

BETTER HERITAGE INFORMATION SUMMARY OF STATE HERITAGE PLACE

Blinman Diapir Geological Site



Blinman Diapir Geological Site SHP 14794, c.2008.

Source: DEW Files

ENTRY IN THE REGISTER

Description or notes with respect to a place entered in the South Australian Heritage Register in accordance with either the *South Australian Heritage Act 1978* or the *Heritage Places Act 1993*.

The South Australian Heritage Council may correct errors or inaccuracies in the Entry in the Register in accordance with s21 of the *Heritage Places Act 1993*.

NAME: Blinman Dome Diapir, via Blinman (Original) **PLACE NO.:** 14794
Blinman Diapir Geological Site (Proposed)

ADDRESS: Lot 7, Glass Gorge Road
Blinman 5730
CR 5369/577 F36352 A7
Hundred of Carr

CONFIRMED IN THE SOUTH AUSTRALIAN HERITAGE REGISTER:

9 October 1997

DESIGNATED AS A PLACE OF GEOLOGICAL SIGNIFICANCE:

10 April 1997

S16 CRITERIA SATISFIED UNDER HERITAGE PLACES ACT 1993

(b) it has rare, uncommon or endangered qualities that are of cultural significance

(c) it may yield information that will contribute to an understanding of the State's history, including its natural history

COMMENTARY ON THE LISTING

Additional information provided as a part of the content of the South Australian Heritage Register in accordance with s14(6) of the *Heritage Places Act 1993* 'hold information in association with the Register'.

KNOWN AS: Blinman Dome Diapir [Designated as a place of geological significance]

ADDRESS Adnyamathanha Country

STATEMENT OF HERITAGE SIGNIFICANCE

The Blinman Dome is one of several diapiric structures in the Flinders Ranges. Presumed to be formed by the upwelling of material (triggered by tectonic forces) into the surrounding rocks, these diapirs are of significance to the study of geological influences on sedimentary strata. Part of the Blinman Dome diapir is exposed in the Blinman Copper Mine, an easily accessible site for the inspection of mineralization typical of the Blinman Dome 'diapir' and the associated rock types (HSA, 2/2000).

Validated 25 February 2000

STATEMENT OF HERITAGE SIGNIFICANCE (Proposed)

The Blinman Diapir is one of several diapiric structures in the Flinders Ranges. Interpreted to be formed by the upwelling of material (triggered by tectonic forces) into the surrounding rocks, these diapirs are of significance to the study of geological influences on sedimentary strata. Part of the Blinman Diapir is exposed within the Blinman Diapir Geological Site in the Blinman Copper Mine, an easily accessible site for the inspection of mineralisation in the Blinman Diapir and the associated rocks.

STATEMENT OF DESIGNATION

Designated Place of Geological Significance

The Blinman Diapir Geological Site, located in the northern Flinders Ranges, is a readily accessible, high-quality example of a section of an exposed diapir. The Blinman Diapir was one of the earliest diapirs to be recognised in South Australia and has served as a reference for the identification of diapirs in the Flinders Ranges since the 1960s. The Blinman Diapir Geological Site contains portions of the diapir, including exposed sections of mineralisation of dolomite within diapiric breccia housed within the shafts,

adit and open cut of the Blinman Copper Mine. The geological processes underlying the formation of diapirs are not well understood and sections of exposed mineralisation are uncommon. Consequently, the Blinman Diapir Geological Site is considered likely to contribute significantly to an understanding of the complex geology of South Australia.

Elements of Significance:

Elements of heritage significance include:

- Exposed diapiric breccia,
- Sub-surface exposures of diapiric breccia in the Blinman Mine,
- Associated surrounding rocks,
- Mine shaft,
- Mine workings such as tailings and slag dumps,
- Rocks and minerals exposed by mining activities,

Elements not considered to contribute to significance of place include:

- Vegetation, fencing and signage.

CRITERIA (under section 16 of the Heritage Places Act 1993)

(b) it has rare, uncommon or endangered qualities that are of cultural significance

It has rare, uncommon or endangered qualities that are of cultural significance as it evidences mineralization typical of the Blinman Dome 'diapir'. (Criteria statement considered at provisional entry, not reconsidered at confirmation. If proposed criteria statement is approved by the SAHC this will be deleted from this document.)

(b) it has rare, uncommon or endangered qualities that are of cultural significance (Proposed replacement statement)

The Blinman Diapir Geological Site is a readily accessible, high-quality South Australian example of a section of an exposed diapir. Diapirs are intrusions of more mobile and/or lower density material that were forced upwards into pre-existing and often denser, more brittle overlying rocks through buoyancy and/or fluid pressure. If large enough, this movement may uplift blocks of rocks up to kilometres in size.

Unusually, mine shafts, adits and an open cut associated with the former Blinman Mine (Blinman Mine & Mine Manager's Cottage SHP 13888) penetrate ~165m into the Blinman Diapir, providing rare direct access to the sub-surface geology and

mineralisation of the diapir. Research is likely to contribute significantly to an understanding of the Flinders Ranges geology and formation of the diapir.

(c) it may yield information that will contribute to an understanding of the State's history, including its natural history

This geology may yield information that will contribute to an understanding of the State's natural history. (Criteria statement considered at provisional entry, not reconsidered at confirmation. If proposed criteria statement is approved by the SAHC this will be deleted from this document.)

(c) it may yield information that will contribute to an understanding of the State's history, including its natural history (Proposed replacement statement)

Diapirs are an upwelling of usually less dense, ductile and pressurised material that intrude into a layer of denser and more brittle rock. The movement of the diapir can greatly alter the surrounding geology of a large area and can result in warping and folding of the surrounding material and alteration of the pre-existing geology.

The Blinman Diapir was one of the earliest diapirs recognised in South Australia and has served as a reference for the identification of diapirs in the Flinders Ranges since the 1960s. The Blinman Diapir contains highly brecciated, approximately Neoproterozoic-aged, 'Willouran' (~827-802 Ma) rocks that intrude into the much younger Tapley Hill Formation.

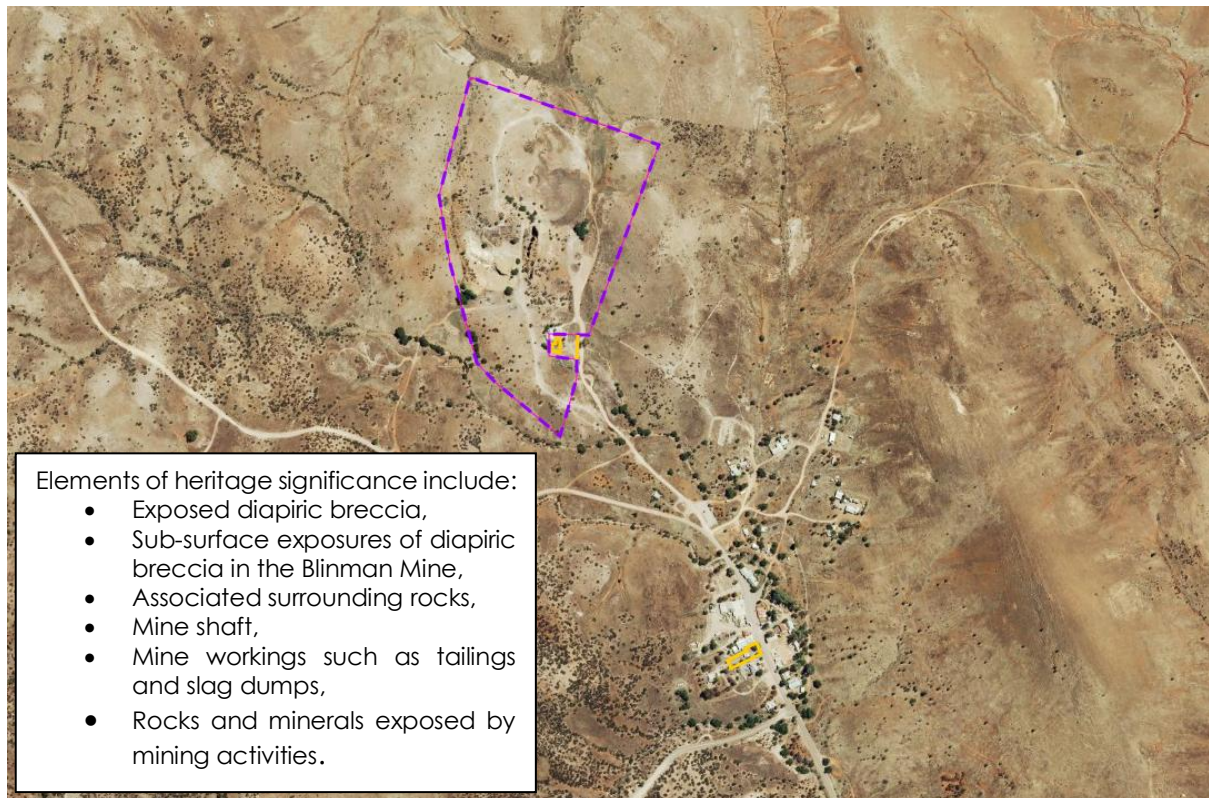
The geological processes leading to the formation of diapirs are not well understood. Although many of the diapirs of the Flinders Ranges are mineralised and contain historic mine workings, the mine shafts, adits and an open cut associated with the former Blinman Mine (Blinman Mine & Mine Manager's Cottage SHP 13888) are the largest and deepest, penetrating 165m into the Blinman Diapir. The extent of these penetrations make the internal geological structure of the diapir and mineralisation accessible for geological study. Detailed investigation of the internal composition and structure of the Blinman Diapir Geological Site within the Blinman Diapir is likely to yield information which will meaningfully contribute to an understanding of the complex geology of South Australia.

SITE PLAN

Blinman Diapir Geological Site

PLACE NO.: 14794

Lot 7, Glass Gorge Road, Blinman



0 0.1 0.2km

**Blinman Diapir Geological Site, Adnyamathanha Country, Lot 7, Glass Gorge Road, Blinman,
Hundred of Carr
CR 5369/577 F36352 A7**

N ↑

LEGEND

Parcel boundaries and Elements of Significance (Indicates extent of Listing)

Existing State Heritage Place(s)*

*The extent of listing for the Blinman Mine & Mine Manager's Cottage (SHP 13888) also encompasses the same extent of listing as the Blinman Diapir Geological Site with some additional structures as outlined in the above Site Plan. 'Cottage and Underground Ruins' (SHP 10296) is located in the nearby Blinman township.

SITE PLAN - DETAIL

BHI Summary of State Heritage Place: 14794

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Confirmed in the South Australian Heritage Register on 9 October 1997

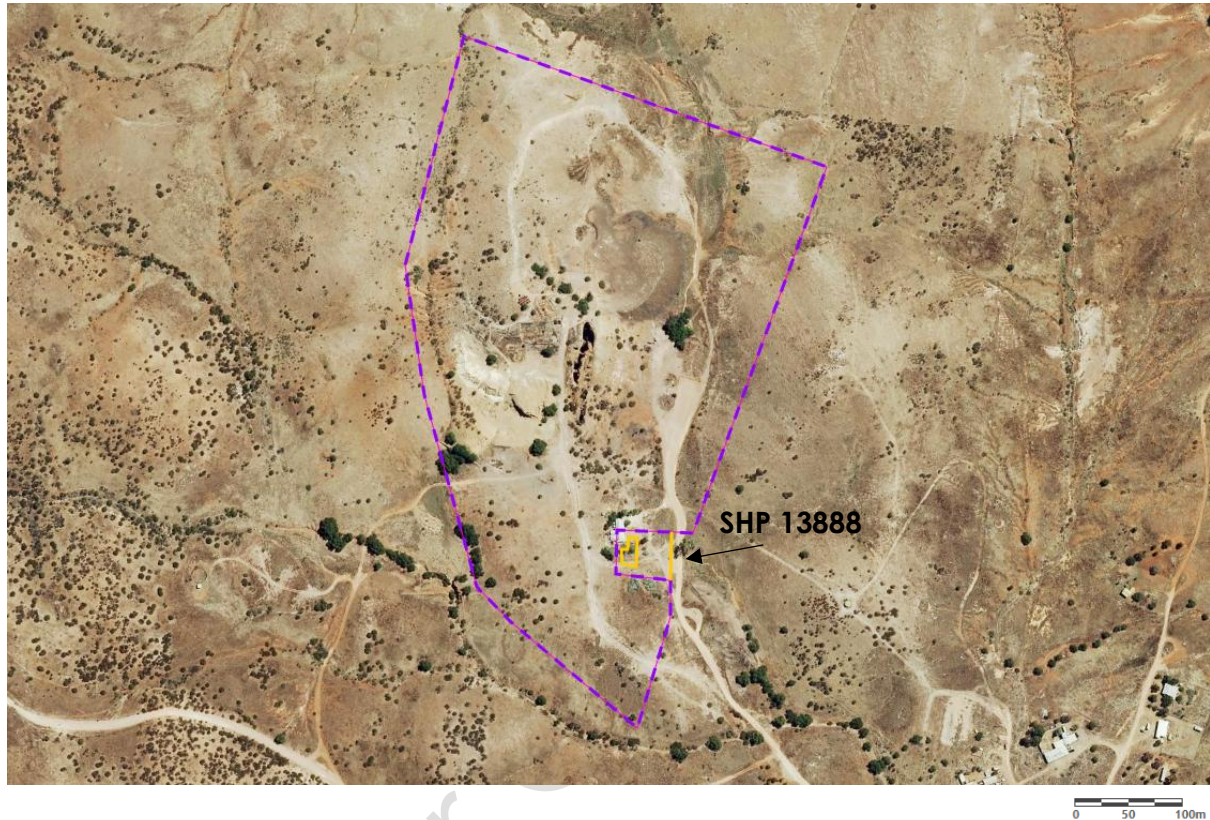
Draft BHI SSHP for Consultation 18 June to 18 September

The South Australian Heritage Council approved this BHI - SSHP on (tbc)

Blinman Diapir Geological Site

PLACE NO.: 14794

Lot 7, Glass Gorge Road, Blinman



Blinman Diapir Geological Site, Adnyamathanha Country, Lot 7, Glass Gorge Road, Blinman,
Hundred of Carr
CR 5369/577 F36352 A7

N ↑

LEGEND

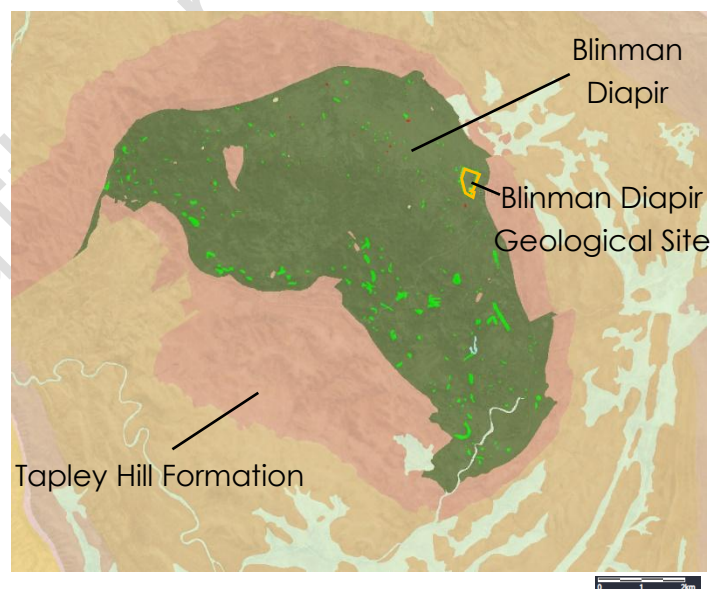
-  Parcel boundaries and Elements of Significance (Indicates extent of Listing)
-  Existing State Heritage Place(s)

The Blinman Diapir Geological Site is a small portion of the larger 'Blinman Diapir' which in turn is recognised as the 'core' of the much larger 'Blinman Dome'.¹ The Blinman Diapir Geological Site is approximately 0.1km² in extent and encompasses the accessible surface exposure (approximate 2%) of the Blinman Diapir.

The Blinman Diapir measures 12km in diameter and covers an area of 44km². The upwards movement of the intrusive diapiric breccia of the Blinman Diapir, likely warped the surrounding geology.² The Blinman Diapir intrusion occurred during the Neoproterozoic approximately ~660-510 Ma. However, the Blinman Dome with the diapir at it's core was created separately later in the Cambrian, during the Delamerian Orogeny ~500 Ma, through regional folding and morphing of surrounding strata.³ The long, approximately polygonal shape of the diapir is roughly concordant with the bedding trends⁴ of the Blinman Dome, which is part of the larger scale Blinman-Oraparinna anticline.⁵

Multiple locations within the Blinman Diapir were recognised collectively as the 'Blinman Dome Diapir' in 'Geological Monuments in South Australia' under the identifying number FR28 (i-v) and the 'Flinders Ranges Heritage Survey' under UNG-RSR-06 and UNG-LR-11 to UNG-LR-14. The only location of these five localities to be recognised as having 'State Heritage value' was location FR 28(i) or UNG-RSR-06 which is the current Blinman Diapir Geological Site.

While these other locations are recognised in the 'Blinman Dome Diapir' Geological Monument, the extent of this listing focuses on the area linked with the Blinman Copper Mine and associated mineralisation (see Site Plan).



The Blinman Diapir (green). Interpreted from SARIG Map (N.D.)

The Blinman Diapir Geological Site (SHP 14794) representing FR28(i), is a portion of diapiric intrusion of the Blinman Diapir dating from approximately Neoproterozoic-

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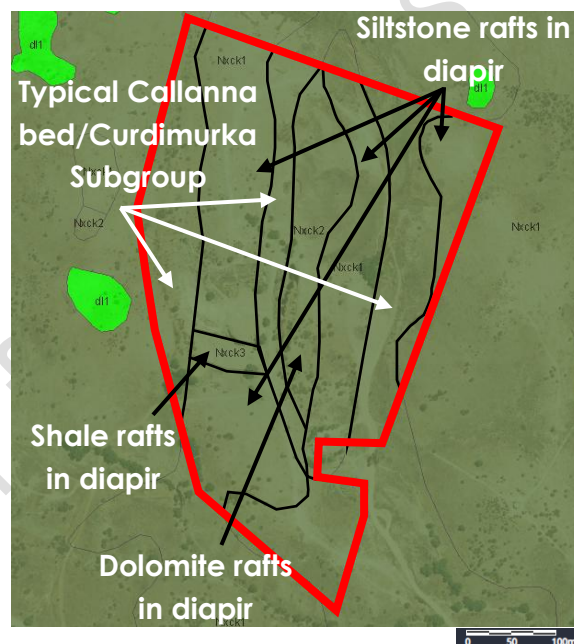
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age, 'Willouran' (~827-802 Ma) Curdimurka Subgroup rocks, as a part of the larger Callanna Group.⁶ The older material intrudes into the ~650 Ma Tapley Hill Formation. The majority of surface rocks associated with the Blinman Diapir are brecciated Curdimurka Subgroup, as a part of the larger Callanna Group.

Mine type dolomite, the large block of mineralised dolomite that the Blinman Mine excavated for copper, is recognised as a part of the heritage values of the Blinman Diapir Geological Site.⁷ The orebody of the mine is present within well-bedded dolostones/dolomite and dolomitic siltstones which are located to the south-east of the mine shaft.⁸ Mineralisation of cuprite and malachite (copper minerals) are present in the first ~90m (depth) of the mine, followed by chalcopyrite, bornite and chalcocite in the 'sulphide zone' an area where minerals have not yet been oxidised by water. This mineralisation shows evidence of sedimentary deposition in its appearance. Some sections of mineralisation are separated into obvious bedding planes (sedimentary) while others are cross-cut veins (metamorphism). Some secondary minerals, like cuprite and malachite, formed as a result of supergene weathering and appear in vughs (small cavities or veins typically lined with crystals).⁹



Geology of the Blinman Diapir Geological Site. Interpreted from SARIG Map (N.D.)

To the east are also dolomites, siltstones and slates in the diapiric breccia, believed to be xenoclasts, rocks that originated elsewhere, present as 'rafts', placed there by the movement of the diapir. Other formations, including those to the west of the mine shaft are more typical Curdimurka Subgroup/Callanna Group formations¹⁰, commonly seen in diapirs.

Elements of Significance:

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The South Australian Heritage Council approved this BHI - SSHP on (tbc)

Elements of heritage significance include:

- Exposed diapiric breccia,
- Sub-surface diapiric breccia,
- Associated surrounding rocks,
- Mine shaft,
- Mine workings such as tailings and slag dumps,
- Rocks and minerals exposed by mining activities,

Elements not considered to contribute to significance of place include:

- Vegetation, fencing and signage.

Refer to State Heritage Place files for Blinman Mine & Mine Manager's Cottage (SHP 13888) to ascertain extent of listing associated with the concurrent listing.

HISTORY OF THE PLACE

Formation of the Blinman Diapir

Diapirs are intrusions of ductile, pressurised material that are forced or enter upwards into pre-existing and often more brittle rocks. The material that comprises a diapir is normally less dense than the surrounding material, causing vertical intrusion through buoyancy. Common forms of diapirs are the result of shales, or low-density evaporites, such as salt, that rise and penetrate layers of host rock along faults or other weaknesses.¹¹ When large enough, this movement causes an uplift of rocks in the surrounding areas. Although rare, the diapir material can, in some locations, eventually become exposed at the surface through erosion.

The Blinman Diapir was formed by the upwards and geological movement (diapirism) of approximately Neoproterozoic-aged, 'Willouran' (~827-802 Ma) Curdimurka Subgroup¹² rocks into Sturt glaciation-aged Tapley Hill Formation rocks,¹³ which the Blinman Diapir outcrops on. Available evidence suggests that the Blinman Diapir may have formed around the same time as the nearby Oraparinna Diapir, reaching its 'diapir stage' (the middle stage of diapir formation) while the Tapley Hill Formation was being deposited¹⁴. During diapir intrusion, the surrounding geological beds were upturned at the rim of the diapir¹⁵. Sometime after, the Delamerian Orogeny occurred. This was a multi-stage mountain building event that effected the whole of the Flinders Ranges, ceased sedimentation for a time and had various folding and metamorphic events.¹⁶ The Blinman Dome's emplacement was a part of these folding events. The dome is defined by steep dips in the bedding of the surrounding geology in a circular pattern and extends for many kilometres.¹⁷

Nevertheless, the origin of the Blinman Diapir is not fully understood and remains contentious,¹⁸ with numerous theories competing to explain the formation of the diapir:

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- Jennings (1985) suggested that the presence of salt along with other low-density sedimentary rocks may have allowed the upwards movement of material through denser rocks towards the surface.¹⁹ This hypothesis is the most widely accepted;
- Backé *et al.* (2010) concluded that the diapir is associated with faults (anticlines) which may have allowed low-density material to travel to the surface or into local zones of extension;²⁰
- Burns, Stephansson and White (1977) hypothesise that, rather than a diapir, the Blinman Diapir would be more appropriately classified as a décollement, where geological processes folded and deformed the layers of rock to create the geological structure. Though, décollement and diapirs are not mutually exclusive;²¹
- Jennings (1985) also hypothesised that the Blinman Diapir may have become exposed due to rock movement and denudation (weathering) of the overlying structures.

The Blinman Diapir is one of the best-known diapirs in South Australia²² and has served as a reference for the identification of Flinders Ranges diapirs since the 1960s.²³ It was also the first diapir described in the central Flinders Ranges.²⁴

Human History

Blinman Diapir Geological Site is located on Adnyamathanha Country. Adnyamathanha People lived on the land and possessed a great understanding of the natural landscape and terrain. They had close contact with neighbouring Aboriginal Peoples including for mining and trading ochre. In the 1840s and 1850s, when colonisation of the Far North commenced, many violent encounters occurred between the colonists and Adnyamathanha People. The Adnyamathanha People were noted as being particularly skilled in their use of the landscape to hide and ambush colonial settlers. While there were deaths on both sides, many more Adnyamathanha People were killed.²⁵

By 1853, rations were being distributed to the Adnyamathanha People, who due to the control and degradation of the land caused by European practices found it difficult to find sufficient food. During the Victorian gold rush, some Adnyamathanha People were employed by pastoralists, however, droughts in the 1890s resulted in many pastoralists leaving the land. In the 1930s, a mission was constructed at Nepabunna and many Adnyamathanha People were relocated to live there.²⁶

The Adnyamathanha People's determination and cohesion was evident into the 1930s when AP Elkin visited the community. He noted that traditional ceremonies, language and culture remained despite the devastating and lasting effects of colonisation.²⁷

The Blinman Mine

In 1859, shepherd Robert Blinman recognised copper minerals in the area now named after him. With three friends, Blinman obtained a mineral lease and mining commenced in 1862 when the Yudnamutana Mining Co. purchased the lease in the area now State Heritage listed as the Blinman Diapir Geological Site. Operating sporadically between 1862 and 1918, this mine was the largest and most productive copper mine in the Flinders Ranges, yielding an estimated 10,000 tonnes of copper valued at £640,000 and supporting a population of over 1,500 in the associated Blinman township during the 1870s.

The major mineralisation occurs mainly in dolomite, which outcropped over approximately 60m prior to the commencement of mining. Mining operations extended approximately 146m underground and another 'underlay shaft' following the sloped dip of the mineral lode expanded for another ~36m downwards. Exploration in 1906 was unable to find mineralisation extending below ~164m.²⁸ Later exploration determined that the extent of mineralisation reached approximately 174m in depth.²⁹ The Blinman Mine also produced lead and barite.³⁰ The mining of this portion of the Blinman Diapir has exposed the mineralisation within the diapir.

Aboriginal Cultural Considerations

The *Heritage Places Act 1993* makes provision for the identification, recording and conservation of places and objects of non-Aboriginal heritage significance. The protection and preservation of Aboriginal heritage is provided for under the *Aboriginal Heritage Act 1988*. Contact the Aboriginal Heritage Unit for listings.

CHRONOLOGY

Year	Event
850-800Ma	Deposition of the Callanna Group/ Curdimurka Subgroup during 'Willouran' time
~720-	Cryogenian Period begins. Period of glaciations. Sturt glaciation (700-665 Ma) Tapley Hill Formation deposited during this period. ³¹ Elatina ('Marinoan') glaciation which, while the start is poorly understood, is believed to have ended ~635Ma.

- 635-538 Ma Cryogenian Period ends, along with the Elatina Glaciation.
635-538 Ma encompasses the Ediacaran Period.
- 538 Ma Neoproterozoic (including the Ediacaran) ends. The Cambrian Period starts.
- ~500Ma Delamerian Orogeny. Folding of sedimentary rocks of the Flinders Ranges.**
- 1859 Shepherd Robert Blinman recognises copper minerals in the area later named after him.
- 1861 Robert Blinman and three friends obtain a mining lease in the Blinman area.
- 1862 Mining commences at the Blinman Mine. During the year, five shafts were sunk including one to a depth of 18m.³²
- 1870s The population of Blinman township surpasses 1,500.
- 1906 Drilling shows that mineralisation does not extend beyond ~164m depth, later disproven.³³
- 1918 Mining activities at the Blinman Mine end.
- 1981 Recognised as a geological monument by the Geological Society of Australia South Australia Branch
- 1989 Blinman Mine & Mine Managers Cottage (SHP 13888) is confirmed in the South Australian Heritage Register.
- 1990 Professor Eric Rudd, owner of the Mine Manager's cottage, establishes Frontier Exploration to explore for minerals, gas and fossil fuels. Drill holes Blinman 1 and Blinman 2 drilled in the nearby area, outside of the State Heritage Place. These were highly scientifically significant.³⁴
- 1995 'Blinman Dome Diapir' is identified in the *Flinders Ranges Heritage Survey*.** Several localities are identified. Co-ordinates presented in the survey for FR28(i) are a larger, square area also encompassing some dolerite intrusions.
- 1997 10 April, 'Blinman Dome Diapir' at its current location is provisionally entered into the South Australian Heritage Register and Designated by the State Heritage Authority.**
- 9 October, 'Blinman Dome Diapir' is confirmed in the South Australian Heritage Register.**

BIBLIOGRAPHY

Publications

BHI Summary of State Heritage Place: 14794
Confirmed in the South Australian Heritage Register on 9 October 1997
Draft BHI SSHP for Consultation 18 June to 18 September
The South Australian Heritage Council approved this BHI - SSHP on (tbc)

- Backé G, Baines, G, Giles, D, Preiss, W and Alesci, A (2010), 'Basin geometry and salt diapirs in the Flinders Ranges, South Australia: Insights gained from geologically-constrained modelling of potential field data', *Marine and Petroleum Geology*, vol. 27, no. 3, pp. 650-665.
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Department for Energy and Mining, South Australian Resources Information Gateway (SARIG) Map (N.D.), *Government of South Australia*. From: <<https://map.sarig.sa.gov.au/>>.

SITE DETAILS

Blinman Diapir Geological Site

PLACE NO.: 14794

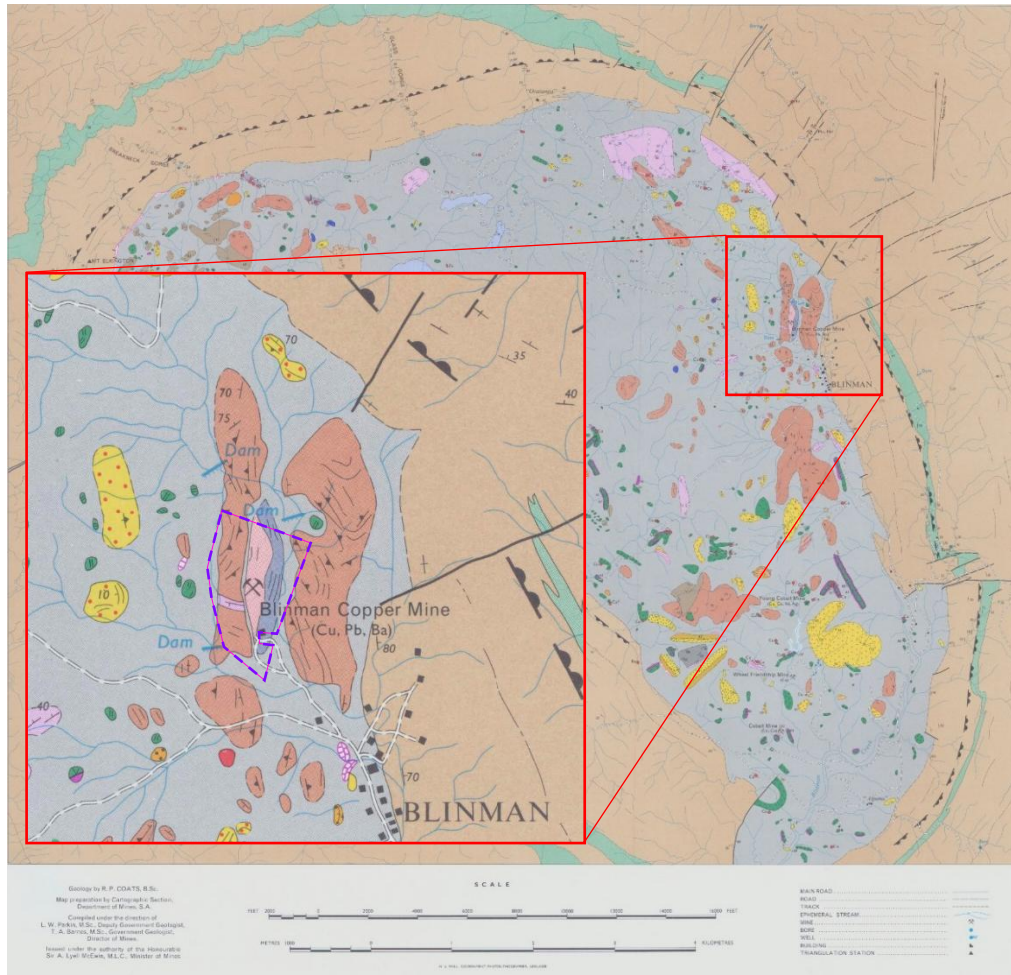
Lot 7 Glass Gorge Road, Blinman

DESCRIPTION OF PLACE:	Exposed diapir and historical mine
HISTORIC THEME/S	Theme 1 Natural Environment 1.1 Tracing climatic and topographical change 1.6 Recognising human impacts on the natural environment
AGE OF FORMATION:	~850-800Ma
REGISTER STATUS:	Provisionally entered 10 April 1997 Designated 10 April 1997 Confirmed 9 October 1997
CURRENT USE:	Tourism (former Blinman Mine)
PREVIOUS USE(S):	Mining Site 1862-1918
LOCAL GOVERNMENT AREA	Pastoral Unincorporated Area
LOCATION:	Street No.: Lot 7 Street Name: Glass Gorge Road Town/Suburb: Blinman Post Code: 5730
LAND DESCRIPTION:	Title CR 5369/577 F36352 A7 Reference: Hundred: Hundred of Carr

PHOTOS

Blinman Diapir Geological Site
Lot 7 Glass Gorge Road, Blinman

PLACE NO.: 14794



Geology of the Blinman Diapir

Source: Coats RP (1964), published 1963.

- Grey siltstones with halite pseudomorphs, dolomitic in part interbedded heavy mineral laminated quartzites
- Dolerites
- Laminated ferruginous and siliceous ribbon slates and siltstones, dolomitic in part
- Well bedded dark grey siltstones and slates, interbedded fine grained siliceous dolomite, dolomitic siltstones (Mine type dolomite)
- Dolomites undifferentiated
- Parcel boundaries and Elements of Significance (Indicates extent of Listing)

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PHOTOS

Blinman Diapir Geological Site
Lot 7 Glass Gorge Road, Blinman

PLACE NO.: 14794



Inside a section of the Blinman Copper Mine, c. 2011

Source: DEW Files

REVISIONS

Date	Changes
13 February 2026	SAHC modified template to include an image at the beginning of the document.

¹ Burns, KL, Stephansson, O, White, AJR (1977), 'The Flinders Ranges breccias of South Australia diapirs or d'collement?', *Journal of the Geological Society*, vol. 134, no. 3, pp. 363-384.

² Webb, BP (1961), 'The Geological Structure of the Blinman Dome', *Transactions of the Royal Society of South Australia*, Vol. 85, pp.1-6.

³ Priess, W (2024) Personal Communication.

⁴ Backé G, Baines, G, Giles, D, Preiss, W and Alesci, A (2010), 'Basin geometry and salt diapirs in the Flinders Ranges, South Australia: Insights gained from geologically-constrained modelling of potential field data', *Marine and Petroleum Geology*, vol. 27, no. 3, pp. 650-665.

⁵ An anticline is a downwards curve or fold in layered rocks, typically forming a U-shape. A hinge is the point on the anticline where the curve is greatest. Backé G, Baines, G, Giles, D, Preiss, W and Alesci, A (2010), 'Basin geometry and salt diapirs in the Flinders Ranges, South Australia: Insights gained from geologically-constrained modelling of potential field data', and Priess, W (2024) Personal Communication.

⁶ Pearl, S (2019), 'The Blinman Heritage Mine: The story of an 18th century mine and its legacy in the small township of Blinman, South Australia', *Australasian Institute of Mining and Metallurgy Bulletin*, pp. 74-76.

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