Appendix 1.

Preliminary assessment of the flora and vegetation on parts of King Location 599 (revised).

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Report To

Kirby Rural Developments

By

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Introduction

The Department of Environmental Protection (DEP) has requested information on the vegetation of parts of King Locations 599 which are subject to an application to sub-divide. The information will be used by the DEP to determine the level of environmental impact assessment required before consideration of the application can proceed. This report provides a preliminary assessment of the status and conservation value of vegetation and flora of the area.

Materials and methods

Background Materials

Available background materials included an enlarged aerial photograph[4], a Land Capability Classification map[5] a description of soil types and their profiles[6] and a photo-enlargement of the 1:50 000 Topographical map[7] which marks tracks and fence-lines, some of which are not visible on the aerial photograph. Many fence-lines were slashed to facilitate vehicle access just prior to the survey and a reconnaissance of the area was made to verify fence locations and select representative sampling sites.

Project area

The project area is situated on the west bank of the lower Ord River and mostly comprises a massive point bar and an adjacent flood plain. The Ord River's riparian zone is not included within the project area.

Land use capability.

Four land-use capability types are mapped. The first two (both suited to agriculture or horticulture) are largely developed and are mostly external to the project area. The third is described as *Unsuitable for irrigated agriculture or horticulture; coarse sand, swamps, stony surfaced soil*. Within the project area it comprises an annually inundated depression (which is a seasonal swamp) and an area of steeper gradients traversed by an incised creek line. This area, in the northwest corner, of the project area appears to have been severely eroded in the past. The majority of the project area is classified "*Suitable for only limited horticultural activities and some irrigated agriculture. Very careful management and extensive drainage required*."

Surface Hydrology

There are three components to the surface hydrology of the project area.

1. Water drains directly into the river from the riverine side of a levee along the northern boundary. Aerial photography indicates that there has been significant erosion of this slope but vegetation cover is considerably more extensive now than it has been (Chris Done personal observation). Most of the other levee soils have been developed and they are outside the project boundary.

[4] Ord River Irrigation Scheme - Run 11, Frame 5005. Flown 26/07/99. Scale 1:20 000. Western Australian Department of Land Administration
[5] Unpublished map prepared by the WA Department of Agriculture 30/06/93. Scale 1: 20 000
[6] Unpublished report prepared by the WA Department of Agriculture
[7] 'Deception Range' (Sheet 4666 3)

2. At some time in the past a channel was scoured across the point bar by river flood waters "cutting the corner". The upstream portion has subsequently been occluded by riverine deposits but the lower portion persists as a paleo-channel evident as a series of depressions that are visible on the aerial photograph because of the relatively dense stands of trees that encircle them. The seasonal swamp, which is the uppermost and largest, thus occupies the head of a shallow basin that trends north, then northwest into the river channel.

3. Although the majority of the area inland of the levee and paleo channel appears flat, water evidently flows generally northwest to west along a series of shallow depressions which are hardly perceptible on the ground until they develop into distinct, incised creek lines near the western boundary. The creek margins (like the riverine slope of the levee to their north) have been significantly eroded (see below) at some time in the past but are redeveloping vegetative cover. Beyond the western boundary of the project area, these creeks join Valentine Creek, which empties into the Ord.

Soils

The distribution of the principal soil types are closely related to the surface hydrology and are described in relation to the three hydrological areas defined above. References to Type numbers refer to the unpublished Department of Agriculture report. Types iv and v do not occur in the project area.

1. The levee is capped by fine, pale loams (probably similar to Type iii) that blend into red soils inland (see 3, below). On the riverine side, the slope has been significantly eroded exposing red soils. Although these scars are evident on the 1999 aerial photography, there has been substantial recovery of vegetation cover in recent years (Chris Done, personal observation)

2. The seasonal swamp and the adjacent paleo-channel contain heavy grey clay soils (Type vi).

3. Most of the area is mantled by a friable red soil complex (Type ii) but water-worn pebbles on eroded surfaces and in a creek line on the western boundary (only one was examined) indicate that underlying deposits contain some coarser materials. The shallow depressions that provide drainage across the red soils, , are occupied by heavy, cracking, grey clays (type i). They are delineated on the land-use capability map although they are not distinguished in the accompanying key.

Vegetation sampling

Vegetation and principal floristic components of the project area were studied by sampling quadrats and by three supplementary methods.

1. Quadrats. Floristic composition of the three hydrological/soil units was examined by listing all species present in seven 50x50 m quadrats. The quadrat sites were selected to represent friable red soils (2), clay soils in drainage depressions traversing the former (2), levee loams (2) and an incised creek line (1) (Table 1 and Figure 1). Exotic species have been flagged with an asterisk (*).

Table 1.

Location and representation of the seven 50x50 m quadrats used to determine the characteristic flora of the project area.

Site	Soil type	Topography	AMG:
BS 1	cracking grey clay ("black soils")	narrower (almost imperceptible) drainage line in a flat landscape	465583 8259782
BS 2	cracking grey clay ("black soils")	broader, (almost imperceptible) drainage line/inundating hollows	465633 8260165
RS 1	friable red soil	almost imperceptibly higher ground in a flat landscape	465024 8260687
RS 2	friable red soil	almost imperceptibly higher ground in a flat landscape	465869 8259774
LL 1	fine, pale loam	flat levee crest	465952 8260659
LL 2	fine, pale loam	flat levee crest	adjacent to LL 1
CK 1	red soils with coarser material including pebbles	incised creek bed and adjacent moderate valley slopes	465224 8260830

2. Aerial photography. The distribution pattern and density of trees was ascertained from examination of the aerial photograph.

3. Opportunistic observations. After sampling the quadrats, all slashed fence lines were driven and any species not represented in any quadrat were noted. (Most grasses and smaller herbs would have been overlooked).

4. The seasonal swamp. Plants seen during a cursory visit to the seasonal swamp were noted. (We were advised that the vegetation of the seasonal swamp is being assessed as part of a separate study by environmental scientist, Mr. Lindsay Stephens from Landform Research).

Results

Vegetation

At this time of year many grasses and herbs have not yet flowered. Although most species were identifiable, no doubt others were overlooked. For the most part the project area is a savanna grassland consisting of a very open woodland over perennial grasses. Tree density appears greater on the red soils and those parts of the levee that had not been severely eroded. Canopy density was considerably greater about the creek line near the western boundary and around the margins of the seasonal swamp and other depressions on the paleo-channel. Basic descriptions of the vegetation at each quadrat site is shown in Table 2.

Table 2.

Basic descriptions of the vegetation at of each quadrat.

Site	Vegetation
BS 1	Very open low woodland of (mostly sapling) *Bauhinia cunninghamii* (on clays) and *Eucalyptus tectifica* (on marginal red soils) over perennial grasses, *Themeda* and *Heteropogon* respectively.
BS 2	Very open low woodland of *Bauhinia cunninghamii* over perennial grasses, *Dichanthium* and *Chrysopogon*. Some depressions are inundated in summer.
RS 1	Very open low woodland of *Eucalyptus tectifica* and *Bauhinia cunninghamii* over sparse shrubs, perennial grasses including *Sehima* and *Heteropogon*. Some recovering erosion patches
RS 2	Very open low woodland of *Eucalyptus tectifica, Corymbia confertiflora*

	and Adansonia gregorii (Boab) over sparse shrubs perennial grass, (principally*Themeda*) and leguminous herbs (notably *Christia*)
LL 1	Very open low woodland of *Eucalyptus tectifica, Corymbia confertiflora* and *Brachychiton diversifolius* over *dense* patches of woody herbs (**Hyptis*), vines (**Passiflora*) and perennial grasses principally *Heteropogon*)
LL 2	Very open low woodland of *Eucalyptus tectifica, Corymbia confertiflora* and *Brachychiton diversifolius* over *dense* patches of woody herbs (**Hyptis*), vines (**Passiflora*) and perennial grasses principally *Heteropogon*)
CK 1	Open tall woodland of *Eucalyptus tectifica* and *Corymbia confertiflora* over mid-dense, diverse low woodland and tall shrubland over perennial grass (principally *Heteropogon*). Sparse herbs in the creek bed.

Floristic composition.
Table 3 summarises the floristic composition of the area

Table 3.
The total numbers native and exotic ferns, monocotyledons (grasses etc) and dicotyledons (broad-leafed plants) recorded in the project area.

	Ferns	Monocots	Dicots	All Species
native	1 (100%)	21 (84%)	93 (83%)	115 (83%)
exotic	0 (0%)	4 (16%)	19 (17%)	23 (17%)
Total	1	25	112	138

A More detailed summary is provided in Appendix1 while full species lists are provided in Appendices 2 and 3.

Discussion
Generally, the vegetation and floristic composition of the area are common on this section of the lower Ord River flood plain but in this preliminary assessment community associations have not been compared with those in other areas. Several features are worth comment.

Condition. The generally good condition of the area was indicated by good cover of perennial grasses, fairly high species diversity and lack of the signs of multiple, severe fires in recent years. Areas with significant slope appear to have been severely eroded in the past but those we saw have considerably improved vegetation cover, albeit with an exotic component.

Diversity. The species diversity of the project area is relatively high, reflecting the range of soil types and variety in surface hydrology. Some species that tolerate a wide range of environmental conditions occurred on most soil types in the project area, but many species showed clear preference s (Appendices 2 and 3). In this preliminary study we have not analysed community composition in relation to soils or other factors but some examples are clear to the casual observers. Eg. Eucalypts were generally absent from the black soils where the characteristic tree was Bauhinia (*Bauhinia cunninghamii*). Darwin Box (*Eucalyptus tectifica*) typified the red soils while Coolabahs (*E. microtheca*) River Gums (*E. camaldulensis*) and Ghost Gums (*Corymbia bella*) only grew round the seasonal swamp..

It is worth noting that a large number of species were only recorded in two of the most restricted habitats, the seasonal swamp environs and the incised creek (site CK 1). However, all these species are wide spread elsewhere in the region.

Weeds. Exotic plants (weeds) occurred throughout the area but did not dominate most sites. Areas where weeds did dominate the non-tree vegetation included the seasonal swamp (where there was a well developed weed complex) and loam soils of the levee where Hyptis (**Hyptis suaveolens*) and Stinking passionfruit (**Passiflora foetida*) were the most vigorous invaders. Levee soils adjacent to Weero Road were also heavily weed infested. Caltrop (**Calotropis procera*) being the most obvious because of its size and distinctive colour, but there were many other species, some of which were not encountered elsewhere. Some exotic species (eg. Stylo, **Stylosanthes hamata*) have probably been introduced for pasture improvement. Stylo was dominant species on a regenerating scald near the CK 1 site where it performed a useful function. Buffel Grass (**Cenchrus ciliaris*) was seldom encountered.

Two exotic tree species were widespread. At present they appear sparse but one, Neem (**Azarichta indica*) occurred in 4 of 7 quadrats and at the seasonal swamp suggesting that it is well established. The fact that most quadrat records were of saplings growing under native tree species (seed is spread by bowerbirds) may explain their relative "invisibility". The other, Raintree (**Albizia lebbeck*[8]) was recorded only once in a quadrat (its seed are not bird dispersed and it tends to grow in more open sites where it is readily visible). Nevertheless, like Neem, it has serious weed tendencies and is spreading rapidly in the Kununurra area. Other potentially serious tall shrub/small tree weed species that were present included Leucaena (**Leucaena leucocephala*)and Parkinsonia (**Parkinsonia aculeata*). Leucaena was noted at only one site (off the track to sites LL 1 & 2) while the latter was rare except around the seasonal swamp where it was abundant.

Rare species.

No species listed on the State's threatened or priority lists were recorded. However, the presence of *Typhonium* sp. (Araceae - the Arum Lily family) is interesting and may be significant. Three species have been recorded from Western Australia, all in the North Kimberley. This is the first record of the genus in the East Kimberley. The species has not been determined but specimen details have been forwarded to Alistair Hay (Royal Botanic Gardens, Sydney) who is revising the family for a definitive treatment in a forth-coming volume of Flora of Australia.

Two fruiting specimens with markedly different leaf shapes were collected (ANS 1468/9; Figures 2, 3a and 3b) at Site BS 2 where they were located in an area that would be inundated for periods in summer, most vegetation being confined to the tops of mounds.

Before the significance of this record can be ascertained the plant's identity and status in the Northern Territory need to be determined. Further field work to determine its abundance at the site and occurrence elsewhere in the Kununurra area may be warranted. If so, these actions should be undertaken by CALM.

Conclusion

For the most part, this area supports a flora that is diverse but well represented in the region. The presence of one species, *Typhonium* sp. is significant as the first Western Australian record for genus outside the North Kimberley. Determining its identity and status in the

[8] This species occurs naturally elsewhere in the Kimberley but the "weedy" form is introduced to Australia

Northern Territory will be the first step in ascertaining the significance of this record. The seasonal swamp is interesting for two reasons. Firstly, its vegetation (although heavily weed infested) is distinctly different from the Ord's riparian vegetation because it is seasonally inundated and not exposed to scouring effects of river flow events. Secondly, its geomorphological origin as a paleo-channel scoured across a point bar is unique on this section of the lower Ord.

Appendix 1.

The total numbers native and exotic ferns, monocotyledons (grasses etc) and dicotyledons (broad-leafed plants) recorded in the project area.

		BS 1	BS 2	RS 1	RS 2	LL 2	LL 1	CK 1	Seasonal Swamp	Other
FERNS	**native**	0	2	0	0	0	0	0	0	0
	exotic	0	0	0	0	0	0	0	0	0
	Total	0	2	0	0	0	0	0	0	0
	% exotic	0	0	0	0	0	0	0	0	0
MONOCOTS	**native**	8	10	10	4	6	3	5	5	0
	exotic	1	1	2	0	1	0	1	4	0
	Total	9	11	12	4	7	3	6	9	0
	% exotic	11	9	17	0	14	0	17	44	0
DICOTS	**native**	32	17	34	35	15	26	43	7	8
	exotic	6	4	9	3	6	8	7	12	3
	Total	38	21	43	38	21	34	50	19	11
	% exotic	16	19	21	8	29	24	14	63	27
TOTAL	**native**	40	29	44	39	21	29	48	12	8
	exotic	7	5	11	3	7	8	8	16	3
	Total	47	34	55	42	28	37	56	28	11
	% exotic	15	15	20	7	25	22	14	57	27

BS 1 = Black Soil Site 1
BS 2 = Black Soil Site 2
RS 1 = Red soil Site 1
RS 2 = Red soil Site 2
LL 1 = Levee Loam Site 1
LL 2 = Levee Loam Site 2
CK 1 = Creek Line Site 1

seasonal swamp Not systematically sampled.

Other Species noted within the study area but not recorded on any plot or at the seasonal swamp

APPENDIX 2. **MONOCOTYLEDONS (Grasses etc) and FERNS** (BS 1 includes 2 spp on adjacent track that were not in the plot)

Family	Species	BS 1	BS 2	RS 1	RS 2	LL 1	LL 2	CK 1	Seasonal swamp	Other	TOTAL BS1-CK1
FERNS											
Marseliaceae	Marselia sp		1								1
Ophioglossaceae	Ophioglossum costatum R.Br.		1								
TOTAL		*0*	*2*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*
MONOCOTS											
Araceae	Typhonium sp1		1								1
Commelinaceae	Commelina ciliata Stanley	1									1
Commelinaceae	Commelina ensifolia R. Br.	1	1	1			1	1			5
Commelinaceae	Murdannia graminea (R.Br.) G. Brueckner	1	1	1	1	1	1				6
Cyperaceae	*Cyperus (white flower ANS 1470)*		*1*								
Haemodoraceae	Haemodorum ensifolium F.Muell.					1					1
Orchidaceae	Cymbidium canaliculatum R.Br.								1		0
Poaceae	*Cenchrus ciliaris L.			1					1		1
Poaceae	*Cynodon dactylon (L.) Pers.								1		0
Poaceae	*Echinochloa colona (L.) Link	1	1						1		2
Poaceae	*Urochloa mosambicensis (Hackel) Dandy			1		1		1	1		3
Poaceae	Aristida holathera Domin			1							1
Poaceae	Chrysopogon fallax S.T. Blake	1	1	1				1			4
Poaceae	Dichanthium fecundum S.T. Blake	1	1								2
Poaceae	Digitaria ciliaris (Retz.) Koeler			1		1			1		2
Poaceae	Digitaria ctenantha		1								1
Poaceae	Eriachne obtusa R. Br.		1	1	1	1					4
Poaceae	Heteropogon contortus (L.) P. Beauv. Ex Roemer & Schultes	1		1	1	1	1	1			6
Poaceae	Panicum decompositum R. Br.		1								1
Poaceae	Pseudoraphis spinescens(R.Br.) Vick.								1		0
Poaceae	Sehima nervosum (Rottler) Stapf.			1				1			2
Poaceae	Sorghum plumosum (R. Br.)P. Beauv.	1		1							2
Poaceae	Sorghum stipodeum (Ewart & J.White)C.Gardner & C.E.Hubb.		1								1
Poaceae	Themeda triandra Forssk.	1		1	1	1		1			5
Poaceae	Urochloa piligera (F. Muell. ex Benth.) R. Webster								1		0
Poaceae	Urochloa pubigera (Roem. & Schult.) R.D.Webster								1		0
TOTAL		9	11	12	4	7	3	6	9	0	

italics = spp added subsequent to the report presentation to John K.

APPENDIX 3. DICOTYLEDONS

Family	Species	BS 1	BS 2	RS 1	RS 2	LL 2	LL 1	CK 1	Seasonal swamp	Other	TOTAL BS1-CK1
Amaranthaceae	Achyranthes aspera L.	1		1				1	1		3
Amaranthaceae	Gomphrena canescens R. Br.							1			1
Amaranthaceae	Ptilotus fusiformis (R.Br.)Steud.				1			1			2
Anacardiaceae	Buchanania obovata Engl.							1			1
Apocynaceae	Carissa lanceolata R.Br.	1	1	1	1	1	1	1			7
Apocynaceae	Wrightia saligna (R.Br.) F. Muell. ex Benth.							1			1
Asclepiadaceae	*Calotropis procera (Aiton) W.T. Aiton		1	1	1	1	1	1			6
Asclepiadaceae	Cynanchum spp							1			1
Asclepiadaceae	Gymnanthera oblonga (Burm.f.)P.S.Green				1						1
Asteraceae	*Bidens bipinatifida L.			1			1		1		2
Asteraceae	*Emilia sonchifolia (L.) Wight	1		1			1				3
Asteraceae	*Tridax procumbens L.	1	1	1	1	1	1	1	1		7
Asteraceae	Pterocaulon serrulatum (Montr.) Guillumin		1								1
Asteraceae	Pterocaulon sphacelatum (labill.) F. Muell.	1	1	1	1			1			5
Asteraceae	Pterocaulon verbascifolium (Benth.)F.Muell.				1						1
Bignoniaceae	Dolichandrone heterophylla (R. Br.) F. Muell.	1				1		1			3
Bombacaceae	Adansonia gregorii F. Muell.				1						1
Boraginaceae	Ehretia saligna R.Br.						1	1			2
Boraginaceae	Heliotropium spp	1						1			2
Caesalpiniaceae	*Parkinsonia aculeata L.								1	1	0
Caesalpiniaceae	*Senna occidentalis (L.) Link						1				1
Caesalpiniaceae	Bauhinia cunninghamii (Benth.)Benth.	1	1	1		1	1	1			6
Caesalpiniaceae	Senna venusta (F. Muell.) B. Randell									1	0
Capparaceae	Cleome viscosa L.	1									1
Cochlospermaceae	Cochlospermum fraseri Planch.			1	1		1	1			4
Combretaceae	Terminalia canescens (DC.)Radlk. in T.Durand									1	0
Convolvulaceae	Bonamia media (R.Br.)Hallier	1	1	1			1	1			5
Convolvulaceae	Ipomoea diversifolia R.Br.	1		1							2
Convolvulaceae	Ipomoea eriocarpa R.Br.				1						1
Convolvulaceae	Polymeria sp.A Kimberley Flora(T.E.H.Aplin et al.418)	1		1							2
Curcurbitaceae	Cucumis melo L.	1	1	1							3
Euphorbiaceae	*Euphorbia heterophylla L.									1	0

Euphorbiaceae	*Euphorbia hirta L.								1		0
Euphorbiaceae	Euphorbia coghlanii Bailey	1	1	1	1						4
Euphorbiaceae	Flueggea virosa (Roxb. Ex Willd.) Voigt			1			1	1			3
Euphorbiaceae	Phyllanthus maderaspatensis L.	1						1			2
Euphorbiaceae	Phyllanthus virgatus Poir.						1	1			2
Euphorbiaceae	Phyllanthus *trachygyne*				1						1
Euphorbiaceae	Sauropus spp		1		1						2
Goodeniaceae	Goodenia sepalosa Benth.						1				1
Goodeniaceae	Goodenia *af. malvina (ANS 1463)*	1	1								2
Goodeniaceae	Goodenia *af lamprosperma (ANS 1464)*	1									1
Lamiaceae	Hyptis suaveolens (L.) Poit.			1		1	1	1	1		4
Lauraceae	Cassytha capillaris Meisn. in A.DC.									1	0
Lecythidaceae	Planchonia careya (F.Muell.)Knuth in Engl.							1			1
Loranthaceae	Amyema sanguinea (F. Muell.) Danser							1	1		1
Malvaceae	*Sida acuta Burm.f.			1					1		1
Malvaceae	Abutilon andrewsianum W. Fitzg.			1	1						2
Malvaceae	Gossypium australe F.Muell.				1						1
Malvaceae	Hibiscus meraukensis Hoichr.	1		1							2
Malvaceae	Hibiscus pentaphyllus F. Muell.				1	1	1				3
Meliaceae	*Azarichta indica Juss			1		1	1	1	1		4
Menispermaceae	Tinospora smilacina Benth.	1		1	1		1				4
Mimosaceae	*Acacia farnesiana (L.) Willd.	1				1	1	1	1		4
Mimosaceae	*Albizia lebbeck (L.) Benth.		1								1
Mimosaceae	*Leucaena leucocephala (Loam.) De Wit									1	0
Mimosaceae	Acacia holoserecia Cunn. ex Don							1			1
Moraceae	Ficus opposita Miq.	1	1	1	1	1	1	1			7
Myrtaceae	Corymbia bella K.D.Hill & L.A.S.Johnson								1		0
Myrtaceae	Corymbia confertiflora (F.Muell.)K.D.Hill & L.A.S.Johnson	1			1	1	1	1			5
Myrtaceae	Corymbia polycarpa (F.Muell.)K.D.Hill & L.A.S.Johnson								1		0
Myrtaceae	Eucalyptus camaldulensis Dehnh.								1		0
Myrtaceae	Eucalyptus microtheca F. Muell.								1		0
Myrtaceae	Eucalyptus pruinosa Schauer in Walp.									1	0
Myrtaceae	Eucalyptus tectifica F.Muell.	1	1	1	1	1	1	1			7
Myrtaceae	Eucalyptus terminalis (F.Muell.)K.D.Hill & L.A.S.Johnson			1							1
Myrtaceae	Melaleuca minutifolia F.Muell.			1							1
Myrtaceae	Melaleuca nervosa (Lindl.)Cheel							1			1
Oleaceae	Jasminum didymum G.Forst.							1			1
Oleaceae	Jasminum molle R.Br.							1			1

Papilionaceae	*Clitoria ternatea L.			1				1	1		2
Papilionaceae	*Macropetalum atropurpureum (DC.) Urban					1					1
Papilionaceae	*Stylosanthes hamata (L.) Taub.	1		1				1	1		3
Papilionaceae	Aeschynomene indica L.	1	1						1		2
Papilionaceae	Alysicarpus spp	1						1			2
Papilionaceae	Christia australasica (Schindl.)Meeuwen	1		1	1			1			4
Papilionaceae	Crotalaria medicaginea Lam.						1				1
Papilionaceae	Crotalaria montana Roth.	1	1	1	1						4
Papilionaceae	Crotalaria novae-hollandiae DC.					1	1				2
Papilionaceae	Flemingia spp (sterile)			1	1						2
Papilionaceae	Indigofera colutea Burm.f.) Merr.				1						1
Papilionaceae	Neptunia dimorphantha Domin	1		1	1						3
Papilionaceae	Nomismia rhomboidea (Benth.)Pedley			1							1
Papilionaceae	Rhynchosia minima (L.)DC.	1	1	1			1	1			5
Papilionaceae	Tephrosia spp							1			1
Papilionaceae	Uraria cylindracea Benth.	1			1		1	1			4
Papilionaceae	Vigna lanceolata Benth.	1	1	1	1		1	1			6
Papilionaceae	Zornia prostrata S.T. Reynolds and A.E. Holland				1						1
Passifloraceae	*Passiflora foetida L.	1	1	1	1	1	1	1	1		7
Pedaliaceae	Josephinia eugeniae F.Muell.									1	0
Portulacaaceae	Portulaca filifolia F. Muell.							1			1
Proteaceae	Grevillea dimidiata F.Muell.			1							1
Proteaceae	Grevillea erythroclada W.Fitzg.									1	0
Proteaceae	Hakea arborescens R.Br.			1		1	1	1			4
Rubiaceae	Gardenia spp				1	1		1			3
Rubiaceae	Psydrax pendulina S.T.Reynolds ms	1									1
Sapindaceae	Dodonaea physocarpa F.Muell.			1							1
Scrophulariaceae	Stemodia spp		1								1
Solanaceae	Physalis minima L.									1	0
Solanaceae	Solanum lucani F. Muell.									1	0
Sterculiaceae	*Melochia pyramidata L.	1									1
Sterculiaceae	Brachychiton diversifolius R. Br.				1	1	1	1			4
Sterculiaceae	Brachychiton tuberculatus (W.Fitzg.)Guymer				1		1				2
Sterculiaceae	Corchorus sidoides F.Muell.			1	1		1	1			4
Sterculiaceae	Waltheria indica L.			1	1	1		1			4
Tiliaceae	*Corchorus aestuans L. ?								1		0
Tiliaceae	Grewia retusifolia Kurz	1	1	1	1	1	1	1			7
Verbenaceae	Clerodendrum floribundum R. Br.						1				1
Violaceae	Hybanthus aurantiacus (Benth.)F.Muell.							1			1

Violaceae	Hybanthus ennaspermus (L.) F. Muell	1		1	1	1		1			5
Vitaceae	Cayretia trifolia (L.) Domin	1		1	1		1	1			5
Zygophyllaceae	Tribulopis pentandra R.Br. in Sturt				1						1
TOTAL		38	21	43	38	21	34	50	19	11	

SUMMARY 93 native species
19 exotic species
112 species

BS 1 includes 8 spp on adjacent track that were not in the plot

Appendix 2.

Typhonium sp. (Araceae) on King Location 599.
Supplement to Kirby Report

Collection of material.
While undertaking a preliminary flora survey on part of King Location 559 in late December 2001 (Start and Done 2002) we collected two fruiting specimens (ANS 1468 & ANS 1469, Figs 2, 3a & 3b in Start and Done 2002) of *Typhonium* sp (Araceae ~ Arum lily family). They differed substantially in leaf shape, but had (at least superficially) similar fruits.

Both specimens were sent to Dr Alistair Hay, Royal Botanic Gardens, Sydney[9]. Dr Hay, who is the world expert on Australasian species of this group, is currently revising it for a forthcoming volume of *Flora of Australia* (Hay in prep.). His initial impression, based on the different leaf forms, was that the collections represented two species both 'new to science'. However, it is possible that one dimorphic species is involved. If so, and given such morphological variation in leaf form, the specimens may represent new forms of a previously described taxon. (Hay, personal communication to ANS)

At Dr. Hay's request, we returned to the site (BS2) to collect live material to be grown in the Royal Botanic Gardens. We failed to locate additional plants in the original survey quadrat at BS2 (on the north side of the fence line) but did locate about ten immature, plants, all with a leaf form similar to ANS 1468, on the south side of the fence. As with the original collections, they were growing in water-logged black soil on the margins of puddles. Live plants were sent to Dr Hay.

We searched some other black soil sites (not on King Location 559) for Typhoniums, without success. However, our efforts were far short of a comprehensive or systematic survey.

Status of Western Australian* Typhonium *species.
There are seventeen species of *Typhonium* in Australia (Hay *et al*. 1999) with three named species known from Western Australia (Florabase). They are:

- *Typhonium liliifolium* F.Muell. North Kimberley (Mitchell Plateau and Kalumburu, 5 specimens in the Western Australian Herbarium)
- *Typhonium nudibaccatum* A.Hay. North Kimberley (Mitchell Plateau, 7 specimens in the Western Australian Herbarium)
- *Typhonium peltandroides* A.Hay, M.D.Barrett & R.L.Barrett. North Kimberley (Beverley Springs Station, 2 specimens from one location, both in the Western Australian Herbarium.)

The King Location collection is the first Western Australian record of any *Typhonium* species outside the North Kimberley biogeographic region. However, Typhoniums are poorly known. Two of the species recorded from Western Australia have been named in the past ten years (1993, 1999). They are tuberous perennial plants that, in this region, are only apparent above ground in the wet season. Thus, they may be more diverse and more

[9] A duplicate of ANS 1468 is lodged in the Kimberley Regional Herbarium, Kununurra and a leaf of ANS 1467 is held by AN Start in field notebook 12: p109.)