YALYALUP
Mineral Sands Project

ENVIRONMENTAL SCOPING DOCUMENT

Final V2 - 29 May 2019

Prepared by:

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DOCUMENT DETAILS

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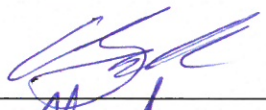
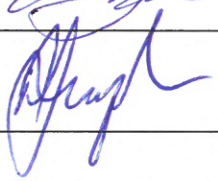
DMS17-004-ESD_001_db_FINAL_V2	ENVIRONMENTAL SCOPING DOCUMENT, YALYALUP MINERAL SANDS PROJECT	AB026	29-May-19	Doral Mineral Sands Pty Ltd

PREPARED BY

NAME / TITLE	ROLE	SIGNATURE	DATE
Damon Bourke Senior Environmental Scientist (ABEC)	Author		29-May-19
Craig Bovell HS&E Superintendent (Doral)	Reviewer		29-May-19
Andrew Templeman	Approver		29-May-19

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ENVIRONMENTAL SCOPING DOCUMENT

PROPOSAL NAME	YALYALUP MINERAL SANDS PROJECT
ASSESSMENT NUMBER	17233
LOCATION	YALYALUP, WESTERN AUSTRALIA
LOCAL GOVERNMENT AREA	CITY OF BUSSELTON
PROPONENT	DORAL MINERAL SANDS PTY LTD
PUBLIC REVIEW PERIOD	4 WEEKS
EPBC REFERENCE NO.	EPBC 2017/8094

1. INTRODUCTION

The Environmental Protection Authority (EPA) has determined that the above proposal is to be assessed under Part IV of the *Environmental Protection Act 1986* (EP Act).

The purpose of the Environmental Scoping Document (ESD) is to define the form, content, timing and procedure of the environmental review, required by s. 40(3) of the EP Act. This draft ESD has been prepared by Doral Mineral Sands Pty Ltd (Doral), the proponent, in consultation with the EPA, decision making authorities and interested agencies consistent with the EPA's *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual 2016* (EPA, 2016a).

Form

The EPA requires that the form of the of the report on the environmental review required under s. 40 (Environmental Review Document, ERD) is according to the Environmental Review Document template.

Content

The EPA requires that the environmental review includes the content outlined in sections 2 to 6 of this ESD.

Timing

Table 1 sets out the timeline for the assessment of the proposal agreed between the EPA and the proponent.

TABLE 1: ASSESSMENT TIMELINE

KEY ASSESSMENT MILESTONES	COMPLETION DATE
EPA approves Environmental Scoping Document	8 April 2019
Proponent submits first draft Environmental Review Document	25 November 2019
EPA provides comment on first draft Environmental Review Document (*6 weeks from receipt of ERD*)	20 January 2020
Proponent submits revised draft Environmental Review Document	9 March 2020
EPA authorises release of Environmental Review Document for public review (*2 weeks from EPA approval of ERD*)	23 March 2020
Proponent releases Environmental Review Document for public review for 4 weeks	24 March 2020
Close of public review period	21 April 2020
EPA provides Summary of Submissions (*3 weeks from close of public review period*)	12 May 2020
Proponent provides Response to Submissions	7 July 2020
EPA reviews the Response to Submissions (*4 weeks from receipt of Response to Submissions*)	4 August 2020
EPA prepares draft assessment report and completes assessment (*6 weeks from EPA accepting Response to Submissions)*	15 September 2020

KEY ASSESSMENT MILESTONES	COMPLETION DATE
EPA finalises assessment report (including 2 weeks consultation on draft conditions) and gives report to Minister (*6 weeks from completion of assessment*)	27 October 2020

Procedure

The EPA requires the proponent to undertake the environmental review according to the procedures in the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2016* (EPA, 2016b) and the *Procedures Manual* (EPA, 2016a), including requirements for public review.

This draft ESD has not been released for public review. The ESD will be available on the EPA website (www.epa.gov.au) upon endorsement and must be appended to the Environmental Review Document.

Assessment by Accredited Assessment

The proposal has been referred and determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* and will be assessed by accredited assessment under Part IV of the EP Act. The relevant matters of national environmental significance (MNES) for this proposal are:

- Listed threatened species and communities (s18 and 18A)
    - Western Ringtail Possum *(Pseudocheirus occidentalis)* – Critically Endangered.
    - Whicher Range Dryandra *(Banksia squarrosa* subsp. *Argillacea)* – Vulnerable.
    - Vasse Featherflower *(Verticordia plumose* var. *vassensis)* – Endangered.
    - Shrublands on the southern Swan Coastal Plain Ironstones – Endangered.
- The ecological character of a declared Ramsar wetland (section 16 and 17B)
    - Vasse-Wonnerup Ramsar wetland system;
- Migratory species (section 20 and 20A)
    - Wood sandpiper *(Tringa glareola)* – Migratory;
    - Sharp-tailed sandpiper *(Calidris acuminate)* – Migratory;
    - Long-toed stint *(Calidris subminuta)* – Migratory.

This ESD includes work required to be carried out and reported on in the Environmental Review Document in relation to MNES. The Environmental Review Document will also address the matters in Schedule 4 of the *Environmental Protection and Biodiversity Conservation Regulations 2000*. In addition, in accordance with sections 136(1)(b) and 136(4) of the EPBC Act, the ERD will include information on the following matters:

- The proponent's history in relation to environmental matters;
- The likely economic and social impacts of implementing the proposed action (risks and benefits).

MNES that may be impacted by the proposal will be identified and the potential impacts on these matters addressed within each relevant preliminary environmental factor identified in Table 2. Proposed offsets to address significant residual impacts on MNES will also be discussed in the Environmental Review Document.

2. THE PROPOSAL

The subject of this ESD is the proposal by Doral Mineral Sands Pty Ltd to mine the Yalyalup Mineral Sands Deposit, located ~11km southeast of Busselton, WA (Figure 1). The proposal is in an area Doral have been granted Retention Licence R70/0052, which covers an area of approximately 2,290ha.

The proposal has a total disturbance area of ~372.67ha within a Development Envelope of 894.17ha. The proposed mine pits have a disturbance area of ~334.32ha and associated infrastructure has a disturbance of ~38.35ha. The majority of the disturbance area (~371ha) is located on previously cleared farmland currently used for beef cattle, dairy cattle and pasture, with the remaining ~1.67ha occurring within degraded native vegetation. The City of Busselton's Town Planning Scheme (TPS) No. 21 (TPS 21) shows the Development Envelope as being zoned as 'Agriculture'. The Development Envelope and indicative footprint of the proposal is delineated in Figure 2.

Approximately 12-16 million tonne (t) of ore from the deposit will be mined progressively via a series of open-cut pits using dry mining techniques to produce ~500-700,000t of heavy mineral concentrate (HMC). The HMC product to be generated from mining the deposit includes zircon, ilmenite, leucoxene and rutile. Dewatering of groundwater inflows into the pit will be required to enable dry mining to occur. Mining will be staged in order to minimise the area of disturbance (at any one time) with the aim of achieving focussed and effective management of the environmental factors at each pit location, prior to moving onto the next pit location.

Processing of ore will commence in-pit and then slurry will be pumped from the feed preparation plant to the wet concentration plant for further processing. Waste clay and sand materials from processing of this ore will be combined and backfilled into the mine voids using co-flocculation (co-disposal system) where possible. Some material will be initially placed in a Tailing Storage Facility, herein referred to as Solar Evaporation Ponds (SEPs), to allow drying of the clay and recycling of water back to the process water pond (PWP) (return water), prior to being co–disposed into mine voids. The mined area will be rehabilitated back to pasture and/or native vegetation, depending on pre-mining conditions, consistent with the post-mine land use requirements.

HMC produced at the wet concentrator plant will be stockpiled on site prior to transport to Doral's Picton Dry Separation Plant, located ~60km northeast of the mine, for separation using electrostatic processes. The Picton Dry Separation Plant has a licence to process HMC sourced from Doral's Yoongarillup Mine. Processing of HMC into products of zircon, ilmenite, and leucoxene has occurred since the Picton Dry Separation Plant was approved by Ministerial Statement No. 484 in 1998. Once processed, HMC products are hauled by truck to either the Bunbury Port or Fremantle Port for export. Processing activities at the Picton Dry Separation Plant and exporting of product are not part of this Proposal and are not further described in this referral document.

The key characteristics of the proposal are set out in Tables 2 and 3. The key proposal characteristics may change as a result of the findings of studies and investigations conducted and the application of the mitigation hierarchy by the proponent.

TABLE 2: SUMMARY OF THE PROPOSAL

Proposal title	Yalyalup Mineral Sands Mine
Proponent name	Doral Mineral Sands Pty Ltd
Short description	The Proposal is to develop, mine, rehabilitate and decommission the Yalyalup Mineral Sands Mine. The Proposal includes the development of mine pits and associated infrastructure, wet concentration processing plant, solar evaporation ponds, groundwater abstraction and water management infrastructure and process water pond. The life of mine is expected to be 4.5 to 5.5 years.

TABLE 3: LOCATION AND PROPOSED EXTENT OF PHYSICAL AND OPERATIONAL ELEMENTS

ELEMENT	LOCATION	PROPOSED EXTENT
Physical Elements		
Mine pits	Figure 2	Clearing of ~1.53 ha of native vegetation and ~332.79ha of cleared pasture and exotic planted species within the 894.17ha Development Envelope
Associated infrastructure	Figure 2	Clearing of ~0.14ha of native vegetation and ~7.71ha of pasture within a 894.17ha Development Envelope
Solar Evaporation Ponds	Figure 2	Clearing of ~30.5ha of cleared pasture within a 894.17ha Development Envelope
Operational Elements		
Groundwater Abstraction		Abstraction of up to 2.4 gigalitres (GL) per annum from the Yarragadee aquifer
Ore processing (waste)		250,000 tonnes per annum

3. PRELIMINARY KEY ENVIRONMENTAL FACTORS AND REQUIRED WORK

The preliminary key environmental factors for the environmental review are:

1. Flora and Vegetation
2. Terrestrial Fauna
3. Hydrological Processes
4. Inland Waters Environmental Quality
5. Social Surroundings

Table 4 outlines the work required for each preliminary key environmental factor and contains the following elements for each factor:

- **EPA factor** and **EPA objective** for that factor.
- **Relevant activities** – the proposal activities that may have a significant impact on that factor.
- **Potential impacts and risks** to that factor.
- **Required work** for that factor.
- **Relevant policy and guidance** – EPA (and other) guidance and policy relevant to the assessment.

TABLE 4: PRELIMINARY KEY ENVIRONMENTAL FACTORS AND WORK REQUIRED

FLORA AND VEGETATION	
EPA Objective	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.
Relevant activities	Clearing of native vegetation. Groundwater abstraction.
Potential impacts and risks	Direct loss of flora and vegetation from clearing activities. Indirect impacts on flora and vegetation from: • Groundwater abstraction (addressed under Hydrological Processes). • Fragmentation of vegetation. • Altered fire regime. • Dust from mining operations and vehicle movements. • Introduction and spread of weeds and phytophthora dieback. • Potential development of acid sulfate soils which may modify ecosystem functions (addressed under Hydrological Processes).
Required work	1. Undertake flora and vegetation surveys in accordance with *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016d) in areas that are likely to be directly or indirectly impacted as a result of the proposal.

	2. Undertake a detailed review of soil information from existing exploration drilling/assay data, depth to groundwater, proposed dewatering extents, and specific water dependency of flora species/ecosystems within the area predicted to be impacted by the Proposal (i.e. dewatering). 3. Describe the existing flora and vegetation within areas potentially directly or indirectly affected by the proposal including regional context. This will include work to relocate or confirm the absence of previous records of significant flora. 4. Assess the cumulative direct and indirect impacts (such as direct clearing, drawdown of groundwater dependent ecosystems, weeds, fragmentation of vegetation, altered fire regime and dust) associated with the proposal to flora and vegetation by conducting quantitative analysis. This will include: • A summary of the known regional distribution of vegetation units. • The total area (in ha) of each vegetation unit within areas potentially directly or indirectly affected by the proposal. • The area (in ha) of each vegetation unit to be impacted (directly or indirectly) in a 'worst case' scenario. • Maps illustrating the known recorded locations of conservation significant species. • Identification of vegetation units which may be Threatened or Priority Ecological Communities (TECs/PECs). This will include consultation with DBCA to determine whether any vegetation units potentially directly or indirectly affected by the proposal are representative of State listed TECs/PECs. • Identification of any significant flora species within areas potentially directly or indirectly affected by the proposal. • For each conservation significant species/community, including MNES, within areas potentially directly or indirectly affected by the proposal, provide where possible: o Baseline information on their distribution (including know occurrences), ecology and habitat preferences at the Site level; o Information on the conservation value of each habitat type from a local and regional perspective; o If a population of a conservation significant species is present on the site, its size and the importance of that population from a local and regional perspective; • Map of weed and phytophthora dieback occurrences in areas likely to be directly or indirectly impacted by the proposal. 5. Provide figures and tables showing the predicted extent of loss of vegetation and significant flora species from both direct and indirect impacts. 6. Provide discussion of the proposed management, monitoring and mitigation methods to be implemented to demonstrate that the design of the proposal has addressed the mitigation hierarchy to avoid and minimise impacts to flora and vegetation. 7. Provide details of the inherent and residual impacts to flora and vegetation before and after applying the mitigation hierarchy and identify whether the residual impacts are significant by applying the Significant residual Impact

	Model in the WA Environmental Offsets Guideline (Government of Western Australia, 2014). 8. Quantify any significant residual impacts by completing the Offset Template, spatially defining the area of 'good' to 'excellent' native vegetation that will be disturbed as a result of the proposal and propose an appropriate offsets package that demonstrates application of the WA Environmental Offsets Policy and Guideline (Government of WA, 2011 and 2014). 9. Prepare a Mine Closure Plan consistent with *Guidelines for Preparing Mine Closure Plans* (DMP and EPA, 2015) which considers the proposed rehabilitation methodologies to achieve successful progressive rehabilitation of all disturbed areas by mining to the agreed end landuse. 10. Provide a statement of how the proponent considers the EPA's objective for this factor has been addressed.
Relevant policy and guidance	<u>EPA Policy and Guidance</u> *Statement of Environmental principles, Factors and Objectives* (EPA, 2016c) *Environmental Factor Guideline – Flora and Vegetation* (EPA, 2016d) *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016e) *Instructions on how to Prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA, 2016f) *Environmental Offsets Policy, Perth, Western Australia (Government of Western Australia, 2011).* *Environmental Offsets Guidelines, Perth, Western Australia (Government of Western Australia, 2014).* <u>Other Policy and Guidance</u> Matters of National Environmental Significance. Significant Impact Guidelines 1.1. *Environmental Protection and Biodiversity Conservation Act 1999* (DoE, 2013). *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (DSEWPaC, 2012a). *Guidelines for Preparing Mine Closure Plans* (DMP and EPA, 2015). *Western Australian Water in Mining Guideline. Water licensing delivery report series. Report No. 12 (DoW, 2013).* *Conservation Advice Banksia squarrosa subsp. argillacea Whicher Range banksia, Whicher Range dryandra. Canberra: Department of the Environment* (Threatened Species Scientific Committee, 2015). *Approved Conservation Advice for Verticordia plumosa 3 var. vassensis (Vasse Featherflower). Canberra: Department of the Environment, Water, Heritage and the Arts* (DEWHA, 2008a). *Shrubland Association on Southern Swan Coastal Plain Ironstone (Busselton area) (Southern Ironstone Association) Recovery Plan. Interim recovery plan no. 215. Department of Environment and Conservation* (Meissner & English, 2005).

	Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi. Canberra, ACT: Commonwealth of Australia (DoE, 2014).
TERRESTRIAL FAUNA	
EPA Objective	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.
Relevant activities	Clearing of fauna habitat. Groundwater abstraction and drawdown of superficial and groundwater aquifers. Mining activities.
Potential impacts and risks	Direct clearing of fauna habitat resulting in the loss or fragmentation of fauna habitat. Death, injury and/or displacement of fauna species, as a result of clearing and construction activities. Dewatering activities may affect GDE's and the ecological character of the Vasse-Wonnerup Ramsar wetland which may reduce the value of fauna habitat resulting in displacement of fauna and migratory species. Vehicle movements during construction and operation may result in the loss of individual fauna, especially less-mobile species, from vehicle strikes. Presence of artificial water bodies may result in the loss/injury of induvial fauna. Increase in the number of predatory introduced species. Light, noise and dust emissions could disrupt fauna behaviour or reduce the value of fauna habitat. Introduction and/or spread of *Phytophthora* dieback which may reduce the value of fauna habitat. Altered fire regime which may reduce available fauna habitat.
Required work	11. Conduct a desktop study and Level 1 Fauna Survey in accordance with *Technical Guidance – Terrestrial Fauna Surveys* (EPA, 2016h) and *Technical Guidance – Sampling Methods for Terrestrial Vertebrate Fauna* (EPA, 2016i) for Terrestrial Fauna within the Development Envelope. In addition, the desktop assessment and Level 1 survey will include consideration of fauna values associated with the creek system immediately to the west of the Development Envelope. 12. Conduct a targeted Western Ringtail Possum assessment in areas containing suitable habitat within the Development Envelope in accordance with relevant EPA and Commonwealth guidance. 13. Conduct a targeted Black Cockatoo assessment in areas containing suitable habitat within the Development Envelope in accordance with relevant EPA and Commonwealth guidance. 14. Describe the terrestrial fauna including conservation significant and migratory species that occur or likely to occur within the Development Envelope. 15. Conduct targeted surveys for any other significant species, communities or habitats identified by the desktop study and Level 1 survey as potentially being present.

	16. Assess direct and indirect impacts on fauna, conservation significant fauna, migratory species and fauna habitats, including specific consideration of direct and indirect impacts to the Vasse-Wonnerup Ramsar wetland and the creek system immediately west of the Development Envelope. 17. For each conservation significant species, including MNES recorded or likely to occur within the Development Envelope, provide where possible: o Baseline information on their distribution (including know occurrences), ecology and habitat preferences at the Site level; o Information on the conservation value of each habitat type from a local and regional perspective; o If a population of a conservation significant species is present on the site, its size and the importance of that population from a local and regional perspective; o Maps illustrating the known recorded locations of conservation significant species. o Quantification of the area of habitat that is likely to be directly or indirectly impacted by the proposal, broken down by habitat use where appropriate (e.g. breeding habitat, foraging habitat). 18. Provide figures and tables showing the likely extent of habitat loss from direct and indirect impacts. 19. Provide discussion of the proposed management, monitoring, mitigation methods and rehabilitation to be implemented to demonstrate that the design of the proposal has addressed the mitigation hierarchy to avoid and minimise impacts terrestrial fauna. 20. Provide details of the inherent and residual impacts to flora and vegetation before and after applying the mitigation hierarchy and identify whether the residual impacts are significant by applying the Significant residual Impact Model in the WA Environmental Offsets Guideline (Government of Western Australia, 2014). 21. Quantify any significant residual impacts by completing the Offset Template, spatially defining the area of 'good' to 'excellent' native vegetation that will be disturbed as a result of the proposal and propose an appropriate offsets package that demonstrates application of the WA Environmental Offsets Policy and Guideline (Government of WA, 2011 and 2014). 22. Prepare a Mine Closure Plan consistent with *Guidelines for Preparing Mine Closure Plans* (DMP and EPA, 2015) which addresses the need for progressive rehabilitation of habitat for conservation significant species. 23. Provide a statement of how the proponent considers the EPA's objective for this factor has been addressed.
Relevant policy and guidance	<u>EPA Policy and Guidance</u> *Statement of Environmental principles, Factors and Objectives* (EPA, 2016c) *Environmental Factor Guideline – Terrestrial Fauna* (EPA, 2016g). *Technical Guidance – Terrestrial Fauna Surveys* (EPA, 2016h).

	Technical Guidance – Sampling Methods for Terrestrial Vertebrate Fauna (EPA, 2016i). *Instructions on how to Prepare Environmental Protection Act 1986 Part IV Environmental Management Plans (EPA, 2016f)* *Guidelines for Preparing Mine Closure Plans (DMP and EPA, 2015).* *Environmental Offsets Policy, Perth, Western Australia (Government of Western Australia, 2011).* *Environmental Offsets Guidelines, Perth, Western Australia (Government of Western Australia, 2014).* <u>Other Policy and Guidance</u> Matters of National Environmental Significance. Significant Impact Guidelines 1.1. *Environmental Protection and Biodiversity Conservation Act 1999* (DoE, 2013). Significant impact guidelines for the vulnerable western ringtail possum (*Pseudocheirus occidentalis*) in the southern Swan Coastal Plain, Western Australia. Nationally threatened species and ecological communities. EPBC Act policy statement 3.10. (DEWHA, 2009). *Survey guidelines for Australia's threatened mammals. EPBC Act survey guidelines 6.5.* (DSEWPaC, 2011). *Survey guidelines for Australia's threatened birds. Guidelines for detecting birds listed as threatened under the EPBC Act*. (DEWHA, 2010). *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy October 2012.* (DSEWPaC, 2012a). *EPBC Act Referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris, Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii, Forest red-tailed black cockatoo (vulnerable) Calyptorhynchus banksii naso* (DSEWPaC, 2012b) *Conservation Advice Pseudocheirus occidentalis Western ringtail possum. Canberra: Department of the Environment and Energy* (Threatened Species Scientific Committee, 2018a) *Conservation Advice Calyptorhynchus baudinii Baudin's cockatoo. Canberra: Department of the Environment and Energy* (Threatened Species Scientific Committee, 2018b). *Western Ringtail Possum (Pseudocheirus occidentalis) Recovery Plan. Wildlife Management Program No. 58. Department of Parks and Wildlife, Perth, WA* (DPaW, 2017) *Approved Conservation Advice for Calyptorhynchus banksii naso (Forest Red-tailed Black Cockatoo). Canberra: Department of the Environment, Water, Heritage and the Arts* (DEWHA, 2009). *Forest Black Cockatoo (Baudin's Cockatoo Calyptorhynchus baudinii and Forest Redtailed Black Cockatoo Calyptorhynchus banksii naso) Recovery Plan. Department of Environment and Conservation, Western Australia* (Chapman, 2008).

	Carnaby's Cockatoo (Calyptorhynchus latirostris) Recovery Plan. Department of Parks and Wildlife, Perth, Western Australia (DPaW, 2013). *Threat abatement plan for predation by feral cats. Canberra, ACT: Commonwealth of Australia* (DoE, 2015a). *Threat abatement plan for predation by the European red fox. DEWHA, Canberra* (DEWHA, 2008b). *Wildlife Conservation Plan for Migratory Shorebirds. Canberra, ACT: Department of the Environment* (Commonwealth of Australia, 2015). *EPBC Act Policy Statement 3.21 - Industry Guidelines for avoiding, assessing and mitigating impacts on EBBC Act listed migratory shorebird species* (DoE, 2015b).
HYDROLOGICAL PROCESSES	
EPA Objective	To maintain the hydrological regimes of groundwater and surface water so that environmental values are protected.
Relevant activities	Mine pit dewatering. Groundwater abstraction (process water).
Potential impacts and risks	Dewatering of mine pits and drawdown of water table which may affect: • Water availability at surrounding superficial and Leederville aquifer users • Potential GDE's and vegetation • Acid Sulfate Soils • Surface water courses; • Vasse-Wonnerup System Ramsar Wetland. Abstraction of process water from the Yarragadee aquifer may affect other users of the Yarragadee aquifer and the overlying Leederville aquifer. Reduction in surface water yield in the Lower Sabina River sub-catchment and Vasse-Wonnerup System Ramsar Wetland.
Required work	24. Characterise the baseline hydrological and hydrogeological regimes, both at a local and regional level, including: o Geology; o Groundwater levels and flows; o Surface water and drainage features and flows; o Connectivity between surface water and groundwater features including a conceptual site model; o Figure depicting the sensitive receptors within the locality (i.e. Vasse-Wonnerup Ramsar wetland and local surface water bodies. 25. Undertake a targeted ASS investigation in areas proposed to be directly and indirectly disturbed by either excavation or dewatering, to determine the potential presence and distribution of ASS, and if present provide details of proposed management measures.

	26. Model the predicted extent, duration and recovery (including figures) of groundwater drawdown associated with mine pit dewatering. This will include, but not limited to: o Assessment of cumulative impacts from all pits and how recharge will vary over the life of the Project; o A formal sensitivity analysis and uncertainty analysis on all the aquifer properties included in the model and assess leakage from the overlying aquifers. The model will also explore an extended period of below and above average rainfall. 27. Prepare a conceptual water balance to determine the site water demands over the life of the project. This will include: o All fluxes (and their seasonal variations); o Discussion of the capacity to reuse surplus mine dewater; o Requirements for supplementary process water to be sourced from the Yarragadee aquifer. 28. Discuss potential environmental impacts and benefits of identified surplus water management options (i.e. discharge of excess mine dewater, reuse on site, local water supply, aquifer recharge etc.) and discuss the most appropriate water management strategy for the Proposal. 29. Model the predicted extent, duration and recovery of process water abstraction from the Yarragadee aquifer and assess potential impacts to other Yarragadee groundwater users. 30. Conduct a surface water assessment to assess how proposed mine pits will impact on surface water flows to the Lower Sabina sub-catchment and the Vasse-Wonnerup Ramsar wetland. 31. Assess potential impacts of groundwater drawdown from mine pit dewatering on water availability to nearby bore users, potential GDE's, ASS, surface water features and the Vasse-Wonnerup Ramsar wetland. 32. Demonstrate application of the mitigation hierarchy to avoid or minimise impacts to avoid and minimise impacts to Hydrological Processes. 33. Provide discussion of the proposed management, monitoring, trigger and contingency actions within environmental management plans, to ensure residual impacts (direct and indirect) are not greater than predicted. 34. Provide a statement of how the proponent considers the EPA's objective for this factor has been addressed.
Relevant policy and guidance	<u>EPA Policy and Guidance</u> *Environmental Factor Guideline – Hydrological Processes* (EPA, 2016k). <u>Other Policy and Guidance</u> *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC & ARMCANZ, 2000). *Western Australian Water in Mining Guideline. Water licensing delivery report series. Report No. 12* (DoW, 2013).

	Hydrogeological Reporting Associated with a Groundwater Well Licence. Operational Policy 5.12. (DoW, 2009). *Identification and investigation of acid sulfate soils and acidic landscapes* (DER, 2015a). *Treatment and management of soil and water in acid sulfate soil landscapes* (DER, 2015b).
INLAND WATERS ENVIRONMENTAL QUALITY	
EPA Objective	To maintain the quality of groundwater and surface water so that environmental values are protected.
Relevant activities	Mine pit dewatering. Emergency discharge.
Potential impacts and risks	Reduction in groundwater quality to the Superficial and Leederville aquifers as a result of dewatering potential ASS which may affect beneficial users of water. Reduction in surface water quality as a result of discharge of water in emergency situations, which may have a localised adverse effect on the receiving environment, such as the Lower Sabina River and the Ramsar Vasse-Wonnerup wetlands.
Required work	35. Characterise the baseline hydrological and hydrogeological regimes, both at a local and regional level, including: o Geology; o Groundwater levels and flows; o Background water quality o Surface water and drainage features and flows; o Connectivity between surface water and groundwater features including a conceptual site model; o Figure depicting the sensitive receptors within the locality (i.e. Vasse-Wonnerup Ramsar wetland and local surface water bodies; 36. Provide a detailed description of the design and location of the Proposal with the potential to impact surface water or groundwater. 37. Prepare a conceptual water balance to determine the site water demands over the life of the project. This will include: o All fluxes (and their seasonal variations); o Discussion of the capacity to reuse surplus mine dewater; o Requirements for supplementary process water to be sourced from the Yarragadee aquifer. 38. Identify the location(s) of any proposed discharges to the environment and assess possible impacts these may have on the environment.

	39. Demonstrate application of the mitigation hierarchy to avoid and minimise impacts to Inland Waters Environmental Quality. 40. Provide discussion of the proposed management, monitoring, trigger and contingency actions to be implemented. 41. Provide a statement of how the proponent considers the EPA's objective for this factor has been addressed.
Relevant policy and guidance	<u>EPA Policy and Guidance</u> Environmental Factor Guideline – Inland Waters Environmental Quality (EPA, 2016l). <u>Other Policy and Guidance</u> *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC & ARMCANZ, 2000). *Identification and investigation of acid sulfate soils and acidic landscapes* (DER, 2015a). *Treatment and management of soil and water in acid sulfate soil landscapes* (DER, 2015b). *Information Sheet on Ramsar Wetlands (RIS) – 2009-2014 version* *Ecological Character Description for the VasseWonnerup Wetlands Ramsar Site in South-west Western Australia. Unpublished report to the Department of Environment and Conservation and Geographe Catchment Council Inc. by Wetland Research & Management. September 2007* (WRM, 2007). *Swan Coastal Plain South Management Plan 2016. Management plan number 85. Department of Parks and Wildlife, Perth* (DPaW, 2016).
SOCIAL SURROUNDINGS	
EPA Objective	To protect social surroundings from significant harm
Relevant activities	Noise associated with mining and processing may be generated during construction and operation phases of the proposal. Disturbance of culturally significant sites.
Potential impacts and risks	Numerous residential premises located within 1km of the proposal may potentially be impacted by noise from construction, mining and processing operations.
Required work	42. Prepare a detailed numerical noise model and conduct a noise impact assessment to identify all potential impacts to sensitive noise receptors associated with the proposal. The model will include all elements specified for a detailed noise assessment by previous EPA guidance (EAG No. 8) is included. 43. Provision of a map showing the location of all noise sensitive premises adjacent to the Proposal or likely to be affected by the proposal. 44. Commitment to investigate the use of Amenity Agreements should the modelled noise impacts show non-compliance with the Noise regulations. 45. Discussion of noise management measures and contingencies.

	46. Identify sites of cultural significance by conducting ethnographic and archaeological surveys of the Development Envelope. 47. Assess potential impacts on any heritage sites and/or cultural associations and provide proposed management measures to avoid or minimise impacts (if identified). 48. Provide a statement of how the proponent considers the EPA's objective for this factor has been addressed.
Relevant policy and guidance	<u>EPA Policy and Guidance</u> *Environmental Factor Guideline – Social Surroundings* (EPA, 2016m).

4. OTHER ENVIRONMENTAL FACTORS OR MATTERS

During assessment of proposals, other factors or matters may be identified as being relevant to the proposal, but not of significance to warrant further assessment by the EPA, or impacts can be regulated by other statutory processes to meet the EPA's objectives.

These factors do not require further work as part of the environmental review, or detailed discussion and evaluation in the ERD, although they must be included in the ERD in a summarised, tabular format.

The EPA has identified Air Quality as an "Other Environmental Factor" or matter relevant to the proposal at this stage of the assessment.

TABLE 5: OTHER ENVIRONMENTAL FACTORS AND WORK REQUIRED

AIR QUALITY	
EPA Objective	To maintain air quality and minimise emissions so that environmental values are protected
Relevant activities	Construction, mining, operation of vehicles, plant, equipment and processing infrastructure.
Potential impacts and risks	Particulate emissions associated with construction, mining, handling and processing may be generated during construction and operation phases of the proposal. Greenhouse gas emissions associated with construction, mining, handling and processing may be generated and released into the atmosphere.
Required work	49. Characterise baseline air quality within the mining area. 50. Identify and provide map showing location of sensitive receptors adjacent to or likely to be affected by the proposal. 51. Assess if particulate emissions will meet the relevant guidelines (TSP, PM10) at the nearest sensitive receptors. 52. Quantify and present the Scope 1 Greenhouse emissions for the proposal. 53. Provide discussion of the proposed management, monitoring, trigger and contingency actions within environmental management plans, to ensure impacts are not greater than predicted. 54. Provide a statement of how the proponent considers the EPA's objective for this factor has been addressed.
Relevant policy and guidance	EPA Policy and Guidance *Environmental Factor Guideline – Air Quality* (EPA, 2016n). *Other Policy and Guidance* *A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities* (DEC, 2011). *National Environment Protection (Ambient Air Quality) Measure*

	National Greenhouse and Energy Reporting Act 2007 (NGER Act)

5. STAKEHOLDER CONSULTATION

Doral will consult with stakeholders who are affected, or are interested in the proposal. This includes the decision-making authorities (DMA's), other relevant State and Commonwealth government agencies and local government authorities, the local community and environmental non-government organisations.

Doral will document the following in the Environmental Review Document:

- Identified stakeholders;
- Stakeholder consultation undertaken and the outcomes, including DMA's specific regulatory approvals and any adjustments to the proposal as a result of consultation;
- Any future plans for consultation.

6. DECISION-MAKING AUTHORITIES

At this stage the EPA has identified the decision-making authorities (DMA's) listed in Table 5 for the proposal. Additional DMA's may be identified during the assessments.

TABLE 5: DECISION-MAKING AUTHORITIES

DECISION-MAKING AUTHORITY	RELEVANT LEGISLATION
Minister for Environment	*Environmental Protection Act 1986* *Wildlife Conservation Act 1950*
Minister for Water	*Rights in Water and Irrigation Act 1914*
Minster for Mines and Petroleum	*Mining Act 1978*
Minister for Aboriginal Affairs	*Aboriginal Heritage Act 1972*
Minister for Health	*Radiation Safety Act 1975*
Minister for Lands	*Land Administration Act 1997*
Commonwealth Minister for Environment	*Environment Protection and Biodiversity Act 1999*
Department of Water and Environmental Regulation	Part V of the *Environmental Protection Act 1986* *Environmental Protection Regulations 1987*
Department of Mines, Industry Regulation and Safety	*Mining Act 1978* *Mines Safety and Inspection Act 1994* *Mines Safety and Inspection Regulations 1995* *Dangerous Goods and Safety Act 2004*
Radiological Council of Western Australia	*Radiation Safety Act 1972*
City of Busselton	*Planning Development Act 2005*

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FIGURES

LOCATION MAP

Legend

- Yalyalup Site Location
- Operating Mines

Ramsar Sites DPAW

- Vasse-Wonnerup System

Geographe Bay

Picton Dry Processing Plant

Site Location

Vasse-Wonnerup System

Wonnerup / Cristal

~4.6km

~4.0km

~10.7km

~2.5km

Tutunup South / Iluka

~6.0km

Yoongarillup / Doral

Whicher National Park

Wellesley
Parkfield
Brunswick
Roelands
Burekup
Bunbury
Glen Iris
Waterloo
Withers
Usher
Paradise
Henty
Dalyellup
Gelorup
Dardanup
Ferguson
Stratham
Boyanup
Elgin
Gwindinup
Tuart Forest National Park
Capel
Argyle
Beelerup
Ludlow
Wonnerup
Ruabon
Busselton
Caves Rd
Marybrook
Bovell
Yalyalup
Vasse
Kalgup
Tutunup
Paynedale
Ambergate
Jindong
Brazier
Kaloorup
Boallia
Walsall
Yoganup
Cundinup
Treeton
Baudin
Barrabup
Nannup
Osmington
Sues Rd
Bussell-Hwy
South-Western-Hwy
Vasse-Hwy
Goodwood Rd
Capel River
Margaret River
Brunswick River
Preston River
Abba River
Sabina River
St John Brook
Carbunup River
60 m
232 m
261 m
227 m
101 m

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, U
GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri C
MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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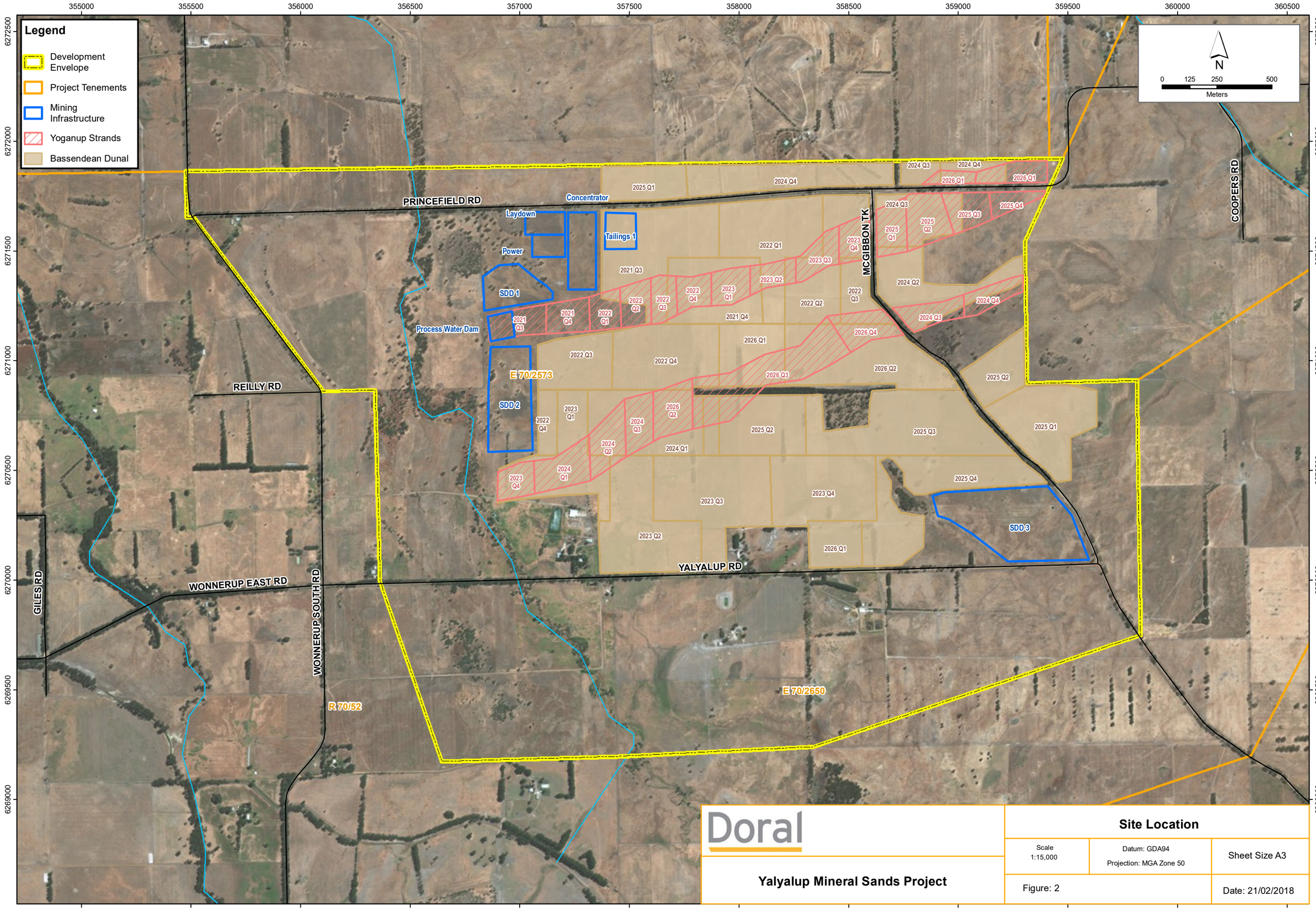
Kilometers

Doral

Yalyalup Mineral Sands Project

Regional Location

Scale	Datum: GDA94 Projection: MGA Zone 50	Sheet Size A3
1:250,000		
Figure: 1		Date: 21/02/2018



Doral

Yalyalup Mineral Sands Project

Site Location

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1:15,000		
Figure: 2		Date: 21/02/2018