GOVERNMENT OF WESTERN AUSTRALIA

Environmental Protection Authority

Arrowsmith North Silica Sand Project

VRX Silica Limited

Report 1778

January 2025

This assessment report has been prepared by the Environmental Protection Authority (EPA) under s. 44 of the *Environmental Protection Act 1986* (WA). It describes the outcomes of the EPA's assessment of the Arrowsmith North Silica Sand Project proposal by VRX Silica Limited.

The Arrowsmith North Silica Sand Project was determined under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* to be a controlled action and to be assessed by the EPA under an accredited process. This document is also the result of the EPA's accredited assessment process.

This assessment report is for the Western Australian and Commonwealth Ministers for Environment and sets out:

- what the EPA considers to be the key environmental factors identified in the course of the assessment
- an assessment of the matters of national environmental significance
- the EPA's recommendations as to whether or not the proposal may be implemented and, if it recommends that implementation be allowed, the conditions and procedures, if any, to which implementation should be subject
- other information, advice and recommendations as the EPA considers appropriate

Darren Walsh
Chair
Environmental Protection Authority

7 January 2025

ISSN 1836-0491 (Online)
Assessment No. 2291

Contents

Figures

Tables

Appendices

Summary

Proposal

The Arrowsmith North Silica Sand Project is a proposal to develop a silica sand mine. The proposal is located approximately 270 kilometres (km) north-northwest of Perth and 35 km northwest of Eneabba, in the Midwest region of Western Australia. The proponent for the proposal is VRX Silica Limited.

The proposal includes the sequential block mining of silica sand, development of a mine feed plant, moveable surface conveyor, pipeline, processing plant, stockpiles, freshwater supply bore, access corridor, laydown, administration, water storage and associated infrastructure including gas fired power station, communications equipment, offices, workshop and additional laydown areas.

An access road connecting the mine to Brand Highway, freshwater supply bore and water pipeline will be located within the access development envelope; all other infrastructure will be within the mine development envelope. Product will be hauled via road to Geraldton port where it will be exported internationally.

The mine development envelope and disturbance footprint are 292.6 hectares (ha), and the access development envelope is 60.4 ha with a disturbance footprint of 6.5 ha. The proposal will be implemented in stages with progressive clearing, mining and rehabilitation to be undertaken concurrently over the 30-year life of the project.

Context and environmental values

The proposal is located within the Lesueur Sandplain subregion of the Geraldton Sandplains bioregion. The proposal is within the Yamatji Nation Native Title determination area. The Arrowsmith River, a registered Aboriginal heritage site, is located adjacent to the southern boundary of the access development envelope. Part of the access development envelope lies within the Arrowsmith Lake Area, an Environmentally Sensitive Area. The closest conservation reserve is Beekeepers Nature Reserve located approximately 2.9 km to the west of the access development envelope.

Flora and vegetation, terrestrial fauna and social surroundings are the key environmental factors that may be impacted by the proposal.

The proposal will result in the overall clearing of 299.1 ha of native vegetation in mostly pristine condition, which represents a loss of 0.37% of the pre-European extent remaining of Eridoon (378.1) vegetation association. No species listed as threatened flora under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or *Biodiversity Conservation Act 2016* (BC Act) have been recorded within the development envelopes. Seven priority flora species were recorded within the development envelopes.

Conservation significant fauna was recorded during surveys of the area and the proposal contains foraging habitat for Carnaby's black cockatoo (*Zanda latirostris*), listed as endangered under the EPBC Act and BC Act.

Consultation

The EPA published the proponent's referral information for the proposal on its website for seven days public comment and received three comments. The EPA also published the proponent's environmental review document on its website for public review for four weeks (from 19 June 2023 to 16 July 2023) and received five public comments and five Government agency comments. The EPA considered the comments received during these public consultation periods in its assessment.

Assessment of key environmental factors

The EPA has identified the key environmental factors (listed below) during the assessment. For each factor, the EPA has assessed the residual impacts of the proposal on the environmental values and considered whether the environmental outcomes are likely to be consistent with the EPA environmental factor objectives.

Environmental factor: Flora and Vegetation	
Residual impact or risk to environmental value	Assessment finding
Clearing up to 299.1 ha of native vegetation. Clearing of individuals of seven priority flora species. Loss of potential habitat for threatened flora species *Paracaleana dixonii* and other significant flora.	The clearing of 299.1 ha of native vegetation in mostly pristine condition, including individuals of priority flora and habitat for significant flora, is a residual impact. The impact on the Eridoon (378.1) vegetation association represents a loss of 0.37% of the pre-European extent remaining of approximately 80,734.1 ha. The EPA considered the connection of the remaining vegetation in the local and regional area and notes there are large remnant areas of the Eridoon vegetation association extending in all directions from the proposal. The proponent has applied the mitigation hierarchy to reduce the impact to flora and vegetation values through redesign of the proposal and a reduction in the disturbance footprint of 113.1 ha. The proponent has recently undertaken further targeted surveys for *Paracaleana dixonii* during the 2024 flowering season in the remainder of the development envelopes and has communicated with the EPA that no individuals were recorded; the findings are to be provided in a report. The proponent is committed to avoiding impact to the species, and if identified will implement a 100-metre avoidance buffer around any individuals. The EPA supports the proponent's commitment to develop a research program which will contribute to research on ecological restoration of priority flora that will be impacted at higher proportions (greater than 15%) by the proposal and improve knowledge on their use in rehabilitation. The proponent proposes to undertake progressive clearing while concurrently undertaking progressive

	rehabilitation of the disturbance footprint, with the exception of 14.5 ha for permanent infrastructure, with native vegetation. The EPA expects that the proponent will undertake progressive rehabilitation during operations and the Department of Energy, Mines, Industry Regulation and Safety would regulate mine closure under the *Mining Act 1978*. The EPA advises that the residual impacts can be regulated through conditions including limitations on clearing (condition A1); implementing a staged progressive clearing and rehabilitation approach (condition A2); limitations on the disturbance of priority flora, ensuring no impact to *Paracaleana dixonii* if identified through implementing an exclusion zone, implementation of a research program for priority flora (condition B1); and progressive rehabilitation of the disturbance footprint (condition B4). The EPA considers that with implementation of the recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for flora and vegetation.
Indirect impacts associated with fragmentation of vegetation, dust deposition, spread of weeds and dieback, burial from slurry spills or hydrocarbon spills, altered hydrological regimes and fire regimes.	The EPA has assessed the potential indirect impacts to flora and vegetation taking into consideration the slow rate of clearing, relatively low level of activity during mining operations and rehabilitation and established management practices. The EPA considers that with the required specific management and contingency measures of condition B1, and progressive rehabilitation required under condition B4, these indirect impacts can be managed such that the proposal can be implemented to be consistent with the EPA objective for flora and vegetation.

Environmental factor: Terrestrial Fauna	
Residual impact or risk to environmental value	Assessment finding
Clearing of 299.1 ha of native vegetation that supports conservation significant fauna including foraging habitat for Carnaby's black cockatoo.	The proposal will directly impact on the habitat of four conservation significant fauna species and add to the cumulative impact on these species. The EPA notes that there is substantial similar Kwongan heath habitat remaining in the surrounding local and regional area, with the proposal impacting approximately 0.3% of the existing native vegetation within 20 km. The EPA acknowledges the proponent's progressive slow rate of clearing and mining operations, and concurrent rehabilitation approach to minimise the impacts of fragmentation and loss of habitat. The EPA advises that the residual impacts are likely to be regulated through a limit on the extent of the

	development envelope (condition A1); implementing a staged progressive clearing and rehabilitation approach (condition A2); avoidance of fauna habitat identified as dense riparian thickets, pre-clearance surveys for Malleefowl and implementation of exclusion zones around any active mounds, contribution to a research program to improve knowledge on *Idiosoma kwongan* (condition B2); and progressive rehabilitation of the disturbance footprint (condition B4). The EPA considers that the impact to Carnaby's black cockatoo habitat is a significant residual impact. The EPA advises that this significant residual impact should be subject to reasonable conditions to limit the disturbance to Carnaby's black cockatoo foraging habitat (condition B2), undertake progressive rehabilitation (condition B4) and a requirement for offsets (condition B5) to counterbalance this significant residual impact. The EPA considers that subject to the implementation of recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for terrestrial fauna.
Fauna mortality or injury due to vehicle and machinery movements. Increased feral animal activity. Indirect impact associated with habitat degradation from introduction or spread of weeds and dieback, discharge of slurry spills, hydrocarbon spills, altered fire regimes, reduction of groundwater depth.	The EPA has assessed the potential indirect impacts to terrestrial fauna taking into consideration the slow rate of clearing, low level of activity during operations and established management practices. The EPA considers that with the required specific management and contingency measures of condition B2, including specified actions to minimise the risk of physical injury or mortality and trench construction requirements, and rehabilitation required under condition B4, these indirect impacts can be managed such that the proposal can be implemented to be consistent with the EPA objective for terrestrial fauna.

Environmental factor: Social Surroundings	
Residual impact or risk to environmental value	Assessment finding
Disturbance to vegetation and fauna habitat which may impact on Traditional Owners' use of the land for traditional purposes. Potential indirect impact to adjacent Aboriginal Heritage Site (Arrowsmith River) and Other Heritage Places (Arrowsmith Lake) through alteration of hydrological	Implementation of the proposal is not expected to directly impact on Aboriginal cultural heritage sites. The EPA considers there is a risk of residual indirect impact to Aboriginal cultural heritage associated with changes to environmental attributes such as nearby waterways and clearing of native vegetation. The EPA acknowledges that the proponent has taken reasonable steps to consult with the Yamatji Southern Regional Corporation (YSRC) and proposes to develop and implement a Cultural Heritage Management Plan in consultation with the YSRC to

regimes including abstraction of groundwater, the clearing of native vegetation and product haulage.	mitigate impacts to cultural heritage values and landscapes. The EPA encourages the proponent to consult with the YSRC to deal with Aboriginal cultural heritage that may be affected by proposal impacts to physical or biological surroundings. The EPA notes that the *Aboriginal Heritage Act 1972* does not apply to sites outside the impact area (disturbance footprint) or to indirect impacts. The EPA advises that potential impacts to Aboriginal cultural heritage should be subject to recommended condition B3 to ensure protection of Aboriginal heritage and ensure the environmental outcome is likely to be consistent with the EPA objective for social surroundings.
Noise, dust and light emissions from construction and operations.	The EPA notes that during construction, staged progressive mining and rehabilitation activities, any noise and dust impacts will be localised, and dust suppression measures will be implemented to minimise impacts. The EPA expects the proponent to use best practice noise management to minimise impacts on amenity and comply with the Environmental Protection (Noise) Regulations 1997. The EPA advises that subject to the proposed minimisation measures and regulation by other DMAs, specifically Part V of the EP Act, which can apply conditions relating to the design and operation of the proposal to manage impacts from dust and noise, the environmental outcome is likely to be consistent with the EPA objective for social surroundings.

Holistic assessment

The EPA considered the connections and interactions between relevant environmental factors and values to inform a holistic view of impacts to the whole environment. The EPA formed the view that the holistic impacts would not alter the EPA's conclusions about consistency with the EPA factor objectives.

Conclusion and recommendations

The EPA has taken the following into account in its assessment of the proposal:

- environmental values which may be significantly affected by the proposal
- residual impacts, emissions and effects in relation to the key environmental factors, separately and holistically (this has included considering cumulative impacts of the proposal where relevant)
- likely environmental outcomes (and taking into account the EPA's recommended conditions), and the consistency of these outcomes with the EPA objectives for the key environmental factors
- the EPA's confidence in the proponent's proposed mitigation measures

- whether other statutory decision-making processes can mitigate the potential impacts of the proposal on the environment
- principles of the *Environmental Protection Act 1986*.

The EPA has recommended that the proposal may be implemented subject to conditions recommended in Appendix A.

1 Proposal

The Arrowsmith North Silica Sand Project is a proposal to develop a silica sand mine. The proposal is located approximately 270 kilometres (km) north-northwest of Perth and 35 km northwest of Eneabba, in the Midwest region of Western Australia (see Figure 1).

The proposal includes the sequential block mining of silica sand, development of a mine feed plant, moveable surface conveyor, pipeline, processing plant, stockpiles, freshwater supply bore, access corridor, laydown, administration, water storage and associated infrastructure including gas fired power station, communications equipment, offices, workshop and additional laydown areas.

An access road connecting the mine to Brand Highway, freshwater supply bore and water pipeline will be located within the access development envelope; all other infrastructure will be within the mine development envelope. Product will be hauled via road to Geraldton port where it will be exported internationally.

The mine development envelope and disturbance footprint are 292.6 hectares (ha), and the access development envelope is 60.4 ha with a disturbance footprint of 6.5 ha. The proposal will be implemented in stages, with progressive clearing, mining and rehabilitation to be undertaken concurrently over the 30-year life of the project.

The proponent for the proposal is VRX Silica Limited. The proponent referred the proposal to the Environmental Protection Authority (EPA) on 17 March 2021. The referral information was published on the EPA website for seven days public comment. On 18 May 2021, the EPA decided to assess the proposal at the level of Public Environmental Review. The EPA also published the environmental review document (ERD) (Preston Consulting 2023) on its website for public review for 4 weeks (from 19 June 2023 to 16 July 2023).

The proposal was determined under the *Environment Protection and Biodiversity Conservation Act 1999* to be a controlled action and to be assessed by the EPA under an accredited process.

The elements of the proposal which have been subject to the EPA's assessment are included in Table 1.

Table 1: Proposal content document

Proposal element	Location	Maximum extent or range
Physical elements		
Mine development envelope: • mine feed plant (mobile) • conveyor (mobile) • surface slurry pipeline (mobile)	Figure 2	Clearing of no more than 292.6 ha within the 292.6 ha mine development envelope

Proposal element	Location	Maximum extent or range
• processing plant and stockpiles • topsoil stockpiles • water storage • gas fired power station • associated infrastructure including administration, communications equipment, offices, workshop and laydown areas		
Access development envelope: • access road • water bore • water pipeline	Figure 2	Clearing of no more than 6.5 ha within the 60.4 ha access development envelope
Operational elements		
Mining and vegetation direct transfer	Within mine development envelope	Mining to be undertaken such that topsoil and vegetation is transferred directly to rehabilitation areas via vegetation direct transfer
Silica sand production	-	Production of up to 2 Mtpa of silica sand
Energy production	-	Up to 5 MW
Groundwater abstraction	-	Abstraction of 0.9 GL/a from the Yarragadee aquifer
Proposal elements with greenhouse gas emissions		
Construction elements		
Scope 1	Land use change: 1,000 – 1,200 tCO_2-e per annum	
Scope 2	N/A	
Scope 3	Up to 30,416 tCO_2-e per annum during the first three years	
Operation elements		
Scope 1	Land use change: • 1,000 – 1,200 tCO_2-e per annum • up to 33,160 tCO_2-e peak total Energy production:	

Proposal element	Location	Maximum extent or range
		• up to 17,121 tCO_2-e per annum for the first three years and 30,743 tCO_2-e per annum thereafter • maximum 550,170 tCO_2-e over the life of the proposal
Scope 2	N/A	
Scope 3	60,471 tCO_2-e per annum	
Rehabilitation		
Areas temporarily cleared for laydown during the construction phase will be rehabilitated following construction. Final closure and rehabilitation to commence within one year of cessation of operations. Mined areas are to be progressively rehabilitated using vegetation direct transfer and infill planting.		
Commissioning		
N/A		
Decommissioning		
Removal of all above surface and buried infrastructure within 2 years of cessation of operations.		
Other elements which affect extent of effects on the environment		
Proposal time	Construction phase	Approximately six months
	Operations phase	30 years
	Decommissioning phase	Approximately two years after operations

Units and abbreviations
ha – hectare
Mtpa – million tonnes per annum
MW – megawatts
GL/a – gigalitres per annum
tCO_2-e – tonnes carbon dioxide equivalent

Proposal amendments

The proposal is set out in section 3 of the proponent's referral supporting report (Preston Consulting 2021), which is available on the EPA website.

During the assessment process the EPA encouraged the proponent to identify avoidance and mitigation measures for the proposal in addition to those included in the original proposal. The proponent requested changes to the proposal during the assessment under section 43A of the *Environmental Protection Act 1986* (EP Act). The changes were designed to reduce potential impacts on the environment. The EPA Chair's notices of 13 October 2021, 14 June 2022 and 25 October 2024 consenting to the changes, are available on the EPA website.

The proponent's changes to the proposal since referral has resulted in:

- a reduction in the mine development envelope from 1,025 ha to 292.6 ha
- a reduction in the access development envelope from 447 ha to 60.4 ha
- a reduction in the overall extent of clearing of native vegetation from 412.2 ha to 299.1 ha
- clearing of Carnaby's black cockatoo foraging habitat reduced from 376.2 ha to 299.1 ha
- a reduction in clearing several priority flora species
- avoiding direct impact to an Aboriginal heritage site
- a reduction in power requirements from 10 megawatts (MW) to 5 MW.

The consolidated and updated elements of the proposal which have been subject to the EPA's assessment are included in Table 1.

Proposal alternatives

The proposed disturbance footprint within the mine development envelope was determined based on the location of the silica sand, which limits possible alternative locations for the proposal. The proponent considered other possible access routes during the development of the proposal. The final access development envelope was the preferred option as it was designed to minimise impacts on flora and vegetation and avoid areas of Aboriginal cultural heritage. Alternative proposal locations and designs considered are discussed in section 2.3.3 of the ERD (Preston Consulting 2023).

The proponent has used baseline studies and investigations to inform the proposal design and subsequently reduced the extent of the development envelopes and disturbance footprints, so that impacts to the environment can be minimised as far as practicable.

Proposal context

The proposal is located within the Lesueur Sandplain Interim Biogeographic Regionalisation for Australia (IBRA) subregion of the Geraldton Sandplains bioregion. Land uses within the area include dryland agriculture, conservation, unallocated crown land and crown reserves. The proposal lies primarily within mining lease M70/1389 held by Ventnor Mining Pty Ltd, a wholly owned subsidiary of VRX Silica Ltd. The proposal occurs entirely within the Eridoon (378.1) vegetation association, of which approximately 65% of the pre-European extent currently remains, with clearing largely associated with historical agricultural land use.

The proposal is within the Yamatji Nation Native Title determination area. The Arrowsmith River, a registered Aboriginal heritage site, is located adjacent to the southern boundary of the access development envelope. The nearest sensitive residential receptor is located approximately 1.7 km from the proposed haul road and 3.3 km from the proposed processing plant.

Part of the access development envelope lies within the Arrowsmith Lake Area defined under section 51B of the EP Act as an Environmentally Sensitive Area. The closest conservation reserve is Beekeepers Nature Reserve located approximately 2.9 km to the west of the access development envelope and 4.2 km to the southwest of the mine development envelope. Other nearby reserves include Yardanogo Nature Reserve approximately 4.4 km to the north of the mine development envelope and Beharra Springs Nature Reserve approximately 4.7 km southeast of the mine development envelope.

A portion of the northeastern mine development envelope lies within the mapped extent of a contaminated site (ID 14216) classified on the Department of Water and Environmental Regulation (DWER) Contaminated Sites Database as 'Contaminated – restricted use' under the *Contaminated Sites Act 2003* (CS Act). The DWER Basic Summary of Records indicates that hydrocarbons are present in groundwater as a result of the operations of a petroleum gas processing facility. It is noted that the extent of groundwater impact has been laterally delineated and does not appear to be migrating. The land use of the contaminated site is restricted to commercial/ industrial use and groundwater abstraction within the portion of the site occupied by the gas processing facility is not recommended. The proposal is located over 5 km from the gas processing facility with groundwater abstraction proposed to be located outside the mapped extent of the contaminated site and not expected to be impacted.

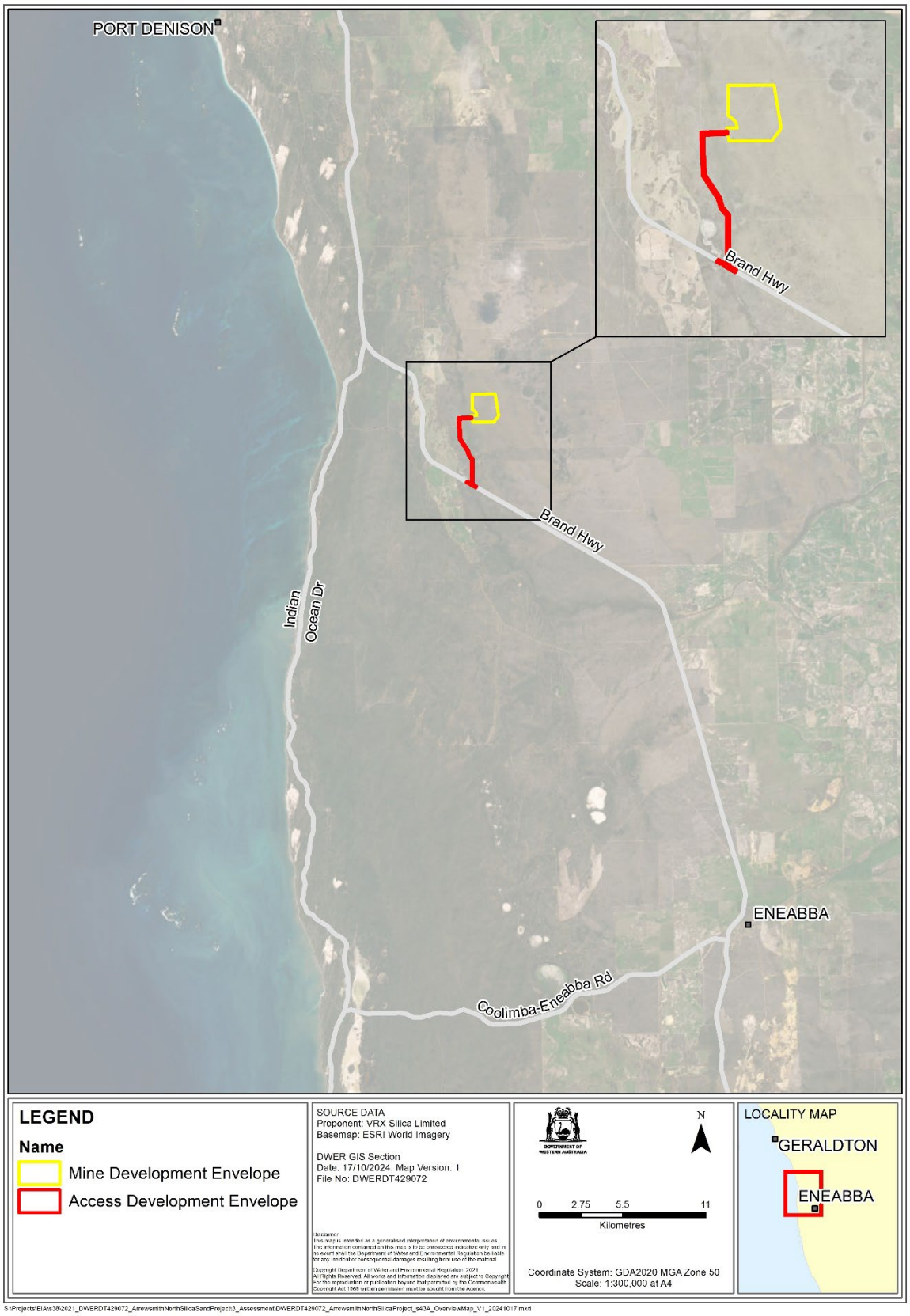

Figure 1: Proposal location

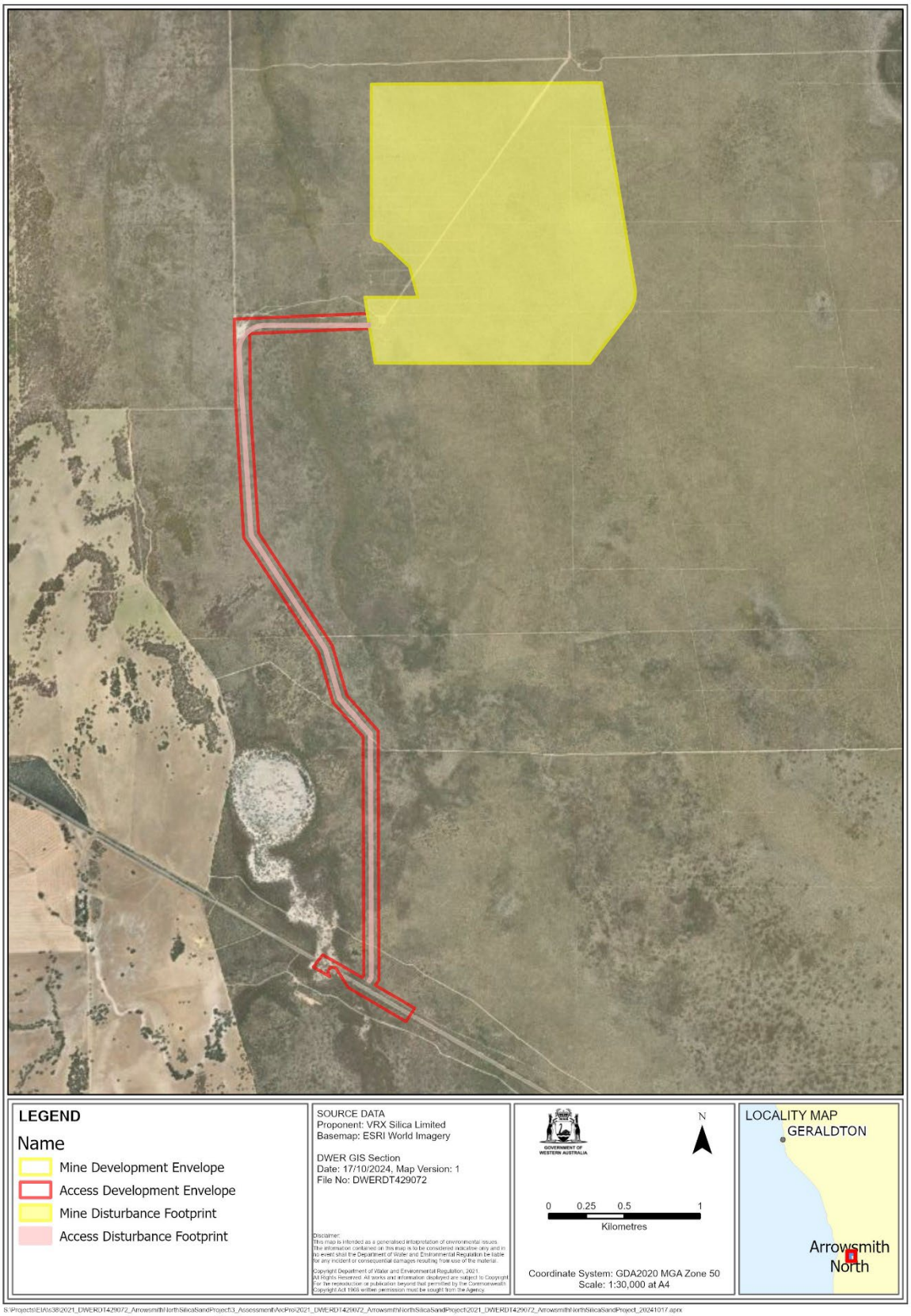

Figure 2: Mine and access development envelopes and disturbance footprint

2 Assessment of key environmental factors

This section reports the outcome of the EPA's assessment of the key environmental factors against its environmental objectives, and its recommendations on conditions the proposal should be subject to if it is implemented.

The EPA has also considered the principles of the *Environmental Protection Act 1986* (see Appendix D) in assessing whether the residual impacts will be consistent with its environmental factor objectives.

The EPA evaluated the impacts of the proposal on other environmental factors including inland waters, air quality and greenhouse gas emissions, and concluded these were not key factors for the assessment. This evaluation is included in Appendix E.

2.1 Flora and vegetation

The EPA environmental objective for flora and vegetation is *to protect flora and vegetation so that biological diversity and ecological integrity are maintained* (EPA 2016a).

The proponent submitted the following studies and reports to inform the assessment of potential impacts to flora and vegetation:

- Flora and Vegetation Assessment of Arrowsmith North Survey Area (appendix 6 of the ERD) (Mattiske Consulting 2022a)
- Review of Roots and Vegetation Direct Transfer (appendix 8 of the ERD) (Mattiske Consulting 2020a)
- Investigation of Root Systems of the Priority Flora species recorded in the Arrowsmith North mine survey area (appendix 9 of the ERD) (Mattiske Consulting 2022b)
- Arrowsmith North Silica Sand Project – Phytophthora Dieback occurrence assessment (appendix 10 of the ERD) (Glevan Consulting 2020)
- Arrowsmith North Access Route – Phytophthora Dieback occurrence assessment (appendix 11 of the ERD) (Glevan Consulting 2021)
- VRX Arrowsmith North Project: *Paracaleana dixonii* Targeted Survey in Proposed Mine Development Envelope (appendix 1 of the Response to Submissions [RtS]) (Brian Morgan Consultant Botanist 2024)
- Rehabilitation Management Plan - Arrowsmith North Silica Sand Project (appendix 2 of the RtS) (Preston Consulting 2024a)
- Arrowsmith North Silica Sand Project – Phytophthora Dieback Management Plan (appendix 3 of the RtS) (Glevan Consulting 2022)
- Memorandum Report: Supplementary Targeted flora and vegetation survey of Arrowsmith North. Part A – Flora (appendix 4 of the RtS) (Terratree 2024a)
- Memorandum Report: Supplementary Targeted flora and vegetation survey of Arrowsmith North. Part B – Vegetation (appendix 7 of the Rts) (Terratree 2024b).

The surveys undertaken were consistent with the *Technical Guidance – Flora and*

vegetation surveys for environmental impact assessment (EPA 2016b). The EPA considers that the proponent has completed relevant studies to appropriately inform the assessment as required by the environmental scoping document (ESD).

Key environmental values and context

The proposal location is characterised by undulating sandplains over laterite with relict dunes and limestone outcrops. The Lesueur Sandplain IBRA subregion has high floristic diversity and levels of endemism with vegetation comprised mainly of proteaceous scrub heaths.

The proposal occurs entirely within vegetation association Eridoon 378.1, which is described as mixed heath with scattered tall shrubs *Acacia* spp, Proteaceae and Myrtaceae. The pre-European extent of native vegetation currently remaining for this vegetation association is approximately 65%. On a regional scale, the proposed clearing of native vegetation will impact 0.37% of the current pre-European extent. The condition of vegetation within the mine development envelope ranged from 'pristine' (96.5%) to 'excellent' (3.5%) (Preston Consulting 2023).

The seven vegetation communities mapped within the disturbance footprint extend beyond the development envelopes and are well represented in the broader area. These vegetation communities contain several priority flora species and would be considered habitat for significant flora. Riparian vegetation associated with a drainage line was mapped to the west of the mine development envelope and southwest of the access development envelope. No groundwater dependent vegetation was identified within the development envelopes (Preston Consulting 2023).

No Threatened Ecological Communities (TECs) listed under the EPBC Act or *Biodiversity Conservation Act 2016* (BC Act), or Priority Ecological Communities (PECs) as listed by the Department of Biodiversity, Conservation and Attractions (DBCA), were recorded within the development envelopes.

No species listed as threatened flora under the EPBC Act or BC Act have been recorded within the development envelopes. There is the potential for threatened flora species *Paracaleana dixonii* (Sandplain duck orchid), listed as endangered under the EPBC Act and vulnerable under the BC Act, to be present within the development envelopes. *Paracaleana dixonii* is considered a Matter of National Environmental Significance (MNES) under the EPBC Act for the Commonwealth assessment.

The surveys recorded 11 priority flora species in the broader area with seven priority species ranging from Priority 1 (P1) to P4 recorded within the development envelopes.

No areas within the development envelopes were identified as currently impacted or infested with dieback (*Phytophthora*). None of the 11 weed species recorded in

<table>
<tr><td colspan="2">the survey areas are declared pest organisms pursuant to section 22 of the Biosecurity and Agriculture Management Act 2007 or listed as Weeds of National Significance.</td></tr>
<tr><th>Impacts from the proposal</th><th>Assessment finding, environmental outcomes and recommended conditions</th></tr>
<tr><td>Potential direct impacts
clearing up to 299.1 ha of native vegetation, of which the majority is in ‘pristine’ condition
clearing of individuals of 7 priority flora species
loss of potential habitat for Paracaleana dixonii and other significant flora.
Potential indirect impacts
fragmentation of native vegetation
smothering vegetation by dust generation
introduction and/or spread of weeds
introduction of dieback
burial from slurry spills or hydrocarbon spills
changes to the depth of groundwater
alteration of fire regimes.
Avoidance and minimisation measures
reducing the development envelopes and disturbance footprints to minimise the extent of vegetation clearing and impact on several priority flora species</td><td>Assessment findings and environmental outcomes
The EPA considers that the key environmental values for flora and vegetation likely to be impacted by the proposal are native vegetation in pristine condition and significant flora species.

The EPA recognises that increased cumulative loss of native vegetation through the implementation of current and future developments is a key threat to flora and vegetation values within the Geraldton Sandplains bioregion. In assessing this proposal, the EPA has had regard to the combined and cumulative effect that surrounding approved and proposed projects may have on flora and vegetation.

The EPA notes that the proponent has conducted several flora and vegetation surveys between 2018 and 2023 across a broad area which has provided a good understanding of the environmental values present at a local scale.

<u>Vegetation</u>
The EPA has assessed the likely residual impacts of the proposal on vegetation to be the clearing of up to 299.1 ha of native vegetation in mostly pristine condition.

The EPA notes that the proposed impact on Eridoon (378.1) vegetation association represents a loss of 0.37% of the pre-European extent remaining of 80,734.1 ha. The EPA considered the connection of the remaining vegetation in the local and regional area, and notes there are large remnant areas of the Eridoon vegetation association extending in all directions from the proposal, mainly north to south, thus minimising fragmentation. The EPA notes there are also several nature reserves in the area surrounding the proposal that are managed by DBCA. Based on the range and extent within the</td></tr>
</table>

• avoiding the riparian vegetation west of the mine development envelope • implementing a progressive mining and rehabilitation approach • implementing the Rehabilitation Management Plan • using existing cleared areas to minimise the extent of additional vegetation clearing • implementing dust suppression measures • implementing weed management and control measures • implementing the Dieback Management Plan • implementing hydrocarbon storage and spill mitigation measures • implementing measures to minimise the risk and impact of slurry spills • limiting mining to 10 metres (m) above the superficial confining layer • controls to minimise and manage fire. **DMA regulation** <u>*Mining Act 1978*</u> In accordance with the *Mining Act 1978*, the proponent will be required to ensure the Mine Closure Plan is consistent with the Statutory Guidelines for Mine Closure Plans (DMIRS	region, it is unlikely the proposal will have a significant impact on the vegetation association. The EPA acknowledges that the proponent has revised the overall development envelopes and disturbance footprints since referral, which has reduced the overall extent of clearing by 27% (reduction of 113.1 ha). The EPA acknowledges that the proponent proposes to undertake progressive clearing while concurrently undertaking progressive rehabilitation using a vegetation direct transfer (VDT) method. While the EPA considers there are limitations with the VDT method, it is likely to be a better rehabilitation approach than traditional methods, particularly for shallow rooted vegetation, and will be complimented by infill planting. The EPA notes that the proponent has prepared a Rehabilitation Management Plan outlining the proposed progressive rehabilitation of native vegetation within the disturbance footprint. The EPA advises the proponent will need to refine and improve its practices as it progressively rehabilitates the site, based on the results of ongoing monitoring and further research and development to maintain contemporary rehabilitation practices. The EPA expects that the proponent will undertake progressive rehabilitation during operations and DEMIRS would regulate mine closure under the *Mining Act 1978*. The Rehabilitation Management Plan will be an addendum to the Mine Closure Plan and include the outcomes specified by the EPA. The EPA has taken into consideration the slow rate of clearing and progressive nature of the rehabilitation and considers that subject to condition A1 to limit the extent of clearing, condition A2 to implement a staged progressive clearing and rehabilitation approach, and condition B4 for rehabilitation, the residual impact to vegetation can be managed so that the environmental outcome will be consistent with the EPA objective for flora and vegetation. <u>*Paracaleana dixonii*</u> The proponent identified threatened flora species *Paracaleana dixonii* to have a low probability of

2023) which includes requirements for rehabilitation and revegetation of land and closure objectives and criteria, and submit to the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) for approval. **Consultation** Matters raised during stakeholder consultation and the proponent's responses are provided in the Response to Submissions document (Preston Consulting 2024b). Key issues raised during public consultation on the proposal were clearing of native vegetation, including impacts to Kwongan heath and significant flora, the effectiveness of the proposed rehabilitation method, and the cumulative impacts from this proposal and others in the region. The issues raised about potential direct and indirect impacts to flora and vegetation have been considered in this assessment. **Cumulative impact** The EPA considered the cumulative effects from the range of threats and pressures in the area of the proposal and whether the environment affected by the proposal has significant value. Cumulative impacts to native vegetation, specifically vegetation	occurrence based on recent surveys and data analysis, including distance to previously recorded locations (the closest over 5 km east), differing soil substrates, landforms and geology (Preston Consulting 2023). The EPA notes that *Paracaleana dixonii* has not been recorded to date in the proposal area. During the assessment of this proposal, about 30% of the development envelopes had been subject to targeted survey, largely due to the short flowering period and cryptic nature of the species. *Paracaleana dixonii* grows from a tuber to between 130 and 180 mm high and is a late flowering orchid (late October to early December). The EPA acknowledges that the proponent has recently undertaken further targeted surveys during the 2024 flowering season in the remainder of the development envelopes and has communicated with the EPA that no individuals were recorded; the findings are to be provided in a subsequent report. The EPA notes the proponent is committed to avoiding impacts to *Paracaleana dixonii* and has developed a contingency plan in the event it is recorded within the disturbance footprint (Preston Consulting 2024b). If the species is identified, the proponent proposes to implement a 100-metre radius buffer around the recorded individual with a shallow (6 degrees) slope between the crest of the buffer and the mine floor to prevent erosion, allow vegetation to re-establish following rehabilitation, and ensure the change in topography between pre and post mined areas and the surrounding landscape is gradual. The EPA advises that subject to recommended condition A1 to limit the extent of clearing, condition B1 to require pre-clearance surveys and ensure no impact to *Paracaleana dixonii* and condition B4 for rehabilitation, the *Paracaleana dixonii* is protected and the environmental outcome will be consistent with the EPA objective for flora and vegetation. <u>Priority flora</u> The EPA acknowledges that the proponent has applied the mitigation hierarchy to reduce the impact to priority flora species through redesign of

association Eridoon 378.1 will occur from five other proposals. Cumulative impacts to the same priority flora species will occur at four other proposals. Cumulatively, the impacts to flora and vegetation are considered limited to a relatively small extent in comparison to the remaining extent of their known regional occurrence. The EPA considers the environmental outcomes are likely to be consistent with the EPA objective for flora and vegetation.	the proposal and a reduction in the disturbance footprint of 113.1 ha. Seven priority flora species were identified within the development envelopes and will be impacted by clearing as follows (Preston Consulting 2024b): • *Schoenus* sp. Eneabba (P2) – 167 (20.1%) of locally recorded individuals • *Comesperma rhadinocarpum* (P3) – 10 (16.9%) of locally recorded individuals • *Hemiandra* sp. Eneabba (P3) – 60 (15.4%) of locally recorded individuals • *Hypocalymma gardneri* (P3) – 11 (2.1%) of locally recorded individuals • *Banksia elegans* (P4) – 1,068 (18%) of locally recorded individuals • *Stawellia dimorphantha* (P4) – 83 (19.2%) of locally recorded individuals • *Schoenus griffinianus* (P4) – 3 (0.9%) of locally recorded individuals. Priority flora species *Hypocalymma gardneri* (P3) and *Schoenus griffinianus* (P4) are represented by several individuals in the local area, occur over a relatively broad range and impacts are considered to be low; therefore, the EPA has not recommended a condition to limit disturbance to these species. The EPA has recommended limits for the removal of individuals for *Banksia elegans* (P4), which would be directly impacted by the proposal. This species has been recorded in another 44 locations across a large range from Moore River to Geraldton and is well represented in the surrounding region (Preston Consulting 2024b). While the species has a large range and occurs in several populations across its range, the EPA has determined that the likelihood of significant impact to this species can be mitigated through limitations on removal. The EPA has recommended limits for the removal of individuals for *Schoenus* sp. Eneabba (P2), *Comesperma rhadinocarpum* (P3), *Hemiandra* sp. Eneabba (P3) and *Stawellia dimorphantha* (P4), which would be directly impacted by the proposal. These limits are in place either because the species have smaller ranges and/or few individuals have been recorded. None of the species are restricted to

	the development envelopes and most of the species have known regional populations from at least 13 records across a range of at least 100 km (Preston Consulting 2024b). Although the exact numbers of individuals across their whole range is unknown, the regional impact on these seven priority flora species is likely to be substantially lower as most have broad ranges and several regional populations. The EPA notes that no flora species recorded within the survey areas represent range extensions to their current known distributions and that records of all priority flora are found within the wider region. The EPA considers that proposed clearing is not expected to significantly impact on the local extent, regional extent, or conservation status of these priority flora species. The EPA assessment has determined that the proposal will not result in a significant residual impact to priority flora which needs to be counterbalanced by offsets. The EPA advises that while a direct offset for priority flora is not considered necessary, the proponent has proposed to develop a Priority Flora Research Program to address knowledge gaps for the improvement of on-ground management and protection of priority flora to achieve a positive conservation outcome (Preston Consulting 2024c). The EPA supports this program, which will contribute to research on ecological restoration of priority flora that will be impacted at higher proportions by the proposal and improve knowledge on their use in rehabilitation. The EPA acknowledges the proponent's progressive rehabilitation approach, outlined in the Rehabilitation Management Plan, which includes seed collection, propagation and infill planting. The proponent will identify target species for seed collection, including significant species within the disturbance footprint prior to clearing, to conserve viable populations of priority flora where possible (Preston Consulting 2024a). The EPA considers that subject to condition A1 to limit the extent of clearing of native vegetation, condition A2 to implement a staged progressive

	clearing and rehabilitation approach, condition B1 to limit the disturbance to priority flora individuals and contribute to a research program, and condition B4 for rehabilitation, the residual impacts can be managed so that the environmental outcome will be consistent with the EPA objective for flora and vegetation. <u>Indirect impacts to flora and vegetation</u> The proponent has committed to implementing a range of management measures to ensure indirect impacts to flora and vegetation are minimised including dust suppression, weed monitoring and control, hygiene management, and fire management (Preston Consulting 2024a). The EPA notes that the proponent has prepared a Phytophthora Dieback Management Plan and Rehabilitation Management Plan to manage potential indirect impacts. The EPA has assessed the potential indirect impacts to flora and vegetation taking into consideration the slow rate of clearing, low level of activity during operations and established management practices, and considers that with the specific management and contingency measures of condition B1 and rehabilitation condition B4, these indirect impacts can be managed such that the proposal can be implemented to be consistent with the EPA objective for flora and vegetation. **Recommended conditions to ensure consistency of environmental outcome with EPA objective** **Condition A1** • limitations on extent of the proposal. **Condition A2** • implementation of the proposal in stages. **Condition B1** • no impact to any identified *Paracaleana dixonii* • disturb no more than the known populations of priority flora as described in Table 1 of the conditions

	• complete targeted surveys for *Paracaleana dixonii* prior to ground disturbing activities • implement the Dieback Management Plan. **Condition B4** • requirement to rehabilitate the disturbance footprint.

2.2 Terrestrial fauna

The EPA environmental objective for terrestrial fauna is *to protect terrestrial fauna so that biological diversity and ecological integrity are maintained* (EPA 2016c).

The proponent submitted the following studies and reports to inform the assessment of potential impacts to terrestrial fauna:

- Discussion of the potential foraging value of the rehabilitated landscape for Carnaby's Cockatoo (appendix 19 of the ERD) (BCE 2020)
- Arrowsmith North Project Short-range Endemic (SRE) Invertebrate Desktop Assessment (appendix 15 of the ERD) (Bennelongia 2021a)
- Arrowsmith North Project SRE Invertebrate Survey (appendix 16 of the ERD) (Bennelongia 2021b)
- Fauna Assessment of Arrowsmith North (appendix 14 of the ERD) (BCE 2022).

The field surveys undertaken for the assessment were consistent with the *Technical Guidance - Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020a) and *Technical Guidance – Sampling of short-range endemic invertebrate fauna* (EPA 2016d). The EPA considers that the proponent has completed the relevant studies to appropriately inform the assessment as required by the ESD.

Key environmental values and context

The proposal location is characterised by three Vegetation and Substrate Associations (VSA's) as described by Bamford Consulting Ecologists (2022) and based on the vegetation mapping of Mattiske (2022a), which are used to identify fauna habitat types as follows:

- VSA1: Kwongan heath – low, dense, Proteaceous/Myrtaceous shrubland on yellow and pale sands. This VSA contains several *Banksia* species that flower at different times of the year
- VSA2: Dense riparian thickets (and seasonal watercourse and swamps) – dense thickets mostly of *Acacia blakelyi*, in some areas *Allocasuarina*

campestris, growing on peaty-sand low in the landscape but extending onto slopes

- VSA3: Open, low woodland of *Banksia* sp. With scattered *Eucalyptus todtiana* and *Xylomelum angustifolium* over shrubs on sand.

The vegetation types present are reflective of the vegetation complexes occurring within the Lesueur Sandplain subregion, which is highly diverse in floristic and vegetation communities, with most of the vegetation in the survey area classified as being in pristine and excellent condition (Mattiske 2022a). The proposal will result in the clearing of 299.1 ha of vegetation that occurs entirely within VSA1 (Kwongan heath), which represents approximately 18% of its mapped extent within the survey area. None of these VSA's are restricted to the development envelopes (Preston Consulting 2024b).

A total of 18 vertebrate fauna species of conservation significance were identified as potentially occurring within the survey area, with several of these species locally extinct or described as irregular visitors (BCE 2022). In addition, specimens from 36 different invertebrate species were collected, with 27 species classified as potential short-range endemics (SRE's) (Bennelongia 2021b). Of these, two conservation significant SRE species were recorded during the survey, *Idiosoma kwongan* and *Bothriembryon perobesus*.

The conservation significant fauna discussed below are either known or likely to occur within the proposal or are considered significant due to their occurrence at the edge of their range, and include:

- Carnaby's black cockatoo (*Zanda latirostris*) – Endangered under the EPBC Act and BC Act
- Malleefowl (*Leipoa ocellata*) – Vulnerable under the EPBC Act and BC Act
- Kwongan heath shield-backed trapdoor spider (*Idiosoma kwongan*) – listed as Priority 1 under the BC Act
- Bothriembryontid land snail (*Bothriembryon perobesus*) – listed as Priority 1 under the BC Act.

Carnaby's black cockatoo and Malleefowl are considered Matters of National Environmental Significance (MNES) under the EPBC Act for the Commonwealth assessment.

Carnaby's black cockatoo is primarily associated with habitat types VSA1 and VSA3. The value of the vegetation lies predominantly in its foraging value for Carnaby's black cockatoos in the form of myrtaceous and proteaceous species mostly occurring in VSA1 and VSA3, which have high foraging value for black cockatoos and VSA2, which has moderate foraging value. Malleefowl is primarily associated with VSA2 with limited use of VSA1 and VSA3, and SREs (specifically the *Idiosoma kwongan*) associated with VSA1.

The development envelopes are located within the mapped distribution of Carnaby's black cockatoo. A fauna survey and assessment of Carnaby's black cockatoo foraging habitat was conducted in 2020 and 2022. No individuals were observed during the surveys, but the species has been confirmed in the general area, with moderate to high quality foraging habitat recorded throughout the

development envelopes. Foraging evidence was found within the development envelopes and the potential for roosting and breeding sites exists nearby (BCE 2022). Several roost sites (both potential and confirmed) were recorded in proximity to the survey area. The closest known breeding sites are approximately 50 km away in Mt Lesueur National Park to the south and Dookanooka Nature Reserve to the east (Rycken and Douglas 2023). A large area of intact foraging habitat remains adjacent to the proposal and is in the same range for Carnaby's foraging habitat from potential roosting/breeding habitat, with the closest roosting site approximately 4 km west of the proposal and some roosts 10 km south and 15 km north.

Malleefowl were identified as potentially occurring within the development envelopes. Searches for Malleefowl mounds were conducted during Aboriginal heritage surveys, flora and vegetation surveys (Mattiske 2020) and fauna assessment surveys (BCE 2022). No sightings or evidence of Malleefowl was found within the survey areas, but historic records are known for the region within 10 km of the proposal. While the vegetation in the development envelopes was considered potential habitat for the species, the species is not usually associated with this habitat type as much of the vegetation is too low and Malleefowl usually occur in woodlands and tall shrublands (BCE 2022). The proposal is located in an extensive continuous landscape of primarily Kwongan heath, which may provide potential habitat for Malleefowl, however, the species is known to inhabit a broad range of habitat types.

A survey for burrowing SRE species was undertaken by Bennelongia (2021b) in June and July 2021 across the development envelopes and surrounding local area to assess the extent of habitats beyond the proposal and provide some regional context. One male individual of *Idiosoma kwongan* was recorded from a single location in the middle of the mine development envelope. It is one of five records within 17 km of the proposal and does not represent a range extension for the species. *Idiosoma kwongan* is described as restricted to the Geraldton Sandplains bioregion, however, it is noted that the species is not restricted to a specific habitat within Kwongan heath, indicating it has the potential to exist within this broad habitat type anywhere within its known range.

The *Bothriembryon perobesus* has been recorded across a range of approximately 290 km from Geraldton to Gingin. The species has been collected from locations surrounding the proposal, with the closest approximately 5 km west (Preston Consulting 2023). The shells of dead *Bothriembryon perobesus* individuals were collected during surveys, indicating its presence within the development envelopes. The species is found in Banksia woodlands and low shrubland, which is locally widespread and connected to habitat outside the development envelopes. The EPA considers the potential impact to this species is low and is not subject to recommended implementation conditions.

Impacts from the proposal	Assessment finding, environmental outcome and recommended conditions

Potential impacts • clearing of 299.1 ha of fauna habitat • fauna mortality or injury due to vehicle and machinery movements • increased feral animal activity • habitat degradation from introduction or spread of weeds and dieback, discharge of slurry spills, hydrocarbon spills, altered fire regimes, reduction of groundwater depth. **Avoidance and minimisation measures** • reducing the disturbance footprints to minimise the extent of habitat clearing required • avoiding the dense riparian thickets (VSA2) fauna habitat type • conducting pre-clearance surveys for Malleefowl • implementing a progressive mining and rehabilitation approach • implementing the Rehabilitation Management Plan • implementing dust suppression measures and weed management and control measures • implementing the Dieback Management Plan • implementing hydrocarbon storage and spill mitigation measures	**Assessment finding and environmental outcomes** <u>Carnaby's black cockatoo</u> The EPA has assessed the likely residual impacts of the proposal on Carnaby's black cockatoo to be the clearing of up to 299.1 ha of moderate to high quality foraging habitat. While the EPA notes that no individuals of Carnaby's black cockatoo were observed during the surveys, the species is considered a regular visitor of the area. No roosting or breeding habitat was identified within the development envelopes, although potential breeding habitat exists in the wider area. The EPA has considered the proponent's efforts to minimise impacts to Carnaby's black cockatoo habitat by reducing the disturbance footprint by 27 % (113.1 ha). The EPA notes the proponent has proposed mitigation and management measures to avoid and reduce potential impacts to Carnaby's cockatoo, including implementing vehicle speed limits and feral animal control. The EPA considers that the implementation of the proposal adds to the cumulative impacts of Carnaby's cockatoo foraging habitat loss in the region and may exacerbate some of the threatening processes as outlined in the Recovery Plan for the species (DPaW 2013). The EPA acknowledges the proponent's slow rate of clearing and mining operations and concurrent progressive rehabilitation approach, outlined in the Rehabilitation Management Plan, to minimise the impacts of fragmentation and loss of habitat. While rehabilitation via VDT is unlikely to be suitable for most of the foraging species for Carnaby's black cockatoo, such as the deep-rooted *Banksia* species, the EPA notes that the proposed rehabilitation also includes seed collection, propagation and infill planting, which will focus on keystone foraging species for Carnaby's black cockatoo (Preston Consulting 2024a).

• implementing vehicle speed limits • undertaking trench inspections • implementing feral animal control measures **DMA regulation** <u>*Mining Act 1978*</u> In accordance with the *Mining Act 1978*, the proponent will be required to ensure the Mine Closure Plan is consistent with the Statutory Guidelines for Mine Closure Plans (DMIRS 2023) which includes requirements for rehabilitation and revegetation of land and closure objectives and criteria, and submit to the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) for approval. **Consultation** Matters raised during stakeholder consultation and the proponent's responses are provided in the Response to Submissions document (Preston Consulting 2024b). Key issues raised during public consultation on the proposal were clearing of fauna habitat, including impacts to significant fauna such as Carnaby's black cockatoo and SRE's, the effectiveness of the proposed rehabilitation method, and the cumulative impacts from this proposal and others in the region. The issues raised about potential impacts to terrestrial fauna have been considered in this assessment. **Cumulative impact**	In assessing the impacts to Carnaby's black cockatoo, the EPA has had regard for the relatively small scale of clearing associated with the proposal within the 12 km expected foraging range of the closest Carnaby's roost and the moderate to high value remnant native vegetation representative of suitable foraging habitat in the local and regional area, including the large area of intact foraging habitat adjacent to the proposal in the same range for Carnaby's foraging habitat from potential roosting/breeding habitat. The EPA has assessed the residual impact to Carnaby's black cockatoo to be significant. This is consistent with the WA Environmental Offsets Guidelines (Government of Western Australia 2014) and EPBC Act Environmental Offsets Policy definition of significant residual impact. The proponent has prepared an Offset Strategy (Preston Consulting 2024c) which outlines the proposed offsets to counterbalance the significant residual impacts of the proposal on this species. The EPA considers that the Offset Strategy requires further revision to meet the criteria of the WA Environmental Offsets Policy and Guidelines to offset the significant residual impacts. Further details on the offset strategy are provided in section 4 of this report. The EPA recommends condition A1 to limit the extent of clearing of native vegetation, condition A2 to implement a staged progressive clearing and rehabilitation approach, condition B2 to limit clearing of Carnaby's black cockatoo foraging habitat and avoid and minimise impacts to terrestrial fauna, condition B4 for rehabilitation and offset condition B5 to counterbalance the significant residual impact to Carnaby' cockatoo foraging habitat, to ensure the environmental outcome is will be consistent with the EPA objective for terrestrial fauna. <u>Malleefowl</u> The proposal will result in the overall disturbance of 299.1 ha of potentially suitable Malleefowl habitat. The proposal is located in an extensive continuous landscape of primarily Kwongan heath, which may provide potential habitat for

The EPA considered the cumulative effects from a range of threats and pressures in the area of the proposal and whether the environment affected by the proposal has significant value. The proponent has assessed the cumulative effects to Carnaby's black cockatoo foraging habitat. The proponent has considered the impacts of the proposal and additional proposals within the context of the Geraldton Sandplains bioregion, within 50 km of the proposal, within the expected foraging range from the proposal and within the expected foraging range from nearby roosts that intersect the proposal using publicly available data (Preston Consulting 2024b). Overall, the proposal is expected to contribute to the cumulative clearing of native vegetation representative of potential Carnaby's foraging habitat by 0.02% to 1%. It is acknowledged that Carnaby's black cockatoo will be affected by cumulative impacts in the region as the species utilises various habitats and flora species for foraging. The EPA has considered the small scale of impact from this proposal, the proposed progressive rehabilitation and offsets, which includes the acquisition and restoration of habitat in the regional context. Given the context of cumulative impacts and pressures on Carnaby's black cockatoo, the EPA considers that replacement of habitat through rehabilitation and offsets are necessary to	Malleefowl, however, the species is known to inhabit a broad range of habitat types. The EPA notes that during the surveys no Malleefowl mounds were recorded, and no evidence of recent activity was observed. Historic records exist for Malleefowl in the wider area, with disused mounds recorded 10 km south, but due to the lack of suitable habitat it is considered a potential irregular visitor (BCE 2022). The EPA notes that the proponent has proposed mitigation and management measures to avoid and reduce potential impacts to Malleefowl, including pre-clearance surveys and implementation of avoidance zones around any identified active Malleefowl mounds. While the proposed extent of clearing of potential habitat is small in relation to available regional habitat, the residual impact to Malleefowl may exacerbate some of the threatening processes including habitat loss and fragmentation from clearing as outlined in the Recovery Plan for the species (DEH 2007). The EPA considers that subject to condition A1 to limit the extent of clearing of native vegetation, condition B2 to avoid and minimise impacts including undertaking pre-clearance surveys and avoidance of direct disturbance within 200 m of active Malleefowl mounds if identified, implementing vehicle speed limits, and condition B4 for rehabilitation, the residual impacts can be managed so that the environmental outcome will be consistent with the EPA objective for terrestrial fauna. *Idiosoma kwongan* Implementation of the proposal will result in the direct impact to one known male individual of *Idiosoma kwongan* (P1) recorded in the mine development envelope and disturbance of 299.1 ha of suitable habitat. This SRE species is known from five records within 17 km of the proposal. The EPA acknowledges that impacts may be considered locally significant given it is likely that other

ensure that the cumulative impacts to habitat loss are counterbalanced. The EPA notes that due to the low likelihood of individuals of Malleefowl occurring within the proposal area, the progressive nature of mining and the presence of suitable habitat available to this species in the surrounding area, the cumulative impacts to Malleefowl are not considered to be significant. The EPA acknowledges there is limited information available regarding the habitat preference and distribution of *Idiosoma kwongan*. The EPA notes that due to the widespread and connected habitat for this species outside the development envelopes, and the progressive nature of clearing while vegetation is being rehabilitated, the cumulative impacts to *Idiosoma kwongan* are not likely to be significant. The EPA acknowledges that the implementation of this proposal will have a cumulative impact on some conservation significant fauna species through displacement and habitat loss. Cumulatively, the impact on terrestrial fauna is considered limited to a small extent in comparison to the native vegetation and suitable fauna habitat remaining in the region.	individuals of *Idiosoma kwongan* may be present within the disturbance footprint. The EPA notes that the species occurs within the southern Geraldton Sandplains region but is not restricted to a specific habitat within the Kwongan heath. The preferred fauna habitat within the development envelope for *Idiosoma kwongan* is locally widespread and connected to habitat outside the development envelope, and therefore it is expected that the species likely occurs outside of the proposal area. The proponent has identified the recorded linear range extension for this species is 83 km with a spatial range of approximately 180,136 ha. The total extent of remaining Kwongan heath within this known range is 126,194 ha, of which 52,884 ha (42%) is mapped as being within DBCA estate (Preston Consulting 2024b). The EPA notes that the proponent has committed to monitor SRE species during the progressive mining and rehabilitation activities. The survivorship of SRE groups such as burrowing mygalomorph spiders is considered unlikely as the depths to which these animals burrow (300 mm to over 500 mm, with some up to 1,000 mm deep) exceed that of the translocated soils through VDT (300 mm to 400 mm) (Bennelongia 2021b). Given the proposal's residual impact to local individuals and/or populations and the limited information available for *Idiosoma kwongan*, the EPA recommends the proponent contributes to a research program with the aim of improving the scientific understanding of the ecology of the species. The EPA considers that subject to condition A1 to limit the extent of clearing of native vegetation, condition A2 to implement a staged progressive clearing and rehabilitation approach, condition B2 to avoid and minimise impacts and develop a research program, and condition B4 for rehabilitation, the residual impacts can be managed so that the environmental outcome will be consistent with the EPA objective for terrestrial fauna.

	Recommended conditions to ensure consistency of environmental objectives with EPA objective **Condition A1** • limitations on extent of the proposal. **Condition A2** • implementation of the proposal in stages. **Condition B2** • disturbance limits to the clearing of habitat that supports Carnaby's black cockatoo • avoidance of fauna habitat type identified as dense riparian thickets • complete targeted pre-clearance surveys for Malleefowl prior to ground disturbing activities • implement 200 m exclusion zones around any active Malleefowl mounds • avoid and minimise adverse impacts and disturbance to native fauna and a long-term increase in feral animal populations • trench inspections and suitable actions • vehicle and machinery speed limits • review and revise the Rehabilitation Management Plan • contribution to a research program to improve knowledge on *Idiosoma kwongan.* **Condition B4** • requirement to rehabilitate the disturbance footprint. **Condition B5** • requirement for an adequate offset to counterbalance the residual impacts to Carnaby's black cockatoo foraging habitat.

2.3 Social surroundings

The EPA environmental objective for social surroundings is *to protect social surroundings from significant harm* (EPA 2023a).

The proponent submitted the following studies and reports to inform the assessment of potential impacts to social surroundings:

- Record of interview with Barry Dodd (Representative of the Amangu People) (appendix 18 of the ERD) (Transcript by VRX Silica Ltd 2021)
- Final report regarding the archaeological and ethnographic, work program clearance heritage survey undertaken over VRX Silica's Arrowsmith North and Arrowsmith Central project areas undertaken by the Southern Yamatji representatives and Yamatji Marlpa Aboriginal Corporation (appendix 24 of the ERD) (Yamatji Marlpa Aboriginal Corporation 2018)
- Final report regarding the archaeological and ethnographic, work area clearance, heritage survey undertaken over VRX Silica Ltd's Arrowsmith North and Arrowsmith Central project areas undertaken by the Amangu representatives of Yamatji Nation and Yamatji Marlpa Aboriginal Corporation (appendix 25 of the ERD) (Yamatji Marlpa Aboriginal Corporation 2020)
- Assessment of Aboriginal Heritage Values and Traditional Uses Arrowsmith North Project – VRX Silica (appendix 26 of the ERD) (Horizon Heritage Management 2021)
- Survey Report: 2021 VRX Silica Arrowsmith North Mine Development Area YSRC Heritage Survey (appendix 27 of the ERD) (Sticks and Stones Cultural Resources Management 2022).

These documents have been used by the EPA as the basis for its assessment. The EPA considers that the proponent has completed the relevant studies to appropriately inform the assessment as required by the ESD. Assessment of the potential impacts has been undertaken in accordance with the Technical Guidance – Environmental impact assessment of Social Surroundings – Aboriginal cultural heritage (EPA 2023a).

Key environmental values and context

The proposal is located within the Midwest region with surrounding land uses comprising dryland agriculture, conservation and crown reserves. The closest sensitive receptor (a residence) is approximately 1.7 km southwest of the proposed haul road and 3.3 km northwest of the processing plant.

The proposal is located within the Yamatji Nation Native Title Claim area (WC 2020/001). No Department of Planning, Lands and Heritage (DPLH) registered Aboriginal Heritage Sites, Other Heritage Places or artefacts were identified within the development envelopes during the desktop assessment or the archaeological and ethnographic surveys. One registered Aboriginal Heritage Site (Arrowsmith River ID 30068) is located adjacent to the southern boundary of the access development envelope. Three Other Heritage Places are within 9.5 km of the proposal with the closest, Arrowsmith Lake, approximately 500 m west of the access development envelope.

Archaeological and ethnographic surveys were conducted across the proposal area in 2018, 2020 and 2021 with representatives of the Yamatji Southern Regional Corporation (YSRC). Landscape features associated with water are considered highly significant to the Yamatji people as they are a source of food

and water, used as camping places and are of cultural importance (Horizon Heritage Management 2021). YSRC representatives advised that Arrowsmith River and Arrowsmith Lake are areas of significance due to the resource (food and water) availability and the connection their ancestors had with the place.

Impacts from the proposal	Assessment finding, environmental outcome and recommended conditions
Potential impacts • potential indirect impact to adjacent Aboriginal Heritage Site (Arrowsmith River) and Other Heritage Places (Arrowsmith Lake) through alteration of hydrological regimes including abstraction of groundwater, the clearing of native vegetation and product haulage • disturbance to vegetation and fauna habitat which may impact on Traditional Owners' use of the land for traditional purposes • noise, dust and light emissions from construction and operations. **Avoidance and minimisation measures** • reducing the development envelopes and disturbance footprints to avoid direct impact on environmental and cultural heritage values • obtaining an Access Agreement with the YSRC • developing and implementing a Cultural Heritage Management Plan in consultation with YSRC to mitigate impacts to cultural heritage values and landscapes • developing and implementing a Ranger Program in consultation with YSRC to encourage participation in land management activities • maintaining Traditional Owners' access to land for traditional uses	**Assessment finding and environmental outcomes** <u>Aboriginal cultural heritage</u> Implementation of the proposal is not expected to directly impact on Aboriginal Heritage sites. The EPA considers the proposal has the potential to indirectly impact Aboriginal heritage sites and cultural values, through changes to environmental attributes such as waterways of the nearby ephemeral Arrowsmith River and Arrowsmith Lake, clearing of native vegetation and product haulage. The proposal may also impact on the availability of land used for traditional purposes such as bush tucker or medicine. The EPA acknowledges that the proponent has taken reasonable steps to consult with the YSRC about the impacts associated with implementation of the proposal, and the EPA has used this information to inform its assessment. The proponent has engaged with the Traditional Owners of the land in relation to potential impacts on areas of cultural and heritage sensitivity and has committed to developing and implementing a Cultural Heritage Management Plan and a Ranger Program in consultation with the YSRC. The EPA notes that the AH Act does not apply to sites outside the impact area (i.e. disturbance footprint) or to indirect impacts. The EPA advises that potential

• ongoing consultation with the YSRC and, if required, obtaining approval under section 18 of the *Aboriginal Heritage Act 1972* (AH Act) prior to the disturbance of any Aboriginal heritage sites • implementation of dust suppression measures • implementation of work measures to minimise noise • implementing the Rehabilitation Management Plan. **DMA regulation** *Aboriginal Heritage Act 1972* Consent is required from the Minister of Aboriginal Affairs to disturb registered Aboriginal sites under the AH Act within areas of the development envelope likely to be directly affected. The EPA notes that the AH Act does not apply to sites outside the disturbance footprint, or to indirect impacts within the development envelope. Part V, Division 3 of the EP Act To manage the emissions and discharges (including noise and dust) during construction and operation of the proposal, the proponent is required to obtain a works approval and licence under Part V of the EP Act. The licence would relate to prescribed activities that may impact on social surroundings such as processing, screening of material and bulk storage of chemicals. *Rights in Water and Irrigation Act 1914* Groundwater allocation and abstraction is regulated by the DWER through permits and licences issued under the RiWI Act, which considers existing land users during its assessment. The proponent has developed a Water Supply Operating Strategy, which will be assessed by the DWER to ensure it adequately addresses agreed water	impacts to Aboriginal cultural heritage should be subject to recommended condition B3 to ensure protection of Aboriginal heritage and ensure the environmental outcome will be consistent with the EPA objective for social surroundings. Amenity The proposal is located approximately 35 km northwest of Eneabba and 35 km southeast of Dongara. Nearby residents may be impacted by noise, dust or light emissions. The main source of noise and light emissions will be the processing plant. The closest sensitive receptors are 1.7 km from the proposal; this is consistent with the EPA Guidance for separation distances for sand and limestone extraction which recommends a buffer of 300 m to 500 m. The EPA notes that during construction, mining and rehabilitation activities, any noise and dust impacts will be localised, and dust suppression measures will be implemented to minimise impacts. The EPA expects the proponent to use best practice noise management to minimise impacts on amenity and comply with the Environmental Protection (Noise) Regulations 1997. The EPA advises that subject to the proposed minimisation measures and regulation by other DMAs, specifically under Part V of the EP Act, which can apply conditions relating to the design and operation of the proposal to manage impacts from dust and noise, the environmental outcome will be consistent with the EPA objective for social surroundings. **Recommended conditions to ensure consistency of environmental objectives with EPA objective**

management objectives and outcomes. The proponent is required to provide sufficient information so an assessment of the environmental, social and economic impacts can be undertaken and ensure there are no adverse impacts on existing users or the environment by the proposed taking of groundwater. The proponent is required to describe the key features of the mitigation, offsets or compensation strategies for unavoidable impacts. **Consultation** Key matters raised during public consultation on the proposal were in relation to Aboriginal cultural heritage values. Matters raised during stakeholder consultation and the proponent's responses are provided in the Response to Submissions document (Preston Consulting 2024b). **Cumulative impact** Native vegetation and fauna are important to the Traditional Owners for cultural uses such as bush tucker and medicine. As outlined in section 2.1 (flora and vegetation) and section 2.2 (terrestrial fauna), the cumulative impact of the proposal on these matters is not expected to be material, and this is anticipated to be consistent for any cumulative impacts on culturally important flora and fauna values.	**Condition A1** • limitations on extent of the proposal. **Condition B3** • no disturbance to Aboriginal cultural heritage unless consent is granted under the AH Act • no interruption of access to land for traditional use and custom • avoidance and minimisation of other adverse impacts to Aboriginal cultural heritage • requires reasonable steps for consultation about achievement of the above, for the life of the proposal.

3 Holistic assessment

While the EPA assessed the impacts of the proposal against the key environmental factors and environmental values individually in the key factor assessments above, given the link between flora and vegetation, terrestrial fauna and social surroundings, the EPA also considered connections and interactions between them to inform a holistic view of impacts to the whole environment.

The EPA's evaluation of other environmental factors (those which were not considered key factors for assessment) is included in Appendix E.

Flora and vegetation – Terrestrial fauna

There is a high level of connectivity between the environmental factors of flora and vegetation and terrestrial fauna. The conservation significant flora and vegetation provides habitat for conservation significant fauna occurring within the proposal area. Minimising the direct and indirect impacts to flora and vegetation will also minimise impacts to conservation significant fauna habitat.

The EPA has considered the proponent's slow rate of clearing, relatively low level of activity during mining operations and progressive rehabilitation approach. The EPA has recommended conditions relating to the staging of the proposal to ensure that it is implemented in such a manner that specifies a maximum area to be cleared and a minimum area to be rehabilitated during each stage and ensures that environmental offsets are in place prior to commencing the stage of mining they are counterbalancing.

The EPA considers that the progressive mining and rehabilitation processes, proposed mitigation and management measures, recommended conditions for residual impacts and provision of offsets to counterbalance the significant residual impacts to terrestrial fauna will also mean the inter-related impacts to the values of other factors of the environment including the values associated with flora and vegetation and terrestrial fauna are likely to be consistent with the EPA environmental factor objectives.

The EPA is aware of the number of other proposals in the wider Midwest region and has considered the proposal in the context of its cumulative impact. The EPA notes that on a bioregional scale, implementation of this proposal would contribute to cumulative impacts through loss of conservation significant flora and fauna habitat. However, the impacts are not to a level that would alter the likely outcomes of any mitigation measure, rehabilitation or offset implemented as part of this proposal.

Social surroundings

There is a direct link between Aboriginal culture and the physical or biological aspects of the environment. Access to land, ability to carry out traditional Aboriginal customs and areas of cultural importance may be impacted through impacts to environmental factors of flora and vegetation, terrestrial fauna and inland waters.

The EPA considers that the proposed mitigation and management measures, recommended conditions and management via other regulatory processes for impacts to flora and vegetation, terrestrial fauna and inland waters will also mean the interrelated impacts to the values of social surroundings will likely be consistent with the EPA environmental factor objectives.

Summary of holistic assessment

When the separate environmental factors and values affected by the proposal were considered together in a holistic assessment, the EPA formed the view that the impacts from the proposal would not alter the EPA's views about consistency with the EPA's factor objectives as assessed in section 2.

4 Offsets

Environmental offsets are actions that provide environmental benefits which counterbalance the significant residual impacts of a proposal.

Consistent with the *WA Environmental Offsets Guidelines* (Government of Western Australia 2014), the EPA may consider the application of environmental offsets to a proposal where it determines that the residual impacts of a proposal are significant, after avoidance, minimisation and rehabilitation have been pursued.

In the case of this proposal, likely (and potential) significant residual impacts are:

- clearing of 299.1 ha of native vegetation that represents moderate to high value foraging habitat for Carnaby's black cockatoo (*Zanda latirostris*).

In considering the residual impacts of the proposal, the EPA has had regard for the proponent's slow rate of clearing and concurrent progressive rehabilitation approach to minimise the fragmentation and loss of habitat.

Environmental offsets are not appropriate in all cases. In this case the EPA considers offsets are appropriate given the proponent has applied avoidance and mitigation measures by amending the proposal during the assessment to avoid or minimise impacts to environmental values (principle 1 of the *WA Environmental Offsets Policy*) and the scale of the significant residual impacts on environmental biodiversity values are not minor (principle 2 of the *WA Environmental Offsets Policy*).

For this proposal, the EPA advises the preferred approach is a combination of land acquisition and on-ground management (including restoration/revegetation), aimed at delivering benefits to the values being impacted across short-, medium- and long-term time scales.

Proposed offsets

The proponent's draft Offset Strategy dated December 2022 was advertised during the public review period. The initial offset proposed included a portion of the proponent's Arrowsmith North mining lease (M 70/1389) that contained native vegetation representative of moderate to high value Carnaby's cockatoo foraging habitat. The proponent stated that they intended to gradually mine the area after completion of this proposal in approximately 30 years. Additionally, DEMIRS advised that the proposed offset site contains a significant supply of silica sand and potentially oil and gas. This proposed offset was therefore not considered appropriate as it did not meet the guiding principles of long term and enduring (principle 6 of the *WA Environmental Offsets Policy*).

A revision to the Offset Strategy dated October 2023 was submitted during the response to submissions (RtS) on the ERD. Further revisions were submitted in May 2024 and September 2024 in response to matters raised during the assessment.

The EPA requested the proponent revise the Offset Strategy to incorporate accurate and reasonable values in the offset metrics and provide additional detail on how the proposed offset will contribute to regional environmental outcomes for the impacted environmental values. The proponent revised the draft Offset Strategy to incorporate comments from regulators, including the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW), DWER, DBCA and DEMIRS (Preston Consulting 2024c).

The proponent has proposed the following offsets to counterbalance the significant residual impacts of the proposal, detailed in the Offset Strategy (Preston Consulting 2024c):

- Land acquisition, conservation (within DBCA estate or via conservation covenant) and management of 958.2 ha of land, located adjacent to Boothendarra Nature Reserve, 57 km northwest of Moora and approximately 100 km from the proposal (Figure 3)
- Restoration of Carnaby's cockatoo foraging habitat within 74 ha of the above offset site that has been previously cleared of native vegetation.
- Future restoration of 88 ha of Carnaby's cockatoo foraging habitat at an additional offset site that has not yet been determined.

The EPA has considered whether the proposed offsets are likely to counterbalance the significant residual impacts. The proponent has identified offsets that are considered suitable, however, there is a residual gap in the required offsets that is yet to be identified (the future restoration site referenced above). While the complete package of offsets could not be finalised as part of the assessment, the EPA considers that a suitable additional offset site can be secured and has recommended conditions that restrict clearing in a staged manner that is dependent on provision of the full offsets package.

While this approach (of an unfinalised environmental offset strategy) is generally not preferred, the EPA has considered that staging of the proposed clearing and rehabilitation will allow the proposal's direct and indirect impacts to be managed, allow for continuous improvement with rehabilitation activities and ensure the offsets will be of best value. In this case it was considered that there is only a small proportion of the offsets which aren't known, a long lead time to the impact, and several streams of work that will add value to the final offsets, which combine to make staging of the proposal and offset appropriate in this case.

The key issues raised during the EPA's assessment of offsets and how they have been considered are described further below.

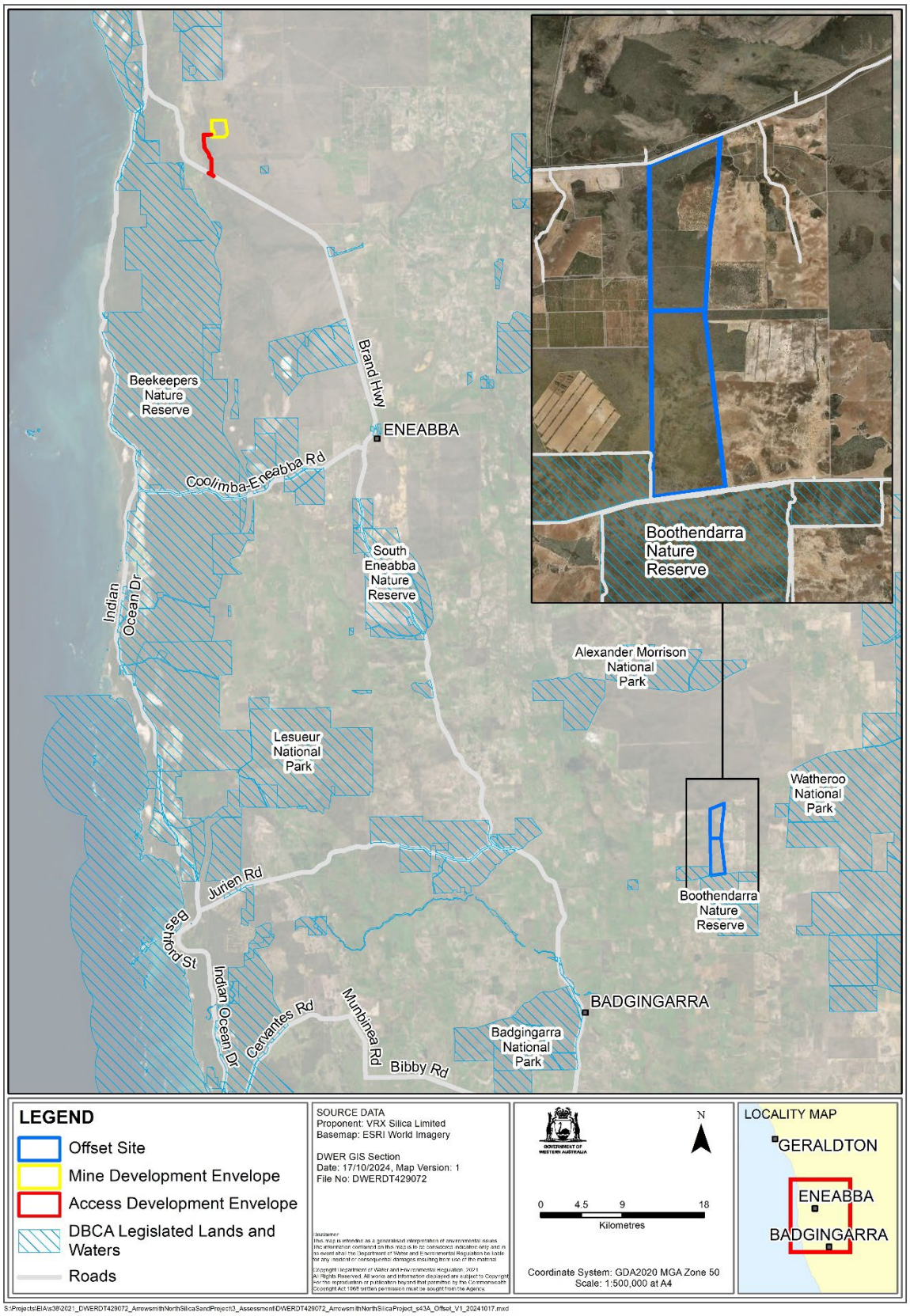

Figure 3: Proposed offset site location

Assessment of proposed offsets

Land acquisition and on-ground management

The proponent is proposing to acquire and manage 958.2 ha of land within two freehold lots near Badgingarra, approximately 100 km south of the proposal. The proposed offset site is located within the Lesueur Sandplain subregion of the Geraldton Sandplains bioregion.

A survey of the offset site (Phoenix 2023) reported that 99% of the site contains high value foraging habitat for Carnaby's black cockatoo, with over 85% comprising Kwongan vegetation (Banksia shrubland) in good to excellent condition. The proposed offset site is reported to have potential value as nesting and roosting habitat with numerous confirmed Carnaby's cockatoo sightings, potential hollow trees and roosting areas nearby (Preston Consulting 2024c).

The EPA notes that the offset site connects to remnant native vegetation associated with Boothendarra Nature Reserve, which is adjacent to the southern boundary, and would provide a significant habitat corridor. There are also several other nature reserves and national parks surrounding the site including Watheroo National Park to the east, Alexander Morrison National Park to the north and Badgingarra National Park to the southwest (Figure 3).

The proponent proposes to protect the environmental values at the site by ceding it to the conservation estate under DBCA management, or if this does not occur, applying a conservation covenant under the *Soil and Land Conservation Act 1945.* The EPA accepts the use of a conservation covenant for the conservation protection applied to the offset site or alternate covenant or protection regime. Management of the offset site is proposed to be undertaken for 20 years, and the proponent will either engage a local land management organisation (such as Traditional Owners), a landcare contractor or provide funds to the DBCA if the offset site(s) are approved for management by DBCA. The EPA expects the proponent to liaise with DBCA to determine if native vegetation adjacent to Boothendarra Nature Reserve could be included within the boundaries of the reserve. This would provide a short-term offset benefit to Carnaby's black cockatoos in the region by protecting this vegetation and habitat from future clearing, in combination with the medium-term benefits of on-ground management including maintenance and improvement of native vegetation, and threat abatement.

The EPA acknowledges the distance of the offset site to the proposal site, and while it is usually preferable to have an offset as close as possible to the impact site, in this case it was considered acceptable given:

- the high value of the offset and its connection to several existing conservation nature reserves
- the moderate to high value remnant native vegetation in the local area, of which the proposal will cumulatively contribute to a relatively minor proportion (0.7%) of the loss of vegetation within a 12 km range of the closest roost, which is the expected foraging range from roosting habitat for Carnaby's. A large area of intact foraging habitat remains adjacent to the proposal and is in the same range

for Carnaby's foraging habitat from potential roosting/breeding habitat, noting there are no known breeding sites nearby, with the closest roosting site approximately 4 km west of the proposal and some roosts 10 km south and 15 km north

- the requirement for an additional restoration offset site closer to the development envelope within the local area to counterbalance the significant residual impact of later stage mining.

The EPA has considered whether the offsets are likely to counterbalance the significant residual impacts for Carnaby's black cockatoo foraging habitat. The EPA's view is that the values of the offset site are relevant to the environmental values being impacted. The survey of the offset site indicates that the properties identified to-date are likely to contain suitable Carnaby's black cockatoo foraging habitat and will partially counterbalance the significant residual impacts. The EPA has recommended specific objectives in condition B5-2 that require that land acquisition and on-ground management offsets provide a positive environmental benefit to Carnaby's black cockatoos.

Restoration

The proponent is proposing to undertake restoration of 74 ha of a cleared portion of the land acquisition offset site to introduce native foraging species for Carnaby's black cockatoo through infill planting and direct seeding. A Rehabilitation Management Plan (Preston Consulting 2024a) has been developed for the proposal in addition to the restoration of cleared land at the offset site and will draw on the learnings from the VDT trials about rehabilitation practices for Kwongan heath vegetation and Banksia species.

The proponent is also proposing to undertake additional restoration of Carnaby's cockatoo foraging habitat at a future offset site that has not yet been identified. The proponent has stated that this offset is for the residual impacts associated with the final few years of mining disturbance (i.e. after year 25) and would be implemented after 10 years of mining operations but prior to the associated clearing to allow experience to be gathered during rehabilitation activities.

The EPA considers that restoration of the 74 ha portion of the proposed land acquisition offset site and restoration of an additional offset site are also required to contribute towards counterbalancing the significant residual impacts to Carnaby's black cockatoo foraging habitat.

The EPA notes that the proposed land acquisition offset site is approximately 100 km from the proposal and local populations of Carnaby's black cockatoo may be directly impacted as a result of the reduction in high value foraging habitat within range. The EPA recommends that the proponent acquires the additional offset site in proximity to the proposal (impact site) to provide a positive environmental benefit to local Carnaby's populations.

The EPA has recommended conditions relating to the staging of the proposal to ensure that it is implemented in accordance with requirements that specify a maximum area that can be cleared, a minimum area for progressive rehabilitation

and environmental offset measures that must be in place for each proposal stage (condition A2). Additionally, the EPA has recommended environmental outcomes and objectives in offsets condition B5-2 that include the requirement to ensure an additional offset area within 50 km of the mine development envelope is secured to provide self-sustaining moderate to high quality foraging habitat for Carnaby's black cockatoos.

EPA public advice: Considering environmental offsets at a regional scale

The proponent has proposed offsets that are consistent with the values set out in the EPA's (March 2024) Public Advice: Considering environmental offsets at a regional scale. The public advice aims to assist proponents and others to identify the guiding values and priorities which should be considered to enable environmental offsets to contribute to environmental protection and enhancement outcomes at regional scales.

The proposed restoration offsets are directly relevant to the guiding value of restoration and have the potential to enhance degraded and restore impacted environmental values.

The proponent has also had regard for recovery plans and has proposed offsets with the aim of managing threatening processes and complementing management of lands outside of the boundary of the environmental offset, thereby providing a degree of regional scale management.

It is noted that the land acquisition offset site is located within the same Lesueur Sandplain subregion of the Geraldton Sandplains bioregion as the proposal, demonstrating connectedness to the physical and ecological function values of those being impacted.

The proposed offsets are likely to provide co-benefits for social surroundings given the potential for improved recreation opportunities in high value areas of conservation significance and provide a contiguous corridor between large areas of native vegetation.

Outcome

In summary, and in considering whether the offsets are likely to counterbalance the significant residual impacts, the EPA has had regard for principles 3, 4 and 6 of the *WA Environmental Offsets Policy*. Given proposals for environmental offsets should be underpinned by sound information and knowledge, should be relevant and proportionate to the significance of the environmental values being impacted, long-term and strategic, the EPA is of the view that the proposed offsets would likely counterbalance the significant residual impacts to the values being impacted.

The EPA acknowledges that while the majority of the offsets have been identified and are considered suitable, there is a residual gap in the required offsets that is yet to be suitably identified. The EPA considers that a suitable offset site can be secured and has recommended conditions that limit the amount of clearing permitted and

amount of rehabilitation required in a staged approach that is dependent on provision of the full offsets package.

The EPA has recommended several environmental outcomes and objectives in condition B5 that the revised Offset Strategy would need to address to ensure significant residual impacts are counterbalanced. Importantly, the EPA's recommended conditions B5-3 and C1-1(2) would require the Offset Strategy to be revised, submitted and approved prior to the commencement of ground disturbing activities that would impact the environmental values required to be offset. Further to this, an Offset Strategy Environmental Management Plan is required to detail proposed on-ground management and completion criteria that would result in tangible environmental benefits to the values being offset.

5 Matters of national environmental significance

The Commonwealth Minister for the Environment has determined that the proposal is a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as it is likely to have a significant impact on one or more Matters of National Environmental Significance (MNES). It was determined that the proposed action is likely to have a significant impact on the following matters protected by the EPBC Act:

- listed threatened species and communities (s. 18 and s. 18A).

The EPA has assessed the controlled action on behalf of the Commonwealth as an accredited assessment under the EPBC Act.

This assessment report is provided to the Commonwealth Minister for Environment who will decide whether or not to approve the proposal under the EPBC Act. This is separate from any Western Australian approval that may be required.

Commonwealth policy and guidance

The EPA had regard to the following relevant Commonwealth guidelines, policies and plans during its assessment:

- *Approved Conservation Advice for* Paracaleana dixonii Hopper & A.P.Br. nom. inval. (Sandplain Duck Orchid) (DoEWHA 2008)
- *Carnaby's Cockatoo* (Calyptorhynchus latirostris) *Recovery Plan* (DPaW 2013)
- *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (DSEWPC 2012)
- *Referral guideline for three WA threatened black cockatoo species: Carnaby's Cockatoo* (Zanda latirostris), *Baudin's Cockatoo* (Zanda baudinii) *and the Forest Red-tailed Black cockatoo* (Calyptorhynchus banksia naso) (DAWE 2022)
- *Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi* (DoEE 2018).

EPA assessment

Impacts to the environment relating to MNES are also covered under the key environmental factors of flora and vegetation (section 2.1) and terrestrial fauna (section 2.2) of this report.

Listed threatened species and communities (sections 18 and 18A)

Listed threatened species and communities and listed migratory species that occur or may occur in the proposal area include:

- Carnaby's black cockatoo (*Zanda latirostris*) – Endangered under the EPBC Act, confirmed
- Malleefowl (*Leipoa ocellata*) – Vulnerable under the EPBC Act, not recorded, potential habitat
- *Paracaleana dixonii* (Sandplain duck orchid) – Endangered under the EPBC Act, not recorded during targeted surveys to date.

No individuals of *Paracaleana dixonii* have been recorded during any of the surveys undertaken thus far. The EPA notes that the proponent has recently undertaken further targeted surveys to cover the entire development envelopes and confirm its presence/absence. The proponent is committed to avoiding impacts to *Paracaleana dixonii* and has developed a contingency plan in the event it is recorded within the disturbance footprint.

The occurrence of the above-listed threatened species is discussed in sections 5, 6 and 12 of the proponent's ERD (Preston Consulting 2023) and in the proponent's response to submissions (Preston Consulting 2024b).

Potential impacts to listed species are primarily a result of clearing of vegetation and habitat loss. The proposal will result in the loss of up to 299.1 ha of native vegetation and fauna habitat. Discussion of these species is provided in sections 2.1 and 2.2 of this report.

Summary

The EPA recommends the following environmental conditions to minimise impacts on MNES:

- condition A1 – limits the location and authorized extent of clearing of native vegetation to 299.1 ha
- condition B1-1(1) – ensures no impact to *Paracaleana dixonii*
- condition B1-2 – requires proponent to undertake pre-clearance surveys for *Paracaleana dixonii*
- condition B1-3 – minimises indirect impacts to flora and vegetation
- condition B2-1 – limits the authorised extent of disturbance of foraging habitat for Carnaby's black cockatoo (*Zanda latirostris*) to 299.1 ha
- condition B2-2 – minimises indirect impacts to terrestrial fauna
- condition B2-3 – requires proponent to undertake pre-clearance surveys for Malleefowl (*Leipoa ocellata*) and where mounds are detected, establish exclusion zones
- condition B2-4 – requires trenches to be constructed in a manner that minimises impacts to fauna
- condition B2-6 – speed limits on vehicle and machinery to minimise impacts to fauna
- condition B4 – requires implementation of rehabilitation activities

- conditions A2 and B5 – requires staged implementation of offsets.

The EPA considers that there will be a significant residual impact from the clearing and disturbance of habitat for Carnaby's black cockatoo (*Zanda latirostris)*. The EPA has recommended an offset in condition B5 (see section 4) which takes into account the significant residual impact due to implementation of the proposal.

The EPA's view is that the impacts from the proposal on the above-listed species are therefore not expected to result in an unacceptable or unsustainable impact on any matters of national environmental significance.

6 Recommendations

The EPA has taken the following into account in its assessment of the proposal:

- environmental values likely to be significantly affected by the proposal
- assessment of key environmental factors, separately and holistically (this has included considering cumulative impacts of the proposal where relevant)
- EPA's confidence in the proponent's proposed mitigation measures
- likely environmental outcomes which can be achieved with the imposition of conditions
- consistency of environmental outcomes with the EPA's objectives for the key environmental factors
- whether other statutory decision-making processes can mitigate the potential impacts of the proposal on the environment and
- principles of the EP Act.

The EPA recommends that the proposal may be implemented subject to the conditions recommended in Appendix A.

7 Other advice

The EPA may, if it sees fit, include other information, advice or recommendations relevant to the environment in its assessment reports, even if that information has not been taken into account by the EPA in its assessment of a proposal.

The EPA provides the following information for consideration by the Minister.

The EPA notes that the following aspects of the proposal can be regulated through Part V of the EP Act:

- licensing of emissions and discharges (including noise, dust, light spill) from prescribed premises
- regulation of spills including chemicals and hydrocarbons.

The DWER administers the *Rights in Water and Irrigation Act 1914* (RiWI Act) that provides for the granting of licences and permits to abstract groundwater and surface water. The EPA notes that abstraction of groundwater from the Yarragadee aquifer required for this proposal can be regulated by the DWER through the RiWI Act.

The DEMIRS administers the *Mining Act 1978* which requires the proponent to provide a Mining Proposal and Mine Closure Plan for rehabilitation and revegetation of land, and regulate ground disturbance, construction and operational activities.

The EPA notes there are several existing and new proposals for mineral sands, silica sand and rare earth mining, and gas extraction and processing in the Midwest region. The EPA considers there is a need for infrastructure planning in the region to avoid increased environmental impacts and habitat fragmentation from clearing for multiple pipelines, haul roads and other infrastructure, as well as planning for offsets to deliver environmental protection at a local and regional scale.

The EPA recommends ongoing consultation between the proponent and Yamatji Southern Regional Corporation as the project progresses and encourages the proponent to seek their input into the proposed Cultural Heritage Management Plan and the Rehabilitation Management Plan. The EPA notes that good practice consultation with relevant Traditional Owners is vital in ensuring that significant impacts to Aboriginal cultural heritage resulting from a proposal are identified, considered early in the proposal design, and mitigated.

Appendix A: Recommended conditions

Section 44(2)(b) of *Environmental Protection Act 1986* specifies that the EPA's report must set out (if it recommends that implementation be allowed) the conditions and procedures, if any, to which implementation should be subject. This appendix contains the EPA's recommended conditions and procedures.

Recommended Environmental Conditions

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED
***(Environmental Protection Act 1986*)**

ARROWSMITH NORTH SILICA SAND PROJECT

Proposal:	The proposal is to develop a silica sand mine approximately 270 km north of Perth. The proposal includes the development of a mine feed plant, moveable surface conveyor, pipeline, processing plant, stockpiles, freshwater supply bore, access corridor, laydown, administration, water storage and associated infrastructure.
Proponent:	VRX Silica Limited Australian Company Number 59 142 014 873
Proponent address:	Ground Floor, 52 Kings Park Road WEST PERTH WA 6005
Assessment number:	2291

Report of the Environmental Protection Authority: 1778

Introduction: Pursuant to section 45 of the *Environmental Protection Act 1986,* it has been agreed that the proposal entitled Arrowsmith North Silica Sand Project described in the 'Proposal Content Document' attachment of the referral of 17 March 2021, as amended by the change to proposal approved under s. 43A on 13 October 2021, 14 June 2022 and 25 October 2024 may be implemented and that the implementation of the proposal is subject to the following implementation conditions and procedures.

Conditions and procedures

Part A: Proposal extent

Part B: Environmental outcomes, prescriptions and objectives

Part C: Environmental management plans and monitoring

Part D: Compliance and other conditions

PART A: PROPOSAL EXTENT

A1 Limitations and Extent of Proposal

A1-1 The proponent must ensure that the proposal is implemented in such a manner that the following limitations or maximum extents / capacities / ranges are not exceeded:

Proposal element	Location	Maximum extent
Physical elements		
Mine development envelope	Figure 2	No more than 292.6 **ha**
Access development envelope	Figure 2	No more than 60.4 **ha**
Disturbance footprint within the **mine development envelope**	Figure 2	No more than 292.6 **ha**
Disturbance footprint within the **access development envelope**	Figure 2	No more than 6.5 **ha**
Direct **disturbance** of native vegetation	Within the development envelopes shown in Figure 2	**Clearing** of no more than 299.1 **ha** of native vegetation in total and no more than 11 **ha** in any one year for **stages** 2, 3 and 4.
Progressive rehabilitation	Within the development envelopes shown in Figure 2	No less than 299.1 **ha**
Operational elements		
Groundwater abstraction	NA	No more than 0.9 **GL/a**
Power supply	NA	Up to 5 **MW** of energy production
Mining within the **mine development envelope**	Figure 2	Mining to occur above the water table only
Timing elements		
Project life	NA	Up to 30 years from commencement of **ground disturbing activities**
Clearing	NA	In accordance with **stages** as set out in condition A2-1

Progressive rehabilitation	NA	In accordance with condition A2-1, to progressively follow mining at a minimum rate of 5 **ha** per year

A2 Proposal Staging

A2-1 The proponent must implement the proposal in the following **stages** and in accordance with the following requirements within the **disturbance** footprints as identified in condition A1-1:

Table 1: Proposal stages

Proposal Stage	Year	Maximum area cleared	Minimum area for progressive rehabilitation
Stage 1	1	17 **ha**	NA
Stage 2	2-10	65 **ha**	65 **ha**
Stage 3	11-20	108 **ha**	108 **ha**
Stage 4	21-30	109.1 **ha**	109.1 **ha**
Stage 5 (Closure)	31-33	NA	17 **ha**

A2-2 The proponent must not undertake **clearing** of more than 11 **ha** in any year during **stages** 2, 3 and 4 of the proposal.

A2-3 The proponent must implement the following offset measures and achieve the minimum offset amount for each proposal **stage**:

Table 2: Staging of offset measures

Stage and maximum amount of clearing	Offset measure to be undertaken during stage	Minimum offset amount
Stages 1 and 2 – 82 **ha** of **clearing**	**Land acquisition** of the **Offset Conservation Area** identified in condition B5-2(2)	958.2 **ha**
	Restoration and **on-ground management** of the **Offset Conservation Area** identified in condition B5-2(2)	74 **ha**
Stage 3 – 108 **ha** of **clearing**	**Land acquisition**, restoration and **on-ground management** of the **Offset Conservation Area** identified in condition B5-2(3)	64 **ha**
Stages 4 and 5 – 109.1 **ha** of **clearing**	Ongoing **on-ground management** of all **Offset Conservation Areas** as required per completion	NA

	criteria in the Offset Strategy Environmental Management Plan	

A2-4 Within one (1) month of commencing **ground disturbing activities** the proponent must give notice in writing to the **CEO** specifying the date on which **ground disturbing activities** commenced.

A2-5 Within six (6) months after the end of each proposal **stage**, the proponent must provide a report to the **CEO** for the purpose of determining whether the proponent has:

(1) complied with the maximum area **cleared** limits and **progressive rehabilitation** requirements for the specific proposal **stage** set out in Table 1 under condition A2-1; and

(1) undertaken the offset measures set out in Table 2 under condition A2-3 for that **stage**.

A2-6 For **stages** 3, 4 and 5, the proponent may only implement the proposal **stage** after receiving notice in writing from the **CEO** confirming that the proponent has completed the offset measures required for the previous implementation **stage** in accordance with condition A2-3.

PART B – ENVIRONMENTAL OUTCOMES, PRESCRIPTIONS AND OBJECTIVES

B1 Flora and Vegetation

B1-1 The proponent must ensure the implementation of the proposal achieves the following environmental **outcomes**:

(1) no impact to any identified *Paracaleana dixonii* within the **mine** or **access development envelopes**;

(2) **disturb** no more than the **known populations** of priority flora species as described in Table 3:

Table 3: Disturbance of known priority flora records

Species	Disturbance
Schoenus sp. Eneabba (F. Obbens & C. Godden I154) (Priority 2)	Up to 167 individuals
Comesperma rhadinocarpum (Priority 3)	Up to 10 individuals
Hemiandra sp. Eneabba (H. Demarz 3687) (Priority 3)	Up to 60 individuals
Banksia elegans (Priority 4)	Up to 1,068 individuals
Stawellia dimorphantha (Priority 4)	Up to 83 individuals

B1-2 Prior to **ground disturbing activities**, the proponent must undertake the following actions:

(1) complete targeted surveys for *Paracaleana dixonii* in accordance with **flora and vegetation technical guidance** to confirm the presence of the species and, if present, the number of plants within the disturbance footprints;

(2) where individuals of *Paracaleana dixonii* are recorded under condition B1-2(1), **ground disturbing activities** shall not commence until a one hundred (100) metre **exclusion zone** is established around the identified individuals or other measures are in place to ensure the individuals are likely to remain part of a sustainable population; and

(3) submit the findings of the surveys and measures required under condition B1-2(1) in the form of a report to the **CEO** for confirmation that conditions B1-2(1) and B1-2(2) are satisfied.

B1-3 The proponent must ensure the implementation of the proposal achieves the following environmental **objectives**:

(1) avoid, where practicable, or otherwise minimise indirect impacts to native vegetation, including threatened flora and priority flora, from **dust**

emissions, spread of **environmental weeds** or dieback, slurry spills, fire, altered hydrological regimes and contamination; and

(2) no **adverse impacts** to flora and vegetation occurring directly adjacent to the **disturbance** footprints.

B1-4 The proponent must implement management and contingency measures to ensure the **objectives** for indirect impacts in condition B1-3 are achieved during construction activities and operations to prevent the introduction or spread of **environmental weeds** in the development envelopes and in surrounding areas as a result of the proposal.

B1-5 The proponent must include, in any Mining Proposal and Mine Closure Plan required under the *Mining Act 1978* and licence application required under the *Rights in Water and Irrigation Act 1914*, measurable environmental **outcomes** and management measures with the **objective** to maintain hydrological regimes and the quality and quantity of groundwater and surface water.

B1-6 The proponent must review and revise the Arrowsmith North Silica Sand Project Phytophthora Dieback Management Plan (Version 1.0, September 2022) environmental management plan with the purpose of ensuring the flora and vegetation environmental **objectives** in condition B1-3 are achieved.

B1-7 The proponent shall prepare a research program (environmental management plan) for *Schoenus* sp. Eneabba (F. Obbens & C. Godden I154), *Comesperma rhadinocarpum*, *Hemiandra* sp. Eneabba (H. Demarz 3687), *Banksia elegans* and *Stawellia dimorphantha* within twelve (12) months of implementation of the proposal. The research program should:

(1) identify the **objectives** and intended **outcomes**, including:

(a) to contribute to research on ecological restoration of the priority flora identified in this condition B1-7 to enable them to be introduced into the development envelopes; and

(b) to address priority knowledge gaps for the improvement of on-ground management and protection of the priority flora identified in this condition B1-7 to achieve a positive conservation outcome.

(2) specify the deliverables and completion criteria relevant to the **outcomes** and **objectives** in condition B1-7(1);

(3) identify how the research will result in a positive conservation **outcome** and will address knowledge gaps that have been identified as a research priority needed to improve the management and protection for the species;

(4) provide an implementation and reporting schedule, including an outline of key activities, all deliverables, stages of implementation, reporting of research results (including interim results), reporting on implementation status, and milestones towards completion criteria;

(5) identify the governance arrangements including responsibilities for implementing, and oversight of, the research program, agreements with government agencies, agreements with any third parties, and **contingency measures**;

(6) identify how a research program summary, and the results (including interim results) of the research program will be communicated and/or published in an open access format; and

(7) identify the third party to carry out the work required to meet the **outcomes** of condition B1-6(1), who is satisfactory for the role to the **CEO**. In applying to the **CEO** for endorsement of the selected third parties, the proponent shall provide:

(a) demonstration of the track record, experience, qualifications and competencies of the proposed third party to carry out the work and achieve the **outcomes**.

B2 Terrestrial Fauna

B2-1 The proponent must ensure the implementation of the proposal achieves the following environmental **outcomes**:

(1) **disturb** no more than 299.1 **ha** of foraging habitat for Carnaby's black cockatoo (*Zanda latirostris*); and

(2) avoid fauna habitat type identified as **dense riparian thickets.**

B2-2 The proponent must ensure the implementation of the proposal achieves the following environmental **objectives**:

(1) avoid, where practicable, or otherwise minimise the risk of physical injury or mortality from **construction** or **operation activities** on native fauna;

(2) minimise the risk of **adverse impacts** including behavioural changes and health impacts from **construction** or **operation activities** on native fauna; and

(3) ensure there is no ongoing increase in population of introduced or feral fauna species.

B2-3 Prior to **ground disturbing activities**, the proponent must undertake the following actions:

(1) within seven (7) days prior to **clearing**, using a licensed **fauna spotter**, undertake **pre-clearance surveys** to detect presence of:

(a) Malleefowl (*Leipoa ocellata*) individuals or mounds within the **mine** and **access development envelopes**; and

(2) where individuals in B2-3(1) are identified, **ground disturbing activities** shall not commence until either:

(b) the individual has been relocated by a licensed **fauna handler**; or

(c) the individual has been observed by the **fauna spotter** to have moved on from the area to adjoining suitable habitat.

(3) where **active Malleefowl (*Leipoa ocellata*) mounds** are detected under condition B2-3(1), **ground disturbing activities** shall not commence until a two hundred (200) metre exclusion zone is implemented around the active mound and other measures are in place to ensure the active mounds are likely to remain part of a sustainable population.

B2-4 During **ground disturbing activities**, the proponent must undertake the following actions:

(1) visually inspect open trenches for the presence of vertebrate fauna and, where required, remove trapped vertebrate fauna from within open **trenches**, using a suitably trained or licensed **fauna handler**:

(a) at least twice daily, with the first daily clearing to be completed no later than three (3) hours after sunrise and the second clearing to be completed between the hours of 3:00 pm and 6:00 pm of that same day, unless otherwise agreed to by the **CEO**; and

(b) within one (1) hour prior to backfilling of **trenches.**

(2) ensure open **trench** lengths shall not exceed a length capable of being inspected and cleared by the requirements set out in condition B2-4(1);

(3) ensure ramps providing egress points and/or fauna refuges providing suitable shelter from the sun and predators for trapped vertebrate fauna are to be placed in the **trench** at intervals not exceeding fifty (50) metres;

(4) in the event of substantial rainfall, and following the clearing of vertebrate fauna from the **trench**, pump out any pooled water in the open **trench** and discharge it to adjacent vegetated areas in a manner that does not cause erosion;

B2-5 The proponent shall produce and provide a report on fauna management no later than sixty (60) days after the completion of **ground disturbing activities** to the **CEO**. The report shall include the following:

(1) details of fauna inspections;

(2) the number and type of fauna cleared from **trenches** and actions taken;

(3) **fauna spotter/fauna handler** details;

(4) results of **pre-clearance surveys**;

(5) measures that were implemented to minimise impacts on significant fauna, if the surveys required by condition B2-3 record significant fauna; and

(6) vertebrate fauna mortalities.

B2-6 During operations, vehicle and machinery speed limits must not exceed:

(1) 60 **km/hr** on all unsealed roads; and

(2) 40 **km/hr** on unsealed or gravel roads and within one (1) kilometre of an **active Malleefowl (*Leipoa ocellata*) mound** identified by a licenced **fauna spotter** within the **mine** or **access development envelopes**.

B2-7 The proponent must review and revise the Rehabilitation Management Plan (Version 2, VRX-ARN-RMP-03, 20 September 2024) environmental management plan so that it satisfies the requirements of condition C4-1 and condition C5-1 and demonstrates the terrestrial fauna environmental **outcomes** in condition B2-1 and environmental **objectives** in condition B2-2 are achieved, and submit it to the **CEO**.

B2-8 The proponent shall prepare a research program (environmental management plan) for *Idiosoma kwongan* within twelve (12) months of implementation of the proposal. The research program should:

(1) identify the **objectives** and intended **outcomes**, including to address priority knowledge gaps for the improvement of on-ground management and protection of *Idiosoma kwongan* to achieve a positive conservation outcome;

(2) specify the deliverables and completion criteria relevant to the **outcomes** and **objectives** in condition B2-8(1);

(3) identify how the research will result in a positive conservation **outcome** and will address knowledge gaps that have been identified as a research priority needed to improve the management and protection for the species;

(4) provide an implementation and reporting schedule, including an outline of key activities, all deliverables, stages of implementation, reporting of research results (including interim results), reporting on implementation status, and milestones towards completion criteria;

(5) identify the governance arrangements including responsibilities for implementing, and oversight of, the research program, agreements with government agencies, agreements with any third parties, and **contingency measures**;

(6) identify how a research program summary, and the results (including interim results) of the research program will be communicated and/or published in an open access format; and

(7) identify the third party to carry out the work required to meet the **outcomes** of condition B2-8(1), who is satisfactory for the role to the **CEO**. In applying to the **CEO** for endorsement of the selected third parties, the proponent shall provide:

(a) demonstration of the track record, experience, qualifications and competencies of the proposed third party to carry out the work and achieve the **outcomes**.

B3 Social Surroundings – Aboriginal Heritage

B3-1 The proponent must implement the proposal to meet the following environmental **outcomes**:

(1) no **disturbance** to **Aboriginal cultural heritage**, unless consent is granted to disturb that site under the *Aboriginal Heritage Act 1972*.

(2) subject to reasonable health and safety requirements, no interruption of ongoing access to land utilised for traditional use or custom by the **relevant Traditional Owners**.

B3-2 The proponent must implement the proposal to meet the following environmental **objective**:

(1) avoid, where practicable, and otherwise minimise **adverse impacts** to **Aboriginal cultural heritage**.

B3-3 The proponent must take reasonable steps to consult with **relevant Traditional Owners** about the achievement of the **outcomes** in condition B3-1 and **objectives** in condition B3-2 for the life of the proposal.

B3-4 The proponent must take reasonable steps to consult with **relevant Traditional Owners** about the Rehabilitation Management Plan required under condition B4-2.

B4 Rehabilitation

B4-1 The proponent must implement the proposal to ensure the following environmental **outcomes** are achieved:

(1) all **cleared** areas, with the exception of 14.5 **ha** which will remain **cleared** for permanent infrastructure for the life of the proposal, are to be **progressively rehabilitated** in accordance with the timing for each proposal **stage** set out in condition A2-1;

(2) rehabilitated vegetation is **self-sustaining,** including not **adversely impacted** by **environmental weeds**, dieback, increases in feral predation, hydrological changes or contamination;

(3) rehabilitated areas are consistent with the species diversity and abundance of native vegetation within comparative analogue or reference sites;

(4) rehabilitation includes the use of native seeds and propagated material collected from native vegetation within the **disturbance** footprints;

(5) rehabilitated landforms are stable and do not cause pollution or **environmental harm**;

(6) rehabilitated drainage lines are stable, not prone to erosion, and support ecological processes;

(7) rehabilitated areas achieve the **rehabilitation completion criteria** for impacted environmental values including Carnaby's black cockatoo (*Zanda latirostris*) and priority flora; and

(8) closure planning and rehabilitation are undertaken in a progressive manner consistent with achievement of the above **outcomes** during **operational activities**, where practicable, and as soon as practicable upon closure.

B4-2 The proponent must review and revise the Rehabilitation Management Plan (Version 2, VRX-ARN-RMP-03, 20 September 2024) environmental management plan that demonstrates how achievement of the environmental **outcomes** in condition B4-1 will be monitored, achieved and substantiated, and satisfies the requirements of condition C4. The Rehabilitation Management Plan can be prepared as an addendum or incorporated into the Mine Closure Plan required under the *Mining Act 1978* to be submitted for approval to the Department of Energy, Mines, Industry Regulation and Safety.

B4-3 The proponent must include the environmental **outcomes** of condition B4-1 in the Mine Closure Plan required under the *Mining Act 1978* and submitted for approval to the Department of Energy, Mines, Industry Regulation and Safety.

B5 Environmental Offsets

B5-1 The proponent must implement offsets to counterbalance the significant residual impacts of the proposal on the following **environmental values**:

(1) Carnaby's black cockatoo (*Zanda latirostris*) **foraging habitat**.

B5-2 The proponent must ensure the implementation of the offsets achieves the following environmental **outcomes** and **objectives**:

(1) counterbalance the significant residual impacts to the **environmental values** identified in condition B5-1;

(2) prior to the commencement of **stage** 2, **land acquisition** of an **Offset Conservation Area;**

(3) prior to the commencement of **stage** 3, **land acquisition** of an additional **Offset Conservation Area** within fifty (50) kilometres of the **mine development envelope**;

(4) **on-ground management** offsets including threat abatement, **revegetation** and/or restoration activities within the **Offset Conservation Areas** to achieve a positive environmental benefit and provide **self-sustaining** moderate to high quality **foraging habitat** for Carnaby's black cockatoo (*Zanda latirostris*);

(5) maintain and improve where practicable the resilience of Carnaby's black cockatoo (*Zanda latirostris*) **foraging habitat** in the **Offset Conservation Areas**;

(6) environmental offsets are in place prior to commencement of the proposal **stage** they counterbalance; and

(7) achievement of the minimum offset amount during each proposal **stage** identified in Table 2 under condition A2-3.

Offset Strategy (Environmental Management Plan)

B5-3 The proponent must, in consultation with the Department of Biodiversity, Conservation and Attractions, review and revise the Offset Strategy Environmental Management Plan (Version 2, VRX-ARN-OFF-02, 20 September 2024) so that it demonstrates how the environmental **outcomes** and **objectives** in condition B5-2 will be achieved, and how this achievement will be substantiated, and submit it to the **CEO**.

B5-4 The Offset Strategy (Environmental Management Plan) must:

(1) demonstrate that the environmental **outcomes** and **objectives** in condition B5-2 will be met;

(2) have regard to the **conservation advice**, **recovery plans** and **threat abatement plans** relevant to the species in condition B5-1;

(3) spatially identify the **Offset Conservation Areas** to be **acquired** in accordance with condition B5-2(2) with **on-ground management** and/or for **on-ground management**, that contains the environmental values identified in condition B5-1;

(4) demonstrate how the **environmental values** within the **Offset Conservation Areas** will be maintained, improved and/or managed in order to counterbalance the significant residual impact to the **environmental values** in condition B5-1 and achieve the environmental **outcomes** and **objectives** in condition B5-2;

(5) demonstrate application of the principles of the WA Environmental Offsets Policy, the *WA Environmental Offsets Metric* and the WA Offsets Template, as described in the *WA Environmental Offsets Guidelines,* and the *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy Assessment Guide*, or any subsequent revisions of these documents;

(6) identify how the ongoing performance of the offset measures, and whether they are achieving the **outcomes** and **objectives** in condition B5-2, will periodically be made publicly available;

(7) identify how the **Offset Conservation Areas** will be protected, being either the sites are ceded to the Crown for the purpose of management for conservation, or the sites are managed under other suitable mechanism for the purpose of conservation as agreed by the **CEO** by notice in writing;

(8) for offsets **acquired** specify:

  (a) a timeframe and works associated with establishing the **Offset Conservation Areas**, including a contribution for maintaining the offset for at least twenty (20) years after completion of purchase; and

  (b) identify the **relevant management body** for the on-going management of the **Offset Conservation Areas**, including its role, and the role of the proponent, and confirmation in writing that the **relevant management body** accepts responsibility for its role.

(9) where **on-ground management** is proposed:

  (a) state the targets for each **environmental value** to be achieved by **on-ground management**, including completion criteria, which will

result in a **tangible improvement** to the **environmental values** listed in condition B5-1.

For **revegetation** offsets, this must include, but not be limited to:

(i) quantity of Carnaby's black cockatoo (*Zanda latirostris*) **foraging habitat** to be achieved;

(ii) completion criteria to measure (at a minimum) foraging habitat value, vegetation structure, species diversity and abundance, plant density and vegetation condition that is to be achieved to provide high-quality Carnaby's black cockatoo **foraging habitat**;

(iii) criteria to measure and demonstrate the **revegetation** is **self-sustaining**; and

(iv) adaptive management to ensure successful **revegetation**.

(b) demonstrate the consistency of the targets with the environmental **outcomes** and **objectives** in condition B5-2 and the objectives of any relevant guidance, including but not limited to, recovery plans or area management plans;

(c) detail the **on-ground management** actions, with associated timeframes for implementation and completion, to achieve the targets identified in condition B5-5(9)(a); and

(d) detail the monitoring, reporting and evaluation mechanisms for the targets and actions identified under condition B5-4(9)(a) and condition B5-4(9)(c).

(10) Upon identification of a suitable **Offset Conservation Area** required under condition B5-2(3), the proponent must revise and resubmit to the **CEO** under condition C2-2 a copy of the Offset Strategy (Environmental Management Plan) that spatially identifies the proposed **Offset Conservation Area** to be **acquired** for **on-ground management** that contains the **environmental values** identified in condition B5-1.

Contingency offsets

B5-5 If, after receiving the ongoing performance review of the offsets and monitoring, reporting and evaluation required by condition B5-4(9)(d), the **CEO** in consultation with the Department of Climate Change, Energy, the Environment and Water, determines that the proposal has not met the environmental **outcomes** and **objectives** in condition B5-2, and after notifying the proponent in writing, the proponent must undertake an additional offset to counterbalance the significant residual impact from the additional impact to Carnaby's black cockatoo (*Zanda latirostris*).

B5-6 Within twelve (12) months of receiving notice in writing from the **CEO** that an additional offset is required under condition B5-5 the proponent must update the Offset Strategy Environmental Management Plan required by condition B5-3 to include additional offsets to counterbalance the significant residual impacts to Carnaby's black cockatoo (*Zanda latirostris)*.

PART C – ENVIRONMENTAL MANAGEMENT PLANS AND MONITORING

C1 Environmental Management Plans: Conditions Related to Commencement of Implementation of the Proposal

C1-1 The proponent must:

(1) not undertake **ground disturbing activities** until the **CEO** has confirmed in writing that the environmental management plan required by condition B1-6, condition B2-7 and condition B4-2 meets the requirements of those conditions and conditions C4 and C5;

(2) not undertake **ground disturbing activities** until the **CEO** has confirmed in writing that the Offset Strategy (Environmental Management Plan) required by condition B5-3 meets the requirements of that condition; and

(3) submit the research programs (environmental management plans) required by condition B1-7 and condition B2-8 within twelve (12) months of implementation of the proposal and be confirmed by the **CEO**, in consultation with the Department of Biodiversity, Conservation and Attractions, in writing that they meet the requirements of those conditions.

C2 Environmental Management Plans: Conditions Relating to Approval, Implementation, Review and Publication

C2-1 Upon being required to implement an environmental management plan under Part B, or after receiving notice in writing from the **CEO** under condition C1-1 that the environmental management plan(s) required in Part B satisfies the relevant requirements, the proponent must:

(1) implement the most recent version of the **confirmed** environmental management plan; and

(2) continue to implement the **confirmed** environmental management plan referred to in condition C2-1(1), other than for any period which the **CEO** confirms by notice in writing that it has been demonstrated that the relevant requirements for the environmental management plan have been met, or are able to be met under another statutory decision-making process, in which case the implementation of the environmental management plan is no longer required for that period.

C2-2 The proponent:

(1) may review and revise a **confirmed** environmental management plan provided it meets the relevant requirements of that environmental management plan, including any consultation that may be required when preparing the environmental management plan;

(2) must review and revise a **confirmed** environmental management plan and ensure it meets the relevant requirements of that environmental management plan, including any consultation that may be required when preparing the environmental management plan, as and when directed by the **CEO;** and

(3) must revise and submit to the **CEO** the **confirmed** Environmental Management Plan if there is a material risk that the outcomes or objectives it is required to achieve will not be complied with, including but not limited to as a result of a change to the proposal.

C2-3 Despite condition C2-1, but subject to conditions C2-4 and C2-5, the proponent may implement minor revisions to an environmental management plan if the revisions will not result in new or increased **adverse impacts** to the environment or result in a risk to the achievement of the limits, outcomes or objectives which the environmental management plan is required to achieve.

C2-4 If the proponent is to implement minor revisions to an environmental management plan under condition C2-3, the proponent must provide the **CEO** with the following at least twenty (20) business days before it implements the revisions:

(1) the revised environmental management plan clearly showing the minor revisions;

(2) an explanation of and justification for the minor revisions; and

(3) an explanation of why the minor revisions will not result in new or increased **adverse impacts** to the environment or result in a risk to the achievement of the limits, outcomes or objectives which the environmental management plan is required to achieve.

C2-5 The proponent must cease to implement any revisions which the **CEO** notifies the proponent (at any time) in writing may not be implemented.

C2-6 **Confirmed** environmental management plans, and any revised environmental management plans under condition C2-4(1), must be published on the proponent's website and provided to the **CEO** in electronic form suitable for on-line publication by the Department of Water and Environmental Regulation within twenty (20) business days of being implemented, or being required to be implemented (whichever is earlier).

C3 Conditions Related to Monitoring

C3-1 The proponent must undertake monitoring capable of:

(1) substantiating whether the proposal limitations and extents in Part A are exceeded; and

(2) **detecting** and substantiating whether the environmental outcomes identified in Part B are achieved (excluding any environmental outcomes in Part B where an environmental management plan is expressly required to monitor achievement of that outcome).

C3-2 The proponent must submit as part of the Compliance Assessment Report required by condition D2, a compliance monitoring report that:

(1) outlines the monitoring that was undertaken during the implementation of the proposal;

(2) identifies why the monitoring was capable of substantiating whether the proposal limitation and extents in Part A are exceeded;

(3) for any environmental outcomes to which condition C3-1(2) applies, identifies why the monitoring was scientifically robust and capable of **detecting** whether the environmental outcomes in Part B are met;

(4) outlines the results of the monitoring;

(5) reports whether the proposal limitations and extents in Part A were exceeded and (for any environmental outcomes to which condition C3-1 (2) applies) whether the environmental outcomes in Part B were achieved, based on analysis of the results of the monitoring; and

(6) reports any actions taken by the proponent to remediate any potential non-compliance.

C4 Environmental Management Plans: Conditions Relating to Monitoring and Adaptive Management for Outcomes Based Conditions

C4-1 The environmental management plans required under condition B2-7, condition B4-2 and condition B5-3 must contain provisions which enable the substantiation of whether the relevant outcomes of those conditions are met, and must include:

(1) **threshold criteria** that provide a limit beyond which the environmental outcomes are not achieved;

(2) **trigger criteria** that will provide an early warning that the environmental outcomes are not likely to be met;

(3) monitoring parameters, sites, control/reference sites, methodology, timing and frequencies which will be used to measure **threshold criteria** and **trigger criteria**. Include methodology for determining alternate monitoring sites as a contingency if proposed sites are not suitable in the future;

(4) baseline data;

(5) data collection and analysis methodologies;

(6) adaptive management methodology;

(7) **contingency measures** which will be implemented if **threshold criteria** or **trigger criteria** are not met; and

(8) reporting requirements.

C4-2 Without limiting condition C3-1, failure to achieve an environmental outcome, or the exceedance of a **threshold criteria**, regardless of whether threshold **contingency measures** have been or are being implemented, represents a non-compliance with these conditions.

C5 Environmental Management Plans: Conditions Related to Management Actions and Targets for Objective Based Conditions

C5-1 The environmental management plans required under condition B1-6, condition B2-7, condition B4-2 and condition B5-3 must contain provisions which enable the achievement of the relevant objectives of those conditions and substantiation of whether the objectives are reasonably likely to be met, and must include:

(1) **management actions**;

(2) **management targets**;

(3) **contingency measures** if **management targets** are not met; and

(4) reporting requirements.

C5-2 Without limiting condition C2-1, the failure to achieve an environmental objective, or implement a **management action**, regardless of whether **contingency measures** have been or are being implemented, represents a non-compliance with these conditions.

PART D – COMPLIANCE, TIME LIMITS, AUDITS AND OTHER CONDITIONS

D1 Non-compliance Reporting

D1-1 If the proponent becomes aware of a potential non-compliance, the proponent must:

(1) report this to the **CEO** within seven (7) days;

(2) implement **contingency measures**;

(3) investigate the cause;

(4) investigate environmental impacts;

(5) advise rectification measures to be implemented;

(6) advise any other measures to be implemented to ensure no further impact;

(7) advise timeframe in which contingency, rectification and other measures have and/or will be implemented; and

(8) provide a report to the **CEO** within twenty-one (21) days of being aware of the potential non-compliance, detailing the measures required in conditions D1-1(1) to D1-1(7) above.

D1-2 Failure to comply with the requirements of a condition, or with the content of an environmental management plan required under a condition, constitutes a non-compliance with these conditions, regardless of whether the **contingency measures**, rectification or other measures in condition D1-1 above have been or are being implemented.

D2 Compliance Reporting

D2-1 The proponent must provide an annual Compliance Assessment Report to the **CEO** for the purpose of determining whether the implementation conditions are being complied with.

D2-2 Unless a different date or frequency is approved by the **CEO**, the first annual Compliance Assessment Report must be submitted within fifteen (15) months of the date of this Statement, and subsequent reports must be submitted annually from that date.

D2-3 Each annual Compliance Assessment Report must be endorsed by the proponent's Chief Executive Officer, or a person approved by proponent's Chief Executive Officer to be delegated to sign on the Chief Executive Officer's behalf.

D2-4 Each annual Compliance Assessment Report must:

(1) state whether each condition of this Statement has been complied with, including:

(a) exceedance of any proposal limits and extents;

(b) achievement of environmental **outcomes**;

(c) achievement of environmental **objectives**;

(d) requirements to implement the content of environmental management plans;

(e) monitoring requirements;

(f) implement **contingency measures**;

(g) requirements to implement adaptive management; and

(h) reporting requirements.

(2) include the results of any monitoring (inclusive of any raw data) that has been required under Part C in order to demonstrate that the limits in Part A, and any outcomes or any objectives are being met;

(3) provide evidence to substantiate statements of compliance, or details of where there has been a non-compliance;

(4) include the corrective, remedial and preventative actions taken in response to any potential non-compliance;

(5) be provided in a form suitable for publication on the proponent's website and online by the Department of Water and Environmental Regulation; and

(6) be prepared and published consistent with the latest version of the Compliance Assessment Plan required by condition D2-5 which the **CEO** has confirmed by notice in writing satisfies the relevant requirements of Part C and Part D.

D2-5 The proponent must prepare a Compliance Assessment Plan which is submitted to the **CEO** at least six (6) months prior to the first Compliance Assessment Report required by condition D2-2, or prior to implementation of the proposal, whichever is sooner.

D2-6 The Compliance Assessment Plan must include:

(1) what, when and how information will be collected and recorded to assess compliance;

(2) the methods which will be used to assess compliance;

(3) the methods which will be used to validate the adequacy of the compliance assessment to determine whether the implementation conditions are being complied with;

(4) the retention of compliance assessments;

(5) the table of contents of Compliance Assessment Reports, including audit tables; and

(6) how and when Compliance Assessment Reports will be made publicly available, including usually being published on the proponent's website within sixty (60) days of being provided to the **CEO**.

D3 Contact Details

D3-1 The proponent must notify the **CEO** of any change of its name, physical address or postal address for the serving of notices or other correspondence within twenty-eight (28) days of such change. Where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State.

D4 Time Limit for Proposal Implementation

D4-1 The proposal must be substantially commenced within five (5) years from the date of this Statement.

D4-2 The proponent must provide to the **CEO** documentary evidence demonstrating that they have complied with condition D4-1 no later than fourteen (14) days after the expiration of period specified in condition D4-1.

D4-3 If the proposal has not been substantially commenced within the period specified in condition D4-1, implementation of the proposal must not be commenced or continued after the expiration of that period.

D5 Public Availability of Data

D5-1 Subject to condition D5-2, within a reasonable time period approved by the **CEO** upon the issue of this Statement and for the remainder of the life of the proposal, the proponent must make publicly available, in a manner approved by the **CEO**, all validated environmental data collected before and after the date of this Statement relevant to the proposal (including sampling design, sampling methodologies, monitoring and other empirical data and derived information products (e.g. maps)), environmental management plans and reports relevant to the assessment of this proposal and implementation of this Statement.

D5-2 If:

(1) any data referred to in condition D5-1 contains trade secrets; or

(2) any data referred to in condition D5-1 contains particulars of confidential information (other than trade secrets) that has commercial value to a person that would be, or could reasonably be expected to be, destroyed or diminished if the confidential information were published,

the proponent may submit a request for approval from the **CEO** to not make this data publicly available and the **CEO** may agree to such a request if the **CEO** is satisfied that the data meets the above criteria.

D5-3 In making such a request the proponent must provide the **CEO** with an explanation and reasons why the data should not be made publicly available.

D6 Independent Audit

D6-1 The proponent must arrange for an independent audit of compliance with the conditions of this statement, including achievement of the environmental outcomes and/or the environmental objectives and/ or environmental performance with the conditions of this statement, as and when directed by the **CEO**.

D6-2 The independent audit must be carried out by a person with appropriate qualifications who is nominated or approved by the **CEO** to undertake the audit under condition D6-1.

D6-3 The proponent must submit the independent audit report with the Compliance Assessment Report required by condition D2, or at any time as and when directed in writing by the **CEO**. The audit report is to be supported by credible evidence to substantiate its findings.

D6-4 The independent audit report required by condition D6-1 is to be made publicly available in the same timeframe, manner and form as a Compliance Assessment Report, or as otherwise directed by the **CEO**.

Table 4: Abbreviations and definitions

Acronym or abbreviation	Definition or term
Aboriginal cultural heritage	Means the tangible and intangible elements that are important to the Aboriginal people of the state, and are recognised through social, spiritual, historical, scientific or aesthetic values, as part of Aboriginal tradition to the extent they directly affect or are affected by physical or biological surroundings.
Access development envelope	The area shown within Figure 2 and defined by geographic coordinates in Schedule 1.
Acquired/ land acquisition	The protection of **environmental values** on an area of initially unprotected land for the purpose of conservation through improved security of tenure or restricting the use of land (e.g. ceding land to the Crown or perpetual conservation covenants). This includes upfront costs of establishing the offset site and the on-going management of costs of maintaining the offset for the long term (20 years).
Active malleefowl (*Leipoa ocellata*) mound	As defined in the National Malleefowl Monitoring Manual (2020) or its updates.
Adverse impact / adversely impacted	Negative change that is neither trivial nor negligible that could result in a reduction in health, diversity or abundance of the receptor/s being impacted, or a reduction in **environmental value**. Adverse impacts can arise from direct or indirect impacts, or other impacts from the proposal. In relation to flora and vegetation, includes but is not limited to, a definable change in spatial coverage or a change in the health, species diversity, structure and plant density of vegetation, vegetation and flora mortality, spread or introduction of environmental weeds, introduction or spread of disease and edge effects. In relation to terrestrial fauna, includes but is not limited to, habitat fragmentation, vehicle strike, collision with fencing, artificial light and vibration, noise emissions and predation. In relation to **Aboriginal cultural heritage**, includes but is not limited to, hydrological change, structural damage, introduction or spread of non-indigenous flora and/or fauna, alteration of fauna behaviour, dust, light and noise emissions.
CEO	The Chief Executive Officer of the Department of the Public Service of the State responsible for the administration of section 48 of the *Environmental Protection Act 1986*, or the **CEO's** delegate.

Cleared/ Clearing	Has the same meaning as in section 51A of the *Environmental Protection Act 1986*.
Confirmed	In relation to a plan required to be made and submitted to the **CEO**, means, at the relevant time, the plan that the **CEO** confirmed, by notice in writing, meets the requirements of the relevant condition. In relation to a plan required to be implemented without the need to be first submitted to the **CEO**, means that plan until it is revised, and then means, at the relevant time, the plan that the **CEO** confirmed, by notice in writing, meets the requirements of the relevant condition.
Conservation advice	Conservation advice made or adopted by the Australian Government Minister for Environment under the *Environment Protection and Biodiversity Conservation Act 1999*.
Contaminated/ Contamination	Having a substance present at above background concentrations that presents, or has the potential to present, a risk or harm to human health, the environment or any environmental value.
Contingency measures	Planned actions for implementation if it is identified that an environmental outcome, environmental objective, threshold criteria, or **management target** are likely to be, or are being, exceeded. Contingency measures include changes to operations or reductions in disturbance or **adverse impacts** to reduce impacts and must be decisive actions that will quickly bring the impact to below any relevant threshold, **management target** and to ensure that the environmental **outcome** and/or **objective** can be met.
Construction activities	Activities that are associated with the substantial implementation of a proposal including but not limited to, earthmoving, vegetation clearing, grading or construction of right of way. Construction activities do not include Geotechnical investigations (including potholing for services and the installation of piezometers) and other preconstruction activities where no clearing of vegetation is required.
Dense riparian thickets	The habitat type as defined in the report 'Arrowsmith North Silica Sand Project – Environmental Review Document' (12 June 2023) and supporting spatial data.
Detecting/ Detectable	The smallest statistically discernible effect size that can be achieved with a monitoring strategy designed to achieve a statistical power value of at least 0.8 or an alternative value as determined by the **CEO**.
Dieback	A plant disease of native ecosystems. The main species responsible, *Phytophthora cinnamomi*, is a microscopic and soil-borne organism that was introduced into Western Australia.
Disturb/ disturbance	Means directly has or materially contributes to the disturbance effect on health, diversity or abundance of the receptor/s being impacted or on an environmental value.

	In relation to flora, vegetation or fauna habitat, includes to result in the death, destruction, removal, severing or doing substantial damage to an environmental value. In relation to fauna, includes to have the effect of altering the natural behaviour of fauna to its detriment. In relation to **Aboriginal cultural heritage**, includes direct physical or biological effects on the tangible and intangible elements that are important to Aboriginal people, and are recognised through social, spiritual, historical, scientific or aesthetic values, as part of Aboriginal tradition.
Dust emissions	Airborne particulate matter from the erosion of soil, sand and rock.
Environmental value(s)	A beneficial use, or ecosystem health condition.
Environmental weeds	Any plant declared under section 22(2) of the *Biosecurity and Agriculture Management Act 2007*, any plant listed on the Weeds of National Significance List and any weeds listed on the Department of Biodiversity, Conservation and Attractions' Midwest Impact and Invasiveness Ratings list, as amended or replaced from time to time.
Environmental harm	Has the meaning provided by section 3A(2) of the *Environmental Protection Act 1986*.
Exclusion zone	A spatial area where ground-disturbing activities or any other proposal related activities are not permitted.
Fauna handler	A person who is qualified and has attained the appropriate licence/s and authorisation/s under section 40 of the *Biodiversity Conservation Act 2016* and the Biodiversity Conservation Regulations 2018.
Fauna spotter	A person who is suitably trained in species identification, who does not perform any handling of animals where a licence to do so is required.
Flora and vegetation technical guidance	The Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016) or its revisions.
Foraging habitat	Vegetation and plant species known to support foraging within the range of the Carnaby's black cockatoo including proteaceous and myrtaceous plant species such as Banksia spp.
GL/a	Gigalitres per annum
Ground disturbing activities	Any activity or activities undertaken in the implementation of the proposal, including any clearing, civil works or construction.
Ha	Hectare(s)
Km/hr	Kilometre(s) per hour

Known populations	Known population at the time of assessment as detailed in the 'Arrowsmith North Silica Sand Project – Environmental Review Document' (12 June 2023), Response to Submissions (20 September 2024) and supporting spatial data.
Management action(s)	The identified actions implemented with the intent of to achieving the environmental objective.
Management target(s)	A type of indicator to evaluate whether an environmental objective is being achieved.
Mine development envelope	The area shown within Figure 2 and defined by geographic coordinates in Schedule 1.
MW	Megawatt(s)
Objective(s)	An objective is the proposal-specific desired state for an environmental factor/s to be achieved from the implementation of management actions.
Offset Conservation Area(s)	The land(s) identified in condition B5-4 containing the **environmental values** identified in condition B5-1
On-ground management	This includes **revegetation** (re-establishment of native vegetation in degraded areas) and rehabilitation (repair of ecosystem processes and management of weeds, disease or feral animals) with the objective to achieve a **tangible improvement** to the environmental values in the offset area.
Operation activity/ operational activities	Operation of the plant infrastructure for the proposal and includes pre-commissioning, commissioning, start-up and operation of the plant infrastructure for the proposal.
Outcome(s)	A proposal-specific result to be achieved when implementing the proposal.
Pollution	Has the meaning provided by section 3A(1) of the *Environmental Protection Act 1986*.
Pre-clearance survey(s)	Surveys designed to identify the presence or evidence of threatened fauna listed under the *Biodiversity Conservation Act 2016* prior to **ground disturbing activities**.
Progressive rehabilitation/ progressively rehabilitated	Progressive rehabilitation is expected to be undertaken in stages as mining progresses, as identified in condition A2, with no more than 17 **ha** to be open/cleared at any given time. Rehabilitation should be undertaken in a manner that minimises requirements for rehandling of materials and to maximise retention of biological function in topsoil. Progressive rehabilitation includes characterisation of materials (including soils and mine waste), backfill, consolidation, topsoil placement, and rehabilitation measures and monitoring.

Recovery plans	Recovery plans made or adopted by the Australian Government Minister for Environment under the *Environment Protection and Biodiversity Conservation Act 1999.*
Rehabilitation completion criteria	The criteria specified as management targets in the environmental management plan required by condition B4-2 and any subsequent confirmed version.
Relevant management body	A party or parties that has a role in the establishment and/or on-going management of the **Offset Conservation Area(s)**. Note: This includes the role of the proponent.
Relevant Traditional Owner(s)	In relation to the land subject to the proposal, means one or more of the following: - a registered native title body corporate for the land; or - a registered native title claimant for the land; or - a group of persons with Aboriginal traditional and cultural associations with the land.
Revegetate/ revegetation	Re-establishment of native vegetation/habitat in degraded areas.
Self-sustaining	Refers to vegetation that can survive (continue indefinitely) without ongoing management actions such as watering, weed control or infill planting.
Stage(s)	A stage of the proposal identified in Table 1 under condition A2-1.
Tangible improvement	A perceptible, measurable and definable improvement that provides additional ecological benefit and/or value.
Threat abatement plans	Threat abatement plans made or adopted by the Australian Government Minister for Environment under the *Environment Protection and Biodiversity Conservation Act 1999*.
Threshold criteria	The indicators that have been selected to represent limits of impact beyond which the environmental **outcome** is not being met.
Trench/ trenches	Any excavation that is of sufficient depth that would cause vertebrate fauna to be become trapped and unable to escape and would include, but not be limited to, trenches or pits for utilities, pipelines, dewatering pits or bell holes.
Trigger criteria	Indicators that have been selected for monitoring to provide a warning that, if exceeded, the environmental **outcome** may not be achieved. They are intended to forewarn of the approach of the threshold criteria and trigger response actions.

Figures (attached)

Figure 1 Arrowsmith North Silica Sand Project proposal location (this figure is a representation of the co-ordinates referenced in Schedule 1)

Figure 2 Arrowsmith North Silica Sand Project development envelopes (this figure is a representation of the co-ordinates referenced in Schedule 1)

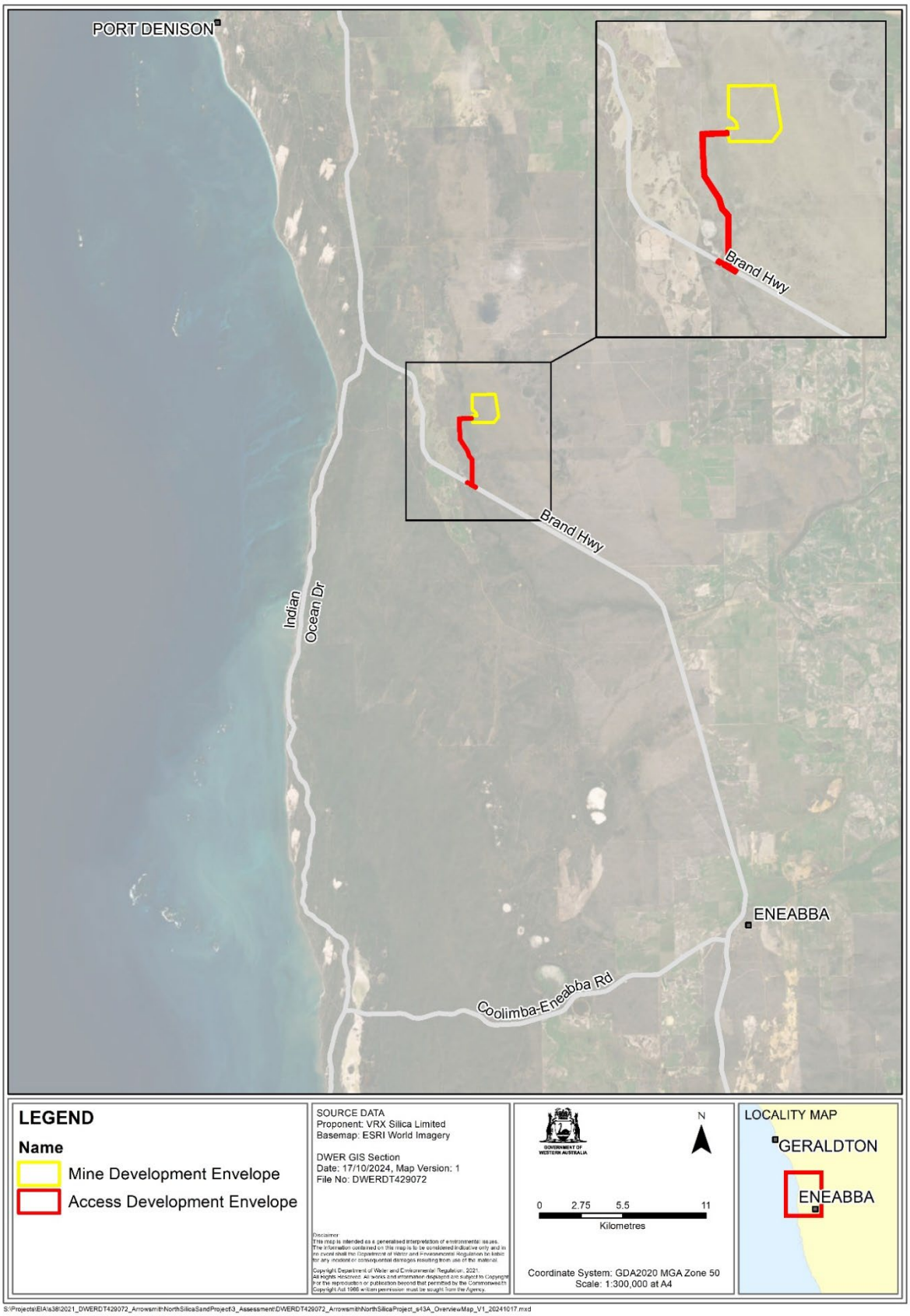

Figure 1 Arrowsmith North Silica Sand Project proposal location

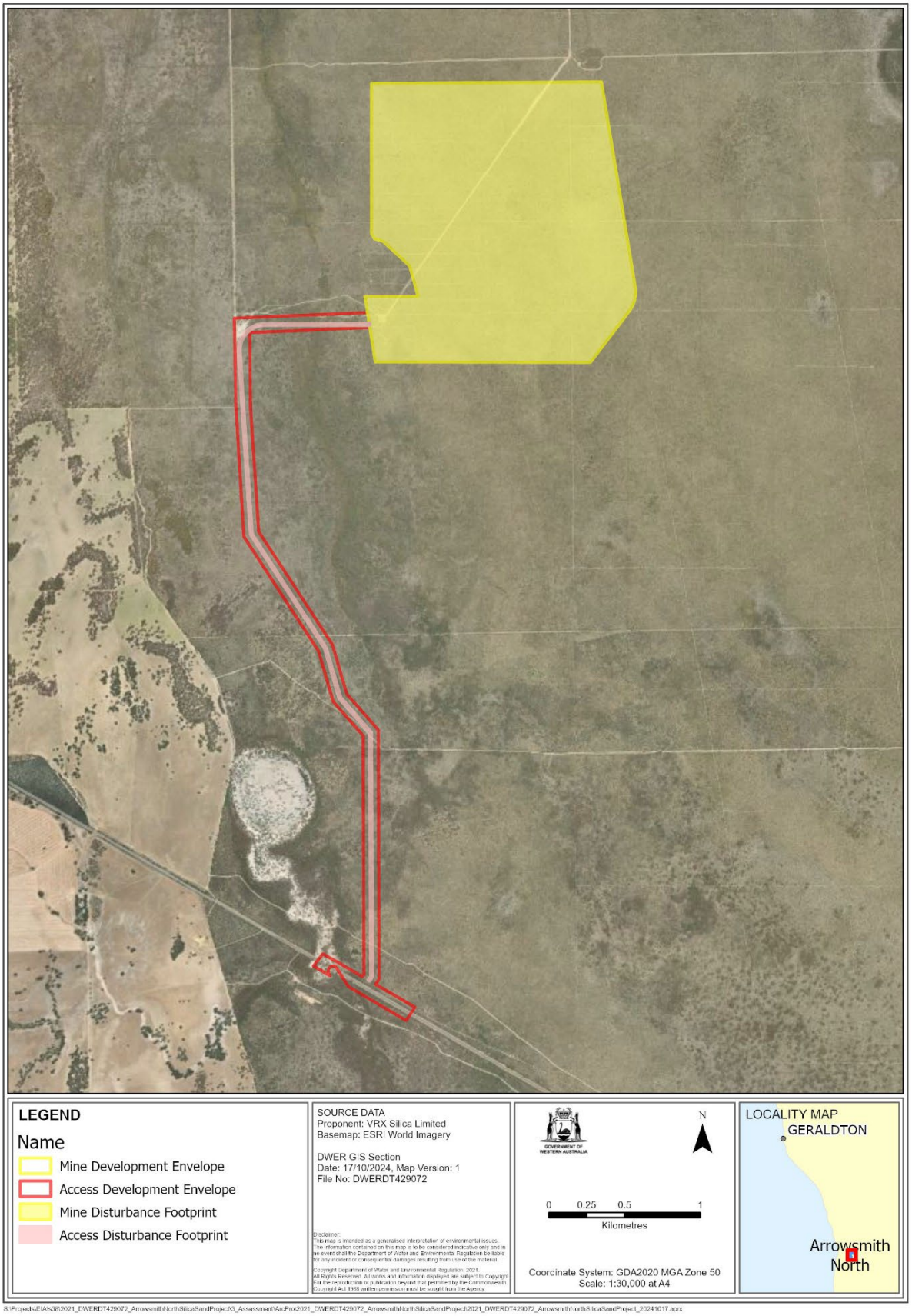

Figure 2 Arrowsmith North Silica Sand Project development envelopes

Schedule 1

All co-ordinates are in metres, listed in Map Grid of Australia Zone 50 (MGA Zone 50), datum of Geocentric Datum of Australia 2020 (GDA2020).

Spatial data depicting the figures are held by the Department of Water and Environmental regulation. Record no. DWER-801164602-350821.

Appendix B: Decision-making authorities

Table B1: Identified relevant decision-making authorities for the proposal

Decision-Making Authority	Legislation (and approval)
1. Minister for Aboriginal Affairs	*Aboriginal Heritage Act 1972* - section 18 consent to impact a registered Aboriginal Heritage site
2. Minister for Environment	*Biodiversity Conservation Act 2016* - section 40 authority to take or disturb threatened species
3. Minister for Mines and Petroleum	*Mining Act 1978* - granting of a new mining lease
4. Minister for Water	*Rights in Water and Irrigation Act 1914* - permit to take water - groundwater abstraction licence - licence to construct bores
5. Minister for Lands	*Land Administration Act 1997* - lease/licence/easement over Crown land
6. Chief Dangerous Goods Officer Department of Energy, Mines, Industry Regulation and Safety	*Dangerous Goods Safety Act 2004* - storage and handling of dangerous goods
7. Director Worksafe Mines Safety Department of Energy, Mines, Industry Regulation and Safety	*Work Health and Safety Act 2020* - mine safety - approval to commence mining operations
8. Chief Executive Officer Department of Water and Environmental Regulation	*Environmental Protection Act 1986* - part V works approval and licence - water licensing
9. Chief Executive Officer, Department of Biodiversity, Conservation and Attractions	*Biodiversity Conservation Act 2016* - authority to take flora and fauna (other than threatened species)
10. Executive Director Resource and Environmental Compliance Department of Mines, Industry Regulation and Safety	*Mining Act 1978* - mining proposal - mine closure plan
11. Commissioner for Main Roads Western Australia	*Main Roads Act 1930* - application to undertake works within road reserve
12. Chief Executive Officer Shire of Irwin	*Health Act 1911* Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974

Appendix C: Regulation under other statutory processes

Statutory decision-making process	Environmental outcome
Mining Act 1978	Mining activities and associated closure and rehabilitation to be managed via a Mining Proposal and Mine Closure Plan under the *Mining Act 1978* and achieve the following outcomes: • rehabilitated landforms are stable and do not cause pollution or environmental harm • rehabilitated vegetation is self-sustaining • rehabilitated areas are consistent with the species diversity and abundance of native vegetation within comparative analogue or reference sites • rehabilitation includes the use of native seeds collected from native vegetation within the proposal • rehabilitated drainage lines are stable, not prone to erosion, and support ecological processes • closure planning and rehabilitation are undertaken in a progressive manner consistent with achievement of the above outcomes during operations, where practicable, and as soon as practicable upon closure.
Environmental Protection Act 1986 - part V works approval and licence Environmental Protection (Noise) Regulations 1997	Regulate emissions and discharges from construction and operations to achieve the following outcomes: • no adverse impacts to soil, surface water and groundwater quality • maintain air quality and minimise emissions so that environmental values are protected • protect sensitive receptors from dust and noise.
Rights in Water and Irrigation Act 1914	No adverse impacts to groundwater or surface water.
Aboriginal Heritage Act 1972	No disturbance to Aboriginal cultural heritage, unless consent is granted to disturb that site under the *Aboriginal Heritage Act 1972* and has involved reasonable steps to consult with relevant Traditional Owners.
Environment Protection and Biodiversity Conservation Act 1999	The EPA has recommended conditions in relation to impacts on listed threatened species and communities protected by the EPBC Act. The Department of Climate Change, Energy, the Environment and Water may impose additional conditions under the EPBC Act.

Appendix D: Environmental Protection Act principles

Table D1: Consideration of principles of the *Environmental Protection Act 1986*

EP Act principle	Consideration
1. The precautionary principle *Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.* *In application of this precautionary principle, decisions should be guided by –* *(a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and* *(b) an assessment of the risk-weighted consequences of various options.*	The EPA has considered the precautionary principle in its assessment and has had particular regard to this principle in its assessment of flora and vegetation, terrestrial fauna and social surroundings. The proponent has investigated the biological and physical environment to identify environmental values of the proposal area. The EPA notes that the proponent has identified measures to avoid potential serious or irreversible damage to the environment including: • revising the overall development envelopes and disturbance footprints to reduce the extent of native vegetation clearing and avoiding impacts to known locations of several priority flora species • avoiding mapped riparian thicket vegetation • avoiding impacts to threatened flora *Paracaleana dixonii*, if identified during pre-clearance surveys • restricting mining to above the water table • redesigning the access development envelope to avoid disturbing Arrowsmith River, a registered Aboriginal heritage site and significant surface water feature. The EPA has recommended conditions where there is uncertainty to prevent and avoid environmental impacts from occurring, and to counterbalance significant residual impacts where they may occur. In addition, the EPA has recommended a condition for a research program to provide additional scientific certainty and support better understanding of long-term environmental outcomes associated with protection and restoration of priority flora. The EPA has concluded that subject to the implementation of the recommended conditions, the proposal is unlikely to pose a threat of serious or irreversible harm.
2. The principle of intergenerational equity *The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.*	The EPA has considered the principle of intergenerational equity in its assessment and has had particular regard to this principle in its assessment of flora and vegetation, terrestrial fauna and social surroundings.

EP Act principle	Consideration
	The EPA notes that the proponent has identified measures to avoid and minimise impacts to the key environmental factors for flora and vegetation, terrestrial fauna and social surroundings. The EPA has considered these measures during its assessment and has recommended conditions to ensure that appropriate measures are implemented. The EPA recommends rehabilitation of the disturbance footprint is undertaken to reinstate vegetation, priority flora species, and fauna habitat, such as Carnaby's black cockatoo foraging habitat. The EPA recommends offsets are imposed to ensure that the significant residual impacts to terrestrial fauna, in particular Carnaby's black cockatoo foraging habitat, are counterbalanced. The EPA recommends that there are no adverse impacts to Aboriginal cultural heritage and that the proponent consults with the Yamatji Southern Regional Corporation and relevant Traditional Owners, regarding the development of a Cultural Heritage Management Plan and Ranger Program. The EPA has concluded that the environmental values are likely to be protected and that the health, diversity and productivity of the environment will be maintained and enhanced for the benefit of future generations.
3. The principles of the conservation of biological diversity and ecological integrity *Conservation of biological diversity and ecological integrity should be a fundamental consideration.*	The EPA has considered the principle of conservation of biological diversity and ecological integrity in its assessment and has had particular regard to this principle in its assessment of flora and vegetation, and terrestrial fauna. The EPA has considered to what extent the potential impacts from the proposal to flora and vegetation and terrestrial fauna can be ameliorated to ensure consistency with the principle of conservation of biological diversity and ecological, including by provision of offsets. The EPA has recommended limits of disturbance to native vegetation and implementation of mitigation measures, which will contribute to the conservation of biodiversity diversity and ecological integrity of these values. The EPA has recommended rehabilitation conditions, which includes seed collection and propagation from native vegetation within the disturbance footprint prior to clearing to conserve viable populations of priority flora where possible. The EPA has concluded that given the nature of the impacts are significant (Carnaby's black cockatoo foraging habitat) that the recommended offset conditions are likely to counterbalance the impacts of the loss of biological diversity and ecological integrity.

EP Act principle	Consideration
4. Principles relating to improved valuation, pricing and incentive mechanisms *(1) Environmental factors should be included in the valuation of assets and services.* *(2) The polluter pays principle — those who generate pollution and waste should bear the cost of containment, avoidance or abatement.* *(3) The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes.* *(4) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.*	In considering this principle, the EPA notes that the proponent will bear the costs relating to implementing the proposal to achieve environmental outcomes, and management and monitoring of environmental impacts during construction, operation and decommissioning of the proposal. The EPA has had particular regard to this principle in considering flora and vegetation and terrestrial fauna. The EPA notes that the proponent will be responsible for bearing the cost of rehabilitation and acquisition and management of the proposed offsets.
5. The principle of waste minimisation *All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.*	The EPA has considered the principle of waste minimisation in its assessment and has had particular regard to this principle in its assessment of the proposal. The EPA notes the proponent will implement appropriate management of wastes on site and will avoid and minimise discharge of emissions into the environment during construction, operation and closure by adopting the hierarchy of waste controls (avoid, minimise, reuse, recycle and safe disposal). The EPA acknowledges that the proponent has identified there is a market in the agriculture and brick-making industry for the proposal's tailings waste product, which removes the requirement for on-site disposal. The EPA recognises that other decision-making authorities, including DEMIRS and DWER, will have additional requirements that will further prevent impacts associated with waste management and disposal.

Appendix E: Other environmental factors

Table E1: Evaluation of other environmental factors

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
Land			
Terrestrial environmental quality	Potential impacts to terrestrial environmental quality due to contamination from chemical or hydrocarbon spills and soil acidification.	Public comments • no public comments were received. Agency comments • DEMIRS commented on the knowledge gaps in relation to the potential presence of acid sulfate soils (ASS) and that a more detailed assessment would be required under the *Mining Act 1978*.	The EPA did not identify terrestrial environmental quality as a preliminary key environmental factor when the EPA decided to assess the proposal. In considering the potential impacts to terrestrial environmental quality, the EPA had regard to the following: • no waste products are proposed to be disposed of on-site • the low risk of acidic drainage identified in the Acid Base Accounting (ABA) assessment • the proponent's commitment to engage a suitably qualified geochemistry specialist to undertake a detailed ABA analysis of samples from within the proposal • regulation by DEMIRS under the Mining Act, which requires the proponent to prepare a Mining Proposal and Mine Closure Plan to manage materials capable of generating acid • regulation by DEMIRS under the Dangerous Goods Act for storage and management of hydrocarbons • regulation by DWER under Part V of the EP Act to mitigate any emissions or discharges to land. It is not likely that the proposal will have a significant impact on terrestrial environmental quality, and the proposal is likely to be consistent with the EPA factor objective. Accordingly, the EPA did not consider

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
			terrestrial environmental quality to be a key environmental factor at the conclusion of its assessment.
Subterranean fauna	Potential impacts to subterranean fauna from groundwater abstraction.	Public comments • no public comments were received. Agency comments • no agency comments were received.	The EPA did not identify subterranean fauna as a preliminary key environmental factor when the EPA decided to assess the proposal. In considering the potential impacts to subterranean fauna, the EPA had regard to the following: • mining is to occur above the water table therefore no dewatering is required as part of the proposal • the proposal area does not have calcretes, karst, fractured rock aquifers or other geological units that usually support habitat for stygofauna • the proposal area is unlikely to be considered troglofauna habitat given the presence of deep sands and subsequent lack of voids It is not likely that the proposal will have a significant impact on subterranean fauna, and the proposal is likely to be consistent with the EPA factor objective. Accordingly, the EPA did not consider subterranean fauna to be a key environmental factor at the conclusion of its assessment.
Water			
Inland waters	Potential impacts to inland waters due to groundwater abstraction, changes to hydrological regimes, contamination from hydrocarbon or chemical spills and sedimentation from earthmoving activities or slurry pipeline spills.	Public comments • concern over hydrological impacts due to the deep mining • concern over declining rainfall and groundwater abstraction adding further stresses at a local and regional scale • disruption of groundwater flows including to the Arrowsmith River	The EPA considered inland waters as a preliminary key environmental factor when the EPA decided to assess the proposal. In considering the potential impacts to inland waters, the EPA had regard to the following: • the modification of the proposal to avoid intersecting the Arrowsmith River • the design of an appropriate floodway crossing at the minor ephemeral drainage line southeast of

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
		• risks to groundwater from hydrocarbon and other chemical spills • erosion, sedimentation and indirect impacts to surface water flows. <u>Agency comments</u> • DCCEEW requested further information on proposed monitoring to ensure surface water hydrological patterns are not adversely affected • DWER advised that the proposed abstraction of groundwater from the Yarragadee aquifer would result in no adverse impacts on other users, including the environment. DWER advised at the time of reporting that the proposed abstraction of 0.9 GL from the Yarragadee aquifer was available for licensing.	Arrowsmith Lake within the access development envelope to maintain the natural hydrological regime • the progressive nature of the clearing, mining operations and rehabilitation activities • depth to the superficial aquifer, over 15 m below ground level in the vicinity of the mine development envelope, which would not be impacted by mining as this is proposed to occur above the superficial groundwater table • groundwater is proposed to be abstracted from the deeper Yarragadee aquifer • the absence of groundwater dependent ecosystems • the bioremediation of hydrocarbon-affected soils, if required, would not occur at the proposal location but would be removed and treated at an offsite licensed facility • regulation by DWER under the RiWI Act, which requires the proponent to obtain a licence to construct a bore and abstract groundwater. The RIWI Act provides for the management of water resources and in particular for their sustainable use and development to meet the needs of current and future users, and for the protection of their ecosystems and the environment in which water resources are situated including by the regulation of activities detrimental to them • the proponent's Water Supply Operating Strategy to compliment any approvals • regulation by DWER under Part V of the EP Act to mitigate any emissions or discharges to surface water and groundwater • regulation by DEMIRS under the Mining Act, which requires the proponent to prepare a Mining Proposal and Mine Closure Plan to maintain hydrological

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
			regimes and the quality and quantity of groundwater and surface water • regulation by DEMIRS under the Dangerous Goods Act for storage and management of hydrocarbons. Accordingly, the EPA did not consider inland waters to be a key environmental factor at the conclusion of its assessment.
Air			
Air quality	Potential impacts to air quality due to emissions associated with dust, combustion and vehicle exhaust.	Public comments • impacts of air emissions to surrounding vegetation. Agency comments • DWER advised that the risks to nearby sensitive receptors were considered to be low based on the proponent's modelling provided for combustion emissions and predicted concentrations and that detailed dispersion modelling was not required.	The EPA considered air quality as a preliminary key environmental factor when the EPA decided to assess the proposal. In considering the potential impacts to air quality, the EPA had regard to the following: • separation distance between proposal and the nearest sensitive receptors i.e. approximately 1.7 km southwest of the proposed haul road and 3.3 km northwest of the processing plant • the silica sand upgrading process which is predominately a wet process, and the storage and hauling of the product, which will be wet to minimise dust generation • management measures proposed including dust suppression and vehicle speed restrictions. Accordingly, the EPA did not consider air quality to be a key environmental factor at the conclusion of its assessment.
Greenhouse gas emissions	The proposal will generate greenhouse gas emissions that contribute to climate change, impacting on Western Australia's environment.	Public comments • concerns over the contribution to cumulative greenhouse gas emissions in the region. Agency comments	The EPA considered greenhouse gas emissions as a preliminary key environmental factor when the EPA decided to assess the proposal. In considering the potential impacts to greenhouse gas emissions, the EPA had regard to the following:

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
	The proponent has estimated the following GHG emissions for the proposal: • Scope 1 emissions from land clearing of up to 1,200 tonnes of carbon dioxide equivalent (tCO_2-e) per annum • Scope 1 operational emissions of up to 30,743 tCO_2-e per annum (peak emissions) • Scope 2 emissions are not relevant to the proposal • Scope 3 operational emissions of 60,471 tCO_2-e per annum.	• DWER noted that road transport of product is included under scope 3 emissions, whereas it should be considered under scope 1 emissions as it is a direct activity associated with implementation of the proposal. However, it was considered that these estimates would not significantly increase the estimated scope 1 emissions.	• the approved Environmental Scoping Document (ESD) for the proposal (Preston Consulting 2022) which required the proponent to provide estimates of the expected scope 1, 2 and 3 greenhouse gas emissions over the life of the proposal and to demonstrate how the EPA objective for this factor could be met • the EPA Environmental Factor Guideline – Greenhouse Gas Emissions (EPA 2024b) which details that GHG emissions from a proposal will be considered where they are reasonably likely to exceed 100,000 tonnes CO2-e of scope 1 or scope 2 emissions in any year • estimated scope 1 and scope 2 greenhouse gas emissions from the proposal are below the 100,000 tCO_2-e threshold for this factor guideline. Accordingly, the EPA did not consider greenhouse gas emissions to be a key environmental factor at the conclusion of its assessment.

Appendix F: List of submitters

7-day comment on referral

Organisations and public

- Private submitters identified as members of the Wildflower Society of Western Australia (2)
- Private submitter (1)

Public review of proponent information

Organisations and public

- Conservation Council of Western Australia
- Wildflower Society of Western Australia
- Yamatji Southern Regional Corporation Ltd.
- Private submitter (2)

Government agencies

- Department of Energy, Mines, Industry Regulation and Safety
- Department of Water and Environmental Regulation
- Department of Biodiversity, Conservation and Attractions
- Department of Climate Change, Energy, the Environment and Water
- Department of Planning, Lands and Heritage

Appendix G: Assessment timeline

Date	Progress stages	Time (weeks)
18 May 2021	EPA decided to assess – level of assessment set	
15 March 2022	EPA approved Environmental Scoping Document	43
8 June 2023	EPA accepted Environmental Review Document	64
19 June 2023	Environmental Review Document released for public review	1
16 July 2023	Public review period for Environmental Review Document closed	4
12 November 2024	EPA accepted proponent's Response to Submissions	69
21 November 2024	EPA completed its assessment	1
7 January 2025	EPA provided report to the Minister for Environment	7
9 January 2025	EPA report published	3 days
30 January 2025	Appeals period closed	3

Timelines for an assessment may vary according to the complexity of the proposal and are usually agreed with the proponent soon after the EPA decides to assess the proposal and records the level of assessment.

In this case, the EPA provided its assessment report to the Minister 7 weeks after completing its assessment as it was not practicable to provide it within 6 weeks, due to finalisation of the report coinciding with public holidays and the Christmas close-down period[1].

[1] Consistent with section 36 of the *Acts Interpretations Act 1901*

Appendix H: Relevant policy, guidance, procedures and references

BCE 2020, *Arrowsmith Silica Sands Project, Rehabilitation Strategy, Discussion on the potential foraging value of the rehabilitated landscape for Carnaby's Black-Cockatoo*, Bamford Consulting Ecologists.

BCE 2022, *Fauna Assessment of Arrowsmith North,* prepared for VRX Silica Limited by Bamford Consulting Ecologists.

Bennelongia 2021a, *Arrowsmith North Project SRE Invertebrate Desktop Assessment,* prepared for VRX Silica Limited by Bennelongia Environmental Consultants.

Bennelongia 2021b, *Arrowsmith North Project SRE Invertebrate Survey*, prepared for VRX Silica Limited by Bennelongia Environmental Consultants.

Brian Morgan Consultant Botanist 2024, *VRX Arrowsmith North Project: Paracaleana dixonii Targeted Survey in proposed Mine development envelope 2022-2023,* prepared for VRX Silica Limited.

DAWE 2022, *Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black- cockatoo,* Department of Agriculture, Water and the Environment, Canberra, Australia.

DEH 2007, *National Recovery Plan for Malleefowl Leipoa ocellata*, Department for Environment and Heritage, Canberra, Australia.

DoEE 2018, *Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi*, Department of the Environment and Energy Commonwealth of Australia.

DoEWHA 2008, *Approved Conservation Advice for Paracaleana dixonii Hopper & A.P.Br. nom. inval. (Sandplain Duck Orchid*), Department of the Environment, Water, Heritage and the Arts, Canberra, Australia.

DMIRS 2023, *Statutory Guidelines for Mine Closure Plans*, Department of Mines, Industry Regulation and Safety, Government of Western Australia, Perth, WA.

DPaW 2013, *Carnaby's cockatoo (Calyptorhynchus latirostris) Recovery Plan,* Department of Parks and Wildlife, Perth, Western Australia.

DSEWPC 2012, *Environmental Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*, Department of Sustainability, Environment, Water, Population and Communities, Commonwealth of Australia.

DWER 2021, *Environmental offsets metric: Quantifying environmental offsets in Western Australia*, Department of Water and Environmental Regulation, Government of Western Australia

EPA 2016a, *Environmental factor guideline – Flora and vegetation*, Environmental Protection Authority, Perth, WA.

EPA 2016b, *Technical guidance – Flora and vegetation surveys for environmental impact assessment*, Environmental Protection Authority, Perth, WA.

EPA 2016c, *Environmental factor guideline – Terrestrial fauna*, Environmental Protection Authority, Perth, WA.

EPA 2016d, *Technical guidance – Sampling of short-range endemic invertebrate fauna*, Environmental Protection Authority, Perth, WA.

EPA 2016e, *Environmental factor guideline – Terrestrial environmental quality*, Environmental Protection Authority, Perth, WA.

EPA 2016f, *Environmental factor guideline – Subterranean fauna*, Environmental Protection Authority, Perth, WA.

EPA 2020a, *Technical guidance –Terrestrial vertebrate fauna surveys for environmental impact assessment*, Environmental Protection Authority, Perth, WA.

EPA 2021a, *Environmental impact assessment (Part IV Divisions 1 and 2) procedures manual*, Environmental Protection Authority, Perth, WA.

EPA 2021b, *Statement of environmental principles, factors, objectives and aims of EIA*, Environmental Protection Authority, Perth, WA.

EPA 2023a, *Technical guidance –Environmental impact assessment of social surroundings - Aboriginal cultural heritage*, Environmental Protection Authority, Perth, WA.

EPA 2024, *Public advice – Considering environmental offsets at a regional scale*, Environmental Protection Authority, Perth, WA

EPA 2024b, *Environmental factor guideline – Greenhouse gas emissions*, Environmental Protection Authority, Perth, WA.

Glevan Consulting 2020, *Arrowsmith North Silica Sands Project, Phytophthora Dieback occurrence assessment,* Version 1.0, prepared for VRX Silica Ltd.

Glevan Consulting 2021, *Arrowsmith North Access Route, Phytophthora Dieback occurrence assessment,* Version 0.4, prepared for VRX Silica Limited.

Glevan Consulting 2022, *Arrowsmith North Silica Sand Project, Phytophthora Dieback Management Plan,* prepared for VRX Silica Limited.

Government of Western Australia 2011, *WA Environmental Offsets Policy*, Government of Western Australia, Perth, WA.

Government of Western Australia 2014, *WA Environmental Offsets Guidelines*, Government of Western Australia, Perth, WA.

Horizon Heritage Management 2021, *Assessment of Aboriginal Heritage Values and Traditional Uses, Arrowsmith North Project – VRX Silica*.

Mattiske Consulting Pty Ltd 2020, *Review of Roots and Vegetation Direct Transfer,* prepared for VRX Silica Ltd.

Mattiske Consulting Pty Ltd 2022a, *Flora & Vegetation Assessment, Arrowsmith North Survey Area,* prepared for VRX Silica Ltd.

Mattiske Consulting Pty Ltd 2022b, *Investigation of Root Systems of the Priority Flora species recorded in the Arrowsmith North mine survey area*, prepared for VRX Silica Ltd.

Preston Consulting 2021, *Arrowsmith North Silica Sand Project, Supplementary Report*, prepared for VRX Silica Ltd.

Preston Consulting 2022, *Environmental Scoping Document, Arrowsmith North Silica Sand Project*, prepared for VRX Silica Ltd.

Preston Consulting 2023, *Arrowsmith North Silica Sand Project, Environmental Review Document,* prepared for VRX Silica Ltd.

Preston Consulting 2024a, *Arrowsmith North Silica Sand Project, Rehabilitation Management Plan*, prepared for VRX Silica Ltd.

Preston Consulting 2024b, *Arrowsmith North Silica Sand Project, Response to Submissions*, prepared for VRX Silica Ltd.

Preston Consulting 2024c, *Arrowsmith North Silica Sand Project, Offset Strategy*, prepared for VRX Silica Ltd.

Rycken and Douglas 2023, *Carnaby's Black-Cockatoo Breeding Program report 2022-23*, BirdLife Australia, Melbourne, Victoria.

Sticks and Stones Cultural Resources Management 2022, *Survey Report, 2021 VRX Silica Arrowsmith North Mine Development Area, YSRC Heritage Survey (Aboriginal Heritage Site Avoidance Survey for selected areas within the Arrowsmith North Project Area, Dongara Region, Western Australia*), prepared for VRX Silica Ltd, YSRC and the Yamatji people.

Terratree 2024a, *Memorandum Report: Supplementary Targeted flora and vegetation survey of Arrowsmith North. Part A – Flora*, prepared for VRX Silica Ltd.

Terratree 2024b, *Memorandum Report: Supplementary Targeted flora and vegetation survey of Arrowsmith North. Part B – Vegetation*, prepared for VRX Silica Ltd.

VRX Silica Ltd 2021, *Record of interview with Barry Dodd (representative of the Amangu people)*, Transcript by VRX Silica Limited.

Yamatji Marlpa Aboriginal Corporation 2018, *Archaeological and ethnographic heritage survey over Arrowsmith North,* prepared for VRX Silica Limited.

Yamatji Marlpa Aboriginal Corporation 2020, *Final archaeological and ethnographic heritage survey over Arrowsmith North*, prepared for VRX Silica Limited.