PLASHETT
GRESFORD
SINGLETON
PATERSON
LOCHINVAR
MAITLAND
BRCKE
RYLSTONE
CESSNOCK
KINDARUN
WOLLONG
NEWCASTLE
COORANBONG
PORT STEPHENS
OCEAN
PACIFIC
SOUTH
KRUI RIVER
GOULBURN RIVER
HUNTER RIVER
25"
30"
35"
40"
45"
50"
149°30
150°00
150°30
151°00
151°30
152°00
32°00
32°30
33°00

FIGURE 3

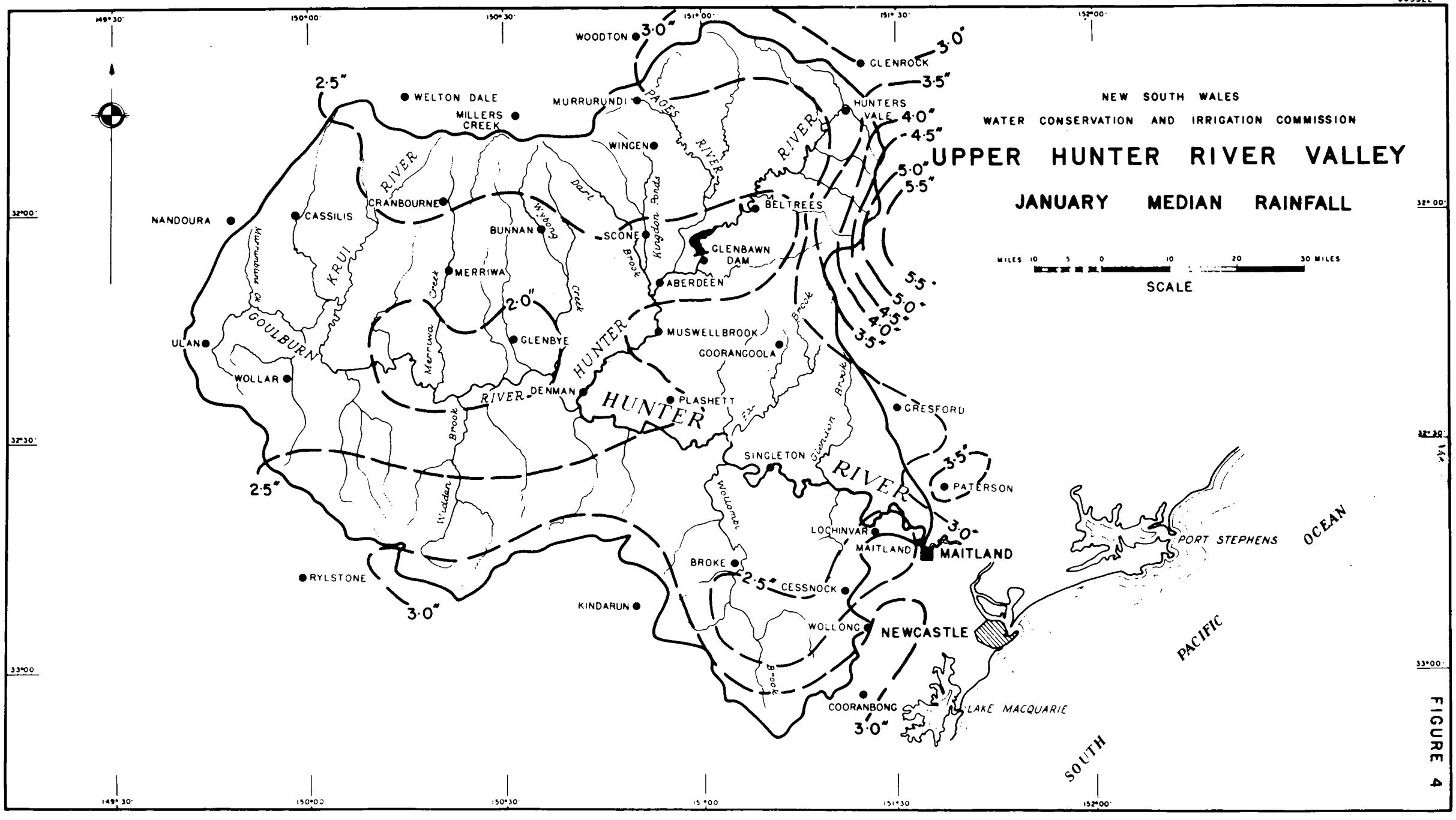

NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
UPPER HUNTER RIVER VALLEY
JANUARY MEDIAN RAINFALL
SCALE
MILES 10 5 0 10 20 30 MILES
WOODTON
GLENROCK
WELTON DALE
MILLERS CREEK
MURRURUNDI
WINGEN
HUNTERS VALE
BELTREES
NANDOURA
CASSILIS
CRANBOURNE
BUNNAN
SCONE
GLENBAWN DAM
MERRIWA
ABERDEEN
ULAN
GLENBYE
MUSWELLBROOK
GOORANGOOLA
WOLLAR
DENMAN
PLASHETT
GRESFORD
SINGLETON
PATERSON
LOCHINVAR
MAITLAND
BROKE
CESSNOCK
RYLSTONE
KINDARUN
WOLLONG
NEWCASTLE
COORANBONG
LAKE MACQUARIE
PORT STEPHENS
OCEAN
PACIFIC
SOUTH
GOULBURN
KRUI
HUNTER
RIVER
PAGES
Merriwa Creek
Wybong Creek
Dart Brook
Kingdon Ponds
Widden Brook
Wollombi Brook
Glennies Creek
Ezy Brook
2·5"
3·0"
3·5"
4·0"
4·5"
5·0"
5·5"
2·0"
149° 30'
150° 00'
150° 30'
151° 00'
151° 30'
152° 00'
32° 00'
32° 30'
33° 00'

FIGURE 4

003523

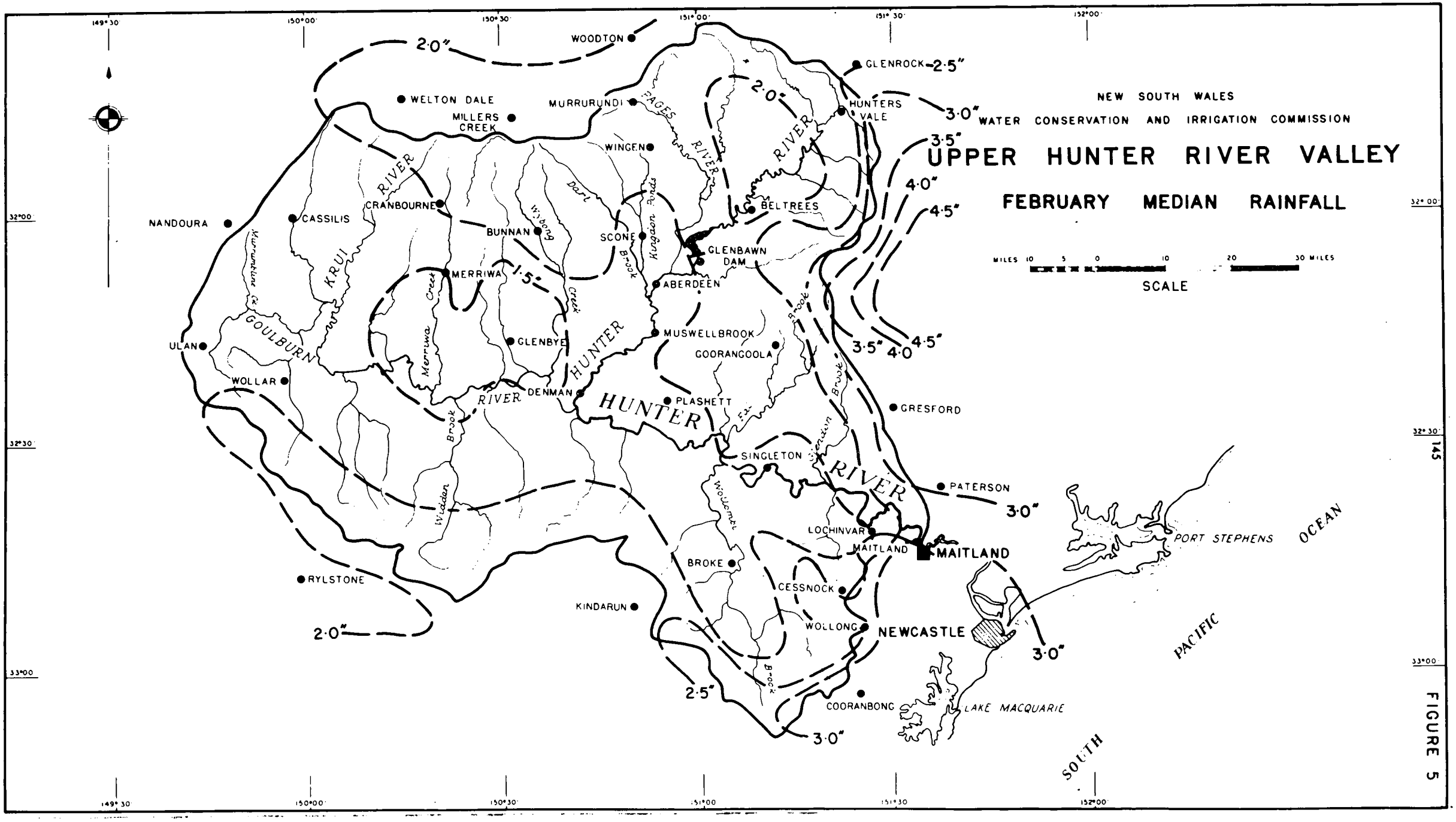


FIGURE 5

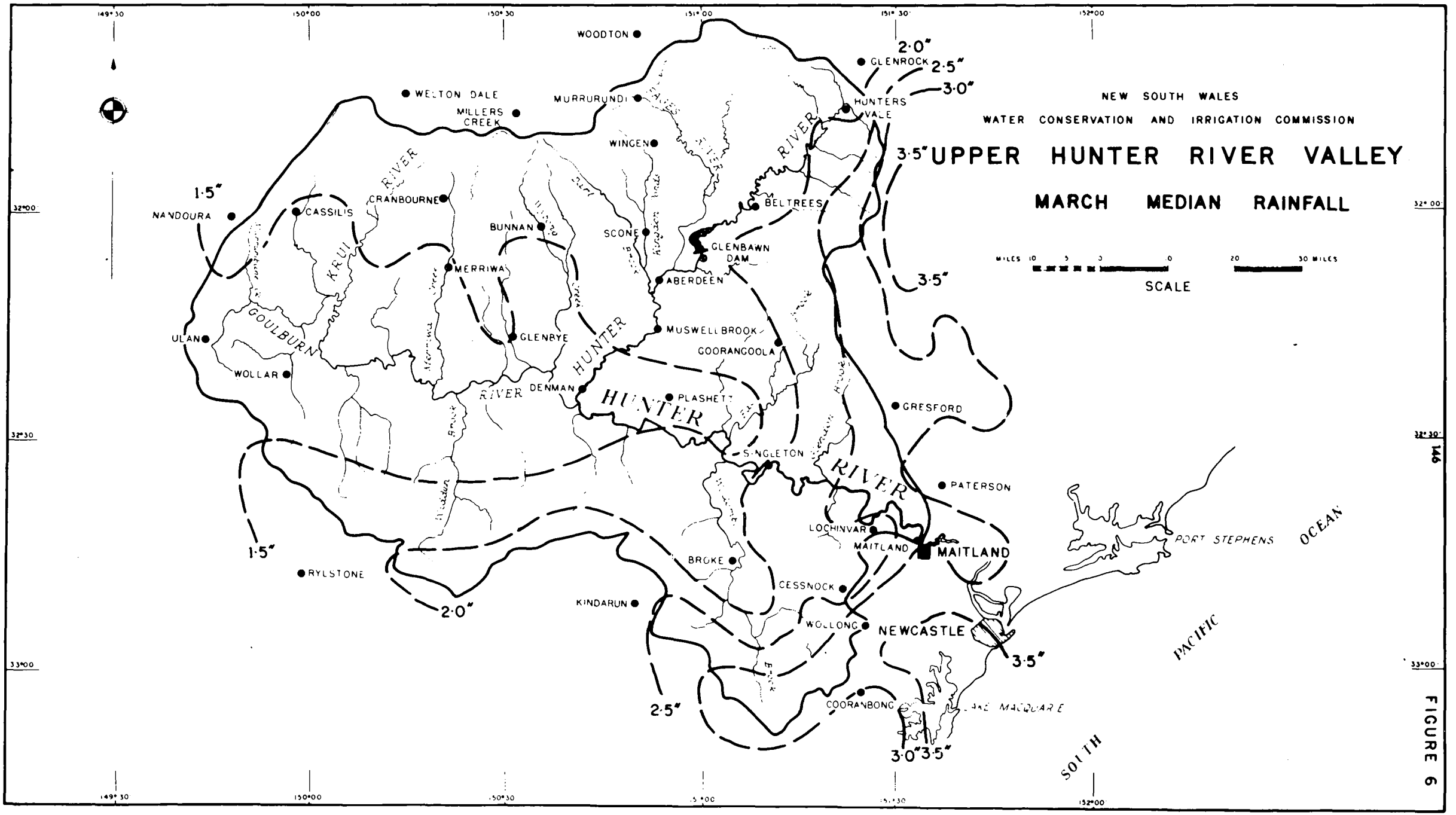

NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
UPPER HUNTER RIVER VALLEY
MARCH MEDIAN RAINFALL
SCALE
MILES 10 5 0 0 20 30 MILES
WOODTON
GLENROCK
WELTON DALE
MILLERS CREEK
MURRURUNDI
HUNTERS VALE
WINGEN
NANDOURA
CASSILIS
CRANBOURNE
BUNNAN
SCONE
BELTREES
GLENBAWN DAM
MERRIWA
ABERDEEN
ULAN
GLENRYE
MUSWELLBROOK
GOORANGOOLA
WOLLAR
DENMAN
PLASHETT
GRESFORD
SINGLETON
PATERSON
LOCHINVAR
MAITLAND
MAITLAND
BROKE
RYLSTONE
CESSNOCK
KINDARUN
WOLLONG
NEWCASTLE
COORANBONG
LAKE MACQUARIE
PORT STEPHENS
OCEAN
PACIFIC
SOUTH
KREWL RIVER
GOULBURN RIVER
HUNTER RIVER
HUNTER RIVER
1·5"
2·0"
2·5"
3·0"
3·5"
149°30
150°00
150°30
151°00
151°30
152°00
32°00
32°30
33°00

FIGURE 6

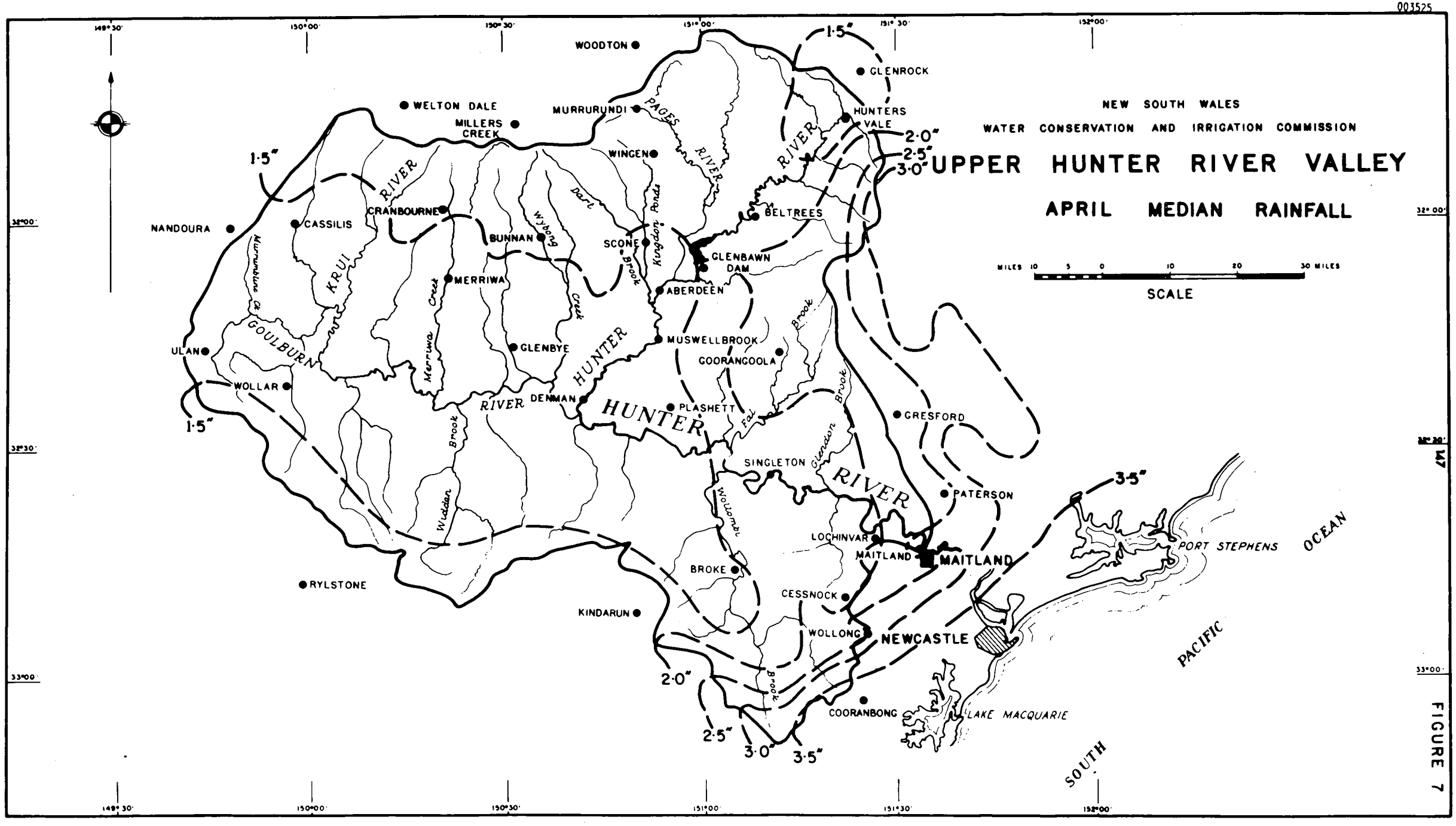
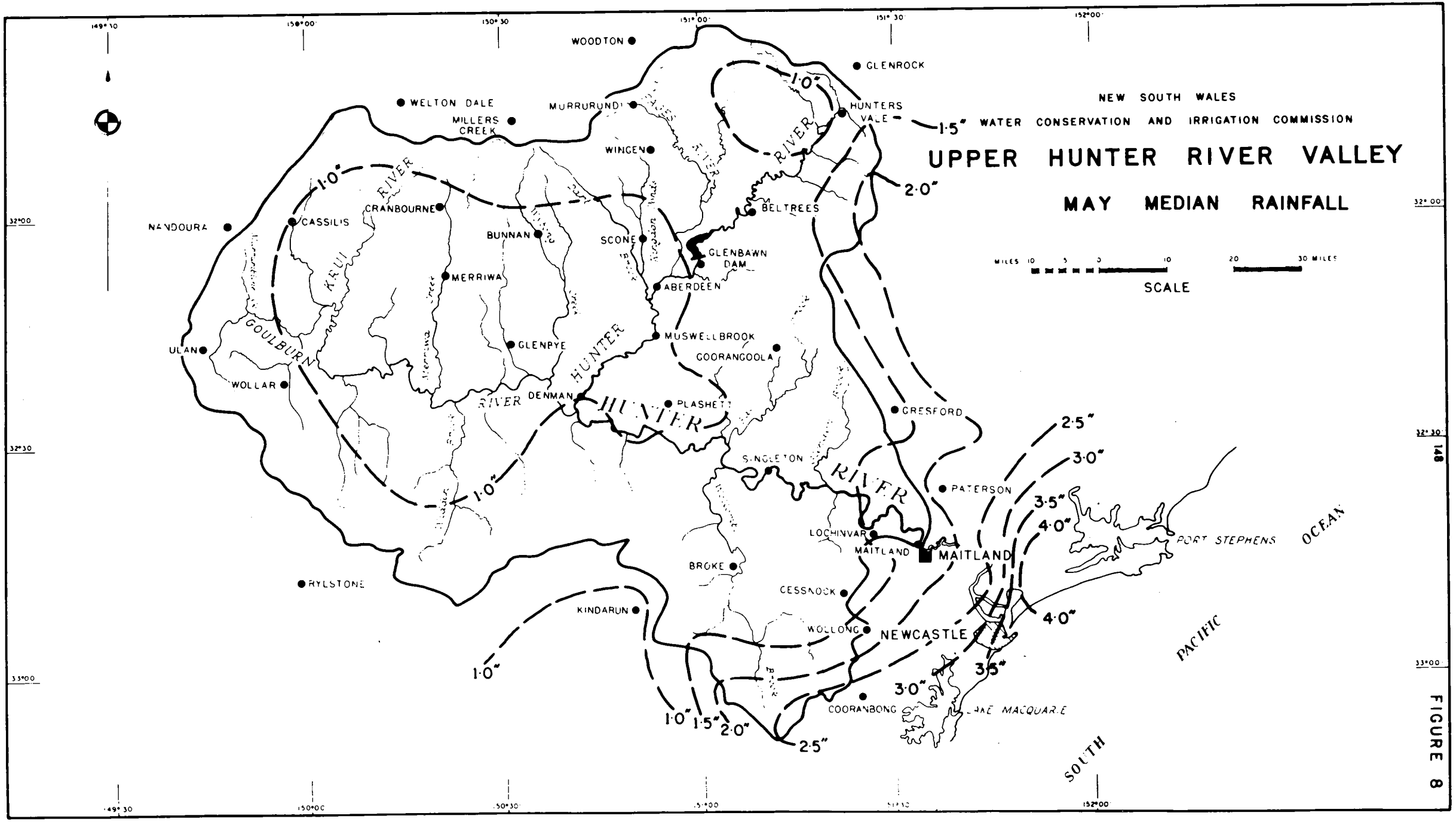
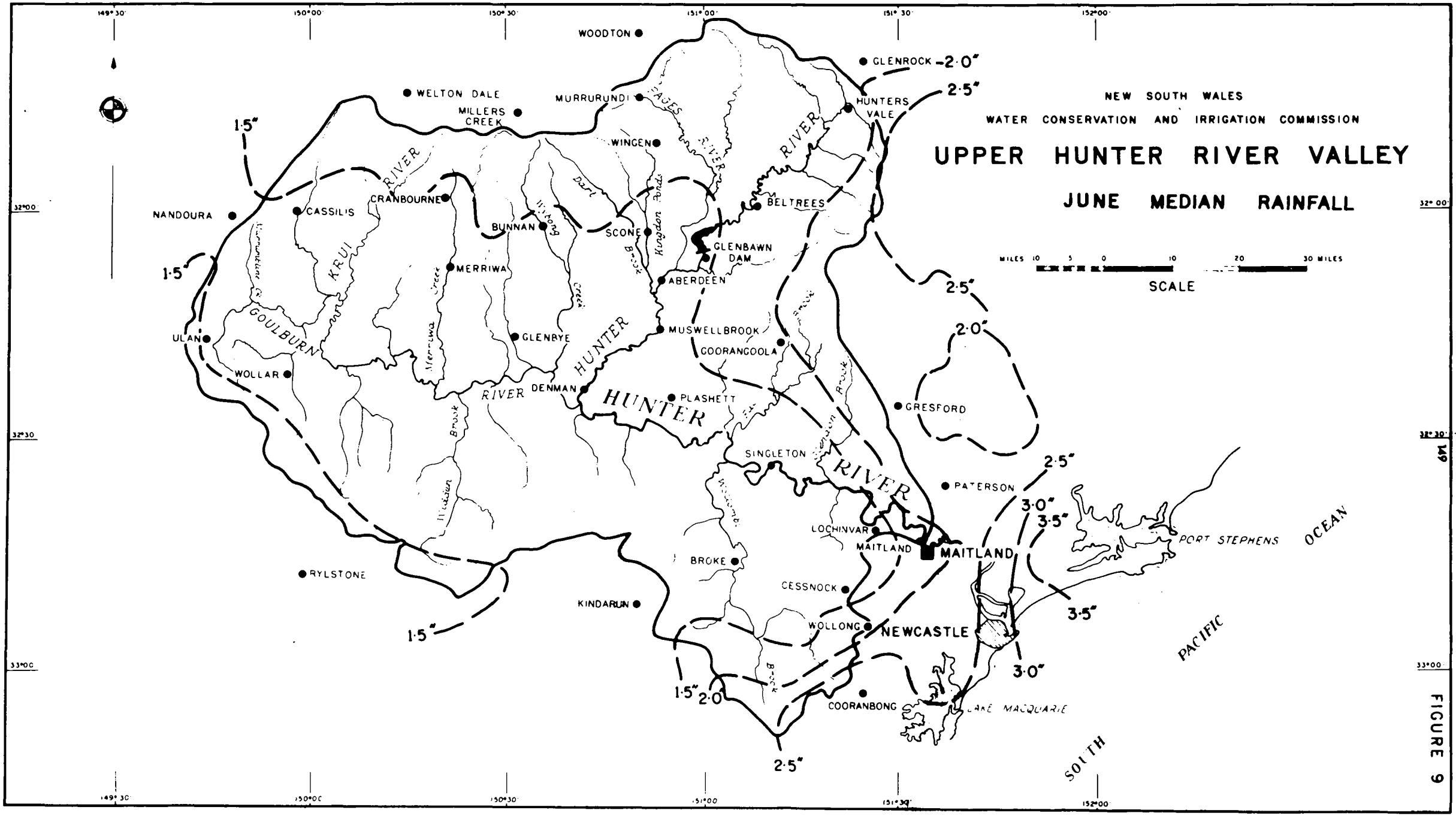
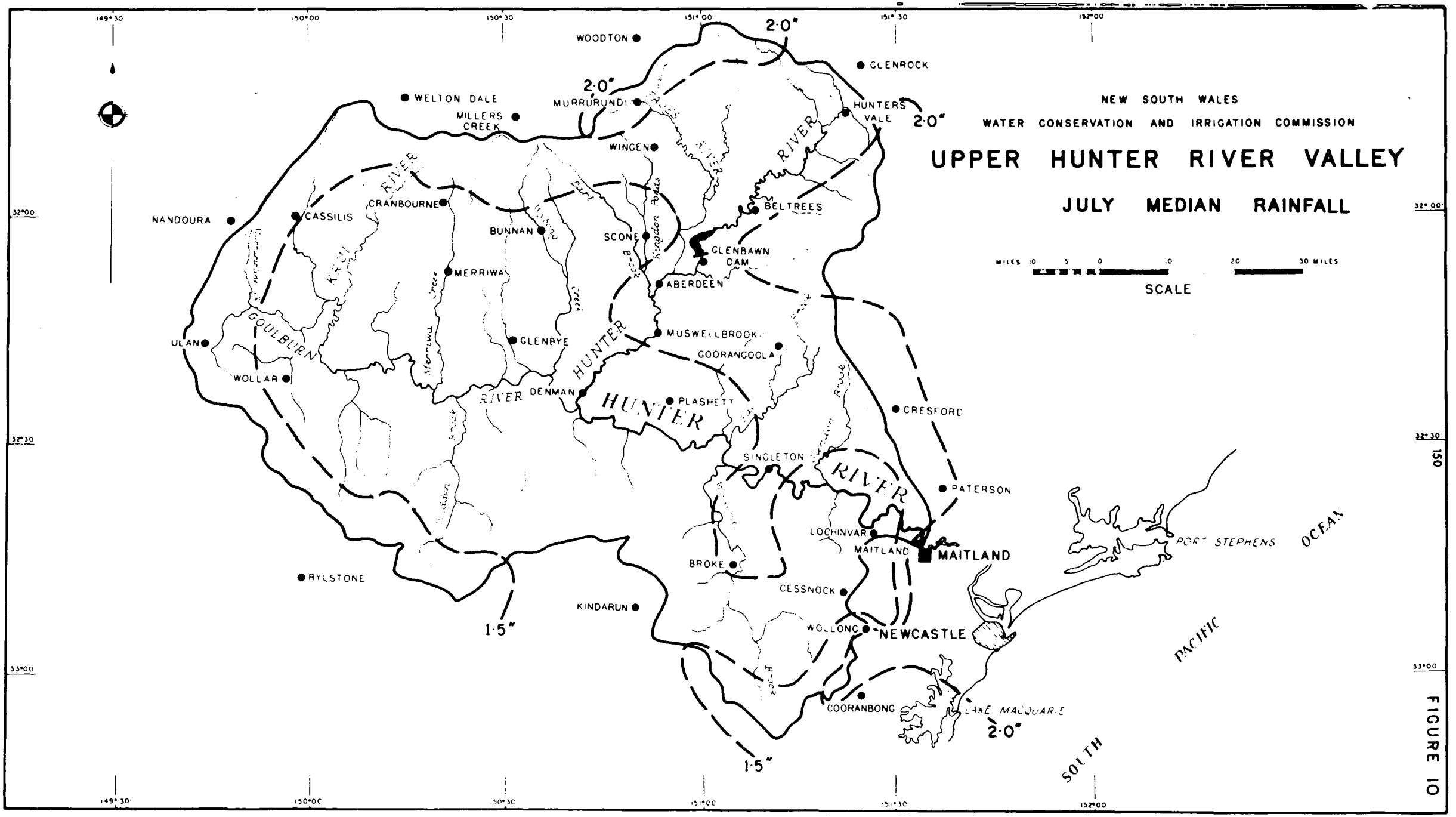

NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
UPPER HUNTER RIVER VALLEY
APRIL MEDIAN RAINFALL
SCALE
MILES 10 5 0 10 20 30 MILES
WOODTON
GLENROCK
WELTON DALE
MILLERS CREEK
MURRURUNDI
HUNTERS VALE
WINGEN
BELTREES
NANDOURA
CASSILIS
CRANBOURNE
BUNNAN
SCONE
GLENBAWN DAM
ABERDEEN
MERRIWA
GLENBYE
MUSWELLBROOK
COORANGOOLA
ULAN
WOLLAR
DENMAN
PLASHETT
GRESFORD
SINGLETON
PATERSON
LOCHINVAR
MAITLAND
BROKE
CESSNOCK
RYLSTONE
KINDARUN
WOLLONGONG
NEWCASTLE
COORANBONG
LAKE MACQUARIE
PORT STEPHENS
OCEAN
PACIFIC
SOUTH
HUNTER RIVER
GOULBURN
KRUI
PAGES RIVER
1·5"
2·0"
2·5"
3·0"
3·5"
148°30'
150°00'
150°30'
151°00'
151°30'
152°00'
32°00'
32°30'
33°00'

FIGURE 7


NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
UPPER HUNTER RIVER VALLEY
MAY MEDIAN RAINFALL
SCALE
MILES 10 5 0 10 20 30 MILES
WOODTON
GLENROCK
WELTON DALE
MILLERS CREEK
MURRURUNDI
HUNTERS VALE
WINGEN
BELTREES
NANDOURA
CASSILIS
CRANBOURNE
BUNNAN
SCONE
GLENBAWN DAM
MERRIWA
ABERDEEN
ULAN
GLENRYE
MUSWELLBROOK
COORANGOOLA
WOLLAR
DENMAN
PLASHETT
GRESFORD
SINGLETON
PATERSON
LOCHINVAR
MAITLAND
PORT STEPHENS
OCEAN
BROKE
CESSNOCK
RYLSTONE
KINDARUN
WOLLONG
NEWCASTLE
PACIFIC
COORANBONG
LAKE MACQUARIE
SOUTH
GOULBURN
KEWELL
HUNTER
RIVER
1·0"
1·5"
2·0"
2·5"
3·0"
3·5"
4·0"
149°30
150°00
150°30
151°00
151°30
152°00
32°00
32°30
33°00
148
FIGURE 8


NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
UPPER HUNTER RIVER VALLEY
JUNE MEDIAN RAINFALL
SCALE
MILES 10 5 0 10 20 30 MILES
WOODTON
GLENROCK
WELTON DALE
MILLERS CREEK
MURRURUNDI
WINGEN
HUNTERS VALE
BELTREES
NANDOURA
CASSILIS
CRANBOURNE
BUNNAN
SCONE
GLENBAWN DAM
MERRIWA
ABERDEEN
ULAN
GLENBYE
MUSWELLBROOK
COORANGOOLA
WOLLAR
DENMAN
PLASHETT
GRESFORD
SINGLETON
PATERSON
LOCHINVAR
MAITLAND
BROKE
RYLSTONE
CESSNOCK
KINDARUN
WOLLONG
NEWCASTLE
COORANBONG
LAKE MACQUARIE
PORT STEPHENS
OCEAN
PACIFIC
SOUTH
RIVER
HUNTER
GOULBURN
KREWI
1·5"
2·0"
2·5"
3·0"
3·5"
149
FIGURE 9


NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
UPPER HUNTER RIVER VALLEY
JULY MEDIAN RAINFALL
SCALE
MILES 10 5 0 10 20 30 MILES
WOODTON
GLENROCK
WELTON DALE
MILLERS CREEK
MURRURUNDI
HUNTERS VALE
WINGEN
BELTREES
NANDOURA
CASSILIS
CRANBOURNE
BUNNAN
SCONE
GLENBAWN DAM
MERRIWA
ABERDEEN
ULAN
GLENRYE
MUSWELLBROOK
GOORANGOOLA
WOLLAR
DENMAN
PLASHETT
GRESFORD
SINGLETON
PATERSON
LOCHINVAR
MAITLAND
MAITLAND
BROKE
PORT STEPHENS
OCEAN
RYLSTONE
CESSNOCK
KINDARUN
WOLLONG
NEWCASTLE
PACIFIC
COORANBONG
LAKE MACQUARIE
SOUTH
2·0"
1·5"
HUNTER RIVER
GOULBURN RIVER
FIGURE 10

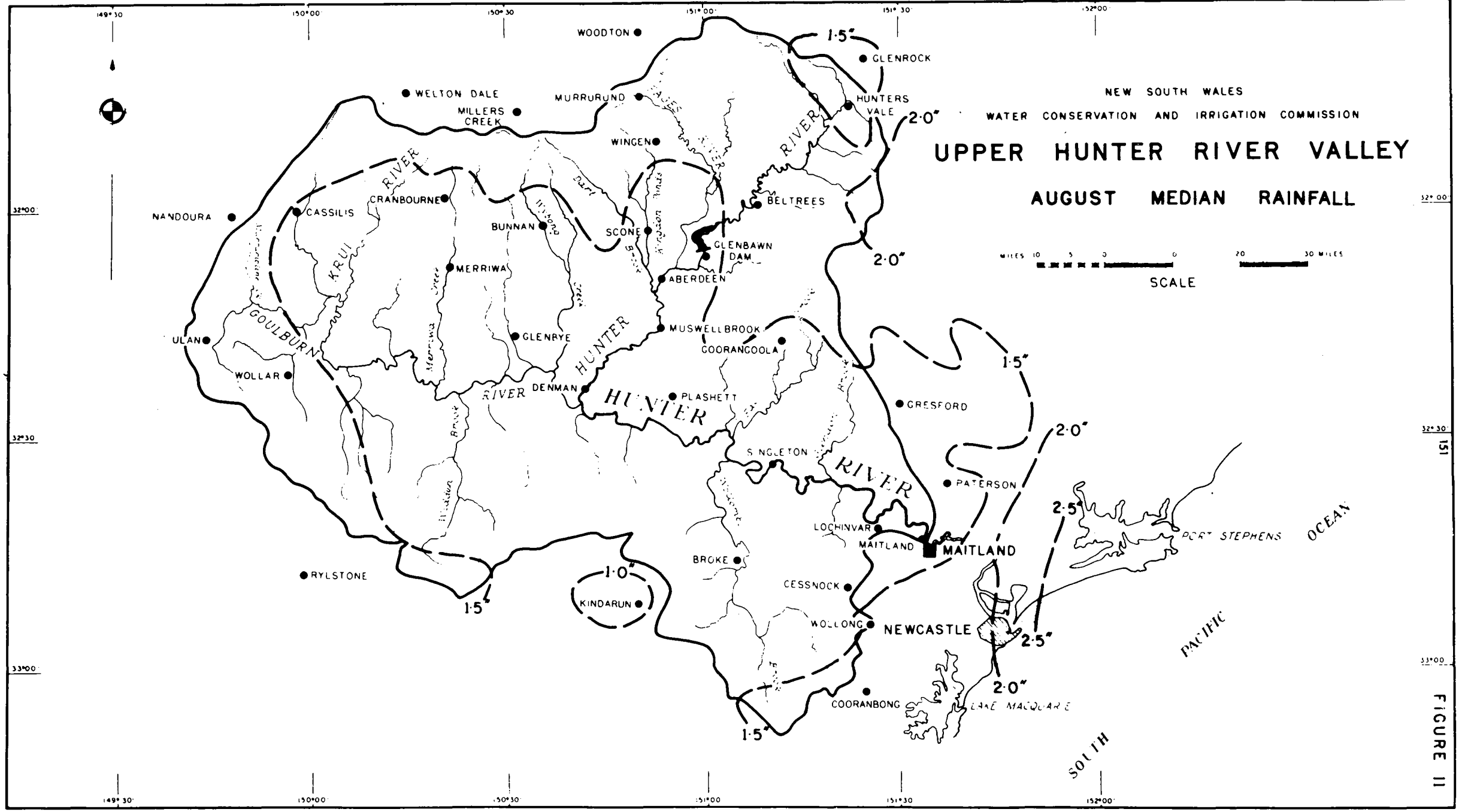

NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
UPPER HUNTER RIVER VALLEY
AUGUST MEDIAN RAINFALL
SCALE
MILES 10 5 0 0 20 30 MILES
WOODTON
GLENROCK
WELTON DALE
MILLERS CREEK
MURRURUND
HUNTERS VALE
WINGEN
BELTREES
NANDOURA
CASSILIS
CRANBOURNE
BUNNAN
SCONE
GLENBAWN DAM
MERRIWA
ABERDEEN
ULAN
GLENRYE
MUSWELLBROOK
COORANGOOLA
WOLLAR
DENMAN
PLASHETT
GRESFORD
SINGLETON
PATERSON
LOCHINVAR
MAITLAND
MAITLAND
PORT STEPHENS
OCEAN
BROKE
RYLSTONE
KINDARUN
CESSNOCK
WOLLONG
NEWCASTLE
PACIFIC
COORANBONG
LAKE MACQUARIE
SOUTH
GOULBURN
KRUI
RIVER
HUNTER
RIVER
1·5"
2·0"
2·5"
1·0"
149° 30
150° 00
150° 30
151° 00
151° 30
152° 00
32° 00
32° 30
33° 00
151

FIGURE 11

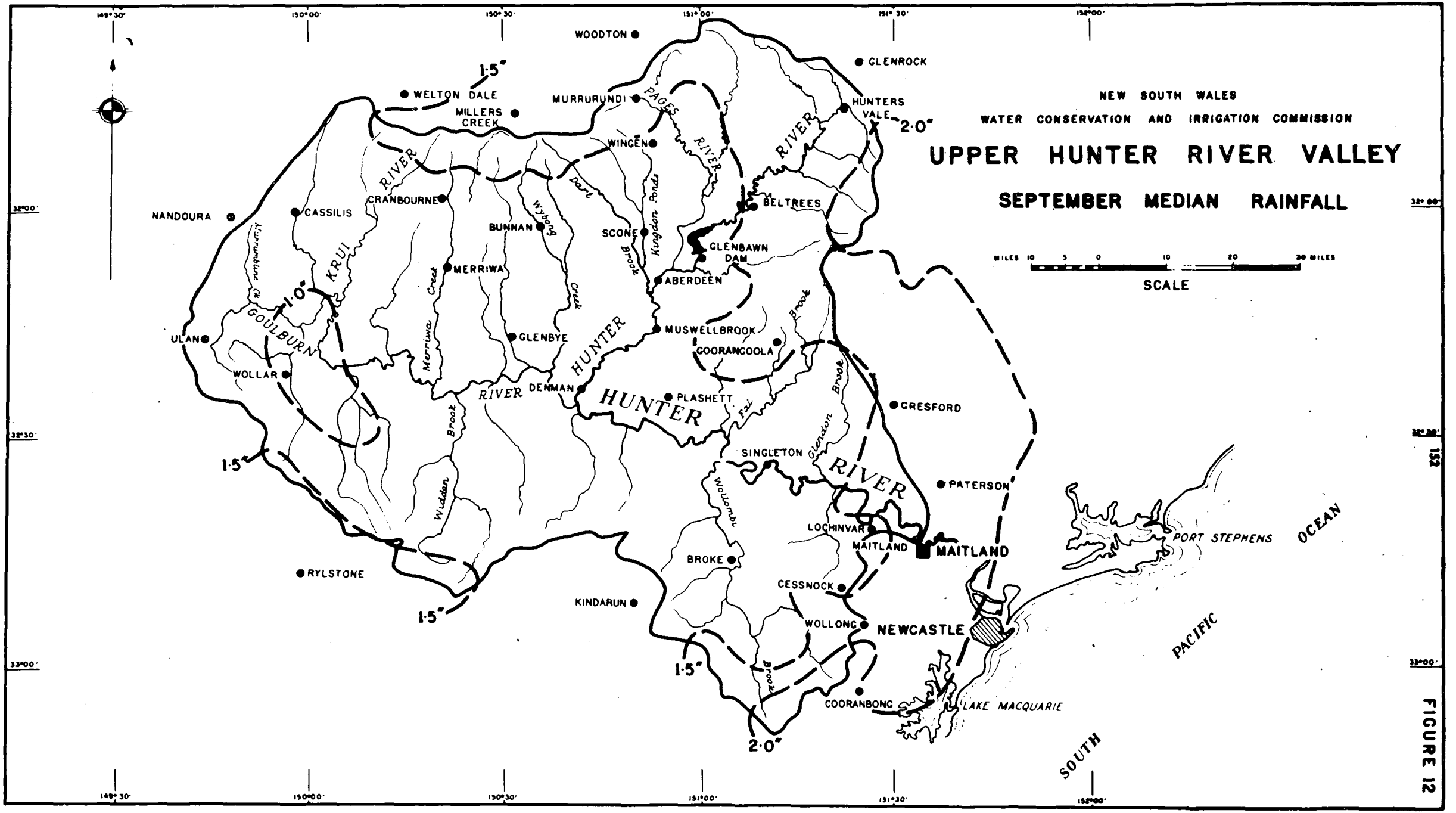

NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
UPPER HUNTER RIVER VALLEY
SEPTEMBER MEDIAN RAINFALL
SCALE
MILES 10 5 0 10 20 30 MILES
WOODTON
GLENROCK
WELTON DALE
MILLERS CREEK
MURRURUNDI
HUNTERS VALE
WINGEN
BELTREES
NANDOURA
CASSILIS
CRANBOURNE
BUNNAN
SCONE
GLENBAWN DAM
MERRIWA
ABERDEEN
ULAN
GLENBYE
MUSWELLBROOK
COORANGOOLA
WOLLAR
DENMAN
PLASHETT
GRESFORD
SINGLETON
PATERSON
LOCHINVAR
MAITLAND
BROKE
RYLSTONE
CESSNOCK
KINDARUN
WOLLONG
NEWCASTLE
COORANBONG
LAKE MACQUARIE
PORT STEPHENS
OCEAN
PACIFIC
SOUTH
KRUI RIVER
GOULBURN RIVER
HUNTER RIVER
PAGES RIVER
RIVER
Kingdon Ponds
Merriwa Creek
Widden Brook
Glendon Brook
Wollombi Brook
1·5"
1·0"
2·0"
149°30'
150°00'
150°30'
151°00'
151°30'
152°00'
32°00'
32°30'
33°00'

FIGURE 12

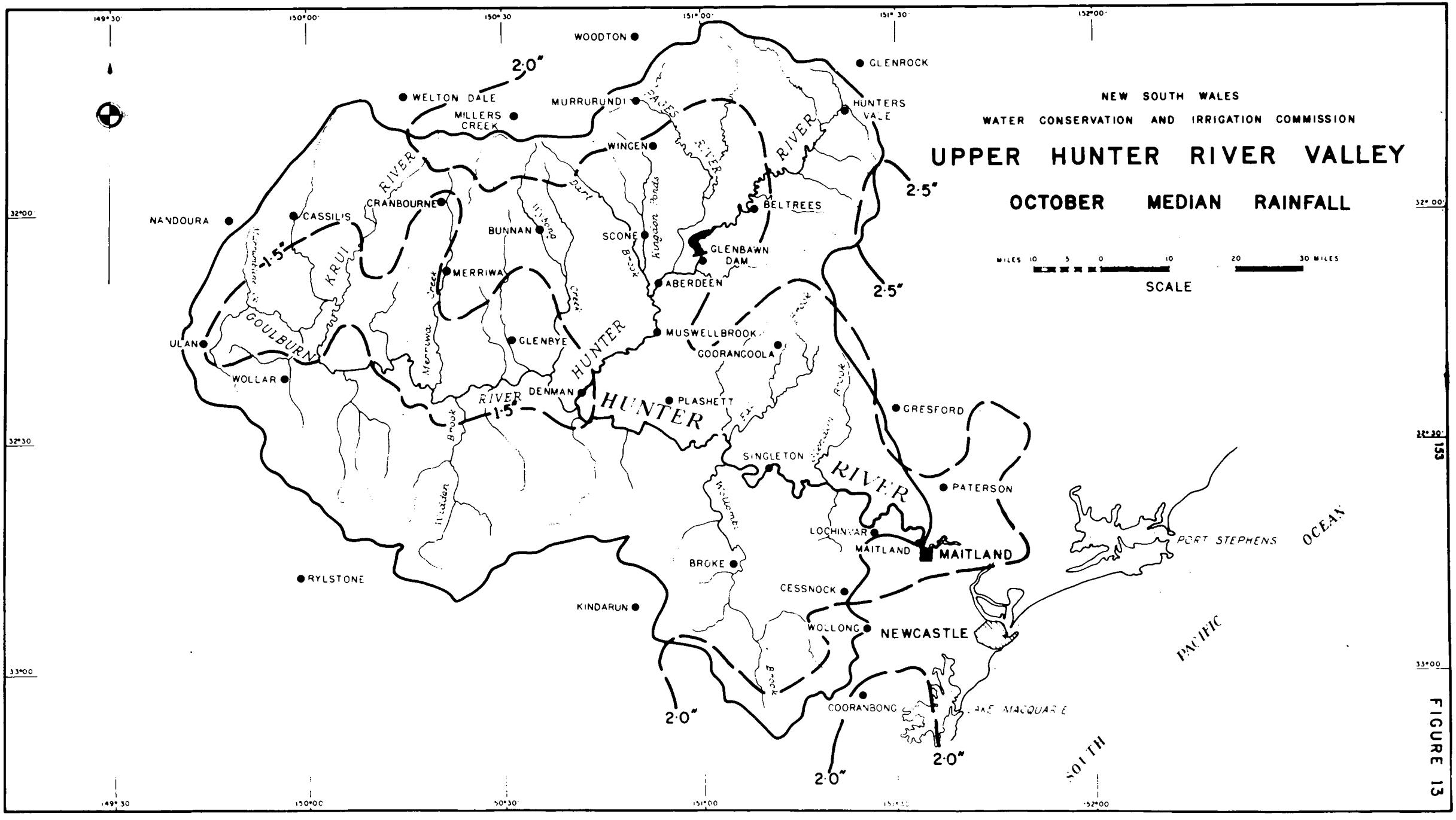
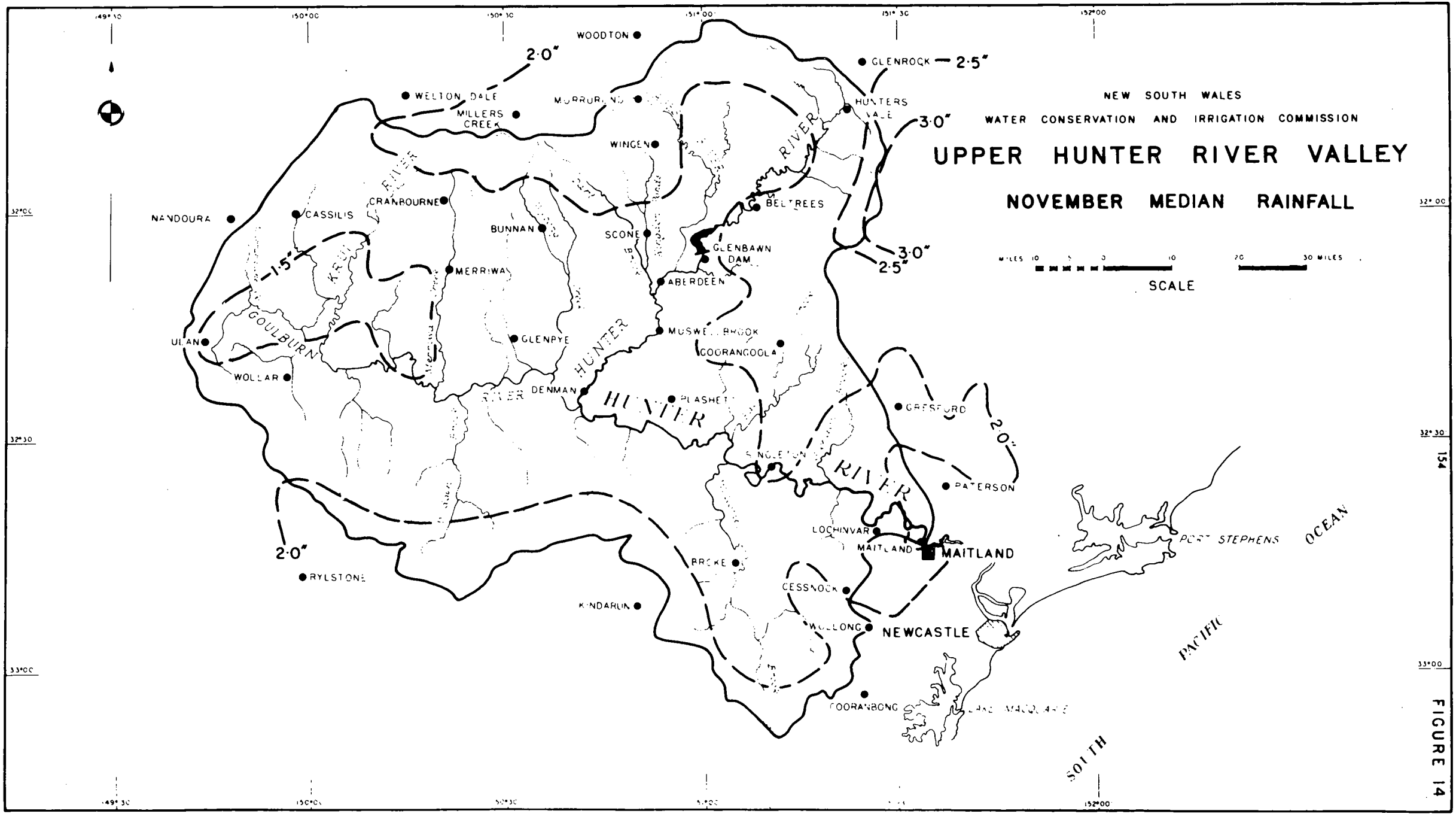
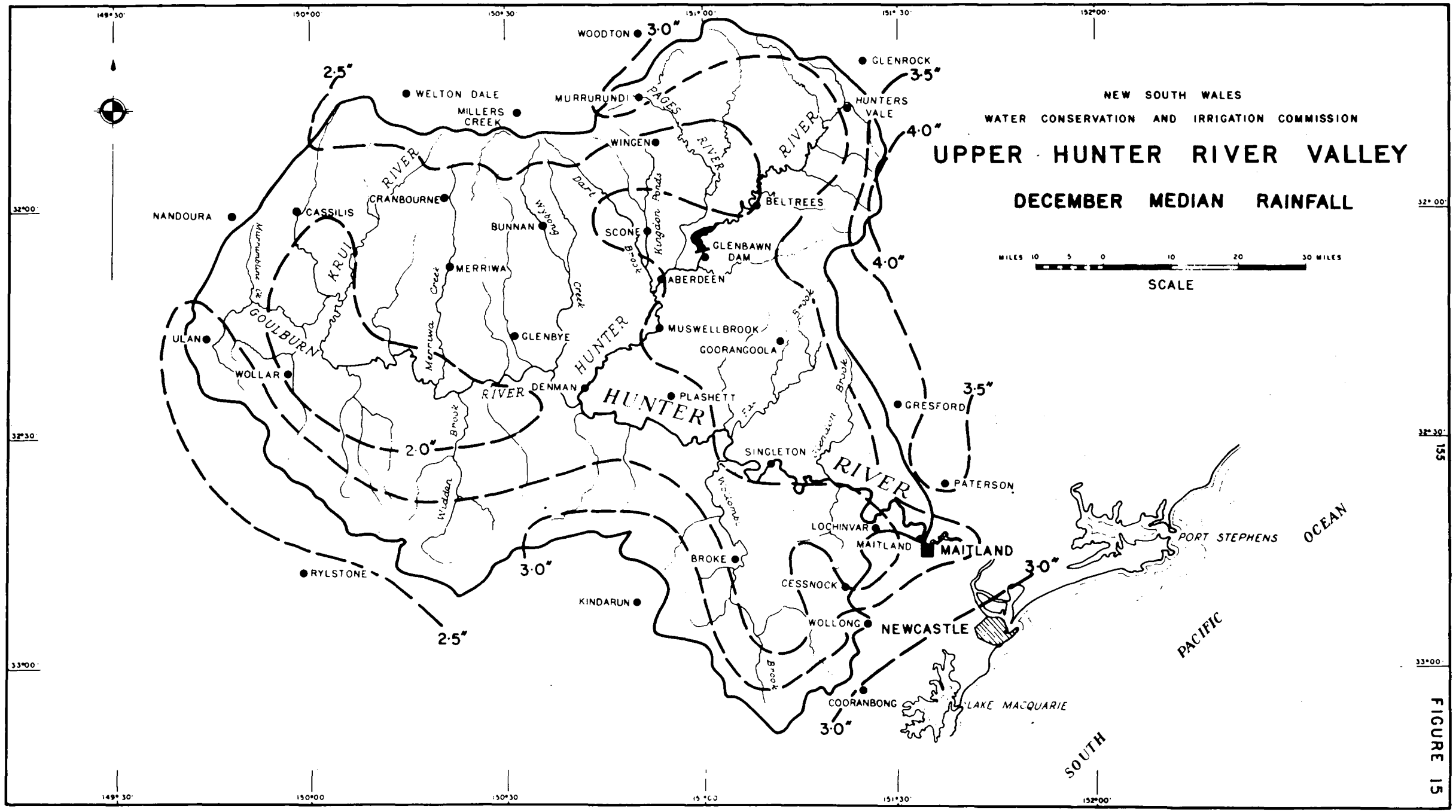

NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
UPPER HUNTER RIVER VALLEY
OCTOBER MEDIAN RAINFALL
SCALE
MILES 10 5 0 10 20 30 MILES
WOODTON
GLENROCK
WELTON DALE
MILLERS CREEK
MURRURUNDI
HUNTERS VALE
WINGEN
BELTREES
NANDOURA
CASSILIS
CRANBOURNE
BUNNAN
SCONE
GLENBAWN DAM
MERRIWA
ABERDEEN
ULAN
GLENBYE
MUSWELLBROOK
GOORANGOOLA
WOLLAR
DENMAN
PLASHETT
GRESFORD
SINGLETON
PATERSON
LOCHINVAR
MAITLAND
PORT STEPHENS
OCEAN
BROKE
RYLSTONE
CESSNOCK
KINDARUN
WOLLONG
NEWCASTLE
PACIFIC
COORANBONG
LAKE MACQUARIE
SOUTH
2·0"
1·5"
2·5"
HUNTER RIVER
GOULBURN RIVER
KRUI RIVER
PAGES RIVER
149°30
150°00
150°30
151°00
151°30
152°00
32°00
32°30
33°00

FIGURE 13



154

FIGURE 14



155

FIGURE 15

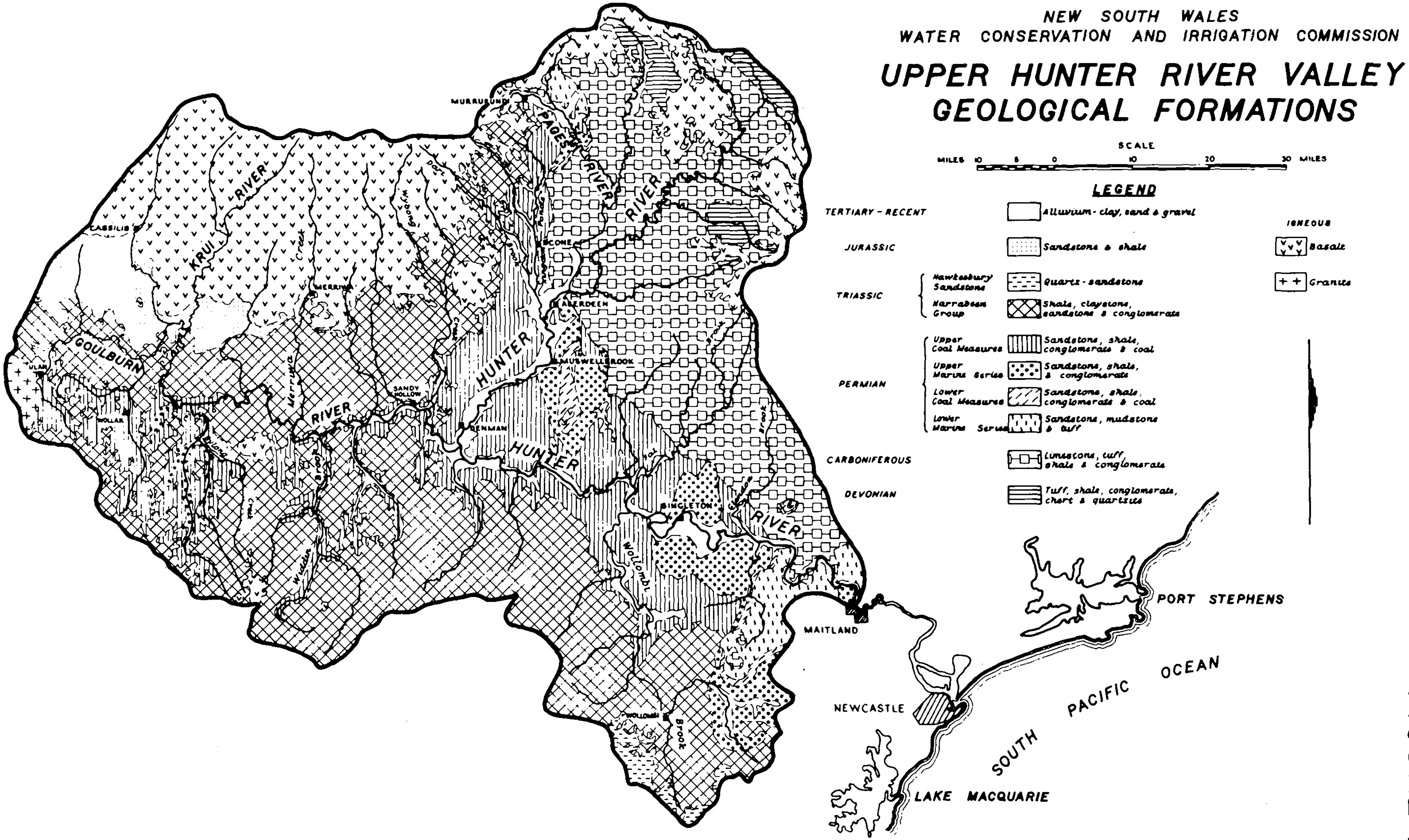
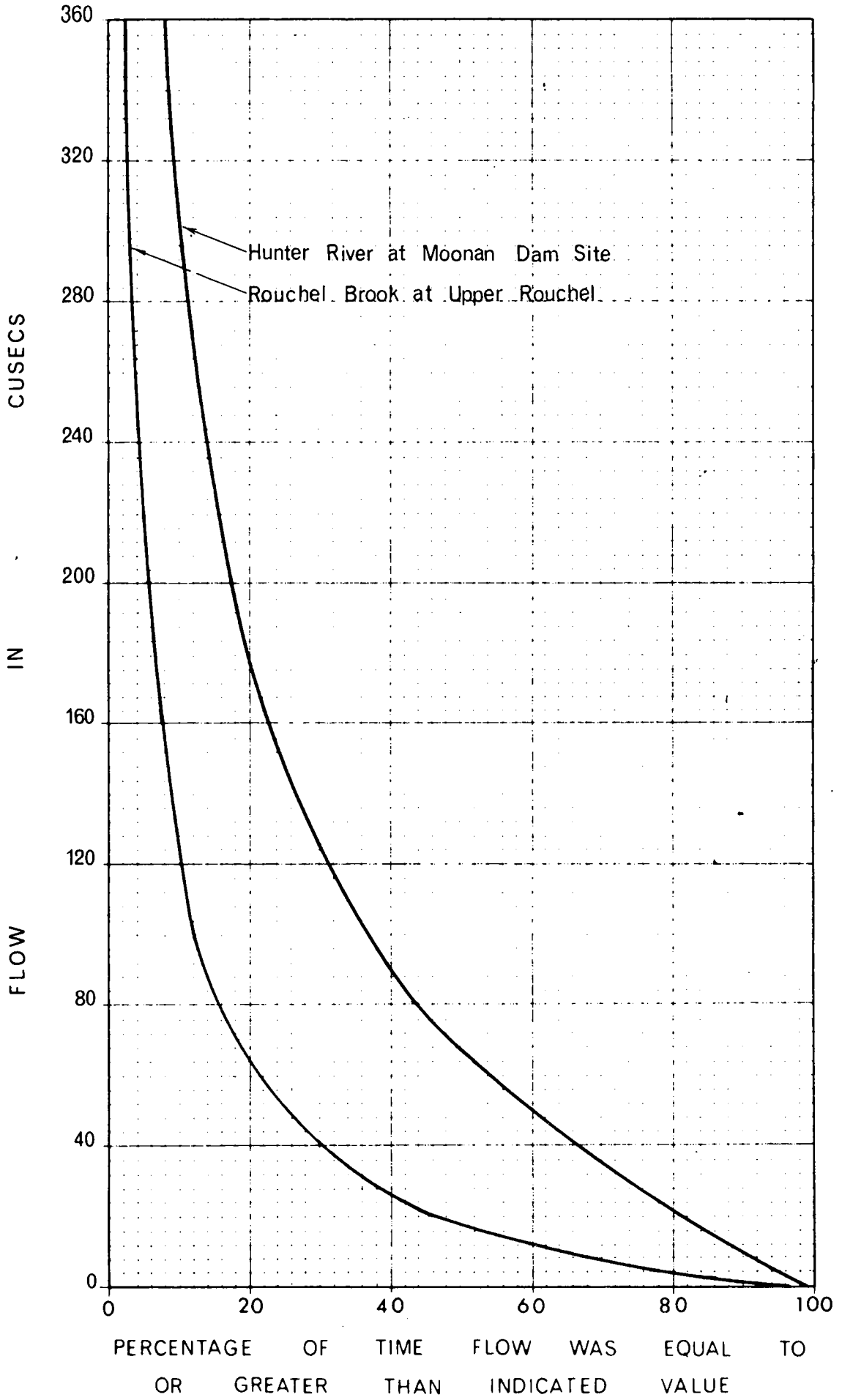

NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
UPPER HUNTER RIVER VALLEY
GEOLOGICAL FORMATIONS
SCALE
MILES 10 5 0 10 20 30 MILES
LEGEND
TERTIARY - RECENT
Alluvium - clay, sand & gravel
JURASSIC
Sandstone & shale
TRIASSIC
Hawkesbury Sandstone
Quartz - sandstone
Narrabeen Group
Shale, claystone, sandstone & conglomerate
PERMIAN
Upper Coal Measures
Sandstone, shale, conglomerate & coal
Upper Marine Series
Sandstone, shale, & conglomerate
Lower Coal Measures
Sandstone, shale, conglomerate & coal
Lower Marine Series
Sandstone, mudstone & tuff
CARBONIFEROUS
Limestone, tuff, shale & conglomerate
DEVONIAN
Tuff, shale, conglomerate, chert & quartzite
IGNEOUS
Basalt
Granite
MURRURUNDI
CASSILIS
KRUI RIVER
GOULBURN
RIVER
HUNTER
PAGES RIVER
RIVER
SCONE
ABERDEEN
MUSWELLBROOK
MERRIWA
SANDY HOLLOW
DENMAN
WOLLAR
ULAN
HUNTER
SINGLETON
RIVER
WOLLOMBI
Brook
MAITLAND
PORT STEPHENS
NEWCASTLE
LAKE MACQUARIE
SOUTH PACIFIC OCEAN

FIGURE 16

FIGURE 21

03539



FLOW DURATION CURVES FOR HUNTER RIVER AT MOONAN DAM SITE AND ROUCHEL BROOK AT UPPER ROUCHEL

FIGURE 17

INSET — LIDDELL STATIONS

NEW SOUTH WALES

WATER CONSERVATION AND IRRIGATION COMMISSION

UPPER HUNTER RIVER VALLEY GAUGING STATIONS

AT 31st. DECEMBER 1968

MILES 10 5 0 10 20 30 MILES

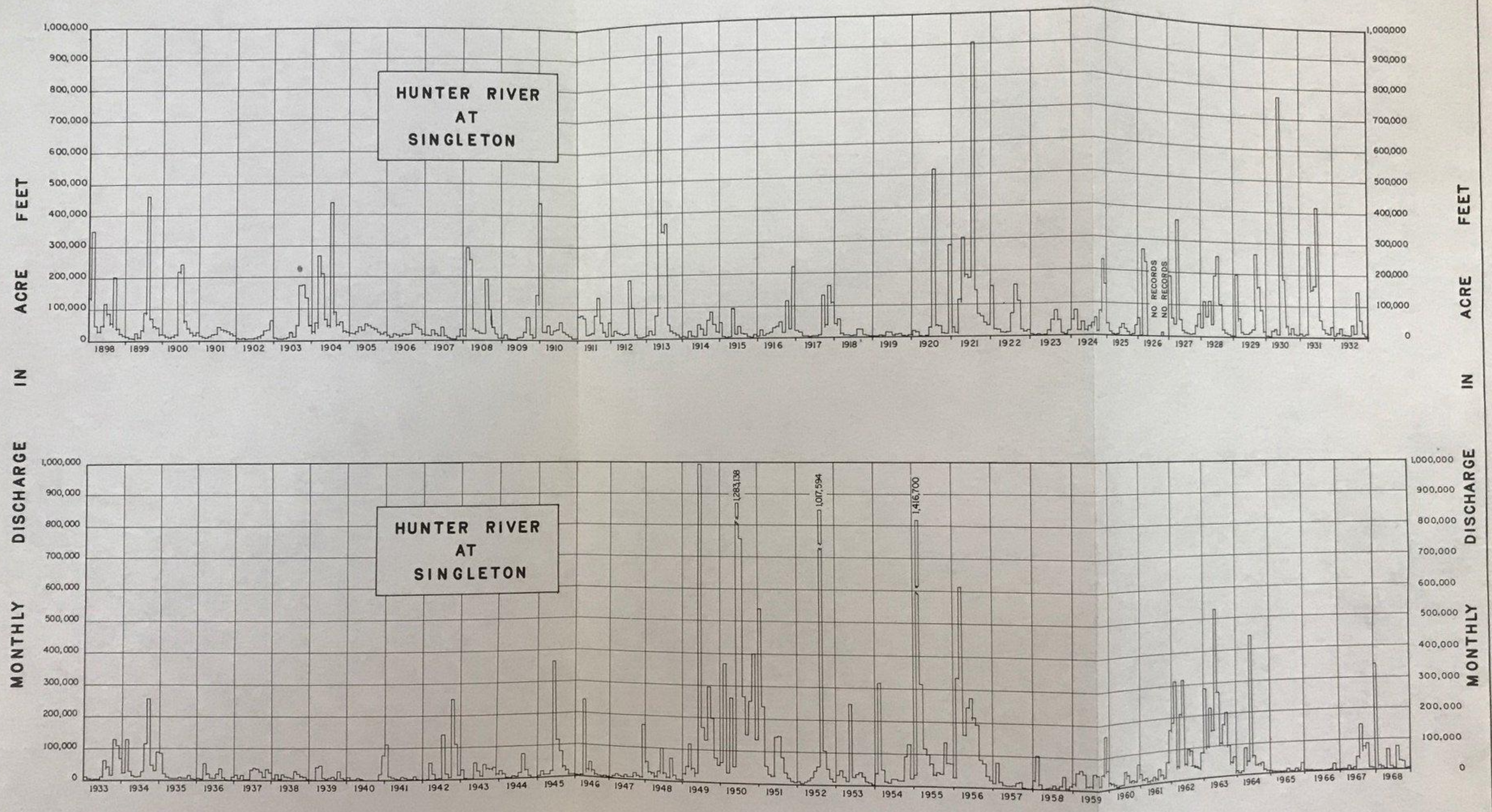
LEGEND

Staff Gauge

Automatic Recorder — Pressure Type (P) — Float Type — Servo Type (S)

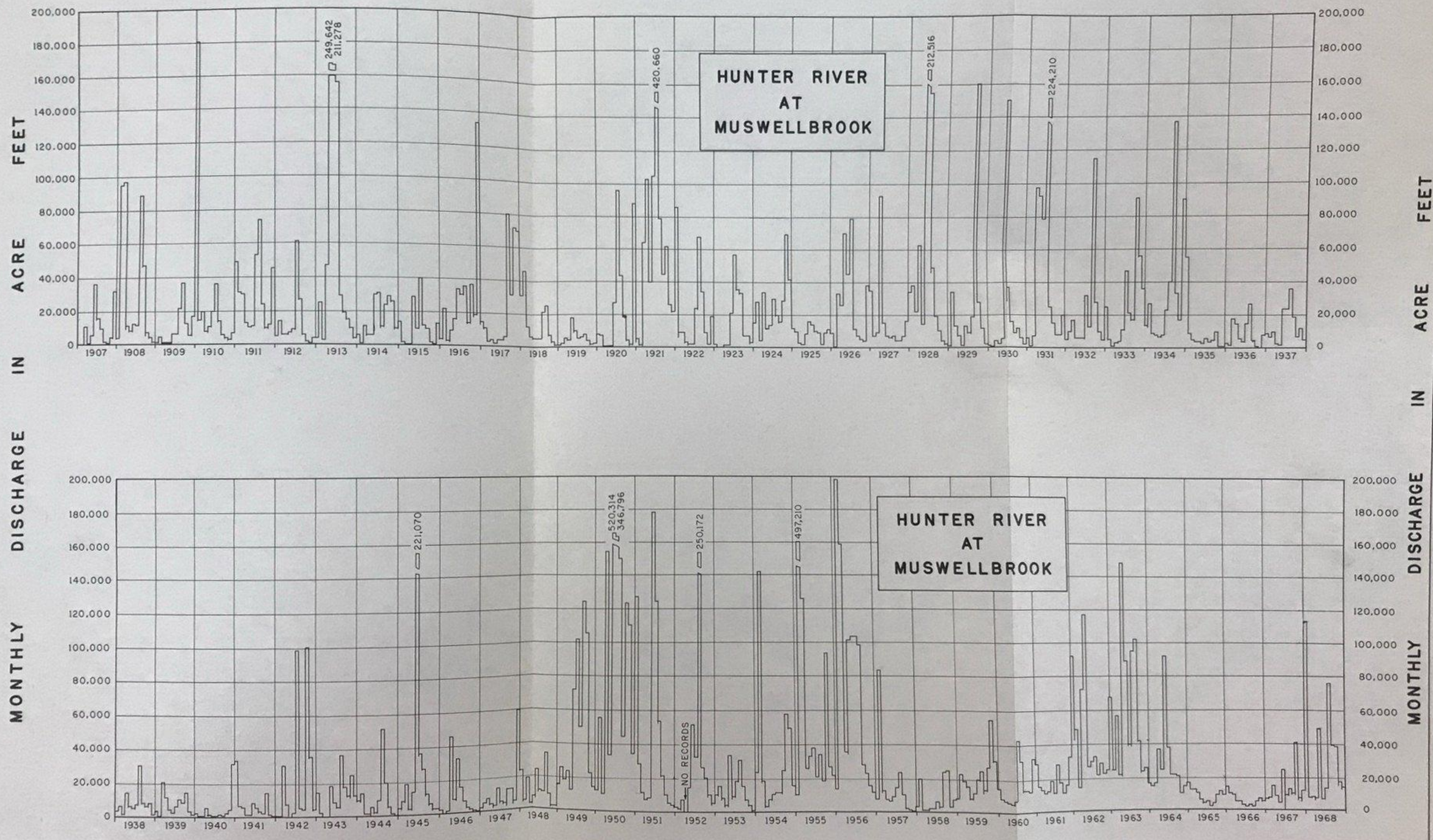
Discontinued Station

FIGURE 18



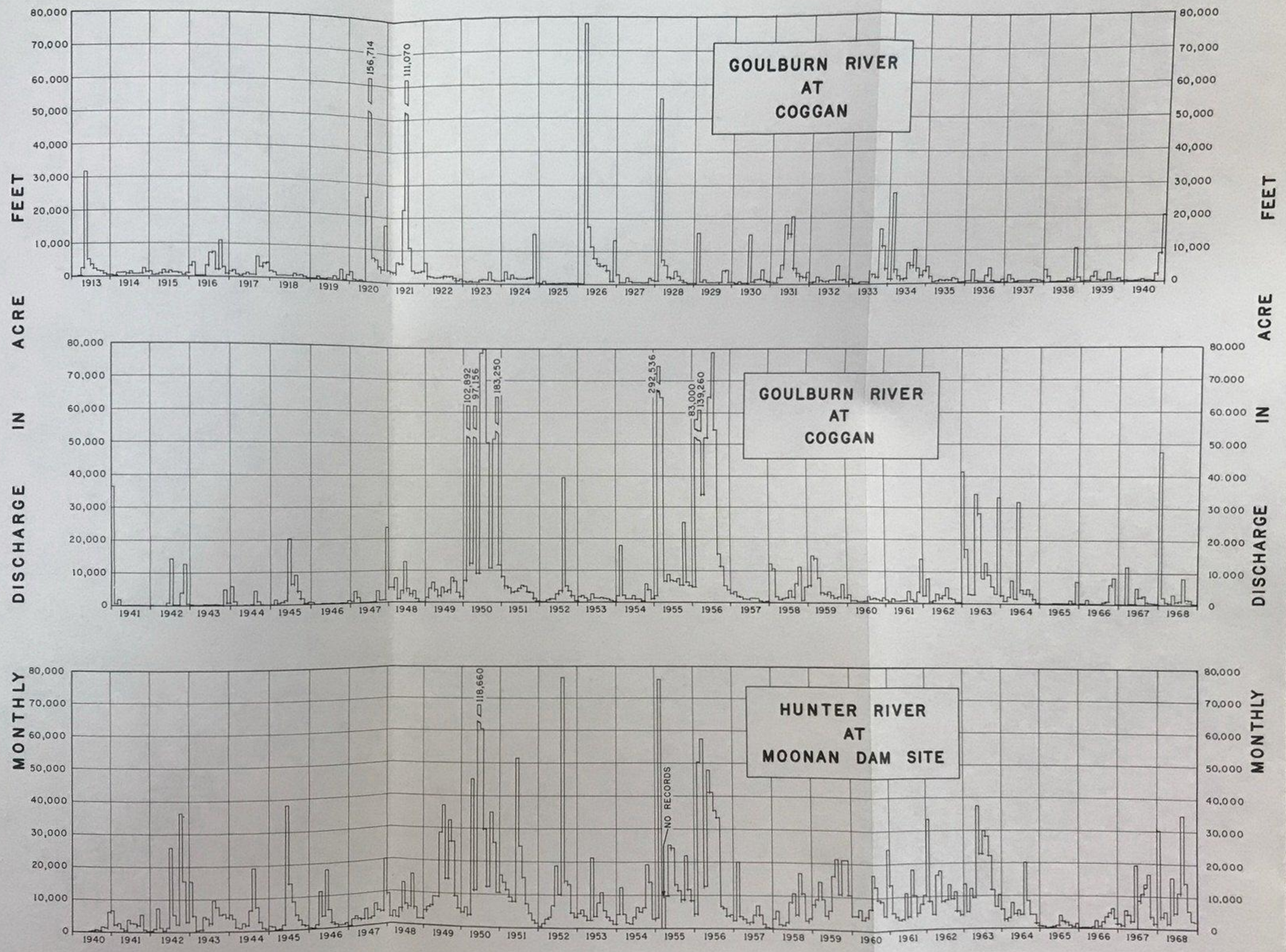
HYDROGRAPH OF MONTHLY DISCHARGE — HUNTER RIVER AT SINGLETON

FIGURE 19



HYDROGRAPH OF MONTHLY DISCHARGE — HUNTER RIVER AT MUSWELLBROOK

FIGURE 20

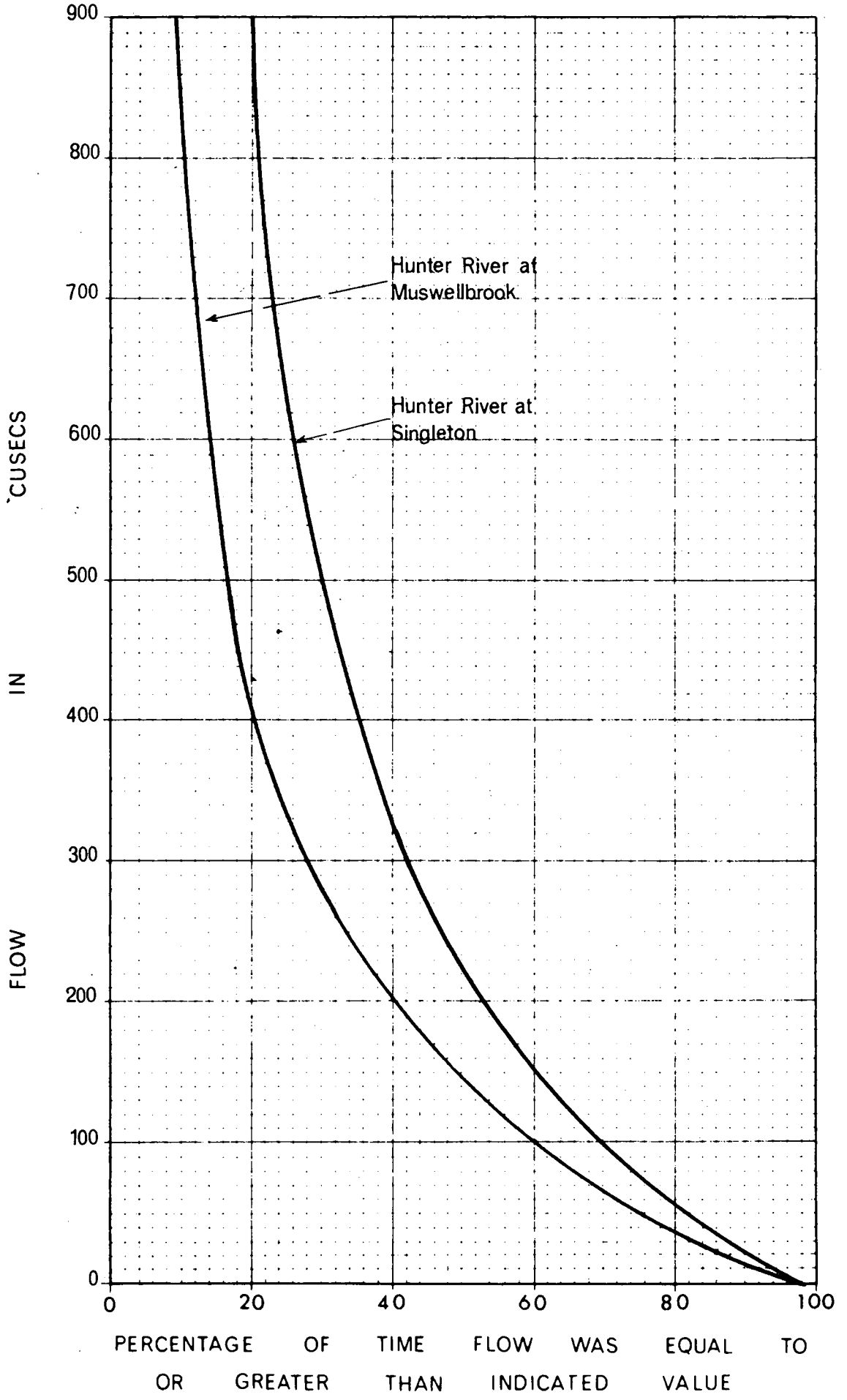


HYDROGRAPHS OF MONTHLY DISCHARGE

GOULBURN RIVER AT COGGAN
HUNTER RIVER AT MOONAN DAM SITE

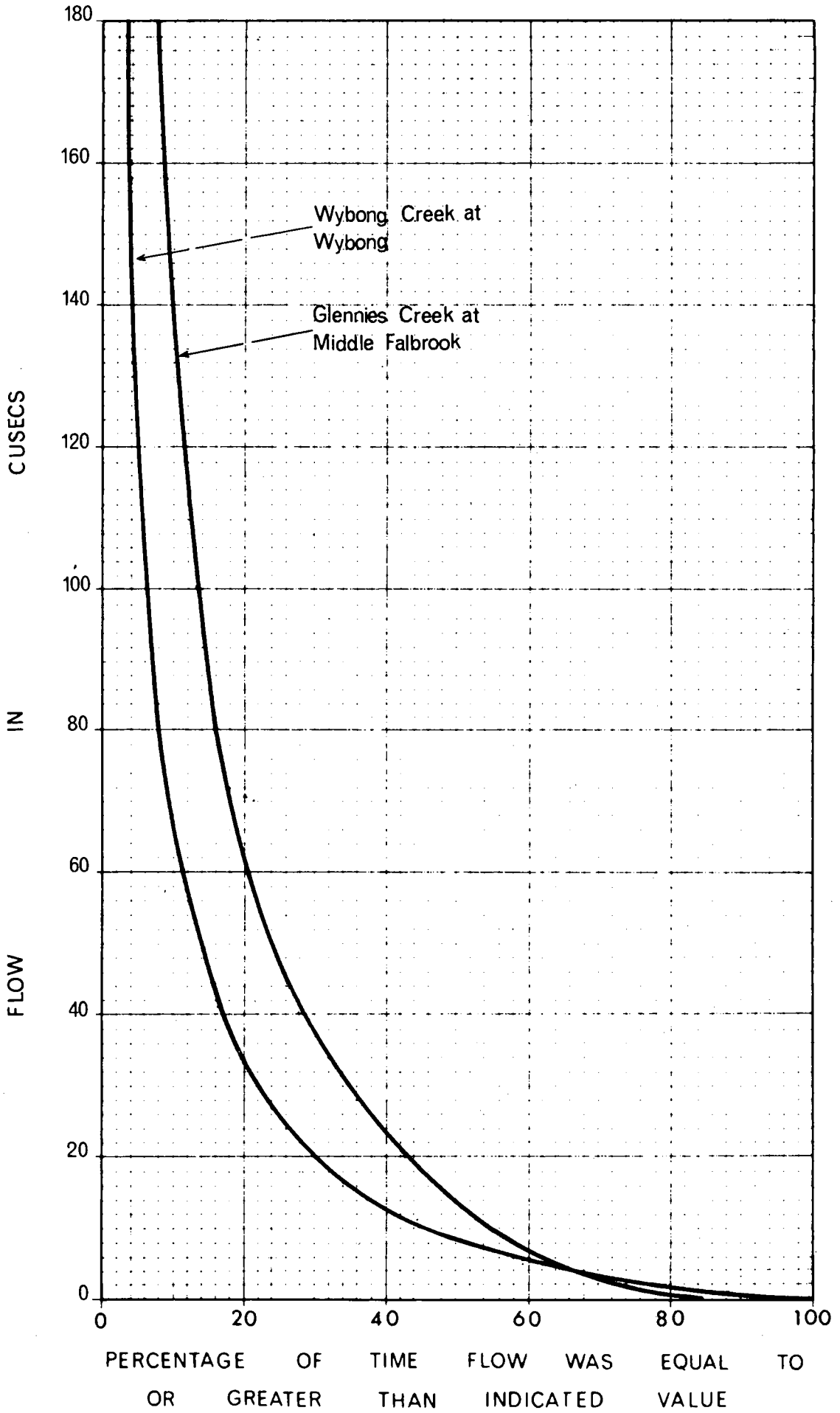
FIGURE 22

03540



FLOW DURATION CURVES FOR HUNTER RIVER AT MUSWELLBROOK AND SINGLETON

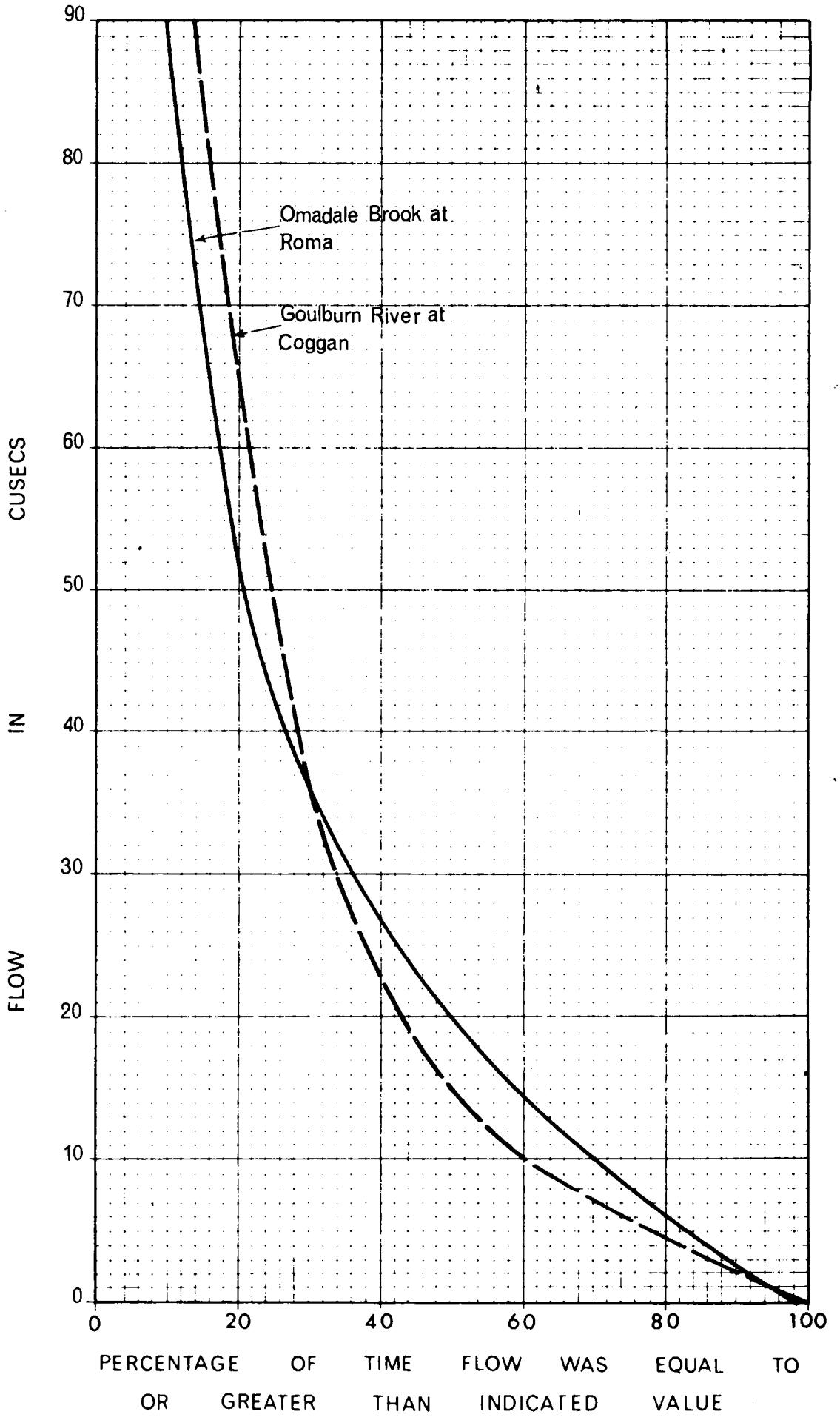
FIGURE 23



FLOW DURATION CURVES FOR WYBONG CREEK AT WYBONG AND GLENNIES CREEK AT MIDDLE FALBROOK

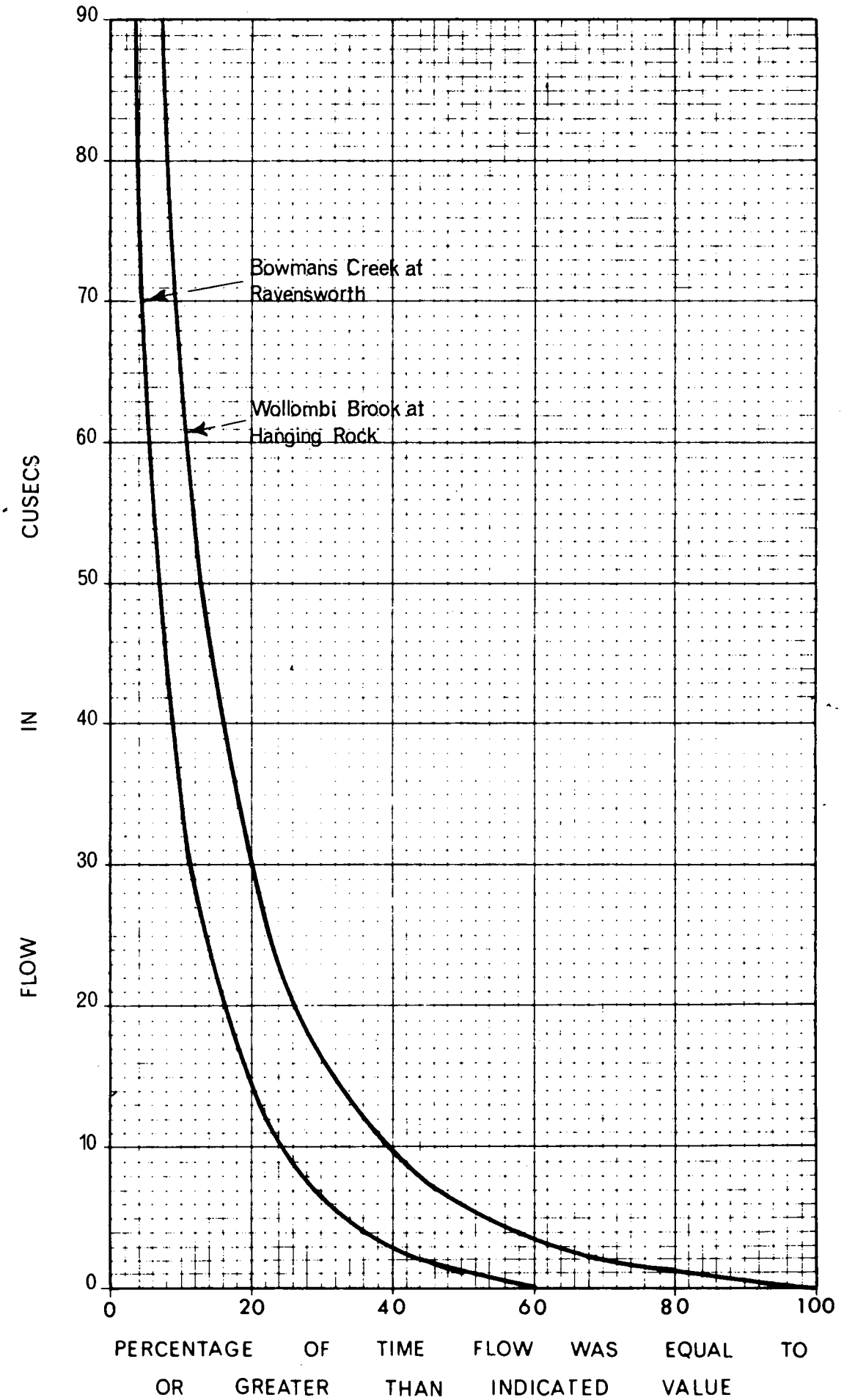
FIGURE 24

03542



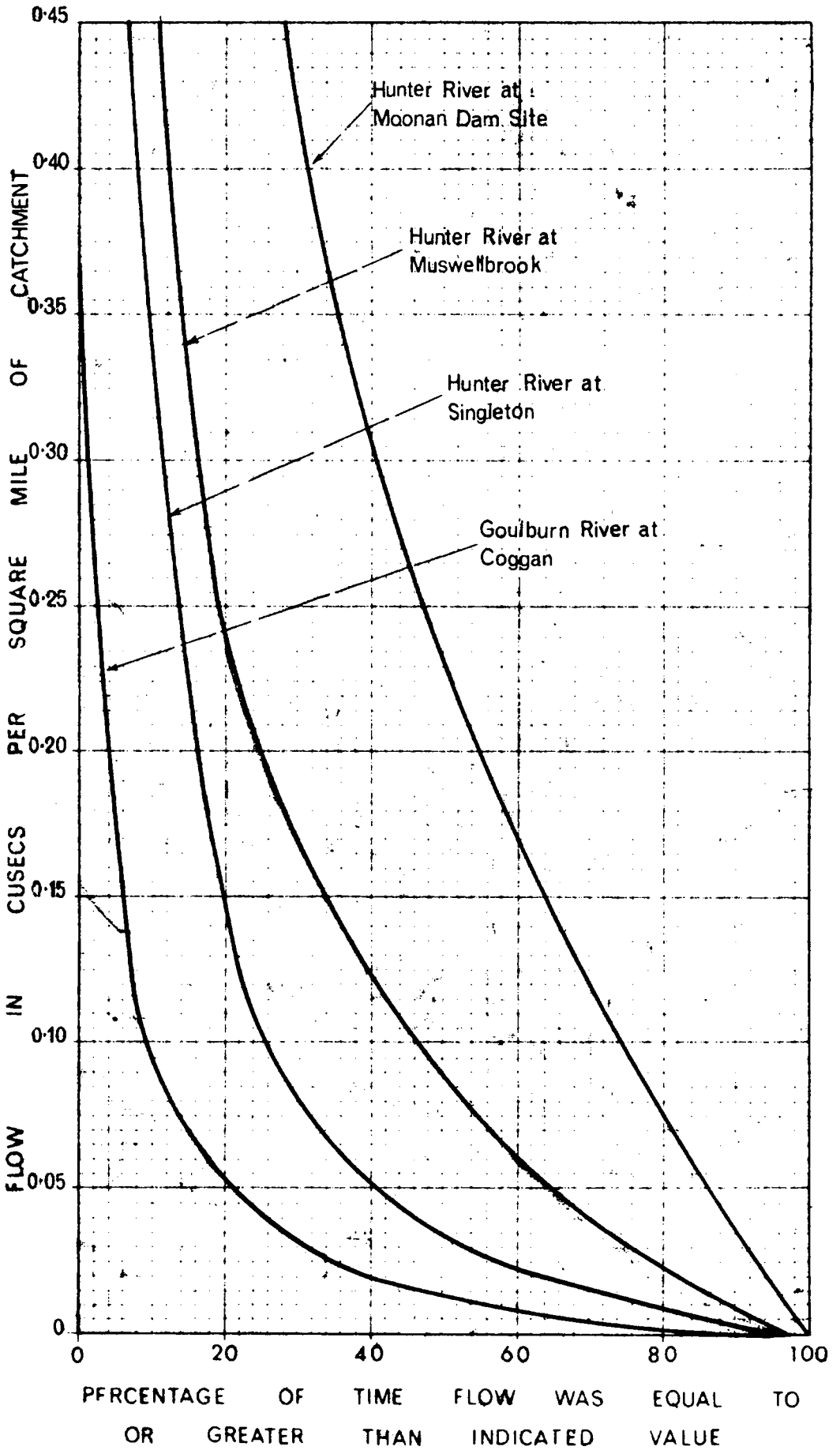
FLOW DURATION CURVES FOR OMADALE BROOK AT ROMA AND GOULBURN RIVER AT COGGAN

FIGURE 25

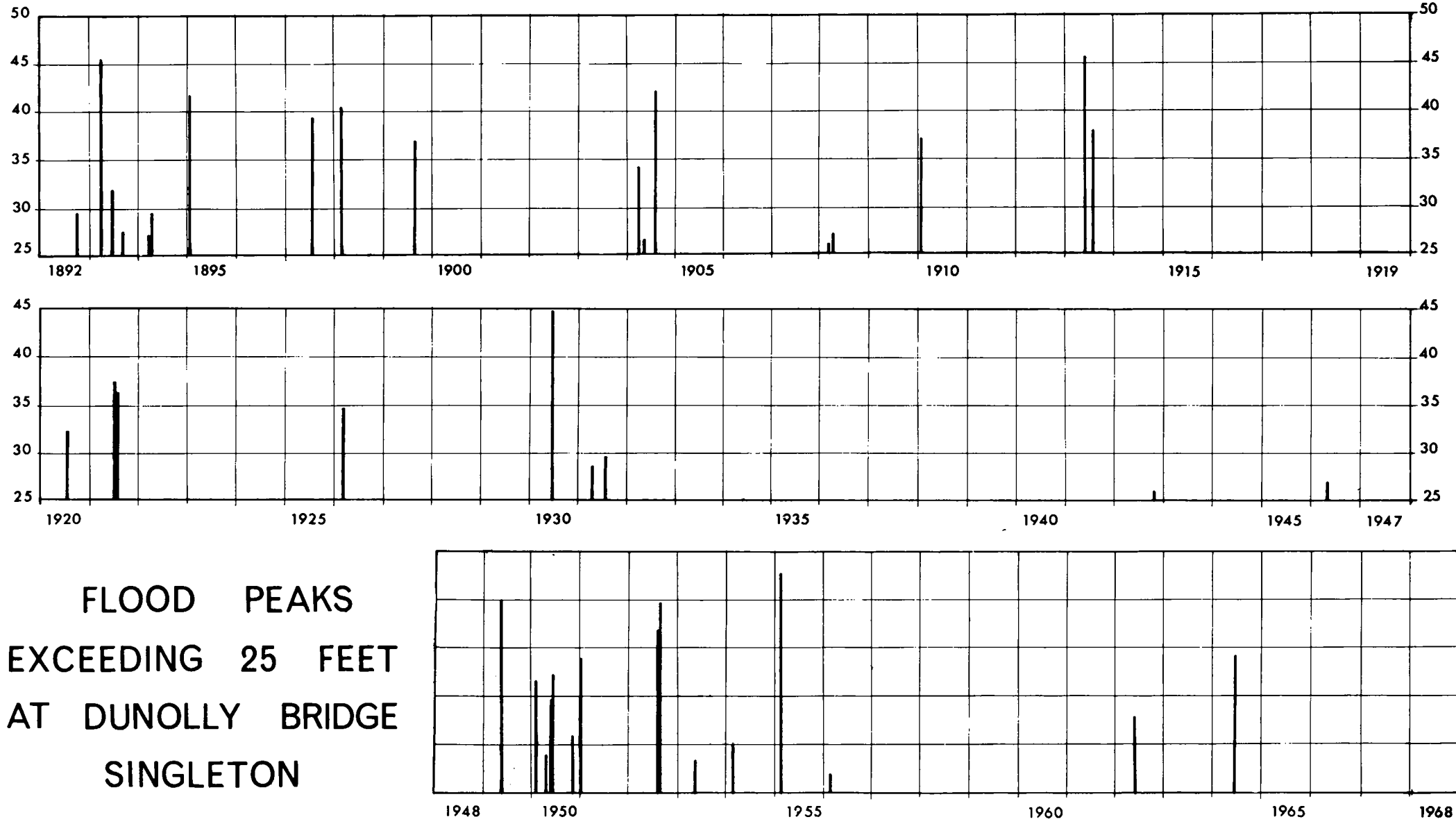


FLOW DURATION CURVES FOR BOWMANS CREEK AT RAVENSWORTH AND WOLLOMBI BROOK AT HANGING ROCK

FIGURE 26



FLOW DURATION CURVES FOR UPPER HUNTER VALLEY STREAMS



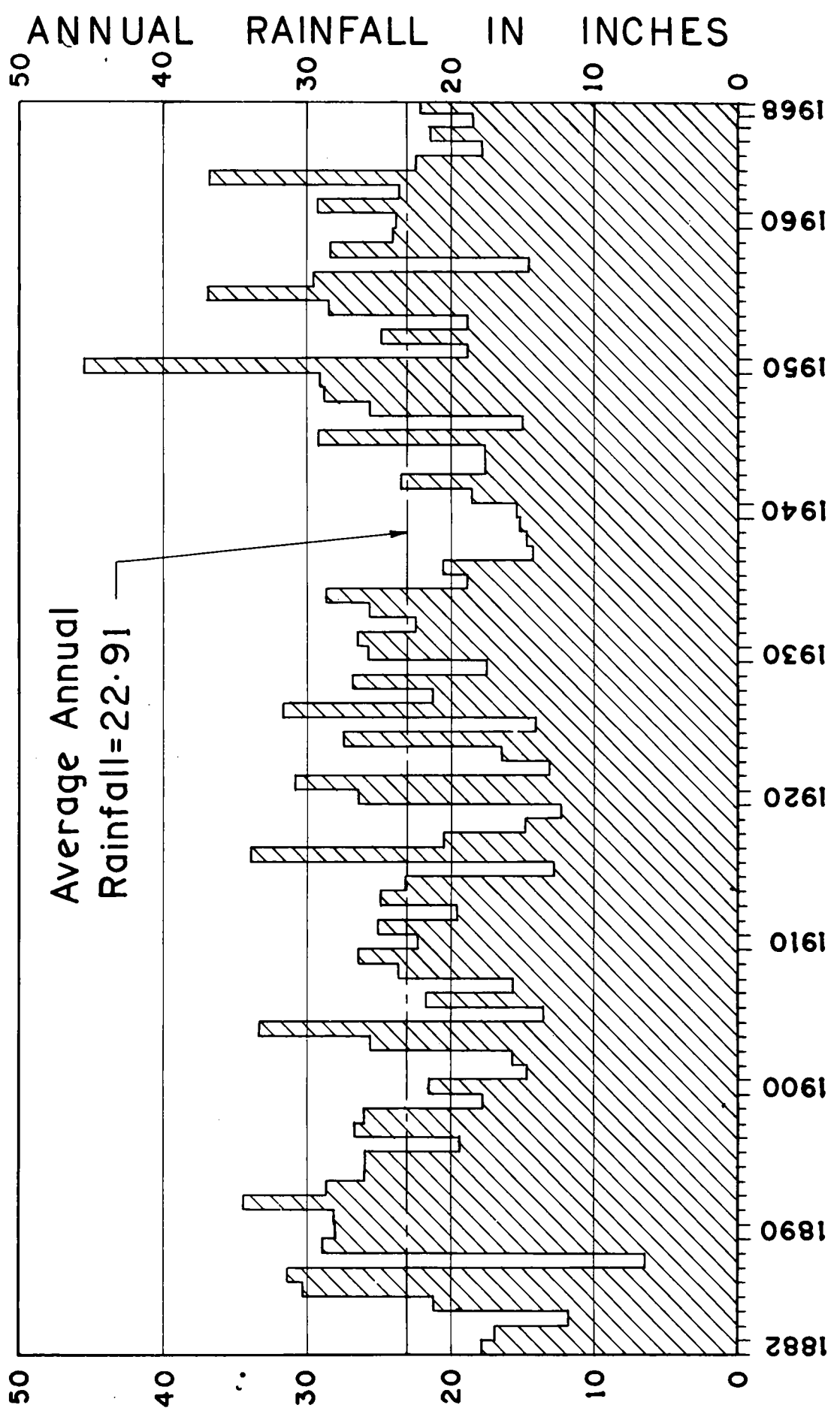
FLOOD PEAKS EXCEEDING 25 FEET AT DUNOLLY BRIDGE SINGLETON

FIGURE 27

FIGURE 28

ANNUAL RAINFALL IN INCHES
50
40
30
20
10
0
1968
1960
1950
1940
1930
1920
1910
1900
1890
1880
1871
Average Annual Rainfall = 24·15
ANNUAL RAINFALLS AT MUSWELLBROOK

FIGURE 29



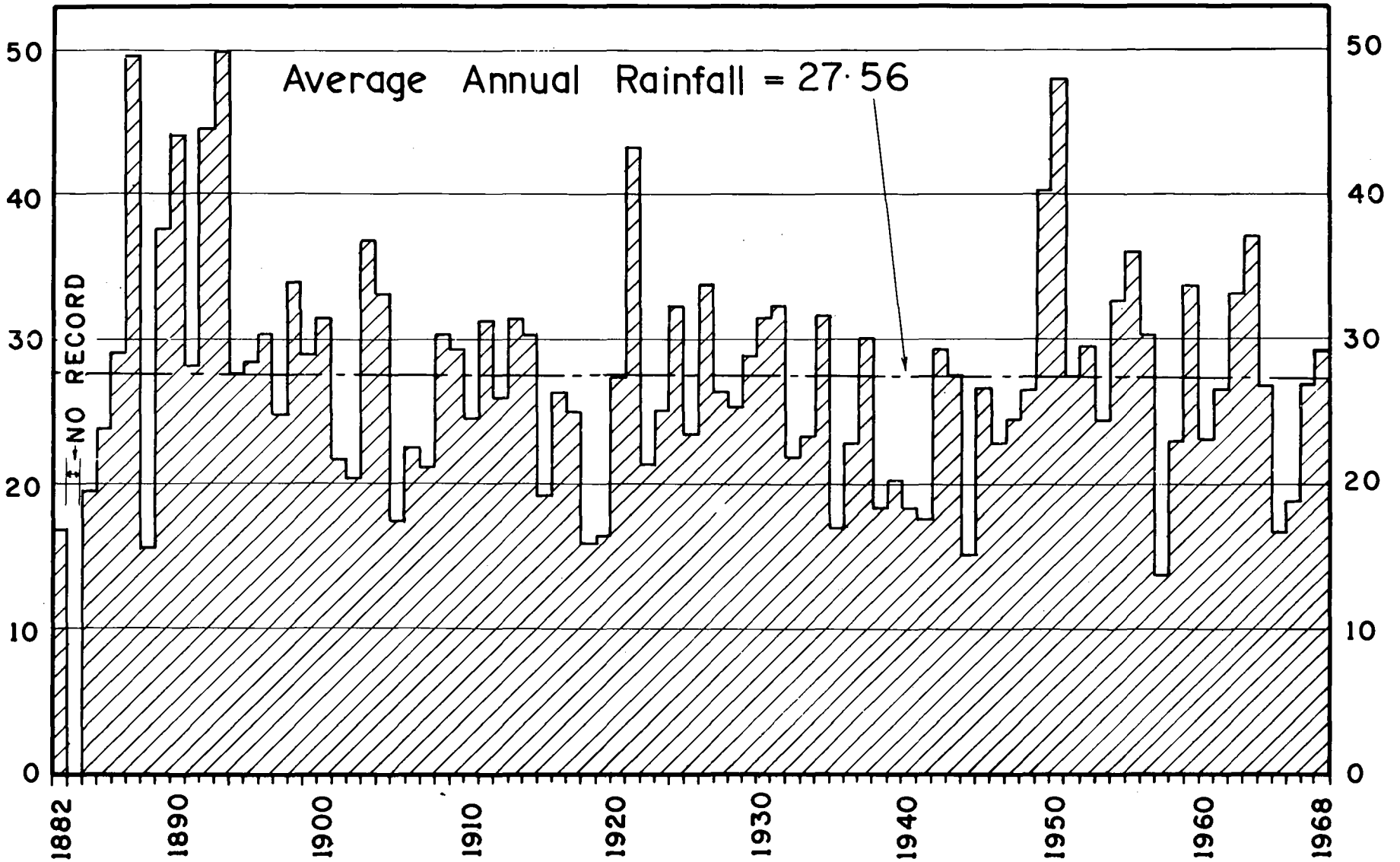
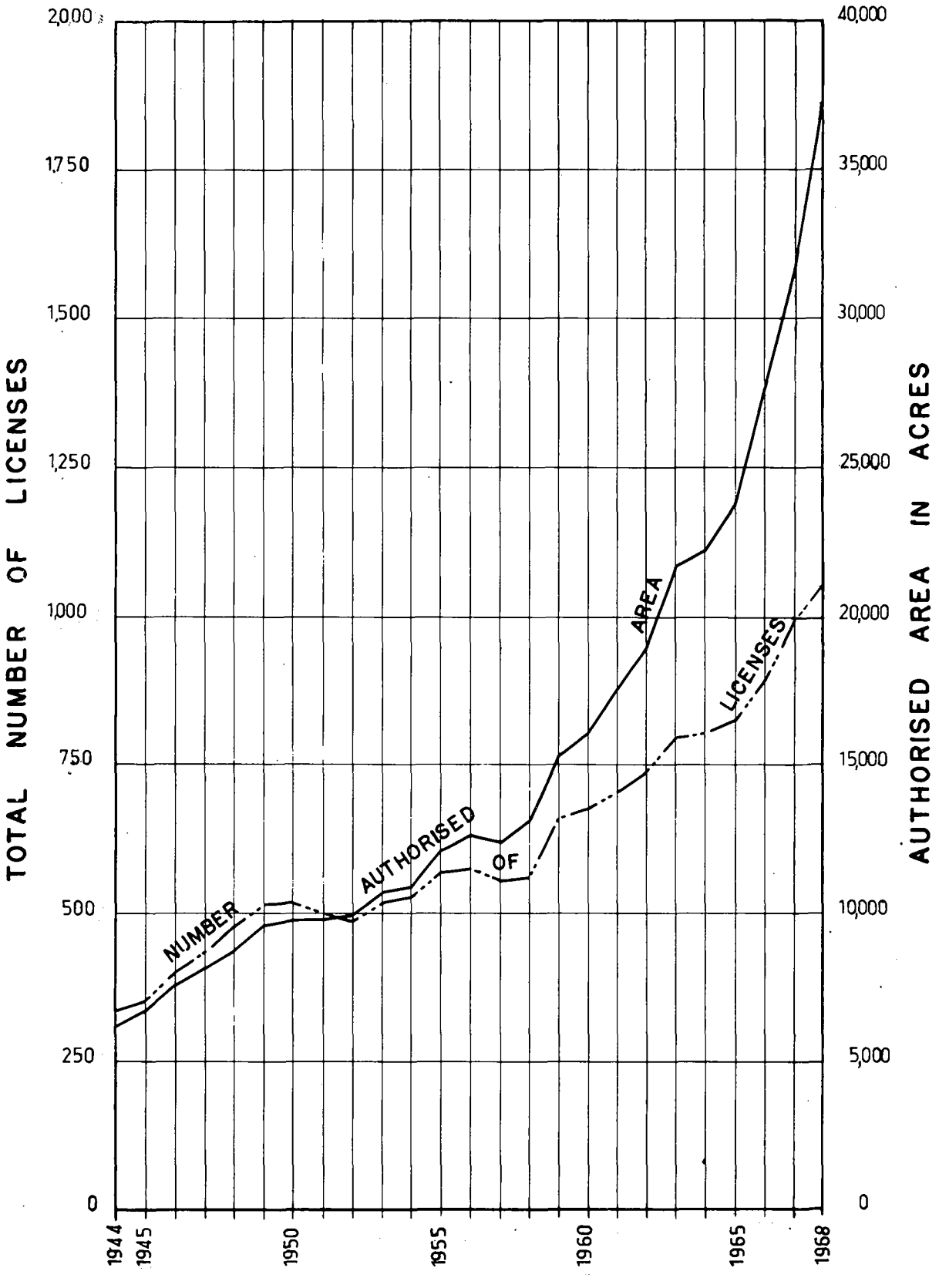

Average Annual Rainfall = 27·56
I - NO RECORD
50
40
30
20
10
0
1882
1890
1900
1910
1920
1930
1940
1950
1960
1968
ANNUAL RAINFALL IN INCHES
ANNUAL RAINFALLS AT SINGLETON

FIGURE 30

FIGURE 31



UPPER HUNTER VALLEY

AREA AUTHORISED FOR IRRIGATION AND TOTAL NUMBER OF LICENSES AT 30th. JUNE FOR EACH YEAR INDICATED

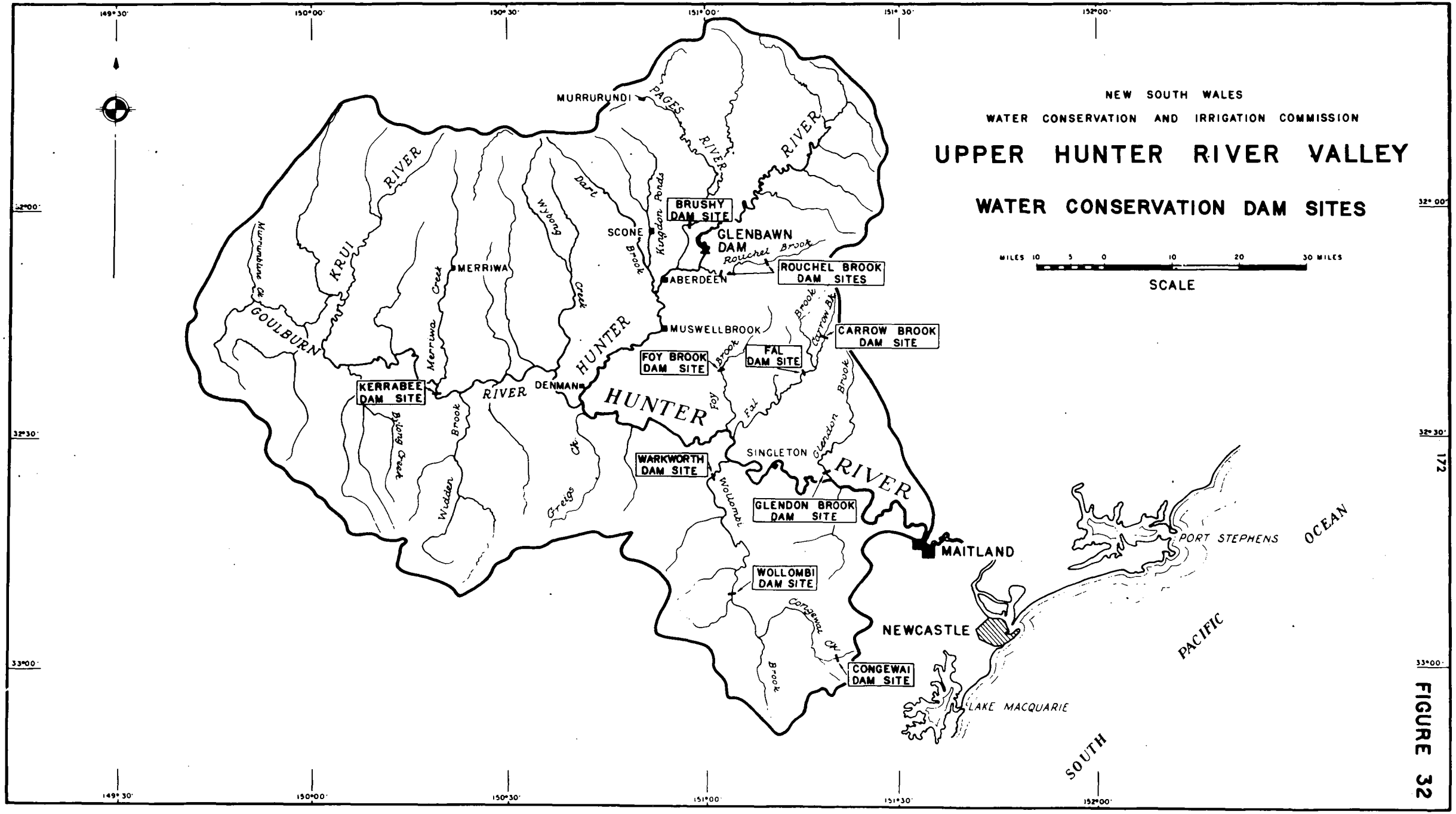


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FIGURE 32