Calotis moorei Recovery Plan



December 2009



Australian Government



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Department of Environment, Climate Change and Water Recovery Planning Program

Calotis moorei **Recovery Plan**

Prepared in accordance with the New South Wales Threatened Species Conservation Act 1995

December 2009

Executive Summary

This is the final NSW and Commonwealth Recovery Plan for *Calotis moorei*. The plan considers the conservation requirements across the known range, identifies actions that should ensure long term viability and the agencies responsible for these actions.

Calotis moorei is listed on Schedule 1 (endangered) of the NSW *Threatened Species Conservation Act 1995* (TSC Act), and on Part 1 (endangered) of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC).

Calotis moorei is a small multibranched daisy known from a property west of Louth, NSW, and three populations near Menindee, NSW. Surveys have not been conducted more widely and *Calotis moorei* may occur at other locations.

Proposed recovery actions are:

- A survey of potential habitat
- Genetic analysis to resolve the taxonomy
- Reassessment of the conservation status
- Monitoring of population status
- Investigation of grazing impacts if required
- Seed storage if required

This recovery plan will be implemented over a 5 year period. Actions are estimated to cost \$85,000.

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1 Current Conservation Status

Calotis moorei is listed on Schedule 1 (endangered) of the NSW *Threatened Species Conservation Act 1995* (TSC Act), and on Part 1 (endangered) of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

2 Description

Calotis moorei is described as an erect to ascending perennial herb to 45 cm high, septatehairy. Basal leaves not known; cauline leaves usually spathulate or oblanceolate to obovate, to 7 cm long, 2-14 mm wide, margins coarsely toothed or lobed, sessile; upper leaves lanceolate to ovate, often entire; with septate hairs. Heads 6-9 mm in diameter, solitary, terminal; involucral bracts ovate, septate-hairy, also glandular hairy on margins; receptacle ovoid, with scales. Ray florets yellow; ligule 4.5-5.8 mm long. Achenes 1.3-2.2 mm long, tuberculate, glabrous, wingless; pappus of 3-8 barbed awns of equal or unequal length, fused and expanded at the base, hairy within cup (Everett 1992).

Phillip Short described the species in 1991, hypothesising the specific status "with some reservations" (Short 1991). Short believed that the species may be a "hybrid apomict which is produced from time to time in disturbed habitats" – meaning that the presumed 'species' may be a hybrid and reproduces asexually.

It is not known whether Short (1991) was aware that the type specimen from Mount Mulyah was growing among a large population of *Calotis cymbacantha*. The only differences between the species appear to be the number of awns on the achene (seed). Otherwise, in the field, the plants appear to be identical. *Calotis cymbacantha* possesses two awns, whereas *Calotis moorei* has between four and eight awns. Few specimens have been found with three awns, and in these specimens only some achenes in each flower head are three awned, possibly suggesting a single gene difference between the species (Joy Everett pers. comm.). Populations near Menindee are found in association with *Calotis erinacea*, which has similar habit, leaf shape, and awn character with respect to numbers, divergence and awn barbs. However the achene faces of *Calotis erinacea* are smooth as opposed to tuberculate (warty), and the plant stems are generally glabrous (Armstrong & Bollard, 2008). Given the current lack of adequate information on the Menindee populations, and the known dominance of *Calotis cymbacantha* amongst the Mount Mulyah population, genetic study is required to resolve the question of taxonomy unless *Calotis moorei* can be verified as a certain separate species from Menindee surveys during a good spring season.

3 Distribution & Abundance

Calotis moorei is currently known from two distinct geographic areas, with a population at "Mount Mulyah" north-west of Louth, and three populations near Menindee, NSW. These records are located in the Mulga Lands and Darling Riverine Plains Interim Biogeographic Regions of Australia, the Northern Far West Plains and Southern Far West Plains Botanical Subdivisions, and the Western and Lower Murray Darling Catchment Management Authorities.

A further collection was made in 1913 from a property near Deniliquin called "Zara", although several unsuccessful searches suggest that this population is now extinct. *Calotis*

cymbacantha has only been collected a few times in the Riverina, which marks the very eastern edge of its range. It is unlikely that *Calotis moorei* will prove to be any more common in the region.

There are eight collections from "Mount Mulyah" between 1967 and 1990 in the Australian National Herbarium in Canberra. There appear to be 3 different localities at Mount Mulyah. One of these was examined in 2003, near the homestead. Forty-five *Calotis moorei* were located in this area, but this count was not exhaustive. There is no count information for the populations near Menindee.

Map showing the location of *Calotis moorei*:



4 Tenure

Both the "Mount Mulyah" and "Tandou" populations of *Calotis moorei* occur on Western Lands perpetual lease. The Kinchega National Park population occurs on national park land, and the Menindee Common population occurs on Common land. "Zara" is private property.

5 Habitat

At "Mount Mulyah", *Calotis moorei* has been found on sandy soils. Populations surrounding Menindee are characterised by calcareous sandy loam soils on a broad low rise at Menindee Common, and fine white sand on the northern fringe of an ephemeral lake at "Tandou" (Botanic Gardens Trust, 2008).

Vegetation near the homestead at "Mount Mulyah" site is predominantly a herbfield and grassland, with only a few shrubs. It is likely that originally the area supported *Acacia cambagei* (gidgee) woodland, however other stands of gidgee on the property did not support any populations of *Calotis moorei*.

At "Mount Mulyah", *Calotis moorei* was found growing among a large population of the closely related species *Calotis cymbacantha*. The other populations of *Calotis cymbacantha* observed tended to occur in open areas away from stands of trees or shrubs. It is possible that *Calotis cymbacantha* is the best indicator of occurrence of *Calotis moorei*, although this depends on taxonomic clarification.

Records around Menindee associated with calcareous sandy loam soils are characterised as *Maireana pyramidata* (black bluebush) chenopod shrubland with a grassy – herbaceous understorey. This area is highly disturbed, with a high abundance of exotic herbaceous species. Records associated with fine white sand are characterised as *Dodonaea viscosa* shrubland fringed by *Eucalyptus camaldulensis* (River Red Gum) (Botanic Gardens Trust, 2008).

6 Biology

Calotis moorei is described as a perennial herb. Some plants observed at "Mount Mulyah" in September 2003 appeared to be drying out. Collected specimens did not exhibit the well developed root system normally associated with perennial herbs. Specimens have been collected from July to April, suggesting that plants may persist in good seasons.

There is no specific information about the biology and ecology of *Calotis moorei*. Short (1991) noted that conspicuous yellow ray florets are generally associated with cross pollination, and considered this likely with *Calotis moorei*. The taxonomically similar, and hence closely related *Calotis cymbacantha* and *Calotis erinacea* are said to be edible to stock (Cunningham et al. 1992). This is only likely prior to flowering. Once the seed heads have developed, the plants becomes very spiny.

7 Legislative Context

The TSC Act identifies and protects native plants and animals in danger of becoming extinct. The Act also provides for species recovery and threat abatement programs. More than 80 species of native plants and animals have recently become extinct in NSW and around 1000 more are threatened with extinction.

The purpose of the Act is to:

- conserve biological diversity and promote ecologically sustainable development
- prevent the extinction and promote the recovery of threatened species, populations and ecological communities
- protect the critical habitat of those species, populations and ecological communities that are endangered

- eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities
- ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed, and
- encourage the conservation of threatened species, populations and ecological communities through co-operative management.

The EPBC Act enables the Commonwealth Minister for the Environment to require the preparation of a Recovery Plan for nationally listed species and communities, or adopt plans prepared by others including those developed by State agencies. Both Acts include specific requirements for the matters to be addressed by Recovery Plans and the administrative process for preparing Recovery Plans.

This Recovery Plan has been prepared to satisfy both the requirements of the TSC Act and the EPBC Act and therefore will be the only Recovery Plan for the species. It is the intention of the Director-General of DECC to forward the final version of this Recovery Plan to the Commonwealth Minister of the Environment for adoption, once it has been approved by the NSW Minister for the Environment.

7.1 Recovery plan implementation

The TSC Act requires that a public authority must take any appropriate measures available to implement actions included in a Recovery Plan for which they have agreed to be responsible. Public authorities identified as responsible for the implementation of Recovery Plan actions are required by the TSC Act to report on measures taken to implement those actions. In addition, the Act specifies that public authorities must not make decisions that are inconsistent with the provisions of the Recovery Plan.

The public authority responsible for the implementation of this Recovery Plan is the NSW Department of Environment, Climate Change and Water.

The EPBC Act specifies that a Commonwealth agency must not take any action that contravenes a Recovery Plan.

7.2 Environmental assessment

The New South Wales *Environmental Planning and Assessment Act 1979* (EP&A Act) requires that consent and determining authorities, and the Director-General of the Department of Environment, Climate Change and Water, as a concurrence authority, consider relevant Recovery Plans when exercising a decision-making function under Parts 4 and 5 of the EP&A Act. Decision-makers must consider known and potential habitat, biological and ecological factors and the regional significance of individual populations.

The clearing of native vegetation in NSW is subject to consent under the *Native Vegetation Act 2003* from relevant Catchment Management Authorities in accordance with a property vegetation plan (PVP) or development consent approved by the Minister for Climate Change and the Environment in accordance with the Act. This Act is integrated with the EP&A Act and requires that threatened species are taken into account by the consent authority when considering clearing applications under Part 4 of the EP&A Act. Any clearing applications

that are within the predicted range of *Calotis moorei* and contain suitable habitat will need to consider the impact of the proposal on this species.

The EPBC Act regulates actions that may result in a significant impact on nationally listed threatened species and ecological communities. It is an offence to undertake any such actions in areas under State or Territory jurisdiction, as well as on Commonwealth-owned areas, without obtaining prior approval from the Commonwealth Environment Minister. As *Calotis moorei* is listed nationally under the EPBC Act, any person proposing to undertake actions likely to have a significant impact on this species should refer the action to the Commonwealth Minister for the Environment for consideration. The Minister will then decide whether the action requires EPBC Act approval.

Guidelines are available from the Commonwealth Department of the Environment, Water, Heritage and the Arts to assist proponents in determining whether their action is likely to have a significant impact. In cases where the action does not require approval under the EPBC Act, but will result in the death or injury of *Calotis moorei* and the plant occurs in or on Commonwealth land, a permit issued by the Commonwealth Minister under the EPBC Act will be required.

The Environment Minister can also delegate the role of assessment and approval to other Commonwealth Ministers under a Ministerial Declaration, and to the States and Territories under bilateral agreements. The development of a bilateral agreement between NSW and the Commonwealth is not yet complete, but when in place will avoid the need for duplication of environmental assessment.

7.3 Critical Habitat

The TSC Act makes provision for the identification and declaration of Critical Habitat. It is an offence to damage Critical Habitat (unless the action is exempted under the provisions of the TSC Act) and a Species Impact Statement is mandatory for all developments and activities proposed within declared Critical Habitat. Since routine agricultural activities are exempted from the TSC Act, and these are the activities with the most potential to impact upon *Calotis moorei*, little benefit would be obtained from a listing of critical habitat.

At this stage it would be premature to nominate any habitat as being critical to the survival of *Calotis moorei*. The taxonomy requires confirmation from genetic analysis and the distribution is poorly known. The species could prove to be more widespread.

7.4 Role and interests of indigenous people

In making a National Recovery Plan, regard must be had to the role and interests of indigenous people in the conservation of Australia's biodiversity.

The NSW TSC Act requires the Director-General to consider any special knowledge or interests that indigenous people may have in the species that is the subject of the plan and the measures to be contained within the plan. DECC acknowledges that flora, fauna, land, sea and ecological processes such as fire have ongoing cultural, social and economic value to Aboriginal people. These values are built on the cultural and historical association between Aboriginal people and the environment and are both tangible and intangible. DECC also

acknowledges that Aboriginal people wish to be involved in land management and possess important environmental knowledge that may be able to assist the achievement of conservation and community objectives. Involvement in recovery planning can play an essential role in assisting Aboriginal people to take a direct role in looking after the land and sea, valued places and species. DECC understands that such involvement has the capacity to generate a range of benefits for Aboriginal people. These may include assisting the passing on of cultural knowledge, fostering inter-generational contact and respect, assisting the development of partnerships with landowners and agencies, and developing the capacity of Aboriginal people to engage in collaborative land management programs.

The Western Catchment Management Authority Aboriginal Reference Advisory Group and the Menindee Local Aboriginal Land Council were consulted over the preparation of this Recovery Plan, including being provided with information on the species and the recovery planning process and being offered the opportunity for input into this process. Indigenous communities on whose traditional lands *Calotis moorei* occurs will be invited to be involved in the implementation of the plan.

8 Management Issues

8.1 Threats

There are no obvious threats to the populations at "Mount Mulyah", Menindee Common and Kinchega National Park. These populations may not be in decline. At the time of writing, the population at "Tandou" is being grazed by Dorper sheep, which are known to be efficient grazers of lesser quality pasture. It is not known if Dorper sheep will eat *Calotis* spp. while fruiting, however the main threat is in the early growing phase through to maturity.

A very small localised population is inherently at risk from chance events. If the species proves to be confined to "Mount Mulyah" and three populations around Menindee, and the populations are small, precautionary measures will be required. Small populations are also more susceptible to adverse genetic influences, such as inbreeding depression.

Grazing is a potential threat to all populations, although the threat of macropods on Kinchega National Park is likely to be minor relative to conventionally grazed areas. It is unclear to what extent this threat is real. In 2003, none of the plants found at "Mount Mulyah" appeared to have been grazed. When mature, the plant is unlikely to be palatable due to the sharp, woody awns on the seeds. In dry times, the plant persists as seed in the soil and so may be unaffected by even heavy grazing pressure, depending on the length of drought relative to seed dormancy. Impacts are most likely following emergence until maturity. At this time heavy stocking rates could be detrimental.

Short (1991) mentioned the collector, C.W.E. Moore, proposed that invasion of *Dodonaea* viscosa subsp. angustissima (narrow-leaf hop bush) may be responsible for the absence of regeneration of *Calotis moorei* since 1984. Herbaceous species are suppressed under a heavy cover of narrow-leaf hop bush. The area occupied by the extant population is very open and unlikely to become dominated by narrow-leaf hopbush due to the proximity to the homestead. Elsewhere on the property there are extensive open areas where *Calotis*

cymbacantha occurs, presumably indicative of appropriate habitat. Hop bush regeneration could not be construed as a major threat at this site.

8.2 Social and economic consequences

The costs of the recovery of *Calotis moorei* are not great. If other populations exist and the species is considered secure, minimal resources may be needed to ensure the survival of the species. If "Mount Mulyah" and Menindee are the only sites of significance in NSW the recovery program costs will include survey, genetic analysis and perhaps investigation of the population biology of *Calotis moorei*. Exclosures might be necessary if grazing was demonstrated a threat, but their cost is likely to be minor in terms of lost production.

8.2 Biodiversity benefits/impacts

The preparation and long-term implementation of Recovery Plans for threatened species, populations and ecological communities contributes to, and highlights the importance of, conserving all biodiversity. The conservation of biodiversity has a number of wider community benefits. These include:

- provision and maintenance of a range of ecosystem functions on which we and other species depend;
- Contributing to increased biological and ecological knowledge of species, communities, habitats and ecosystems;
- Potential medical, economical, agricultural and industrial products; and
- Cultural, aesthetic and spiritual values.

The conservation of *Calotis moorei* populations and the habitat in which it occurs will also benefit other species that share the same habitat and have similar biology. This Recovery Plan will increase public awareness of *Calotis moorei* and hence raise the profile of threatened species conservation issues. This, in turn, will lead to greater opportunities for the conservation of threatened species and increased protection of biodiversity.

9 Species Ability to Recover

It is unlikely that populations of *Calotis moorei* will decline irrespective of recovery measures. The species appears to be fecund, and may prove to be more widespread. If the species occurs at more locations in NSW, monitoring the status of populations may be all that is required, or even a change of conservation status may be appropriate.

10 Recovery Objectives and Performance Criteria

10.1 Specific objectives are:

- 1. To prevent the decline of *Calotis moorei* and ensure its long-term viability in nature.
- 2. To determine the distribution of *Calotis moorei* in NSW.
- 3. To clarify the taxonomy between *Calotis moorei*, *Calotis cymbacantha*, and *Calotis erinacea*.
- 4. To improve the understanding of the biology of *Calotis moorei*.
- 5. To monitor the distribution and abundance of, and threats on, *Calotis moorei*.

10.2 Recovery performance criteria:

- 1. The size and status of the remaining populations are known.
- 2. The taxonomy of *Calotis moorei*, *Calotis cymbacantha*, and *Calotis erinacea* is resolved.
- 3. The biology of *Calotis moorei* is sufficiently well understood to predict the likely impacts of grazing and other potential threats, and introduce appropriate ameliorative measures.

11 Recovery Actions

11.1 Action 1 Survey

Survey the potential habitat of *Calotis moorei* in NSW. For each site record population size, habitat including major associated species, and potential threats, and conduct repeated monitoring over an extended timeframe (see also Action 4). This survey can only be conducted in appropriate seasons.

Outcome: The distribution, habitat, population size(s) and potential threats to *Calotis moorei* in NSW are better known.

11.2 Action 2 Genetic analysis

Conduct appropriate genetic analyses to determine whether *Calotis moorei* is a hybrid or a genetically distinct species.

Outcome: The taxonomic status of the species is known.

11.3 Action 3 Reassess conservation status

If surveys show that the population of *Calotis moorei* in NSW is very large, and threatening processes are not having a major impact on the species, a reassessment of conservation status is warranted. It may be that the species could be removed from Schedule 1 (endangered) and placed on Schedule 2 (vulnerable). If the species is considered secure a nomination to remove *Calotis moorei* from the Schedules of the TSC Act and the EPBC Act could be prepared.

Outcome: The conservation status is reassessed after survey and appropriate action taken.

11.4 Action 4 Monitoring

Monitor populations at an appropriate frequency to better understand the life history, fecundity and recruitment and to clarify the nature and impacts of potential threats. These data should be used, as appropriate, to inform and/or develop appropriate on-ground management strategies/actions.

Outcome: Life history, population demographics and potential threats are better understood.

11.5 Action 5 Identify the impacts of grazing on populations

Monitoring the impacts of total grazing pressure may give some indication of the likely impacts of grazing. If damaged plants are found that suggest grazing may be a threat, further investigation using exclosures may be warranted.

Outcome: The influence of grazing is understood and, if necessary, appropriate action taken to minimize its impact.

11.6 Action 6 Seed storage

If the species is confined to "Mount Mulyah" and three populations at Menindee it would be prudent to undertake appropriate seed collection and storage to prevent extinction in the event of a catastrophe.

Outcome: Seed is placed in secure storage under appropriate environmental conditions.

12 Implementation

The following table allocates responsibility for the implementation of recovery actions specified in this plan to relevant government agencies for the period 2009 to 2014.

Action No:	Description	Priority	Estimated Cost/yr					Total Cost	Responsible party/funding	In-kind	Cash
			Year 1	Year 2	Year 3	Year 4	Year 5		source		
12.1	Survey potential habitat	1	20,000					20,000	DECC		20,000
12.2	Genetic analysis	1	40,000					40,000	DECC		40,000
12.3	Reassess status	1							DECC		
12.4	Monitoring	1	2,000	2,000	2,000	2,000	2,000	10,000	DECC	10,000	
12.5	Investigate grazing	1		500	500	500	500	2,000	DECC	2,000	
12.6	Seed storage	1		3,000				3,000	DECC		3,000
12.7	DECC implementation	1	2,000	2,000	2,000	2,000	2,000	10,000	DECC		10,000
Tota			64,000	7,500	4,500	4,500	4,500	85,000		12,000	73,000

Priority ratings are: 1- Action critical to meeting plan objectives, 2- Action contributing to meeting plan objectives, 3-Desirable, but not essential, action.

'In-kind' funds represent the salary component for permanent staff and current resources.

'Cash' funds represent the salary component for temporary staff and other costs such as the purchasing of survey and laboratory equipment.

13 Preparation Details

The draft plan was prepared by Geoffrey Robertson, Senior Threatened Species Officer, with amendments for the final plan made by Rob Armstrong, Senior Threatened Species Officer.

13.1 Date of last amendment

No amendments have been made to date.

13.2 Review date

This plan will be reviewed within five years of the date of publication.

14 References

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15 Personal Communications

Ben Bullen: caretaker, "Mount Mulyah".

Joy Everett: Botanist, Royal Botanic Gardens, Mrs Macquaries Rd. Sydney.

16 Acknowledgments

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Joy Everett: Botanist, Royal Botanic Gardens, for taxonomic advice and information.

Maurizio Rossetto: Conservation Ecologist, Royal Botanic Gardens, for advice on the process and costs of genetic analysis.

Appendix 1 – Extant Location Details

Species	Date	Datum	Zone	Easting	Northing	Number	Collector
Calotis moorei	17-Sep-03	AGD66	55	263393	6642938	1	G. Robertson
Calotis moorei	17-Sep-03	AGD66	55	263517	6642901	2	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263510	6643023	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263548	6643016	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263558	6643016	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263558	6643017	6	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263564	6643012	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263555	6643004	3	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263553	6643005	2	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263555	6643011	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263552	6643005	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263548	6643005	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263560	6643019	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263557	6643020	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263553	6643019	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263548	6643024	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263545	6643017	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263546	6643023	2	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263541	6643024	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263541	6643034	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263542	6643045	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263556	6643047	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263562	6643041	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263563	6643038	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263566	6643039	5	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263567	6643028	2	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263580	6643036	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263572	6643057	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263576	6643058	1	G. Robertson
Calotis moorei	18-Sep-03	AGD66	55	263701	6643105	1	G. Robertson
Calotis moorei	30-Sep-00	AGD66	54	632982	6420987	?	W.A. Cherry,
							K.D. Hill,
							A.E. Orme
Calotis moorei	02-Oct-00	AGD66	54	611061	6391840	?	W.A. Cherry,
							K.D. Hill,
Calotis moonai	15 Nov 07	ACD66	54	622080	6421140	9	A.E. Orme
Calous moorel	13-100-07	AGD00	54	033089	0421140	<i>'</i>	A E. Orme
Calotis moorei	16-Nov-07	AGD66	54	617852	6410611	9	R. Johnstone
	101.01.07			01.002	0.10011		A.E. Orme



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