

**COOPERATIVE RESEARCH CENTRE
FOR CONTROL OF PHYTOPHTHORA
ROOT DISEASES OF NATIVE
VEGETATION**

**Department of Conservation
& Land Management (CALM)**

CSIRO Division of Forestry

Murdoch University

University of Melbourne

Australian Nature Conservation Agency

Alcoa of Australia Ltd

1. TITLE (<10words) Research Centre for...

Control of *Phytophthora* Root Diseases of Native Vegetation

2. Aim and principal objectives: (<100 words)

To protect Australia's biological resources from a major threat caused by *Phytophthora* root diseases.

We aim to:

- harness and focus excellent but uncoordinated R&D expertise and resources to the problem of controlling *Phytophthora*
- develop an array of effective, practical control prescriptions
- arrest and reverse the current spread and impact of disease through integrated disease management
- communicate the issues and solutions to the community, particularly to relevant land and resource managers
- train young scientists in a range of disciplinary skills to protect our natural resources from pathogens in future
- exploit commercial opportunities derived from the activities of the CRC.

3. Research Classification: (number and title):

Group 1801. Environmental Management

4. Participating Organisations (core)

Name: (Uni Department, CSIRO Division etc.)	Type	Location		Input \$'000 (Total Period)		Strategic contribution				
		Postcode	City	Cash	In Kind	E	R	A	C	D
School of Biological and Environmental Sciences, Murdoch University	U	6150	Perth	-	2,250	✓	✓			
Dept of Biochemistry, University of Melbourne	U	3052	Melbourne	-	3,089	✓	✓			
Western Australia Dept of Conservation and Land Management (CALM)	S	6152	Perth	-	4,389			✓	✓	
Australian Nature Conservation Agency (ANCA)	C	2601	Canberra	1,000	-					✓
Divisions of Forestry/Soils/Entomology CSIRO	C	2600	Canberra	-	2,451	✓	✓			
Alcoa Australia Pty (ALCOA)	I	6154	Perth	216	2,177	✓	✓		✓	

5. Participating Organisations (supporting)

Name: (Uni Department, CSIRO Division etc.)	Type	Location		Input \$'000 (Total Period)		Strategic contribution				
		Postcode	City	Cash	In Kind	E	R	A	C	D
Research School of Biological Science, Australian National University	U	2601	Canberra	-	558		✓			
Dept of Geography, University of Western Australia	U	6009	Perth	-	69		✓			
Dept of Microbiology Monash University	U	3168	Melbourne	-	535		✓			
Dept of Applied Chemistry Royal Melbourne Institute of Technology	U	3083	Melbourne	-	268		✓			
Kings Park and Botanic Garden	S	6005	Perth	-	757	✓	✓			
Chemistry Centre (WA)	S	6004	Perth	-	1,227		✓			
Edith Cowan University	U	6027	Perth	-	304		✓			
Mineral Deposits Pty Ltd	I	6004	Perth	3	18				✓	
Westralian Sands Pty	C	6271	Perth	-	36				✓	✓
Worsley Alumina Pty Ltd	C	6225	Collie	15	5				✓	
RGC Mineral Sands Ltd	C	6530	Geraldton	15	135				✓	
Cable Sands (WA) Pty Ltd	C	6230	Bunbury	6	25			✓		✓
Ciba-Geigy Australia Ltd (Ciba-Geigy)	I	2145	Sydney	105	476				✓	

6. Proposed cooperative arrangements

- CRC will operate as an unincorporated joint venture.
- CRC will be primarily located in Western Australia with nodes in Victoria and the ACT.
- CRC will have two primary components - **Communication & Education** (with a full-time manager) and **Research and Development** (five programs, each managed by a senior scientist).
- There will be a **Board of Management**, with nominees from each core participant, presided over by an independent chairman, which will set overall policies, research directions and budgets.
- There will be a **Management Committee**, chaired by the Director, and consisting of the five program managers and the Communication & Education unit Manager, which will direct, co-ordinate and integrate ongoing activities, meeting on a regular basis.

TITLE: CRC for Control of Phytophthora Root Diseases of Native Vegetation

7. Director Name

Current position and employer

% time in Centre

- The interim director of the CRC will be Dr J. Armstrong (Director, Science and Information, CALM) and the interim deputy director will be Dr K. Old, (Assistant Chief, CSIRO Division of Forestry).
- A full time Director, will be appointed following international advertisement for the position against agreed criteria, upon the recommendation of the Board of Management.

8. Program Leaders and other key researchers

Title/Name	Present Organisation	% time in Centre	Role in Centre
Dr David Coates	WA Dept of Conservation & Land Management	30	Manager Program 1
Dr Ian Colquhoun	ALCOA of Australia	60	Manager " 2
Dr Ray Wills	WA Dept of Conservation & Land Management	60	Manager " 3
Dr Phil O'Brien	Dept of Biol. and Environ Sci., Murdoch University	30	Manager " 4
Assoc Prof Bruce Grant	Dept of Biochemistry, University of Melbourne	50	Manager " 5
Dr Giles Hardy	Dept of Biol. and Environ Sci, Murdoch University	50	Education coordinator
Dr Brian Shearer	WA Dept of Conservation and Land Management	55	Project leader
Mr Mike Stukely	WA Dept of Conservation and Land Management	60	Project leader
Assoc Prof Jen McComb	Dept of Biol. and Environ Sci, Murdoch University	20	Project leader
Dr Nick Malajczuk	CSIRO Division of Forestry	20	Project leader
Dr Inez Tommerup	CSIRO Division of Forestry	40	Project leader
Dr Margaret Byrne	CSIRO Division of Forestry	40	Project leader
Dr Andrew Davidson	Dept of Microbiology, Monash University	10	Project leader
Dr Kingsley Dixon	Kings Park and Botanic Garden	10	Project leader
Dr Ken Gayler	University of Melbourne	30	Project leader
Dr Julie Niere	RMIT	25	Project leader
Dr Adrienne Hardham	RSBS, Australian National University	10	Project leader

9. Outcomes from Centre's activities; strategy for technology transfer

Technology

- GIS-based plans for the control and management of areas at risk from disease.
- A suite of prescriptions for the use of phosphonate, a very effective systemic fungicide, in reducing disease impacts.
- Techniques for the measurement of fungicide residues in plants.
- Ultimately, management options will shift from reliance on hygienic operational prescriptions and chemical application to include biological control methods.

Resource protection

- Australia's biological resources which are threatened by *Phytophthora*-caused disease will be conserved.
- Benefits to our economy (eg employment, tourism and export), material resources (eg wood, food and pharmaceuticals), heritage (eg biodiversity) and environmental life-support systems (adaptability to climate change, etc.)

Commercial product

- Savings of many millions of dollars currently spent on prevention of disease spread in mining, forestry and other operations.
- Patent and Intellectual Property rights to effective solutions, including fungicides.
- Education packages that meet the needs of diverse land managers and horticulturalists operating in disease-risk situations.

Technology Transfer (Primarily via the Communication and Education unit, but also through industrial collaboration)

- By direct communication to operational sectors of end-user participants in the CRC.
- By tailor-made training courses for other public and private sector organisations active in disease risk areas.
- By pro-active initiatives to raise community awareness through centres such as Kings Park and Botanic Garden (KPBG) in Perth.
- By training tertiary students, particularly post-graduate researchers.

10. Budget (\$'000) Period for grant support 7 years

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	TOTAL
participants input in kind								
. salaries								
. capital items								
. other								
total in kind	2756	2764	2678	2646	2610	2643	2680	18769
participants input cash	948	854	268	-	-	-	-	2070
TOTAL (cash + in kind)	3704	3618	2946	2646	2610	2643	2680	20839
CRC funding sought	2135.3	2352.5	2452.6	2707.5	2405.9	2288.1	2116.7	16459.6
GRAND TOTAL	5839.3	5970.5	5398.6	5353.5	5015.9	4931.1	4796.7	37297.0

TITLE: CRC for Control of Phytophthora Root Diseases of Native Vegetation

11. Summary of Research and Education.

Australia is experiencing the most devastating pandemic disease of native vegetation yet recorded.

Phytophthora root disease has been listed as one of five processes threatening the biodiversity of the continent, ANCA being required to develop a Threat Abatement Plan by 1998. The CRC will bring together expertise in Western Australia and key research groups from the eastern States to develop the means to contain the spread of *Phytophthora* spp and reduce their impact on native ecosystems, some of which rank globally as unique centres of plant diversity. The Centre will develop conservation and disease control strategies for native heath and shrub communities, rehabilitated mine sites and adjacent forests and woodlands. These strategies will include land and resource management based on GIS, chemical and biological control of the pathogens and use of resistant species and cultivars of native plants.

Research Unit

Program 1 Disease Management on Natural Lands

Manager: Dr David Coates (CALM)

Integrate the most up to-date methods of disease detection, disease control and flora conservation techniques to provide management prescriptions that reduce the impact of disease on native vegetation and conserve endangered communities and taxa at risk from the diseases. Continuously assimilate useful products from other programs into revised prescriptions

- Rapid Diagnostics: Dr Phil O'Brien/Murdoch, Dr Adrienne Hardham/ANU.
- Control methodologies and Management prescriptions: Dr Brian Shearer /CALM.
- Fungicide Application, Persistence and Efficacy: Dr Brian Shearer/CALM.
- *Ex situ* conservation and gene banking: Dr Kingsley Dixon/Kings Park and Botanic Garden (KPBG).

Program 2 Disease Management in Mining and Rehabilitation Areas

Manager Dr Ian Colquhoun (ALCOA)

Improve cost-effectiveness of disease control and minimise impacts of *Phytophthora* during mining operations in native plant communities. Rehabilitate mined and other severely disturbed areas affected or at risk from *Phytophthora*.

- Improve cost-effectiveness of mining in disease risk areas
- Minimise *Phytophthora* disease associated with mining operations: Dr Ian Colquhoun/ALCOA.
- Minimise *Phytophthora* impacts on rehabilitated sites: Dr Giles Hardy/Murdoch.
- *Phytophthora*-resistant cultivars of trees and shrubs: Dr Jen McComb/Murdoch.
- Marker-aided selection of *P. cinnamomi*-resistant jarrah: Dr Margaret Byrne/CSIRO.

Program 3 Hazard assessment, prediction and decision support tools

Manager Dr Ray Wills (CALM)

Provide a GIS-based decision support system for use in monitoring and controlling the spread of *Phytophthora*-caused disease and the management of highly susceptible taxa.

- Mapping disease distribution through GIS and remote sensing: Dr Ray Wills/CALM.
- Epidemiological modelling of *Phytophthora* disease in landscapes: Wills /CALM.
- Effects of soil microbiological factors on disease epidemiology and impacts: Dr Nick Malajczuk/CSIRO.

Program 4 Molecular Genetics and Biocontrol of *Phytophthora*

Managers Dr Phil O'Brien (Murdoch), Dr Inez Tommerup (CSIRO DF)

Understand host genetic and molecular basis for variation in resistance and susceptibility to *Phytophthora* diseases and develop bio-control methods for *Phytophthora* spp, especially *P. cinnamomi*, based on fungal viruses (dsRNA elements)

- Molecular genetics of *Phytophthora* spp: Dr Inez Tommerup/CSIRO.
- Molecular aspects of pathogenicity: Dr Phil O'Brien/Murdoch.
- Mycoviruses as biocontrol agents: Dr Andrew Davidson/Monash.
- Control strategies based on fungal genetics/viruses: O'Brien, Tommerup, Davidson.

Program 5 Biochemistry and mode of action of Phosphonate

Manager Dr Bruce Grant, University of Melbourne

Enhance the efficacy of phosphonate as a fungicide for *Phytophthora* spp in Australian native vegetation through a more complete understanding of its mode of action.

- Mode of action of phosphonate: Dr Bruce Grant/University of Melbourne.
- Uptake and persistence of phosphonate in the pathogens and hosts: Grant/Dr Julie Niere /RMIT.
- Interaction of phosphonate with host defence responses: Dr Ken Gayler/University of Melbourne.

Education and Communication Unit

Coordinators Dr Giles Hardy/Murdoch, Dr Bruce Grant/Melbourne, Dr Steve Hopper/KPBG

There will be a strong community awareness program focused through KPBG. The CRC will also have a major role in education through training at the post graduate level which will be focussed at Murdoch University and the University of Melbourne. Graduate students will be trained in a wide range of specialist disciplines (co-supervised by CRC research scientists). It will also develop and market through TAFE a prospectus of unit courses in a range of topics including nursery hygiene, propagation and conservation of native flora, field operations and land management to reduce impacts of *Phytophthora*. This will be aimed at employers and agencies with managers and field staff operating in *Phytophthora* disease areas, landcare groups and the concerned public. These courses will draw on the wide range of skills in the CRC, will be tailor-made for client needs and will operate on a user-pays basis.

12. Preferred evaluation panel (tick) life sciences <input checked="" type="checkbox"/> physical sciences and engineering <input type="checkbox"/> both <input type="checkbox"/>																							
13. Contact Officer <table style="width: 100%;"> <tr> <td style="width: 30%;">title and name</td> <td style="width: 40%;">Dr Tony Start</td> <td style="width: 30%;">postal address</td> </tr> <tr> <td></td> <td></td> <td>Dept of Conservation & Land Management Western Australian Wildlife Research Centre P.O. Box 51 Wanneroo W.A. 6065</td> </tr> <tr> <td>position</td> <td></td> <td></td> </tr> <tr> <td>phone</td> <td>(09) 495 5100</td> <td></td> </tr> <tr> <td>fax</td> <td>(09) 306 1641</td> <td></td> </tr> <tr> <td>E Mail</td> <td></td> <td>street address for courier delivery</td> </tr> <tr> <td></td> <td></td> <td>Dept. of Conservation & Land Management Western Australian Wildlife Research Centre Ocean Reef Road Woodvale. W.A.</td> </tr> </table>			title and name	Dr Tony Start	postal address			Dept of Conservation & Land Management Western Australian Wildlife Research Centre P.O. Box 51 Wanneroo W.A. 6065	position			phone	(09) 495 5100		fax	(09) 306 1641		E Mail		street address for courier delivery			Dept. of Conservation & Land Management Western Australian Wildlife Research Centre Ocean Reef Road Woodvale. W.A.
title and name	Dr Tony Start	postal address																					
		Dept of Conservation & Land Management Western Australian Wildlife Research Centre P.O. Box 51 Wanneroo W.A. 6065																					
position																							
phone	(09) 495 5100																						
fax	(09) 306 1641																						
E Mail		street address for courier delivery																					
		Dept. of Conservation & Land Management Western Australian Wildlife Research Centre Ocean Reef Road Woodvale. W.A.																					
Preferred location for interview: Perth																							
14. Application number and title of relevant previous application(s) (if applicable) <table style="width: 100%;"> <tr> <td style="width: 10%;">Round</td> <td style="width: 50%;">Application No.</td> <td style="width: 40%;">Title</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">NO PREVIOUS</td> <td style="text-align: center;">RELEVANT APPLICATION</td> </tr> </table>			Round	Application No.	Title	1	NO PREVIOUS	RELEVANT APPLICATION															
Round	Application No.	Title																					
1	NO PREVIOUS	RELEVANT APPLICATION																					
15. Possible assessors (up to six including at least two Australian and two overseas, giving for each - title and name; - full street address for courier delivery; - phone and fax nos with international codes; - area of expertise)																							
1. Dr Clive Brasier U.K. Forestry Commission Research Station Alice Holt Lodge Wrecclesham near Farnham Surrey England Ph: 44 420 22255 Fax: 44 420 23653	2. Dr Everett Hansen Oregon State University Botany and Plant Pathology Dept Corvallis, Oregon OR 97331 Ph: 1 503 737 5243 Fax: 1 503 737 3479 Pathology of <i>Phytophthora</i> in natural forests and plantations																						
Leading expert on <i>Phytophthora</i> biology and biocontrol using dsRNA																							
3. Prof John Irwin CRC for Tropical Plant Pathology University of Queensland St Lucia QLD 4067 Ph: 61 07 3652790 Fax: 61 07 3654771	4. Dr Mick Brown Forestry Commission of Tasmania GPO Box 207B Hobart Tas 7001 Ph: 61 002 338202 Fax: 61 002 338270																						
Director CRC for Tropical Plant Pathology leading <i>Phytophthora</i> pathologist																							
5. Dr Albert Rovira CRC for Soil and Land Management University of Adelaide Private Bag 2 Glen Osmond SA 5064 Tel: 61 08 3038670 Fax: 61 08 3038699	6. Professor Peter Tsao Dept of Plant Pathology University of California Riverside CA 92521 USA Ph 1 714 787 4131																						
Recently-retired Director CRC for soil and Land Management. World expert on soil microbiology/ Plant interactions.																							
World expert on the genus <i>Phytophthora</i>																							

TITLE: CRC for Control of Phytophthora Root Diseases of Native Vegetation

16. Current research grants held by the director and key researchers of the Centre

Researcher and Researcher's Organisation	Title of Grant	Scheme (eg ARC)		Total \$'000s
K. Old, CSIRO Division of Forestry	Biocontrol of <i>Phytophthora cinnamomi</i>	LWRRDC	1994-97	240
M. Byrne, CSIRO Division of Forestry	Marker-aided selection of resistant jarrah	RIRDC	1994-96	120
B. Grant, University of Melbourne	Mode of action of Phosphonate	ARC LG	1992--94	145
"	Mechanism of Phosphonate action	ARC LG	1995-97	321*
"	The nature and function of Elicitins in <i>Phytophthora</i>	ARC SG	1995	30
"	Development of Phosphonate-based fungicides	RIRDC	1992-94	115
"	Generic fungicides based on Phosphonate	RIRDC	1995-98	168*
"	Control of <i>P. infestans</i> in potato	HRDC	1993-94	126
"	Development of Phosphonate fungicides	Ciba-Geigy	1993-94	105
"	Development of Phosphonate fungicides	Ciba-Geiby	1995-98	150*
P. O'Brien, Murdoch University	Development of DNA diagnostic test for <i>Phytophthora</i> species	ANCA	1992-96	81
"	Distinguishing among ectomycorrhizal fungi from eucalypts	CSIRO/MdU	1994/95	9
"	Isolation of pathogenicity genes from <i>Rhizoctonia solani</i> by linkage to DNA markers	CLIMA	1995	5
"	Isolation of fungal genes controlling pathogen host interactions	MdU (SRG)	1994	8
"	Gene mapping of lupin	GRDC	1994-97	146
"	Application of the random amplified polymorphic DNA (RAPD) assay to identify grain varieties grown by Western Australian farmers	WA Grains	1994/95	7
G. Hardy	Effects of low oxygen levels and water inundation on the resistance of <i>Eucalyptus marginata</i> to <i>P. cinnamomi</i>	MdU (SRG)	1994/95	6
B. Shearer, CALM	Efficacy and application of Phosphonate	ANCA	1992-96	93
"	<i>Phytophthora megasperma</i> as a pathogen	ANCA	1992-96	83
"	Associated pathogens	ANCA	1992-96	60
D. Coates, CALM	Germplasm storage of species threatened by <i>Phytophthora</i>	ANCA	1992-96	83
"	Impact and control of <i>Phytophthora</i>	ANCA	1992-96	47
R. Wills, CALM	GIS modelling of <i>Phytophthora</i> disease	ANCA	1992-96	114

Note: *Indicates funds applied for

TITLE: CRC for Control of Phytophthora Root Diseases of Native Vegetation

16. Cont.

Researcher and Researcher's Organisation	Title of Grant	Scheme (eg ARC)	Grant Period	Total \$'000s
P. O'Brien, Murdoch University	Use of PCR to detect Phytophthora from soil samples	ANCA via CALM	1992-96	40
M. Stukely, CALM	Use of isozyme techniques to identify Phytophthora spp.	MERIWA	1994-95	59

17. Explain how these research programs will interact with the proposed Centre's program.

The ANCA grants are components of a contract between ANCA's Endangered Species Program and CALM. Collectively they form much of the base-line from which the CRC Research and Development Programs one and three are developed. They will continue to under-pin the work of those two Programs and thus be aimed at providing practical tools and techniques for planners and managers. They will also be critically important to ANCA's statutory obligation to prepare a Threat Abatement Plan by 1998. A grant from MERIWA adds another tool to the capacity to identify Phytophthora spp. rapidly and accurately in circumstances where present techniques have limitations.

One of the RIRDC funded projects (Marker-aided selection of resistant jarrah) effectively comprises the current phase of project 2.4. Much of the remaining funding for recent projects in Program two has been provided directly or indirectly by mining companies, particularly ALCOA, often through CALM, Murdoch University etc.

The LWRRDC grant tackles a core component of Program four whilst the array of grants from ARC LG, RIRDC, HRDC and Ciba-Geigy for work on Phosphonate demonstrate the perceived significance of this compound for Australian resource management as well as the commercial potential of phosphonate as a fungicide.

Program 4 will use molecular techniques for the analysis of variability of Phytophthora, both for diagnostic purposes and in studies of pathogenicity. Grants currently supporting research on molecular genetics of other pathogenic genera, and mycorrhizal fungi are providing much valuable information which can be readily applied to Phytophthora research.

The grants are collectively substantial but they are not integrated into a single, multifaceted program of research and development as is proposed for this CRC. Nor are the outcomes made available in the integrated and user-enhanced way that we propose in our communication and Education Unit.

∴

TITLE: CRC for Control of Phytophthora Root Diseases of Native Vegetation

18. Research Staff Resources

(a) Professional staff resources contributed by organisation

Please provide information for the in-kind professional research staff contributed by each organisation. Use your best estimates for a typical year.

Key to the title of Research Subprograms

1	Disease management on natural lands
2	Disease management on mining and rehabilitation sites
3	Hazard assessment, prediction and decision support tools
4	Molecular genetics and biocontrol of Phytophthora
5	Biochemistry and mode of action of phosphonate
6	

Contributing Organisation: CALM

% of Time Spent on Individual Programs												
Name of Researchers	Main Activity	Total % Time	Research Subprograms (R)						Total R	E	C	A
			1	2	3	4	5	6				
D. Coates	R	30	20						20			10
B. Shearer	R	55	50		5				55			
R. Wills	R	60			50				50			10
G. Behn	R	100			100				100			
M. Stukely	R	60		60					60			
TOTAL		305	70	60	155				285			20

Contributing Organisation: CSIRO

Name of Researchers	Main Activity	Total % Time	% of Time Spent on Individual Programs						Total R	E	C	A
			Research Subprograms (R)									
			1	2	3	4	5	6				
K. Old	A	10				10			10			
M. Dudzinski	R	25				25			25			
I. Tommerup	R	40				40			40			
N. Malajczuk	R	20			20				20			
J. Scott	R	10			10				10			
S. Cooke	R	20			20				20			
M. Byrne	R	40		40					40			
R. Corner	R				20							
TOTAL		165		40	70	75			165			

Contributing Organisation: University of Melbourne

∴ % of Time Spent on Individual Programs												
Name of Researchers	Main Activity	Total % Time	Research Subprograms (R)						Total R	E	C	A
			1	2	3	4	5	6				
B. Grant	R	50					30		30	10		10
K. Gayler	R	30				10	20		30			
C. Stehmann	R	100					100		100			
TOTAL		180				10	150		160	10		10

TITLE: CRC for Control of Phytophthora Root Diseases of Native Vegetation

18. Research Staff Resources

(a) Cont.

Contributing Organisation: **Murdoch University**

Name of Researchers	Main Activity	Total % Time	% of Time Spent on Individual Programs									
			Research Subprograms (R)						Total R	E	C	A
			1	2	3	4	5	6				
P. O'Brien	R	30	5			25			30			
J. McComb	R	20		20					20			
TOTAL		50	5	20		25			50			

Contributing Organisation: **ALCOA**

Name of Researchers	Main Activity	Total % Time	% of Time Spent on Individual Programs									
			Research Subprograms (R)						Total R	E	C	A
			1	2	3	4	5	6				
I. Colquhoun	R	70		55	5				60		10	
P. Elliott	C	10								5	5	
G. Baird	C	20								10	10	
G. Kaeding	C	10								5	5	
T. Passcher	E	20								10	10	
J. Gardner	C	5									5	
G. Hardy*	R	90		50	10				60	30		
TOTAL		225		105	15				120	60	45	

* Salary paid by ALCOA 1995-96, thereafter by CRC. Hardy is located at the Murdoch University.

Contributing Organisation: **RMIT**

Name of Researchers	Main Activity	Total % Time	% of Time Spent on Individual Programs									
			Research Subprograms (R)						Total R	E	C	A
			1	2	3	4	5	6				
J. Niere	R	25					25	25				
TOTAL		25					25	25				

TITLE: CRC for Control of Phytophthora Root Diseases of Native Vegetation

18. Research Staff Resources

(a) Cont.

Contributing Organisation: **Kings Park and Botanic Garden**

% of Time Spent on Individual Programs												
Name of Researchers	Main Activity	Total % Time	Research Subprograms (R)						Total R	E	C	A
			1	2	3	4	5	6				
S. Hopper	E	5								5		
K. Dixon	R	10	10						10			
Education Officer	E	100								100		
TOTAL		115	10						10	105		

Contributing Organisation: **Monash University**

% of Time Spent on Individual Programs												
Name of Researchers	Main Activity	Total % Time	Research Subprograms (R)						Total R	E	C	A
			1	2	3	4	5	6				
A. Davidson	R	10				10			10			
TOTAL		10				10			10			

Contributing Organisation: **ANU RSBS**

Name of Researchers	Main Activity	Total % Time	% of Time Spent on Individual Programs									
			Research Subprograms (R)						Total R	E	C	A
			1	2	3	4	5	6				
A. Hardham	R	10	10							10		
TOTAL		10	10							10		

Contributing Organisation: **University of Western Australia**

" % of Time Spent on Individual Programs												
Name of Researchers	Main Activity	Total % Time	Research Subprograms (R)						Total R	E	C	A
			1	2	3	4	5	6				
D. Milton	R	5							5			
TOTAL		5							5			

TITLE: CRC for Control of Phytophthora Root Diseases of Native Vegetation

18. Research Staff Resources

(a) Cont.

Contributing Organisation: Edith Cowan University

Name of Researchers	Main Activity	Total % Time	% of Time Spent on Individual Programs									
			Research Subprograms (R)						Total R	E	C	A
			1	2	3	4	5	6				
I. Bennett	R	20		20					20			
TOTAL		20		20					20			

Contributing Organisation: RGC Mineral Sands Ltd

Name of Researchers	Main Activity	Total % Time	% of Time Spent on Individual Programs									
			Research Subprograms (R)						Total R	E	C	A
			1	2	3	4	5	6				
A. Peterson	R	5		5					5			
D. Herpich	R	10		10					10			
N. McMulkin	R	10		10					10			
TOTAL		25		25					25			

Contributing Organisation: Cable Sands (WA) Pty Ltd

Name of Researchers	Main Activity	Total % Time	% of Time Spent on Individual Programs										Total R	E	C	A
			Research Subprograms (R)													
			1	2	3	4	5	6								
A. Thompson		3		3							3					
TOTAL		3		3							3					

Contributing Organisation: Chemistry Centre (WA)

% of Time Spent on Individual Programs												
Name of Researchers	Main Activity	Total % Time	Research Subprograms (R)						Total R	E	C	A
			1	2	3	4	5	6				
N. Rothnie	R	15	5					10		15		
W. Best	R	25	10					15		25		
Z. Spaclek	R	25	25							25		
B. Greirson	R	20	20							20		
TOTAL		85	60					25		85		

TITLE: CRC for Control of Phytophthora Root Diseases of Native Vegetation

18. Research Staff Resources (Cont)

(b) Cash funded professional staff, (excludes Director, Executive Officer and PA)

Please provide information on professional research positions expected to be funded from CRC Program Grant plus other cash contributions.

% of Time Spent on Individual Programs												
Type & Level of Appoint.	Main Activity	Total % Time	Research Subprograms (R)						Total R	E	C	A
			1	2	3	4	5	6				
Mngr Comm/Education	E	100								100		
Lecturer (Dr Giles Hardy)	R/L *	100		50	10				60	40		
Research Scientist	R	100	100						100			
Post Doctoral Fellow	R	100						100	100			
"	R	100				100			100			
"	R	100			100				100			
"	R	100			100				100			
"	R	100	100						100			
"	R	100		100					100			
TOTAL												
		900	200	150	210	100	100		760	140		

* From July 1996 Dr Hardy will be funded by the CRC. He will continue to be located on the Murdoch Campus and will fulfill the role of Education Coordinator in WA.

SUMMARY OF PROFESSIONAL STAFF RESOURCES (IN PERSON YEARS)

	Total Equiv. Person Years	Person Years Spent on Individual Programs									
		Research Sub-programs (R)						Total	E	C	A
		1	2	3	4	5	6	R			
TOTAL CONTRIBUTED	12.23	1.55	2.73	2.4	1.2	2		9.88	1.75	0.45	0.3
TOTAL FUNDED BY CRC GRANT & OTHER CASH	9	2	1.5	2.1	1	1		7.6	1.4	-	-
GRAND TOTAL	21.23	3.55	4.23	4.5	2.2	3		17.48	3.15	0.45	0.3
Percentage of total professional staff resources in each activity	100	17	20	21	10	14		82	15	2	1

(c) Support Staff

Please provide information on support staff contributed by organisation and employed by CRC.

(1) Contributed	
Contributing Organisation	No. Staff (person years)
CALM	2
CSIRO	0.8
ALCOA	2.6
Uni of Melbourne	0.8
Murdoch University	1
Kings Park and Botanic Garden	1.5
TOTAL	8.7

(2) CRC Funded
(person years) 9

TOTAL

17.7

19. All IN-KIND contributions from participating organisations

"SALARIES", for the research staff only and excluding on-costs.

"CAPITAL ITEMS", for items over \$20 000 including equipment.

"OTHER", including admin, overheads, other salaries and all salary on-costs.

Note: 1.73 salary on-costs added to the in-kind contributions of participants hiring staff.
on CRC funds.

YEAR 1 YEAR 2 YEAR 3 YEAR 4 YEAR 5 YEAR 6 YEAR 7 TOTAL
(in \$'000s)

PARTICIPANT

CALM

SALARIES	149	152	155	158	161	165	168	1,108
CAPITAL ITEMS								
OTHER *	450	456	462	468	475	481	488	3,281
TOTAL	599	608	617	627	636	646	656	4,389

*Includes, for all participants, a 2x salary multiplier + an in-kind contribution to for staff
employed on CRC funds

CSIRO

SALARIES	104	88	78	79	81	83	84	597
CAPITAL ITEMS								
OTHER	274	308	287	290	228	231	234	1,854
TOTAL	379	396	365	370	309	314	319	2,451

University of Melbourne

SALARIES	116	119	122	127	128	131	133	876
CAPITAL ITEMS								
OTHER	298	304	310	319	322	327	332	2,212
TOTAL	415	424	433	446	450	457	465	3,089

Murdoch University

SALARIES	28	31	32	32	32	33	33	222
CAPITAL ITEMS								
OTHER	279	286	288	290	293	295	298	2,028
TOTAL	307	317	319	322	325	328	331	2,250

ALCOA of Australia

SALARIES	127	93	70	71	73	74	76	584
CAPITAL ITEMS								
OTHER	268	268	206	209	211	214	217	1,593
TOTAL	395	361	276	280	284	289	293	2,177

In-kind for years 3-7 are subject to normal internal financial restraints and approvals

CIBA GEIGY

SALARIES								
CAPITAL ITEMS								
OTHER	68	68	68	68	68	68	68	476
TOTAL	68	68	68	68	68	68	68	476

Royal Melbourne Institute of Technology

SALARIES	5	5	5	5	5	6	6	37
CAPITAL ITEMS								
OTHER	33	33	33	33	33	33	33	231
TOTAL	38	38	38	38	38	38	38	268

TITLE: CRC for Control of Phytophthora Root Diseases of Native Vegetation

19. All IN-KIND contributions from participating organisations

"SALARIES", for the research staff only and excluding on-costs.

"CAPITAL ITEMS", for items over \$20 000 including equipment.

"OTHER", including admin, overheads, other salaries and all salary on-costs.

**Note: 1.73 salary on-costs added to the in-kind contributions of participants hiring staff .
on CRC funds.**

YEAR 1 YEAR 2 YEAR 3 YEAR 4 YEAR 5 YEAR 6 YEAR 7 TOTAL

(in \$'000s)

PARTICIPANT

Edith Cowan University

SALARIES	9	9	9	9	9	9	9	63
CAPITAL ITEMS								
OTHER	43	33	33	33	33	33	33	241
TOTAL	52	42	42	42	42	42	42	304

Mineral Deposits Pty Ltd

SALARIES	2	2	2					6
CAPITAL ITEMS								
OTHER	4	4	4					12
TOTAL	6	6	6					18

Worsley Alumina Ltd

SALARIES								
CAPITAL ITEMS								
OTHER	5							5
TOTAL	5							5

RGC Mineral Sands Ltd

SALARIES	15	15	15					45
CAPITAL ITEMS								
OTHER	30	30	30					90
TOTAL	45	45	45					135

Cable Sands (WA) Pty Ltd

SALARIES	1	1	1	1	1	1	1	8
CAPITAL ITEMS								
OTHER	2	2	2	2	2	2	2	17
TOTAL	4	4	4	4	4	4	4	25

SALARIES								
CAPITAL ITEMS								
OTHER								
TOTAL								

SALARIES								
CAPITAL ITEMS								
OTHER								
TOTAL								

TITLE: CRC for Control of Phytophthora Root Diseases of Native Vegetation

19. Cont.

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	TOTAL
PARTICIPANT	(in \$'000s)							
Kings Park and Botanic Garden								
SALARIES	36	36	36	36	36	36	37	252
CAPITAL ITEMS								
OTHER	72	72	72	72	72	72	73	505
TOTAL	108	108	108	108	108	108	110	757
Monash University								
SALARIES	5	5	5	5	5	6	6	37
CAPITAL ITEMS								
OTHER*	71	71	71	71	71	72	72	498
TOTAL	76	76	76	76	77	77	77	535
*Figure represents 2x multiplier on salary + in-kind contribution contingent on placement of a technical officer at Monash University by the CRC								
ANU Research School of Biological Sciences								
SALARIES	6	6	6	6	6	7	7	45
CAPITAL ITEMS	-	-	-	-	-	-	-	
OTHER	73	73	73	73	74	74	74	513
TOTAL	79	79	79	80	80	80	81	558
*Figure represents 2x multiplier on salary + in-kind contribution contingent on placement of a technical officer at RSBS by the CRC								
University of WA								
SALARIES	3	3	3	3	3	3	3	23
CAPITAL ITEMS								
OTHER	6	6	6	7	7	7	7	46
TOTAL	9	9	10	10	10	10	10	69
Chemistry Centre (WA)								
SALARIES	55	56	57	58	60	61	62	409
CAPITAL ITEMS								
OTHER	110	112	114	117	119	121	124	818
TOTAL	165	168	172	175	179	182	186	1,227
Westralian Sands Ltd								
SALARIES	2	5	5					12
CAPITAL ITEMS								
OTHER	4	10	10					24
TOTAL	6	15	15					36
CONTRIBUTIONS	2,756	2,764	2,680	2,646	2,610	2,643	2,678	18,769
(Carry over to page 11)								

TITLE: CRC for Control of Phytophthora Root Diseases of Native Vegetation
20. All cash contributions from participating organisations

(All tentative offers must be marked as such)

(in \$'000s)

PARTICIPANT	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	TOTAL
:								
: ALCOA of Australia*	130	86						216
:								
: Murdoch University	50							50
:								
: WA Dept of Commerce/Trade See attached letter	220	220	220					660
:								
:								
: ANCA (funding sought for a further 3 years)	500	500						1,000
:								
:								
: RGC Mineral Sands Ltd	5	5	5					15
:								
: Ciba- Geigy Ltd**	35	35	35					105
:								
: Mineral Deposits Pty Ltd	1	1	1					3
:								
: Worsley Alumina Pty Ltd (tentative offers)	5	5	5					15
:								
: Cable Sands (WA) Pty Ltd	2	2	2					6

* Tied to Program 2

** Tied to Program 5

TOTAL CASH

948	854	268						2,070
-----	-----	-----	--	--	--	--	--	-------

TOTAL IN-KIND

(From Page 10)

2,756	2,764	2,678	2,646	2,610	2,643	2,680		18,769
-------	-------	-------	-------	-------	-------	-------	--	--------

21. Total Contributions

(CASH + IN-KIND)

(in \$'000s)

3,704	3,618	2,946	2,646	2,610	2,643	2,680		20,839
-------	-------	-------	-------	-------	-------	-------	--	--------

22. CRC funding

(in \$'000s)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	TOTAL
SOUGHT FROM THE COMMONWEALTH	2,135.3	2,352.5	2,452.6	2,707.5	2,405.9	2,288.1	2,116.7	16,458.0
TOTAL FUNDING FOR CRC	5,839.3	5,970.5	5,398.6	5,353.5	5,015.9	4,931.1	4,796.7	37,297.0

23. Company details

1. Ciba-Geigy Australia Ltd

Turnover: \$311 million
 Ownership: 100% Ciba-Geigy Basle Ltd
 Paid up Capital: \$24 m
 Number of Employees: 370

2. Westralian Sands Limited

Mineral sand mining and processing company based in the South West of W.A.

Turnover: 97 million
 Ownership: Australian owned public company
 Paid up Capital: \$24m
 Number of Employees: 300

3. RGC Mineral Sands Limited (a wholly owned subsidiary of Renison Goldfields Consolidated Ltd

Annual Turnover: \$622 million
 Total Shareholder Equity: \$560 million
 Number of Employees: 3,247

4. Worsley Alumina Pty Ltd - management company for the following joint ventures partners:

1. Bauxite/Alumina Joint Venture (900 people)
 - Reynolds Aust. Alumina Ltd
 - The Shell Company of Aust. Ltd
 - Koba Alumina Assoc. (Aust) Ltd

2. Boddington Gold Joint Venture (150 people)
 - Reynolds Australia Metals Ltd
 - Billiton Aust. Gold Pty Ltd
 - Newcrest Mining Ltd
 - Koba Alumina Assoc. (Aust) Pty Ltd

5. Cable Sands (WA) Pty Ltd

Turnover: \$35 million
 Ownership: 100% by Nissho Iwai Corp of Japan
 Paid up capital: \$2 m
 Employees: 230




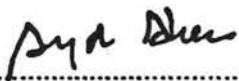

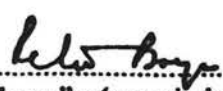
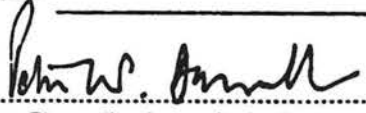
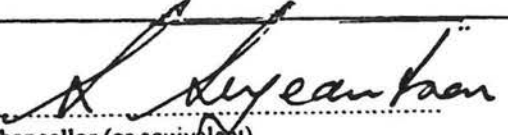
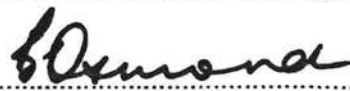
6. ALCOA of Australia Ltd

Turnover: \$2.2 billion
 Ownership ALCOA International Holdings Co 51%
 Western Mining Corporation Holdings Ltd 48.25%
 Paid up capital \$415 m
 Employees: 6100

24. STATEMENT OF REPRESENTATION AND INTENT

The undersigned warrant that their respective organisations support and will actively participate and cooperate in the proposed Cooperative Research Centre. Each participant is willing to contribute, subject to this application being successful, the staff, funds and other resources indicated in the application. A formal agreement will be negotiated between participants setting forth mutually acceptable terms and conditions for the establishment, operation, and evaluation of the Centre. Suitable affiliate status for the Centre staff within the institution of higher education will be included in the agreement.

Please note that original signatures from all participants must be included on this page in the unbound copy of this form submitted with the application.

 Vice Chancellor (or equivalent) Name: Professor Frank P. Larkins Position: Deputy Vice-Chancellor (Research) Higher education institution: The University of Melbourne Date: 30th June 1994	 Chief/senior executive Name: JOHN C RADCLIFFE Position: DIRECTOR, INSTITUTE OF PLANT PRODUCTION & PROCESSING Organisation: CSIRO Date: 29-6-94 <small>signed as the only authorised person of the act and in holder of establishment of CSIRO</small>
 Chief/senior executive Name: Peter Bridgewater Position: Chief Executive Officer Organisation: Australian Nature Conservation Agency Date: 23/6/94	 Chief/senior executive Name: Dr Syd Shea Position: Executive Director Organisation: CALM Date: 29 June 1994
 Chief/senior executive Name: S.R. Baker Position: Manager of Mines Organisation: Alcoa of Australia Limited Date: 28/06/94	 Vice Chancellor (or equivalent) Name: Professor PJ Boyce Position: Vice-Chancellor Higher education institution: Murdoch University Date:
Chief/senior executive Name: Position: Organisation: Date:	 Vice Chancellor (or equivalent) Name: P. Lep. DARVALL Position: DVC (R&D) Higher education institution: MONASH UNIV Date: 4/7/94
 Vice Chancellor (or equivalent) Name: S.W. SERJEANTSON Position: Deputy Vice-Chancellor Higher education institution: A.N.U. Date: July 4th 1994	 Chief/senior executive Name: C.B. CSOMOND Position: DIRECTOR Organisation: RES. SCHOOL BIOL. SCI. ANU Date: July 4, 94

24. STATEMENT OF REPRESENTATION AND INTENT

The undersigned warrant that their respective organisations support and will actively participate and cooperate in the proposed Cooperative Research Centre. Each participant is willing to contribute, subject to this application being successful, the staff, funds and other resources indicated in the application. A formal agreement will be negotiated between participants setting forth mutually acceptable terms and conditions for the establishment, operation, and evaluation of the Centre. Suitable affiliate status for the Centre staff within the institution of higher education will be included in the agreement.

Please note that original signatures from all participants must be included on this page in the unbound copy of this form submitted with the application.

B. Lawrence
 Vice Chancellor (or equivalent)
 Name: **B. LAWRENCE**
 Position: **ACTING VICE CHANCELLOR**
 Higher education institution **EDITH COWAN UNIVERSITY**
 Date: **29 JUNE 1994**

S. D. Hopper
 Chief/senior executive
 Name: **DR S. D. HOPPER**
 Position: **DIRECTOR & CEO**
 Organisation: **KINGS PARK & BOTANIC GARDEN**
 Date: **27/6/94**

Christopher D.S. Davies
 Chief/senior executive
 Name: **CHRISTOPHER D.S. DAVIES**
 Position: **GENERAL MANAGER / DIRECTOR**
 Organisation: **CABLE SANDS (WA) PTY LTD**
 Date: **28 JUNE 1994**

R. J. Glover
 Chief/senior executive
 Name: **MR R. J. GLOVER**
 Position: **MANAGER MINING OPERATIONS**
 Organisation: **MINERAL DEPOSITS PTY LTD**
 Date: **1.7.94**

Fiona Nicholls
 Chief/senior executive
 Name: **Ms Fiona Nicholls**
 Position: **Manager Environmental Affairs**
 Organisation: **RGC Mineral Sands Limited**
 Date: **29 June 1994**

B.G. Todd
 Chief/senior executive
 Name: **B.G. TODD**
 Position: **Company Secretary**
 Organisation: **Westralian Sands Limited**
 Date: **10/06/94**

Chief/senior executive
 Name:
 Position:
 Organisation:
 Date:

G. L. Browder
 Chief/senior executive
 Name: **G L BROWDER**
 Position: **GENERAL MANAGER**
 Organisation: **WORELEY ALUMINA PTY LTD**
 Date: **29 JUNE 1994**

Chief/senior executive
 Name:
 Position:
 Organisation:
 Date:

Chief/senior executive
 Name:
 Position:
 Organisation:
 Date: