

# Memo

To: Rory Swiderski

From: Jarrad Clark

Date: 10 May 2019

Subject: Subterranean fauna likelihood of occurrence assessment conducted for the proposed Worsley Mine Expansion - Contingency Bauxite Mining Envelope



## Version History

Report	Version	Prepared / Approved By	Date Submitted to Client
Draft Report	V1	Jarrad Clark	20/12/2019
Draft Report	V2	Jarrad Clark	10/02/2019
Final Report	V3	Jarrad Clark	10/05/2019

Dear Rory,

This memo documents an assessment of the likelihood of occurrence of subterranean fauna conducted for the proposed Contingency Bauxite Mining Envelope (CBME) component of the proposed Worsley Mine Expansion (WME) Project.

## 1 CONTEXT

South32 Worsley Alumina Pty Ltd (South32) is proposing to expand existing mining activities at the South32 Boddington Bauxite Mine (BBM) and the South32 Refinery as part of the WME (the Proposal).

The Primary Assessment Area (PAA) of the WME includes the Worsley Mining Development Envelope (WMDE), Bauxite Transport Corridor (BTC), Contingency Bauxite Mining Envelope (CBME) and maintenance within the Refinery Lease Area (RLA). The estimated totals for these areas are:

- WMDE covers a land area of 27,796 ha, which includes the Pre-existing Approval Area and an overlapping land area of 3,332 ha with the Bauxite Transport Corridor
- The BTC covers a land area of 4,146 ha
- CBME covers a land area of 747 ha
- Maintenance within the Refinery Lease Area covers a land area of 5 ha

The PAA (incorporating the WMDE, Bauxite Transport Corridor, CBME and Maintenance within the Refinery Lease Area) represents a total of 29,362 ha (excluding the overlap area of 3,332 ha) and 32,694 ha (including the overlap area).

This preliminary assessment for Subterranean Fauna likelihood of occurrence overlaps the proposed PAA for the CBME and Maintenance within the Refinery Lease Area provided by South32. It does not include the WMDE or Bauxite Transport Corridor, as these areas are addressed in the Subterranean Fauna Likelihood of Occurrence Assessment for the WMDE (10 May 2019; Phoenix 2019).

Current mining activities will continue to operate throughout the duration of the assessment process for this Proposal, including transport of ore via the overland bauxite conveyor through to the Refinery. Operations at the Refinery will continue on a business as usual basis; no changes to the Refinery are requested as part of this Proposal.

In the context of the Refinery however, contingency bauxite mining is proposed as a control measure in the event that bauxite supply to the Refinery is impacted. An existing bauxite resource is located at the Refinery Lease Area (RLA) within the proposed Contingency Bauxite Mining Envelope (CBME). As per bauxite mining

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operations at BBM, mining would be expected in the upper 8 – 12m and dependant on depth to caprock, to a maximum depth of approximately 40m.

## 2 SCOPE OF WORK

The scope of work was as follows:

- conduct a brief subterranean fauna risk assessment for the proposed CBME, that included:
  - a search of the WA Museum Arachnida/Myriapoda and Crustacea databases
  - review of records from surveys in the vicinity of the Refinery
- review of geological and hydrogeological information for the proposed CBME
- based on the above, determine the likelihood of occurrence of a diverse, abundant and conservation significant subterranean fauna assemblage.

## 3 OVERVIEW OF SUBTERRANEAN FAUNA

For the purposes of environmental impact assessment (EIA), the EPA (2016a) defines subterranean fauna as: *fauna which live their entire lives (obligate) below the surface of the earth*. They include stygofauna (aquatic and living in ground water) and troglofauna (air-breathing and living in caves and voids). The EPA's objective with respect to subterranean fauna is *its protection so that biological diversity and ecological integrity are maintained*.

The obligate underground existence of subterranean fauna greatly increases the likelihood of short range endemism and the possibility that a species' conservation status may be impacted as a result of the implementation of a proposal. Subterranean fauna species may therefore be considered to be significant due to (EPA 2016a):

- being identified as Threatened or Priority species
- locally endemic
- potentially new species
- occupying restricted habitats
- forming part of a Threatened or Priority Ecological Community.

The likelihood of occurrence of subterranean fauna in most geologies (beyond karst limestone) within the southwest is considered low and unlikely to occur within "deep sands or clays (especially over solid rock)" (EPA 2016b).

## 4 METHODS

The study area for the assessment was defined as the proposed CBME with a buffer of approximately 70 km, and included:

- a review of troglofauna and stygofauna records held by the WA Museum Arachnology, Myriapodology and Crustacea databases (NW corner: 33.1694S/115.9704E; SE corner: 33.2896S/116.1098E); within 5 km of the study area
- a review of any applicable published or unpublished subterranean fauna surveys
- a review of geological and hydrogeological spatial datasets for the proposed CBME.

## 5 RESULTS

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## 5.1 FAUNA

No troglifauna or stygofauna have been recorded within 5 km of the Worsley Refinery and proposed CBME (WAM 2018).

A relatively recent stygofauna survey to the north of the study area at Murray (~47 km NW), found stygofauna to be present in 10% of the 20 bores sampled; Three previously unknown species were recorded (GHD 2010). This survey however was undertaken within sand and limestone (to the west) and sand and clay (to the east) lithologies, of superficial, unconfined aquifers of the Perth basin and is therefore of limited applicability to the current study area, which occurs east of the Darling Fault, within the Northern Jarrah Forest (JAF01) (Cowan 2001).

The most comparable recent project to be assessed by the EPA was the expansion of the Boddington Gold Mine, which is located immediately north of the BBM in the Jarrah Forest Bioergion (JAF01; DoE 2012). Here a subterranean desktop assessment was undertaken (Outback Ecology 2012). The assessment concluded that in the context of the proposed expansion of the waste rock dump and residue disposal, significant stygofauna or troglifauna communities were unlikely to occur; no surveys were undertaken. Subsequently the Life of Mine Project was approved and subterranean fauna was not considered a significant environmental factor in the EPA's assessment of the Project (Strategen 2013).

A second comparable Project is the Talison Lithium Australia Pty Ltd (Talison) Greenbushes Lithium Mine, which is located within the Jarrah Forest Bioregion approximately 70 km SSW of the study area (JAF02; DoE 2012). It has operated for over 30 years. No subterranean fauna surveys have been conducted historically or in the context of the expansion proposal. In June 2018, Talison applied to expand the mine by 25%. The EPA referral notice indicates that subterranean fauna will not be considered a significant environmental factor in the assessment (EPA 2018).

## 5.2 GEOLOGY/REGOLITH

The South32 Refinery is located on the Yilgarn Craton, a stable shield area, consisting of linear belts of metamorphosed sedimentary and volcanic rocks that have been intruded with granitic rocks (granitoid formation) (Golder Associates 2004).

The surface geology comprises two units (Stewart *et al.* 2008):

1. Ferruginous (laterite) duricrust
2. Logue Brook Granite

The Cainozoic aged laterite consists of a ferruginous or aluminous hard cap layer, generally two metres thick (the duricrust) which overlies a pallid, kaolinitic (clay) zone of varied thickness (Golder Associates 2004).

Both are considered unlikely to support a diverse and/or abundant troglifauna fauna assemblage.

## 5.3 HYDROLOGY

The hydrogeology of the proposed CBME is described by Commander (1989) and DWER (2002) as containing rocks of low permeability (fractured and weathered rocks), with minor groundwater resources.

Wilkes *et al* (2004) further described the hydrology for the Augustus River catchment occupied by the Refinery Lease Area:

- shallow weathered zone aquifer comprising clayey sands and of 1–4 m thickness
- deep weathered zone aquifer characterised by weathered granite and ranging from 15–40 m thickness
- fractured zone aquifer within basement rock and along margins of dolerite dykes and
- saprolite clay aquitard between the shallow and deep weathered aquifers.

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These low permeability, high clay-content sequences, are considered unlikely to support a diverse and/or abundant stygofauna assemblage.

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## 6 CONCLUSION

The proposed CBME occurs within the southwest of WA, an area generally known to have low prospects for subterranean fauna presence for non-karst geologies (EPA 2016b). A review of the local geology and hydrogeology has found that the area is dominated by a low permeability lithology of granite and laterite, over pallid, kaolinitic (clay) zones of varied thicknesses, and with only minor local aquifers present.

The WA Museum database searches revealed no subterranean fauna species known within 5 km of the Refinery and, a review of published and unpublished literature has failed to find any additional data in close proximity to, or applicable to the Project, which may provide evidence to the contrary.

It is therefore concluded that subterranean fauna are unlikely to be present and thus development of the proposed CBME presents a low risk to subterranean fauna. Further two relatively recent Project expansions within the Jarrah Forest Bioregion (JAF01 and JAF02; EPA 2018; Strategen 2013) have not conducted field surveys for subterranean fauna as the EPA did not consider subterranean fauna to be significant environmental factors.

Yours Sincerely,

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