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← *Seek Alternatives:*  
*This pasture returned to full production after gravel mining.*

Result of no topsoil management, inadequate ripping, no seeding, lack of nutrients and poor species selection. (C. 13 Years) →



← **REHABILITATION**  
*Objective at Year 1:*  
*Good understorey development*  
*Note: Close contour deep ripping.*

If done correctly - the result at Year 3. →

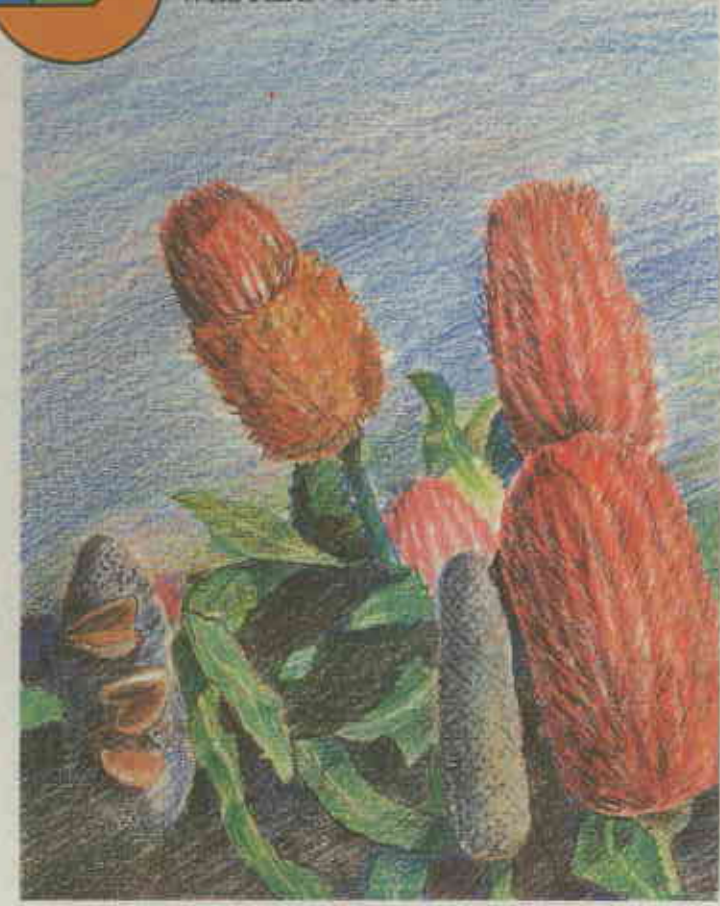


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GUIDELINES FOR

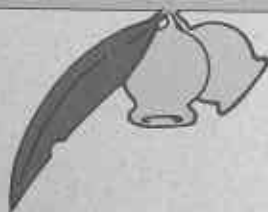
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**THE MANAGEMENT AND  
REHABILITATION OF GRAVEL PITS**

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SOUTH WEST FOREST AREAS

BACKGROUND .....	1
SITE SELECTION .....	2
LEAD TIMES .....	2
SENSITIVE MANAGEMENT .....	2
PROSPECTING .....	2
DIEBACK STATUS .....	2
ALTERNATIVE SOURCES .....	3
MAXIMISING RESOURCES .....	3
WATER CONSERVATION .....	3
FLORISTIC VALUES .....	3
VISUAL IMPACT .....	4
OTHER PLANNING REQUIREMENTS .....	4
OPERATIONAL & REHABILITATION PROCEDURES .....	5
COMMISSIONING .....	5
POLLUTANTS .....	6
REHABILITATION .....	7
CHECKLIST A .....	12
CHECKLIST B .....	14
SEED MIX PRESCRIPTIONS .....	16



Quarrying on Conservation and Land Management (CALM) lands results in the loss of conservation and production values. It also impacts on aesthetics, recreational and water production values.

The aim of this document is to establish a consistent standard for management and rehabilitation to minimise these impacts.

This document is to be used for all CALM operations, leases and is to be included as contract conditions for CALM contractors.

Policy Statement No. 2 - Basic Raw Materials should be used in conjunction with this document.

This document is presented in two parts:-

- (i) **The Guidelines** which outline the principles of pit management. (Minimum criteria are in **Bold Type**).
- (ii) **The Checklists** which are essentially a summary of the guidelines for approval to commence new pits (Checklist A) and for rehabilitation (Checklist B).

**Lead Times**

Ideally 3 months lead time is required to allow timber salvage and to complete environmental checks. (See also Dieback Status).

**Sensitive Management**

Checklist A and any other relevant checklist must be completed and approvals obtained.

**Prospecting**

Testing should be done in a systematic manner during dry soil conditions and subject to dieback controls.

**Dieback Status**

- The dieback status of the pit must be ascertained before any work commences and a 7-Way Test may be required. A minimum of three years no burn lead time may be necessary to allow expression of dieback symptoms if dieback free gravel is required.
- Dieback-free forest is a valuable resource.

Gravel Source

Dieback-free Gravel

Gravel Destination

Dieback-free  
Uninterpretable  
Suspect  
NEQ (Not Effectively  
Quarantined)

Dieback gravel

Dieback  
Immediately below dieback  
in high potential risk  
(where appropriate)

Outside of CALM Land, dieback-free gravel should only be used for high value, protectable locations.

**Alternative Sources**

Sites with low natural values should be utilized in preference to mining undisturbed ecosystems, eg: powerline easements, cleared private property, etc.

**Maximising Resource**

- Avoid shallow resources. Try to maximise the resource available for every hectare cleared. A suggested minimum depth of gravel is one metre.
- Maximise resource by utilizing alternatives (Shale/coarse sand) as a base in boggy country

**Water Conservation**

Pits proposed in harnessed catchments must be discussed with Water Authority of WA. Sediment control structures may be required. Contour drains to slow water speed, and allow sediment to settle and disperse water over a larger area (preferably into litter) are desirable. These need not be earthen banks but may be formed using reject logs, stones or branches. Pit layout and access should be designed to prevent water accumulation and erosion. Pits are not to be located within stream reserves.

As a minimum standard all second and third order (or higher) water courses within 3km of a catchment reservoir are to have a buffer of 100m from the drainage point of the pit.

For water courses in non harnessed catchments or outside the 3km zone the minimum buffer width is 50m.

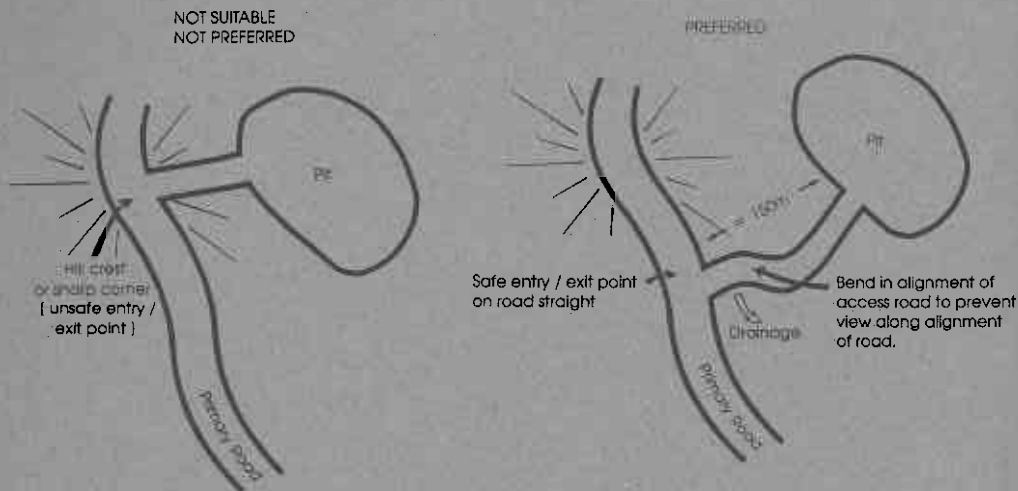
**Floristic Values**

All sites are to be checked for D.E.F. and priority listed species before any operation proceeds. This should preferably be carried out during spring.

## Visual Impact

This must be minimised by adequate screening (buffer) from public roads (150 metres is a suggested minimum), by dog legging the access roads into the pit and by avoiding sites in view of prominent observation points.

FIG. 1 LOCATION OF ACCESS TRACK



## Other Planning Requirements

No more than 2ha is to be cleared at any one time without the approval of the Regional Manager.

A pit management plan showing sequence of mining (Figures 2 and 3), access routes and topsoil management strategies is to be produced and attached to Checklist "A".

## Commissioning

### Clearing

Clearing boundaries are to be marked with white paint crosses facing the area to be cleared. In non-forest situations the boundary must be pegged with prominent white painted pegs flagged with white tape. All forest produce may be harvested at the users expense if less than 3 months notice is given to the District.

Debris, free of topsoil, must be cleared into heaps or windrows at a distance of no closer than 5m from standing trees and burnt, or if required retained for later scattering over the rehabilitated pit after topsoil has been spread over the pit surface.

### Dieback Management

- All earthmoving machinery must be clean of all dirt and root material to the satisfaction of the District Manager before entering or leaving the pit.
- Access to the pit must be properly formed and free draining. Drainage from access roads should not enter the pit.
- Dieback-free pits must be closed to unauthorised access whilst not in use. This should consist of a physical, immovable barrier.
- All vehicles entering a dieback-free pit must be clean of soil and root material. This may require the establishment of a suitably located washdown facility in the field.
- Dieback-free pits should be worked under dry soil conditions.

## Stripping Topsoil

Topsoil Management is of critical importance. This is the only effective means of re-establishing a diverse vegetation.

- **A nominal 100 to 150mm of topsoil is to be stockpiled.** Immediate topsoil use should be encouraged by sequential operations if the pit is ongoing (See Figure 3). Topsoil from the newly cleared area should be used for rehabilitation of the previously mined area. Subsoil below 150mm depth must be stored separately.

## Gravel Winning

- Gravel should be won from the front of the pit first and progress to the back of the pit if possible. If material quality is patchy, mixing from various sites will be necessary.
- To increase pit life basement clay can be mixed with surface gravel.
- Gravel winning should be carried out by a bulldozer fitted with rippers in preference to a wheeled loader. The dozer should push up sufficient gravel and basement clay to allow mixing at the loading phase.
- Rock crushing to improve utilization should be encouraged.

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## Pollutants

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- No oil changes in the pit.
- Remove soil contaminated by spilt oil and fuel.
- Remove all rubbish.

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## Rehabilitation

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### Landscaping

- Batters must be no greater than **1 vertical to 4 Horizontal** (14°). Pit floors should have at least 1:100 fall to avoid ponding and dieback intensification. Drainage should be constructed to avoid dieback spread on a broad front downhill from pit.
- Laterite floaters must be cracked, removed, or buried in the batters. Rockpiles only with approval of DM.

### Ripping

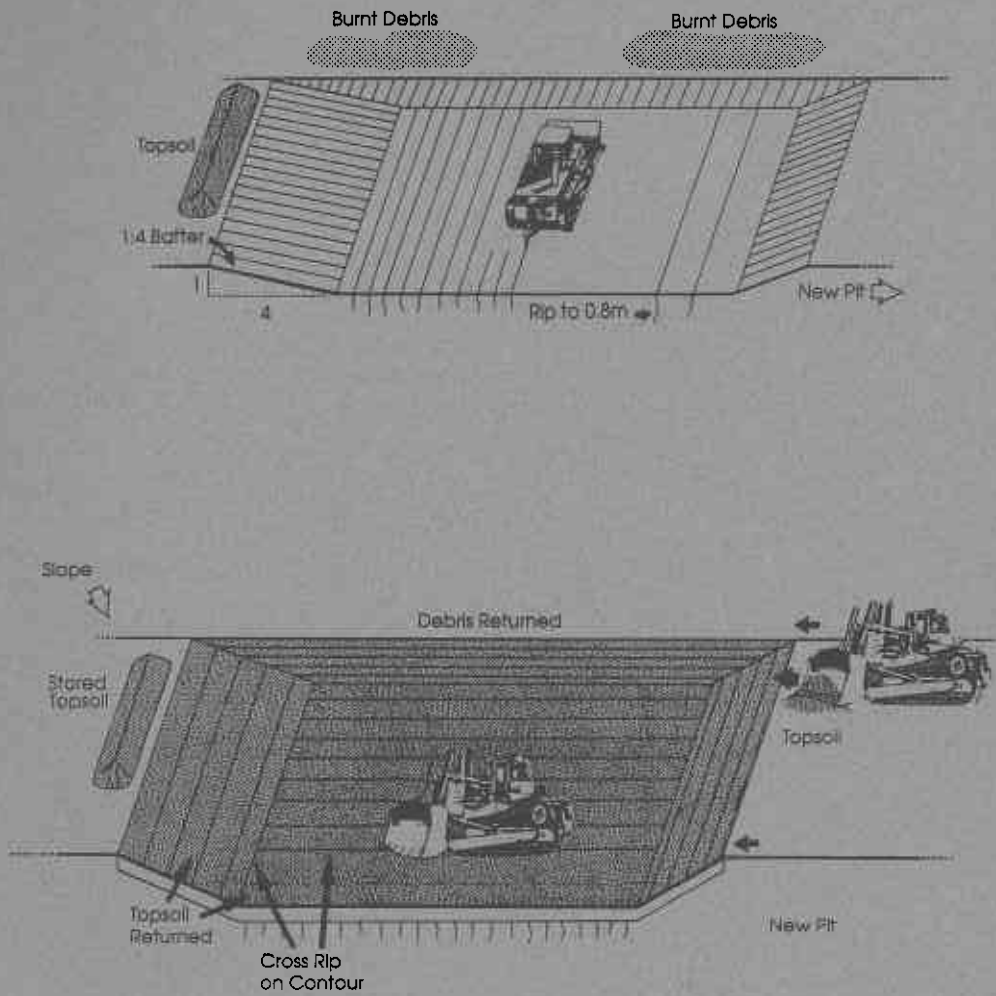
- Ripping should be carried out during summer months to maximise shatter zone in clay base materials.
- The pit floor **must** be ripped at **1m intervals across the contour to a depth of 0.8m** prior to return of overburden and then topsoil. **After the return of topsoil the pit must be cross ripped on the contour at 1 metre intervals to a depth of 0.8 metres.** Capacity to achieve this should be investigated prior to approving large scale operations.

**If ripping to depth is not possible the operator will be required to drill and blast the caprock.** This will have a bearing on site selection and depth of excavation. Holes should be on 4m x 5m centres to min 1.5m depth with adequate charge to shatter the caprock without blowing out (eg 4.5kg Anfo)

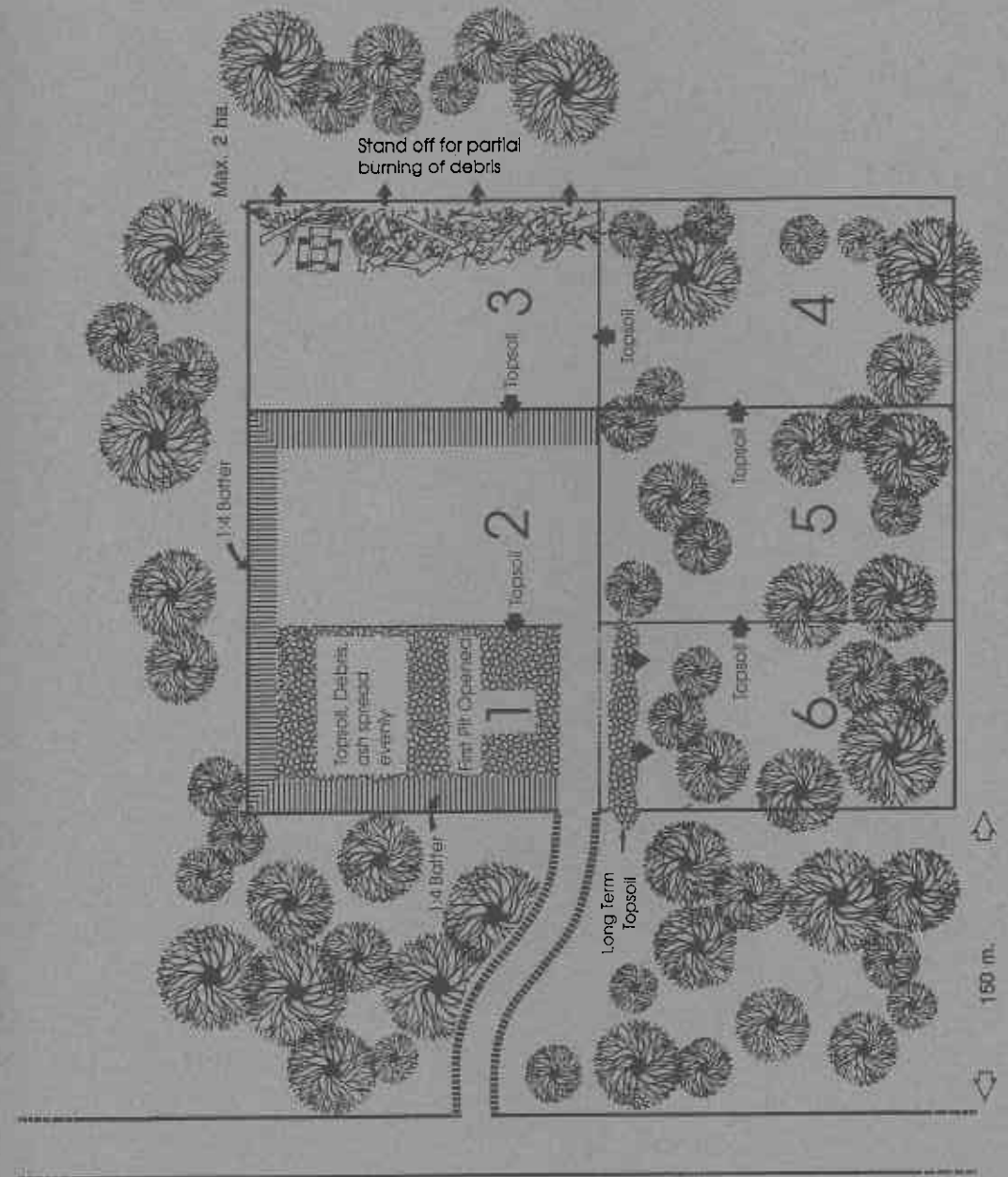
Batters should be ripped one way on the contour.

**Winged tyne rippers should be used to increase the shatter zone.**

**FIG. 2 IDEALISED PIT MANAGEMENT**



**FIG. 3 IDEALISED MINE PLAN**



### Topsoil Return

- Topsoil return is not permitted until the site has been inspected and approved (Checklist 'B').
- Topsoil should be returned evenly. Fresh topsoil should be used whenever possible. Final surface should be rough. Vegetation and debris are to be returned to the pit floor and minimum of 1 den log and mound per ha to be provided as per Chuditch Management Program.

### Road Closure

- Closed access roads should be returned to original profile and ripped to 0.8m depth.
- A windrow/ditch/log should be placed at the entry.

### Seeding

- Seeding should take place in April. **Indigenous tree and shrub species only** are to be used. (See lists appended). Rate : Min 1.5 kg mixed seed/ha. (Major overstorey tree species must be included in the seed mix as well as in the planting stock).
- Species used should reflect the pre-existing and surrounding species as much as possible.
- Seed bearing brush is a useful seed source.

### Planting

- Planting of overstorey species is required in the first year at a rate of 600 trees/ha. Second year planting of trees and shrubs is required if a success criterion of less than 30 shrubs and 5 trees per 100m<sup>2</sup> (10mx10m) over 90% of the area is not achieved by year 2.
- Use random spacing and pattern or alternatively rows should not be readily visible from adjacent roads.

### Weed Control

- Weed Control may be required in year 2.

### Fertilizer

- 100g DAP buried adjacent (150mm) each seedling.
- Min 250kg/ha superphosphate is to be applied prior to seeding. If topsoil is insufficient or of low fertility 400kg/ha should be applied.



Photocopy as required.

**APPROVAL FOR CLEARING OF GRAVEL EXTRACTIONS**

Planning		Initial to confirm check is completed	Comments
1.	CONFORMS WITH POLICY STATEMENT NO.2 and sensitive management checklists		
2.	ALTERNATIVES EXAMINED		
3.	OUT OF SIGHT OF PROMINENT OBSERVATION POINTS		
4.	150 m BUFFER FROM ROAD (or sufficiently screened)		
5.	50 m BUFFER FROM OTHER WATER COURSES. >100 m IN HARNESSSED CATCHMENT		
6.	OUTSIDE STREAM RESERVE/V.R.M. FOR ROAD RESERVE		
7.	SINGLE ACCESS ROAD APPROVED		
8.	DIEBACK STATUS AND PROPOSED USE OF MATERIAL (>3 year No Burn if D/B free)		
9.	DIEBACK MANAGEMENT PLANS (7 WAY TEST)		
10.	PUBLIC ACCESS BARRIERS NEEDED		
11.	DRF & OTHER CONSERVATION VALUES		
12.	MAXIMUM OF 2 ha (AT ANY ONE TIME)		
13.	CLEARLY DEMARCATED		
14.	TIMBER RECOVERY PLAN AGREED (ATTACH) (Adequate lead time?)		
15.	*SKETCH PLAN APPROVED (ATTACH)		
16.	TOPSOIL MANAGEMENT AGREED (ATTACH) - DEPTH - STOCKPILE - IMMEDIATE USE ON EXISTING PIT?		
17.	REHAB BACKLOG ADDRESSED (ATTACH) (COMPLETION OF CHECKLIST B MAY BE NECESSARY)		

\* Sketch plan to show access, drainage control, topsoil stockpile, sequential mining proposals

Signed: \_\_\_\_\_ (Operator) \_\_\_\_\_

APPROVAL IS NOW GIVEN TO CLEAR ..... ha. AS PROPOSED IN THE

(District Manager) Date: \_\_\_\_\_

ATTACHED PLAN AND DEMARCATED IN THE FIELD.



## SOUTH WEST FOREST AREAS

Selection can be made from the following list. Availability may be the major constraint.

(Seed should preferably be collected locally)

A - Northern Jarrah Forest

B - Eastern Jarrah/Wandoo Forest

C - Southern Jarrah Forest

D - Southern Karri Forest

Tick (✓) indicates suitability

TREES	A	B	C	D
<i>Allocasuarina decussata</i>				✓
<i>Allocasuarina fraseriana</i>	✓	✓	✓	
<i>E. accedens</i>	✓	✓		
<i>E. calophylla</i>	✓	✓	✓	✓
<i>E. diversicolor</i>			✓	
<i>E. haematocylon</i>			✓ (Busselton, Kirup, Collie)	
<i>E. marginata</i>	✓	✓	✓	✓
<i>E. wandoo</i>	✓	✓		
SHRUBS				
<i>Acacia alata</i>	✓	✓	✓	
<i>acelastrifolia</i>	✓	✓	✓	
<i>drummondii</i>	✓	✓	✓	
<i>pulchella</i>	✓	✓	✓	
<i>browniana</i>			✓ (Manimup)	✓
<i>lateritica</i>	✓		✓ (Kirup)	
<i>microbotrya</i>	✓	✓		
<i>myrtifolia</i>			✓	✓
<i>saligna</i>	✓		✓	
<i>urophylla</i>			✓	✓
<i>Adenanthos barbigerus</i>	✓		✓	✓ (Not K types)
<i>Allocasuarina humilis</i> (sandy sites, dry)	✓		✓	
<i>Bosslaea ornata</i>	✓	✓	✓	
<i>Daviesia decurrens</i>			✓	
<i>Dryandra nivea</i>	✓		✓	
<i>D. sessilis</i>	✓	✓	✓	
<i>Gastrolobium spinosum</i>	✓		✓	
<i>Grevillea brevicuspis</i>			✓	✓
<i>Hakea lissocarpa</i>	✓	✓	✓	✓
<i>Hakea trifurcata</i>	✓		✓	
<i>Hovea chorizemifolia</i>	✓		✓	
<i>Hovea elliptica</i>		✓	✓	
<i>Isopogon sphaerocephalus</i>	✓		✓	✓
<i>Kennedia coccinea</i>	✓	✓	✓	✓
<i>Kennedia prostrata</i>	✓	✓	✓	
<i>Melaleuca scabra</i>	✓		✓	
<i>Mirbella dilatata</i>	✓	✓	✓	✓
<i>Petrophile diversifolia</i>			✓	✓
<i>Sollva heterophylla</i>			✓	
<i>Xanthorhoea gracilis</i>	✓		✓	