A JOINT POSITION PAPER ON THE MARRADONG TIMBER RESERVE BY DSD, CALM AND WORSLEY ALUMINA

Conservation and Land Management

State Development
WESTERN AUSTRALIA

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File: 85/86

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BACKGROUND

The Marradong Timber Reserve is situated to the south-west of Boddington and north of Worsley Alumina's bauxite mine at Mt Saddleback (see Map 1). Marradong is divided by a mining lease boundary, as follows:

	Area (ha)	**Agreement Lease**	**Company**
West Marradong	1003.5	ML1SA	Alcoa
East Marradong	927.5	ML258SA	Worsley Alumina

East Marradong is part of the Principal Mineralised Area (PMA) referred to in Worsley's 1978 Environmental Review and Management Programme. It contains 40-50 Mt of bauxite (Map 2) and has been regarded as a cornerstone of the Worsley operation from its inception. Worsley has the right to mine East Marradong under the Alumina Refinery (Worsley) Agreement.

West Marradong probably contains similar bauxite reserves to East Marradong, but is extremely remote from Alcoa's mining operations at Huntly and Willowdale. It is possible that Worsley may, with the State's approval, gain access to West Marradong through commercial negotiation with Alcoa.

Marradong had not been identified as a proposed Reserve in the System 6 Study Report of 1981, or the Darling Range Study Group (DRSG) report of 1982. However, it was proposed as a Conservation Park in CALM's Regional Plan for the Northern Forest Region, which was released in December 1987. The proposal was opposed in submissions from Mines Department, DRD and Worsley Alumina because of the bauxite potential of the area.

The relative standing of a Conservation Park is defined in the draft amendment to the CALM Act and in terms of mining potential is similar to that of an A Class Nature Reserve.

In 1987, CALM wished to conserve Marradong because two of the vegetation community types which occur there are so poorly represented in other reserves, that less than 2% of the original estimated distribution was regarded as secure. On the information available, it appeared that the reservation of Marradong would have doubled this figure.

On 31 May 1989, the Minister for CALM directed that Worsley Alumina and CALM should work together to evaluate and report on the biological and mineral values of the area.

BOTANICAL STUDIES

Worsley Alumina commissioned a flora and vegetation survey of the Marradong Timber Reserve, together with an assessment of the conservation values of the plant communities on a local and regional basis. This work was executed by Dr E M Mattiske between the spring of 1989 and the summer of 1990/91. Dr Mattiske has undertaken ecological studies on the Darling System vegetation for some fifteen years, with the former Forests Department, Alcoa of Australia Limited, CALM and Worsley Alumina.

Study Conclusions

The initial study recorded 290 plant species, of which 21 were described as "potentially rare, geographically restricted, poorly collected or in need of further investigation". Dr Mattiske later reviewed the status of these 21 species and reduced the list to 11 that were considered to be "poorly collected, in need of research or rare", but not "vulnerable or endangered". One species is on the CALM Priority Two List*, but additional studies by Dr Mattiske in the eastern forest areas located further populations of this species in other conservation and State forest areas, including the rehabilitation areas at the Saddleback bauxite mine. The additional work also revealed that this species occurs in a wider range of vegetation communities than originally thought.

The study confirms the presence of the botanical assemblages indicated earlier by CALM. However, the additional information has revealed that Marradong contains only 0.6 km^2 of the two critical vegetation types. The System 6 regional mapping had suggested that 6.3 km^2 might be present, which gave rise to CALM's initial concerns. It is also evident that the conservation value of the area has been reduced by:

- A heavy logging regime which has changed the forest structure. The logging was completed some years ago, but illegal cutting of firewood appears to be continuing.

- A high level of physiological stress, which could be due to several factors including burning, drought and (possibly) Jarrah dieback.

- Some grazing activity and weed infestation, especially in areas adjacent to farmland.

It was decided that the Management Priority Areas (MPA's) mostly likely to contain vegetation similar to that of Marradong should be surveyed. Worsley then commissioned Dr Mattiske to conduct a general reconnaissance of nine MPA's in the vicinity of Boddington and Marradong, during October and November 1990. Comparisons were also made with previous findings at the Boddington Gold Mine (BGM).

* Definition:

Priority Two - Poorly Known Taxa
Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (ie. not currently endangered). Such taxa are under consideration for declaration as "rare flora", but are in urgent need of further survey.

The reconnaissance indicated that the Marradong vegetation complexes also occurred in Duncan, Russell, Stene, Gyngoorda and the BGM area. These findings were consistent with previously known similarities of soils, climate and landform.

Dr Mattiske's results are attached (Tables 4 and 5).

MINING AND REHABILITATION

Worsley Alumina's proposed mining operations in Marradong have been examined in the light of the surveyed distribution of plant communities. This work has confirmed previous experience, in that mining would primarily affect the Jarrah plant community types.

CALM's main objective is the conservation of the Michibin and Coolakin regional vegetation types, which predominantly contain Wandoo rather than Jarrah plant communities. As the Wandoo vegetation communities are not usually associated with bauxite, the level of direct impact from mining on the Michibin and Coolakin types should be low. Worsley Alumina is also prepared to minimise indirect impact by paying special attention to the siting of services and facilities and by adopting appropriate mining and rehabilitation procedures.

It is considered by all parties that the post-mining biological value of Marradong should be maximised. This can be achieved by:

- Ensuring that most of the original species return to the mined area after rehabilitation.
- Assisting in the re-establishment of the original vegetation types.

Worsley Alumina has determined that, of the 205 plant species identified in the area of major mining impact, only 33 required further investigation to develop their rehabilitation potential. This work has already commenced in association with the Saddleback rehabilitation programme and will continue.

Current techniques which could contribute to the re-establishment of plant communities include:

- Maximising the return of topsoil to the area from which it was taken.
- Using a wide range of species in the understorey/groundcover seed mix.
- Collecting seed locally.
- Modifying the seed mix where site conditions and the original vegetation anomalies warrant it.

CONSERVATION STATUS

CALM is particularly concerned that the Coolakin and Michibin regional mapping units are inadequately represented in secure reserves. These units were subjected to extensive agricultural clearance and very little remains.

The percentages of the estimated pre-clearance distribution which occur within proposed reserves calculated by CALM from the System 6 regional mapping, to be as follows:

TABLE 1

CONSERVATION SIGNIFICANCE OF MARRADONG
FROM SYSTEM 6 REGIONAL MAPPING

Regional Unit	Total % in Proposed Reserves (including Marradong)	% in Marradong	% Total Contributed by Marradong
Yalambee-Dwellingup	11	2	18
Cooke	39	-	-
Coolakin	* 0.9	0.5	55
Michibin	* 3.0	1.4	47

* Representation of less than 5% is considered to be inadequate.

From the evidence then available, Marradong appeared to contain 6.3 km^2 of the Michibin and Coolakin vegetation units. From this it was concluded that the area of these vegetation units available for reservation could be doubled if Marradong became a Conservation Park; see Table 1 above.

Subsequent detailed study by Dr Mattiske has indicated, however, that only 0.6 km^2 of Michibin and Coolakin vegetation occurs in the whole of the Marradong Timber Reserve (see Map 2). The disparity between the predicted and actual areas is by no means unusual. Differences of this magnitude commonly occur when regional mapping is followed by detailed work. The reduced area is not considered to be very significant in the context of much larger areas which occur within the other proposed reserves. See Table 2, below.

TABLE 2

COOLAKIN/MICHIBIN COMPONENT OF PROPOSED RESERVES

Proposed Reserves	Total Area km^2	Coolakin km^2	Michibin km^2
Boyagarring	12.5	1.5	5.4
Gunapin	133.8	3.8	0.3
Stene	44.3	13.5	0.5
Sullivan	100.4	-	2.0
Wandering	43.8	8.8	2.2
Lupton	94.9	4.8	1.4
Total	429.7	32.4	11.8

Notes:

(1) The area of Coolakin and Michibin vegetation in Boyagarring, Gunapin, Stene and Sullivan Reserves is from Tables 6.17 and 6.19 of DRSG.

(2) Since the Lupton and Wandering Reserves are outside the System 6 boundary, areas of Coolakin and Michibin occurring within them have been estimated (by Dr E M Mattiske) as a percentage of the total area of each reserve. These estimates are:

Lupton :	5%	Coolakin	1.5%	Michibin
Wandering :	20%	Coolakin	5.0%	Michibin

MPA's which might contain similar botanical features to those of Marradong are those in the eastern part of the Darling Range, with equivalent climate, soil and landform. These MPA's fall mostly within the Worsley mining lease, ML258SA, although a large part of Duncan is in Alcoa's lease. Alcoa has agreed to relinquish this ground through the Reserves Review process.

During early changes to the proposed ML258SA, the Company agreed that sections of some MPA's would be excluded. Since 1986, Worsley has co-operated in bringing forward exploration programmes to evaluate the bauxite potential of those MPA's which remained within the lease. The Company has systematically relinquished MPA's shown to be non-critical for future mining. The details of the exclusions and relinquishments are shown on Table 3, below.

TABLE 3

PROPOSED RESERVES EXCLUDED AND/OR RELINQUISHED FROM WITHIN ML 258SA OUTER BOUNDARY

Proposed Reserve	Area Excluded from ML258SA km^2	Area Agreed to be Relinquished from ML 258SA km^2	Date when Relinquishment was agreed
Boyagarring	14.8	-	-
Muja	17.0	17.0	Dec 1986
Goonac	1.0	51.0	Dec 1986
Stene	-	32.9	Dec 1986
Wandering	38.3	42.6	Sep 1988
Lupton	60.6	31.0	Sep 1988 Feb 1991
Gunapin	-	130.1	Nov 1989
Sullivan	45.0	62.6	Nov 1989
Total	176.7	367.2	

Note: "Proposed Reserves" are those included in Table 6.17 of DRSG. Areas are as calculated by Worsley Alumina.

Additional exclusions and agreed excisions from within the ML 258SA outer boundary but outside the DRSG study area include:

Proposed Reserve	Area Excluded from ML258SA km^2	Area Agreed to be Relinquished from ML 258SA km^2	Date when Relinquishment was agreed
Dryandra	160.0	6.5	Jan 1987
Boyagin	46.5	-	
Total	206.5	6.5	

Unresolved MPA's

Gyngoorda - Worsley's desk studies indicate significant bauxite potential in this reserve. Drilling was undertaken in the 1990/91 summer season.

Russell - This is likely to be the most difficult to resolve as it contains some 30 Mt of bauxite. Mining may occur at some time during the life of the Worsley project. Immediate resolution is not a high priority.

Duncan - Further drilling was undertaken in the 1990/91 summer season. The Company will wait until all results are available before making an assessment.

CONCLUSIONS

1. It has been accepted by all parties that East Marradong, which is held by Worsley Alumina, should not be declared as a Conservation Park and that mining can proceed. CALM would prefer West Marradong to be conserved, but acknowledges Alcoa's Agreement rights to the bauxite. DSD would prefer Worsley to come to a commercial arrangement with Alcoa to mine and rehabilitate the whole of Marradong in a coordinated manner. All parties agree that, if it is decided in the State's interest that the whole of Marradong should be mined, then no part of the Timber Reserve should be declared a Conservation Park.

2. The Coolakin and Michibin regional units are not adequately represented in reserves. There may be a need for CALM to secure adequate areas of these units in the future, possibly by the acquisition of private land.

3. The vegetation types occurring at Marradong do occur elsewhere. Although there is no direct equivalent, a close match is found in parts of Duncan and Stene and on some areas of private property.

4. The botanical study has confirmed the presence of the plant communities which were indicated earlier by CALM. Detailed work has revealed, however, that the area occupied by the Coolakin and Michibin units is only 10% of that predicted by the regional mappin and will not be directly affected by mining. The

conservation value of Marradong has also been reduced by logging and a high degree of physiological stress.

5. Worsley will continue to evaluate the rehabilitation potential of the Marradong vegetation and will employ appropriate procedures to maximise post-mining biological values and to encourage the re-establishment of native vegetation.

6. Worsley's 10 year mining plans are to show areas of conservation value and describe management procedures for their protection.

27 June 1991 (K:RBD110:sk)

APPENDIX 1

A Brief Summary of Northern Jarrah Forest Classification

The recognition of different vegetation communities within the northern Jarrah forest has developed over the last century (Diels 1906; Williams 1932, 1945; Speck 1952, 1958; Churchill 1961, 1968; Smith 1974; Havel 1975a, 1975b; Heddle et al 1980).

An integrated ecological classification was not adopted until the early 1970s when Havel developed a system which incorporated site conditions, plant community structures and floristic characteristics to define site-vegetation types.

The method used by Heddle et al (1980) to map the System 6 area at a regional scale (1:250 000), integrated the classification system of Havel with the structural classification of Smith (1974) and the geomorphological classification of Churchward & McArthur (1980), subdivided on climatic criteria. The maps produced from the System 6 work, indicate the presence of four vegetation complexes in the Marradong area; Yalanbee-Dwellingup, Cooke, Coolakin and Michibin. These vegetation complexes can be related to component site-vegetation types based on their site factors and botanical elements.

In considering a localised area such as Marradong it is preferable to map at the site-vegetation type level to account for the degree of variation in the plant communities. The Marradong area was mapped by E M Mattiske & Associates (1990) using a coding scheme consistent with that used in previous work carried out for the Bauxite Initial Mining Area in the Saddleback State Forest, to enable comparison. This coding scheme is at a similar level of definition to the site-vegetation type of Havel (1975a and 1975b), but uses different classifications that were developed to describe the eastern extremities of Havel's site-vegetation types.

(K:RBD110)

TABLE 4

Summary of Vegetation Complexes in the Survey Areas

Survey Areas	Vegetation Complexes										
	4	5	6	7	8	11	12	13	14	23	27
Duncan	*			*		+	+	*	+		
Russell	+	*		+	+		*	*			
Stene	*	*						*	+		+
BGM	*		+	+				*	+		+
Marradong		*		+					+		+
Gyngoorda		*	+	+				*	*		+
Wandering			*	+					*		*
Boyagarring			*						*		+
Lupton			*						*	+	*
Sullivan			*		*		*	+			+
Gunapin	+		*		*		*	+			

Note: * - Dominant Vegetation Complex
+ - Minor Vegetation Complex
BGM - Boddington Gold Mine

Vegetation Complexes (based on Heddle, Loneragan & Havel, 1990)

4 - Dwellingup - Yalanbee - Hester
5 - Yalanbee - Dwellingup
6 - Yalanbee
7 - Cooke
8 - Goonaping
11 - Yarragil (Max. Swamps)
12 - Swamp
13 - Pindalup - Yarragil
14 - Coolakin
23 - Williams - Avon - Brockman - Mumballup
27 - Michibin

TABLE 5

Summary of Site-Vegetation Types in the Survey Areas

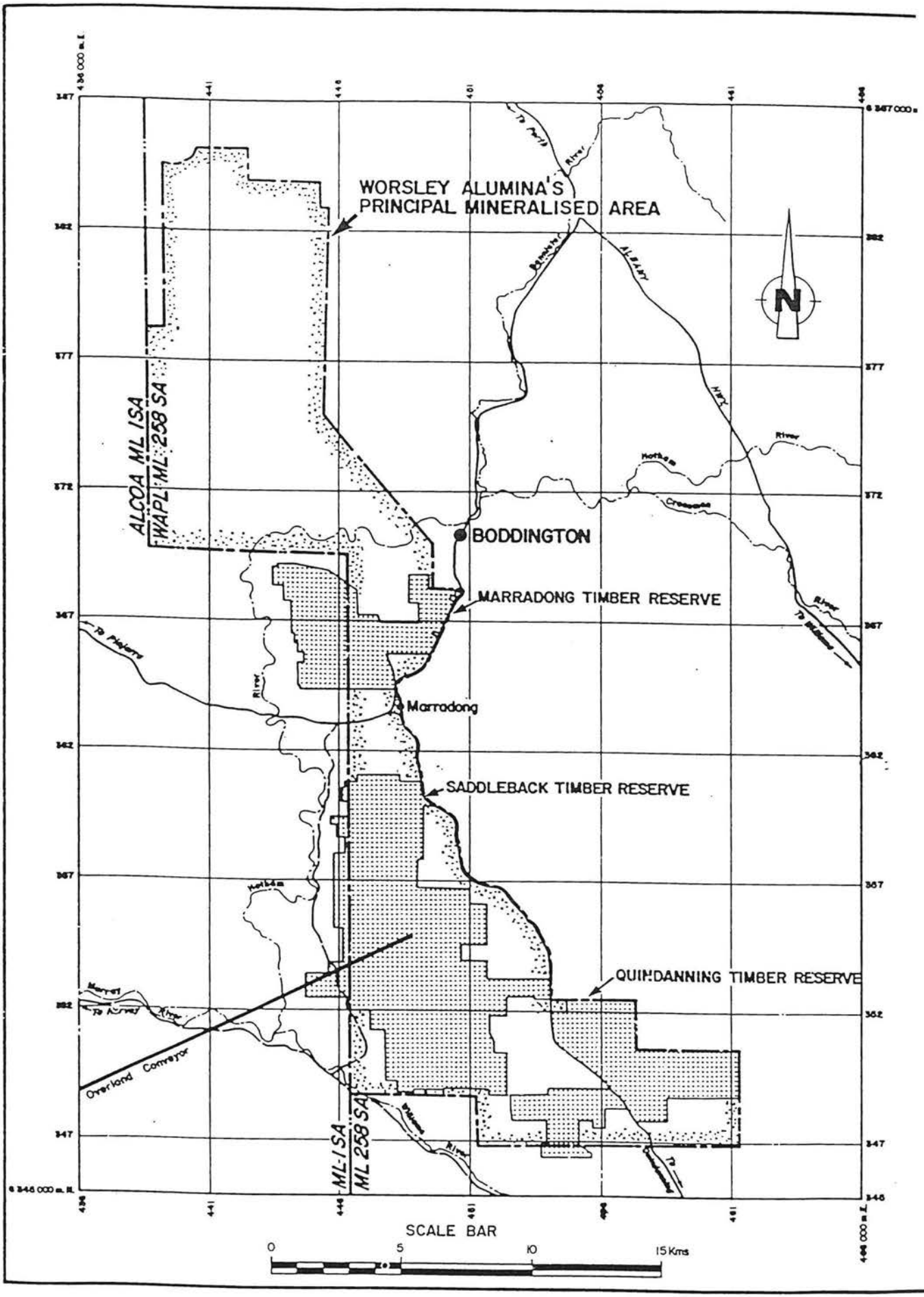
Survey Areas	Site-Vegetation Types															
	A	B	J	F	L	Y	M	Z	H	P	S	T	D	E	W	G
Duncan	+			+	+	*	+	+	*	+	+	+	*		+	+
BGM	+					*	*	+	*	+	+	+	+		+	+
Marradong	+				+	*	*	+	*	+	+	+				+
Gyngoorda	+		+			+	*	+	*	+	+		+	+		+
Russell	+	+	+	+	+	*	*	+	*				+	+		+
Stene	+					*	*	+	*	+	+		+			+
Boyagarring	+					*	*	+	+		+					+
Wandering	+				+	*	*		*							+
Lupton	+					*	*	+	*							+
Gunapin	*	+	+	+		+	*	+	*				+			+
Sullivan	*	+	+	+		*	+	+	*				+			+

Note: * - Dominant Site-Vegetation Type
+ - Minor Site-Vegetation Type
BGM - Boddington Gold Mine

Site-vegetation types are based on Havel (1975a and b)

MAP 1

LOCATION INFORMATION AND BOUNDARY OF PRINCIPAL MINERALISED AREA



MAP 2

MARRADONG TIMBER RESERVE : OREBODIES AND COOLAKIN/MICHIBIN OCCURRENCES