Australian Vermiculite Industries
Producers of Quality Vermiculite

MLS 165
Mud Tank Vermiculite Mine

Annual and Final Report

Year ending 2014

Prepared By  Ensolve Pty Ltd on behalf of Australian Vermiculite Industries
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1. Abstract

The Mud Tank Vermiculite Mine, located 150km north east of Alice Springs, operated between 1996 and 2013. Australian Vermiculite Industries held MLS165 to lease expiry on 31st December 2014. When acquired by Imerys in 2002, tenement management was poor, little exploration had been undertaken and minimal geological or historic information was made available. The only reported exploration for vermiculite was carried out from 1986 to 1988 and included costeaming, large diameter (750mm) auger holes and the excavation of bulk samples for test work. The large diameter auger holes were restricted to a depth limit of only 27m. A technical review undertaken in 1999 reported that ‘There is a general lack of data to support a resource estimation at Mud Tank, and none of the resource figures quoted in this report are comfortable to the AusIMM/JORC Code Guidelines’.

AVI make no recommendations to the future management or exploration of MLS165.

2. Location, title history, physiography and access

The Mud Tank Project (Mud Tank) is located 150 kilometres north of Alice Springs in the Northern Territory of Australia on Mining Lease (MLS) 165. The project is owned and operated by Australian Vermiculite Industries (AVI), a wholly owned subsidiary of Imerys Minerals Australia (Imerys).

AVI, which included Mud Tank and its Management team, was acquired by Imerys as a strategic acquisition to back up its major vermiculite reserves in Zimbabwe. Following an internal reorganisation the AVI management reported directly to regional management based in China where Company administration and all other transactions occurred. Following a fire and loss of information within the China office this situation was changed and AVI management was handed to Imerys Minerals Australia in late 2012.

Mining of vermiculite ore commenced in 1996 and operations consisted of two decommissioned pits, a dry beneficiation processing plant, and supporting mine infrastructure including an on-site camp.

MLS 165 is situated within the NT Crown Land Portion 3790 designated as a gemstone fossicking reserve. MLS 165 was excised from portion 3790 in 1995 to allow commencement of mining. It was agreed that upon completion of mining, the land would be returned to NT land portion 3790. The area is surrounded by Alcoota Pastoral Lease. Access to Mud Tank is via the Stuart and Plenty Highways. Approximately 10km past Gemtree Caravan Park Binns Track travels to the west where the zircon field and Mud Tank Mine is located, some 8km from the Plenty Highway.

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An overview of the Mud Tank Project layout, tenements and access is presented in the figures below.

Figure 1 - Location Plan

Figure 2 - MLS 165 within NT Portion 3790
Vermiculite is mined by open pit method and after extraction, is crushed and upgraded to a concentrate by dry processing methods. The concentrate contains around 95% vermiculite flake compared with a range of 25-70% in the original deposit. The concentrate is graded and marketed according to flake size, with the larger flake grades (+4mm) commanding higher prices.

Secondary processing of the concentrate involves exfoliation, which takes place in plants located close to the final market.

The Mud Tank project was approved under the Preliminary Environmental Review (PER) in 1995 with a projected 20-year life of mine. Pre-strip mining commenced in 1996 with the first sale of vermiculite ore from the project also occurring in 1996. Mining of Pit A ceased in 2003 with the commencement of mining Pit B in February 2010 through to completion in May 2010. The ore extracted from the open pits was stockpiled and processed progressively until it become economically unviable to continue in 2013.
In the latter half of 2013, the Mud Tank mine site was decommissioned and the land fully rehabilitated. The mine closure was fully documented in the Mud Tank Mine Closure Plan prepared by AVI and approved by the DME in November 2013. As part of this closure plan, Annual Site Inspections have been undertaken and reported annually to the DME.

MLS 165 expired on 31st December 2014.

Mud tank lies in an area in central Australian classified as Arid Zone. The Bureau of Meteorology (BOM) station maintaining full long-term climatic data is located at Alice Springs Airport (station ID 15590). The nearest BOM station collecting rainfall data is located at Gemtree Caravan Park (station ID 15653). The rainfall data has been based on data from the Gemtree station. The average annual rainfall for the Gemtree station is 356 mm per year with high evaporation rates of around 2,800mm.

There is no natural permanent supply of water within ML165. All creeks flow after heavy rainfall. Limited historic (pre-mining) groundwater information is available for the area. The information is limited to a single report title ‘Mud Tank – Mining Water Supply’ compiled by E.Rooke 1995.

Historic drilling had mixed success in the region and water strikes invariably yielded small supplies (<1 to 5 l/s) of poor water quality (TDS values 2,500 to 9,700 mg/l). Of the several sites drilled and tested to supply potable water to the camp facility RN16676 was the only bore that proved adequate in quality and supply to meet the operational requirements.

RN 16676 was completed as a production bore and draws water from a thin, sandstone aquifer believed to be of Cainozoic age. Pumping infrastructure consists of a Mono B Mk.3 320 submersible pump (rate at maximum discharge of 0.6 l/s at 90mm total head). This bore will remain post closure as agreed to by the Department of Water, Alcoota station and AVI.

RN 16677 was drilled and cased at the same time RN 16676 was developed. The water quality of this bore was classified as saline and unsuitable for potable water use. Although cased, it remained unequipped for the duration of the project. It has since been capped and the collar will be cut flush with ground level as part of the closure activities.

There have been no chemicals used in the processing of vermiculite ore at Mud Tank, therefore the contamination risk to the environment, including surface and groundwater, is minimal. Diesel fuel was used on site for power generation. One diesel generator powered the site, its associated fuel was stored within a bunded area and no spills were recorded for the duration of the project.

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2 E Rooke 1995 Mud Tank Mining Water Supply – Bore Completion Report  
3 E Rooke 1995 Mud Tank Mining Water Supply – Bore Completion Report
The project area, the broader fossicking reserve, the underlying and adjoining pastoral leases are all located in the Greater MacDonnell Ranges site of Conservation Significance. The Great MacDonnell Ranges site of conservation significance bioregion expands some 31,326km². The Mud Tank project is situated on the north-eastern perimeter of the conservation zone near Hart Range.

3. Geological setting, exploration/mining history and exploration rationale

For some 40 years or so the Mud Tank area, in particular Zircon Hill, has been an important source of gem quality zircon; the presence of zircon in the area has been known for possibly 70 years of more. Zircon mining has occurred on a semi-commercial fossicking scale usually from surface to 1-2 metres in depth.

Zircon occurrence is widespread but significant concentrations are found only in secondary deposits overlying the carbonate-dominated bodies, the adjacent vermiculite and in modern creeks. Significant primary concentrations have been found associated with magnetite and apatite rich zones in the main carbonate plug on Zircon Hill.

The leased area is centred on the landform know as Zircon Hill. Zircon and Specimen Hills rise to about 10m above alluvial flats along and to the north of Marktree Creek. Marktree Creek drains into Waite Creek; all form part of the major drainage basin of the Sandover River. The creek and smaller tributary drainage channels carry water during brief periods after rains.

Much of the surface of the higher parts of Zircon Hill was historically disturbed by the activity of zircon fossicking. Further disturbance of this area has not occurred as a result of mining activities; as the mining of vermiculite did not occur in this area. Vermiculite extraction took place on the flanks of the hill and remains a visible disturbance to the natural topography in this area.

Vermiculite is a form of mica. As such is has a typical flaky habit but is characterised by the presence of water in the lattice structure which gives it the ability to exfoliate rapidly on heating. Although there are several mineral species within the vermiculite group most commercial vermiculite has a two layer structure comprising minerals such as hydrobiotite, chlorite or smectite.

Vermiculite is commonly associated with rocks such as carbonatite and pyroxenite and is usually formed by weathering or hydrothermal alteration of other forms of mica such as biotite. If weathering is involved in the formation of vermiculite its commercial properties are usually

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4 NT Sites of Conservation Significance – Greater MacDonnell Ranges
only of near surface extent and decrease with depth. Few occurrences are of major lateral extent and many comprise only dykes of limited dimensions and variable quality.

4. Exploration index map

Not applicable

5. Geological activities and office studies

A technical review and evaluation of the Mud Tank project was undertaken by the Resource Service Group (RSG) in 1999 on behalf of Imex Limited, and appears to be the only source of resource information available; Resource Service Group (1999) Mud Tank Vermiculite Project Technical Review and Valuation.

It is reported that ‘There is a general lack of data to support a resource estimation at Mud Tank, and none of the resource figures quoted in this report are comfortable to the AusIMM/JORC Code Guidelines for the reporting and classification of mineral resources and reserves.’ ‘Similarly, the valuations quoted in this report are not compatible with the VALMIN Code for the valuation of mineral properties.’

‘Exploration has been carried out at Mud Tank for apatite, zircon and vermiculite by a combination of Government agencies and private companies since the late 1940’s. The most recent and consistent exploration for vermiculite was carried out by Clutha Minerals on behalf of the title holders, Blue Circle Southern Cement, from 1986 to 1988.’ This work included costeanning, large diameter (750mm) auger holes and the excavation of bulk samples for test work. The large diameter auger holes were restricted to a depth limit of only 27m.

‘RSG has estimated a resource for the Mud Tank deposit using a similar, very simplistic, but more realistic approach (to that which Clutha applied). RSG estimates that a resource of approximately 120,000 tonnes of recoverable vermiculite is likely to exist at the Mud Tank deposit, assuming a 30 vermiculite grade and a 30% recovery.’

The informal nature of mining at Mud Tank is further supported by a statement made in the RSG review ‘The Mud Tank operations does not have a current mine plan or production

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5 Mud Tank PER 1993
schedule, mainly due to the lack of a comprehensive resource estimate and consequent reserve statement.\textsuperscript{10}

6. **Remote sensing**

Nil Undertaken

7. **Geophysical activities**

Nil Undertaken

8. **Surface geochemistry**

Nil Undertaken

9. **Drilling**

Refer to section 5

10. **Geotechnical studies**

Nil Undertaken

11. **Resource and reserve estimation and modelling**

Refer to section 5

12. **Conclusion and recommendations**

Insufficient geological and resource information exists to enable a recommendation be made on the future prospectively of MLS165. AVI make no recommendations to the future management or exploration of MLS165.

13. **References**

AVI (2013) *Mud Tank Mine Closure Plan*, Ballarat


E Rooke 1995 *Mud Tank Mining Water Supply – Bore Completion Report*

APPENDIX 1 – MUD TANK VERMICULITE PROJECT
TECHNICAL REVIEW AND VALUATION, 1999

APPENDIX 2 – MUD TANK MINE CLOSURE PLAN, 2013

APPENDIX 3 – MUD TANK MINING WATER SUPPLY –
BORE COMPELATION REPORT, 1995