EIS 1389

AB020195

Flora survey : Peats Ridge clay/shale mine - Austral Brick Co. Pty Ltd. Mining lease application 62 comprising lot 2 DP 610603 and lot 78 DP 660900 Calga-Peats Ridge Road, near Peats Ridge

ANNE CLEMENTS & ASSOCIATES PTY. LIMITED
(A.C.N. 002 564 436)
Environmental and Botanical Consultants
Box 1623, North Sydney 2059
Phone: (02) 9955 3362, Facsimile: (02) 9957 4343

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14 January 1997

Flora survey:

Peats Ridge Clay/Shale Mine - Austral Brick Co. Pty Ltd.
Mining Lease Application 62 comprising Lot 2 DP 610603 and Lot 78 DP 660900 Calga-Peats Ridge Road, near Peats Ridge

Prepared by:
Dr AnneMarie Clements
A.N. Rodd
Rosalind Moore

Prepared for:
Rob Corkery
R.W. Corkery & Co. Pty Ltd.
on behalf of Austral Brick Co. Pty Ltd.

Contents

The proposed clay/shale mine is located within Mining Lease Application 62 comprising Lot 2 DP 610603 and Lot 78 DP 660900 Calga-Peats Ridge Road, near Peats Ridge (Figure 1). The survey area consists of the project site and the site access road (Figure 2). The flora of an approximately 250 m x 300 m area surrounding the proposed clay/shale mine, and the site access road (approximately 1 km east of the Calga-Peats Ridge Road) were surveyed on the 30 October 1996 by A.N. Rodd and Rosalind Moore, and subsequently inspected by Dr AnneMarie Clements on 13 November 1996. Potential floral constraints along the site access road to the south of the project site were assessed.

1.0 Biological setting

1.1 Climate

The closest climatic station to the survey area site is Waratah Road, Peats Ridge (meteorological station #61351). It is approximately 6 km NNW of the project site. This station has recorded rainfall and temperature for the past 15 years (Bureau of Meteorology 1996).

The mean annual rainfall recorded is 1299 mm. Mean monthly rainfall is lower in winter (June to August total: 245 mm) and higher in summer (December to February total: 365 mm); with similar rainfall and lower evaporation to that of summer in Autumn (March to May total: 393 mm) (Bureau of Meteorology 1996).

The mean annual daily maximum temperature is 22 °C and the mean annual daily minimum temperature is 11 °C. January has the highest monthly mean daily temperature with 27 °C and July the lowest monthly mean daily temperature with 16 °C (Bureau of Meteorology 1996).

1.2 Geology and Soils

The area of and surrounding the survey area consists of Triassic Hawkesbury Sandstone. These sandstones are composed of fine to medium-grained, medium to poorly sorted, fluvial sands interbedded with numerous, discontinuous claystone lenses (Percover 1984). The sandstone is relatively soft and friable (Brink & Co. Pty Ltd 1991).

The eastern half of the project site consists of sandy soils with shallow topsoils. The western half of the project site have a thicker topsoil and support intensive agricultural activities (R.W. Corkery & Co. Pty Ltd 1996).

1.3 Land use

Approximately two thirds of the project site has been cleared of native vegetation. The remaining third supports relatively undisturbed remnant native vegetation (Figure 2).

Paddocks of pasture grasses in the NW corner occupy approximately one third of the project site. The paddocks appear not to have been grazed recently.

Four former clay quarries cover between a quarter and a third of the project site. Two of the quarries were relatively full of water in October/November 1996. The periphery of the four former quarries is highly disturbed.

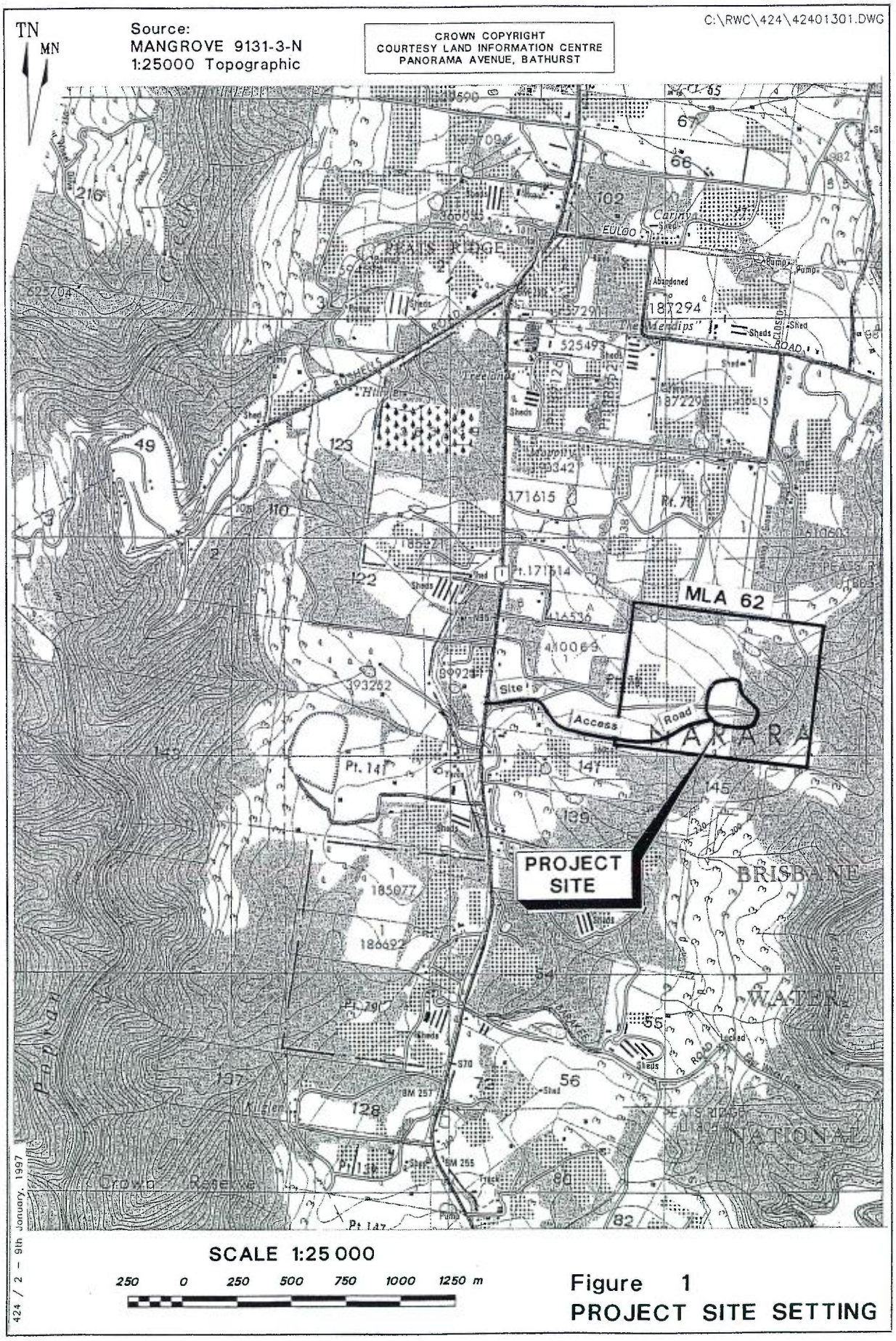


Figure 1
PROJECT SITE SETTING

C:\RWC\424\42401303.DWG

TN MN

Northern Pit

North-eastern Pit

Yards and Ramp

Site Access Road

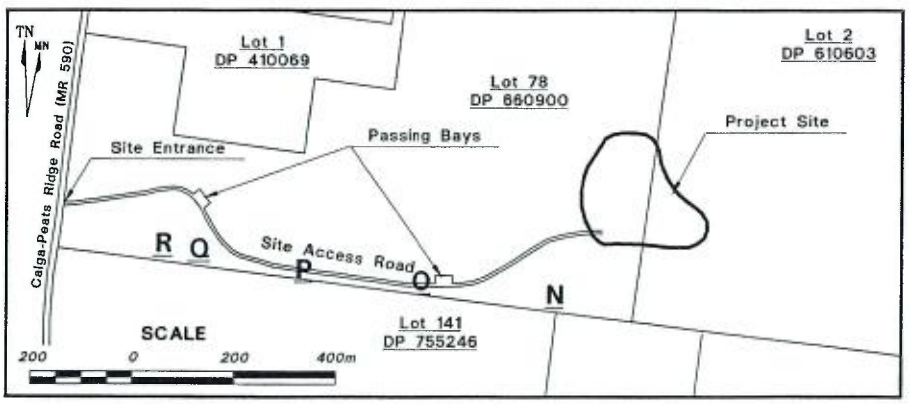
Southern Pit

South-eastern Pit

A B C D E F H I J K L M Y

T1 T2 T3 T4 T5

256 254 258 250 248 246 244 242



REFERENCE

- Project Site Boundary
- Existing Batter
- 90 Contour (Interval = 2m)
- Track
- Fence
- Eucalypt Forest
- N Sampling Location

SCALE 1:2 000

20 0 20 40 60 80 100 m

Contour Information - Brink & Co Pty Ltd

424 / 2 - 9th January, 1997

Figure 2
VEGETATION

Table 1 - Species recorded for Peats Ridge

Note: Asterisk preceding Bot. name code signifies species is not indigenous to site.

Bot. name code	Botanical name	Common name
1. Pteridophytes		
Cyatheaceae		
cyat coop	Cyathea cooperi	Straw Tree-fern, Scaly Tree-Fern
Dennstaedtiaceae		
hist inci	Histiopteris incisa	Batswing Fern, Oak Fern
hypole muel	Hypolepis muelleri	Harsh Ground Fern
pterid escu	Pteridium esculentum	Bracken
Dicksoniaceae		
calochl dubi	Calochlaena dubia	Rainbow Fern, False Bracken
Gleicheniaceae		
glei dica	Gleichenia dicarpa	Pouched Coral-fern
Lindsaeaceae		
lind line	Lindsaea linearis	Screw Fern
Lycopodiaceae		
lycopo cern	Lycopodium cernuum	Scrambling Clubmoss
Selaginellaceae		
selagi ulig	Selaginella uliginosa	
2. Gymnosperms		
Pinaceae		
* pinu radi	Pinus radiata	Monterey Pine, Radiata Pine
3. Dicotyledons		
Acanthaceae		
brunonie pumi	Brunoniella pumilio	Dwarf Blue Trumpet
Apiaceae		
actinot mino	Actinotus minor	Lesser Flannel Flower
cente asia	Centella asiatica	Heart-leaved Pennywort
platys line	Platysace linearifolia	
xanth pilo f C	Xanthosia pilosa form C	
xanthosi trid	Xanthosia tridentata	
Apocynaceae		
pars stra	Parsonsia straminea	Common Silkpod, Monkey Rope
Araliaceae		
polysc samb	Polyscias sambucifolia	Elderberry Panax
Asteraceae		
* agerati aden	Ageratina adenophora	Crofton Weed
* cony albi	Conyza albida	Tall Fleabane
* gnap coar	Gnaphalium coarctatum	Cudweed
* hypoch radi	Hypochoeris radicata	Flatweed, Cat's-ears, False Dandelion
ozot dios	Ozothamnus diosmifolius	White Dogwood
* pseudogn lute	Pseudognaphalium luteoalbum	Jersey Cudweed
* sene mada	Senecio madagascariensis	Fireweed, Madagascar Ragwort
* soliv sess	Soliva sessilis	Bindii, Bindi-eye, Jo-Jo
* sonc oler	Sonchus oleraceus	Common Sow-thistle, Milk-thistle
Caryophyllaceae		
* ceras glom	Cerastium glomeratum	Mouse-ear Chickweed
* paron bras	Paronychia brasiliana	Chilean Whitlow Wort
* stel medi	Stellaria media	Chickweed

Bot. name code	Botanical name	Common name
Casuarinaceae		
allo litt	Allocasuarina littoralis	Black She-Oak
casu glau	Casuarina glauca	Swamp Oak, Swamp She-oak
Clusiaceae		
hype gram	Hypericum gramineum	Small St Johns-wort
Cunoniaceae		
ceratop gumm	Ceratopetalum gummiferum	NSW Christmas Bush
Dilleniaceae		
hibb aspe	Hibbertia aspera	Rough Guinea-flower
hibb brac	Hibbertia bracteata	Guinea-flower
hibb empe	Hibbertia empetrifolia	Trailing Guinea-flower
hibb obtu	Hibbertia obtusifolia	Guinea-flower
hibb sp.	Hibbertia sp. (unidentified)	
Droseraceae		
dros spat	Drosera spatulata	Common Sundew
Epacridaceae		
epac pulc	Epacris pulchella	
melic proc	Melichrus procumbens	
monot scop	Monotoca scoparia	Prickly Broom-heath
Euphorbiaceae		
ampe xiph	Amperea xiphoclada	Broom Spurge
micran eric	Micrantheum ericoides	
phylla hirt	Phyllanthus hirtellus	Thyme Spurge
pora eric	Poranthera ericifolia	Heath-leaved Poranthera
Fabaceae Faboideae		
boss hete	Bossiaea heterophylla	
boss obco	Bossiaea obcordata	Spiny Bossiaea
davie cory	Daviesia corymbosa	
dill reto	Dillwynia retorta	Eggs-and-bacon Pea, Parrot Pea
gomphol gran	Gompholobium grandiflorum	Wedge-pea
gomphol lati	Gompholobium latifolium	Golden Glory Pea
hard viol	Hardenbergia violacea	False Sarsaparilla
hove line	Hovea linearis	Narrow-leaf Hovea
kenn rubi	Kennedia rubicunda	Dusky Coral-pea
phyllot gran	Phyllota grandiflora	
pult elli	Pultenaea elliptica	
pult rosm	Pultenaea rosmarinifolia	
pult sp.	Pultenaea sp. (unidentified)	
* trif repe	Trifolium repens	White Clover
* vici sati angu	Vicia sativa subsp. angustifolia	Narrow-leaved Vetch
Fabaceae Mimosoideae		
acac decu	Acacia decurrens	Black Wattle
acac lini	Acacia linifolia	Flax-leaved Wattle
acac myrt	Acacia myrtifolia	Red Stemmed Wattle
acac suav	Acacia suaveolens	Sweet Wattle
acac term	Acacia terminalis	Sunshine Wattle
acac ulic	Acacia ulicifolia	Prickly Moses, Prickly Wattle
Goodeniaceae		
damp stri	Dampiera stricta	Blue Dampiera
goode bell	Goodenia bellidifolia	
goode hete	Goodenia heterophylla	
scae ramo	Scaevola ramosissima	Purple Fan-flower
Haloragaceae		
gono micr	Gonocarpus micranthus subsp. micranthus	Creeping Raspwort

Bot. name code	Botanical name	Common name
Lauraceae		
cassy pube	Cassytha pubescens	Devil's Twine, Dodder-laurel
* cinn camp	Cinnamomum camphora	Camphor-laurel
Loranthaceae		
muel euca	Muellerina eucalyptoides	Mistletoe
Malvaceae		
* sida rhom	Sida rhombifolia	Paddy's Lucerne
Myrtaceae		
ango cost	Angophora costata	Angophora, Rusty Gum, Sydney Red Gum
ango hisp	Angophora hispida	Dwarf Apple
baec dios	Baeckea diosmifolia	
euca capi	Eucalyptus capitellata	Brown Stringybark
euca capi x sieb	Eucalyptus capitellata x sieberi	
euca globo	Eucalyptus globoidea	White Stringybark
euca gumm	Eucalyptus gummifera	Red Bloodwood
euca haem	Eucalyptus haemastoma	Broad-leaved Scribbly Gum
euca pipe	Eucalyptus piperita	Sydney Peppermint
euca sieb	Eucalyptus sieberi	Silvertop Ash
kunz ambi	Kunzea ambigua	Tick-bush
lept juni	Leptospermum juniperinum	Prickly Tea-tree
lept polyg	Leptospermum polygalifolium	Yellow Tea-tree, Tantoon Tea-Tree
lept trin	Leptospermum trinervium	Paperbark Tea-tree
Passifloraceae		
* pass edul	Passiflora edulis	Passionfruit
Phytolaccaceae		
* phyto octa	Phytolacca octandra	Inkweed
Pittosporaceae		
billa scan	Billardiera scandens	Dumplings, Apple-berry
pitt undu	Pittosporum undulatum	Pittosporum
rhyt proc	Rhytidosporum procumbens	
Plantaginaceae		
* plant lanc	Plantago lanceolata	Plantain, Ribwort
Polygalaceae		
come eric	Comesperma ericinum	Heath Milkwort
Polygonaceae		
* acet vulg	Acetosella vulgaris	Sorrel, Sheep Sorrel
persi deci	Persicaria decipiens	Slender Knotweed
Proteaceae		
bank oblo	Banksia oblongifolia	
bank serr	Banksia serrata	Saw Banksia, Old Man Banksia
bank spin coll	Banksia spinulosa var. collina	Hill Banksia
conosp long	Conospermum longifolium subsp. longifolium	Long-leaf Coneseeds
grev buxi buxi	Grevillea buxifolia subsp. buxifolia	Grey Spider-flower
grev spec	Grevillea speciosa	Red Spider-flower
hake dact	Hakea dactyloides	Broad-leaved Hakea
hake gibb	Hakea gibbosa	Needlebush
hake seri	Hakea sericea	Needlebush, Silky Hakea
hake tere	Hakea teretifolia	Needlebush, Dagger Hakea
isop anem	Isopogon anemonifolius	Broad-leaf Drumsticks
lamb form	Lambertia formosa	Mountain Devil, Honey-flower
lomat sila	Lomatia silaifolia	Native Parsley, Crinklebush
perso isop	Persoonia isophylla	
perso levi	Persoonia levis	Broad-leaved Geebung
perso line	Persoonia linearis	Narrow-leaf Geebung
petrop pulc	Petrophile pulchella	Conesticks

Bot. name code	Botanical name	Common name
telo spec	Telopea speciosissima	Waratah
xylo pyri	Xylomelum pyriforme	Woody Pear
Rosaceae		
* rubu disc	Rubus discolor	Blackberry
Rubiaceae		
oper vari	Opercularia varia	Stinkweed
pomax umbe	Pomax umbellata	Pomax
Rutaceae		
boro pinn	Boronia pinnata	Pinnate Boronia
erios hisp	Eriostemon hispidulus	Wax Plant
Santalaceae		
leptom acid	Leptomeria acida	Native Currant
Sapindaceae		
dodo triq	Dodonaea triquetra	Native Hops
Stackhousiaceae		
stack vimi	Stackhousia viminea	Slender Stackhousia
Thymelaeaceae		
pime lini lini	Pimelea linifolia subsp. linifolia	Slender Rice-flower
Tremandraceae		
tetrat thym	Tetratheca thymifolia	Black-eyed Susan
Verbenaceae		
* lant cama	Lantana camara	Lantana
* verbe bona	Verbena bonariensis	Purpletop
* verbe offi	Verbena officinalis	European Vervain
4. Monocotyledons		
Anthericaceae		
caesi parv	Caesia parviflora	Pale Grass Lily
Asparagaceae		
* myrsip aspa	Myrsiphyllum asparagoides	Florists' Smilax
Colchicaceae		
burcha umbe	Burchardia umbellata	Milkmaids
Cyperaceae		
baum nuda	Baumea nuda	
caus flex	Caustis flexuosa	Old-man's Whiskers, Curly-wig
cyatho dian	Cyathochaeta diandra	
* cype erag	Cyperus eragrostis	Drain Flat-sedge, Umbrella Sedge
eleo spha	Eleocharis sphacelata	Tall Spike-rush
gahn sieb	Gahnia sieberiana	Red-fruited Saw-sedge
* isol prol	Isolepis prolifera	
lepidos later	Lepidosperma laterale	Variable Sword-sedge
ptiloth deus	Ptilothrix deusta	
schoenu sp.	Schoenus sp.	
Doryanthaceae		
dorya exce	Doryanthes excelsa	Gymea Lily
Hydrocharitaceae		
vall giga	Vallisneria gigantea	Ribbonweed, Eelweed
Iridaceae		
pate glab	Patersonia glabrata	Native Iris, Leafy Purple-flag
pate seri	Patersonia sericea	Native Iris, Silky Purple-flag
* sisyr irid	Sisyrinchium iridfifolium	Blue Pigroot
Juncaceae		
* junc arti	Juncus articulatus	Jointed Rush
* junc cogn	Juncus cognatus	

Bot. name code	Botanical name	Common name
junc cont	Juncus continuus	
junc plan	Juncus planifolius	
Lomandraceae		
loman cyli	Lomandra cylindrica	Needle Mat-rush
loman fili cori	Lomandra filiformis subsp. coriacea	Wattle Mat-rush
loman fili fili	Lomandra filiformis subsp. filiformis	Wattle Mat-rush
loman glau	Lomandra glauca	Pale Mat-rush
loman grac	Lomandra gracilis	
loman long	Lomandra longifolia	Honey Reed, Spike Mat-rush
loman mult	Lomandra multiflora	Many-flowered Mat-rush
loman obli	Lomandra obliqua	
Orchidaceae		
microt unif	Microtis unifolia	Onion Orchid
thely sp.	Thelymitra sp.	Sun Orchid
Phormiaceae		
diane caer	Dianella caerulea	Blue Flax-lily
diane prun	Dianella prunina	Big Blue Flax-lily
diane revo	Dianella revoluta	Blue Flax-lily, Spreading Flax-lily
Poaceae		
agrosti aven	Agrostis avenacea	Blown Grass, Fairy Grass
* androp virg	Andropogon virginicus	Whisky Grass, Broomsedge
anis aven	Anisopogon avenaceus	Oat Spear Grass
aristi vaga	Aristida vagans	Wiregrass
* axon affi	Axonopus affinis	Narrow-leaved Carpet Grass
* briz maxi	Briza maxima	Quaking Grass
* brom cath	Bromus catharticus	Prairie Grass
chionoc pall	Chionochloa pallida	Red-anther Wallaby Grass
cynod dact	Cynodon dactylon	Couch, Bermuda Grass
dant tenu	Danthonia tenuior	Wallaby Grass
diche crin	Dichelachne crinita	Long-haired Plume Grass
diche micr	Dichelachne micrantha	Short-haired Plume Grass
echinopo sp.	Echinopogon sp.	
entol stri	Entolasia stricta	Wiry Panic
erag brow	Eragrostis brownii	Brown's Lovegrass
impe cyli	Imperata cylindrica var. major	Blady Grass
microl stip	Microlaena stipoides	Meadow Rice-grass, Weeping Grass
paspalu sp.	Paspalum sp.	
* paspalu urvi	Paspalum urvillei	Vasey Grass
* penn clan	Pennisetum clandestinum	Kikuyu (Grass)
* sporob indi cape	Sporobolus indicus var. capensis	Parramatta Grass
stip pube	Stipa pubescens	Tall Speargrass
tetrar junc	Tetrarrhena juncea	Wiry Ricegrass
* vulp brom	Vulpia bromoides	Squirrel-tail Fescue
Restionaceae		
lepy scar	Lepyrodia scariosa	Scale-rush
Xanthorrhoeaceae		
xant medi	Xanthorrhoea media	Grass Tree
Xyridaceae		
xyri grac laxa	Xyris gracilis subsp. laxa	Slender Yellow-eye

Table 2 - Species recorded in transects 1 to 5 and spot locations A to R

Notes: 1. asterisk before botanical name signifies non-native species

2. for full botanical and common names see Table 1

Bot. name code	1	2	3	4	5	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1. Pteridophytes																							
Cyatheaceae																							
cyat coop								X															
Dennstaedtiaceae																							
hist inci								X															
hypole muel								X							X	X					X		
pterid escu	3	3	3		3														X				X
Dicksoniaceae																							
calochl dubi		1		1																			
Gleicheniaceae																							
glei dica				1				X						X									X
Lindsaeaceae																							
lind line			2		2											X						X	X
Lycopodiaceae																							
lycopo cern								X															
Selaginellaceae																							
selagi ulig																X							
2. Gymnosperms																							
Pinaceae																							
* pinu radi																					X		
3. Dicotyledons																							
Acanthaceae																							
brunonie pumi		1																		X			

Bot. name code	1	2	3	4	5	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Apiaceae																							
actinot mino		1	3	2	3									X						X		X	X
cente asia															X	X							
platys line	1																			X			
xanth pilo f C				3																			
xanthosi trid			1		1									X						X			X
Apocynaceae																							
pars stra																X							
Araliaceae																							
polysc samb		1			2																		
Asteraceae																							
* agerati aden	3	2						X	X						X				X		X	X	
* cony albi						X	X		X										X		X	X	
* gnap coar						X			X														
* hypoch radi	1	1	3	1	1	X		X	X					X					X	X	X	X	
ozot dios			2																				
* pseudogn lute						X																	
* sene mada	2	3	3			X	X		X							X			X		X	X	
* soliv sess						X																	
* sonc oler		1																					
Caryophyllaceae																							
* ceras glom						X																	
* paron bras						X			X														
* stel medi						X																	
Casuarinaceae																							
allo litt									X											X			
casu glau											X												
Clusiaceae																							
hype gram														X									

Bot. name code	1	2	3	4	5	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Cunoniaceae																							
ceratop gumm					1																		
Dilleniaceae																							
hibb aspe	2		1		3																		
hibb brac			2																				
hibb empe																							X
hibb obtu																				X			
hibb sp.																						X	
Droseraceae																							
dros spat														X									
Epacridaceae																							
epac pulc				2	1									X						X			
melic proc		1																					
monot scop		1		1																			
Euphorbiaceae																							
ampe xiph					1								X										
micran eric	1		3	3	2									X		X				X			
phylla hirt	1	3	2	1	1															X			
pora eric			2																	X			
Fabaceae Faboideae																							
boss hete		1		1																X			
boss obco		3	3	3	3															X			X
davie cory																							X
dill reto																				X		X	
gomphol gran			1																				
gomphol lati		2	2		2																		
hard viol				2					X														
hove line		1																					
kenn rubi	2																						
phyllot gran			1																				

Bot. name code	1	2	3	4	5	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
pult elli	2																			X		X	
pult rosm														X								X	X
pult sp.				1																			
* trif repe						X																	
* vici sati angu	1																						
Fabaceae Mimosoideae																							
acac decu			1							X						X							
acac lini		1	3	1	2				X							X			X				
acac myrt		1		1	1				X					X									
acac suav	1	1							X											X		X	
acac term																						X	
acac ulic			1	1																X			
Goodeniaceae																							
damp stri																				X		X	X
goode bell			1																				
goode hete				2	1								X							X			
scae ramo			1											X						X			
Haloragaceae																							
gono micr								X															
Lauraceae																							
cassy pube					2															X			X
* cinn camp																				X			
Loranthaceae																							
muel euca																					X		
Malvaceae																							
* sida rhom						X	X		X										X		X		
Myrtaceae																							
ango cost	3	3	2		3											X		X	X	X		X	
ango hisp																							X
baec dios																							X

Bot. name code	1	2	3	4	5	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
euca capi	2	1	1		2											X		X	X	X	X	X	X
euca capi x sieb																						X	
euca globo					1																X		
euca gumm	2	3	3		3											X	X	X		X	X	X	X
euca haem																X		X			X	X	X
euca pipe	2	1	2		2				X							X	X		X				X
euca sieb	2	2	3		1											X				X			
kunz ambi																X			X				X
lept juni																X							
lept polyg	3	2		1	1										X				X		X	X	
lept trin			3		2											X						X	X
Passifloraceae																							
* pass edul																							X
Phytolaccaceae																							
* phyto octa						X			X			X											
Pittosporaceae																							
billa scan		3	2																	X			X
pitt undu																				X	X		X
rhyt proc																				X			
Plantaginaceae																							
* plant lanc						X															X		
Polygalaceae																							
come eric					1								X										
Polygonaceae																							
* acet vulg						X																	
persi deci															X								
Proteaceae																							
bank oblo																X							X
bank serr			2		1															X		X	X
bank spin coll	3	2	2		3											X				X			

Bot. name code	1	2	3	4	5	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
conosp long		1	1		1															X			
grev buxi buxi			2		2																	X	
grev spec	1	1	1																			X	
hake dact		1													X							X	X
hake gibb																							X
hake seri																				X			X
hake tere									X							X				X			
isop anem																				X			
lamb form		2																		X	X	X	X
lomat sila		3	3		1															X			
perso isop													X							X			
perso levi	1			1	3															X			X
perso line	2				1																		
petrop pulc					1															X		X	
telo spec		1	1																				
xylo pyri			1																				
Rosaceae																							
* rubu disc			1						X														
Rubiaceae																							
oper vari		1		1																X			
pomax umbe																				X			
Rutaceae																							
boro pinn	1		3		3									X						X			X
erios hisp					2															X			X
Santalaceae																							
leptom acid													X							X			
Sapindaceae																							
dodo triq					1								X	X									
Stackhousiaceae																							
stack vimi																				X			

Bot. name code	1	2	3	4	5	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Thymelaeaceae																							
pime lini lini			3	2	1															X		X	
Tremandraceae																							
tetrat thym					2								X										
Verbenaceae																							
* lant cama	2	2							X			X				X				X	X	X	X
* verbe bona						X	X									X							
* verbe offi						X		X															
4. Monocotyledons																							
Anthericaceae																							
caesi parv				1	1									X						X			X
Asparagaceae																							
* myrsip aspa																					X		
Colchicaceae																							
burcha umbe																							X
Cyperaceae																							
baum nuda																X							
caus flex																				X			
cyatho dian	1	3	3	1	3									X						X	X	X	
* cype erag								X							X								
eleo spha								X							X								
gahn sieb														X									
* isol prol								X															
lepidos later		1	1	2	1											X						X	
ptiloth deus																						X	
schoenu sp.																						X	
Doryanthaceae																							
dorya exce		3	2		3															X			

Bot. name code	1	2	3	4	5	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Hydrocharitaceae																							
vall giga								X															
Iridaceae																							
pate glab				3									X	X						X			
pate seri			3		3									X						X			X
* sisyr irid								X	X														
Juncaceae																							
* junc arti								X															
* junc cogn						X	X	X	X						X								
junc cont								X						X									
junc plan								X						X	X								
Lomandraceae																							
loman cyli		3																		X			
loman fili cori		1			2									X						X			
loman fili fili	1																			X			
loman glau		1																				X	
loman grac	1	1	2																				
loman long																						X	
loman mult	1	2																					
loman obli	1			1																X			X
Orchidaceae																							
microt unif								X	X											X		X	
thely sp.																						X	
Phormiaceae																							
diane caer																				X			
diane prun																				X			
diane revo		3	2		2																		
Poaceae																							
agrosti aven						X			X											X			
* androp virg	1	3	3	1	1			X	X					X		X			X	X	X	X	X

Bot. name code	1	2	3	4	5	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
anis aven			1		1																		
aristi vaga					2																		
* axon affi								X							X	X						X	
* briz maxi																					X		
* brom cath						X	X																
chionoc pall	1	3	3		3																		
cynod dact						X													X		X		
dant tenu																				X			
diche crin	1	1																					
diche micr																						X	
echinopo sp.																						X	
entol stri	1	3	3	2	2									X		X				X	X	X	X
erag brow	1		1		1									X		X						X	
impe cyli	3				2														X	X			
microl stip		1																		X		X	
paspalu sp.								X															
* paspalu urvi								X							X	X							
* penn clan						X	X		X						X	X			X		X		
* sporob indi cape						X																	
stip pube			3	2	2															X			
tetrar junc					2											X						X	X
* vulp brom									X														
Restionaceae																							
lepy scar															X	X						X	
Xanthorrhoeaceae																							
xant medi		2	2		1															X	X	X	X
Xyridaceae																							
xyri grac laxa																						X	

Table 3
Tree and shrub (species > 2 m height) data

Transect 1

Species	Q1	Q2	Q3	Mean No. and height per 10 m x 10 m
Angophora costata	5 to 17m	8 to 10m	5 to 8m	6 to 11 m
Banksia spinulosa var. collina	-	2 to 2m	-	0.7 to 2 m
Eucalyptus capitellata	4 to 9m	2 to 7m	-	2 to 8 m
Eucalyptus gummifera	1 @ 9m	-	1 @ 10m	0.7 to 9.5 m
Eucalyptus piperita	1 @ 12m	-	2 to 9m	1 to 10 m
Eucalyptus sieberi	1 @ 7m	-	4 to 10m	1.7 to 9 m
Leptospermum polygalifolium	13 to 2.5m	8 to 3m	17 to 3m	12.7 to 2.8 m
Persoonia levis	1 @ 2m	-	-	0.3 to 2 m
Persoonia linearis	1 @ 2.5m	1 @ 2m	-	0.7 to 2.3 m

Transect 2

Species	Q1	Q2	Q3	Mean No. and height per 10 m x 10 m
Acacia linifolia	1 @ 4m	-	-	0.3 @ 4m
Acacia suaveolens	-	1 @ 2m	-	0.3 @ 2m
Angophora costata	1 @ 3m	1 @ 14m	1 @ 6m	1 to 7.7m
Doryanthes excelsa	6 to 2.5m	3 to 2.5m	6 to 2m	5 to 2.3m
Eucalyptus capitellata	3 to 10m	-	-	1 to 10m
Eucalyptus gummifera	6 to 9m	5 to 10m	3 to 12m	4.7 to 10 m
Eucalyptus piperita	-	-	1 @ 12m	0.3 @ 12 m
Eucalyptus sieberi	-	2 to 14m	1 @ 10m	1 to 13 m
Hakea dactyloides	-	-	2 to 3m	0.7 to 3 m
Lambertia formosa	1 @ 2m	2 to 2m	-	1 to 2 m
Leptospermum polygalifolium	-	13 to 3m	11 to 4m	8 to 3.5 m
Telopea speciosissima	-	-	1 @ 5m	0.3 to 5 m

Transect 3

Species	Q1	Q2	Q3	Mean No. and height per 10 m x 10 m
Acacia decurrens	-	-	1 @ 5m	0.3 to 5 m
Acacia linifolia	1 @ 2m	1 @ 3m	4 to 4m	2 @ 3.5 m
Angophora costata	2 to 13m	-	1 @ 5m	1 @ 10.3 m
Banksia serrata	1 @ 3.5m	4 to 4m	-	1.7 @ 3.9 m
Conospermum	1 @ 2m	-	-	0.3 @ 2m

longifolium				
Doryanthes excelsa	4 to 2m	-	9 to 2m	4.3 @ 2 m
Eucalyptus capitellata	-	-	1 @ 12m	0.3 @ 12 m
Eucalyptus gummifera	3 to 4m	4 to 3m	1 @ 6m	2.7 @ 3.8 m
Eucalyptus piperita	-	4 to 3m	1 @ 15m	1.7 @ 5.4 m
Eucalyptus sieberi	4 to 8m	4 to 6m	1 @ 7m	3 @ 7 m
Leptospermum trinervium	1 @ 2.5m	1 @ 2m	1 @ 2m	1 @ 2.2 m
Ozothamnus diosmifolius	1 @ 2m	2 to 2m	-	1 @ 2m

Transect 4
No trees recorded

Transect 5

Species	**Q1**	**Q2**	**Q3**	**Mean No. and height per 10 m x 10 m**
Angophora costata	2 to 18m	2 to 6m	4 to 4m	2.7 @ 8 m
Ceratopetalum gummiferum	1 @ 3m	-	-	0.3 @ 3 m
Doryanthes excelsa	5 to 2m	7 to 2m	6 to 2m	6 @ 2 m
Eucalyptus capitellata	1 @ 14m	-	1 @ 2m	0.7 @ 8 m
Eucalyptus globoidea	-	-	2 to 8m	0.7 @ 4 m
Eucalyptus gummifera	1 @ 8m	2 to 2m	2 to 6m	1.7 @ 4.8 m
Eucalyptus piperita	-	6 to 11m	2 to 16m	2.7 @ 12.6 m
Eucalyptus sieberi	1 @ 7m	-	-	0.3 @ 7m
Leptospermum polygalifolium	2 to 12m	-	-	0.7 @ 12 m
Leptospermum trinervium	-	1 @ 2.5m	4 to 4m	1.7 @ 3.7 m
Persoonia levis	-	1 @ 2.5m	2 @ 2m	0.7 @ 2.2 m
Petrophile pulchella	1 @ 2m	-	-	0.3 @ 2 m

Relatively undisturbed areas of remnant vegetation are located to the NE corner and along the southern boundary of the project site.

The Brisbane Waters National Park boundary is about 150 m from SE boundary corner of the project area and approximately 500 m from the eastern boundary (Figure 1).

To the west of the project site, there are signs of a former large scale nursery operation. There appears to be no large dam to supply the water for operating a nursery.

The site access road passes through partly cleared native vegetation with some areas fully cleared and sown to pastures.

2.0 Flora

2.1 Previous studies in the region

Benson (1986) has mapped the vegetation of the survey area at a 1:100 000 scale as map units C and 10a. Unit C is cleared: "native vegetation has been largely removed for agricultural or suburban development but remnant vegetation of varying size and condition may remain". Unit 10a is a broad unit incorporating five structural formations, namely Open Forest/Woodland, Low Woodland, Open Scrub, Open Heath and Sedgeland. The dominant species of each of these communities are:

- Open Forest/ Woodland: *Eucalyptus piperita* (Sydney Peppermint) and *Angophora costata* (Angophora);
- Low Woodland: *Eucalyptus gummifera* (Red Bloodwood), *E. exima* (Yellow Bloodwood), *E. punctata* (Grey Gum), *E. haemastoma* (Scribbly Gum);
- Open scrub: *Banksia ericifolia* (Heath Banksia), *Hakea teretifolia* (Dagger Hakea);
- Open-heath: *Allocasuarina distylla*, *Baeckea* spp., *Darwinia* spp.; and
- Sedgeland: Cyperaceae and Restionaceae, *Banksia robur* (Swamp Banksia).

2.2 Current survey

A total of 194 species were recorded; 156 native and 38 exotic (Table 1). Species nomenclature is consistent with Harden (1990-1993).

2.2.1 Sample method

Vegetation data were collected from five 10 m wide transects in the areas of remnant native vegetation, supplemented by 18 spot locations (A-R) (Table 2, Figure 2). Spot locations N to R sampled the site access road.

The sampling area of each transect was 300 m^2, consisting of three contiguous 10 m x 10 m quadrats. The transects sampled homogeneous vegetation communities. Homogeneity was visually assessed.

The relative frequency of plant species in the native remnant bushland was assessed by recording the presence/absence of each species in three quadrats. The presence/absence of herb and shrub species recorded in 5 m x 5 m sub-quadrats were recorded. In the 10 m x 10 m quadrat, the numbers of individuals and the height of trees and shrubs (> 2 m height) recorded (Table 3) describe the vegetation structure.

2.2.2 Vegetation communities

2.2.2.1 Eucalypt forest

The remnant vegetation was predominantly an open eucalypt forest community (transects 1, 2, 3 and 5 and spot locations E and H) (Figure 2). Dominant canopy species were *Eucalyptus sieberi* (Silvertop Ash), *E. capitellata* (Brown Stringybark), *E. gummifera* and *Angophora costata* with a canopy height of about 12 m (Table 3). Members of the Fabaceae and Proteaceae families were well represented in the understorey, these included *Banksia spinulosa* var. *collina* (Hair-pin Banksia), *Lomatia silaifolia* (Crinklebush), *Telopea speciosissima* (Waratah), *Grevillea buxifolia* (Grey Spider Flower), *Persoonia levis* (Broad-leaved Geebung), *Bossiaea obcordata* (Spiny Bossiaea), *Acacia myrtifolia* (Red-stemmed Wattle), *Gompholobium latifolium* (Golden Glory Pea) and *Pultenaea rosmarinifolia*. Other dominant understorey shrub species included *Boronia pinnata*, *Tetratheca thymifolia* (Black-eyed Susan) and *Leptospermum polygalifolium* (Yellow Tea-tree). Monocotyledons present included *Lomandra* spp. (Mat Rush), *Xanthorrhoea media* (Grass Tree), *Doryanthes excelsa* (Gymea Lily) and *Patersonia glabrata* (Leafy Purple-flag) (Table 2).

Relatively few exotic species were recorded in this community. Those observed included *Hypochaeris radicata* (Flatweed), *Andropogon virginicus* (Whisky Grass), *Ageratina adenophora* (Crofton Weed), *Lantana camara* (Lantana), *Rubus disclor* (Blackberry) and *Senecio madagascariensis* (Fireweed).

The SW section of the survey area supported a small area (approximately 10 m x 10 m) of eucalypt forest with wet heath understorey community, situated around a shallow water-filled depression (spot locations J and K). It appeared to be in a naturally occurring soak. Dominant canopy species included *Eucalyptus capitellata*, *E. haemastoma* and *E. sieberi*. Understorey species included *Banksia oblongifolia*, *Leptospermum polygalifolium* (to 7 m), *Kunzea ambigua* (Tick-bush), *Hakea dactyloides* (Broad-leaved Hakea) and *Hypolepis muelleri* (Harsh Ground Fern). The wetland species, *Persicaria decipiens* (Slender Knotweed) and *Eleocharis sphacelata* (Tall Spike-rush) were present in the depression.

2.2.2.2 Regeneration on former quarries

The former quarries (SE pit, NE pit and the northern pit) appear not to have been planned and no rehabilitation undertaken. The quarries appear to have been excavated relatively recently, probably 2-5 years ago as natural regeneration is not advanced. Both terrestrial and aquatic/wetland flora were sampled.

Terrestrial flora observed included *Acacia linifolia* (Flax-leaved Wattle), *A. myrtifolia*, *Patersonia glabrata*, *Bossiaea obcordata* and *Micrantheum ericoides*. The two quarries sampled on the eastern side of the project site (NE pit - transect 4 and SE pit - spot location I) were relatively weed free, both were observed to have only two exotic species, namely *Andropogon virginicus* (a common weed of open areas on low nutrient soils) and *Hypochaeris radicata*.

The third quarry (the northern pit - spot locations C and D) had a higher number of exotic species including *Pennisetum clandestinum* (Kikuyu), *Vulpia bromoides* (Squirrel-tail Fescue), *Conyza albida* (Tall Fleabane) and *Ageratina adenophora* (sopt location D). The

cleared pasture grass paddocks are to the immediate west of this pit. Aquatic/wetland flora observed in the pit (spot location C) included *Eleocharis sphacelata*, *Juncus planifolius*, *Vallisneria gigantea* (Ribbonweed) and *Lycopodium cernuum* (Scrambling Clubmoss). These aquatic/wetland species in the pit are all native species and their growth should be encouraged in dams associated with the proposed clay/shale mine and associated rehabilitation.

2.2.2.3 Agricultural land

West of the project site has been cleared of native vegetation, with the exception of a narrow (single row) band of trees at the gate (Spot L and M), namely *Eucalyptus gummifera*, *E. piperita*, *E. haemastoma*, *E. capitellata* and *Angophora costata*.

The paddocks appeared unutilised and supported exotic species including *Senecio madagascariensis*, *Pennisetum clandestinum*, *Sida rhombifolium* (Paddy's Lucerne), *Verbena bonariensis* (Purple Top), *Conyza albida*, *Trifolium repens* (White Clover) and *Sporobolus indicus* var. *capensis* (Parramatta Grass).

Nutrient, exotic seeds and water runoff from the agricultural land need to be considered in the design of the post mining landform.

2.2.2.4 Site access road

The site access road is located to the SW of the project site and runs in a westerly direction for about 1 km to Calga-Peats Ridge Road. The survey (data from spot locations N, O, P, Q and R) assessed any likely flora constraints. The vegetation was eucalypt forest and small areas of paddocks. The eastern section of the site access road was in a drainage depression (spot N), bordered by cleared paddocks. Species recorded include *Eucalyptus piperita*, *E. capitellata* and *Angophora costata*, *Leptospermum polygalifolium* and *Kunzea ambigua* plus a groundcover dominated by exotics including *Pennisetum clandestinum*, *Andropogon virginicus* (dense) and *Senecio madagascariensis*.

Approximately 150 m west of the drainage line on the sandstone ridge with frequent sandstone outcropping, the weed frequency was low and a high diversity of local native species were recorded. The same canopy dominants (*Eucalyptus gummifera*, *E. capitellata*, *E. sieberi* and *Angophora costata*) as recorded in the bushland remnants occur in this area.

Approximately 300 m further west (spot P), the vegetation consisted of a few scattered remnant eucalypts with a cleared, weedy understorey. The dominant canopy species were *Eucalyptus globoidea* (White Stringybark), *E. gummifera*, *E. sieberi*, *E. capitellata* and *E. haemastoma*. *Muellerina eucalyptoides*, a native mistletoe, was observed on *E. haemastoma*. Two individuals of *Pinus radiata* (Monterey Pine) were noted. Natives recorded in the understorey included *Pittosporum undulatum* (Sweet Pittosporum), *Lambertia formosa* (Mountain Devil) and *Leptospermum polygalifoilum*. Exotic species recorded included *Lantana camara*, *Andropogon virginicus* and *Pennisetum clandestinum*.

About 200 m further west (spot location Q) the vegetation was a eucalypt open forest with some clearing having occurred. Dominant canopy species included *Eucalyptus capitellata*, *E. gummifera* and *E. haemastoma*. The native component of the shrubby understorey

included *Acacia suaveolens* (Sweet Wattle), *Grevillea speciosa* (Red Spider Flower), *Dillwynia retorta* and *Petrophile pulchella* (Conesticks). Exotics were not well represented here. Those recorded included *Lantana camara*, *Conyza albida*, *Senecio madagascariensis* and *Andropogon virginicus*.

Further west, about 175 m east of the Calga-Peats Ridge Road and south of a small dam (spot location R), the vegetation was dense with a eucalypt canopy and a wet heath understorey. To the immediate north of this spot, though outside of the site access road, there was a patch of low swampy heath. Dominant canopy species recorded at spot location R were *Eucalyptus capitellata*, *E. piperita*, *E. gummifera* and *E. haemastoma*. Understorey species included *Hakea gibbosa* (Needlebush), *Leptospermum trinervium* (Paperbark Tea-tree), *Banksia oblongifolia, Baeckea diosmifolia*, *Pittosporum undulatum*, *Lambertia formosa* and *Gleichenia dicarpa* (Pouched Coral-fern).

2.3 Weed species

Of the 38 exotic species recorded, two species (*Ageratina adenophora* and *Rubus discolor* (a member of the *Rubus fruiticosus* aggregate)) are classified as noxious for the Gosford City Council region. The two weeds are in category W3 (Noxious Weeds Act 1993 Order No. 3). Gray *et al.* (1993) describes the W3 weed category as:

> *A weed which poses a threat to agriculture, the environment, or the community and has the potential to spread to other areas, but is so widespread that total suppression and destruction is impractical.*

with the prescribed action:

> *Landholders must prevent the spread and reduce the numbers and distribution of W3 weeds to the satisfaction of the LCA.*

2.4 Rare or threatened species

None of the species recorded appear on the CSIRO Rare or Threatened Australian Plants (ROTAP) (Briggs and Leigh 1996) nor Schedules 1 and 2 of the NSW Threatened Species Conservation Act 1995.

Benson (1986) lists 50 species as having conservation significance for the Gosford and Lake Macquarie 1:100 000 map sheet (Appendix 1). None of these species were recorded in the survey area.

3.0 Conclusions

There are no national, state, regional or local species of conservation significance recorded on the project site or along the site access road.

Unplanned mining has occurred on the project site in the recent past. Agricultural uses with massive clearing and sowing of exotic pasture species dominate the upper slopes and ridge top. These activities are not compatible with the conservation of native vegetation in the Brisbane Water National Park (approximately 150 m downslope of the SE corner of the project site).

Planning of the rehabilitation is essential to protect the National Park from the adverse impacts of the existing agricultural land use upslope and to ameliorate the impacts of the unplanned mining operations.

4.0 Recommendations

The proposed clay/shale mine provides an opportunity to buffer the National Park from the existing land uses.

If the current agricultural land use is to be retained on the western side of the project site, then construction of a dam with adjoining shallows and at least one island would intercept the nutrient, exotic seeds and water runoff. The dam would also act as a water supply for agricultural land use as well as providing avifauna habitat. The final landform should be in a swale. Trialing the growth of local native cut flowers such as *Doryanthes excelsa* and *Telopea speciosissima* on the agricultural land should be considered.

The area on the eastern side of the project site of the dam should be recontoured to form a "natural" landform and local native bushland species re-established using topsoil and biomass respread as well as some direct seeding and planting if required.

References

Benson D. (1986)
The vegetation of the Gosford and Lake Macquarie 1: 100 000 vegetation map sheet. *Cunninghamia* 1(4), Royal Botanic Gardens Sydney. pp 467-489.

Briggs J.D and Leigh J.H. (1996)
Rare or threatened Australian plants. CSIRO, Canberra. 1995 revised edition.

Brink & Co. Pty Ltd (1991)
Investigation of Clay Resources on Portions 2 and 78, Parish Narara, Peats Ridge Area. Tumbi Umbi NSW.

Bureau of Meteorology (1996)
Climatological summary for Peats Ridge (Waratah Road). Climate and Consultancy Section. NSW Regional Office Bureau of Meteorology.

Corkery R.W. & Co. Pty Ltd. (1996)
Proposed Clay Mine at Peats Ridge (Draft). Prepared for Austral Brick Co. Pty Ltd.

Gray P., Trounce B. and Gorham P. (1993)
NSW noxious weeds legislation. Agnote DPI/78. NSW Agriculture, Division of Plant Research.

Harden G. J. (1990-93)
Flora of New South Wales. Volumes 1-4. University of New South Wales Press

Percover S.R. (1984)
Mineral resources of the Central Coast plateau lands within the shires of Gosford and Wyong New South Wales. Geological Survey of New South Wales. Department of Mineral Resources. GS 1984/359.

Species of particular conservation importance within the Gosford and Lake Macquarie Vegetation map sheet

Species listed here are either rare or threatened (from Leigh *et al.*, 1981), or of significance in terms of geographic distribution, or localized populations disjunct from other occurrences.

pop. = population, Sth = southern, Nth = northern, NP = national park, SRA = state recreation area, NR = nature reserve.

Species	Locality/habitat	Significance (codings as in 2EC, 2V, 3V, 2RC, 3RC, Leigh *et al.*, 1981)
DICOTYLEDONS		
AIZOACEAE		
Macarthuria neocambrica	Munmorah SRA	Sth limit
ARALIACEAE		
Astrotricha crassifolia	Patonga	local pop., rare
ASTERACEAE		
Olearia cordata	Wisemans Ferry, Fernances Trig.	2V, local endemic, only 2 pop. known.
O. nernstii	Gosford	Sth limit
CONVOLVULACEAE		
Wilsonia backhousei	Saltmarsh, Wamberal Lagoon N.R.	Nth limit
CUNONIACEAE		
Caldcluvia paniculosa	Ourimbah, rainforest	Sth limit
ELAEOCARPACEAE		
Elaeocarpus obovatus	Wyong, rainforest	Sth limit
EPACRIDACEAE		
Leucopogon amplexicaulis	Brisbane Water NP	3RC, Nth limit
L. margarodes	Brisbane Water NP	Sth limit
L. pleiospermus	Woy Woy	Sth limit
Styphelia laeta var. *latifolia*	Brisbane Water NP	local pop.
FABACEAE		
Acacia bynoeana	Dora Creek, Morisset, Kulnura	rare
A. quadrilateralis	Redhead district	rare
A. prominens	Gosford district	local pop.
GOODENIACEAE		
Velleia perfoliata	Hawkesbury district	3RC
HALORAGACEAE		
Gonocarpus chinensis subsp. *verrucosa*	Hawkesbury River	rare
LAMIACEAE		
Prostanthera incisa var. *pubescens*	Kendall's Glen, Gosford	rare, possibly endemic taxon
LAURACEAE		
Endiandra discolor	Gosford district	Sth limit
MELIACEAE		
Dysoxylum fraseranum	rainforest	Sth limit
MYRSINACEAE		
Embelia australiana	Wyong District	Sth limit
MYRTACEAE		
Darwinia glaucophylla	Brisbane Water NP	2RC
D. procera	Brisbane Water NP	2RC
Decaspermum paniculatum	Ourimbah, rainforest	Sth limit

Species	Locality/habitat	Significance (codings as in 2EC, 2V, 3V, 2RC, 3RC, Leigh *et al.*, 1981)
Eucalyptus multicaulis	Brisbane Water NP	local pop.
E. luehmanniana	Brisbane Water NP	2RC Nth limit
Melaleuca deanei	Brisbane Water NP	3RC, Nth limit
Rhodomyrtus psidioides	rainforest	Sth limit
Syzigium paniculatum	littoral rainforest, Wamberal Lagoon NR	local pop.
PROTEACEAE		
Banksia paludosa	Doyalson	Nth limit
Grevillea shiressii	Brisbane Water NP	2EC
Grevillea sp. aff. *capitellata*	Brisbane Water NP	local pop.
Grevillea sp. nov.	sandstone scarp, Somersby–Narara	local endemic pop.
Hakea bakerana	Lake Macquarie district, Doyalson–Wyee, Dharug NP	uncommon
RUTACEAE		
Acronychia wilcoxiana	Gosford district	rare
Boronia fraseri	Brisbane Water NP	2RC
SAPINDACEAE		
Dodonaea megazyga	Olney State Forest	3RC, Sth limit
TREMANDRACEAE		
Tetratheca glandulosa	Mangrove Mtn–Wisemans Ferry	2RC, local pop. Nth limit.
Tetratheca juncea	Lake Macquarie district	3V, local pop.
VITIDACEAE		
Tetrastigma nitens	rainforest	Sth limit
MONOCOTYLEDONS		
JUNCAGINACEAE		
Maundia triglochinoides	Swamp, Wyong	Sth limit
LILIACEAE		
Allania endlicheri	Brisbane Water NP	3RC, local pop.
Blandfordia grandiflora	Gosford northwards	Sth limit
POACEAE		
Ancistrachne maidenii	Hawkesbury River	2RC, rare
SMILACACEAE		
Ripogonum fawcettianum	rainforest	Sth limit
XANTHORRHOEACEAE		
Xanthorrhoea resinosa subsp. *fulva*	Coastal sand systems	Sth limit
ZINGIBERACEAE		
Alpina caerulea	Martinsville	Sth limit
FERNS		
ASPLENIACEAE		
Asplenium aethiopicum	Watagan Mtns	rare
BLECHNACEAE		
Blechnum ambiguum	Brisbane Water NP	Nth limit
LINDSAEACEAE		
Lindsaea dimorpha	Brisbane Water NP	local pop., rare
OPHIOGLOSSACEAE		
Botrychium australe	Martinsville	uncommon