

OF

GHANGARA WORKING PLAN AREA.

INTRODUCTION.

This Working Plan dated 1st day of March, 1929, forms the first Revision of the Working Plan for the Ghangara Working Circle dated 1st day of March, 1925 and approved by the Governor in Executive Council on the 11th day of June, 1925. Subject to the approval of the Governor in Council in accordance with Section 31 of the "Forests Act, 1918", this Working Plan shall remain in force until the next periodic revision which, circumstances permitting shall be completed on September, 30th, 1934.

From an economic view-point tens of thousands of acres of this type of country, apparently un-suitable for any other purpose, require attention.

It is considered that as the soil of a large proportion of the area consists of deep sands and the climate is favourable, this belt of country should be suitable for the growth of *Pinus pinaster*.

The work carried out under the last Plan was definitely an experiment to determine the best methods of establishing *Pinus pinaster* on this type of country, and also whether any other species are suited to the locality. The results have been sufficiently promising to warrant a continuance of operations.

The results obtained during this Plan period will determine the action to be taken at the revision of the plan in five years time.

1. NAME LOCATION AND SIZE.

The Gnangara Working Plan Area is included in the Swan Land District and the Metropolitan Forest District and is shown on Forests Department Plan No. 417 (Lands Department Lithograph 1A/40).

The total area of land temporarily reserved on June 6th, 1922, for pine plantation purposes is 107,000 acres (See Map No.1).

7,700 acres was surveyed and sub-divided for this purpose in 1918 (See Map No.2).

The total area governed by this Plan is 1,420 acres as shown on Map No. 5.

2. ACCESS AND MARKETS.

Situated  $3\frac{1}{2}$  miles to the West of Upper Swan Railway station and reached from that station in six miles by the nearest road. Three miles of this road are macadamised and three miles sand track.

The indigenous timber is only fit for firewood and the nearest market for this product is Perth, 80 miles distant by road.

3. HISTORY.

In November 1916, the Conservator of Forests, Mr. C. E. Lane-Poole, inspected the country between Wanneroo and the Midland Railway with a view to selecting 18,000 acres of country suitable for afforestation with conifers. This extent of country was considered sufficient to supply the soft-wood requirements of the State in 30 years and from then on in perpetuity.

On 27th November, Cabinet approved of this planting scheme as submitted.

In 1918 several locations held within the proposed area were resumed; and in that year, Mr. W.E. Moss, Surveyor, surveyed and sub-divided 7,700 acres of the Southern portion of the country available.

Included in this work was the survey of tram-lines to be connected with West Guildford and to serve for the transport of firewood obtained from the area when clearing for pine planting.

The Scheme for the development of a firewood business with Perth was, however, rendered abortive for the time being owing to other big supplies being opened up.

During the years 1918 to 1925 a series of very small planting and sowing experiments were carried out.

#### 4. PHYSIOGRAPHY.

The country consists of undulating sandy hills, intersected by sandy flats with small swamps all of which with the exception of one in Location 2828 are dry during the greater part of the summer.

The geological formation of the surface is marine sand of tertiary age, and the soils vary from shallow sands over coffee rock to deep white or yellow sands. Many of the flats are underlain with a bed of coffee rock or brown sandstone which varies greatly in thickness from a few inches to several feet.

A soil and vegetation type survey has been carried out over approximately 3,000 acres of the proposed plantation area. A full report is attached as appendix No.1 and a plan illustrating the extent of the various types is attached as Map No. 6.

The climate is extra tropical with winter rains during the months of May to October and long dry summers from November to March, during which little rain is recorded.

The Average annual rainfall at Perth is 34.37 inches.

The following records from Perth with which climate that of Gnangara closely approximates, contain the main points of interest.

TEMPERATURE.

Yearly mean maximum 75<sup>o</sup> F. Jan. 84.3;  
Feb. 84.6; March 81.1; April 75.8; May 68.6; June 63.8; July  
62.6; Aug. 63.8; Sept. 66.0; Oct. 69.1; Nov. 75.2; Dec. 80.6;

Yearly mean minimum 55.1<sup>o</sup>F. Jan. 65.2;  
Feb. 63.3; March 60.7; April 57.0; May 52.3; June 49.4; July  
47.6; Aug. 48.1; Sept. 50.3; Oct. 52.7; Nov. 56.5; Dec. 60.5;

RAINFALL.

Average per year for 52 years 34.37 inches.  
Jan..34; Feb. .45; March.81; April 1.65; May 4.97; June 6.94;  
July 6.56; Aug/ 5.65; Sept. 3.42; Oct. 2.22; Nov. .80; Dec. .56;

5. DESCRIPTION OF INDIGENOUS FOREST GROWTH.

On the sand hills which cover the greater part of the area governed by this Working Plan the tree species are:- *Banksia attenuata*, *Banksia Menziesii*, *Banksia illicifolia*, *Eucalyptus Todtiana*, *Casuarina Fraseriana*, and *Nuytsia floribunda*.

On the flats, *Eucalyptus marginata* and *Eucalyptus calophylla* of poor form occur in mixture with the above *Banksia* species. In addition *Melaleuca raphiophylla* are scattered throughout and *Xanthorrhoea Preissii* and *Xanthorrhoea humilis* occur sometimes scattered and at others densely.

A full description of the various vegetative types is contained in appendix No. 1.

6. PAST MANAGEMENT.

Work in connection with the establishment of the plantation commenced in March, 1925 with the building of an Overseer's house and stables, the clearing of a Nursery etc.

(a) Utilisation of Indigenous Timber.

Every effort has been made to dispose of the Banksia on this country, as firewood, but up to the present without result.

Several firewood permits have been issued, but the permit holders after varying periods have been obliged to discontinue operations.

The Department in one instance cut the wood and sold it at the stump for 3/6d a cord ( a loss of 4/- on cutting costs) but the permit holder could not even then make a financial success of the venture.

The great drawback is the absence of a made road from the plantation to the main road. This 4 mile stretch of sand makes hauling an expensive operation. Road construction on this type of country is very expensive and the construction of a road to connect the plantation with the main road will probably not be justified for some years yet.

The royalty derived from the sale of firewood to 15th September, 1929, is £18. 10.0.

(b) Field Survey.

Approximately 7,000 acres were sub-divided into 40 acre compartments by Surveyor Moss, 1917 - 1918 (see Map No.2).

This survey has formed the basis of the present sub-division, all compartments having been roughly cut in two.

200 acres were sub-divided in the summer of 1925-1926 and comprise Compartments 1 to 14 (see Map No.5). An additional 400 acres was sub-divided in the summer of 1927 and comprise Compartments 15 to 25 (See Map No. 5).

The original numbering of Compartments was not satisfactory and these have therefore, been numbered as follows :-

<u>Original Numbering.</u>	<u>New Numbering.</u>
121	1
121A	2
120	3
119	4
116	5
116A	6
117	7
117A	8
115	9
114	10
114A	11
113	12
118A	13
118	14
106A	15
106	16
102 and 102A	17
123	18
124	19
125	20
128	21
129	22
130)	23
}	24
}	25

(c) Nursery.

It was thought when operations commenced at this centre that it would be impossible to raise good planting stock on the sandy country available. A site on better soil was therefore selected on Location 1628 adjacent to the Plantation and two acres were purchased in 1925. This was sown in June, 1925 with 80 lbs. of Pinus pinaster seed.

Unfortunately this nursery proved a failure. It was found to be impossible to economically cope with the weed growth. The land was rather low lying and moist right through the summer, causing weeds to grow luxuriantly through the hot months. Couch grass, Sorrel and Summer Grass were the biggest trouble. This nursery was sold back to the original owner and a new site cleared adjacent to the Overseer's house on Location 2828. This nursery is known as Headquarters nursery. Trouble was also experienced here it being found impossible to raise plants big enough for planting out in one season and if left for two seasons were too large. Satisfactory  $\frac{1}{I}$  stock could probably be raised here but this type is costly compared with the cost of raising seedlings. A more favourable locality was looked for and an area located near the Western boundary of Compartment 25 on Location 2828. This nursery is now well established and gives every promise of raising first class  $\frac{1}{O}$  stock.

(d) Preparation of ground for Planting.

1. Clearing.

This work has been carried out by Departmental employees and all operations in connection therewith governed by the instructions set out in the Manual.

Up to the 28th February, 1929, the following Compartments have been cleared and burnt up:- 1, 2, 3, 4, 5, 6, 7, 8, 9, and Compts. 10, 15, and 16, clear felled (see Map No.8).

The strips on the firebreaks surrounding Compartments 1 to 10 have been grubbed for ploughing.

Investigations into the heavy mortality among the pines on several compartments showed that the parasitism of *Nuytsia floribunda* was largely the cause. Grubbing was found to be useless as all pieces left in the ground sprouted. Poisoning with a caustic soda - arsenic mixture was then tried with complete success.

The total area of land cleared including fire-breaks is  $314\frac{1}{2}$  acres plus 86 acres which have been clear-felled but not burnt.

## 2. Cultivation of Ground.

This has been carried out only prior to planting. The sole object is to eradicate the indigenous scrub and so reduce the competition for moisture in the summer months.

Experiment has shown that ploughing is the only method of cultivation that will successfully eradicate the scrub.

Grubbing the scrub from the spots on which the young pines were to be planted (spots up to 3' x 3' being grubbed) was tried but although a certain benefit was derived the method was a failure.

Ploughing once 4" deep, was found to bring the little pines through the first summer, but the scrub recovered and a heavy mortality occurred during the second summer.

Ploughing 6" deep and cross ploughing to a similar depth has been found to give most satisfactory results to date, but ploughing three times is also being tried.

Many experiments have been carried out with different methods of cultivation and these with the results are entered in the Compartment register.

## 3. Planting.

Compartments 1 and 2 were planted with *Pinus pinaster* spaced 6' x 6' in 1926. Compartments 3, 4, and 7 were planted with *Pinus pinaster* spaced 7' x 7' in 1927. Compartments 6 and 7 were planted with *Pinus pinaster* spaced 7' x 7' in 1928.

A total area of  $187\frac{1}{2}$  acres has been planted since work commenced in 1925 to 28th February, 1929.

Various manuring experiments have been carried out at planting and these together with results are entered in the Compartment register.



Experimental plots of the following species have been established :- Pinus taeda, Pinus caribaea, Pinus muricata and Pinus Coulterii.

Full particulars of all the planting work carried out and the results obtained to date are entered in the Compartment register for this Working Plan Area.

4. Grazing and Protection against Animals.

Grazing was not permitted on the Working Circle during the last plan period.

It was thought that rabbits and brush kangaroos might cause damage and the first 300 acres to be treated was fenced with rabbit proof fencing, but no effort was made to exterminate these animals within the fenced area. Although both rabbits and brush may be seen inside the fence no damage has yet been caused by them and expensive fencing of this type is probably not justified.

5. Permanent Plant.

The headquarters are situated on Location 2828.

The buildings consist of one Overseer's cottage (type F.D.6A) Stables (Type F.D.2) 6 portable huts have been provided for the use of casual employees.

A well has been sunk adjacent to headquarters, and a windmill and 2,000 gal. tank and stand erected. This ensures a plentiful supply of water for house and garden.

A shallow well has been sunk on the camp site on Compartment 3 and a hand pump and water trough provided.

Several small feed paddocks have been established.

A large scale map showing the location of the buildings and other permanent improvements carried out on Location 2828 is attached as Map No.7.

A telephone line has been constructed to connect the headquarters on Location 2828 with the P.M.G.'s Dept., Guildford Exchange.

6. Expenditure.

Year.	Permanent Plant.	Establishment of Plantation.	Total.
1925 - 15/9/27	£1608. 4. 11d	£2989. 3. 4d	£4597. 8. 3d
16/9/27 - 15/9/28	£ 96. 7. 5d.	£ 984. 5. 3d.	£1080. 12. 8d
16/9/28 - 15/9/29	-	-	£1001. 8. 3d
Totals -			

7. OBJECTS OF MANAGEMENT.

To render productive by afforestation with conifers the large areas of land which at present show extremely poor forest growth, and which, as far as is now known are unsuitable for any other purpose.

To ascertain the most economical method of establishment of *Pinus pinaster*, and other species, and to obtain indications of the growth which will be made by these species of conifers, on this class of country.

To produce in part the future soft wood demands of the State.

8. SUBDIVISION.

Future subdivision will conform as closely as possible to the instructions set out in the Manual and any amending circulars, referring to this work.

Existing subdivision and any further subdivision carried out during the period of this plan will be shown on Map No. 3. attached hereto.

The area of 500 to 600 acres bounded on the South by Location 2516 and East and West by Nos. 5 and 6 South spurs respectively and the main line on the North will be subdivided. This area is shown on Plan No. 5 and the tentative sub-division lightly lined in yellow.

9. SYLVICULTURAL SYSTEM.

The conversion of the comparatively poor Eucalypt and Banksia growth into coniferous forest by clearing and planting.

10. SPECIES.

*Pinus pinaster* has been chosen as the species likely in the view of present knowledge to give the most satisfactory results on this Working Circle, and will, therefore, form the major portion of the planting stock.

Other species which will be tried out are - *Pinus caribaea*, *Pinus taeda*, *Pinus palustris*, *Pinus muricata* and any others which it is thought might thrive in this locality.

The aboretum established on Location 2828 with a view to trying out the suitability of lesser known species to this type of country will be completed.

11. METHOD AND ORDER OF OPERATIONS.

The various operations on the Working Circle will be carried out in the order given below and subject to alterations approved by the Conservator will conform with the instructions given in the Foresters' Manual :-

(a) Utilisation of Indigenous Timber.

There is no sale at present for any class of produce from the Working Circle. Every effort shall be made to dispose of the *Banksia* as firewood, but without a made road little success can be expected while supplies of Jarrah blocks are readily available close to Perth or unless more economical means of transport are introduced. Meanwhile the supply of *Banksia* from private property close to Perth is becoming rapidly depleted and each year the value of this timber as a firewood depreciates.

All operations will be conducted under and controlled by permit under the Forests Act.

(b) CLEARING.

The present practice is as follows:-

All Banksia and any other timber up to 12" diameter is felled ground level. This lies for at least twelve months before burning. After ploughing the remaining big timber is felled and the tops burnt prior to planting.

This latter provision will be varied in future as follows:-

All big timber standing within .FIVE. . . . chains of an external boundary or 2 chains of an internal firebreak will be clear felled and burnt as previously. Any other big timber will be ringbarked at the time of carrying out the falling of the small timber and left standing.

As it is essential that a good burn be obtained all country must be protected from fire for at least two years before the final burn is put through.

(c) PLOUGHING.

Past results have shown that some form of cultivation before planting is essential in order to reduce scrub competition and ploughing has been proved to be the cheapest effective method of cultivating. Two ploughings are essential with the second ploughing at right angles to the first. Ploughing must not be less than six inches deep.

(d) FIREBREAKS.

(e) SPOT HOEING.

The necessity for spot hoeing prior to planting has not been fully determined and further experiments in this connection will be carried out.

(f) NURSERY PRACTICE.

12. DETERMINATION OF PLANTING RATE.

There is not sufficient data available on which to determine the rotation of any species grown under local conditions.

It is considered however, that the rotation for *Pinus pinaster* in this locality will be not less than 40 years to produce timber of sufficiently large dimensions for general trade purposes.

As the total area of the Working Circle will be approximately between 3,000 and 4,000 acres an endeavour will be made to plant 100 acres per annum.

13. PRESCRIPTION.

(a) Utilisation of Indigenous Timber.

Approximately 110 acres of first-class *Banksia* country becomes available each year. It is inadvisable to allow a larger area than this to be cut over annually owing to the difficulty of obtaining a satisfactory burn when required.

An area must be sold at least two years prior to planting to enable the wood to be cut and removed. Unless it is desired by the permit holder to utilise the whole tree no big timber may be felled.

(b) Preparation of Ground for Planting.

Clearing will be carried out at an average rate of 110 acres per annum in order to provide 100 acres of planting country annually.

As far as possible, Compartments will be cleared in this order:-

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YEAR	COMPARTMENT	AREA
1929 - 30	15, 16, 19.	92
1930 - 31	20, 21, 22, 23	126
1931 - 32	11, 12, 13, 14	110
1932 - 33	26, 27, 28, 29	100 (approx)
1933 - 34	30, 31, 32, 33	100 (approx.)

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Compartments 17, 18, 24 and 25 will not be cleared during the period of this plan. It is feared that the removal of the timber from these compartments will cause a rise in the winter level of the water in the swamp adjacent to the nursery on the western boundary of Compartment 25. This would ruin the nursery.

(c) Planting.

Planting will be carried out at the rate of 100 acres annually.

In this operation the following table will be adhered to as far as possible.

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Planting Season	Compartments	Area in Acres.
1929	8, 9.	53
1930	15, 16, 19, 10.	110.
1931	20, 21, 22, 23	126
1932	11, 12, 13, 14	110
1933	26, 27, 28, 29	100 (approx.)

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Espacing for *Pinus Pinaster* will be 7' x 7'.

(d) Nursery Operations.

25 lbs. of *Pinus pinaster* seed will be sown each year in the Swamp Nursery. Sowing will be carried out during the last week in July or first week in August. The Nursery will be given a dressing of lime periodically, one ton to the acre,

and annually, before sowing, a dressing of blood and bone fertiliser at the rate of 2 to 3 cwt per acre. The major portion of the planting stock required will be raised in this nursery and will comprise  $\frac{1}{0}$  stock.

Experiments will be carried out in Headquarters Nursery to raise  $\frac{1}{1}$  stock. Seed will be sown, in late August and the resultant plants lined out during the following July.

(e) Refilling.

Should failures in any season exceed 10% for 6' x 6' planting or 5% for 7' x 7' and 8' x 8' refilling must be carried out early in the planting season following.

Should failures be noticed in newly planted areas prior to September 15th these should be refilled. On no account may refilling be carried out after the above date.

No refilling will be done in two year old plantations.

(f) Sucker Bashing.

Will be carried out as directed by the Forester in Charge.

14. GRAZING CONTROL.

Grazing of any sort will be absolutely prohibited on the fenced portion of the Working Circle during this period of the Plan.

The area comprising Compartments 15 to 25 will be fenced prior to the commencement of planting operations on these compartments.

It will probably be necessary to fence an additional area before this Plan period terminates. This fence will run from the South-West corner of Location 2828 due South to the Northern boundary of Location 2516 and thence East along this to the South West corner of Compartment 12.



Type No. 3 fence as shown in the Foresters' Manual will be constructed. Results have shown that rabbit proof fencing is not warranted at the present stage.

15. FIRE CONTROL.

The whole of the Working Circle shall be considered as being under fire control measures.

The measures will vary as follows:-

Complete protection will be afforded the area comprised in Compartments 1 to 25 irrespective of whether any of the Compartments are planted or not.

Commencing with the summer of 1930 that area bounded on the West by a line drawn South to Location 2516 from the South West corner of Location 2828, on the South by the Northern boundary of Location 2516, on the East by Compartments 12, 14, 15, 18 and on the North by Location 2828 will be protected from fire.

A ploughed strip 10 feet wide will be maintained around the external boundaries of the block formed by Compartments 15 to 25 and also around the second area as outlined above. In addition, it shall be the duty of the officer responsible for the carrying out of the provisions of this plan to ensure that where the area afforded complete protection is bounded by uncleared land, a boundary strip 10 chains wide of this land is burnt often enough to prevent an uncontrolled fire coming into the protected area. Directions for this burning will be given each year by the Forester in Charge of Metropolitan Plantations.

Throughout the cleared area firebreaks as shown on the accompanying plan will be constructed and maintained in accordance with the instructions contained in the Manual and any amending circulars referring to the work.

The location and measures necessary for the suppression of any fires which may arise on the protected area will be the duty of the resident Working Overseer.

16. CONTROL OF WORK.

The Gwangara Plantation constitutes a Minor Working Plan Area.

Headquarters are situated on, and close to the Southern boundary of Location 2828.

A Resident Working Overseer is employed on the area.

The Forester in Charge of Metropolitan Plantations will be responsible for the Overseer's work and all other operations in connection with the Working Plan.

17. SUPPLEMENTARY PROVISIONS.

(a) Permanent Plant.

It is not considered that any houses will be built during this period of the Plan.

(b) Compartment and Experiment Register.

A Register will be kept setting out the treatment received by each Compartment viz - methods of clearing, cultivating, planting etc., the origin of all planting stock, origin of seed and in short, full information on every point, likely to prove of interest at a later date.

(c) Working Plan Control.

The annual report drawn up on standard lines will constitute the Working Plan Control.

(d) Revision of the Plan.

The work in connection with the revision of the Plan must be commenced not later than 1st December, 1933.

APPENDICES.

1. Maps 1 to 8.
  2. Resume of original Experiments.
  3. Soil and Vegetation Type Survey.
  4. Compartment Register.
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