THE MURONGA LAVA FLOW

M. Godwin and L.M. Pearson.

ABSTRACT; The Muronga Crater, together with a number of closely associated pyroclastic cones, lies in the south central region of the Tertiary McBride volcanic province in North Queensland, Australia.

Muronga's basalt lava sheet is one of the three most recent flows of the McBride Plateau which has a thickness of approximately 600 m.

This paper outlines the three lava tubes, the lava caves already located, some meteorological data and some of the flora and fauna in the locality.

INTRODUCTION

The Muronga Crater is located on Lava Plains Pastoral Holding some 5 km west of the Kennedy Developmental Highway approximately 100 km south of Mt Garnet in North Queensland (Fig 1).

This crater is adjacent to the large flat rimmed scoria cone, Mt Tabletop. It is one of a group of pyroclastic cones apparently associated with the Muronga eruption (Fig 2).

The basaltic lava outflow is generally in a south westerly direction from the crater reaching the southern margin of the McBride Plateau. The main flow is in a southerly direction for 10 km and before turning in a south south westerly direction. The overall length extending for approximately 34 km with a 400 m drop in elevation from the vent to the toe of the flow. The present Spring Creek and Lagoon Creek have been displaced by this flow. A subsidiary flow heads west south west to the north of an older Volcano cone, Mount McMaster, for a distance of 19 km filling a former gentle valley now bounded by Emu and Rocky Creeks.

There are no significant easterly flows from this vent although there have been some minor flows down previous watercourse valleys. Only one of these has crossed the Kennedy Developmental Highway along Wyandotte Creek (Fig 3).

The edge of the flow is marked with thick but narrow width lava tongues. The formation of these is attributed to the high viscosity of the flow. This viscosity may also be responsible for the rough surface of the flow which is still devoid of soil cover in many places and covered with deciduous vine thicket. This thicket has also been noted on aa lava.

Muronga lava flow is one of the three most recent of the eruptions which created the 600 m thick McBride plateau. Isotope dating has established that volcanic activity here commenced approximately 8 million years ago and that the last flow was from Kinrara Crater less than 80,000 years ago (Griffin and McDougall).

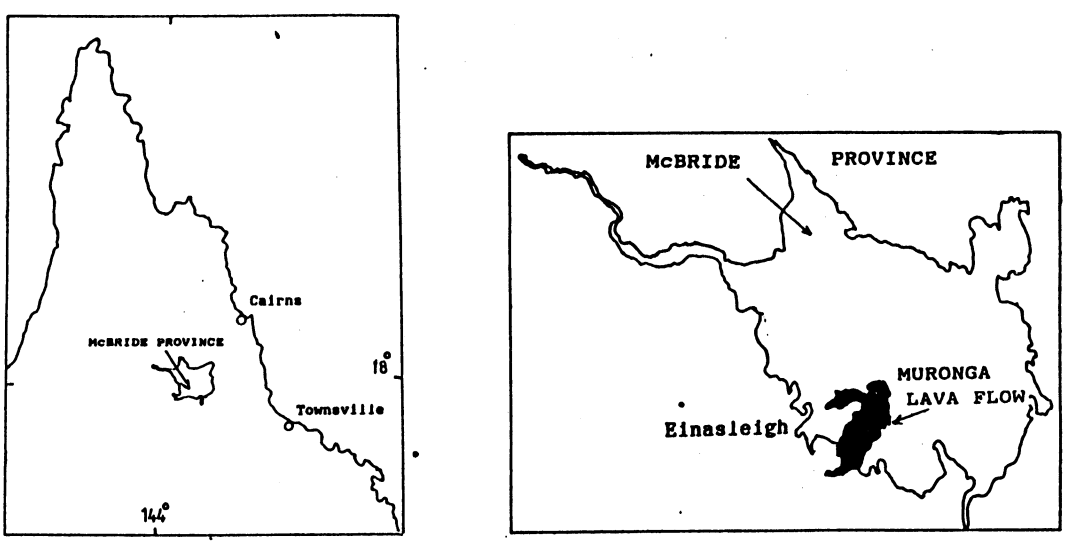


Fig 1 Locations of Muronga lava flow and the McBride Volcanic Province.

Fig 2 Muronga lava vent and the associated pyroclastic cones. Mt Tabletop is the central, flat rimmed cone. The lava vent is between Mt Tabletop and the cone to its right. Dark patches on the foreground are deciduous vine thicket in lava channels. The northern edge of flow is visible as dark line just above ash cones.

Griffin and McDougall[1] obtained an age of about 150,000 years for Muronga basalt so that it is of similar age to the Undara flow which is dated at about 190,000 years.

MURONGA'S ARTERIAL SYSTEM

Some 60 km of lava stream channel or collapsed lava tubes are evident on aerial photographs of the flow, which reached the southern margin of the McBride Plateau.

The Eight Mile Creek lava tube runs almost due south from Muronga Crater on Lava Plains Holding.

No exploration has been done on this tube yet. From images on aerial photographs parts of this tube appear to have been open lava stream channels.

The Spring Creek lava tube runs south south west entering Spring Creek Holding at about the position of Collins No 1 Cave and east of Mt Wheeler, forking around Four Mile Plain.

Seven open and accessible parts of the tube ranging in length from 17 m to 370 m in a 1.5 km segment running south from the original discovery of the obvious collapse. Access to two further sections, one of 80 m and the other of 200 m was given by moving boulders in the entrances. Further details and maps are included in Appendix 1.

The Emu Creek lava tube runs south west from Muronga between Mt McMaster and an unnamed volcano some 4 km north of it. The tube then forks around Emu Hill.

Only 2 km of this tube has been searched. To date two caves have been located in the segment of tube on the northern branch near Emu Hill. One is in the up-flow end of a collapse located by a Rosella Plains Station pilot when mustering cattle and is 30 m long. The other is in the down-flow end of a collapse (Grid Ref St Ronans 7861:460570) and while blocked by a boulder exhausts very warm air and has a strong bat guano odour.

METEOROLOGICAL DATA

Measurements were taken on the 10th and 11th August 1985 using wet and dry thermometers outside the entrance to Collins No 1 Cave and at 4 locations in the tube and are as set out in Appendix 2. Again on 25th August 1985 measurements were obtained in Two Ten Tunnel and Handful Cave.

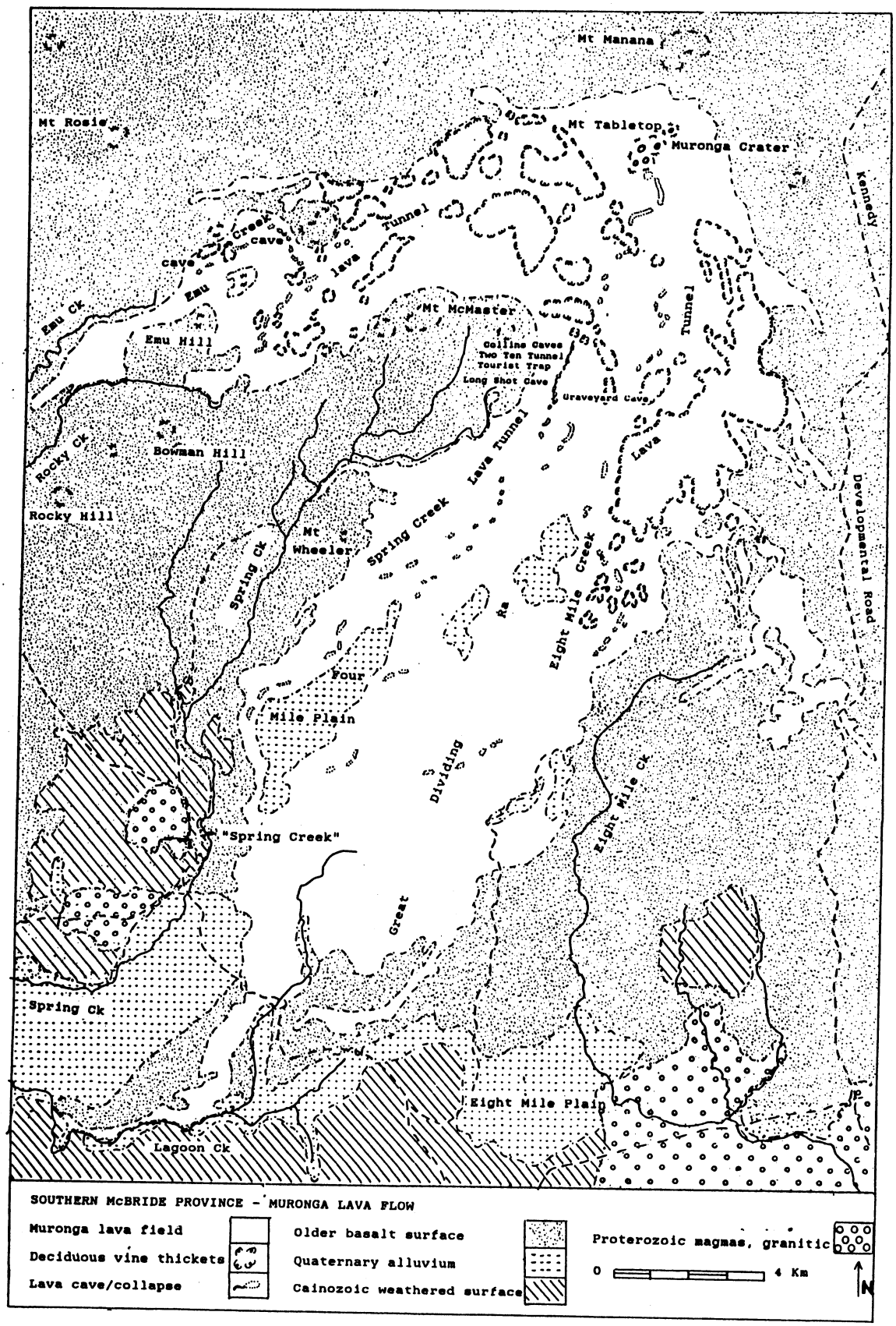


Fig 3 Southern McBride Volcanic Province - Muronga lava flow and surrounding geology.

FLORA

The vegetation of the area has two distinct types.

Eucalypt woodland described as Land Unit Bb 3 of the Boonderoo Land System (Appendix IV) in areas subject to periodic fires

Eeciduous vine thicket described as Land Unit Ca 2 of the Toomba Land System (Appendix IV) on rocky outcrops where fires are absent

The landscape and vegetation are more fully described in Appendix III.

Details of the five land systems which relate landscape with vegetation are given in Appendix IV and the map (Fig 4, Appendix IV) shows the extent of the systems of land units in the area.

FAUNA
Details of fauna sighted are given in Appendix V.

These details are derived from obversations on only several visits and for verterbrates would include only some hundred sightings giving few individuals except for bats which in some cases consist of large colonies.

On 10th August 1985 a population of about 1000 bats (*Miniopteris sp* mainly *M. shreibersii*) were noted but were not present two weeks later, perhaps disturbed by the visit.

Inverterbrates have been sampled in a number of Chillagoe Caving Club Inc. trips to the area or in association with the American Explorers Club Chillagoe Expeditions. Some one thousand specimens have been collected. Many of these specimens are still awaiting identification or indeed classification.

An interesting and possibly troglobitic species of peripatus, which shares features with both the earthworms and arthropods, was found by Howarth and Irvin deep in Two Ten Cave and in the stagnant air zone of Long Shot Cave.

In Hoch and Asche 1988 discussion on Undarana species suggests that the *U. collina* in the Muronga flow is nearly flightless and shows no reaction to light while the *U. rosella* in the 30 km distant Undara flow is capable of short sustained flight and is occasionally attracted to bright light. Thus these species in adjacent lava flows show different levels of cave adaption. They have contrasted this with another cixiid, *Solonaima baylissa*, the most cave adapted species encounteres thus far. Though blind and flightless and thus obligated to the cavernicolous existance it is found in both the Undara and Muronga lava tubes. Further, morphological similarities between the two populations suggest that there is a continuing gene flow between them although there is no obvious connection between the Undara and Muronga lava tube systems.

ACKNOWLEDGEMENTS
Messrs G. & D. Collins and staff of Rosella and Spring Creek cattle stations for reporting the existence of the lava tubes and assistance with aircraft to relocate known entrances.
Messrs D. Irvin, T. Robinson and A. Cummins of Chillagoe Caving Club Inc. for organisation of exploratory expeditions to the flow and for provision of survey details on the caves.

Mrs J. Godwin for typing the land system descriptions which otherwise would never have been completed for this paper. Her patience with us in our efforts to produce this paper are much appreciated.

Mrs A. Atkinson for provision of the aerial photo by H.J Lamont of James Cook University.

APPENDIX I - LAVA TUBES CAVES
(Caves listed from north to south. Maps follow listing)

SPRING CREEK LAVA TUBES

Collins No. 1 Cave

This tunnel was located by Gerry Collins in the northern end of the collapse that he spotted from the air. It is 150 m in length running northwards and contains a blind fork and one which reconnects with the main passage at the extremity of which partial ventilation can be noticed. When visited on 10.08.85 about 1,000 bats (mostly *Miniopteris sp* mainly *M. Shreibersii*) were in residence. These created a spectacle as they departed the cave entrance at twilight to feed. They resembled bees leaving a hive. (This visit may have created a disturbance as they were not present during a visit a fortnight later). The cave is obviously a regular roost as its guano deposits are substantial. The cave interior provided a habitat for several arthropod species one of which (a fly) was parasitic on bats. Arthopods were collected on behalf of the Queensland Museum and the Bishop Museum (Hawaii).

Collins No. 2 Cave

This cave was located in the southern end of the same collapse as Collins No. 1 Cave and about 100 m from the entrance of that cave. It runs southward for about 150 m with a blind branch leading off to the southwest at about 40 m from the entrance. From here on for the next 20 odd metres the tunnel is occupied by a pile of fallen rocks. The narrow end section is reached via a short crawl over a red soil floor. Several species of arthropod were collected from this cave and a substantial difference between this and Collins Cave No 1 is indicated. Of interest was the existence of a myglomorph spider well into the dark section of the cave.

Climatic observation - at 3.45pm (10.08.85) the temperature inside the cave close to the entrance was 20.5°C and the relative humidity 100%.

Two-Ten-Tunnel (located 10.08.85 entrance excavated 25.08.85
P. Cummins, L. Brown, M. Godwin)

The entrance to this cave is 200 m south of the collapse forming the southern end of Collins No. 2 Cave. The tunnel leads a slightly dog-legged course northward for 210 paces from an excavated entrance at the northern end of a 25 m long scrub-filled collapse depression. This depression blocks the northern end of 'Handful Cave'. The cave floor contains only a light covering of two different types of guano. A few bats were in residence at the time of first inspection. Climatic observations - at 10.30am on 25.08.85 the temp and relative. humidity 30 m inside this cave were 22.5°C and 87% respectively while outside the entrance the measurements were 24.0°C and 74% respectively.

(It was noticed that the bleached stems of germinated in-washed seeds reacted by quick movement when a torch was brought close to them). Dr Frank Howarth found the caterpillar-like ancient life form, peripatus here in 1986.

Handful Cave (Excavated by A & W Cummins and D. Brown 25.08.85)

The entrance (excavated) to this section of the tunnel is about 100 m south of the entrance to Two-Ten-Tunnel. It is slightly dog-legged and runs northward toward Two-Ten-Tunnel for 83 m (approx). Drainage rills indicate that drainage is towards the middle of the cave. Climatic measurements in the middle of the tunnel at 10.30am on the 25.08.85 - Temp 23.0°C Relative humidity 91%.

A woodland vegetated collapse southward leads to "Tourist Trap Cave".

Tourist Trap Cave (located by J. Sammarco - an American tourist 11.08.85)

The entrance is in the same collapse depression as 'Handful Cave' and 140 m SSW of it. The tunnel is less than straight and about 100 m in length. It contains two sections of arching 'false floor' A small population of about a dozen orange bodied bats (*Rhinolophus megaphyllus*) as well as two grey bodied bats (*Miniopterus sp.* Juveniles) were in residence 11.08.85. In one section termite galleries extended down the wall from the roof to the red soil floor.

Daylight Cave (located by J. Sammarco 11.08.85)

A small section of collapsed roof gives access to this cave which extends northward about 20 m before being blocked and southward about 40 m where it has another entrance which leads to a collapse at the northern end of 'Long Shot Cave'. An echidna burrow (in use) is located in the mid-section of this cave.

Long Shot Cave (located by J. Sammarco 11.08.85)

This cave is about 370 m in length. The entrance is amongst shrubbery in the southern end of a depression of vine thicket running northwards to "Daylight Cave" 40 m away. The cave has much biological activity no-doubt generated by its high level of detritus in-washed through the roof in places. In fact the roof consists of soil in one place hinting at a very thin roof. Tree roots dangle through the roof in many places and the floor is composed of a deposit of soil and paler material (decomposed basalt?). There are a number of arching 'False Floors' one of which requires a crawl to negotiate. The southern half of the tunnel is noticeably warmer than the northern half and the high CO_2 level (2.8%) generates heavy breathing. A few bats (*Rhinolophus*?) were in residence 11.08.85. A short pool of water with a muddy bottom occurs at the southern end. Dr Frank Howarth and D. Irvin found the caterpillar-like ancient life-form, peripatus here in 1986. It is probably a new species. They also located here troglobitic singing crickets previously known only from South East Asia, blind plant hoppers similar to those from Bayliss and Nasty caves in the Undara system and a large eyeless spider known from Bayliss Cave.

Impatience Cave (located by A. Cummins 24.08.85)

The entrance is about 400 m due south (174^{o} mag) of the entrance to 'Long Shot Cave'. The cave is short (only 17 m) and runs south. The entrance rock scree runs to the end of the cave. It contained three bats (possibly *Eptesicus*) at the time of location.

Graveyard Cave (located by P. Cummins 24.08.85)

This cave is dog-legged, contains an arching false floor, a small daylight through a collapsed roof and an upper and lower level passage way in one section. The remains of a common brushtail possum were found in the upper passage. Tracks and dung of the echidna were found at the dark or southern end of the tunnel. A few bats (possibly *Hipposideros ater*) were in residence at the time of location.

Beyond here there is a marginal increase in slope and lava tongues become more numerous.

EMU CREEK LAVA TUBE

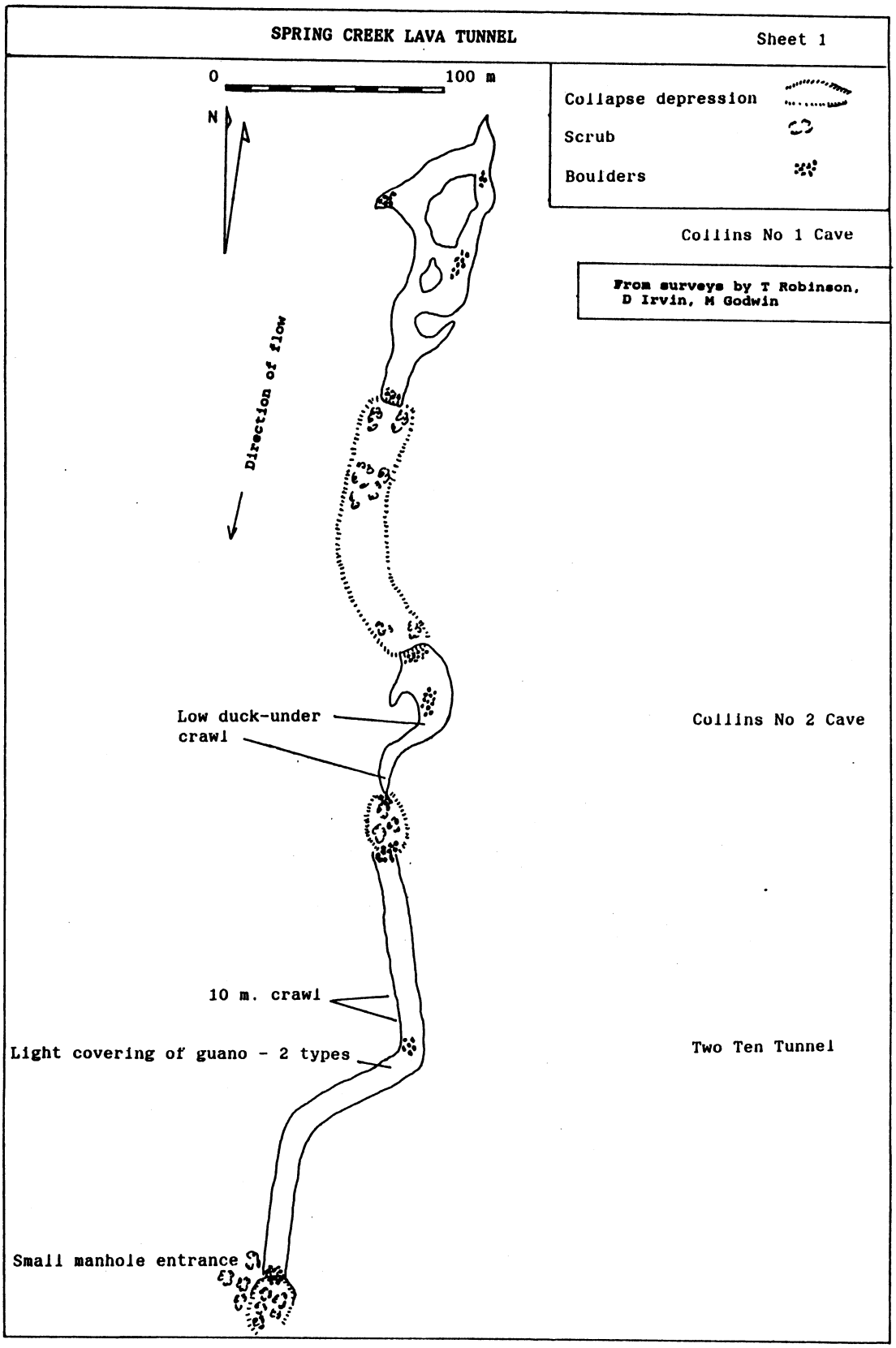
This tunnel system flowed south west from Muronga eventually forking around either side of Emu Hill. Two caves have been located in the north arm of the fork but less than 2 km of this tunnel has been searched.

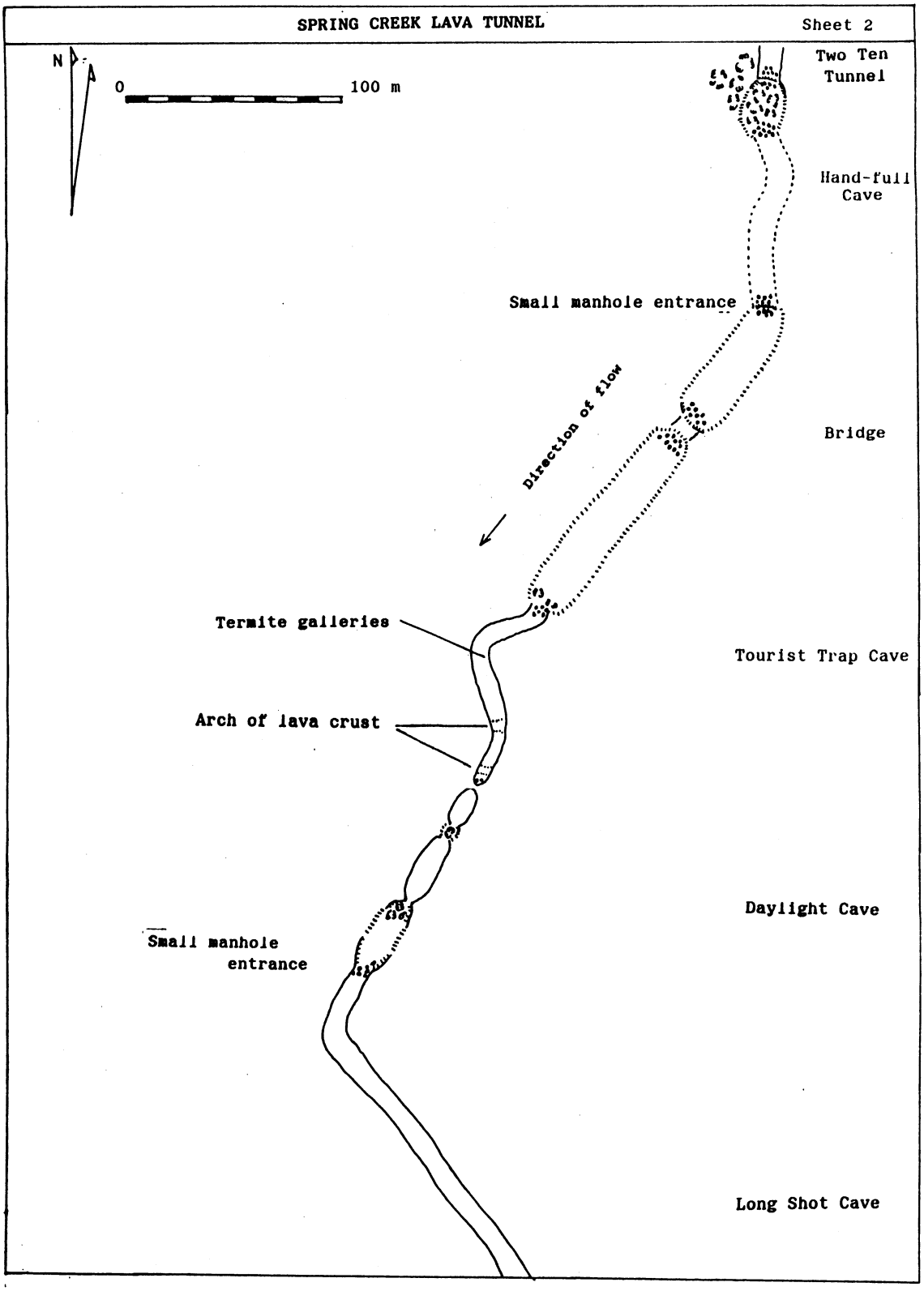
The first is in the down flow end of a collapse at grid ref. St Ronans 7861:460570. A boulder blocks the tight entrance. The cave exhausts very warm air and when visited in Jun 1990 a very strong bat odour could be detected 40 m from the entrance.

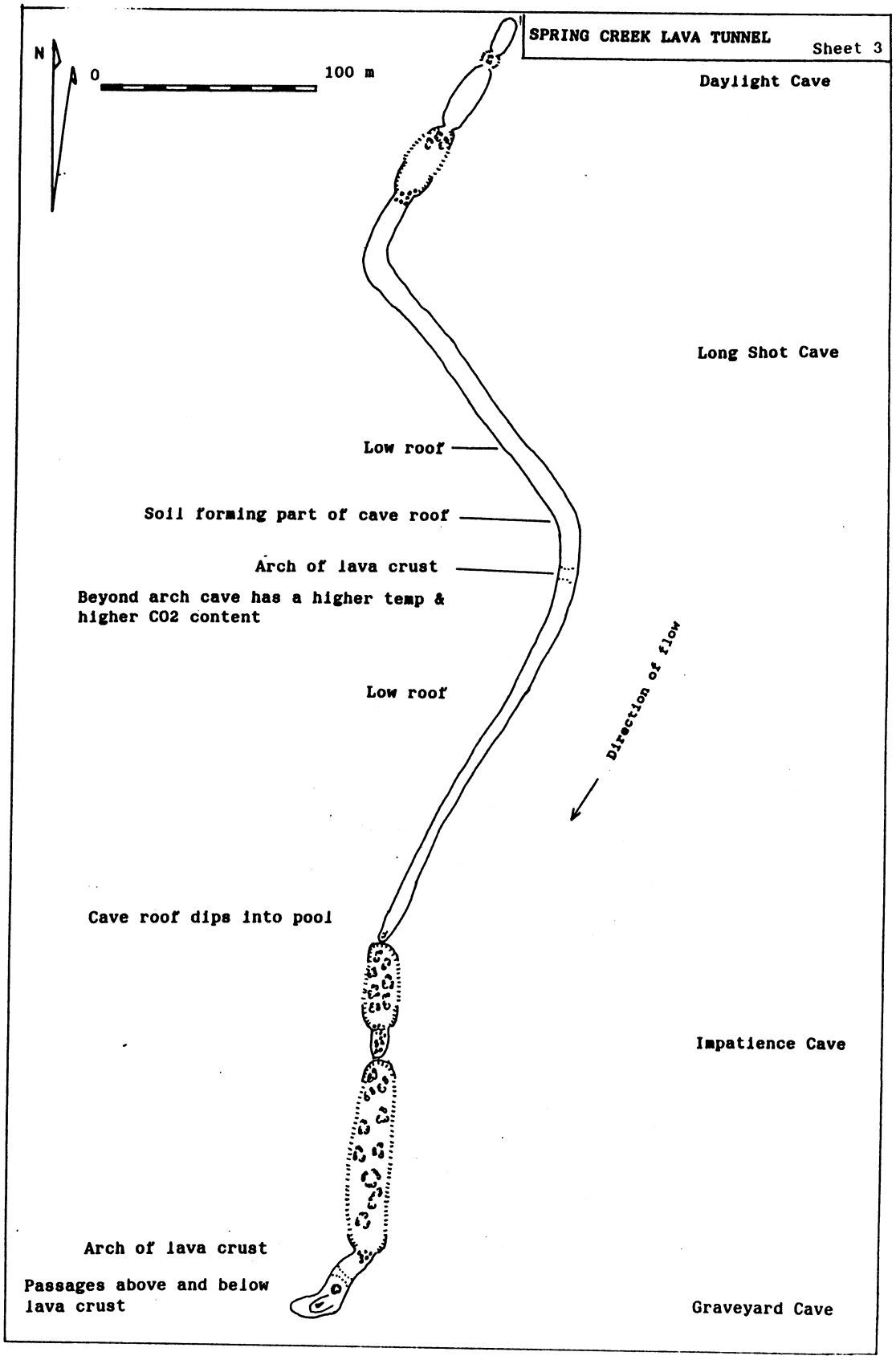
The second was located by the Rosella Plains mustering pilot from the air at grid ref. St Ronans 7861:440563. It is in the up-flow end of a collapse and is about 30 m long.

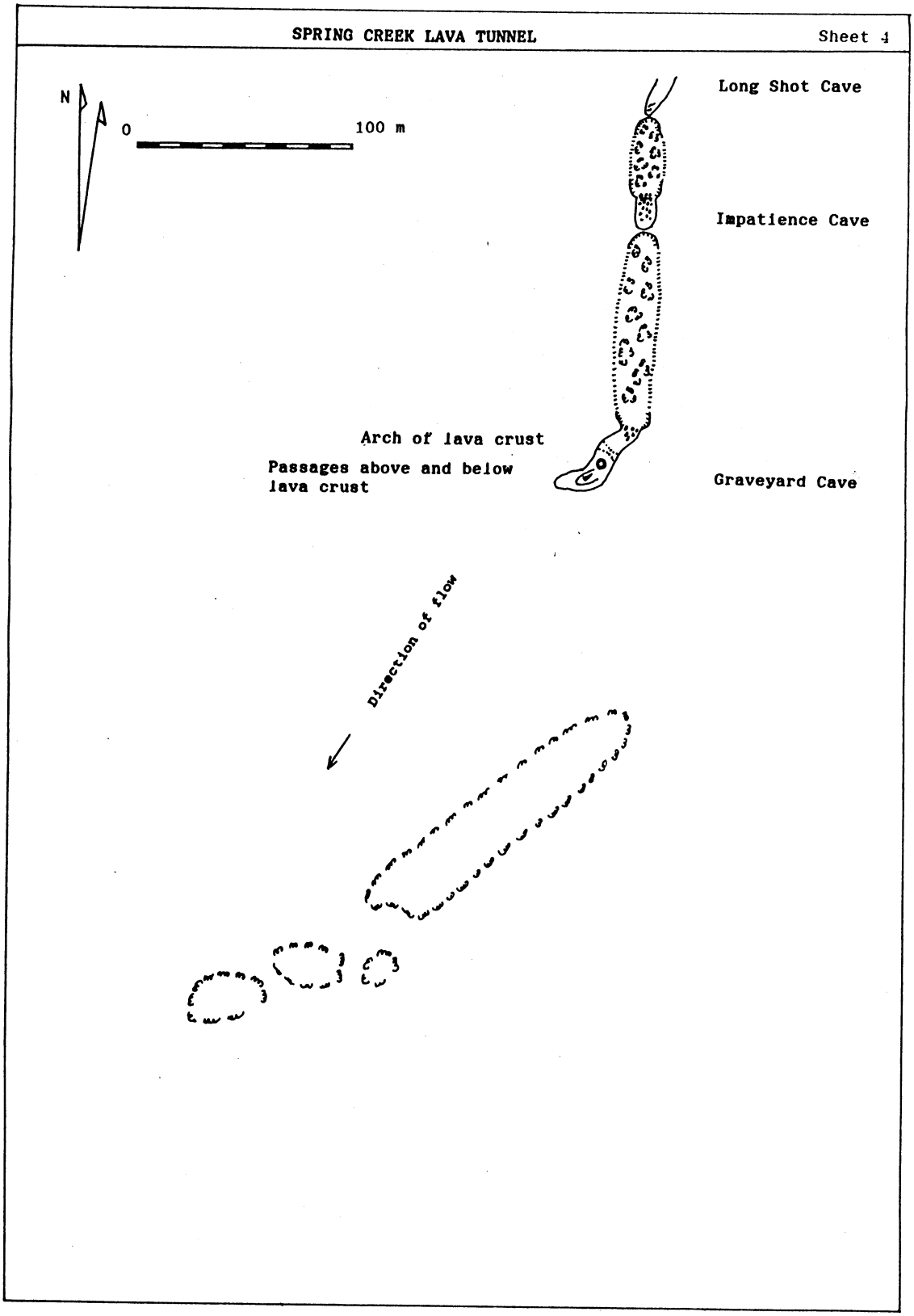
EIGHT MILE CREEK LAVA TUNNEL

This system has not been searched as yet.


SPRING CREEK LAVA TUNNEL
Sheet 1
0
100 m
N
Collapse depression
Scrub
Boulders
Collins No 1 Cave
From surveys by T Robinson, D Irvin, M Godwin
Direction of flow
Low duck-under crawl
Collins No 2 Cave
10 m. crawl
Light covering of guano - 2 types
Two Ten Tunnel
Small manhole entrance


SPRING CREEK LAVA TUNNEL
Sheet 2
N
0
100 m
Two Ten Tunnel
Hand-full Cave
Small manhole entrance
Direction of flow
Bridge
Termite galleries
Tourist Trap Cave
Arch of lava crust
Daylight Cave
Small manhole entrance
Long Shot Cave


SPRING CREEK LAVA TUNNEL
Sheet 3
N
0
100 m
Daylight Cave
Long Shot Cave
Low roof
Soil forming part of cave roof
Arch of lava crust
Beyond arch cave has a higher temp & higher CO2 content
Low roof
Direction of flow
Cave roof dips into pool
Impatience Cave
Arch of lava crust
Passages above and below lava crust
Graveyard Cave


SPRING CREEK LAVA TUNNEL
Sheet 4
N
0
100 m
Long Shot Cave
Impatience Cave
Arch of lava crust
Passages above and below lava crust
Graveyard Cave
Direction of flow

APPENDIX II - METEOROLOGICAL DATA

DATE	10-Aug 1985				11-Aug 1985	
TIME	2.00pm		8.30pm		7.00am	
CLIMATIC MEASUREMENT	Temp (C)	Rel. Hum. (%)	Temp (C)	Rel. Hum. (%)	Temp (C)	Rel. Hum. (%)
SITE						
Outside entrance (shade)	29.0	85	18.0	80	14.5	94
Just inside entrance	24.5	85	17.0	95	15.0	94
End of the first eastern (blind) passage	20.0	100	16.5	96	15.0	94
Second fork	19.0	100	16.0	100	15.0	94
Two thirds along eastern (main) passage	19.0	100	16.0	98	15.5	94

Table 1 1985 climatic measurements - Collins No 1 Cave.

DATE	25th Aug 1985	
TIME	10.30am	
CLIMATIC MEASUREMENT	Temp (C)	Rel. Hum. (%)
SITE		
10m inside entrance of Two Ten Tunnel	22.5	87
Entrance depression Two Ten Tunnel	24.0	74
Central part of Handful Cave	23.0	91

Table 2 1985 climatic measurements -Two Ten Tunnel and Handful Cave

APPENDIX III - LANDSCAPE AND VEGETATION (see Perry et. al.)

(a) Eucalypt Woodland on Shallow Rocky Red Soils

The characteristic Land Unit of the tunnel area is the previously mentioned lava plain which is slightly undulating or stepped according to the configuration of various underlying flows. Lava tongues are also evident. Rock covers 50-90% of the surface. The soil is fairly shallow and also occupies the rock joints. It is a red non-cracking clay (Kraznozem - Uf 6.31 (northcote)) whose infiltration and drainage properties are adequate.

The vegetation is a grassy ironbark woodland.

Canopy Species

Narrow leafed ironbark (*Eucalyptus crebra),* variable barked bloodwood (*Euc. erythrophloia),* batwing coral tree (*Erythrina vespertilio*), Silver oak *(Grevillea parallela*).

Understory Species

Variable barked bloodwood, Silver oak, bootlace oak (*Hakea lorea*), (*Grevillea mimosoides*), beefwood (*G. striata*) rare, prickly pine (*bursaria incana*), cocky apple (*Planchonia careya*).

Ground Cover Species

Kangaroo grass (*Themeda triandra*) dominant; black spear grass (*Heteropogon contortus*); giant spear grass (*Heteropogon triticeus*), (*Panicum* possibly *mindanaense*); (*Alysicarpus sp.*), (*Indigofera sp.*), white spear grass (*Aristida sp.*)

The Land Unit is subject to periodic fires.

Perry et al have described this as Land Unit 1 of the Boonderoo Land System. This paper refers to it as L/U Bb 3 (Appendix IV).

(b) Deciduous Vine Ticket on Broken Basalt Lava Where Fires are Absent

On the fresher flows and lava tongues which are little weathered, and in the depressions of the collapsed tunnels, the surface is composed of broken basalt inaccessible to fire. Reddish-brown clay (Kraznozem) soils accumulate deep down between boulders and Deciduous Microphyll Vine Ticket is supported here:

Canopy Species
(*Celtis paniculata*), kurrajong (*Brachychiton australe*), helicopter tree (*Gyrocarpus americanus*), burdekin plum (*Pleiogynium timorense*), fig (*Ficus obliqua*) and (*F. virens*), lacebark (*Brachychiton chillagoensis*), whitewood (*Atalaya hemiglauca*), boonaree (*Heterodendrum oleifolium*).

Understory Species
(*Mallotus philippensis*), grey boxwood (*Drypetes lasiogyna var. australascus*), sandpaper fig (*Ficus opposita*), Shining leaf stinging tree (*Dendrocnide photinphylla*), poison peach (*Trema aspera*), ebony (*diospyros ferrea var. humilis*), (*Alectryon connatus*), wilga (*Geijera salicifolia*), (*Rapania howittiana*), (*Cupaniopsis anacardioides*), (*Antidesma parviflorum*), wallaby apple (*Citriobatus spinescens*), Strychnine bush (*Strychnos axilaris*), currant bush (*Carissa ovata*), *Olea paniculata* (native olive).

Vines
Yam (*Dioscorea transversa*), (*Rhyssopteris timorensis*), grapes (*Cissus oblonga, C. opaca, C. hastata, Tetrastigma sp. (C2848)*), (*Stephania aff. bancroftii*), (*Jasminum racemosum*), (*Eustrephus latifolius*), wonga vine (*Pandorea pandorana*), (*Deeringea amaranthoides*).

Epiphytes
(*Dendrobium liguiforme*), pencil orchid (*Dendrobium teretifolium*), (*Sarcochilus hillii*).

Lithophytes

(*Platycerium veitchii*), (*Cheilanthes vella*).

Ground Cover species

(*Plectranthus sp. aff. parviflorus*), Chaff flower (*Achyranthes aspera*).

Perry et al refers to this as Land Unit 1 of the Toomba Land System. This report refers to it as L/U Ca 2 (Appendix IV).

APPENDIX IV - LAND SYSTEMS OF THE MURONGA LAVA FLOW AREA

The Land Systems were originally described by Perry et al. 1954, based on geological and other data available at the time. Subsequent geological studies together with additional habitat studies of Godwin, 1985 and Godwin and Goosem, 1990 have enabled the production of a more comprehensive description and maps as set out below.

The Toomba and Boonderoo land systems occur on the Muronga flow while the Rosella, Kilbogie and Yanman land systems are in the surrounding adjacent areas or inliers.

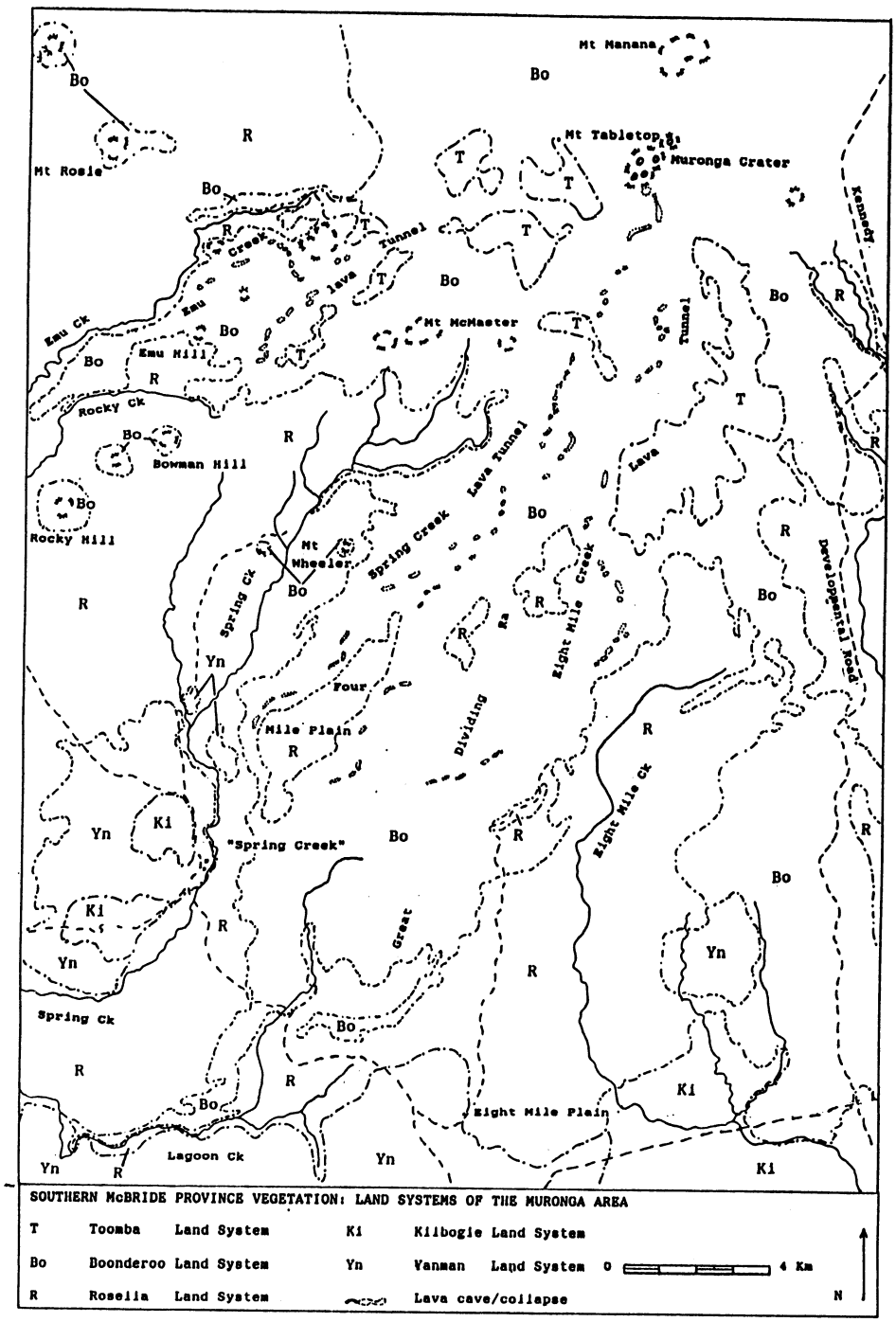
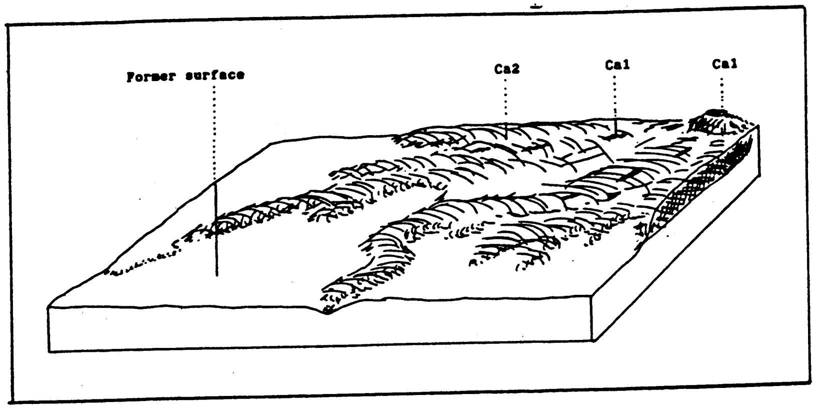


Fig 4 Southern McBride Province - Land Systems of Muronga area.

TOOMBA LAND SYSTEM

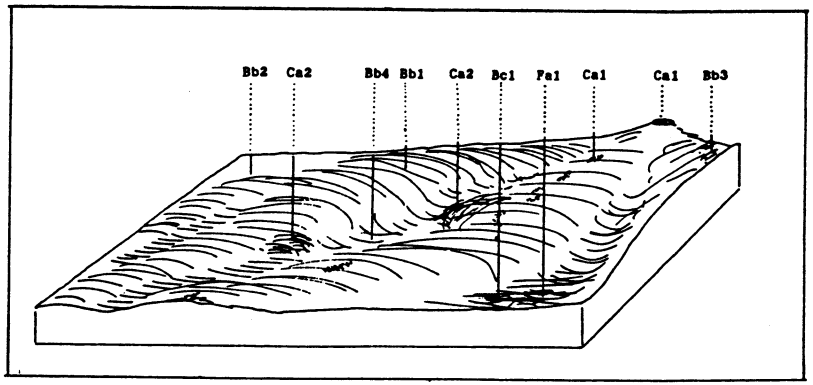
TOPOGRAPHY	Rough lavafield
GEOLOGY	Quaternary basalt.
GEOMORPHOLOGY	Constructional volcanic land surface. Little weathered lava flows.
DRAINAGE	Nil. All Subsurface.
ELEVATION	300 - 800m. Local amplitude < 30m.
CLIMATE	Mean annual rainfall 470 - 590 mm. Mean annual growing season: agricultural 15 - 22 wk., pastoral 20 - 27 wk.



Land Unit	Area	Land Forms	Soils	Vegetation
Ca 2	Large	Very rough, little-weathered basalt plateaux and plains (Fire free)	Rock	Deciduous microphyll vine woodland
Ca 1	Very Small	Central-type vents (Fire free)	Rock	Deciduous microphyll vine woodland

BOONDEROO LAND SYSTEM

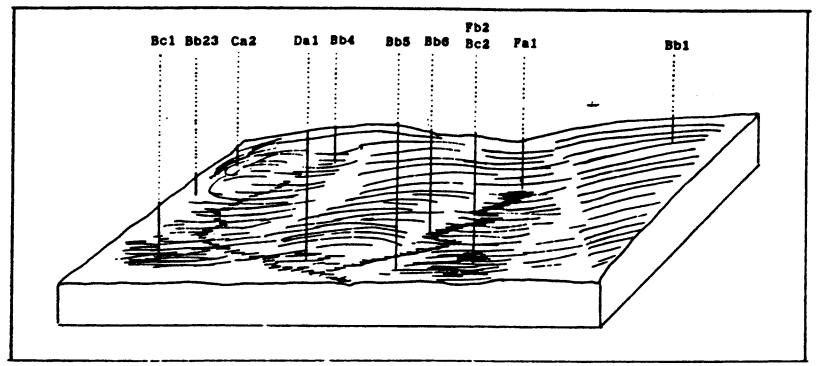
TOPOGRAPHY	Red basalt lava plains
GEOLOGY	Tertiary and Quaternary basalt.
GEOMORPHOLOGY	Constructional volcanic land surface. Basalt plains and plateaux. Pliocene and pleistocene surface.
DRAINAGE	Sparse.
ELEVATION	470 - 1000m. Local amplitude < 70m.
CLIMATE	Mean annual rainfall 500 - 762 mm. Mean annual growing season: agricultural 10 - 25 wk.,pastoral 15 - 35 wk.



Land Unit	Area	Land Forms	Soils	Vegetation
Ca 1	V.Small	Vents, Collapses	Basalt rock	Deciduous microphyll vine woodland
Ca 2	Small	Boulder field (fire free)	Basalt rock & soil	Deciduous microphyll vine woodland
Bb 1	Large	Plain	Lang:Kraznozem	Ironbark woodland: E.crebra, E.erythrophloia, E.papuana, Grevillea parallela, Themeda triandia Heteropogon contortus.
Bb 2	Small	Plain	Lang:Kraznozem	Open woodland: E.orgadophila, E.leptophleba
Bb 3	Small	Very low rises	Skeletal: Clay & Rock	Ironbark woodland: E.crebra, E.erythrophloia, E.papuana, Heteropogon contortus, Grevillea parallea, Themeda triandra
Bc 1	Small	Lower areas in the plain	Rosella:Calcareous Cracking Clay	Downs woodland: E.orgadophila, bloodwood (Grassy open woodland)
Bb 4	Small	Lower areas in the plain	Glendhu: Brown Clay	Ironbark woodland with box: E.crebra, E.erythrophloia, E.papuana, Themeda triandra, Heteropogon contortus, Bothriochloa Sp.
Fa 1	Small	Very shallow depressions	Spring & Tobermorey: Calacreous Clay loam	Couch grass, short grass & lagoon vegetation: Cynodon dactylon, Imperata cylindrica, Cyperus Sp., Ophiuros exaltatus

ROSELLA LAND SYSTEM

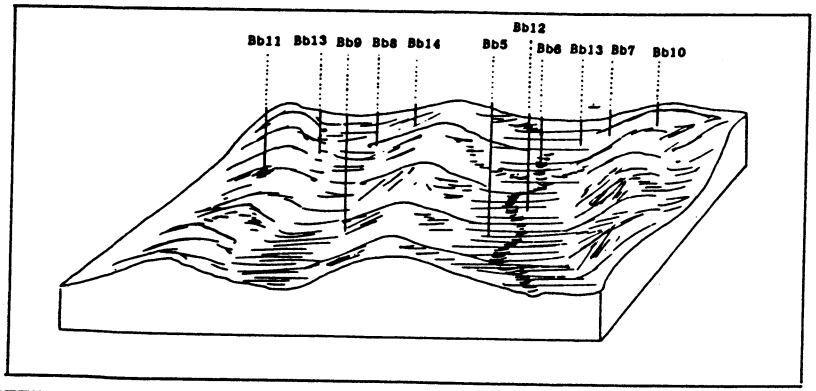
TOPOGRAPHY	Basalt plains and plateaux with black soil
GEOLOGY	Tertiary and Quaternary basalt.
GEOMORPHOLOGY	Constructional volcanic land surface. Pliocene and pleistocene surface.
DRAINAGE	Sparse.
ELEVATION	470 - 1000m. Local amplitude < 70m.
CLIMATE	Mean annual rainfall 500 - 762 mm. Mean annual growing season: agricultural 9 - 25 wk.,pastoral 14 - 35 wk.



Land Unit	Area	Land Forms	Soils	Vegetation
Ca 2	Small	Boulder field (fire free)	basalt rock & soil	Deciduous microphyll vine woodland
Bc 1	Large	Plain	Rosella: Calcareous Cracking Clay	Downs woodland (Grassy open woodland) Eucalyptus orgadophila, bloodwood
Bc 2	Moderate	Alluvial plain	Rosella: Calcareous Cracking Clay	Grassy open woodland :E.papuana, E.erythrophloia, Coelorachis Sp.
Fb 2	Moderate	Plain (alluvial)	Rosella: Calcareous Cracking Clay	Grassland (With emersent Eucalypts): Coelorachis rottboelioides
Bb 5	Small	Plain - levee	Rosella: Calcareous Cracking Clay	Medium woodland of box & bloodwood: E.terminalis, E.leptophleba, E.micronеura
Bb 1	Small	Plain	Lang: Kraznozom	Ironbark woodland: E.crebra, E.erythrophloia, E.papuana, G.parallela, G.mimosoides, H.contortus, T.triandra
Bb 4	Small	Plain	Glendhu: Brown Clay	Ironbark woodland: E.crebra, E.erythrophloia, E.papuana, G.parallela, G.mimosoides, H.contortus, T.triandra
Bb 6	Small	Stream Channel		Fringing woodland: E.camaldulensis;Casuarina cunninghamiana, Arundinella nepalensis
Da 1	Small	Levee/depression	Rosella: Calcareous Cracking Clay	Ti tree scrub: Melaleuca bracteata
Fa 1	Small	Very shallow depressions	Spring & Tobermorey: Calcareous Clay loam	Couch Grass & Lagoon vegetation: Cynodon dactylon, Imperata cylindrica, Cyperus Sp.
Bb23	Small	Colluvial aprons from adjacent basalt	Gilgae complex - Cracking/ non-cracking Clay	Ironbark/box woodland complex: E.crebra, E.brownii; Coelorachis rottboelioides, blue grass

KILBOGIE LAND SYSTEM

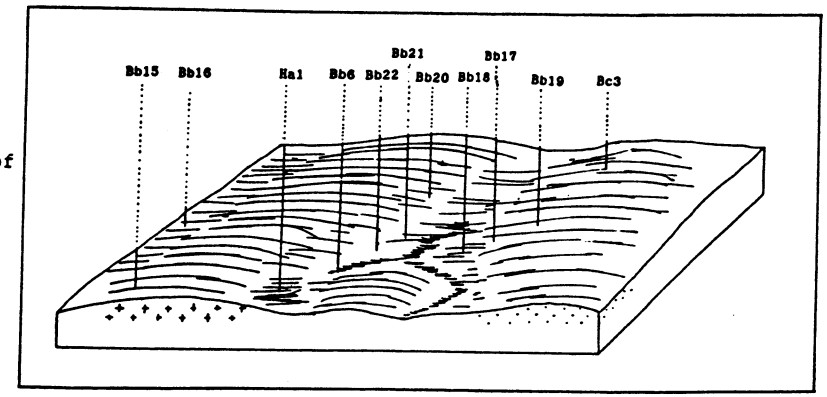
TOPOGRAPHY	Timbered, irregular plains
GEOLOGY	Pre-Cambrian etheridge complex. Metamorphic rocks and granite.
GEOMORPHOLOGY	Destructional land surface. Plains of erosion. Late tertiary to quaternary suface with elements of the pre - mid mesozoic surface.
DRAINAGE	Moderate intensity, subrectangular pattern.
ELEVATION	170 - 800m. Local amplitude < 30m.
CLIMATE	Mean annual rainfall 558 - 812 mm. Mean annual growing season: agricultural 12 - 17 wk.,pastoral 17 - 22 wk.



Land Unit	Area	Land Forms	Soils	Vegetation
Bb 7	Large	Gentle to moderate slopes - metamorphics	Wyandotte:Sand over Clay; Forsayth:Clay loam over clay	Ironbark woodland: E.crebra, E.erythrophloia, E.whitei, E.papuana, Heteropogon contortus, Bothriochloa ewartiana, Themeda triandra
Bb 5	Small	Flatter parts	Rosella:Calcareous Cracking Clay	Box woodland: E.microneura
Bb 8	Medium	Lower slopes	Cargoon:Red & Yellow podzolics	Box woodland: E.Brownii
Bb 9	Small	Gentle to moderate slopes on granite	Elliott:Sand over clay Cockatoo / Cullen:Sand	Ironbark woodland:Euc.crebra, E.whitei, E.erythrophloia, E.papuana, Heteropogon contortus, Bothriochloa ewartiana, Themeda
Bb14	Moderate	Gentle to moderate slopes on granite	Red & Yellow podzolics	Ironbark/box woodland: E.crebra, E.microneura
Bb10	Small	Upper slopes	Skeletal sand & Clay	Eucalyptus woodland: E.crebra, E.palycarpa, E.papuana, E.confertiflora, E.brownii, E.shirleyi;Erythrophloeum chlorostachys Acacia Sp., Erythroxylum ellipticum, Terminalia aridicola, Aristida Sp.
Bb11	Small	Upper slopes/Crests	Rock cutcrop	Eucalypt woodland: E.peltata, E.similis, E.shirleyi, Erythroxylum ellipticum, Maytenus cunninghamii, Dodonaea Sp., Acacia Sp.
Bb 6	Small	Stream channels		Fringing woodland: E.camaldulensis;Casuarina cunninghamiana, Arundinella nepalensis
Bb12	Small	Levee	duplex	Box woodland: E.leptophleba, E.papuana, Bothriochloa Sp.
Bb13	Moderate	Gentle slopes	Brown podzolics	Ironbark/Ironwood woodland: E.crebra, Erythrophloeum chlorostachys

YANMAN LAND SYSTEM

TOPOGRAPHY	Timbered plains
GEOLOGY	Etheridge complex and plutonic rocks. Pre-Cambrian and paleozoic. Metamorphic rocks and granite. Minor areas of tertiary terrestrial deposits.
GEOMORPHOLOGY	Destructional land surface. Plains of erosion. Early to mid tertiary surface.
DRAINAGE	Moderately intense, subrectangular pattern.
ELEVATION	250 - 600m. Local amplitude < 50m.
CLIMATE	Mean annual rainfall 584 - 889 mm. Mean annual growing season: agricultural 12 -25 wk.,pastoral 17 - 35 wk.



Land Unit	Area	Land Forms	Soils	Vegetaiton
Bb15	Medium	Gently undulating Granite plains	Zingari & Nangum: Red & yellow earths	Ironbark woodland: E.crebra, E.erythrophoia, E.papuana, E.polycarpa, E.confertiflora, Themeda Sp. Bothriochloa Sp., Aristida Sp., Heteropogon Sp.
Bb16	Large	Laterized parts of gently undulating granite plain	Cargoon, Wallabadah: Red & yellow podzolics	
Bb17		Laterized parts on sandstone	Sturgeon:Red & yellow earths	Poplar gum woodland: E.alba, E.intermedia, E.leptophleba
Bb18		Laterized parts on sandstone	Currajong:Brown sands & loams	
Bb19		Laterized parts on sandstone	Sturgeon:Red & yellow earths	Ironbark/box woodland: E.Crebra, E.leptophleba
Bc 3	Small	Eroding slopes	Shallow duplex soils	Silver - leaf ironbark low open woodland:E.melanophloia E.shirleyi
Bb20	Small	Lower slopes	Bleached podzolics	Box woodland: E.brownii
Bb21	Small	Depressions	Clay soils	Box woodland: E.leptophleba, Bothriochloa Sp., Ophiuros Sp., Dichanthium Sp., Aristida Sp.
Bb22	Small	Flats/Levees		Box woodland: E.microneura; Bothriochloa Sp.
Ha 1	Small	Swamps		Lagoon vegetation: Eleocharis Sp., Pseudoraphis Spinescens.
Bb 6	V.Small	Stream channel		Fringing woodland: E.camaldulensis, Casuarina Cunninghamiana, Melaleuca Sp., Pandanus Sp., Arundinella nepalensis

APPENDIX V - FAUNA OBSERVATIONS

VERTERBRATES
Mammals

Rocky Wallaby	*Petrogale inornata* susp. () - 2 seen (dark tail tips) in broken basalt Deciduous vine thicket and one along Spring Creek in black Ti Tree scrub (status - common)
Grey Kangaroo	*Macropus giganteus* - a few small groups seen in Boonderoo Land System (status - common)
Wallaroo	*Macropus robustus ssp* robustus many small groups encountered in Boonderoo Land System (status - abundant)
Rufous Rat Kangaroo	*Aepyprimnus rufescens* seen in more open areas sometimes on basalt (status - common)
Antilopine	*Macropus antilopinus* groups seen to the west of Emu Creek (status - common)
Dingo	*Cannis familiaris* - mobile - reported to be common in Boonderoo Land System - 2 seen (status - common)
Rabbit	*Oryctolagus cuniculu* - Dung seen around Spring Creek homestead.
Common Brushtail Possum	*Trichosurus vulpecula* - dung seen in DVT particularly under fig trees - 1 dead animal found in 'Graveyard Cave' (status - common)
Echidna	*Tachyglossus aculeatus* - tracks and dung found in caves, in deciduous vine thicket, 1 seen at camp site 25.10.85 Boonderoo L/S (status - common)
Eastern horseshoe bat	*Rhinolophus megaphyllus* -.Population of about 12 in Tourist Trap Cave (August 1985)
Bentwing bat	*Miniopterus sp.* mainly *M.Shreibersii* - Population of 1,000 (est) bats was using Collins No. 1 Cave 10.08.85 - Two weeks after the visit they had left.

(Note: mammals expected here but not yet verified:

Undara eptesicus (*Eptesicus troughtoni)*, black striped wallaby *(Macropus dorsalis)*, spectacled hare wallaby (*Largorchestes conspicillatus*). They are known on the Undara System).

Birds

Emu-	*Dromaius novaehollandii* 9 sightings in 4 days Boonderoo Land System (status - common)
Wedgetail Eagle	*Aquila audax* _6 seen in 2 days Boonderoo L/S (status - common)
Whistling Kite	*Haliastur sphenurus* _ A number seen Boonderoo L/S (status - common)
Black Kite	*Milvus migrans* - A number seen Boonderoo Land System (status - common)
Brown Falcon	*Falco berigora* - Boonderoo Land System (status - common)
Boobook Owl	*Ninox novaezeelandiae* - More than one heard 2 nights Boonderoo L/S (status - common)
Crested Pigeon	*Ocyphaps lophates* - Numerous seen Boonderoo L/S (status - common)
Nankeen Kestrel	*Falco cenchroides* - Boonderoo Land System (status - common)
Squatter Pigeon	*Geophaps scripta* - Yanman Land System (status - common)
Northern Jackass	*Dacelo leachii* - Yanman and Boonderoo Land System (status - common)

Reptiles

Death Adder — *Acanthophis praelongus* - 1 seen Boonderoo L/S, reported to be common on the basaltic red soils and also on Toomba L/S (status - common)

INVERTERBRATES

This information on cave adapted Arthropods has been compiled from published reports of Howarth, Hoch and Asche, Stone, Irvin.

ONYCHOPORA (ancient form - annelid - arthropod intergrade)
peripatus *(sp. nov.?)* (Howarth and Irvin)
Long Shot Cave, Two Ten Tunnel

ARACHNIDA
Phalangida
\- (daddy long legs) (undetermined)
Long Shot Cave
Araneae
pholcidae *Spermophora Sp. nov. (Gray 1973)*
Collins Cave system
family unknown
(eyeless hunting spider) (Howarth and Irvin)
Long Shot Cave

DIPLOPODA
Cambalida (large white eyeless millipede)
Collins Cave system

INSECTA
Dictyoptera (cockroaches)
Nocticolidae
Nocticola sp. nov. (Stone)
Long Shot Cave
Orthoptera
Tettigoniidae (cave crickets)
Singing cave crickets (Howarth and Irvin)
Long Shot Cave
Hemiptera (bugs)
Heteroptera
Emesinae
(thread legged bugs)
Long Shot Cave
Homoptera
Fulgoroidea (plant hoppers)
Cixiidae
Undarana collina
Collins No 2 Cave Two Ten Tunnel
Solonaima baylissa
Long Shot Cave

REFERENCES

ATKINSON, F.A., 1989, The Remarkable Undara Lava Tube System, McBride Volcanic Province, North Queensland, **Tasmanian Cave and Karst Research Group Quarterly Newsletter.**

ATKINSON, F.A., 1990, The Undara Lava Tube System and its Caves, **Helictite 28(1):3.**

ATKINSON, F.A., GRIFFIN, T.J. STEPHENSON, P.J., 1975, A Major Lava Tube System from Undara Volcano, North Queensland, **Bull. Vol.** 39-2, pp. 1-28.

BOTANY BRANCH - DEPT. PRIMARY INDUSTRIES - QLD, 1989, **'Rare and Threatened Plants of Qld'.**

CSIRO, 1964, **'General Report on Lands of the Leichhardt - Gilbert Area, Qld 1953-1954'**

DEPT. NAT. DEVELOPMENT, 1972, **'Burdekin - Townsville Region Resource Series'.**

GRAY, M.R., 1973,Survey of the Spider Fauna of Australian Caves,**Helictite,** 11 (3), 47-75.

GRIFFIN, T.J., AND MCDOUGALL, I., 1975, Geochronolgy of the Cainozoic McBride Volcanic Province Northern Queensland, **J. Geol. Soc. Aust.** 22 (4), pp. 387-96.

GRIMES K. 1980, 'The tertiary Geology of North Queensland' in '**Geology and Geophysics of North Eastern Australia**' Ed Henderson R. and Stephenson P.

HAMILTON-SMITH, E.,1967, The Arthropoda of Australian Caves, **J. Aust. Ent. Soc.** 6, 103-118

HOCH, H. AND ASCHE, M., 1988, Cave-Dwelling Planthoppers of Australia (Insecta: Homoptera: Fulgoriodes)., in Pearson L.M. in (Ed) **Preprints of Tropicon Conference**, Aust. Speleol. Federation.

HOCH, H. AND HOWARTH, F.G., 1989, Six New Cavernicolous Cixiid Planthoppers in the genus Solonaima from Australia, (Homoptera - fulgoroidea), **Systematic Entomology** 14, 377-402

HOWARTH, F.B., 1988, Environmental Ecology of North Queensland Caves: or why there are so many troglobites in Australia, in (Ed) **Preprints of Tropicon Conference**, Aust. Speleol. Federation.

IRVIN D. 1988, ' Spring Creek Lava Tunnels', in Pearson, L.M. (Ed), **Preprints of Tropicon Conference**, Aust. Speleol. Federation.

MATTHEWS, P.G., (Ed.), 1985 **Australian Karst Index Aust.** Speleol. Fed., Melbourne, 481 pp

MOORE, B.P., 1964, Present day Cave Beetle Fauna in Australia - a pointer to the past climatic change, **Helectite,** Oct 1964, 3-9

STEPHENSON, P.J., GRIFFIN, T.J. AND SUTHERLAND, F.L., 1980, Cainozoic Volcanism in Northeastern Australia, in **Geology and Geophysics of Northeastern Australia**, (Eds.) Henderson, R.A. and Stephenson, P.J. pp. 468.

STEVENS, N.C., 1976 Undara Crater and Lava Tubes in de Jersey, N.J. Stevens, N.C. and Willmot, W.F., (Eds.), **Geological Elements of the National Estate in Queensland**, Geol. Soc. Aust., Qld. Div. Brisbane.

STONE, F.D., 1988, The Cockroaches of North Queensland Australia and the Evolution of Tropical Troglobites, in Pearson, L.M. (Ed), **Preprints of Tropicon Conference**, Aust. Speleol. Federation.