HERITAGE ASSESSMENT REPORT

NAME:	Tantanoola Caves Complex	**PLACE:**	26555

ADDRESS: Boandik Country

Tantanoola Caves Conservation Park, 32047 Princes Highway, Tantanoola SA, 5280

CR/5772/853, H420600 S213, Hundred of Hindmarsh

This heritage assessment considers that the place meets criteria (c). Refer to Summary of State Heritage Place for final approved wording, including criteria statements.

Guide Jacqui Mortensen illuminates the spectacular 'chocolate fountain' formation at the Tantanoola Caves.

Source: Hill, K (2015)

ASSESSMENT OF HERITAGE SIGNIFICANCE

Statement of Heritage Significance:

The Tantanoola Caves Complex is located along a dolomitic karst ridge featuring the only known pink dolomite caves in South Australia. The abundance and variety of types of decorations including drapery, helictites, flowstones and wedding cake formations found in Tourist Cave and Lake Cave are impressive in their density and complexity. The Tantanoola Cave Complex including Tourist Cave, Lake Cave, Up-and-Down Rocks and 16 smaller karst features have a high potential of yielding new scientific information about the natural history of South Australia and specifically the geological and speleological development of the South East. Knowledge of the dolomite presence will also contribute to a broader understanding about the processes, likely volcanic, required to convert limestone to dolomite, and the regional impact of volcanism.

Statement of Designation: Geological

The Tantanoola Caves Complex encompasses an extensive dolomite exposure known as the Up-And-Down-Rocks. This small area is the only substantial pink dolomite exposures within the State.

No other South Australian dolomite exposures contain substantial cave systems present within the dolomite, whereas the Up-and-Down rocks and surrounding areas contain 19 individual karst features including two major caves, the Tantanoola Tourist Cave and Lake Cave.

The catalyst for the formation of dolomite from limestone is not well understood. The caves within the Tantanoola Caves Complex present a unique opportunity to yield important information about the development of dolomite within the South-East as well as the South East's geological history. The Tantanoola Caves Complex also records marine transgressions, regressions and various uplift and volcanic events that happened throughout the previous 5 million years.

Elements of Significance:

The significant geological features contained within the complex are:

- Extensive pink dolomite exposures throughout the complex,
- various karst features, including the major cave chambers and Up-And-Down Rocks,
- evidence of geological history recorded within the fabric of the place,
- potential evidence of local volcanic activity with a high likelihood for scientific yield

Statement of Designation: Speleological

The Tantanoola Caves Complex is an area containing 19 karst features on a limestone/dolomite ridge exposure. The caves present within the Conservation Park provide excellent exposures of pink dolomite, the result of an iron component linked to local volcanism. They are the only examples of pink dolomite caves in the State and provide ample opportunity for scientific research.

Lake Cave is recognised as a Special Purpose Reference Cave based on the *Principles of Karst Management*, demonstrating that it contains exceptional scientific value. The cave retains a high level of integrity and intactness.

Both caves are highly decorated for their size, containing varied and abundant cave formations, some of which are rare and appear in high concentration. These decorations are continuing to form and grow. Other formations contain information pertaining to previous infill events and demonstrate the rich history of the caves. The dolomite component of the caves will provide high scientific value in understanding the formation of cave decorations, the processes that alter limestone to dolomite and impacts on the surrounding landscape.

Elements of Significance:

The significant speleological features contained within the complex are:

- Numerous cave features within substantial pink dolomite rock,
- extensive speleothems including 'wedding cake' column formations, draperies, helictites and flowstones,
- Lake Cave recognised as a Special Purpose Reference Cave for high likelihood to yield scientific information,
- preserved natural sediments, collapses and rockfall formations,
- fossils embedded within the cave walls and evidence of animal scratchings,
- type locality for the cave cricket *Speleotettix tindalei*.

Relevant South Australian Historical Themes

The Tantanoola Caves Complex demonstrates the following historical theme:

1. Natural Environment

    1.1 Tracing climatic and topographical change

    1.5 Appreciating South Australia's natural environment

Comparability / Rarity / Representation:

The Tantanoola Caves Complex located in the Tantanoola Caves Conservation Park is a karst topography formed from limestone with substantial dolomite infusions and contains 19 karst features including two large caves. The two major caves are known as Tantanoola Tourist Cave and Lake Cave. The caves are inset into an ancient sea cliff face known as the Up-And-Down rocks and contain some of the most spectacular cave decorations within the State.

All major caves present at the site are developed in dolomite which is a local stone requiring specific, likely volcanic, conditions for development. Lake Cave is recognised as a Special Purpose Reference Cave based on the *Principles of Karst Management* developed by Graeme Worboys and Mark Butz (1979).[1] Research and explorations of Lake Cave must be pre-approved under strict guidelines. As such, Lake Cave has retained a high level of integrity and intactness.

Three main themes emerge for consideration in this section, namely:

- Karst caves with a limestone/dolomite composition in Australia
- Caves with cave decoration
- Fossil caves in South Australia

Karst caves with a limestone/dolomite composition in Australia

Geoscience Australia define karst as 'a distinct topography in which the landscape is largely shaped by the dissolution of carbonate bedrocks (usually limestone, dolomite, or marble).'[2] In the South-East of South Australia, limestone, made from calcium carbonate is abundant due to the deposition of shelly marine fossils. The dissolution of the limestone often leads to the formation of caves and sinkholes (karst), which are common throughout the South-East. However, to form dolomite a different process must be undertaken to chemically alter the limestone. As a result, dolomite karst is much rarer comparatively than limestone but can still be found readily throughout the State. Dolomite is found throughout the Flinders Ranges and Adelaide Hills and has been quarried in the Yorke Peninsula, Sellicks Beach and Rapid Bay.[3]

Several caves in the State contain dolomite, however, in most examples the dolomite does not form a substantial element of the cave. Comparatively the Tantanoola Caves contain ~80% dolomite.
Examples of caves containing dolomite elements include:

- Wooltana Cave, North of Wooltana Station Homestead, Flinders Ranges – a cave known for deposits of bat guano. It is set in Cambrian-aged Limestone and contains <10% dolomite within the cave walls.
- Corra Lynn Cave, 212 Quarry Road, Curramulka, (SHP 22798) – large 14-km vast multi-level maze system that was formed in conglomerate rock. The conglomerate is formed from numerous consolidated types of rock millions of years ago and happened to contain dolomite.

Limestone Caves entered in the South Australian Heritage Register include:

- Naracoorte Caves Complex, 8kms south of Naracoorte, Naracoorte Caves National Park, Naracoorte (SHP 26459) – expansive limestone cave complex, of 19 separate cave systems including Blanche and Victoria Fossil Caves, Naracoorte Caves, (SHP 11604)
- Green Waterhole – Tank Cave Complex, Lot 550 Princes Highway, Tantanoola, (SHP 26530) – extensive underwater limestone cave system.

- Engelbrecht Cave, 26 Chute Street, Mount Gambier, (SHP 14733) – limestone cave with no decorations but ornate solution features in the walls and an extensive submerged passage system.

Blanche Cave & Victoria Fossil Cave (SHP 11604) and partial areas of Naracoorte Caves Complex (SHP 26459) have also been World Heritage listed for their 'importance in telling the story of Australia's unique animal heritage'.[4]

Representative examples recognised on interstate Heritage Registers include:

- Jingemia Cave, Lot 350 Eagle Hill Rd, Watheroo National Park, Watheroo, WA – a large national park containing dolomite and chert caves in Western Australia. Chert is compressed sea sponge material from a seabed layer and contains a very high percentage of silicon dioxide derived from the natural tiny glass spicules within the sponges.

Unlisted dolomite caves interstate include:

- Newdegate Cave, 754 Hastings Caves Rd, Hastings Caves State Reserve, Hastings, Tasmania – largest dolomite tourist cave in Australia and the only dolomite cave in Tasmania.[5] However, it is a grey dolomite, not a pink dolomite like the Tantanoola Cave Complex.

Caves with cave decoration

Cave decorations are common features of karst caves due to the natural processes facilitating the movement of water and deposition of minerals into the cave. They take thousands to millions of years to form. Many of the State Heritage Listed caves in South Australia contain cave decorations, and the Tantanoola Caves Complex is densely-decorated for its size. The walls and ceilings of the cave have extensive speleothem coverage that, considering its small size, is noteworthy against larger caves. Uncommon cave formations have also been found in great abundance within the Tantanoola Caves including drapery, helictites, flowstones and wedding cake (column) formations, while the pink and orange coloured dolomite also adds to the aesthetic aspects of the caves.

Decorated limestone caves entered in the South Australian Heritage Register include:

- Naracoorte Caves Complex, 8kms south of Naracoorte, Naracoorte Caves National Park, Naracoorte (SHP 26459).
- Blanche Cave & Victoria Fossil Cave, 9kms south of Naracoorte, Naracoorte Caves National Park, Naracoorte (SHP 11604).

The Alexandra Cave in the Naracoorte Caves Complex (SHP 26459) and Victoria Fossil Cave in the Blanche Cave & Victoria Fossil Cave (SHP 11604) are examples of highly decorated caves in the Naracoorte Caves National Park.

Other comparable caves, Corra Lynn Cave (SHP 22798) and Engelbrecht Cave (SHP 14733) lack extensive decorations as Corra Lynn Cave is dry, while Engelbrecht Cave has collapse chambers or is predominantly submerged in water. The environments of both caves make it difficult for formations to be produced.

Decorated limestone/dolomite caves recognised interstate include:

- Newdegate Cave, 754 Hastings Caves Rd Hastings Caves State Reserve, Hastings, Tasmania – largest dolomite tourist cave in Australia.

A section of Victoria Fossil Cave, Naracoorte National Park (SHP 11604)

Source: National Parks and Wildlife Service (2023)

Stalactites and stalagmites in Alexandra Cave, Naracoorte Caves National Park (SHP 26459)

Source: Bourne, S (2017)

Graham Pilkington in a passage in Corra Lynn Cave (SHP 22798)

Source: Bourne, S (2011)

One of many decorated caves in Hastings Cave State Reserve, Tasmania

Source: Tasmania Parks and Wildlife Service (2023)

Tantanoola Tourist Cave interior

Source: Dew Files 7 February 2023

Fossil caves in South Australia

Due to the nature of their formation, all limestone is by nature a fossil rock form, so the walls of all limestone caves within South Australia contain fossil specimens. The walls of the caves are created from the shelly remains of marine life; therefore, it is common for shells to be embedded in the walls. It is also not uncommon for both recent and ancient vertebrate bones to be found deposited inside the caves.

South Australian caves with more abundant fossil assemblages include:

- Blanche Cave & Victoria Fossil Cave, 9kms south of Naracoorte, Naracoorte Caves National Park, Naracoorte (SHP 11604). – Victoria Fossil Cave contains exemplary examples of fossil specimens. It is considered one of the largest and best-preserved Pleistocene fossil deposits in Australia.
- Naracoorte Caves Complex, 8kms south of Naracoorte, Naracoorte Caves National Park, Naracoorte, (SHP 26459) – containing numerous caves with notable fossil assemblages including but not limited to Wet Cave, Cathedral Cave and Robertson Cave.
- Green Waterhole - Tank Cave Complex, Lot 550 Princes Highway, Tantanoola (SHP 26530) – extensive underwater limestone caves with impressive underwater preservation of fossil deposits.
- Corra Lynn Cave, 212 Quarry Road, Curramulka (SHP 22798) – contains extensive Miocene-pliocene fossil deposits within the 14km maze-like cave.
- Kelly Hill Cave, South Coast Road, Karatta, Kangaroo Island (identified for assessment) – contains fossils specimens with excellent preservation, including numerous species now extinct on Kangaroo Island. In some cases, these are still articulated.

Assessment against Criteria under Section 16 of the *Heritage Places Act 1993*. All Criteria have been assessed using the 2020 Guidelines.

(a) it demonstrates important aspects of the evolution or pattern of the State's history.

Criterion arguments have considered the *Guidelines for State Heritage Places*:

> *The place should be closely associated with events, developments or cultural phases which have played a significant part in South Australian history. Ideally it should demonstrate those associations in its fabric.*
>
> *Places will not normally be considered under this criterion if they are of a class of things that are commonplace, or frequently replicated across the State, places associated with events of interest only to a small number of people, places associated with developments of little significance, or places only reputed to have been the scene of an event which has left no trace or which lacks substantial evidence.*

Criterion (a) focuses on the 'State's history'. The first test asks which 'historic theme' is demonstrated by the place. In this case, the theme is 'natural history', which is a theme, but is about 'pre-history' rather than 'historic' events. In contrast, criterion (c) talks about the 'history, including its natural history'. Given that the Tantanoola Caves Complex is considered to meet criterion (c) because of its significant associations with natural history, it has been considered under criterion (c) rather than criterion (a).

It is recommended that the nominated place **does not fulfil** criterion (a).

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

Criterion arguments have considered the *Guidelines for State Heritage Places*:

> *The place should demonstrate a way of life, social custom, industrial process or land use which is no longer practised, is in danger of being lost, or is of exceptional interest. This encompasses both places which were always rare, and places which have become scarce through subsequent loss or destruction.*
>
> *Places will not normally be considered under this criterion if their rarity is merely local, or if they appear rare only because research has not been done elsewhere, or if their distinguishing characteristics have been degraded or compromised, or if they are at present common and simply believed to be in danger of becoming rare in the future.*

The Tantanoola Cave Complex, has immense scientific value and therefore is, under the definitions in the Burra Charter considered to be culturally significant, the Burra Charter stating: 'Cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects.'

The Tantanoola Caves Complex is currently the only known caves with substantial dolomite elements in South Australia and the only pink dolomite caves in the State. However, there is uncertainty about the interrelationship between the formation of

the caves and when the conversion of limestone to dolomite occurred. This uncertainty means that at present the Tantanoola Caves Complex cannot be considered rare, uncommon or endangered. Future research may yield information that will enable a determination about the Tantanoola Caves Complex under this criterion to be considered.

Given the scientific value of the caves is the potential to yield information that will contribute to an understanding of the State, the Tantanoola Caves Complex is more appropriately represented under criterion (c).

It is recommended that the nominated place **does not fulfil** criterion (b).

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

Criterion arguments have considered the *Guidelines for State Heritage Places*:

> *The place should provide, or demonstrate a likelihood of providing, information that will contribute significantly to our knowledge of the past. The information should be inherent in the fabric of the place. The place may be a standing structure, an archaeological deposit or a geological site.*
>
> *Places will not normally be considered under this criterion simply because they are believed to contain archaeological or palaeontological deposits. There must be good reasons to suppose the site is of value for research, and that useful information will emerge. A place that will yield the same information as many other places, or information that could be obtained as readily from documentary sources, may not be eligible.*

The Tantanoola Caves Complex contains geological and speleological information of significance to South Australia. The Tantanoola Caves Conservation Park contains Up-and-Down Rocks, Tantanoola Tourist Cave and Tantanoola Lake Cave. Together they demonstrate aspects of the State's natural history over a period of approximately one million years - namely its geological and speleological history including:

- Demonstrating marine transgressions and regressions that caused groundwater to initially form the caves by dissolution of the surrounding rock.
- Formation of dolomite – most likely depicting local historical volcanic activity.
- Precipitated 'flowstones' and decorations – producing 'growth' layers in some cases 'growing' over 'fill', demonstrating environmental stages of development.
- Deposited 'fill' sediment – demonstrating instances of the Tourist cave opening allowing fossil and wind-blown (aeolian) deposition.

The site is capable of yielding information regarding each of these aspects including the formation of the special local pink dolomite which is a renowned building stone. Dolomite formation occurs through a process known as metamorphism through which, the chemical composition and crystalline structure of the limestone is modified by the replacement of calcium ions by magnesium ions. Dolomite at the Tantanoola caves can yield scientific evidence about the conversion of limestone to dolomite,

volcanic activity and the chemical changes necessary to form the material. Dating of the dolomite, the internal formations and sediments can also produce a geological time frame applicable across the region, contributing important new explanations for the development of this South Australian landscape.

Tantanoola Caves complex is the only locality in South Australia where the combination of the above listed geological conditions exist in comparison to the ~1,000 non-dolomite caves recorded across the Upper and Lower South-East. Tantanoola Caves Complex has the capacity to yield scientific information that will increase our understanding of the geological development of this part of the State.

Both major caves, the formations within them and the exposed groundwater within Lake Cave can provide information about local and State historical rainfall, soil composition and living organisms at the time of formation.

Additionally, the high concentration of speleothems within the caves at the Tantanoola Caves Complex can yield important information about the history of speleothem formation within the cave. For these reasons Tantanoola Caves Complex is considered to meet criterion (c).

It is recommended that the nominated place **fulfils** criterion (c).

(d) it is an outstanding representative of a particular class of places of cultural significance.

Criterion arguments have considered the *Guidelines for State Heritage Places*:

> *The place should be capable of providing understanding of the category of places which it represents. It should be typical of a wider range of such places, and in a good state of integrity, that is, still faithfully presenting its historical message.*
>
> *Places will not be considered simply because they are members of a class, they must be both notable examples and well-preserved. Places will be excluded if their characteristics do not clearly typify the class, or if they were very like many other places, or if their representative qualities had been degraded or lost. However, places will not be excluded from the Register merely because other similar places are included.*

The Tantanoola Caves Complex South East regional landscape is an example of the class of place 'karst landscapes' or 'karst topographies'. These are areas of land that have been created through the erosion or dissolution of limestone, creating extensive landscapes containing features such as caves, streams, sinkholes, and springs. It is estimated that 4% of the Australian continent has exposed karst landscapes on the ground surface[6], approximately 307,681 km^2. Elements that denote an outstanding example of a karst landscape are:

- Extensive and diverse limestone environments and features both above and below ground. For example, karrens, limestone forests, cave and river systems.
- Extensive examples of the evolution of the natural history of the area and the development of the landscape.

- Superlative natural geological formations with exceptional aesthetic qualities.
- Retention of a high quality natural above and below ground environment.
- Continued development of the natural environment through the transferal of water, air, and sediments into and out of underground karst features.
- High levels of cultural significance through a proven, or potential, for scientific yield.

South Australian karst landscapes have high cultural significance due to their connection to the natural environment, scientific values, and general contribution to the State's landscape. The South East karst landscape is known as the Gambier Karst and demonstrates detailed geological histories, unique speleological systems and poorly understood underground ecosystems[7] often in the form of cave systems and sinkhole environments. It is Tertiary and Quarternary in age, approximately 66Ma–Present, and sediments extend northward past Bordertown and East, well into Victoria[8].

Tantanoola Caves Complex demonstrates the elements of the class of place. However, it is only a very small portion of the much larger Gambier karst landscape. As only a fragment of the Gambier karst, Tantanoola Caves Complex cannot be considered an outstanding example of a karst landscape. Instead, the Tantanoola Caves Complex is considered to meet criteria (c) due to its potential to yield specific new information about the State's natural history.

It is recommended that the nominated place **does not fulfil** criterion (d).

(e) it demonstrates a high degree of creative, aesthetic or technical accomplishment or is an outstanding representative of particular construction techniques or design characteristics.

Criterion arguments have considered the *Guidelines for State Heritage Places*:

> *The place should show qualities of innovation or departure, beauty or formal design, or represent a new achievement of its times. Breakthroughs in technology or new developments in design would qualify, if the place clearly shows them. A high standard of design skill and originality is expected.*
>
> *Places would not normally be considered under this criterion if their degree of achievement could not be demonstrated, or where their integrity was diminished so that the achievement, while documented, was no longer apparent in the place, or simply because they were the work of a designer who demonstrated innovation elsewhere.*

As Tantanoola Caves Complex is a natural site it is not considered to demonstrate a high degree of aesthetic, creative or technical accomplishment nor is it an outstanding representative of construction techniques or design characteristics.

It is recommended that the nominated place **does not fulfil** criterion (e).

(f) it has strong cultural or spiritual association for the community or a group within it.

Criterion arguments have considered the *Guidelines for State Heritage Places*:

> *The place should be one which the community or a significant cultural group have held in high regard for an extended period. This must be much stronger than people's normal attachment to their surroundings. The association may in some instances be in folklore rather than in reality.*
>
> *Places will not be considered if their associations are commonplace by nature, or of recent origin, or recognised by a small number of people, or not held very strongly, or held by a group not widely recognised, or cannot be demonstrated satisfactorily to others.*

The Tantanoola Caves Conservation Park is a well-known tourist attraction and brings revenue and visitors into the town of Tantanoola every year. However, there is no evidence to suggest a greater association to the community of Tantanoola.

Additionally, though the Lake Cave contains an underground lake with a tunnel system beneath it, due to the 'special purpose reference cave' categorisation, very few people have had the opportunity to access the cave. While the Cave Exploration Group of South Australia (CEGSA) have the greatest knowledge and familiarity with Lake Cave through the original detailed mapping program and subsequent cave diving investigations, the cave is only very rarely visited due to its reference role. Therefore, the association with CEGSA is not considered a strong one.

Another group who may have a connection with the caves are people with mobility considerations and who benefit from wheelchair accessibility options. The Tantanoola Tourist Cave is entirely wheelchair accessible, providing those who require disability access the option to explore this cave environment. However, there is no evidence to suggest that this group holds strong cultural or spiritual associations with the cave.

It is recommended that the nominated place **does not fulfil** criterion (f).

(g) it has a special association with the life or work of a person or organisation or an event of historical importance.

Criterion arguments have considered the *Guidelines for State Heritage Places*:

> *The place must have a close association with a person or group which played a significant part in past events, and that association should be demonstrated in the fabric of the place. The product of a creative person, or the workplace of a person whose contribution was in industry, would be more closely associated with the person's work than would his or her home. Most people are associated with many places in their lifetime, and it must be demonstrated why one place is more significant than others.*
>
> *Places will not generally be considered under this criterion if they have only brief, incidental or distant association, or if they are associated with persons or groups of little significance, or if they are associated with an event which has left no trace, or if a similar association could be claimed for many places, or if the association cannot be demonstrated. Generally the home or the grave of a notable person will not be entered in the Register unless it has*

some distinctive attribute, or there is no other physical evidence of the person's life or career in existence.

Norman Tindale has carried out several explorations and searches for fossil material at the Tantanoola Caves Complex. He was also the first European to formally record many of the caves that are found on the site. However, Tindale was a career researcher who is best known for his work as an anthropologist in the North of the State. Consequently, he is not considered to have a special association with the Tantanoola Caves Complex.

It is recommended that the nominated place **does not fulfil** criterion (g).

PHYSICAL DESCRIPTION

The Tantanoola Caves Conservation Park is located adjacent to the Princes Highway in the Tantanoola district. The Tantanoola Caves Conservation Park encompasses an area of approximately 14 hectares and is one of South Australia's oldest conservation parks.[9] The park is positioned along the Tartwaup fault line, and the Tantanoola Caves are a major exposure of dolomite along the fault line. The Park contains 2 major caves, and there are 19 total karst features within the Conservation Park.[10] The karst features are formed within the Up-And-Down Rocks. These cliffs are greater than 10m above ground level and consist of tertiary Gambier limestone which has been infused and largely altered to dolomite.

A short walking trail follows the cliffs as they extend northwest into a dolomite quarry that was originally active in the 1920s. The quarry at the northern end of the Up-and-Down rocks is a large circular ~6 metre cliff face located along the cliffline on the loop trail between the Tourist cave and Lake Caves. Quarried material was used as railway ballast, flux for glass making and facing stone on buildings. The remaining non-dolomitised cream-colored limestone walls of the cliffs and caves consists almost entirely of fossilised marine fauna including shark teeth, molluscs, sponges, and echinoderms.

The most notable caves in the Conservation Park are the Tantanoola Tourist Cave and the Lake Cave. There are a number of other very small cave features. The two main caves contain 'extraordinary display(s) of cave decorations'.[11] In particular, Tantanoola Tourist Cave is noted as 'one of the most delicate and highly decorated caves in the South-East'.[12]

Tantanoola Tourist Cave

The Tantanoola Tourist Cave (also known as the Show Cave) is accessible to the public through a short excision carved into the Up-And-Down Rocks face. The chamber is locked with a sealed door when not being accessed for a tour. The cave itself is 3-6m below ground and is approximately 25m x 18m x 8m high. The visible roof and walls of the cave are speckled with orange-pink dolomite amongst abundant cave decorations. Wheelchair accessible ramps and walkways create a path that leads to the back of the cave where an artificial pool was created deeper into the single

chamber to generate beautiful reflections of the ceiling. Some 'lampenflora', referring to algae and plants growing as a result of permanently installed lighting, as well as cave invertebrates can also be found in the cave. For example, Tantanoola Tourist Cave is the type locality for the extant cave cricket *Speleotettix tindalei*.[13]

Features of the cave include:

- Sheet-like draperies,
- 'Wedding cake' column formations,
- Flowstones,
- Upturned Helictites,
- Evidence of cave collapses,
- Evidence of previous cave openings,
- Animal scratches,
- Vertebrate fossils preserved in-situ within cave walls.
- Marine fossils embedded in the limestone walls where dolomitisation has not occurred.
- Type locality for the cricket *Speleotettix tindalei.*

Tantanoola Lake Cave

Tantanoola Lake Cave (originally known as North Cave until the lake was discovered in 1957) is the second major cave within the Conservation Park. This cave is recognised as a special purpose reference cave and is locked at all times. [14]

Records of the cave describe a small entry tunnel leading into a dual chamber cave separated by a long and narrow angular crevasse. The crevasse opens out onto a spectacular balcony in the wall of a large chamber which is approximately 50m x 30m x 25m high. 15m below the balcony, is a beautiful clear freshwater natural lake approximately 30m in diameter and up to 10m deep. The depth of the cave and continued presence of dolomite demonstrates how deep the dolomite goes into the earth.

The Lake cave contains stalactites, columns, and large flowstone balconies[15] with similar precipitations as those occurring in the Tourist cave but to a lesser extent.[16] Lake Cave contains an underwater tunnel at the base of the lake. Though the first chamber of Lake Cave was frequented by cave divers for ~20-25 years, the lake chamber and tunnel has been explored by cave divers very infrequently since its discovery. These explorations determined that a short underwater passage extends back beneath the entrance tunnel continuing to a low silty room which terminates within the bounds of the Conservation Park. [17]

Tindale's smaller cave sites

In early research of the Tantanoola Caves Complex, Tindale identified 4 caves, labelled A-D.

- Cave A – now the Tantanoola Tourist Cave,
- Cave B ~40m southeast of the Tantanoola Tourist Cave. This was a tiny hole only a couple of meters long. Now demolished and built over by an amenities block,
- Cave C ~55m South-East of the Tantanoola Tourist Cave. This was a small overhang with a soil/rubble floor. Now demolished but was the focus of some fossil research,[18]
- Cave D – now called 'Devil's Lair' (L-518). A small cave with a rimstone pool approximately 8m x 5m located in the cliff face ~100m northwest of Tantanoola Tourist Cave. Believed to have once been a Tasmanian Devil den.

[Note: In his report, Tindale describes a significant Cave 'E'. However, this is in limestone located 5 kms away from the dolomite ridge in a forest and is unrelated to the caves described above.]

Other dolines (sinkholes) and karst features

Painted Cave (L519). A small cave found at the base of the Up-and-Down Cliffs and given its name due to the unusual colouring of the dolomite, varied texture of rocks and algae growth that has coloured the cave. It is referred to in only one publication as a small cave in rockfall.

Many small sinkholes and depressions in the cliffs are also present and recorded below.[19] These include unnamed but documented features that range from small undescribed holes to dolines that are 6.8 metres wide and half a metre deep.

Karst Identification no.	Type
L585	unnamed cave
LXKRM 297s1	small doline
LXKRM 297s2	doline 6.8 x 3 x 0.5m deep
LXKRM 298s1	hole 0.3 x 0.2m deep
LXKRM 298s2	hole 0.3m diameter
LXKRM 299	joint in North side of quarry
LXKRM 300	small doline in SW corner of park
LXKRM 764	0.3m diameter opening in cliff
LXKRM 765	doline 1.5m diameter x 0.3m deep
LXKRM 767	small hole
LXKRM 768	hole
LXKRM 769	hole 0.5m diameter x 0.1m deep

Elements of Significance:

Elements of heritage significance include (but are not necessarily limited to):

- Up-and-Down Rocks cliff face and ridge (including quarried sections),
- individual caves within the park boundary (notably Tantanoola Tourist Cave, Lake Cave, Devil's Lair, Painted Cave, Cave L585) including the cave walls, floors and roof,
- speleothems (stalactites, stalagmites, stromatolites and helictites etc),
- cave features including but not limited to: undisturbed sediments (naturally deposited), in-situ fossils (embedded in walls and trace fossil scratchings), natural collapses and rockfall formations,
- minor karst features.

Elements not considered to contribute to significance of place include (but are not necessarily limited to):

- built structures, including the visitor information centre,
- fence, stairs, carpark, toilets and benches near Tantanoola Tourist Cave entrance.

HISTORY

Approximately 37–12 million years ago (Late Eocene to Mid-Miocene)[20], an extensive limestone sea floor developed offshore of south-eastern South Australia after Australia separated from Antarctica. Between 15 and 10 million years ago, this limestone sea floor emerged from the sea due to regional tectonic uplift, becoming the large Gambier Limestone Plain (extending to the Bordertown/ Kingston area) and including the Tantanoola Conservation Park and the Up-And-Down Rocks. [21] The Tartwaup Fault (hinge line) developed along the Glenelg River-Mount Gambier-Tantanoola-Millicent region to offshore beyond Beachport.

Around 5 million years ago, extensive volcanism (termed the 'newer volcanics') commenced across the Western Victorian and South East region. Between 1–2 million years ago, the Mount Burr Range volcanoes erupted along the Tartwaup Fault. It is likely that at some time during this event or one slightly prior, chemically altered portions of the limestone ($CaCO_3$) through heat and the dissolution of minerals formed the dense, hard pink building-grade dolomite ($CaMgCO_3$)[22] at the Tantanoola Caves Complex.

Much later, at approximately 300 thousand years ago (ka), the area around the Up-and-Down Rocks was surrounded by a rising sea[23] from Pleistocene transgressions (sea level rise, shifting shorelines landward) which eroded part of the cliff face and may have opened a natural entrance to the Tantanoola Tourist Cave (but not into Lake Cave further back from the cliff).

Outside of the Tantanoola Tourist Cave, a scree (loose stone and sediment) slope developed and is still present as a result of deposition many years ago.[24] Eventually,

sediment and partial cliff collapse deposited sufficiently for the cave entrance to be reduced to the small hole which would be discovered recorded by Europeans in 1930.

Colonial settlement and early survey

Europeans found Tantanoola Tourist Cave on the 26th of March 1930 when Boyce Lane, a 16-year-old boy, lost his ferret and investigated what was, at that point, a small hole in the cliff face with the belief that the animal had crawled inside.[25]

Following this discovery, in the same year Tantanoola Tourist Cave became a tourist destination when it became a Pleasure Resort under the *National Pleasure Resorts Act 1914*.[26] Also in 1930, 17 acres of the area surrounding the caves was proposed to be used as a 'Stone Reserve'[27]. The area near Up-and-Down Rocks was quarried for railways ballast and for road construction. For example, rock from the area was used locally as a gravel base for bitumen for Prince's Highway between the Snuggery Railway station and Glencoe.[28]

The first official record of European knowledge of Lake Cave was in a 1933 publication by anthropologist Norman Tindale for the South Australian Museum. Eventually, however, the caves were closed for a short while due to safety concerns and a change of ownership from the local Council. Sometime before 1958, a portion of an area deeper within the Tantanoola Tourist Cave chamber was concreted over to create an artificial lake with the intent of rivalling 'The Mirror' within the Alexandra Cave at the Naracoorte Caves National Park.

In 1972, the Tantanoola Caves Complex was re-opened as a conservation park. In 1980, Up-and-Down Rocks and the two Tantanoola Caves were added to the Register of the National Estate. In 1983 a significant modification was completed in order to allow for wheelchair access – a new initiative for Australian cave visitation at the time, making it very accessible for tourism, visitational and research purposes. To achieve this, the entrance floor was lowered which also exposed the intriguing structures within the rockface of the cliffs surrounding it which can now be seen and analysed.

Scientific investigation

Thus far, only limited research has been completed on the Tantanoola Caves. However, various advanced techniques would allow the dating of fossil specimens and rock walls of the cave. Athol Jackson and Kevin Mott of the Cave Exploration Group of South Australia (CEGSA) undertook a seismic analysis of the Tourist Cave using geophones to determine the size and existence of any other passages within the cave after speculation that the cave continued deeper than was easily visible. The team's research identified an anomaly beyond the northeast end of the cave, determining that there is a small extension of cave beyond the well-known walls. This extension has not been mapped or further explored as cave decorations would need to be destroyed in order to proceed. [29]

Palaeontological research at the Tantanoola Caves Complex has been conducted in numerous minor excavations, including when the entrance was lowered to enable

the cave to become wheelchair accessible, resulting in various small collections of vertebrate fossils. Findings include:

- collections from caves A-D by Tindale,1933,[30]
- collections from Tindale and Tidemann, 1967[31] from the caves complex site and stored at the South Australian Museum,[32]
- frog fossils, documented 1992 and collected as the accessibility entryway was excavated,[33]
- unidentified bird fossils,[34]
- bat fossils,[35]
- rodent subfossils,[36]
- animal scratches on the walls[37]

Two rare examples of marine animals identified as a fur seal fossil, [38] and a penguin fossil[39] were mentioned in Tindale's 1933 scientific paper, informally identified by a colleague in his team with an intention to publish. However, publication never occurred and investigations in 2023 into fossil remains at the South Australian Museum (SAM) by collection manager, Mary-Anne Binnie, both in the Tantanoola collection and the marine fossil collections did not yield any results.[40] No evidence of such finds, material or notes were rediscovered.

This has significance as it negates the mid-20th century misconception that Tantanoola Tourist Cave was a sea cave excavated by wave action and had been a marine habitat in the geological past. Those misconceptions and early showmanship by the cave's discoverers led to incorrect local folklore which also included that of the cave being the 'Lair of the Tantanoola Tiger' when a Syrian wolf in the 19th century escaped from a travelling circus camped in the vicinity.

Similarly, other informal sources (not Tindale) have mentioned fossil bones of the megafauna *Zygomaturus*[41] but there has been no evidence of this animal's remains amongst Tantanoola Cave records.

While the fossils reported from and present in the caves are scientifically important, the Tantanoola Caves Complex is not considered by the scientific fraternity to contain the best examples of fossil assemblages.

Chronology

Year	Event
60 Ma	Australia finally separates from Antarctica and the regional Tartwaup Fault in the Tantanoola region develops as one of many large coastal faultlines along the broken southern edge of the continent.
23-5 Ma	Miocene – South-East South Australia, Lower Murray River Basin in South Australia and entire Nullarbor Plain covered by shallow cool-water seas forming expansive sea floor of bryozoal/carbonate limestone deposits.
15-10Ma	Neogene Tectonics - limestone floor begins to be uplifted from the sea due to large regional tectonic uplift, becoming the Gambier Limestone

	Plain, Murray Plains and the Nullarbor Plain. In the South-East, the large Tartwaup Fault develops further along the Glenelg River - Mount Gambier-Tantanoola-Millicent region and further west offshore.
Uncertain date	Up-and-Down Rocks uplifted in a limestone anticline forming a local ridge. Dolomitisation (chemical change of limestone) may have occurred during this phase.
5 Ma	Pleistocene – shallowing of sea and further exposure of areas. Extensive volcanism (termed the 'Newer Volcanics') commenced in Western Victoria and the South-East region.
1-2Ma	Mount Burr Range volcanoes erupt along Tartwaup Fault, adjacent to the Tantanoola Caves Complex and Green Waterhole-Tank Cave Fossil Complex (SHP 26530). Dolomitisation of the Up-and-Down Rocks area may have alternatively occurred during this period. Commencement of 13 ice age sea regressions and transgressions across the South-East limestone plain. Possible original dissolution of limestone/dolomite by groundwater to initiate the Tantanoola Caves.
528 ka	Oldest dated megafauna fossils in the Naracoorte Region.
~300 ka	Possible first opening of Tantanoola Tourist Cave entrance caused via sea cliff erosion as part of the 9th ('Reedy Creek') marine transgression. Marine sands and pebbles deposited around all sides of the Up-and-Down Rocks ridge which may have become a small island for this time.
134 ka	Oldest dated megafauna from Mount Gambier region (Kilsby's Sinkhole), 30kms southeast of the Tantanoola Caves Complex.
~50 ka	Probable arrival of Bunganditj (Boandik) people in the South-East region including the Tantanoola area after their gradual coastal migration around the continent from the north.
Post-1836	Tantanoola and Green Waterhole locations first encountered by European explorers/settlers following along the southern edge of the Mt Burr Range towards the Mount Gambier mountain.
1844	Locality passed through by Governor Grey's exploration expedition from Adelaide to Mount Gambier, likely utilising natural water sources available here, including Green Waterhole. Up-and-Down rocks and other outcrops used in navigation.
~1850	Regional agriculture commenced.
1860	'Hanging Rocks' Inn built ~2 kms north of Up-and-Down Rocks cliff face (still standing, and previously an Indicative Place on the Register of the National Estate, though currently dilapidated).
~1861	Charles Henry Lane (grandfather of Tantanoola Tourist Cave discoverer Boyd Lane) built the farmhouse (now restored) next to Up-and-Down Rocks.

1889 Up-and-Down Rocks gazetted as a Stone Reserve 'for Road-building purposes' and quarrying began for limestone at the base of the northern cliffs and dolomite at top. Remains of both quarries still exist.

1930 Proposed as a Pleasure Resort[42] and leased to Tantanoola District Council for 1 shilling per year. Management of the Tourist Cave vested in the Lane family who installed a generator and basic electric lighting; then later multi-coloured lighting for fantasy effects including a panel creating 'The Lair of the Tantanoola Tiger' folklore.

1933 First scientific publication on the Tantanoola Caves by SA Museum anthropologist Norman Tindale. Noted numerous fossil and geological specimens.

1952 Diamond drilling across Up-And-Down Rocks ridge including outside of the State pleasure resort area to prove quality and extent of dolomite resource, led by G. Cochrane.

1953 Function at the cave. 480 people and the 'Mount Gambier Band' gathered to celebrate the 23rd Anniversary of the cave's discovery.

1957 Cave Exploration Group of SA (CEGSA) members discover the Lake chamber within Lake Cave.

1958-61 CEGSA formally surveyed and mapped Tantanoola Tourist Cave under the leadership of Bob Sexton. This map was used as a base document for all subsequent evaluations, modifications, and improvements.

1962-1967+ Dolomite and diamond drilling at Up-And-Down Rocks.[43]

1963 Both caves and their maps published in Australia's 'Helictite' scientific Journal in a paper entitled *Caves of the Coastal Areas of South Australia* by Bob Sexton[44]. This subsequently became CEGSA Occasional Paper #3.

1970 Extra land purchased to enclose all of Tantanoola Lake Cave within the Pleasure resort boundary. Lake Cave gated for protection and to manage access.

1971 Tantanoola Lake Cave lake was first dived by Phil Prust and Ian Lewis.

1972 Tantanoola District Council relinquished the lease of the Tourist Cave and Resort site. Gazetted as Tantanoola Caves Conservation Park and run by the National Parks and Wildlife Service (NPWS).

1976 Tantanoola Caves information incorporated into the South Australian Cave Reference Book, CEGSA Occasional Paper #5,[45] which is the State reference for karst features (now periodically digitally updated as 'OzKarst').

1980 Up-and-Down Rocks and the two caves added to the Register of the National Estate.

1983	Australian Speleological Federation completed a detailed formal Draft Management Plan for NPWS with a recommendation to construct wheelchair access to the Tantanoola Tourist Cave. Construction completed same year.[46]
1992	Final updated Tantanoola Caves Management Plan released by NPWS.
1994-2000	Revegetation of the park area, signage and Disabled Amenities block installed. Lookout Loop Trail completed along the cliff front and across the cliff tops via the old dolomite quarry. Old fire lookout tower dismantled.
2008	A revised Tantanoola Caves Management Plan was created to replace the 1992 plan.
2023	Historical reports of seal and penguin bones that were preliminarily identified in 1933 were thoroughly re-assessed and investigated at the South Australian Museum. No evidence of such finds, material or notes were rediscovered.

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- Fred Aslin
- Thomas Shortt
- Jasmine Norris
- Rachel Douglas

SITE RECORD

NAME:	Tantanoola Caves Complex	**PLACE NO.:**	26555

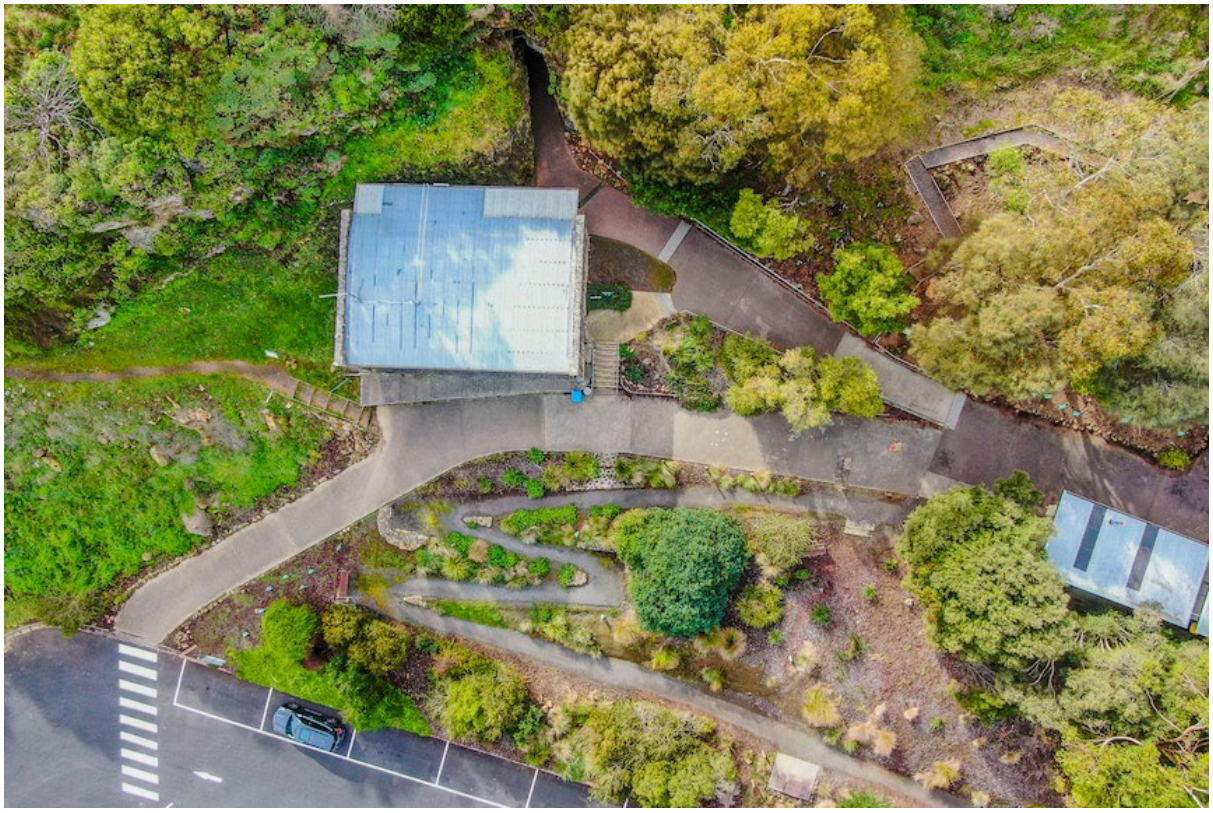
FORMER NAME:	Tantanoola Tourist Cave (Current), Tantanoola Lake Cave (North Cave)	
DESCRIPTION OF PLACE:	Area of Tantanoola Conservation Park	
DATE OF CONSTRUCTION:	~300ka, Conservation Park in 1972	
REGISTER STATUS:	Provisional Entry Tba Confirmed tba	
CURRENT USE:	Conservation Park	
PREVIOUS USE(S):	1962: Quarry	
LOCAL GOVERNMENT AREA:	Tantanoola	
LOCATION:	**Street No.:**	32047
	Street Name:	Princes Highway
	Town/Suburb:	Tantanoola
	Post Code:	5280
LAND DESCRIPTION:	**Title Reference:**	CR/5772/853
	Hundred:	Hindmarsh
	Encumbrance:	Native Title claim: First Nations of the South-East #1

PHOTOS

NAME:	Tantanoola Caves Complex	PLACE NO.:	26555

The Up-And-Down Rocks from the Conservation Park car park

Source: Dew Files 7 February 2023



A portion of the Tantanoola Caves Conservation Park visitor information centre from above. The accessibility ramps leading to the cave entrance can be seen top left

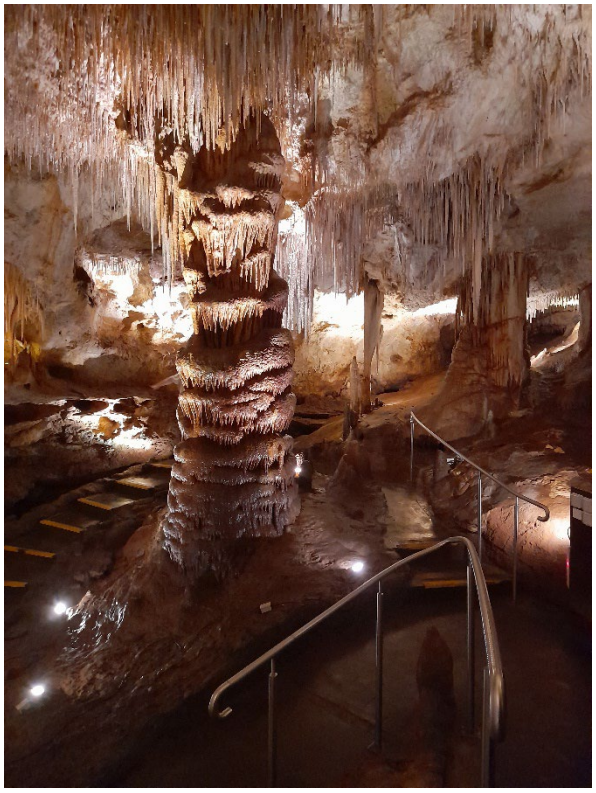
Source: ABC South East SA

PHOTOS

NAME: Tantanoola Caves Complex **PLACE NO.:** 26555

The interior of Tantanoola Tourist Cave

Source: Dew Files 7 February 2023



The interior of Tantanoola Tourist Cave including the wedding cake formation

Source: Dew Files 7 February 2023

Exposed dolomite in the Up-And-Down Rocks at the edge of the former dolomite quarry in the cliff line

Source: Dew Files 7 February 2023

PHOTOS

NAME:	Tantanoola Caves Complex	PLACE NO.:	26555

The underground lake in Tantanoola Lake Cave, pink dolomite is distinguishable around the lake's circumference

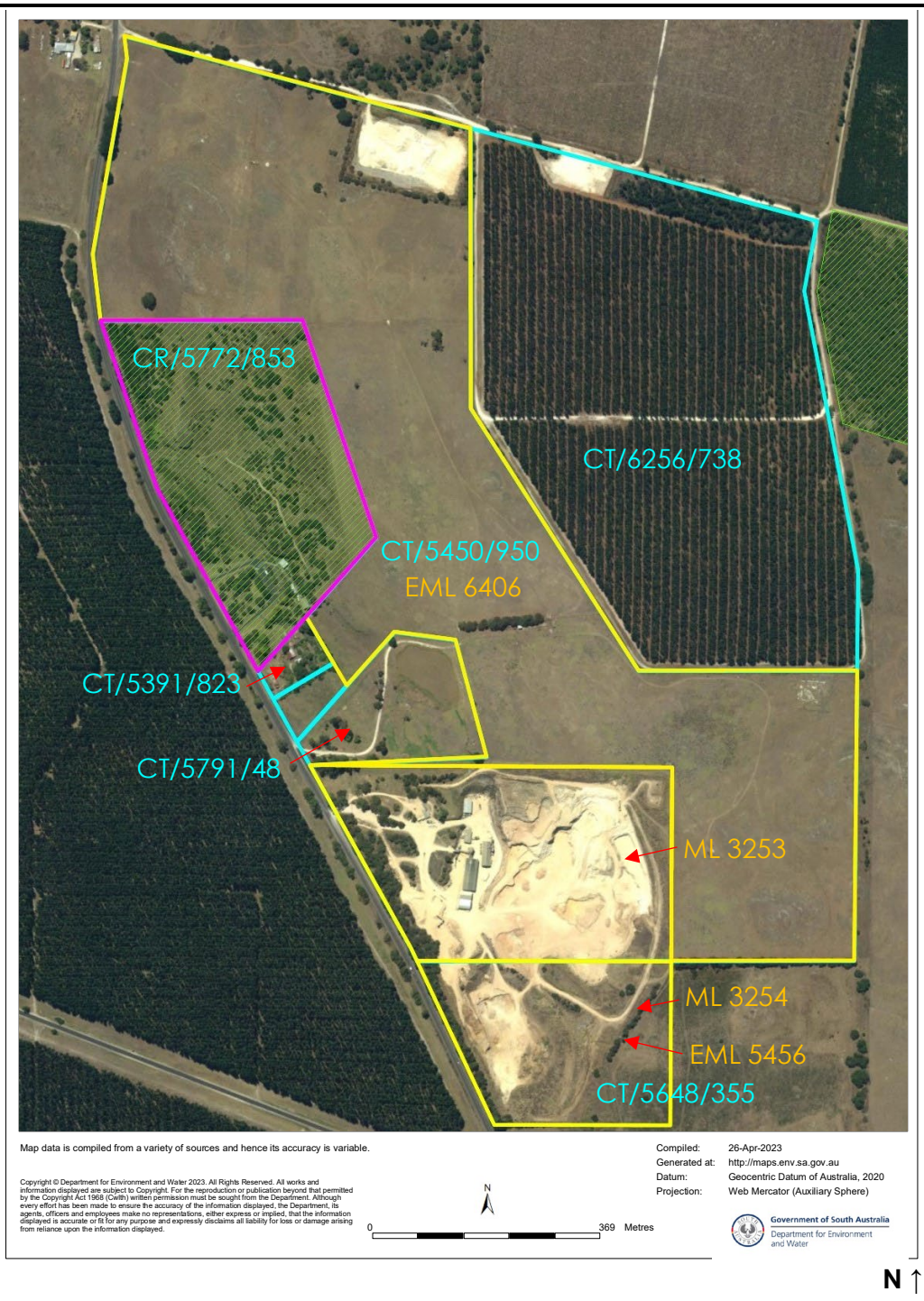
Source: Bourne, S (2008)

Vertebrate Fossil specimens embedded in-situ in infill of the Tantanoola Tourist Cave

Source: Dew Files 7 February 2023

SITE PLAN

NAME: Tantanoola Caves Complex **PLACE NO.:** 26555



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LEGEND

Parcel boundaries (Indicates extent of Listing)

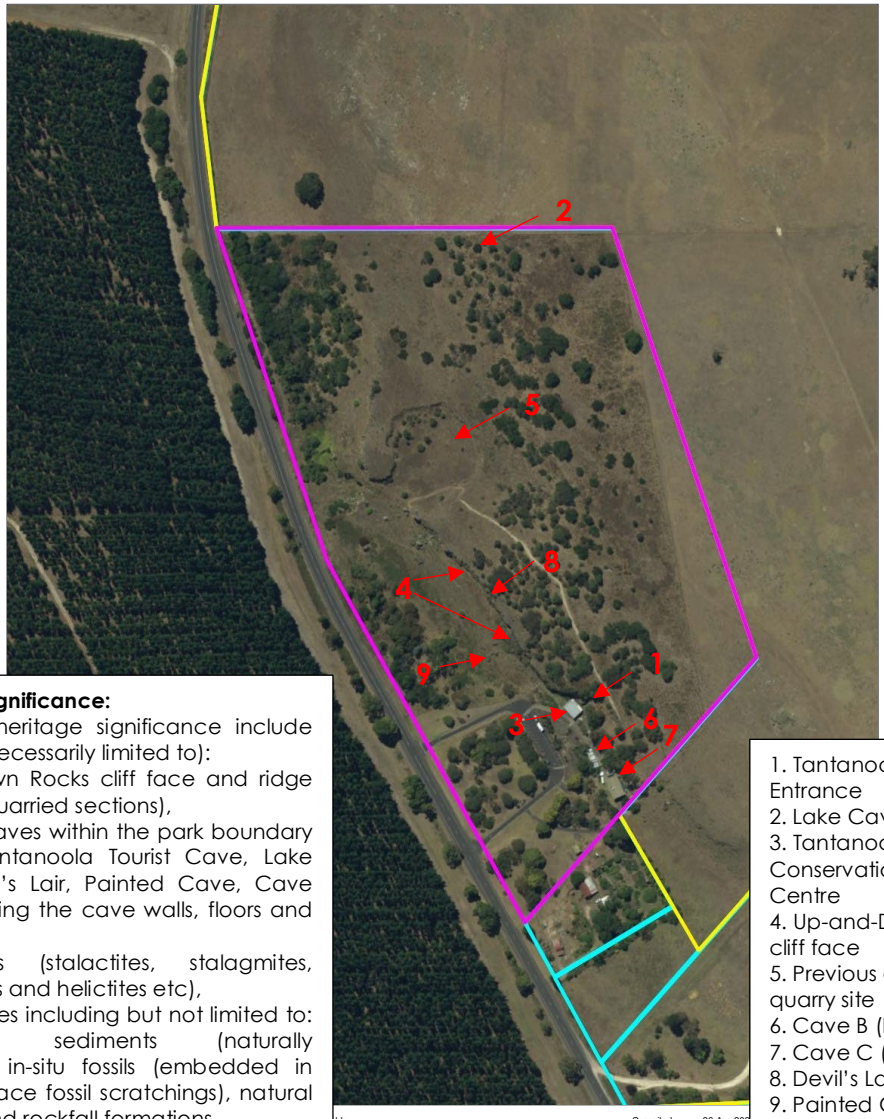
Minister Environment and Conservation Land

Cadastral Boundary

Active Mining Tenements

SITE PLAN

NAME: Tantanoola Caves Complex **PLACE NO.:** 26555



Elements of Significance:
Elements of heritage significance include (but are not necessarily limited to):

- Up-and-Down Rocks cliff face and ridge (including quarried sections),
- individual caves within the park boundary (notably Tantanoola Tourist Cave, Lake Cave, Devil's Lair, Painted Cave, Cave L585) including the cave walls, floors and roof,
- speleothems (stalactites, stalagmites, stromatolites and helictites etc),
- cave features including but not limited to: undisturbed sediments (naturally deposited), in-situ fossils (embedded in walls and trace fossil scratchings), natural collapses and rockfall formations,
- minor karst features.

1. Tantanoola Tourist Cave Entrance
2. Lake Cave Entrance
3. Tantanoola Conservation Park Visitors Centre
4. Up-and-Down Rocks cliff face
5. Previous dolomite quarry site
6. Cave B (Destroyed)
7. Cave C (Destroyed)
8. Devil's Lair
9. Painted Cave

Tantanoola Caves Complex, 32047 Princes Highway, Tantanoola SA
CR/5772/853, H420600 S213, Hundred of Hindmarsh

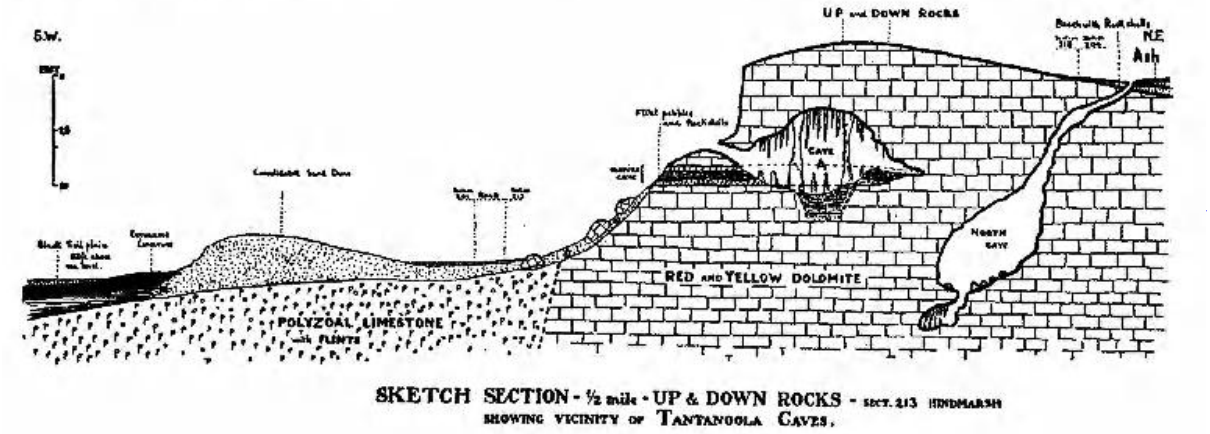
LEGEND **N ↑**

Parcel boundaries (Indicates extent of Listing)


Cadastral Boundary
Active Mining Tenements

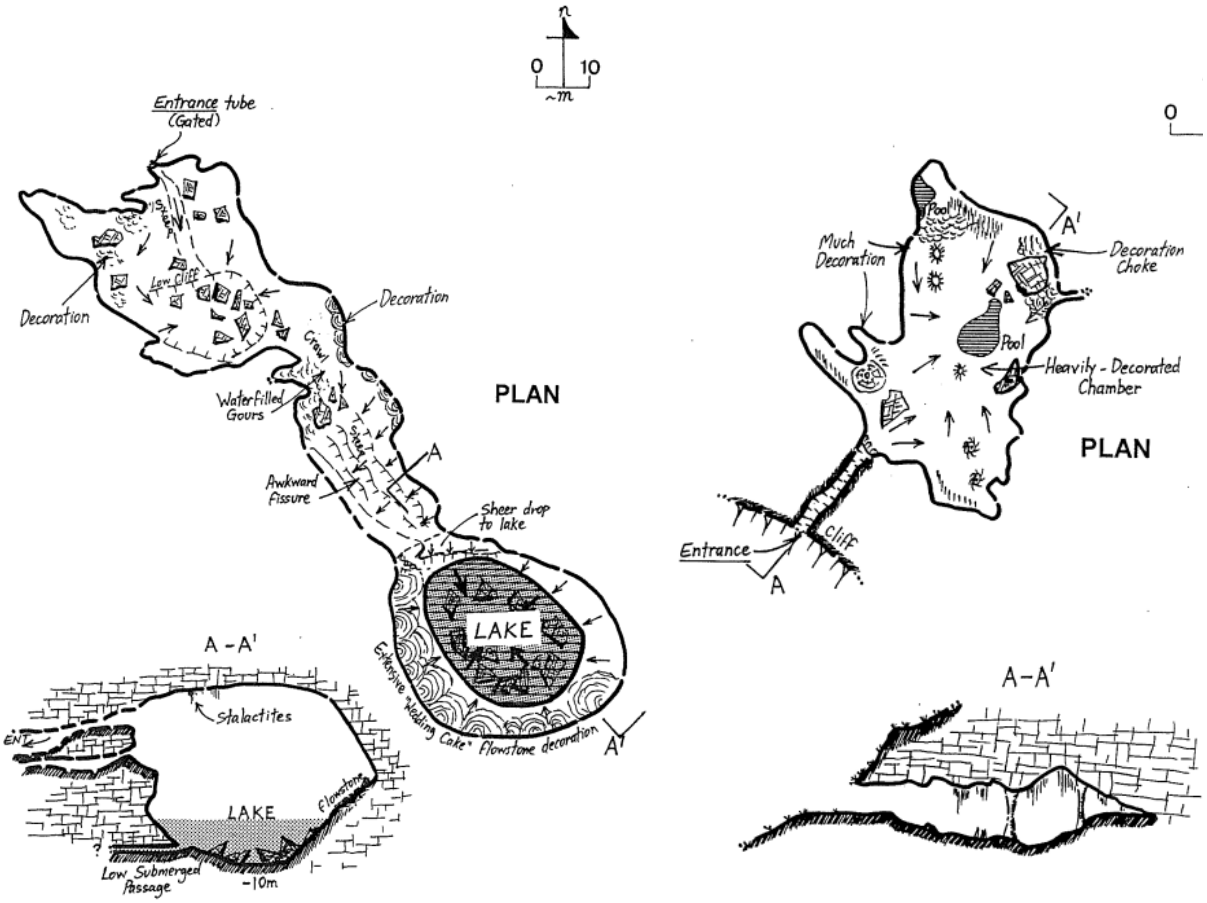
SITE PLAN

NAME: Tantanoola Caves Complex **PLACE NO.:** 26555



Tantanoola Tourist Cave (Cave A) And Lake Cave (North Cave)

Source: Tindale, N 1933



Interior description and diagram of the Tantanoola Caves. Left: Lake Cave, Right: Tantanoola Tourist Cave

Source: Horne, P 1993 (Adapted from original maps surveyed by Peters & Sexton, RT (1958, 1961), Horne, P (1989), Cave Exploration Group of South Australia.

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