



Professor Matthew Tonts  
Chair  
Environmental Protection Authority (EPA)  
Locked Bag 10  
Joondalup DC WA 6919

29th August 2022

Dear Professor Tonts,

**RE: Submission on South32 Worsley Alumina Pty Ltd Proposed Worsley Mine Expansion (Revised Proposal) Public Environmental Review | Not Supported [No Development Alternative / should be rejected by the EPA]**

Thank you for the opportunity to submit comments on the South32 Worsley Alumina proposal under Public Environmental Review.

This submission addresses all Environmental Factors in South32's Environmental Review Document (ERD).

South32's proposal would have major impacts on a number of conservation significant species and their habitats and would cause unacceptable levels of harm to the environment, climate and social surrounds.

The Environmental Review Document fails to meet the EPA's required work as defined in the Environmental Scoping Document. The cumulative impact assessment is wholly inadequate and many of the proposal's conclusions are contrary to the precautionary principle. There are major areas in the ERD where fundamental principles of monitoring and survey methodologies are not met. The company is already a major emitter of greenhouse gases and this proposal would substantially increase the emissions, making it even more difficult for WA to reduce carbon emissions and meet National targets. The proposed water use associated with the plan, particularly in the context of the 20% rainfall decline in the region and the IPCC's finding that the region is at risk of climate transition or collapse, is unconscionable.

The proposal is unacceptable. It cannot meet the objectives of the EPA factors and Wafa submits that it should be rejected by the EPA.

**Wafa Key Recommendations**

1. The Proposal should be rejected.
2. If the Proposal is not rejected outright, there should no clearing of remaining native vegetation in the assessment area permitted. This would mean that the 4,399 ha of forest, woodland and heath proposed for clearing would be protected and conditions be imposed to prevent dust, weed and disease incursions and hydrological impacts from any mining on already cleared nearby land.

3. There must be no increase in water consumption by the proponent and instead a plan must be developed and enforced to reduce the company's water use over time.
4. The EPA should carry out a strategic review of the Northern Jarrah Forests and set out a plan for protecting and restoring the region to improve its resilience to climate change.
5. Greater formal protection of the NJF should be prioritised by changing land categories from state forest and timber reserve to national park and nature reserve, and formalising protection of proposed conservation areas, with a goal of creating a connected, comprehensive and secure conservation system in the NJF where currently only 22% of the region is protected.
6. No mining expansions in the NJF should be authorised in light of the IPCC's findings and the State of the Environment Report.
7. Greater transparency of State Agreements and Ministerial Statements should be provided for, with these being made publicly available as well as being made available for public review.

WAFA supports the submissions entered by other environment groups on this matter. We particularly endorse the Peel Harvey Catchment Council's thorough submission and its critical findings on the inadequacies of the ERD in terms of not meeting EPA required work, failing to meet the expectations for a PER and numerous, fundamental failures regarding survey and monitoring methodologies, results and conclusions.

WAFA is conscious of the significance of this proposal in terms of the EPA's new cumulative assessment framework, and we submit that in the context of this important new approach for environmental regulation in WA, and such a poor cumulative assessment by the proponent, the proposal should be rejected and a strategic review of the NJF should be conducted by the EPA as a matter of priority.

Thank you again for the opportunity to make a submission on this important matter. I am available to discuss any of the points raised in this submission.

Yours sincerely,

A handwritten signature in blue ink that reads "Beckerling". The signature is written in a cursive, flowing style.

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## FLORA AND VEGETATION

### EPA OBJECTIVE: TO PROTECT FLORA AND VEGETATION SO THAT BIOLOGICAL DIVERSITY AND ECOLOGICAL INTEGRITY ARE MAINTAINED

The proposal would result in the **direct loss of up to an additional 4,399 ha of native vegetation** (ERD, 5) within the 29,356 hectare PAA. The vast majority of this native vegetation that South32 plans to clear is considered to be **‘excellent’ or ‘very good’ quality Jarrah, Marri and Wandoo forest and woodlands** (ERD, 193 -194). Quality is defined in terms of species richness and little to no weed infestation. Over a quarter of the PAA is considered to have high to medium potential of being old-growth forest, meaning it is relatively undisturbed (ERD, 193).

Forty-four per cent of the PAA is made up of cleared areas, agriculture and plantations, considered in the ERD as being ‘completely degraded.’ The **proposal would result in the loss of up to 40% of the remaining native vegetation in the PAA** (when including the Pre-existing Approval Area) (ERD, 225 and 198). There is another 8,400 ha pre-approved for clearing in the Extended Mining Areas (ERD, 225) outside of the PAA.

‘The majority of the disturbance associated with the Revised Proposal is anticipated to occur in Jarrah/ Marri/ Allocasuarina (Sheoak) woodlands on slopes and ridges (JC) (approx. 3,145ha), followed by cleared lands (2,050ha), which is characterised by isolated stands of remnant trees, and Jarrah/Marri woodlands on slopes (JM) (1,399 ha) (ERD, 336).

There are twelve identified vegetation complexes in the PAA and they are listed with information on how much of the vegetation complex remains compared to the pre-European extent and how much further clearing South32 now proposes (ERD, 201). It shows that for four of the vegetation complexes, less than 50% of the pre-European extent remains, and South32 plans further clearing.

The ecosystems in the area are highly diverse and forty distinct site-vegetation types are described including Blackbutt and Bullich open forest; Wandoo and Flooded Gum woodlands, Marri and Jarrah forest, and Banksia and Hakea heaths (ERD, 203 – 209).

South32 acknowledges (ERD, 198) that the native vegetation clearing has potential to ‘reduce locally significant vegetation communities, riparian vegetation and Priority flora taxa, reducing their known extents in the local and regional areas,’ and ‘may also result in indirect impacts to flora and vegetation, including:

- **Further fragmentation** of vegetation in the local area through partial or complete clearing of isolated remnant bands or patches
- Increased competition or degradation of quality of vegetation from **invasive species (weeds)**
- Vegetation death from **invasive pathogens**
- **Reduced vegetation health** associated with dust generated
- Potential impacts on **ecological and social values of forests**, including within public reserves, through increased water use for operations and dust suppression (see Section 5.5)
- Changes to vegetation structure and floristic composition through **altered surface water**
- Changes to vegetation structure due to **groundwater level rise**
- Change to vegetation structure due to **increased water use** resulting in groundwater drawdown
- Cumulative impacts in relation to the **direct loss of suitable habitat**, and
- Reduce the local and regional extent of vegetation communities and potentially **disturb conservation significant flora**.

## Areas of High Environmental Value

The South32 ERD claims (ERD, 96) that ‘areas of potential high conservation value ... are recognised as being important contributors to biodiversity or heritage’ and ‘disturbance to these areas is sought to be avoided or minimised.’ These areas are ‘managed internally and through negotiations with relevant stakeholders’ and include, but are not limited to:

- Priority 1 and 2 flora
- Moderate to high-risk existing groundwater dependent ecosystems (GDEs)
- High quality vegetation with the potential to support short-range endemic and threatened fauna
- Fauna corridors and ecological linkages within Marradong Timber Reserve and
- Stream zone buffers on hierarchy category 3 or higher where riparian vegetation occurs.

The South32 ERD says that no flora that is listed at a State or Federal level as Threatened, and no old-growth forests will be impacted by clearing and that ‘clearing associated with the Revised Proposal has been designed to avoid areas of high environmental value as defined in the Worsley Alumina Protected Areas Plan’ (ERD, 237).

But it does not create Protected Areas to avoid disturbance of Priority 1 and 2 flora or other recognised high conservation values, including the excellent and very high-quality Jarrah, Marri and Wandoo forests.

**This is wholly inadequate. All intact ecosystems in the Primary Assessment Area (PAA) are of high conservation value and must be protected. They have been assessed as being of excellent or very high quality (ERD, 193), they provide critical habitat for a number of priority flora (ERD, 200) and threatened and endangered fauna (ERD, 302), they are drought-susceptible and at risk of climate collapse (IPCC, 2022 Laurance et al. 2011).**

Only a very inadequate 22% of the Northern Jarrah Forest is currently protected in formal conservation areas.

The ERD outlines information about the **Conservation Significant Flora that will be destroyed or disturbed** if this proposal is granted (ERD, 210-222). On page 200, the ERD specifies that **eleven Priority flora species would be cleared. Two of these (Synaphea panhesya P1 and Banksia subpinnatifida var. subpinnatifida P2) would be cleared in their known entirety within the PAA.** The South32 ERD says that this represents less than 12% and 4% of the local extent, and that it is ‘likely’ they occur in greater numbers regionally (ERD, 200). It concludes that ‘the Revised Proposal is not expected to significantly impact the Priority flora populations at a local scale or affect the conservation status of the species at a regional level.’

**It is irresponsible and contrary to the precautionary principle to assume that because there may be more occurrences of a threatened species than records can confirm it is acceptable to destroy known populations. These are restricted and rare flora species and they must be protected from clearing.**

**A full assessment of the project’s significance must be based on a holistic consideration of the Northern Jarrah Forest’s current condition and threatened future in the context of cumulative impacts and climate change.**

## Cumulative Impacts for Flora and Vegetation

The South32 ERD recognises the cumulative loss of ‘conservation significant flora and vegetation’ from past clearing and logging (ERD, 227), but does not acknowledge the contribution to the Northern Jarrah Forest’s current systemic risk of ecosystem transition and collapse (Laurance et al. 2011, IPCC 2022).

The ERD also fails to acknowledge how the State Agreement Act has shielded clearing for bauxite mining from proper environmental scrutiny in the past and is known to have been an obstacle to the establishment of conservation protection areas in the Northern Jarrah Forest.

Despite acknowledging the ‘high level of species diversity and richness’ in the proposal area, future cumulative

impacts on flora and vegetation are overlooked by the proponent because impacted vegetation types are not endemic to the PAA, i.e., they occur elsewhere in the Northern Jarrah Forests (ERD, 228). There is no assessment of the condition or protection status of these vegetation types elsewhere and there is underreporting of cumulative clearing threats to the Northern Jarrah Forests, most immediately from Alcoa's approved mining areas. The ERD points to 19,176 ha of future approved and proposed clearing<sup>1</sup> by Worsley and Newmont Boddington Gold Mine in the vicinity. Elsewhere (ERD, 230), it is noted Alcoa is seeking approval to clear another 6,700 ha but does not mention the already approved areas of future clearing. However, Alcoa's 'current and proposed' clearing is later put at 26,606 ha (ERD, 706). **This would amount to a total of 45,782 ha.**

The assessment does acknowledge that there will be 'limited' cumulative impacts on two locally significant vegetation types (ERD, 227 and 233).<sup>2</sup> These are Yarri/Blackbutt woodland (with some Wandoo) and tall Melaleuca shrubland (ERD, 180 and 182).

The company admits later in the ERD that its greenhouse gas emissions contribute to 'chronic and acute physical impacts in the south-west of Western Australia' that 'impact the health and resilience of ecosystems, habitats and species' and **will 'effect the efficacy of existing and future mitigation activities'** (ERD, 618-19). **But it fails to make any intelligent qualitative finding in relation to these cumulative impacts.**

**The cumulative impact assessment done by the company is insufficient. It quantifies loss of flora and vegetation to a certain extent but fails to take account of expert advice on the threat the region faces, particularly that 'the resilience and adaptive capacity of the forests is being reduced by ongoing land clearing and degrading land management practices,' and the need to mitigate this by 'avoiding and reducing forest degradation' (IPCC, 11-80). It fails to take a holistic approach to the hydrological impacts of further clearing on flora and vegetation and its conclusions are contrary to the precautionary principle.**

**South32's reliance on rehabilitation being a mitigation strategy is unacceptable.**<sup>3</sup> Rehabilitated areas are not comparable to mature forests. A review of the company's own past rehabilitation performance found native plant density and native species richness were well below that in surrounding forests (ERD, 245-46). Rehabilitated areas cannot provide the habitat value of mature forests, particularly to threatened fauna species that rely on the structure and function of mature forests including nesting hollows that only form in very old trees. They also do not have the resilience to climate change of mature forests and their substantially higher evapotranspiration rates and high use of water make them a threat to the surrounding forests.

Compared to old-growth forests, the long-term average carbon stock of regrowth forests is 30-70 % lower (Roxburgh et al. 2006, Keith et al. 2014, Keith et al. 2015). Large, old trees actively fix large amounts of carbon compared to smaller trees and a single big tree can add the same amount of carbon to the forest within a year as is contained in an entire mid-sized tree (Stephenson et al. 2014).

South32 has not adequately considered the impact of rehabilitation on the surrounding forest. The thirsty young trees in rehabilitation sites can use twice the volume of water that old forests do. This means that vitally important groundwater, which is already lower than the forests require due to climate change, is being even further depleted by rehabilitation sites.

South32 admits to a current 45% rehabilitation deficit (shortfall) and proposes to reduce this to under 35% by 2033,

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<sup>1</sup> The ERD on p. 376 puts the combined area as 23,497 ha, however, includes the 4,321 ha already cleared in the approved area. To account for future clearing, we are using the figure of 19,176 ha.

<sup>2</sup> L\* = Open woodland of Eucalyptus patens with some Eucalyptus wandoo over Xanthorrhoea preissii, Macrozamia riedlei, Trymalium ledifolium, Acacia saligna and Hakea prostrata on clay and clay loam soils on lower slopes (ERD, 182). A = Tall shrubland of Melaleuca lateritia, Hakea varia, Melaleuca viminea and Melaleuca incana subsp. incana on clay-loams in seasonally wet valley floors (ERD, 180)

<sup>3</sup> In a remarkable piece of sophistry, the South32 claims its rehabilitation has offset value by delivering a conservation gain that is additional to what is required under existing approvals and laws (ERD, 408-9). However, this is based on the State Agreement Act applying low level rehabilitation standards.

with some allowance for exceptional circumstances (ERD, 22 and 103). However, after 10 years of clearing, only up to 70-80% of mined areas will be rehabilitated (ERD, 226). This is early-stage rehabilitation: it takes longer to provide ecological benefits (ERD, 407). To date, none of Worsley's rehabilitation has been signed off as meeting completion criteria. Cumulative clearing versus rehabilitation shown in Table 2 of the Mining Completion Plan is inconsistent with that of Chart 1 in "Plan of Bauxite Mining Operations 2016- 2025" (Oct 2015). This issue was identified by DMIRS (Appendix E05: *BBM Closure Plan Appendix E*, 175).

South32 has not sufficiently demonstrated and cannot guarantee that the rehabilitation undertaken will meet restoration targets.

South32 will designate some rehabilitation areas as 'protected' and not re-clear these (ERD, 96, 115). But there is no indication of the proportion of rehabilitation this might be, and whilst the two companies seek to avoid it, there is nothing to prevent Boddington Gold Mining from clearing Worsley rehabilitation (ERD, 115).

**Rehabilitation is especially not a mitigation strategy for the forest of the future.** The methods being used and the broader context that it is occurring in is better suited to wetter climates and is not in the interests of the surrounding forest, particularly large trees (Wardell-Johnson et al. 2015, 15). It also cannot ever replicate the original forest, particularly not under a drying climate. South32 acknowledges that climate change may 'affect the efficacy of existing and future mitigation strategies', such as rehabilitation (ERD, 618). Most effective mitigation must be the avoidance of further clearing.

### Forest diseases

*Phytophthora cinnamomi* is a soil borne plant pathogen thought to be introduced into WA and considered to be one of the most significant threats to biodiversity in the south-west of WA. The PAA contains a range of highly susceptible flora including Proteaceae (Banksias and Hakeas), Ericaceae (snotty gobble), Myrtaceae (Eucalypts) and Xanthorrhoeaceae (grass-trees).

South32 states there will be 'No new introduction of forest disease as a result of Worsley Alumina's activities to areas surrounding Worsley Alumina's mining operations' (Appendix E05: *BBM Closure Plan*, 23). No evidence is provided to support the efficacy of current hygiene practices including any spread of *Phytophthora* from previous mining operations that would allow them to achieve this objective. It also fails to define how it will mitigate waterlogging impacts, which are known to increase susceptibility to dieback.

South32 proposes that all pit and rehabilitation drainage will be designed so that 'no water can flow from infested into uninfested areas' (Appendix E05: *BBM Closure Plan*, 98-99). No information is provided to demonstrate how South32 would achieve this under high rainfall events.

### Data and survey sufficiency

Much of the flora survey data and analysis relies on amalgamation of out-dated previous studies, many of which were desktop based or limited to a small portion of the PAA. There are a number of incomplete analyses and references to further work being required, for example reference to additional studies that will be incorporated as results are finalised (ERD, 15), and 'additional studies' (ERD, 1) which are presumably in the process of being completed. Reference is made to 'collections ... still being processed' and 'rehabilitation areas awaiting completion of rehabilitation assessments' (Appendix F3: *Addendum Assessment of Threatened and Priority Flora on Worsley Mine Expansion, 2022.*, 21). There is no evidence of South32's commissioned surveys or analysis being peer reviewed.

### Conclusions

**The proposal would have profound impacts on flora and vegetation and it cannot meet the EPA objective for this**

factor to protect flora and vegetation so that biological diversity and ecological integrity are maintained.

South32's Protected Area Plan is wholly insufficient. It does not provide for the protection of Priority 1 and 2 flora species or high-quality vegetation and overall it does not adequately protect flora and vegetation in the PAA.

Two priority species would be cleared in their known entirety within the PAA. The cumulative impact assessment does not consider the risk of ecosystem transition or collapse under climate change.

The reliance on rehabilitation being a mitigation strategy is unacceptable and the cumulative impact assessment done by the company is insufficient.

### Alternative proposal to improve outcomes for the environment

The proposal should be rejected.

And, at the very least: All forests, woodlands, shrublands and heaths in the Primary Assessment Area (PAA) must be protected from clearing and conditions must be imposed to ensure that these Protected Areas are not disturbed by clearing or impacted by increased spread of weeds or disease; groundwater or surface water alterations, or dust.

### References

2021 *Australia State of the Environment Report* <https://www.dcceew.gov.au>

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Keith, H., Lindenmayer, D., Mackey, B., Blair, D., Carter, L., McBurney, L., Okada, S. and Konishi-Nagano, T. (2014). Managing temperate forests for carbon storage: impacts of logging versus forest protection on carbon stocks. *Ecosphere* 5(6): 75

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Laurance, W. et al. (2011). The 10 Australian ecosystems most vulnerable to tipping points, *Biological Conservation* 144: 1472-1480.

MacFarlane, C. and Silberstein, R.P. (2010). *Wungong Catchment Trial: water use by regrowth and old-growth jarrah forests at Dwellingup, Western Australia*. [Perth, WA] Wungong Catchment Trial.

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## TERRESTRIAL FAUNA

### EPA OBJECTIVE: TO PROTECT TERRESTRIAL FAUNA SO THAT BIOLOGICAL DIVERSITY AND ECOLOGICAL INTEGRITY ARE MAINTAINED

There are **seventeen conservation significant<sup>1</sup> fauna species** recorded in the PAA and South32 acknowledges that after avoidance and mitigation measures there will be **'significant residual impacts' on eight of these species** that it proposes to address through offsets (ERD, 419 – 421). Another species, the Brush-tailed Phascogale, also faces a serious threat, with the potential for the proposal to 'impact the species at both an individual and population level' (ERD, 347) but the company does not propose off-sets for this species (ERD, 422). The company ignores the likely impact on Numbats altogether, despite being recently recorded in and near the PAA and the PAA comprising 11,858 ha of suitable habitat.

This submission will focus on the 10 species expected to suffer the greatest impacts. These are Red-tailed, Baudin's and Carnaby's Cockatoos, Quokkas, Chuditch, Red-tailed Phascogales, Brush-tailed Phascogales, Woylies, Western Ringtail Possums and Numbats. We also consider Short Range Endemic Fauna.

The other 7 affected conservation significant species not covered in the submission are Peregrine Falcon, Blue billed Duck, Western False Pipistrelle, Rakali, Quenda, Western Brush Wallaby and Dell's Skink (ERD, 319-25).

### Habitat types

The proposal covers 'six broad fauna habitat types': Jarrah/Marri, Wandoo, Mallee woodlands, heath, riparian/wetland, and others (including rehabilitated areas, plantations, dams and cleared lands' (ERD, 256).

The ERD states on page 336: 'The majority of the disturbance associated with the Revised Proposal is anticipated to occur in Jarrah/Marri/Allocasuarina (sheoak) woodlands on slopes and ridges (JC) fauna habitat type (approx. 3,145ha) followed by cleared lands habitat type (2,050ha), which is characterised by isolated stands of remnant trees, and the Jarrah/Marri woodlands on slopes (JM) habitat type (1,399 ha).'

The vast majority of the native vegetation that South32 proposes to clear has been assessed as being excellent or very high quality (ERD, 193-194) and is important habitat for wildlife, including 17 'conservation significant' species (ERD, 302-303).

### Potential general impacts include (ERD, 336):

- Habitat loss through vegetation clearing. The Revised Proposal will result in the direct loss of native, plantation and rehabilitated vegetation, and hence fauna habitat, through clearing associated with mine operations and supporting infrastructure
- Further fragmentation of habitat in the local area through partial or complete clearing and associated habitat loss of isolated remnant bands or patches
- Injury, mortality or displacement of fauna from construction and operations (including vehicle strikes)
- Indirect impacts from dust, noise and vibration during construction and operations
- Increased competition or predation by introduced (feral) species
- Cumulative impacts in relation to the direct loss and fragmentation of habitat for fauna.

Cumulative impacts also include clearing for agriculture and mining (43% of PAA is already cleared), impacts from climate change including decline in rainfall, and historical disturbance to forest areas from logging, invasive species, forest disease and tracks and road construction. Added to this, rehabilitation provides suboptimal habitat post-mining, including for threatened and endangered species.

Although not included in the list of likely impacts by the company, the proposal is also likely to cause a decline in

breeding success of threatened species through the removal of breeding habitat, causing a reduction in population and pushing threatened species closer to extinction.

The potential impact to aquatic fauna from changes in the flow regime and water quality of creeks from activities associated with the Revised Proposal is assessed under Inland Waters environmental factor (Section 5.5.5). South32 proposes to use 400 ML/a of ground and surface water in addition to the 500 ML/a already being used. This is likely to have a profound effect on water available to adjacent intact Jarrah forest, streams, reservoirs and fauna.

### Threatened Fauna Management and pre-clearance surveys

The impact of proposed clearing will highly likely result in fauna injury, mortality and stress. Animals are usually harmed in one of two ways: clearing land is typically done with heavy machinery that can injure or kill wildlife and/or animals are harmed when, after an area is cleared, there is little food or shelter and predators and disease increase. These unstable environmental factors can lead to animals suffering injuries or death, often after days or months of pain and distress.

Pre-clearance surveys are required to identify, record and delineate habitat considered to be essential in the lifecycle of fauna and to minimise the mortality or injury risk to fauna species potentially impacted by clearing operations. South32's threatened fauna pre-clearance fauna survey and management fails to mitigate injury and mortality risks and raises serious animal welfare concerns. Contrary to what is stated in the ERD, South32's proposed pre-clearance surveys would not be conducted in accordance with best practice, EPA guidance nor DBCA recommendations. **No statements are included on pre-clearance plans for humane or animal-welfare principles.**

No trapping and relocation is proposed for species where this has been shown to be effective and no sensitive clearing principles have been proposed for animals who suffer stress and myopathy under trapping and relocation.

No performance indicators, trigger criteria and threshold criteria and contingency actions for outcome-based SMART performance standards are included, despite the fact that the EPA specifies their inclusion under Part IV Environmental Management Plans (EPA, 2018).

### Threatened fauna habitat loss

The proposal would result in the loss of up to 65% of the suitable habitat for threatened fauna in the 29,356 ha assessment area.

The Red-tailed Phascogale has already been lost from 99% of its former range and is known to be persisting in the area that South32 wants to clear. In spite of this, the company proposes to clear 65% of the suitable habitat for this species in the assessment area. This would have profound impacts on the local population, and the company admits it could have an impact at a whole of population level.

South32 proposes to clear 60% of the suitable habitat in the PAA for the critically endangered Woylie; 48% of the Quokka's habitat, 40% of the Brush-tailed Phascogales' habitat ; 38% of the Chuditch habitat and an unquantified proportion of the suitable habitat for the critically endangered Western Ringtail Possum and Numbat. It would clear 18% of the breeding habitat for the Red-tailed and Carnaby's Cockatoos and 23% of the breeding habitat for the Baudin's in the PAA, and 37% of all three species' foraging habitat in the PAA.

Species	Suitable habitat in South32 assessment area (Ha)	Habitat proposed to be cleared by South32 (%)	Habitat proposed to be cleared by South32 + Boddington Gold Mine	Cumulative habitat loss due to South32 + Boddington Gold Mine (% of suitable habitat)
Red-tailed Black Cockatoo	Foraging: 16,152 Breeding: 12,688	Foraging: 37% Breeding: 18%	7,523	21%
Baudin's Cockatoo	Foraging: 16,152 Breeding: 12,676	Foraging: 37% Breeding: 23%	6,961	22%
Carnaby's Cockatoo	Foraging: 16,364 Breeding: 12,676	Foraging: 37% Breeding: 18%	7,387	21%
Woylie	4,385	60%	3,215	21%
Red-tailed Phascogale	691	65%	Not quantified	Not quantified
Brush-tailed Phascogale	5,198	40%	6,501	22%
Quokka	493	48%	Not quantified	Not quantified
Western Ring-tailed Possum	493	Not quantified	Not quantified	Not quantified
Chuditch	2,018	38%	7,429	21%
Numbat	11,858	Not quantified	Not quantified	Not quantified

### Black Cockatoos

The forest that South32 proposes to clear is known habitat for Red-tailed, Baudin's and Carnaby's Black Cockatoos, with Red-tails the most abundant (ERD, 307).

*A Thousand Cuts, Mining in the Northern Jarrah Forests*, explains on page 24 that **bauxite mining is the primary cause of deforestation of forest habitat for all three species of SW black cockatoos.**

The Recovery Plans for these birds have called for protection of habitat but these recommendations have not been implemented (*A Thousand Cuts*, 24).

The ERD acknowledges on page 307 that all three species have 'suffered a decline in their distribution and population sizes due to a reduction in available breeding, roosting and foraging habitats resulting from vegetation clearing' (DAWE, 2020b). Similarly, Johnstone and Kirkby (2019) found that there has been a significant decline in breeding success in the Northern Jarrah Forest compared to the Perth Peel region (ERD, 308).

South32 proposes to clear the following 'high value' foraging and nesting habitat. The area is a combination of this proposal plus an additional 942 ha the company has pre-existing approval for.

Species	Foraging Habitat (ha)	Breeding Habitat (ha)
Red-tailed Black Cockatoo	5,499	1,468
Carnaby's	3,683	2,133
Baudin's	5,121	0

Confirmed breeding trees for Carnaby's and Red-tailed Black Cockatoos exist within the areas South32 proposes to clear (ERD, 313-314). **The company proposes to destroy 65 confirmed and high potential breeding trees (ERD, 341).** There are no doubt many more actively used and high potential breeding trees that have not been identified. Although surveys and modelling have inferred the presence of a large number of high potential habitat trees, the Biodiversity and Forest Management Plan (Appendix E01) does not indicate what percentage of these will be retained. The potential habitat trees represent a class of trees that are important to retain for the next generation of breeding hollows. As confirmed hollows (generally >200 years old) senesce from age, disease, extreme weather, or fire, these potential trees (within a relatively short period of time) will become the next generation of nesting trees, and extremely important in the succession and survival of the species.

**The number of suitable breeding trees has already been significantly depleted by logging and burning** in the region. This is acknowledged in the ERD (317 and 350-351). The ERD also recognises the high value forest in the Worsley Mine Development Envelope (WMDE) and Bauxite Transport Corridor (BTC) where there are low impacts of past logging and high-quality breeding and foraging habitat for the birds, and where **'16% of trees in these development envelopes [were] assessed as having at least one hollow'** (ERD, 316).

*A Thousand Cuts* explains that: 'All three species breed in hollows of native trees at least a century old. Clearing for bauxite mining removes these trees and no rehabilitated site has native trees anywhere near that old. ... putting nest boxes at all rehabilitated sites for fauna is considered impractical' (page 24).

### Mitigation

Regarding nesting, the ERD states that 10% of breeding trees will be destroyed (ERD, 341) and that 'Trees that are a confirmed Black Cockatoo breeding tree will be marked and temporarily deferred from clearing until the resident individuals have moved from the hollow whereby clearing will again be permitted' (ERD, 353). There is a concern that the agreed number of Confirmed Habitat Trees or High Potential Habitat Trees supporting Black Cockatoo Hollows will be already protected from clearing in designated protected areas within the PAA, and insufficient retention in active mining areas.

Allowing a 10% loss of breeding hollows from clearing - equal to 65 hollows (Appendix G3: Phoenix 2021a) - infers that Worsley accepts a 10% reduction in breeding success in the Indicative Disturbance Footprint (IDF). This is an unacceptable loss for a threatened species which cannot be mitigated through the proposed offset (artificial hollows, see below) due to Forest Red-tailed Black Cockatoos not reliably breeding in artificial nests.

On page 338 of the ERD, the company states that 'persistence of conservation significant fauna in the highly modified environments occurring in the PAA and surrounds (mining and agriculture) suggests a level of adaptability to these conditions and landscapes (BIOSTAT, 2021a). Species in the area have adapted to the fragmented environment and have been recorded in systematic surveys and opportunistically over the years.' This statement belies the species' significant conservation significance, is **unscientific, contrary to the precautionary principle and advice of experts, and reflects a lack of concern and a failure by South32 to acknowledge the implications of its actions on the environment.**

The company proposes an offsets package for Black Cockatoos and claims that rehabilitation constitutes a part of this offset package. It gives rehabilitation a score of 6/10 for Black Cockatoos for foraging, despite evidence that it is only the Carnaby's and Baudin's who use rehabilitation for foraging, and then only after 4 years (ERD, 312). The Red-tailed and Baudin's Cockatoos show a strong preference for high quality forest habitat for foraging, with the Red-tailed Cockatoo in particular 'less likely to be recorded using mine rehabilitated lands' (ERD, 312).

'Although rehabilitated mine sites provide some food resources from four years on there is no evidence that this provides equivalent food resources to the original forest that was cleared. Jarrah and especially Marri are important food resources' (*A Thousand Cuts*, 24).

Elsewhere in the ERD, it is stated there is a time lag of 5-8 years for cockatoo foraging resources to become available (ERD, 258).

None of the species can use rehabilitation for breeding for at least 130 years. See further discussion of offsets below.

### Cumulative impacts

The ERD acknowledges the cumulative loss of habitat for Cockatoos from other mining activities, logging and clearing for agriculture, but only quantifies the total hectares of habitat loss associated with the Boddington Gold Mine and the Worsley Revised Proposal (ERD, 376-377), ignoring other approved and proposed forest clearing, for example for bauxite mining by Alcoa (ERD, 376-377).

The cumulative loss of habitat **that would result from the Boddington Gold Mine and South32 Worsley proposal** would comprise (ERD, 377):

Species	Suitable habitat (ha)	Cumulative clearing (ha)	%
Forest Red-tailed Black Cockatoo	36,162	7,523	21%
Baudin's Black Cockatoo	32,397	6,961	22%
Carnaby's Black Cockatoo	34,997	7,387	21%

Further losses from Alcoa clearing and other impacts including logging and agriculture are not quantified.

### Conclusion

**The company is knowingly planning towards a 10% decline in breeding success for endangered Cockatoos within the PAA. It takes an unscientific approach that is at odds with the precautionary principle and the EPA's objective for this factor when considering Cockatoo habitat impacts overall.**

**All confirmed and potential habitat for Black Cockatoos must be protected from clearing.**

**The EPA should reject the proposal to prevent impacts on these endangered and vulnerable birds.**

### Woylies

Woylies were once widespread across Australia but are now listed as Critically Endangered 'following estimates of a 90% decline in population size between 1999 and 2006' (DBCAs 2017). [woylie\\_fauna\\_profile.pdf \(dpaw.wa.gov.au\)](http://dpaw.wa.gov.au/woylie_fauna_profile.pdf)

Decline and threats to Woylies include habitat alteration directly from land clearing, which has reduced the effective area of habitat that meets all their food and shelter requirements and increases their vulnerability to exotic predators; vegetation change caused by the root pathogen *Phytophthora cinnamomic*, and impacts of climate change, all of which are actual and potential impacts of South32's mining operations (DEC 2012).

South32 openly states that the mine operations emissions alone (without factoring loss of forest stored carbon) will contribute to climate change (ERD, 618-19), which is listed as a threatening process for Woylie in the National Recovery Plan.

Woylies now require particular and active habitat protection for their well-being and survival. Key habitat for Woylies is known to be long-unburnt tall forests and woodlands, which is a habitat in short supply across their range.

Woylies are likely to be associated with the 'larger contiguous forested areas in the PAA' and the company acknowledges that the 'loss of larger stands of contiguous remnant native forest may impact the local population of the species' (ERD, 337).

**South32 proposes to clear up to 2,631 ha of the 4,385 ha (i.e., 60%) of the Woylie habitat identified within the PAA (Appendix E04 Protected Areas Plan, p11).** The estimated 'adjusted impact' (after mitigation measures and in consideration of habitat quality) is 1,857 ha for the Woylie (ERD, 640). The identified 4,385 ha of Woylie habitat in the PAA is shown in Appendix E04 on page 13. Protected Areas Plan (epa.wa.gov.au)

This proposed extent of clearing of this Critically Endangered species' habitat highlights that the hierarchy of considerations that is embedded in State and Federal offsets policy when planning impacts on Matters of National Environmental Significance (MNES) has not been properly applied by South32.

In the first instance impacts to MNES should be avoided with all reasonable efforts made to avoid, then remaining impacts mitigated. The 'residual impacts'—those remaining after all reasonable efforts to avoid and mitigate have been exhausted—can then be offset, in accordance with the rules of the offsets policy. **Clearing of 60% or 2,631 ha of the habitat of a highest conservation category MNES species with a large offset proposed is the result of avoidance measures not being reasonably applied.**

**The company acknowledges that the Woylie is particularly threatened by its proposed clearing and that the loss of larger stands of contiguous remnant native forest may impact the species at a local and even regional level (ERD, 337 and 343).**

## Mitigation

South32s mitigation measures for Woylies, including pre-clearance survey and post mining rehabilitation do not adequately address the risk of impacts. South32 acknowledges that its rehabilitation under 20 years of age is of low mitigation value to Woylies because of their particular habitat needs (ERD, 410).

By way of mitigating impacts, the company proposes not to 'clear more than 2,631 ha of the 4,385 ha of Woylie habitat identified within the PAA as outlined in the Protected Areas Plan' (ERD, 425).

The company further proposes protection of wholly inadequate 'ecological linkages' and there is a specially flagged note in the Protected Areas Plan (Appendix E04, p4) which says that the Protected Areas identified in the plan in Figure 4 may be modified, reduced or removed with approval from the Worsley Environmental Management Liaison Group (EMLG).

As part of pre-clearance surveys to mitigate the high-level impact across 2,631 ha to Woylies, South32 do not propose any targeted trapping and relocation programs.

Recognising the significant residual impact, the company proposes further measures in the form of specific offsets for Woylies including a fenced enclosure (Direct Offset 5) (see below pages 25-26).

The offset of a fenced enclosure proposed for the Collie area is highly problematic for the following reasons:

- The offset does not fully counterbalance the significant residual impact of the proposal and does not represent the preferred "like for like" or at the very least "like for similar" principle in state and federal offsets policy.
- As it contains existing native vegetation, the proposed offset results in net loss of vegetation from the 2,631 ha of

habitat cleared.

- The enclosure site is located on Lot 102 and 100 currently owned by Worsley Alumina, and would not offset or provide local benefit to the area impacted.
- While predator free fenced enclosures are an important conservation tool, there are at least 5 Woylie fenced predator free enclosures already in existence in Western Australia, with more throughout Australia.
- No information is provided on agreements, consultation or suitable recipient sites for translocated woylies, and what agency would be responsible for management of recipient sites and populations
- No details are provided on the long term management of the enclosure, including maintenance cost and maintenance of animals within it.

### Cumulative impacts

The ERD acknowledges the cumulative impacts from other mining activities, logging and clearing for agriculture, but only quantifies the total hectares of habitat loss for Woylies associated with the Boddington Gold Mine and the South32 Worsley Revised Proposal (ERD, 376-377).

The cumulative loss of habitat **that would result from the Boddington Gold Mine and South32 Worsley proposal**, if this clearing goes ahead would comprise (ERD, 377):

Species	Suitable habitat (ha)	Cumulative clearing (ha)	%
Woylie	15,033	3,215	21%

Further losses from Alcoa clearing and other impacts including logging and agriculture are not quantified.

### Conclusion

**The impacts on this critically endangered mammal would be significant. South32 acknowledges that there is potential to impact the Woylie not only at a local level as a result, but also at a regional level (ERD, 377 – 378).**

**The offsets proposed are reflective of the failure to make all reasonable and exhaustive attempts to adequately avoid and mitigate impacts to the Woylie.**

**The company has not met the EPA or EPBC standards and the proposal cannot meet the EPA objective for this factor. The EPA should reject the proposal to prevent potential impacts on Woylies at a local and even regional level.**

### Red-tailed Phascogale

The WA population has contracted to less than 1% of its original range. Up to 84% of the native vegetation in its former range has been cleared for agriculture (Greening Australia).

Red-tailed Phascogales rely on hollows, particularly in Wandoo trees, for nesting and denning, as well as hollows in logs and grass skirts of grasstrees (ERD, 323).

The Threatened Species Scientific Committee’s Approved Conservation Advice states that the main severe threats are loss of habitat to land clearing and salinity, increasing habitat fragmentation, loss of tree hollows (including old growth paddock trees), drought and feral animals (Short and Hide, 2012). The Conservation Actions aim to control

feral animals and restore habitat through management and rehabilitation of woodlands and development of woodland linkages.’ ([DCCEEW 2016](#))

South32 proposes to clear up to 449 ha of the 690.9 ha of Red-Tailed Phascogale habitat identified within the PAA.

The company acknowledges that ‘the loss of nesting hollow trees and fragmentation of habitats due to clearing associated with the **Revised Proposal has the potential to impact the species at both an individual and population level**’ (ERD, 347).

### Mitigation

The South32 ERD states that ‘Impacts at a population level are less likely as suitable habitat will remain in the PAA and surrounding forested areas. It has been observed that the Red-tailed Phascogale appears to have adapted to inhabiting small remnants; an attribute that has allowed it to exist throughout its current range (Short & Hide 2012; Short, Hide & Stone 2011, cited in BIOSTAT, 2021a).’ **This is an irresponsible and unscientific statement at odds with the precautionary principle. Expert advice is that old-growth values, including hollows in very old trees, are key habitat that the species relies on and calls for known populations and habitats to be protected.**

The company proposes offsets for Red-tailed Phascogales and says it ‘will not clear more than 449 ha of the 690.9 ha of Red-Tailed Phascogale habitat identified within the PAA as outlined in the Protected Areas Plan’ (ERD, 425).

### Cumulative impacts

The ERD largely ignores the cumulative impacts on this species.

### Conclusion

**All remaining populations of Red-tailed Phascogales must be actively protected to prevent further declines and provide for survival and recovery of this species which has already lost up to 84% of its original habitat. The potential for the clearing to impact the species at a whole of population level makes the proposal unacceptable.**

**The EPA should reject this proposal.**

### Brush-tailed Phascogale

Like Red-tailed Phascogales, Brush-tailed Phascogales rely on tree hollows, which are scarce in the forests after 150 years of logging, clearing and inappropriate fire regimes. Individual Brush-tailed Phascogales have been recorded in most areas of the PAA, making this particularly important habitat for this species, and clearing of their habitat would have severe impacts.

The ERD says that: ‘...clearing associated with the Revised Proposal **will result in an approximate 40% reduction of suitable habitat within the PAA, with an approximate 17% reduction in the Wider Mapped Area (WMA)**’ (ERD, 347).

‘The loss of nesting hollow trees and fragmentation of habitats due to clearing associated with the Revised Proposal has the potential to **impact the species at both an individual and population level**’ (ERD, 347).

### Mitigation

There don’t appear to be any specific mitigation measures proposed for the Brush-tailed Phascogale in the [Protected Areas Plan](#) or Section 5.3.5 (ERD, 383).

### Cumulative impacts

The ERD acknowledges the cumulative impacts from other mining activities, logging and clearing for agriculture, but only quantifies the total hectares of habitat loss for Brush-tailed Phascogales associated with the Boddington Gold

Mine and the Worsley Revised Proposal (ERD, 376-377).

Species	Suitable habitat (ha)	Cumulative clearing (ha)	%
Brush-tailed Phascogale	28,966	6,501	22

Further losses from Alcoa clearing and other impacts including logging and agriculture are not quantified.

### Conclusion

**The potential for the clearing to impact the species at a whole of population level makes the proposal unacceptable. The proposal cannot meet the EPA objective for this factor and the EPA should reject this proposal.**

### Quokka

Quokkas have been recorded in the PAA in three habitat types: Jarrah/Marri communities, Blackbutt (Yarri) woodlands and Jarrah/Marri/Allocasuarina complexes, which make up approximately 493 ha of the Contingency Bauxite Mining Area (CBME) (ERD, 325).

**Approximately 236 ha of this habitat is planned to be cleared, which is equal to 48% of the Quokkas' habitats in the area (ERD, 349).**

Mainland Quokkas face a particular and significant threat of extinction in the Northern Jarrah Forests with as few as 150 individuals estimated to remain in the sub-population (Aus Govt Species Profile and Bain, 2015).

Bauxite mining is the primary cause of clearing of this threatened mammal's forest habitat in the Northern Jarrah Forest sub-population (*A Thousand Cuts*, 20). The species requires a very particular habitat, they are impacted by fragmentation of their habitats, and are losing resilience and the ability to recover from disturbance (*A Thousand Cuts*, 20).

The Quokka Recovery Plan finds that certain actions occurring in habitat critical to the Quokka's survival may have significant impacts. These actions include: any increase in human activity that leads to degradation of habitat; any significant increase in land clearing that leads to cumulative loss or degradation of available foraging, nesting, feeding, hibernation or migration habitat, and clearing of existing habitat that is to be off-set by revegetation at another location that results in a net loss in the short or long-term (p 17).

### Mitigation

The company acknowledges that rehabilitation is of low mitigation value for Quokkas as anything less than 20 years old will not meet the species' habitat requirements (ERD, 410 and 659). Accordingly, addressing impacts will rely on offsets, specifically the implementation of the Protection Areas Plan (ERD, 349) (see below pages 25-26).

### Cumulative impacts

The ERD largely ignores the cumulative impacts on this species.

### Conclusion

**Any clearing of known and likely habitat and linkages between habitats is contrary to advice of experts and the precautionary principle.**

**This proposal should be rejected by the EPA.**

### Western Ringtail Possum

This critically endangered mammal has been recorded in the Contingency Bauxite Mining Envelope (CBME) and the Refinery Lease Agreement (RLA) area. They are considered likely to be using habitats covering approximately 493 ha of CBME.

The species' Recovery Plan finds that, "**Any habitat where western ringtail possums occur naturally are considered critical and worthy of protection** (p 7). It states: 'The loss and fragmentation of native vegetation cover is identified as one of the principle factors threatening western ringtail populations. This is due to their high dependence on mid-storey and overstorey vegetation for food, shelter and protection from predators. The long-term viability of populations is further compromised by the size of, and connectivity between, habitat remnants' (p 14).

The company's assessment finds that 'approximately 236 ha of potential habitat for the species is located in the CBME IDF. ... **Habitat loss within the CBME may impact this species'** (ERD, 348).

### Mitigation and cumulative impacts

The company acknowledges that its rehabilitation under 20 years of age is of low mitigation value to Western Ringtail Possums because of their particular habitat needs (ERD, 410 and 660). Accordingly, the company proposes specific offsets through the implementation of the Protected Areas Plan (ERD, 348) (see below pages 25-26).

### Conclusion

**There should be no clearing of known and potential habitat, or linkages between habitats, for this critically endangered mammal.**

**The EPA should reject this proposal to prevent potentially severe impacts on this species.**

### Chuditch

The Chuditch Recovery Plan explains that the mammal has disappeared from approximately 95% of their former range in the last 200 years', with habitat reduction being a primary cause ([DCCEEW, 2012](#)). Chuditch are 'most abundant in areas of contiguous Jarrah forest' ([Australian Wildlife Conservancy](#)).

'Chuditch require large areas of intact habitat to survive. Chuditch are rarely found where habitat is severely fragmented by clearing, except as transient animals. Loss and fragmentation of quality habitat for agriculture, residential and mining development has contributed significantly to the decline of Chuditch populations in the south-west of Western Australia. .... clearing is particularly deleterious where: the affected land includes or adjoins riparian habitat (Serena and Sodequist 1989); it creates new gaps in otherwise homogeneous habitat, it leads to progressive fragmentation of habitat, or it necessitates the construction of roads (especially sealed roads) through, or adjacent to, uncleared habitat (Chuditch Recovery Plan 2012, 13-14).

Noting the severe potential impact of mining on Chuditch, the Recovery Plan says: 'The presence of Chuditch has the potential to have an economic impact on development and mining where clearing of Chuditch habitat is proposed. This is becoming apparent in the south-west where extensive mining tenements exist in significant forest habitat. Exploration for bauxite in these tenements has commenced but currently no new mining operations have been approved' (Chuditch Recovery Plan 2012, 16-17).

As stated in the Recovery Plan one of the major threats to Chuditch is land-clearing particularly of riparian vegetation, and the removal of suitable den logs and den sites from Chuditch habitat. Free-ranging populations of Chuditch are now restricted to WA within 5% of their historical range. Also listed as a major threat is predation by

foxes and feral cats and deliberate and accidental mortality including road kills both of which will increase with increased land clearing and mining activities. There have been Chuditch sightings throughout the Worsley Mining Development Envelope.

**The proposed clearing of 4,399ha of native vegetation that provides habitat for Chuditch should not be allowed as it goes against the first recovery action in the Chuditch Recovery Plan to retain and improve habitat critical for survival (DBCA 2021).**

The South32 ERD describes a reduction in the number of Chuditch in recent years and says: ‘This could potentially be due to habitat fragmentation from land clearing associated with agricultural activities and mine operations, and the lack of sufficiently mature rehabilitated areas to support this species, or predation from introduced fauna’ (e.g. cats and foxes) (BIOSTAT, 2021a) (ERD, 321). It goes on to say: ‘Habitat loss, habitat fragmentation and insufficient maturity of rehabilitated areas may impact this species at a local level and potentially at a regional level’ (ERD, 343).

**Clearing associated with the Revised Proposal will result in the loss of approximately 38% of suitable habitat for the Chuditch within the PAA. ... Habitat loss is expected to impact individuals within the PAA’** (ERD, 344). The loss of approximately 38% of suitable habitat for the Chuditch is equal to 2,018 ha.

**‘Impacts at a population level may also occur if suitable habitats become highly fragmented and important movement corridors are lost’** (ERD, 343-44).

### Mitigation

South32 says it ‘will implement a number of mitigation and management measures to minimise potential impacts to the Chuditch as a result of the Revised Proposal (Section 5.3.5), citing the Protected Areas Plan and proposed offsets and suggesting that rehabilitation areas will ‘in time’ provide habitat (ERD, 344 and Appendix L22, S118).

As part of pre-clearance surveys to minimise risk of mortality and injury to Chuditch, South32 does not propose any targeted trapping and relocation despite this being a standard practice for other recent large scale clearing applications for Quoll species - see <https://www.mainroads.wa.gov.au/globalassets/community-environment/environment/construction-reports/marble-bar-road-coongan-gorge-epbc-2017-7880-compliance-report-2020-21.pdf?v=4963dd>

### Cumulative impacts

The ERD acknowledges the cumulative impacts from other mining activities, logging and clearing for agriculture, but only quantifies the total hectares of habitat loss for Chuditch associated with the Boddington Gold Mine and the Worsley Revised Proposal (ERD, 376-377).

The cumulative loss of Chuditch habitat that would result from the Boddington Gold Mine and this proposal would comprise:

Species	Suitable habitat (ha)	Cumulative clearing (ha)	%
Chuditch	35,342	7,429	21%

Further losses from Alcoa clearing and other impacts including logging and agriculture are not quantified.

### Conclusion

**The impacts on this mammal would be unacceptable and the proposal should be rejected by the EPA.**

## Numbat

The numbat is an emblematic, small, unique mammal with its strictly diurnal nature setting it apart from almost all other Australian terrestrial mammals. The species needs large areas of natural woodland vegetation due to their relatively large home ranges and specific foraging requirements, feeding exclusively on termites. Listed as Endangered both at State and National level, fewer than 1,000 individuals currently remain in wild natural populations, most of which occur in Southwest WA. Each remaining subpopulation is of high value for the conservation of the species.

South32 has identified suitable habitat types for Numbats within the PAA as Wandoo woodland (WO) (2,686.6 ha), Jarrah/Marri woodlands on slope (JM) (3,512 ha), Jarrah/Marri/Allocasuarina woodlands on slopes and ridges (JC) (5,208.6 ha), Marri/Jarrah on lower slopes (DL) (437.1 ha) and low eucalypt woodland over low shrubs (ML) (14.1 ha) (ERSD, 260).

**The total suitable area habitat for Numbat within the PAA is therefore 11,858.4 ha. However, no information is given on the area of Numbat habitat that would be cleared aside** from the 4,399ha of total native vegetation proposed to be cleared for the overall expansion.

The national Numbat Recovery Plan lists key threats as habitat destruction, invasive predators and climate change, all of which are activities that are proposed and associated with South32's expansion proposal.

South32 attest that occurrence of a Numbat population within the PAA and nearby forest areas is 'unlikely' and the 'likelihood of a viable population currently existing in and around WMDE is considered low' (BIOSTAT, 2021a)' (ERD, 323). Based on this, South32 has not considered Numbats in targeted surveys, impact assessment, management, relocation planning. Thus, **there is no consideration for avoidance, mitigation, rehabilitation or offsets measures, despite being listed as Endangered under State and Commonwealth legislation as a MNES.**

### Survey effort and method

Despite stating that there has been a significant amount of survey effort in the PAA over many years, there is no evidence of targeted and appropriate Numbat surveys, with the exception of camera trapping undertaken by South32, following a sighting within the PPA in early 2021.

South32 notes that at various times since 1982, searches targeting specific species were undertaken during the projects, however there is no evidence that this includes Numbats.

The only targeted survey for Numbats undertaken in 2021 has gaps in the survey period, including during juvenile Numbat dispersal. Failing to take into consideration seasonality and survey gaps does not meet Targeted Surveys criteria, as defined in the current guidelines for fauna survey (EPA 2020).

While camera trapping methods may detect elusive animals occurring in low densities, the method has not been tested for efficiency for Numbats and if camera trap limitations are overlooked - such as the camera model, height and placement - animal population data from camera trap studies may be inadequate or flawed and can misinform management (Seidlitz et al. 2020). Indeed, current research (Seidlitz et al. 2020) highlights that camera traps are not the preferred methodology for detecting Numbats, as such the high portion of camera trap data (camera days and hours) provided as a basis for precluding numbat presence within the PAA are not entirely relevant.

Current research has shown that sign surveys can be more efficient than driven transects and cameras for Numbats (Seidlitz 2021). Despite this, South32 have not undertaken Numbat sign surveys by skilled and experienced observers, and have only relied on limited camera surveys undertaken in 2021 and other non-target survey data.

### Low detectability

Contrary to statements that Numbats are highly visible and active during that day and thus would have been more

observable within the PAA, Numbats are small and well camouflaged, and difficult to detect. The statement that ‘a high degree of assurance that the very obvious signs of numbat activity would have been identified’ (Appendix G1: *BIOSTAT Pty Ltd Desktop Fauna Assessment, 2021, 88*) contradicts knowledge and research. It is well documented that numbats have low detection rates particularly in low density populations, even when appropriate survey methods are used. For example in transect sampling drive surveys conducted in a semi-arid fenced feral predator-free reserve where visibility and detectability would be greater than in a forest or woodland environment, 10 numbats were observed in 500 km, equivalent to one numbat observed per 50 km (Veira et al. 2007).

Based on one sighting, the dispersal of a numbat from Dryandra to Boddington would represent an extreme and unprecedented dispersal event across a highly cleared and fragmented landscape. The Recovery Plan notes that farmland represents a significant barrier to dispersal and ‘radio-tracking of dispersing numbats has shown that they rarely cross farmland, but often end up in suitable habitat at the edge of cleared land. This evidence indicates that the farmland-forest interface is a barrier for dispersing numbats.’ Since South32’s initial capture on monitoring cameras in April 2021, there have been additional Numbat sightings in the area within 2021, which are not mentioned in the ERD (all recorded on State fauna databases).

### Cumulative impacts

The cumulative impacts of the proposal would be significant for any local and regional Numbat occurrences given the extent of historical and ongoing land clearing, fragmentation and disturbance, with cleared areas accounting for approximately 43% (12,708 ha). Current approvals and operations for mining are contributing to this, for example a large portion of the Jarrah/Marri fauna habitat type has been cleared for approved mining in the southern WMDE (Saddleback area). Other cumulative impacts include effects of a drying climate on feeding resources and pressures from feral cats and foxes, exacerbated by land clearing and fragmentation.

### Mitigation

No assessment of impact, avoidance, mitigation or offset calculations have been provided for the Numbat despite evidence of recent occupation of the PAA and surrounds. No information has been provided on the suitability of proposed rehabilitation for Numbat.

### Threatened fauna management plan including pre-clearance

Despite Numbats being listed as a species that may be considered in addition to those listed within the Threatened Fauna Management Plan that includes the necessity for pre-clearance surveys, no pre-clearance surveys are proposed.

### Conclusions

**For reasons outlined, there is adequate information to indicate that Numbats occur within and/or close to the PAA and as such should be assessed for impacts in South32s proposal.**

**Accordingly, South32 have failed to meet requirements to consider all threatened fauna under the EPA Act and that no approval for mining within the PAA should be given until the impacts on the Numbat as a MNES is addressed.**

### Short-range Endemic Fauna

Short-range endemic (SRE) fauna are highly localised animals. ‘A total of 89 SREs have been recorded in the PAA, including 22 that have been recorded only in the PAA’ (ERD, 328).

The South32 assessment says that: ‘Of the SRE species collected in the surveys [including of the wider area], twenty-eight remained indeterminate ... It is possible that the indeterminate taxa represent any of the collected or

previously collected taxa, or **possibly new taxa**’ (ERD, 328).

Having acknowledged that there may be a number of SRE species in the areas to be cleared that have never before been formally described, the ERD goes on to conclude that, ‘the more ‘common’ or ‘widespread’ SRE taxa can recolonise rehabilitation areas, however, the more cryptic taxa area less likely to disperse naturally and return to such areas (ERD, 328).

**This shrugging of the shoulders about the potential loss of SREs that may exist nowhere else on Earth is completely unacceptable.**

## Offsets

As outlined above, **offsets have been proposed for 8 of the 17 conservation significant fauna species** recorded as having a moderate or high likelihood of occurrence in the PAA and where a significant residual impact is expected.

Offsets sit at the bottom of the mitigation hierarchy and are ‘the least preferred option’ (EPA 2021, 7). To ‘Minimise harm to MNES ... all reasonable measures to avoid and then to mitigate significant impacts [must be employed], and then lastly apply appropriate offsets’ (Samuels 2020, 203).

The effectiveness of biological offsets generally has been called into question. A recent WA offsets review (DWER 2019) found that ‘environmental offsets approved since the release of the [2011] offsets policy have not fully counterbalanced the significant residual impacts of approvals’ (DWER 2019, v). ‘Despite land acquisition offsets, there has been an overall reduction in the area of native vegetation’ (DWER 2019, 19). The review specifically notes for Carnaby’s Cockatoos that the EPA found ‘the high proportion of land acquisition offsets for this species has contributed to the overall reduction in the area of its habitat’ (EPA cited in DWER 2019, 21).

The 2021 *State of the Environment Report* also cites critical findings with respect to biological offsets’ effectiveness: ‘The Australian National Audit Office identified several concerns with increased reliance on offsets to achieve the objectives of the EPBC Act ([ANAO 2020](#)). For example, there is no departmental guidance for reviewing offsets, no quality assurance process for reviewing approved offset plans, no agreed method for estimating averted risk, and no appropriate systems to map offsets for internal or external use.

The effectiveness of offsets is often not evaluated after they are implemented, and it is becoming clear that some types of impacts can be difficult to offset and that the underlying principle of ‘no net loss’ can often not be demonstrated (Gibbons et al. 2018).’

The Worsley Biodiversity Offset Plan focuses on:

**Habitat protection** - ‘protection and enhancement of habitat that is otherwise under threat of clearing or disturbance’ is 25% of the total offset offering (ERD, 631). The target species are Carnaby’s, Baudin’s and Forest Red-tailed Black Cockatoos, Chuditch, Western Ring-tail Possums, Red-tailed Phascogales and Quokkas.

The habitat protection area is 4,175 ha across 13 areas of varying size and 220 ha across 4 areas of varying size (Appendix L01: *Biodiversity Offsets Plan*, 39 and 47) – total of 4,395 ha. (Direct Offsets 1 and 2)

It is important to be aware that the PAA includes a specially flagged note on page 4 that says: The Protected Areas identified in the plan in Figure 4 may be modified, reduced or removed with approval from the EMLG (Appendix E04, 4).

**Ecological restoration** – ‘the re-establishment of native vegetation’ on forest areas cleared for mining (rehabilitation) and already cleared agricultural land – will be 50-55% of the offsets (ERD, 634). The targeted species are Carnaby’s, Baudin’s and Forest Red-tailed Black Cockatoos, Chuditch, Red-tailed Phascogales and Quokkas. The total area of ecological restoration will be 5,151 ha (Direct Offsets 1, 2 and 3).

**Ecological restoration for habitat has significant time delays. For foraging and roosting habitat for black cockatoos**

**this is between 6 to 8 years after vegetation establishment: for breeding habitat for black cockatoos the delay is >100 – 200 years** (ERD, 635 and Appendix L01: *Biodiversity Offsets Plan*, 40). For Chuditch a conservation benefit takes 10 years, for Quokkas up to 20 years (Appendix L01: *Biodiversity Offsets Plan*, 40).

**Installation of artificial hollows** for breeding habitat for black cockatoos and some further measures, such as creating linkages between nesting and feeding areas (ERD, 635). There are 200 in number (ERD, 640). (Direct Offset 4)

**Woylie conservation actions** – establishment of an additional ‘insurance’ population’ in a fenced, predator enclosure ‘within a dedicated conservation reserve’ (ERD, 635 and 638). Expected area is 3,586 ha (ERD, 640). The aim is a ‘net gain of at least 40 individuals’ (Appendix L01: *Biodiversity Offsets Plan*, 33). (Direct Offset 5)

The 5 Direct offsets are described at ERD, pages 636-7.

## Conclusions

The proposal would have profound impacts on fauna and it cannot meet the EPA objective for this factor to protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

South32’s mitigation proposals including rehabilitation, insufficient ecological linkages, nest boxes and a remote enclosure for Woylies are wholly insufficient and cannot adequately protect the impacted fauna.

The proposed clearing would occur within a broader landscape that has been subject to extensive fragmentation as a result of cumulative logging and clearing for existing mining operations, agriculture and plantations.

Further clearing and fragmentation of the landscape would further degrade habitat and result in an increase in predation as fauna move between fragments.

The loss of habitat and increase in fragmentation that would occur if this proposal is granted is expected to result in localised impacts to individuals and populations and, for a number of the species, there is potential for these impacts to be at a regional and even population level.

The South32 proposal fails to make all reasonable efforts to avoid impacts on fauna species (eg Protection areas), and the remaining impacts have not been adequately mitigated. As a result, the ERD relies heavily on offsets for conservation significant species, which are known to be problematic and only a last resort option.

**The reliance on unproven biodiversity offsets to address the significant environmental impacts on 8 conservation significant fauna – half of them listed as endangered or critically endangered – is unacceptable and the EPA should reject the proposal.**

## Alternative proposal to improve outcomes for the environment

**The proposal should be rejected.**

**And, at the very least: All forests, woodlands, shrublands and heaths in the Primary Assessment Area (PAA) must be protected from clearing and conditions must be imposed to ensure that these Protected Areas are not disturbed by clearing or impacted by increased spread of weeds or disease, groundwater or surface water alterations, or dust.**

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## TERRESTRIAL ENVIRONMENTAL QUALITY

### EPA OBJECTIVE: TO MAINTAIN QUALITY OF LAND AND SOILS SO THAT ENVIRONMENTAL VALUES ARE PROTECTED.

The proposal would have significant impacts on soil and water, particularly through erosion, compaction and contamination.

South32's ERD fails to provide adequate data and information on this factor.

It does not provide the contamination records from hydrocarbon and chemical spills and leaks or the erosion record of current operations. It cites unpublished research without providing supporting data on relevant matters, and it provides no research citation on some impacts such as deep ripping to address soil compaction. It also fails to account for the loss of soil carbon resulting from clearing.

The ERD describes the soil systems and subsystems in the PAA (ERD, 434 and 436-7).

Key potential environmental impacts are listed (ERD, 449) and then assessed as follows:

- **Erosion** by wind and water leading to topsoil loss, poor soil structure, reduced water infiltration and loss of soil health.

Erosion risks for different topographies and soil types are discussed but not the erosion record in current operations (ERD, 449-50).

- **Soil health** is recognised by the company as being 'important for biological and chemical processes and the resilience of flora and fauna ecosystems. It is largely controlled by microbial activity and soil carbon compositions' (ERD, 443).

However, the ERD says that 'most soils within the PAA are at 'high' risk of structural decline through **subsurface soil compaction**: in the Contingency Bauxite Mining Envelope the risk is greater (Appendix H1: GHD 2020d, 37).

Compaction is said to be addressed by deep ripping prior to returning overburden and topsoil (ERD, 450) but this is a post facto measure and there is no research cited as to the impacts of deep ripping on soil structure and health.

The assessment of mining impacts on soil health cites unpublished research from the University of WA without providing the data on rehabilitated areas which were formerly forest (ERD, 443 and 450). The ERD claims that soil carbon will increase in forest rehabilitated areas over time but bases this on a comparison of mined and unmined pasture sites, not forests and rehabilitation sites (ERD, 450).

- **Salinisation** of soils leading to vegetation death and decreases in water quality. This is assessed by the company as 'low' risk, 'based on published mapping and the recorded geological profile' (ERD, 450). Rises in water table levels may lead to salination of watercourses (ERD, 451, see Inland Waters).
- **Contamination** of land and soil through hydrocarbon fuel and chemical spills and leaks. This is recognised to occur in current operations. The company says it is 'not expected to increase' (ERD, 451). Spills and leaks are said to be monitored and managed and there is no data provided as to the record of this type of soil contamination. Management plans to address this risk are on page 458.
- **Acid sulfate** soil disturbance leading to land and soil contamination. The risk is assessed by the company as 'extremely low' and 'low' for mining areas but 'high' for watercourses – for example the Hotham River which will be subject to infrastructure crossings (ERD, 452, Appendix H1: GHD 2020d). Management plans to address this risk are on pages 456-58.

Soil and groundwater contamination remediation processes are not outlined (Appendix E05: *BBM Closure Plan* Appendix E, 182).

The environmental degradation resulting from the company's rehabilitation deficit is not specifically considered

under this factor. There are large parcels of cleared land that are not being rehabilitated on schedule and it is likely that this is causing a reduction in terrestrial environmental quality over time.

### **Conclusion**

**The ERD provides little to no information by which an assessment of current practices can be made.**

**The company says it expects that the risks of significant potential environmental impacts for land and soils will not change from current mining and refining operations. However, it is expected that with expansion of the mining operation there would be increases in erosion, chemical spills, loss of carbon and a reduction in the overall soil health within the PAA.**

**The assessment of impacts on soil health is especially thin, despite acknowledging its importance for biological and chemical processes and the resilience of flora and fauna ecosystems. Notably, there is no assessment of the environmental impacts in relation to carbon sequestration.**

**The company's assessment on this factor is insufficient for the purposes of a Public Environmental Review. The proposal cannot meet the EPA's objective for this factor and should be rejected.**

## INLAND WATERS

**EPA OBJECTIVE: TO MAINTAIN THE HYDROLOGICAL SYSTEMS AND QUALITY OF GROUNDWATER AND SURFACE WATER SO THAT ENVIRONMENTAL VALUES ARE PROTECTED.**

### Surface Water

Most of the PAA is in the Hotham-Williams subsystem of the Peel Harvey Catchment. Only 7% of the waterways in this subsystem are in good or near pristine conditions.

The proposal would impact the Hotham and Williams Rivers (directly), the downstream environments of the Murray River Catchment (regionally) and the Peel-Yalgorup System, recognised as a Wetland of International Importance under the Ramsar Convention.

Direct impacts of the proposal on waterways include:

- erosion of riverbanks and scouring of streams
- changes to the water balance in Water Dependent Ecosystems
- increases in salinity due to cumulative clearing impacts
- sedimentation and turbid waters through clearing impacts
- waterway contamination from spills or storm water runoff from clearing areas
- altered flow regimes and water quality causing impacts to aquatic fauna and overall waterway health.

The proposal would also involve three new crossings over the Hotham River. This would cause disturbance to riparian areas and likely increases in turbidity and pollutants entering the river system.

### Groundwater

The ERD acknowledges that declining rainfall means groundwater levels are falling in undisturbed areas, although are generally stable in agricultural areas. Company-commissioned modelling shows that after clearing for bauxite mining ‘generally **groundwater level rises at 5 meters above the pre-mining groundwater table elevations, however, some areas of up to 10 meters elevation are noted**’ (Appendix I1: GHD 2020a, 37). After rehabilitation, the modelling predicts that the groundwater mound dissipates to within 1 m of pre-mining levels over 5 to 30 years, ‘but the recovery may be longer in areas where hydraulic gradients are flat and mining areas are extensive’ (Appendix I1: GHD 2020a, ii and 38).

The ERD recognises: ‘For vegetation species that are not tolerant to rapid changes in water regimes, or are not tolerant of extended periods of waterlogging, there may be a shift in vegetation community structure. Increased soil moisture may also lead to opportunistic establishment or promote the spread of pathogens, such as Phytophthora [dieback] species’ (ERD, 512). This risk is generally greatest in lower topographical areas.

Whilst the ERD presents rehabilitation as a mitigation strategy, there is **no modelling of the actual impacts of rehabilitation on groundwater flows and levels and no mention of the known impacts thirsty rehabilitation has on surrounding forests through competition for water**. The ERD also fails to address directly how removing the bauxite regolith down to bedrock or clay levels (and replacing with overburden and topsoil) alters the ground hydrology.

Further, there has been minimal groundwater monitoring over the whole time of the company’s mining operations (Appendix I1: GHD 2020a, 47, Appendix B). There are no bores reported to have been monitoring water level and salinity throughout. The first six bores measuring water level and salinity were not constructed until the mid-1990s, a decade after mining commenced.

Most of the modelling datasets only commenced in the mid-2000s, with a total of only 23 datasets monitoring mining impacts to 2016 and only one of them in the currently mined area of 55 km<sup>2</sup>. The minimal amount of monitoring to calibrate the modelling casts serious doubt on its accuracy.

### Groundwater abstraction

Groundwater extraction is proposed to **increase from 500 ML/a to 900 ML/a**, primarily for use in dust suppression (ERD, 21). Additional modelling predicts the increased abstraction will partly counter the water table impacts from clearing by lowering levels and reducing baseflow to the Hotham River (Appendix I2: GHD 2020b). **The ERD acknowledges the increased groundwater abstraction 'has the potential to cause localised drawdown, which may affect vegetation' (ERD, 225)**. But the assessed impact of existing and increased abstraction is only theoretical, based on modelling.

Company-commissioned modelling documents 25 abstraction bores (Appendix I1, Appendix A, Table A1), however, Figure 5-51 (ERD, 489) shows a further 9 bores north of the Hotham River. There is no information as to when these became operational, whether they are still operational and what their drawdown is.

Concerningly, ten of the 25 abstraction bores in the current bauxite mining area are located on streamlines and at locations of groundwater dependent ecosystems. Many of the additional 9 abstraction bores north of the Hotham River are similarly located. One of the few monitoring bores (M05) adjacent to an abstraction bore (M01/11) shows groundwater level fluctuations of 5-7 m between 2012 and 2016, likely due to groundwater abstraction. There is no explanation for why groundwater dependent ecosystems are being exposed to these impacts.

South32 is not required to obtain a water extraction licence for the additional bores as they will not be in areas covered by the Rights in Water Irrigation Act (ERD, 21). Hence, the additional groundwater abstraction will be outside regulatory scrutiny for 'the sustainable use and development of water resources, protection of their ecosystems and the environment in which water resources are situated' (RIWI Act).

### Cumulative impacts of groundwater abstraction

South32's ERD states that the 'mine is considered sufficiently separated from other developments' for cumulative impacts to be unlikely. The stated exception is the possible 'localised' 'overlap' with the Newmont Boddington gold mine in the northern portion of the WMDE (ERD, 228 and 705). However, 'Modelling undertaken for the Newmont Boddington Gold Life of Mine Extension Project predicted that, at the time of completion of mining in 2041, the modelled 5m drawdown contour in the upper bedrock will extend approximately 8 km east and west of the mine, 10 km north and 6 km south' (ERD, 228). Assuming an average 8 km radius, this is approximately 200 square km, which is hardly 'localised.'

The Boddington Gold Mine groundwater drawdown area includes a 10 km reach of the Hotham River, the whole of the 34 Mile Brook/Wattle Hollow Brook streamlines and their Water Dependent Ecosystems, as well as a very large area of forested land. The company-commissioned modelling does not document the minimum groundwater levels expected or likely impact on surface water flows in the PAA.

There is no additional water for **refinery operations** as the refinery will maintain the same production rate of 4.7 Mtpa.

### Groundwater dependent ecosystems (GDEs)

GDEs are primarily located within lower topographic areas where vegetation accesses the groundwater table and/or drainage lines with surface water (Appendix I1: GHD 2020a, i).

The company-commissioned modelling report states: **'There is insufficient information with which to assess the**

**impacts to the GDEs**, given that the groundwater level changes at the GDEs are not well understood (monitoring bores generally absent) and that the tolerance of the GDEs to increasing groundwater levels and changes in quality are also not well understood' (Appendix I1: GHD 2020a, ii).

The modelling 'shows that the predicted **groundwater mound is spatially extensive and underlies the majority of the GDEs** which have been mapped within the WMDE (and BTC). The sensitivity, or the tolerance of the GDEs to changes in groundwater levels and any associated water quality is yet to be defined. Nevertheless, where the depth to groundwater is shallow (up to 2 meters below ground level) the GDEs ... have been assigned as relatively "high-risk" areas of concern'. Given GDEs are 'commonly located in areas where the depth to groundwater is shallow ... **the majority of the GDEs are deemed as high-risk areas of concern ... [and] are likely to require management to address potential mining related impacts**' (Appendix I1: GHD 2020a, ii).

## Conclusions

**South32 has failed to adequately address the impacts of increased water use and further clearing, mining and groundwater abstraction in a drying landscape. The region has been identified by the IPCC as an ecosystem at risk of climate collapse or ecosystem transition. Most concerning is the lack of long-term monitoring that would allow the modelling to be accurately calibrated: something the company's commissioned consultant considered was an issue. The lack of monitoring was not just in groundwater dependent ecosystems, but across all mining areas and includes both monitoring of groundwater levels and salinity and of changes to surface water flow and water quality over the life of mine.**

**In addition, the company has failed to consider the impacts of taking nearly 1 billion litres of water every year from this already drought-prone, at-risk environment. And it overlooks the additional evapotranspiration from rehabilitation and the implications for the surrounding forest.**

**The impacts on inland waters, vegetation and groundwater dependent ecosystems would be unacceptable and the EPA should reject this proposal.**

## SOCIAL SURROUNDINGS

### EPA OBJECTIVE: TO PROTECT SOCIAL SURROUNDINGS FROM SIGNIFICANT HARM.

South32 proposes to minimise physical impacts to known Aboriginal and European heritage locations, amenity, economic impacts and human health, yet it is clear that there will be significant impacts in at least several of these areas.

### Aboriginal Heritage

The ERD is inconsistent in the number of Aboriginal sites that will be impacted and it does not adequately respond to locally identified Aboriginal cultural values.

The ERD notes that, while the company will 'Minimise physical impacts to known Aboriginal and European heritage locations,' it acknowledges that there will be significant impacts: 'it is known that three Aboriginal heritage sites will be impacted by the construction of the river crossings' (ERD, 595). The cumulative impacts on Aboriginal Heritage in the area are not adequately assessed. A number of remaining Aboriginal heritage places are classified as 'not a site' and therefore excluded from assessment and protection under the Aboriginal Heritage Act (ERD, 571). But this is an example of cumulative impact that the proposal would exacerbate, yet this is not acknowledged. The record of consultations with Traditional Owners indicates they did 'not support any of the proposed haul road and bridge crossings that will impact upon the river' but advised 'that *if the works are to proceed*' then there are mitigation measures that can be taken (Appendix C, *Consultation Summary*, 23, emphasis added). It appears Traditional Owners were presented with the *fait accompli* of works and were only able to advise on the measures to mitigate damage.

Alternative proposals that avoid these significant heritage and cultural sites have not been adequately investigated and the impacts of their loss on communities would be significant.

### Non-Aboriginal Heritage

The ERD acknowledges the importance of protecting natural and historical heritage but does not give sufficient attention or commitment to addressing the expected heritage impact.

### Tourism, recreation and economic impacts

#### Tullis Bridge

Tullis Bridge is within the Indicative Development Footprint (IDF) which is highly valued by both the Aboriginal and non-Aboriginal community for heritage, as well as for amenity reasons. No community offset is suggested to compensate for the impact on the Tullis Bridge, particularly for the Aboriginal community.

#### Hotham Valley Railway

The Hotham Valley Railway is an important tourist attraction in the Peel region. The protection measures proposed for the Hotham Valley Railway are not sufficient and require additional consideration of the current and potential future uses to propose adequate protection measures for preservation of railway heritage and economic opportunities.

South32 proposes to build an overpass over the railway to minimise impact to the railway itself. However, the current use of the railway as a nature walking track would be severely impacted by an overpass haulage route. This proposal would prevent the preservation of important heritage values in the area and severely limit the future economic potential of a tourist rail route.

## **Bibbulmun Track**

The Bibbulmun Track is an important State heritage asset with environmental and social values. There is inconsistency in the proposal with regard to the impact on the Bibbulmun Track. On page xxxvii, the ERD states: 'There will be no disturbance to the Bibbulmun Track, with a 100m buffer applied to protect visual amenity.' Yet on page 608, the wording is: 'A 1.1 km section of the Bibbulmun Track may be indirectly impacted in the long term (more than 10 years).' This raises the possibility of realignment of the Bibbulmun Track. It is not clear if this may occur due to mining operations or other processes. However, this does not build confidence in the original statement that there will be 'no disturbance' to the Bibbulmun Track.

## **Sensitive landscape receivers**

EPA guidance for separation of land uses, although not strictly applying to heritage sites, does provide space for the identification of additional sensitive 'land uses which require high levels of amenity or are sensitive to particular emissions' (EPA, 2005). Buffers for blasting and other activities associated with extractive industries are determined on a case-by-case basis but are identified as contributing noise, dust and risk impacts, all of which would have negative impacts on users of heritage sites such as Tullis Bridge and the Bibbulmun Track. The rehabilitation deficit noted in the ERD (page 103) is particularly concerning given social and environmental impacts.

## **Visual impacts**

The proposal notes that the viewpoints selected for inclusion in the Visual Impact Assessment were selected in consultation with DBCA and the EPA. It is not clear if the local community has been included in this process as major stakeholders. The community should be involved in decisions regarding what constitutes a sensitive interface and the avoidance and mitigation measures required to safeguard these.

The current practices for removal of vegetation do not in all instances maintain buffers along public and other major roads or sensitive interfaces.

The cumulative impact on aesthetic value has not been given consideration.

## **Noise**

There are gaps with regard to South32's noise regulation compliance planning and mitigation processes. The proximity of proposed construction areas (for haul roads and associated bridgeworks) to recreational sites and Tullis Bridge are likely to have significant impact on the community. This site is more likely to be used on weekends and outside of working hours. It is therefore important to understand the management measures South32 is proposing at these times.

## **Dust**

Main sources of dust are clearing operations, blasting and haul roads. The proposal is inconsistent on the likelihood, decision-making process and management for haul roads.

The ERD states: 'It is likely that the majority of the haulage routes will utilise existing mine haul roads within the WMDE' (ERD, 25). It is not clear what 'the majority' refers to and what length of new haul roads are expected to be developed and the impact this will have on vegetation clearing, dust, noise etc. The ERD (page 35) also notes that the BTC area is large considering the identification of two feasible haul roads routes already and a relatively small proposed site for the crusher.

## Conclusion

The company does not adequately address the proposal's significant impacts on social surroundings. There are gaps and inconsistencies in the assessment and mitigation efforts are deficient.

The company's assessment on this factor is insufficient for the purposes of a Public Environmental Review.

The proposal cannot meet the EPA's objective for this factor and should be rejected.

## References

EPA (2005). *Guidance for the Assessment of Environmental Factors: Separation Distances between Industrial and Sensitive Land Uses* [https://www.epa.wa.gov.au/sites/default/files/Policies\\_and\\_Guidance/GS3-Separation-distances-270605.pdf](https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/GS3-Separation-distances-270605.pdf)

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## AIR QUALITY

### EPA OBJECTIVE: TO MAINTAIN AIR QUALITY AND MINIMISE EMISSIONS SO THAT ENVIRONMENTAL VALUES ARE PROTECTED.

The air quality implications of South32 Worsley's proposal are significant. Mining, transport and alumina refinery operations cause air borne emissions of dust, toxins and combustion products that have the potential to cause serious health impacts, including cancer and silicosis, as well as the amenity and visibility issues associated with dust.

The South32 ERD downplays the impacts of its proposal on health, amenity and visibility issues for the local communities.

While the South32 website says that the 'potential health risks at our workplace include potential exposure to carcinogenic substances (silica, diesel particulate matter, nickel, and coal tar pitch volatiles), and other airborne contaminants (coal dust, fluoride, lead and manganese dust), the ERD does not address these issues and overlooks the potential impacts on surrounding communities.

Complaints from the local communities about visible dust and possible health effects are barely acknowledged.

The ERD outlines in general terms that particulate matter of varying sizes are 'associated with amenity or visibility issues;' 'can enter the respiratory tract and remain suspended for many days in the atmosphere,' and 'are potentially associated with human health impacts, and can remain suspended in the atmosphere for months to years' (ERD, 535).

Toxics are not included in the Air Quality Monitoring. This is a significant shortcoming of the AQM given the known risks from mercury in crushed bauxite ore, the freshwater contamination of mercury at the mine site, and the range of other air toxics emitted in bauxite mining and refining.

Uncontrolled dust could impact the environment by physically smothering vegetation and/or by introducing chemical risks, eg, from toxics (mercury and other contaminants) or other polluting compounds (NOx, SO2).

The risks to the surrounding forest are not effectively measured through the air quality standards applied which are informed by human health criteria, and the risks to the environment from dust are downplayed and should take into account residual impacts, alongside any cumulative impacts.

There is reliance on buffer zones for dust management (for dilution) rather than active dust minimisation or control.

**The processes of an alumina refinery are highly polluting with typical pollutants including mercury, VOCs, GHGs, fluoride, benzene, acetaldehyde, formaldehyde and SO2. The Worsley refinery is old and in need of technological upgrade, both to its fuel source and its emissions controls.**

### Sources of air pollution

The ERD outlines (on pages 535-536) the largest sources of dust resulting from the operations and provides a summary of emissions estimates from dust generating activities in Appendix J1 (ETA, 2020a).

The potential impacts that may occur to air quality from implementing the Revised Proposal are:

- Generation of particulates from mining activities, including material handling, vehicle and machinery movement and wind erosion to the local airsheds and sensitive receptors
- Generation of particulates from refining activities, including the disposal of bauxite residue
- Emissions of combustion products associated primarily with earthmoving and blasting activities' (ERD, 539).

'The contribution of estimated PM10 emissions at the BBM shows that wind erosion is the single largest contributor (50%), followed by ore processing (28%), wheel-generated dust on haul roads (21%), mining activity (1.8%) and drilling/blasting (0.2%)' (ERD, 536).

'The results of the NOX and CO emissions estimates for the WMDE and BTC show that fuel (diesel) combustion emissions from haul trucks are the single largest contributor to NOX emissions (approximately 198 tpa), and blasting is the single largest contributor to CO emissions (approximately 126 tpa). A summary of the NOX and CO emissions estimates by source are provided in Appendix J1' (ERD, 538).

'The 2018 inventory showed that material air emissions from the Refinery include CO, SO<sub>2</sub>, NOX, particulates, odour and volatile organic compounds' (VOCs) (ENVALL, 2018) (ERD, 538).

## Mitigation

South32 engaged a consultant to conduct a 'benchmarking assessment' of its activities against 'current leading practices.' The consultant (ETA) found some 'notable points of departure from leading practice' at the 'Saddleback secondary crusher and stacking at Saddleback, where high dust emissions were observed on site' (ETA, 2020b) (ERD, 550-51).

It also found that there other mining processes where 'improvement is possible' include:

- Land clearing/topsoil removal
- Loading (front end loader)
- Haul road dust suppression
- Stacking at Marradong
- Open areas across the mine (with the exception of Marradong) (ERD, 550).

'The improvements identified were related to minimising the time between clearing and rehabilitation (to reduce the large open cleared areas which present high risk of wind erosion), reducing water truck deadtime and water load loss, reducing drop heights and tramming of front end loaders.'

The ERD finds as a result of this assessment that 'there are potential opportunities for improvement, including wind shields, water sprays or enclosures. Worsley Alumina will consider these recommendations for improvement in future maintenance planning of the crushing and stacking facilities' (ERD, 551).

## Cumulative impacts

The ERD acknowledges that, 'The release of combustion products associated with the continuation of mining activities relevant to this Revised Proposal will result in the continuation of pollutants being released into the atmosphere. These emissions will contribute to cumulative impacts in the local and regional airsheds associated with the Primary Assessment Area (i.e. Collie airshed, Boddington airshed and South West regional airshed). In high concentrations, combustion products also have the potential to cause human health effects, as reflected by the Air NEPM Human Health Criteria' (NEPC, 2016) (ERD, 546).

## Conclusion

**The ERD is not adequate for the purpose of a Public Environmental Review. The potential exists for serious human and environmental health impacts to be exacerbated and for new impacts to occur as a result of this proposal.**

**The EPA should reject the proposal and require an in-depth, transparent assessment of the risks to be carried out.**

## GREENHOUSE GAS EMISSIONS

**EPA OBJECTIVE: TO REDUCE NET GREENHOUSE GAS EMISSIONS IN ORDER TO MINIMIZE THE RISK OF ENVIRONMENTAL HARM ASSOCIATED WITH CLIMATE CHANGE.**

Alumina refining is WA's second most carbon polluting industry, emitting almost twice the volume of carbon dioxide than coal-fired power stations in the State.<sup>4</sup>

South32 Worsley's ERD acknowledges that the proposal would cause the emission of **269.85 million tonnes of CO2e over 15 years**. This would be made up of 43.35 Mt CO2e Scope 1 and 2 emissions (if planned emission reductions are achieved), and 226.5 Mt CO2e Scope 3 emissions.<sup>5</sup>

### Major sources of emissions

Burning coal and gas to produce steam for the refining of bauxite into alumina is the largest source of operational emissions (Scope 1 and Scope 2).<sup>2</sup> Bauxite mining accounts for 3% of total operational emissions, largely from diesel fuel consumption for transport (App E10: GHG Management Plan, 2022, 5-7).

Clearing and decomposition of cleared vegetation accounts has been estimated by the company as 15,200 tonnes of CO2e per annum, or 228,000 tonnes of CO2e over 15 years (App E10, 6)<sup>6</sup>. However, actual emissions appear to be significantly higher, based on the area of land cleared over the last ten years and assuming above and below ground carbon of 300 tonnes of CO2e per hectare. Assuming all above and below ground carbon is ultimately emitted to the atmosphere, on average over the last 10 years the release of carbon from land clearance for mining would be around 100,000 to 115,000 tonnes of CO2e per year, or 1.5 to 1.7 Mt CO2-e over 15 years. **Processing of sold products** is the largest source of Scope 3 emissions (Appendix E10, 7).

### Mitigation

South32 aims to achieve net zero operational (Scope 1 and Scope 2) GHG emissions by 2050 (ERD, 614). This would involve its business-as-usual total operational emissions of 56.1 Mt CO2e being reduced – at best – by 12.75 Mt CO2e (ERD, 616) to a total of **43.35 Mt CO2e over 15 years**. In addition, **Scope 3 emissions would 'be in the order of 226.5 Mt CO2e'** (ERD, 616, Appendix E10, 7).

The company says that its emissions reduction is expected to be achieved by switching from coal to gas and then potentially other low carbon fuels. **This planned switch from coal to gas will reduce South32 Worsley's CO2 emissions but ignores the methane emissions from gas production.** Over a 20-year time frame, methane has about 80 times more warming effect than CO2.

Use of renewables to produce steam is said to be challenging, requiring 'a fundamental change' to the refinery's infrastructure and 'a significant expansion of the south-west energy grid' (ERD, 616, Appendix E10, 19).

Worsley has trialed the use of biomass from forestry operations as a fuel source in the multi-fuel cogeneration boilers since 2018. Volumes were expected to reach 'in the order of 200,000 bone dry metric tonnes per year.' While considered technically feasible, the company says that supply is an issue. Burning biomass for energy is highly carbon polluting, and when it comes from native forests, the broader climate and biodiversity impacts are profound. The ERD says that there will be no use of biomass if the boilers are converted to gas (Appendix E10, 19). If the company is

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<sup>4</sup> <https://www.abc.net.au/news/2022-06-16/closing-coal-plants-only-part-of-the-answer-say-scientists/101149050> and <https://www.cleanenergyregulator.gov.au/>

<sup>5</sup> Scope 1 emissions arise directly from the company's operations, Scope 2 emissions are from the associated consumption of non-renewable energy sources, and Scope 3 arise from downstream activities, eg the processing of alumina into aluminium by another company.

<sup>6</sup> The source of these numbers is an unpublished, unavailable report.

not able to reach interim 5 yearly targets, it may resort to carbon offsets (of an unspecified nature) (ERD, 622).

## Context and comparisons

**The South32 Worsley refinery has comparatively high GHG emissions intensity (emissions/t alumina): about 50% higher than the average for the Alcoa refineries in WA.** The company claims that its GHG intensity is about 16% higher than other Australian refineries, however, this has not been able to be verified. According to the company, this is largely due to its use of coal rather than gas (ERD, 617, Appendix E10).

While coal consumption in WA decreased over the last decade by about 10%, coal use by Worsley refinery has remained steady, and over the last 5 years accounts for about 25% of the State's coal use (Climate Analytics, 2022). With the announced retirement of coal power stations by 2030, the fraction of the state coal use consumed by the Worsley refinery will continue to increase.

In other words, **the Worsley refinery will become a major drag on State efforts to move away from coal and will continue to rely on burning fossil fuel gas into the future.** The company says that using renewables in refining will be 'a challenge.'

South32's bauxite mining emissions intensity is comparable with Alcoa's Willowdale Mine and lower than the Australian average, but this reflects haul distances rather than fuel efficiencies (ERD, 618).

South32 mentions its share of WA's total GHG emissions was about 4.5% in 2021 (ERD, 710), but not the cumulative amount from the bauxite/alumina industry - calculated at 11% (Climate Analytics, 2022). In nearly 15 years to 2019, the WA bauxite/alumina industry emissions have been fairly constant and show little or no sign of decreasing. Hence it needs to greatly accelerate emissions reductions if it is to contribute to meeting the national target (Climate Analytics, 2022).

## Impacts

Unlike air pollutants under Air Quality, GHGs are not localised: they are regional and even global pollutants and have long-term atmospheric and environmental impacts. This means, while it is hard to attribute direct environmental impacts from Worsley's GHG emissions, it is essential the proposal be evaluated in terms of its contribution to State and national GHG abatement goals and, most importantly, in relation to achieving the Paris Agreement goal of limiting global warming to 1.5 degrees Celsius.

The company admits its emissions contribute to 'chronic and acute physical impacts in the south-west of Western Australia' that 'impact the health and resilience of ecosystems, habitats and species' and will 'affect the efficacy of existing and future mitigation activities' (ERD, 618-19).

WA has a serious problem, with carbon emissions continuing to rise and a lack of action by Government or regulators to prevent private industry from developing climate-wrecking projects.

## Conclusion

**WA's GHG emissions already exceed the level required to support the Paris Agreement. Hence, WA must cut its emissions more steeply than other States in the future. If the proposal is approved, it will be much more difficult for Western Australia to reduce carbon emissions and meet national targets and the recognised environmental impacts from climate change will be severe.**

**The EPA should reject this proposal.**

## References

Climate Analytics (2022) Personal correspondence.