

## FORESTS DEPARTMENT

BUNBURY Office,

To.....Conservator of Forests.....  
Forests Department,  
PERTH.....

.....19th September,.....1978.....  
Western Australia

Reference-H.O.....

Local.....908.3.....

ATTENTION: Inspector Hammond

SUBJECT:.....  
.....

Herewith a position paper on reforestation in the  
Wellington Catchment.

*D. Spiggins*  
.....  
Regional Leader,  
Administration.

WFT:MS

Enc.

POSITION PAPER

REFORESTATION IN THE WELLINGTON CATCHMENT

SEPTEMBER, 1978

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## ATTACHMENTS

1. Locality plan of Wellington Catchment.
2. Reforestation layout, Stenes.
3. (a) Groundwater profile, main transect - Stenes.  
(b) Groundwater across forest - pasture interfaces.
4. Estimated operational costs of establishment.

SUMMARY  
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P.W.D. predict salinity levels in the Wellington Reservoir will steadily rise to about 1100mg./litre T.D.S. by the 1980's.

A program of selective reforestation of cleared land has been chosen as a remedial measure to reverse salinity increases. A submission has been made to Government for a budget of \$9.5 million for the first 5 years of a reforestation program of about 2000 ha. per year. If the program is successful, extension to other catchments is likely.

Forests Department has been asked to participate and indicate the level of involvement possible.

Current involvement in trials at Stenes farm and S.E.C. properties has provided useful knowledge in techniques and groundwater patterns.

Primary objective of reforestation will be for maximum transpiration but the resource will have potential for timber production and possibly honey.

The impact of a rapid increase in reforestation rates on nurseries and seed is discussed. Limited knowledge on species performance means early plantings will have to be on best judgement. A species mixture is recommended to offset possible collapse of some species.

A small task force should prepare immediately a list of species for 1979 and 1980 planting. Preparation of a working plan to cover the requirements of a large program should follow.

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1. Development of the salinity problem in the Collie River

By 1960 only 250km.<sup>2</sup> or 9% of the 2830km.<sup>2</sup> of the Wellington Catchment had been cleared.

Although a ban on further alienation was imposed in 1961, by that time 1000km.<sup>2</sup> or 35% of the catchment had been alienated and clearing was proceeding at a rapid rate.

By 1976 when legislation to control clearing was passed, 636km.<sup>2</sup> or 22.5% of the catchment was cleared.

Salinity levels of Wellington Reservoir have increased steadily since the 1950's when levels were about 250mg/l T.D.S. By 1976/77 levels were about 900mg/l.

2. Current proposal of P.W.D. to tackle problem

2.1 Alternatives examined

P.W.D. have considered several engineering solutions to improve water quality. These include desalination, diversion of saline streams, scouring saline water from the reservoir, and using new resources such as the Brunswick River or underground water from the Coal Basin.

Some of these are very expensive options. Some have some drawbacks. Partial reforestation has been selected as the only catchment management measure reasonably likely to succeed. It is also one of the cheapest options.

The decision has been made in the knowledge that the proportion of reforestation which would have to be made to lower salinity to an acceptable level and the rate at which improvements would occur, are unknown.

However, the predicted salinity increases and the implications are such that some action has to be taken as soon as possible and P.W.D. have selected reforestation as the best possibility.

2.2 Reforestation programme proposed for Wellington Catchment

A proposal has been submitted by the State to the Commonwealth Government for equal sharing of a \$9.5 million budget over the next 5 years. Two thirds of this figure (\$6.25 million) being for reforestation.

Expenditure of \$1.23 million per year is based on a reforestation rate of 2000 hectares/year and a unit cost of \$600 per hectare. P.W.D. have estimated 60% of the cost will go towards land acquisition with the remainder to cover planting, fencing and maintenance of trees.

The sum of \$100,000 for reforestation has been included in the P.W.D. budget for financial year 1978/79. For the following years 1979/80 and 1980/81, the sum of \$600,000, the States portion of the programme is being sought.

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(Some clarification of costs and financing is required here).

1. Although a figure of \$100,000 for reforestation is mentioned by P.W.D. for 1978/79, a sum of \$80,000 is mentioned on H/O file 13/77, 23/8/78.
2. Is it intended that this sum would be for reforestation only. Fencing, etc., be covered by P.W.D.
3. Estimates costs of establishment on the Wellington Catchment are set out in attachment 4.

If overheads and admin. charges are included, current costs for establishment of jiffy potted stock is estimated to cost \$354/ha. Areas to be mounded would cost an additional \$20/ha.

If these costs are used a 2000 hectare program/year would cost \$780,000.

By P.W.D. estimation though, 60% of the yearly \$1.25 million would be required for land acquisition. 40% or \$500,000 would be available for reforestation including fencing and ongoing maintenance.

Even if the figure of \$500,000 is used this would only be sufficient to establish 1400 hectares.

If wages overhead and administration charges are not included a cost of \$270/ha. would be used, i.e. about 1800 ha. less the costs of fencing and maintenance.

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### 2.3 Extension of reforestation to other catchments

In 1977 as a holding operation only the area of land subject to alienation bans was extended to include all river basins of the South-west.

The initiation of a partial reforestation programme on the Collie River catchment is seen by P.W.D. as providing a valuable pilot study. If results from this study prove to be successful, extension of a reforestation programme to other South-west catchments is a strong possibility.

### 2.4 Requests for Forests Department involvement

P.W.D. have requested us to give detailed consideration as to how the Forests Department could participate in the proposed reforestation programme with the aim of building up to the maximum level as soon as possible.

P.W.D. have been informed that we would like to be involved and that the details of the anticipated build up will be given early consideration.



### 3. Past and current Forests Department involvement

#### 3.1 Stenes Farm

In 1976, just prior to legislation to control clearing, Public Works Department purchased this farm which is on the headquarters of the Bingham River, about 60 km. N.E. of Collie.

Purchase was motivated by the fact that Stene was considering further clearing or selling. The property is about 4500 hectares, of which only 30% was actually cleared.

Despite the relatively small percentage of clearing (which commenced in 1964/65 in Location 3170, the most eastern location salt ~~patches~~ had appeared by 1972/73 in the main river valley and had begun to spread upslope.

Having purchased the property, P.W.D. were keen to use part of the farm as a demonstration area to show that partial reforestation could arrest salt development but still allow farming to continue.

In 1976 in conjunction with Forests Department, a 140 ha. cleared section in location 3170 was selected with the aim of reforesting about 20% of the area in a series of strip plantings about 40 metres wide.

Strips were located as per plan (Attachment 2). The object was to encircle the main salt patch with the aim of lowering water tables locally so as to minimise capillary rise of salts during summer and discharge of saline groundwater during winter.

Further strips were located about 200 metres upslope to ensure there were only small areas where the gap in tree cover was less than 200 metres. The assumption was that 40 metre strips this distance apart would act as groundwater pumps and cause local depression of the groundwater table.

Because the trial consisted of continued cattle grazing between the strips, it was necessary to fence each strip.

Some 50 boreholes were later established in the study area to:-

- (a) identify the general water table levels over the area.
- (b) provide details of the groundwater levels along a transect through the main Bingham Valley.
- (c) obtain information on water table gradients across pasture - native forest, pasture-regrowth and pasture-reforestation strip, interfaces.



The boreholes are monitored regularly by P.W.D. staff. Significant effects on groundwater tables due to reforestation strips, will probably not occur for some years. What is of interest is the dramatic difference in groundwater levels beneath pasture and beneath adjoining native forest (See Attachment 3a, 3b).

A gauging weir has also been constructed just upstream of the  $\uparrow$  4455, to monitor streamflow out of the reforested sections of the property.

A third objective of the trial was obtain some information on tree species likely to be suitable for reforestation in these parts of the catchment.

51.5 hectares of plantings have been made over the last 3 years including 15 different species.

1976 - 5 ha.

1977 - 14.5 ha.

1978 - 32 ha.

At this stage the intention is to carry out 35 ha. of planting in 1979 to link up with the A class Reserve 4455, immediately downstream of the study area, plus about 5 ha. of strip planting on both sides of the main valley in the south east of location 3170.

Beyond this, further planting of the farm is not programmed at this stage on the grounds that further reduction of grazing area could make the leaseholder (former owner, R. Stene) unwilling to continue the grazing lease arrangement.

The concept of partial planting in strips and continued grazing as being tried at Stenes, creates several management problems which could mitigate against its use for broadscale rehabilitation of the catchment.

Because stock have to be excluded from the planted strips, some 7 km. of fencing was required for 19.5 ha. of planting. At about \$1400/km. for the type of fence used, this could be a very expensive item for large scale plantings.

Even though numerous laneways were left at the time of planting, to allow cattle to move from one side of a strip to the other, these have not proved sufficient. Additional laneways have been constructed and because of the number of strainer assemblies needed, this is an expensive exercise.

At the same time grazing between the strips obviously reduces the potential for tree damage by grassfires. Control of grass by some means is essential.

Alternatives to fencing narrow individual strips could be:-

1. Fence the perimeter only of the general area in which strip plantings are to be made. Exclude stock until the trees are high enough to withstand grazing, but in the meantime, control the fire risk by hay cutting, etc., between the strips.
2. Fence off large compact sections of properties and replant within these thus reducing the amount of fencing required.

Because of the experience we could gain in this type of planting and information we would have access to from borehole monitoring, etc., the method of financing reforestation on Stenes so far has been for P.W.D. to pay for all material costs. Forests Department has financed the supply of labour and equipment and supply of plants.

From 1979 onwards plantings at Stenes will be outside the study area and should be treated as ordinary catchment reforestation, with full costs being borne by P.W.D.

### 3.2 S.E.C. Property (Formerly Piavanini) Loc. 1224, 1225, 3678

To offset the area S.E.C. proposed to clear in the Wellington Catchment for the 330 Kv, Muja-Perth line and 132 Kv Muja- Kojonup power lines, S.E.C. were required to purchase and reforest an equivalent area on the catchment.

On the S.E.C.'s behalf, several locations were inspected and these properties of 212 ha. (198 ha. cleared) were purchased by S.E.C. The properties straddle the Bingham River just downstream from Stenes farm.

S.E.C. accepted the offer of the Forests Department to act as advisor and contractor in reforesting the cleared land sections.

Twenty hectares in the most western location were planted in 1978. The balance will be planted in 1979 and 1980. Species used were *Eucalyptus accedens*, *E. calophylla*, *E. wandoo* and *E. camaldulensis*.

It is S.E.C. intention to lease the area for grazing once the trees are large enough. So far they have shown little appreciation of some of the problems involved in ongoing management of reforested areas, e.g. rabbits and fire control.

### 3.3 Scotts (Location 2916)

This 411 ha. property of which 146 ha. is cleared, was recently purchased by P.W.D.

It is on the southern branch of the Collie River and located about 6 km. east of Wilga.

Dr McKinnell has been keen to establish an arboretum of about 50 ha. on this property as there is a lack of trial plots in the catchment generally.

P.W.D. have agreed informally to the proposal and the 50 ha. section has just been soil surveyed on a 50m. x 50m. grid by S/F Gilchrist.

It was originally planned to spread the plantings of this arboretum over 3 years. In view of the desirability of getting information more rapidly, it is recommended the area be considered part of the 200 ha. area to be reforested in 1979 and be completed in one year.

## 4. Future Forests Department involvement

Whilst the Central Region is able to handle the proposed 1979 program of 300 ha, escalation to a 2000ha./year program as early as 1980 would require considerable pre-planning and organisation.

The limited lead time is undesirably short. If we decide to participate in the program, every effort should be made to press for a more gradual build up and to divert funds for the first two years primarily to land purchase.

Once ability to establish on a large scale, i.e. up to 1000 ha./year is proven, it is considered easier to increase to 2000 ha/year or beyond than in the build up to the first 1000 ha. This has been the experience in the Sunklands.

If we are involved, it is imperative that the actual reforestation itself is successful. The program will undoubtedly receive wide publicity and will also be closely watched by people such as Whittington, etc., who will be keen to point out any reforestation failures.

Some of the problems created by a short lead time are seen to be:-

1. Limited research information on the most suitable species for different sites. For the first few years choice of species as with many other factors will have to be made on the best knowledge available.
2. Limited time to refine existing establishment methods and test alternatives on a large scale operational basis.
3. Limited information on properties that will be available for reforestation and ~~their~~ soil types. As with normal pine plantation practice, soil surveys will be required as a basis for planning any reforestation.
4. Limited time in which to obtain extra planting equipment and/or test out contractors who could be used for part of the establishment operation.
5. Limited time to train supervisory staff and employees in establishment procedures and set up a sound working structure within the Department.
6. Limited time to develop structures and working relationships within the inter-departmental committee of P.W.D., Forests Department and Agriculture Department which it is proposed be set up to plan and co-ordinate the reforestation program.
7. Limited time to expand nurseries to produce up to 2 million plants per year for this project and also to test different types of container stock.

## 5. Objectives relevant to Forests Department

If the Department elects to undertake the proposed expanded reforestation program, an appreciation of the objectives of reforestation are necessary. These are discussed below:

### 5.1 Catchment Protection

As funds would be supplied for the aim of reversing salinity increases, the primary objective of reforestation should be to establish an evergreen cover of deep rooted species which have a high transpiration rate.

Species which can continue this function in the long term and are unlikely to be unduly affected by factors such as fire, insect attack, stock, drought, etc., would be preferred.

In early plantings a mixture of species will probably be required to minimise the risk of some species failing completely.



## 5.2 Timber Production

This will normally be a secondary objective, however, the planting of some 20,000 ha. over a 10 year program will create a resource which could produce sawlogs, poles, pulp, firewood and charcoal.

In the southern branch of the Collie River there are some properties with soils almost suitable for normal *Pinus radiata* plantation establishment. Just how much will be suitable will depend on the results of soil survey.

In the lower rainfall areas in eastern parts of the catchment, wider espacement *P. radiata* plantings could be possible where soils are suitable. *Pinus pinaster* is also a possibility.

Broadscale planting of softwoods could be risky due to possible damage by wildfires which would cause the transpiration function to cease entirely.

## 5.3 Other Products

Planting of some 20,000 hectares or more could provide a valuable honey resource and should be taken into account when selecting species.

Nut producing trees should be considered if they are reasonable water users.

## 5.4 Optimisation of farming

It is P.W.D. intention to reforest only about 30% of already cleared land. Preference will be given to the eastern parts of the catchment followed by areas on the southern branch of the Collie River.

P.W.D. aim to describe the already cleared land in these parts of the catchment into areas which are saline sensitive and should be reforested and areas where farming can continue without serious conflict with water quality.

By a process of land acquisition, resumption if necessary of sections of properties which are saline sensitive and resale of sections of purchased properties which are not saline sensitive, P.W.D. hope to create farm properties which can continue in operation without conflicting with the overall objective of improving water quality.

In the process of purchase and amalgamation of cleared land it is inevitable that some of the existing farmers will leave the catchment.

Where woodlots or strip planting are used, continued grazing outside the planting is most desirable to reduce the risk of damage by wildfires.

## 6. Planning and Survey

### 6.1 Properties and areas available

P.W.D. policy is to favour planting of properties in the eastern and southern branch parts of the catchment so reforestation is most likely to be concentrated in these parts for at least the first few years of the program.

The method of deciding which sections of individual properties should be reforested is not known, but the following approach could be used.

1. P.W.D. to set a priority for zones of the catchment where reforestation is required.
2. As much information as possible be gathered from existing records on soil types, rainfall, species possibilities and agricultural possibilities.
3. A strategic plan be developed by input from P.W.D., Forests Department and Agriculture Department. The plan to show the ideal allocation of land use.
  - 3.1 P.W.D. to define saline sensitive areas where reforestation was essential.
  - 3.2 Forests Department to indicate areas where other reforestation should be given a high priority for reasons such as:
    - To increase the size of the reforestation on the saline sensitive area to make a workable unit, e.g. a pine woodlot may need to be at least 20 ha. to justify its planting.
    - To improve the boundary of planting to make future management easier, e.g. it may be desirable to link the new plantings with existing native forest stands.
  - 3.3 Agriculture representatives would indicate properties or sections of properties which should remain under agriculture as one farming unit and those sections which should be offered for sale to neighbouring landholders.

4. Obviously there would be situations outside the saline sensitive areas where there would be conflict as to whether the land should be reforested or remain for agriculture.

Discussion and compromise would be necessary. If each interest was able to place a priority for their nominated use of specific areas, a computer model could probably be used to help in deciding the best land uses for specific areas.

5. Following preparation of such a strategic plan, P.W.D. could take steps to purchase, exchange or resume if necessary, properties or parts of properties to allow implementation of the land uses indicated on the strategic plan.
6. Once the general area where reforestation was to take place was agreed upon, a detailed soil survey would be necessary.
7. Based on the soil survey, a plan similar to a pine subdivision would be made up indicating species location and other management information.

From a reforestation view, block plantings rather than narrow strips are easier to manage and would be preferred. However, the patterns of planting will probably vary from property to property and will depend on the inputs from each of the three Departments involved.

## 6.2 Nurseries and planting stock

Current practice is to plant 1100 stems per hectare. At a planting rate of 2000ha./year, 2.2 million plants would be needed.

So far the large size jiffy pot has been used for eucalypts, i.e. 6cm. x 6cm. x 6cm. deep. Hamel can raise a total of about 600,000 of this type of stock per year; Narrogin are fully committed to raising plastic pots for public sales.

Expansion of either or both nurseries would be required to lift production if the large jiffy pot is to be used. A new nursery at Collie itself would be considered.

Narrogin would probably have problems in obtaining sufficient non-saline water for any great expansion, although they have the advantage that stock is hardened off better than Hamel trees and is less likely to suffer frost damage. Hamel have the room and facilities to expand.



Alternatives to extending nurseries to cater for the large number of plants required are:-

1. Use smaller sized pots, e.g.

small jiffy pots - 3cm. x 3cm. x 4cm. deep.

small paper pots - 4cm. x 4cm. x 5cm. deep.

Small jiffy pots would raise production by a factor of 4 and small paper pots by 2.

Both pots were used reasonably successfully in trials in the karri in 1978 and large scale trials will be put down in 1979 areas in the Wellington Catchment.

2. Open root raising

Although reasonably successful in the karri, previous trials in the north have not been promising.

A trial planting of Euc. rudis wildlings was made in 1978 plantings and their survival will be watched with interest. Further open root trials will be laid down in 1979 but in view of the harsh conditions in e.g. eastern parts of the catchment, success may be doubtful.

3. Broadcast seeding or spot sowing

Although an attractive alternative to planting container stock, more research trials are required before it could be considered as an alternative method.

At accepted broadcast sowing rates of  $\frac{1}{2}$ kg./ha., a 2000ha. program would require 1000kg. of seed, which could be very difficult to obtain.

Spot sowing using lesser rates per hectare would have to be used if the method can be used on an operational basis.

The need for extra seed, whether direct seeding or nursery stock is used will be considerable and seed collection of likely species should start soon.

6.3 Preparation and planting operation

During year one at Stenes (1976), plantings were generally very successful. In 1977 when plantings extended into waterlogged, often saline sites, survival rates fell.

Modifications to preparation and planting techniques were made for 1978 P and results so far are quite acceptable. However, there is scope for improving the efficiency of the operation and testing equipment such as planting machines to reduce costs.

It is clear from experience so far that a lot of preparatory work needs to be carried out in the year prior to planting, e.g. fencing to prevent grazing, eradication of rabbits, and demarcation in the winter prior to planting of areas to be mounded.

Also the work to be done by Divisional staff needs to be allowed for on estimates and the work fitted in to the works program. Nursery requirements need to be known well in advance.

The above implies that soil surveys, subdivision plans and most of the details for any proposed planting need to be completed no later than 18 months prior to planting dates, e.g. 1980 P areas would need to be resolved by early 1979.

#### 6.4 - Maintenance and follow up work

The need for ongoing management of reforested land and the uncleared portions of purchased properties has probably not been fully appreciated by P.W.D.

Items likely to occur are:-

1. Fence repairs, alterations.
2. Vermin control.
3. Crop tending.
  - 3.1 Refertilizing, minor element sprays for pines.
  - 3.2 Weed control, refilling.
  - 3.3 Pruning of softwoods.
  - 3.4 Non commercial thinning and cleaning.
4. Protection.
  - 4.1 Maintenance of firebreaks.
  - 4.2 Prescribed burning.
  - 4.3 Fire suppression.
5. Utilisation operations.

Acceptance of the need for these operations who would be responsible and the method of financing would need to be agreed with P.W.D. before large scale planting starts.

## 7. Staff and Infrastructure.

### 7.1 Staff Needs (Departmental)

An increase in wages employees would be needed otherwise existing works programmes would have to be sacrificed. An equivalent of 15 additional men is suggested for a 2000ha. program.

Staff numbers would also need to increase. Because any new staff would require considerable training and experience and particularly because proper supervision is so important it would be necessary to transfer existing staff to the project.

Staff needs and roles for a 2000/ha. year project are seen to be:-

<u>ROLE</u>	<u>LEVEL</u>
1. Head Office liaison with P.W.D. and Agriculture Department to set overall policy and resolve conflicts between interdepartmental committee representatives.	1 x L. 5 - 6
2. Inter-departmental committee representative to plan and co-ordinate the reforestation programme. Preparation of strategic plans.	1 x L. 4
3. Overall field supervision and implementation of program in the field.	1 x S.D.F.O. or competent Senior Forester.
4. Supervision of implementation of about 400 ha. of the annual program. Responsible to S.D.F.O. or S/F.	1 x A/F or Forester level for every 400 ha. unit. Maximum of 5.

At least in the initial stages, all staff from Level 4 downwards would need to devote the majority of their time to the project.

No allowance has been made for a soil survey, as it would be preferable initially for the supervising forester to survey the area he is to plant; to gain maximum knowledge of the area. Agriculture Department may be able to assist with soil surveys.

In addition to planning and supervisory staff there would be a need for a professional and 2 - 3 Technical *Research* Assistants to lay down semi-operational trials and evaluate species performances.

Once the nursery program is increased the appointment of a professional forester for overall nursery responsibility would be most desirable.

Because of geographical location and awareness of other activities in the Region likely to interact with the program, we believe that planning and co-ordination of the program should remain largely within the Central Region.

At the start of the Sunklands project and several times since, Wanneroo officers have visited this project and have given valuable advice on planting techniques, and equipment.

I would envisage a similar situation would apply to this project where the advice of officers from other regions who have skills in this field would be sought from time to time.

A suggestion that the project be run by the Northern Region would we believe suffer the same problems if the Central Region attempted to run, e.g. Mundaring Plantation from Bunbury.

## 7.2 Use of outside contractors and consultants

If additional staff numbers are refused by the Government or new staff cannot be obtained so as to release trained staff, the hiring of trained people on a contract basis should be considered for at least part of the program.

Every effort should be made to use outside contractors in 1979 for some of the preparation and planting work to test their potential for carrying out a large portion of the work as is done in the pine planting program.

Operations such as mounding may be attractive work for farmers living on the catchment.

## 8. Immediate Management requirements

### 8.1 1979 Planting

The 1979 programme of 300 ha. + on the catchment consists of 100 ha. (S.E.C. properties) and 200 ha. (P.W.D. land).

Objectives of planting will be:-

1. Successful completion of the program and refills and maintenance if necessary of P.78, P.77 areas.
2. Establishment in areas of the catchment where reforestation is urgently required; ~~of~~ a wide range of species judged worth testing.

Plantings to cover all soil types and to be made such that valid comparisons of performance are possible. Room to be left for addition of new species.

3. To establish further trials to test:

- 3.1 Stock types - small jiffy pots, paper pots, open rooted, large jiffy pots.
- 3.2 Seeding - spot seeding, broadcast seeding.
- 3.3 Planting Methods - hand planting, machine planting.

With respect to the 2nd objective, it is proposed that this be achieved by establishment of a 50 ha. arboretum at Scotts (Location 2916) - Southern Branch.

Dr McKinnell will discuss a list of possible species with Dwellingup Research in the next week for use in this arboretum.

It is proposed that the S.E.C. 100 ha., be planted with the same species as used last year.

viz. Euc. accedens - upper slopes  
Euc. calophylla - mid slopes  
Euc. camaldulensis } - lower slopes  
Euc. wandoo )

The balance of 100 ha. for the P.W.D. would be made up by: Completion of Stenes programme - 40 ha.  
An area yet to be decided - 110 ha.  
with P.W.D. (Possibly balance of Scotts location).

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150 ha.

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## 8.2 Future areas

The only definite properties which P.W.D. have at the moment are Scotts - 146 ha. cleared and Stenes 1250ha. cleared.

Other properties are in the negotiation stage but may take time before they are available. P.W.D. have undertaken to advise us immediately these are completed.

## 8.3 Staff

Central Region staff are able to handle the 1979 broadscale planting but assistance from Research Branch would be required for:

1. Layout and supervision of establishment of the arboretum.
2. Design and establishment of the seeding trials.

## 8.4 Organisation

The present system should operate for the time being until completion of the task force report (see Sec. 9).

## 9. Suggested task force report

Many of the questions raised by the request to participate in a reforestation programme of up to 2000 ha./year in such a short build up time require more investigation before an adequate reply can be given to P.W.D.

One item which would need confirmation would be that additional staff and employees could be recruited to undertake the extra work. If an assurance can not be given our contribution would be limited to an advising role.

Further information would be required from P.W.D. as to how they intend to plan for reforestation. I understand P.W.D. will be forwarding a paper within the next 2 weeks to the Departments likely to be involved on how they intend to proceed. Comments will be requested within 2 - 3 months.

If additional staff and employees are assured, setting up a *small* task force <sup>is recommended</sup> with the aim of:-

1. Identifying likely species.
2. Preparation of an operational working plan for reforestation on the catchment.

The suitable species identification should commence almost immediately.

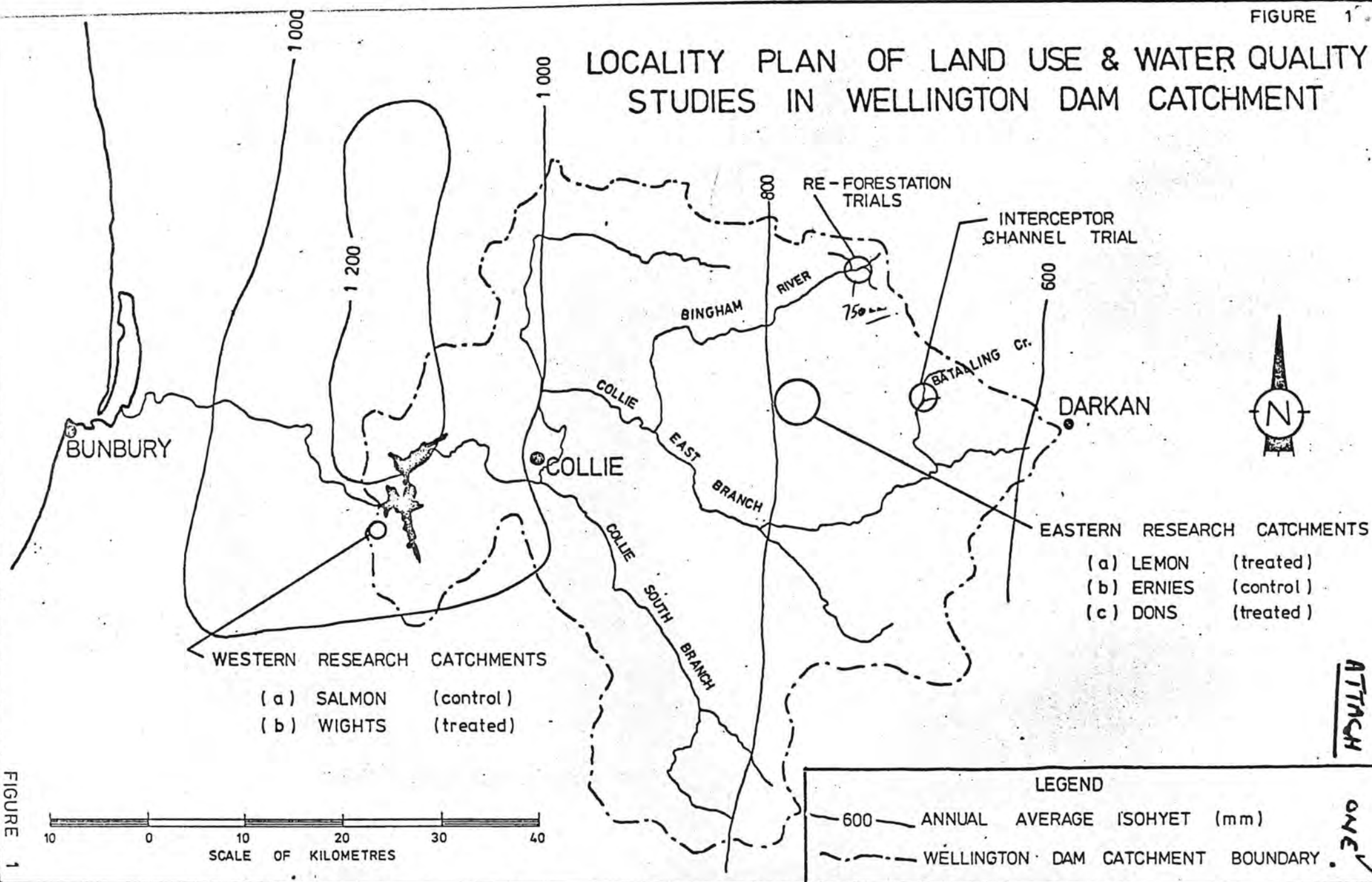
Preparation of the working plan should not commence until the P.W.D. submission is received.

It is envisaged the plan would give recommendations for the following:-

1. When could a reforestation rate of 2000/ha. per year be achieved with a realistic chance of success.
2. As a consequence of answers to (1), what needs to be done and when with respect to:
  - 2.1 Soil survey.
  - 2.2 Planning.
  - 2.3 Nurseries, seed collection.
  - 2.4 Additional equipment.
  - 2.5 Additional staff.
  - 2.6 Staff and employee training.
  - 2.7 Research investigation, short and long term.
  - 2.8 Job prescriptions.



# LOCALITY PLAN OF LAND USE & WATER QUALITY STUDIES IN WELLINGTON DAM CATCHMENT



# MAP OF REFORESTATION LAYOUT AND BOREFIELD

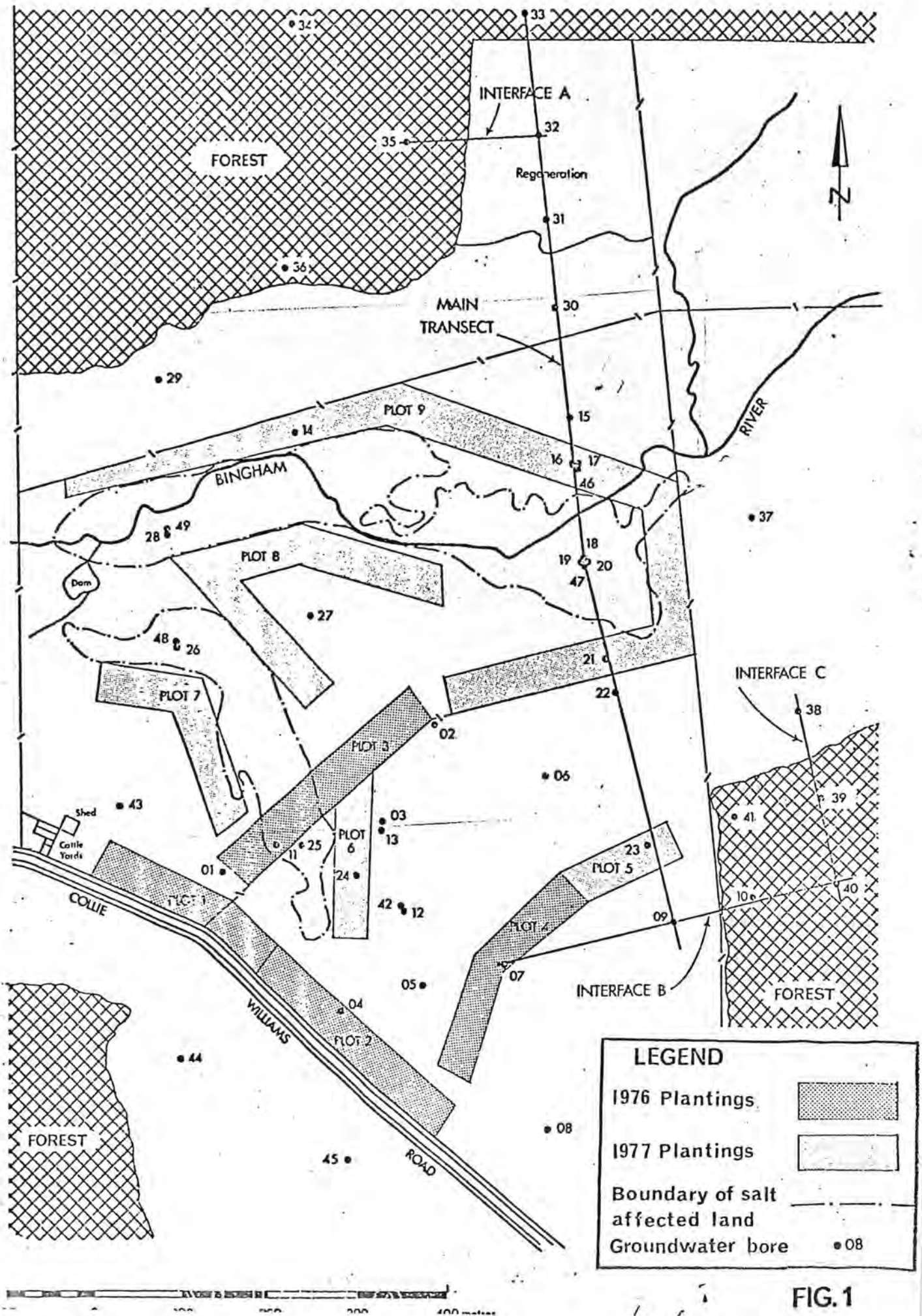
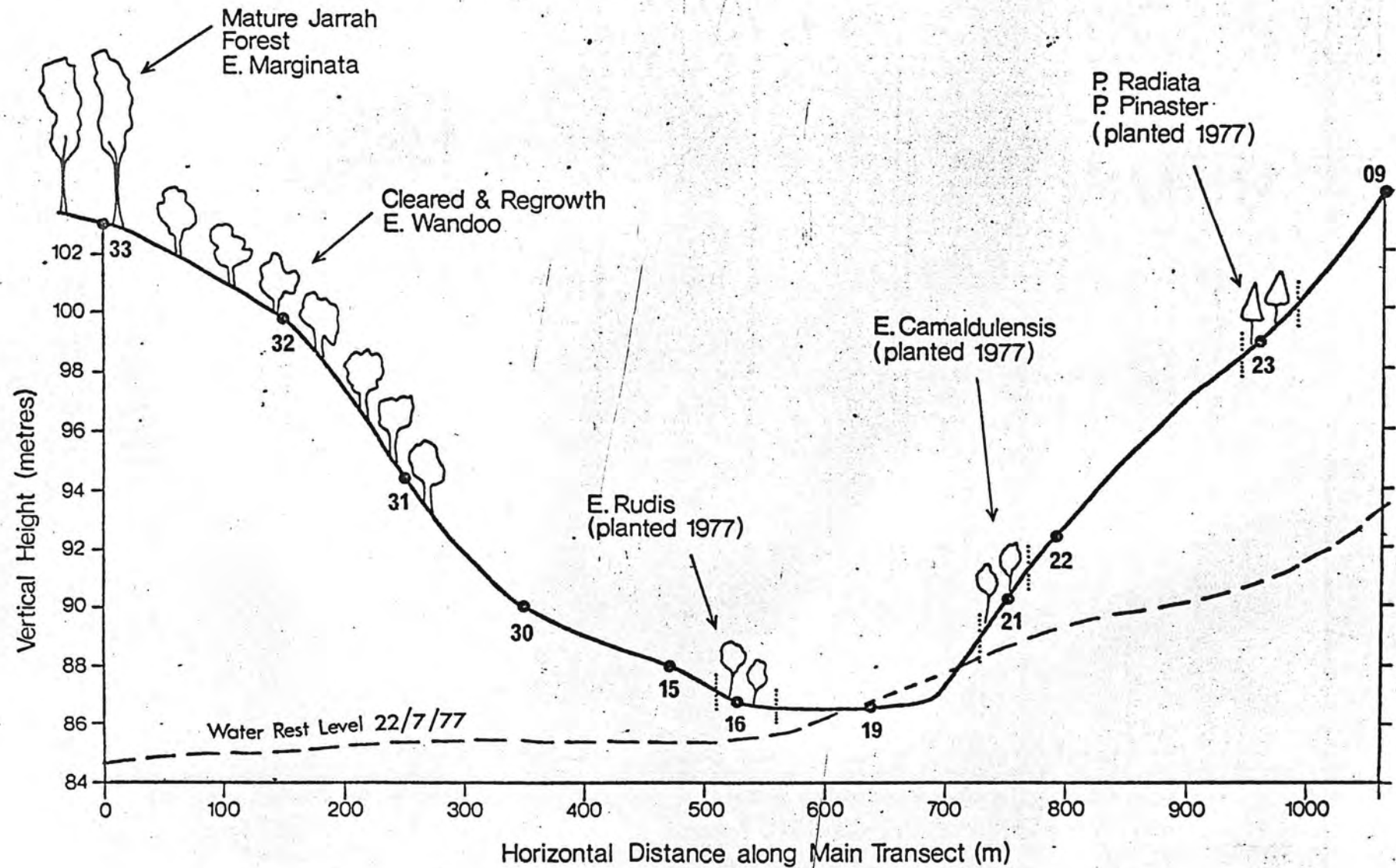


FIG.1

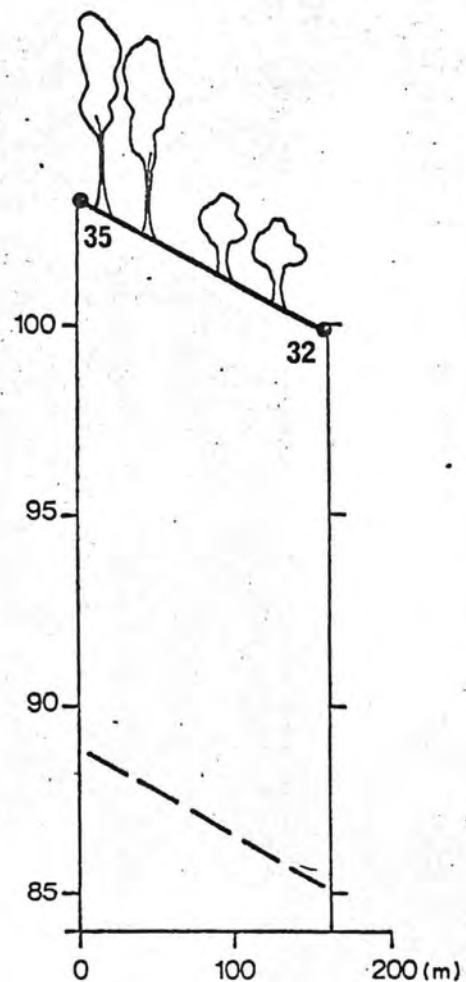
# VEGETATION AND GROUNDWATER PROFILE OF MAIN TRANSECT



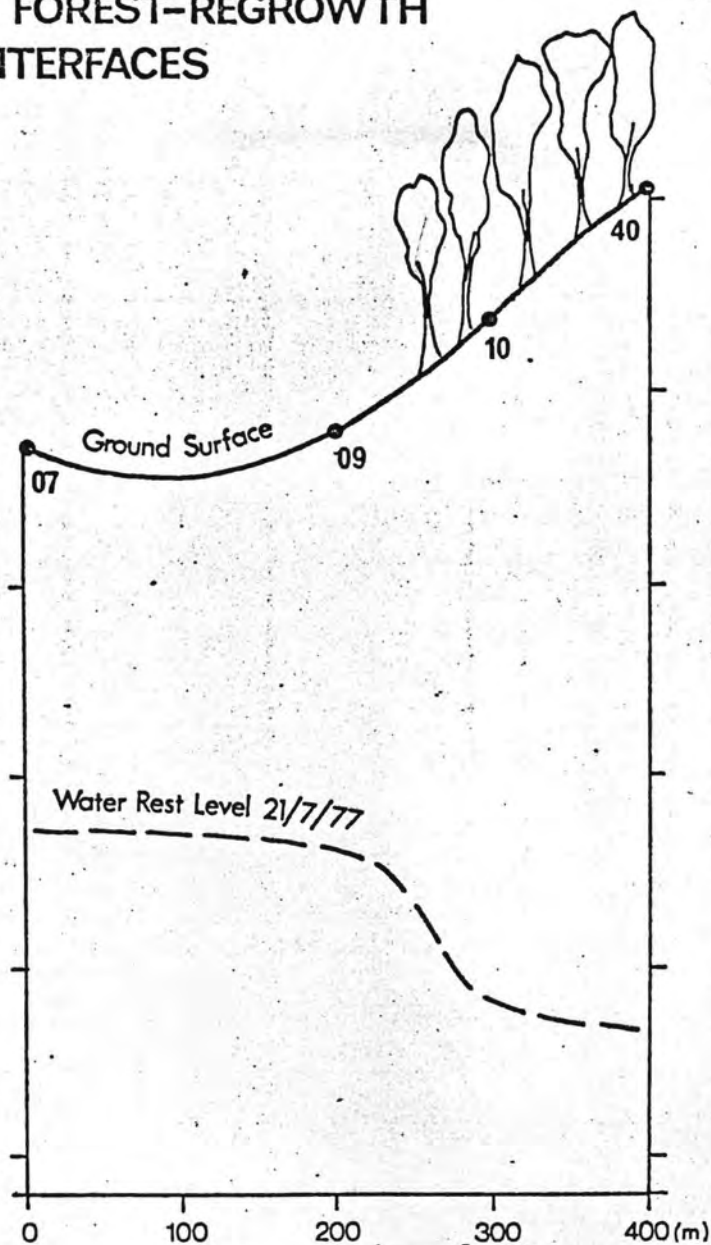
ATTACH. 3 (a)

FIG. 2

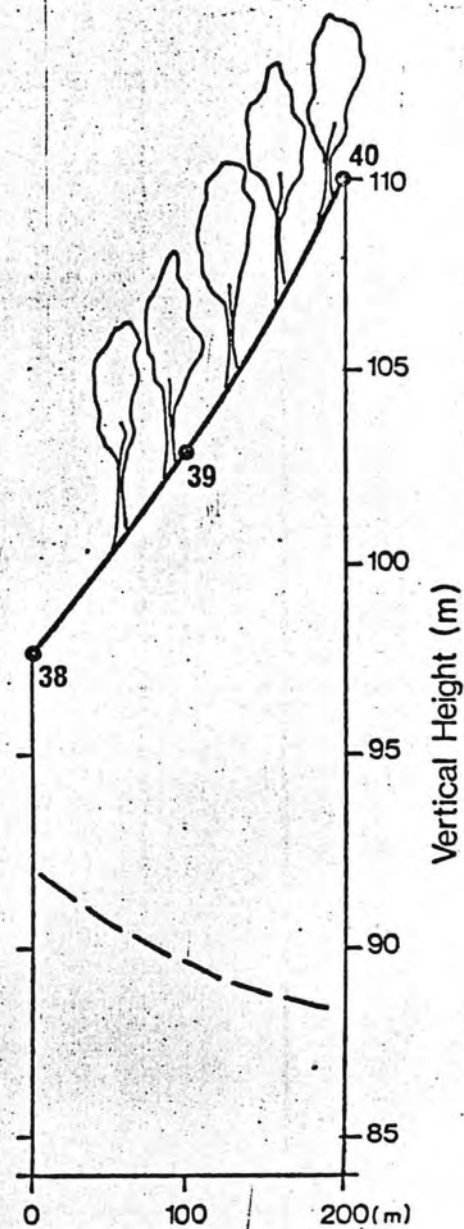
# GROUNDWATERS ACROSS FOREST-REGROWTH AND FOREST-PASTURE INTERFACES



INTERFACE A  
Forest-Regrowth



INTERFACE B  
Pasture-Forest



INTERFACE C  
Pasture-Forest



ESTABLISHMENT COSTSJiffy Pot eucalypts - Cost per hectare

	<u>MATERIAL</u>	<u>WAGES</u>	<u>PLANT</u>	<u>TOTAL</u>
Vorox	10	10	10	30
Cultivation		10	10	20
Plants	110		10	120
Planting		40	10	50
Fertiliser	30	15	5	50
<b>TOTAL</b>	<b>150</b>	<b>75</b>	<b>45</b>	<b>270</b>

Mounding would add an extra \$20-\$25/hectare to these costs for moist areas.

Wages	75
O/H + 32%	25
	<hr/>
	100
+ material and plant	195
	<hr/>
+ 20% admin.	295
	59
	<hr/>
<b>TOTAL</b>	<b>354/ha.</b>

Open rooted pines

	<u>MATERIAL</u>	<u>WAGES</u>	<u>PLANT</u>	<u>TOTAL</u>
Vorox	10	10	10	30
Cultivation		10	10	20
Plants	20		10	30
Planting		30	5	35
Fertiliser	20	15	5	40
Zinc Spray	6	10	4	20
<b>TOTAL</b>	<b>56</b>	<b>75</b>	<b>44</b>	<b>175</b>

Wages	75
O/H + 32%	25
	<hr/>
	100
Material & Plant	100
	<hr/>
	200
Admin. 20%	40
	<hr/>
	<b>\$240/ha.</b>

Estimated costs of spot seeding

	<u>MATERIAL</u>	<u>WAGES</u>	<u>PLANT</u>	<u>TOTAL</u>
Vorox	10	10	10	30
Cultivation		10	10	20
Seed ( $\frac{1}{2}$ kg/ha)	40			40
Sowing		10	5	15
Fertiliser (Year 2)	30	15	5	50
<b>TOTAL</b>	<b>80</b>	<b>45</b>	<b>30</b>	<b>155</b>

Wages	\$ 45
O/H 32%	15
	<hr/>
	60
Material & Plant	110
	<hr/>
	170
Admin. 20%	34
	<hr/>
	<b>\$204/ha.</b>