

Have your say on Alcoa's forest mining expansions

WA FOREST ALLIANCE SUBMISSION GUIDE



Alcoa's Pinjarra Alumina Refinery Revised Proposal (Assessment 2253)
& Bauxite Mining on the Darling Range for 2023-2027 (Assessment 2385)

Deadline for public submissions: 21 August 2025

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Proposals by Alcoa to clear nearly 11,500 ha of the Northern Jarrah Forest (NJF) for bauxite mining are now under assessment by the Environmental Protection Authority (EPA). It is critical that the EPA hears from people who are concerned to stop this clearing and protect the NJF.

**Submissions are due by
21 August 2025.**



This guide has been prepared by WA Forest Alliance with support from the End Forest Mining Alliance and independent experts.

We have summarised key environmental concerns with the Environmental Review Documents (ERDs), but the more that you are able to include your own personal concerns, evidence, suggestions and additional information, the better.

Please don't delay in getting your submission in. Pass this guide on to friends and family and encourage them to also make a submission.

WHAT IS ALCOA PROPOSING TO DO?

Alcoa is a US-owned mining company that has been operating in WA since 1961 under a State Agreement with the WA Government. This Agreement has meant that most of Alcoa's operations, including already clearing over 28,000 ha of forests, have been approved behind closed doors. **This is the first time in over 60 years that the public have the opportunity to have their say on the company's mining operations.**

The EPA is assessing Alcoa's Pinjarra Alumina Refinery Revised Proposal (Assessment 2253) and Bauxite Mining on the Darling Range for 2023-2027 (Assessment 2385). When referring to both, we will use the term 'the Proposals'.

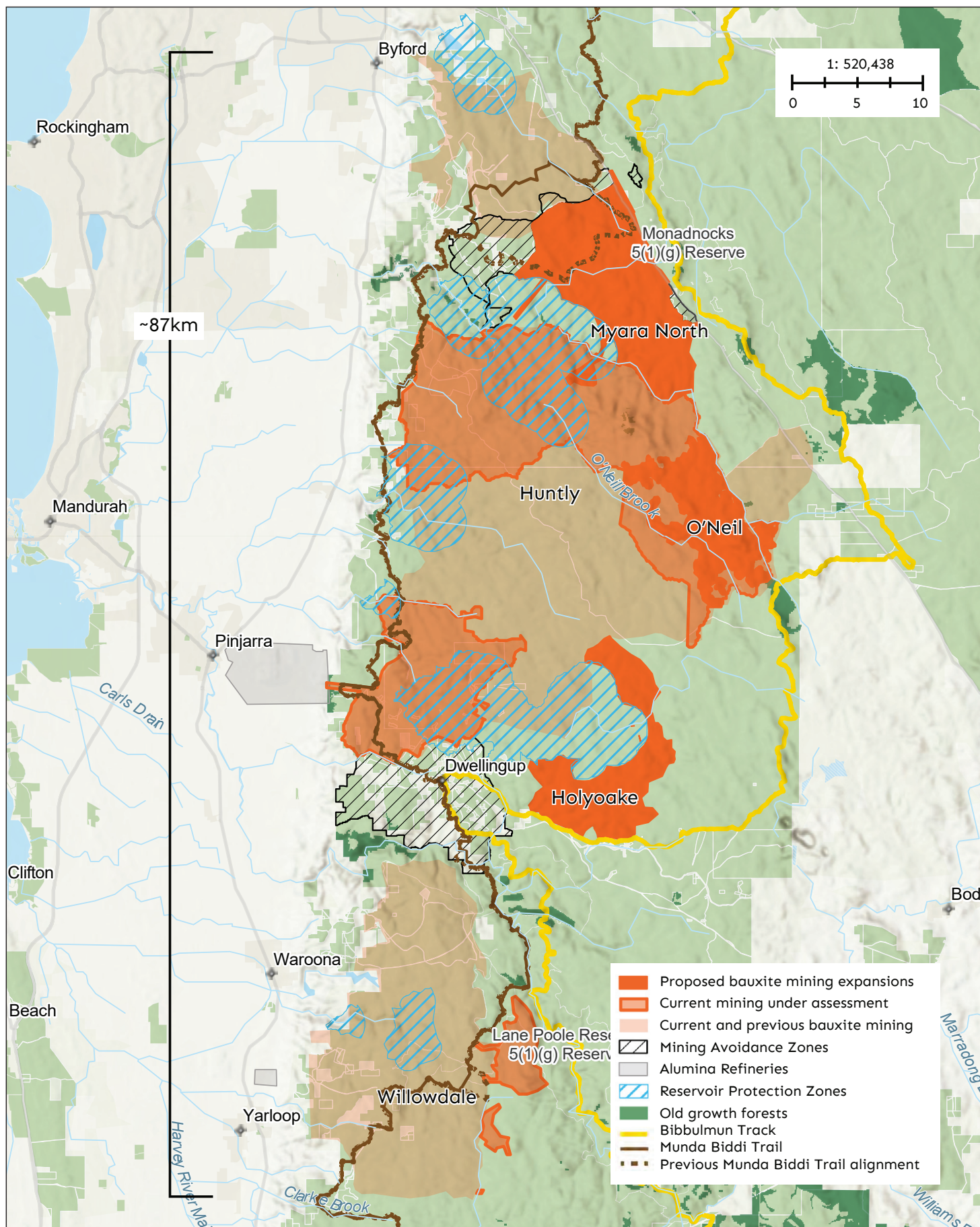
Assessment 2253 - what we call **the Expansion** - involves 7,500 ha across Myara North, O'Neil and Holyoake Mine Development Envelopes (DEs) over 20 years. The Expansion would also increase production at the Pinjarra Alumina Refinery by 5%. References to the Expansion ERDs are marked as (EX chapter number - page number).

Assessment 2385 - **the MMP** - is the assessment of Alcoa's current mining as part of the Mining Management Program 2023-2027, which WAFA referred to the EPA in 2023. This is a 5-year rolling document that is resubmitted every year. The Cook Labor Government has provided Alcoa with an exemption under Section 6 of the Environmental Protection Act, allowing it to continue clearing forests, despite the EPA assessment.

The MMP involves 3,958 ha of clearing in Huntly and Willowdale Mine DEs. Some activities in the region are not included in the assessment as they have been previously referred to the EPA, and cannot be again. The assessment also covers 178,340 ha of exploration across the Darling Range from Mundaring to Collie; it does not include refinery operations. References to the MMPs ERDs are marked as (MMP 'page number').

Both assessments are under Public Environmental Review (PER), the highest level of assessment possible by the EPA. The EPA combined these two assessments '[f]or the sake of efficiency and to allow better consideration of the combined and cumulative impacts to the Northern Jarrah Forest'. **Together, it is the largest amount of forest clearing ever before the EPA.**

Note: You can only make one submission to the EPA, on one or both Assessments. You cannot make separate submissions on the two Assessments.



Map 1. Overview of Alcoa's operations in the NJF, old growth forests, major trails, and reservoir protection zones.

The Expansion is shown as 'Proposed bauxite mining expansions', and the MMP areas under assessment as 'Current mining under assessment'. In addition, Alcoa's current mining, not under assessment, is shown as 'Current and previous bauxite mining'. As can be seen in Map 1, old growth forests are adjacent or within the Expansion and MMP. MMP mining and Expansion infrastructure overlap with Reservoir Protection Zones. The Expansion is also adjacent to the Bibbulmun Track, and the Munda Biddi Trail has been rerouted preemptively to avoid the Expansion.

MAKING YOUR SUBMISSION

There are three ways you can submit: online through the EPA portal, or hard copy or USB files delivered by post or in person. You can find the relevant addresses, the online survey and Alcoa's two ERDs at wafa.org.au/alcoa

Whilst individual submissions will have the most impact, if you cannot make your own submission, or know of others who oppose this destruction but do not have the capacity to make their own, there is an option to sign on to Wafa's submission at wafa.org.au/alcoa

Formatting your submission

Your submission will be the most effective if you organise it into sections defined by the environmental factors that the EPA assesses these proposals against: Flora and Vegetation; Terrestrial Fauna, Terrestrial Environmental Quality, Inland Waters, Social Surroundings, Air Quality and Greenhouse Gas (GHG) Emissions.

The online survey has different boxes for these factors, and for additional responses to Rehabilitation, Holistic Impacts, Stakeholder Engagement and other matters you want to raise. Fill in one or more of these boxes, or simply upload documents at the end. Submissions can be

text-based or oral, by submitting video or audio files. Make sure to specify whether you want Alcoa to be able to view your video or not.

We have provided information on each of the factors below. The guide is a basis only. You don't have to address every environmental factor. **You are encouraged to expand on any sections and add your own personal experience and views, including why you value the NJF.**

The EPA is keen to hear what the NJF means to you.

While you are developing your submission, bear in mind the EPA environmental objective set for each factor (listed at the start of each chapter in this guide) and the environmental principles upon which the EPA is asked to protect the environment, the three key being:

- The **precautionary principle**, which means taking conservative action to prevent potential harm when there's no complete scientific certainty about the risk. Better safe than sorry.
- **Intergenerational equity**, the principle of fairness and justice between different generations, ensuring that current actions do not negatively impact the well-being or opportunities of future generations, and
- Conservation of biological diversity and ecological integrity.

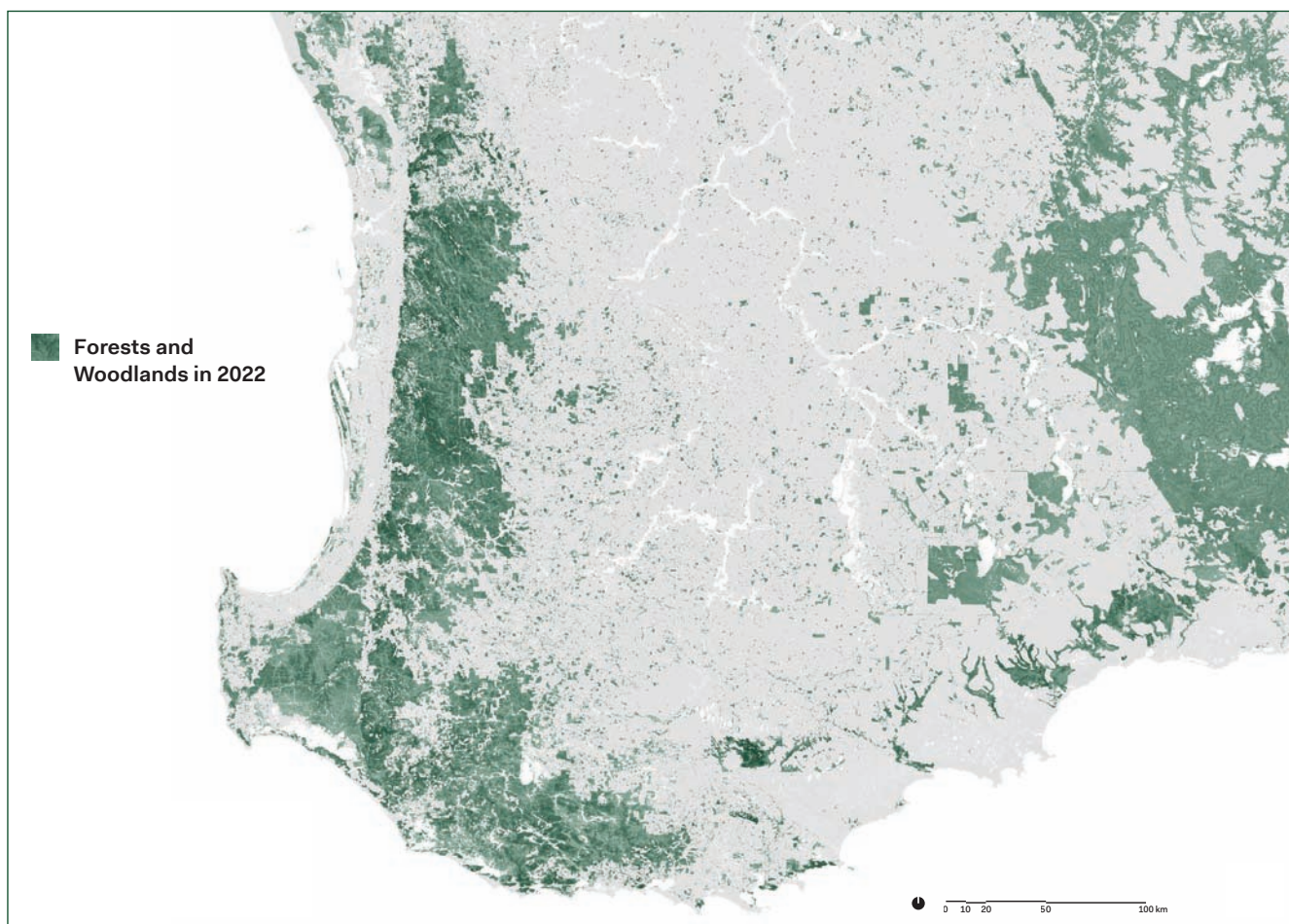
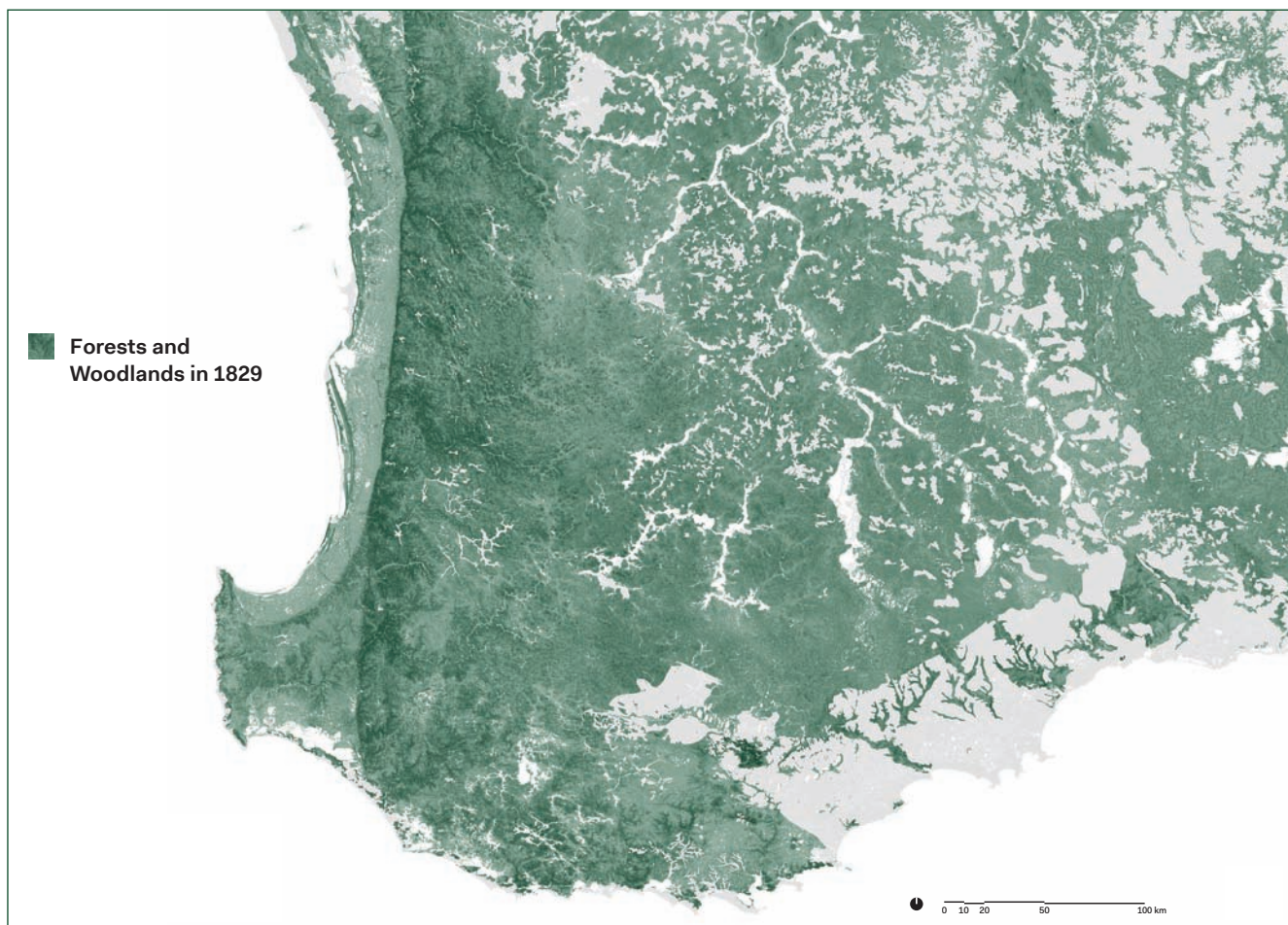
For relevant resources visit wafa.org.au/alcoa

ABBREVIATIONS

AZ	Avoidance Zone
BI	Biodiversity Indicator
CAR	Comprehensive, Adequate and Representative (Reserve system)
CO₂e	Carbon Dioxide Equivalent
CWD	Coarse Woody Debris
CWR	Critical Weight Range
DBCA	Department of Biodiversity, Conservation & Attractions
DEC	Department of Environment and Conservation
DE	Development Envelope
DoH	Department of Health
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority

ERD	Environmental Review Document
EX	Expansion (used in citation shorthand, e.g., EX 7-26)
FD	Functional Diversity
GDE	Groundwater Dependent Ecosystem
GHG	Greenhouse Gas
GL	Gigalitre
ha	Hectare
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
LDA	Limited Disturbance Area
MAZ	Mining Avoidance Zone
MMP	Mining Management Program
MS646	Ministerial Statement 646

Mtpa	Million tonnes per annum
NJF	Northern Jarrah Forest
PER	Public Environmental Review
PFAS	Per- and Polyfluoroalkyl Substances
PM2.5	Particulate Matter smaller than 2.5 micrometres
PM10	Particulate Matter smaller than 10 micrometres
POW	Prisoner of War
RPZ	Reservoir Protection Zone
SRE	Short-Range Endemic
t	Tonne
TEC	Threatened Ecological Community
WA	Western Australia
Wafa	Western Australian Forest Alliance



Maps 2a & 2b. Pre-European extents of forest and woodland as of 1829, and remnant vegetation areas in 2020 as defined by J.S. Beard et al. classed as Vegetation Types 1-9. (Martin et al 2022)

THE NORTHERN JARRAH FOREST

The Northern Jarrah Forest (NJF) is one of the last great ecosystems of its kind; a rich, ancient, and incredibly diverse landscape found only in the Southwest Biodiversity Hotspot. It provides critical habitat for many plants and animals including Black Cockatoos and mainland Quokkas.

The NJF stores and draws down huge volumes of carbon from the atmosphere, regulates rainfall and temperature along the Darling Scarp and is a catchment for major rivers from north of Perth down to Collie.

What makes this forest especially precious is the way it survives in some of the most nutrient-impooverished soils on Earth. Despite decades of research, we are still discovering new things about this forest. In an age of extinction and ecological instability, the NJF is a living library of untapped knowledge about resilience, cooperation between species, and adaptation to harsh climates.

The NJF also holds deep cultural and spiritual importance for the Noongar people, the Traditional Custodians of this land. After tens of thousands of years, their knowledge, stories, and connection to Country are woven into the landscape. Protecting the NJF means respecting and upholding this enduring relationship.

It's not just a forest, it's a living system that took millions of years to evolve and can't be recreated once it's destroyed. Nevertheless, over the past 150 years it has been subjected to extensive logging and clearing for timber, agriculture, housing, infrastructure and mining.

Now, climate change is adding to the pressures. Since the 1970s, rainfall in the region has declined by 20%. In 2022 the Intergovernmental Panel on Climate Change (IPCC) report found that the NJF is at particular risk of climate collapse, saying that 'The resilience and adaptive capacity of the forests is being reduced by ongoing land clearing and degrading land management practices.' It points out that this can be mitigated by 'avoiding and reducing forest degradation' (Lawrence et al. 2022, 1636).

To achieve this and give the NJF a chance of survival, we cannot allow Alcoa's forest mining to continue. Once the forest is gone, it's gone. We have a responsibility to protect it - and a limited window of opportunity in which to do so.

SCALE OF IMPACT

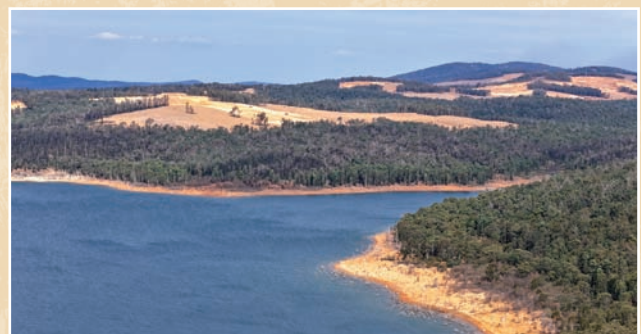
Alcoa proposes to clear 11,458 ha of the Northern Jarrah Forest (NJF): 7,500 ha for the Expansion and 3,958 ha that is still uncleared under the MMP. This is nearly 29 times the size of Kings Park. This clearing and associated impacts do not exist in a silo, it compounds on previous clearing by Alcoa as well as forest mining by other companies as detailed in the table below.

Table 1. Scale of mining in the NJF

Forest Mining	Ha
Proposed NJF clearing by Alcoa – Expansion and MMP	11,458
Completed, approved and proposed NJF clearing by Alcoa to 2045	45,525
Completed, approved and proposed NJF clearing by Alcoa/South32/Newmont to 2045	72,359 (6.6% of NJF)
NJF clearing, including Alcoa/South32 explorations	120,000 (11.0% of NJF)

Alcoa claims forest fragmentation affects an additional 26.5 - 41.0% of the size of forests cleared. Roughly half of the remaining forest fragments are small, at less than 100 ha, with the rest between 100-1000 ha (EX 6-184). No figures are given for the associated 'edge-effects' on unmined forest.

By contrast, the Institute of Foresters (2018) has put NJF fragmentation from bauxite mining at nearly fourfold the area cleared. In its assessment of the impacts of Alcoa's bauxite mining on drinking water catchments, Water Corporation (2022) nominated a 50m edge effect on forest surrounding the mine sites, which almost doubles the impacted area.



Alcoa's bauxite mining next to Serpentine Dam.

HOLISTIC IMPACT ASSESSMENT

EPA QUESTION:

Provide comment on the holistic impact assessment, having regard to the overall environmental effects of the proposal(s).

A holistic environmental impact assessment considers how different environmental and social effects interact, amplify, or reduce each other over time and space. It looks beyond isolated impacts to understand the full, interconnected consequences of a project or intervention. This approach helps reveal cumulative risks, long-term trade-offs, and more responsible pathways for decision-making.

Alcoa's holistic impact assessments for both Proposals are similar and inadequate (EX 16-1-6, MMP 738-43). For the Expansion in particular, identifying key environmental values, presenting basic diagrams, summarising combined effects and mentioning residual impacts and offsets, Alcoa 'ticks the boxes' for the EPA's required tasks, however, all this falls short of a proper holistic assessment, and that matters.

It is a matter of not seeing the forest for the trees.

The holistic impact assessment diagrams (EX 16-3, MMP 739) miss important environmental values (for example soil quality and nutrient cycles) and non-linear connections. There is no temporal layering of environmental impacts.



Mature Jarrah forest. Photo: Donna Chapman

Commentary on *how* listed specific impacts and environmental values are linked is superficial for the Expansion. For the MMP, an additional summary of potential effects on the environment as a whole does attempt this, albeit very briefly (MMP 744-46).

As mentioned above climate change is pushing the NJF to the brink of collapse, and compounds the impacts that mining and other threats have on the forests and waterways and the species that call them home.

The holistic assessments provide no new insights, conditions or mitigation measures, only repeating content from elsewhere in the ERDs.

Different possible scenarios for the NJF are not presented: only best-case outcomes from mitigation and offsets.

RISKS & RECOMMENDATIONS

1. Alcoa has not properly analysed the Proposals' impacts for the 'environment as a whole', missing critical connections across systems, scales, and time. It assumes best-case scenarios, lacks ecological depth, and depends on systems rebounding that science tells us are slow, fragile, or irreversible. Mitigation should be a tool for protecting nature, not a justification for undermining it. The precautionary principle should be upheld.
2. The inadequate holistic impact assessment highlights the need for the EPA to undertake Strategic Advice under section 16e of the Environmental Protection Act for the entire NJF bioregion. This process could address knowledge gaps, provide a thorough cumulative impact assessment for the NJF bioregion and advise the WA Government on its long term management.

EPA OBJECTIVE:

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

Both Proposals will largely clear the three Jarrah-Marri vegetation complexes. Alcoa considers these are of 'lower conservation significance', as they are dominant in the region, but acknowledges their importance as habitat for conservation significant fauna (EX 5-101).

The impacted forest is predominantly of juvenile to immature age (<70 years since logged). About 10% of the Expansion Mine DE and 15% for the MMP is mature-age (25% for the Willowdale area) (EX 5-27, MMP 190). Vegetation condition is rated according to age structure: 'excellent' for mature to 'good' for juvenile. There are areas of old growth forest on the boundary of O'Neil and within the Huntly DEs (see Map 1).

Groundwater dependent ecosystems (GDEs) respectively make up 26% and about 16% of the Mine DEs for the Expansion and the MMP (EX 5-46, MMP 180). Although not to be cleared, they will be impacted by waterlogging and changes to groundwater levels (EX 5-47).

In addition to the GDEs, two Threatened Ecological Communities are listed: Empodisma peatlands and Granite communities of the NJF (MMP 244).

Alcoa has mapped potential suitable habitats of conservation significant flora (warranting special protection), noting this is not an indicator of populations (EX 5-88). Twenty conservation significant flora species are known or considered likely to occur across the impacted area of the Expansion (EX 5-92-95), but potentially more (EX 5-88).

For the MMP, baseline and targeted flora surveys conducted within or near the Huntly Mine DE in 2020-2024 recorded ten flora species listed as Priority by DBCA. However, the targeted surveys covered only 2% of the Huntly Mine DE and none

of the Willowdale Mine DE. And, while not having been found in this small survey area, Alcoa admits that 'given the lack of survey intensity and coverage', flora species listed as threatened may be present (MMP 225) and therefore unable to be considered in this assessment.

Mining impacts

Strip mining removes all onsite vegetation. Alcoa states the Expansion involves the 'loss of floristic diversity, ecosystem diversity and structural complexity' of the cleared vegetation - predominantly Jarrah-Marri forest (EX 5-190, 17-4). It assesses these impacts as both 'partial' - because the vegetation complexes to be mainly impacted 'are well represented' in the NJF (EX 17-4) - and short term - up to 30 years when rehabilitation will be established (EX 16-1), however there are serious doubts on rehabilitation's effectiveness (see Rehabilitation).

Alcoa claims to have cleared only 2% of the NJF - that figure nearly doubling to 3.84% by 2045 (EX 5-137, MMP 749), but it involves the highest quality, most biodiverse parts of the NJF.



Isopogon. Photo: PHCC

Alcoa expects conservation significant flora species will not become threatened as their habitats are found elsewhere (EX 5-119) and considers GDEs to be more affected by climate changes impacts on hydrology (EX 5-192).

Climate

Alcoa acknowledges the IPCC's *high confidence* projection that, in the next 30 to 40 years, climate change will increasingly threaten the NJF's biodiversity, 'potentially leading to irreversible changes in ecosystem composition and structure and the extinction of some threatened species' (EX 5-63, Lawrence et al. 2022, 1597). Whereas the IPCC also states **ongoing clearing is reducing the 'resilience and adaptive capacity' of the forests and should be avoided** (Lawrence et al. 2022, 1636), Alcoa concludes the Proposals are 'not expected to amplify the impacts on vegetation condition' from climate change (EX 5-182). This ignores the IPCC's warnings and undermines the clear and increasing impacts of climate change without valid reasoning. It is also inconsistent, with Alcoa noting for its offsets that there are 'knowledge gaps' in relation to the NJF's 'vulnerability to climate change' (Alcoa 2025a, 18).

Alcoa offers no mitigation measures, such as avoidance, in response to major climate change impacts in the NJF that have already occurred, notably the forest die-off events in recent years.

Fragmentation

Forest fragmentation reduces biodiversity and ecosystem functionality and resilience. In terms of vegetation, habitat fragmentation is 'one of the most important causes for the decline of plant species' (Heinken and Webber 2013).

'Maintaining the total area of forest and **minimising fragmentation arising from permanent clearing** are key elements of biodiversity conservation strategies' (Conservation and Parks Commission 2023, 50).

Alcoa mentions fragmentation having impacts on Jarrah forest ecosystems in its holistic impact assessment, but without elaborating on them

(EX 16-4). For the Expansion, fragmentation is only mentioned as not impacting conservation significant flora (EX 5-188). For the MMP, Alcoa notes 'increased edge effects on vegetation, which include changes in understorey structure and composition' - but only in relation to ecological linkages protecting diversity (MMP 196). For the Expansion, Alcoa recognises vegetation may be impacted by dust disposition (an edge effect) but has no data on Jarrah forest susceptibility and states that, from experience, the impacts will not be significant (EX 5-192).

Water Corporation (2022, 20, 38) has a different view: 'No definitive study has been undertaken of edge effects of mining in the Northern Jarrah Forest, although significant tree death on the margins of rehabilitated areas has been observed, resulting from localised changes to hydrology associated with post mining revegetation'.

Mitigation

For the Expansion, Alcoa proposes to mitigate environmental impacts on flora and vegetation through *avoidance* of clearing old growth forest and known populations of threatened flora and waterlogging and salinity impacts to significant flora. It will also *minimise* clearing of mature-age forest and potential occurrences of granite communities, GDEs and threatened flora species habitats (EX 5-167).

For the MMP, Mining Avoidance Zones (MAZs) will be created for old growth forests, threatened flora populations and habitats, and Threatened Ecological Communities (TECs) (MMP 260). Alcoa states that clearing will be minimised for mature-age forest, potential Priority Ecological Communities (PECs) and GDEs, and Priority flora, with disturbance or adverse impacts limited to 2% of the known population (MMP 261).

MAZs for TECs do not include buffers. However, *Empodisma* peatlands are vulnerable to minor hydrological changes and so require buffers to protect from mining. Granite communities are also sensitive to hydrological changes, weed incursion and other disturbances.

RISKS & RECOMMENDATIONS

1. Alcoa downplays the biodiversity and ecological integrity value of vegetation to be cleared by relying on broad-scale representation of Jarrah-Marri complexes. Localised clearing of this forest cannot be justified in the context of ongoing cumulative losses across the NJF.
2. Alcoa misrepresents significant residual impacts on flora and vegetation in claiming they are partial and short term. This:
 - understates how long it takes for mature forest structure and complexity to develop (at least 100 years).
 - ignores evidence that large, tall Jarrah trees are unlikely to return after replanting (Campbell et al. 2024, see Rehabilitation).
 - ignores the prediction that climate change will “drive replacement of large trees with short, multi-stemmed individuals, transforming ecosystem structure” (Matusick et al. 2016, Water Corporation 2022, 7).
 - misrepresents the mitigation capabilities of rehabilitation for biodiversity and ecological integrity (see Rehabilitation).
 - ignores Alcoa’s mining plans beyond the Proposals that will result from 178,340 ha of exploration.
3. Forest maturation is important for forest biodiversity and health, resilience to bushfires and fauna habitat (Conservation and Parks Commission 2023). Clearing sets back this process by at least a century, but with cumulative climate effects, this may be forever.
4. To ensure old growth forests on the boundaries of proposed mining and exploration activities are not affected by edge effects and other indirect impacts, there should be no new clearing or exploration within 2 km of old growth forests to safeguard them as critical habitats for the future.
5. Alcoa expects the Proposals to not contribute to climate change impacts on vegetation conditions. The points above make this untrue: the Proposals are synergetic with threatening processes and trends in the NJF.
6. Due to limited baseline flora surveys undertaken, more conservation significant flora may also be unaccounted for, which makes it impossible to thoroughly assess the scope of impact. The EPA should not accept Alcoa’s evaluation of impact on conservation significant flora based on inadequate data and downplaying consequences of fragmentation, including reduced connectivity, weed incursion, and increased tree mortality at forest edges.
7. The absence of buffers around TECs like Empodisma peatlands and Granite communities contradicts conservation best practice. Without buffers, MAZs do not provide meaningful protection. Alcoa must adopt precautionary buffers (50–100 m minimum), as recommended for TECs elsewhere. Recommendations of the recent Auditor General’s report Conservation of Threatened Ecological Communities should also be adopted to ensure stronger alignment with the state and federal biodiversity and conservation acts, clear accountability mechanisms, and a pathway to ongoing ecological resilience for TECs.
8. Alcoa must also apply more precautionary buffers around GDEs. It must demonstrate that ecosystem function will be maintained, not just vegetation retained, taking into account predicted changes to groundwater regimes under climate change.

EPA QUESTION:

Provide comment on the proposed rehabilitation program, including the completion criteria.

After 60 years, Alcoa is yet to have any of its rehabilitation signed off as completed (Milne 2023). Despite this, Alcoa maintains it is able to mitigate the environmental impacts of the Proposals through rehabilitation and protect the biodiversity and ecological integrity of the NJF accordingly (EX 2-36, MMP, 377).

Alcoa's claims to rehabilitation success rest on performance against DBCA-approved completion criteria and adaptive management.

An independent review of Alcoa's rehabilitation concluded, however, the 'severity, duration and scale' of potential environmental impacts of Alcoa's future mining mean **there are real doubts as to 'whether these impacts can be realistically and credibly managed through rehabilitation'** (Stantec 2023, 28).

Flawed measures

Alcoa's main measure of success is **species richness** (the total number of flora species compared to a nearby unmined forest plot). For three decades, Alcoa's rehabilitation has averaged around 80% species richness at 15 months of age, meeting or exceeding this completion criteria (EX 2-39).

While species numbers may be similar, their composition (relative abundance) is different, with some species achieving greater dominance (Norman et al. 2006, 284): **'it cannot be claimed that plant community composition has been completely restored'** (Koch 2007, S36).

The independent review found that, despite improvements in rehabilitation methods, **differences in species composition between rehabilitated and unmined forest remain** (Stantec 2023). Moreover, certain species abundant before clearing are not taken into account in compositional targets in the completion criteria (Stantec 2023, 13). Examples

include *Banksia grandis*, *Allocasuarina fraseriana* and *Xanthorrhoea preissii* (EX 2-42).

Measures of **functional diversity** (FD) - the range of roles organisms have in ecosystems - have been added to ecological restoration goals because of their associations with biodiversity (Standish et al. 2021). In Alcoa's rehabilitation, it was found 'three of four FD indices had not reached those of reference jarrah forest 25 years' (2021, 11). Importantly, these FD indices 'did not correlate with species richness, indicating a risk of over-reliance on richness as a metric of rehabilitation performance' (Standish et al. 2012, 10).

The independent review also established:

- **At 25 years, understory cover in rehabilitation areas is about half that in non-mined forest areas** (Stantec 2023, 10, EX 2-44).
- **Marri rehabilitation rates have not met completion criteria levels in recent years.** Hence, a 'large area' has needed remedial infill planting, but it is unclear how Alcoa will fix this deficit in the future (Stantec 2023, 29).

To assess Alcoa's rehabilitation, Campbell et al (2024, 2, 10) used ecological 'attributes that measure progress against five-star outcomes', and only gave it **two-stars out of five**. Their report found that **rehabilitation does not:**

- **'achieve' a state similar to the native reference ecosystem**
- **improve over longer timeframes**
- **nor show sustained improved outcomes from adaptive management'.**

And that

- **'early forking is significantly more common' in rehabilitation, indicating a 'restricted capacity to develop the distinctive structure of mature, high-quality jarrah trees, even over long timeframes'.**

The authors attributed these failures to mining having removed the lateritic substrate (bauxite) on which the forest ecosystem has evolved. Alcoa denies this (EX 7-27, MMP 422) **but does not attempt to restore the three Jarrah-Marri vegetation complexes that it clears** (Koch 2007, 27). The result is an immediate local loss in flora and vegetation complexity and biodiversity.

Alcoa's current Rehabilitation Completion Criteria (2016) is under revision with DBCA. Whilst we welcome this revision, and appreciate that it will reflect outcomes of this assessment (EX 5-176), not having a draft available makes it difficult to comment on the efficacy of the criteria these Proposals will be measured against.

Backlog and remediation

If completion criteria are not met, remediation in terms of additional species planting is necessary, particularly as there is only limited species establishment in rehabilitation from surrounding forest (Norman et al. 2006, 286).

Remediation is also required to remedy work that has not been done properly. The independent review noted: **'Given the acknowledged importance of pit floor ripping for long-term rehabilitation performance, it is a concern that there have been occasions where this has not occurred' and there has been 'apparently no remedial action'**. This highlights problems in Alcoa's self-certification and 'the importance of effective monitoring and evaluation by regulating agencies' (Stantec 2023, 19).

Alcoa's failure to ensure rehabilitation rates kept pace with clearing and mining was revealed through public scrutiny. Alcoa aims to address the resulting backlog (EX 2-27, MMP 219), however, there are serious doubts as to their capability to do so. Alcoa needs to source large quantities of seed, which can only be collected in limited quantities from State forest. Seed supply is not currently keeping up with the demand. Seed shortages for certain species can impact species and plant functional diversity in rehabilitation (Andres et al. 2023). Alcoa also

relies on regrowth from topsoil, but when this is not handled properly, the diversity shortfalls are compounded.

Adaptive management

The independent review found a series of inadequacies and 'identified opportunities for improvement to the monitoring and evaluation process, particularly for remedial or corrective actions that would be critical to reducing vulnerabilities, provide a strong evidence-base to support adaptive management and allow a more robust and credible evaluation of rehabilitation success' (Stantec 2023 28). Alcoa does not address these inadequacies in the ERDs.

Climate change

Alcoa assumes a best-case scenario that future rehabilitation will be successful with climate change. The independent review, however, found there is 'no published data on the resilience of current era rehabilitation to drought or water stress', noting it will be some years before this can be assessed (Stantec 2023, 26). In short, 'more accurate assessments of the response of rehabilitation to disturbances resulting from climate change are required' (Stantec 2023, 31). Also, expectation of rehabilitation adaptability assumes appropriate deep ripping and initial site preparation. As mentioned before, this has not always been the case (Stantec 2023 19, 34).



Alcoa rehabilitation in Jarrahdale.

Biodiversity Indicators (BIs)

The EPA 'required Alcoa to develop adequate and scientifically robust Biodiversity Indicators (BIs) and a supporting detailed monitoring framework that could be used to assess whether impacts of and environmental outcomes ... are likely to be consistent with the ongoing ecological integrity... of the NJF' (Stantec 2023, 27). The independent review found no evidence that Alcoa's proposed new BIs will drive improvement in ensuring rehabilitation is consistent with the ongoing ecological integrity of the NJF. Nor do the BIs adequately address current rehabilitation deficiencies. The draft BIs have not changed since being reviewed (EX 2-47-48).

Mine closure

The Huntly Mine Closure plan has not been updated to reflect the current Forest Management Plan (Alcoa 2025b, 116).

For future land use type, Alcoa has selected the 'production from relatively natural ecosystems' - conservation, recreation, tourism, water catchment (Alcoa 2025b, 94) - rather than 'conservation and natural environments', which includes 'land under rehabilitation that has been restored to a near natural state' (ABARES 2016, 6-7). Yet, in multiple places, Alcoa continues to cite timber production as a closure outcome, even though commercial logging has ended.

For flora and vegetation closure works program, problematic Jarrah-Marri overstorey density, resulting from past rehabilitation prescriptions, is almost entirely the focus for ecological integrity (EX 5-190, Alcoa 2025b 127-28). This highlights the inadequacies of current completion criteria for biodiversity and ecological integrity.

There is no mention of ecological functioning monitoring and goals, nor clear explanation of who collects, analyses, and is accountable for monitoring data (Stantec 2024, 28).

Rehabilitation is not, and never will be, the mitigation measure Alcoa proposes it to be for the significant environmental impacts of both Proposals.

RISKS & RECOMMENDATIONS

1. Alcoa is yet to meet its completion criteria in 60 years of mining. There needs to be greater clarity regarding the company's long term responsibilities for rehabilitation management. There is also already a backlog of rehabilitation and a known seed shortage raises doubts about rehabilitation performance in the future.
2. Key indices are lacking in Alcoa's rehabilitation success assessments, such as species composition, functional diversity, understory cover, Marri rehabilitation rates, and the form of Jarrah trees.
3. Rehabilitation failures can be linked to mining having removed the bauxite on which the Jarrah forest ecosystem has evolved. No matter what Alcoa claims, even best efforts at rehabilitation do not - and cannot not - restore the Jarrah forest.
4. Rehabilitation is already failing to meet ecological restoration criteria and a drying and warming climate will make success more difficult. There is no 'published data' on the resilience of current rehabilitation methods to climate change and future adaptability is reliant on adequate site preparation, which has found to be not always the case.
5. Deficiencies in Alcoa's self-certification and regulatory agency oversight of rehabilitation must be rectified before any consideration of an approval. Alcoa should be held immediately accountable for its rehabilitation management breaches.
6. It is not acceptable for the Proposals to go ahead - under any conditions - until there is clarity on future completion criteria and remediation of past rehabilitation.

EPA OBJECTIVE:

To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

Both Proposals impact largely '**contiguous intact forest**' with '**multiple habitat types**' for a **wide range of fauna species** (EX 6-25, 6-132, MMP 297). The Proposals DEs also have high connectivity with protected fauna habitats in Lane Poole Recreation Reserve, Monadnocks Conservation Reserve, and Serpentine National Park between them. **The impacted fauna habitats have high conservation values.** Around 75 % of the Expansion DEs vegetation is rated 'good' to 'excellent' quality habitat (EX 6-25); for the MMP, around 90 % is rated 'high' or 'medium' quality with 'high' applying to 11 of 14 conservation significant fauna species (MMP 335-37).

Both Proposals are considered to **directly impact fauna diversity and ecological integrity** through **habitat loss and injury or death** from clearing and mining processes, and have indirect impacts such as **habitat fragmentation**, disturbances from light, noise and or vibration and attraction of feral animals. (EX 6-146, EX 6-169, MMP 362).

The significant residual impacts for both Proposals are virtually identical. Habitat loss is considered 'limited', 'temporary' and 'partial', but occurring 'in the context of widespread cumulative impacts (from logging, fire, dieback, climate change and mine rehabilitation under past completion criteria) and habitat fragmentation. Direct mortality of fauna is expected to be 'low', 'short-term' and manageable (EX 6-207-08, 17-8, MMP 384).

Habitat loss

The direct fauna habitat loss through clearing for both Proposals will be 11,458 ha.

Whilst acknowledging potential significant impacts for local populations, Alcoa considers residual impacts to be largely mitigated by: habitat clearing



Early stage rehabilitation.

being 'limited' relative to their regional extents (MMP 363), mining avoidances, fauna dispersals, and rehabilitation.

The only recognised **longer-term impacts are losses of coarse woody debris (CWD) and mature trees** (EX 207, MMP 367). 'Rehabilitation restores minor densities of CWD and does not restore tree hollows, both which will take over a century to accumulate to levels comparable to un-mined forest' (EX 6-177).

Calling these losses 'partial' diminishes their critical importance, especially when Alcoa acknowledges other cumulative impacts on habitat (EX 207, MMP 367).

Alcoa's claim that clearing impacts are mitigated by the extent of fauna habitats across the wider NJF does not properly consider the impacts of habitat fragmentation. For the Expansion, fragmentation will impact about 4,600 ha (EX 6-184). 'The total duration of fragmentation impacts is expected to be about 15 to 20 years in each mine region, being the cumulative timeframe for mining, rehabilitation, and fauna recolonisation' (EX 6-184).



Chuditch. Photo: Clarissa Human

Chuditch, for example, require large home ranges and habitat that is not excessively fragmented (DCE 2012). For this species, Alcoa only states fragmentation 'may cause localised disruption of breeding' and 'insufficient foraging resources for individuals' but on a 'temporary' (less than ten years) basis 'following completion of rehabilitation' (EX 6-185). However, the reduced survival of individuals could cause population declines.

Overall, Alcoa fails to take seriously to heart the already threatened status of a range of fauna species, in part or substantially due to habitat loss and fragmentation. It also does not consider properly how species populations will be impacted in the time it takes for rehabilitation to establish.

Alcoa proposes to '**avoid or minimise clearing high value habitats**' (EX 6-190), specifically for Black Cockatoos, Critical Weight Range (CWR) mammals (considered particularly vulnerable to extinction), Woylies, Quokka, Chuditch, Western Ringtail Possums, Numbats and Carters Freshwater Mussel, and Short-Range Endemic (SRE) fauna (EX 6-190-92, MMP 5, 380). Some avoidance areas were established pre-assessment; others are to be determined through pre-clearing surveys. Alcoa also plans to address habitat fragmentation by maintaining 'ecological linkages' to upland vegetation, habitat outside Mine DEs, riparian/swamp refuges, seasonal water sources and seasonal aquatic foraging (EX 6-197).

Any mining avoidance is welcome, but those from pre-clearing surveys require regulatory oversight and verification and the relatively small scale of many species-specific avoidance measures does not compensate for the forever loss of 'contiguous intact' forest habitat in the Proposal areas. In the case of Black Cockatoos: they 'require large areas of habitat for breeding, night roosting and foraging, as well as connectivity between these habitats to assist their movement through the landscape' (DAWE 2022).

Conservation significant species that are not listed as threatened, such as the Quenda and others, are not subject to avoidance zones meaning much of their habitat will be cleared.

Alcoa expects **direct mortality of fauna** during clearing 'to be low and not cause a significant impact' as clearing will be 'progressive and staged' and adjacent to unmined forest where fauna can find refuge (EX 6-207) - given the opportunity to escape (EX 6-169). There is no evidence provided that direct mortality from clearing is 'low', only some evidence for 'vehicle interactions' during mining at Huntly (EX 6-169). Soil fauna does not seem to be considered, and it is impossible to believe all creatures great and small can, and do, escape clearing processes.

Alcoa only once mentions potential problems with **fauna dispersal** (animals spreading into unmined forest as a mitigation measure) causing 'a level of intraspecific and interspecific competition for habitat resources'. Without supporting evidence, Alcoa asserts this is only 'for a period, until home ranges are re-established, and a biodiversity equilibrium is once again attained' (MMP 362).

Great weight is placed on mitigation of impacts on fauna through **rehabilitation**. Rehabilitation is said to restore most habitat values in the range of 7 to 14 years (EX 6-162). Alcoa claims rehabilitation 'restores most terrestrial vertebrate biodiversity ... within about 10 years', but not Woylie or reptiles (EX 6-177-78) while invertebrate biodiversity is partially restored in 'about 10-20 years' (EX 6-177).

However, it cannot be concluded from species sightings in rehabilitation that appropriate fauna

communities have reestablished themselves (Craig et al. 2015; Anderson et al. 2022). Chuditch individuals were found to 'quickly re-colonize restored areas and use available habitat', but no conclusions were drawn as to the consequences for Chuditch 'survival and demography' (McGregor et al. 2014). The independent review of rehabilitation considers there is much room for improvement in monitoring and evaluation of rehabilitation as fauna habitat, such as including specific targets to return particular groups of fauna. This is important due to the ecosystem functions fauna provide in pollination, soil development and establishment of vegetation through seed dispersal. (Stantec 2023, 18, Anderson et al. 2022).

Moreover, Alcoa provides mixed messages on the effectiveness of different rehabilitation completion criteria. 'The effectiveness of rehabilitation under past prescriptions has been demonstrated through long-term research and is at a high level of confidence'. There is moderate confidence in contemporary rehabilitation prescriptions improving fauna habitat values (e.g. for Black Cockatoos and reptiles) compared to past prescriptions (e.g. 1980s-1990s)' (EX 6-208) perhaps 'given the lack of studies on recolonisation of fauna in current era rehabilitation' (Stantec 2024, 35). On the other hand, Alcoa cites pre-2016 rehabilitation prescriptions as a cumulative negative impact (EX 207, MMP 367) and expects more recent prescriptions to improve habitat quality for a number of species (EX 6-178-81, Stantec 2003, 35).

Given the failure to meet completion criteria for rehabilitation to date – let alone those measures needed to protect the flora and vegetation biodiversity and ecological integrity in the future (Stantec 2023), the claim to mitigate habitat loss through rehabilitation is in doubt.

Despite expressing confidence in their rehabilitation, Alcoa concludes mitigation measures will not counterbalance the likely significant residual impacts on habitat for some threatened species, therefore, offsets are required (see Offsets) (EX 14-3) .



Baudin's Black Cockatoo. Photo: Keith Lightbody

Black Cockatoos

Classification

Alcoa lists Baudin's and Carnaby's Cockatoos as Endangered and Forest Red-Tailed Cockatoos as Vulnerable.

The Baudin's Black Cockatoo's conservation classification is incorrect. Appeals Convenor Reports to the WA Minister for Environment have stated repeatedly it is Critically Endangered, as per the IUCN Red List of November 2021. The Environment Minister has upheld the Appeals Convenor's recommendations on this a number of times and strengthened offsets as a result. **An incorrect classification downplays the extinction risk for Baudin's Cockatoos and has consequences for offset calculations.**

Foraging

For the Expansion, over **7,000 ha of Black Cockatoos high value habitat** for foraging and breeding will be cleared.

Again, Alcoa expects short term impacts with Black Cockatoos **foraging on rehabilitation** in 7-11 years from clearing (EX 6-151). In the meantime, the birds are expected to adjust to mining and feed in unmined forest. Alcoa admits there is 'insufficient data' to determine the carrying capacity of wider forests and whether habitat clearing would in fact 'result in a decline in local populations of Black Cockatoos' (EX 6-151). Yet, the company only takes carrying capacity issues seriously in relation to poor fruiting years for Jarrah and Marri (EX 6-152).

Black Cockatoos do forage in rehabilitation areas. Yet there is no data on whether rehabilitation provides equivalents in terms of food availability and quality. Alcoa admits foraging 'within mine rehabilitation has been recorded at low densities compared to un-mined forest' (EX 6-151), but puts this down to overstory stem density. It speculates that contemporary rehabilitation prescriptions to reduce overstory density 'may improve' foraging habitat quality (EX 6-179, emphasis added). Still, there are no guarantees that rehabilitation will provide the same quantity and quality of food as unmined vegetation.

Known failures of 'contemporary' rehabilitation are not acknowledged. Marri trees, for example, provide critical foraging and breeding habitat for Black Cockatoos (EX 6-60, Johnstone et al. 2013). An independent review of Alcoa's rehabilitation found that Marri rehabilitation was not successful and, moreover, remedial work had not been done (Stantec 2023).

Other stressors

Alcoa also does not fully take into consideration the compounding and cumulative effects of stresses like climate change, bushfires and prescribed burns in their rehabilitation efforts.(EX 6-187). Instead, Alcoa makes general statements such as climate change will 'result in changes to the fauna habitat types

caused by changes in the structure of vegetation communities' (EX 6-187). This misses, for example, how climate change is affecting flowering and seed setting or the availability of perennial water sources in summer and autumn that may impact breeding locations of Black Cockatoos. These are mentioned separately elsewhere (EX 6-151-52), but not in terms of holistic scenarios for the NJF.



Carnaby's Black Cockatoo. Photo: Keith Lightbody

Breeding

The impacts of **habitat loss for Black Cockatoos breeding** are considered 'long-term (> 100 years)' (EX 6-151). The key factor is the loss of trees with nesting hollows that can take 100 to 150 years to start forming in Jarrah and Marri (EX 6-59) – and then decades more to develop suitable nest hollows (DAWE 2022).

The Expansion could impact about 300 known and 650 suitable nesting trees¹ (EX 6-151). Following pre-clearing surveys, all **such trees will be avoided with a 30 m minimum buffer**, 'unless clearing is for Critical Infrastructure whereby ... a 10 m radius buffer will be implemented instead, unless the tree cannot be avoided' (EX 6-191, 6-223, also MMP 376, 397, 401). 'Short-lived' exploration activities will have a 10m buffer.

There is also inconsistency between proposed nesting trees buffers throughout the Proposals. In some MMP appendices the buffer is described as 50 m as part of the Limited Disturbance Areas (LDAs) (Alcoa 2023a 34 and Alcoa 2023b 37), and 10 m in other appendices for the Expansion (Alcoa 2023c 48).

A 30 m buffer is inadequate to prevent edge effects and mining related disturbances. The proponent has not demonstrated how a 30 m buffer will adequately prevent edge-related effects like dust, noise, and light intrusion, and consequent disturbances to black cockatoo nesting activity.

There is no evidence that a 30 m buffer will provide sufficient foraging for nesting females, given their requirements for feed in the vicinity of their nests (DAWE 2022, 23).

Alcoa has been required to provide 50 m buffers from January 2027 by the Ministerial Approval Conditions for Alcoa's 2023-2027 Mining Management Program. The DBCA has previously advised: 'Minimum buffer distances should be at least 250 meters for black cockatoo habitat trees that are known breeding trees ... and 50 meters for potential black cockatoo nesting trees' (Appeals Convenor, 34-36).

The expected loss of up to 144,500 potential nesting trees in the Expansion alone (EX 6-151) will have much longer-term consequences for 'the future local extent of breeding habitat' for Black Cockatoos (EX 6-209). The Proposals will **remove the breeding trees of the future**, which due to climate change are not on a certain recovery trajectory.

¹ Black Cockatoo trees are categorised in the Expansion and by DBCA as either 'known' trees, which have nest hollows in use or 'suitable' trees which have suitable hollows, these are combined in the MMP as 'nest' trees. 'Potential' trees lack hollows but are old enough to have them develop in a few decades. These are referred to as 'habitat' trees in the MMP (EX 6-59 and MMP 332).

RISKS & RECOMMENDATIONS

1. The impact on fauna habitat is much greater than the 11,458 ha of direct clearing due to fragmentation, competition for remaining habitat, and longer term impacts of failing rehabilitation which will be exacerbated by climate change. The Proposals' impact assessments must be updated accordingly and based on independent studies.
2. The EPA and DBCA must require the updated rehabilitation completion criteria to include fauna-specific criteria, including targets to return particular groups of fauna and improved evaluation of rehabilitation as habitat.
3. The failure to rehabilitate Marri, a key Black Cockatoo food and nesting tree, as well as admissions that foraging within mine rehabilitation is lower compared to unmined forest, must be addressed with further research and factored into the EPA's assessment of habitat recovery.
4. The Baudin's Black Cockatoo's conservation classification must be corrected to Critically Endangered, as per the IUCN Red List of November 2021 and previous decisions by the EPA Appeals Convenor and WA Environment Minister.
5. No known and suitable Black Cockatoo nesting trees at all should be cleared, and critical infrastructure should be rerouted. The buffer for Black Cockatoo nesting trees must be clarified and increased from 10-50 m to a minimum 250 m buffer for known and suitable nesting trees and 50 m for potential nesting trees in line with DBCA's recommendation. The Baudin's Black Cockatoo is Critically Endangered and the retention of both current and upcoming feeding and breeding habitat is essential to the species' survival.

Offsets are critical to the assessment.

Please ensure you comment on offsets under Fauna or Other Matters.

Offsets are a last resort measure to 'counterbalance any significant residual environmental impacts' (EPA 2014).

For Alcoa, the *only* significant residual impact from both Proposals is the 'loss or degradation' of habitat of six threatened fauna species: the three Black Cockatoos, Woylie, Chuditch and Quokka (EX 14-3-4, MMP 720).

Alcoa proposes additional conservation actions in State Forest (EX 14-6-8, MMP 724-25) 'to protect and enhance' the above species' habitats, benefiting also Numbats, Western Ring Tailed Possums, Quenda,

Brushtailed Phascogale, Western Brush Wallaby and Rakali (EX 14-9, MMP 724-75). Conservation actions are chosen as threatened species recovery plans consider it **better to protect and improve existing habitat** than to replant elsewhere (Alcoa 2025a, 20). Additionally, Alcoa plans to 'help resolve knowledge gaps' re maintaining the ongoing ecological integrity of the NJF (EX -9, Alcoa 2025a, 18).

Alcoa will fund the conservation actions for 20 years at \$3,500 per cleared ha, determined annually (EX 14-19, Alcoa 2025a, 66).

Offset areas are calculated as per the tables below, with some overlap in habitat between species.

Expansion (EX 14-4, 14-14):

Threatened Species	Habitat impacted (ha)	Weighted Av. habitat quality score	Quantum of Impact (ha)	Offset extent (ha)
Forest red-tailed Black Cockatoo	6,396	9	6,572	20,350
Baudin's Black Cockatoo	6,418	9	6,591	22,065
Carnaby's Black Cockatoo	6,418	8	5,842	20,050
Woylie	6,293	5	3,783	13,890
Chuditch	6,334	7	5,283	17,020
Quokka	674	7	883	2,895

MMP (MMP 723, 727):

Threatened Species	Habitat impacted (ha)	Habitat value	Significant Residual Impact (ha)	Offset extent (ha)
Forest red-tailed Black Cockatoo	3,932	10	2,267	7,518
Baudin's Black Cockatoo	3,918	10	2,416	8,609
Carnaby's Black Cockatoo	3,918	10	2,416	8,609
Woylie	4,117	7	1,961	8,512
Chuditch	4,117	8	1,537	5,062
Quokka	96	8	36	119



Baudin's Black Cockatoos. Photo: Keith Lightbody

The conservation actions/offset projects in these areas will include: permanent drinking water for Black Cockatoos, remnant vegetation rehabilitation, riparian vegetation enhancement, predator and feral animal control, fire mitigation/rapid response technologies, population structure and habitat usage surveys (EX 14-12, MMP 726).

For the Expansion, the aim is 'a one point increase in the weighted average habitat quality score' within 5 years, maintained until the end of the offset period (EX 4-11-12).

Offset areas are to be in State Forest, close to mined areas as possible and with 'high environmental values that would benefit from additional conservation actions' (EX 14-12). Two areas have been identified for the Expansion: parts of the already proclaimed Mining Avoidance Zones (MAZs) in Jarrahdale (2,647 ha adjoining Serpentine National Park) and Dwellingup (5,087 ha adjoining Lane Poole Conservation Reserve) (see Map 1). There are no offset areas specified yet for the MMP.

Whilst in MAZs, the exclusion zones are still within Alcoa's lease.

Alcoa proposes to consult and engage with the WA Government to seek agreement to **add proposed offset conservation areas into the conservation reserve system** for future protection (EX 14-13), particularly when 'near to an existing conservation reserve or area proposed for addition into the conservation reserve system under the Forest

Management Plan' (Alcoa 2025a, 20). Both the WA and Federal Government require long-term security of offsets. While Alcoa indicates a willingness to oblige, achieving this will 'require new legal solutions' to ensure permanent protection from all future mining and development activities (WABSI 2025, 14).

RISKS & RECOMMENDATIONS

1. The minimal enhancement and protection of fauna habitat does not justify the mining expansions that are a cause of the significant residual impacts on high value fauna habitat in the NJF. There is no evidence of equivalence between Alcoa's proposed offsets and habitat destruction, and offset area calculations do not take into account impacts of forest fragmentation.
2. After a long history of blocking forest protection efforts in the NJF, Alcoa's gesture to engage with government on the selection of areas for future protection would be welcome, if it wasn't in order to secure the company further forest destruction. The offset plans also lack specific commitments to independent scientific assessments of offset area suitability. Dracula should not be in charge of the blood bank.

Alcoa's gesture also means little if the State government does not agree to block all future mining and development in preferred areas (EX 14-13, MMP 731).

3. The attraction of corporate funding of conservation actions should not blind decision makers to the need for preventative actions to halt the causes of significant residual impacts on high value habitat - actions that are entirely doable. A short-term corporate buyout of DBCA's responsibilities is unacceptable.
4. Offsets should be recalculated with the IUCN Critically Endangered status for Baudin's Black Cockatoos.

EPA OBJECTIVE:

To maintain quality of land and soils so that environmental values are protected.

Soils

Bauxite mining removes 4-6m of lateritic bauxite. This is replaced with about 1.5m of topsoil and sandy gravel overburden, and ripped substrate clay: slopes are created and contours ripped to form furrows in preparation for rehabilitation (EX 7-26).

Jarrah tree roots are mostly in the topsoil and overburden, with 'sinker' roots penetrating the caprock below. Alcoa acknowledges an 'expected partial loss of soil water capacity' from mining, due to the removal of 'about 2m of loamy soils'. However, the company continues to state: the 'loss of the bauxite friable fragmental layer has not been observed to result in impaired growth or health of rehabilitation' (EX 7-27, MMP 422), yet this is refuted by scientists (see Rehabilitation).

Rehabilitated mine pits are at risk of erosion, particularly in the first 2-3 years (EX 7-28). For that higher risk period, main erosion causes were excessive on-site runoff, poor surface completion and returned topsoil/overburden is too shallow (EX 7-28-29). Alcoa admits to no long-term data with which to compare erodibility of rehabilitation relative to unmined forest (EX 7-28).



Erosion in a mine site. Photo: Donna Chapman

For the Expansion, Alcoa proposes to 'minimise' erosion risks, essentially by doing what it says it already does (EX 7-34), with reporting on self-certification failures, and occasional inspections by DBCA resulting in remediation (EX 7-37, MMP 429). However, on-ground reports indicate site preparation is not effective in minimising erosion (see photos below).

For the MMP, there are specific commitments for the creation of slopes: 'Slopes must always be less than 18 degrees. No landscaped pit is to have a slope greater than 15 degrees for more than 20 metres unless it is on contour of the surrounding forest floor' (MMP 427). The photos below indicate noncompliance with this.



Steep mine pits.

RISKS & RECOMMENDATIONS

1. Alcoa's pit preparation for rehabilitation, erosion risk management, and promised remediation has been found to be inadequate on several occasions. Alcoa should be held immediately accountable for any breaches.

WATER INLAND WATERS

EPA OBJECTIVE:

To maintain the hydrological systems and quality of groundwater and surface water so that environmental values are protected.



Serpentine Dam with Alcoa's mining in background. #MilesTweediePhotography

Water catchments

'Bauxite mining operations represent the single most significant risk to water quality in Perth Metropolitan and Southwest drinking water catchments' (Water Corporation 2022).

Disturbance from the Expansion will predominately occur in Serpentine and South Dandalup Dam catchments (80% to 2044) (EX 8-74). For the MMP, 43% of Huntly Mine disturbance will be in the Serpentine Dam catchment while Willowdale is predominately in the Murray River catchment (MMP 485-86).

Reservoir Protection Zones (RPZ) are 2 km buffers around a reservoir to protect it from contamination.

Members of the public are not allowed in for any reason, yet Alcoa has been clearing forests for mining and infrastructure in these areas. Alcoa's current mining was pulled back 1 km from the Serpentine Dam in late 2023 by the WA Government. Mining activities, except for infrastructure in the RPZs have been 'deferred' for the Expansion; for the MMP, mining is proposed to continue in a number of RPZs but within 1-2 km zone for Serpentine Dam (MMP 498) (see Map 1). Over 8,800 ha of the Exploration DE will occur in drinking water dam RPZs, 1 km from the water level (MMP 703-04).

For the Water Corporation, the 'probability of contamination of reservoirs' is 'certain' (Water Corporation 2022, 7). Sediment/turbid water from mining and rehabilitation can enter reservoirs.

While not hazardous in itself, turbidity reduces the efficacy of treatment processes in inactivating or removing pathogens. Alcoa's Huntly and Willowdale mines had an average of 45 drainage failures/year in 2017-2022 (EX 8-118). The cost of treatment for all dams for the 2023-27 MMP would be 'in the order of \$3.25 billion' (Water Corporation 2022, 7).

Also, the WA Department of Health has stated that the 2023 Alcoa Transitional Approvals Framework² 'is not consistent with the published DWSP [Drinking Water Safety Plan] risk management objectives and Australian Drinking Water Guidelines' (WA DoH, 2024).

Three key risk factors increase the likelihood of sediment/turbid water entering reservoirs: clearing more than 30% of a subcatchment, in areas greater than 16% slope, and in areas of potential shallow groundwater (EX 8-118). For the Expansion, Alcoa states that no more than 30% of a subcatchment will be cleared, *with the exception of the Myara North infrastructure corridor* (EX 8-161). Clearing will also abide by the 16% slope limit (EX 8-161), but for the MMP, this limit only applies to the RPZs, *not the wider catchment* (MMP 510). However, Water Corporation states its assessment of existing drainage failures 'indicates risks escalate when the area of clearing exceeds 25-30% of sub catchment areas' and 'that 50% of drainage failures were associated with areas exceeding 16% slope' (2022, 53, 27).

The Expansion will involve construction of river crossings over the Serpentine and South Dandalup rivers for haul and mine access roads and a conveyor (EX 8-98). These crossings are in the RPZs and have potential to impact water quality. They will also require controversial Section 18 applications under the Aboriginal Heritage Act 1972. A pumping station and pipeline will also be constructed through the RPZ to source water from the Serpentine Dam (EX 1-48).

² <https://www.wa.gov.au/service/environment/environment-information-services/alcoa-transitional-approvals-framework-and-assurance-program>

PFAS

Alcoa used PFAS from 2013 to 2021 as a fire suppressant. Low concentrations have been detected in some groundwater bores within Alcoa's mining areas (MMP, 479 and 501). Alcoa states that water for dust suppression is largely sourced from local reservoirs, storm water run-off and treated wastewater. They do not acknowledge the recently revealed use of water contaminated with PFAS for dust suppression, which was not approved by Department of Water and Environmental Regulation (DWER) (Mitsopoulos 2025).

Waterflow

An increase of inflow to the reservoirs is expected during Alcoa's mining, but then a decrease (compared to non-mined areas) once rehabilitation begins (EX 8-146). Rainfall is expected to decline due to climate change, cumulatively reducing the streamflow in future years. Groundwater has already declined up to 15m within the Mine DEs. (MMP 477)

Water use

It is difficult to determine the total water use by Alcoa, with various figures used throughout the documents. It appears the Pinjarra Refinery uses on average approximately 7.43 giga litres (billion litres) of water per year (GL/year) from ground and surface sources. Alcoa expects this to increase by 0.5-1 GL/year when the refinery is upgraded to 5.25 Mtpa, but is still investigating how this additional water will be sourced (EX 8-151-153).

Alcoa's existing mine operations use approximately 1 GL of water per year, primarily for dust suppression, sourced via water abstraction licences, harvested stormwater and recycled treated water. Alcoa expects this to increase to up to 3.7 GL/year (MMP 75).

For the Expansion, Myara North is expected to use up to about 3 GL/year and Holyoake 1 GL/year: an estimated use for O'Neil is not stated, but could be assumed to be similar to the 1 GL/year for current mining in the region. An additional 1.6 GL/year will be required for 18-months for the Expansion construction. Water is to be sourced from treated stormwater run-off and water from the Serpentine and South Dandalup Dams with supply still to be negotiated by Watercorp (EX 8-147 and 1-56).

In total approximately 17 GL of surface and groundwater will be used by Alcoa each year on average, for mining and refining, with additional water sourced from rainfall harvesting and process inputs. For comparison, the maximum output of the Kwiana Desalination Plant is 50 GL/year.

For both Proposals, particularly the MMP, there are a large number of knowledge and or data gaps. These include:

- groundwater monitoring data and analysis (MMP 436, EX 8-27, 8-56, 8-66),
- quantitative risk assessment for drinking water and contaminant modelling (MMP 437),
- water quality monitoring stations (MMP 453),
- surface water quality, flow and salinity (MMP 436, 454),
- water quality sampling for potential contaminants (including PFAS) (MMP 458),
- hydraulic modelling for reservoirs (MMP 465),
- surveys of wetland systems (MMP 474) and
- detailed sedimentation assessments (MMP 498).

RISKS & RECOMMENDATIONS:

1. An immediate and permanent ban must be placed on all mining and exploration activities except rehabilitation in RPZs to minimize the risk to drinking water. Planned infrastructure corridors in RPZs must find alternative routes.
2. In addition, all mining in drinking water catchments should be phased out by 2028, at the end of the window of the currently approved 2024-2028 MMP.
3. In line with Water Corporation's (2022, 8) recommendations, there should be no exceptions to the 30% clearing limit in a sub catchment and to the mining prohibition in areas of greater than 16% slope.
4. Alcoa's existing significant water use in a drying climate must be taken into consideration by Water Corporation when negotiating supply from the Serpentine and South Dandalup Dams, and by the EPA when assessing the impact of a pipeline being built through the RPZ to access the water.
5. As there are a lot of knowledge and data gaps, the precautionary principle must be upheld. Without robust baseline data, key risks to drinking water safety and water-dependent ecosystems cannot be reliably evaluated.

EPA OBJECTIVE:

To maintain air quality and minimise emissions so that environmental values are protected.

Dust from mining and construction and gases and particulate emissions from refining, residue storage and power generation are the main concerns (EX 9-25 and MMP 603).

Refinery

Refinery emissions from combustion and metallurgical processes include carbon monoxide, carbon dioxide, oxides of nitrogen, oxides of sulfur, and particulate matter <2.5 micrometres (PM_{2.5}) and soot (EX 1-25), volatile organic compounds, aldehydes, ketones, and metals adsorbed onto vapour or particulates. These substances are known as air toxics and there are specific guidelines for exposure for human health. Alcoa does not predict to exceed the guidelines.



Refinery residue ponds.

Emissions from residue ponds include all the refining process-generated reagent and waste products that evaporate from ponds and include volatile organic compounds, aldehydes, and ketones (EX 9-22).

Air quality modelling for the refinery was done in 2021 (EX 9-17, Appendix B-12), but there is no assessment of cumulative impacts of the proposed production increase.

Mining

The main emission from mining is dust as a particulate matter. There are mainly potential impacts for human health and social amenity, but also to flora and vegetation, inland waters, and terrestrial environmental quality.

Alcoa's assessment of existing air quality (as a base line) is inadequate. 'Air quality within the Myara North and O'Neil mine regions is considered to be typical of a rural area' yet, at the monitoring station, 'Huntly Mine activities significantly contribute to dust concentrations under certain meteorological conditions'. Difficulties in screening out Alcoa's contributions mean 'a level of uncertainty persists' as to the sources of high concentrations of dust (EX 9-6, also MMP 603). There is 'no background air quality monitoring data' for Holyoake mine (EX 9-10), nor for the remainder of Huntly Mine DE (MMP 603).

Dust mitigation measures involve minimisation (EX 959-60). However they are basic and inadequate. The measure of separating dust sources from sensitive receptors³ is not emission minimisation; it relies on distance to reduce impacts on humans. Similarly, there is great reliance on water for dust suppression. Not only does this require heavy fresh water use, it is a short-term measure that cannot be sustained during busy vehicular activity in dry conditions.

Significant exceedances of relevant air quality standards are predicted at Myara North. While the consultant that did the modelling, GHD Pty Ltd, called these 'major exceedances' and attributed them to acting mining nearby (B11-1, Executive Summary), Alcoa minimises or dismisses them as 'a degree of double counting of dust from mine operations' and for less than 18 days/year (EX 9-28).

³ Locations where people live or spend time, native vegetation and fauna (EX 9-10-11).



Huntly mine

Yet the dispersion modelling did not include the existing Myara ore crusher as a source because it is represented in the other dust monitoring data (B11-1, 36). Several exceedances of relevant air quality standards are also predicted at O'Neil. No exceedances are predicted at Holyoake because there are no nearby receptors.

Alcoa has requested conditions 6-8 from Ministerial Statement 646 (MS646), which governs its current authorised extent for the Pinjarra Refinery, be removed and instead incorporated into the Refinery environmental licence L5271/1983/14 to 'remove the current overlap in regulation of air quality at the Refinery given Alcoa's demonstrated compliance in air quality under both MS646 and L5271/1983/14' (EX 9-62). However, L5271/1983/14 applies only to the immediate area of the Pinjarra Refinery and is not applicable to mining in the Huntly, Myara or O'Neil areas.

Alcoa's claim of 'demonstrated compliance in air quality under both MS646 and L5271/1983/14' is unjustified. The DWER webpage currently lists 4 environmental incidents for Alcoa and one for ongoing dust monitoring. Alcoa's *Air Quality Management Plan*, required under MS646, is not available to the public. It does not include any avoidance or mitigation measures which are essential.

Alcoa claims there is 'little published research on the quantified effects of dust deposition on native vegetation within the NJF', but goes on to acknowledge research indicating adverse effects on photosynthesis, leaf temperature and plant growth at certain loads. Alcoa assumes the effects of dust on photosynthesis will be lower in drier months, even though dust accumulation is expected to peak. Alcoa justifies this position based on an untested assumption that the understorey vegetation photosynthesises less during this time, due to their shallower roots and lower soil moisture (MMP 251-52).

Additionally, water use for dust suppression can impact adjacent forest through excess water runoff, spray drift and contaminants (MMP 252). The impact on fauna does not appear to be assessed, despite being acknowledged as sensitive receptors (EX 9-11).

RISKS & RECOMMENDATIONS

1. The EPA's assessment report should include independent analysis of the air quality impact assessments and not rely on Alcoa's summaries and downplay of exceedances.
2. Alcoa should be using a far better standard for dust mitigation, including blast stemming and active practice controls of dust emissions for haul roads, conveyors, stockpiles, crushers, transfer points and open areas. Alcoa's assertion the Refinery Air Quality Management Plan is an effective established practice with high certainty is not validated or supported by any evidence.

EPA OBJECTIVE:

To minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable.

'The EPA recognises that there are inherent links between the Greenhouse Gas (GHG) Emissions factor and other environmental factors through effects on climate. This is evidenced in part by the significant drying of the state's south-west. This drying in turn places significant additional pressures on water resources, flora and fauna, marine environmental quality, and social surroundings.' (EPA 2023)

Alcoa expects both Proposals to result in **more than 1.4 billion tonnes (t) of CO₂ equivalent (CO₂-e) GHG emissions to 2045** - over 1.0 billion tonnes from the Expansion (2026-45) and over 4.1 million tonnes (Mt) CO₂-e from the MMP (2023-27). MMP emissions do not include alumina refining (MMP 634).

Emissions breakdowns are as follows:

Alcoa's Pinjarra Expansion (2026-2045) (EX ix-x)

	Yearly (CO ₂ -e)	2026-2045 (CO ₂ -e)
Scope 1		
Refinery to 2045	1,874,250 t	37,485,000 t
Mining and Infrastructure	158,000 t	3,160,000 t
Forest carbon	na	6,337,492 t (to 2050)
TOTAL SCOPE 1		45,714,993.6 t
Scope 2		
Refinery to 2045	600,000 t	12,000,000 t
Clearing, Mining and Infrastructure	90,000 t	1,800,000 t
TOTAL SCOPE 2		13,800,000 t
Scope 3		
	47,409,000 t	948,180,000 t
Total	50,131,250 t	1,008,962,492 t

Alcoa's MMP 2023 – 2027 (MMP 68)

	Yearly (CO ₂ -e)	2022 – 2027 (t CO ₂ -e)
Scope 1		
Huntly Mine peak gross	124,900 t	
Huntly forest carbon	1,827,798 t	
Willowdale Mine	48,990 t	
Willowdale forest carbon	1,175,433 t	
TOTAL SCOPE 1	3,177,121 t	19.06 Mt
Scope 2		
Huntly Mine peak gross	65,495 t	
Willowdale mine peak gross	13,973 t	
TOTAL SCOPE 2	79,468 t	0.476,808 Mt
Scope 3		
Huntly	44.9 Mt	
Willowdale	20.8 Mt	
TOTAL SCOPE 3	65.7 MT	394.2 Mt
Total		413.739,534 Mt

GHG emissions from both of Alcoa's Proposals will be **greater than Woodside's Scarborough gas project** (878 Mt) and could be **more than double Australia's total annual emissions**.

GHG emissions from Alcoa's Expansion alone could total **more than 11-times Western Australia's total annual emissions**.



Active mining

Emissions are largely from the Refinery. Nevertheless, forest clearing is unacceptable in a climate crisis.

While the tables above include **forest carbon emissions from clearing**, Alcoa also gives net figures that include sequestration through rehabilitation. On this basis, for the Expansion, GHG emissions from clearing are estimated to be 2,806,640 t CO₂e by 2050; for the MMP they will be 3,278,208 t CO₂e. Importantly, **rehabilitation sequestration is not expected to exceed clearing emissions until about 2075-2076 (EX 10-8).**

Importantly, these are estimates. They assume the same amount of rehabilitation as clearing in a year and rehabilitation success, but this is unjustified due to the known backlog and inadequacies of rehabilitation (see Rehabilitation). The expectation of sequestration exceeding clearing emissions in 50 years takes no account of wildfire.

RISKS & RECOMMENDATIONS:

- Net GHG emissions rest on assumptions. As such, the claimed long-term carbon neutrality of the Proposals is highly uncertain and cannot be relied on in environmental decision-making. With at least 1.4 billion t CO₂-e GHG emissions over the next 20 years, the EPA has a clear mandate to either reject or significantly strengthen this proposal.
- 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, Australia will not be heeding the science and meeting its international climate commitments, and the recognised environmental impacts from climate change will be severe.



PEOPLE

SOCIAL SURROUNDINGS

EPA OBJECTIVE:

To protect social surroundings from significant harm.

Heritage

WAFA supports any and all concerns raised through public comment by local First Nations people and corporations. WAFA also acknowledges the limitations of the Aboriginal Heritage Act 1972 including the controversial section 18. Alcoa proposes to apply for Section 18 applications, including for river crossings as part of the Expansion.

Registered Aboriginal heritage sites and those identified during surveys as well as European heritage sites will all receive a 10 m 'Limited Disturbance Area' (LDA). These buffers aim to *minimise* direct impacts to areas of environmental and social value. Mine pits are not permitted in the LDAs, but haul roads, mine infrastructure and facilities are.

If these heritage areas overlap with the following they will receive greater buffers; 50 m for Black Cockatoo suitable and known nest trees, old growth forest and granite outcrops, 100 m for stream zone/riparian vegetation and 200 m for the top water line of Serpentine Dam.

A 10 m buffer doesn't match with what is recommended for European heritage sites in the Historical Archaeological Assessment undertaken for the expansion; 20 m buffer for Shield Trees, 50m buffers for the 40 Mile Peg Well, and Log Landings sand 100 m for the Jarrahdale Board Mill. (Archae-aus 2021, 183, 189, 191, 197).

For the Expansion, Alcoa states it will avoid direct impacts to the Italian POW (Prisoner Of War) Camp, Water Well, and Holyoake (Log Landing) by establishing mining avoidance zones (EX 11-42), but it does not state the areas of the zones or if buffers apply.

Amenity

According to an online survey commissioned by the WA Government in 2021, **almost everyone in WA uses the forest for personal or business purposes, and having access to WA's native forests is of utmost importance to individuals** (Subroy et al. 2021).

Alcoa acknowledges that mining will directly impact the amenity of the Bibbulmun Track, due to its proximity (see Map 1). Impacts to visual and audio amenity from construction, operational and blasting noise are expected, increasing with proximity to the source (MMP 617).

The Bibbulmun Track has a minimum 200 m buffer on either side applied, in line with its Comprehensive Adequate and Representative (CAR) Informal Reserve designation. Alcoa proposes to comply with an avoidance zone if the mine DE is within 200 m of the track.

Mining disturbance will be visible on the Bibbulmun Track in the mid to distant ground from Mount Cooke, Mount Vincent, Mount Wells and Boonering Hill and elevated viewpoints within the Monadnocks Conservation Park and noise from blasting may extend in a 1.2 km radius (EX 12-48). Alcoa asserts the visual impact will last until rehabilitation is established (MMP 616), which would take almost two decades (EX 12-91).

A 200 m buffer will not protect the integrity of the Bibbulmun Track's forested areas from edge effects, nor protect the visual and auditory experience of the forest. Therefore a buffer of at least 1000 m should be implemented instead.

The inadequacy of a 200 m buffer surrounding the Bibbulmun Track is further illustrated by this viewpoint approximately 2 km from the closest mining (Alcoa 2023c).



Photomontage showing view west from Mount Vincent (Alcoa 2023c).

Most of the impacts on the Munda Bidi Trail have been avoided, not by moving the mining around the trail, but by moving the trail around the mining. The Trail would have run directly through the proposed Myara North mine, but it was preemptively moved in 2023, before the Expansion has been assessed, let alone approved (see Map 1).

The Balmoral Trail and its extension will be partially closed during mining for a combined 14.1 km, with rehabilitation visible from the trail once reopened. This will also affect the POW Camp - Three Mountains Walk. The heritage listed POW Camp will be accessible by appointment only. Alcoa states that the POW camp will be in an AZ, but does not specify what size buffer will be around the camp. Due to the camp's proximity to mining, dust is likely to be deposited there, at visible levels (EX 12-42, 12-72).

By Alcoa's own admission 'the closure of walking tracks due to mining restricts recreation value and exposure to scenic value' (MMP 591).



Sullivan Rock, Bibbulmun Track. Photo: Donna Chapman

The Expansion's proposed Holyoake Mine will also impact the Dwellingup Discovery Forest, proposed by the local community in 2016, particularly Zone 5 - Murray Basin Wilderness Zone, the majority of which is within the mine DE. Alcoa admits the area includes 'Several potential ecological, water catchment, heritage, recreational and scientific values' (Alcoa 2025d 13), yet doesn't address them specifically, relying on broader assessments elsewhere in the ERD.

RISKS & RECOMMENDATIONS

1. Details of MAZs and LDAs for both heritage, amenity and environmental values, must be provided and clarified to ensure they are aligned with recommendations from Noongar people and corporations, and relevant experts and Government departments.
2. The buffer between mining and exploration and the Bibbulmun Track must be increased from an inadequate 200 m to at least 1000 m.
3. Given its significance to the Jarrahdale community, the Balmoral Trail and Extension and POW Camp should all be placed in an avoidance zone of at least 1000 m to safeguard their history, heritage, recreation and environmental values.
4. To protect its environmental, cultural and heritage amenity, Dwellingup Discovery Forest should be removed from the Expansion Proposal.

STAKEHOLDER ENGAGEMENT

EPA QUESTION:

Provide comment on the proponent's stakeholder engagement strategy, having regard to the identification of key issues and consultation outcomes.

If you are a relevant stakeholder, such as a member of an affected community or relevant organisation, you may want to comment here on the experience of your engagement with Alcoa, or lack thereof.

Alcoa's stakeholder engagement strategy for the MMP is insufficient, at a total of 7 pages long,

including the stakeholder engagement register appendix. It does not even include a summary of key issues raised and the company's response, as in the Expansion strategy document. No engagement after the MMP was accepted for assessment by the EPA in late 2023 is recorded.

Make your submission at wafa.org.au/alcoa by **21 August 2025**



View to Mount Solus. Photo: Donna Chapman

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