Alcoa of Australia Limited

Flora and Vegetation Management Plan

Huntly and Willowdale Mines

16 December 2024

Version	Description of Changes	Date
v0	Flora and Vegetation MP Revision	31 August 2023
v1	Updated from Version 0	16 December 2024

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Abbreviations

Abbreviation	Definition
Alcoa	Alcoa of Australia Limited
ARD	Armillaria Root Disease
BAM Act	*Biosecurity and Agricultural Management Act 2007* (WA)
BC Act	*Biodiversity Conservation Act 2016* (WA)
BSEC	Bauxite Strategic Executive Committee (formerly MMPLG)
CPC	Conservation and Parks Commission
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety
DPIRD	Department of Primary Industries and Regional Development
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EP Act	*Environmental Protection Act 1986* (WA)
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FCA	Forest Clearing Advice
FPC	Forest Products Commission
Flora and Vegetation MP	Flora and Vegetation Management Plan
GDE	Groundwater Dependent Ecosystem
GDP	Ground Disturbance Permit
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation of Australia
LDA	Limited Disturbance Area
MAZ	Mining Avoidance Zone
ML1SA	Mineral Lease 1SA
MMP	Mining and Management Program
MMPLG	Mining and Management Program Liaison Group (changed to BSEC)
MOG	Mine Operations Group
MS	Ministerial Statement
NJF	Northern Jarrah Forest (IBRA Subregion)
PEC	Priority Ecological Community
PMST	Protected Matters Search Tool
PSHB	Polyphagous Shot-hole Borer
RCC	Rehabilitation Completion Criteria
ROM	Run of Mine
SED	Strategic Exploration Drilling
SVT	Site Vegetation Type
TEC	Threatened Ecological Community
WA	Western Australia
WAOL	Western Australian Organism List
WoNS	Weeds of National Significance

Definitions

Term	Definition
Activities	Refers to mining activities, and infrastructure development and sustainment.
Construction	Project phase that includes harvesting and clearing activities, and the construction of haul roads and infrastructure.
Declared Pest	Under the BAM Act, the Minister may declare harmful organisms that are present within an area of the State to be a Declared Pest.
Environmental Impact Assessment (EIA)	An orderly and systematic process to evaluate a proposal and its effects on the environment, as well as to consider the mitigation and management of those effects (EPA, 2023).
Exploration	Exploration drilling targets areas outside of Alcoa's current mining operational envelope with a broader extent but less intense activities. As per the EP (Darling Range Bauxite Mining) Exemption Order 2023 "Exploration" is defined as: activities carried out in search of minerals, including (without limitation) (a) mapping; (b) surveying; (c) drilling; (d) the collection of and assaying of soil, rock, groundwater, and minerals samples; and (e) other activities involving the application of 1 or more of the geological sciences.
Flora and Vegetation MP	This document.
Forest Clearing Advice (FCA)	To obtain endorsement to clear within Conceptual Clearing Areas (as per the 5-year Mine Plan), approved by Mining and Management Programs (MMP). Forest Clearing Advice (FCA) are submitted to the Mine Operations Group (MOG- a sub-committee of the former MMPLG (now Bauxite Strategic Executive Committee [BSEC]), at an average rate of two per year. Endorsement of the FCA by the MOG is required prior to commencing vegetation clearing activities, including timber harvesting for mining, haul roads and constructing associated infrastructure.
Ground Disturbance Permit (GDP)	The GDP is an internal process which was created to avoid, minimise and manage potential environmental and heritage risks. The process reviews potential exploration, construction and operational activities in-line with Project constraints and environmental commitments and provides a due diligence check of potential environmental sensitivities prior to the activity commencing. Activities are assessed and signed-off by the appropriate level of the business based on the type of activity.
Groundwater Dependent Ecosystem (GDE)	GDE includes ecosystems that use groundwater as all or only as part of their water supply to meet all or some of their water requirements.
Indicator	A measurable or quantifiable characteristic selected for specific purposes to indicate health or condition of that part of the environment (EPA, 2024).
Infrastructure	Includes any structures that enable or support mining activities including (but not limited to): stockpiles; haul roads; conveyors; crushers; structures for water storage; and water monitoring and infrastructure.
Key weed species	Weed species listed as either a Declared Pest, Weed of National Significance (WoNS) or weed species ranked as

Term	Definition
	having high invasiveness and low feasibility of control by DBCA (2014).
Limited Disturbance Area (LDA)	Spatial area which prohibits mine pits but allows for infrastructure and haul roads.
Management Actions	The identified actions implemented to meet the environmental objective (EPA, 2024).
Management Targets	A type of indicator that is defined to demonstrate that the objective is being met (EPA, 2024).
Mining activities	Refers to the integrated process of extracting bauxite from mineral reserves below the surface by coordinating the use of people and equipment. This refers specifically to removing topsoil and overburden, breaking caprock (blasting or ripping) to expose the viable bauxite, removal of viable bauxite, crushing and conveying bauxite to the refineries. Excludes infrastructure or rehabilitation activities.
Mining Avoidance Zone (MAZ)	Spatial area which prohibits mine pits and infrastructure, with the exception of monitoring and rehabilitation activities which have minimal impacts.
Monitoring	The regular observation and recording of activities taking place in a program. Monitoring assesses management outcomes, the condition of the environment to help determine if desired outcomes are being achieved (CPC, 2023).
Old Growth Forest	Forests that have not been subject to major disturbance by timber harvesting, grazing, mining, or introduced diseases, and that remain dominated by larger, older trees (DPaW, 2017; CPC, 2023).
Operational	Active and established activities occurring across the Project, including mine pits, infrastructure, crusher, conveyor, and haul roads.
Other operations	Adjunct activities associated with mining, infrastructure, and rehabilitation.
Priority Ecological Community (PEC)	Possible threatened ecological communities that do not meet the stringent survey criteria for the assessment of threatened ecological communities (EPA, 2016).
Priority flora	Listed flora species that are either under consideration as threatened flora but are in need of additional surveys to adequately determine their status or are adequately known but require monitoring to ensure that their security does not decline (EPA, 2016).
Project	Huntly and Willowdale bauxite mines (including exploration).
Reference site	A site located in a similar system, or in a location that experiences similar natural environmental conditions as an area being monitored or managed, but largely un-impacted by human influences and used as a benchmark for determining the environmental objective/s targeted in an EMP (EPA, 2024).
Rehabilitation	In relation to an area that has been disturbed, includes: (a) stabilisation of the area; and (b) restoration of the landforms of the area to a state that is as close as practicable to their original undisturbed state; and (c) the return of the native vegetation of the area to a state that is as close as practicable to its original undisturbed state.

Term	Definition
Significant flora and vegetation	As per EPA (2016), flora and vegetation may be considered significant for a range of reasons, including, but not limited to, the following: Flora • being identified as threatened or priority species; • locally endemic or associated with a restricted habitat type (e.g. surface water or GDEs); • new species or anomalous features that indicate a potential new species; • representative of the range of a species (particularly at the extremes of range, recently discovered range extensions, or isolated outliers of the main range); • unusual species, including restricted subspecies, varieties, or naturally-occurring hybrids; or • relictual status, being representative of taxonomic groups that no longer occupy widely in the broader landscape. Vegetation • being identified as Threatened Ecological Communities or Priority Ecological Communities; • restricted distribution; • degree of historical impact from threatening process; • a role as a refuge; or • providing an important function required to maintain ecological integrity of a significant ecosystem.
Strata	The vertical layers (strata) of vegetation within a forest according to the different heights to which the plants grow.
Strategic Exploration Drilling (SED)	Includes additional drilling to be undertaken in various areas to provide early, additional information on mineralisation presence, extent, quality, and continuity.
Threatened Ecological Community (TEC)	A naturally occurring assemblage of plants and animals listed under relevant legislation and endorsed by the Minister for Environment as being threatened with extinction by human activity, or in danger of being destroyed or significantly modified by development or other pressures (EPA, 2016).
Threatened flora	Western Australian flora species that been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been listed under relevant legislation. Environmental values which are protected listed by legislation or are considered to be of ecological importance, which includes threatened flora under the BC Act and EPBC Act.
Timber harvesting	The process of cutting and removing merchantable timber or other forest products. The Forest Products Commission (FPC) is responsible for the sustainable management and development of Western Australia's forest products industry on land owned or leased by the State. Alcoa works closely with the FPC to appropriately sequence mine clearing and ensure sustainable forest harvesting to support maximum recovery and re-use of wood residue. Before Alcoa accesses a new mining area, the State reserves the right to any marketable timber or other forest products from that area. Alcoa harvests these areas and coordinate with FPC to enable product removal.

Term	Definition
Vegetation complex	A classification system for vegetation types within the south-west of Western Australia defined by Havel (1975). The system delineates forest vegetation using a combination of plant species co-occurrence patterns, landforms, soils and rainfall.
Western Australian Organism List (WAOL)	Provides the status of organisms which have been categorised under the BAM Act.
Weed species	Weed species are plants that can grow in locations where they are not desired and can have adverse effects on the environment and economy.
Weeds of National Significance (WoNS)	A list of plant species selected based on their invasiveness and impact characteristics, their potential and current area of spread and their primary industry, environmental and socioeconomic impacts, and agreed upon by Australian governments based on an assessment framework (Invasive Plants and Animals Committee, 2016).

1 Executive Summary

This Flora and Vegetation Management Plan (Flora and Vegetation MP) has been prepared by Alcoa of Australia Limited (Alcoa) for the Huntly and Willowdale bauxite mines (the Project) located within the Northern Jarrah Forest (NJF) Interim Biogeographic Regionalisation for Australia (IBRA) subregion and within Mineral Lease 1SA (ML1SA).

The purpose of this Flora and Vegetation MP is to provide the monitoring, mitigation and management framework for significant flora and vegetation communities listed under the State *Biodiversity Conservation Act 2016* (BC Act) that are known to occur within the Project area. This Flora and Vegetation MP specifically addresses the monitoring, mitigation and management of the risks and potential impacts that may arise from Alcoa's bauxite mining on these significant flora species and vegetation communities (refer to Appendix B and Appendix C for conservation categories and definitions).

This is proposed to be achieved through:

- identification of significant flora and vegetation communities present within the Project area;
- establishment and maintenance of Limited Disturbance Areas (LDA) and Mining Avoidance Zones (MAZ) within internal spatial databases to avoid and minimise impacts to identified significant flora and vegetation communities' values; and
- prescribe mitigation measures to avoid or minimise environmental impacts on significant flora and vegetation communities through implementation of appropriate objective-based and outcome-based management measures.

This Flora and Vegetation MP specifically addresses the following significant flora and vegetation communities currently known to occur within the Project area, as presented in Table 1-1.

Table 1-1: Significant Flora Species and Vegetation Communities Known to Occur Within the Project Area[1, 2]

Category	Status	Family	Species/Vegetation Community
Flora	Priority 1	Dilleniaceae	*Hibbertia ambita*
			Hibbertia hortiorum
		Cyperaceae	*Netrostylis* sp. Nannup (P.A. Jurjevich 1133)
	Priority 2	Elaeocarpaceae	*Tetratheca phoenix*
	Priority 3	Fabaceae	*Acacia drummondii* subsp. *affinis*
			Acacia horridula
		Proteaceae	*Grevillea dissectifolia*
			Grevillea prominens
		Lamiaceae	*Hemigenia microphylla*
		Asparagaceae	*Thysanotus anceps*
	Priority 4	Myrtaceae	*Calothamnus graniticus* subsp. *leptophyllus*
		Rutaceae	*Cyanothamnus tenuis*
		Malvaceae	*Lasiopetalum cardiophyllum*
		Asteraceae	*Senecio leucoglossus*
		Stylidiaceae	*Stylidium ireneae*
	Potential Priority / Novel Species	Proteaceae	*Banksia* sp. Hoffman[3]

[1] Listings current at time of publication; the PEC potentially occurs within the Project area.
[2] Alcoa recognises that there may be additional significant flora and vegetation community values within the Project areas. As further knowledge is gained, this Flora and Vegetation MP will be updated as per the adaptive management approach.
[3] *Banksia* sp. Hoffman is informally named and considered by the DBCA as a potentially new species. DBCA informed Alcoa of this on 16 September 2024, and therefore this species is considered in this Flora and Vegetation MP as a significant flora species which is undergoing further study and taxonomic review by the DBCA (current at the time of publication).

Category	Status	Family	Species/Vegetation Community
Vegetation community	Priority Ecological Community 3	N/A	Granite Communities of the Northern Jarrah Forest

It is anticipated that all proposed monitoring, mitigation and management provisions outlined within this Flora and Vegetation MP will have flow-on benefits for all native flora and vegetation communities occurring within the Project area. This Flora and Vegetation MP will supersede the Flora and Vegetation MP v0 upon submission and will be updated as further data and knowledge is gained through ongoing studies and research, and continued monitoring is undertaken to verify the efficacy of management controls. This adaptive management approach is recognised by the Western Australian (WA) Environmental Protection Authority (EPA) as a systematic approach to improving environmental results and management practices during Project implementation through the application of learning from monitoring outcomes and management actions (EPA, 2024).

The Key Environmental Factor relevant to this Flora and Vegetation MP is:

Flora and Vegetation, defined by the EPA (2016): "*To protect flora and vegetation so that biological diversity and ecological integrity are maintained*".

This Flora and Vegetation MP addresses the monitoring and management of the pre-mining and active mine cycle phases of the WA mining operations within the Huntly and Willowdale mine regions (eight regions[4] and three regions[5] respectively), including:

- Exploration (components presented in section 3);
- Construction (components presented in section 4); and
- Operational (active mining, components presented in section 5).

This Flora and Vegetation MP does not address the rehabilitation phase or closure management activities, as these are addressed in separate documents.

Table 1- below presents a summary of the Project and the outcome-based and objective-based provisions developed for the key environmental factor (Flora and Vegetation) to be met through the implementation of this Flora and Vegetation MP. Table 1- also summarises the environmental criteria and management targets to measure the achievement of the associated environmental outcomes and objectives during the pre-mining and active mining phases.

Table 1-2: Summary of the Project and Flora and Vegetation MP Purpose and Environmental Provisions

Proponent Name	Alcoa of Australia Limited (Alcoa)
Conditions/ Commitments	Environmental Protection (Darling Range Bauxite Mining Proposal) Exemption Order 2023, SL 2023/200 (14 December 2023). Ministerial Approval conditions for the 2023 – 2027 Mining and Management Program (MMP), Appendix A (20 December 2023). Ministerial Statements: • Ministerial Statement 1157 (and previous Ministerial Statements 728, 897 and 1069) • Ministerial Statement 646
State Agreements	State Agreements: • *Alumina Refinery (Kwinana) Agreement Act 1961* • *Alumina Refinery (Wagerup) Agreement Act and Acts Amendment Act 1978* • *Alumina Refinery (Pinjarra) Agreement Act 1969* • *Alumina Refinery Agreements (Alcoa) Amendment Act 1987*
Purpose of this Management Plan	This Flora and Vegetation MP provides for the management of significant flora and vegetation communities with the potential to be impacted by the Project during all pre-mining and active mining phases of WA mining operations (exploration, construction and operational mining).
Flora and Vegetation EPA Objective: *To protect flora and vegetation so that biological diversity and ecological integrity are maintained.*	

[4] Huntly mine regions: Del Park; Huntly 1 & 2; White; McCoy; O'Neil; Myara; Myara North; Holyoake.
[5] Willowdale mine regions: Arundel; Orion; Larego.

Mining Phase: Exploration		
Management plan provisions	**Outcome-based**	
	Trigger criteria	1. Required exploration activities are identified to be on a trajectory towards (within 30 m) of the MAZ for: • Old Growth Forest; or • National Parks; or • formal conservation reserves; or • known populations of threatened flora[6, 7].
	Threshold criteria	1. Required exploration activities intrudes into any of the MAZ for: • Old Growth Forest; or • National Parks; or • formal conservation reserves; or • known populations of threatened flora[6, 7].
	Objective-based	
	Management targets	1. Establish appropriate buffer zones for any newly identified significant flora and / or vegetation communities[8]. 2. Avoid or otherwise minimise indirect impacts within any applied LDA or MAZ through the generation of dust or ground vibration. 3. Avoid or otherwise minimise indirect impacts within any applied LDA or MAZ through potential introduction of and / or establishment of *Phytophthora* dieback and / or weed species. 4. Avoid or otherwise minimise indirect impacts within any applied LDA or MAZ through potential introduction of and / or spread of emerging biosecurity risks such as Myrtle Rust (*Austropuccinia psidii*) and Polyphagous Shot-hole Borer (*Euwallacea fornicatus*). 5. No exploration drilling is undertaken within the 100 m buffer (LDA) for mapped or derived (i.e. in the absence of vegetation mapping) streamzone vegetation[9] **OR** No exploration drilling is undertaken within the 50 m buffer (LDA) for mapped major rock outcrop (>1 ha) vegetation. 6. Avoid or otherwise minimise impact to vegetation (e.g. streamzone vegetation) resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spills) outside of containment infrastructure.
Mining Phase: Construction		
Management plan provisions	**Outcome-based**	
	Trigger criteria	1. Clearing of native vegetation approaches 85% of the approved annual clearing limit[10]. 2. Required construction activities are identified to be on trajectory towards (within 30 m) of the MAZ for: • Old Growth Forest; or • National Parks; or • formal conservation reserves; or • known populations of threatened flora[6, 7]. 3. Required construction activities (not including: streamzone crossings [such as, haul roads, access roads / tracks]) encroaches within 50 m of the 100 m buffer (LDA) for mapped streamzone vegetation **OR** Required construction activities (not including construction such as haul roads, access roads / tracks) encroaches within 10 m of the 50 m buffer (LDA) for mapped major rock outcrop (>1 ha) vegetation.
	Threshold criteria	1. Clearing of native vegetation exceeds the approved annual limit[10]. 2. Required construction activities intrudes into any of the MAZ listed below:

[6] At the time of publication, there were no known threatened flora species occurring within the Huntly and Willowdale mines.
[7] Appropriate MAZ will be established for any newly identified threatened flora aligning with State guidelines and principles.
[8] The extent and / or radius of appropriate buffer zones will take into account individual species' physiological and biological attributes and landscape profiles.
[9] Excludes any requirement/s for drilling for bores or geological investigation.
[10] 800 ha per calendar year (applies to MMP 23 – 27 period). Unused capacity may be rolled over into the following year, following approval from the State Development Minister. Approved limits per calendar year will reflect clearing limits for the applicable time period including future approvals.

		• Old Growth Forest; or • National Parks; or • formal conservation reserves; or • known populations of threatened flora[11],[12]. 3. Required construction activities (not including: streamzone crossings [such as, haul roads, access roads / tracks]) intrudes into the 100 m buffer (LDA) for mapped streamzone vegetation **OR** Required construction activities (not including construction such as haul roads, access roads / tracks) intrudes into the 50 m buffer (LDA) for mapped major rock outcrop (>1 ha) vegetation.
	Objective-based	
	Management targets	1. Establish appropriate buffer zones for any newly identified significant flora and / or vegetation communities[13]. 2. Minimise as far as practicable indirect impacts within any applied LDA or MAZ through the potential introduction and / or establishment of *Phytophthora* dieback and / or weed species. 3. Minimise as far as practicable indirect impacts within any applied LDA or MAZ through potential introduction of and / or spread of emerging biosecurity risks such as Myrtle Rust (*Austropuccinia psidii)* and Polyphagous Shot-hole Borer (*Euwallacea fornicatus*). 4. Minimise impact to vegetation (e.g. streamzone vegetation) resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spills) outside of containment infrastructure. 5. Avoid or otherwise minimise vegetation fragmentation, as far as reasonably practicable, by retaining ecological corridors / linkages (i.e. streamzone vegetation).
Mining Phase: Operational		
Management plan provisions	**Outcome-based**	
	Early response criteria	1. In-field assessment indicates trending towards decline in vegetation condition and / or compositional change/s in critical strata levels (e.g. understorey indicator species such as *Gahnia trifida*) of mapped or derived streamzone vegetation monitoring sites and / or changes since baseline compared to reference sites. 2. In-field assessment indicates trending towards decline in vegetation condition in major rock outcrop vegetation monitoring sites since baseline and compared to reference sites. 3. Key weed species[14] recorded within vegetation monitoring sites which has not been previously recorded during baseline surveys compared to reference sites.
	Trigger criteria	1. In-field assessment indicates statistically significant decline in vegetation condition and / or compositional change/s in critical strata levels (e.g. understorey indicator species such as *Gahnia trifida*) of mapped or derived streamzone vegetation monitoring sites and / or changes since baseline compared to reference sites. 2. In-field assessment indicates statistically significant decline in vegetation condition in major rock outcrop vegetation monitoring sites since baseline and compared to reference sites. 3. Key weed species[14] recorded within vegetation monitoring sites which has not previously been recorded during baseline surveys and is classified by DBCA (2014) as having high ecological impact and low feasibility of control and exceeds 15% of total understorey cover. 4. Operational activities are identified to be on trajectory towards (within 30 m) of the MAZ for: • Old Growth Forest; or • National Parks; or

[11] At the time of publication, there were no known threatened flora species occurring within the Huntly and Willowdale mines.
[12] Appropriate MAZ will be established for any newly identified threatened flora aligning with State guidelines and principles.
[13] The extent and / or radius of appropriate buffer zones will take into account individual species' physiological and biological attributes and landscape profiles.
[14] Weed species listed as either a Declared Pest, Weed of National Significance (WoNS) or weed species ranked as having high invasiveness and low feasibility of control by DBCA (2014).

		• formal conservation reserves; or • known populations of threatened flora[15, 16]. 5. Operational activities (not including: streamzone crossings [such as, haul roads, access roads / tracks]) intrudes within 50 m of the 100 m buffer (LDA) for mapped streamzone vegetation **OR** Operational activities (not including: haul roads, access roads / tracks) intrudes within 10 m of the 50 m buffer (LDA) for major mapped rock outcrop (>1 ha) vegetation.
	Threshold criteria	1. In-field assessment indicates statistically significant decline in vegetation condition and / or compositional change/s in critical strata levels (e.g. understorey indicator species such as *Gahnia trifida*) of mapped or derived streamzone vegetation monitoring sites with no indication of recovery in native vegetation strata, abundance, cover and condition outside of natural variation since baseline and compared to reference sites and be attributable to Alcoa operational activities. 2. In-field assessment indicates statistically significant decline in vegetation condition in major rock outcrop vegetation monitoring sites since baseline and compared to reference sites with no indication of recovery in native vegetation strata, abundance, cover and condition outside of natural variation since baseline and compared to reference sites and be attributable to Alcoa operational activities. 3. Operational activities intrudes into any of the MAZ listed below: • Old Growth Forest; or • National Parks; or • formal conservation reserves; or • known populations of threatened flora[15, 16]. 4. Operational activities (not including: streamzone crossings [such as, haul roads, access roads / tracks]) intrudes within the 100 m buffer (LDA) for mapped streamzone vegetation **OR** Operational activities (with the exception of monitoring and management) intrudes into the 50 m buffer (LDA) for mapped major rock outcrop (>1 ha) vegetation.
	Objective-based	
	Management targets	1. Establish appropriate buffer zones to any newly identified significant flora and / or vegetation communities[17]. 2. Minimise as far as practicable indirect impacts within any applied LDA or MAZ through potential introduction of and / or establishment of *Phytophthora* dieback and / or weeds. 3. Minimise as far as practicable indirect impacts within any applied LDA or MAZ through potential introduction of and / or spread of emerging biosecurity risks such as Myrtle Rust (*Austropuccinia psidii)* and Polyphagous Shot-hole Borer (*Euwallacea fornicatus*). 4. Minimise impact to vegetation (e.g. streamzone vegetation) resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spills) outside of containment infrastructure. 5. Avoid or otherwise minimise vegetation fragmentation, as far as reasonably practicable, by retaining ecological corridors / linkages (i.e. streamzone vegetation).

[15] At the time of publication, there were no known threatened flora species occurring within the Huntly and Willowdale mines.
[16] Appropriate MAZ will be established for any newly identified threatened flora aligning with State guidelines and principles.
[17] The extent and / or radius of appropriate buffer zones will take into account individual species' physiological and biological attributes and landscape profiles.

2 Context, Scope and Rationale

This Flora and Vegetation MP has been prepared by Alcoa for the Huntly and Willowdale bauxite mine regions located within Alcoa's ML1SA and covers all phases of pre-mining and active mining cycles (including exploration, construction and operational mining, excluding rehabilitation and closure management). This Flora and Vegetation MP has been developed to address the environmental management of known significant flora and vegetation communities in accordance with relevant State and Commonwealth guidelines, procedures and guidance documents, such as the State *Environmental Factor Guideline: Flora and Vegetation* (EPA, 2016a) and the Commonwealth Department of Climate Change, Energy, the Environment and Water's (DCCEEW, 2024) *Environmental Management Plan Guidelines*.

Additionally, this Flora and Vegetation MP has been prepared in accordance with the Western Australian EPA's Environmental Management Plan (EMP) instructions (EPA, 2024) and template (EPA, 2021a). Further, this Flora and Vegetation MP has been developed with consideration and alignment of the *Forest Management Plan 2024 – 2033* (Conservation and Packs Commission [CPC], 2023), relevant threat abatement plans such as the *Threat Abatement Plan for Disease in Natural Ecosystems Caused by Phytophthora cinnamomi* (Commonwealth of Australia, 2018), and associated documents. The full list of resources utilised in the development of this Flora and Vegetation MP are presented in Appendix D.

This Flora and Vegetation MP describes the monitoring and management actions that will be undertaken to ensure that potential impacts on known significant flora and vegetation communities that may result from Project activities have been avoided, minimised and mitigated in accordance with mitigation hierarchy principles. Alcoa's Biodiversity Policy (Alcoa, 2021) requires that the mitigation hierarchy is implemented to manage potential impacts to biodiversity values which is in order of priority:

- impact avoidance;
- impact minimisation; and
- rehabilitation.

Alcoa's key mitigation measures include (but not limited to) implementing:

Mining Avoidance Zones (MAZ): a spatial area which prohibits mine pits and infrastructure, with the exception of monitoring and management activities which have minimal impacts. Implemented MAZ of relevance for this Flora and Vegetation MP are:

- known populations of threatened flora species[18, 19] (unless regulatory consultation and appropriate approvals obtained);
- Old growth forest; and
- National parks and formal conservation reserves.

Limited Disturbance Areas (LDA): a spatial area which prohibits mine pits but allows for infrastructure and haul roads. Implemented LDA's of relevance to this Flora and Vegetation MP are:

- the 50 m buffer, including vegetation, surrounding a mapped major rock outcrop (>1 ha); and
- mapped streamzone vegetation and its 100 m buffer.

This Flora and Vegetation MP is also expected to meet current conditions and commitments (refer to Table 2-1) and is subject to approval by the State Development Minister. Approved management plans and any revised management plans will be published on Alcoa's website and provided to the State Development Minister in electronic form within twenty (20) business days of being implemented or being required to be implemented (whichever is earlier).

The following are key objectives of this Flora and Vegetation MP:

- identify significant flora and vegetation communities which may be at risk of potential impacts, both direct and indirect, from Project activities;
- apply the mitigation hierarchy to avoid, minimise and mitigate (through rehabilitation) any potential impacts to known significant flora and vegetation communities;
- describe how potential impacts resulting from the Project will be identified, mitigated and adequately managed and monitored through the setting of both outcomes and objectives along with response actions; and
- demonstrate Alcoa's adaptive management approach strategies relevant to known significant flora and vegetation communities to meet best practice principles as the Project continues and there is increased understanding of significant flora and vegetation values.

[18] At the time of publication, there were no known threatened flora species occurring within the Huntly and Willowdale mines.
[19] Appropriate MAZ will be established for any newly identified threatened flora aligning with State guidelines and principles.

2.1 Huntly and Willowdale Mine Regions

Alcoa's WA mining operation is comprised of the Huntly and Willowdale mines, located within ML1SA, which falls within the Northern Jarrah Forest (NJF) IBRA subregion. The Jarrah Forest is a continuous open forest stretching from south of Moora to north of Collie and encompasses the hills of the Darling Scarp and undulating terrain to the east. The NJF subregion comprises a total of approximately 1.90 million hectares and is broadly characterised by Jarrah (*Eucalyptus marginata*) forest on ironstone gravels and Marri-Wandoo (*Corymbia calophylla-Eucalyptus wandoo*) woodlands on loamy soils, with sclerophyll understoreys. Landforms of the Jarrah Forest are diverse, and the Department of Primary Industries and Regional Development's (DPIRD) Land Systems (Churchward & McArthur, 1989) divide the areas in which Alcoa operates into two groups:

1. **Darling Plateau System (255Dp)**
   Lateritic plateau. Duplex sandy gravels, loamy gravels and wet soils. Jarrah-Marri-Wandoo forest and woodland.
2. **Murray Valleys System (255Mv)**
   Western Darling Range from the Avon Valley to Harvey. Deeply incised valleys with red loamy earths, shallow duplexes and rock outcrop and Jarrah-Marri-Wandoo forest and woodland with mixed shrubland.

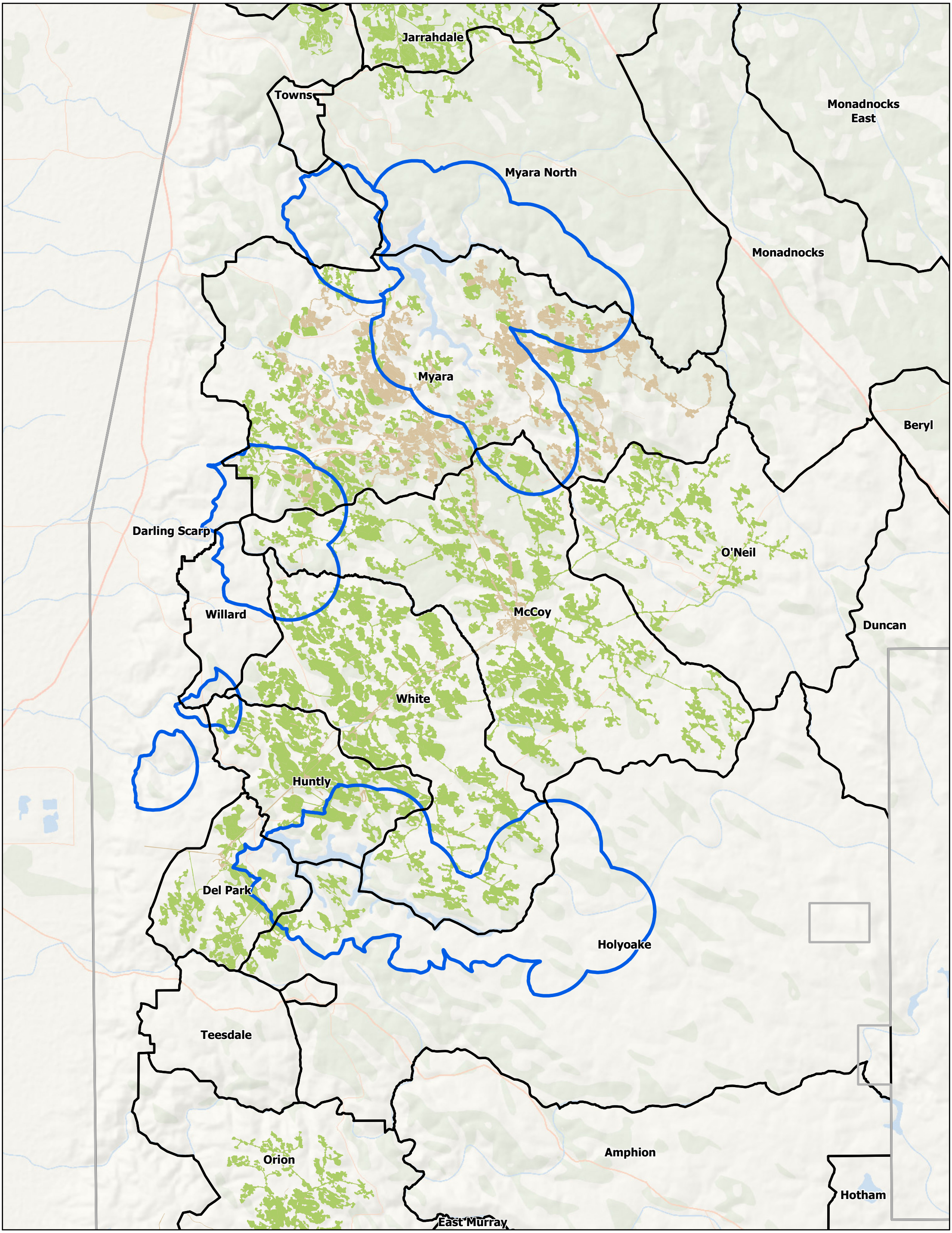
Alcoa's operations are restricted primarily to the bauxite-rich upland forests of the Darling Plateau System (255Dp) which are typically dominated by Jarrah, Marri, and mosaics of Sheoak (*Allocasuarina fraseriana*) and Wandoo. To the north of the Huntly mine (Myara North Region) lies the former Jarrahdale mine, which operated from 1963 – 1998 and is now closed and rehabilitated and is not considered under this Flora and Vegetation MP.

Huntly Mine

The Huntly mine (Figure 2-1) is primarily located within the Shire of Serpentine Jarrahdale and the Shire of Murray and extends from Dwellingup in the south to Jarrahdale in the north. This mine lies within Dwellingup and Jarrahdale State Forests and is broadly bordered by Serpentine National Park and the Darling Scarp to the west, the Monadnocks Conservation Park and Albany Highway to the east, Dwellingup and Pinjarra-Williams Road to the south and the former Jarrahdale Mine to the north.

Willowdale Mine

The Willowdale mine (Figure 2-2) is located within the Shire of Waroona and the Shire of Harvey and is broadly bordered by Lane Pool Reserve in the east and north-east, the Darling Scarp to the west and Harvey Dam and surrounding rural land to the south-east. The mine predominantly lies within Dwellingup State Forest and Lane Pool Reserve.



Legend

- ML1SA
- Mining Regions
- Reservoir Protection Zones (RPZ)
- Cleared Areas
- Rehabilitation

Alcoa

N

0 2 4 6 8 10 km

Flora and Vegetation Management Plan

Figure 2-1 Huntly Mine Overview

Scale: 1:150,000

Date Printed: 22/11/2024

Towns
Holyoake
Teesdale
Amphion
Darling Scarp
Orion
East Murray
Arundel
Laregо
Cornwall

Legend

- ML1SA
- Mining Regions
- Reservoir Protection Zones (RPZ)
- Cleared Areas
- Rehabilitation

Alcoa

N

0 1 2 3 4 5 km

Flora and Vegetation Management Plan

Figure 2-2 Willowdale Mine Overview

Scale: 1:100,000

Date Printed: 22/11/2024

2.2 Key Environmental Factors

Environmental factors (defined in the EPA's Administrative Procedures, [EPA, 2021c]) are factors that the EPA uses as an organising principle for Environmental Impact Assessment (EIA), comprising a number of environmental values. They provide a systematic approach to organising environmental information for the purpose of EIA. Further, the EPA has identified an environmental objective for each environmental factor, which aims to ensure the objects and principles of the State *Environmental Protection Act 1986* (EP Act) are achieved (EPA, 2023).

Flora and Vegetation

The EPA (2016a) defines flora as native vascular plants and vegetation as groupings of different flora patterned across the landscape that occur in response to environmental conditions.

The EPA's environmental objective for the factor "Flora and Vegetation" is: "*To protect flora and vegetation so that biological diversity and ecological integrity are maintained".* In the context of this objective, ecological integrity is the composition, structure, function and processes of ecosystems, and the natural range of variation of these elements (EPA, 2016a).

Key flora and vegetation values identified for this Flora and Vegetation MP have been selected for a range of reasons, including:

- being identified as a threatened or priority flora species; and/or
- being identified as a threatened or priority ecological community; and/or
- locally endemic flora species or having restricted distributions and habitat types.

Potential Impacts

Over the last 200 years, the magnitude and rate of change have increased within the NJF and beyond into the forest ecosystems of the south-west of Western Australia, due to: disturbance from mining, timber harvesting and water abstraction; clearing for townsites, agriculture and infrastructure; the introduction and spread of exotic diseases, weed species and pest animals; and changing bushfire events (CPC, 2023). In particular, agriculture and timber harvesting activities have caused widespread impacts, including:

- loss of biodiversity and habitat from permanent clearing;
- long-term loss of mature trees and associated hollows from timber harvesting;
- spread of *Phytophthora* dieback in forested areas from timber harvesting;
- agricultural impacts to soils including erosion, salinity, compaction, and acidification;
- secondary salinity impacts to the Murray and Avon rivers from permanent clearing; and
- conversion of the natural landscape to rural character and conversion of Old Growth Forest to juvenile to immature forest age.

The areas in which Alcoa operates also support high levels of nature-based recreation and tourism, such as camping, hiking and mountain biking. These anthropogenic disturbances, in addition to inappropriate fire regimes, have also contributed to changes in the landscape and vegetation communities, and the cumulative effects of these disturbances have also resulted in several flora species being listed under the EPBC Act and BC Act. The interaction between weed species and fire is of increasing concern as climate change continues to alter fire regimes (e.g. transformer weed species, because of their ability to alter environments).

Impacts to flora and vegetation can be direct or indirect and may be permanent or temporary.

Potential direct impacts from Project activities include clearing of vegetation, and the removal, fragmentation, degradation or modification of habitat and substrates, and may also cause other direct impacts by reducing the diversity and abundance of flora species in an area (EPA, 2016a).

Potential indirect impacts from Project activities may include, for example (EPA, 2016a):

- fragmentation of populations, isolation of populations / occurrences;
- impacts on habitat that supports significant flora and vegetation;
- impacts on other species with important ecological functions (e.g. pollinators, seed dispersal vectors, essential symbiotic fungi);
- introduction or promotion of weed species and / or disease such as *Phytophthora* dieback, and temporary impacts such as fire;
- altered hydrological regimes, including increase or decrease of groundwater level and alteration of surface water flows, and pollution or modification of water quality; and
- spills and/or leaks from storage and handling of hazardous materials and waste.

Other indirect impacts may include increased or altered dust and fire regimes.

2.3 Condition Requirements

The conditions and associated endorsed commitments for the Huntly and Willowdale mines that are relevant to this Flora and Vegetation MP are detailed below in Table 2-1. Project avoidance areas and constraints[20] are presented in Figure 2-3.

Table 2-1: Conditions and Commitments as Relevant for this Flora and Vegetation MP

Ministerial Statement 1157[21] Conditions		Section in this Flora and Vegetation MP
3	Alcoa will plan and manage its mining operations to minimise disturbance to biologically diverse fringing major rock outcrops and stream zones. Appropriate buffers will be maintained between these areas and mine pit boundaries. Stream crossings will be constructed in a manner which facilitates their removal and rehabilitation after use, unless required for ongoing forest management or other purposes agreed with the State's Mining and Management program Liaison Group (MMPLG, now BSEC).	Figure 2-3 Sections 3 – 6
4	Alcoa will continue its program of biological surveys and support activities contributing to the conservation of rare, endangered and priority species existing within the vicinity of its mining operations.	Section 0 Section 7 Appendix A-1
7	Alcoa will forego the bauxite resources in the jarrah forest conservation areas agreed in consultation with the State's Reserves Review Committee and specified in the Alumina Refinery Agreement Amendment Act, No 99 of 1986, for as long as their conservation values remain. Mining adjacent to the conservation areas will utilise site-specific environmental management procedures agreed in consultation with the MMPLG (now BSEC). These will include particular consideration of dieback management and mine rehabilitation requirements.	Figure 2-3
9	Alcoa will implement a comprehensive dieback management programme designed specifically for its mine operations in the jarrah forest. This will include the rehabilitation of dieback-affected areas adjacent to its mine operating areas, in accordance with procedures agreed with State agencies, and irrespective of the Cause of introduction of the disease.	Section 0 – 7
10	Alcoa is committed to an ongoing research program into all aspects of its operation that have the potential to adversely affect the environment, and into those environmental characteristics that could be adversely affected by its operations.	Appendix A-1 Appendix E
Environmental Protection (Darling Range Bauxite Mining Proposals) Exemption Order 2023 (Schedule 1) Conditions		**Section in this Flora and Vegetation MP**
2 (2)	Mining activities associated with the Huntly Mine – (a) must not disturb land outside the Huntly Mine disturbance footprint; and (b) must not disturb native vegetation outside the Huntly Mine native disturbance footprint.	Figure 2-3
2 (3)	Mining activities associated with the Willowdale Mine – (a) must not disturb land outside the Willowdale Mine disturbance footprint; and (b) must not disturb native vegetation.	Figure 2-3
2 (4)	Exploration activities associated with the implementation of the Darling Range bauxite mining proposals must not disturb land outside the Darling Range exploration disturbance footprint.	Figure 2-3 Section 3
3 (2)	In implementing the Darling Range bauxite mining proposals, Alcoa and its associates must not engage in clearing or other activities likely to disturb a forest clearing advice area.	Figure 2-3
3 (3)	Subclause (2) does not apply to – (a) Rehabilitation; or	Figure 2-3

[20] The term 'constraints' refers to limitations or restrictions that impact the planning, design, and operational activities of a mining project.
[21] MS1157 supersedes MS 728, 897, 1069.

	(b) Monitoring activities implemented in accordance with Division 3.	
Ministerial Approval Conditions for the 2023-2027 Mining and Management Program (MMP) (Approval Letter ref: 60-076783, Dec 2023) and referred to in the 2024-2028 MMP Approval		**Section in this Flora and Vegetation MP**
2.	Alcoa will treat as not having been endorsed, 1,231 ha of Forest Clearing Advices (FCA) endorsed prior to 1 September 2023 as defined in Figure 5 of the Exemption Order, being: (a) 1,016 ha of FCA in Huntly; and (b) 214 ha of FCA in Willowdale.	Figure 2-3
8.	Alcoa will not undertake any MMP-related clearing until the Mine Operations Group (MOG) has provided its endorsement of the relevant FCA.	Page 7
13.	From the date of the MMP Approval: Alcoa will implement to the extent practicable the plans referred to below until the relevant revised plan is submitted to the State Development Minister in accordance with condition 14: (a) Flora and Vegetation Management Plan submitted to the Minister for State Development on 13 November 2023, as included in the MMP.	Section 7
14.	Alcoa will review and update the plans referred to below and submit them to the State Development Minister for approval within the timeframes outlined in condition 17, and in accordance with *Environmental Protection Authority's Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA 2021). (a) the Flora and Vegetation Management Plan, in consultation with the Department of Biodiversity, Conservation and Attractions (DBCA) and relevant stakeholders so that it: i. Satisfies the requirements of condition 18 and 19.	This document[22].
17.	Alcoa must submit the management plans to the State Development Minister within the following time periods, or such other time period should the State Development Minister determine, following a request from Alcoa (a) Flora and Vegetation Management Plan, by 31 December 2024	This document[22].
18.	The management plans required under condition 17 must contain evidence to demonstrate compliance with relevant '*Operational restrictions*' and '*Clearing restrictions*' conditions, and must also include: (a) threshold criteria and trigger criteria that are relevant to the environmental impacts that the plans are mitigating and managing; (b) monitoring parameters, sites, control/reference sites, methodology, timing and frequencies, which will be used to measure threshold criteria and trigger criteria; (c) methodology for determining alternate monitoring sites as a contingency if proposed sites are not suitable in the future; (d) data collection and analysis methodologies; (e) adaptive management methodology; (f) contingency measures which will be implemented if threshold criteria or trigger criteria are not met; and (g) reporting requirements.	This document[22]. Sections 3-7 Appendix A-1
19.	The management plans required under condition 17 must, also contain provisions which demonstrate whether conditions 4 (a) and (b) and relevant '*Operational restrictions*' and '*Clearing restrictions*' conditions are reasonably likely to be met, and must also include:	This document[22]. Sections 3-7

[22] Document prepared using EPA Environmental Management Plan Template Instructions (EPA, 2021a and 2024).

	(a) management actions;	
Ministerial Approval Conditions for the 2023-2027 Mining and Management Program (MMP) (Approval Letter ref: 60-076783, Dec 2023)		**Section in this Flora and Vegetation MP**
	(b) management targets; (c) contingency measures if the management targets are not met; and (d) reporting requirements.	Sections 3-6
20.	Upon submission of each management plan, Alcoa must, to the extent practicable: (a) implement the submitted management plan(s) until receiving notice from the State Development Minister confirming that the management plan(s) satisfies the relevant requirements (i.e. is approved); and (b) following approval by the State Development Minister, implement the most recently approved version of the management plan.	Section 0
21.	Alcoa: (a) may review, revise and re-submit to the State Development Minister any management plan listed in condition 17 at any time provided it meets relevant requirements of that management plan, including any consultation that may be required when preparing the management plan; and (b) must review and revise any management plan listed in condition 17 and ensure it meets the relevant requirements of that management plan, including any consultation that may be required when preparing the management plan, as and when directed by the State Development Minister.	Sections 7 and 8
22.	Approved management plans, and any revised management plans, must be published on Alcoa's website and provided to the State Development Minister in electronic form suitable for on-line publication within twenty (20) business days of being implemented, or being required to be implemented (whichever is earlier).	Section 0

Wellbucket
Dale
Victor
Beraking East
Beraking West
Jarrahdale
Monadnocks East
Towns
Myara North
Monadnocks
Myara
Darling Scarp
Beryl
O'Neil
Willard
McCoy
Duncan
White
Huntly
Del Park
Holyoake
Teesdale
Amphion
Orion
Marradong
Hotham
Arundel
East Murray
Saddleback
Laregо
Bednall
Cornwall
Leach
Mungalup

Legend

- ML1SA
- Mining Regions
- Exploration Disturbance Footprint (Section 6)
- Reservoir Protection Zones (RPZ)
- Munda Biddi Trail
- Bibbulmun Track
- Mining Avoidance Zones
- OCA1 Top Water Line 200m Buffer
- Rock Outcrops 50m Buffer
- Mapped Stream Vegetation 100m Buffer
- Government Aboriginal Heritage Sites 10m Buffer
- Nature Reserves
- National Parks
- Conservation Parks
- Old Growth Forest

Alcoa

N

0 2.5 5 10 15 20 25 km

Flora and Vegetation Management Plan

Figure 2-3 Project Constraints

Scale: 1:350,000

Date Printed: 22/11/2024

2.4 Rationale and Approach

This Flora and Vegetation MP provides management provisions for potential impacts to known significant flora and vegetation communities specific to Alcoa's activities (including exploration, construction and operational phases) within the Project areas. During the development of this Flora and Vegetation MP, it is also considered that the management of identified key threatening processes on known significant flora and vegetation communities will have flow-on effects for other native flora and vegetation communities occurring within the Project area.

Further, specific outcome-based provisions have been applied in regard to the specific vegetation types within, for example, streamzones and granite outcrops. Existing and proposed in-field monitoring of these selected vegetation types within both impact and reference sites to monitor for changes in vegetation composition, structure and function over time as indicators of vegetation condition to protect identified flora and vegetation values a widely used method (Lawley, V. *et al.* 2016). To enable detection of changes in significant flora and vegetation values as a result of Project potential impacts require robust baseline data and continued collection of data from impact and reference sites to enable comparison. However, careful consideration is required to select appropriately comparable impact and reference sites.

2.4.1 Environmental Outcomes and Management Objectives

This Flora and Vegetation MP adopts a combination of outcome-based and objective-based provisions to achieve the proposed environmental outcomes, across the three phases of pre-mining and active mining (exploration, construction and operational phases).

Outcome-based provisions are applied where sufficient information exists to establish objectives and measurable criteria (EPA, 2021d). Environmental criteria are defined to assess performance against the environmental outcome, these are:

- **Early response criteria:**
  - Internal indicators selected to provide information on changes to the environment that are precursors to an environmental impact.
- **Trigger criteria:**
  - External reportable criteria where indicators are selected for monitoring to provide a warning that if exceeded, the outcome may not be achieved. They are intended to forewarn the approach of the threshold criteria and trigger response actions.
- **Threshold criteria**:
  - External reportable criteria where indicators have been selected to represent the limit of acceptable impact beyond which the environmental outcome is not being met and where there is likely to be a significant impact on the environment.

Objective-based provisions have been applied where a level of uncertainty or lack of appropriate knowledge exists, that prevents setting achievable and effective objectives and measurable trigger and threshold criteria. In this case, management targets have been established to measure the success of management actions in meeting the environmental outcome.

2.4.2 Current Knowledge

A wide range of flora and vegetation surveys, studies and research programmes have been undertaken across the Huntly and Willowdale mine regions over many years and include various flora and vegetation assessment and survey methodologies, such as targeted and detailed surveys, and including traverses, transects and quadrats. Further information on the current knowledge of flora and vegetation values associated with the Project is provided in Appendix E.

This Flora and Vegetation MP provides the monitoring, mitigation and management framework for known significant flora and vegetation communities. Information obtained from various historical and contemporary flora and vegetation survey results are presented in Figure 2-4 to Figure 2-9. Results of flora and vegetation surveys relevant to this Flora and Vegetation MP that were undertaken during the preparation of this Flora and Vegetation MP may not be presented within this version. However, future iterations of the Flora and Vegetation MP will ensure all relevant and contemporary information is included.

Vegetation

A total of 52 Site Vegetation Types (SVT) have been recorded and mapped across the Project area including Flooded Gum Woodland, Blackbutt Forest, and Upland Jarrah-Marri Forest (see Figure 2-4 and Figure 2-5). For the full list of SVTs and their description, refer to Appendix E (Table E- 2).

Jarrahdale
Towns
Monadnocks East
Myara North
Monadnocks
Myara
Beryl
rling Scarp
O'Neil
Willard
McCoy
Duncan
White
Huntly
Del Park
Holyoake
Teesdale
Orion
Amphion
Hotham
East Murray

Legend

Species Code

- A
- AC
- AD
- AW
- AW/AX
- AW/CW
- AX
- AY
- C
- CL
- CQ
- CW
- D
- DA
- DAM
- DB
- DG
- E
- G
- G1
- G2
- J
- M
- P
- PG
- PL
- PS
- PT
- PW
- Q
- R
- R/G
- Rehab
- S
- S-SP
- SP
- SP-D
- ST
- SW
- SW-D
- T
- TP
- TS
- W
- WA
- WD
- Y
- YG
- YS
- Z

Legend

- ML1SA
- Mining Regions

Alcoa

N

0 1 2 4 6 8 10 km

Flora and Vegetation Management Plan

Figure 2-4 Huntly Mine Mapped Vegetation Types

Scale: 1:150,000

Date Printed: 22/11/2024

Towns
Holyoake
Teesdale
Amphion
Darling Scarp
Orion
East Murray
Arundel
Larego
Cornwall

Legend

Species Code

- A
- AC
- AD
- AW
- B
- C
- CA
- CL
- CQ
- CW
- D
- DA
- DG
- E
- G
- M
- P
- PL
- PS
- PT
- PW
- Q
- R
- R/G
- Rehab
- S
- SP
- ST
- SW
- T
- TP
- TS
- W
- WA

Legend

- ML1SA
- Mining Regions

Alcoa

N

0 1 2 3 4 5 km

Flora and Vegetation Management Plan

Figure 2-5 Willowdale Mine Mapped Vegetation Types

Scale: 1:100,000

Date Printed: 22/11/2024

Potential Groundwater Dependent Ecosystems (GDEs)

The National Atlas of Groundwater Dependent Ecosystems presents the current knowledge of GDEs across Australia. It displays ecological and hydrogeological information on known GDEs and ecosystems potentially using groundwater. The Atlas will be used as a tool to assist in the consideration of ecosystem groundwater requirements. Geoscience Australia (2014) classifies GDEs as those ecosystems which rely on groundwater for some or all of their water requirements. However, not all GDEs draw on groundwater directly, and not all are solely reliant on groundwater. Ecosystem dependency on groundwater may vary temporally (over time) and spatially (depending on its location in the landscape).

Two GDEs identified by Geoscience Australia (2014) have relevance to the Project:

1. Terrestrial vegetation that relies on the availability of shallow groundwater; and
2. Wetlands such as paperbark swamps and forests and mound springs.

The study of GDEs within WA has primarily been undertaken on the Swan Coastal Plain (Froend *et al.*, 2004, Sommer and Froend, 2010) and, to a lesser extent, the Blackwood Plateau (Froend and Loome, 2005) and Collie Basin (SKM and WRM, 2010).

Surveys have been undertaken to assess the potential for GDEs to occur within the Huntly and Willowdale mine regions, based on vegetation types and key indicator species that prefer and occur on seasonally moister and wetter soils on the swamps, valley floors and lower slopes. Key plant species that are considered to be indicative of potential GDEs within the Project area include: *Banksia littoralis*; *Hakea varia*; *Acacia divergens*; *Boronia molloyae*; *Thomasia paniculata*; *Astartea scoparia*; *Babingtonia camphorosmae*; *Calothamnus lateralis*; *Eucalyptus rudis*; *Hypocalymma angustifolium*; *Melaleuca preissiana*; *Melaleuca rhaphiophylla*; *Melaleuca lateritia*; *Melaleuca viminea*; *Regelia ciliata*; *Gahnia trifida* and *Taxandra linearifolia* (Mattiske, 2021a).

Based on surveys and assessments undertaken across the Project, the following SVTs are considered to be associated with potential GDEs across the Project:

<u>Swamps and Broad Valleys</u>

A; Tall shrubland of *Melaleuca lateritia*, *Hakea varia*, *Melaleuca viminea* and *Melaleuca incana* subsp. *incana* on clay-loams in seasonally wet valley floors.

AC: Open Woodland of *Eucalyptus rudis – Melaleuca preissiana - Eucalyptus patens - Banksia littoralis* with dense *Taxandria linearifolia* and *Astartea scoparia* in understorey on broad swamps and water courses.

AD: Low open woodland of *Eucalyptus rudis* and *Eucalyptus marginata* over *Banksia littoralis*, *Hakea prostrata* and *Pericalymma ellipticum* over low shrubs and herbs on leached sands over sandy-gravel on lower slopes.

AW: Low open woodland of *Eucalyptus patens* and *Melaleuca preissiana* over *Banksia littoralis*, *Hakea prostrata* and *Pericalymma ellipticum* over low shrubs and herbs on leached sands over sandy-gravel on lower slopes.

AX: Open woodland of *Eucalyptus rudis* over *Acacia saligna*, *Melaleuca incana* subsp. *incana* and *Hypocalymma angustifolium* on clay- loams on valley floors.

AW/AX: Localised patchy mosaic of AW and AX.

D: Open Forest of *Eucalyptus marginata*, *Corymbia calophylla - Hakea prostrata* on lower slopes with mixed low understorey species, including *Babingtonia camphorosmae* and *Acacia extensa* on clay loams to gravelly clay-loams.

DA: Open Forest of *Eucalyptus marginata - Corymbia calophylla - Hakea prostrata* on lower slopes with patches of *Melaleuca preissiana*, *Banksia littoralis* and *Hakea varia* over mixed low understorey species, including *Babingtonia camphorosmae* and *Acacia extensa* on clay loams to gravelly clay-loams. Local variant also includes *Xylomelum occidentale*.

DG: Open forest of *Corymbia calophylla* and *Eucalyptus marginata* over *Hakea lissocarpha*, *Macrozamia riedlei*, *Pericalymma ellipticum*, *Grevillea bipinnatifida*, *Allocasuarina humilis*, *Acacia alata*, *Babingtonia camphorosmae*, *Hypocalymma angustifolium* and *Lysiandra calycina* on clay-loams on lower slopes with localised patches of outcropping.

E: Open woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Mesomelaena tetragona*, *Kingia australis*, *Leptospermum erubescens* and *Babingtonia camphorosmae* on sandy to sandy-loam soils on slopes.

J: Open Woodland to open forest of *Eucalyptus marginata*, *Corymbia calophylla* and *Eucalyptus patens* over *Mesomelaena tetragona*, *Leptocarpus scariosus*, *Babingtonia camphorosmae* and *Stirlingia latifolia* on broad sandy-loam flats valley slopes.

WA: Open Forest of *Eucalyptus megacarpa - Eucalyptus patens – Corymbia calophylla* on lower slopes with mixed low understorey species, including *Banksia littoralis* and occasional *Melaleuca preissiana* over *Acacia extensa* and *Hypocalymma angustifolium* on seasonally moister sandy-loam gravelly soils.

Valley Floors and Lower Slopes

C: Woodland to Open Forest of *Eucalyptus patens* – *Corymbia calophylla* - *Banksia littoralis* and *Banksia seminuda* with dense *Taxandria linearifolia* and *Astartea scoparia* in understorey on creek lines and water courses.

CW: Woodland to Open Forest of *Eucalyptus patens* – *Eucalyptus megacarpa* - *Corymbia calophylla* - *Banksia littoralis* with dense *Taxandria linearifolia* and *Astartea scoparia* in understorey on creek lines and water courses.

W: Open Forest of *Eucalyptus megacarpa* - *Eucalyptus patens* – *Corymbia calophylla* on lower slopes with mixed low understorey species, including *Acacia extensa* and *Hypocalymma angustifolium* on seasonally moister sandy-loam gravelly soils.

Q: Open Forest of *Eucalyptus marginata* - *Corymbia calophylla* - *Eucalyptus patens* with mixed understorey species, including *Trymalium floribundum*, *Acacia extensa* and *Lysiandra calycina* on loam soils on lower slopes.

Slopes with Higher Seasonal Moisture

PW: Open Forest of *Allocasuarina fraseriana* - *Eucalyptus marginata* - *Corymbia calophylla* with scattered understorey, including *Grevillea wilsonii*, *Adenanthos barbiger*, *Babingtonia camphorosmae* and *Hypocalymma angustifolium* on sandy gravels.

SW: Open Forest of *Eucalyptus marginata* - *Corymbia calophylla* – *Banksia grandis* with scattered understorey, including *Adenanthos barbiger*, *Hypocalymma angustifolium* and *Styphelia tenuiflora* on seasonally moister sandy-gravelly soils.

These SVTs, which are considered as potential GDEs, are expected to be subject to seasonal inundation and / or waterlogging due to groundwater and / or surface water flows and are primarily located within or adjacent to streamzones, which form part of the mapped streamzone + 100 m buffer. The location of potential GDEs across Huntly and Willowdale mines based on SVTs, the mapped and derived (in the absence of vegetation mapping) streamzone vegetation locations in the landscape is presented in Figure 2-6.

Wellbucket
Dale
Victor
Beraking East
Beraking West
Jarrahdale
Monadnocks East
Towns
Myara North
Monadnocks
Myara
Darling Scarp
Beryl
O'Neil
Duncan
Willard
McCoy
White
Huntly
Del Park
Holyoake
Teesdale
Amphion
Marradong
Orion
Hotham
East Murray
Arundel
Saddleback
Laregо
Bednall
Cornwall
Leach
Mungalup

Legend

ML1SA
Mining Regions
Mapped Stream Vegetation
Derived Stream Vegetation

Alcoa

N

0 5 10 15 20 25 km

Flora and Vegetation Management Plan

Figure 2-6 Potential Groundwater Dependent Ecosystems

Scale: 1:350,000

Date Printed: 25/11/2024

Reference Ecosystems

Alcoa utilises analogue reference ecosystems (Figure 2-7), which are adjacent or nearby sites from which necessary ecological attributes can be quantified. These analogue sites are termed 'permanent forest plots' by Alcoa and are 80m^2 plots or equivalent coverage (containing quadrats) established in unmined forest adjacent to mining areas within the same SVT. Alcoa's extensive permanent forest plot database contains over 151 permanent plots established in various post-harvesting (including historic harvesting) scenarios. Alcoa has defined two analogue reference ecosystems based on Havel complexes: upland forest (SVTs: P, S, T) and; streamzone (SVTs: A, C, W, D).

Whilst these reference ecosystems are primarily utilised in developing and refining Alcoa's Rehabilitation Completion Criteria (RCC), they are highly useful for providing complementary monitoring opportunities for flora and vegetation data collection and analyses which are relevant to this Flora and Vegetation MP.

Wellbucket
Dale
Victor
Beraking East
Beraking West
Jarrahdale
Monadnocks East
Towns
Myara North
Monadnocks
Myara
Darling Scarp
Beryl
O'Neil
Duncan
Willard
McCoy
White
Huntly
Del Park
Holyoake
Teesdale
Amphion
Marradong
Hotham
Orion
East Murray
Arundel
Saddleback
Laregо
Bednall
Cornwall
Leach
Mungalup

Legend

- ML1SA
- Mining Regions
- Reference Plot Locations
- Cleared Areas
- Rehabilitation

Alcoa

N

0 5 10 15 20 25 km

Flora and Vegetation Management Plan

Figure 2-7 Reference Ecosystems

Scale: 1:350,000

Date Printed: 25/11/2024

Significant Flora

From the range of desktop assessments, on-ground surveys, and monitoring undertaken across the Project, sixteen significant flora species, comprised of 12 families and 13 genera, have been recorded across both the Huntly and Willowdale mines (refer to Appendix B, Table B- 1). Figure 2-8 presents the recorded locations of significant flora species across the Huntly and Willowdale mines. Figure 2-8 outlines the recorded significant flora and their habitats.

The majority of significant flora species known to occur within the Project areas have been recorded infrequently across surveys and seasons, including *Hibbertia ambita*, *Netrostylis* sp. Nannup (P. A. Jurjevich 1133), *Acacia drummondii* subsp. *affinis* and *Hemigenia microphylla*. There is one known potentially novel flora species reported by the DBCA to occur within the Project area, informally named *Banksia* sp. Hoffman by the DBCA, which is currently undergoing taxonomic work and has yet to be assessed against the EPBC Act or BC Act. When Alcoa is informed of any status updates to this species' taxonomic identification or any other flora species of significance, per the adaptive management approach, the next iteration of this Flora and Vegetation MP will be updated to reflect any additional and / or contemporary information.

Table 2-2: Significant Flora and their Associated Habitats[23]

Knowledge of Significant Flora and their Associated Habitats	
References: Western Australian Herbarium (1998-); Thiele (2019); Butcher (2007)	
Species	Knowledge
Acacia drummondii subsp. *affinis*	Erect shrub, growing to 0.3 – 1 m high. Produces yellow flowers during July to August and occurs in laterite or sand over laterite, in Jarrah, Jarrah-Marri and occasionally Wandoo forest and Woodland.
Acacia horridula	Sand or gravelly soils over granite, and rocky hillsides of the Jarrah Forest and Swan Coastal Plain IBRA regions. It is often recorded in open Eucalyptus woodland vegetation, however, can also be found in dense shrubland.
Banksia sp. Hoffman[24]	Relatively bare, heavy black-gravel soils (DBCA, *pers. comm.*).
Calothamnus graniticus subsp. *leptophyllus*	Clay over granite and lateritic soils, on hillsides.
Cyanothamnus tenuis	Gritty brown sandy clay over granite, in creeks and on slopes.
Grevillea dissectifolia	Grows in Eucalypt forest in moist situations or depressions in gravelly soils recorded as brown or yellow sand, loam or clay, sometimes in heavy laterite with exposed granite sheet or outcrops
Grevillea prominens	Gravelly loam along creek lines in Jarrah Forest.
Hemigenia microphylla	Sandy clay, peaty clay and granite, and in winter-wet depressions.
Hibbertia ambita	Erect to (rarely) sprawling shrub, growing up to 1.1 m high. Grows in Jarrah – Marri shrubby forests on hillslopes, in brown clay-loam soils over laterite. Flowers August to October.
Hibbertia hortiorum	Mat-forming, prostrate, shrub growing up to 0.1 m high and 0.5 m across. Grows in Jarrah – Marri forests over laterite. Flowers late September and early October
Lasiopetalum cardiophyllum	Lateritic gravelly soils, sandy clay. Flats, hillslopes.
Netrostylis sp. Nannup (P.A. Jurjevich 1133)	Occurs in Jarrah Forest (limited information available).
Senecio leucoglossus	Gravelly brown / grey loam or clayey sand over laterite or granitic soils, often growing on hillsides or slopes, ridges, or amongst granite rocks. It has been recorded from the Jarrah Forest, Swan Coastal Plain and Warren IBRA regions, from Perth to just north of Donnelly River.
Stylidium ireneae	Brown or white loamy sand, often over laterite, and grows in valleys near creek lines, and often with *Agonis*. Most records of *Stylidium ireneae* occur in the Northen Jarrah Forest near Dwellingup, with other records occurring on the Swan Coastal Plain, near Perth, and in the Warren region, near Augusta and Manjimup.
Tetratheca phoenix	Brown gravelly loam over granite, on mid-upper slopes, often near large rock outcrops. Often primarily in Jarrah forest with a mid – low understorey.
Thysanotus anceps	White or grey sand, lateritic gravel, and soils. It has been recorded in the Geraldton Sandplains, Jarrah Forrest and Swan Coastal Plain IBRA regions.

[23] Alcoa recognises that there may be additional significant flora within the Project areas. As further knowledge is gained, this Flora and Vegetation MP will be updated as per the adaptive management approach.
[24] Banksia sp. Hoffman is informally named and considered by the DBCA as a potentially new species. DBCA informed Alcoa of this on 16 September 2024, and therefore this species is considered in this Flora and Vegetation MP as a significant flora species which is undergoing further study and taxonomic review by the DBCA (current at the time of publication).

Wellbucket
Dale
Victor
Beraking East
Beraking West
Jarrahdale
Monadnocks East
Towns
Myara North
Monadnocks
Myara
Darling Scarp
Beryl
O'Neil
Duncan
Willard
McCoy
White
Huntly
Del Park
Holyoake
Teesdale
Amphion
Marradong
Orion
Hotham
East Murray
Arundel
Saddleback
Larego
Bednall
Cornwall
Leach
Mungalup

Legend

- ML1SA
- Mining Regions
- *Banksia* sp. Hoffman

Flora Survey Results (Points)

Priority 1
- *Hibbertia ambita*
- *Hibbertia hortiorum*
- *Netrostylis* sp. Nannup (P.A. Jurjevich 1133)

Priority 2
- *Tetratheca phoenix*

Priority 3
- *Acacia drummondii* subsp. *affinis*
- *Acacia horridula*
- *Grevillea dissectifolia*
- *Grevillea prominens*
- *Thysanotus anceps*

Priority 4
- *Hemigenia microphylla*
- *Calothamnus graniticus* subsp. *leptophyllus*
- *Cyanothamnus tenuis*
- *Stylidium ireneae*
- *Senecio leucoglossus*

Alcoa

N

0 5 10 15 20 25 km

Flora and Vegetation Management Plan

Figure 2-8 Significant Flora Records

Scale: 1:350,000

Date Printed: 27/11/2024

Significant Vegetation Communities

The following Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) have been identified from database searches as potentially occurring within or near to operational areas.

Threatened Ecological Communities

Database searches, including the Protected Matters Search Tool, indicate that there are four potential TECs:

- *Banksia* Woodlands of the Swan Coastal Plain ecological community (EN under the EPBC Act and P3 by DBCA);
- Clay Pans of the Swan Coastal Plain (CE under the EPBC Act and P1 by DBCA);
- Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community (CE under the EPBCA Act and P3 by DBCA); and
- *Empodisma* peatlands of southwestern Australia (EN under the EPBC Act).

Indicative distribution mapping of the '*Empodisma* peatlands' TEC shows several highly restricted areas where the TEC may occur within the vicinity of the Project area (DCCEEW, 2023b). Based on key diagnostic characteristics, ecological community descriptions, and known distribution and habitat as per Conservation or Listing Advice for the TEC, the TEC *Empodisma* peatlands of southwestern Australia is assessed as having a low potential to occur within the Project areas. The '*Empodisma* peatlands' TEC is generally restricted in distribution to occur within the Warren IBRA bioregion and Southern Jarrah Forest subregion, with highly restricted and scattered occurrences through the Northern Jarrah Forest (DCCEEW, 2023a).

The 'Claypans of the Swan Coastal Plain' TEC is mostly found in the Swan Coastal Plain bioregion, but occurrences are known from the Northern Jarrah Forest (Department of Parks and Wildlife, 2015). The Distribution and size of the claypans of the 'Claypans of the Swan Costal Plain' TEC is very restricted and cannot be mapped using existing regional soil-landscape or local vegetation mapping (Department of Parks and Wildlife, 2015). It is therefore not possible to estimate the areal extent of TEC and it is assessed as 'Unlikely to Occur'.

The remaining two TECs listed above are only found on the Swan Coastal Plain, or its fringes, and have not been recorded within the Project area, so have been assessed as 'Does Not Occur' (Threatened Species Scientific Committee, 2016, 2019).

Priority Ecological Communities

One botanical PEC, listed at State level (Granite Communities of the Northern Jarrah Forest), is considered to potentially occur within the Huntly and Willowdale mine regions. There is a potential that the SVTs associated with rock outcrops (SVTs G and R as defined by Mattiske Consulting utilising the definitions of Havel (1975a and 1975b) may have affinities with this PEC. Clarification of the latter affinities necessitated comparisons with the granite areas studied by Markey (1997) on the northern Darling Scarp and the eastern fringes of the Northern Jarrah Forest. In this context there are some species that reflect the presence of exposed or shallow rock outcrops; however, these species tend to occur on wider areas of granites and the differentiation on whether all granite areas in the southwest should be aligned is open to interpretation, and the PEC has not been systematically mapped or assessed.

Figure 2-9 presents the database searches of State-listed TECs and PECs across the Project areas and surrounding regions, in addition to other vegetation types and areas of restricted distribution that occur across the Huntly and Willowdale mine regions which are considered significant by Alcoa, such as streamzone vegetation and rock outcrops.

Wellbucket
Dale
Victor
Beraking East
Beraking West
Jarrahdale
Monadnocks East
Towns
Myara North
Monadnocks
Myara
Darling Scarp
Beryl
O'Neil
Duncan
Willard
McCoy
White
Huntly
Del Park
Holyoake
Teesdale
Amphion
Marradong
Orion
Hotham
Arundel
East Murray
Saddleback
Laregо
Bednall
Cornwall
Leach
Mungalup

Legend

- ML1SA
- Mining Regions
- Priority Ecological Communities
- Threatened Ecological Communities
- Rock Outcrops
- Mapped Stream Vegetation

Alcoa

N

0 5 10 15 20 25 km

Flora and Vegetation Management Plan

Figure 2-9 Significant Vegetation Communities

Scale: 1:350,000

Date Printed: 25/11/2024

Weed Species

Weed species are categorised according to the threats that they pose to the environmental values addressed by this Flora and Vegetation MP.

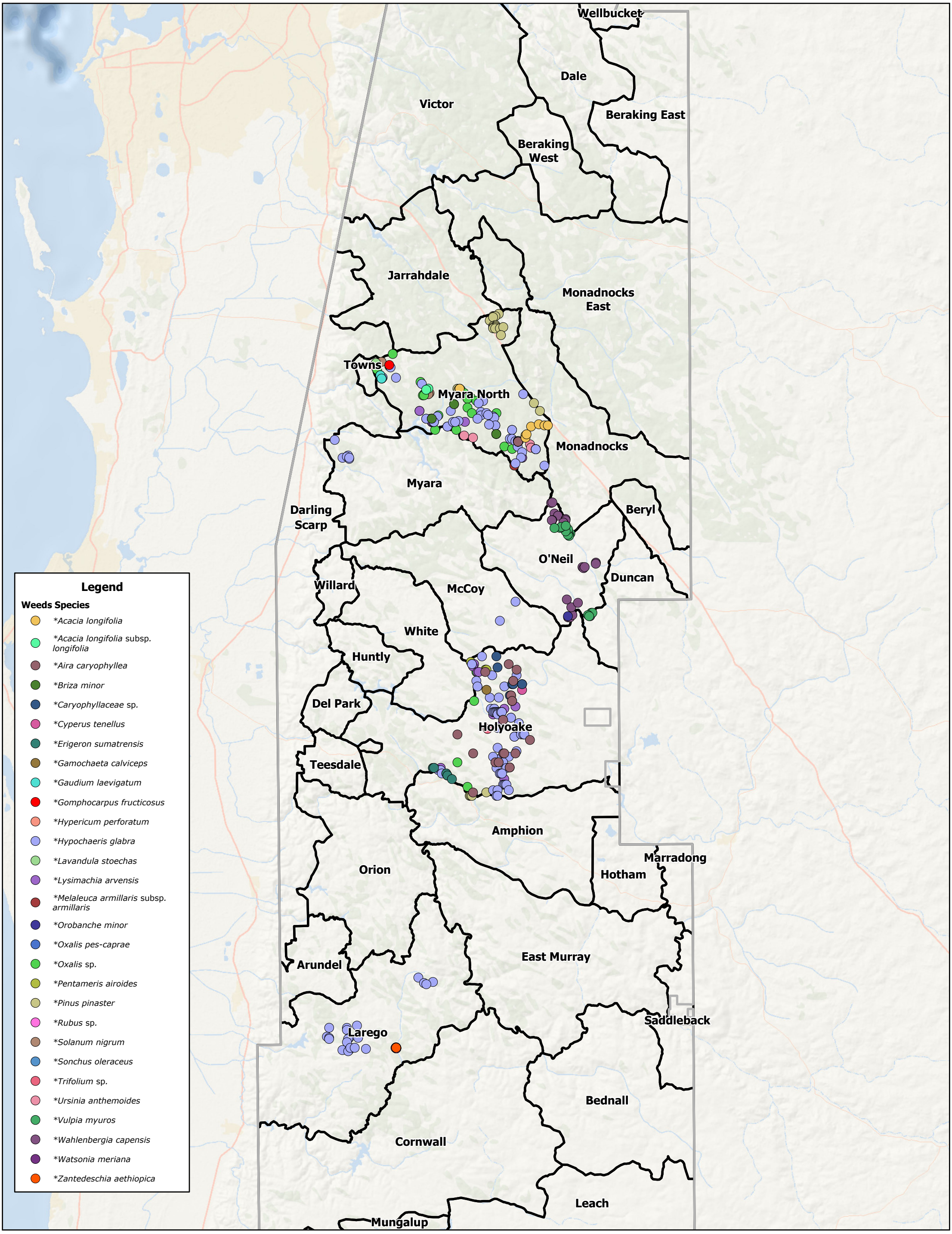
Weed species, location and abundance are recorded during targeted surveys (or detailed surveys where required) and reviewed against current Declared Pests as per the Western Australian Organism List (WAOL) (DPIRD, 2024), Weeds of National Significance (WoNS; Invasive Plants and Animals Committee, 2016) and DBCA (2014) weed species' ecological impact and invasiveness rankings for the southwest.

Under this Flora and Vegetation MP, key weed species are considered to be those listed as either a Declared Pest, WoNS or weed species ranked as having high invasiveness and low feasibility of control by DBCA (2014).

Some weed species may be introduced either through dumping of garden waste, recreational activities, tourism or other activities in the State Forest, which is beyond the control of Alcoa. Other weed species listed in Table E- 2 occur as garden escapes from plantings on small private properties. Many species are restricted to disturbed areas such as road verges, cleared agricultural and small land holdings.

A desktop review was undertaken to identify weed species that occur or have the potential to occur within the Project areas. In total, 182 species were identified: seven of these species are listed as Declared Pests within Western Australia; none are listed as WoNS (see Table E- 3).

A total of twenty-five weed species have been recorded across the Project areas, of these two are listed as Declared Pests (**Gomphocarpus fruticosus* [Narrowleaf Cottonbush] and **Zantedeschia aethiopica* [Arum Lily]). No WoNS have been recorded across the Project areas. Figure 2-10 presents the known recorded locations of weed species occurring across the Project areas.



Legend

ML1SA

Mining Regions

Alcoa

N

0 5 10 15 20 25 km

Flora and Vegetation Management Plan

Figure 2-10 Weed Species

Scale: 1:350,000

Date Printed: 27/11/2024

Biosecurity Threats

Phytophthora cinnamomi

The pathogen *Phytophthora cinnamomi*, known as *Phytophthora* dieback, is a destructive disease that has had a large impact on both Western Australian and Australian native plants. Of the many root pathogens that cause disease within Australian, *Phytophthora cinnamomi* has caused the most significant impact to date and poses the biggest threat (Commonwealth Department of Environment, 2014).

Phytophthora species are considered parasitic and behave mainly as a necrotrophic pathogen causing damage to the host plant's root tissues because of infection and invasion. *Phytophthora d*ieback can cause permanent damage to ecosystems because once an area is infested with the pathogen, eradication is usually impossible. The disease presents a significant threat to biodiversity as it places important plant species at risk of death, local extirpation or extinction (Glevan, 2021).

The Northern Jarrah Forest has widespread *Phytophthora* dieback infestation, resulting from the extensive activities of the timber industry and environmental conditions favourable to the disease. *Phytophthora* dieback was first observed in the Northern Jarrah Forest in the 1920s; however, the causal agent was not isolated until 1964 (Bradshaw, 2015). The disease affects more than 20% of native plant species in the southwest region, the most susceptible families being Proteaceae, Ericaceae and Xanthorrhoeaceae (Glevan, 2021). Within these families, the genera *Adenanthos, Andersonia, Astroloma, Banksia*, *Isopogon*, *Leucopogon, Persoonia*, *Petrophile*, *Xanthorrhoea,* and *Xylomelum* all demonstrate high susceptibility (Glevan, 2021). The affected species are key components of the Jarrah forest floristic diversity (Bradshaw, 2015).

Interaction between the three physical components forming the 'disease triangle' (the pathogen *Phytophthora* species, the environment and the host) is required for *Phytophthora* dieback to occur and for the disease to develop over time. A population of hosts is made up of susceptible, infected and immune or resistant individuals. Also, the relationship between the presence of *Phytophthora* and the development of *Phytophthora* dieback is variable based on the susceptibility of native plant species and the different environmental characteristics, landform types and rainfall zones across bioregions (Glevan, 2021).

Alcoa has established a protocol for delineating and managing fungal diseases, such as the dieback associated with *Phytophthora cinnamomi,* within and near operational areas (Koch, 2007). Integrating an intensive dieback management program within all mining processes (development, mining, and rehabilitation) is part of the environmental management system for Alcoa's WA mining operations. All forest areas are mapped for dieback in advance of any exploration activities. A dieback interpretation recheck is undertaken for any area in which an operation is planned where more than 12 months have elapsed since the last interpretation. This information is used when planning access and mining activities.

Alcoa engage a qualified supplier to perform *Phytophthora* Dieback Mapping services in accordance with the DBCA guidelines and standards as per the DBCA Dieback Interpreters Manual (DBCA, 2015). The Supplier, as the industry expert, has been requested to inform Alcoa if they become aware of other forest diseases that they observe in the forest or become aware that they could be entering the forest through industry knowledge/connections.

Figure 2-11 presents the mapped locations of *Phytophthora* dieback infestations across the Huntly and Willowdale mines and the Disease Risk Areas.

Marri Canker Disease

The decline of Marri trees (*Corymbia calophylla*) with Marri Canker Disease is known in WA as caused by the native fungal pathogen *Quambalaria coyrecup*. Since the 1970s, Marri Canker Disease has caused a serious decline of Marri trees throughout its range in the southwest of WA (Paap *et al.,* 2017). A landscape-scale study indicated that cankers were found across most of the range of *Corymbia calophylla* and that canker incidence was significantly related to the proportion of non-native vegetation present (a proxy for disturbance) and more prevalent in cooler and wetter areas (Paap *et al.,* 2017). Cankers can be present on trunks, branches and twigs of trees of all ages and are a symptom caused by the death of areas of bark and the cortex tissue below (Centre of Excellence for Climate Change, Woodland and Forest Health, 2012).

A landscape-scale study indicated that Cankers were found across most of the range of *Corymbia Calophylla,* and that Canker incidence was significantly related to the proportion of non-native vegetation present (a proxy for disturbance) and more prevalent in cooler, wetter areas. The study generated an indicative probability map specifically relevant for roadside areas, which indicated a Canker probability of 0.3 – 0.45 for the Northern Jarrah Forest subregion between Jarrahdale and Dwellingup (i.e. in the vicinity of the Huntly Mine DE), with a probability of 0.45 – 0.6 westwards towards the Darling Scarp (Paap *et al.,* 2017). However, no land-scale sites were surveyed in the Northern Jarrah Forest subregion between Jarrahdale and Dwellingup and the Canker incidence in the area is undocumented.

Australian Honey Fungus

Armillaria luteobubalina (Australian Honey Fungus) is a widespread, endemic pathogen in the Jarrah forest. The pathogen attacks and kills the roots of susceptible trees and shrubs, causing Armillaria Root Disease (ARD). ARD is generally not

the primary cause of death in a healthy forest but kills trees weakened by competition, age or environmental stress. The fungus has been previously identified at specific areas within Myara North and Holyoake via white mycelium on the root system of indicator species' plant samples where negative results for *Phytophthora cinnamomi* were received. No significant infestations were located requiring field demarcations, with single or few isolated deaths attributed to the disease (Glevan, 2021).

Myrtle Rust

Myrtle Rust, caused by *Austropuccinia psidii*, poses a severe threat to various native plants in Australia's Myrtaceae family, which includes eucalypts, bottlebrushes, tea trees, and other key species in forest and woodland ecosystems. First detected in New South Wales in 2010, Myrtle Rust has since spread across multiple states and regions, including parts of Western Australia. The fungus thrives in moist, shaded conditions, making areas with high humidity particularly vulnerable. Plants infected by Myrtle Rust often display purple lesions on leaves, followed by vibrant yellow spores. As the infection advances, affected plants may exhibit stunted growth, heavy defoliation, and dieback of branches, ultimately leading to death in severely impacted trees and shrubs (DPIRD, 2022; DBCA, 2024; DCCEEW, 2024c).

The disease primarily attacks new growth, meaning that seedlings and young foliage are especially susceptible, which can significantly reduce a plant's ability to regenerate and impact biodiversity within the ecosystem. Control of Myrtle Rust in natural environments is challenging due to its spore-based dispersal, which can spread via wind, animals, and human movement. While fungicides can manage outbreaks in controlled environments like nurseries, they are impractical for large-scale natural applications. The Australian Government has established the National Myrtle Rust Working Group to coordinate responses, but biosecurity remains critical to preventing additional strains from entering Australia (DPIRD, 2022; DBCA, 2024; DCCEEW, 2024c).

To date, there have been no records of Myrtle Rust occurring within the Project areas.

Polyphagous Shot-hole Borer

The Polyphagous Shot-hole Borer (PSHB), *Euwallacea fornicatus*, is an invasive beetle causing severe ecological impacts in southwest WA. The beetle, originally from Southeast Asia, bores into a wide range of tree species, including native and ornamental plants, creating shot-like holes in trunks and branches where it introduces a fungal symbiont (*Fusarium euwallaceae*). This fungus disrupts the host tree's vascular system, leading to a disease known as Fusarium Dieback, which can kill susceptible trees in a few months. The combination of boring damage and fungal infection ultimately disrupts the water and nutrient transport in the tree, weakening or killing it (DPIRD, 2024b).

In Western Australia, the PSHB has spread in urban, peri-urban, and forest areas, impacting native tree species like Marri and Sheoak. The Department of Primary Industries and Regional Development (DPIRD) actively monitors and manages infestations to limit spread. Community participation is essential; DPIRD encourages landowners to report symptoms and avoid moving wood from infected trees. Proper disposal of affected wood, promoting tree diversity, and professional pruning can help mitigate further impact (DPIRD, 2024b).

The northern extent of the Huntly mine areas fall within DPIRD's Quarantine Area Zone B, however to date, there have been no confirmed records of PSHB occurring within the Project areas.

Wellbucket
Dale
Victor
Beraking East
Beraking West
Jarrahdale
Monadnocks East
Towns
Myara North
Monadnocks
Myara
Darling Scarp
Beryl
O'Neil
Duncan
Willard
McCoy
White
Huntly
Del Park
Holyoake
Teesdale
Amphion
Marradong
Orion
Hotham
East Murray
Arundel
Saddleback
Laregо
Bednall
Cornwall
Leach
Mungalup

Legend

- ML1SA
- Mining Regions

Alcoa Mapped Dieback
- Infested
- Uninfested
- Uninterpretable

- Disease Risk Areas

Government Dieback
- Infested
- Uninfested
- Permanent Uninterpretable

Alcoa

N

0 5 10 15 20 25 km

Flora and Vegetation Management Plan

Figure 2-11 Mapped Phytophthora Dieback and Disease Risk Area

Scale: 1:350,000

Date Printed: 25/11/2024

Fire

The southwest forests have been subject to fire for cultural reasons by indigenous people for up to 60,000 years prior to European settlement. Controlled burning activities are undertaken by DBCA, and as such, the role of burning in Alcoa operations is undertaken in consultation with district and regional DBCA offices. Fire activities undertaken in pre-clearing areas are in consultation with DBCA, as the responsible agency for prescribed burns plants of the southwest forest region have mechanisms to be resilient to fire, and recent efforts have been undertaken to manage the forests to minimise risks associated with uncontrolled intense wildfires which is unfavourable to some plant species.

Dust

Dust emissions generated from vegetation clearing, disturbed areas, mine pit excavation, crushing and road use have been identified as a potential indirect impact on vegetation, primarily by reducing photosynthesis and increasing leaf temperature (Doley, 2006). Understorey vegetation is potentially more susceptible to dust accumulation and impact, as predicted by Doley (2013). The Jarrah Forest understorey is likely to exhibit lower photosynthetic activity during summer and autumn due to shallower roots and limited access to soil moisture compared to deeper-rooted overstorey species. As a result, dust accumulation that occurs during summer and autumn between wind events may have limited impacts on understorey vegetation. Following winter and spring rains and the recharge of shallow soil moisture, the understorey vegetation will become more active, which will coincide with rainfall events that cause dust wash--off and reduce dust accumulation. To date, there has been limited monitoring undertaken, including limited published research available on the quantified effects of dust deposition on native vegetation within the Northern Jarrah Forest, and it is unknown at what rates it causes adverse impacts on native flora and vegetation.

History of Timber Harvesting

The Northern Jarrah Forest has been subject to widespread timber harvesting since the 1870s, with progressive development of silvicultural practice since the 1920s and the introduction of biodiversity management in the 1980s (Stoneman *et al.*, 2005). Of the 1.11 million hectares of native vegetation within the Northern Jarrah Forest subregion, 0.77 million hectares (69.4%) lies within DBCA managed lands, of which 0.52 million hectares (46.9%) is covered by ML1SA. Of the 0.52 million hectares of native vegetation within ML1SA, 22,793 hectares (4.3%) is mapped as Old Growth Forest. The remaining 95.7% has been subject to timber harvesting of varying frequency and intensity. Approximately 0.42 million hectares (80.8%) of the native vegetation within ML1SA lies within DBCA managed State Forests and Timber Reserves that have been subject to timber harvesting operations.

Logging in the southwest was largely uncontrolled from 1870 to 1920, targeting the western side of the Northern Jarrah Forest and clear-felling the higher quality forest, with a lack of fire management resulting in damaging post-harvest fires (Stoneman *et al.*, 2005). As of 1920, it was estimated that almost 0.4 million hectares had been logged and the forest canopy reduced by 50% (Wallace 1966, quoted in Davidson, 2016). At that time, the Western Australian hardwood export industry was the largest in the world, with production in 1927 alone exceeding the estimated forest yield by over 2 million m^3 (Wardell-Johnson, 2015).

After the *Forests Act 1918* was passed, large areas of State Forest were established and placed under the management of a newly formed forests department. Silvicultural practice evolved to clear groups of senescent trees, converting large areas to even-aged stands to promote logging rotation (Calver and Wardell-Johnson, 2004). Harvesting intensity increased following the 1961 wildfires to reduce the area of regeneration requiring fire protection and to reduce the risk of *Phytophthora cinnamomi*, which had been identified as the cause of Jarrah dieback (Stoneman *et al*., 2005).

The late 1970s and 1980s saw the introduction of multiple-use management practices to cover values other than wood products. The 1994 Forest Management Plan included objectives for ecological sustainability, biodiversity conservation, tourism and recreation (Stoneman *et al.*, 2005). In 1999, the State and Commonwealth Government signed a Regional Forestry Agreement (RFA) to balance competing interests and provide security for forest reserves and resource availability. The RFA established additional conservation reserves within the Northern Jarrah Forest and the end of logging in remaining Old Growth Forests.

2.4.3 Key Assumptions and Uncertainties

Assumptions

It is assumed that active identification and management of known significant flora and vegetation communities within the Project areas will demonstrate that potential impacts from Alcoa's operations are appropriately avoided and minimised in a manner consistent with the principles of the mitigation hierarchy.

It is anticipated that all proposed mitigation, monitoring and management provisions outlined within this Flora and Vegetation MP will have flow-on benefits for all native flora and vegetation communities occurring within the Project areas.

Uncertainties

There have been limited population-specific studies undertaken for significant flora to assist in understanding the short to long-term responses and natural population viability in response to potential mine-related impacts of these species within and outside the mine areas.

There is limited data on the sensitivity of significant flora and vegetation communities in response to increased dust levels. There is also limited understanding and knowledge around future population responses to cumulative impacts resulting from anthropogenic disturbances (for example, nature-based recreation and tourism, such as camping, hiking and mountain biking) across the Project areas. The areas in which Alcoa operates are also subject to pressures from illegal firewood harvesting.

There is limited knowledge of the potential impacts of climate change on significant flora and vegetation communities. The CPC (2023) considers that the cumulative effects of climate change are likely to have significant impacts on some vegetation communities occurring across the Northern Jarrah Forest. However, there are high levels of uncertainty about the magnitude of the effect of climate change on forest ecosystems.

Alcoa will continue to undertake and invest in research to build a greater understanding around these uncertainties.

3 Exploration Phase Components

This section of the Flora and Vegetation MP defines the monitoring and management components to ensure that potential impacts associated with exploration activities are avoided or otherwise minimised.

3.1 Overview of Exploration Activities

Exploration drilling provides detailed information to support Alcoa's long-term strategic decisions and planning for near-term future mine development and target areas outside of Alcoa's current mining operational envelope.

All of the exploration and development drilling by Alcoa utilises equipment, that has been designed for minimal disturbance to the forest floor and vegetation. An Alcoa 15 m × 15 m local grid is used for drill planning with the early stages of exploration using multiples of 15 m spacing such as 60 m × 60 m or 60 m × 120 m to suit the large areas being investigated. The results are analysed and modelled to reduce the area of investigation to the limits of the bauxite resource (economically extractable material) before the next stage of drilling, typically a 30 m × 30 m grid. This is considered development drilling as it "infills" only the selected areas of the 60 m × 60 m drilling. The final stage of drilling, 15 m × 15m grid, is typically applied to a further reduced area selected for mining to reduce costs and the disturbance footprint.

Exploration and development drilling is used to define the lateral and vertical extents of ore bodies, understand the location and quality of bauxite and improve the confidence of tonnes and grade estimations. It represents the vast majority of drilling activity and utilises a fleet of tractor-mounted drill rigs modified to operate in forested areas with minimal ground disturbance. While this fleet uses drilling techniques generally used in the WA mining sector, it has been customised to be compact and self-contained (no support trucks). This reduces their environmental impact by creating smaller diameter (45 mm to 70 mm) and shallow (average 6 m) holes compared to standard mining equipment.

Strategic exploration Drilling (SED) is the name given to programmes' drilling areas outside of Alcoa's current mining operational envelope or 10 to 15-year mining horizon. SED areas have larger extents but less intense activities, such as 240 m × 60 m or 120 m × 120 m drilling densities. The results from this drilling activity are used to inform longer-term strategic business decisions. Being tractor-mounted rigs (3 m in width), these are more suitable for drilling in a forested area, and therefore, no clearing takes place, minimising environmental impacts.

Exploration drilling is not undertaken within the mapped or derived (in the absence of vegetation mapping) streamzone vegetation (LDA)[25]. Once vegetation mapping has been undertaken and in-field verification confirms there is no streamzone vegetation present within a targeted exploration area, then drilling may occur. *Phytophthora* dieback mapping is carried out over a large proportion of planned drilling areas, and where mapping has not been undertaken prior to exploration drilling, drilling is restricted to occur under dry soil conditions. Where dieback mapping has been undertaken, drill rigs and any other vehicles will be appropriately cleaned prior to entry and when moving into dieback free or uninterpretable. Preference of *Phytophthora* dieback areas for drilling during wetter periods at the start and end of the season are the main *Phytophthora* dieback control measures.

3.1.1 Supplementary Drilling

Alcoa proposes undertaking a small volume of supplementary drilling, namely diamond drilling or triple tube aircore as part of ongoing exploration activities. This work aims to improve Alcoa's knowledge of the regolith profile, water tables, and geophysical and metallurgical properties of bauxite. It will provide additional information that may be required to support mining studies for approvals, mining and processing. The path to the drill location will be pre-planned and marked to ensure the rig can access with minimal disturbance to the forest.

Alcoa plans to hire the most suitable drill rigs available that can operate without constructing tracks, pads or sumps. The drill rigs will be of a compact design, utilising a method to recirculate and contain drilling fluids for off-pad disposal. Drill rigs accessing uncleared forest will be mounted on metal tracks, helping to minimise soil compaction. Holes will be of a diameter up to 140 mm with a maximum depth of 60 m; holes will be backfilled in accordance with the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) draft exploration and prospecting rehabilitation guidance (DEMIRS, 2022).

[25] Excludes any requirement/s for drilling for bores or geological investigation.

3.2 Potential Impacts and Mitigation Measures

Potential impacts associated with exploration drilling may include disturbance to significant flora and vegetation communities whilst traversing through native vegetation and during drill activities.

Exploration activities are expected to have minimal disturbance as there is no clearing of trees and minimal disturbance to native vegetation whilst traversing the forest to access exploration areas. Drill rigs are restricted to movement along specified tracks whilst traversing mapped streamzone vegetation.

Table 3-1 below outlines the key environmental values, potential impacts and mitigation measures for the Project during the exploration phase.

Table 3-1: Key Environmental Values, Potential Impacts, and Mitigation Measures – Exploration Phase

Flora Value	Potential Impacts / Risk	Avoid / Minimise
Significant flora and vegetation		
Flora • Being identified as threatened or priority species. • Locally endemic or associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems). • New species or anomalous features that indicate a potential new species. **Vegetation** • Being identified as Threatened or Priority Ecological Communities. • Restricted distribution (e.g. streamzone vegetation and rock outcrop vegetation).	**Direct Impact:** • Disturbance to significant flora or vegetation communities whilst traversing native vegetation. • Disturbance to significant flora or vegetation communities whilst conducting drilling activities.	• Land will not be disturbed outside the Darling Range exploration disturbance footprint. • No exploration activities undertaken within any identified MAZ for: Old Growth Forest; National Parks; or formal conservation reserves). • No exploration activities undertaken within any identified MAZ for known threatened flora populations[26, 27] (unless prior regulatory approval obtained). • No drilling is undertaken within the identified 100 m buffer (LDA) for mapped or derived (i.e. in the absence of vegetation mapping) streamzone vegetation[28]. • Drill rigs are restricted to movement along specified tracks whilst traversing mapped streamzone vegetation. • No exploration drilling is undertaken within the LDA (50 m buffer) for mapped major rock outcrop (>1 ha) vegetation. • Appropriate environmental assessment and / or internal database review will be undertaken prior to exploration activities to understand potential for significant flora and vegetation community values to occur within exploration areas. • Minimise disturbance to vegetation by the use of custom-built drill rigs to suit forested areas. • Review of current flora database and maintain spatial database of significant flora and vegetation communities, as part of a Ground Disturbance Permit (GDP). • Establish appropriate MAZ for any newly identified threatened flora or vegetation communities. • Establish appropriate buffers, e.g. LDA, for priority flora species or vegetation communities, as appropriate for the specific flora or vegetation type[29]. • Minimise disturbance to significant flora and vegetation through provision of appropriate training for all personnel around the protection of these.
	Indirect Impact: • Introduction of and / or spread of *Phytophthora* dieback (and other disease such as *Armillaria*), and introduction of and / or spread of weed species.	• Where *Phytophthora* dieback mapping has not been carried out prior to exploration drilling, vehicles will be inspected to ensure external cleanliness prior to entry, and drilling will only occur under dry soil conditions. • Where *Phytophthora* dieback mapping has been undertaken prior to exploration drilling, drill rigs and any other vehicles will be appropriately cleaned prior to entry and when moving into dieback free or uninterpretable, as is the preference for start and end of seasonal wetter periods. • Ensure *Phytophthora* dieback management procedures are implemented during exploration activities. • Minimise the introduction and / or spread of *Phytophthora* dieback and other forest disease and weeds by following vehicle hygiene procedures, installing relevant signage, and establishing clean down points at specific locations as required. • Appropriate environmental assessment undertaken within conceptual exploration area prior to undertaking exploration activities. • During exploration activities, if key weed species[30] are observed, appropriate weed treatment will be undertaken according to the weed control management outlined by Weeds Australia (Invasive Plants and Animals Committee, 2016).
	Indirect Impact: • Introduction of and / or spread of emerging biosecurity risks such as Myrtle Rust (*Austropuccinia psidii*) Polyphagous Shot-hole Borer (PSHB, *Euwallacea fornicatus*).	• Avoid and or otherwise minimise the introduction of biosecurity risks by following appropriate vehicle hygiene procedures. • Avoid the introduction of the PSHB into exploration areas by following recommendations, to the extent practicable, for Zone B within DPIRD's guidance notes (DPIRD, 2024a). • Avoid the introduction of Myrtle Rust into exploration areas by following recommendations, to the extent practicable, within DPIRD's guidance notes (DPIRD, 2022).
	Other threatening processes • Indirect impacts from dust and ground vibration during exploration activities.	• Appropriate speed limits along access tracks are established to minimise the generation of excessive dust. • Regular inspection of machinery and equipment to ensure operating as expected and are not causing additional / excess ground vibration. • Minimise the generation of dust through the use of low impact exploration drill rigs. • Minimise ground vibration through the use of low impact exploration drill rigs.

[26] At the time of publication, there were no known threatened flora species occurring within the Huntly and Willowdale mines.
[27] Appropriate MAZ will be established for any newly identified threatened flora aligning with State guidelines and principles.
[28] Excludes any requirement/s for drilling for bores or geological investigation.
[29] The extent and / or radius of appropriate buffer zones will take into account individual species' physiological and biological attributes and landscape profiles.
[30] Weed species listed as either a Declared Pest, Weed of National Significance (WoNS) or weed species ranked as having high invasiveness and low feasibility of control by DBCA (2014).

3.3 Exploration Phase Provisions

Potential impacts associated with exploration drilling may include disturbance to significant flora and vegetation communities whilst traversing through native vegetation and during drill activities. However, Alcoa's exploration programmes are predicted to have minimal impact due to the nature of the activity.

To ensure that exploration activities do not result in impacts greater than that predicted (via avoid / minimise), both outcome-based and objective-based provisions have been adopted for significant flora and vegetation communities (see Table 3-2 and Table 3-3).

Environmental outcome:

- Ensure no adverse direct impact (clearing) from exploration activities on significant flora and vegetation communities during the exploration phase.

Environmental objectives:

- Establish appropriate buffer zones to any newly identified significant flora and / or vegetation communities[31].
- Minimise indirect impacts to any identified LDA or MAZ as a result of exploration activities.
- Ensure the ecological integrity of significant flora and vegetation communities is maintained through appropriate hygiene control practices.
- No exploration drilling is undertaken within the 100 m buffer (LDA) for mapped or derived (i.e. in the absence of vegetation mapping) streamzone vegetation[32].
- No exploration drilling is undertaken within the 50 m buffer (LDA) for mapped major rock outcrop (>1 ha) vegetation.
- Minimise impact to vegetation (e.g. streamzone vegetation) resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spills) outside of containment infrastructure.

[31] The extent and / or radius of appropriate buffer zones will take into account individual species' physiological and biological attributes and landscape profiles.
[32] Excludes any requirement/s for drilling for bores or geological investigation.

Table 3-2: Outcome-based Provisions – Exploration Phase

EPA Objectives To protect flora and vegetation so that biological diversity and ecological integrity are maintained. **Outcome:** Ensure no adverse direct impact (clearing) from exploration activities on significant flora and vegetation communities during the exploration phase. **Key impacts and risks**: Potential impacts such as traversing native vegetation and / or drilling during exploration activities.			
Indicators:	**Response actions**	**Monitoring: Frequency and Location**	**Reporting**
Trigger Criterion 1: Required exploration activities are identified to be on a trajectory towards (within 30 m) of the MAZ for: • Old Growth Forest; or • National Parks; or • formal conservation reserves; or • known populations of threatened flora[33, 34].	**Trigger Actions:** • Undertake review of exploration phase plans, and final drill holes and tracks. • If applicable, conduct in-field assessment to confirm disturbance. • If avoidance can be achieved, update exploration plans accordingly. • Re-assess work practices and procedures. • Re-assess training requirements. If investigations and on-ground assessment (if applicable) indicate that the trigger exceedance is due to exploration activities, implement trigger level response actions, such as rehabilitation if appropriate.	• Pre-drilling inspections where significant flora or vegetation communities have been identified during the assessment process. • In-field assessment as relevant per request (exploration plan and drill hole locations). • Reconciliation of the exploration plan, access tracks and exploration drill hole tracking against the environmental assessment. • Opportunistic review of exploration disturbance. • Annual audit of activities and review of internal protocols, where relevant. • Annual spatial database review of MAZ.	If the trigger criterion was exceeded during the reporting period, the annual compliance assessment report will discuss potential contributing factors for trigger level exceedance including a description of their effectiveness, and an assessment whether revision of the trigger criterion or objective is required.

Threshold Criterion 1:
Required exploration activities intrudes into any of the MAZ for:
• Old Growth Forest; or
• National Parks; or
• formal conservation reserves; or
• known populations of threatened flora[33, 34].
	Threshold Actions:
	• As above, including the addition of:
	• If exceedance of the threshold criteria is considered likely to be attributable to Alcoa's exploration, implement relevant actions, for example:
	  ○ Rehabilitation;
	  ○ Other mitigation action/s (relevant to the exceedance).
	• Implement as appropriate, recovery actions such as additional remediation works.
	Continue to implement recovery actions until confirmed that the impact is below trigger criteria level.
		• Pre-drilling inspections where significant flora or vegetation communities have been identified during the assessment process.
		• Reconciliation of the exploration plan, access tracks and exploration drill hole tracking against the environmental assessment.
		• Opportunistic review of exploration disturbance.
		• Annual spatial database review of MAZ.
		• Regular review of Alcoa's internal incident register.
			In the event that monitoring, or surveys indicate exceedance of the threshold, the exceedance will be reported to the State Development Minister in writing within 21 days of the exceedance being identified. The compliance assessment report will include discussion around the assessment/s and whether revision of the management objective or criteria is required.

[33] At the time of publication, there were no known threatened flora species occurring within the Huntly and Willowdale mines.
[34] Appropriate MAZ will be established for any newly identified threatened flora aligning with State guidelines and principles.

Table 3-3: Objective-based Provisions – Exploration Phase

EPA Objectives To protect flora and vegetation so that biological diversity and ecological integrity are maintained. **Objective:** Minimise indirect impacts from exploration activities to significant flora and vegetation communities. **Key impacts and risks**: Potential impacts such as traversing native vegetation and / or drilling during exploration activities causing potential spread of forest diseases and / or weed species. Potential impacts such as generation of dust and ground vibration during exploration drilling activities.			
Management Target	**Management Actions**	**Monitoring: Frequency and Location**	**Reporting**
Target 1 Establish appropriate buffer zones for any newly identified significant flora and / or vegetation communities[35].	• Undertake appropriate environmental assessments as per relevant guidance documents. • Update Alcoa's internal spatial database to reflect significant flora and vegetation community records. • Should the environmental assessment identify significant flora and / or vegetation communities, appropriate buffer zones will be applied. • Update Alcoa's internal spatial database with applied MAZ and / or LDA as appropriate.	• Environmental assessments to align with flora and vegetation guidance around timing for the southwest region.	If the management action was conducted during the reporting period, the annual compliance assessment report will discuss the assessment/s and whether revision of the management action or target is required.
Target 2 Avoid or otherwise minimise indirect impacts within any applied LDA or MAZ through the generation of dust or ground vibration.	• Ensure adequate maintenance of exploration drill rigs. • Induction training for exploration personnel to include minimisation of environmental disturbance. • Exploration drill rigs are designed to have minimal environmental impact.	• Regular inspection and maintenance of exploration drill rigs and equipment to ensure compliance with standards. • Undertake pre-mobilisation inspections. • Inspection of hazard / incident records. • Opportunistic auditing of training records.	
Target 3 Avoid or otherwise minimise indirect impacts within any applied LDA or MAZ through potential introduction of and / or establishment of *Phytophthora* dieback and / or weed species.	• Boundaries of *Phytophthora* dieback mapped areas are marked in-field (e.g. flagging) and available on internal spatial database (i.e. infested, uninfested, uninterpretable) along access tracks, and appropriate portable washdown equipment is established where practicable. Ensure *Phytophthora* dieback management procedures are implemented during exploration activities. • Where *Phytophthora* dieback mapping has not been carried out prior to exploration drilling, drilling • will only occur during dry soil conditions, and all vehicles and equipment will be inspected prior to entry to the drilling area. • Undertake appropriate environmental assessments as per relevant guidance documents. • Update Alcoa's internal spatial database to reflect relevant records. • Ensure controls are in place including signage, wash down bays and clean down points. • If key weed species are observed, appropriate weed treatment will be undertaken according to the weed control management outlined by Weeds Australia (Invasive Plants and Animals Committee, 2016). • Induction training for exploration personnel includes minimising environmental disturbance from *Phytophthora* dieback and weeds.	• Opportunistic visual observations during activities. • Desktop reconciliation of *Phytophthora* dieback mapping (i.e. infested, uninfested, uninterpretable). • Opportunistic auditing of training records. • *Phytophthora* dieback hygiene mapping is undertaken to provide initial interpretation to provide historical reference. Once mapping is completed, it is valid for 12 months. Subsequently, dieback lines are periodically reassessed where future activities are planned. Active dieback edges are assessed for changes in addition to an assessment of dieback-free forest areas to determine any new spot infections.	
Target 4 Avoid or otherwise minimise indirect impacts within any applied LDA or MAZ through potential introduction of and / or spread of emerging biosecurity risks, such as Myrtle Rust (*Austropuccinia psidii*) and Polyphagous Shot-hole borer (*Euwallacea fornicatus*).	• Undertake appropriate environmental assessments as per appropriate guidance documents. • Update Alcoa's internal spatial database to reflect records. • Ensure controls are in place, including signage, clean-down points, and following Alcoa's *Phytophthora* dieback hygiene procedures. • Induction training for exploration personnel to include minimisation of environmental disturbance. • Follow vehicle hygiene procedures.	• Opportunistic visual observations during activities. • Regular inspection and maintenance of exploration drill rigs and equipment to ensure compliance with standards. • Desktop reconciliation of potential areas of biosecurity concern. • Opportunistic auditing of training records.	
Target 5 No exploration drilling is undertaken within the 100 m buffer (LDA) for mapped or derived (i.e. in the absence of vegetation mapping) streamzone vegetation[36]. **OR** No exploration drilling is undertaken within the 50 m buffer (LDA) for mapped major rock outcrop (>1 ha) vegetation.	• Exploration drilling will only occur within approved areas. • Review of mapped and derived streamzone vegetation prior to conducting drilling. • Review of mapped major rock outcrops and associated vegetation mapping prior to drilling. • Establish (if required) and maintain LDA and MAZ, and ensure these areas are incorporated into the mine planning process and internal spatial database.	• Pre-drilling inspections. • Opportunistic review of exploration disturbance. • Post-exploration activity inspections. • Reconciliation of the exploration plan, access tracks and drill hole tracking against the environmental assessment. • Review of mapped and derived streamzones as required. • Annual spatial database review of LDA and MAZ.	
Target 6 Avoid or otherwise minimise impact to vegetation (e.g. streamzone vegetation)	• Ensure adequate maintenance of vehicles and machinery and undertake pre-mobilisation inspections. • Induction training for exploration personnel to include spill management (including prevention, minimisation, escalation and clean up, and reporting).	• Opportunistic review of exploration disturbance. • Post-exploration activity inspections. • Review of mapped and derived streamzones as required.	If the management action was conducted during the reporting period, the compliance assessment report will

[35] The extent and / or radius of appropriate buffer zones will take into account individual species' physiological and biological attributes and landscape profiles.
[36] Excludes and requirement/s for drilling for bores or geological investigation.

EPA Objectives To protect flora and vegetation so that biological diversity and ecological integrity are maintained. **Objective:** Minimise indirect impacts from exploration activities to significant flora and vegetation communities. **Key impacts and risks**: Potential impacts such as traversing native vegetation and / or drilling during exploration activities causing potential spread of forest diseases and / or weed species. Potential impacts such as generation of dust and ground vibration during exploration drilling activities.			
Management Target	**Management Actions**	**Monitoring: Frequency and Location**	**Reporting**
resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spill) outside of containment infrastructure.	• Ensuring vehicles and / or machinery carry appropriate spill clean-up kits which are regularly maintained and replaced as required. • Any contaminated soils are to be collected, transported and disposed of to an appropriately licensed facility.		discuss the assessment/s and whether revision of the management action or target is required.

4 Construction Phase Components

4.1 Overview of Construction Activities

Soil is stripped in two layers including a surface layer of topsoil (~ 150 mm) and a thicker layer (average 400 mm) of overburden. The topsoil contains most seeds, organic material, plant nutrients and microbial activity and is an important resource for rehabilitation. The topsoil for direct return is stripped to 75 mm to avoid diluting the seed resource concentrated within the top 50 – 75 mm of the topsoil. This process involves stripping from an area about to be mined and returning the soil to an area being rehabilitated within three months. This avoids long-term storage in a stockpile, which can cause degradation of the biological components of the topsoil. When topsoil must be stockpiled for more than three months before being used in rehabilitation, it is stripped to a depth of 150 mm. The overburden, which extends to the top of the cemented caprock layer, is stockpiled next to the mined area to be returned to the pit floor during rehabilitation.

Construction activities are typically limited to daytime operations where practicable unless required during nighttime hours for a specific construction programme. Mobile towers will illuminate construction areas operating at night. However, permanent and / or temporary lighting will be positioned to minimise the artificial light directed to adjacent native vegetation and streamzone vegetation whilst maintaining a safe working environment for personnel.

4.2 Potential Impacts and Mitigation Measures

Proposed construction activities such as construction of mine access, haul roads, conveyors and facilities have the potential to impact significant flora and vegetation communities through:

- habitat loss and fragmentation;
- introduction and / or spread of weed species and *Phytophthora* dieback and other forest diseases;
- introduction and / or spread of biosecurity risks such as Myrtle Rust or Polyphagous Shot-hole Borer;
- spills and / or leaks from hydrocarbons (vehicles and machinery); and
- other potential indirect impacts such as the generation of fire, dust and ground vibration.

Table 4-1 below outlines the key environmental values, potential impacts and mitigation measures associated with the Project during the construction phase.

Table 4-1: Key Environmental Values, Potential Impacts, and Mitigation Measures – Construction Phase

Flora and Vegetation Value	Potential Impacts / Risk	Avoid / Minimise
Significant flora and vegetation		
Flora • Being identified as threatened or priority species. • Locally endemic or associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems). • New species or anomalous features that indicate a potential new species. **Vegetation** • Being identified as Threatened or Priority Ecological Communities. • Restricted distribution (e.g. streamzone vegetation and rock outcrop vegetation).	**Direct Impact: Clearing** • Habitat loss through construction of infrastructure, mine access and haul roads, conveyors and facilities (including mine pits). • Potential loss of and / or decline in the health of significant flora and vegetation communities. • Habitat fragmentation due to the loss of habitat connectivity and genetic flow through construction infrastructure, mine access and haul roads, conveyors, and facilities (including mine pits).	• No construction activities will be undertaken within any identified MAZ for: Old Growth Forest; National Parks; or formal conservation reserves. • No construction activities undertaken within any identified MAZ for known threatened flora populations[37] (unless prior regulatory approval obtained). • Minimise construction activities within the identified 100 m buffer (LDA) for mapped or derived (i.e. in the absence of vegetation mapping) streamzone vegetation[38]. • Minimise construction activities within the 50 m buffer (LDA) of mapped major rock outcrop (>1 ha) vegetation. • Review of current flora database and maintain spatial database of significant flora and vegetation communities as part of the GDP prior to clearing. • Establish an appropriate MAZ for any newly identified threatened flora or vegetation communities[39]. • Establish appropriate buffers for priority flora species or vegetation communities, as appropriate for the specific flora or vegetation type[40]. • Prohibit land disturbance outside the Huntly Mine disturbance footprint and Willowdale Mine disturbance footprint. • Minimise infrastructure clearing in streamzone vegetation with haul road creek crossings constructed perpendicular to creek flow to reduce habitat impact. • Clearing or construction activities required within mapped and derived (i.e. in the absence of mapping) streamzones will occur during summer or autumn months, as far as practicable. • Minimise clearing of mature growth forest where practicable through review of available forest age mapping in clearing design. • Implement clearing markup and demarcation processes in the field and within work packs to identify LDA and MAZ. • Minimise disturbance to significant flora and vegetation through provision of appropriate training for all personnel around the protection of these. • Avoid or minimise fragmentation by retaining ecological corridors and linkages, such as streamzone vegetation, and by prioritising and sequencing rehabilitation areas to enhance habitat connectivity as far as practicable. • Minimise the creation of vegetation peninsulas with only one connection to larger remnants. • Conceptual Clearing Areas to be surveyed for significant flora and vegetation community values as per relevant guidelines.
	Indirect Impact: • Introduction of and / or spread of *Phytophthora* dieback (and other disease such as *Armillaria*), and introduction of and / or spread of weeds.	• Inspect construction vehicles and equipment for soil and vegetative material before entering undisturbed areas. • Abide by vehicle hygiene procedures, *Phytophthora* dieback management procedure and weed control. • Construction vehicle and equipment movements are limited to designated roads, access tracks and cleared areas. • *Phytophthora* dieback and other forest diseases controls, including signage, wash down bays and clean-down points, and abide by *Phytophthora* dieback hygiene procedures. • Demarcation of P*hytophthora* dieback infested, uninfested and uninterpretable areas in construction and operational drawings and in the field using signage and flagging tape. • *Phytophthora* dieback assessment as part of GDP prior to clearing activities. • Conceptual Clearing Area will be surveyed for key weed species prior to clearing as part of targeted and / or detailed surveys. • During construction activities, if key weed species are observed, appropriate weed treatment will be undertaken according to the weed control management outlined by Weeds Australia (Invasive Plants and Animals Committee, 2016).
	Indirect Impact: • Introduction of and / or spread of emerging biosecurity risks such as Myrtle Rust (*Austropuccinia psidii*) and Polyphagous Shot-hole Borer (PSHB, *Euwallacea fornicatus*).	• Avoid and / or otherwise minimise the introduction of biosecurity risks by following appropriate vehicle hygiene procedures. • Avoid the introduction of the PSHB into construction areas by following recommendations, to the extent practicable, for Zone B within DPIR's guidance notes (DPIRD, 2024a). • Avoid the introduction of Myrtle Rust into construction areas by following recommendations, to the extent practicable, within DPIRD's guidance notes (DPIRS, 2022). • Inspection of construction and operational vehicles and equipment for soil and vegetative material prior to entry to undisturbed areas. • Construction and operational vehicle and equipment movements are limited to designated roads, access tracks and cleared areas. • During construction activities, if evidence is observed that indicates potential presence of Myrtle Rust and / or PSHB, apply appropriate fungicides and insecticides and / or follow DPIRD advice, ensuring no or minimal adverse impacts on non-target species, in targeted high-risk areas (such as streamzone vegetation).
	Other potential indirect impacts • Indirect impacts from dust and ground vibration during construction activities.	• Dust suppression for conveyor belts (using covers), haul roads and other key operational areas. • Dust suppression activities carried out (e.g. via water carts) during high-level usage of haul roads. • Routine housekeeping practices around central facilities and workshops will be implemented to reduce dust generation.

[37] At the time of publication, there were no known threatened flora species occurring within the Huntly and Willowdale mines.
[38] Excludes any requirement/s for drilling for bores or geological investigation.
[39] Appropriate MAZ will be established for any newly identified threatened flora aligning with State guidelines and principles.
[40] The extent and / or radius of appropriate buffer zones will take into account individual species' physiological and biological attributes and landscape profiles.

4.3 Construction Phase Provisions

Direct impacts, such as clearing, and indirect impacts, including the introduction and spread of *Phytophthora* dieback and biosecurity risks such as Myrtle Rust, may affect significant flora and vegetation communities during Alcoa's construction activities. These impacts will be managed in adherence to the mitigation hierarchy to avoid and / or minimise risks arising from construction activities.

To ensure that potential impacts associated with construction activities are not greater than those predicted (via avoid / minimise), both outcome-based and objective-based provisions have been adopted for all known significant flora and vegetation communities (see Table 4-2 and Table 4-3).

Environmental outcome:

- No clearing to any identified MAZ as a result of construction activities.
- Limit clearing of native vegetation to approved limits per calendar year[41].
- Ensure no adverse direct impact (clearing) from construction activities on significant flora and vegetation communities during construction.

Environmental objectives:

- Establish appropriate buffer zones for any newly identified significant flora and / or vegetation communities[42].
- Avoid or otherwise minimise clearing within the 50 m buffer (LDA) of mapped major rock outcrop (>1 ha) vegetation.
- Ensure the ecological integrity of significant flora and vegetation communities is maintained through appropriate hygiene control practices.
- Minimise impact to vegetation (e.g. streamzone vegetation) resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spills) outside of containment infrastructure.
- Avoid or otherwise minimise vegetation fragmentation.

[41] 800 ha per calendar year (applies to MMP 23 – 27 period). Unused capacity may be rolled over into the following year, following approval from the State Development Minister. Approved limits per calendar year will reflect clearing limits for the applicable time period including future approvals.
[42] The extent and / or radius of appropriate buffer zones will take into account individual species' physiological and biological attributes and landscape profiles.

Table 4-2: Outcome-based Provisions – Construction Phase

<table>
<tr><td colspan="4">EPA Objectives
To protect flora and vegetation so that biological diversity and ecological integrity are maintained.
Outcome:
Limit clearing of native vegetation to ensure the preservation of flora and vegetation within the mine disturbance footprint.
Key impacts and risks:
Potential direct impacts (clearing) during construction activities.</td></tr>
<tr><th>Criteria Indicator</th><th>Response Actions</th><th>Monitoring: Frequency and Location</th><th>Reporting</th></tr>
<tr><td>Trigger Criterion 1
Clearing of native vegetation approaches 85% of the approved annual clearing limit[43].</td><td rowspan="2">Trigger 1 Actions:
• Prepare to halt non-essential clearing operations if necessary.
• Conduct an internal review of all ongoing and planned clearing activities.
• Review internal processes to ensure all clearing remains below the threshold criteria.</td><td rowspan="3">• Area (ha) of native vegetation cleared per calendar year (for example through remote sensing).
• Reconciliation assessment against clearing activities once a specific clearing area is completed.
• If triggered, an in-field assessment will be undertaken against trigger criteria.
• Annual spatial database review of MAZ.</td><td rowspan="3">If the trigger criterion was exceeded during the reporting period, the annual compliance assessment report will discuss potential contributing factors for trigger level exceedance including a description of their effectiveness, and an assessment whether revision of the trigger criterion or objective is required.</td></tr>
<tr><td>Trigger Criterion 2
Required construction activities are identified to be on trajectory towards (within 30 m) of the MAZ for:
• Old Growth Forest; or
• National Parks; or
• formal conservation reserves; or
• known populations of threatened flora[44, 45].

Trigger Criterion 3
Required construction activities (not including: streamzone crossings [such as, haul roads, access roads / tracks]) encroaches within 50 m of the 100 m buffer (LDA) for mapped streamzone vegetation.
OR
Required construction activities (not including: construction such as haul roads, access roads / tracks) encroaches within 10 m of the 50 m buffer (LDA) for mapped major rock outcrop (>1 ha) vegetation.</td><td>Trigger 2 and 3 Actions:
• Undertake a review of the mine plan and ensure LDA and MAZ are incorporated into the mine plan process.
• Reconciliation assessments including MAZ and other buffers, where applicable.
• Review spatial database where relevant, including any updates.
• Review GDPs, where applicable.
• If relevant, conduct an in-field assessment to confirm and / or verify potential exceedance.
• If investigations and on-ground assessment (if applicable) indicate that the trigger exceedance is due to construction activities, implement trigger-level response actions in consultation with relevant stakeholders, for example:
○ Rehabilitation.</td></tr>
<tr><td>Threshold Criterion 1
Clearing of native vegetation exceeds the approved annual limit[43].

Threshold Criterion 2
Required construction activities intrudes into any of the MAZ listed below:
• Old Growth Forest; or
• National Parks; or
• formal conservation reserves; or
• known populations of threatened flora[46, 47].

Threshold Criterion 3
Required construction activities (not including: streamzone crossings [such as, haul roads, access roads / tracks]) intrudes into the 100 m buffer (LDA) for mapped streamzone vegetation.
OR
Required construction activities intrudes into the 50 m buffer (LDA) for mapped major rock outcrop (>1 ha) vegetation.</td><td>Threshold Actions:
• As above, including the addition of:
• If exceedance of the threshold criteria is considered likely to be attributable to Alcoa's clearing activities, implement relevant actions, for example:
○ Rehabilitation;
• Other mitigation action/s (relevant to the exceedance);
• Implement as appropriate, recovery actions such as additional remediation works.
Continue to implement recovery actions until confirmed that the impact is below trigger criteria level.</td><td>• Area (ha) of native vegetation cleared per calendar year (for example through remote sensing).
• Reconciliation assessment against clearing activities once a specific clearing area is completed.
• If triggered, an in-field assessment will be undertaken against threshold criteria.
• If triggered, monitoring as per relevant mitigation actions.</td><td>In the event that monitoring, or surveys indicate exceedance of the threshold, the exceedance will be reported to the State Development Minister in writing within 21 days of the exceedance being identified. The compliance assessment report will include discussion around the assessment/s and whether revision of the management objective or criteria is required.</td></tr>
</table>

[43] 800 ha per calendar year (applies to MMP 23 – 27 period). Unused capacity may be rolled over into the following year, following approval from the State Development Minister. Approved limits per calendar year will reflect clearing limits for the applicable time period including future approvals.
[44] At the time of publication, there were no known threatened flora species occurring within the Huntly and Willowdale mines.
[45] Appropriate MAZ will be established for any newly identified threatened flora aligning with State guidelines and principles.
[46] At the time of publication, there were no known threatened flora species occurring within the Huntly and Willowdale mines.
[47] Appropriate MAZ will be established for any newly identified threatened flora aligning with State guidelines and principles.

Table 4-3: Objective-based Provisions – Construction Phase

EPA Objectives To protect flora and vegetation so that biological diversity and ecological integrity are maintained. **Objective:** Ensure no adverse indirect impacts from construction activities on significant flora and vegetation communities. **Key impacts and risks**: Potential indirect impacts during construction activities.			
Management Target	**Management Actions**	**Monitoring: Frequency and Location**	**Reporting**
Target 1 Establish appropriate buffer zones for any newly identified significant flora and / or vegetation communities[48].	• Undertake appropriate environmental assessments as per relevant guidance documents. • Update Alcoa's internal spatial database to reflect records. • Should the environmental assessment identify significant flora and / or vegetation communities, appropriate buffer zones will be applied. • Update Alcoa's internal spatial database with applied MAZ and / or LDA as appropriate.	• Environmental assessments to align with flora and vegetation guidance around timing for the southwest region. • Vegetation mapping of mining regions to identify significant vegetation communities prior to finalisation of Conceptual Clearing Areas. • Targeted pre-clearance significant flora and vegetation communities surveys to be undertaken over Conceptual Clearing Areas within five years of clearing for construction activities.	If the management action was conducted during the reporting period, the compliance assessment report will discuss the assessment/s and whether revision of the management action or target is required.
Target 2 Minimise as far as practicable indirect impacts within any applied LDA or MAZ through the potential introduction of and / or establishment of *Phytophthora* dieback and / or weed species.	• Boundaries of *Phytophthora* dieback mapped areas are marked in-field (e.g. flagging) and available on Alcoa's spatial database (i.e. infested, uninfested, uninterpretable) along access tracks, and appropriate portable washdown equipment is established where practicable. • Ensure *Phytophthora* dieback management procedures are implemented during construction activities. • Undertake appropriate environmental assessments as per relevant guidance documents. • Update Alcoa's internal spatial database to reflect records. • Ensure controls are in place including signage, wash down bays and clean-down points. • All key weed species are treated according to the weed control management outlined by Weeds Australia (Invasive Plants and Animals Committee, 2016). • Induction training for exploration personnel includes minimising environmental disturbance from *Phytophthora* dieback and weed species.	• Opportunistic visual observations during activities. • Desktop reconciliation of *Phytophthora* dieback mapping (i.e. infested, uninfested, uninterpretable). • Opportunistic auditing of training records. • *Phytophthora* dieback hygiene mapping is undertaken to provide initial interpretation to provide historical reference. Once mapping is completed, it is valid for 12 months. Subsequently, dieback lines are periodically reassessed where future activities are planned. Active dieback edges are assessed for changes in addition to an assessment of dieback-free forest areas to determine any new spot infections.	
Target 3 Minimise as far as practicable indirect impacts within any applied LDA or MAZ through potential introduction of and / or spread of emerging biosecurity risks such as Myrtle Rust (*Austropuccinia psidii*) and Polyphagous Shot-hole Borer (PSHB, *Euwallacea fornicatus*).	• Update Alcoa's internal procedures in-line with relevant biosecurity guidance. • Ensure controls are in place, including clean-down points, and following vehicle hygiene procedures. • Induction training for construction personnel to include minimisation of environmental disturbance.	• Undertake periodic review of biosecurity guidance. • Opportunistic visual observations during activities. • Regular inspection and maintenance of construction vehicles and machinery. • Opportunistic auditing of training records.	
Target 4 Minimise impact to vegetation (e.g. streamzone vegetation) resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spills) outside of containment infrastructure.	• Ensure controls are in place, including clean-down points, and following vehicle hygiene procedures. • Induction training for construction personnel includes spill management (including prevention, minimization, escalation and clean up, and reporting). • Ensure construction vehicles and / or machinery carry appropriate spill clean-up kits regularly maintained and replaced as required. • Any contaminated soils to be collected, transported, and disposed to an appropriately licensed facility.	• Opportunistic review of construction disturbance. • Regular inspection and maintenance of construction vehicles and machinery. • Review of spatial database for mapped and derived streamzones as required. • Post-clearing assessment as applicable.	
Target 5 Avoid or otherwise minimise vegetation fragmentation, as far as reasonably practicable, by retaining ecological corridors / linkages (i.e. streamzone vegetation).	• Establish (if required) and maintain LDA and MAZ, and ensure these areas are incorporated into the mine planning process and internal spatial database (for example, streamzone vegetation providing retained ecological corridors).	• Opportunistic review of disturbance and mine planning. • Post-clearing inspections. • Regular review of LDA and MAZ.	

[48] The extent and / or radius of appropriate buffer zones will take into account individual species' physiological and biological attributes and landscape profiles.

5 Operational Phase Components

5.1 Overview of Operational Activities

The bauxite ore deposit, which presents as cemented caprock, is broken by blasting or ripping with a large bulldozer. Blasting uses conventional Ammonium Nitrate - Fuel Oil (ANFO) explosives. The broken cemented caprock and the underlying friable bauxite are removed by excavators and loaded onto haul trucks. The mining fleet is diesel-fuelled and includes excavators, loaders, trucks and earthmoving equipment.

The bauxite is trucked via a network of haul roads to Run of Mine (ROM) pads in preparation for primary and secondary crushing. The crushed ore is transported via a conveyor to stockpiles at the refineries.

5.2 Potential Impacts and Mitigation Measures

The following operational activities have the potential to impact significant flora and vegetation communities:

- extension of mining and operation of mining and haulage equipment;
- introduction and spread of weeds and / or *Phytophthora* dieback and / or other forest disease such as *Armillaria*;
- introduction and spread of emerging biosecurity risks such as Myrtle Rust and Polyphagous Shot-hole Borer;
- spills and leaks from hydrocarbons (vehicles and machinery);
- the generation of dust emissions; and
- vegetation disturbance by vehicle and machinery movements.

Table 5-1 below outlines the key environmental values, potential impacts and mitigation measures associated with the Project during the operational phase.

Table 5-1: Key Environmental Values, Potential Impacts, and Mitigation Measures – Operational Phase

Flora Value	Potential Impacts / Risk	Avoid / Minimise
Significant flora and vegetation		
Flora • Being identified as threatened or priority species. • Locally endemic or associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems). • New species or anomalous features that indicate a potential new species. **Vegetation** • Being identified as Threatened or Priority Ecological Communities. • Restricted distribution (e.g. streamzone vegetation and rock outcrop vegetation).	**Direct Impact: Clearing** • Habitat loss to significant flora through operation of mine access and haul roads, conveyors and facilities (including mine pits). • Potential loss of significant flora while operating mine access and haul roads, conveyors and facilities. • Potential loss of and / or decline in the health of significant flora and vegetation communities. • Habitat fragmentation due to the loss of habitat connectivity and genetic flow through the operation of mine access and haul roads, conveyors, and facilities (including mine pits).	• No operational activities are undertaken within any identified MAZ for: Old Growth Forest; National Parks; or formal conservation reserves. • No operational activities undertaken within any identified MAZ for known threatened flora populations[49, 50] (unless prior regulatory approval obtained). • Review of current flora database and maintain spatial database of significant flora and vegetation communities as part of the GDP as required. • Establish an appropriate MAZ for any newly identified threatened flora or vegetation communities[49, 50]. • Establish appropriate buffers, e.g. LDA, for priority flora species or vegetation communities, as appropriate for the specific flora or vegetation type[51]. • Prohibit land disturbance outside the Huntly Mine disturbance footprint and Willowdale Mine disturbance footprint. • Minimise infrastructure clearing in streamzone vegetation and major rock outcrops, with haul road creek crossings constructed perpendicular to creek flow to reduce habitat impact. • Limit clearing of mature growth forest where practicable through review of forest age in clearing design. • Implement clearing markup and demarcation processes in the field and within work packs to clearly identify protected areas. • Minimise disturbance to significant flora and vegetation through provision of appropriate training for all personnel around the protection of these. • Conceptual Clearing Areas to be surveyed for significant flora values during targeted pre-clearance surveys. • Avoid or minimise vegetation fragmentation by retaining ecological corridors and linkages, such as streamzone vegetation, and by prioritising and sequencing rehabilitation areas to maintain habitat connectivity. • Minimise the creation of vegetation peninsulas with only one connection to larger remnants.
	Indirect Impact: • Introduction of and / or spread of *Phytophthora* dieback (and other disease such as *Armillaria*), and introduction of and / or spread of weeds.	• Inspection of operational vehicles and equipment for soil and vegetative material prior to entry to undisturbed areas. • Abide by vehicle hygiene procedures, *Phytophthora* dieback management procedure and weed control. • Vehicle and equipment movements are limited to designated roads, access tracks and cleared areas. • *Phytophthora* dieback and other forest diseases controls including wash down bays, clean down points, abide by dieback hygiene procedures. • Demarcation of *Phytophthora* dieback-infested, uninfested and uninterpretable areas in construction and operational drawings and in the field using signage and flagging tape. • During operational activities, if key weed species[52] are observed, appropriate weed treatment will be undertaken according to the weed control management outlined by Weeds Australia (Invasive Plants and Animals Committee, 2016).
	Indirect Impact: • Introduction of and / or spread of emerging biosecurity risks such as Myrtle Rust (*Austropuccinia psidii*) and Polyphagous Shot-hole Borer (PSHB, *Euwallacea fornicatus*).	• Inspection of operational vehicles and equipment for soil and vegetative material prior to entry to undisturbed areas. • Abide by vehicle hygiene procedures. • Vehicle and equipment movements limited to designated roads, access tracks and cleared areas. • During operational activities, if evidence is observed that indicates potential presence of Myrtle Rust and / or PSHB, apply appropriate fungicides and insecticides and follow DPIRD advice, ensuring no or minimal adverse impacts on non-target species, in targeted high-risk areas (such as streamzone vegetation).
	Other impacting processes • Indirect impacts from dust and ground vibration during operational activities.	• Dust suppression for conveyor belts (through utilisation of covers), haul roads and other key operational areas. • Routine housekeeping practices around central facilities and workshops will be implemented to reduce dust generation.

[49] At the time of publication, there were no known threatened flora species occurring within the Huntly and Willowdale mines.
[50] Appropriate MAZ will be established for any newly identified threatened flora aligning with State guidelines and principles.
[51] The extent and / or radius of appropriate buffer zones will take into account individual species' physiological and biological attributes and landscape profiles.
[52] Weed species listed as either a Declared Pest, Weed of National Significance (WoNS) or weed species ranked as having high invasiveness and low feasibility of control by DBCA (2014).

5.3 Operational Phase Provisions

Direct impacts (e.g. clearing) and indirect impacts (e.g. introduction and spread of *Phytophthora* dieback) on significant flora and vegetation communities, during Alcoa's operational (active mining) phase will adhere to the mitigation hierarchy to avoid and / or minimise risks as a result of operational activities.

To ensure that potential impacts associated with the Project's operational phase are not greater than those predicted (avoid / minimise) both outcome-based and objective-based provisions have been adopted for all known significant flora and vegetation communities (see Table 5-2 and Table 5-3).

Environmental outcome:

- No clearing to any identified MAZ as a result of operational activities.
- Limit clearing of native vegetation to approved limits per calendar year[53].
- Ensure no adverse direct impact (clearing) from operational activities on significant flora and vegetation communities.

Environmental objective:

- Establish appropriate buffer zones for any newly identified significant flora and / or vegetation communities[54].
- Ensure the ecological integrity of known populations of significant flora and vegetation communities is maintained through appropriate hygiene control practices.
- Minimise impact to vegetation (e.g. streamzone vegetation and mapped major rock outcrop (>1 ha) vegetation) resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spills) outside of containment infrastructure.
- Avoid or otherwise minimise vegetation fragmentation.

[53] 800 ha per calendar year (applies to MMP 23 – 27 period). Unused capacity may be rolled over into the following year, following approval from the State Development Minister. Approved limits per calendar year will reflect clearing limits for the applicable time period including future approvals.
[54] The extent and / or radius of appropriate buffer zones will take into account individual species' physiological and biological attributes and landscape profiles.

Table 5-2: Outcome-based Provisions - Operational Phase[55]

EPA Objectives To protect flora and vegetation so that biological diversity and ecological integrity are maintained. **Outcome:** • No clearing to any identified MAZ as a result of operational activities. • Limit clearing of native vegetation to approved limits per calendar year. • Ensure no adverse direct impact (clearing) from operational activities on significant flora and vegetation communities. **Key impacts and risks**: Potential direct impacts (clearing) during operational activities.			
Criteria Indicator	**Response Actions**	**Monitoring: Frequency and Location**	**Reporting**

Early Response Criterion 1
In-field assessment indicates trending towards decline in vegetation condition and / or compositional change/s in critical strata levels (e.g. understorey indicator species such as *Gahnia trifida*) of mapped or derived streamzone vegetation monitoring sites and / or changes since baseline compared to reference sites.
	Early Response 1 and 2 Actions:
	• Investigate potential exceedance by reviewing:
	  ○ degree of infrastructure disturbance;
	  ○ reference data to ascertain if changes have also occurred at reference sites; and
	  ○ site, tree condition and climatic factors to determine if other factors may have caused the change (e.g. fire, storm, insect activity etc.).
		• Annual in-field assessment of selected sites.
		• Monitoring provisions for vegetation critical strata levels within streamzone vegetation selected monitoring sites (including weed species).
		• Monitoring programme will commence Q3 2025.
			N/A

Early Response Criterion 2 In-field assessment indicates trending towards decline in vegetation condition in major rock outcrop vegetation monitoring sites since baseline and compared to reference sites.		• Annual in-field assessment of selected sites. • Monitoring provisions for vegetation condition within major rock outcrop selected monitoring sites (including weed species). • Monitoring programme will commence Q3 2025.	
Early Response Criterion 3 Key weed species recorded within vegetation monitoring sites which has not been previously recorded during baseline surveys compared to reference sites.	**Early Response 3 Actions:** • Where new key weed species incursions are found, appropriate weed treatment will be undertaken according to the weed control management outlined by Weeds Australia (Invasive Plants and Animals Committee, 2016). • Review recorded key weed species against the current Western Australian Organism List (DPIRD, 2024a), Weeds of National Significance (WoNS; Invasive Plants and Animals Committee, 2016) and DBCA (2014) weed species' ecological impact and invasiveness rankings for the southwest and update internal database where required. • Review vehicle and machinery hygiene practices. • If required, undertake targeted key weed species mapping / assessment.	• Opportunistic visual observations and annual in-field assessments in high-risk areas such as streamzones and areas of high importance to significant flora and vegetation communities. • Where relevant, undertake periodic review of existing targeted key weed species mapping / assessments. • Monitoring programme will commence Q3 2025.	

Trigger Criterion 1
In-field assessment indicates statistically significant decline in vegetation condition and / or compositional change/s in critical strata levels (e.g. understorey indicator species such as *Gahnia trifida*) of mapped or derived streamzone vegetation monitoring sites and / or changes since baseline compared to reference sites.
	Trigger 1 and 2 Actions:
	Investigate potential cause of exceedance by review of the following:
	• mine plan;
	• Internal incident report/s relating to operational activities;
	• Site-specific observations; operation works extent and predictions; and
	• Relevant Operational plan/s.
	• If warranted (investigations and in-field assessments indicate that trigger exceedance is attributable to Alcoa's operational activities), implement trigger level actions which may include:
	  ○ Update any relevant operational procedures and / or plans;
	  ○ Re-assess work practices and training requirements;
	  ○ Update relevant operational plan/s;
	  ○ Investigate the potential for rehabilitation; and
	  ○ Other measures as agreed by relevant stakeholder/s.
	If assessments indicate that trigger criteria are likely to be exceeded and attributable to Alcoa's operational activities, then consult with relevant stakeholders.
		• Annual in-field assessment of selected sites.
		• Monitoring provisions for vegetation critical strata levels within streamzone vegetation selected monitoring sites (including weed species).
		• Monitoring programme will commence Q3 2025.
			If the trigger criterion was exceeded during the reporting period, the annual compliance assessment report will discuss potential contributing factors for trigger level exceedance including a description of their effectiveness, and an assessment whether revision of the trigger criterion or objective is required.

Trigger Criterion 2 In-field assessment indicates statistically significant decline in vegetation condition in major rock outcrop vegetation monitoring sites since baseline and compared to reference sites.		• Annual in-field assessment of selected sites. • Monitoring provisions for vegetation condition within major rock outcrop selected monitoring sites (including weed species). • Monitoring programme will commence Q3 2025.	
Trigger Criterion 3 Key weed species[56] recorded within vegetation monitoring sites which has not previously been recorded during baseline surveys and is classified by DBCA (2014) as	**Trigger 3 Actions:** Investigate potential cause of exceedance by reviewing the following: • mine plan;	• Opportunistic visual observations and annual in-field assessments in high-risk areas such as streamzones and areas of high importance to significant flora and vegetation communities.	If the trigger criterion was exceeded during the reporting period, the annual compliance assessment report will discuss potential contributing factors for trigger level exceedance including a description of

[55] As per the Environmental Protection (Darling Range Bauxite Mining Proposals) Exemption Order 2023 (SL 2023/200) "Mining activities" mean *(a) extraction and processing of bauxite from mineral reserves below the surface of the earth, including but not limited to (i) the removal of topsoil and overburden, (ii) blasting, ripping or otherwise breaking caprock to expose bauxite, (iii) removal of bauxite, (iv) crushing of bauxite, (v) transport of bauxite to a refinery and (b) activities that are preparatory to, incidental to or consequential upon extraction and processing of bauxite, including but not limited to (i) exploration, (ii) land clearing, (iii) the construction or maintenance of mining infrastructure, and (iv) rehabilitation.*

[56] Weed species listed as either a Declared Pest, Weed of National Significance (WoNS) or weed species ranked as having high invasiveness and low feasibility of control by DBCA (2014).

EPA Objectives To protect flora and vegetation so that biological diversity and ecological integrity are maintained. **Outcome:** • No clearing to any identified MAZ as a result of operational activities. • Limit clearing of native vegetation to approved limits per calendar year. • Ensure no adverse direct impact (clearing) from operational activities on significant flora and vegetation communities. **Key impacts and risks**: Potential direct impacts (clearing) during operational activities.			
Criteria Indicator	**Response Actions**	**Monitoring: Frequency and Location**	**Reporting**
having high ecological impact and low feasibility of control and exceeds 15% of total understorey cover.	• Reference site data; • Causal environmental factors; and • Review recorded weed species against current Western Australian Organism List (DPIRD, 2024a), Weeds of National Significance (WoNS; Invasive Plants and Animals Committee, 2016) and DBCA (2014) weed species' ecological impact and invasiveness rankings for the southwest and update internal database where required. If warranted (investigations and in-field assessments indicate that trigger exceedance is Attributable to Alcoa's operational activities): • Appropriately treat, remove and manage as soon as is reasonably practicable.	• Where relevant, undertake periodic review of existing targeted key weed species mapping / assessments. • Monitoring programme will commence Q3 2025.	their effectiveness, and an assessment whether revision of the trigger criterion or objective is required.
Trigger Criterion 4 Operational activities are identified to be on trajectory towards (within 30 m) of the MAZ for: • Old Growth Forest; or • National Parks; or • formal conservation reserves; or • known populations of threatened flora[57, 58]. **Trigger Criterion 5** Operational activities (not including: streamzone crossings [such as, haul roads, access roads / tracks]) intrudes within 50 m of the 100 m buffer (LDA) for mapped streamzone vegetation. OR Operational activities (not including: haul roads, access roads / tracks]) intrudes within 10 m of the 50 m buffer (LDA) for major mapped rock outcrop (>1 ha) vegetation.	**Trigger 4 and 5 Actions:** • Undertake a review of the mine plan and ensure MAZ are incorporated into the mine planning process. • Reconciliation assessments including MAZ and other buffers, where applicable. • Review spatial database where relevant, including any updates. • Review GDPs, where applicable. • If relevant, conduct an in-field assessment to confirm and / or verify potential exceedance. • If investigations and on-ground assessment (if applicable) indicate that the trigger exceedance is due to operational activities, implement trigger-level response actions in consultation with relevant stakeholders, for example: ○ Rehabilitation.	• Area (ha) of native vegetation cleared per calendar year (for example through remote sensing). • Reconciliation assessment against clearing activities once a specific clearing area is completed. • If triggered, an in-field assessment will be undertaken against threshold criteria. • If triggered, monitoring as per relevant mitigation actions.	
Threshold Criterion 1 In-field assessment indicates statistically significant decline in vegetation condition and / or compositional change/s in critical strata levels (e.g. understorey indicator species such as Gahnia trifida) of mapped or derived streamzone vegetation monitoring sites with no indication of recovery in native vegetation strata, abundance, cover and condition outside of natural variation since baseline and compared to reference sites and be attributable to Alcoa operational activities.	**Threshold 1 and 2 Actions**: • As above, including the addition of: • If exceedance of the threshold criteria is considered likely to be attributable to Alcoa's operational activities, implement action/s as agreed during prior consultation with relevant stakeholders, for example: ○ Rehabilitation; • Other mitigation action/s as agreed with relevant stakeholder/s; • Implement, as appropriate recovery actions such as additional remediation works. Continue to implement recovery actions until it is confirmed that the impact is below the criteria level.	• Annual in-field assessment of selected sites. • Monitoring provisions for vegetation critical strata levels within streamzone vegetation selected monitoring sites (including weed species). • Monitoring programme will commence Q3 2025.	In the event that monitoring, or surveys indicate exceedance of the threshold, the exceedance will be reported to the State Development Minister in writing within 21 days of the exceedance being identified. The compliance assessment report will include discussion around the assessment/s and whether revision of the management objective or criteria is required.
Threshold Criterion 2 In-field assessment indicates statistically significant decline in vegetation condition in major rock outcrop vegetation monitoring sites since baseline and compared to reference sites with no indication of recovery in native vegetation strata, abundance, cover and condition outside of natural variation since baseline and compared to reference sites and be attributable to Alcoa operational activities.		• Annual in-field assessment of selected sites. • Monitoring provisions for vegetation condition within major rock outcrop vegetation selected monitoring sites (including weed species). • Monitoring programme will commence Q3 2025.	

[57] At the time of publication, there were no known threatened flora species occurring within the Huntly and Willowdale mines.
[58] Appropriate MAZ will be established for any newly identified threatened flora aligning with State guidelines and principles.

EPA Objectives To protect flora and vegetation so that biological diversity and ecological integrity are maintained. **Outcome:** • No clearing to any identified MAZ as a result of operational activities. • Limit clearing of native vegetation to approved limits per calendar year. • Ensure no adverse direct impact (clearing) from operational activities on significant flora and vegetation communities. **Key impacts and risks**: Potential direct impacts (clearing) during operational activities.			
Criteria Indicator	**Response Actions**	**Monitoring: Frequency and Location**	**Reporting**
Threshold Criterion 3 Operational activities intrudes into any of the MAZ listed below: • Old Growth Forest; or • National Parks; or • formal conservation reserves; or • known populations of threatened flora[59, 60]. **Threshold Criterion 4** Operational activities (not including: streamzone crossings [such as, haul roads, access roads / tracks]) intrudes within the 100 m buffer (LDA) for mapped streamzone vegetation. **OR** Operational activities (with the exception of monitoring and management) intrudes into the 50 m buffer (LDA) for mapped major rock outcrop (>1 ha) vegetation.	**Threshold 3 and 4 Actions:** • As above, including the addition of: • If exceedance of the threshold criteria is considered likely to be attributable to Alcoa's operational activities, implement action/s as agreed during prior consultation with relevant stakeholders, for example: ○ Rehabilitation; • Other mitigation action/s as agreed with relevant stakeholder/s; • Implement, as appropriate recovery actions such as additional remediation works. Continue to implement recovery actions until it is confirmed that the impact is below the criteria level.	• Area (ha) of native vegetation cleared per calendar year (for example through remote sensing). • Reconciliation assessment against clearing activities once a specific clearing area is completed. • If triggered, an in-field assessment will be undertaken against threshold criteria. • If triggered, monitoring as per relevant mitigation actions.	In the event that monitoring, or surveys indicate exceedance of the threshold, the exceedance will be reported to the State Development Minister in writing within 21 days of the exceedance being identified. The compliance assessment report will include discussion around the assessment/s and whether revision of the management objective or criteria is required.

[59] At the time of publication, there were no known threatened flora species occurring within the Huntly and Willowdale mines.
[60] Appropriate MAZ will be established for any newly identified threatened flora aligning with State guidelines and principles.

Table 5-3: Objective-based Provisions - Operational Phase

EPA Objectives To protect flora and vegetation so that biological diversity and ecological integrity are maintained. **Objective:** Establish appropriate buffer zones to any newly identified significant flora and / or vegetation communities. Ensure the ecological integrity of known populations of significant flora and vegetation communities are maintained through appropriate hygiene control practices. Ensure no adverse indirect impacts from operational activities on significant flora and vegetation communities. **Key impacts and risks**: Potential indirect impacts during operational activities.			
Management Target	**Management Actions**	**Monitoring: Frequency and Location**	**Reporting**
Target 1 Establish appropriate buffer zones to any newly identified significant flora and / or vegetation communities[61].	• Undertake appropriate environmental assessments as per relevant guidance documents. • Update Alcoa internal spatial database to reflect records. • Should the environmental assessment identify significant flora and / or vegetation communities, appropriate buffer zones will be applied[61]. • Update Alcoa's internal spatial database with applied MAZ and / or LDA as appropriate.	• Environmental assessments to align with flora and vegetation guidance around timing for the southwest region. • Vegetation mapping of mining regions to identify significant vegetation communities prior to finalisation of Conceptual Clearing Areas. • Detailed and / or targeted pre-clearance significant flora and vegetation community surveys to be undertaken over Conceptual Clearing Areas within five years of clearing for construction activities.	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required.
Target 2 Minimise as far as practicable indirect impacts within any applied LDA or MAZ through potential introduction and / or establishment of *Phytophthora* dieback and / or weeds.	• Boundaries of *Phytophthora* dieback mapped areas are marked in-field (e.g. flagging) and available on GIS (i.e. infested, uninfested, uninterpretable) along access tracks, and appropriate portable washdown equipment is established where practicable. • Ensure *Phytophthora* dieback management procedures are implemented during exploration activities. • Undertake appropriate environmental assessments as per relevant guidance documents. • Update Alcoa internal spatial database to reflect records. • Ensure controls are in place including signage and clean down points. • All key weed species are treated according to the weed control management outlined by Weeds Australia (Invasive Plants and Animals Committee, 2016). • Induction training for operational personnel to include minimisation of environmental disturbance from *Phytophthora* dieback and weeds.	• Opportunistic visual observations during activities for identified WoNS, Declared Plants, and weeds are treated according to the weed control management outlined by Weeds Australia (Invasive Plants and Animals Committee, 2016). • Desktop reconciliation of *Phytophthora* dieback mapping (i.e. infested, uninfested, uninterpretable). • Opportunistic auditing of training records. • *Phytophthora* dieback hygiene mapping is undertaken to provide initial interpretation to provide historical reference. Once mapping is completed, it is valid for 12 months. Subsequently dieback lines are periodically reassessed where future activities are planned. Active dieback edges are assessed for changes in addition to assessment of dieback free forest areas to determine any new spot infections.	
Target 3 Minimise as far as practicable indirect impacts within any applied LDA or MAZ through potential introduction of and / or spread of emerging biosecurity risks such as Myrtle Rust (*Austropuccinia* psidii) and Polyphagous Shot-Hole Borer (PSHB, *Euwallacea fornicatus*).	• Update Alcoa's internal procedures in-line with relevant biosecurity guidance. • Ensure controls are in place including clean down points, and by following vehicle hygiene procedures. • Induction training for operational personnel to include minimisation of environmental disturbance.	• Undertake periodic review of biosecurity guidance. • Opportunistic visual observations during activities. • Regular inspection and maintenance of operational vehicles and machinery. • Opportunistic auditing of training records.	
Target 4 Minimise impact to vegetation (e.g. streamzone vegetation) resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spills) outside of containment infrastructure.	• Ensure controls are in place including clean down points and following vehicle hygiene procedures. • Adequate maintenance of operational vehicles and machinery, and pre-mobilisation inspections are undertaken. • Induction training for operational personnel to include spills management (including prevent, minimise, escalate and clean up, and report). • Ensuring vehicles and / or machinery carry appropriate spill clean-up kits which are regularly maintained and replaced as required. • Any contaminated soils to be collected, transported, and disposed to any appropriately licensed facility.	• Opportunistic review of operational disturbance. • Regular inspection and maintenance of operational vehicles and machinery. • Review of spatial database for mapped and derived streamzones as required. • Post-clearing assessment as applicable.	
Target 5	• Establish (if required) and maintain LDA and MAZ, and ensure these areas are incorporated into the mine planning process and internal spatial database.	• Opportunistic review of disturbance and mine planning. • Post-clearing inspections where applicable during operational activities.	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and

[61] The extent and / or radius of appropriate buffer zones of significant flora species will take into account individual species' physiological and biological attributes.

EPA Objectives To protect flora and vegetation so that biological diversity and ecological integrity are maintained. **Objective:** Establish appropriate buffer zones to any newly identified significant flora and / or vegetation communities. Ensure the ecological integrity of known populations of significant flora and vegetation communities are maintained through appropriate hygiene control practices. Ensure no adverse indirect impacts from operational activities on significant flora and vegetation communities. **Key impacts and risks**: Potential indirect impacts during operational activities.			
Management Target	**Management Actions**	**Monitoring: Frequency and Location**	**Reporting**
Avoid or otherwise minimise vegetation fragmentation as far as reasonably practicable, by retaining ecological corridors / linkages (i.e. streamzone vegetation).		• Regular review of spatial database for LDA and MAZ.	whether revision of the management action or target is required.

Table 5-4: Supplementary Provisions - Operational Phase

Supporting parameters / indicators for the trigger and threshold criteria			
Aspect	**Response Actions**	**Monitoring: Frequency and Location**	**Reporting**
Remote sensing of: • mapped or derived streamzone selected vegetation monitoring sites; • major rock outcrop vegetation selected monitoring sites; • open forest habitat.	Supporting indicator, review will inform the trigger and threshold criteria.	• Remotely sensed imagery of relevant vegetation condition and cover of selected sites to monitor changes in vegetation strata outside of typical seasonal variation. • The programme to commence Q3 2025.	If the trigger and/or threshold criterion was exceeded during the reporting period, the compliance assessment report will include supporting monitoring results, if relevant to the exceedance.
Improve knowledge and understanding			
Aspect	**Objectives**		
Improve the knowledge of the ecology and biology of potentially susceptible species to changes in hydrological regimes.	• Improve the knowledge of habitat preferences and biological functioning of relevant species to changes in hydrological regimes. • Undertake studies / assessments to investigate the sensitivity of vegetation health relevant to changes in hydrological regimes. • The criteria and / or targets will be updated as appropriate / required with consideration of additional data, assessment and knowledge and adaptive management.		
Improve the knowledge of GDEs.	• Undertake studies / assessments to investigate and confirm locations of GDEs across the Huntly and Willowdale mine regions. • The criteria and / or targets will be updated as appropriate / required with consideration of additional data, assessment and knowledge and adaptive management.		
Gain understanding and improve knowledge of potential PECs and TECs to occur across the Project areas.	• Undertake studies / assessments to investigate and attempt to confirm locations of PECs and TECs within the Project areas. • The criteria and / or targets will be updated as appropriate / required with consideration of additional data, assessment and knowledge and adaptive management.		

6 Other Potential Impacts / Threats

A threatening process is defined as a key threatening process if it threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community (DCCEEW, 2021).

This section of the Flora and Vegetation MP details the general provisions for other indirect impacts that have not already been considered in previous sections, including:

- fire; and
- dust.

The objective-based provisions for these threatening processes relevant to the Project are summarised in Table 6-1.

Table 6-1 Objective-based Provisions – General Provisions for Other Threatening Processes for All Active Mine Phases

EPA Objectives To protect flora and vegetation so that biological diversity and ecological integrity are maintained. **Objective:** Ensure no indirect impacts (from general activities) from exploration, construction and operational activities on significant flora and vegetation communities. **Key impacts and risks**: Potential indirect impacts (fire, dust deposition) during Project activities.			
Management Target: **Fire** as a potential threatening process / indirect impact	**Management Actions:**	**Monitoring: Frequency and Location**	**Reporting**
Firefighting response procedures are in place including the provision and maintenance of firefighting equipment in accordance with the relevant fire safety standards.	• Appropriate equipment is to be available to control localised outbreaks of fire. • Ensure procedures are implemented to control fires. • Emergency response team are appropriately trained in fire response. • Avoid or otherwise minimise clearing during high fire danger periods. • As far as practicable, facilitating DBCA's prescribed burns to be undertaken within forest blocks prior to mining and adjacent to current mining operations to reduce fuel loads.	• Regular inspection and maintenance of equipment to ensure compliance with relevant fire safety standards. • Inspection of hazard / incident records.	If the management action was not achieved during the reporting period, the Annual Environmental Report will include a description and analysis of event/s.
Management Target: **Dust** as a potential threatening process / indirect impact	**Management Actions:**	**Monitoring: Frequency and Location**	**Reporting**
Minimise dust deposition as far as reasonably practicable.	• Dust suppression activities carried out (e.g. via water carts) during high level usage of haul roads.	• Regular inspections of records and incidents. • Regular inspections of installed operational lighting, and planning procedures.	If the management action was not achieved during the reporting period, the Annual Environmental Report will include a description and analysis of event/s.

7 Adaptive Management and Review of the Flora and Vegetation MP

The EPA defines adaptive management as a systematic approach to improving environmental results and management practices during Project implementation through the application of learning from monitoring of outcomes and management actions (Figure 7-1 EPA [2024]).

Alcoa is committed to undertaking this adaptive management approach for the Project which includes:

- identifying and defining significant flora and vegetation values and appropriate outcomes and objectives that are risk-based, specific, measurable, adequate and realistic;
- the ongoing collection and analysis of baseline and monitoring data and undertaking comparisons to baseline, historic, reference, local and regional data regularly to determine potential impacts;
- evaluating the effectiveness and relevance of management actions against the outcomes and objectives and undertaking reviews on an annual basis to determine if any changes to actions, targets or monitoring are required;
- evaluating existing methodologies and adopting new or additional monitoring methodologies where suitable;
- reviewing and amending applicable protection and / or buffer zones with regard to data collection and analyses;
- undertaking a range of research programmes relating to significant flora and vegetation across the Project and applying knowledge gained to address any knowledge gaps; and
- undertaking a regular review of and respond to legislative requirements.

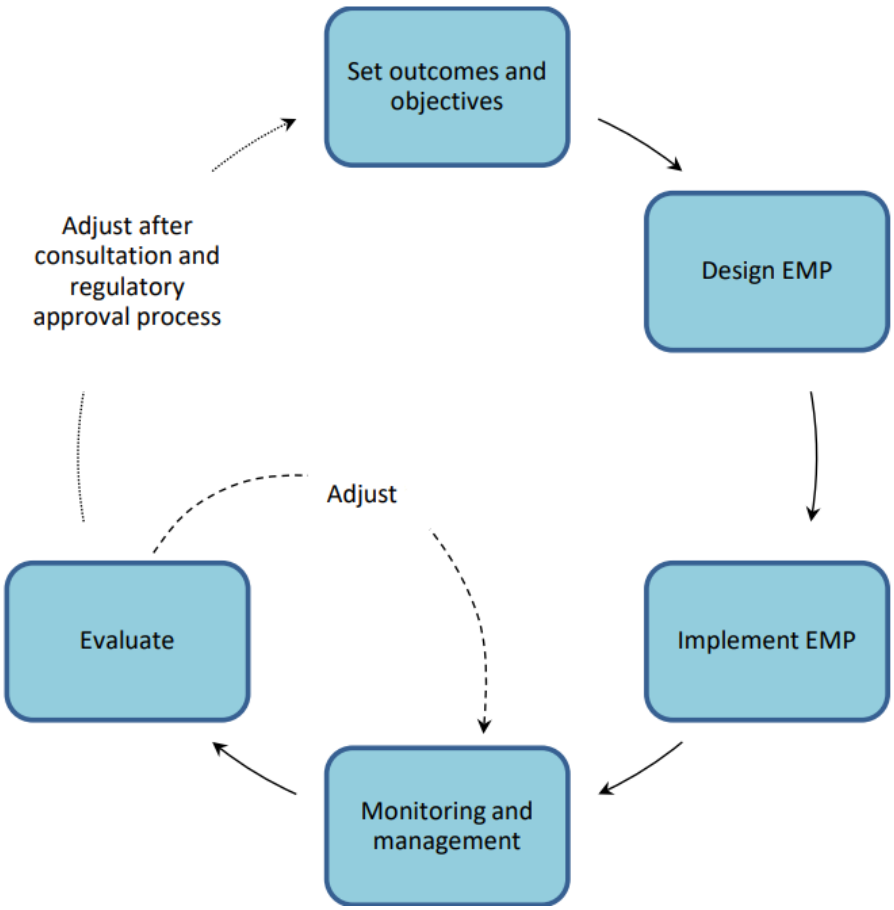


Figure 7-1: Adaptive Management Approach (EPA, 2024)

Changes to the Flora and Vegetation MP

Alcoa will periodically review this Flora and Vegetation MP throughout the Project implementation and will update the Plan as required to include new data and information obtained through ongoing surveys, monitoring activities and research programmes. Updates to the Plan will be made in accordance with the adaptive management approach described above. If and when, substantial changes are made to the Plan, Alcoa will consult with all relevant stakeholders regarding the changes.

Based on the results of the review and revision process of the Plan, Alcoa updated and adjusted the measures and strategies in consultation with relevant stakeholders from the previous Flora and Vegetation Management Plan v0 (Alcoa of Australia Limited, 2023a) as summarised in Table 7-1 below.

Table 7-1 Summary of Changes Between Flora and Vegetation MP Versions[62]

Complexity of Changes: Moderate Revisions				
Number of Key Environmental Factors: Two – Three				
Item No.	**EMP Section No.**	**EMP Page No(s).**	**Summary of Change(s)**	**Reason(s) for Change**
1.	1. Executive Summary	10 – 15	Updated the description of changes and added new environmental objectives and criteria. Rehabilitation phase removed.	To align with updated environmental management practices and regulatory requirements. The Rehabilitation and Schedule Management Plan is required as a separate standalone document as per MMP 2023 – 2027 Ministerial approval condition 15 (a).
2.	2. Context, Scope and Rationale	16	Expanded the context and rationale to include additional details on the scope of the plan and its alignment with State and Commonwealth guidelines.	To provide a clearer understanding of the plan's purpose and compliance with regulations.
3.	2.1 Huntly and Willowdale Mine Regions	16 – 19	Added detailed descriptions of the Huntly and Willowdale mine regions, including specific areas of operation.	To provide comprehensive information on the mine regions and their operational status.
4.	2.2 Key Environmental Factors	20	Updated the descriptions of existing environmental factors.	To ensure all relevant environmental factors are considered and accurately described.
5.	2.3 Condition Requirements	21 – 23	Updated condition requirements to reflect new commitments and regulatory changes.	To comply with updated regulatory requirements and commitments.
6.	2.4 Rationale and Approach	25	Revised the rationale and approach to include new survey and study findings and updated management actions.	To incorporate the latest research and best practices in environmental management.
7.	2.4.2 Current Knowledge	26 – 44	Added new information on current knowledge, including recent survey results and studies.	To provide the most up-to-date information on flora and vegetation in the mine regions.
8.	2.4.3 Key Assumptions and Uncertainties	45	Updated key assumptions and uncertainties to reflect new data and potential impacts.	To ensure the plan accurately reflects current understanding and potential risks.
9.	3. Exploration Phase Components	46 – 52	Expanded the exploration phase components to include additional details on exploration activities and potential impacts.	To provide a comprehensive overview of exploration activities and environmental considerations.
10.	4. Construction Phase Components	53 – 61	Added new information on construction phase components, including specific activities and mitigation measures.	To ensure all construction activities are adequately addressed and mitigated.
11.	5. Operational Phase Components	62 – 72	Updated operational phase components to include new management actions and monitoring programs.	To align with updated operational practices and ensure effective environmental management.
12.	6. Other Potential Threats / Impacts	73 – 74	Additional potential threats and impacts were included, and mitigation measures were updated.	To ensure all potential threats are identified and adequately mitigated.
13.	7. Adaptive Management and Review of the Flora and Vegetation MP	75 – 77	Revised the adaptive management and review section to include new monitoring and evaluation processes.	To ensure the plan remains effective and responsive to changing conditions.

[62] Summary of changes between Flora and Vegetation MP v0 and this document, Flora and Vegetation MP v1.

8 Stakeholder Consultation

To date, consultation has been undertaken with internal and external stakeholders during the preparation of this Flora and Vegetation MP.

External comments relating to this Flora and Vegetation MP, and other comments as relevant are summarised in Table 8-1 below. Table 8-1 also includes Alcoa's response actions and how these have been addressed in this Flora and Vegetation MP.

Table 8-1: Summary of External Stakeholder Consultation in Relation to this Flora and Vegetation MP

Date	Stakeholder	Consultation	Stakeholder Response	Alcoa Action
16/09/24	DBCA	Initial meeting with DBCA to discuss Version 0 of the Flora and Vegetation MP.	DBCA provided feedback regarding suitability of the Flora and Vegetation MP Version 0 and necessary improvements.	DBCA's feedback was considered and utilised to inform writing of this Flora and Vegetation MP Version 1.
04/11/2024	DBCA	Alcoa provided DBCA with the full draft Flora and Vegetation Management Plan v1 for their review and comment.	DBCA provided high-level 'initial comments' to Alcoa via DBCA document review comments sheet on 05/12/24.	A number of improvements to this Flora and Vegetation MP v1 had been made prior to receiving DBCA feedback. Based on DBCA comments received, updates to the Flora and Vegetation MP v1 were completed for aspects that could be addressed within the timeframe before submission of this Flora and Vegetation MP v1. Any outstanding aspects to be addressed that could not be addressed within the timeframe prior to submission to the State Development Minister will be addressed as appropriate in the next iteration of the Flora and Vegetation MP.

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10 APPENDICES

APPENDIX A: Survey and Monitoring Provisions

Table A-1: Survey, Monitoring and Methodology Provisions for Relevant Species / Aspects of the Project

Survey / Monitoring	Alcoa Responsible Team / Department	Relevant Species / Aspect	Location	Timing	Methodology	Rationale
Pre-clearance survey	Mining Studies	Baseline flora and vegetation mapping (including weeds)	Selected sites to be confirmed according to the mine plan.	During appropriate seasons in accordance with EPA (2016c) survey timing.	In-field assessments / surveys.	To collect and analyse baseline data and to allow comparison with ongoing monitoring data to assess potential level of impacts and to revise appropriate management actions if required. Results from surveys will be used to inform further works. Further information to be provided in future iterations of the Flora and Vegetation MP.
Pre-clearance survey	Mining Studies	Targeted significant flora surveys (including weeds)	Conceptual clearing areas.	During appropriate seasons in accordance with EPA (2016c) survey timing.	In-field assessments / surveys.	To collect and analyse baseline data and to allow comparison with ongoing monitoring data (where relevant) and to assess potential direct and indirect impacts to significant flora prior to clearing. Results from surveys will be used to inform further works, including the revision of MAZ for significant flora species' populations. Further information to be provided in future iterations of the Flora and Vegetation MP.
Monitoring / audit	Exploration	Exploration drill holes	Selected exploration sites and opportunistic.	As soon as reasonably practicable post drill hole completion and rehabilitation, within 12 months.	Visual observation and where applicable, photographic records and GPS locations, of drill hole disturbance to ensure they are appropriately backfilled and/or capped.	Inadequate rehabilitation of drill holes presents, and ponding of water can increase the potential for subsidence of drill holes. Drill spoil is an appropriate backfill material. Monitoring and auditing of newly completed drill holes to ensure they are adequately closed, and where any open holes are identified they can be appropriately remediated.
Monitoring / audit	Exploration	Exploration tracks	Selected exploration sites and opportunistic.	As soon as reasonably practicable post exploration completion and rehabilitation, within 12 months.	Visual observation, photographic records and GPS locations of selected exploration access tracks.	Photographic records to ensure minimal disturbance and clearing and avoidance of MAZ / LDAs
Monitoring	Operations[63] and / or Mining Studies	Vegetation composition and condition (including weeds, for critical strata levels)	Selected permanent monitoring sites to be confirmed* (e.g. streamzone vegetation, open forest areas and major rock outcrop vegetation). These will include both impact and reference sites. *Some sites are already established, refer to Reference Ecosystem Plots (Figure 2-7).	Annually or bi-annually, during appropriate seasons. Programme to commence Q3 2025.	In-field assessments of permanent monitoring plots (e.g. 20 x 20 m plots with 2 x 2 m quadrats) across high value habitats (selected from various vegetation types) at both impact and reference sites and will include supporting remote sensing, for example, LiDAR for density of vegetation structure (e.g. strata levels by height bands) and will be guided by a range of resources, including McFarlane, D. J. and Wallace, J. F. (2019). In-field vegetation assessments to also include records of any visual observations of high-level disturbance from feral fauna (e.g. European fox dens, feral pig and European rabbit activity). Vegetation condition scales for the south-west and Interzone Botanical Province may be used in assessing condition (EPA, 2016c).	To determine and monitor any impacts to vegetation as a result of the Project in comparison to selected baseline / control plots. To determine, monitor and manage any impacts to vegetation) as a result of new weed incursions or spread of existing weeds as a result of the Project, and in comparison, to baseline / control plots.
Monitoring	Operations[63] and / or Mining Studies	Threatened flora species[64]	Location/s are species-specific and vegetation-specific. For any taxonomically confirmed threatened flora individual or population.	Annually or bi-annually, during appropriate seasons, and to be species-dependent. Programme to commence as required after confirmed identification of threatened flora individuals or populations[45].	Species-dependent, however monitoring methodologies to align with relevant State and Commonwealth monitoring guidance and / or guidelines, for example: DEC (2010) and DCCEEW's Conservation Advice summaries or Recovery Plans where relevant.	On-going monitoring of threatened flora populations to ensure the outcomes described within this Flora and Vegetation MP can be met by undertaking appropriate assessments to gain understanding of population extents and quality, ensure the ongoing viability of the population/s, determine any population trends, and undertake specific management actions if required.
Monitoring	Operations[63] and / or	Selected priority and other significant flora species[65] (excluding threatened	Location/s are species-specific and	Annually or bi-annually, during appropriate seasons, and to be	Species-dependent, however monitoring methodologies to align with relevant State and Commonwealth monitoring	On-going monitoring of priority and other significant flora populations (excluding threatened flora species) to

[63] Refers to the period following handover from the construction phase through operations until commencement of the rehabilitation phase and aligning with long-term mine planning.
[64] At time of publication, there were no confirmed records of identified threatened flora occurring within the Huntly and Willowdale mine regions.
[65] Monitoring of priority and other significant flora species' populations will be undertaken on a prioritisation basis, with consideration of individual population locations in comparison to impact areas.

Survey / Monitoring	Alcoa Responsible Team / Department	Relevant Species / Aspect	Location	Timing	Methodology	Rationale
	Mining Studies	flora species)	vegetation-specific.	species-dependent. Programme to commence Q3 2025 (taking into account species-specific guideline recommendations where available).	guidance and / or guidelines where available, for example: DEC (2010).	ensure the outcomes described within this Flora and Vegetation MP can be met by undertaking appropriate assessments to gain understanding of population extents and quality, to ensure the ongoing viability of the population/s, determine any population trends, and undertaken specific management actions if required. Monitoring results will assist to further refine appropriate MAZ for specific significant flora species.
Monitoring	Operations[66] and / or Mining Studies	Weed species	Selected permanent monitoring sites to be confirmed* (e.g. streamzone vegetation, open forest areas, and major rock outcrop vegetation), and at other selected high-traffic locations such as adjacent to haul roads and long-term infrastructure. These will include both impact and reference sites. *Some sites are already established, refer to Reference Ecosystem Plots (Figure 2-7).	Annually or bi-annually, during appropriate seasons. Programme to commence Q3 2025.	In-field assessments of permanent monitoring plots (e.g. 20 x 20 m plots with 2 x 2 m quadrats) and / or appropriate transect assessments. If required, targeted weed assessments including weed identification, population and distribution mapping will be undertaken.	Univariate and / or multivariate statistics to determine, monitor and manage any impacts to vegetation) as a result of new weed incursions or spread of existing weeds as a result of the Project, and in comparison, to baseline / control plots. Identified weed populations mapped to monitor extent and potential spread. Results from surveys will be used to inform further works. Further information to be provided in future iterations of the Flora and Vegetation MP.

[66] Refers to the period following handover from the construction phase through operations until commencement of the rehabilitation phase and aligning with long-term mine planning.

APPENDIX B: Significant Flora and Vegetation Communities Relevant to the Project

Table B- 1: State and Commonwealth Listings of Significant Flora Known to Occur within the Project Areas[67, 68]

Family	Common Name	Species	Listing	
			State (BC Act)	Commonwealth (EPBC Act)
Asparagaceae	N/A	*Thysanotus anceps*	Priority 3	N/A
Asteraceae	N/A	*Senecio leucoglossus*	Priority 4	N/A
Cyperaceae	N/A	*Netrostylis* sp. Nannup (P.A. Jurjevich 1133)	Priority 1	N/A
Dilleniaceae	N/A	*Hibbertia ambita*	Priority 1	N/A
	N/A	*Hibbertia hortiorum*	Priority 1	N/A
Elaeocarpaceae	N/A	*Tetratheca phoenix*	Priority 2	N/A
Fabaceae	N/A	*Acacia drummondii* subsp. *affinis*	Priority 3	N/A
Fabaceae	N/A	*Acacia horridula*	Priority 3	N/A
Lamiaceae	N/A	*Hemigenia microphylla*	Priority 3	N/A
Malvaceae	N/A	*Lasiopetalum cardiophyllum*	Priority 4	N/A
Myrtaceae	Granite Claw Flower	*Calothamnus graniticus* subsp. *leptophyllus*	Priority 4	N/A
Proteaceae	N/A	*Banksia* sp. Hoffman[69]	N/A	N/A
	N/A	*Grevillea dissectifolia*	Priority 3	N/A
	N/A	*Grevillea prominens*	Priority 3	N/A
Rutaceae	Blue Boronia	*Cyanothamnus tenuis*	Priority 4	N/A
Stylidiaceae	N/A	*Stylidium ireneae*	Priority 4	N/A

[67] Information current at time of publication of this Flora and Vegetation MP.
[68] Alcoa recognises that there may be additional significant flora within the Project areas. As further knowledge is gained, this Flora and Vegetation MP will be updated as per the adaptive management approach.
[69] *Banksia* sp. Hoffman is informally named and considered by the DBCA as a potentially new species and therefore is considered in this Flora and Vegetation MP as a significant flora species and is under further study and taxonomic review.

Table B- 2: State and Commonwealth Listings of Significant Vegetation Communities with the Potential to Occur within the Project Areas[70]

Vegetation Community	Description	Listing	
		State (BC Act)	Commonwealth (EPBC Act)
Priority Ecological Community: Granite Communities of the Northern Jarrah Forest	Jarrahdale area – Monadnocks, Blue Rock; insufficient information to distinguish discrete community type/s (DBCA, 2023).	Priority 3(i)	N/A
Threatened Ecological Community: *Empodisma* peatlands of southwestern Australia.	The assemblage of plants, animals and other organisms associated with a type of freshwater, peat-based wetland that is found in the High Rainfall Province of the south-west of Western Australia. It is typically a sedgeland to shrubland vegetation complex on peaty substrates that almost always includes the perennial grass-like twig rush *Empodisma gracillimum*. *Empodisma* peatlands provide habitat for a diverse range of hydrophilic species, including threatened, regionally endemic, and relictual flora and fauna species (DCCEEW, 2023).	N/A	Endangered

[70] Information current at time of publication of this Flora and Vegetation MP.

APPENDIX C: State and Commonwealth Flora and Ecological Communities Conservation Categories and Definitions

Table C- 1: Biodiversity Conservation Act 2016 (State) Flora Conservation Categories and Definitions

Category	Definition
T *Threatened*	Flora species that are listed as critically endangered, endangered or vulnerable threatened species.
CR *Critically Endangered*	Threatened flora species considered to be facing an extremely high risk of extinction in the wild in the immediate future.
EN *Endangered*	Threatened flora species considered to be facing a very high risk of extinction in the wild in the near future.
VU *Vulnerable*	Threatened flora species considered to be facing a high risk of extinction in the wild in the medium-term future.
EX *Extinct*	Species where there is no reasonable doubt that the last member of the species has died.
SP *Specially Protected*	Meeting one or more of the following categories: species of special conservation interest; migratory species; species subject to international agreement; or species otherwise in need of special protection.
CD *Conservation Dependent*	Species of special conservation need that are dependent on ongoing conservation intervention to prevent it becoming eligible for listing as Threatened.
OS *Other specially protected*	Species otherwise in need of special protection to ensure their conservation.

Table C- 2: Department of Biodiversity, Conservation and Attractions (DBCA) Priority Flora Categories and Definitions

Category	Definition
Priority 1	Poorly known species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation.
Priority 2	Poorly known species, that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, for example, national parks, conservation parks, nature reserves and other lands being managed for conservation.
Priority 3	Poorly known species that are known from several locations and the species does not appear to be under imminent threat or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under threat.
Priority 4	Rare, Near Threatened and other species in need of monitoring. Rare: Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently Threatened or in need of special protection but could be if present circumstances change. Near Threatened: Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as conservation dependent specially protected species.

Table C- 3: Department of Biodiversity, Conservation and Attractions (DBCA) Priority Ecological Communities Category Definitions

Category	Definition
Priority One	Poorly known ecological communities. Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well known form one or more localities but do not meet adequacy of survey requirements, and / or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
Priority Two	Poorly known ecological communities. Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
Priority Three	Poorly known ecological communities. (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; (iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
Priority Four	Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. (i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
Priority Five	Conservation Dependent ecological communities. Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Table C- 4: Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth) Flora Categories and Definitions

Category	Definition
EX *Extinct*	Taxa not definitely located in the wild during the past 50 years.
EW *Extinct in the Wild*	Taxa known to survive only in captivity.
CE *Critically Endangered*	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
EN *Endangered*	Taxa facing a high risk of extinction in the wild in the near future.
VU *Vulnerable*	Taxa facing a high risk of extinction in the wild in the medium-term future.
MG *Migratory*	Consists of species listed under the following International Conventions: • Japan-Australia Migratory Bird Agreement (JAMBA) • China-Australia Migratory Bird Agreement (CAMBA) • Convention on the Conservation of Migratory Species of Wild animals (Bonn Convention)

APPENDIX D: Resources Utilised in Flora and Vegetation MP Development

Table D- 1: Resources Utilised in Flora and Vegetation MP Development

STATE AND COMMONWEALTH DEPARTMENT / AUTHOR	DOCUMENT TITLE
State and Commonwealth Guidelines, Guidance and Instructions	
Environmental Protection Authority (EPA) 2016a	*Environmental Factor Guideline: Flora and Vegetation*, EPA, Western Australia.
Environmental Protection Authority (EPA) 2016b	*Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, EPA, Western Australia.
Environmental Protection Authority (EPA) 2018	*Environmental Factor Guideline: Inland Waters*, EPA, Western Australia.
Environmental Protection Authority (EPA) 2021a	*Templates – Environmental Management Plans.*
Environmental Protection Authority (EPA) 2021b	*Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual*, EPA, Western Australia.
Environmental Protection Authority (EPA) 2021c	*Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2021.*
Environmental Protection Authority (EPA) 2021d	*Interim Guidance – Environmental outcomes and outcomes-based conditions*, EPA, Western Australia.
Environmental Protection Authority (EPA) 2023	*Statement of Environmental Principles, Factors, Objectives and Aims of EIA*, EPA, Western Australia.
Department of Climate Change, Energy, the Environment, and Water (DCCEEW) 2024	*Environmental Management Plan Guidelines*, DCCEEW, Canberra, March. CC BY 4.0.
Environmental Protection Authority (EPA) 2024	*Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans*, EPA, Western Australia.
Invasive Plants and Animals Committee, 2016	*Australian Weeds Strategy 2017 to 2027*, Australian Government Department of Agriculture and Water Resources, Canberra.
State Forest Management Plan	
Conservation and Parks Commission (CPC) 2023	*Forest Management Plan 2024-2033.* Conservation and Parks Commission. Perth, Western Australia.
Threat Abatement Plans and Associated Documents	
Commonwealth of Australia (2018a)	*Background document: Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi.*
Commonwealth of Australia (2018a)	*Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi.*
Forest Agreement and Associated Document	
Commonwealth of Australia (1999)	*Regional Forest Agreement for the South-West Forest Region of Western Australia.*
Department of Biodiversity, Conservation and Attractions (DBCA) 2019	*Assessment of Matters Pertaining to Renewal of the Regional Forest Agreement for the South-West Forest Regional of Western Australia.*

APPENDIX E: Project Knowledge – Surveys, Study Findings and Research

Table E- 1 Key Flora and Vegetation Studies and Research

Year/s	Author	Project / Study Region	Summary of Project / Study and Findings
1983, 1992, 1993	E. M. Mattiske & Associates	Jarrahdale, Chandler and Kingsbury Drive and Cobiac	Baseline Flora and Vegetation and Monitoring studies. Baseline studies based on detailed surveys on 120 m x 120 m grid systems as a minimum to align with drilling programs. Studies highlighted flora and site-vegetation types in respective areas. Site-vegetation types were based on earlier work of Havel (1975a, 1975b) for the northern Jarrah Forest. Studies included targeted flora searches with an emphasis on novel species, range extensions and threatened and priority species.
1985, 1988, 1991, 1992, 1993	E. M. Mattiske & Associates	Del Park, Bates, Jones and Huntly	Baseline Flora and Vegetation and Monitoring studies. Baseline studies based on detailed surveys on 120m x 120m grid systems as a minimum to align with drilling programs. Studies highlighted flora and site-vegetation types in respective areas. Site-vegetation types were based on earlier work of Havel (1975a, 1975b) for the northern Jarrah Forest. Studies included targeted flora searches with an emphasis on novel species, range extensions and threatened and priority species.
1988 to 1994, 1996 to 2006	E. M. Mattiske & Associates, Mattiske Consulting Pty Ltd	Monitoring transects	Assessment of creek lines and valley systems near Urbrae, Cameron, Gordon and Jayrup.
1993, 1994	E. M. Mattiske & Associates	Willowdale	Baseline Flora and Vegetation and Monitoring studies. Baseline studies based on detailed surveys on 120 m x 120 m grid systems as a minimum to align with drilling programs. Studies highlighted flora and site-vegetation types in respective areas. Site-vegetation types were based on earlier work of Havel (1975a, 1975b) for the northern Jarrah Forest.
1994, 1996, 1997, 2001, 2011, 2012, 2015, 2018, 2019, 2020, 2021, 2023	Mattiske Consulting Pty Ltd	Willowdale, Keats, Larego, Vaquita and Holyoake	Baseline Flora and Vegetation and Monitoring studies. Baseline studies based on desktop studies and detailed surveys on 120 m x 120 m grid systems as a minimum to align with drilling programs and representative permanent plots. Studies highlighted flora and site-vegetation types in respective areas. Site-vegetation types were based on earlier work of Havel (1975a, 1975b) for the northern Jarrah Forest. Post 1998, references to Mattiske and Havel vegetation complexes were also assessed in the regional context for vegetation representation in managed forest and conservation areas. Studies included targeted flora searches with an emphasis on novel species, range extensions and threatened and priority species.
1994, 2009, 2012, 2019, 2021, 2022	Mattiske Consulting Pty Ltd	Huntly, O'Neil, Myara and Myara North	Baseline Flora and Vegetation and Monitoring studies. Baseline studies based on desktop studies and detailed surveys on 120 m x 120 m grid systems as a minimum to align with drilling programs and representative permanent plots. Studies highlighted flora and site-vegetation types in respective areas. Site-vegetation types were based on earlier work of Havel (1975a, 1975b) for the northern Jarrah Forest. Post 1998, references to Mattiske and Havel vegetation complexes were also assessed in the regional context for vegetation representation in managed forest and conservation areas. Studies included targeted flora searches with an emphasis on novel species, range extensions and threatened and priority species.
2005 to 2014, 2016 to 2021	Mattiske Consulting Pty Ltd	Huntly, Myara and Willowdale	Assessment of rehabilitation areas at 9 months and 15 months (2005 to 2014). Assisting in data collection (2016 to 2021). Alcoa assisting in monitoring permanent plots as requested in spring months.

Year/s	Author	Project / Study Region	Summary of Project / Study and Findings
2020	Glevan Consulting	Myara North, Holyoake	*Phytophthora* Dieback assessments were conducted by Glevan Consulting across the Myara North and Holyoake Development Envelopes within Alcoa's Huntly Bauxite Mine between 2017 and 2020. The assessments covered 16,820 hectares, equivalent to 39.6% of the 42,426-hectare total area. These studies aimed to determine the presence and impact of the *Phytophthora cinnamomi* pathogen on local vegetation, primarily to inform hygiene management during exploration drilling and pre-mine clearing activities. Key indicator species such as *Eucalyptus marginata*, *Banksia species*, *Xanthorrhoea preissii*, and *Persoonia longifolia* were monitored for signs of the disease. Results indicated varying disease expressions, from subtle to significant vegetation damage, and highlighted the vulnerable Mediterranean climate zone where the pathogen thrives due to specific environmental conditions, particularly rainfall and soil temperature. A total of 595 samples were collected, confirming 153 new *Phytophthora* infestations. Hygiene boundaries for infested areas were mapped, with reassessments recommended every 12 months due to potential pathogen spread via human or animal vectors.
2021 to 2024	Mattiske Consulting Pty Ltd	Myara North, Huntly, Myara, Willowdale, Antiope, Holyoake, Kingsbury West, Spion, Warrington, Holyoake East, O'Neil	Baseline Flora and Vegetation and Monitoring studies. Baseline studies based on desktop studies and detailed surveys on 120 m x 120 m grid systems as a minimum to align with drilling programs and representative permanent plots. Studies highlighted flora and site-vegetation types in respective areas. Site-vegetation types were based on earlier work of Havel (1975a, 1975b) for the northern Jarrah Forest. Post 1998, references to Mattiske and Havel vegetation complexes were also assessed in the regional context for vegetation representation in managed forest and conservation areas. Studies included targeted flora searches with an emphasis on novel species, range extensions and threatened and priority species.
2021 to 2024	AECOM Australia Pty Ltd Biologic Environmental Survey Pty Ltd *Ecologia* Environment Eco Logical Australia Western Environmental	Myara North, Huntly, Myara, Willowdale, Antiope	Alcoa commissioned multiple pre-clearance flora surveys across its mining operations to assess conservation significance and support regulatory approvals. Surveys combined desktop analyses and fieldwork using grid systems with spacing adjusted for vegetation density and microhabitat requirements. Targeted assessments identified species of conservation interest, including Threatened and Priority species, and evaluated habitat suitability. Surveys within Myara North and Willowdale regions revealed limited occurrences of Priority species such as *Thysanotus anceps* (P3) and *Pimelea rara* (P4), while Threatened species were absent. Likelihood assessments were refined post-survey, citing habitat conditions and survey timing. Regional ecological communities were noted as unlikely or low impact. Findings informed management strategies, including clearing avoidance, weed control, and regulatory submissions.

Table E- 2: Site Vegetation Types (SVTs) Recorded Across the Project

Code	Description
Swamps and Broad Valleys	
A	Tall shrubland of *Melaleuca lateritia*, *Hakea varia*, *Melaleuca viminea* and *Melaleuca incana* subsp. *incana* on clay-loams in seasonally wet valley floors.
AC	Open Woodland of *Eucalyptus rudis – Melaleuca preissiana – Eucalyptus patens – Banksia littoralis* with dense *Taxandria linearifolia* and *Astartea scoparia* in understorey on broad swamps and water courses.
AD	Low open woodland of *Eucalyptus rudis* and *Eucalyptus marginata* over *Banksia littoralis*, *Hakea prostrata* and *Pericalymma ellipticum* over low shrubs and herbs on leached sands over sandy-gravel on lower slopes.
AW	Low open woodland of *Eucalyptus patens* and *Melaleuca preissiana* over *Banksia littoralis*, *Hakea prostrata* and *Pericalymma ellipticum* over low shrubs and herbs on leached sands over sandy-gravel on lower slopes.
AW/AX	Localised patchy mosaic of AW and AX.
AW/CW	Localised patchy mosaic of AW and CW.
AX	Open woodland of *Eucalyptus rudis* over *Acacia saligna*, *Melaleuca incana* subsp. *incana* and *Hypocalymma angustifolium* on clay-loams on valley floors.
AY	Open woodland of *Eucalyptus wandoo* over *Hakea varia*, *Hypocalymma angustifolium*, *Babingtonia camphorosmae* and *Gastrolobium calycinum* over herbs and sedges on clay-loams in seasonally wetter valley floors.
WA	Open Forest of *Eucalyptus megacarpa – Eucalyptus patens – Corymbia calophylla* on lower slopes with mixed low understorey species, including *Banksia littoralis* and occasional *Melaleuca preissiana* over *Acacia extensa* and *Hypocalymma angustifolium* on seasonally moister sandy-loam gravelly soils.
Valley Floors and Lower Slopes	
C	Woodland to Open Forest of *Eucalyptus patens – Corymbia calophylla – Banksia littoralis* and *Banksia seminuda* with dense *Taxandria linearifolia* and *Astartea scoparia* in understorey on creek lines and water courses.
CA	Woodland of *Eucalyptus rudis – Melaleuca preissiana – Eucalyptus patens – Banksia littoralis* with dense *Taxandria linearifolia* and *Astartea scoparia* in understorey on broad swamps and water courses.
CL	Cleared vegetation.
CQ	Localised patchy mosaic of C and Q.
CW	Woodland to Open Forest of *Eucalyptus patens – Eucalyptus megacarpa – Corymbia calophylla – Banksia littoralis* with dense *Taxandria linearifolia* and *Astartea scoparia* in understorey on creek lines and water courses.
Q	Open Forest of *Eucalyptus marginata – Corymbia calophylla – Eucalyptus patens* with mixed understorey species, including *Trymalium floribundum*, *Acacia extensa* and *Lysiandra calycina* on loam soils on lower slopes.
W	Open Forest of *Eucalyptus megacarpa – Eucalyptus patens – Corymbia calophylla* on lower slopes with mixed low understorey species, including *Acacia extensa* and *Hypocalymma angustifolium* on seasonally moister sandy-loam gravelly soils.
WD	Open Forest of *Eucalyptus megacarpa – Eucalyptus patens – Corymbia calophylla* on lower slopes with mixed low understorey species, including *Hakea prostrata*, *Babingtonia camphorosmae* and *Hypocalymma angustifolium* on seasonally moister sandy-loam gravelly soils.

Code	Description
Y	Open woodland of *Eucalyptus wandoo* over *Hypocalymma angustifolium* and *Babingtonia camphorosmae* over herbs and sedges on clay-loams on seasonally moister lower slopes.
YG	Open woodland of *Eucalyptus wandoo* over *Hypocalymma angustifolium*, *Babingtonia camphorosmae*, *Grevillea bipinnatifida* and *Allocasuarina humilis* over herbs and sedges on clay-loams on seasonally moister lower slopes underlain by outcrops.
YS	Localised patchy mosaic of Y and S.
Slopes and Ridges – Sandy Loam Gravels	
B	*Conospermum stoechadis*, *Corymbia calophylla*, *Dasypogon bromeliifolius*, *Eucalyptus marginata*, *Hibbertia polystachya*, *Lepidosperma squamatum*, *Mesomelaena tetragona*, *Patersonia occidentalis* on sandy clay (sometimes gravel) on ridgelines, upper slopes and on occasion, valley floors.
M	Open woodland of *Eucalyptus wandoo* over *Trymalium ledifolium*, *Macrozamia riedlei* and *Hakea lissocarpha* on clay loams with some gravel on mid to upper slopes and ridges.
P	Open Forest of *Allocasuarina fraseriana – Eucalyptus marginata – Corymbia calophylla – Banksia grandis* with scattered understorey, including *Adenanthos barbiger*, *Styphelia nitens*, *Grevillea wilsonii*, *Leucopogon capitellatus* on sandy gravels.
PG	Open Forest of *Allocasuarina fraseriana – Eucalyptus marginata – Corymbia calophylla* with scattered understorey, including *Grevillea wilsonii*, *Adenanthos barbiger* and *Grevillea bipinnatifida* on sandy-loams over shallow outcropping.
PL	Plantation.
PS	Open Forest of *Allocasuarina fraseriana – Eucalyptus marginata – Corymbia calophylla – Banksia grandis* with scattered understorey, including *Adenanthos barbiger*, *Leucopogon capitellatus* on gravels and sandy gravels.
PT	Open Forest of *Allocasuarina fraseriana – Eucalyptus marginata – Corymbia calophylla – Banksia grandis* with scattered understorey, including *Adenanthos barbiger*, *Leucopogon verticillatus*, *Pteridium esculentum* and *Bossiaea aquifolium* subsp. *aquifolium* on sandy-loam gravels.
PW	Open Forest of *Allocasuarina fraseriana – Eucalyptus marginata – Corymbia calophylla* with scattered understorey, including *Grevillea wilsonii*, *Adenanthos barbiger*, *Babingtonia camphorosmae* and *Hypocalymma angustifolium* on sandy gravels.
S	Open Forest of *Eucalyptus marginata – Banksia grandis – Allocasuarina fraseriana* with scattered understorey, including *Adenanthos barbiger*, *Leucopogon capitellatus* and *Styphelia tenuiflora* on gravels and sandy-gravels.
S-SP	Localised patchy mosaic of S and SP.
SP	Open Forest of *Allocasuarina fraseriana – Eucalyptus marginata – Corymbia calophylla – Banksia grandis* with scattered understorey, including *Adenanthos barbiger*, *Grevillea wilsonii* and *Leucopogon capitellatus* on sandy-gravels to gravelly soils.
SP-D	Degraded SP vegetation type.
ST	Open Forest of *Eucalyptus marginata – Corymbia calophylla* with scattered understorey, including *Leucopogon capitellatus*, *Leucopogon verticillatus*, *Pteridium esculentum*, *Lasiopetalum floribundum* and *Styphelia tenuiflora* on sandy-gravelly soils.
Slopes and Ridges – Loam Gravels	
T	Open Forest of *Eucalyptus marginata – Corymbia calophylla* with scattered understorey, including *Leucopogon verticillatus*, *Pteridium esculentum*, *Clematis pubescens* and *Bossiaea aquifolium* subsp. *aquifolium* on sandy-loam gravelly soils.

Code	Description
TP	Open Forest of *Eucalyptus marginata – Corymbia calophylla – Banksia grandis – Allocasuarina fraseriana* with scattered understorey, including *Clematis pubescens*, *Pteridium esculentum*, *Adenanthos barbiger*, *Leucopogon verticillatus* and *Bossiaea aquifolium* subsp. *aquifolium* on sandy-loam gravels.
TS	Open Forest of *Eucalyptus marginata – Corymbia calophylla – Banksia grandis* with scattered understorey, including *Leucopogon verticillatus*, *Pteridium esculentum*, *Clematis pubescens* and *Bossiaea aquifolium* subsp. *aquifolium* on sandy-loam gravelly to gravelly soils.
Z	*Eucalyptus marginata* over outcropping of laterite on slopes (sometimes over granite) with *Macrozamia riedlei* and Ericaceae species.
Slopes with Higher Seasonal Soil Moisture	
SW	Open Forest of *Eucalyptus marginata – Corymbia calophylla – Banksia grandis* with scattered understorey, including *Adenanthos barbiger*, *Hypocalymma angustifolium* and *Styphelia tenuiflora* on seasonally moister sandy-gravelly soils.
SW-D	Degraded SW vegetation type.
Swamps and Broad Valleys	
D	Open Forest of *Eucalyptus marginata – Corymbia calophylla – Hakea prostrata* on lower slopes with mixed low understorey species, including *Babingtonia camphorosmae* and *Acacia extensa* on clay loams to gravelly clay-loams.
DA	Open Forest of *Eucalyptus marginata – Corymbia calophylla – Hakea prostrata* on lower slopes with patches of *Melaleuca preissiana*, *Banksia littoralis* and *Hakea varia* over mixed low understorey species, including *Babingtonia camphorosmae* and *Acacia extensa* on clay loams to gravelly clay-loams. Local variant also includes *Xylomelum occidentale*.
DG	Open forest of *Corymbia calophylla* and *Eucalyptus marginata* over *Hakea lissocarpha*, *Macrozamia riedlei*, *Pericalymma ellipticum*, *Grevillea bipinnatifida*, *Allocasuarina humilis*, *Acacia alata*, *Babingtonia camphorosmae*, *Hypocalymma angustifolium* and Lysiandra calycina on clay-loams on lower slopes with localised patches of outcropping.
E	Open woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Mesomelaena tetragona*, *Kingia australis*, *Leptospermum erubescens* and *Babingtonia camphorosmae* on sandy to sandy-loam soils on slopes.
J	Open Woodland to open forest of *Eucalyptus marginata*, *Corymbia calophylla* and *Eucalyptus patens* over *Mesomelaena tetragona*, *Leptocarpus scariosus*, *Babingtonia camphorosmae* and *Stirlingia latifolia* on broad sandy-loam flats valley slopes.
Outcrop Areas	
G	Mosaic of Open Woodland of *Eucalyptus marginata – Corymbia calophylla* on the fringes of outcrops ranging to open heath communities of Proteaceae-Myrtaceae species and lithic complexes on the outcrop areas.
G1	Mosaic of Open Woodland of *Eucalyptus marginata – Corymbia calophylla* on the fringes of outcrops ranging to open heath communities of Proteaceae-Myrtaceae species and lithic complexes on the outcrop areas.
G2	Woodland of *Allocasuarina huegeliana* and associated herbs and low shrubs on shallow granite outcrops with shallow soils.
R	Open Woodland of *Eucalyptus marginata – Corymbia calophylla* on fringes of granite outcrops or shallow soils over mixed understorey species reflecting shallow soils over granite.
R/G	Localised patchy mosaic of R and G.
Other Areas	
DAM	Dam
Rehab	Rehabilitation Area

Table E- 3: Weed Species Identified from Database Searches and On-ground Surveys as Occurring or the Potential to Occur within the Project Areas[71]

[#]*Occurrence: R: Recorded; P: Potential to Occur*

Species	Occurrence[#] (R / P)	WA Status[72]	Weed of National Significance (Commonwealth)
**Acacia dealbata* subsp. *dealbata*	P	Permitted	No
**Acacia decurrens*	P	Permitted	No
**Acacia floribunda*	P	Permitted	No
**Acacia iteaphylla*	P	Permitted	No
**Acacia longifolia*	**R**	Permitted	No
**Acacia longifolia* subsp. *longifolia*	**R**	Permitted	No
**Acacia mollifolia*	P	Permitted	No
**Acacia podalyriifolia*	P	Permitted	No
**Acacia pycnantha*	P	Permitted	No
**Aira caryophyllea*	**R**	Permitted	No
**Aira cupaniana*	P	Permitted	No
**Arctotheca calendula*	P	Permitted	No
**Aristida ramosa*	P	Permitted	No
**Asclepias curassavica*	P	Declared Pest	No
**Avellinia festucoides*	P	N/A	No
**Avena barbata*	P	Permitted	No
**Babiana angustifolia*	P	Permitted	No
**Bellardia trixago*	P	Permitted	No
**Bellardia viscosa*	P	Permitted	No
**Brachychiton populneus*	P	Permitted	No
**Brachypodium distachyon*	P	Permitted	No
**Brassica tournefortii*	P	Permitted	No
**Briza maxima*	P	Permitted	No
**Briza minor*	**R**	Permitted	No
**Bromus diandrus*	P	Permitted	No
**Bromus hordeaceus*	P	Permitted	No
**Callistemon citrinus*	P	Permitted	No
**Callitriche stagnalis*	P	Permitted	No
**Campylopus introflexus*	P	N/A	No
**Caryophyllaceae* sp.	**R**	Permitted	No
**Centaurium erythraea*	P	Permitted	No
**Chloris gayana*	P	Permitted	No
**Cicendia filiformis*	P	Permitted	No
**Cichorium intybus*	P	Permitted	No
**Cotula coronopifolia*	P	Permitted	No
**Cotula turbinata*	P	Permitted	No
**Crassula natans* var. *minor*	P	N/A	No
**Crepis foetida*	P	Permitted	No
**Cuscuta epithymum*	P	Permitted	No
**Cynodon dactylon*	P	Permitted	No
**Cyperus brevifolius*	P	N/A	No

[71] Information current at time of publication of this Flora and Vegetation MP.
[72] As per requirements under the BAM Act.

Species	Occurrence# (R / P)	WA Status[72]	Weed of National Significance (Commonwealth)
**Cyperus tenellus*	**R**	Permitted	No
**Datura ferox*	P	Permitted	No
**Disa bracteata*	P	Permitted	No
**Dittrichia graveolens*	P	Permitted	No
**Ehrharta calycina*	P	Permitted	No
**Ehrharta longiflora*	P	Permitted	No
**Ehrharta* sp.	P	Permitted	No
**Eleusine indica*	P	Permitted	No
**Erigeron sumatrensis*	**R**	N/A	No
**Erodium botrys*	P	Permitted	No
**Eucalyptus microcorys*	P	Permitted	No
**Eucalyptus saligna*	P	Permitted	No
**Euphorbia helioscopia*	P	Permitted	No
**Euphorbia terracina*	P	Permitted	No
**Ficinia marginata*	P	Permitted	No
**Ficus carica*	P	Permitted	No
**Freesia leichtlinii* subsp. *alba*	P	N/A	No
**Fumaria capreolata*	P	Permitted	No
**Galenia pubescens*	P	Permitted	No
**Galium divaricatum*	P	Permitted	No
**Galium murale*	P	Permitted	No
**Gamochaeta calviceps*	**R**	Permitted	No
**Gaudium laevigatum*	**R**	Permitted	No
**Gladiolus caryophyllaceus*	P	Permitted	No
**Gladiolus undulatus*	P	Permitted	No
**Glyceria declinata*	P	Permitted	No
**Gomphocarpus fruticosus*	**R**	Declared Pest[73]	No
**Hypericum perforatum*	**R**	Permitted	No
**Hypochaeris glabra*	**R**	Permitted	No
**Hypochaeris radicata*	P	Permitted	No
**Ixia fuscocitrina*	P	N/A	No
**Ixia polystachya*	P	Permitted	No
**Juncus articulatus*	P	Permitted	No
**Juncus bufonius*	P	Permitted	No
**Juncus capitatus*	P	Permitted	No
**Juncus microcephalus*	P	Permitted	No
**Juncus usitatus*	P	Permitted	No
**Lachenalia flava*	P	N/A	No
**Lagurus ovatus*	P	Permitted	No
**Lathyrus tingitanus*	P	Permitted	No
**Lavandula stoechas*	**R**	Permitted	No
**Lilium candidum*	P	Permitted	No
**Linum trigynum*	P	Permitted	No
**Logfia gallica*	P	Permitted	No

[73] Declared Pest control category: C3 – Management.

Species	Occurrence# (R / P)	WA Status[72]	Weed of National Significance (Commonwealth)
**Lolium rigidum*	P	Permitted	No
**Lonicera japonica*	P	Permitted	No
**Lotus angustissimus*	P	Permitted	No
**Lotus subbiflorus*	P	Permitted	No
**Lotus uliginosus*	P	Permitted	No
**Lupinus cosentinii*	P	Permitted	No
**Lupinus luteus*	P	Permitted	No
**Lysimachia arvensis*	**R**	Permitted	No
**Medicago polymorpha*	P	Permitted	No
**Melaleuca armillaris* subsp. *armillaris*	**R**	N/A	No
**Melia azedarach*	P	Permitted	No
**Melinis repens*	P	Permitted	No
**Misopates orontium*	P	Permitted	No
**Monopsis debilis* var. *depressa*	P	N/A	No
**Moraea flaccida*	P	Declared Pest[74]	No
**Nandina domestica*	P	Permitted	No
**Oenothera lindheimeri*	P	Permitted	No
**Ornithopus pinnatus*	P	Permitted	No
**Orobanche minor*	**R**	Permitted	No
**Oxalis corniculata*	P	Permitted	No
**Oxalis glabra*	P	Permitted	No
**Oxalis incarnata*	P	Permitted	No
**Oxalis pes-caprae*	**R**	Permitted	No
**Oxalis* sp.	**R**	Permitted	No
**Panicum miliaceum*	P	Permitted	No
**Parentucellia latifolia*	P	Permitted	No
**Paspalum dilatatum*	P	Permitted	No
**Pelargonium* x *domesticum*	P	Permitted	No
**Pentameris airoides*	**R**	Permitted	No
**Petrorhagia dubia*	P	Permitted	No
**Phyllopodium cordatum*	P	Permitted	No
**Phytolacca octandra*	P	Permitted	No
**Pinus pinaster*	**R**	Permitted	No
**Pinus radiata*	P	Permitted	No
**Pittosporum undulatum*	P	Permitted	No
**Poa annua*	P	Permitted	No
**Podalyria sericea*	P	Permitted	No
**Polygonum aviculare*	P	Permitted	No
**Prunus cerasifera*	P	Permitted	No
**Quercus palustris*	P	Permitted	No
**Raphanus raphanistrum*	P	Permitted	No
**Robinia pseudoacacia*	P	Permitted	No
**Romulea rosea*	P	Permitted	No

[74] Declared Pest control category: Exempt.

Species	Occurrence# (R / P)	WA Status[72]	Weed of National Significance (Commonwealth)
**Rubus anglocandicans*	P	Declared Pest[75]	No
**Rubus laudatus*	P	Declared Pest[75]	No
**Rubus loganobaccus*	P	Permitted	No
**Rubus ulmifolius*	P	Declared Pest[75]	No
**Rubus* sp.	**R**	Permitted	No
**Rumex acetosella*	P	N/A	No
**Rumex crispus*	P	Permitted	No
**Salvia verbenaca*	P	Permitted	No
**Selago corymbosa*	P	N/A	No
**Senecio diaschides*	P	Permitted	No
**Senecio vulgaris*	P	Permitted	No
**Setaria italica*	P	Permitted	No
**Setaria verticillata*	P	Permitted	No
**Silene gallica*	P	Permitted	No
**Silene gallica* var. *quinquevulnera*	P	N/A	No
**Solanum hoplopetalum*	P	Permitted	No
**Solanum nigrum*	**R**	Permitted	No
**Sonchus asper*	P	Permitted	No
**Sonchus oleraceus*	**R**	Permitted	No
**Sorghum halepense*	P	Permitted	No
**Sparaxis bulbifera*	P	Permitted	No
**Sphaeromorphaea australis*	P	N/A	No
**Sphaeropteris cooperi*	P	N/A	No
**Stellaria media*	P	Permitted	No
**Symphyotrichum squamatum*	P	Permitted	No
**Syncarpia glomulifera*	P	Permitted	No
**Tagetes erecta*	P	Permitted	No
**Tolpis barbata*	P	Permitted	No
**Tribulus terrestris*	P	Permitted	No
**Trifolium angustifolium*	P	Permitted	No
**Trifolium arvense*	P	Permitted	No
**Trifolium campestre*	P	Permitted	No
**Trifolium cernuum*	P	Permitted	No
**Trifolium dubium*	P	Permitted	No
**Trifolium incarnatum* var. *incarnatum*	P	N/A	No
**Trifolium ornithopodioides*	P	Permitted	No
**Trifolium repens*	P	Permitted	No
**Trifolium* sp.	**R**	Permitted	No
**Tritonia crocata*	P	Permitted	No
**Ursinia anthemoides*	**R**	Permitted	No
**Vellereophyton dealbatum*	P	Permitted	No
**Verbascum virgatum*	P	Permitted	No
**Vicia sativa*	P	Permitted	No
**Vinca major*	P	Permitted	No

[75] Declared Pest control category: C3 – Management / Exempt.

Species	Occurrence# (R / P)	WA Status[72]	Weed of National Significance (Commonwealth)
**Vulpia bromoides*	P	Permitted	No
**Vulpia muralis*	P	Permitted	No
**Vulpia myuros*	**R**	Permitted	No
**Wahlenbergia capensis*	**R**	Permitted	No
**Washingtonia filifera*	P	Permitted	No
**Watsonia borbonica*	P	Permitted	No
**Watsonia meriana*	**R**	Permitted	No
**Watsonia meriana* var. *bulbillifera*	P	N/A	No
**Watsonia meriana* var. *meriana*	P	N/A	No
**Zantedeschia aethiopica*	**R**	Declared Pest[76]	No

[76] Declared Pest control category: Exempt.