ROADING IN SOUTH COAST NATIONAL PARKS

FOREST RANGER : GLYN YATES

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SUMMARY

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Prior to the formation of the Department of Conservation and Land Management in March 1985 my involvement with National Parks was as a user rather than a manager. Since that point and being transferred to South Coast Region which comprises some 12 national parks, 160 nature reserves and the odd timber reserve my works programme has been almost entirely on National Parks of the region.

The following report is a direct result of the requirement of a 3,000 to 4,000 word report for the successful completion of the LF 5/6 promotional examination. The report pertains to the roading programme undertaken in the region in 1986. Also management considerations related to roading are considered. The works saw nearly a quarter of a million dollars spent throughout the region on tourist roading.

The completed works were very successful and saw the achievement of a high standard of roading. The problems associated with the works are considered and 18 recommendations made for future works. The main recommendations were:

1. That future work be well planned in all aspects in advance.

2. Standard minimum and maximum road specifications be formulated.

3. Due to limited funding the decision must be made between building new roads and doing no maintenance or doing the appropriate maintenance and reducing the new constructions.

As very little reference material is available on the matter of roading in National Parks, I trust this report will be of value to people involved in such works in future operations.

GLYN YATES
FOREST RANGER

TABLE OF CONTENTS

INTRODUCTION

The report which follows relates to economic, environmental, human usage and logistical considerations which are necessary prior to roading operations in South Coast National Parks. Also considered are the long term ramifications such as environmental changes, maintenance works and management objectives. As a practical example of the implementation of these policies the 1986 programme which saw $242 000 spent over 11 jobs is considered. The context of "roading" for the scope of the report pertains primarily to tourist roading. The programme this year was spread over an area from Albany to 150 kilometres east of Esperance, including both major and minor roadworks all were completed in the 8 weeks prior to June 1, 1986.

1. LOCATION

The national parks within the South Coast Region are mostly in coastal locations with the exception of Stirling Range National Park and Porongurup National Park. (Appendix 1). The region runs from 40 kilometres west of Denmark to the South Australian border. The northern boundary of the region is varying distances inland but the average is approximately 350 kilometres. The coastal environment and the huge size of the region along with the other factors expanded upon in this report have created specific problems associated with roading in South Coast national parks.

1.1 Albany District

This District covers the western half of the region and the eastern Boundary the Ravensthorpe/Hopetoun Road. (Appendix 2). The District has 9 resident field staff who are responsible for managing 382 000 hectares of CALM estate covering 5 national parks and one nature reserve. The field staff in conjunction with District office staff are also responsible for the management of various unmanned national parks and nature reserves.

1.1.1 Two Peoples Bay Nature Reserve. The only manned nature reserve in the region. Approximately 4000 ha of coastal reserve with limited gravel road access and high visitation (40 000 people per year). The area is primarily reserved for the protection of the Noisy Scrub Bird, (Atrichornis clamosus) a small Gazetted rare and endangered Avifauna only naturally found in this reserve. The reserve contains very limited road construction materials, because of this most operations require the contractor to provide the materials.

1.1.2 Torndirrup National Park. Approximately 15 kms from Albany the park is about 4000 ha. The area is located on the coast and has extremely high visitation (250 000 people per year). The roads within the park are nearly all bitumen. The park is most popular for such attractions as the Natural Bridge and Gap. Because of its proximity to Albany, continuing pressure exists for further access

to the south coast. Access is gained through the park to Goode Beach and Frenchman Bay residential areas. Roading Materials are supplied from outside the park due to the close promixity of both gravel, limestone and environmental considerations

1.1.3 Porongurup National Park. An inland park located 40 kilometres north of Albany. Mountains cover a high percentage of the 2400 ha park. This causes obvious roading limitations. The visitors (approx 30 000 a year) to the park come to enjoy this isolated karri forest to picnic and bush walk mainly. The roading within the park is generally bounding private property and hence the maintenance responsibility falls to the Plantagenet Shire.

1.1.4 Stirling Range National Park. Possibly the best known of the national parks in the district. The park covers some 120 000 ha and is popular with mountain climbers, bushwalkers, and tourists looking at the diverse flora of the area, receiving approximately 50 000 visitors a year with the busiest time being Spring.

Because of the height of the mountains and the low vegetation, visual impact of both roads and gravel pits is high if not strategically located. Due to the geology of the mountains roading materials are limited to gravel and this is in short supply.

1.1.5 William Bay National Park. Located approximately 65 kms west of Albany. The park is about 1900 ha and has a high percentage of coastal dunes. The park has an extremely popular swimming beach which sees a visitation in the vicinity of 100 000 people per year in the park. The limited roading system of the park is constructed in a fragile dune environment. Good quality roading material is very limited.

1.1.6 Fitzgerald River National Park. This park is of World Biosphere Status and has some of the most diverse flora and fauna in the Southern Hemisphere. The park covers some 250 000 ha, it also has a vast area of coastline as well as a central area inaccessible to all traffic in winter and only accessible to 4 Wheel Drives during summer. (Visitation is only moderate and mainly confined to the south eastern area of the park near Hopetoun). The park has vast areas of watergaining clay type soil. Also some sand plain areas and coastal granite exists.

1.2 Esperance District

This District covers the eastern half of the region and begins at the Ravensthorpe/Hopetoun Road and covers the remainder of the region to the east. (Appendix 3). Within the District (the larger of the two) there are 3 national parks with resident rangers. These parks cover approximately 350 000 ha. These officers along with District staff based in Esperance, are also responsible for the management of various unmanned national parks and nature reserves.

1.2.1 Stokes National Park. This park is approximately 80 kms west of Esperance, the centre of which is Stokes Inlet on the Lort River. The park covers about 9 500 ha and has comparatively limited pressure from tourists. The park has only limited access and most of this is 4 Wheel Drive traffic. The roads within the park exist mainly on coastal dunes or grey sands. Road building materials are scarce and visual impact of such operations are high.

1.2.2 Cape Le Grand National Park. The area is possibly one of the most visually attractive of the entire south coast area. Because of this and the fact that it is the longest established park in the District and has the best access of the 3 parks, it attracts vast numbers of visitors all year round especially during summer (approximately 45 000 per year).

The park some 31 000 hectares is located 60 km east of Esperance has reasonable supplies of both gravel and limestone. The park has been infected by dieback in the past and this appears to have significantly effected the vegetation of the area.

1.2.3 Cape Arid National Park. This park was not gazetted until 1978. It covers some 280 000 ha most of which has not been affected by white man. The park is the most isolated within the region. Public usage is mainly related to a few coastal sites. Because of these factors, the park is still largely a wilderness with limited internal access roading.

The road making materials at Cape Arid are limited and well dispersed within the park. The materials include limestone and gravel. The gravel in most areas lacks a reasonable clay quantity effecting its value as a construction material. The area has diverse flora and fauna as yet largely undocumented.

2. DIEBACK

The disease known as dieback is caused by a fungus named "Phythophthora cinnamomi", which attacks the root tissue of plants effectively starving the plant of food. The fungus is spread by the movement of infected soil or root material or by gravitational affects on water. It requires warm, moist conditions to become active and multiply. The fungus is known to have varying effects on some 900 species of plants. The fungus has a high impact on the Proteaceae, Myrtaceae, Epacridaceae and Xanthorrhoaceae plant families, which are the basis of the coastal plant communities within the South Coast Region.

DEAD BANKSIA DUE TO DIEBACK INFECTION FROM THE ROAD.
STIRLING RANGE NATIONAL PARK

2.1 Vegetation

The coastal vegetation of the entire south coast region is highly susceptible and requires extreme care to protect it from dieback. The parks on the south coast have vast areas of land yet to be assessed by botanists, so within many areas if care is not taken, plants may be destroyed before ever being documented. These fears held for the areas within South Coast Region have been proved to be justified by the impact on vegetation of already infected sites.

2.2 History

Very little was known about the disease until recently. Because of this areas have been affected by the disease. These infections have been caused by various factors. The most damaging has been the construction of roads and firebreaks. These operations have caused the disease to become widespread in parks and reserves such as Stirling Range National Park, Two Peoples Bay Nature Reserve and Cape Le Grand National Park.

2.3 Fauna

Because of the significant impact that dieback is having on various plant associations which occur over wide areas of the coastal strip extreme concern is held for the imminent effect on fauna habitat. The loss of suitable habitat would cause reductions in fauna populations and increase the pressure on remaining areas.

2.4 Roading Standards

Within most of the parks in the region there exists many roads or tracks which are unsuitable for two reasons:

i. They are muddy at various times of the year. While still allowing vehicle access along these roads, mud can be picked up and transferred to another site. The mud which is moved to different sites may be infected with the fungus dieback, hence transporting the disease further afield. also survival.

ii. Many of the roads within national parks are high in the profile (ie., mid to upper slope or on ridgetops). This method of high profile roading increases the overall area of land at risk from infection. If dieback were introduced on these roads, once a specific site was infected, then due to the nature of its spread, all the vegetation down slope of the site is at risk - so the closer the road is to the watercourse the less area at risk.

THE STANDARD OF SOME OF THE EXISTING TRACKS WITHIN SOUTH COAST NATIONAL PARKS. THE IDEAL SITUATION FOR THE SPREAD OF DIEBACK

3. SOIL TYPES

Because of the huge area of the Region, there exists a diverse range of soil types throughout. Some of the parks such as Cape Arid or Fitzgerald River cover such an expansive area that a wide variety of these soil types exist within their boundaries. The 1986 roading took place in a broad range of these soil types.

3.1 Clays

Several roading operations within the Region were on clay soils, the Point Anne/Pabelup Track Road (Appendix 6) is a typical example. In most operations in the main forest area where clays are encountered, they usually occur over short linear distances or are beneath a shallow layer of gravel (between 100 mm - 1000 mm). On the Point Anne/Pabelup Road the clay exists on the surface making construction under moist conditions very difficult and environmentally damaging. These sites also are water gaining sites. During the 1986 operations only a relatively small amount of rain (50 mm) was necessary to bring the roading operation to a halt.

3.2 Limestone

Within most of the national parks located on the south coast there exists deposits of limestone. These deposits vary between parks and sites in relation to depth, quantity and quality. In the 1986 roadworks the only sites on which limestone was used were in Cape Le Grand and Torndirrup National Parks.

THE LIME PIT IN CAPE LE GRAND NATIONAL PARK

3.3 Sands

Large areas of freely draining grey sands exist throughout the Region. These sites are relatively stable if worked when still moist, but if the roadworks take place in the dry part of the year the sands turn to powder and cause several problems:

i. The machinery have difficultly moving through it.

ii. Forming works are virtually impossible.

iii. Loose sand absorbs large amounts of gravel before a reasonable road is made.

iv. When the first rains fall, the loose sands erode and block the pipes.

3.4 Dunes

The most difficult soil type in which to make roads is the loose yellow sand of the coastal strip. These conditions are difficult because:

i. They have no binding components to hold them together.

ii. The topography of the areas in which they exist is usually short steep hills.

iii. The sands are very susceptible to wind and water erosion.

Only one operation took place in this soil type this year. This operation was undertaken in Torndirrup National park.

THE TYPICAL COASTAL SAND WHICH IS DIFFICULT TO CONSTRUCT ROADS IN THIS EXAMPLE IS WITHIN TORNDIRRUP NATIONAL PARK.

3.5 Rock

The roading operations through Scenic Drive in the Stirling Range National Park went through some quite rocky country. This was made up of metamorphic sandstone. This environment is difficult to

construct roads in as it is not particularly stable and gravel sources are difficult to find.

4. FLORA AND FAUNA

Areas are dedicated as National Parks for various reasons:

i. They may represent a typical example of an area which may no longer exist in an unspoilt state.

ii. They may be environmentally sensitive.

iii. They may contain the only known population of Flora or Fauna.

iv. They may have within their area a huge variety of Flora and Fauna.

These reasons are but a few and as they may represent the purpose for the areas becoming national parks, then any operation taking place within the parks must be considered in respect to what influence they would have on the broad objectives of park management.

4.1 Flora and Fauna Surveys

Because a number of the parks within the Region have many gazetted rare or endangered flora and fauna within them, it is necessary to ensure no unrecognised adverse effect is brought to bear on these plants and animals without due consideration. To this end flora and fauna surveys are conducted over the traverse of proposed roading alignments. If these alignments have rare flora or fauna on them then consideration is given to either moving the alignment or what consequences it will have on the flora or fauna.

4.1.1 Fauna. Depending on the fauna the roading may kill some animals during construction ie., worms, ants. While other larger animals can move away from the immediate threat, the construction may still have varying effects on their survival. The following are considerations:

movement across roads

i. The animal may have its environment destroyed in construction.

ii. The habitat of the animals may be very specific and may be destroyed.

iii. The construction of the road will bring vehicles through and therefore road kills are inevitable.

iv. The construction of the road will change the water courses of the area. This may effect the animals.

All these factors and many more, some which are related to individuals, require consideration prior to construction.

4.1.2 Flora. This will mainly be affected by construction. Obviously any plants which exist along the alignment are to be destroyed in the clearing operation. For this reason it is important to keep to a minimum any soil disturbance. Other factors that need mentioning are:

i. The effect roading has in micro-catchment which may cause relative floods or droughts to small areas.

ii. The possible introduction of weeds by the traffic using the roads.

iii. The possible introduction of dieback or other diseases by the vehicles using the roads or the construction equipment.

iv. The symbiotic or abiotic relationship between plants and animals may be destroyed.

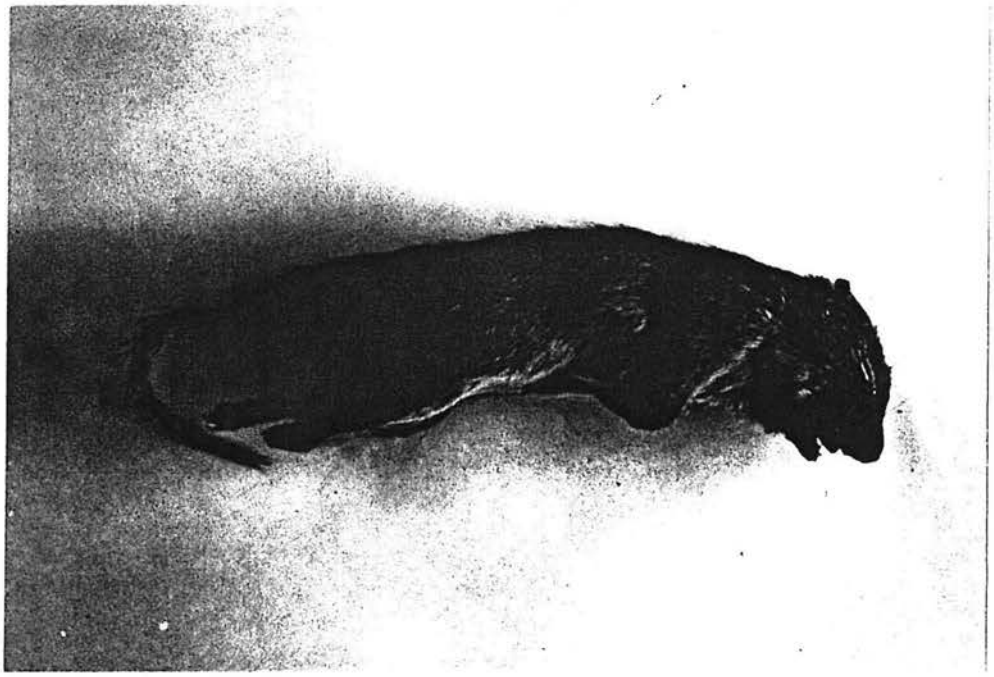
4.2 Limits of the Survey

Over 10 ha is represented by a road which covers 18 kms to a width of 6m. This is a relatively large area especially if every plant and animal within the area where to be checked. The flora which appears the easiest to survey because of its static nature is not so straightforward due to huge numbers. Because of these reasons the survey has very obvious limitations, but serves as a guide to identifying rare flora and fauna with a view to minimizing impact on these plants and animals.

4.3 Specific Cases

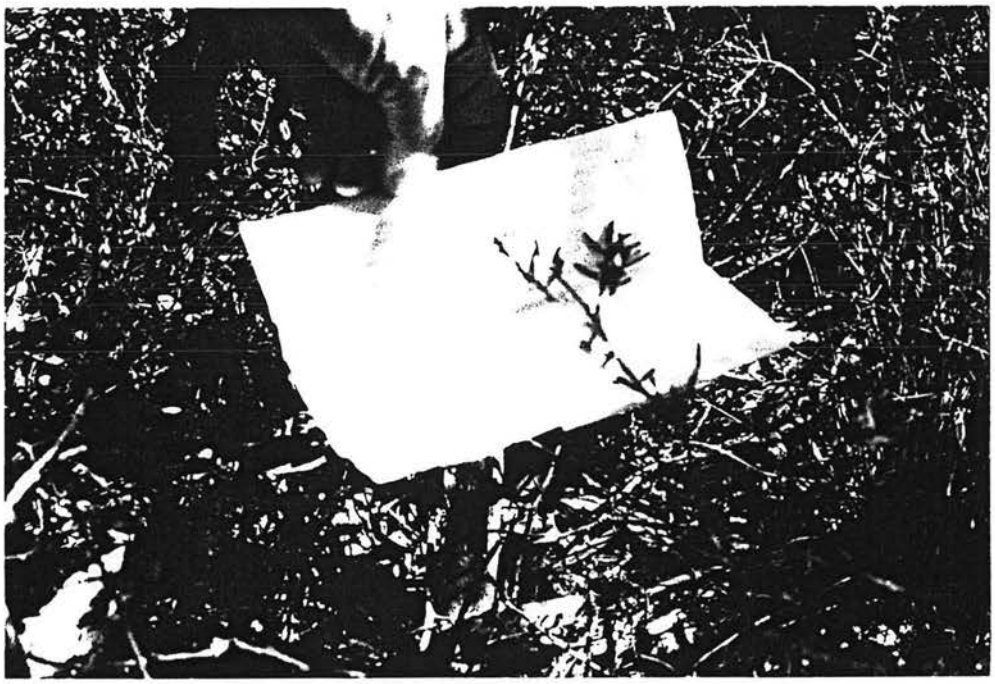
During the 1986 roadworks, four of these specific cases arose where rare or endangered flora or fauna were encountered and action had to be taken so as to minimize affect on the plants and animals concerned.

4.3.1 Dibbler (Parantechinus apicalis). A small marsupial found in very limited areas was located in the Fitzgerald River National Park. (Appendix 6). This animal had not been located for some 20 years until recently. Because of this, roadworks had to be postponed until a biological survey to determine the extent of the population in relation to the proposed road was known.



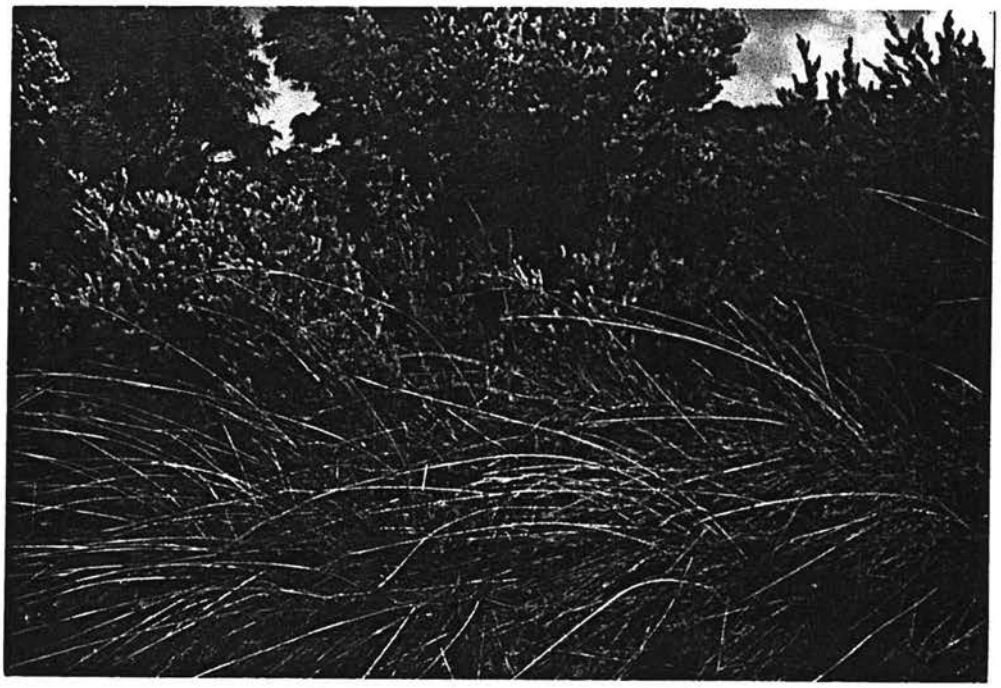
A DIBBLER (Paratechinus apicalis)

4.3.2 Templetonia neglecta. Although not rare this small plant has a very limited distribution within the Fitzgerald River National Park and because the Flora and Fauna Survey located the plant on the chosen alignment of the Point Anne roadworks it was necessary to change the alignment of the road.



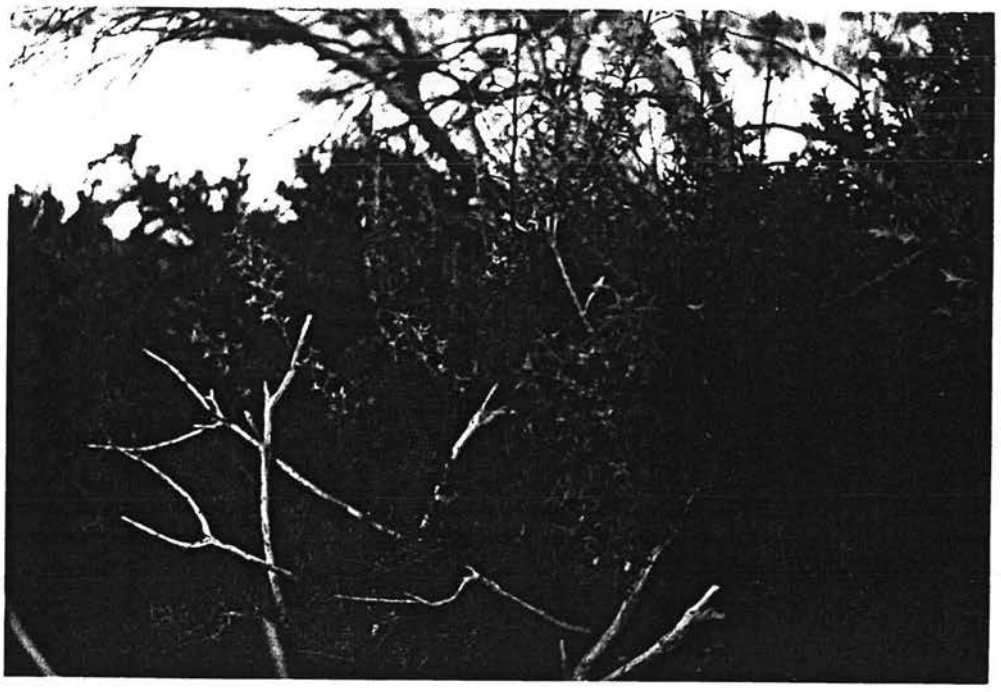
TEMPLETONIA NEGLECTA

4.3.3 Adenanthos cunninghammii. This species of woolybush is located within Torndirrup National Park close to a proposed alignment of a new road. Because there are only 47 known plants in existence this site had to be watched to ensure no soil disturbance took place near the specimen which was adjacent to the proposed alignment.

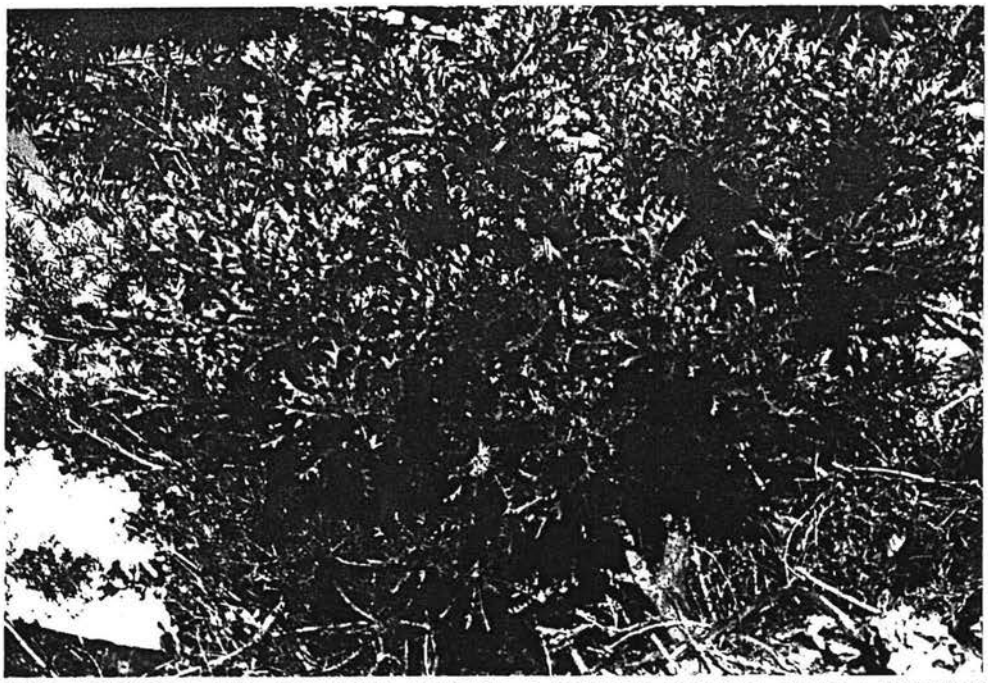


ADENANTHOS CUNNINGHAMMII

4.3.4 Lambertia echinata. Within Cape Le Grand National Park a fair quantity of gravel was required for various works. One site from which gravel could have been taken was avoided as it contained this rare plant.



THE RARE LAMBERTIA ECHINATA



THIS DRYANDRA WAS GROWING WITHIN 5 METRES OF THE RARE LAMBERTIA ECHINATA - NOTE THE SIMILARITY BETWEEN THE TWO

5. AESTHETICS

The impact of visual degradation is high in any situation but it is more devastating in National Parks as these areas are managed for natural beauty and environmental considerations. The visual impact may relate to road straightness, siting of roads or gravel pits high in the profile.

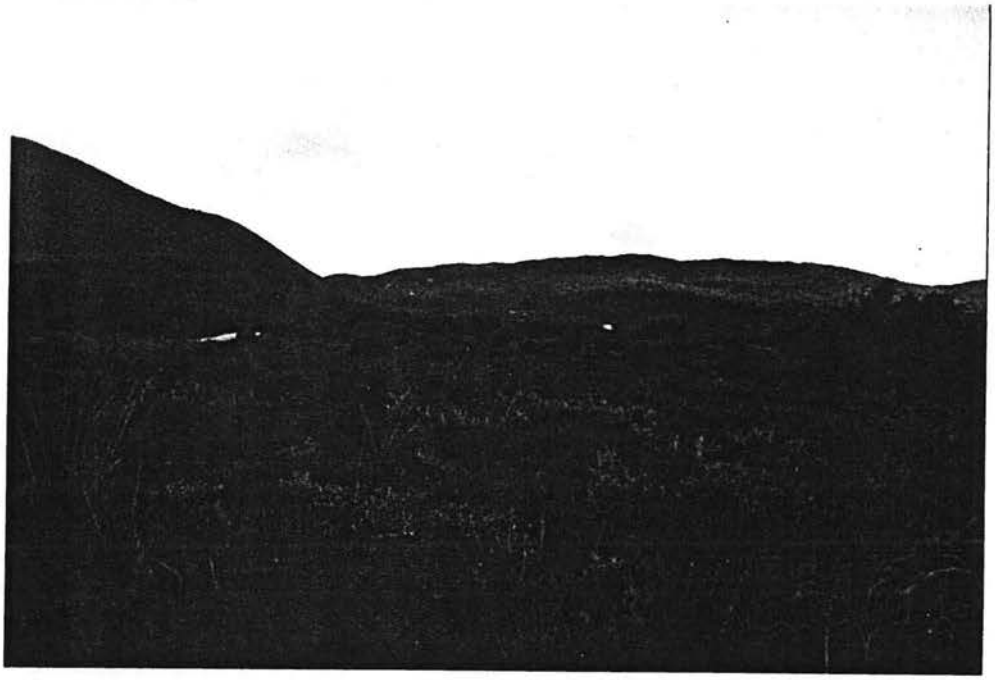
5.1 Straightness

The very nature of National Parks is such that the visitors slow down and enjoy the natural environemnt they are passing through. If a road were straight then the people using that road would drive at a faster speed hence not appreciate the area they are passing through. Also the straightness would make the road unattractive.

AS WELL AS THE POOR CONDITION OF THIS TRACK NOTE HOW THE TRACK IS VISIBLE FOR SEVERAL KILOMETRES BECAUSE OF STRAIGHTNESS

5.2 Visibility

When roads are constructed it is important to consider what parts of the road will be visible from a distance. Because of the topography of the park many roads are constructed in areas where there visibility from other areas of the park are unavoidable, if this is the case then the visual impact of the road must be minimized.



THIS SHOWS THE LOW VISIBILITY OF ECLIPSE ISLAND ROAD FROM A DISTANCE

5.3 Tourist Access

As mentioned in previous sections it is important to consider the impact of high profile roading for both dieback and aesthetic reasons. But also it is important to meet the scenic aspirations of the tourists. For this reason it is necessary not to deny public access to high points for scenic views under certain circumstances.

6. FACILITIES

When the construction of a road is planned it is important to consider if the road is constructed, that facilities are available for the people at the terminus of the road. It is important that such facilities such as car parks, tables, barbecues and toilets are provided as the individual case requires.

THE SITE AT WHICH FACILITIES ARE TO BE CONSTRUCTED AT POINT ANNE BEFORE THE COMPLETION OF THE TWO WHEEL DRIVE ACCESS

6.1 Environmental Pressure

Because of the fragile nature of the coastal environment it is important that factors such as:

a) dune damage caused by foot or vehicle traffic;

b) introduction of weeds and disease;

c) public pressure on the vegetation for firewood and fire lighting material;

are considered when the road is planned.

6.2 Pressure Diversion

If an area is being damaged by pressure on the environment by the public, several alternatives are available for a reduction in this pressure. One of these options is to construct roads to alterntive sites so as to relieve overall pressure and spread the burden of the public.

6.3 Point Anne/Dunns Rock

These two are examples of 1986 roadworks. The Point Anne roadworks have been designed to finish three kilometres from the coast. This will allow the site at the beach to be developed and the establishment with the appropriate facilities before the public pressure arrives. The site at Dunns Rocks Road is the opposite in

how do we reach
whats best?
why was it
done?

that the road now goes to the location of the site. But at this stage there are no facilities and the area will receive increased pressure and the site development may not be in accordance with long term objectives.

7. FUNDING SOURCE

The funding for the 1986 roadworks was provided by the Main Roads Department as has been the case in previous years. These funds vary from year to year. 1986 saw $265 000 available. This funding is provided for tourist roads after the Department has made its submission to the MRD on behalf of the districts for both maintenance funds and new construction works.

7.1 New Works

As the roading system of the south coast national parks is at present very limited a high percentage of the funds available are used for new works. The Establishment funds are for the construction of new roads or major upgrading to a reasonable standard of existing tracks. Examples of which are Dunns Rock Road, Point Anne/Pabelup Track and Eclipse Island Road.

7.2 Maintenance

As road systems are developed in national parks more funds are required in the years to follow for maintenance works. These funds are used to do such operations as maintenance grading, regravelling, or additional drainage as required.

8. SUPERVISION

With the 1986 works the construction of the roads under all circumstances was undertaken by contractors. These people had to tender for the works and generally the lowest tender was successful. Because of this it was essential that strict supervision of the works was undertaken.

8.1 Ranger Supervision

With all the jobs in the parks during 1986 the day to day control of the operations were undertaken by the National Park Ranger Staff. These rangers were provided with the specifications of the job and given guidance on the requirement of the job and controlled the operations to an acceptable standard.

8.2 District Staff Supervision

With the National Park Rangers controlling the day to day operations it was only necessary for District Office staff to check each job every week or so unless problems arose between visits. Because many of the jobs were being conducted simultaneously District staff mainly helped resolved small unforseen problems as the overall objectives of the construction were understood by everyone involved.

9. 1986 PROGRAMME

The 1986 works saw $255 000 spent over 13 jobs. These jobs were commenced in April 1986 and most were completed by mid May 1986. Still three jobs are to be completed in the spring of 1986. The works were within six National Parks.

9.1 Torndirrup National Park. (Appendix 4)

Within this park three operations were planned for 1986 but only two took place. One at Stony Hill was deferred until 1987 as insufficient funds were provided in 1986 for job completion.

9.1.1 Misery Beach. The works undertaken in the area known as Misery Beach were maintenance works that followed up the initial construction stages undertaken in recent years. The works included the maintenance grading of the roads, the provision of additional gravel over one culvert and the regravelling of a carpark with a higher quality gravel.

9.1.2 Eclipse Island Road. This was the major construction undertaken in the park and involved the new construction of 4 kilometres of road to the coast. The works required a 5 metre wide road to be constructed from limestone. The road was difficult to construct due to loose coastal sands. The contractor also had to negotiate steep inclines during the operation. Due to the limited construction materials available in the park the contractor was also required to provide the limestone used. Limestone was used in preference to gravel as the chances of dieback introduction were reduced.

AN EXAMPLE OF THE STEEP SLOPE WHICH NEEDED TO BE NEGOTIATED BY THE MACHINERY

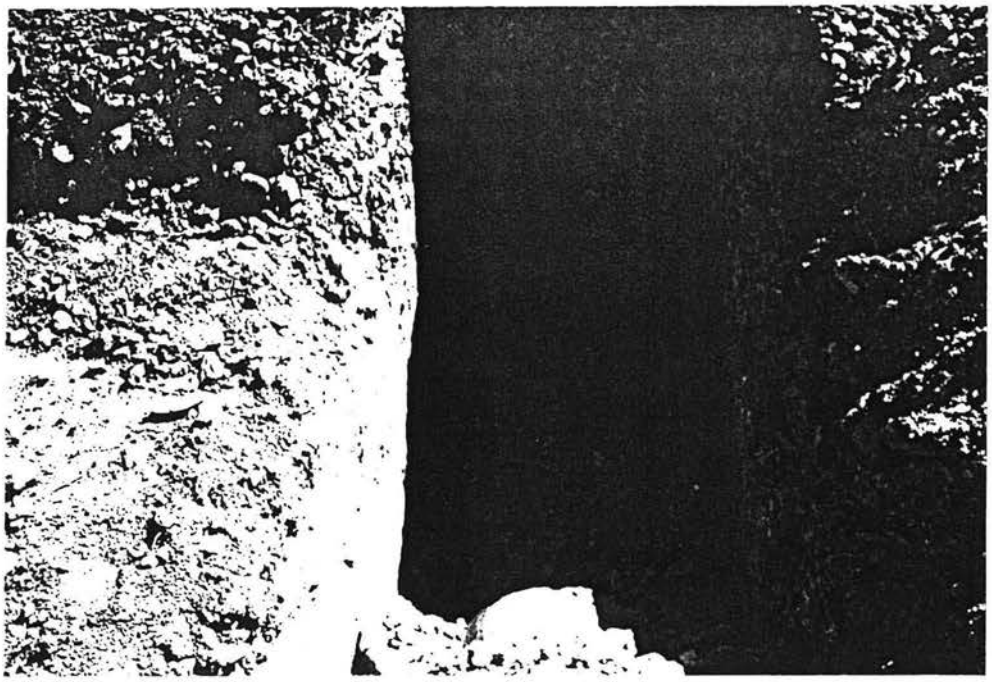
THE ROADWORKS DURING CONSTRUCTION

9.2 Stirling Range National Park. (Appendix 5)

This park has been gazetted for many years. It has an established roading system requiring mainly maintenance. In 1986 maintenance and some upgrading of existing roads took place.

9.2.1 Maintenance. The $6 000 provided for maintenance was used to grade and patch gravel roads such as Red Gum Pass, Mt Trio Road and Scenic Drive.

9.2.2 Scenic Drive. This road which runs east west through the park for 42 kilometres and is one of the main scenic routes within the park. Over recent years the road has had increased traffic and reduced maintenance. Because of this and recent flood damage it has been necesary to install additional drainage and undertake maintenance grading throughout the Drive. This involved installing some 65 sets of culverts, various offshoot drains and maintenance grading the road through its entire length. The job at times was very difficult due to the large amount of rock encountered during the installation of the culverts. This made the installation a very lengthy process. The rock also caused problems with grading as offshoot drains and table drains were difficult to install. Since the completion of the roadworks other jobs caused by the works have been commenced ie. rocking the culverts, guideposts and checking that the culverts are working. The first of the winter rains have started and to date the drains are working well.



ONE OF THE MANY CULVERTS FOLLOWING INSTALLATION

AN EXAMPLE OF A DRAINAGE PROBLEM TRYING TO BE OVERCOME

9.3 Fitzgerald River National Park, (Appendix 6)

Some $53 000 were allocated for roadworks in this park in 1986. These funds were to be used to maintain Hammersley Drive the one established two wheel drive road within the eastern section of the park. Because this road is the main two wheel drive access it gets high volumes of traffic. The $3 000 allocated in 1986 would need to

be increased in the future just to keep pace with the sections of the road requiring attention. The other funds were for the Point Anne Road/Pabelup Track road construction in the south west section of the park.

9.3.1 Hammersley Drive. This road takes tourists from the main highway between Jerramungup and Ravensthorpe to Hopetoun. The drive takes people through some of the most spectacular areas of the park. Providing good access to areas such as West Beach, Cave Point and Mylies Beach. The road runs for some 38 kilometres through the park. The $3 000 provided was used to maintain the worst sections of the road. The works established a well cambered road for improved drainage. Works of this standard will continue in the future to upgrade the entire road to a well formed and drained surface.

ONE OF THE VIEWS FROM HAMMERSLEY DRIVE

9.3.2 Point Anne/Pabelup Track. Within the overall management of the park the construction of a loop road between the Gairdner entrance and the Jacup entrance is an objective which will hopefully be realised in the next few years. In recent years funding has been provided to undertake these works. The 1986 programme involved the construction of 15 kilometres of new roads along the two access'. The works required the flora and fauna surveys to be conducted over the desired alignment. This required the alignment to be changed slightly. The new road alignment was well away from the old one that has major drainage problems at the Point Anne end. The upgrading saw a track improved to a 5.5 metre road. At the start of winter the Point Anne section of the roadworks had been all but completed. But the Pabelup Track works had only seen the clearing done before the works got bogged out. Both jobs will be completed in early summer.

POINT ANNE ROAD PRIOR TO THE 1986 WORKS

POINT ANNE ROAD FOLLOWING THE 1986 WORKS

9.4 Stokes National Park. (Appendix 7)

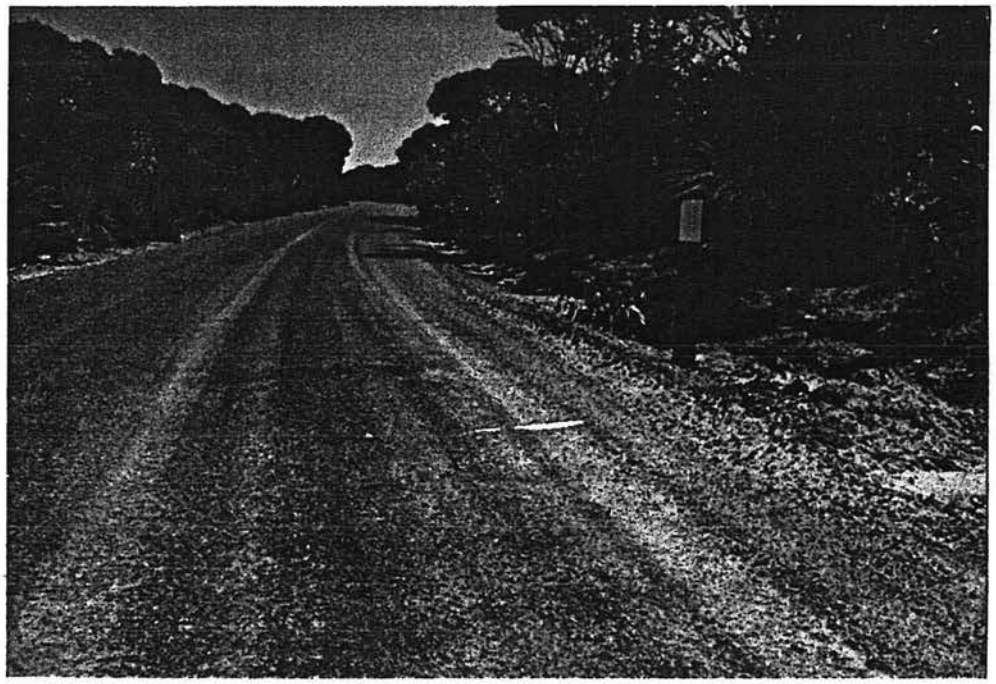
This park is a relatively low "visitation" park as far as tourists are concerned, and because the roading is terminating rather than through access the amount of works is low. 1986 saw $3 000 allocated for maintenance work.

9.4.1 Maintenance. The $3 000 provided was used to patch gravel and maintenance grade the roads between the rangers residence and the camping area. This works saw only $1 200 of the funds available used. Because of this it will allow the other funds to be used in spring for further works of the same nature.

9.5 Cape Arid National Park. (Appendix 8)

1986 saw the continuation of the current roading programme which had been progressing well in recent years. This involved the continued maintenance of the Thomas River area and the continued upgrading of the Poison Crek access, with the gravelling of wet sites.

9.5.1 Thomas River. This area is the only one within this recently gazetted park with good two wheel drive access. Because of this a high proportion of the vehicles coming to the park come to this area. The 1986 programme saw the maintenance grading of the various roads, the cleaning out of blocked culverts and the resetting of shallow culverts lying too near the road surface.



THOMAS RIVER ROAD - NOTE THE CULVERT PIPE STARTING TO SHOW THROUGH

9.5.2 Poison Creek. This area of the park is the only other area where reasonable access is available. The roading in this area is being upgraded slowly but due to limited finances it has been decided that the wet sites along the track will be upgraded first to reduce environmental damage at the specific site and reduce the chance of spreading dieback within the park. 1986 saw the wet spots upgraded to a point where further track alignments are to take place. The remaining funds were used to continue the progressive upgrading of the access.

POISON CREEK ROAD FOLLOWING UPGRADING

9.6 Cape Le Grand National Park. (Appendix 9)

1986 saw more funds allocated to this park than any other with $123 000 available. These funds were to be used on 4 jobs. Cape Le Grand Road upgrading to a bitumen surface of 4 kilometres. Frenchman Peak and Hellfire Bay Road upgrading and widening, upgrading Dunns Rock Road and maintenance grading and patch gravelling of other park roads.

9.6.1 Maintenance. $5 000 was provided for maintenance works within the park but because so many other jobs were to be undertaken on nearly all the other roads within the park these funds were used almost exclusively for the maintenance of Lucky Bay Road. The road which is one of the main throughfares of the park has deteriorated markedly in recent months and the 1986 works repaired this damage.

9.6.2 Frenchman Peak/Hellfire Bay Roads. These two roads provide access to a sandy beach (Hellfire Bay Road) and an interesting climb to the summit of Frenchman Peak. The two roads required widening and upgrading of drainage. The Frenchman Peak works were straightforward while the Hellfire Bay Road was a little more complicated, in that widening involved sidecutting of a hill and correctly draining a carpark.

FRENCHMAN PEAK WITH THE ACCESS ROAD IN THE FOREGROUND

THE CARPARK AT HELLFIRE BAY WHICH PREVIOUSLY SAW WATER RUN INTO THE FACILITIES AREA DURING WINTER

9.6.3 Dunns Rock Road. This road had been getting increased pressure in recent years but had remained a rough 2 wheel drive road until this year, when the 4 kilometres within the park were upgraded to good all weather 2 wheel drive access. The road was constructed from limestone which was won by the contractor at an old pit within the park. The works included drainage (and minor

track realignments. The budget for the works was $15 000 but the actual cost of the job was $25 000 the additional funds were provide from elsewhere in the regions budget.

DUNNS ROCK ROAD - PRIOR TO CONSTRUCTION

THE ROAD DURING CONSTRUCTION - NOTE THE CUTTING OPERATION ON THE LEFT

9.6.4 Cape Le Grand Road - The Shire of Esperance has already bitumised the main access Cape Le Grand Road to the National Park boundary. 1986 saw $90 000 allocated for the Department to bitumise Lucky Bay Road. But following consultation with the MRD and Esperance Shire it was agreed that the funds should be used to continue the Shires works on Cape Le Grand Road. This saw works commence on sealing 4 kilometres of the road.

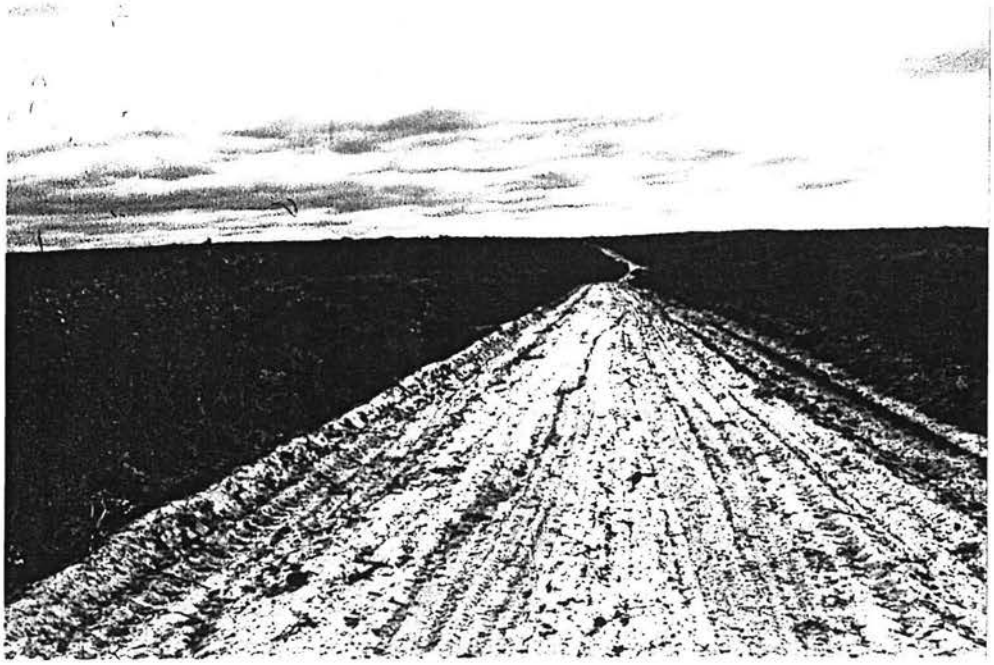
CAPE LE GRAND ROAD DURING THE EARLY STAGES PRIOR TO BITUMIZING

10. CONSTRUCTION

Following the allocation of funds it was necessary to decide on what standard of road was to be constructed for each of the jobs. This was determined by several factors including cost, existing standards, type of traffic, type of road, through access or terminating road, aesthetics and many other factors.

10.1 Clearing

All of the roading within the region that involved new works or upgrading were undertaken in a similar style. The alignment which had been pegged previously was cleared as though the tapes were to mark the centre of the road. The general clearing width was to be 6 metres. This usually involved two "cuts" being taken by the bulldozer. The vegetation cleared from the alignment was either stacked on the road verge to be utilized later for rehabilitation or pushed over the old road which may have existed nearby. These materials used for rehabilitation mean that vegetation does not need to be drawn from elsewhere for this purpose.



AN ALIGNMENT FOLLOWING CLEARING PRIOR TO FORMING

10.2 Forming

Once the actual clearing of the desired alignment has been undertaken it is essential to form the road up. This involves the installation of off-shoot drains and table drains. Another important part of forming in steep topography is cut and fill operations so as not to have excessively steep grades on the roads. The operations may involve cutting the top off hills and filling gullies or sidecutting hill (see Appendix 10).

10.3 Form Grading

Following the general form work undertaken by the bulldozer it is important to achieve the exact road shape desired. If this is not done prior to the gravel or sheeting material being put on the road additional material will be requried to fill small hollows to obtain the proper cambered road. The cost of form grading is far less than the cost of using additional sheeting material.

FORM GRADING IN THE FITZGERALD RIVER NATIONAL PARK

10.4 Sheeting

The sheeting material used during the 1986 programme was either gravel or limestone. The material in most cases was won from the park. All the jobs undertaken had a basic specification that the sheeting material had to be 150 mm deep when compacted.

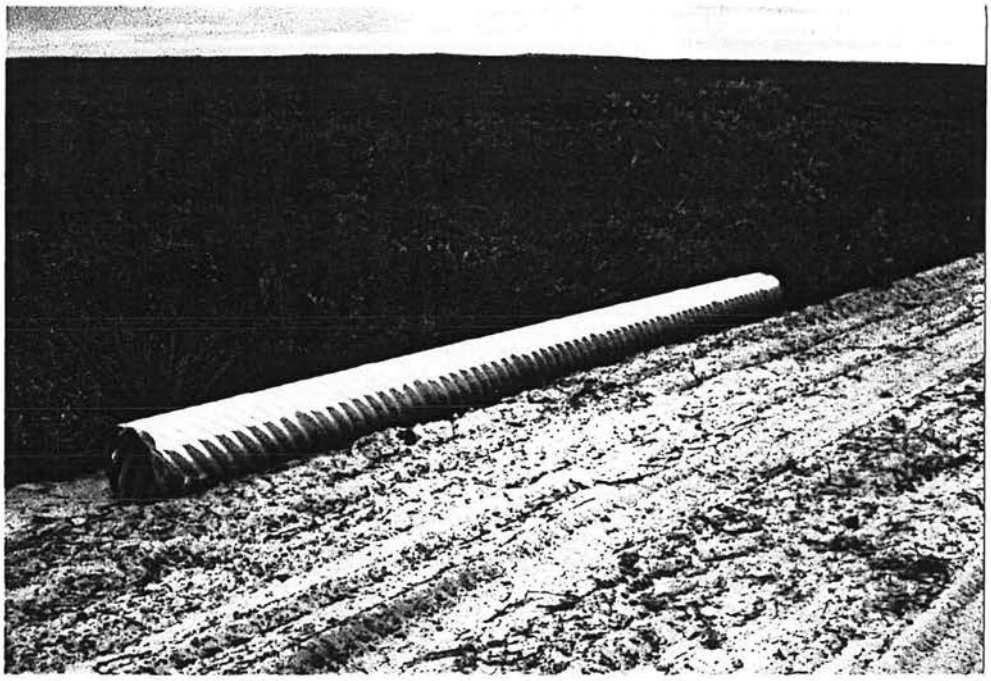
THE GRAVEL PIT AT POISON CREEK IN CAPE ARID NATIONAL PARK

10.5 Final Grading

The final grade completes the essential components of construction. As this is the driving surface it is important the job is of a high standard. Because of this a good operator is neeeded to spread the gravel evenly over the road and achieve the desired results. These factors are very important in National Parks as maintenance funds are limited and it maybe an extended period before funds are available to maintenance grade the road.

10.6 Drainage

One of the most important facets of the roading is correct drainage, as heavy coastal rains over a short period of time can cause serious and expensive damage in these isolated National Parks. All of the culverts installed were required to have a similar amount of sheeting over them as was the size of the culvert ie. 300 mm culvert 300 mm of gravel. The 1986 roadworks involved the usage of both cement culverts and "spiralock" galvanised pipes.



AN EXAMPLE OF THE "SPIRALOCK" PIPES USED AT
SOME JOBS DURING THE 1986 WORKS

11. ROAD SURFACING MATERIALS

As mentioned previously the programme for 1986 saw the sheeting material being provided from within the National park in all sites bar the Eclipse Island Road in Torndirrup National Park and Two Peoples Bay Nature Reserve. The materials were from either limestone or gravel sites which were required to be rehabilitated following completion.

11.1 Clearing

During the clearing of the site from which the sheeting materials was to be removed the vegetation and topsoil were pushed off for use during rehabilitation on completion.

THE STRIPPING OFF OF THE TOPSOIL AND VEGETATION PRIOR TO GRAVEL REMOVAL

11.2 Winning

After the topsoil and vegetation have been pushed off the site the ripper on the bulldozer is used to break up the ground so the sheeting material can be pushed into heaps. It was necessary to dig through the gravel and bring up some clay that can be mixed with the gravel to establish a good material for road construction in most cases.

INDICATES THE GRAVEL AND THE CLAY IS VISIBLE
IN THE FOREGROUND PRIOR TO MIXING

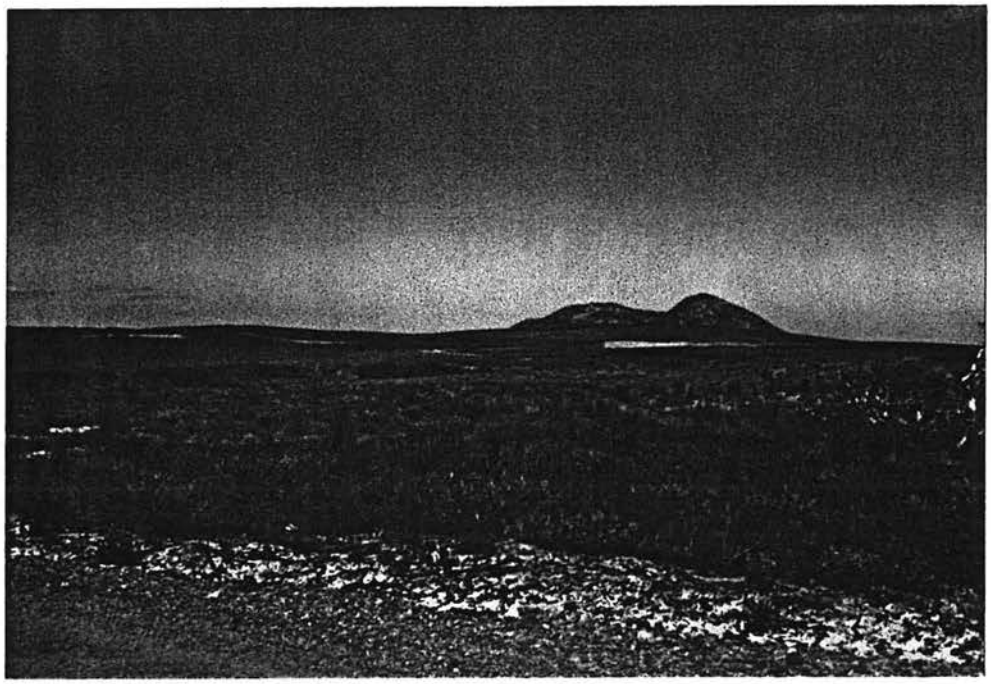
11.3 Rehabilitation

After the gravel has been won and removed for construction purposes it is necessary to rehabilitate the site. This is done by ripping the bottom of the pit along the contour and pushing the topsoil and vegetation back over the used pit.

THE PIT FOLLOWING REHABILITATION

11.4 Siting and Size

The visual impact of gravel or lime pits is high and rehabilitation a lengthy process. It is therefore essential that pits be strategically located to reduce this impact. The size of the pits is also limited to approximately 1 hectare with similar areas of vegetation for flora and fauna survival remaining between pits.



NOTE THE BROKEN UP LOCATION OF PITS AND THE VEGETATION STRIPS WHICH EXISTS BETWEEN EACH.

12. MAINTENANCE

The roading within the National Parks must be undertaken to a high standard. This is important because as mentioned previously it maybe months or years before funds are provided for maintenance of the initial works.

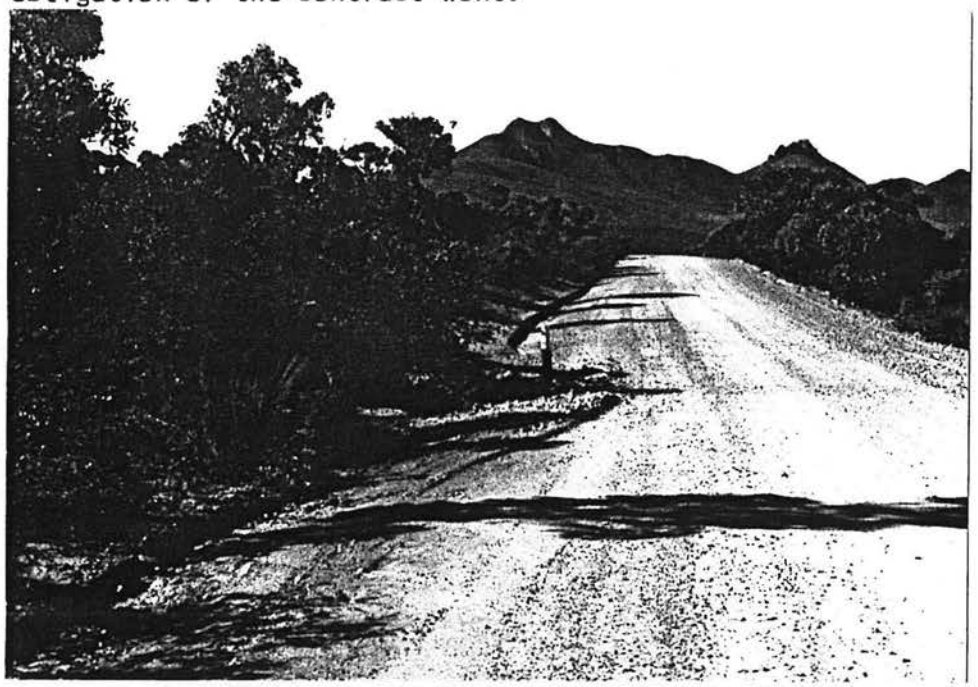
13. PROBLEMS

The 1986 roadworks programme saw many minor problems occur, most of which resolved between the Ranger and contractor. Rarely was it necessary for district staff to be involved. These problems have been caused by many reasons but broadly speaking fit into the following categories; contractors, supervision, planning, standards and environmental considerations.

13.1 Contractors

Because all of the works were undertaken by contractors who were successful in winning a tender then costing at completion is very important. The companies involved were trying to complete the jobs

for the lowest possible cost and hence increase their profits. While on the other hand CALM staff were trying to achieve as much as possible for the funds allocated. Because of this opinions varied as to how jobs were to be completed or as to exactly how far the obligation of the contract went.



AN ATTEMPT TO CUT COSTS BY INCORRECT GRADING

13.2 Supervision

Some of the problems of 1986 are related to superision. Problems occurred due to lack of staff and lack of specific training in road construction techniques. The contractors long experience in construction also gave him an advantage over some Ranger staff. 1987's work should run far better with the experience gained in 1986.

THIS SHOWS THE LACK OF A DRAIN CHANNELLING
RUN OFF INTO THE CULVERT PROVIDED

13.3 Planning

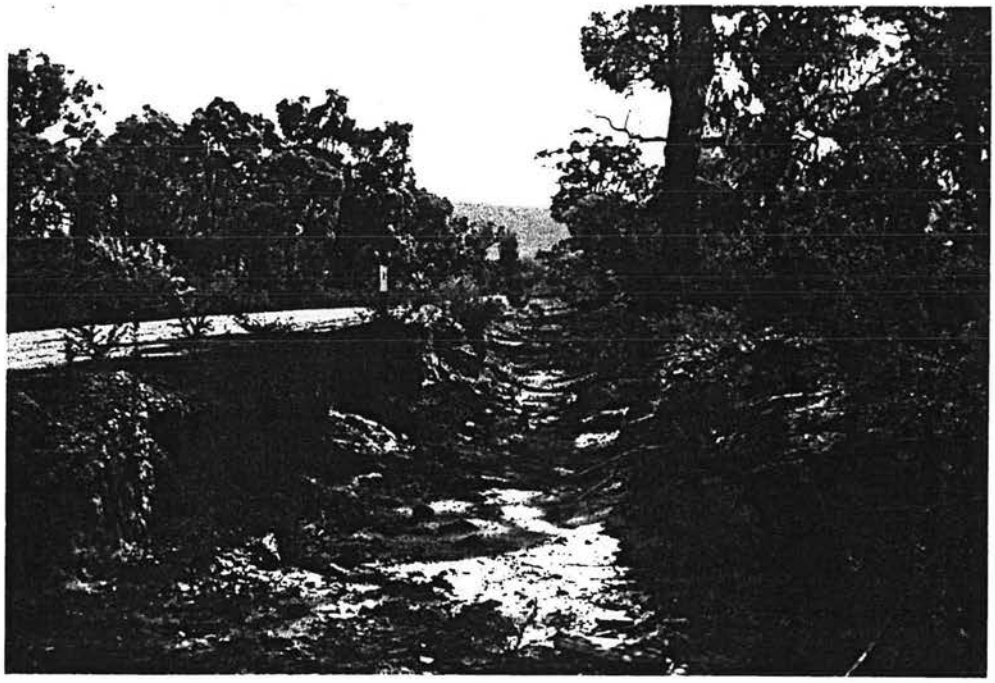
Due to the pressures of many portfolios and the situation of "Management by Crisis" inadequate forward planning was done prior to the works for 1986. This culminated in all the projects being run in a short period of time. The lack of forward planning saw problems occur which would have been recognised and avoided if further preliminary planning had been undertaken.

13.4 Standards

Because of the varied backgrounds of the staff involved in the operations, varying standards of work were expected by different officers. This caused problems mostly for district staff trying to gain some uniformity between jobs. Also problems with contractors were experienced because of hugely varying standards between 2 jobs on which one contractor was employed ie. The Scenic Drive in the Stirlings is a well formed good quality 8 metre road while the Eclipse Island Road is a discrete 4.5 metre road. Works were done on both jobs by the one contractor.

13.5 Environmental Considerations

Environmental considerations are the hardest of the problems to solve but adequate forward planning may avoid or at least reduce the affect of these factors which include weather conditions, flora and fauna restrictions, unavailability of suitable sheeting material or lack of depth of the sheeting material plus many other factors.



FLOOD DAMAGE IN THE STIRLING RANGE NATIONAL PARK

RECOMMENDATIONS

These are designed to improve the roadworks in South Coast National Parks in the future. The author recognises some of these recommendations are either difficult to implement or must be done over a long period of time yet all are believed to help improve future roadworks.

1. More forward planning should take place in future works to avoid many of the problems of 1986. This planning should include all of the aspects mentioned in this report such as dieback, standards, flora and fauna and facilities etc.

2. Far greater involvement and use should be made of experienced dieback interpreters to identify hygiene problems prior to commencement of operations, including dieback interpretation, washdown procedures, high risk sites and so on.

3. The roading should be designed to meet both public and departmental objectives with regard to its position in the profile. Because of this concessions may need to be made to gain the overall best position for the road.

4. The standards of roads must be so as to provide adequate access and an acceptable level of user safety. These standards should involve such things as minimum road widths and correctly designed curves.

5. The roading should be constructed and designed in conjunction with the facilities that are provided at the terminus of the road or along the way ie. there is no point building a great road to a site with no facilities.

6. The location of the road should be multipurpose. As many of national parks on the south coast have limited roading it is important the road serves as many purposes as possible which may include tourist access, fire control or other management objectives.

7. Flora and fauna survey should be either extended throughout our operations and intensified to be realistic, forgotton completely or kept at the present level but with senior management being made aware that the present system is far from foolproof and mistakes will occur.

8. The planning should involve intensive works to locate and verify the quality and quantity of construction materials if they are to be provide from within the national park for road construction prior to commencement.

9. Training of National Park Rangers and further involvement in planning stages will be essential if future jobs are to be completed to a high standard. This training should include:

   i. Planning

   ii. Construction

   iii. Rehabilitation

   iv. Dieback

   v. Contracts and Control of Contractors

10. Training of District Officers to improve their knowledge of such factors as environmental considerations and fire control considerations. This training may not be required for district officer's already conversant with these matter.

11. A reduced workload on all district staff or an increase in staff so that appropriate time can be allocated to the supervision of the future roading programme.

12. The establishment of an effective costing system to determine all costs related to road construction not just contractor costs. These costs should include Ranger and District staff travel. This will enable more accurate costing for proposed works to be undertaken in future years.

13. Due to the policy of having to work via Head Office for contracts over $5 000 a greater understanding of procedures and responsibilities of the District and Head Office respectively is essential.

14. The future contracts should be spread over a greater period of time so that the jobs can be completed without haste and without being curtailed by weather conditions.

15. The contracts should more specific so that both the contractor and the departmental staff are clear of responsibilities and obligations.

16. The time limits of contracts should be realistic and the contractor should be bound to these times with penalties occurrring if the jobs are not completed within the specified period.

17. A policy should be formulated on funding. Due to the limited funds available we presently build more new road while not having to the funds to maintain the roads which already exist. We must either accept that or curtail new roading until funding is provided to an adequate level to maintain existing roads.

18. Standards must be established for roading in the national parks. I believe a minimum and maximum set of specifications should be established so officers unfamiliar with existing roading have at least guidelines to work from.

The specifications should be:

i. Minimum

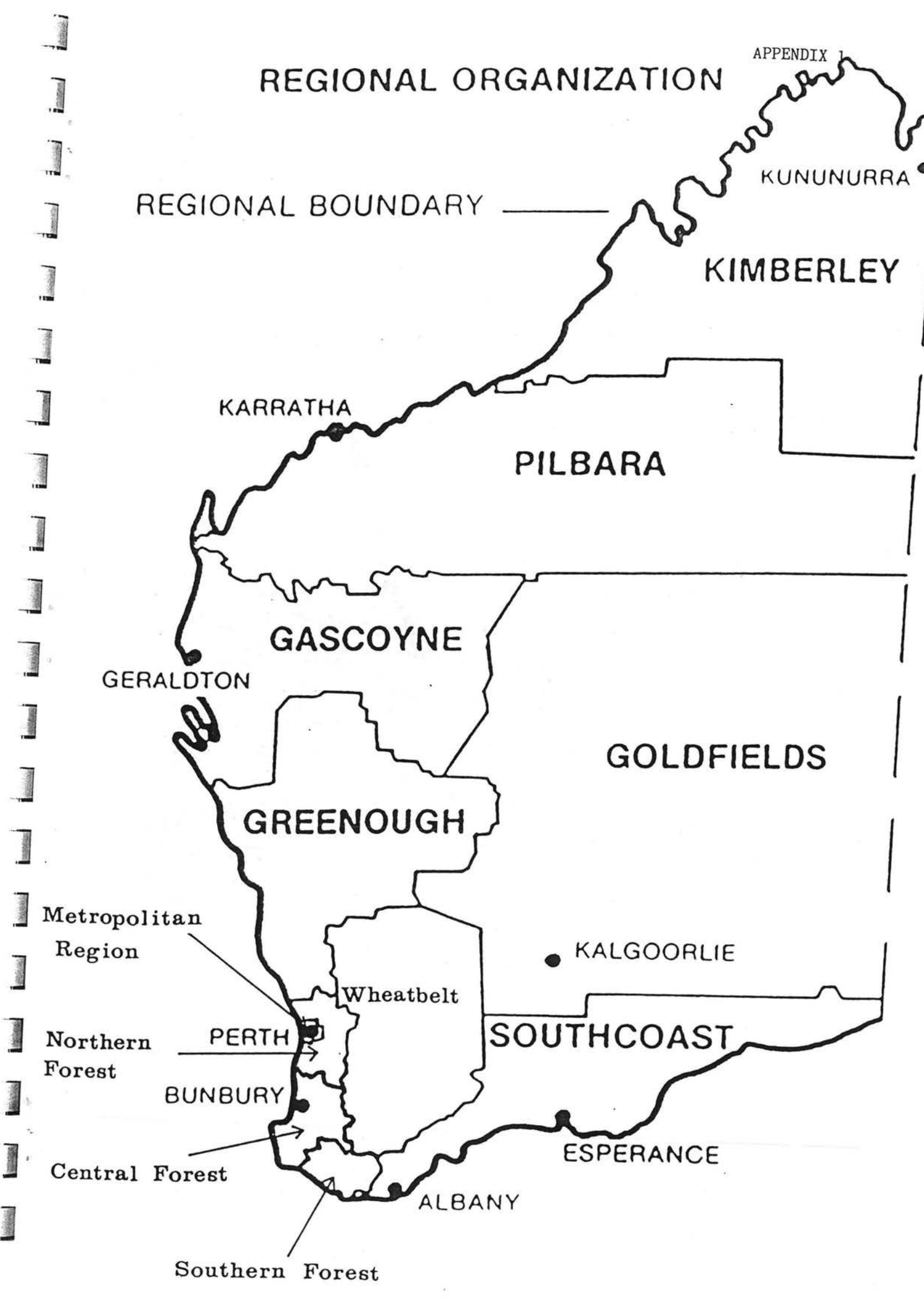
Clearing width	-	6m
Forming width	-	5.5m
Sheeting width	-	5.5m
Sheeting depth	-	150mm compacted minimum
Curve Diametres	-	300m
Miscellaneous	-	All works to be cambered, have table and off-shoot drains and culverts of not less than 300 mm be used.

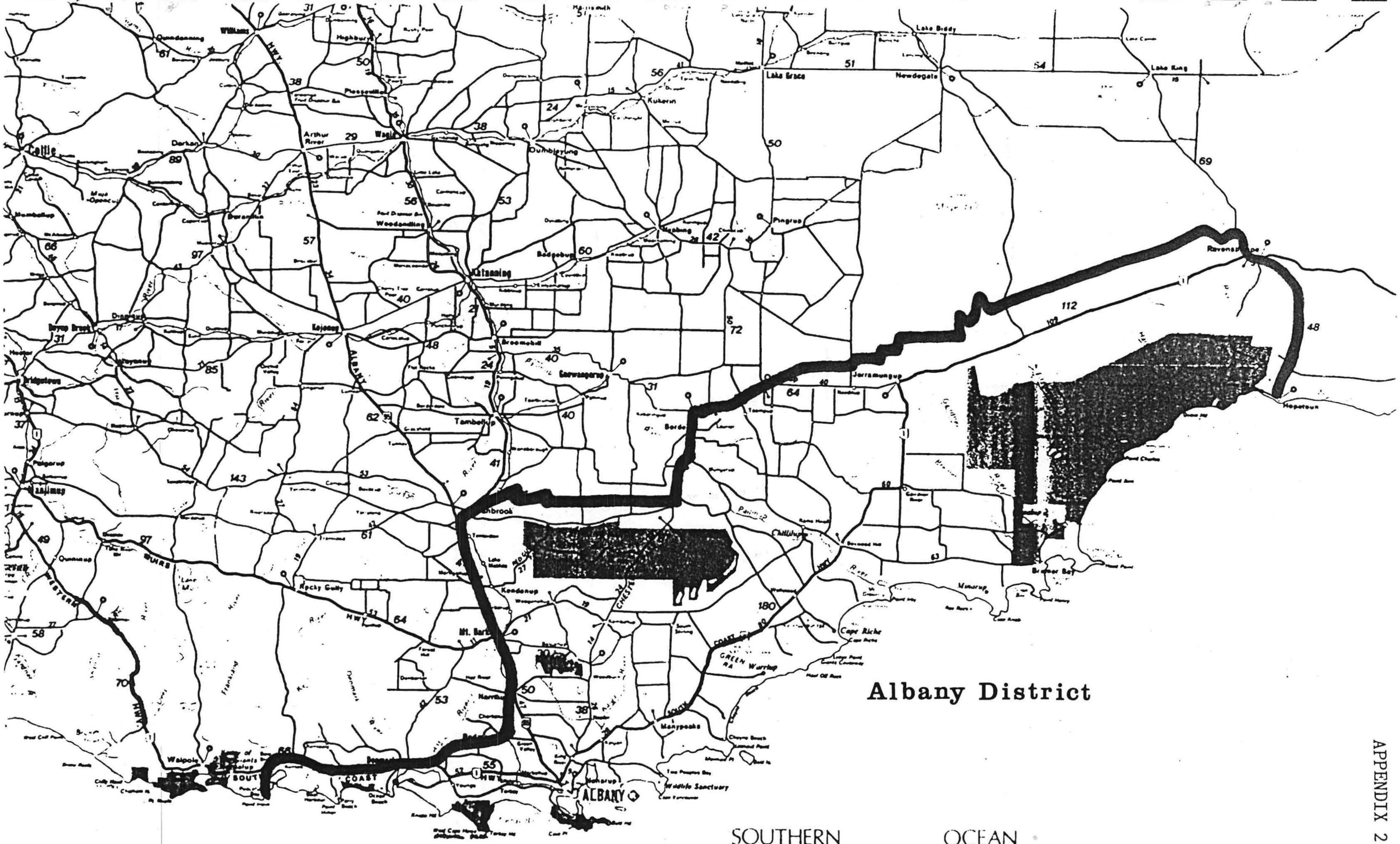
ii. Maximum

Clearing width	-	10m
Forming width	-	8m
Sheeting width	-	8m
Sheeting depth	-	200 mm compacted minimum
Curve diametre	-	560 m
Miscellaneous	-	All works to be cambered, have table and off-shoot drains. Culverts not to be less than 375 mm and curves to be super-elevated by 3 percent.

APPENDIX 1

REGIONAL ORGANIZATION

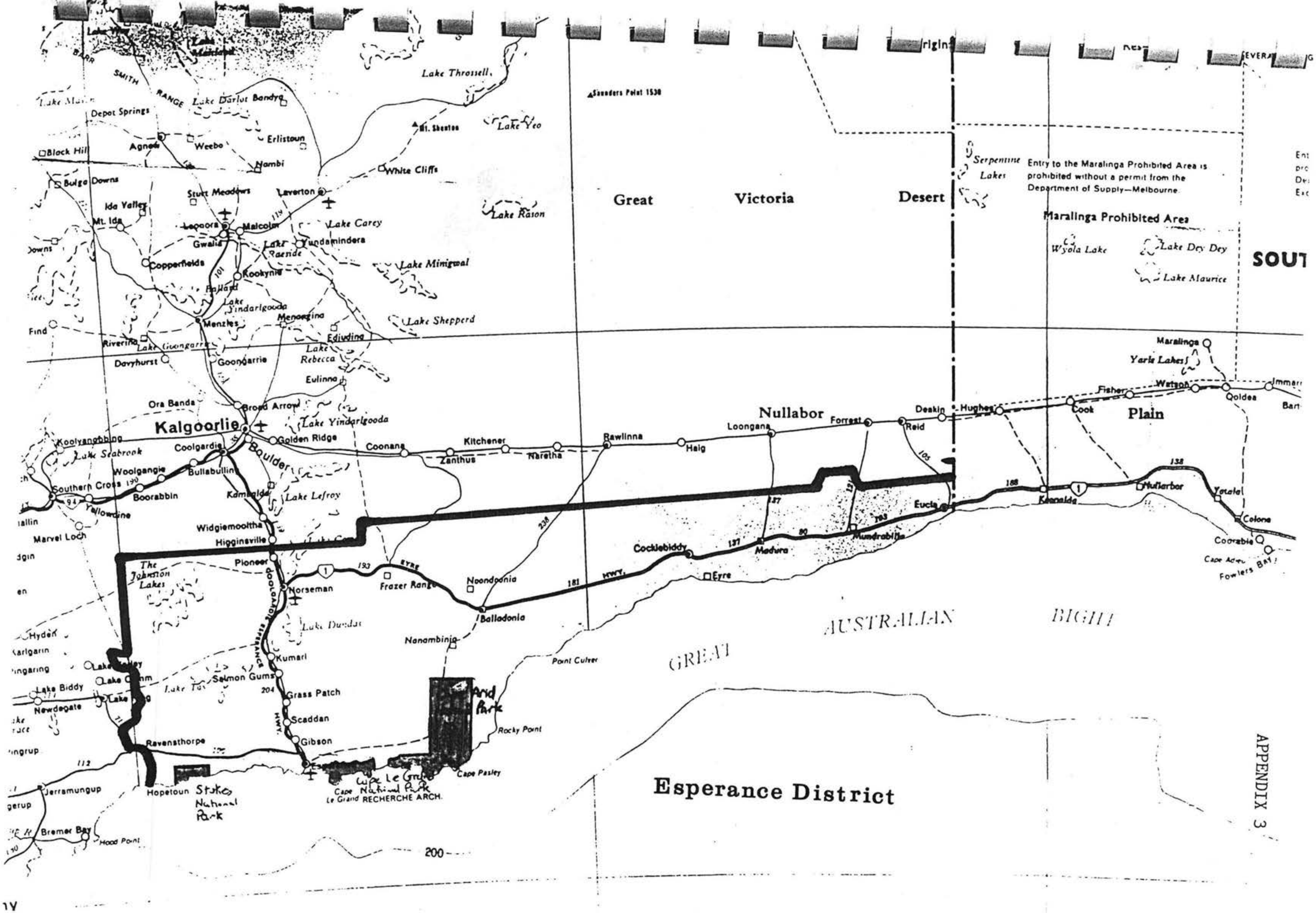




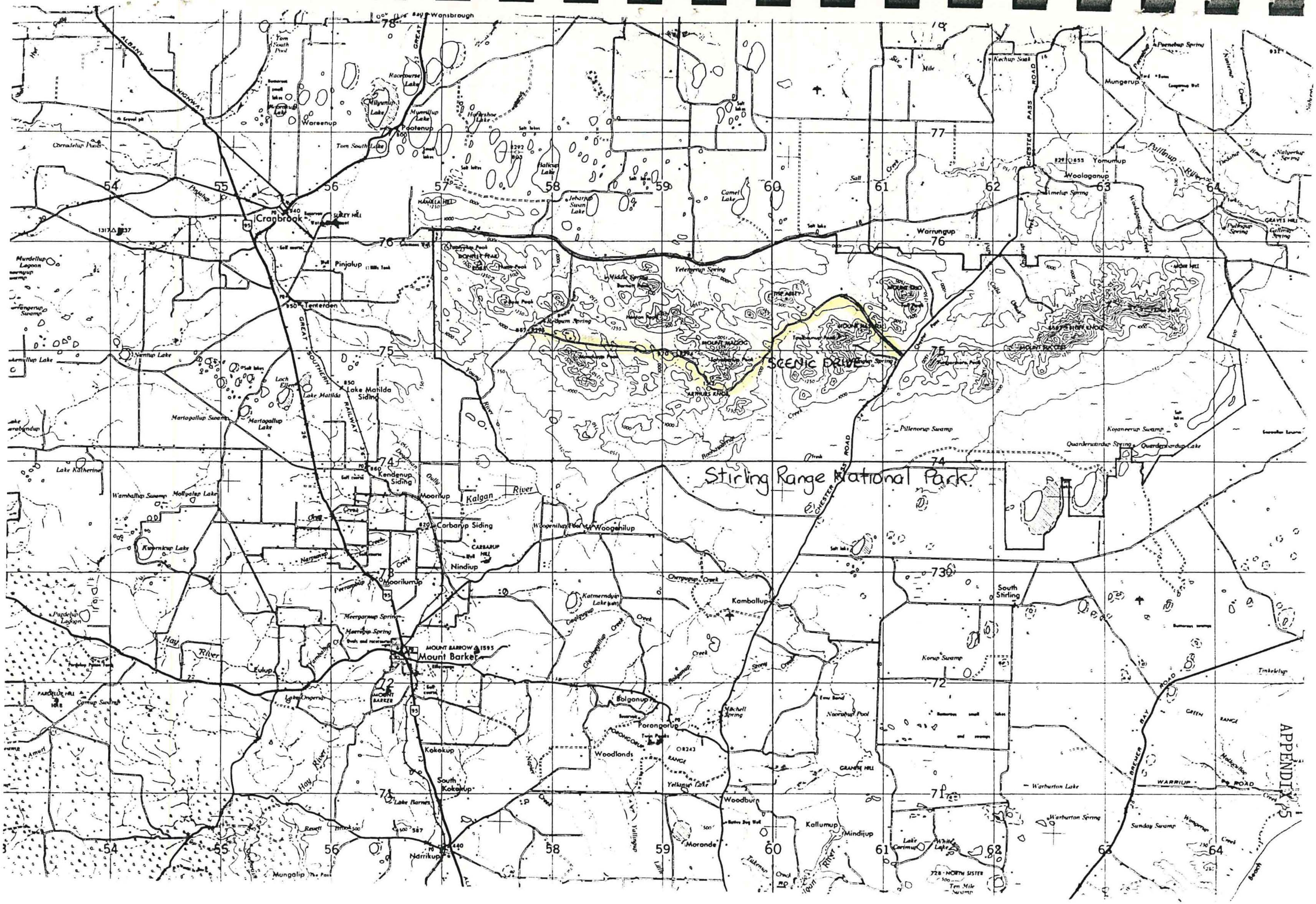
Albany District
SOUTHERN OCEAN
ALBANY
Katanning
Wagin
Williams
Arthur River
Collie
Bridgetown
Kojonup
Broomehill
Tambellup
Gnowangerup
Kukerin
Dumbleyung
Pingrup
Lake Grace
Newdegate
Jerramungup
Ravensthorpe
Hopetoun
Bremer Bay
Cape Riche
Manypeaks
Mt. Barker
Rocky Gully
Walpole

APPENDIX 2

APPENDIX 3



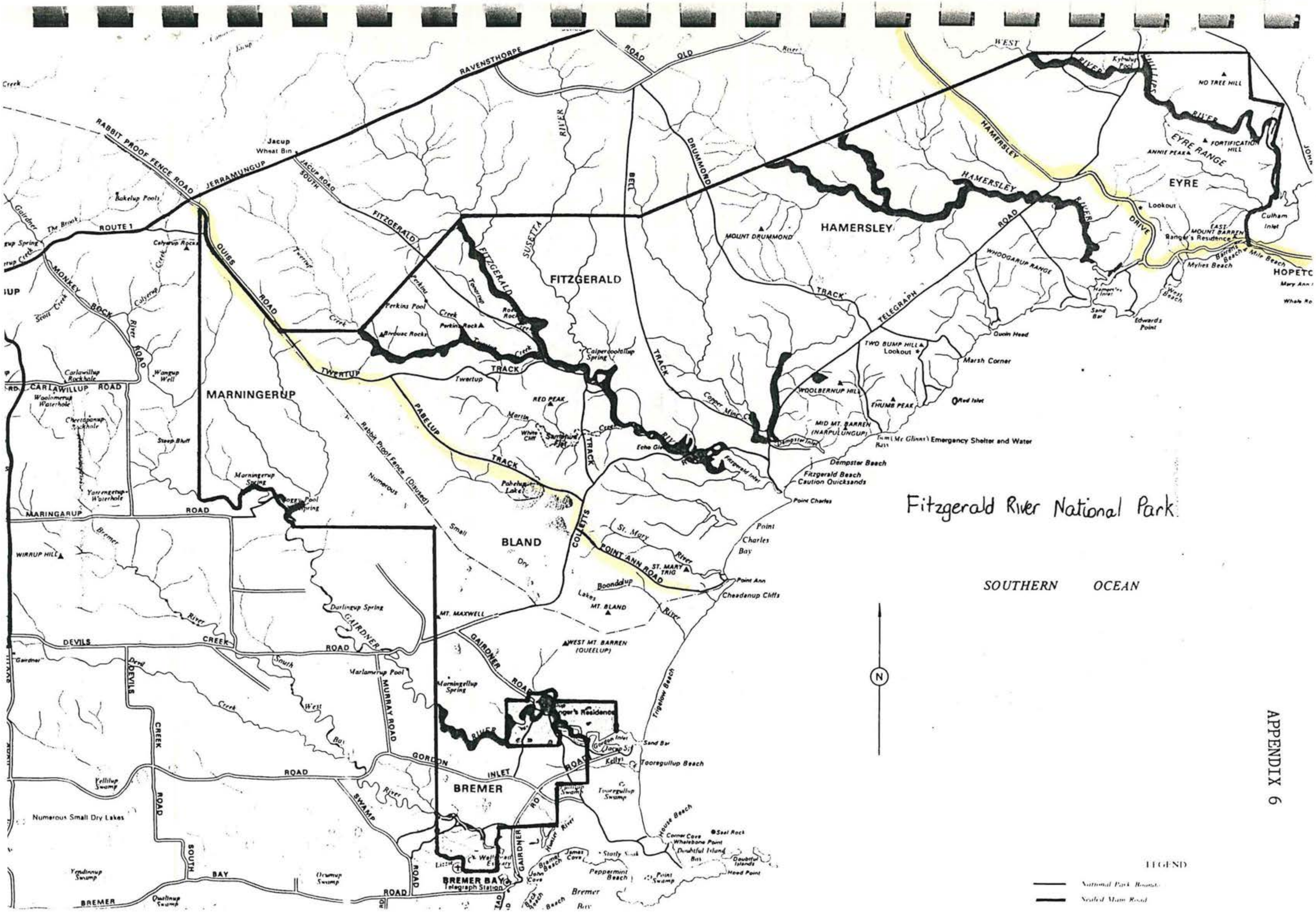
Esperance District
Great Victoria Desert
Nullabor Plain
GREAT AUSTRALIAN BIGHT
Entry to the Maralinga Prohibited Area is prohibited without a permit from the Department of Supply—Melbourne.
Maralinga Prohibited Area
Kalgoorlie
Boulder
Coolgardie
Norseman
Esperance
Balladonia
Cocklebiddy
Madura
Mundrabilla
Eucla
Forrest
Reid
Deakin
Hughes
Cook
Fisher
Watson
Ooldea
Maralinga
Loongana
Rawlinna
Haig
Naretha
Kitchener
Zanthus
Coonana
Golden Ridge
Broad Arrow
Ora Banda
Menzies
Goongarrie
Davyhurst
Leonora
Gwalia
Malcolm
Laverton
Kookynie
Copperfields
Mt. Ida
Ida Valley
Sturt Meadows
Agnew
Weebo
Erlistoun
Nambi
White Cliffs
Depot Springs
Block Hill
Bulga Downs
Lake Throssell
Lake Darlot
Lake Yeo
Lake Rason
Lake Carey
Lake Minigwal
Lake Shepperd
Lake Yindarlgooda
Lake Rebecca
Lake Lefroy
Lake Dundas
Lake Raeside
Lake Goongarrie
Lake Seabrook
Lake Dey Dey
Lake Maurice
Wyola Lake
Yarle Lakes
Serpentine Lakes
Saunders Point 1530
Mt. Shenton
Menangina
Edjudina
Eulinna
Koolyanobbing
Woolgangie
Bullabulling
Southern Cross
Boorabbin
Yellowdine
Marvel Loch
Kambalda
Widgiemooltha
Higginsville
Pioneer
The Johnston Lakes
Frazer Range
Noondoonia
Eyre
Nanambinia
Kumarl
Salmon Gums
Grass Patch
Scaddan
Gibson
Ravensthorpe
Hopetoun
Stokes National Park
Cape Le Grand National Park
Cape Le Grand
RECHERCHE ARCH.
Arid Park
Rocky Point
Cape Pasley
Point Culver
Hyden
Karlgarin
Lake Biddy
Newdegate
Jerramungup
Bremer Bay
Hood Point
Nullarbor
Koonalda
Yalata
Colona
Coorabie
Fowlers Bay
EYRE HWY.
DOOLGARDIE ESPERANCE HWY.
200



Stirling Range National Park
SCENIC DRIVE
Cranbrook
Tenterden
Pinjalup
Wareenup
Pootenup
Wonsbrough
Lake Matilda Siding
Kendenup Siding
Moorilup
Carbarup Siding
Nindiup
Moorilurrup
Mount Barker
Woogenilup
Kamballup
South Stirling
Bolganup
Porongorup
Woodlands
Kokokup
South Kokokup
Narrikup
Mungalip
Woodburn
Kallumup
Mindijup
Morande
Warrungup
Mungerup
Yomunup
Woolaganup
Kalgan River
Hay River
Pallinup River
GREAT SOUTHERN HIGHWAY
ALBANY HIGHWAY
GREAT SOUTHERN RAILWAY
CHESTER PASS ROAD
BREMER BAY ROAD
Pillenorup Swamp
Korup Swamp
Warburton Lake
Lake Katherine
Martagallup Lake
Kwornicup Lake
Lake Barnes

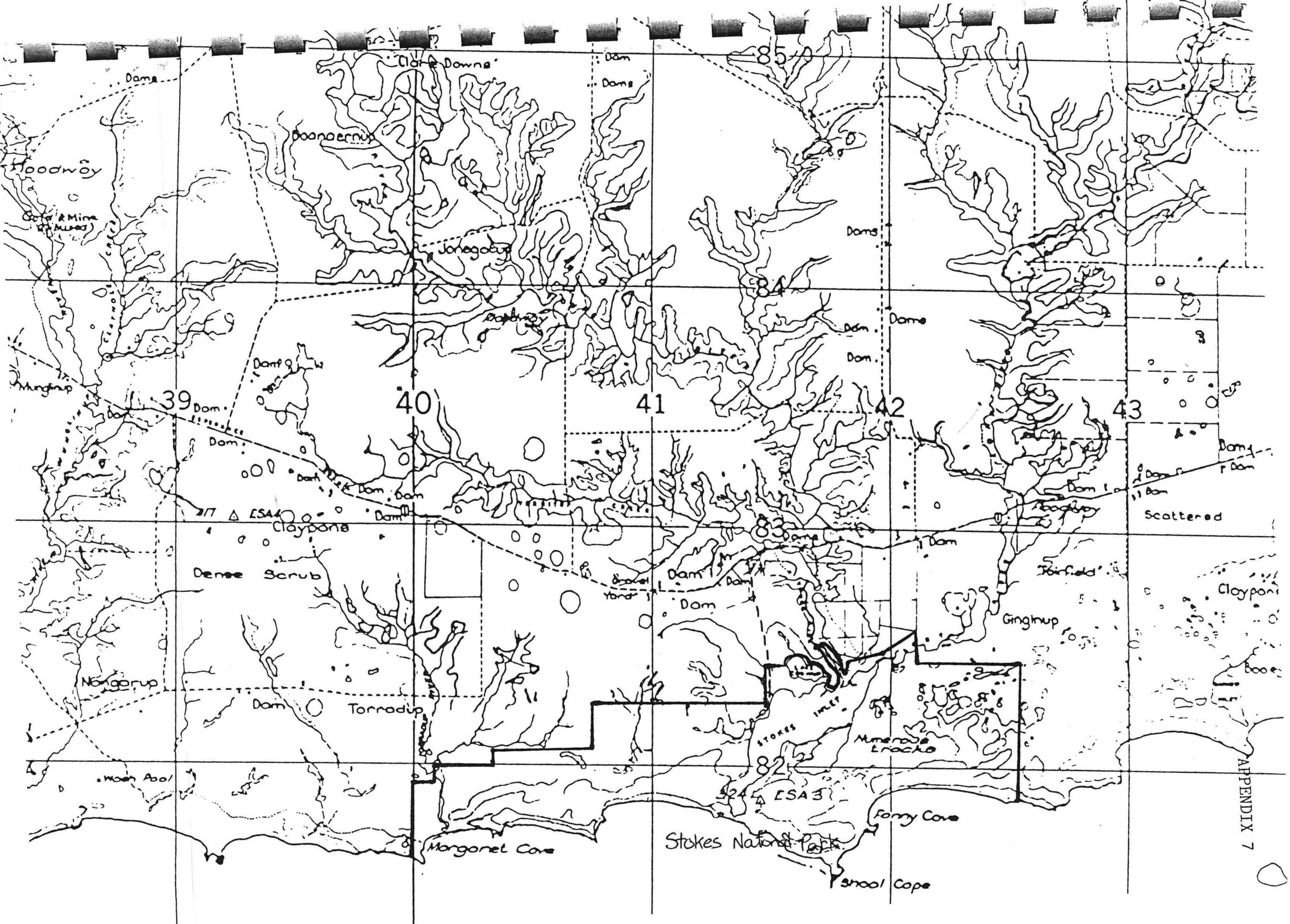
APPENDIX 5

APPENDIX 6



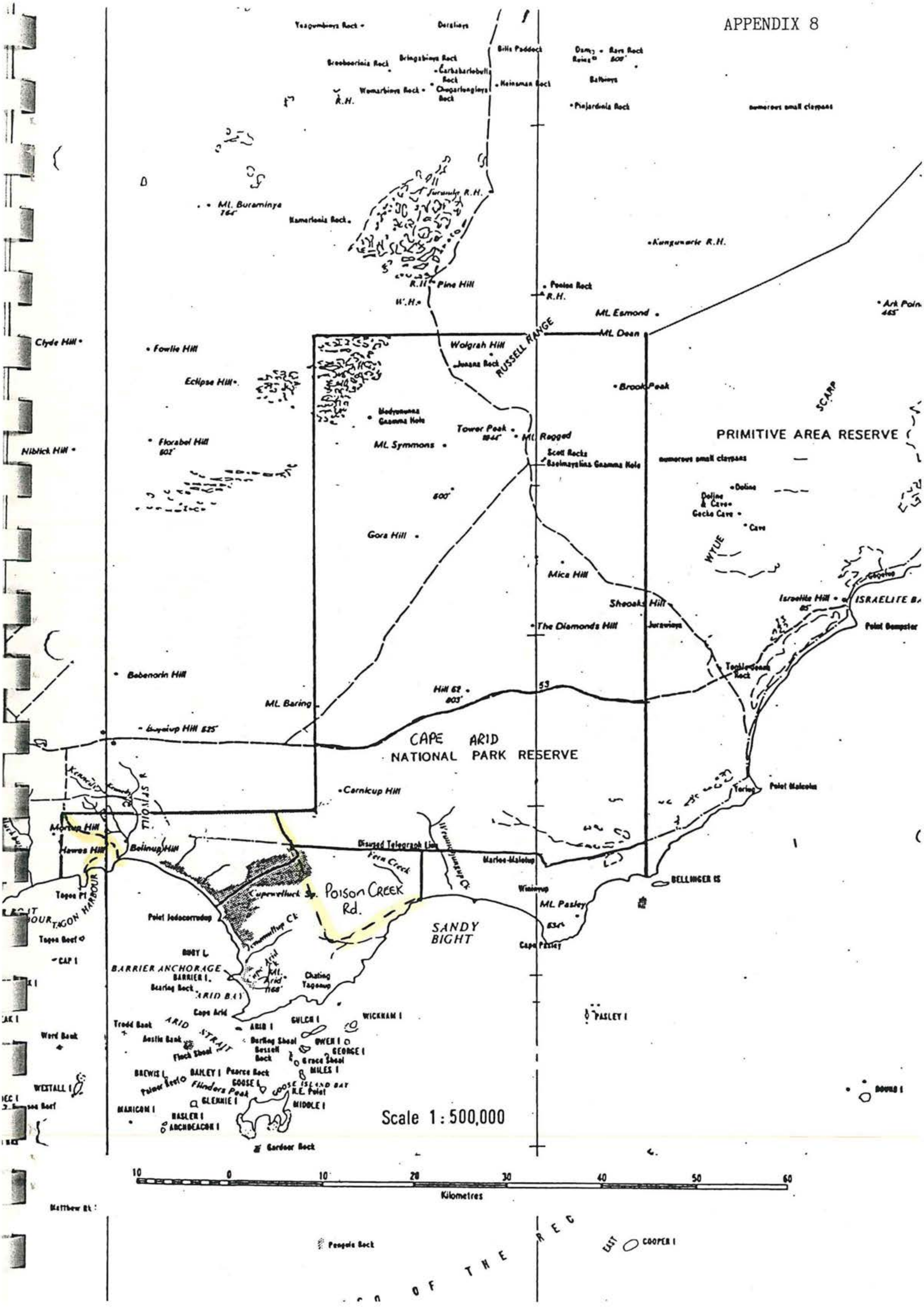
Fitzgerald River National Park
SOUTHERN OCEAN
FITZGERALD
HAMERSLEY
EYRE
MARNINGERUP
BLAND
BREMER
RAVENSTHORPE
JERRAMUNGUP
ROUTE 1
RABBIT PROOF FENCE ROAD
Jacup
Wheat Bin
JACUP ROAD
SOUTH
FITZGERALD
RIVER
OLD
ROAD
WEST
BELL
DRUMMOND
TRACK
HAMERSLEY
DRIVE
EYRE RANGE
FORTIFICATION HILL
ANNIE PEAK
NO TREE HILL
PHILLIPS
RIVER
Kybulup Pool
Lookout
EAST MOUNT BARREN
Ranger's Residence
Culham Inlet
HOPETO
Mylies Beach
MOUNT DRUMMOND
WHOOGARUP RANGE
TELEGRAPH
ROAD
SUSETTA
QUIBS
ROAD
Perkins Pool
Perkins Rock
Bivouac Rocks
Twertup
TWERTUP
TRACK
PABELUP
RED PEAK
Samphire Flat
Copper Mine
Calpercoolallup Spring
TWO BUMP HILL
Lookout
Quoin Head
Marsh Corner
WOOLBERNUP HILL
THUMB PEAK
Red Islet
MID MT. BARREN
(NARPULUNGUP)
Emergency Shelter and Water
Dempster Beach
Fitzgerald Beach
Caution Quicksands
Fitzgerald Inlet
Point Charles
Point Charles Bay
Rabbit Proof Fence (Disused)
Numerous Small Dry Lakes
Pabelup Lakes
COLLETTS
POINT ANN ROAD
St. Mary River
ST. MARY TRIG
Point Ann
Cheadanup Cliffs
Boondalup
Lakes
MT. BLAND
MT. MAXWELL
GAIRDNER
ROAD
WEST MT. BARREN
(QUEELUP)
Tigelow Beach
Marningerup Spring
Moir Pool Spring
MONKEY
ROCK
ROAD
Calyerup Rocks
Bakelup Pools
Carlawillup Rockhole
CARLAWILLUP
ROAD
Woolomerup Waterhole
Cheetapanup Rockhole
Steep Bluff
Yarrengerup Waterhole
MARINGARUP
ROAD
WIRRUP HILL
Bremer
Dunlingup Spring
GAIRDNER
River
DEVILS
CREEK
ROAD
Marlamerup Pool
MURRAY ROAD
Marningellup Spring
RIVER
Ranger's Residence
Gordon Inlet
Sand Bar
Tooregullup Beach
GORDON
INLET
ROAD
Tooregullup Swamp
SWAMP
River
House Beach
Corner Cove
Whalebone Point
Doubtful Island
Seal Rock
Doubtful Islands
Hood Point
Peppermint Beach
Point Swamp
Bremer Bay
Beach
BREMER BAY
Telegraph Station
John Cove
James Cove
Numerous Small Dry Lakes
Yellilup Swamp
Yendinnup Swamp
Oceanup Swamp
Qualinup Swamp
BAY
ROAD
BREMER
SOUTH
CREEK
ROAD
N
LEGEND
National Park Boundary
Sealed Main Road

APPENDIX 7

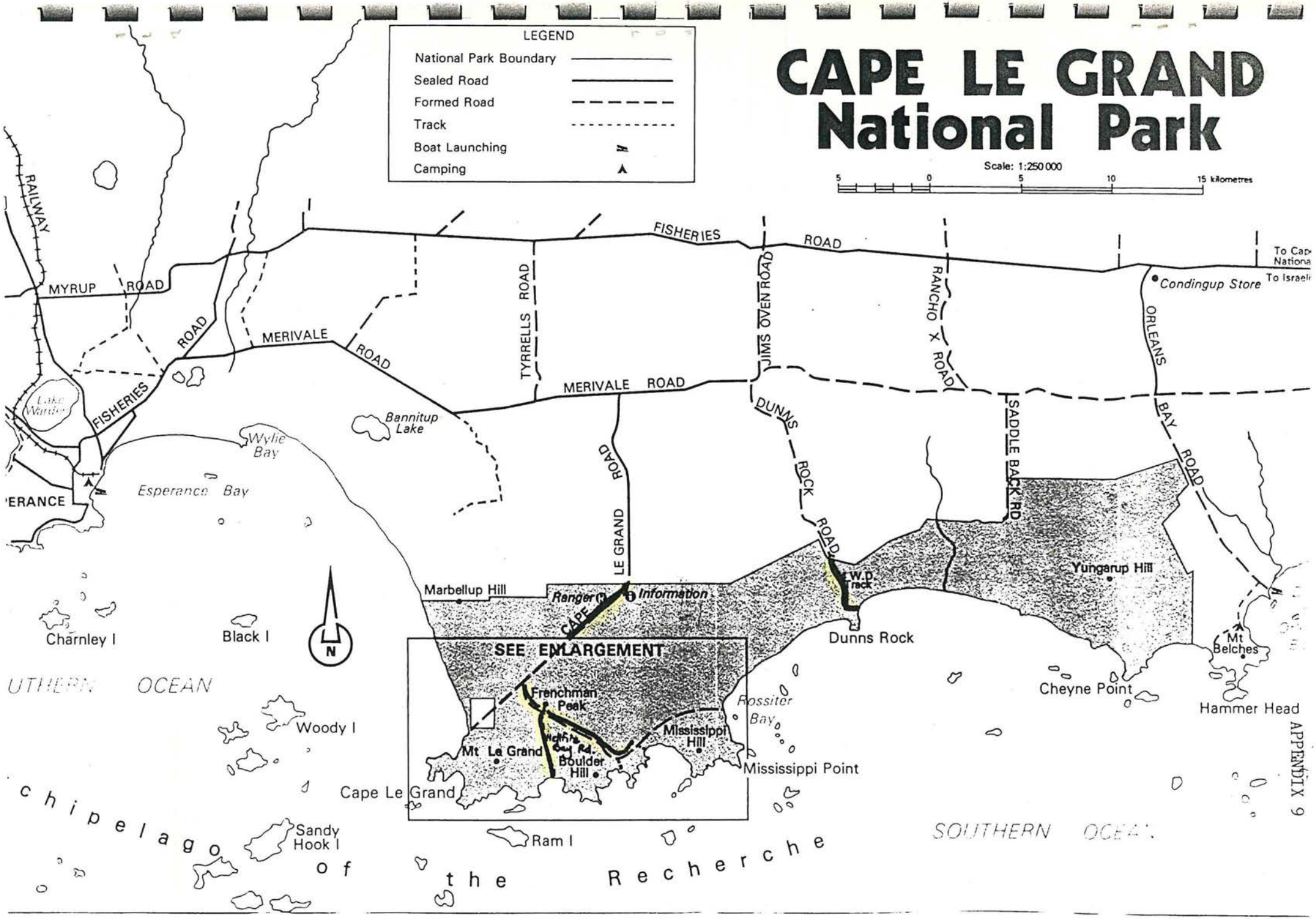


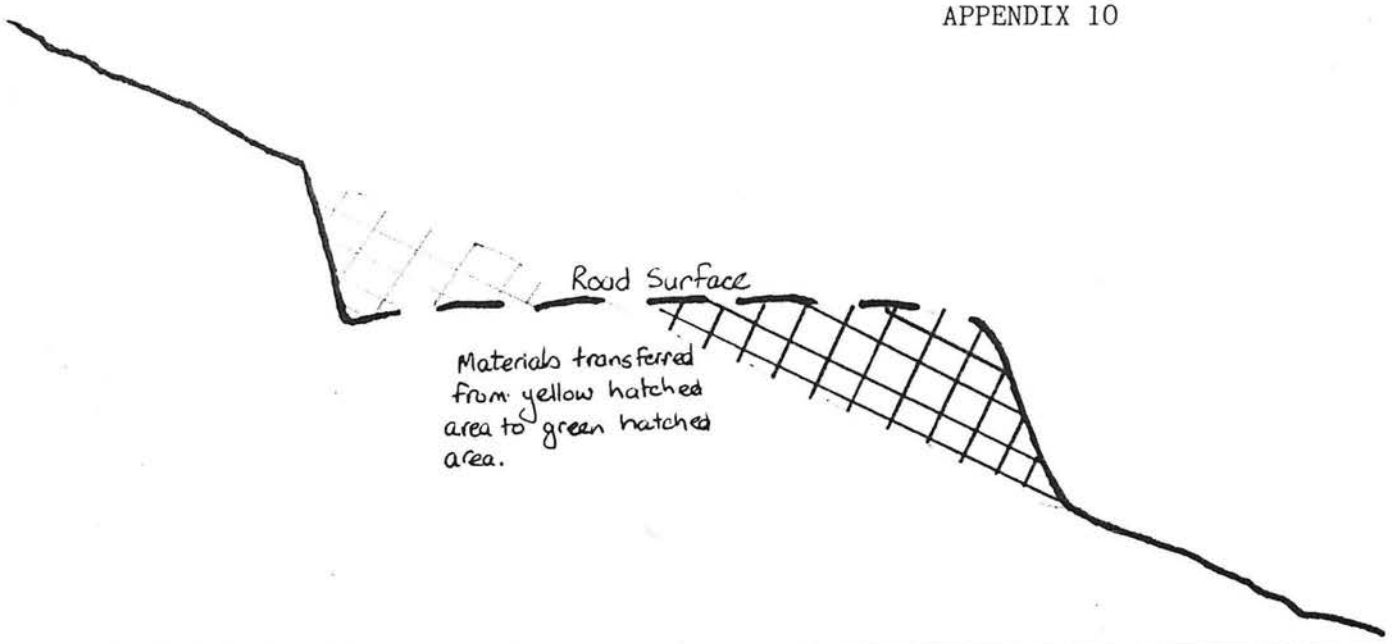
Clare Downs
Dam
Dams
39
40
41
42
43
85
84
83
82
Dam
Claypans
Dense Scrub
Nongorup
Torradup
Scattered
Claypans
Ginginup
ESA 4
ESA 3
Stokes Inlet
Fanny Cove
Stokes National Park
Shoal Cape
Margaret Cove

APPENDIX 8



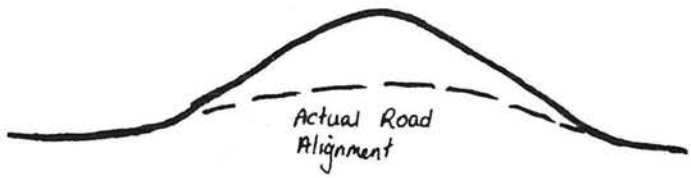
Bills Paddock
Balbinya
Pinjardinia Rock
numerous small claypans
Mt. Buraminya
Kamarlonia Rock
Kunguwarie R.H.
Pine Hill
Poolon Rock
R.H.
Mt. Esmond
Mt. Dean
Ark Point
Clyde Hill
Fowlie Hill
Eclipse Hill
Wolgrah Hill
RUSSELL RANGE
Brook Peak
SCARP
PRIMITIVE AREA RESERVE
Tower Peak
Mt. Ragged
Mt. Symmons
Scott Rocks
numerous small claypans
Niblick Hill
Florabel Hill
Doline
Gecko Cave
Cave
Gora Hill
WYUE
Mica Hill
Sheoak Hill
Israelite Hill
ISRAELITE BAY
Point Dempster
The Diamonds Hill
Bobenorin Hill
Hill 62
Mt. Baring
CAPE ARID
NATIONAL PARK RESERVE
Carnicup Hill
Point Malcolm
Morton Hill
Hawes Hill
Belinup Hill
Disused Telegraph Line
Fern Creek
Poison Creek Rd.
SANDY BIGHT
Mt. Pasley
Cape Pasley
BELLINGER IS
Point Jedacorrudup
BARRIER ANCHORAGE
BARRIER I.
ARID BAY
Cape Arid
Mt. Arid
ARID STRAIT
ARID I
GULCH I
WICKHAM I
PASLEY I
OWEN I
GEORGE I
MILES I
GOOSE I
GOOSE ISLAND BAY
MIDDLE I
Flinders Peak
BAILEY I
BREWIS I.
GLENNIE I
MARICOM I
HASLER I
ARCHDEACON I
WESTALL I
Ward Bank
Gardner Rock
Scale 1:500,000
10
0
10
20
30
40
50
60
Kilometres
Pengele Rock
COOPER I


LEGEND
National Park Boundary
Sealed Road
Formed Road
Track
Boat Launching
Camping
CAPE LE GRAND
National Park
Scale: 1:250 000
5 0 5 10 15 kilometres
RAILWAY
MYRUP ROAD
FISHERIES ROAD
MERIVALE ROAD
TYRRELLS ROAD
JIMS OVEN ROAD
RANCHO X ROAD
ORLEANS BAY ROAD
DUNNS ROCK ROAD
SADDLE BACK RD
LE GRAND ROAD
Condingup Store
To Cape National
To Israeli
Lake Warden
Bannitup Lake
Wylie Bay
Esperance Bay
ERANCE
Marbellup Hill
Ranger
Information
CAPE
W.D. Track
Yungarup Hill
Dunns Rock
Mt Belches
Cheyne Point
Hammer Head
SEE ENLARGEMENT
Frenchman Peak
Mississippi Hill
Mt Le Grand
Boulder Hill
Rossiter Bay
Mississippi Point
Cape Le Grand
Charnley I
Black I
Woody I
Sandy Hook I
Ram I
N
UTHERN OCEAN
SOUTHERN OCEAN
chipelago of the Recherche
APPENDIX 9



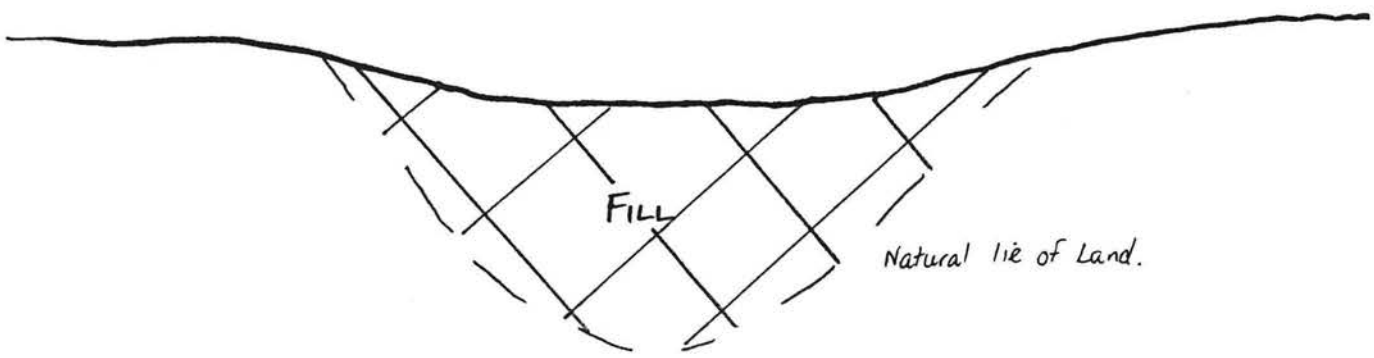
Cutting

Front View



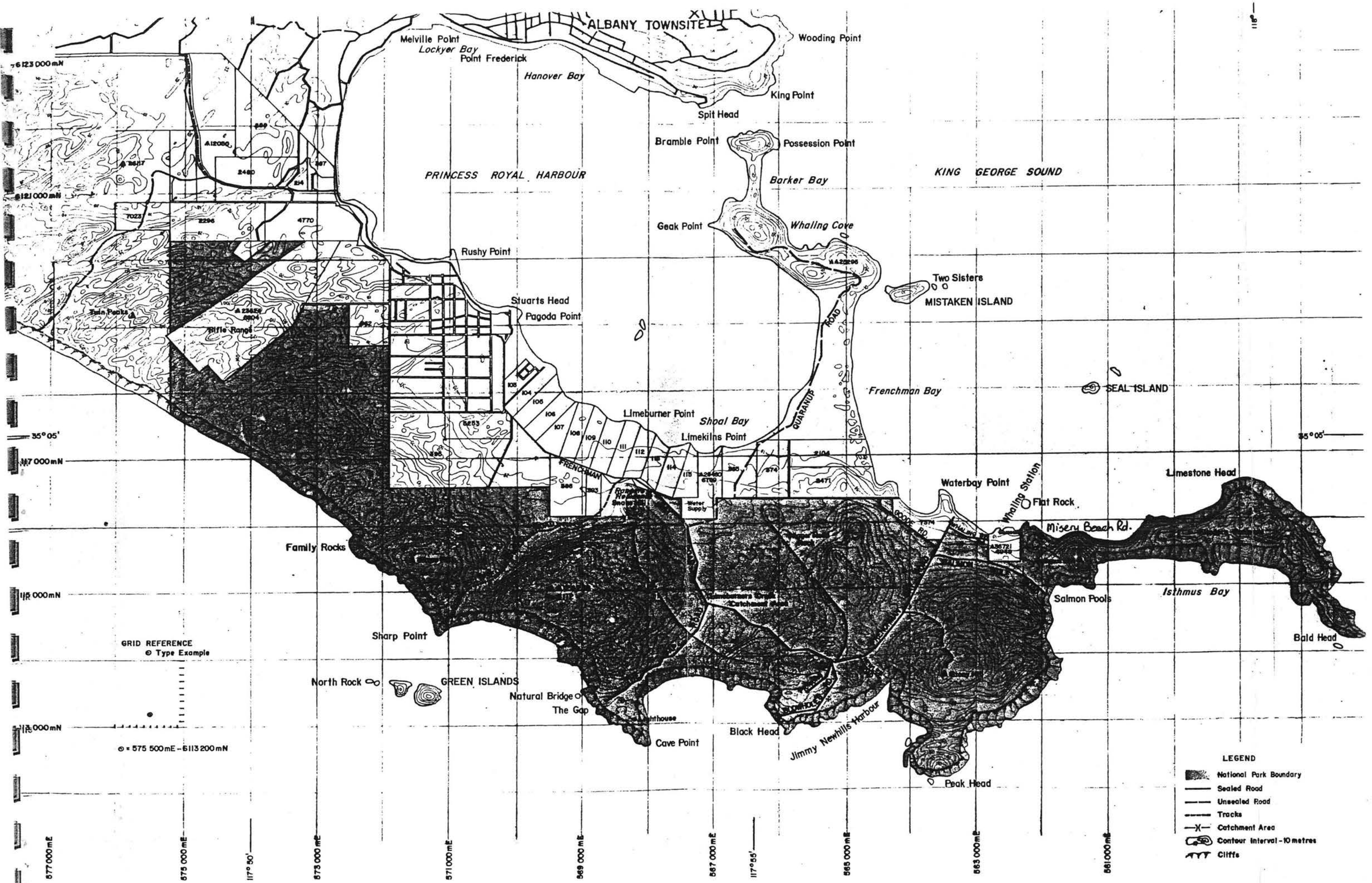
Side View

Filling



References

Due to the lack of reference material available related to roading in National Parks, the author's main sources of reference during compilation were the Regional Manager John Watson, who has a intimate knowledge of roading in National Parks and the Operations Officer Terry Maher who has had a wide experience in roading and road construction techniques in State Forest.



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To MR PRIDHAM ..... ALBANY ..... 30/7/ 19 86

REGIONAL FORESTER – TRAINING ..... Western Australia

Reference–H.O. .....

Local .....

SUBJECT: TRAINING REPORT – FORESTERS PROMOTIONAL EXAMINATION

Please find enclosed my report "Roading in South Coast National Parks". The report stems from my close involvement in all facets of the 1986 roading programme conducted in south coast national parks. I believe the report will be of practical benefit for managers of national parks in the South Coast Region. The report will be distributed to the following people:

Regional Manager	South Coast Region
District Manager	Esperance
District Manager	Albany
Environmental Protection Branch Manager	Como
A/Divisional Manager	Como.

GLYN YATES
FOREST RANGER

FB. JS 18/8.
GB
NC per 21/8.