EXTRACTIVE INDUSTRY LICENCE RENEWAL

CLAY EXTRACTION MANAGEMENT PLAN and EIL RENEWAL

LOT 1 MORANGUP ROAD, MORANGUP

PREPARED FOR

AUSTRAL BRICKS (WA) PTY LTD

AUGUST 2023

Prepared by:

Land Insights
PO Box 289
Mt Lawley WA 6929

Phone: (08) 9271 8506

Document details:

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Executive summary

Land Insights act for Bristile Holdings Pty Ltd (Austral Bricks (WA) Pty Ltd) and lodge this application on their behalf. The application seeks to renew the Extractive Industry Licence for 21 years (as permitted by the Extractive Industry Local Law) for the "Schist Pit" located at Lot 1 Morangup Road, Morangup. The application seeks the continuation of the operation.

The Shire issued Development Approval on the 7th October 2016 for the extraction, cartage and associated activities for the Schist clay pit. An Extractive Industry Licence was issued by the Shire and by order of the WA State Administrative Tribunal (SAT) on the 5th August 2014 which expires on the 19th November 2023.

For the sake of clarity, this application confirms the continuation of the approved extraction will be consistent with the proposal outlined below.

SUBJECT	DESCRIPTION
Operating times	• 06:00 – 17:00 hours from Monday to Saturday between the months of October and May • 06:00 – 17:00 hours from Monday to Friday between the months of June and September • 06:00 – 17:00 hours from Monday to Saturday between the months of June to September with no more than 5 days annually subject to the maximum number of truck movements on those days being no greater than 40. Should any of the days fall on a Shire event day the number will be no greater than 30. • During the Saturday of the Shire's Agricultural Show the number of trucks on the day will be limited to 30 (although it is unlikely that carting will occur on this day).
Volume extracted	Approximately 160,000 tonnes annually. This is consistent with the current approval and no increase in tonnage/operation is proposed as part of this application.

SUBJECT	DESCRIPTION
Site preparation	Limited site preparation is required as the site is already established for clay extraction. Access, signage, fencing, bunding and drainage management has already been established in accordance with the current approvals.
Pit Area	The total "excavation operation area" is approximately 44.7 hectares. This includes the current excavation area, the next stage of extraction, water detention basins, stockpile areas and overburden bunds.
Staging	The existing pit area has not previously been given a stage number, however for this application it has been allocated as "Stage 1a" for the sake of completeness and consistency. The expansion area (previously labelled as "Stage 1") has been labelled as "Stage 1b" to indicate the next phase of excavation. Stage 1b is consistent with the area previously labelled as "Stage 1".
Depth	Depth of excavation is approximately 14-15 metres, depending on the depth of resource across the site.
Excavation	Clay is excavated from the pit area and placed onto stockpile. Earthworks take place as and when required throughout the year but generally during the dry months. The timing of excavation depends on weather conditions, market demand and operational requirements. Excavation will most likely take place over approximately 16 weeks in total per annum, usually divided into 2 or 3 "campaigns".
Direction of excavation	The direction of excavation is generally in a southern direction.
Stockpiling	Clay is stockpiled within the pit area. This is to allow for efficient carting and transport of material from the site and utilises the existing pit area to avoid the need for clearing additional areas of vegetation.
Access	Existing site access is located at Morangup Road at the southern end of Lot 1. A crossover is already located at Morangup Road and the sealed section is approximately 30 metres in length. The main haul road travels north through the site and provides access to the pit and clay stockpiles.

SUBJECT	DESCRIPTION
Carting	It is estimated that there will be approximately 4,250 truck loads per annum. Carting will take place as and when required throughout the year but generally during the dry months. The timing of carting depends on weather conditions, market demand and operational requirements. It is expected that carting will occur over two separate campaigns each year, lasting approximately 3-4 weeks for each campaign.
Environmental management	The proposed excavation operation has been subject to a rigorous environmental assessment (this is presented in Chapter 3) which has considered ways to avoid, reduce and mitigate environmental impact as required by EPA Guidance Statement No. 33. As such, the clay extraction operation will comply with a range of management procedures as presented in the following management plans included with this report: • Dust Management Plan (Land Insights, 2023) • Noise Management Plan (Land Insights, 2023) • Water Management Plan (Land Insights, 2023) • Visual Amenity Management Plan (Land Insights, 2023) • Rehabilitation Management Plan (Land Insights, 2023) • Refuelling Management Plan (Land Insights, 2023) • Waste Management Plan (Land Insights, 2023) • Phytophthora Dieback Hygiene Management Plan (Glevan Consulting, 2020) • Bushfire Management Plan (Bushfire Prone Planning, 2021)
Refuelling	The operation will use mobile refuelling. There will be no storage of fuel on site.
Structures	A temporary lunchroom and portaloo will be located on site. It will only be used during site operations.
Decommissioning	The pit will be recontoured and rehabilitated in accordance with the Rehabilitation Management Plan.

1 Introduction

1.1 Summary

Land Insights act for Bristile Holdings Pty Ltd (Austral Bricks WA Pty Ltd) and lodge this application on their behalf. The application seeks to renew the Extractive Industry Licence for 21 years (as permitted by the Extractive Industry Local Law) for the "Schist Pit" located at Lot 1 Morangup Road, Morangup. The application seeks the continuation of the operation and there is no increase proposed.

The Shire issued Development Approval on the 7th October 2016 in June 2012 for the extraction, cartage and associated activities for the Schist clay pit. An Extractive Industry Licence was issued by the Shire and by order of the WA State Administrative Tribunal (SAT) on the 5th August 2014 which expires on the 19th November 2023.

Issuing a new EIL for this operation is essentially a low-risk decision for the Shire for the following reasons:

- This is an existing operation (i.e. a new site is not being developed)
- The area subject to the application has previously been approved by the Shire (both a DA and EIL)
- The operation is subject to a suite of existing management plans which have been updated to reflect current guidelines and best practice.
- There are no long-term plans for increasing sensitive land uses surrounding the site
- The site is identified as a significant State resource
- The operation has a history of compliance.

In addition, the excavation operation has been subject to a rigorous environmental assessment (presented in Chapter 5) which has considered ways to avoid, reduce and mitigate environmental impact.

One characteristic of extractive industries which is important to note is that the operator is not on the site every day. For large stretches of time and for a majority of the year there will be no activity on the site (i.e. it will be dormant), particularly during wetter months of the year. Excavation, carting and rehabilitation only take place over a certain period of time (commonly referred to as "campaigns") during dry months or at scattered times throughout the year. As a result, the outcomes of this assessment conclude that the operation has a generally low environmental and amenity risk with operational controls in place.

1.2 Background and approvals history

Excavation commenced that the Schist Pit over 60 years ago. Development Approval was issued by the Shire on the 7th October 2016. An Extractive Industry Licence was issued by the Shire and by order of the WA State Administrative Tribunal (SAT) on the 5th August 2014 which expires on the 19th November 2023.

The existing pit area has not previously been given a stage number, however for this application it has been allocated as "Stage 1a" for the sake of completeness and consistency. The expansion area (previously labelled as "Stage 1") has been labelled as "Stage 1b" to indicate the next phase of excavation.

Rate of excavation (tonnages) are variable depending on market demand. In general, the rate of excavation has been significantly lower at this site as was expected in 2014 when the EIL was issued and, as such, this has also meant that excavation of Stage 1b (previously "Stage 1") has not progressed as expected. Previously extracted areas are currently used as water detention basins as the water catchment for the site is substantial. Experience in recent years with the increase in heavy rainfall events is that a relatively large areas is required for water management. These basins have been configured over recent years.

1.3 Purpose of report

The purpose of this report is to provide supporting information for an application to renew the Extractive Industry Licence for a 21 year period (as permitted by the Extractive Industry Local Law). The prescribed application form has been completed and is provided at Appendix A.

1.4 Importance of the resource

Clay is an essential basic raw material used in the manufacture of roof tiles, bricks and paving blocks. As such, the extraction of clay is an important process in the supply of bricks and other construction materials for the community. The importance of clay to the community is reflected in *State Planning Policy 2.4: Basic Raw Materials* (WAPC, 2021) which identifies this site as a "Significant Geological Supply".

Proximity to the Perth Metropolitan Region and manufacturing plants helps to reduce transport costs associated with extraction of clay and, in turn, the costs associated with housing. The Shire of Toodyay is located close to the Perth Metropolitan Area which reduces transport costs from the transport of clay from quarries to the factory.

In addition to transportation reasons, clay deposits near the Perth Metropolitan Area are scattered and under continual pressure from other land uses which threatened to sterilise the resource. The clays found on this property are important to the brickmaking at Austral Bricks. The importance of the resource is reflected in the basic raw material mapping SPP 2.4.

Extraction of clay from this site will continue to provide basic raw materials for the construction industry. The continued operation of the site is particularly pertinent in the current economic climate as it will support employment and the construction industry.

1.5 Location

Lot 1 ("the site") is situated approximately 80km to the north-east of Perth and approximately 25km to the south-west of Toodyay. It is approximately 5km from the closest rural residential estate (located to the south-west and another to the north of the site). The quarry is located in the centre of Lot 1.

Plans associated with the operation are provided at Appendix A.

1.6 Tenure

The site is owned by Bristile Holdings Pty Ltd and managed by Austral Bricks (WA) Pty Ltd, both wholly owned subsidiaries of Brickworks Limited. Certificate of Title details are as follows (and a copy is at Appendix C).

Table 1.1 – Ownership details

LOT #	PLAN/DIAGRAM	VOLUME	FOLIO	OWNER
31	DP404710	2908	777	Bristile Holdings Pty Ltd

1.7 Compliance history

The compliance history of the operation has also been provided in the risk assessment below (Table 5.1). The purpose of this is to demonstrate the reality of the potential impact of the operation and that the management of the site is effective at reducing risk. As the site is already operational, the compliance history can also provide evidence of the accuracy of the risk assessment for the "residual" or "managed" risk.

2 Works and excavation program

2.1 Excavation procedure

Excavation of clay takes place in a sequence of steps which can be broadly broken down into the following:

- Earthworks Campaign (i.e., removal of topsoil and overburden, excavation of clay to stockpile)
- Carting Campaign (transport of clay from the pit or stockpiles to the factories)
- Rehabilitation.

Further information on the excavation process is below.

No processing, crushing, screening or blasting will occur on site.

The proposed excavation operation has been subject to a detailed environmental assessment (presented in Chapter 3) which has been done in accordance with DWER *Guidance Statement – Risk Assessments* which has considered ways to avoid, reduce and mitigate environmental impact.

It is important to note that the operator is not on the site every day undertaking the activities listed above. For large stretches of time and for a majority of the year there will be no activity on the site (i.e. it will be dormant). Austral Bricks operates clay quarries elsewhere in the wheatbelt and the outer Metropolitan area, each with different types of clays. As such, they excavate and cart from different quarries throughout the year depending on market demand for certain products/clay types. Excavation, carting and rehabilitation only take place over a certain period of time or at scattered times throughout the year (as described further below). This application does not propose an increase in tonnage or operation from what is already approved.

Earthworks campaign

The "Earthworks Campaign" refers to the excavation and stockpiling of material. During the earthworks campaign, topsoil and overburden is removed and clay is excavated and placed onto stockpiles located within the Operation Area.

Earthworks take place as and when required throughout the year but generally during the dry months. The exact timing of excavation depends on weather conditions, market demand and operational requirements. During these excavation "campaigns", excavation will generally take place for six days a week during the approved operation times. Excavation will most likely take place over approximately 16 weeks in total per annum, usually divided into 2 or 3 campaigns. It should be noted that for large stretches of time there will be no excavation activities on site.

The operation is currently approved for the excavation and carting of 160,000 tonnes of clay annually which does not represent an increase in tonnage or operation from what is already approved.

The excavation process is undertaken as an "inside out" operation. For example, excavation of the first part of the pit becomes the water detention pond so that drainage management can commence straight away. This can be seen within the existing operation area where the previously excavated areas at the northern end of the pit are now being used for water management. For this operation, two water basins are required as the catchment area to retain water runoff. Vehicles work on the floor of the excavation and work towards the edges of the excavation. Excavation generally takes place in a south-easterly direction.

As vehicles usually operate from the pit floor, the walls of the pit also act as a noise and dust barrier for most of the excavation process. There will be a relatively short period where vehicles are located at the ground level (when clearing vegetation and stripping topsoil and overburden), however as the operation area is surrounded by a large amount of remnant vegetation and undulating landscape, this is not expected to have a high risk of dust or noise impact. In addition, dust and noise management will be in place for the operation.

No processing (crushing, screening etc) will occur on the site. No blasting will be required to facilitate excavation.

Cartage campaigns

The “Cartage Campaign” refers to the removal or transport of clay from the site where it is taken to the Austral Bricks brickmaking factories. Clay resource is carted to various Austral Bricks manufacturing and brickmaking facilities.

Loading and carting from the site will largely occur during September to May (i.e. during the drier months) although it can occur anytime throughout the year depending on the need for clay and weather.

The current approval is for 4,250 truck loads per annum. Cartage will take place over two separate carting campaigns each year. The campaigns will last between 3-4 weeks each time. It should be noted that for a majority most of the year there will be no carting or truck movements in and out of the site.

Carting from the site depends on the market demand for bricks, as well as the types of clay and colour of clay. Therefore, there may be some variation from the truck numbers and the number of days that carting will be required each month (i.e. some months will have more carting days than other months). Austral Bricks operates clay quarries elsewhere in the wheatbelt and the outer Metropolitan area, each with different types of clays. As such, they excavate and cart from different quarries throughout the year depending on market demand for certain products/clay types.

A Stockpile Area will be located within the Operation Area. This allows for ease of access for trucks and also helps with on-site management by keeping the stockpile within the operation area. This is a management technique used to help mitigate potential dust and noise impacts. The stockpile area may also be used to blend clays.

Further information on truck movements is provided below.

Rehabilitation

Rehabilitation of the quarry will involve recontouring the slopes to a safe and stable condition and revegetating with native species. Dams will be created from the lowest parts of the landscape.

Rehabilitation is detailed further in the Rehabilitation Management Plan (Land Insights, 2023). In general, rehabilitation will take place when an area is no longer required for operations (i.e. for clay excavation, for water management and drainage, for stockpiling and for access). It should also be noted that recontoured areas are also utilised for drainage basins during operations so usually cannot be vegetated until decommissioning.

It is expected that rehabilitation will take a few years to complete following decommissioning (to allow for monitoring of revegetation and erosion control). It should also be noted that the rehabilitation and closure of the quarry will also be reviewed by the Department of Mines, Industry Regulation and Safety in accordance with the *Mines Safety and Inspection Act 1994* which will confirm the safety of the slopes.

2.2 Hours of operation

The hours of operation will continue to conform with the current approvals which are as follows.

- 06:00 – 17:00 hours from Monday to Saturday between the months of October and May
- 06:00 – 17:00 hours from Monday to Friday between the months of June and September
- 06:00 – 17:00 hours from Monday to Saturday between the months of June to September with no more than 5 days annually subject to the maximum number of truck movements on those days being no greater than 40. Should any of the days fall on a Shire event day the number will be no greater than 30.
- During the Saturday of the Shire's Agricultural Show the number of trucks on the day will be limited to 30 (although it is unlikely that carting will occur on this day).

No operation will occur on Sundays or Public Holidays. A six-day operation week is required to maintain efficiency. Noise emitting equipment will not start until 7am in accordance with the Noise Regulations.

2.3 Stages and extent of excavation

The operation comprises of different areas which serve a different purpose as follows:

- Active Pit Area
- Stockpiling Area
- Drainage Basins
- Haul Roads
- Overburden Bunds
- Topsoil Stockpiles
- Areas undergoing rehabilitation and recontouring (note that recontoured areas are also utilised as drainage basins).

These areas are marked on the plans at Appendix B (where applicable) and can be seen on the aerial photography of the site.

It should be noted that this application relates to the existing operation/quarry and the future expansion area (the area labelled in previous applications as “Stage 1”). The existing pit area has not previously been given a stage number, however for this application it has been allocated as “Stage 1a” for the sake of completeness and consistency. The expansion area (previously labelled as “Stage 1”) has been labelled as “Stage 1b” to indicate the next phase of excavation. Stage 1b is consistent with the area previously labelled as “Stage 1”.

2.4 Depths and extent of excavation

The extent of excavation is shown on the plans at Appendix B. The size of the existing Pit Area is approximately 44.7 hectares.

The size of the next stage of excavation (Stage 1b) is 11 hectares. It should be noted that prior to clearing the next stage of excavation a few years ago, this area was surveyed to ensure that the extent of clearing was accurate.

The current pit has been excavated to a depth of approximately 14-15 metres. The ultimate depth of the pit areas is expected to be approximately 15 metres, although this can vary depending on the topography, the depth of overburden and the depth of the resource. Depth of resource is determined during drilling campaigns. During drilling, depth to groundwater is also noted and taken into account during operation planning. Excavation remains higher than 2 meters above the aquifer. The latest survey plan by Scanlan Surveys showing the depth and extent of excavation is also attached.

It is important to note that despite the careful planning and onsite investigations which help determine the location of the resource, the depth can vary slightly from the areas depicted on the plans.

2.5 Topsoil and Overburden

Topsoil and overburden will be removed prior to excavation commencing in new areas. Topsoil is scraped from the top of the area to be excavated to a depth of approximately 0.5 metres. It is either transferred directly to an area being rehabilitated or pushed to form low stockpiles for later use in rehabilitation. The current Topsoil Stockpile is labelled on the plan at Appendix B.

Overburden is approximately 3 to 4 metres deep but can vary in depth across the site. Overburden is scraped from the surface and used to create bunds along the perimeter of the excavation/pit area. This practice will continue as the excavation progresses. Overburden bunds also assist with drainage management. It is generally placed around the perimeter of the excavation area, so it is ready to be pushed back into the excavation area for future recontouring.

As excavation progresses, existing topsoil and overburden bunds will be used for recontouring and rehabilitation and new bunds will be established around new pit areas.

2.6 Site preparation

As the site has been used for clay extraction for over 70 years, minimal site preparation is required to continue operation.

Preparation has already commenced for the next stage of excavation (the area previously labelled as "stage 1" and now referred to as "Stage 1b"), including clearing in accordance with an approved Clearing Permit. Should any additional clearing be required, a Clearing Permit will be obtained from DWER in accordance with the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Fencing already exists around the perimeter of the site and a locked gate and signage is located at the site entrance. Drainage management is already established to control water runoff within the operation area. Dieback management procedures and weed control are in place in accordance with the environmental approval issued by the Commonwealth government under the *Environmental Protection and Biodiversity Conservation Act 1999*. Site access including a sealed site entrance and gravel haul road have long been established.

2.7 Access arrangements

Access to the quarry is from an existing entrance at Morangup Road, located at the southern boundary of Lot 1. The main access road/haul road extends north into the site and to the operation area.

The entrance/exit to the site is sealed/bituminised for 30 metres. This means that trucks drive over a sealed section of road before exiting onto Morangup Road, allowing for dust and mud to fall off the trucks and meaning that the unsealed track does not directly adjoin the road.

It should be noted that Morangup Road is a gravel road shortly to the east of the site which tracks dust onto Morangup Road. In addition to this, there is also a gravel driveway to the nature reserve located a short distance to the west along Morangup Road.

Once clay trucks reach the exit, they turn right onto Morangup Road and travel along Toodyay Road towards Perth and the Austral Bricks manufacturing facilities.

Unauthorised access to the site is restricted by locked gates at the entrances.

2.8 Truck movements

Trucks will access the site to cart clay as required throughout the year.

Approximately 160,000 tonnes of clay will be removed from the site annually (depending on demand) which equates to 4,250 truckloads each year. Cartage will take place over two separate carting campaigns each year. The campaigns will last between 3-4 weeks each time. This number can be broken down based on the estimated number of days that carting will take place. The breakdown is as follows:

- 2,125 truck loads per campaign
- 531 truck loads per week (during a carting campaign)

If undertaking carting during the months of October to May, this is further broken down to an average of 89 truck loads per day and nine truck loads per hour.

The carting regime and the specific number of truck movements will vary depending on the weather and demand for a particular type of clay, therefore there may be slight variations in the above figures. There will be some weeks when truck movements will be higher than others. There will also be many occasions where there will be no trucks visiting the site for a few weeks at a time.

Trucks used for carting clay are generally 27.5m prime movers with trailer and 8 wheel truck and dog combinations with gross weight of 64 tonnes and payload of 42 tonnes. The specific type of truck used depends on availability.

2.9 Plant and on-site equipment

No permanent structures associated with the clay pit will be situated on the site. A temporary structure to be used as an office and lunchroom will be located on the site. It will be moved around the site as required. A portable toilet will also be located with the office.

The equipment required for excavation will be brought in on an as-required basis and will include a dozer, excavator, water truck, haul trucks, and loader. This equipment is removed at the end of each "earthworks campaign" or "carting campaign".

No bulk storage of fuel and oil is required on site and no chemicals are stored on site. A Refuelling Management Plan is attached.

All supplies will be delivered. Rubbish bins will be provided for site workers to use. A Waste Management Plan is attached.

2.10 Controls

Excavation activities on site will be conducted in accordance with the *Mines Safety and Inspection Act (1994) and Regulations (1995)*. Operations are managed by a licenced Quarry Manager and inspections occur on a daily basis during the excavation or carting campaigns. In addition, officers from DMIRS will also inspect the quarry at decommissioning to check the safety and stability of slopes.

Operations are managed by a licenced Quarry Manager and inspections occur on a daily basis during the excavation and cartage campaigns. Inspections are also undertaken by the Resources Safety division of the Department of Mines, Industry Regulation and Safety who check safety, operational procedures and workplace health such as dust and noise.

Austral Bricks have procedures in place to manage safety, health, environmental impact, site completion and rehabilitation. Full personal protection is required for all persons on site at all times. All workers are

required to wear full protective safety and high visibility gear when on site and all vehicles have two-way radio capability. There is a site entry "call up" procedure in place. The site is within mobile phone contact.

Fences and warning signs required by DMIRS and the Shire of Toodyay will be maintained as required.

2.11 Public Safety

Public access to the site is restricted and appropriate warning signs are placed at the entrance regarding quarrying and restricted entrance. The site has locked gates when it is not being worked.

Work on site (excavation and cartage) will be discontinuous and there will be periods of time throughout the year when no activity will take place on site. This reduces the risk to public safety from machinery and truck movements. When the site is not operational, the Quarry Manager periodically checks to ensure the site is secure and safe.

2.12 Workforce

Workers will be on site primarily during earthworks campaign or carting campaigns. At such times the workforce will vary from 1-6 workers in addition to the truck drivers who enter and leave the site. There are 1 to 2 staff on-site during excavation campaigns and 4 to 5 staff on-site during carting campaigns.

2.13 Bushfire management

A Bushfire Management Plan was prepared for the operation in 2021 by Bushfire Prone Planning and is attached.

It should be noted that the SPP 3.7 Guidelines includes a provision stating that the requirement for a Bushfire Management Plan for extractive industry is up to the discretion of the decision-maker. Clause 2.6 of the Guidelines states that:

Decision-makers can apply exemptions from the requirements of SPP 3.7 and these Guidelines where there is no intensification of land-use, and/or the proposal is not increasing the bushfire threat.

An example given in the Guidelines for the type of proposal/development which could be exempt includes extractive industries as follows:

A development application for an extractive industry where the extraction is undertaken in an open cleared area (for example, quarries and open cut mining) and no habitable buildings are proposed.

Therefore, although a Bushfire Management Plan has been prepared for the site to assist with site operations and compliance, the requirement for this plan is at the discretion of the Local Government.

3 Environmental Risk Assessment Summary

3.1 Introduction

Environmental management is achieved through implementation of a variety of management plans throughout the duration of the operation. Compliance with these environmental management commitments can also be monitored by the Shire through the Planning Approval and Licence.

The primary aim of the management plans is to ensure the operation has minimal environmental impacts and to help return the land to an appropriate end use. The following management plans are included in this report:

- Dust Management Plan (Land Insights, 2023)
- Water Management Plan (Land Insights, 2023)
- Visual Amenity Management Plan (Land Insights, 2023)
- Rehabilitation Management Plan (Land Insights, 2023)
- Refuelling Management Plan (Land Insights, 2023)
- Waste Management Plan (Land Insights, 2023)
- Phytophthora Dieback Hygiene Management Plan (Glevan Consulting, 2020)
- Bushfire Management Plan (Bushfire Prone Planning, 2021)

3.2 Risk Assessment

The risk assessment for the operation is summarised in the risk matrix below (Table 5.1). It lists the feature being considered, the risk if the operation is not managed and the residual risk once avoidance, mitigation and management is considered. The assessment is based on the criteria in the Department of Water and Environmental Regulation's *Guidance Statement: Risk Assessments* (2017). The environmental and amenity factors considered in the risk assessment below are based on the EPA environmental factors and objectives, where relevant, as listed in "Statement of Environmental Principles, Factors, Objectives and Aims of EIA" (EPA, 2021).

The risk rating is determined by considering the likelihood and consequence of environmental and amenity impact. The risk matrix criteria is set out in Table 5.2. The likelihood and consequence criteria are defined in Tables 5.3 and 5.4. It should be noted that Tables 5.2 – 5.4 are sourced from *Guidance Statement: Risk Assessments* (DWER, 2017).

The "inherent" risk rating is determined in the first part of Table 5.1. It considers the likelihood and consequence of impact if the operation was unmanaged. That is, if there was no avoidance, mitigation, complaints procedures and management. The "residual" risk rating in the second part of the table is determined by considering the likelihood and consequence of impact if the operation is managed in accordance with the various management plans which apply to the operation.

The purpose of the risk assessment is to demonstrate that inherent risk identified as "medium", "high" or "extreme" can be effectively managed. Management of the operation has the potential to reduce the likelihood of an impact occurring (i.e., the frequency) as well as the consequence of what this impact will be.

It should be noted that none of the environmental and amenity factors listed in the table below are considered to have an unmanaged risk greater than "medium". That is, the operation is not considered to have a "high" or "extreme" environmental or amenity risk. Also important to note is that the residual or managed risk for all environmental and amenity factors can be reduced to "low" risk with appropriate management as is shown in the assessment below.

3.3 Compliance History

The compliance history of the operation has also been provided in the risk assessment below (Table 5.1). The purpose of this is to demonstrate the reality of the potential impact of the operation and that the management of the site is effective at reducing risk. As the site is already operational, the compliance history can also provide evidence of the accuracy of the risk assessment for the "residual" or "managed" risk.

Table 5.1 – Environmental Risk Matrix

POTENTIAL IMPACT WITHOUT MANAGEMENT	CONSIDERATION OF INHERENT RISK	INHERENT RISK			MANAGED RISK ASSESSMENT	COMPLIANCE HISTORY	MANAGED RISK		
		L	C	R			L	C	R
Native vegetation may be significantly impacted by the development. The "unmanaged risk" entails no avoidance or mitigation of impact to native vegetation (i.e. it is not clearly defined, mapped and assessed).	The likelihood of impact without management (avoidance and mitigation) is considered to be "possible" as the event could occur at some time and the consequence of impact without management is considered "minor" as there is considered to be low level on site impacts without management.	Possible	Minor	Med	Vegetation values have been determined through a "Flora and Vegetation Assessment" (Del Botanics, 2013). The next stage of excavation has already been cleared in accordance with a Clearing Permit under the EP Act. An additional approval has also been obtained for clearing from the Commonwealth under the EPBC Act. Avoidance, mitigation and reduction and alternatives were considered as part of the Clearing Permit and EPBC Referral process and have been implemented. Future excavation beyond the stage already cleared will require additional Clearing Permits issued by DWER. Options for avoidance, mitigation and reduction will be considered during this planning phase. There will be no further disturbance to vegetation as part of this Licence application for the next 10 years of excavation. The area cleared was surveyed to ensure it was not cleared beyond the approved area. The vegetation surrounding the pit area is managed in accordance with the "Environmental Management and Offset Strategy" (Land Insights, 2015) which requires management of edge effects and disturbance. The managed consequence is considered to be "slight" as the on-site impacts are low-level and offsite local impacts are minimal. The likelihood of further disturbance to native vegetation is "unlikely".	Compliant – All clearing has been undertaken in accordance with approvals and various management plans are in place to further manage and protect remaining vegetation/habitat (refer to the "Environmental Management and Offset Strategy" and the "Phytophthora Dieback Hygiene Management Plan".	Unlikely	Slight	Low

POTENTIAL IMPACT WITHOUT MANAGEMENT	CONSIDERATION OF INHERENT RISK	INHERENT RISK			MANAGED RISK ASSESSMENT	COMPLIANCE HISTORY	MANAGED RISK		
		L	C	R			L	C	R
Threatened Ecological Communities may be impacted if present on the site.	The likelihood of impact without management (avoidance and mitigation) is considered to be "rare" as the event will only occur in exceptional circumstances and the consequence of impact without management is considered "moderate" as there is considered to be mid-level on site impacts without management.	Rare	Moderate	Med	The "Flora and Vegetation Assessment" (Del Botanics, 2013) did not identify any TECs on the site. Threatened communities will not be impacted as further clearing is not proposed as part of this application. The likelihood of native vegetation being impacted with management (avoidance and mitigation) is considered to be "rare" as the event will only occur in exceptional circumstances and the consequence of impact with management is considered "minor" as the on-site impact is considered to be low level.	Compliant – A Flora Survey was undertaken to confirm the vegetation composition.	Rare	Minor	Low
Threatened and Priority flora species may be impacted if present on the site.	The likelihood of impact without management (avoidance and mitigation) is considered to be "rare" as the event will only occur in exceptional circumstances and the consequence of impact without management is considered "moderate" as there is considered to be mid-level on site impacts without management.	Rare	Moderate	Med	"Flora and Vegetation Assessment" (Del Botanics, 2013) did not identify any threatened or priority flora species on the site. Threatened and Priority species will not be impacted as further clearing is not proposed as part of this application. The likelihood of native vegetation being impacted with management (avoidance and mitigation) is considered to be "rare" as the event will only occur in exceptional circumstances and the consequence of impact with management is considered "minor" as the on-site impact is considered to be low level.	Compliant – A Flora Survey was undertaken to confirm the vegetation composition.	Rare	Minor	Low

POTENTIAL IMPACT WITHOUT MANAGEMENT	CONSIDERATION OF INHERENT RISK	INHERENT RISK			MANAGED RISK ASSESSMENT	COMPLIANCE HISTORY	MANAGED RISK		
		L	C	R			L	C	R
Weeds may be introduced to areas of native vegetation adjoining the pit area.	The likelihood of impact without management is considered to be "possible" as the event could occur at some time and the consequence of impact without management is considered "minor" as there is considered to be low level on site impacts without management.	Possible	Minor	Med	The "Environmental Management and Offset Strategy" (Land Insights, 2015) as approved by the Commonwealth provides management actions to protect and manage the vegetation surrounding the pit area from edge effects and disturbance. In addition, a "Weed Management Plan" (Land Insights, 2022) has also been prepared for the operation. The likelihood of weeds being introduced with management is considered to be "unlikely" as the event will not occur in most circumstances and the consequence of impact with management is considered "slight" as the on-site impacts are low-level and offsite local impacts are minimal.	Compliant – Remnant vegetation not approved for clearing is managed from edge effects and disturbance in accordance with the "Environmental Management and Offset Strategy".	Unlikely	Slight	Low
Dieback may be introduced and impact on native vegetation.	The likelihood of impact without management is considered to be "possible" as the event could occur at some time and the consequence of impact without management is considered "moderate" as there is considered to be mid-level on site impacts without management.	Possible	Moderate	Med	Refer to the "Phytophthora Dieback Hygiene Management Plan" (Glevan Consulting, 2020) for specific actions relating to dieback management. Although there is evidence of dieback on the site, this is related to the watercourses beyond the excavation area and the access tracks. The presence and past spread of dieback is related to past operations, trespassers and natural water flow along the creeklines. There is no evidence of dieback within the operation area. The likelihood that the operation will contribute to further spread of dieback is considered to be "unlikely" as a number of management procedures are already in place. The consequence is considered to be "minor" as the on-site impacts are low-level and offsite local impacts are minimal.	Compliant – The operation is managed in accordance with the "Phytophthora Dieback Hygiene Management Plan".	Unlikely	Minor	Med

POTENTIAL IMPACT WITHOUT MANAGEMENT	CONSIDERATION OF INHERENT RISK	INHERENT RISK			MANAGED RISK ASSESSMENT	COMPLIANCE HISTORY	MANAGED RISK		
		L	C	R			L	C	R
Fragmentation to vegetation and ecological linkages.	The likelihood of impact without management is considered to be "unlikely" as the event will not occur in most circumstances and the consequence of impact without management is considered "minor" as there is considered to be low level on site impacts without management.	Unlikely	Minor	Med	There will be no further disturbance to vegetation as part of this Licence application for the next 10 years of excavation. The area cleared was surveyed to ensure it was not cleared beyond the approved area. The vegetation surrounding the pit area is managed in accordance with the "Environmental Management and Offset Strategy" (Land Insights, 2015) which requires management of edge effects and disturbance. There will therefore not be any further clearing or fragmentation of vegetation. In addition, the operation area is surrounded by a large amount of remnant vegetation, therefore any clearing is not considered to fragment the vegetation. The likelihood of causing fragmentation is "rare" as the event will only occur in exceptional circumstances. The managed consequence is considered to be "slight" as the on-site impacts are low-level and offsite local impacts are minimal.	Compliant – Clearing associated with the operation has been undertaken in accordance with the relevant approvals.	Rare	Slight	Low

POTENTIAL IMPACT WITHOUT MANAGEMENT	CONSIDERATION OF INHERENT RISK	INHERENT RISK			MANAGED RISK ASSESSMENT	COMPLIANCE HISTORY	MANAGED RISK		
		L	C	R			L	C	R
Native fauna (individuals and communities) can potentially be significantly impacted through clearing of habitat, introduction of weeds and disease and activities on site.	The likelihood of impact without management is considered to be "unlikely" as the event will not occur in most circumstances and the consequence of impact without management is considered "minor" as there is considered to be low level on site impacts without management.	Unlikely	Minor	Med	There will be no further disturbance to vegetation and habitat areas as part of this Licence application for the next 10 years of excavation. The area cleared was surveyed to ensure it was not cleared past the approved area. The vegetation surrounding the pit area is managed in accordance with the "Environmental Management and Offset Strategy" (Land Insights, 2015) which requires management of edge effects and disturbance. The likelihood of further disturbance to native vegetation and habitat areas for native fauna is "unlikely" as the event will not occur in most circumstances. The managed consequence is considered to be "slight" as the on-site impacts are minimal and offsite local impacts are minimal.	Compliant – All clearing has been undertaken in accordance with approvals and various management plans are in place to further manage and protect remaining vegetation/habitat (refer to the "Environmental Management and Offset Strategy" (Land Insights, 2015) and the "Phytophthora Dieback Hygiene Management Plan" (Glevan Consulting, 2020).	Unlikely	Slight	Low

POTENTIAL IMPACT WITHOUT MANAGEMENT	CONSIDERATION OF INHERENT RISK	INHERENT RISK			MANAGED RISK ASSESSMENT	COMPLIANCE HISTORY	MANAGED RISK		
		L	C	R			L	C	R
Threatened and Priority Fauna disturbed and impacted by the operation (predominantly through clearing).	The likelihood of impact without management is considered to be "possible" as the event could occur at some time and the consequence of impact without management is considered "moderate" as there is considered to be mid-level on site impacts without management.	Possible	Moderate	Med	There will be no further disturbance to vegetation and habitat areas as part of this Licence application for the next 10 years of excavation. The area cleared was surveyed to ensure it was not cleared past the approved area. The vegetation surrounding the pit area is managed in accordance with the "Environmental Management and Offset Strategy" (Land Insights, 2015) which requires management of edge effects and disturbance. The likelihood of further disturbance to native vegetation and habitat areas for threatened and priority fauna is "unlikely" as the event will not occur in most circumstances. The managed consequence is considered to be "slight" as the on-site impacts are minimal and offsite local impacts are minimal.	Compliant – All clearing has been undertaken in accordance with approvals and various management plans are in place to further manage and protect remaining vegetation/habitat (refer to the "Environmental Management and Offset Strategy" (Land Insights, 2015).	Unlikely	Slight	Low
Impact to hydrological regimes such as groundwater level changes, flooding, modification of watercourses etc.	The likelihood of impact to hydrological regimes without management (avoidance of watercourses and groundwater etc) is considered to be "possible" as the event could occur at some time and the consequence of impact without management is considered "moderate" as there is considered to be mid-level on site impacts without management.	Possible	Moderate	Med	There will be no modifications to watercourses, no interception of groundwater and other hydrological regimes. The likelihood of significant impact is "rare" as the event will only occur in exceptional circumstances and the consequence of impact is considered to be "minor" as the on-site impacts are low-level and offsite local impacts are minimal. Refer to the Water Management Plan for more specific management actions (Land Insights, 2023).	Compliant – A Water Management Plan (Land Insights, 2023) has been prepared for the operation and is implemented as required. The results of any water monitoring is provided to the Shire should any dewatering take place.	Rare	Minor	Low

POTENTIAL IMPACT WITHOUT MANAGEMENT	CONSIDERATION OF INHERENT RISK	INHERENT RISK			MANAGED RISK ASSESSMENT	COMPLIANCE HISTORY	MANAGED RISK		
		L	C	R			L	C	R
Intersection with the groundwater table (confined aquifer) which could potentially lead to dewatering requirements and contamination.	The likelihood of impact without management is considered to be "unlikely" as the event will not occur in most circumstances and the consequence of impact without management is considered "minor" as there is considered to be low level on site impacts without management.	Unlikely	Minor	Med	There will be no interception with the groundwater (confined aquifer). There are no expressions of groundwater within the operation area. The likelihood of significant impact is "rare" as the event will only occur in exceptional circumstances and the consequence of impact is considered to be "minor" as the on-site impacts are low-level and offsite local impacts are minimal. Refer to the Water Management Plan for more specific management actions (Land Insights, 2023).	Compliant – The underlying aquifer has not been intersected by operations. A Water Management Plan (Land Insights, 2023) has been prepared for the operation and is implemented as required.	Rare	Minor	Low
Impact to surface water quality due to erosion and transport of sediment to watercourses and wetlands. Sedimentation can result in higher turbidity levels and suspended solids.	The likelihood of impact to hydrological regimes without management (avoidance of watercourses and groundwater etc) is considered to be "possible" as the event could occur at some time and the consequence of impact without management is considered "moderate" as there is considered to be mid-level on site impacts without management.	Possible	Moderate	Med	Refer to the Water Management Plan (Land Insights, 2023). The likelihood of impact with management is "rare" and the consequence of impact is considered to be "minor" as the on-site impacts are low-level and offsite local impacts are minimal.	Compliant – Water management currently takes place in accordance with current approvals. A Water Management Plan (Land Insights, 2023) has been prepared for the operation and is implemented as required.	Rare	Minor	Low

POTENTIAL IMPACT WITHOUT MANAGEMENT	CONSIDERATION OF INHERENT RISK	INHERENT RISK			MANAGED RISK ASSESSMENT	COMPLIANCE HISTORY	MANAGED RISK		
		L	C	R			L	C	R
Impact to surface water and groundwater from hydrocarbons (fuel and oil) and chemicals as a result of spills and leaks from equipment and machinery used.	The likelihood of impact without management is considered to be "unlikely" as the event will not occur in most circumstances and the consequence of impact without management is considered "minor" as there is considered to be low level on site impacts without management.	Unlikely	Minor	Med	Austral Bricks operate in accordance with their Standard Operating Procedure for management and maintenance of machinery and training of staff. Refer to the Refuelling Management Plan (Land Insights, 2023) which addresses management of hydrocarbon spills and leaks. The likelihood of impact with management is "rare" and the consequence of impact is considered to be "minor" as the on-site impacts are low-level and offsite local impacts are minimal.	Compliant – Austral Bricks operates in accordance with a Refuelling Management Plan (Land Insights, 2023) and Standard Operating procedures. .	Rare	Minor	Low
Pathogens from staff amenities posing a risk to water quality and public health.	The likelihood of impact without management is considered to be "unlikely" as the event will not occur in most circumstances and the consequence of impact without management is considered "minor" as there is considered to be low level on site impacts without management.	Unlikely	Minor	Med	Staff amenities are managed in accordance with the manufacturer's instructions. The likelihood of impact with management is "rare" and the consequence of impact is considered to be "minor" as the on-site impacts are low-level and offsite local impacts are minimal.	Compliant – the staff amenities are currently managed in accordance with the specifications and cleaned regularly.	Rare	Minor	Low
Soils subject to significant water and wind erosion.	The likelihood of impact without management is considered to be "possible" as the event could occur at some time and the consequence of impact without management is considered "minor" as there is considered to be low-level on site impacts without management.	Possible	Minor	Med	Wind erosion can be managed through the Dust Management Plan (Land Insights, 2023). The likelihood of impact is "rare" and the consequence of impact is considered to be "minor" as the on-site impacts are low-level and offsite local impacts are minimal.	Compliant – The operational area is maintained to control water erosion and to retain surface water on-site. Wind erosion is managed through the Dust Management Plan (Land Insights, 2023).	Rare	Minor	Low
Risk of acid sulphate soils forming.	N/A	N/A			There is low risk of acid sulphate soils on the site and does not require specific management.	N/A	N/A		

POTENTIAL IMPACT WITHOUT MANAGEMENT	CONSIDERATION OF INHERENT RISK	INHERENT RISK			MANAGED RISK ASSESSMENT	COMPLIANCE HISTORY	MANAGED RISK		
		L	C	R			L	C	R
Local landform not being recontoured to be compatible with the surrounding landscape.	The likelihood of impact without management is considered to be "unlikely" as the event will not occur in most circumstances and the consequence of impact without management is considered "minor" as there is considered to be low level on site impacts without management.	Unlikely	Minor	Med	The site will be rehabilitated in accordance with the Rehabilitation Management Plan (Land Insights, 2023). The likelihood of impact from unsuccessful rehabilitation is "rare" and the consequence of impact is considered to be "minor" as the onsite impacts are low-level.	Compliant – the operation does not have significant visual impact from the surrounding roads or surrounding area.	Rare	Minor	Low
Impact to Aboriginal Heritage Sites. One Registered Heritage Site is located on the site. This site is the "Avon River" (ID 15979) and is mapped along the Morangup Brook (which is located across the north-western corner of Lot 1).	The likelihood of impact without management is considered to be "unlikely" as the event will not occur in most circumstances and the consequence of impact without management is considered "minor" as there is considered to be low level on site impacts without management.	Unlikely	Minor	Med	The heritage site is located at least 550 metres from the operation and will not be directly disturbed by the excavation. Water management on site will protect the watercourse and heritage site from indirect impact. There are no Other Heritage Sites located on or directly surrounding the operation. Austral Bricks has procedures to address Aboriginal heritage and all procedures will follow the *Aboriginal Heritage Act 1972*. The likelihood of significant impact with management is "rare" as the event will only occur in exceptional circumstances and the consequence of impact is considered to be "minor" as the on-site impacts are low-level and offsite local impacts are minimal. Refer to the Water Management Plan for more specific management actions (Land Insights, 2023).	Compliant – water management is in place to protect surrounding watercourses in accordance with the Water Management Plan (Land Insights, 2023).	Rare	Minor	Low
Impact to sites of European heritage.	N/A	N/A			No European heritage sites are located on site.	N/A	N/A		

POTENTIAL IMPACT WITHOUT MANAGEMENT	CONSIDERATION OF INHERENT RISK	INHERENT RISK			MANAGED RISK ASSESSMENT	COMPLIANCE HISTORY	MANAGED RISK		
		L	C	R			L	C	R
Noise levels exceed the assigned noise levels as prescribed by the Noise Regulations to noise sensitive premises.	The likelihood of impact without management is considered to be "unlikely" as the event will not occur in most circumstances and the consequence of impact without management is considered "minor" as there is considered to be low level on site impacts without management. This is largely owing to the adequate separation distances to the nearest sensitive residences.	Unlikely	Minor	Med	Refer to the management provided in the Noise Management Plan (Land Insights, 2023). The likelihood of significant impact with noise management is "rare" as the event will only occur in exceptional circumstances and the consequence of impact is considered to be "slight" as the on-site impacts are minimal and offsite local impacts are minimal.	Compliant –The site operates in accordance with a Noise Management Plan (Land Insights, 2023) and meets the recommended separation distances. No noise complaints have been received for the operation.	Rare	Slight	Low
Dust emissions leave the property boundary and have off-site impact on sensitive premises.	The likelihood of impact without management is considered to be "unlikely" as the event will not occur in most circumstances and the consequence of impact without management is considered "minor" as there is considered to be low level on site impacts without management. This is largely owing to the adequate separation distances to the nearest sensitive residences.	Unlikely	Minor	Med	Refer to the management provided in the Dust Management Plan (Land Insights, 2023). The likelihood of significant impact with dust management is "rare" as the event will only occur in exceptional circumstances and the consequence of impact is considered to be "slight" as the on-site impacts are minimal and offsite local impacts are minimal.	Compliant –The site operates in accordance with a Dust Management Plan (Land Insights, 2023) and meets the recommended separation distances. No noise complaints have been received for the operation	Rare	Slight	Low
Buffers and separation distances are not adequate enough to reduce impact on sensitive land uses.	N/A	N/A			Separation distances to sensitive land uses are greater than the recommended distance of 500-1000 metres as recommended by EPA Guidance Statement No. 3. The closest sensitive residence is 1,400 metres from the operation.	Compliant – Recommended separation distances have been met for the operation.	N/A		

POTENTIAL IMPACT WITHOUT MANAGEMENT	CONSIDERATION OF INHERENT RISK	INHERENT RISK			MANAGED RISK ASSESSMENT	COMPLIANCE HISTORY	MANAGED RISK		
		L	C	R			L	C	R
Impact of truck use on local and regional roads and traffic.	The likelihood of impact without management is considered to be "possible" as the event could occur at some time and the consequence of impact without management is considered "minor" as there is considered to be low-level on site impacts without management.	Possible	Minor	Med	Austral Bricks has already undertaken road improvement to Morangup Road in the past. Financial contributions will be made to the Shire in accordance with the *Shire of Toodyay Local Planning Policy (LPP 7) Extractive Industries – Road Contributions.* The only local road used by the operation is Morangup Road. After this all trucks travel to Perth along Toodyay Road. There is not expected to be any increase in tonnage or truck movements as a result of this application. The likelihood of impact to local roads is therefore considered to be "rare" as the road contributions will be made by the operator and the consequence of impact is "minor" as any impact is likely to be low-level.	Compliant – Austral Bricks will make financial contributions in accordance with the LPP.	Rare	Minor	Low
Impact of the operation on visual amenity and that the pit area can be seen from the public realm.	The likelihood of impact without management is considered to be "unlikely" as the event will not occur in most circumstances and the consequence of impact without management is considered "minor" as there is considered to be low level on site impacts without management.	Unlikely	Minor	Med	The site will be rehabilitated in accordance with the Visual and Amenity Management Plan (Land Insights, 2023). The likelihood of visual impact from unsuccessful rehabilitation is "rare" and the consequence of impact is considered to be "minor".	Compliant – the operation does not have significant visual impact from the surrounding roads or surrounding area.	Rare	Minor	Low

The risk matrix used to determine the overall risk is defined in Table 5.4 below. The criteria set out in Table 5.2 has been used to determine the likelihood of the risk occurring and the consequence criteria is set out in Table 5.3 below. Please note that the tables below are copied from DWER *Guidance Statement: Risk Assessments* (2017).

Table 5.2 – Likelihood Criteria

Likelihood				
Almost certain	**Likely**	**Possible**	**Unlikely**	**Rare**
The risk event is expected to occur in most circumstances.	The risk event will probably occur in most circumstances.	The risk event could occur at some time.	The risk event will probably not occur in most circumstances.	The risk event may only occur in exceptional circumstances.

Source: DWER 2017

Table 5.3 – Consequence Criteria

Criteria	Consequence				
	Slight	**Minor**	**Moderate**	**Major**	**Severe**
Environment	• On-site impact: minimal (No discernible adverse impact). • Off-site impacts local scale: minimal • Off-site impacts wider scale: not detectable	• On-site impacts: low level (discernible effect on the environment but no adverse impact) • Off-site impacts local scale: minimal • Off-site impacts wider scale: not detectable • Minor number of individuals of species may be affected locally.	• On-site impacts: mid level (Minor adverse affect to the environment) • Off-site impacts local scale: low level • Off-site impacts wider scale: minimal • Moderate loss of individuals of species locally.	• On-site impacts: high level (moderate impact to the environment) • Off-site impacts local scale: mid level • Off-site impacts wider scale: low level • Short term impact to an area of high conservation value or special significance^ • Moderate damage to ecosystem function and major loss of individuals of species locally.	• On-site impacts: catastrophic (significant impact to the environment) • Off-site impacts local scale: high level or above • Off-site impacts wider scale: mid level or above • Mid to long term or permanent impact to an area of high conservation value or special significance^ • Significant long-term damage/loss of ecosystem function and loss of individuals of species locally.

Criteria	Consequence				
	Slight	Minor	Moderate	Major	Severe
Public Health and Amenity	• Local scale: minimal to amenity.	• Local scale impacts: low level impact to amenity.	• Adverse health effects: low level or occasional medical treatment • Local scale impacts: mid level impact to amenity.	• Adverse health effects: mid level or frequent medical treatment • Local scale impacts: high level impact to amenity.	• Loss of life • Adverse health effects: high level or ongoing medical treatment • Local scale impacts: permanent loss of amenity.

Source: DWER 2017

^ Determination of areas of high conservation value or special significance should be informed by the Guidance Statement: Environmental Siting.

* 'onsite' means within the Lot boundary.

Table 5.4 – Risk Matrix Ratings

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

Source: DWER 2017

4 Site description

4.1 Climate

The south-west of Western Australia experiences a Mediterranean climate which is characterised by warm, dry summers and cool, wet winters.

The rainfall and temperature data for the region has been obtained from the Bureau of Meteorology "Climate Data Online" services. The average rainfall from the closest station which is the Toodyay station is 520mm. A majority of rainfall is from May to August.

The mean temperature information is from the closest station which is the Northam station. It states that the hottest month is January with an average maximum of 34.2°C and the coldest month is July with an average minimum of 5.4°C.

The prevailing winds throughout the majority of the year are predominantly from the east in summer months and from the west in winter (Bureau of Meteorology, 2022).

4.2 Topography and landform

The topography of the site is variable and undulating with high points and valleys throughout. slightly undulating with a moderate to steep slope throughout. There is a high point at the north-eastern corner and another at the south-eastern corner at approximately 280 metres AHD (Australian Height Datum). These areas are divided by a watercourse which drains towards the northern end of the lot where it reaches a low point of 195m AHD.

The operation area is located in the centre of Lot 1. The natural topography surrounding the pit is at approximately 245m AHD at the north-eastern corner of the operation to approximately 270m AHD at the southern end. The land generally slopes up to the south, down to the west, east and north.

Existing contours within the operation area were surveyed by Scanlan Surveys in 2020. A copy of the plan is provided at Appendix A.

4.3 Geology and soils

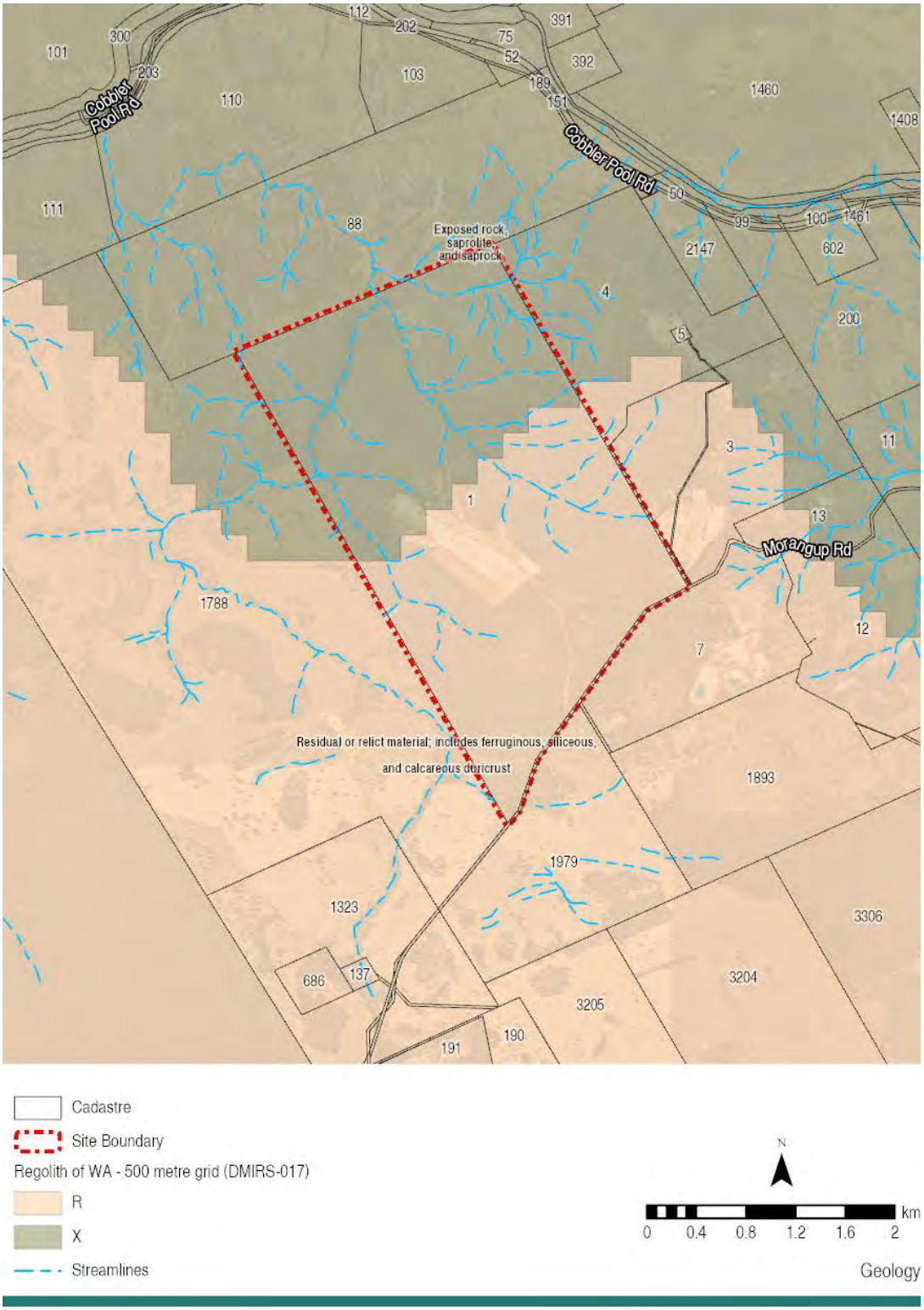
Geology

The site sits on the Darling Plateau which lies east of the Swan Coastal Plain and the Darling Scarp. It is characterised by an undulating hilly landscape and lateritic uplands with major valleys along the scarp. The general area is part of the Pre-Cambrian meta sedimentary complex known as the Jimperding Metamorphic Belt. The belt extends 120 kilometers in a north-westerly direction from York to Clackline and onto Chittering where it becomes the Chittering Metamorphic Belt (Stass Environmental, 2015).

The 500 metres grid Regolith of WA as mapped by DPIRD identifies the geology as “residual or relict materials including ferruginous siliceous and calcareous duricrust” across the southern extent of Lot 1 and “exposed rock, saprolite and saprock” across the northern extent. The geological formation is described as “dissected lateritic terrain with valleys and plateau remnants” and the geology as “deeply weathered mantle over granitic rocks”. The Regolith of WA is shown in Figure 1 below.

The 1:500 000 State interpreted bedrock geology as mapped by DMIRS (2022) is “Yilgarn Craton Granites”. It is described as “granitic rock, metamorphosed”. The Yilgarn Craton Granites are located in a band through the centre of Lot 1 and is associated with the quarry operation.

Figure 1 – Regolith of WA



Soil-landscape

Lot 1 is divided by three different soil-landscape units. Generally speaking, the north-west corner is the "Clackline Steep Rocky Hills" subsystem and "Michibin" subsystem, the centre of the property (including a majority of the operation) is the "Leaver" subsystem, the creeklines are the "Pindalup" subsystem and the southern portion of Lot 1 is the "Yalanbee" subsystem.

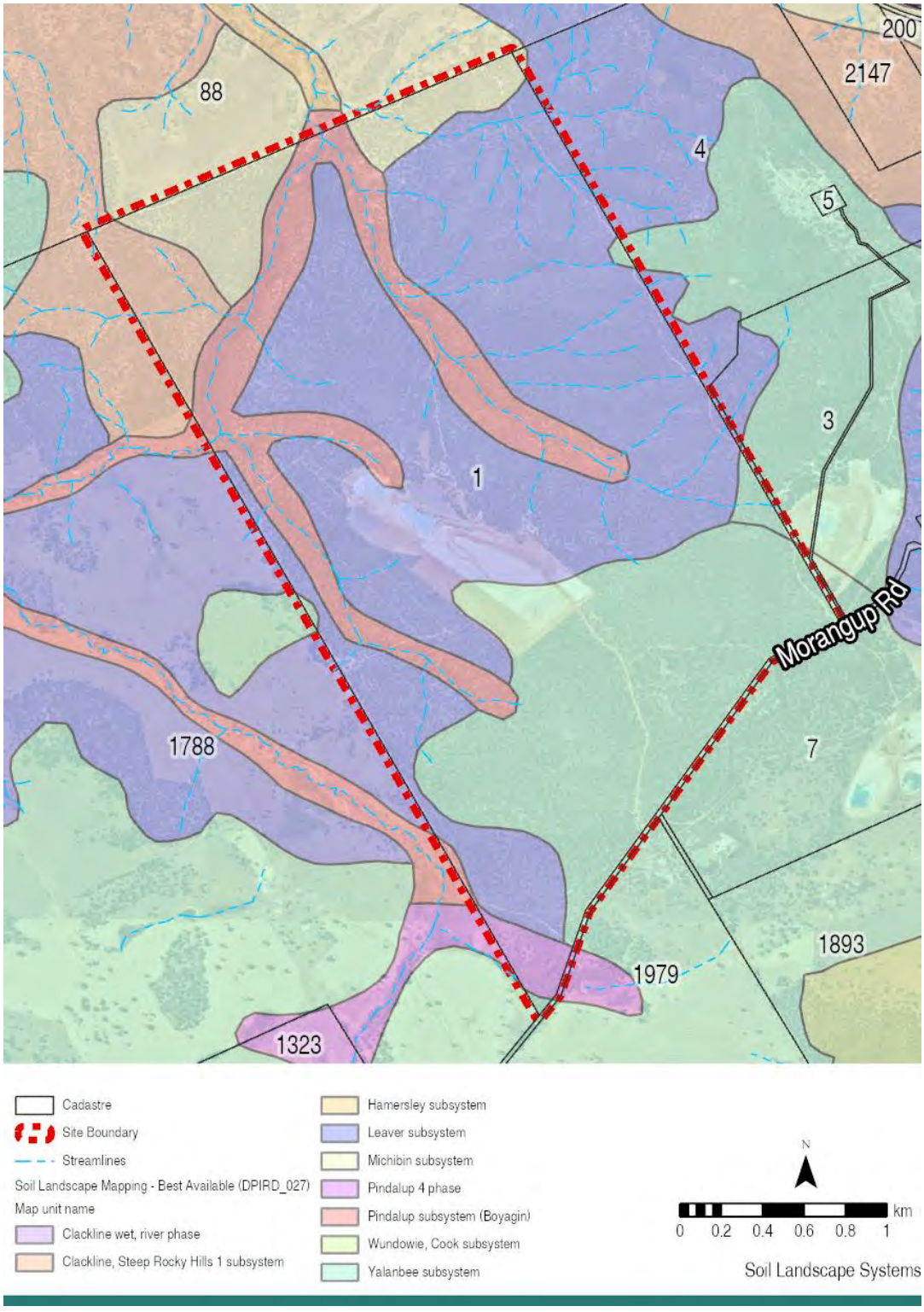
The soil-landscape units mapped across the site are described further in the table below and shown in Figure 2.

Table 4.2 – Soil-Landscape Units

NAME	CODE	DESCRIPTION	LOCATION
Clackline Steep Rocky Hills subsystem	253CcR1	Areas of rock outcrop and steep rocky hills.	Northern portion of Lot 1.
Michibin subsystem	253CcMN	Red and yellowish brown loams and clays, often gravelly with rocky areas and lateritic crests.	Northern portion of Lot 1.
Leaver subsystem	253ByLV	Gravelly yellow and red duplexes, gravelly deep clayey sands and sandy loams over laterite and clay.	Centre of Lot 1, including the operation.
Pindalup subsystem	253ByPN	Alluvial red and yellow duplex and uniform fine soils which are often gravelly.	Associated with the creeklines.
Yalanbee subsystem	253WnYA	Pisolitic gravelly, yellowish brown soils that vary in texture from loamy sands to clays, with pockets of pale sands and areas of outcropping laterite.	Southern end of Lot 1.

Source: DPIRD, 2022

Figure 2 – Soil-landscape Units



Generalised soil qualities of each soil-landscape unit are described in the table below.

Table 4.3 – Soil Qualities

SOIL-LANDSCAPE UNIT	WATER EROSION	WIND EROSION	WATERLOGGING	FLOOD	SALINITY
Clackline Steep Rocky Hills subsystem	Low risk	Moderate risk	Low risk	Low risk	Low risk
Michibin subsystem	Moderate risk	Moderate risk	Low risk	Low risk	Low risk
Leaver subsystem	Low risk	High risk	Low risk	Low risk	Low risk
Pindalup subsystem	High risk	Low risk	High risk	High risk	High risk
Yalanbee subsystem	Low risk	High risk	Low risk	Low risk	Low risk

Source: DPIRD, 2022

Acid sulphate soils

It is not considered that acid sulphate soils are an issue at the site. The acid sulphate soil mapping by DWER does not show a risk across the site. There is no evidence of acid sulphate soils from the groundwater and surface water testing undertaken at the site.

4.4 Vegetation

Existing vegetation

Lot 1 is predominantly covered on remnant vegetation except for the cleared areas associated with the quarry operations, access roads and firebreaks.

A spring *Flora and Vegetation Assessment* was undertaken by Del Botanics in October 2012 of the proposed quarry expansion area. The survey identified three vegetation communities within the survey area:

- "Marri/Jarrah Woodland with a diverse understorey" – Open Forest of *Corymbia calophylla* and *Eucalyptus marginata*, over shrubland of *Banksia sessilis, Banksia armarta* and *Allocasuarina humilis* over herbland of *Hibbertia hypericoides, Gompholobium marginatum* and *Banksia nivea*
- "Powderbark woodland with diverse understorey" – Woodland of *Eucalyptus accedens* over shrubland of *Xanthorrhoea acanthostachya, Melaleuca parviceps, Jacksonia restioides* over herbland of *Hibbertia hypericoides* and *Baekea camphorosmae*
- "Wandoo woodland with diverse understorey" – Woodland of *Eucalyptus wandoo* over shrubland of *Banksia sessilis* and *Leptospermum erubescens*, over herbland of *Banksia nivea, Hibbertia hypericoides* over open grassland of *Neurachne alopecuroidea*

The Flora and Vegetation Assessment (Del Botanics, 2013) rated the vegetation condition within the survey area as "Excellent", "Very Good" and "Good". Tracks located through the survey area were rated as "Completely Degraded".

The Survey recorded four introduced flora species.

The next stage of the pit expansion has already been cleared in accordance with the Clearing Permit issued by DWER. Any further expansion of the pit area will require a new Clearing Permit to be applied for in accordance with the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

In addition to the above flora survey undertaken in 2012, an additional spring flora survey was conducted across two different areas identified for potential offsets in 2013. The results of this survey provide an indication of the types of vegetation found across the remainder of Lot 1. Four vegetation types were identified in the survey and no Threatened or Priority species were observed. The vegetationntypes included Dampland, Jarrah-Marri woodland, Powderbark woodland and Wandoo woodland.

Regional vegetation

The Biogeographic Regionalisation of Australia (IBRA) divides Australia into "bioregions" based on major biological and geographical/geological attributes. Western Australia has 26 biogeographic regions and 53

subregions based on dominant landscape characteristics of climate, lithology, geology, landform and vegetation. The site is located within the Northern Jarrah Forest (NJF) subregion of the Jarrah Forest Bioregion.

The site is located in the Drummond Botanical Subdistrict within the the southwest Botanical Province as described by Beard (1990). Flora composition has been described by Beard (1990) as predominantly consisting of Banksia Low Woodlands on leached sands with Melaleuca swamps where ill drained and Woodlands of Eucalyptus spp. on less leached soils.

Vegetation Mapping

The pre-European system association is mapped by the Department of Primary Industries and Regional Development (DPIRD) as "East Darling 3003" across the southern half of the site and "East Darling 4" across the northern half of the site. Mapping is shown at Figure 3.

They are described as follows:

- "East Darling 3003" – Mainly Jarrah and Marri.
- "East Darling 4" – Jarrah, Marri and Wandoo

Figure 3 – Pre-European Vegetation Mapping

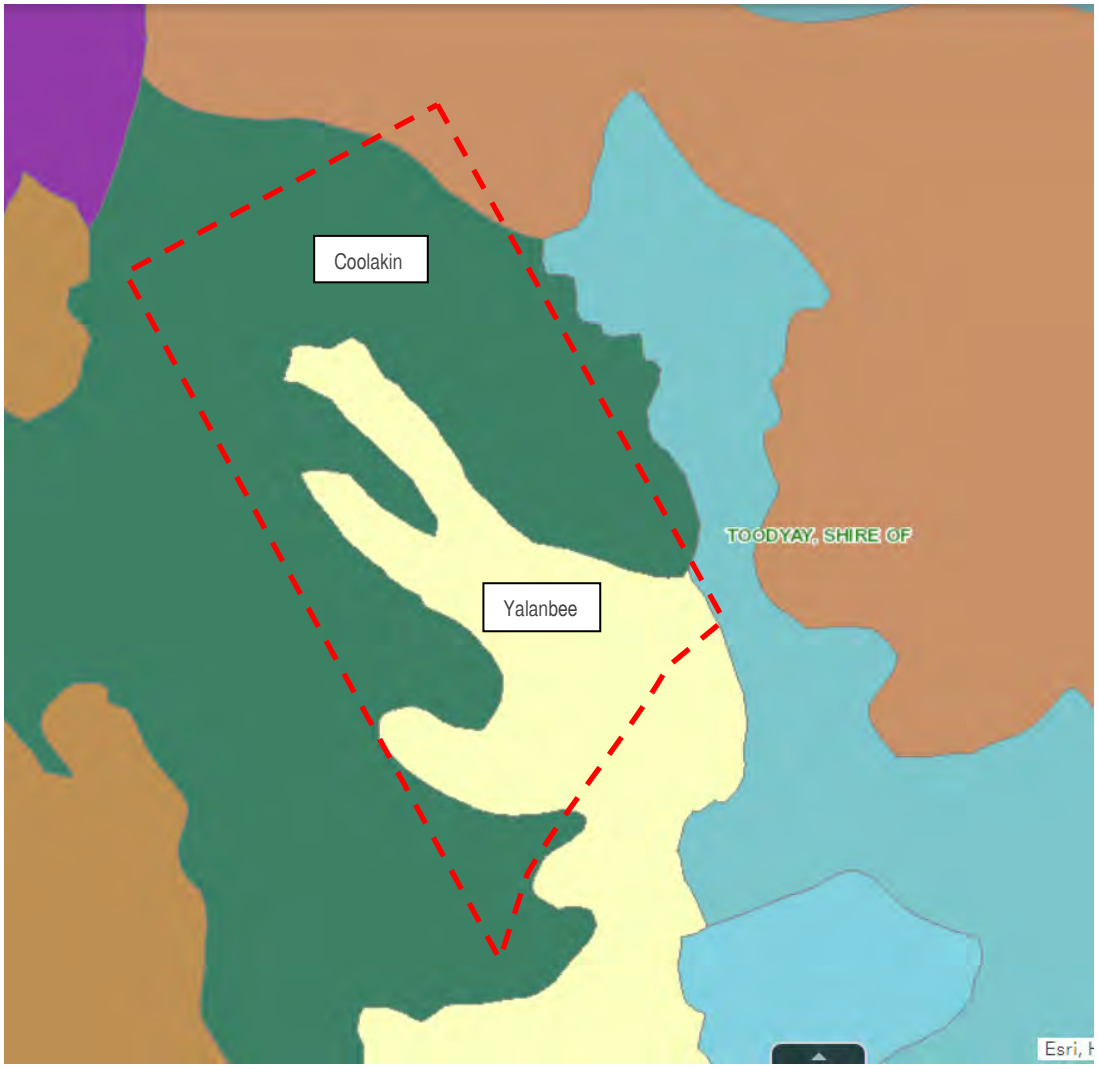
The pre-European vegetation complex is mapped on the SLIP database by the Department of Biodiversity, Conservation and Attractions (DBCA) based on the mapping undertaken by Mattiske and Havel (1998). There are two vegetation complexes mapped across the site as follows and shown in Figure 4.

- "Yalanbee 5" – "Mixture of open forest of *Eucalyptus marginata subsp. thalassica*– *Corymbia calophylla* and woodland of *Eucalyptus wandoo* on lateritic uplands in semiarid and perarid zones."
- "Coolakin" – "Woodland of Eucalyptus wandoo with mixtures of *Eucalyptus patens, Eucalyptus marginata subsp. thalassica* and *Corymbia calophylla* on the valley slopes in arid and perarid zones."

Future extraction areas are mainly located within the "East Darling 3003" and "Yalanbee 5" vegetation mapping areas.

There are no Bush Forever Areas located on the site.

Figure 4 – Vegetation Complexes



Environmentally Sensitive Areas

There are no "Environmentally Sensitive Areas" (ESA) located within or directly surrounding the site. Future excavation areas are not located within an ESA.

Threatened Species and Communities

No Threatened Flora, Priority Flora or Threatened Ecological Communities were recorded during the Flora and Vegetation Assessment of the proposed expansion area (Del Botanics, 2013) and the proposed offset areas (Del Botanics, 2014). A threatened Flora Assessment was undertaken by Del Botanics (2013) for

Caladenia huegelii (Grand Spider Orchid), *Thelymitra stellata* (Star Sun Orchid) and *Thelymitra dedmaniarum* (Cinnamon Sun Orchid). The survey did not record any Threatened Flora species within the survey area.

Clearing Permits

There is currently one active Clearing Permit on the site issued by DWER in 2015. This permit is CPS 5495/2 which permitted clearing of native vegetation to facilitate expansion of the pit area.

EPBC Approval

In 2013, a referral was submitted to the Commonwealth government under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC). The Department decided it was a "controlled action" and that it required further assessment. An approval was issued by the Department in September 2014. The area approved to clear includes not only the current stage but the future expansion for the next 40-50 years. The EPBC approval expires in December 2069.

As required by the conditions of approval, an offset was provided which comprised of a Conservation Covenant over an area of 130 hectares located on Lot 1. This will protect this area from clearing in perpetuity.

As is also required as a condition of approval, an Environmental Management and Offset Strategy was prepared which provides for the management of the offset area and the vegetation directly surrounding the pit.

4.5 Native fauna

The vegetation surrounding the excavation is likely to support a range of native fauna species. A *Level 1 Fauna Survey and Targeted Black-Cockatoo and Chuditch Survey* was undertaken by Western Wildlife in 2012. The purpose of the survey was to support a Clearing Permit application under the EP Act and referral under the Commonwealth EPBC Act. It was conducted over the proposed expansion areas to the south and the surrounding areas.

The survey identified three main habitats within the area surveyed:

- Wandoo woodland (located at the eastern and western sides of the existing pit area)
- Jarrah-Marri woodland (located to the south of the existing pit area)
- Revegetation areas

It is likely that these habitats also occur across the remainder of Lot 1 and surrounding the extraction area. The report by Western Wildlife (2012) notes that these habitats are widely represented in the surrounding area and the woodland habitats are likely to support relatively intact faunal communities.

No further clearing is proposed as part of this application for the next 10 years of extraction.

Conservation significant fauna species

The fauna survey by Western Wildlife (2012) identified the following species of conservation significance 1 that may occur in the study area:

- Carpet Python
- Peregrine Falcon
- Forest Red-tailed Black-Cockatoo
- Baudin's Black-Cockatoo
- Carnaby's Black-Cockatoo
- Fork-tailed Swift
- Rainbow Bee-eater
- Chuditch.

The species of conservation significance 2 that may occur in the study area are:

- Dell's Skink
- Barking Owl
- Masked Owl

- Crested Shrike-tit
- White-browed Babbler
- Quenda
- Western Brush Wallaby

The report also notes that there are eight birds and three small mammals of conservation significance 3 that may be present in the study area.

The survey by Western Wildlife (2012) included a targeted assessment of black cockatoo habitat and a targeted trapping survey for Chuditch. All four of these species are listed as conservation significance 1 species that may occur in the study area.

The following conclusions are made regarding the black-cockatoo and Chuditch survey:

- The study area is a potential roosting habitat for Forest Red-Tailed Black-Cockatoos
- The study area is within n the known or predicted breeding range of both the Forest Red-tailed Black-Cockatoo and Carnaby's Black-Cockatoo, though it is on the very north-eastern edge of the Forest Red-tailed Black-Cockatoos breeding range. Baudin's Black-Cockatoo does not breed in the area.
- The majority of trees with potential large hollows were located within the Wandoo woodland located to the east of the existing pit (it should be noted that following the outcomes of this survey the future extraction areas were modified to avoid a majority of these trees).
- No evidence of breeding was found.
- The study area represents foraging habitat for the Forest Red-tailed Black-Cockatoo, Baudin's Black-Cockatoo and Carnaby's Black-Cockatoo.
- No Chuditch were trapped or recorded on camera traps during the field survey.

4.6 Hydrology

Hydrological mapping

The site sits on the Darling Plateau which lies east of the Swan Coastal Plain and the Darling Scarp. The hydrological zone is the "Eastern Darling Range" which is described as "moderately to strongly dissected lateritic plateau on granite with eastward-flowing streams in broad shallow valleys." This description also accurately describes the landform of Lot 1 which is undulating and dissected by watercourses located in shallow valleys across the site.

The site is located within a "Proclaimed Surface Water Area" under the *Rights in Water and Irrigation (RIWI) Act 1914.* It is not located in a "Proclaimed Groundwater Area" under the RIWI Act 1914.

Hydrological mapping relating to the site (as provided by DWER) are listed below:

- Surface Water Area – "Avon River Catchment"
- Surface Water Subarea – "Avon River Catchment"
- Hydrographic Catchment Basin – "Swan Coastal"
- Hydrographic Catchment - "Swan Avon_Main Avon"
- Hydrographic Subcatchment - "Avon River Catchment"
- Surface Water Management Area – "Avon River Catchment"
- Surface Water Management Subarea - "Avon River catchment"
- Groundwater Area and Sub Area – "Karri"

There are no Public Drinking Water Source Areas (PDWSA's), wetlands, floodplain areas or Floodplain Development Control Areas located on or surrounding the property.

The site is located on the western edge of the "Avon River Management Area" which is identified under the *Waterways Conservation Act 1976*. The Department currently does not have an active management plan for this area at present.

Surface water features

As can be seen from the above, the operation is located within the surface water catchment for the Avon River. The River is considered to be a significant water resource in the local/surrounding area. A number of watercourses intersect the site which flow towards the Avon River. The watercourse on the eastern side of Lot 1 is a tributary of the Avon River and is known as Mortigup Brook (Level 5). It flows from the eastern boundary in a north-west direction and leaves the site to the north where it continues to the Avon River. Another tributary of the Avon River is located on the western side of the Lot which is known as the Morangup Brook (Level 4 watercourse). It flows across the north-west corner of Lot 1. Another minor watercourse extends along the western boundary of the Lot, to the west of the operation area. A small drainage line flows from the outside of the pit towards this watercourse. The watercourses across the site are shown on the plans at Appendix A.

The operation is considered to be adequately separated from the surrounding watercourses. It is approximately 180 metres from the minor watercourse to the west, approximately 550 metres from Morangup Brook and approximately 440 metres from Mortigup Brook. The operation is approximately 3 kilometres from the Avon River.

Further information on water management is provided in the attached Water Management Plan (Land Insights, 2022). The requirements of DWER's *Water Quality Protection Note (WQPN) No. 15 – Basic Raw Material Extraction* is addressed in Chapter 5.13 below which provides a risk assessment against the criteria of the WQPN. A risk assessment is also contained in Chapter 3.

There are no wetlands located on the site. There are no wetlands as mapped by the "Directory of Important Wetlands in Australia". The Avon River located over 1.3km to the north and north-east of the site is mapped by the "Directory of Important Wetlands in Australia".

Groundwater Description

The groundwater aquifers in the region are characterised by low permeability, fractured and deeply weathered rocks of metamorphic or granitoid origin with localised shallow aquifers where deeper sequences of sediments have been deposited by recent erosion. Groundwater in the region is inferred to flow to the north-west based on general topography and surface water bodies (DWER, 2019).

The site is located within the hydrological zone of the “Eastern Darling Range”. The groundwater characteristics for this hydrological zone are described as being mainly low-yielding saprolite aquifers with paloeochannels and sandy Eocene aquifers in some valleys. Groundwater discharge may occur in drainage lines and on valley floors in cleared areas and discharge associated with dolerite dykes may occur on mid to upper slopes landscapes.

The site is not located within a “Proclaimed Groundwater Area” under the RIWI Act 1914. The groundwater resources mapped in the area include fractured rock and paleochannel.

No evidence of seepages or water table have been observed in the pit and no groundwater has been encountered during excavations. The water in the drainage basins is captured from surface water runoff.

Salinity

There have been no observable or measurable impacts of the excavation on salinity of surface or groundwater. Water quality results from the drainage basins within the pit area have indicated that salinity levels are below 1,000mg/L which is considered “fresh” water. Salinity results from 2018 were between 200mg/L and 410mg/L and, similarly, total dissolved solids results ranged from 190mg/L to 380mg/L. pH results from 2018 ranged from between 5.5 and 5.7. As can be seen from the above water quality tests, there is no evidence of salinity buildup on the site during the past 60 years of operation.

In some landforms, salinity levels in water runoff can be a cause for concern if there are relatively high salinity levels in the clay being excavated. The resulting farm dam that is constructed from the

rehabilitation could then contain saline water and not be useful for agricultural use, or water filtration into the ground could contribute to groundwater salinity. In this case, the water quality results indicate that there is a very low risk that the excavations at the site will contribute to increased salinity in surface or groundwater.

4.7 Surrounding land use

Surrounding land uses comprise other extractive industry and rural land uses. Directly to the south and east are two other clay quarries. A hard rock quarry is located to the north.

The site is approximately 5km to the north-east of the closest rural residential area and approximately 13 to the west of the Toodyay townsite. It is approximately 1.4km from the closest rural dwelling.

4.8 Heritage

Aboriginal Heritage

A search of the Aboriginal Heritage Database indicated that there is one Registered Heritage Sites located on the site. This site is the "Avon River" (ID 15979) and is mapped across the Morangup Brook (which is located across the north-western corner of Lot 1). The heritage site is located at least 550 metres from the operation and will not be directly disturbed by the excavation. Water management on site will protect the watercourse and heritage site from indirect impact. There are no Other Heritage Sites located on or directly surrounding the operation. The Registered Heritage Site is shown in Figure 5 below.

Figure 5 – Aboriginal Heritage Places

Heritage Sites

No heritage sites as identified by the Heritage Council (State Heritage Office) are located on or adjoining the property.

4.10 Separation distances

The following sensitive receptors have been identified surrounding the site. They are also shown on the Context Plan at Appendix A.

- Neighbouring rural property to the west – Approximately 1.4km from the operation (865 Morangup Road, Morangup)
- Neighbouring rural property to the south – Approximately 1.6km from the operation (1012 Morangup Road, Morangup)
- Rural properties to the east – Closest is approximately 3km from the operation (575 Lovers Lane, Morangup)
- Rural properties to the north – Closest is approximately 3.3km from the operation (535 Cobbler Pool Road, Morangup).

The EPA's *Guidance Statement No. 3 – Separation Distances between Industrial and Sensitive Land Uses* provides a guideline on the separation distances and buffers for a range of industrial land uses to sensitive land uses (such as residential dwellings). It should be noted that the distances in the policy assume the land use is not managed and, should best practice environmental management take place, these distances can be reduced.

The operations on site fit into the category "clay extraction or processing". The potential impacts are listed as "noise" and "dust". The separation distance is "500-1000 metres, depending on size and processing", however this can be less with appropriate environmental management.

As can be seen from the above list, the clay operations far exceed the recommended separation distance. All surrounding sensitive land uses are over 1000 metres from the operations.

It should also be noted that operational management, including dust and noise management and protection of visual amenity, are provided for this operation to support the continued operation of the site. These management plans are attached to this application.

5 Statutory framework

5.1 State Planning Policy 1 – State Planning Framework

The *State Planning Framework* was prepared by the WAPC in 2017. It sets out the key principles relating to environment, community, economy, infrastructure, regional development and governance to guide the way in which future planning decisions are made. More specifically, the Framework identifies relevant policies and strategies used by the Commission in making decisions.

State Planning Policy 2.4 – Planning for Basic Raw Materials is recognised under the Framework. This is discussed further below.

5.2 State Planning Policy 2 – Environment and Natural Resources Policy

State Planning Policy 2 was prepared by the WAPC in 2003. It aims to integrate environment and natural resource management with broader land use planning and to protect, conserve and enhance the natural environment.

Basic Raw Materials is included within Policy Measure 5.7 which states that "mineral resources, petroleum resources and basic raw materials are important natural resource assets and are a vital part of the economy". The importance of basic raw materials located in close proximity to the metropolitan area is also recognised in the Policy. It states that "A ready supply of basic raw materials close to developing areas is required in order to keep down the cost of land development and the price of housing."

The Policy sets out a list of principles which should be considered by decision-makers including the following relating to basic raw materials. The principles from the Policy are below:

- "the identification and protection of important and economic mineral resources to enable mineral exploration and mining in accordance with acceptable environmental standards
- the identification and protection of important basic raw material resources and provide for their extraction and use

- Support sequencing of uses where appropriate to maximise options and resultant benefits to community and the environment
- Support, where possible, improved efficiencies in the production and consumption of mineral and basic raw material resources to ensure their availability for future environmental and human uses."

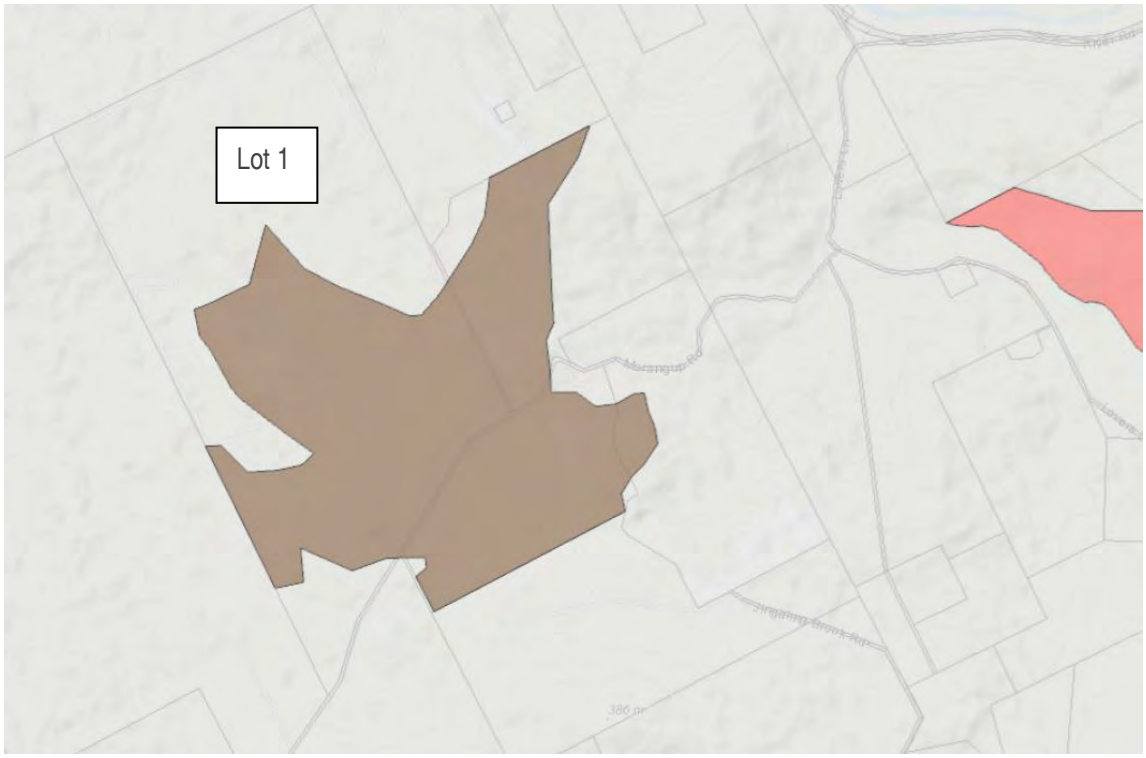
SPP 2 supports the identification, protection and extraction of basic raw materials. The identification of clay resources has already been undertaken, and the site is identified in *State Planning Policy 2.4 – Basic Raw Materials*. Protection of basic raw materials is also provided in SPP 2.4. The extraction of basic raw materials is the basis of this application.

5.3 State Planning Policy 2.4 – Basic Raw Materials

State Planning Policy 2.4 – Planning for Basic Raw Materials was finalised and gazetted in July 2021. It "enables the responsible extraction of BRM, while ensuring the protection of people and the environment". The Policy provides guidance to operators and decision makers regarding applications for BRM extraction, as well as other types of planning applications that can potentially impact on extraction sites or significant geological supplies. The associated Planning for Basic Raw Materials Guidelines (WAPC, 2021) provide further information on the specific requirements that need to be met for extractive industry (including operational and environmental protection requirements).

The associated mapping identifies the majority of Lot 1 as having "Significant Geological Supplies" for clay resources. The figure below shows the location of "Significant Geological Supplies" on the property. The clay operation is located within this recognised area.

Figure 6 – State Planning Policy 2.4 Significant Geological Supplies



This application for extractive industry is consistent with the principles and objectives of the Policy as is demonstrated in Table 5.1 below.

Table 5.1 – Objectives of SPP 2.4

POLICY OBJECTIVES	COMMENT
Ensure BRM and its regional importance is considered at the earliest stages of the planning process.	The Shire of Toodyay Local Planning Scheme does not recognise the basic raw materials or extractive industries on the site (despite the site being recognised in SPP 2.4 and being used for extractive industry for the last 60 years). While the Shire's Local Planning Strategy identifies the site as "Rural" it also reflects the SPP 2.4 basic raw material mapping and identifies the importance of the site for extractive industry.
Protect BRM in SGS areas and ES by avoiding encroachment from incompatible land uses.	There is no intensification of land uses proposed in the Shire of Toodyay Scheme or Strategy. The Strategy identifies the site and surrounding area as "Rural" and includes the basic raw material map[ping from SPP 2.4.
Ensure BRM resources are used efficiently in land use planning and development.	This application is consistent with this objective by ensuring that basic raw materials are utilised.
Identify BRM extraction opportunities through sequential land use without compromising the final intended land use.	The final landform will be recontoured and rehabilitated and does not compromise the final intended land uses.
Ensure the extraction of BRM avoids, minimises or mitigates any adverse impacts on the community, water resources and biodiversity values.	This application complies with this objective by providing a number of detailed management plans, many of which have already been previously approved.

The *SPP 2.4 Planning for Basic Raw Materials Guidelines* (WAPC, 2021) provide support for decision-making authorities, proponents and referral agencies to implement SPP 2.4. Section 4 of the Guidelines provides advice on the assessment of proposals for extractive industries. Of particular note, they state that the "assessment of proposals should prioritise proposals within SGS areas" and "if the resource is identified as a SGS area".

The Guidelines suggest the type and content of information to be submitted with an application for extractive industry including operational information, separation distances, environmental management, surface and groundwater, noise, dust, landscaping, access and rehabilitation. The information recommended by the Guidelines is included in this application. The site already operates in accordance with these various management plans and procedures.

5.4 State Planning Policy 2.9 – Water Resources

The objectives of the Policy are to:

- protect, conserve and enhance water resources that are identified as having significant economic, social, cultural and/or environmental values.
- assist in ensuring the availability of suitable water resources to maintain essential requirements for human and all other biological life with attention to maintaining or improving the quality and quantity of water resources.
- promote and assist in the management and sustainable use of water resources.

The Policy provides a range of policy measures to guide and assist decision-makers in the consideration of water resources in decision-making. Policy Measures are provided for surface water, groundwater, wetlands, waterways, estuaries and total water cycle management.

In general, SPP 2.9 provides for a response to the potential impact of development on water resources that is proportionate to the significance of the water resource concerned with a particular focus on those resources considered 'significant'. For example, Policy Measure (i) is to “protect significant environmental, recreational and cultural values of water resources”. In addition, the language throughout the Policy is aspirational with a focus on aiming to prevent or ameliorate impact where appropriate.

The Policy makes specific reference to decision-making and advises that “where there is demonstratable adverse and unacceptable impact on the quality and quantity of significant water resources, planning

decisions-makers should ensure that planning proposals and applications either do not proceed or are modified so that significant water resources are protected, conserved and enhanced". In accordance with the general goals and aims of this Policy, it is important that significant water resources and potential threats of are identified.

Further information on the water resources on the site are provided in Chapter 2 of this report and a Water Management Plan is also available for the operation.

5.5 Draft State Planning Policy 2.9 – Planning for Water

The "draft State Planning Policy 2.9 – Planning for Water" was prepared by the WAPC in 2021. The intent of the Policy is "ensure that planning and development considers water resource management and includes appropriate water management measures to achieve optimal water resource outcomes". It provides guidance for the consideration of water resources for planning applications and decision-makers. The Policy Measures include consideration of environmental values, social and cultural values, riverine flooding, infrastructure and supply.

The associated SPP 2.9 Guidelines provide further detail as to how the Policy Measures can be considered and the information to be provided in an application. It should be noted that no "important environments" (including "Sensitive Water Resource Areas") are mapped on the site under the draft Policy. The closest feature is a "Sensitive Water Resource Area" for the Avon River located to the north-east of Lot 1. The operation is approximately 2km from this area.

5.6 State Planning Policy 3.7 – Planning in Bushfire Prone Areas

"State Planning Policy 3.7 – Planning in Bushfire Prone Areas" was prepared by the WAPC in 2015. It provides the foundation for land use planning to address bushfire risk management in Western Australia and to inform and guide decision-makers, referral agencies and landowners to help achieve acceptable bushfire protection outcomes. It applies to development in designated bushfire prone areas.

A Bushfire Management Plan was prepared for the operation by Bushfire Prone Planning in 2021.

The latest DPLH mapping (2021) identifies "Bushfire Prone Areas" across the entire site. It should be noted that Version 1.4 of the SPP 3.7 Guidelines includes a provision stating that the requirement for a Bushfire Management Plan for extractive industry is up to the discretion of the decision-maker. Clause 2.6 of the Guidelines states that:

> *Decision-makers can apply exemptions from the requirements of SPP 3.7 and these Guidelines where there is no intensification of land-use, and/or the proposal is not increasing the bushfire threat.*

An example given in the Guidelines for the type of proposal/development which could be exempt includes extractive industries as follows:

> *A development application for an extractive industry where the extraction is undertaken in an open cleared area (for example, quarries and open cut mining) and no habitable buildings are proposed.*

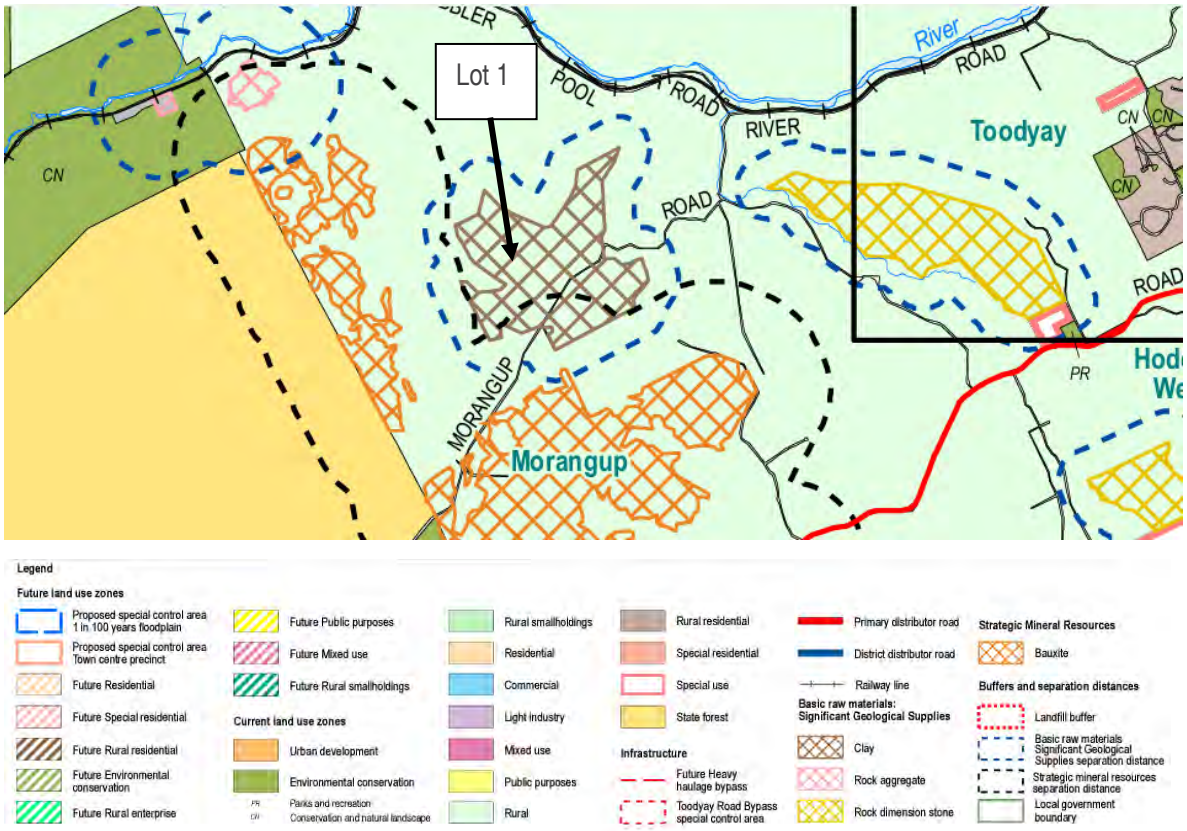
Therefore, although a Bushfire Management Plan has previously been prepared for the site to assist with site operations and compliance, the requirement for this plan is at the discretion of the Local Government and as no habitable building are located on the site, the requirement for a Bushfire Management Plan could be waived.

5.7 Shire of Toodyay Local Planning Strategy

The *Shire of Toodyay Local Planning Strategy* was prepared by the Shire in 2018. It "sets out the Shire's long-term planning directions and objectives for future planning and development."

The site is identified on the Strategy Map as "Rural". The SPP 2.4 State Geological Supply mapping is also included in the Strategy maps (as shown below).

Figure 7 – Shire of Toodyay Local Planning Strategy



Source: Shire of Toodyay

Chapter 6.7 of the Strategy addresses extractive industry in the Shire. It states the following in relation of basic raw materials in Shire decision-making and planning:

> *Extractive industries are important to the growth and economy of Toodyay; however, appropriate strategic planning and management in regards to these activities is essential. This may include providing buffers to separate mining operations from sensitive land uses in order to minimise impacts on the community. Where basic raw materials are present, it is important to consider the zoning and land use of the area, and provisions for the protection, access and use of the resources.*

As is demonstrated throughout this document, the requirements of the Strategy are met as there is no intensification of land uses proposed and appropriate separation distances are provided.

The strategies listed in the Strategy for basic raw materials are addressed in the table below.

Table 5.2 – Strategies for Basic Raw Materials

STRATEGIES	COMMENT
Facilitate the extraction of basic raw materials, subject to appropriate precautions to minimise any adverse impact on adjacent property, or on the natural environmental resources.	This strategy supports this application for continued excavation at the site. A variety of environmental management plans are also included with this application.
Encourage the definition of suitable buffers within LPS5 to limit the impact on adjacent property, and to avoid encroachment of sensitive development into areas subject to reduced air quality, noise or risk.	Not applicable to this application.
Identify and protect basic raw materials including gravel and sand resources from inappropriate developments that would prevent their future use.	Not applicable to this application.
Identify natural resource priority areas and significant geological supplies and buffers to avoid encroachment of sensitive development into areas subject to reduced air quality, noise or other risks.	The significant geological supplies on the site are identified in the Strategy.
Establish appropriate controls for extractive industries to minimise impacts on the environmental and local amenity, including roads	The operation is already subject to a variety of environmental management plans including dieback, dust, noise, bushfire etc.

5.9 Shire of Toodyay Environmental Management Strategy

The *Shire of Toodyay Environmental Management Strategy* was adopted by Council in 2015. It "provides a framework for the achievement of better environmental management outcomes, consistent with the overall vision and mission of the Shire". It identifies five "themes", each of which have objectives, strategies and actions prescribed to them in the Strategy. The five themes are governance and communication, land, biodiversity, water and energy and waste. Most relevant to this application for extractive industries are the themes of land, biodiversity and water.

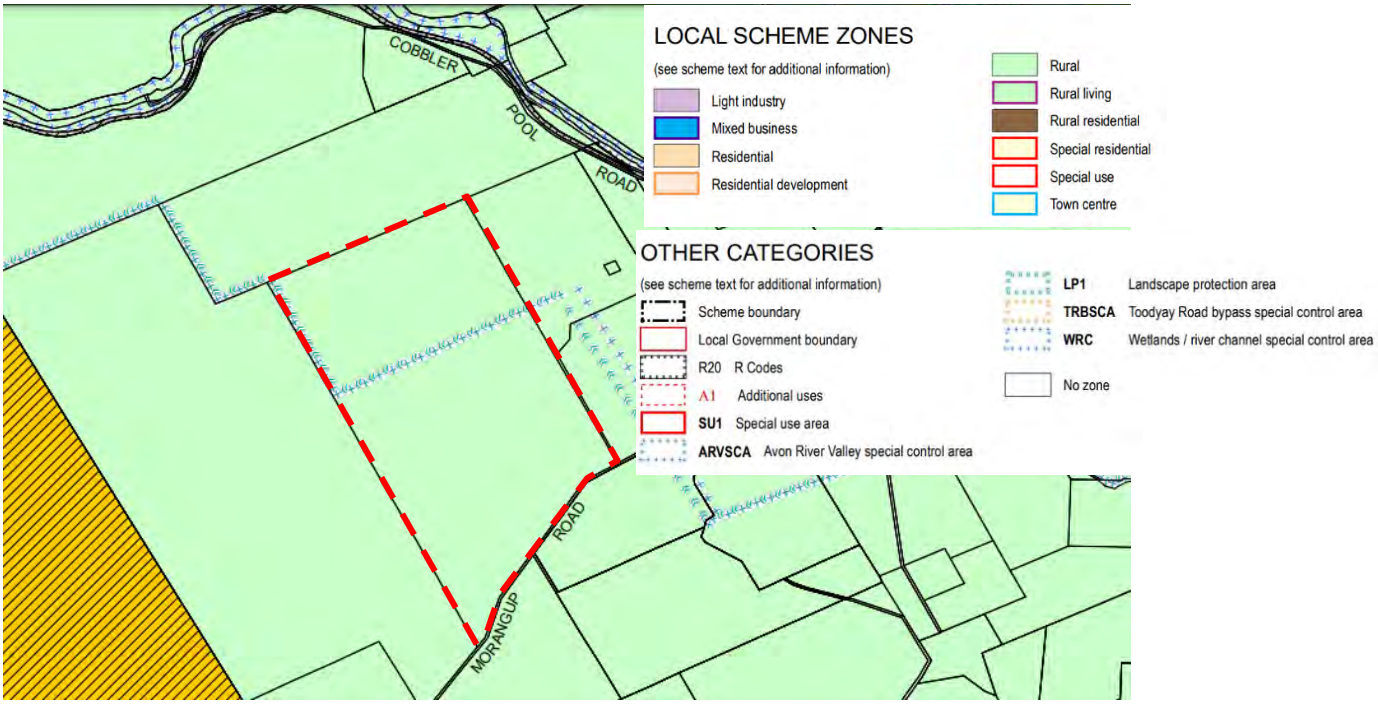
Extractive industries are not specifically mentioned in the Strategy and many of the actions are the responsibility of the Shire to implement. However, the general principles of environmental management can be applied to this application. An environmental assessment is included in Chapter 3 of this application and various management plans are attached.

5.10 Shire of Toodyay Local Planning Scheme No. 4

The *Shire of Toodyay Local Planning Scheme No. 4* was endorsed by the WAPC on the 10th February 2017.

The site is zoned "Rural". The northern portion of the site is also located within the "Avon River Valley Special Control Area" as well as the "Landscape Protection Area". The existing and proposed excavation areas are not located within either of these areas.

Figure 8– Shire of Toodyay Local Planning Scheme No. 4



Source: DPLH

"Industry – Extractive" is an "D" use in the Rural zone. This "means that the use is not permitted unless the local government has exercised its discretion by granting development approval". As is mentioned previously, the operation already has Planning Approval.

The objectives of the Rural zone area addressed in the table below.

Table 5.3 – Objectives of the Rural Zone

OBJECTIVES	COMMENT
Protect broad-scale agriculture from un-planned breakdown of rural land.	The continued operation of the quarry does not result in the breakdown of rural land. The site is largely covered in native vegetation and is not used for rural land use.
Subject to (i) above: (a) provide for tourist related activities, including farm stay, bed and breakfast and holiday accommodation; (b) provide for a range of rural related uses such as intensive agriculture, aquaculture, rural pursuits.	N/A – tourist land uses are not proposed. N/A – intensive agriculture, aquaculture and rural pursuits are not proposed.
Ensure the protection of and conservation of native vegetation.	The operation is surrounded by native vegetation and offsets have been provided to support any clearing applications/approvals.

The continued excavation of clay on Lot 1 is consistent with the existing Planning Approval. Detailed information to support the continued use of the site for extractive industry to support renewal of the EIL is provided in this report.

5.11 Strategic Community Plan Toodyay 2028

The *Strategic Community Plan Toodyay 2028* was prepared by the Shire of Toodyay in 2018. It outlines community priority areas within the planning period from 2018 to 2028 which include social, economic, natural environment, built environment and governance.

Extractive industry is mentioned under the priority area "natural environment". It states that extractive industries are "permitted and supported through State Planning Policies. Within the limitations of the State policy framework, the Shire seeks to regulate these activities through its Local Planning Scheme and an Extractive Industry Local Law. The Shire has the capacity to influence days and hours of operation,

transport routes and conditions (including contributions) and rehabilitation requirements. All Shire decision making is subject to review by the State Administrative Tribunal."

5.12 Shire of Toodyay Local Planning Policies (LPP7) Extractive Industries – Road Contributions

The *Shire of Toodyay Local Planning Policy (LPP 7) Extractive Industries – Road Contributions* was adopted by Council in 2014. It provides a framework for contributions by Extractive Industries to help the Shire to recover the additional costs incurred from road use that will result from that land use. The Policy states that monetary contributions are for both "construction and rehabilitation" and "repairs and maintenance" of local roads used by trucks.

Road contributions will be negotiated between the Shire and Austral Bricks through the determination of the EIL application.

5.13 Shire of Toodyay Extractive Industry Local Law

The *Shire of Toodyay Extractive Industries Local Law* was endorsed by Council on the 24th June 1999. It sets out the licencing requirements for an extractive industry, including the information which is required in an application and determination of the application. This application for a renewal of the extractive industry licence renewal is submitted in accordance with the Local Law.

The information required for a renewal of a licence is set out in Clause 4.3 of the Local Law. This clause specifies that a renewal document needs details of "*the works, excavation and rehabilitation stages reached and of any changes or proposed changes with respect to any of the things referred to in clauses 2.3(1) (b) and (c).*"

It should be noted that in addition to the information required by Clause 2.3 of the Local Law, information has also been provided in this application such as detailed information on the operation and planning context as well as additional management plans.

5.14 Water Quality Protection Note No. 15 – Basic Raw Materials Extraction

Water Quality Protection Note (WQPN) No. 15 was prepared by DWER in 2019. It provides recommendations to operators on how to limit the impacts of their operations to the environment and water resources. Recommendations relate to location, construction, operation, management, closure and rehabilitation.

The guidelines and recommendations from WQPN No. 15 are addressed in the Table below. A risk assessment for the clay extraction operation has been undertaken using the water management considerations from WQPN No. 15 (DWER, 2019) and based on the likelihood, consequence and risk criteria provided in *Guidance Statement: Risk Assessments* (DWER, 2017).

The purpose of the risk assessment is to provide a clear link between the WQPN Policy considerations and the management controls. It also demonstrates the effectiveness of the management controls by providing an assessment of risks using the DWER Guidance Statement. It should be noted that some considerations from the WQPN (such as dust, site rehabilitation, refuelling, waste management etc.) are addressed in their own separate management plans. The considerations that are identified as being relevant to the site (such as management of surface water, stormwater runoff etc.) are considered further in the management section.

A detailed description of water resources is contained in Chapter 4.

Table 5.4 – Water Management Plan Risk Assessment

WQPN 15 CONSIDERATIONS	WQPN 15 POLICY RECOMMENDATION	POTENTIAL IMPACT	PROPOSED CONTROL	RESIDUAL RISK		
				L	C	Risk
Public drinking water source areas.	The Policy makes recommendations if an operation is proposed within a public drinking water source area.	Not applicable – The site is not located within a public drinking water source area.	N/A	N/A		
Clearing control catchments (Country Areas Water Supply Act 1947).	BRM activities within clearing control catchments need to be assessed for potential salinity impacts.	Not applicable – the site is not located within a Clearing Control Catchment area.	N/A	N/A		
Near waterways.	The Policy states that extraction should be above the 1 in 100 flood level, outside of areas subject to waterlogging or flooding and to have adequate buffers to waterways.	The site is not located within areas subject to waterlogging or flooding. The site is approximately 180 metres from the watercourse to the west and approximately 440 metres from the watercourse to the east.	Refer to Water Management Plan (Land Insights, 2023)	Unlikely	Minor	Med
BRM extraction within waterways (in-stream mining).	The Policy provides recommendations for BRM operations which extract from riverbeds or from pits in floodplains.	Not applicable – in-stream mining or extraction in waterways is not proposed.	N/A	N/A		
Wetlands.	The Policy recommends contacting DBCA to discuss wetlands.	There are no wetlands located on the site.	N/A	N/A		
Groundwater.	Assessment of groundwater requires consideration of acid sulphate soils and the maintenance of a vertical separation to the groundwater table.	Extraction will be least 2m above the watertable at all times. No dewatering of groundwater will be required.	Refer to Water Management Plan (Land Insights, 2023)	Unlikely	Slight	Low

WQPN 15 CONSIDERATIONS	WQPN 15 POLICY RECOMMENDATION	POTENTIAL IMPACT	PROPOSED CONTROL	RESIDUAL RISK		
				L	C	Risk
Landscape.	The Policy recommends that land selected should be gently sloping (between 1 in 20 and 1 in 50) so runoff and wastes can be more easily managed, but erosion is avoided. It also recommends that rocky and steep slopes, and land prone to erosion should be avoided.	The existing pit is still being excavated and the expansion areas are located on sloping land. Water management ensures that all runoff is retained on site and not permitted to flow outside the excavation area. Wind erosion risk will be low for the pit area as the clay soils form a crust when dry and stick together when wet. The final landform will be recontoured to safe and stable slopes following decommissioning.	Refer to Water Management Plan (Land Insights, 2023)	Unlikely	Minor	Med
Other land uses.	This aspect relates to separation distances to sensitive land uses and the avoidance of infrastructure.	No permanent infrastructure is located on site. The closest sensitive land uses are well over 1000 metres from the operation area (the closest is 1,400 metres away).	N/A	N/A		
Construction.	The Policy recommends that existing tracks and roads should be used where possible, that any waterway crossings are constructed appropriately and that access should be designed to have the least impact on surface water features and vegetation.	No waterway crossings are proposed.	N/A	N/A		

WQPN 15 CONSIDERATIONS	WQPN 15 POLICY RECOMMENDATION	POTENTIAL IMPACT	PROPOSED CONTROL	RESIDUAL RISK		
				L	C	Risk
Solid waste.	The Policy makes reference to the requirements of the *Environmental Protection (Unauthorised Discharges) Regulations 2004*.	Austral Bricks stores and appropriately disposes of wastes from the site in accordance with the Waste Management Plan.	Refer to Waste Management Plan (Land Insights, 2023)	Rare	Slight	Low
Water supply.	The Policy refers to the need for a licence under the *Rights in Water and Irrigation Act 1914* to construct a bore, and abstract groundwater or surface water in a Proclaimed Surface or Groundwater Area. It also makes recommendations regarding water supply.	The site is not located within a Proclaimed Groundwater Area, however it is located within a Proclaimed Surface Water Area. There is no need for abstraction groundwater for the operation. Water to be used for the operation (dust suppression etc) is captured within the onsite dams.	N/A	N/A		
Wastewater.	The Policy makes recommendations relating to wastewater treatment and management.	Portable toilets will be managed in accordance with the manufacture's specifications. There will be no discharge to the environment.	Refer to Waste Management Plan (Land Insights, 2023)	Rare	Slight	Low
Stormwater.	This aspect of the Policy aims to ensure that stormwater from the operational areas is retained on site. It also recommends that ponds are used to manage turbidity (i.e. settling ponds) and that they are designed to handle up to a 2 hour, 1 in 10 (10 per cent) annual exceedance probability event.	All stormwater is retained onsite and is diverted to the detention basins. The quarry operates in accordance with a Water Management Plan (Land Insights, 2023).	Refer to Water Management Plan (Land Insights, 2023)	Rare	Slight	Low

WQPN 15 CONSIDERATIONS	WQPN 15 POLICY RECOMMENDATION	POTENTIAL IMPACT	PROPOSED CONTROL	RESIDUAL RISK		
				L	C	Risk
Dust	The Policy refers to the obligations of a proponent under the EP Act 1984 and mentions the DWER *A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities* (2011).	Dust is managed on site in accordance with the Dust Management Plan (Land Insights, 2023).	Refer to Dust Management Plan (Land Insights, 2023).	Rare	Slight	Low
Toxic and hazardous substances.	The Policy makes recommendations for the storage and handling of chemicals, pesticides and fuel.	Refuelling is managed in accordance with the Refuelling Management Plan (Land Insights, 2023).	Refer to the Refuelling Management Plan (Land Insights, 2023).	Rare	Slight	Low
Vehicles.	This aspect relates to the cleaning and maintenance of vehicles.	Cleaning and maintenance of vehicles is in accordance with the Refuelling Management Plan (Land Insights, 2023).	Refer to Refuelling Management Plan (Land Insights, 2023).	Rare	Slight	Low
Accidents and emergency response.	The Policy makes recommendations about spills and the need for a contingency plan.	No chemicals are used in the clay extraction operation and Austral Bricks operates within a Refuelling Management Plan (Land Insights, 2023) for the site which includes procedures for spills.	Refer to Refuelling Management Plan (Land Insights, 2023).	Rare	Slight	Low
Monitoring.	The Policy recommends that monitoring occurs as appropriate for the site (i.e. monitoring of surface water if required etc.)	The Water Management Plan (Land Insights, 2023) includes actions relating to monitoring of water in the basins.	Refer to Water Management Plan (Land Insights, 2023)	N/A		

WQPN 15 CONSIDERATIONS	WQPN 15 POLICY RECOMMENDATION	POTENTIAL IMPACT	PROPOSED CONTROL	RESIDUAL RISK		
				L	C	Risk
Closure, rehabilitation and subsequent land uses.	This section of the Policy makes recommendations with regards to mine closure plans and the consideration of the end use of a site.	Closure, decommissioning and site rehabilitation is provided in the Rehabilitation Management Plan (Land Insights, 2023).	Refer to Rehabilitation Management Plan (Land Insights, 2023).	Rare	Slight	Low

6 References

Bureau of Meteorology (2022), Climate Data Online, Accessed from http://www.bom.gov.au/climate/data/

Del Botanics, (2013), *Flora and Vegetation Assessment Lot 1 Morangup Road, Morangup,* Del Botanics, WA.

Del Botanics, (2013), *Threatened Flora Assessment – Lot 1 Morangup Road, Morangup,* Del Botanics, WA.

Del Botanics, (2014), *Flora and Vegetation Assessment – Offset Areas 1 and 2, Lot 1 Morangup Road, Morangup,* Del Botanics, WA.

Department of Conservation and Land Management (DBCA), (2003), *Phytophthora cinnamon and disease caused by it – Volume 1 Management Guidelines,* Department of Biodiversity, Conservation and Attractions, Perth, WA.

Department of Conservation and Land Management (DBCA), (2004) *Draft Best Practice Guidelines for the Management of Phytophthora cinnamomic,* Department of Biodiversity, Conservation and Attractions, Perth, WA.

Department of Environment and Conservation (DWER), (2011), *Guidelines for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites, Remediation and Other Related Activities*, Department of Water and Environmental Regulation, Perth, WA.

Department for Planning and Infrastructure (DPLH), (2007), *Visual Landscape Planning in Western Australia: A Manual for Evaluation, Assessment, Siting and Design,* Department of Planning, Lands and Heritage, Perth, WA.

Department of Planning, Lands and Heritage, (2007), *Visual Landscape Planning in Western Australia: A Manual for Evaluation, Assessment, Siting and Design,* Western Australian Planning Commission, Perth, WA.

Department of Primary Industries and Regional Development, (2021), *Declared Plant Control Table*, Access from https://www.agric.wa.gov.au/declared-plants/declared-plant-control-table

Department of Water and Environmental Regulation, (2017), *Guidance Statement: Risk Assessments,* Department of Water and Environmental Regulation, Perth, WA.

Department of Water and Environmental Regulation, (2019). *Water Quality Protection Note (WQPN) No. 15 – Basic Raw Materials Extraction*, Department of Water and Environmental Regulation, Perth, WA.

Department of Water and Environmental Regulation, (2019), *Decision Report, DER 2017/001530 Salt Valley Road Class II Landfill,* Department of Water and Environmental Regulation, Perth, WA.

Department of Water and Environmental Regulation, (2021). *Draft Guideline – Dust Emissions*, Department of Water and Environmental Regulation, Perth, WA.

Department of Water and Environmental Regulation, (2021). *Draft Guideline – Assessment of Environmental Noise Emissions,* Department of Water and Environmental Regulation, Perth, WA.

Environmental Protection Authority, (2005), *Guidance Statement No. 3 – Separation Distances Between Industrial and Sensitive Land Uses*, Environmental Protection Authority, Perth, WA.

Environmental Protection Authority, (2008), *Guidance Statement No. 33 – Environmental Guidance for Planning and Development*, Environmental Protection Authority, Perth, WA.

Environmental Protection Authority, (2016), *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment,* Environmental Protection Authority, Perth, WA.

Environmental Protection Authority, (2021), *Statement of Environmental Principles, Factors, Objectives and Aims of EIA*, Environmental Protection Authority, Perth, WA.

Glevan Consulting, (2020), *Phytophthora Dieback Hygiene Management Plan*, Glevan Consulting, Perth, WA.

Government of Western Australia, (2022), *SLIP Portal*, Accessed from https://maps.slip.wa.gov.au/landgate/locate/

Invasive Plants and Animals Committee, (2016), *Australian Weeds Strategy 2017 to 2027*, Commonwealth of Australia, Canberra.

Land Insights, (2015), *Environmental Management and Offset Strategy*, Land Insights, Perth, WA.

Ramboll, (2019), *Clay Pit Wind Erosion Study*, Austral Bricks (WA) Pty Ltd, Perth, WA.

Shire of Toodyay, (2009), *Shire of Toodyay Extractive Industries Local Law*, Shire of Toodyay, WA.

Shire of Toodyay, (2014), *Shire of Toodyay Local Planning Policy (LPP 7) Extractive Industries – Road Contributions*, Shire of Toodyay, WA.

Shire of Toodyay, (2015), *Shire of Toodyay Environmental Management Strategy,* Shire of Toodyay, WA.

Shire of Toodyay, (2017), *Shire of Toodyay Local Planning Scheme No. 4,* Western Australian Planning Commission, WA.

Shire of Toodyay, (2018), *Strategic Community Plan Toodyay 2028*, Shire of Toodyay, WA.

Shire of Toodyay, (2018), *Shire of Toodyay Local Planning Strategy*, Western Australian Planning Commission, WA.

Stass Environmental, (2015), *Opal Vale Pty Ltd, Groundwater Assessment 11 Chitty Road, Toodyay WA*, Stass Environmental, WA.

Weeds Australia, (2021), *Weeds of National Significance (WONS)*, Accessed from https://weeds.org.au/weeds-profiles/

Western Australian Planning Commission, (2003), *State Planning Policy 2.0 – Environment and Natural Resources Policy*, Western Australian Planning Commission, Perth, WA.

Western Australian Planning Commission, (2014), *Metropolitan Region Scheme*, Western Australian Planning Commission, Perth, WA.

Western Australian Planning Commission, (2015), *State Planning Policy 3.7 – Planning in Bush Fire Prone Areas*, Western Australian Planning Commission, Perth, WA.

Western Australian Planning Commission, (2016), *State Planning Policy 2.5 Rural Planning,* Western Australian Planning Commission, Perth, WA.

Western Australian Planning Commission, (2017), *State Planning Policy 1 – State Planning Framework*, Western Australian Planning Commission, Perth, WA.

Western Australian Planning Commission, (2021), *State Planning Policy 2.4: Basic Raw Materials,* Western Australian Planning Commission, Perth, WA.

Western Australian Planning Commission, (2021), *Draft State Planning Policy 2.9: Planning for Water Guidelines,* Western Australian Planning Commission, Perth, WA.

Western Wildlife, (2012), *Level 1 Fauna Survey and Targeted Black-Cockatoo and Chuditch Survey,* Western Wildlife, WA.

APPENDIX A

Application Forms

Extractive Industries Licence Application

LOCALITY OF EXCAVATION SITE

House/Street No: _____ Assessment No.: _____

Location No: _____ Lot No: 1 Street Name: Morangup Road

Plan/Diagram No: 34893 Certificate of Title Vol: 82 Folio: 1A

Title encumbrances
(e.g. easements, restrictive covenants): _____

Nearest Street Intersection: Quarry Road

OWNER DETAILS

Full Name: Bristile Holdings Ltd
(include Title, initials and surname / or company name)
ABN: 32 008 668 540

Postal Address: Locked Bag 100, Midland Postcode: 6936

Phone (H): _____ (M): 0409 817 889 (W): _____

Email: trevor.tadman@australbricks.com.au

Owner 1 Signature: _____ Date: 28/7/23

Owner 2 Signature: _____ Date: 27/7/23

Note: *This application can only be signed by the owner, lessor or purchaser under option, of the land on which the development is proposed. An application fee will apply.*

CONTACT PERSON for correspondence *(if different from owner)*

Full Name: Sharee Rassmussen
(include Title, initials and surname)

Postal Address: PO Box 289, Mount Lawley WA 6929

Contact Phone: 08 9271 8506 Email: sharee@landinsights.com.au

Contact Signature: _____ Date: _____

APPLICANT DETAILS *(if different from owner)*

Full Name: Austral Bricks (WA) Pty Ltd
(include Title, initials and surname / or company name)
ABN: 34 079 711 603

Postal Address: Locked Bag 100, Midland

Phone (H): _____ (M): 0409 817 889 (W): _____

Email: trevor.tadman@australbricks.com.au

Applicant Signature: _____ Date: 26/7/23

OFFICE USE ONLY

D/A Fee (Account) $: _____ Receipt No: _____

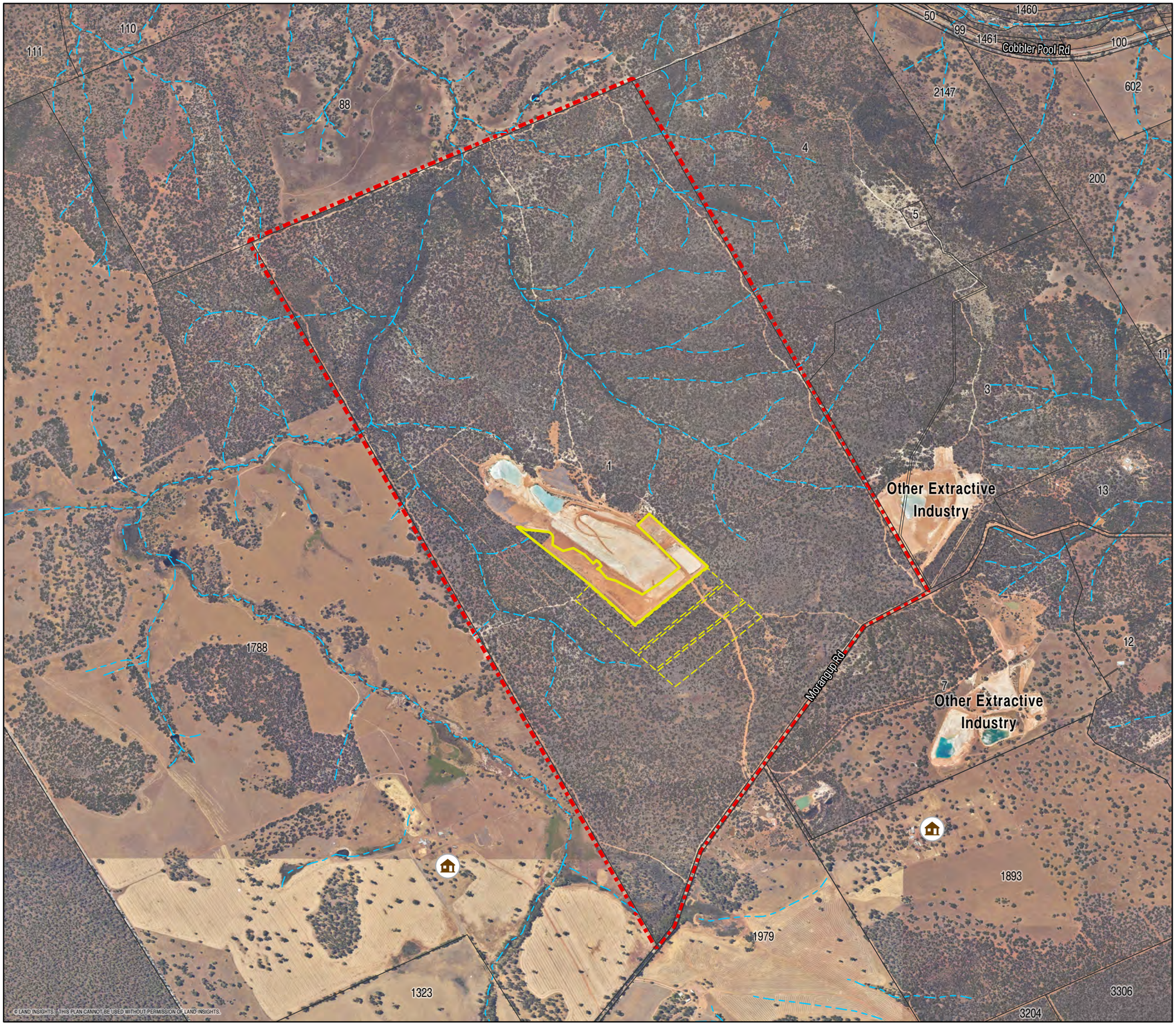
Date Received: _____

Administration Centre
15 Fiennes Street (PO Box 96)
TOODYAY WA 6566

T (08) **9574 9300**
F (08) 9574 2158
E records@toodyay.wa.gov.au
W www.toodyay.wa.gov.au

APPENDIX B

Plans



Cadastre

Site Boundary

Streamlines

Existing Stage

Future Stages

Houses

0 100 200 300 400 500

Metres

1:20,000 @ A3

NOTE: AREAS AND DISTANCES SUBJECT TO SURVEY

Project: 935
Projection: GDA 1994 MGA Zone 50
Date Exported: 15/08/2023 5:59 PM
Layout Name: Context Plan

PO Box 289 Mt Lawley WA 6929
Ph: 9271 8506
admin@landinsights.com.au
landinsights.com.au

Context Plan

LOT 1 MORANGUP ROAD, MORANGUP

MORANGUP SCHIST PIT

AUSTRAL BRICKS

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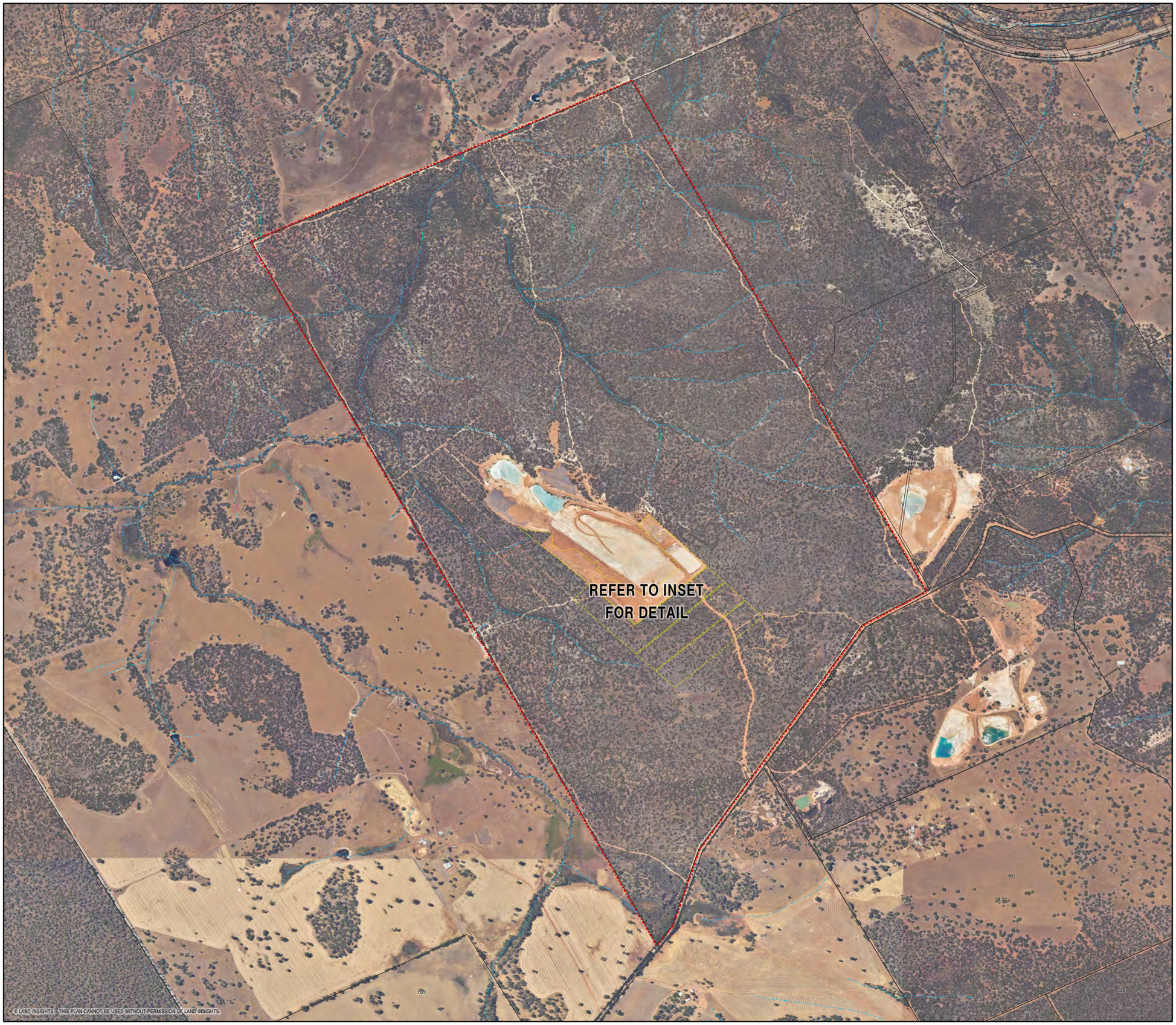

Cadastre

Site Boundary

Existing Stage

Future Stages

Streamlines

0 100 200 300 400 500

Metres

1:20,000 @ A3

NOTE: AREAS AND DISTANCES SUBJECT TO SURVEY

Project: 935
Projection: GDA 1994 MGA Zone 50
Date Exported: 24/08/2023 6:34 PM
Layout Name: Extraction Plan Overview

PO Box 289 Mt Lawley WA 6929
Ph: 9271 8506
admin@landinsights.com.au
landinsights.com.au

Extraction Plan

LOT 1 MORANGUP ROAD, MORANGUP

MORANGUP SCHIST PIT

AUSTRAL BRICKS

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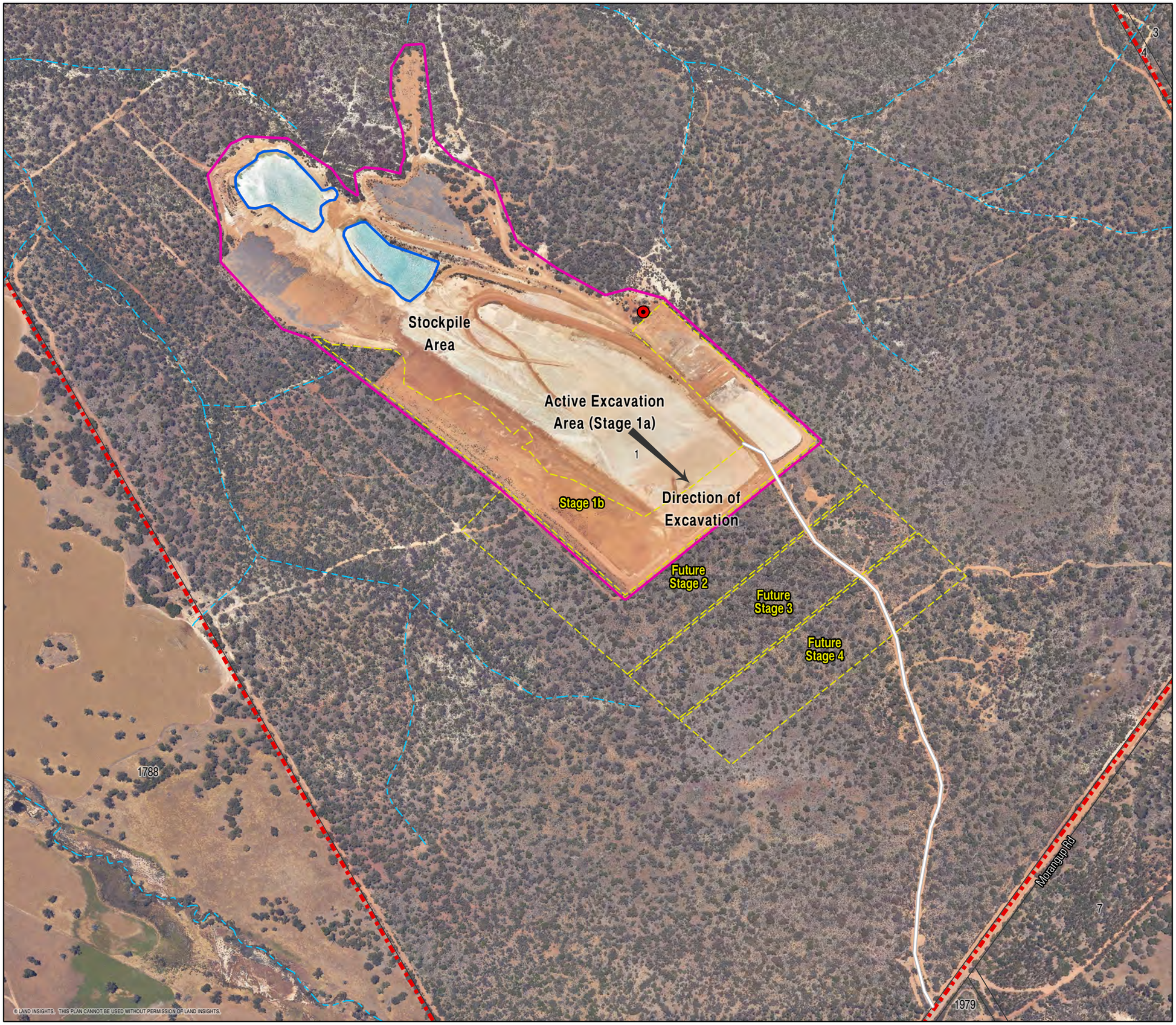

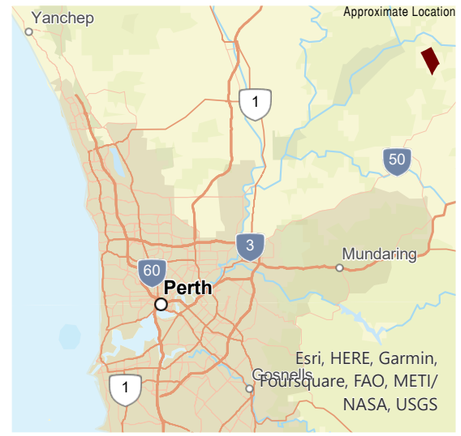

- Cadastre
- Site Boundary
- Streamlines
- Existing Stage
- Future Stages
- Haul Road
- Extraction Operation Area
- Drainage Basins
- Transportable Location (approx)

0 40 80 120 160 200
Metres
1:7,500 @ A3

NOTE: AREAS AND DISTANCES SUBJECT TO SURVEY

Project: 935
Projection: GDA 1994 MGA Zone 50
Date Exported: 24/08/2023 6:32 PM
Layout Name: Extraction Plan Detail

landinsights
PLANNING DESIGN ENVIRONMENT
PO Box 289 Mt Lawley WA 6929
Ph: 9271 8506
admin@landinsights.com.au
landinsights.com.au

Extraction Plan - Detail

LOT 1 MORANGUP ROAD, MORANGUP

MORANGUP SCHIST PIT

AUSTRAL BRICKS

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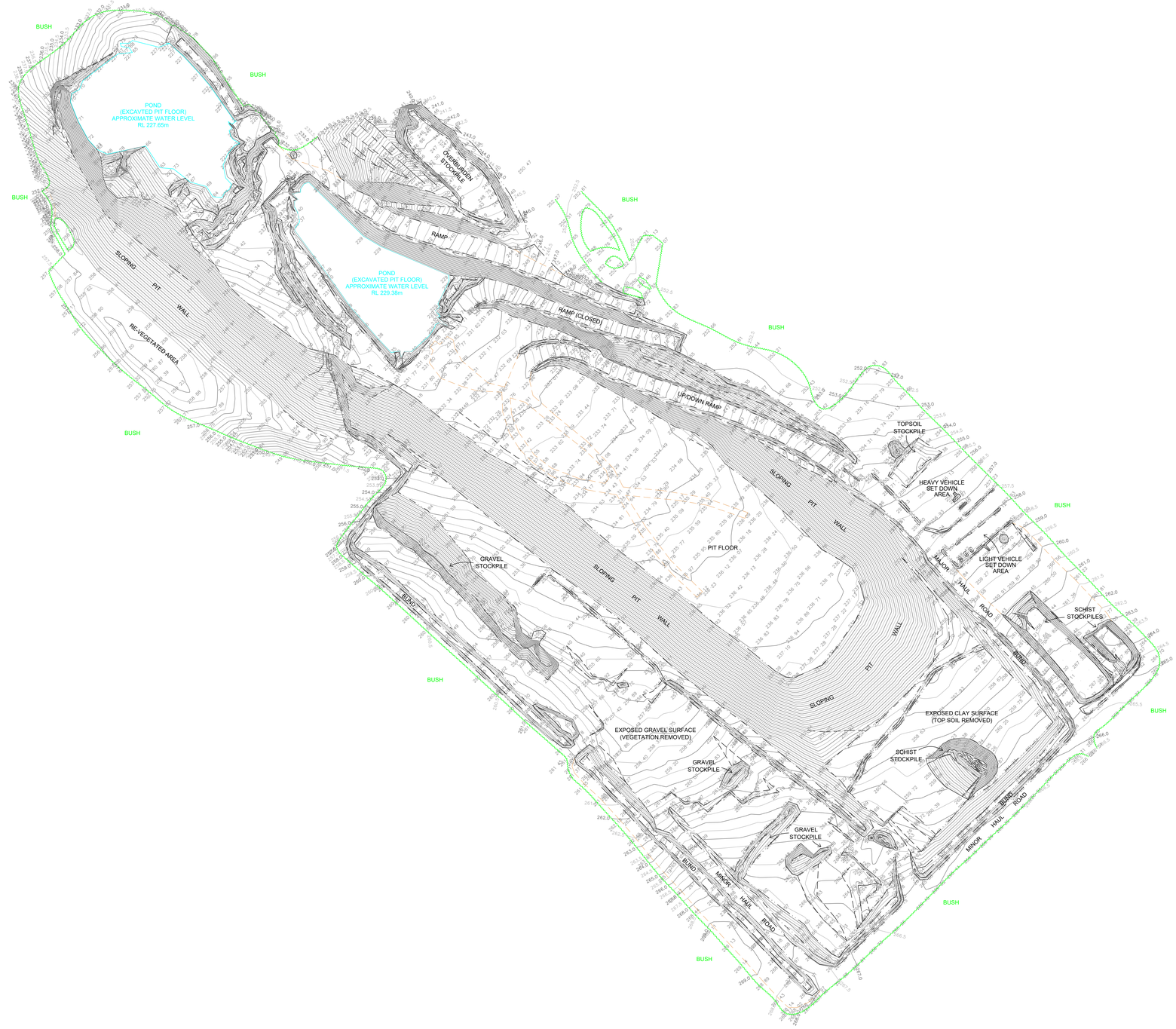
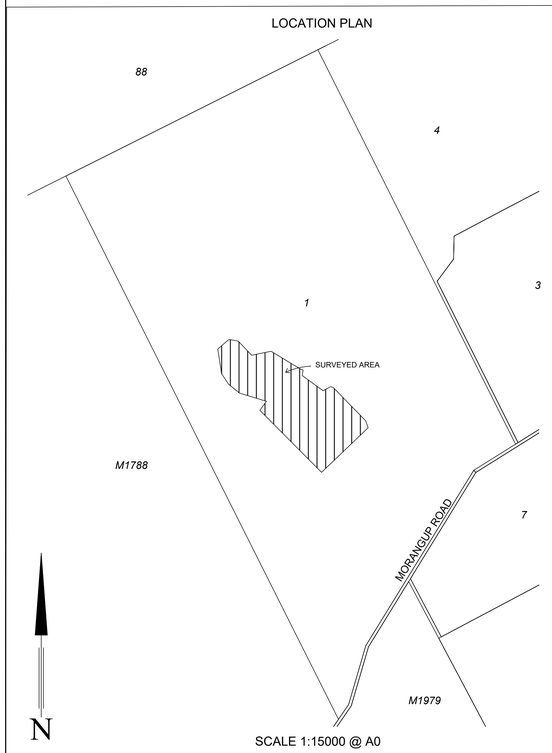


LOCATION PLAN



SCALE 1:15000 @ A0

N

SCALE 1:1500 @ A0

0m 15m 30m 45m 60m 75m

LEGEND

TERRAIN

TOP OF BANK

BOTTOM OF BANK

CHANGE OF GRADE

TRACK

SURVEYORS CERTIFICATE

I, R. D. Scriven, licensed surveyor, hereby certify that on the 21st day of July 2023, I carried out a detailed feature survey of Austral Brick's Schist Pit located on Lot 1 on Diagram 34893 as shown on the above sketch. This plan is accurate and is a correct representation of the survey undertaken for the purposes of this plan.

Date 26/07/2023 Licensed Surveyor

WARNINGS

1. Survey completed using Trimble RTK GPS Equipment. Expected accuracy of observations is ±0.02m Horizontally and ±0.03m Vertically.

NOTE

1. This PLAN is current at the Date of Survey (21/07/2023).
2. 2. The survey position has been determined from Landgate's Standard Survey Mark (SSM) Perth 212.
3. The cadastral boundary position has been determined from Landgate's SCDB (Spatial Cadastral Database).
4. Check Landgate for Diagram & Certificate of Title for any Encumbrances on the Lot including Depth Limits, Easements, Caveats, Covenants etc.

SCANLAN SURVEYS LICENSED SURVEYORS
PO BOX 429 MIDLAND 6936
PH: 08 9250 2261
www.scanlansurveys.com.au
reception@scanlansurveys.com.au

DRAWN BY:	RS	25/07/2023	
CHECKED BY:	JS	28/07/2023	
APPROVED BY:	JS	28/07/2023	
DRAWING FILE:	38009953.DWG		

REVISION	DESCRIPTION	BY	DATE
	ISSUED TO CLIENT	JS	28/07/2023

PLAN OF: CONTOUR AND FEATURE SURVEY OF SCHIST PIT - JULY 2023

PROJECT: LOT 1 ON D 34893 MORANGUP ROAD, MORANGUP

CLIENT: AUSTRAL BRICKS

DIAGRAM: 34893 C/T: 82/1A

HORIZONTAL DATUM: MGA94 - ZONE 50

VERTICAL DATUM: AHD

DRAWING: 3800/99/53 REVISION:

APPENDIX C

Certificate of Title

WESTERN AUSTRALIA

REGISTER NUMBER	
1/D34893	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	N/A

VOLUME 82 FOLIO 1A

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

BGRoberts

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 1 ON DIAGRAM 34893

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

BRISTILE HOLDINGS LTD OF HARPER STREET, CAVERSHAM

(A A028875) REGISTERED 8/4/1968

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. EXCEPT AND RESERVING METALS, MINERALS, GEMS AND MINERAL OIL SPECIFIED IN TRANSFER 7633/1945.
2. *E421846 CAVEAT BY TERRACE GUARDIANS LTD LODGED 9/8/1990.
3. *F695447 CAVEAT BY COMMONWEALTH BANK OF AUSTRALIA LODGED 7/10/1994.
4. *N418573 MEMORIAL. SOIL AND LAND CONSERVATION ACT 1945. AS TO PORTION ONLY REGISTERED 25/8/2016.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 82-1A (1/D34893)
PREVIOUS TITLE: 1089-324
PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AUTHORITY: SHIRE OF TOODYAY

NOTE 1: N148211 DEPOSITED PLAN (INTEREST ONLY) 405305 LODGED.

APPENDIX D

Flora and Vegetation Assessment

Flora and Vegetation Assessment
Lot 1 Morangup Road,
Morangup

Prepared for: Land Insights

Prepared by: **Del Botanics**
PO Box 119
Mt Helena WA 6082
Mobile 0427700496
Email delbotanics@bigpond.com

December 2013

EXECUTIVE SUMMARY

This report has been prepared by Del Botanics on behalf of Land Insights to review remnant vegetation on Lot 1 Morangup Road, Morangup the total area of the site surveyed is approximately 40ha.

This report is the result of a spring botanical survey of the flora and vegetation on the site. The location of the property is shown in **Figure 1** and the extent of the property is shown in **Figure 2.**An additional area was added to the site in 2013, this is shown on **Figure 3** and has been included as part of this report.

The recent Flora and Vegetation Assessment on Lot 1 Morangup Road, Morangup identified a number of flora species within the study area. The vegetation ranged from "Excellent" to "Good" Condition, and existing tracks were rated as "Completely Degraded".

Three Vegetation Types at a local level were recorded during the survey. No species of Threatened (T), Priority Flora or Threatened Ecological Community (TEC) pursuant to subsection 2 of section 23F of the *Wildlife Conservation Act 1950* and listed by Department of Environment and Conservation (DEC) were located during the time of the survey.

Based on the results of this survey, Del Botanics is of the opinion that development of the site would not pose significant or unacceptable impacts on flora and vegetation with consideration to the following recommendations:

- Large trees are retained for fauna habitat;
- Buffers are developed to protect vegetation from weeds and dieback; and
- Vegetation is retained where possible.

STATEMENT OF LIMITATIONS

This environmental report has been prepared in accordance with the scope of services set out in the original quotation. In preparing the report, Del Botanics has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report. Del Botanics has not verified the accuracy or completeness of the data to the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Del Botanics will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed.

In accordance with the scope of services, Del Botanics has have relied on the data and have conducted environmental field monitoring in the preparation of the report. The nature and extent of monitoring conducted is described in the report. Within the limitations imposed by the scope of services, the monitoring, and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care. No other warranty, express or implied, is made.

The report has been prepared for the benefit of the Client and for no other party. Del Botanics assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report. Other parties should not rely upon the report or the accuracy or completeness of any conclusions, and should make their own enquiries and obtain independent advice in relation to such matters.

TABLE OF CONTENTS

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TABLES

FIGURES

PHOTOGRAPHIC PLATES

APPENDICES

1. INTRODUCTION

1.1 BACKGROUND

This report has been prepared by Del Botanics on behalf of Land Insights to review remnant vegetation on Lot 1 Morangup Road, Morangup. A botanical survey of the flora species and vegetation of the site was undertaken in October 2012. The site is approximately 67.6 kilometres east of the Perth central area, the total area of the site surveyed is approximately 40ha. The location of the property is shown in **Figure 1** and the extent of the property is shown in **Figure 2.** An additional area was added to the site in 2013, this is shown on **Figure 3** and has been included as part of this report.

1.2 PURPOSE OF THIS REPORT

This report was prepared to document the flora and vegetation that occurs within Lot 1Morangup Road, Morangup. The flora species and vegetation were used to determine the significance of the site in regards to Threatened and Priority Flora and Threatened Ecological Communities.
In summary this report provides:

- Threatened Flora (T) and Threatened Ecological Communities (TEC) DEC Database search to determine results for the site;
- A spring botanical survey; and
- An assessment of vegetation types and condition.

2. EXISTING ENVIRONMENT

2.1 SOILS AND LANDFORMS

The site is within what is commonly known as the Darling Plateau. The Darling Plateau lies to the east of the Swan Coastal Plain. It is characterised by an undulating hilly landscape and lateritic uplands with major valleys along the scarp. Large rock outcrops are a dominant feature along slopes and crests. The soil types associated with the Darling Plateau are:

- Darling Scarp – shallow red and yellow earths with large granite outcrops a common feature;
- Dwellingup – consists of duri-crust on ridges and sands and gravels in shallow depressions;
- Helena – yellow duplex soils and some shallow gradational earths with granite outcrops a common feature;
- Murray – red and yellow earths on side slopes of valleys and narrow alluvial terraces;
- Yarragil – sandy gravels on the slopes with orange earths in swampy floors;

- Yalanbee – dominated by fine gravel with some duri-crust on ridges;
- Cooke – dominated by granite outcrops and shallow duplex soils;
- Pindalup – contains gravely duplex soils on the slopes with some rocky outcrops, while the valley floors are dominated by grey sands with yellow duplex soils and orange earths; and
- A minor occurrence of Coolakin to the north – slopes dominated by sandy and gravely duplex soils with some rock outcrops.

2.2 CLIMATE

The Darling Plateau generally has a warm Mediterranean climate with hot dry summers and mild wet winters with rainfall ranges between 1000 and 600mm annually.

3. FLORA AND VEGETATION

The survey area lies in the Drummond Botanical Subdistrict within the southwest Botanical Province as described by Beard (1990). Flora composition has been described by Beard (1990) as predominantly consisting of *Banksia* Low Woodlands on leached sands with *Melaleuca* swamps where ill drained and Woodlands of *Eucalyptus* spp. on less leached soils.

The vegetation assessed is known as Darling Plateau Vegetation which is characterised by Marri woodlands with heath on the shallow soils. The Darling Plateau Jarrah forest occurs on the uplands, grading to Jarrah and Marri woodlands on the slopes with scrub along the creeklines. Where granite outcrops occur, at or near the surface, woodland of rock Sheoak and Wandoo are present with herbland on the shallowest soils.

3.1 HEDDLE VEGETATION COMPLEX

Three Heddle vegetation communities have been recorded within the subject area. They are described below.

- **Pn Pindalup**. Open forest of *Eucalyptus marginata subsp. thalassica* - *Corymbia calophylla* on slopes and open woodland of *Eucalyptus wandoo* with some *Eucalyptus patens* on the lower slopes in semiarid and arid zones.

- **D3 - Dwellingup 3**. Open forest of *Eucalyptus marginata subsp. thalassica* - *Corymbia calophylla* on lateritic uplands in semiarid and arid zones.

- **My2 - Murray 2**. Open forest of *Eucalyptus marginata subsp. thalassica* - *Corymbia calophylla*-*Eucalyptus patens* and woodland of *Eucalyptus wandoo* with some *Eucalyptus accedens* on valley slopes to woodland of *Eucalyptus rudis* - *Melaleuca rhaphiophylla* on the valley floors in semiarid and arid zones. This is in close proximity and is likely to occur within the site, however the site does not contain valley floors to coincide with the *Eucalyptus rudis* - *Melaleuca rhaphiophylla* vegetation complex.

3.2 VEGETATION METHODS

A botanical survey was undertaken on the 12th October 2012 and 30th November 2013. The site was surveyed for flora, vegetation communities and condition, Threatened Flora (T), Priority Flora (PF) and potential areas of Threatened Ecological Communities (TEC's). Each variation or difference in vegetation was recorded with a 10 metre by 10 metre quadrat. Data was recorded to statistically determine vegetation types and condition. Six quadrats were assembled in the area to record each change or

variation in vegetation type. Quadrats were not assembled permanently, quadrat data in available in **Appendix B.**

The survey methodology was undertaken in accordance with EPA Position Statement No.3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection* and EPA Guidance Statement No. 51: *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia.*

All plant specimens collected during the field survey were dried, pressed and then sorted in accordance with the requirements of the Western Australian State Herbarium. Identification of specimens occurred through comparison with named material and through the use of taxonomic keys.

The use of standard data collection forms ensured the data was collected in a systematic and consistent manner. At each change in vegetation the following records were made:

- Condition/disturbance;
- Topography;
- Soils.

The vegetation communities occurring on this site were described in detail. Aerial photography was used to extrapolate and map plant communities in combination with running notes made during the course of the survey.

3.3 DECLARED RARE AND PRIORITY FLORA

Species of Flora acquire "Threatened" "Presumed Extinct" or "Priority" conservation status where populations are restricted geographically or threatened by local processes. The Department of Environment and Conservation (DEC) recognise these threats and subsequently applies regulations towards population protection and species conservation. The DEC enforces regulations under the *Wildlife Conservation Act 1950* to conserve Threatened species and protect significant populations. Priority Flora species are potentially rare or threatened and are classified in order of threat. Threatened and Priority Flora category definitions are listed in **Table 1**.

Threatened Flora species are gazetted under subsection 2 of section 23F of the *Wildlife Conservation Act 1950* and therefore it is an offence to "take" or damage rare flora without Ministerial approval. Section 23F of the Act defines "to take" as "… to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora to cause or permit the same to be done by any means".

Table 1: Definition of Rare and Priority Flora Species (DEC 2012)

Conservation Code	Category
T	**Threatened Flora (Declared Rare Flora – Extant)**. Schedule 1 under the Wildlife Conservation Act 1950 Rare Flora Notice Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such **Threatened Flora (Schedule 1)are further ranked by the Department according to their level of threat using IUCN Red List criteria:** **CR**: Critically Endangered - considered to be facing an extremely high risk of extinction in the wild. **EN**: Endangered –considered to be facing a very high risk of extinction in the wild. **VU**: Vulnerable - considered to be facing a high risk of extinction in the wild
X	**Presumed Extinct Flora (Declared Rare Flora – Extinct)** Schedule 2 under the Wildlife Conservation Act 1950 Rare Flora Notice Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
P1	**Priority One: Poorly-known species** pecies that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes
P2	**Priority Two: Poorly-known species** Species that are known from one or a few collections or sight records, some of which are on landsnot under imminent threat of habitat destruction or degradation, e.g. national parks, conservationparks, nature reserves, State forest, vacant Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
P3	**Priority Three: Poorly-known species** Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them..
P4	**Priority Four: Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	**Priority Five: Conservation Dependent species** Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years

A search of the Department of Environment and Conservations (DEC) Threatened (Declared Rare) and Priority flora database identified two Threatened Flora (T), four Priority 2 (P2) and three Priority 4 (P4) species in close proximity to the project site. The results from the database search identified species within the subject area with a 5 km buffer. The species are listed in **Table 2** below: No Threatened or Priority Flora species listed below were located during the time of the survey.

Table 2: Threatened and Priority species in close proximity to the site

Species Name	Conservation Code
Banksia nivea subsp. Morangup (M. Pieroni 94/2)	P2
Caladenia huegelii	T
Chordifex chaunocoleus	P4
Gastrolobium nudum	P2
Grevillea candolleana	P2
Oxymyrrhine coronata	P4
Templetonia drummondii	P4
Thelymitra stellata	T
Verticordia citrella	P2

3.4 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT (1999) – SPECIES LEVEL SIGNIFICANCE

The Environment Protection and Biodiversity Conservation (EPBC) Act promotes the conservation of biodiversity by providing strong protection for plants at a species level. Section 178 and 179 provides the lists and categories of threatened species under the Act and is presented in **Table 3** below.

Table 3: Categories of Threatened Species (EPBC Act, Section 179, 1999)

1	**Extinct** A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
2	**Extinct in the Wild** A native species is eligible to be included in the **extinct in the wild** category at a particular time if, at that time:(a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
3	**Critically Endangered** A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
4	**Endangered** A native species is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
5	**Vulnerable** A native species is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria..
6	**Conservation Dependant** A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

A search of the EPBC website identified two species from those recorded within a 5 km radius of the subject site as Endangered. These species are listed in **Table 4** below: These species were not located during the time of the survey.

Table 4: EPBC listed species

Species Name	Conservation Code
Caladenia huegelii	4
Thelymitra stellata	4

3.4.1 Threatened Ecological Communities

In Western Australia TECs are assessed through a procedure coordinated by the DEC and are assigned to one of the categories outlined below in **Table 5**. While they are not afforded direct statutory protection at a State level (unlike Threatened Flora under the *Wildlife Conservation Act 1950*) their significance is

acknowledged through other State environmental approval processes (i.e. Environmental Impact Assessment pursuant to Part IV of the *Environmental Protection Act 1986*). Scheduled TECs are afforded statutory protection at a Federal level pursuant to the EPBC Act.

The DEC maintains a database of TECs that currently includes 110 ecological communities, and the communities are based on Floristic Community Types (FCT) previously identified and classified on a species composition basis across the Swan Coastal Plain (Gibson et al., 1994). From the full DEC list, the Minister for the Environment has endorsed 69 as TECs requiring special acknowledgement and protection.

Table 5: Categories of DEC Threatened Ecological Communities

PD	**Presumably Totally Destroyed** An ecological community that has been adequately searched for but for which no representative occurrences have been located.
CE	**Critically Endangered** An ecological community that has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future.
E	**Endangered** An ecological community that has been adequately surveyed and is not critically endangered but is facing a very high risk of total destruction in the near future.
V	**Vulnerable** An ecological community that has been adequately surveyed and is not critically endangered or endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future.

The EPBC Act provides for the strong protection of TECs, which are listed under section 181 of the Act and are described as 'Critically Endangered', 'Endangered' or 'Vulnerable' under section 182. Schedules of protected TECs maintained pursuant to the EPBC Act are based on the same FCTs as adopted by DEC, however not all TECs listed by the DEC are scheduled under the EPBC Act.

A search was undertaken on the DEC's Threatened Ecological Communities database. There are no known occurrences of TEC's occurring in close proximity to the site.

3.5 VEGETATION ASSESSMENT RESULTS

A total of 104 taxa, comprising 34 families and 63 genera were recorded on site shown in **Appendix A**. Species representation was greatest among the Myrtaceae (Myrtles), Fabaceae (Pea's) and Proteaceae (Protea's) families.

3.5.1 Introduced species

Four introduced flora species were recorded on the site. Introduced species (weeds) were recorded in the Poaceae, Primulaceae and Oxalidaceae families. This represents 4 % of the total flora recorded on site.

3.5.2 Threatened and Priority Flora

No species of Threatened (T) or Priority Flora were recorded during the survey; No other flora, pursuant to subsection 2 of section 23F of the *Wildlife Conservation Act 1950* and listed by the Department of Environment and Conservation (DEC) were located during the time of the survey. The botanical survey was undertaken in spring to coincide with the flowering times of the threatened species.

3.5.3 EPBC listed and Threatened Ecological Communities

No EPBC listed species or TEC's were recorded during the survey.

3.5.4 Local Vegetation Communities

Vegetation structure is used to determine the coverage in each vegetation community recorded. Definitions are shown in **Table 6** below. These vegetation structure classes are the ones defined and used in Bush Forever (2000, Volume 2, Table 11 and p. 493) to describe vegetation in Bush Forever sites.

3.5.5 Dieback

During the flora and vegetation assessment, field observations identified the possibility of Dieback occurring onsite. The field observations were undertaken by observing the site for multiple deaths in the *Eucalyptus* species (particularly Jarrah) and plants belonging to the Proteaceae family, which are susceptible to dieback. No soil samples have been undertaken to confirm the presence of dieback. However it would be beneficial to reduce water movement on site and keep movement of vehicles and pedestrians on tracks.

Field records of the site indicated that dieback potentially occurs in quadrat 1, 4 and 6. These are shown on **Figure 4**

Table 6: Vegetation Structure Classes

Life Form/ Height Class	Canopy Cover (percentage)			
	100% - 70%	**70% - 30%**	**30% - 10%**	**10% - 2%**
Trees 10-30m Trees < 10m	Closed Forest Low Closed Forest	Open Forest Low Open Forest	Woodland Low Woodland	Open Woodland Low Open Woodland
Shrub Mallee	Closed Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
Shrubs > 2m Shrubs 1-2m Shrubs <1m	Closed Tall Scrub Closed Heath Closed Low Heath	Tall Open Scrub Open Heath Open Low Heath	Tall Shrubland Shrubland Low Shrubland	Tall Open Shrubland Open Shrubland Low Open Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Sedges	Closed Sedgeland	Sedgeland	Open Sedgeland	Very Open Sedgeland

Three vegetation communities were represented on the site at a local level; these have been described below in **Table 7.** Photographic representations of these vegetation communities are shown in the Quadrat data sheets in **Appendix B**. Vegetation types are shown on **Figure 4.**

Table 7: Local Vegetation Communities Recorded at Lot 1 Morangup Road, Morangup, October 2012 and November 2013.

Mapping Code	Community Descriptions
Vegetation Community 1 – Marri/Jarrah Woodland with a diverse understorey	
1	Open Forest of *Corymbia calophylla and Eucalyptus marginata*, over shrubland of *Banksia sessilis, Banksia armarta and Allocasuarina humilis over herbland of Hibbertia hypericoides, Gompholobium marginatum* and *Banksia nivea*
Vegetation Community 2 – Powderbark woodland with diverse understorey	
2	Woodland of *Eucalyptus accedens over shrubland of Xanthorrhoea acanthostachya, Melaleuca parviceps, Jacksonia restioides over herbland of Hibbertia hypericoides and Baekea camphorosmae*
Vegetation Community 3 – Wandoo woodland with diverse understorey	
3	Woodland of *Eucalyptus wandoo over shrubland of Banksia sessilis and Leptospermum erubescens, over herbland of Banksia nivea, Hibbertia hypericoides over open grassland of Neurachne alopecuroidea*

3.5.6 Vegetation Condition

Many bushland remnants have been historically subject to ongoing degradation and are especially susceptible to disturbances arising as a result of indirect impacts from surrounding developments and human activity. Degradation is caused by a wide range of factors, including isolation and edge effects, weed invasion, plant diseases, changes in fire frequency and behaviour, landscape fragmentation, increased predation on native fauna by feral animals, decrease in species richness and general modification of ecological function. These issues can affect the biodiversity rating and ecological viability of areas of remnant vegetation and should be assessed in line with conservation values.

The Vegetation Condition was rated according to the Vegetation Condition Scale commonly used in the Perth Metropolitan Region (Government of WA 2000). The definitions are described in **Table 8** below.

Table 8: Vegetation Condition Scale (Taken from Bush Forever (Government of WA 2000))

Vegetation Condition	Definition
Pristine (1)	Pristine or nearly so, no obvious signs of disturbance.
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good (3)	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing
Good (4)	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded (5)	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded (6)	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

In general, the vegetation condition ranged from "Excellent" to "Good" Condition, tracks were rated as "Completely Degraded". Vegetation condition mapping is provided in **Figure 5.** .

4. CONCLUSIONS AND RECOMMENDATIONS

The recent Flora and Vegetation Assessment on Lot 1 Morangup Road, Morangup identified a number of flora species within the study area. The vegetation ranged from "Excellent" to "Good" Condition, and existing tracks were rated as "Completely Degraded".

All the vegetation surveyed is in Excellent to Good condition, with very few weed species. It is important to retain vegetation in this condition where possible. It is important to create buffers to reduce the spread of weeds and dieback into these areas. This site also provides invaluable habitat for fauna species.

Three Vegetation Types at a local level were recorded during the survey. No species of Threatened (T), Priority Flora or Threatened Ecological Community (TEC) pursuant to subsection 2 of section 23F of the *Wildlife Conservation Act 1950* and listed by Department of Environment and Conservation (DEC) were located during the time of the survey.

Based on the results of this survey, Del Botanics is of the opinion that development of the site would not pose significant or unacceptable impacts on flora and vegetation with consideration to the following recommendations:

- Large trees are retained for fauna habitat;
- Buffers are developed to protect vegetation from weeds and dieback; and
- Vegetation is retained where possible.

5. REFERENCES

Beard J. S. (1990). *Plant life of Western Australia*. Kangaroo Press, Perth.

Department of Conservation and Land Management (2003). *Declared Rare and Priority Flora database*. Publicly available list.

English, V. and Blyth, J. (1997). *Identifying and conserving Threatened Ecological Communities in the South West Botanical Province*. ANCA National Reserves System Cooperative Program, Project Number N702.

Environmental Protection Authority (2001a). Position Statement No. 2. *Environmental Protection of Native Vegetation in Western Australia*. EPA, Perth.

Environmental Protection Authority (2001b). Position Statement No. 3. *Terrestrial biological surveys as an element of biodiversity protection*. EPA, Perth.

Environmental Protection Authority (2003a). Guidance statement No. 10. *Guidance for the Assessment of Environmental Factors – Level of assessment for proposals affecting natural areas within the System 6 Region and Swan Coastal Plain portion of the System 1 Region*. EPA, Perth.

Environmental Protection Authority (2003b). Guidance statement No. 51. *Guidance for the Assessment of Environmental Factors –Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia*. EPA, Perth.

Government of Western Australia (2000). *Bush Forever, Vol. 2*. Government of Western Australia, Perth.

Heddle, E.M., Loneragan,, O.W. and Havel, J.J. (1980). *Darling Systems – Vegetation Complexes*. In: Atlas of Natural Resources Darling System, Western Australia. Department of Conservation and Environment, Perth.

Native Vegetation Handbook for the Shire of Toodyay, Sarah Weaving, produced by Dept of Agriculture, Western Australia and Greening Western Australia.

Western Australian Herbarium (1998-2003). *FloraBase - The Western Australian Flora*. Department of Conservation and Land Management. http://florabase.calm.wa.gov.au/

FIGURES

FIGURE 1: LOCATION OF SUBJECT SITE

FIGURE 2 EXTENT OF SUBJECT SITE

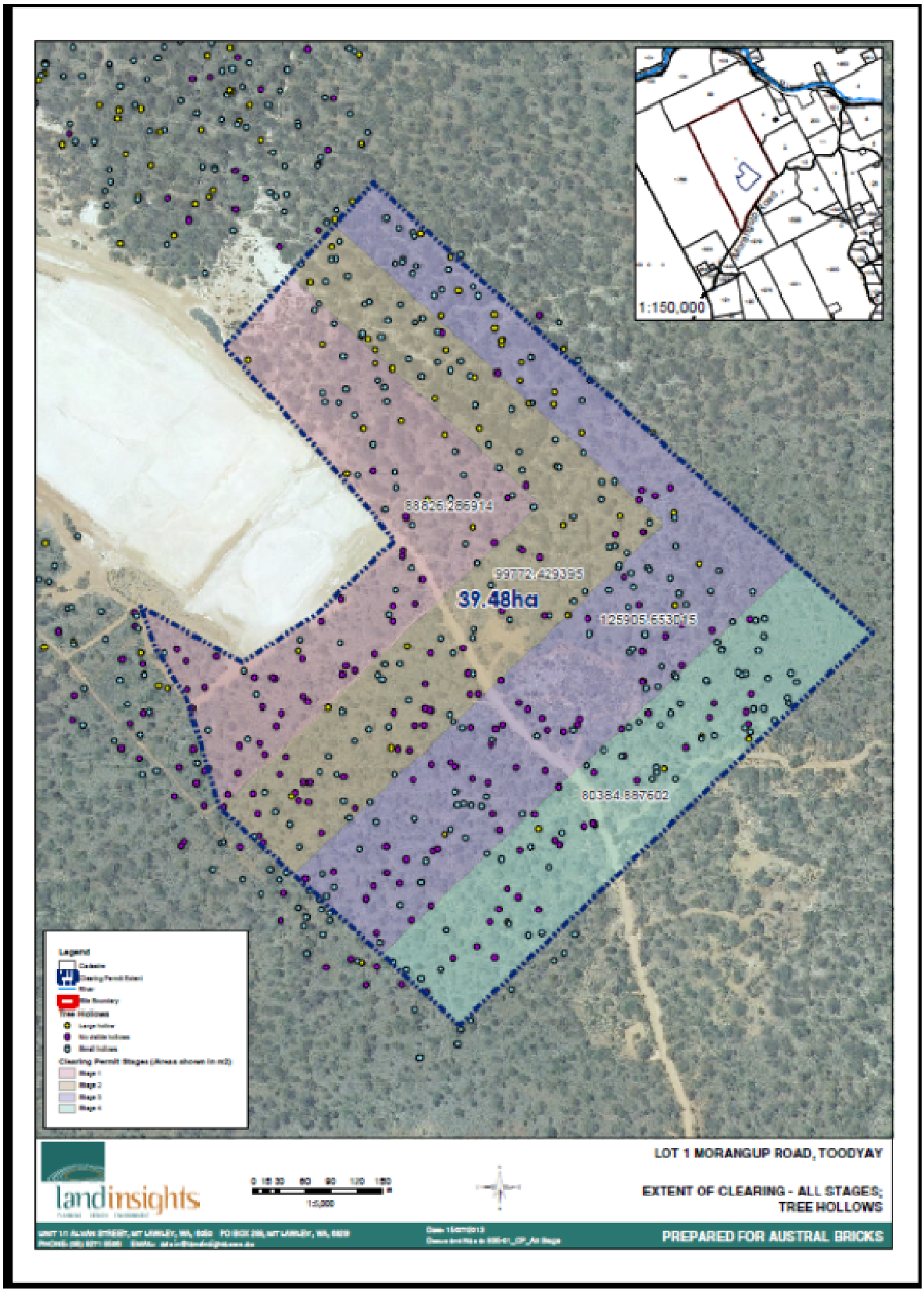
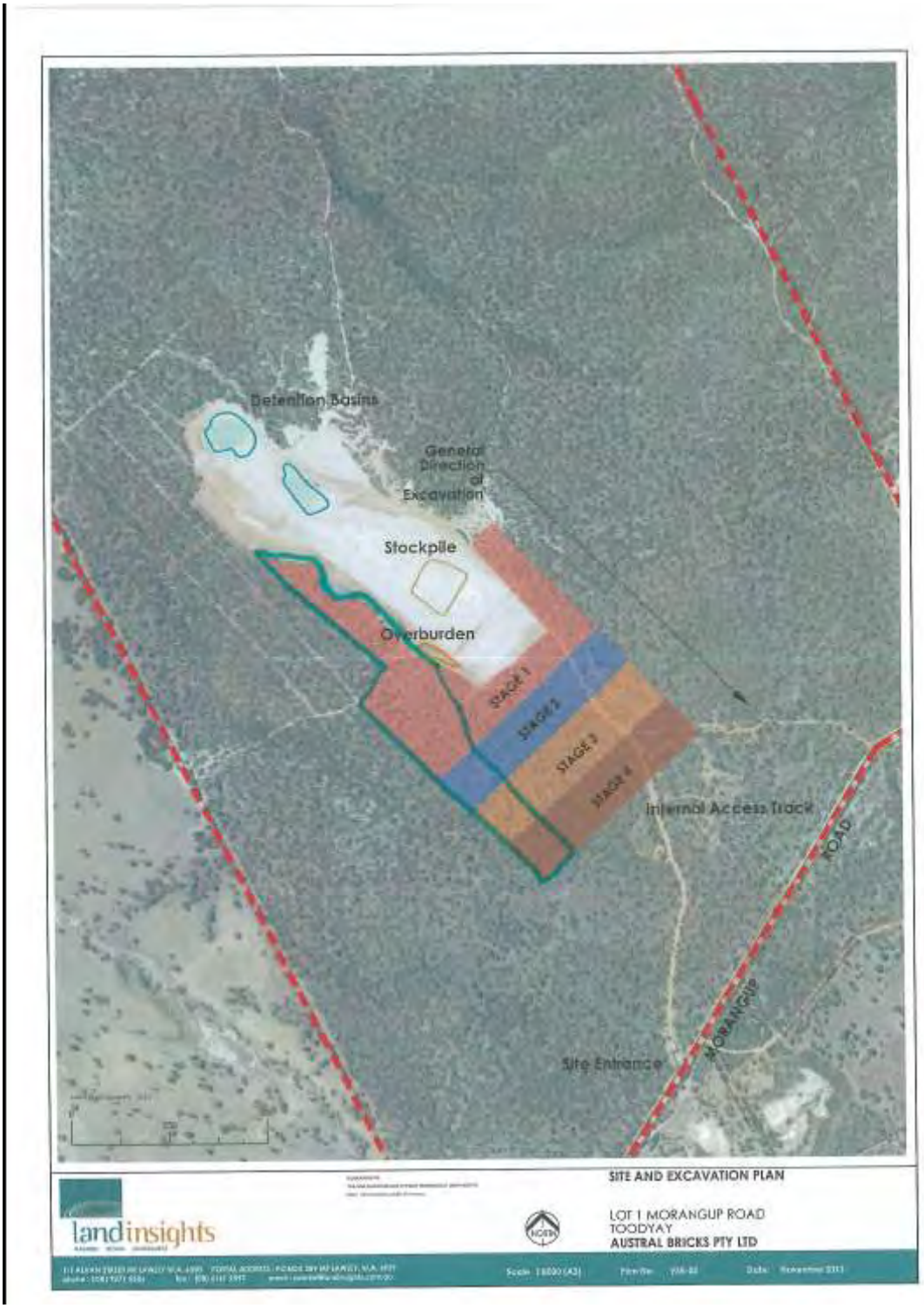


FIGURE 3 NEW EXCAVATION AREA, OUTLINED IN GREEN



Legend

Site Boundary

Extraction Stages

Vegetation Types

Marri Jarrah Woodland

Powderbark Wandoo

Wandoo Woodland

No Vegetation

Plan prepared by Land Insights for and using information provided by Del Botanics.

Photography Processed [illegible] December 2012

LOT 1 MORANGUP ROAD, TOODYAY

0 50 100 200 300 400 500 m

1:7,500

N W E S

VEGETATION TYPE

UNIT 1/1 ALVAN STREET, MT LAWLEY, WA, 6050 PO BOX 289, MT LAWLEY, WA, 6929
PHONE: (08) 9271 8506 EMAIL: admin@landinsights.com.au

Date: 13/05/2014
Document Name: Vegetation Type

AUSTRAL BRICKS

Legend

Site Boundary

Extraction Stages

Vegetation Condition

Excellent

Very Good

Good

Completely Degraded

Plan prepared by Land Insights for and using information provided by Del Botanics.

Photography Processed [illegible] December 2012

LOT 1 MORANGUP ROAD, TOODYAY

VEGETATION CONDITION

0 50 100 200 300 400 500 m

1:7,500

N W E S

landinsights
PLANNING DESIGN ENVIRONMENT

UNIT 1/1 ALVAN STREET, MT LAWLEY, WA, 6050 PO BOX 289, MT LAWLEY, WA, 6929
PHONE: (08) 9271 8506 EMAIL: admin@landinsights.com.au

Date: 13/05/2014
Document Name: Vegetation Condition

AUSTRAL BRICKS

PHOTOGRAPHIC PLATES

Plate 1: Habitat Tree

Plate 2: Habitat Tree

APPENDIX A
VASCULAR PLANT SPECIES RECORDED

APPENDIX A: VASCULAR PLANT SPECIES RECORDED AT LOT 1 MORANGUP ROAD, MORGANUP OCTOBER 2012 AND NOVEMBER 2013

(*DENOTES A WEED SPECIES)

Family	* Species
Amaranthaceae	*Ptilotus manglesii*
Anarthriaceae	*Lyginia barbata*
Apiaceae	*Eryngium pinnatifidum*
Araliaceae	*Trachymene pilosa*
Asparagaceae	*Laxmannia squarrosa*
	Thysanotus patersonii
Asteraceae	**Hypochaeris glabra*
	Lagenophora huegelii
	Pterochaeta paniculata
	Siloxerus multiflorus
	Waitzia nitida
Casuarinaceae	*Allocasuarina humilis*
Celastraceae	*Tripterococcus brunonis*
Cyperaceae	*Lepidosperma squamatum*
	Lepidosperma tenue
	Tetraria octandra
Dilleniaceae	*Hibbertia commutata*
	Hibbertia huegelii
	Hibbertia hypericoides
	Hibbertia sp
Droseraceae	*Drosera leucoblasta*
	Drosera stolonifera
Elaeocarpaceae	*Tetratheca nuda*
	Tetratheca hirsuta
Ericaceae	*Conostephium pendulum*
	Leucopogon nutans
	Leucopogon propinquus
Fabaceae	*Acacia lasiocarpa*
	Acacia lateriticola
	Acacia nervosa
	Acacia pulchella
	Bossieae eriocarpa
	Gompholobium knightianum
	Gompholobium marginatum
	Jacksonia restioides
	Kennedia prostrata
Goodeniaceae	*Damperia linearis*
Haemodoraceae	*Conostylis setigera*
	Conostylis juncea
	Conostylis sp
	Haemodorum spicatum
Hemerocallidaceae	*Johnsonia pubescens*
Iridaceae	*Patersonia pygmaea*
	Patersonia rudis
Lauraceae	*Cassytha racemosa*
Cyperaceae	*Lepidosperma sp*
Malvaceae	*Thomasia foliosa*
Myrtaceae	*Baekea camphorosmae*
	Calothamnus sanguineus
	Calytrix sapphirina

	Calytrix variabilis
	Corymbia calophylla
	Eucalyptus accedens
	Eucalyptus marginata
	Eucalyptus wandoo
	Kunzea recurva
	Leptospermum erubescens
	Melaleuca aspalathoides
	Melaleuca parviceps
	Melaleuca sp
Orchidaceae	*Orchidaceae sp (no identification material)*
Oxalidaceae	**Oxalis ap*
Phyllanthaceae	*Phyllanthus calycinus*
Poaceae	**Aira caryophyllea*
	Austrodanthonia caespitosa
	**Briza maxima*
	Austrostip compressa
	Neurachne alopecuroidea
	Neurachne sp
Primulaceae	**Lysimachia arvensis*
Proteaceae	*Adenanthos cygnorum* Diels subsp. *cygnorum*
	Banksia ? grandis (dead)
	Banksia armata
	Banksia bipinnatifida
	Banksia nivea
	Banksia sessilis
	Conospermum glumaceum
	Conospermum huegelii
	Conospermum sp
	Grevillea pilulifera
	Hakea cyclocarpa
	Hakea lissocarpa
	Hakea stenocarpa
	Hakea undulata
	Lambertia multiflora var. *darlingensis*
	Petrophile seminuda
	Petrophile striata
	Synaphea ? gracillima
	Synaphea sp
Restionaceae	*Desmocladus flexuosus*
Rhamnaceae	*Trymalium sp*
Rutaceae	*Boronia ovata*
	Boronia ? scabra
	Boronia scabra Lindl. subsp. scabra
	Boronia sp
Stylidiaceae	*Stylidium androsaceum*
	Stylidium ciliatum
	Stylidium dichotomum
	Stylidium hispidum
	Stylidium sp

	Stylidium ? hispidum (yellow form)
Xanthorrhoeaceae	*Xanthorrhoea acanthostachya*
	Xanthorrhoea preissii
Zamiaceae	*Macrozamia riedlei*

APPENDIX B
QUADRAT DATA

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FIELD SHEET – FLORA AND VEGETATION SURVEY

Job Code: Austral Bricks	**Date:** 12/10/12	**Site:** Q1
GPS Datum: 50 435928 6504198	**Topography:** Upper slope	**Litter cover:** 30% twigs, 30% leaves
Age since fire: **>10** yrs	**Disturbance:** Hi Med **Lo**	**Soils:** Clay/Loam
Vegetation Description: Powderbark woodland with diverse understorey		
Vegetation Condition: Excellent		
Observations: Potential dieback observed from field investigations		

Coll No.	Taxon
	Eucalyptus accedens
	Eucalyptus marginata
	Corymbia calophylla
	Banksia ? grandis (dead)
	Hibbertia hypericoides
	Petrophile striata
	Melaleuca parviceps
	Xanthorrhoea acanthostachya
	Banksia bipinnatifida
	Cassytha racemosa
	Baekea camphorosmae
	Leptospermum erubescens
	Tetraria octandra
	Gompholobium marginatum
	Acacia lateriticola
	Hakea cyclocarpa
	Conostylis sp
	Bossieae eriocarpa

	Calytrix variabilis
	Banksia nivea
	Hakea undulata
	Jacksonia restioides
	Stylidium hispidum
	Melaleuca sp
	Hibbertia commutata
	Phyllanthus calycinus
	Petrophile striata
	Lepidosperma squamatum
	Boronia ? scabra
	Patersonia rudis
	Stylidium dichotomum
	Damperia linearis
	Boronia sp
	Lambertia multiflora var. darlingensis
	Macrozamia riedlei

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FIELD SHEET – FLORA AND VEGETATION SURVEY

Job Code: Austral Bricks	**Date:** 12/10/12	**Site:** Q2
GPS Datum: 50 436308 6503833	**Topography:** Upper slope	**Litter cover:** 10% logs, 10% leaves
Age since fire: >10 yrs	**Disturbance:** Hi Med **Lo**	**Soils:** Clay/Loam
Vegetation Description: Wandoo woodland with diverse understorey,		
Vegetation Condition: Very Good		
Observations: Good habitat trees		

Coll No.	Taxon
	Waitzia nitida
	Laxmannia squarrosa
	Xanthorrhoea preissii
	Eucalyptus wandoo
	Damperia linearis
	Hibbertia commutata
	Stylidium androsaceum
	Leucopogon nutans
	Drosera stolonifera
	Ptilotus manglesii
	Banksia nivea
	**Lysimachia arvensis*
	Baekea camphorosmae
	Lagenophora huegelii
	Desmocladus flexuosus

	**Briza maxima*
	Acacia pulchella
	Bossiaea eriocarpa
	**Hypochaeris glabra*
	Thysanotus patersonii
	Cassytha racemosa
	Conostylis juncea
	Trachymene pilosa
	Neurachne alopecuroidea
	Eryngium pinnatifidum
	Gompholobium marginatum
	Petrophile seminuda
	Kunzea recurva
	**Oxalis ap*
	Kennedia prostrata
	**Aira caryophyllea*
	Conostephium pendulum
	Petrophile striata
	Hibbertia hypericoides
Opp	*Trymalium sp*
Opp	*Hakea lissocarpa*
Opp	*Banksia armata*
Opp	*Macrozamia riedlei*

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FIELD SHEET – FLORA AND VEGETATION SURVEY

Job Code: Austral Bricks	**Date:** 12/10/12	**Site:** Q3
GPS Datum: 50 436507 6503468	**Topography:** Mid slope	**Litter cover:** 10% logs, 10% leaves
Age since fire: >10 yrs	**Disturbance:** Hi Med **Lo**	**Soils:** Orange, Clay/Loam
Vegetation Description: Marri/Jarrah Woodland with a diverse understorey		
Vegetation Condition: Very Good		
Observations:		

Coll No.	Taxon
	Banksia sessilis
	Xanthorrhoea acanthostachya
	Banksia bipinnatifida
	Synaphea ? gracillima
	Drosera leucoblasta
	Hibbertia hypericoides
	Banksia nivea
	Allocasuarina humilis
	Damperia linearis
	Hakea stenocarpa
	Ptilotus manglesii
	Bossiaea eriocarpa
	Calothamnus sanguineus
	Stylidium ciliatum
	Conospermum glumaceum

	Melaleuca aspalathoides
	Stylidium sp
	Gompholobium marginatum
	Boronia scabra Lindl. subsp. scabra
	Tetratheca hirsuta
	Boronia ovata
	Acacia lasiocarpa
	Calytrix variabilis
	Leptospermum erubescens
	Drosera stolonifera
	Stylidium hispidum
	Jacksonia restioides
	Neurachne alopecuroidea
	Pterochaeta paniculata
	Johnsonia pubescens
	Hibbertia sp
	Conostephium pendulum
	Conospermum glumaceum
Opp	*Corymbia calophylla*
Opp	*Eucalyptus marginata*

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FIELD SHEET – FLORA AND VEGETATION SURVEY

Job Code: Austral Bricks	**Date:** 12/10/12	**Site:** Q4
GPS Datum: 50 436541 6503164	**Topography:** Upper slope	**Litter cover:** 50% logs, 10% leaves
Age since fire: >10 yrs	**Disturbance**: Hi Med **Lo**	**Soils:** Clay/Loam,
Vegetation Description: Jarrah Woodland with diverse understorey		
Vegetation Condition: Excellent		
Observations: Potential dieback observed from field investigations		

Coll No.	Taxon
	Johnsonia pubescens
	Eucalyptus marginata
	Stylidium ciliatum
	Banksia armata
	Boronia sp
	Leucopogon propinquus
	Gompholobium marginatum
	Allocasuarina humilis
	Banksia nivea
	Patersonia rudis
	Neurachne alopecuroidea
	Ptilotus manglesii
	Petrophile seminuda
	Hibbertia hypericoides
	Drosera leucoblasta

	Stylidium ? hispidum (yellow form)
	Boronia ovata
	Tetratheca nuda
	Bossiaea eriocarpa
	Hibbertia commutata
	Gompholobium knightianum
	Acacia lasiocarpa
	Ptilotus manglesii
	Drosera stolonifera
	Xanthorrhoea preissii
	Hibbertia huegelii
	Thomasia foliosa
	Lepidosperma sp
	Thysanotus patersonii
	Melaleuca aspalathoides
	Calytrix sapphirina
	Siloxerus multiflorus
	Austrodanthonia caespitosa
	Austrostip compressa
	Calothamnus sanguineus
	Leptospermum erubescens
	Orchidaceae sp (no identification material)
	Conostylis setigera
	Tripterococcus brunonis
Opp	*Grevillea pilulifera*

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FIELD SHEET – FLORA AND VEGETATION SURVEY

Job Code: Austral Bricks	**Date:** 12/10/12	**Site:** Q5
GPS Datum: 50 435953 6503355	**Topography:** Upper slope	**Litter cover:** 10% logs, 20% leaves
Age since fire: **>10** yrs	**Disturbance:** Hi Med **Lo**	**Soils:** Clay/Loam
Vegetation Description: Wandoo Woodland over sparse understorey		
Vegetation Condition: Very Good		
Observations: Good habitat trees		

Coll No.	Taxon
	Eucalyptus wandoo
	Eucalyptus accedens
	Hibbertia hypericoides
	Banksia sessilis
	Hibbertia commutata
	Banksia bipinnatifida
	Hibbertia huegelii
	Banksia nivea
	Leptospermum erubescens
	Petrophile seminuda
	Thysanotus patersonii
	Neurachne sp
	Thysanotus sparteus
	Lagenophora huegelii
	Leucopogon nutans
	Acacia lasiocarpa

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FIELD SHEET – FLORA AND VEGETATION SURVEY

Job Code: Austral Bricks	**Date:** 12/10/12	**Site:** Q6
GPS Datum: 50 436176 6503212	**Topography:** Mid slope	**Litter cover:** 20% logs, 20% leaves
Age since fire: **>10** yrs	**Disturbance:** Hi **Med** Lo	**Soils:** Clay/Loam
Vegetation Description: Marri/Jarrah Woodland over various understorey		
Vegetation Condition: Excellent		
Observations: Potential dieback observed from field investigations		

Coll No.	Taxon
	Leptospermum erubescens
	Calytrix sapphirina
	Banksia sessilis
	Jacksonia restioides
	Ptilotus manglesii
	Banksia nivea
	Drosera leucoblasta
	Desmocladus flexuosus
	Lyginia barbata
	Conospermum huegelii
	Banksia armata
	Petrophile striata
	Cassytha racemosa
	Siloxerus multiflorus
	Calothamnus sanguineus
	Hibbertia hypericoides

	Pterochaeta paniculata
	Neurachne alopecuroidea
	Leucopogon nutans
	Conostylis sp
	Hibbertia commutata
	Haemodorum spicatum
	Synaphea sp
	Lepidosperma tenue
	Stylidium sp
	Trymalium sp
	Adenanthos cygnorum Diels subsp. cygnorum
	Patersonia pygmaea

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FIELD SHEET – FLORA AND VEGETATION SURVEY

Job Code: Austral Bricks	**Date:** 30/11/13	**Site:** Q7 – New Excavation Area
GPS Datum: 50 436134 65 03196	**Topography:** Upper slope	**Litter cover:** 10% twigs, 30% leaves
Age since fire: **>10** yrs	**Disturbance:** Hi **Med** Lo	**Soils:** Clay/Loam
Vegetation Description: Jarrah/Marri woodland		
Vegetation Condition: Good		
Observations: Banksia sessilis dominant, possibly due to disturbance		

Coll No.	Taxon
	Lepidospermum erubescens
	Banksia armata
	Hibbertia hypericoides
	Xanthorrhoea acanthostachya
	Ptilotus manglesii
	Adenanthos cygnorum Diels subsp. cygnorum
	Eucalyptus marginata
	Lyginia barbata
	Stylidium dichotomum
	Baekea camphorosmae
	Neurachne alopecuroidea
	Acacia nervosa
	Hibbertia huegelii
	Leucopogon nutans
	Comesperma sp
	Calothamnus sanguineus
	Lepidosperma tenue

Opp	*Corymbia calophylla*
	Jacksonia restioides

APPENDIX E

Level 1 Fauna Survey and Targeted Black Cockatoo and Chuditch Survey

Austral Bricks Morangup Rd Quarry, Shire of Toodyay:

Level 1 Fauna Survey & targeted black-cockatoo and Chuditch survey, August 2012

Wandoo woodland in the study area

Prepared for: Austral Bricks

Prepared by: Western Wildlife
8 Ridgeway Pl
Mahogany Creek WA 6072
Ph: 0427 510 934

October 2012

Executive Summary

Introduction

Austral Bricks currently run an open pit at Lot 1 Morangup Rd (the 'study area'), located in the Shire of Toodyay. They propose to extend the existing open pit, which would necessitate the removal of some native vegetation. Austral Bricks commissioned Western Wildlife to undertake a Level 1 fauna survey and targeted black-cockatoo and Chuditch survey of the study area.

Methods

The fauna survey was undertaken in compliance with Environmental Protection Authority (EPA) Position Statement No.3 (EPA 2002) and EPA Guidance Statement 56 (EPA 2004).

The field survey took place on 13th – 17th August 2012 and was carried out by two zoologists. The field survey included:

- Identification of fauna habitats.
- Opportunistic records of fauna.
- Identification of black-cockatoo (*Calyptorhynchus spp*.) habitat trees (trees with a diameter at breast height ≥50cm).
- Targeted trapping for Chuditch (*Dasyurus geoffroii*) using cage traps and camera traps.

Fauna species of conservation significance were classified as Conservation Significance 1 (listed under State or Commonwealth legislation), Conservation Significance 2 (listed as a Priority species by the Department of Environment and Conservation), or Conservation Significance 3 (a locally significant species).

Results and Discussion

The study area has three main habitats; Wandoo woodland, Jarrah – Marri woodland and revegetation areas. These habitats are widely represented in the surrounding area, as the study area is set within a rural landscape of pasture and remnant native vegetation. The Wandoo woodland and Jarrah –Marri woodland are likely to support relatively intact faunal communities. The revegetation areas are likely to support a smaller subset of native fauna. Overall, the study area has the potential to support a wide range of vertebrate species including up to 12 amphibian, 49 reptile, 95 bird and 27 mammal species. A total of two reptile, 42 bird and three mammal species were recorded opportunistically from the study area during the August 2012 site visit.

There are 26 fauna species of conservation significance (CS) that have the potential to occur in the study area. The species of conservation significance 1 that may occur are the Carpet Python, Peregrine Falcon, Forest Red-tailed Black-Cockatoo, Baudin's Black-Cockatoo, Carnaby's Black-Cockatoo, Fork-tailed Swift, Rainbow Bee-eater and Chuditch. The species of conservation significance 2 that may occur are Dell's Skink, Barking Owl, Masked Owl, Crested Shrike-tit, White-browed Babbler, Quenda and Western Brush Wallaby. There are also eight birds and three small mammals of conservation significance 3 that may be present.

The proposal is to extend the existing open pit, necessitating the clearing of native vegetation and therefore fauna habitat, in the study area. The most likely potential impacts of the development are:

- Direct mortality of fauna
- Habitat loss
- Habitat fragmentation
- Road mortalities
- Increased disturbance to fauna

The main potential impact is the loss of habitat, in particular foraging and potential breeding habitat for conservation significant species such as Carnaby's Black-Cockatoo and the Forest Red-tailed Black-Cockatoo.

Recommendations

- *Avoid clearing during late winter and spring in order to minimise the mortality of young birds in nests.*
- *Minimise clearing of existing native vegetation where possible. It is recognised that for clearing permit applications reducing habitat loss may not be possible, however, it is a key principle to consider when designing any development, to ensure it is a compact as possible.*
- *Consider offsetting cleared native vegetation by re-vegetating areas to create corridors for the movement of fauna on adjacent farmland.*
- *During clearing or construction, avoid disturbance to areas of native vegetation that are to be preserved.*
- *Where possible, preserve Wandoo, Powderbark Wandoo, Jarrah and Marri trees with a DBH* ≥50cm.
- *Where habitat for EPBC listed black-cockatoo species or the Chuditch is likely to be cleared, refer the development to the Commonwealth for determination whether it constitutes a significant impact under the EPBC Act.*
- *Carry out appropriate revegetation after mining activities have finished.*
- *Consider stockpiling large hollow logs for use in revegetation, as these take a long time to form naturally.*
- *When clearing, avoid creating isolated patches of woodland.*
- *Use low speed limits and road signage to increase awareness of the presence of fauna such as kangaroos and wallabies, to help prevent road mortalities.*
- *If possible, situate noisy activities together to reduce the area of impact.*
- *Only use night-lighting where necessary for safety and avoid light spill by using the lowest light intensity practicable, using directional or shielded lighting and mounting lighting as low to the ground as practicable.*

Table of Contents

Tables, Figures and Plates

1. Introduction

Austral Bricks currently run an open pit at Lot 1 Morangup Rd (the 'study area'), located in the Shire of Toodyay. They propose to extend the existing open pit, which would necessitate the removal of some native vegetation. Austral Bricks commissioned Western Wildlife to undertake a Level 1 fauna survey and targeted black-cockatoo and Chuditch survey of the study area. The aims of the site visit and literature review were to:

- Identify the fauna habitats present in the study area.
- List the vertebrate fauna that were recorded in the study area and/or have the potential to occur in the study area.
- Identify species of conservation significance, or habitats of particular importance for fauna, that may occur in the study area.
- Carry out a targeted assessment of black-cockatoo (*Calyptorhynchus spp*.) habitat in the study area.
- Carry out a targeted trapping survey for Chuditch (*Dasyurus geoffroii*).
- Comment on the potential impacts the proposed development may have on fauna, particularly on fauna of conservation significance.
- Make recommendations on ameliorating the potential impacts.

This report details the findings of the fauna survey conducted in August 2012.

2. The Study Area – Context and Description

The study area consists of part Lot 1, Morangup Rd, Morangup and it is located in the Shire of Toodyay (Figures 1 and 2). It currently consists of woodlands surrounding an existing open pit.

The study area is about 14km southwest of the Toodyay town centre, and about 58km northeast of Perth. The study area is set within a patch of remnant native vegetation, that is itself set within a landscape of rural land and with small and large patches of native vegetation. To the west of the study area is Avon Valley National Park, Moondyne Nature Reserve and a Timber Reserve (Figure 1). To the south is Morangup Nature Reserve and to the north is Julimar State Forest (Figure 1).

Julimar State Forest and Avon Valley National Park have been subject to fauna translocation programs for Chuditch, Quenda and other conservation significant native fauna.

The project area lies within the Northern Jarrah Forest (JF1) subregion of the Jarrah Forest Bioregion of the Interim Biogeographical Regionalisation for Australia (IBRA) classification system (DEWHA 2004). This subregion lies to the east of the Darling Scarp on the Yilgarn Craton, a duricrusted plateau with an average height of 300m. It is characterised by Jarrah – Marri Forest (with Blackbutt and Bullich in the valleys) in the west, grading to Wandoo woodlands (with Powderbark Wandoo on breakaways) in the east. There are localised sand sheets with low Banksia woodlands, and heath is present around outcropping granite and as an understorey in woodlands (Williams and Mitchell 2001).

The climate is Warm Mediterranean, with the annual rainfall varying from 1100mm on the western edge, to 700mm in the north and east (Williams and Mitchell 2001). The dominant land uses in this subregion are forestry (native forests and plantations), grazing, conservation, dry land agriculture and mining, with smaller areas of rural residential, urban areas, roads and other easements (Williams and Mitchell 2001).

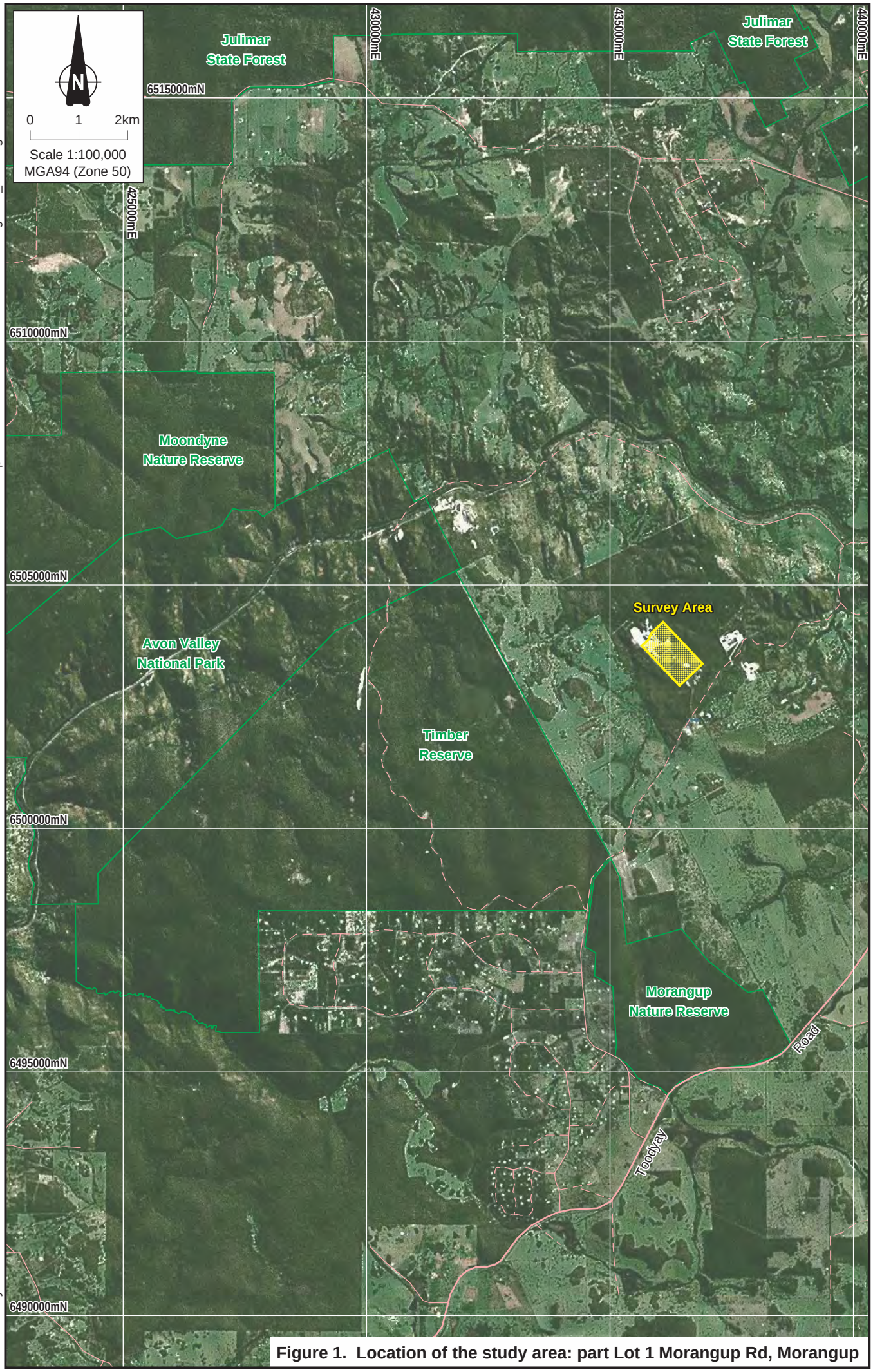

Figure 1. Location of the study area: part Lot 1 Morangup Rd, Morangup

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3. Methods

The survey was conducted as a Level 1 fauna survey in accordance with the Environmental Protection Authority (EPA) Position Statement No.3 (EPA, 2002), Guidance Statement 56 (EPA, 2004) and relevant Commonwealth Government guidelines. The Level 1 fauna survey included a search of available literature and databases (a 'desktop' study), and a field survey of the study area for five days, 13th – 17th August 2012. The field survey served to put the desktop study into context, as well as allowing for the identification of fauna habitats and likely fauna assemblages of the study area.

3.1 Personnel

The personnel involved in the fauna survey, their qualifications and company affiliation, were as follows:

- **Supervising Zoologist:**
  - Ms Jenny Wilcox - *BSc.Biol./Env.Sci., Hons.Biol.* - Western Wildlife
- **Field Zoologist:**
  - Mr Richard King - *BSc.Env.Biol.* - Western Wildlife

3.2 Taxonomy and Nomenclature

Taxonomy and nomenclature for fauna species used in this report follow the Western Australian Museum checklists. These were last updated in November 2010 and are accessed at URL: http://www.museum.wa.gov.au/research/research-areas/#terrestrial-zoology/checklist-terrestrial-vertebrate-fauna-western-australia. In the text, common names are used where appropriate, and all scientific names are given in species lists. Where a species lacks a common name, they are referred to by their scientific name.

3.3 Literature Review

Lists of fauna expected to occur in the study area were produced using information from a number of sources. These included publications that provide information on general patterns of distribution of frogs (Tyler and Doughty 2009), reptiles (Storr *et al*. 1983, 1990, 1999 and 2002), birds (Barrett *et al*. 2003; Johnstone and Storr 1998; Johnstone and Storr 2004) and mammals (Churchill 1998, Menkhorst and Knight 2004; Van Dyck and Strahan 2008).

The databases in Table 1 were searched for fauna records in and around the study area. Some species may occur on database results that are not likely to be present in the study area, usually due either to lack of suitable habitat or the study area being outside the known range of the species as presented in the literature. These species are not included in lists of expected fauna.

These sources of information were used to create lists of species that potentially occur in the study area. As far as possible, expected species are those that are likely to utilise the study area. The lists exclude species that have been recorded in the general region as vagrants, or for which suitable habitat is absent within the study area.

Table 1. Databases used in the preparation of Tables 4 - 7.

Database	Type of records held on database	Area searched
WA Museum Specimen Database (DEC 2007-)	Records of specimens held in the Western Australian Museum. Includes historical records.	8km radius of 31º 36' 04'' S and 116º 19' 39'' E
Fauna Survey Returns Database (DEC 2007-)	Records collected from fauna surveys carried out in Western Australia. Includes observational and trapping data.	8km radius of 31º 36' 04'' S and 116º 19' 39'' E
DEC's Threatened and Priority Fauna Database	Information and records on Threatened and Priority species in Western Australia	8km radius of 31º 36' 04'' S and 116º 19' 39'' E
Birds Australia Atlas Database (DEC 2007-)	Records of bird observations in Australia, 1998-current.	8km radius of 31º 36' 04'' S and 116º 19' 39'' E
EPBC Act Protected Matters Search Tool	Records on matters protected under the EPBC Act, including threatened species and ecological communities, migratory species and marine species.	10km radius of 31º 36' 04'' S and 116º 19' 39'' E

3.4 Field Studies

The field study was carried out by two zoologists on 13th – 17th August 2012. The field study component of a Level 1 fauna survey is primarily to identify the fauna habitats present in the study area. In addition, all fauna encountered during the field survey are recorded. The fauna species recorded are usually conspicuous species such as birds, large mammals and large reptiles. The presence of other species may be inferred from evidence such as tracks, burrows, scats or evidence of foraging.

3.4.1 Targeted survey for threatened black-cockatoo habitat trees

For threatened black-cockatoo species, the entire study area was walked in order to identify the presence of potential habitat trees.

Cockatoo habitat trees are defined as those with a diameter at breast height (DBH) ≥ 50cm (DSEWPaC 2011). Although these may not currently have hollows, trees of this diameter are considered a useful indication of the hollow-bearing potential of the tree. Trees of this size are thought to be potential breeding habitat and important for maintaining breeding habitat in the long term (DSEWPaC 2011).

All habitat trees with a DBH ≥ 50cm were recorded with a GPS location. Notes were made on the tree species, the presence of any hollows (either 'small' and suitable for species other than cockatoos, 'large' and potentially suitable for cockatoos or 'no visible hollows') and any evidence of hollow usage, such as chewing around the hollow entrance. Trees were identified from the ground only, so hollow depth was not ascertained, and it should be noted that some hollows may not be visible from the ground.

3.4.2 Targeted survey for Chuditch

A targeted survey for Chuditch was also carried out, using 35 cage traps distributed throughout the study area (Figure 2). Each cage trap was baited with a mixture of rolled oats, peanut butter, vanilla essence and meat meal, and the bait was refreshed every second day. The cages were situated about 100m apart in transects along tracks and through the bush, designed to cover the entire study area. Each cage was situated under shrubs and sheltered with a heavy-weight hessian bag. The cages were checked every morning for four mornings, to give a total of 140 trap-nights. If captured, Chuditch were weighed, sexed and given a temporary mark in the ear with a non-toxic marker-pen.

In addition, two camera traps were deployed (Figure 2) and baited in order to attempt to record foraging Chuditch.

3.5 Survey Limitations

All fauna surveys have limitations, and not all fauna species present on the site are likely to be sampled during a survey. Fauna may not be recorded because they are rare, they are difficult to trap or observe, or because they are only present on the site for part of the year. Factors that can affect the outcome of a fauna survey are indicated in Guidance Statement 56 (EPA 2004). These are listed below in Table 2. The main limitation for the survey is that as limited trapping was undertaken, there are few fauna records for the study area for taxa other than birds. However, this is consistent with all Level 1 fauna surveys, and is ameliorated by the availability of fauna records from surrounding areas of similar habitat.

Table 2. Fauna survey limitations.

Potential Limitation	Extent of limitation for the survey	
Experience of fauna personnel	Not limiting	The supervising zoologist has 10 years experience in fauna consulting. Team members have 7 years experience.
Types of traps or other survey methods used	Not applicable to Level 1 survey	Limited trapping was undertaken as this was a Level 1 survey. This restricts the majority of fauna records to opportunistic observations.
Number of trapping sites	Not applicable to Level 1 survey	As above.
Ability to survey all habitats present	Not limiting	All habitats present were surveyed on foot.
Availability of fauna information for the area in literature and on databases	Not limiting	Moderate amount of fauna information available on databases and in the literature for most taxa.
Effects of weather during the survey	Not limiting	Weather during the field survey ranged from cool with light rain to warm and dry. Weather conditions are unlikely to affect the outcomes of a Level 1 fauna survey.
Seasonal effects	Not applicable to Level 1 survey	Seasonal effects are not taken into account with a Level 1 survey, as the primary function is habitat assessment.
Disturbance to site such as recent fires, cattle grazing	Not limiting	Works at the current open pit were suspended during the survey.
Ease of access to site	Not limiting	Site access was good. All areas were able to be surveyed on foot.

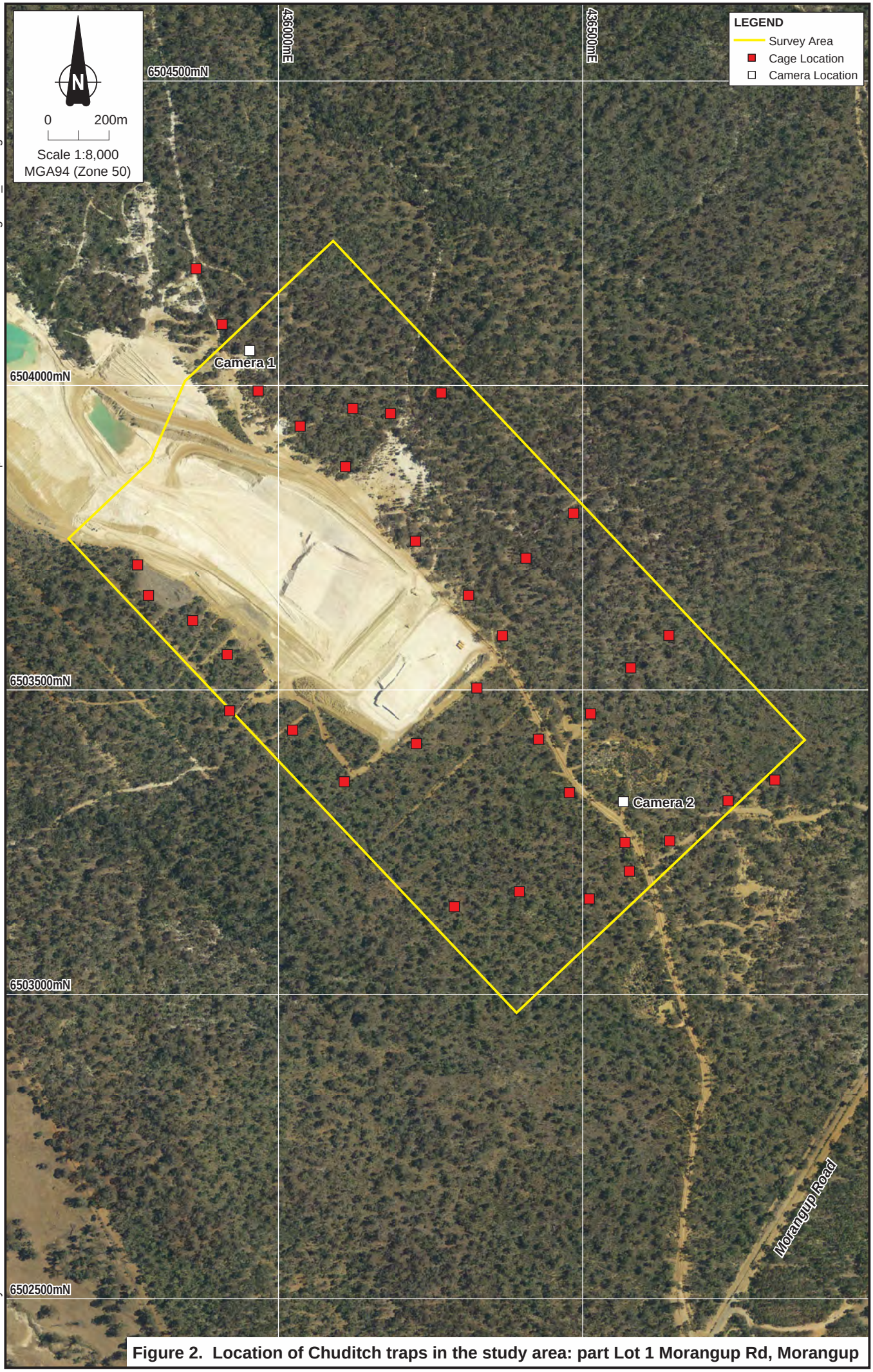

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Figure 2. Location of Chuditch traps in the study area: part Lot 1 Morangup Rd, Morangup

3.6 Assessment of Conservation Significance

Three levels of conservation significance are used within this report to indicate the level of significance of fauna species. These are described in the following sub-sections.

3.6.1 Conservation Significance 1

Conservation Significance 1 (CS1) is the highest level of conservation significance, describing species that are protected under State or Commonwealth legislation. These species are considered to be of state and/or national conservation significance, and some species (e.g. some migratory species) may be considered of international significance.

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is the Commonwealth Government's primary piece of environmental legislation. Listed under Part 3 of the EPBC Act are 'matters of National Environmental Significance'. These include threatened species, threatened ecological communities and migratory species.

Fauna species are assessed against categories based on International Union for Conservation of Nature (IUCN) criteria, into:

- **Extinct**: Taxa not definitely located in the wild during the past 50 years.
- **Extinct in the wild**: Taxa known to survive only in captivity.
- **Critically Endangered**: Taxa facing an extremely high risk of extinction in the wild in the immediate future.
- **Endangered**: Taxa facing a very high risk of extinction in the wild in the near future.
- **Vulnerable**: Taxa facing a very high risk of extinction in the wild in the medium-term future.
- **Conservation Dependent**: Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.

Only fauna classified as 'extinct in the wild' 'critically endangered', 'endangered' or 'vulnerable' are listed as matters of National Environmental Significance.

The migratory species listed under the EPBC Act are those recognised under China-Australia Migratory Bird Agreement (CAMBA), the Japan-Australia Migratory Bird Agreement (JAMBA), the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA), or species listed under the Bonn Convention for which Australia is a range state. Species listed in JAMBA are also protected under Schedule 3 of the *Western Australian Wildlife Conservation Act 1950*.

Reports on the conservation status of most vertebrate fauna species have been produced by the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) in the form of Action Plans. An Action Plan is a review of the conservation status of a taxonomic group against IUCN categories. Action Plans have been prepared for amphibians (Tyler 1998), reptiles (Cogger *et al*. 1993), birds (Garnett and Crowley 2000), monotremes and marsupials (Maxwell *et al*. 1996), rodents (Lee 1995) and bats (Duncan *et al*. 1999). These publications also use categories similar to those used by the EPBC Act. The information presented in some of the earlier Action Plans may be out of date due to changes since publication.

The Western Australian Wildlife Conservation Act 1950 (WA Wildlife Conservation Act) is State legislation for fauna protection administered by the Department of Environment and Conservation (DEC). The WA Wildlife Conservation Act lists species under a set of Schedules

- **Schedule 1:** Fauna that are rare or likely to become extinct.
- **Schedule 2:** Fauna presumed to be extinct.
- **Schedule 3:** Migratory birds that are listed under JAMBA.
- **Schedule 4:** Other specially protected fauna.

Schedule 1 species are further categorised by DEC into the categories 'extinct', 'extinct in the wild', 'critically endangered', 'endangered', 'vulnerable' and 'conservation dependent' species.

3.6.2 Conservation Significance 2

Species of Conservation Significance 2 (CS2) are not listed under State or Commonwealth Acts, but are listed as Priority species by DEC. These species may be considered to be regionally significant.

In Western Australia, DEC maintains a list of Priority Fauna made up of species that are not considered Threatened under the WA Wildlife Conservation Act, but for which DEC feels there is cause for concern. There are five levels of Priority as defined by DEC.

- **Priority 1:** Taxa with few, poorly known populations on threatened lands.
- **Priority 2:** Taxa with few, poorly known populations on conservation lands.
- **Priority 3:** Taxa with several, poorly known populations, some on conservation lands.
- **Priority 4:** Taxa in need of monitoring.
- **Priority 5:** Taxa in need of monitoring (conservation dependent species).

3.6.3 Conservation Significance 3

Conservation Significance 3 (CS3) species are not listed under State or Commonwealth Acts or in publications on threatened fauna or as Priority species by DEC, but are considered by the author to be of local significance.

These are species considered to be of local significance in the study area because they are at the limit of their distribution in the area, they have a very restricted range or they occur in breeding colonies (e.g. some waterbirds). This level of significance has no legislative recognition and is based on interpretation of information on the species patterns of distribution. For example, the Government of Western Australia (2000) used this sort of interpretation to identify significant bird species in the Perth metropolitan area as part of Bush Forever. Recognition of such species is consistent with the aim of preserving regional biodiversity.

4. Habitats of the Study Area

Three main fauna habitats were identified in the study area, as described below and illustrated in Figure 3.

- **Wandoo woodland**

  Most of the northern half of the study area consists of Wandoo (*Eucalyptus wandoo*) and Powderbark wandoo (*Eucalyptus accedens*) woodland (Plates 1 and 2). The understorey is generally sparse, with occasional patches of low shrubs.

- **Jarrah - Marri woodland**

  Most of the southern part of the study area consists of Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) woodland (Plates 3 – 5). The understorey is generally low mixed shrubs, with some taller thickets of Parrotbush (*Dryandra sessilis*).

- **Revegetation areas**

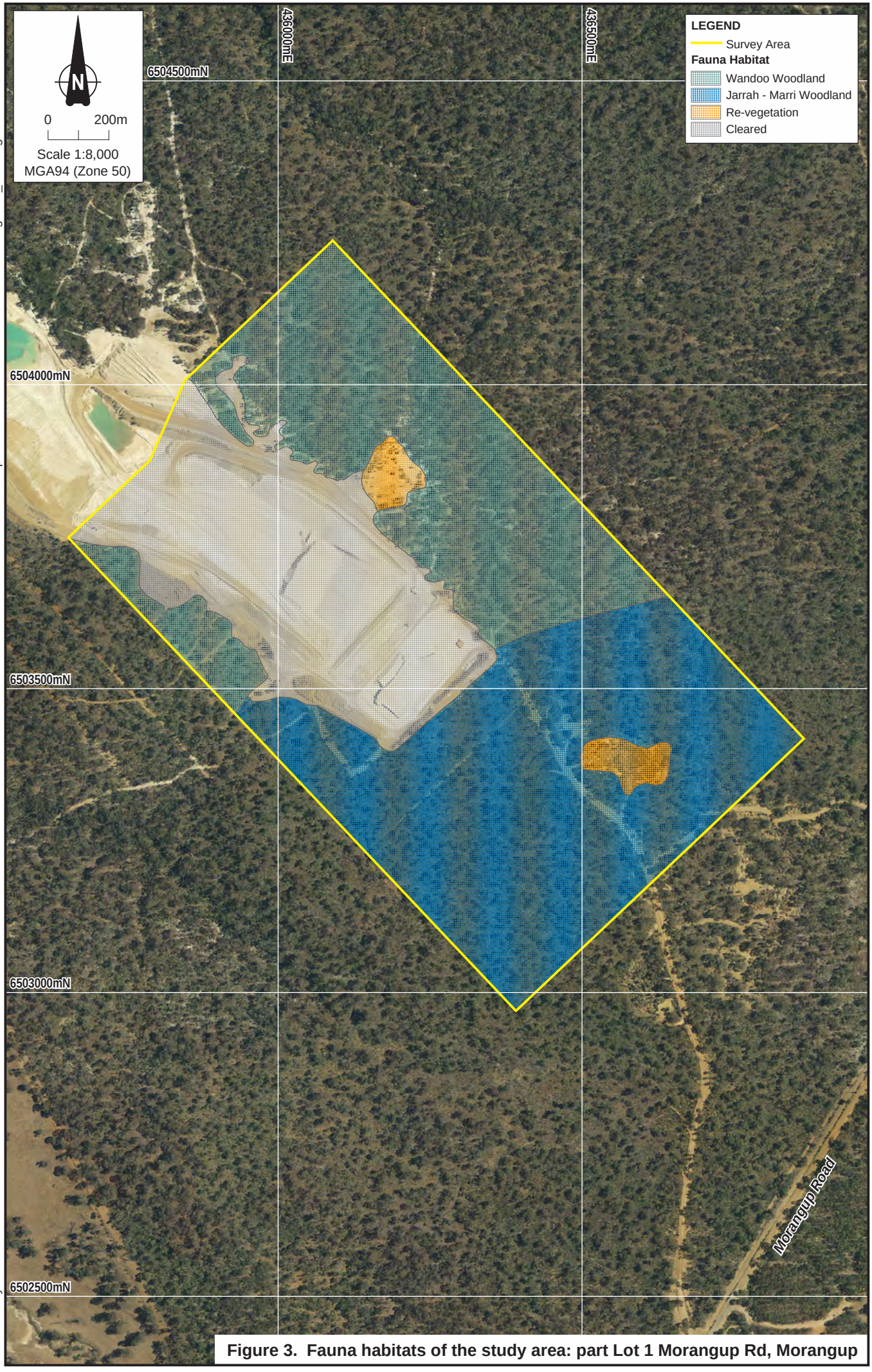
  There are two small areas of revegetation in the study area (Plate 6). The northern area is quite sparse and open, and the southern area is relatively dense with a range of shrubs and small trees.

The habitats in the study area are common in the region. Patchy habitats that can occur within woodlands, such as granite outcrops and heathland, are absent from the study area, though they may occur nearby.

The study area is set into a landscape that generally consists of farmland with patches of remnant native vegetation. Patches of native vegetation are likely to act as 'stepping stones' for fauna moving through the area, and continuous areas of native vegetation may act as 'wildlife corridors' for fauna to move through. The vegetation surrounding the study area is one of the larger patches in the area, with the vegetation in Avon Valley National Park and Julimar State Forest making up very large patches (Figure 1).

The patch of vegetation surrounding the study area is likely to have some linkage function, as it lies between Avon Valley National Park and timber reserves to the west and native vegetation that forms a semi-continuous band southeast through to Hoddys Well and Clackline. In addition, there is a mostly continuous link between the vegetation in the study area and the large area of native vegetation to the north in Julimar State Forest.

Clearing the vegetation on the study area may reduce the linkage value of the vegetation surrounding the study area. However, the proposed clearing would not create any isolated vegetation patches and does not significantly reduce the width of the area available for fauna to move through.



Author: Jenny Wilcox - Western Wildlife~ Drawn: CAD Resources ~ www.cadresources.com.au ~ Tel: +61 8 9246 3242 ~ Fax: +61 8 9246 3202 ~ A4 ~ Date: September 2012 ~ Rev: A ~ CAD Reference: g2079_F003.dgn

Figure 3. Fauna habitats of the study area: part Lot 1 Morangup Rd, Morangup

Plate 1. Wandoo woodland.

Plate 2. Wandoo woodland.

Plate 3. Jarrah - Marri woodland.

Plate 4. Jarrah – Marri woodland.

Plate 5. Thicket of *Dryandra sessilis* in the Jarrah – Marri woodland.

Plate 6. Re-vegetation area.

5. Vertebrate Fauna of the Study Area

The numbers of vertebrate species potentially occurring in the study area are summarised below in Table 3. The amphibians, reptiles, birds and mammals that have the potential to occur in the study area are listed in Tables 4 - 7. Indicated in each table are the species recorded:

- In each study area by Western Wildlife during the 2012 site visit.
- In the wider area on the WA Museum Specimen Database (see Table 1).
- In the wider area on the Birds Australia Atlas Database (see Table 1).
- In the wider area on DEC's Threatened and Priority Fauna Database (see Table 1).
- In the wider area on the EPBC Protected mattered Search Tool (see Table 1).

Table 3. Summary of vertebrate fauna potentially occurring in the study area.

Taxon	Total species	Introduced species	Conservation significant species		
			CS1	CS2	CS3
Amphibians	12	-	-	-	-
Reptiles	49	-	1	1	-
Birds	95	1	6	4	8
Mammals	27	6	1	2	3
Totals:	**183**	**7**	**8**	**7**	**11**

Fauna of conservation significance are discussed in the sections below and are summarised in Table 8. The results of the EPBC Act Protected Matters search and the DEC Threatened and Priority Fauna Database search are given in Appendices 1 and 2.

5.1 Amphibians

Up to 12 species of frog have the potential to occur in the study area (Table 4). No species were recorded opportunistically in the study area, as expected during a spring site visit. All frog species in the area rely on water to breed, and may breed in temporary pools along roadsides or in the drainage lines if water is held in pools. Burrowing frogs (e.g. the Moaning Frog) may be found at considerable distances from water and during the non-breeding season, burrowing frogs may potentially occur throughout the study area.

5.1.1 Amphibians of Conservation Significance

No frogs of conservation significance are likely to be present in the study area.

5.2 Reptiles

There are 49 species of reptile that have the potential to occur in the study area, of which two were recorded opportunistically during the site visit (Table 5). The Jarrah – Marri woodland and the Wandoo woodland are likely to support a relatively intact reptile community. The revegetation areas may support a few generalist reptile species. There are several species that are on the edge of their range in the area, such as *Hemiergis initialis*, for which the bulk of the population is to the west.

Many small reptile species shelter and forage under leaf litter and fallen timber, so these are important habitat components. Other species, particularly geckoes, are likely to shelter under bark or in rock crevices. Some species also use artificial shelter such as old tin, sheds or rubbish. Semi-arboreal species, such as the Carpet Python (*Morelia spilota imbricata*) or Black-tailed Tree Goanna (*Varanus tristis*), may shelter in trees.

5.2.1 Reptiles of Conservation Significance

There are two reptiles of conservation significance that may occur in the study area. Each species is listed and discussed below.

Conservation Significance 1

Carpet Python (southwest pop[n]) *Morelia spilota imbricata*
This species is listed under Schedule 4 (specially protected fauna) of the WA Wildlife Conservation Act, and is Priority 4 according to DEC.

The **Carpet Python** occurs in a range of habitats, including woodlands in the Darling Range, though it appears to require large tracts of bushland in order to persist (Bush *et al*. 2010). This species is mainly nocturnal and during the day it shelters in a range of places, such as tree hollows, rock crevices and in the burrows of other animals (Bush *et al*. 2010). The Carpet Python has been recorded from nearby Moondyne on DEC's Threatened and Priority Fauna Database (Appendix 2) and is likely to be present in the study area.

Conservation Significance 2

Dell's Skink *Ctenotus delli*
This skink is listed as Priority 4 by DEC.

Dell's Skink is an uncommon species that is restricted to the Darling Range, where it occurs in Jarrah and Marri woodlands that have a shrubby understorey (Bush *et al*. 2010). This species shelters in shallow burrows or under rocks, dense vegetation, abandoned stick-ant nests (Bush *et al*. 2010). There are no records of Dell's Skink in the surrounding area on databases (Table 5), however, as the habitat appears suitable, Dell's Skink may be present in the Jarrah – Marri woodland.

5.3 Birds

There are 95 species of bird that potentially occur in the study area, of which 42 were recorded opportunistically during the site visit (Table 6). Most birds in the study area are likely to rely on Jarrah – Marri woodland or Wandoo woodland for all or most of their needs. A few species were observed foraging in open areas around the existing pit, including birds of prey, the White-backed Swallow and Tree Martin.

Hollows in Jarrah, Marri, Powderbark and Wandoo trees are likely to be used for nesting by a range of species, including the Southern Boobook, cockatoos, parrots, pardalotes and the Tree Martin. Birds of prey may favour the taller trees for nesting, and small passerines are likely to favour dense vegetation, such as the dense understorey vegetation in parts of the Jarrah – Marri woodland, for nest-building. When in flower, the understorey thickets of Parrotbush (*Banksia sessilis*) are likely to attract a range of honeyeaters. When the Parrotbush produces seeds, it is likely to attract foraging parrots and cockatoos.

No waterbird species are listed in Table 6. Water may pool along creeks, in roadside ditches and in the open pit after rain, attracting occasional waterbirds, but the study area is not likely to provide significant waterbird habitat and is not adjacent to significant waterbird habitat such as wetlands or rivers.

5.3.1 Birds of Conservation Significance

There are 18 birds of conservation significance that have either been recorded or may potentially occur in the study area. Each species is listed in the boxes below, and discussed.

Conservation Significance 1

Peregrine Falcon *Falco peregrinus*
This falcon is listed under Schedule 4 (other specially protected fauna) of the WA Wildlife Conservation Act.

Forest Red-tailed Black-Cockatoo *Calyptorhynchus banksii naso*
This cockatoo is listed under Schedule 1 (Vulnerable) of the WA Wildlife Conservation Act and as Vulnerable under the EPBC Act.

Baudin's Black-Cockatoo *Calyptorhynchus baudinii*
This cockatoo is listed under Schedule 1 (Vulnerable) of the WA Wildlife Conservation Act and as Endangered under the EPBC Act.

Carnaby's Black-Cockatoo *Calyptorhynchus latirostris*
This cockatoo is listed under Schedule 1 (Endangered) of the WA Wildlife Conservation Act and as Endangered under the EPBC Act.

Fork-tailed Swift *Apus pacificus*
This species is listed as migratory under the EPBC Act and is listed under Schedule 3 of the WA Wildlife Conservation Act.

Rainbow Bee-eater *Merops ornatus*
This species is listed as migratory under the EPBC Act.

The **Peregrine Falcon** is a widespread bird of prey. This falcon nests mainly on ledges on cliffs, rocky outcrops and quarries, and it may also use tall trees (Johnstone and Storr 1998). The Peregrine Falcon was not recorded during the fauna survey and has not been recorded in the general area on databases (Table 6). This species may potentially occur in the study area, but unless a pair were found to be nesting, the site is unlikely to be highly significant for this species. The Peregrine Falcon may nest in tall trees or in the existing pit in the study area and forage over open areas or nearby farmland.

The **Forest Red-tailed Black Cockatoo** is endemic to the south-west of Western Australia and inhabits eucalypt forests and woodlands (Johnstone and Storr 1998). This species was recorded in the study area during the site visit, though it has not been recorded in the general area on databases (Table 6). The main threats to this species are habitat loss, nest hollow shortages, illegal shooting and proliferation of Honeybees (TSSC 2009). This species feeds mainly on seeding Marri and Jarrah (Johnstone and Storr 1998), and is likely to feed in the Jarrah - Marri woodland in the study area. The Forest Red-tailed Black-Cockatoo breeds in large hollows in eucalypts, and has been recorded nesting in Marri, Jarrah, Karri, Wandoo and Bullich (Abbott 2007, Johnstone and Storr 1998). The Forest Red-tailed Black-Cockatoo may potentially nest in the study area and is discussed further in section 5.3.2.

Baudin's Black-Cockatoo is endemic to the south-west of Western Australia, and is rare and declining, primarily due to persecution by orchardists and loss of habitat due to wildfires and vegetation clearance in their range (Johnstone and Storr 1998). This species has not been recorded from the general area on databases (Table 6), and is at the northern limit of its range in the vicinity of the study area, so may only occur on occasion. This species feeds mainly on eucalypt seeds and the seeds of proteaceous plants such as *Banksia spp*. (Johnstone and Storr 1998), so the Marri –Jarrah woodland in the study area may be a foraging resource. Baudin's Black-Cockatoo is not likely to breed in the study area, as its breeding range is further to the south.

Carnaby's Black-Cockatoo is endemic to the south-west of Western Australia, and has declined due to loss of breeding habitat in the wheatbelt and foraging habitat along the west coast (Johnstone and Storr 1998). The core distribution of this species has shifted to the south and west, and has been recorded breeding at sites in the Darling Range and on the coastal plain (Johnstone *et al*. 2003). Carnaby's Black-Cockatoo forage on a range of plant species, but are particularly attracted to *Banksia* woodlands, eucalypt woodlands and pine plantations (Johnstone and Storr 1998). Carnaby's Black-Cockatoo was recorded in the study area during the site visit, and was observed foraging on Marri seeds. This species is also likely to feed on the patches of Parrotbush *(Dryandra sessilis)* in the Jarrah – Marri woodland. Carnaby's Black-Cockatoo may potentially breed in the study area, using large hollows in Wandoo or Powderbark Wandoo. Carnaby's Black-Cockatoo is discussed further in section 5.3.2.

The **Fork-tailed Swift** is a non-breeding visitor to Australia between September and April (Boehm 1962). While it can be common further north, in south-west Australia this species is generally scarce (Johnstone and Storr 1998). The bird is primarily observed foraging for insects in proximity to cyclonic weather (Boehm 1962). Although a migratory species, the Fork-tailed Swift has a large range, a large population that appears to be stable (IUCN 2010). The Fork-tailed Swift is a largely an aerial species and is unlikely to be affected by changes to the study area.

The **Rainbow Bee-eater** is a common species that migrates southwards in summer to breed. It was not recorded in the study area during the fauna survey, though this is consistent with the time of year, and it has been recorded in the general area on databases (Table 6). The Rainbow Bee-eater may forage anywhere over the study area. For breeding, this species requires sandy soils in which to burrow, so breeding habitat may be absent from the study area. As the Rainbow Bee-eater is a relatively common species, development of the study area is unlikely to affect the conservation status of this species in the region, particularly if breeding habitat is avoided.

Conservation Significance 2

Barking Owl *Ninox connivens*
This species is listed as Priority 2 by DEC.

Masked Owl *Tyto novaehollandiae novaehollandiae*
This species is listed as Priority 3 by DEC.

Crested Shrike-tit *Falcunculus frontatus*
This species is listed as Priority 4 by DEC.

White-browed Babbler (western wheatbelt) *Pomatostomus superciliosus ashbyi*
This species is listed as Priority 4 by DEC.

The **Barking Owl** occurs in woodlands and is particularly associated with riparian vegetation (Garnett and Crowley 2000). It nests in tree hollows (Johnstone and Storr 1998), and loss of large trees with nesting hollows is likely to be a threatening process, together with habitat loss (Garnett and Crowley 2000). It is rare and declining in the southwest of Western Australia (Johnstone and Storr 1998, Garnett and Crowley 2000). This species may potentially occur in the study area, though there are no nearby records of the Barking Owl on databases (Table 6).

The south-west subspecies of the **Masked Owl** occurs in forests, and breeds in large hollows in eucalypts. This species may move north and northeast in autumn and winter (Johnstone and Storr 1998) and so may be more common in the area in those seasons, particularly as the study area is on the northern limit of the Masked Owls range. The Masked Owl has declined due to habitat loss (Garnett and Crowley 2000). This species may potentially occur in the study area but as this owl has a home range of about 5 – 10 km^2 (Garnett and Crowley 2000), the study area would represent habitat for a few individuals.

Within its range, the **Crested Shrike-Tit** can be locally common, but usually it is scarce and in some places locally extinct (Johnstone and Storr 2004). This species favours forests and woodlands, usually of smooth-barked eucalypts such as Wandoo. Much of its habitat in the wheatbelt is cleared or fragmented, and this species usually disappears from small fragments (Garnett and Crowley 2000). Although it was not recorded during the site visit, the Crested Shrike-tit may occur in the Wandoo woodlands of the study area.

The western wheatbelt form of the **White-browed Babbler** was not recorded in the study area during the site visit, but has been recorded in the general area on a database (Table 6). This species is of concern as much of its range overlaps the wheatbelt, so its habitat has been widely cleared and fragmented (Garnett and Crowley 2000). The White-browed Babbler may occur in both Wandoo woodland and Jarrah – Marri woodland in the study area.

Conservation Significance 3

Emu	*Dromaius novaehollandiae*
Splendid Fairy-wren	*Malurus splendens*
White-browed Scrubwren	*Sericornis frontalis*
Inland Thornbill	*Acanthiza apicalis*
Western Thornbill	*Acanthiza inornata*
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*
Scarlet Robin	*Petroica multicolor*
Western Yellow Robin	*Eopsaltria australis*

Although all native birds rely on native vegetation for survival, the birds listed above as of conservation significance 3 may be particularly vulnerable to habitat fragmentation due to their biology. They have been listed as they are generally small insectivores, and may have difficulty dispersing across cleared land between woodland patches. The Emu has been listed as it is likely to be restricted to large fragments of native vegetation. These birds are also considered to be of significance on the Swan Coastal Plain, where they have reduced distribution or populations (Government of Western Australia 2000).

5.3.2 Threatened Cockatoo Habitat in the Study Area

A targeted survey for cockatoo roosting, breeding and foraging habitat was carried out during the site visit.

Roosting Habitat

Forest Red-tailed Black-Cockatoos roost in tall Marri or Jarrah trees either within the forest or on the forest edges (DSEWPaC 2011). Therefore, the study area is a potential roost location for this species. Baudin's and Carnaby's Black-Cockatoos generally roost in or near riparian environments or artificial water, often in native or introduced eucalypts (DSEWPaC 2011, Burnham *et al*. 2010). There are tall eucalypts throughout the Wandoo woodland in the study area that may potentially constitute roosting habitat for these species, though they may favour roosting along the Avon River, about 3km north. Although no evidence of roosting by black-cockatoos (e.g. feathers, scats) was recorded during the site visit, it must be remembered that Carnaby's Black-Cockatoo is a seasonal migrant rather than present in an area year-round. Birds may roost nearby when foraging in the area, then move on.

Breeding Habitat

The study area is within the known or predicted breeding range of both the Forest Red-tailed Black-Cockatoo and Carnaby's Black-Cockatoo, though it is on the very northeastern edge of the Forest Red-tailed Black-Cockatoos breeding range (DSEWPaC 2011). Baudin's Black-Cockatoo does not breed in the area.

In the study area, Carnaby's Black-Cockatoo may potentially use Wandoo, Powderbark Wandoo, or Marri trees for breeding, and though they favour smooth-barked eucalypts, they may potentially use any suitably-sized hollow (Johnstone and Storr 1998, DSEWPaC 2012). The Forest Red-tailed Black-Cockatoo is only likely to use hollows in Marri and possibly Wandoo (Johnstone and Storr 1998). Overall, 708 trees were identified that demonstrated a DBH ≥ 50cm (Figure 4). One hundred of these trees appeared to have at least one large existing hollow potentially suitable for cockatoos, with one of these rendered unsuitable by the presence of Feral Honeybees. The majority of the large tree hollows were located in the Wandoo woodland to the east of the existing pit, but there were large hollows throughout the study area (Plate 7).

The presence of trees with a DBH ≥ 50cm indicates that the study area is potential breeding habitat for both black-cockatoo species (DSEWPaC 2011). Although no evidence of breeding was found (e.g. chewed hollow entrances), Carnaby's Black-Cockatoo potentially nests in the study area. The Bindoon – Julimar Important Bird Area (IBA) consists of 52,480ha of native vegetation about 11km north of the study area, and this area is listed as an IBA due to the large number of Carnaby's Black-Cockatoos nesting in the area (Birdlife International 2012). The Forest Red-tailed Black-Cockatoo may potentially nest in the study area, though this species is at the northeast limit of its range in the area.

Plate 7. Trees with potential black-cockatoo hollows.

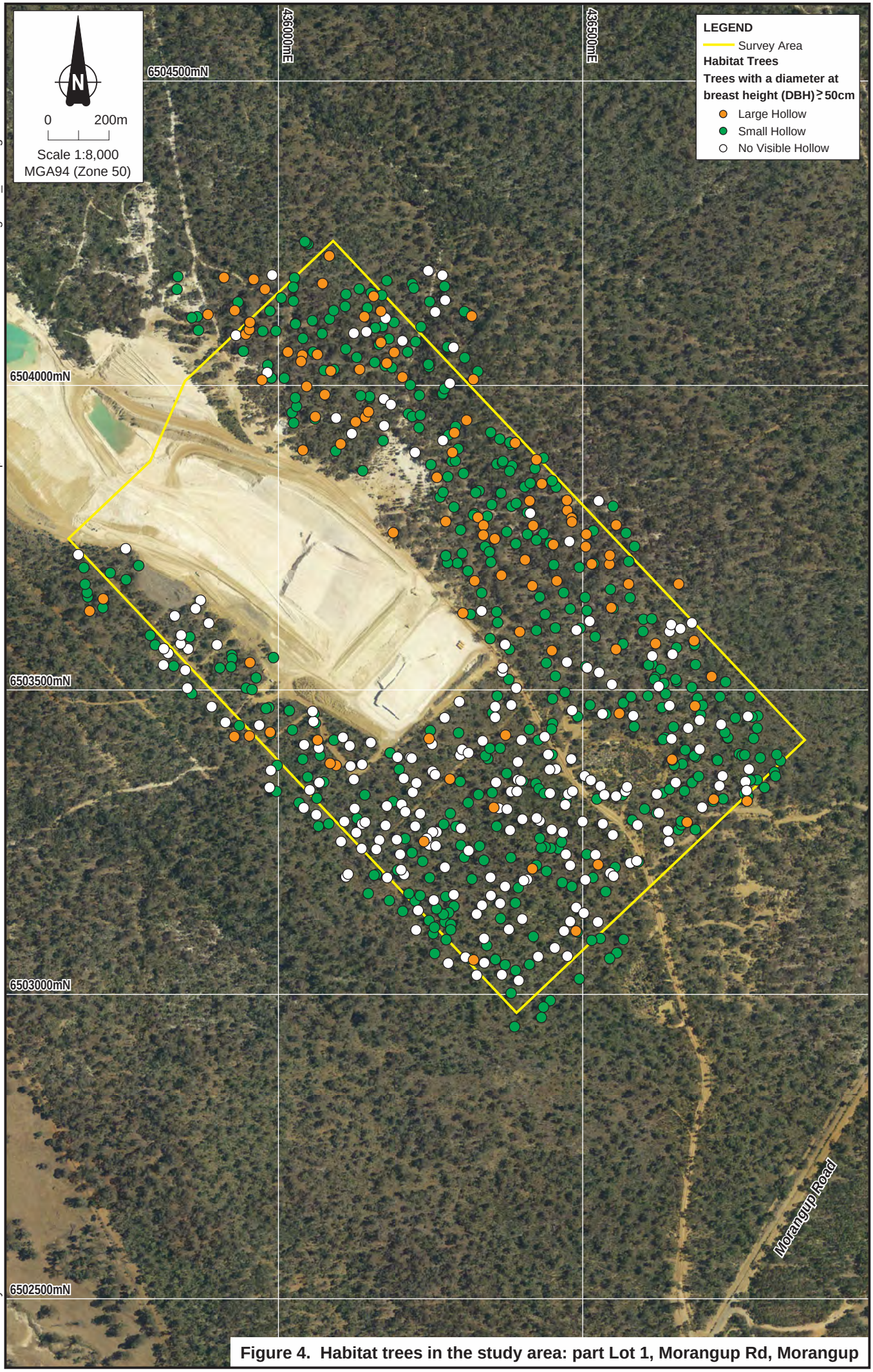


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Figure 4. Habitat trees in the study area: part Lot 1, Morangup Rd, Morangup

Foraging Habitat

The study area represents foraging habitat for the Forest Red-tailed Black-Cockatoo, Baudin's Black-Cockatoo and Carnaby's Black-Cockatoo. Marri, Jarrah, Wandoo and Powderbark are the dominant trees in the study area and these species are sources of food for all three cockatoo species. Carnaby's Black-Cockatoos were observed foraging on Marri seeds in the study area during the site visit, and evidence of foraging on Marri showing characteristic marks on Marri fruits (Plate 8) was observed throughout the study area.

The understorey of the Jarrah – Marri woodland included thickets of Parrotbush (*Dryandra sessilis*). The seeds and flowers of this species are likely to be a foraging resource for both Carnaby's and Baudin's Black-Cockatoo.

Plate 8. Marri nuts chewed by Carnaby's Black-Cockatoo.

5.4 Mammals

There are 27 species of mammal that potentially occur in the study area, of which 21 are native and six introduced (Table 7). Three native mammals were recorded opportunistically during the site visit. Diggings of the Echidna (*Tachyglossus aculeata*) were common throughout bushland in the study area, the Western Grey Kangaroo (*Macropus fuliginosus*) was encountered in low densities and a single Western Brush Wallaby (*Macropus irma*) was observed in the southern part of the study area.

The Brush-tail Possum is likely to occur in the area, but though there appeared to be many suitable tree hollows, no possum scats were recorded. Other mammals that use tree hollows are bats, and many of the bats listed in Table 7 roost in tree hollows or hollow tree trunks. Roosts of some species can be quite large (e.g. Southern Forest Bat roosts may have up to 100 individuals) while male bats may roost alone (e.g. Gould's Wattled Bat) (Van Dyck and Strahan 2008).

5.4.1 Mammals of Conservation Significance

There are six mammals of conservation significance that may occur in the study area. Each species is listed and discussed below.

Conservation Significance 1

Chuditch *Dasyurus geoffroii*
This species is listed under Schedule 1 (Vulnerable) of the WA Wildlife Conservation Act and as Endangered under the EPBC Act.

The **Chuditch** used to occur across much of the continent, but is now restricted to the southwest of Western Australia. It is vulnerable to predation by foxes, and increases in areas where fox control in undertaken (Burbidge 2004). Although they used to occupy a range of habitats, the majority of Chuditch now occur in the Jarrah forest with some wheatbelt populations in drier woodlands, heath and mallee shrublands (Van Dyck and Strahan 2008; Orrell and Morris 1994). Chuditch have been found to hold territories of about 55 to 120 ha (females), or 400 ha or more (males) and these territories may overlap (Van Dyck and Strahan 2008). In forested areas, Chuditch use hollow logs and earth burrows for shelter. An individual female can use an average of 66 logs and 110 burrows within a year (Orrell and Morris 1994).

No Chuditch were trapped or recorded on camera traps during the field survey. However, the Chuditch has been recorded from the general area on databases (Table 7, Appendix 2), and is likely to occur in the study area, at least on occasion. Chuditch are known to be highly mobile, and young male Chuditch can disperse more than 10km from their mother's territory (Soderquist and Serena 2000). Chuditch are likely to be able to negotiate cleared areas when moving, and woodlands in the study area are likely to be suitable habitat.

Conservation Significance 2

Quenda (Southern Brown Bandicoot) *Isoodon obesulus*
This species is listed as Priority 5 by DEC.

Western Brush Wallaby *Macropus irma*
This wallaby is listed as Priority 4 by DEC.

The **Quenda** favours areas with dense understorey and is often particularly common in dense wetland vegetation. A translocated population occurs to the north in Julimar State Forest. None of the characteristic conical Quenda diggings were noted in the study area and no Quenda were trapped as by-catch during the Chuditch trapping. The Quenda may be present in low densities, or as the study area is on the north-eastern edge of this species range, absent from the study area. If present, the Quenda is likely to favour the Jarrah – Marri woodland as it has a dense understorey. Areas of forest without cover at ground level are not likely to be used by the Quenda.

The **Western Brush Wallaby** is endemic to the southwest of Western Australia and occurs in open forests or woodlands (Van Dyck and Strahan 2008). The Western Brush Wallaby was observed in the study area during the site visit, and is likely to be resident. The home-range size of this species has been estimated at about 9.9ha for males and 5.3ha for females (Bamford and Bamford 1999), so the study area may support several individuals.

Conservation Significance 3

Gilbert's Dunnart	*Sminthopsis gilberti*
Little Long-tailed Dunnart	*Sminthopsis dolichura*
Honey Possum	*Tarsipes rostratus*

Gilbert's Dunnart and the **Little Long-tailed Dunnart** are small ground-dwelling native marsupials. Both dunnarts may occur in both the Wandoo and Jarrah – Marri woodlands. As small mammals, they may be vulnerable to increased habitat fragmentation as they may find it difficult to traverse cleared areas.

The **Honey Possum** is a small marsupial that feeds mainly on nectar, pollen and invertebrates. While very common in parts of its range, it can be uncommon in close proximity to Perth. The Honey Possum may occur throughout the study area where nectar-bearing flowers are present. This includes thickets of *Dryandra sessilis* or in the understorey of the Jarrah – Marri woodland, as well as the eucalypt canopy when it is in flower. As the Honey Possum needs to move to find flowering plants, this species requires large tracts of well-connected bushland for survival so may be vulnerable to increased habitat fragmentation.

6. Invertebrates

In general, invertebrate fauna are far less well known than the vertebrate fauna, while being far more numerous. This report is primarily concerned with vertebrate fauna, however, one invertebrate of conservation significance were listed on database searches for the general area (Appendix 2) and is discussed below.

Conservation Significance 1

Shield-backed Trapdoor Spider *Idiosoma nigrum*
This species is listed under Schedule 1 (Vulnerable) of the WA Wildlife Conservation Act.

The Shield-backed Trapdoor Spider is distributed throughout the mid-west, south to about Toodyay and Northam (Burbidge 2004). It inhabits *Acacia* woodlands, particularly Jam (*Acacia acuminata*) woodlands on granitic soils, as well as eucalypt woodlands on heavy soils (Burbidge 2004). This species is primarily threatened due to clearing for agriculture within its range. Although the study area does not contain Jam woodlands, the Wandoo woodland in the study area may be suitable habitat for the Shield-backed Trapdoor Spider, and the spider has been recorded in Morangup (Appendix 2).

7. Summary and Conclusions

The study area has an existing open pit and is surrounded by vegetation with three main fauna habitats; Wandoo woodland, Jarrah – Marri woodland and revegetation areas. These habitats are widely represented in the surrounding area, as the study area is set within a rural landscape of farmland and remnant native vegetation. The Wandoo woodland and Jarrah – Marri woodland are likely to support relatively intact faunal communities. The revegetation areas are likely to support a smaller subset of native fauna. Overall, the study area has the potential to support a wide range of vertebrate species including up to 12 amphibian, 49 reptile, 95 bird and 27 mammal species. A total of two reptile, 42 bird and three mammal species were recorded opportunistically from the study area during the August 2012 site visit.

There are 26 fauna species of conservation significance (CS) that have the potential to occur in the study area. There are no frogs of conservation significance likely to occur, but there are two reptiles, 18 birds and six mammals of conservation significance that may occur. Fauna of CS1 and CS2 are summarised in Table 8.

The species of conservation significance 1 that may occur are the Carpet Python, Peregrine Falcon, Forest Red-tailed Black-Cockatoo, Baudin's Black-Cockatoo, Carnaby's Black-Cockatoo, Fork-tailed Swift, Rainbow Bee-eater and Chuditch. Of these, the Forest Red-tailed Black-Cockatoo and Carnaby's Black-Cockatoo were recorded opportunistically in the study area during the August 2012 site visit. Of the remaining species, Baudin's Black-Cockatoo may occur as a non-breeding visitor to forage in the woodlands and the Carpet Python is likely to be present in woodlands. The Rainbow Bee-eater is likely to be a seasonal visitor and the Peregrine Falcon may potentially nest in tall trees in the area and forage in nearby farmland. The Chuditch may occur in woodland areas, as it is known from Julimar State Forest, 11km to the north.

The species of conservation significance 2 that may occur are the Dell's Skink, Barking Owl, Masked Owl, Crested Shrike-tit, White-browed Babbler, Quenda and Western Brush Wallaby. Of these, the Western Brush Wallaby was recorded opportunistically from the study area during the August 2012 site visit. Some of these species are on the edge of their range in the area (Dell's Skink, Masked Owl and Quenda), so may or may not be present. The Barking Owl and Masked Owl potentially nest in tree hollows in the study area, but both these species tend to be very uncommon. The Crested Shrike-tit may occur in the Wandoo woodlands, and the White-browed Babbler may occur anywhere in the vegetated parts of the study area.

The species of conservation significance 3 that may be present are locally significant bird and small mammal species. These have generally been listed as they may have difficulty dispersing across a fragmented landscape. Five of the CS3 birds were recorded during the site visit.

There is also one invertebrate of CS1 that may occur, the Shield-backed Trapdoor Spider.

7.1 Potential Impacts

The proposal is to extend the existing open pit, necessitating the clearing of native vegetation, and therefore fauna habitat, in the study area. The most likely potential impacts of the development are:

- Direct mortality of fauna during clearing
- Habitat loss
- Habitat fragmentation
- Road mortalities
- Increased disturbance to fauna

Direct mortality

Direct mortality of fauna may occur when clearing or construction activities are carried out. For example, small terrestrial fauna species, young birds in nests and fauna roosting in hollows are usually unable to move out of the way of large machinery. Some direct mortality of fauna is usually unavoidable, and although it is unlikely to affect the conservation status of any species in this case, it is desirable to minimise it where possible.

Recommendation 1: Avoid clearing during late winter and spring in order to minimise the mortality of young birds in nests.

Habitat loss

Almost all native fauna rely on native vegetation for foraging, shelter and nest sites. Any clearing in the study area is likely to result in some habitat loss for native fauna. Most of the native vegetation present is Wandoo and Jarrah - Marri woodland, and therefore foraging habitat for conservation significant species such as CS1 black-cockatoo species. Trees with a diameter at breast height (DBH) ≥50cm represent potential current or future breeding habitat for two CS1 species, the Forest Red-tailed Black-Cockatoo and Carnaby's Black-Cockatoo. Where potential nesting trees or more than 1ha of foraging habitat are to be disturbed, it is appropriate to refer the proposal to the Commonwealth for their determination of any potential impacts under the EPBC Act. Although not recorded during the survey, the study area also contains habitat for the Chuditch, also an EPBC listed species. Where its woodland habitats may be disturbed, it is appropriate to refer the proposal to the Commonwealth for their determination of any potential impacts under the EPBC Act.

Recommendation 2: Minimise clearing of existing native vegetation where possible. It is recognised that for clearing permit applications reducing habitat loss may not be possible, however, it is a key principle to consider when designing any development, to ensure it is a compact as possible.

Recommendation 3: Consider offsetting cleared native vegetation by re-vegetating areas to create corridors for the movement of fauna on adjacent farmland.

Recommendation 4: During clearing or construction, avoid disturbance to areas of native vegetation that are to be preserved.

Recommendation 5: Where possible, preserve Wandoo, Powderbark Wandoo, Jarrah and Marri trees with a DBH ≥50cm.

Recommendation 6: Where habitat for EPBC listed black-cockatoo species or the Chuditch is likely to be cleared, refer the development to the Commonwealth for determination whether it constitutes a significant impact under the EPBC Act.

Recommendation 7: Carry out appropriate revegetation after mining activities have finished.

Recommendation 8: Consider stockpiling large hollow logs for use in revegetation, as these take a long time to form naturally.

Habitat fragmentation

In an un-fragmented landscape fauna are free to move, allowing gene-flow between populations and the capacity to move to take advantage of dispersed or temporary resources such as food or nesting sites. Clearing bushland can result in the increased isolation of the remaining bushland in the area. Natural animal movements can be disrupted, and if a complete barrier is formed between populations, genetic isolation results (Bennet 1991). It can be difficult for fauna to move through a landscape that includes areas of cleared land, and this difficultly will be greater for some species than others. Highly mobile species (such as some birds) may be able to negotiate cleared areas to travel between isolated patches of native vegetation. Small ground-dwelling species (such as many reptiles) may not be able to traverse cleared land, impacting on their ability to maintain gene-flow between populations.

The patch of vegetation surrounding the study area is likely to have some linkage function, as it lies between Avon Valley National Park and timber reserves to the west and native vegetation that forms a semi-continuous corridor southeast through to Hoddys Well and Clackline. In addition, there is a mostly continuous link between the vegetation in the study area and the large area of native vegetation to the north in Julimar State Forest. Clearing the vegetation on the study area may reduce the linkage value of the vegetation surrounding the study area. However, the proposed clearing would not create any isolated vegetation patches and does not significantly reduce the width of the area available for fauna to move through.

Recommendation 9: When clearing, avoid creating isolated patches of woodland.

Road mortalities

Road mortalities are undesirable as they may have impacts on local wildlife populations, may have ethical issues (e.g. injured or orphaned wildlife) and can affect human safety on the road (Magnus 2006). However, except for threatened species, road mortality has not been found to significantly impact bird population sizes at a national level, at least in England (Forman and Alexander 1998).

Fauna at risk of road mortalities include reptiles that may bask on warm bitumen roads, such as the conservation significant Carpet Python. Larger mammals such as kangaroos and the Western Brush Wallaby are also at risk.

Recommendation 10: Use low speed limits and road signage to increase awareness of the presence of fauna such as kangaroos and wallabies, to help to prevent road mortalities.

Increased disturbance to fauna

Disturbance to fauna can be due to noise, movement or light, and includes examples such as the use of light vehicles, heavy machinery, workshop or blasting noises and/or night lighting. Disturbance to fauna may result in fauna avoiding an area, e.g. due to excessive noise, and therefore being unable to utilise an area of available habitat. Fauna may also experience increased stress and/or expend extra energy in avoidance behaviours.

Recommendation 11: If possible, situate noisy activities together to reduce the area of impact.

Recommendation 12: Only use night-lighting where necessary for safety and avoid light spill by using the lowest light intensity practicable, using directional or shielded lighting and mounting lighting as low to the ground as practicable.

7.2 Conclusions

The study area is likely to support a range of vertebrate fauna, with relatively intact faunal communities present in the Wandoo woodland and Jarrah – Marri woodland. Conservation significant fauna species are known to be present in the study area, including the EPBC-listed Carnaby's Black-Cockatoo and Forest Red-tailed Black-Cockatoo.

Clearing for the extension of the existing open pit is likely to result in the loss of native vegetation (and therefore fauna habitats) from the study area. Other potential impacts of the development are some direct mortality of fauna when clearing, a small increase in habitat fragmentation, road mortalities and increased disturbance to fauna.

Table 4. Amphibians that potentially occur in the study area.

+ = species recorded in the study area during the 2012 level 1 fauna survey.
WAM = species recorded in the area on the Western Australian Museum Specimen Database (see Table 1).
FSDB = species recorded in the area on the Fauna Survey Returns Database (see Table 1).
TF = species recorded in the area on the DEC Threatened and Priority Fauna Database (see Table 1).
EPBC = species or species habitat recorded in the area on the EPBC Protected Matters Search Tool (see Table 1).

Species		Status	Records				
			Study Area	WAM	FSDB	TF	EPBC
Hylidae (tree frogs and water-holding frogs)							
Motorbike Frog	*Litoria moorei*						
Limnodynastidae (ground frogs)							
Western Spotted Frog	*Heleioporus albopunctatus*			+			
Hooting Frog	*Heleioporus barycragus*			+			
Moaning Frog	*Heleioporus eyrei*						
Chocolate Frog	*Heleioporus inornatus*						
Sand Frog	*Heleioporus psammophilus*						
Pobblebonk	*Limnodynastes dorsalis*						
Humming Frog	*Neobatrachus pelobatoides*			+			
Myobatrachidae (ground frogs)							
Quacking Froglet	*Crinia georgiana*						
Glauert's Froglet	*Crinia glauerti*						
Granite Froglet	*Crinia pseudinsignifera*						
Guenther's Toadlet	*Pseudophryne guentheri*						
# frog species expected in the study area:		**12**					
# frog species recorded in the study area 2012:		**0**					

Table 5. Reptiles that potentially occur in the study area.

+ = species recorded in the study area during the 2012 level 1 fauna survey.
WAM = species recorded in the area on the Western Australian Museum Specimen Database (see Table 1).
FSDB = species recorded in the area on the Fauna Survey Returns Database (see Table 1).
TF = species recorded in the area on the DEC Threatened and Priority Fauna Database (see Table 1).
EPBC = species or species habitat recorded in the area on the EPBC Protected Matters Search Tool (see Table 1).

Species		Status	Records				
			Study Area	WAM	FSDB	TF	EPBC
Agamidae (dragon lizards)							
Western Bearded Dragon	*Pogona minor*						
Ornate Crevice Dragon	*Ctenophorus ornatus*						
Diplodactylidae (geckoes)							
Clawless Gecko	*Crenadactylus ocellatus*			+			
Wheatbelt Stone Gecko	*Diplodactylus granariensis*			+			
Speckled Stone Gecko	*Diplodactylus polyophthalmus*			+			
Western Saddled Ground Gecko	*Diplodactylus pulcher*						
Southern Spiny-tailed Gecko	*Strophurus spinigerus*						
Carphodactylidae (Knob-tailed Geckoes)							
Barking Gecko	*Nephurus milii*						
Gekkonidae (geckoes)							
Marbled Gecko	*Christinus marmoratus*						
Tree Dtella	*Gehyra variegata*						
Reticulated Velvet Gecko	*Oedura reticulata*						
Pygopodidae (legless lizards)							
Granite Worm-Lizard	*Aprasia pulchella*						
Sandplain Worm Lizard	*Aprasia repens*			+			
Fraser's Legless Lizard	*Delma fraseri*			+			
Gray's Legless Lizard	*Delma grayii*						
Burton's Legless Lizaard	*Lialis burtonis*						
Common Scaleyfoot	*Pygopus lepidopodus*						
Scincidae (skink lizards)							
Fence Skink	*Cryptoblepharus buchananii*		+	+			
Dell's Skink	*Ctenotus delli*	CS2					
West Coast Ctenotus	*Ctenotus fallens*						
	Ctenotus pantherinus						
	Ctenotus schomburgkii						
King's Skink	*Egernia kingii*						
	Egernia multiscutata						
	Egernia pulchra						
	Eremiascincus richardsonii						
	Hemiergis initialis			+			
	Lerista distinguenda			+			
Dwarf Skink	*Menetia greyii*						
	Morethia lineoocellata						
Dusky Morethia	*Morethia obscura*						

Table 5. (cont.)

Species		Status	Records				
			Study Area	WAM	FSDB	TF	EPBC
Scincidae continued…							
Western Bluetongue	*Tiliqua occipitalis*						
Bobtail	*Tiliqua rugosa*		+				
Varanidae (goanna or monitor lizards)							
Gould's Goanna	*Varanus gouldii*						
Black-tailed Tree Goanna	*Varanus tristis*			+			
Typhlopidae (blind snakes)							
Southern Blind Snake	*Ramphotyphlops australis*						
Fat Blind Snake	*Ramphotyphlops pinguis*						
Beaked Blind Snake	*Ramphotyphlops waitii*						
Boidae (pythons)							
Stimson's Python	*Antaresia stimsoni*						
Carpet Python	*Morelia spilota imbricata*	CS1		+		+	
Elapidae (front-fanged snakes)							
Southern Shovel-nosed Snake	*Brachyurophis semifasciata*						
Yellow-faced Whip-Snake	*Demansia psammophis*						
Black-naped Snake	*Neelaps bimaculatus*						
Gould's Hooded Snake	*Parasuta gouldii*						
Black-backed Snake	*Parasuta nigriceps*						
Mulga Snake	*Pseudechis australis*						
Dugite	*Pseudonaja affinis*						
Gwardar	*Pseudonajas nuchalis*			+			
Jan's Banded Snake	*Simoselaps bertholdi*						
# reptile species expected in the study area:			**49**				
# reptile species recorded in the study area in 2012:			**2**				

Table 6. Birds that potentially occur in the study area.

+ = species recorded in the study area during the 2012 level 1 fauna survey.
BA = species recorded in the area on the Birds Australia Atlas Database (see Table 1).
WAM = species recorded in the area on the Western Australian Museum Specimen Database (see Table 1).
FSDB = species recorded in the area on the Fauna Survey Returns Database (see Table 1).
TF = species recorded in the area on the DEC Threatened and Priority Fauna Database (see Table 1).
EPBC = species or species habitat recorded in the area on the EPBC Protected Matters Search Tool (see Table 1).
Int = introduced species.

Species		Status	Records					
			Study Area	BA	WAM	FSDB	TF	EPBC
Casuriidae (cassowaries and emus)								
Emu	*Dromaius novaehollandiae*	CS3	+					
Phasianidae (pheasants and quails)								
Stubble Quail	*Coturnix pectoralis*							
Accipitridae (kites, hawks and eagles)								
Black-shouldered Kite	*Elanus caeruleus*							
Square-tailed Kite	*Hamirostra isura*							
Whistling Kite	*Haliastur sphenurus*			+				
Brown Goshawk	*Accipiter fasciatus*			+				
Collared Sparrowhawk	*Accipiter cirrocephalus*		+	+				
Wedge-tailed Eagle	*Aquila audax*		+	+				
Little Eagle	*Aquila morphnoides*							
Falconidae (falcons)								
Australian Kestrel	*Falco cenchroides*							
Brown Falcon	*Falco berigora*							
Australian Hobby	*Falco longipennis*							
Peregrine Falcon	*Falco peregrinus*	CS1						
Turnicidae (buttton-quails)								
Painted Button-quail	*Turnix varia*		+					
Columbidae (pigeons & doves)								
Common Bronzewing	*Phaps chalcoptera*		+					
Brush Bronzewing	*Phaps elegans*							
Crested Pigeon	*Ocyphaps lophotes*							
Psittacidae (parrots & cockatoos)								
Western Long-billed Corella	*Cacatua pastinator*							
Forest Red-tailed Black-Cockatoo	*Calyptorhynchus banksii*	CS1	+					+
Carnaby's Black-Cockatoo	*Calyptorhynchus latirostris*	CS1	+	+			+	+
Baudin's Black-Cockatoo	*Calyptorhynchus baudinii*	CS1						
Galah	*Cacatua roseicapilla*		+					
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*		+					
Western Rosella	*Platycercus icterotis*			+				
Australian Ringneck	*Platycercus zonarius*		+					
Red-capped Parrot	*Platycercus spurius*		+					
Elegant Parrot	*Neophema elegans*		+					

Table 6. (cont.)

Species		Status	Records					
			Study Area	BA	WAM	FSDB	TF	EPBC
Cuculidae (cuckoos)								
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*		+					
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*							
Pallid Cuckoo	*Cuculus pallidus*							
Fan-tailed Cuckoo	*Cacomantis flabelliformis*			+				
Strigidae (hawk owls)								
Barking Owl	*Ninox connivens*	CS2						
Southern Boobook	*Ninox novaeseelandiae*			+				
Tytonidae (barn owls)								
Barn Owl	*Tyto alba*							
Masked Owl	*Tyto novaehollandiae*	CS2						
Podargidae (frogmouths)								
Tawny Frogmouth	*Podargus strigoides*							
Caprimulgiidae (nightjars)								
Spotted Nightjar	*Eurostopodus argus*							
Aegothelidae (owlet-nightjars)								
Australian Owlet-nightjar	*Aegotheles cristatus*							
Apodidae (swifts)								
Fork-tailed Swift	*Apus pacificus*	CS1						+
Halcyonidae (tree kingfishers)								
Laughing Kookaburra	*Dacelo novaeguineae*	Int.	+	+				
Sacred Kingfisher	*Todiramphus sanctus*			+				
Meropidae (bee-eaters)								
Rainbow Bee-eater	*Merops ornatus*	CS1		+				+
Climacteridae (treecreepers)								
Rufous Treecreeper	*Climacteris rufa*		+	+				
Maluridae (fairy-wrens)								
Splendid Fairy-wren	*Malurus splendens*	CS3	+	+				
Pardalotidae (pardalotes)								
Spotted Pardalote	*Pardalotus punctatus*		+	+				
Striated Pardalote	*Pardalotus striatus*		+	+				
Acanthizidae (scrubwrens and allies)								
White-browed Scrubwren	*Sericornis frontalis*	CS3						
Weebill	*Smicrornis brevirostris*		+	+				
Western Gerygone	*Gerygone fusca*		+	+				
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	CS3		+				
Inland Thornbill	*Acanthiza apicalis*	CS3	+					
Western Thornbill	*Acanthiza inornata*	CS3	+	+				

Table 6. (cont.)

Species		Status	Records					
			Study Area	BA	WAM	FSDB	TF	EPBC
Meliphagidae (honeyeaters and chats)								
Western Spinebill	*Acanthorhynchus superciliosus*		+	+				
Singing Honeyeater	*Lichenostomus virescens*			+				
Yellow-throated Miner	*Manorina flavigula*							
Western Wattlebird	*Anthochaera lunulata*			+				
Red Wattlebird	*Anthochaera carunculata*			+				
Tawny-crowned Honeyeater	*Phylidonyris melanops*		+					
Brown Honeyeater	*Lichmera indistincta*		+	+				
Yellow-plumed Honeyeater	*Lichenostomus ornatus*							
New Holland Honeyeater	*Phylidonyris novaehollandiae*		+	+				
White-cheeked Honeyeater	*Phylidonyris nigra*		+					
Brown-headed Honeyeater	*Melithreptus brevirostris*			+				
White-naped Honeyeater	*Melithreptus chloropsis*		+					
Petroicidae (robins)								
Jacky Winter	*Microeca fascinans*							
Scarlet Robin	*Petroica multicolor*	CS3	+					
Red-capped Robin	*Petroica goodenovii*			+				
Western Yellow Robin	*Eopsaltria australis*	CS3						
Pomatostomidae (babblers)								
White-browed Babbler	*Pomatostomus superciliosus*	CS2		+				
Neosittidae (sittellas)								
Varied Sittella	*Daphoenositta chrysoptera*		+					
Pachycephalidae (whistlers)								
Golden Whistler	*Pachycephala pectoralis*		+	+				
Rufous Whistler	*Pachycephala rufiventris*		+	+				
Grey Shrike-thrush	*Colluricincla harmonica*		+	+				
Crested Shrike-Tit	*Falcunculus frontatus*	CS2						
Dicruridae (fantails & magpie-lark)								
Grey Fantail	*Rhipidura fuliginosa*		+					
Willie Wagtail	*Rhipidura leucophrys*			+				
Magpie-lark	*Grallina cyanoleuca*			+				
Campephagidae (cuckoo-shrikes)								
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*		+	+				
White-winged Triller	*Lalage tricolor*							
Artamidae (woodswallows)								
Black-faced Woodswallow	*Artamus cinereus*							
Dusky Woodswallow	*Artamus cyanopterus*		+	+				

Table 6. (cont.)

Species	Status	Records					
		Study Area	BA	WAM	FSDB	TF	EPBC
Cracticidae (magpies and currawongs)							
Australian Magpie *Cracticus tibicen*		+	+				
Grey Currawong *Strepera versicolor*							
Corvidae (ravens and crows)							
Australian Raven *Corvus coronoides*		+	+				
Hirundinidae (swallows and martins)							
White-backed Swallow *Cheramoeca leucosterna*		+					
Welcome Swallow *Hirundo neoxena*			+				
Tree Martin *Hirundo nigricans*		+					
Zosteropidae (white-eyes)							
Silvereye *Zosterops lateralis*		+	+				
Sylviidae (songlarks and grassbirds)							
Rufous Songlark *Cincloramphus mathewsi*			+				
Dicaeidae (mistletoebird)							
Mistletoebird *Dicaeum hirundinaceum*		+	+				
Motacillidae (pipits and wagtails)							
Australian Pipit *Anthus australis*							
# bird species expected in the study area:	**95**						
# bird species recorded in the study area in 2012:	**42**						

Table 7. Mammals that potentially occur in the study area.

+ = species recorded in the study area during the 2012 level 1 fauna survey.
WAM = species recorded in the area on the Western Australian Museum Specimen Database (see Table 1).
FSDB = species recorded in the area on the Fauna Survey Returns Database (see Table 1).
TF = species recorded in the area on the DEC Threatened and Priority Fauna Database (see Table 1).
EPBC = species or species habitat recorded in the area on the EPBC Protected Matters Search Tool (see Table 1).
Int = introduced species.

Species		Status	Records				
			Study Area	WAM	FSDB	TF	EPBC
Tachyglossidae (echidnas)							
Echidna	*Tachyglossus aculeatus*		+				
Dasyuridae (dasyurid marsupials)							
Chuditch	*Dasyurus geoffroii*	CS1		+		+	+
Little Long-tailed Dunnart	*Sminthopsis dolichura*	CS3					
Gilbert's Dunnart	*Sminthopsis gilberti*	CS3					
Peramelidae (bandicoots and bilbies)							
Quenda or Brown Bandicoot	*Isoodon obesulus*	CS2					
Burramyidae (pygmy possum)							
Western Pygmy-possum	*Cercartetus concinnus*	CS3					
Tarsipedidae (honey possum)							
Honey Possum	*Tarsipes rostratus*	CS3					
Macropodidae (kangaroos and wallabies)							
Western Grey Kangaroo	*Macropus fuliginosus*		+				
Western Brush Wallaby	*Macropus irma*	CS2	+			+	
Phalangeridae (brushtail possums)							
Common Brushtail Possum	*Trichosurus vulpecula*						
Molossidae (freetail bats)							
White-striped Bat	*Tadarida australis*						
Western Freetail Bat	*Mormopterus planiceps*						
Vespertilionidae (ordinary bats)							
Southern Forest Bat	*Vespadelus regulus*						
Gould's Wattled Bat	*Chalinolobus gouldii*						
Chocolate Wattled Bat	*Chalinolobus morio*						
Lesser Long-eared Bat	*Nyctophilus geoffroyi*						
Gould's Long-eared Bat	*Nyctophilus gouldi*						
Greater Long-eared Bat	*Nyctophilus timoriensis*						
Inland Broad-nosed Bat	*Scotorepens balstoni*						
Muridae (rats and mice)							
House Mouse	*Mus musculus*	Int.					
Black Rat	*Rattus rattus*	Int.					

Table 7. (cont.)

Species	Status	Records				
		Study Area	WAM	FSDB	TF	EPBC
Leporidae (rabbit)						
Rabbit *Oryctolagus cuniculus*	Int.					
Canidae (foxes and dogs)						
Red Fox *Vulpes vulpes*	Int.					
Felidae (cats)						
Feral Cat *Felis catus*	Int.					
Suidae (pigs)						
Feral Pig *Sus scrofa*	Int.					
# mammal species expected in the study area:	**28 (22 native)**					
# mammal species recorded in the study area in 2012:	**3 (3 native)**					

Table 8. Summary of conservation significance 1 (CS1) and CS2 fauna in the study area.

*Habitats: A = Jarrah-Marri woodland, B= Wandoo woodland, C = Revegetation areas.

Species	Status	Records in or near study area	Habitats*	Likelihood of occurrence	Potential impacts
REPTILES					
Morelia spilota imbricata **Carpet Python**	CS1	Nearby (Appendix 2).	Various habitats. (A, B, C).	High	• Habitat loss • Habitat fragmentation • Road mortalities
Ctenotus delli **Dell's Skink**	CS2	-	Forests & woodlands. (A).	Moderate	• Habitat loss • Habitat fragmentation
BIRDS					
Falco peregrinus **Peregrine Falcon**	CS1	-	Nest on cliffs, open pits, tall trees. Forages in open areas. (A, B).	Moderate	• Habitat loss (potential loss of nesting trees).
Calyptorhynchus banksii naso **Forest Red-tailed Black Cockatoo**	CS1	Recorded in study area, 2012.	Forests & woodlands. (A, B).	Present	• Habitat loss (foraging habitat and potentially breeding habitat).
Calyptorhynchus baudinii **Baudin's Black-Cockatoo**	CS1	-	Forests & woodlands. (A, B).	Moderate	• Habitat loss (foraging habitat).
Calyptorhynchus latirostris **Carnaby's Black-Cockatoo**	CS1	Recorded in study area, also nearby (Appendix 2).	Forests, woodlands & heathlands. (A, B).	Present	• Habitat loss (foraging habitat and potentially breeding habitat).
Apus pacificus **Fork-tailed Swift**	CS1	-	Overfly any habitat. (A, B, C).	Moderate	• No impacts or negligible impact.
Merops ornatus **Rainbow Bee-eater**	CS1	Nearby (Table 6).	Forages in various habitats. Breeds in creeks & sandy areas. (A, B, C).	High	• Habitat loss (foraging habitat, possibly breeding habitat along fences and dam walls).

Table 8. (cont.)

Species	Status	Records in or near study area	Habitats*	Likelihood of occurrence	Potential impacts
BIRDS continued.					
Tyto novaenollandiae **Masked Owl**	CS2	-	Forests & woodlands. (A).	Low	• Habitat loss (foraging habitat and potentially breeding habitat).
Ninox connivens **Barking Owl**	CS2	-	Forests & woodlands. (A).	Low	• Habitat loss (foraging habitat and potentially breeding habitat).
Falcunculus frontatus **Crested Shrike-Tit**	CS2	-	Forests & woodlands. (A).	Moderate	• Habitat loss. • Habitat fragmentation.
Pomatostomus superciliosus ashbyi **White-browed Babbler (wheatbelt)**	CS2	Nearby (Table 6).	Forests, Woodlands & shrublands (A,B,C)	High	• Habitat loss. • Habitat fragmentation.
MAMMALS					
Dasyurus geoffroii **Chuditch**	CS1	Nearby (Appendix 2).	Forests, woodlands & heathlands. (A, B, C).	High	• Habitat loss. • Habitat fragmentation. • Road mortalities.
Isoodon obesulus **Quenda / Southern Brown Bandicoot**	CS2	-	Dense understorey, wetlands. (A, B, C).	Moderate	• Habitat loss (areas of dense understorey vegetation). • Habitat fragmentation. • Road mortalities.
Macropus irma **Western Brush Wallaby**	CS2	Recorded in study area in 2012.	Woodlands & forests. (A, B).	Present	• Habitat loss (areas of dense vegetation). • Habitat fragmentation. • Road mortalities.

8. References

Abbott, I. (2007). *Karrak watch: a summary of the information about the Forest Red-tailed Black-Cockatoo of south-west Western Australia*. [Online]. Perth: Department of Conservation and Land Management. Available from: http://science.calm.wa.gov.au/articles/2001-10-04/. Accessed: 01 May 2011.

Bamford, M.J. and Bamford, A.R. (1999). *A study of the Brush or Black-gloved Wallaby* Macropus irma *(Jourdan 1837) in Whiteman Park*. Technical Report Series No.1, Western Australian Planning Commission, Perth, Western Australia.

Barrett, G., Silcocks, A., Barry, S., Cunningham, R. and Poulter, R. (2003). *The New Atlas of Australian Birds*. Royal Australasian Ornithologists Union, Victoria.

Bennett, A.F. (1991). Roads, roadsides and wildlife conservation: a review. In: Nature Conservation 2: the role of corridors. Ed by D.A. Saunders and R.J. Hobbs, Surrey Beaty, Chipping Norton, Australia: pp 99-118.

BirdLife International (2012) Important Bird Areas factsheet: Bindoon-Julimar. Downloaded from http://www.birdlife.org on 24/09/2012.

Burbidge, A.A. (2004). *Threatened Animals of Western Australia*. Department of Conservation and Land Management, Kensington, Western Australia.

Burnham, Q, Barrett, G., Blythman, M. and Scott, R. (2010). *Carnaby's Cockatoo (Calyptorhynchus latirostris) identification of nocturnal roost sites and the 2010 Great Cocky Count*. Report prepared for the WA Department of Environment and Conservation by Birds Australia and DEC, Western Australia.

Churchill, S. (1998). *Australian Bats*. Reed New Holland, Sydney.

Cogger, H.G., Cameron, E.E., Sadlier, R.A. and Eggler, P. (1993). *The Action Plan for Australian Reptiles*. Endangered Species Programme Project Number 124, Australian Nature Conservation Agency, Canberra.

DEC (2007-). *Naturemap: Mapping Western Australia's Biodiversity*. Department of Environment and Conservation. URL: http://naturemap.dec.wa.gov.au/

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2011). *Environmental Protection and Biodiversity Conservation Act 1999 draft referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo, Baudin's Cockatoo & Forest red-tailed black cockatoo*. Commonwealth of Australia, 2011.

DEWHA (Department of the Environment, Water, Heritage and the Arts) (2004). Interim Biogeographic Regionalisation for Australia (IBRA), Version 6.1.

Duncan, A., Baker, G.B. and Montgomery, N. (1999). *The Action Plan for Australian Bats*. Environment Australia, Canberra.

Environmental Protection Authority (2002). *Terrestrial Biological Surveys as an Element of Biodiversity Protection*. Position Statement No. 3. March 2002, Perth Western Australia.

Environmental Protection Authority (2004). *Guidance for the assessment of environmental factors*: *Terrestrial fauna surveys for environmental impact assessment in Western Australia*. Guidance Statement No. 56. June 2004, Perth Western Australia.

Environmental Protection Authority (2009). *Guidance for the assessment of environmental factors: Sampling of Short-range Endemic invertebrate fauna for environmental impact assessment in Western Australia*. Guidance Statement No. 20. May 2009, Perth Western Australia.

Forman, R.T.T. and Alexander, L.E. (1998). Roads and their major ecological effects. *Annual Review of Ecology and Systematics* 29: 207-231.

Geering, A., Agnew, L. and Harding, S. (2007). *Shorebirds of Australia*. CSIRO Publishing, Collinwood, Victoria.

Garnett, S. and Crowley, G. (2000). *The Action Plan for Australian Birds*. Environment Australia and the Royal Australasian Ornithologists Union.

Government of Western Australia (2000). *Bush Forever Volume 2*. Department of Environmental Protection, Perth.

IUCN (2010). IUCN Red List of Threatened Species. Version 2010.1. <www.iucnredlist.org>. Accessed 06 December 2010.

Johnstone, R.E. & Storr, G.M. (1998). *Handbook of Western Australian Birds. Volume 1: Nonpasserines (Emu to Dollarbird)*. Western Australian Museum, Perth.

Johnstone, R.E. & Storr, G.M. (2004). *Handbook of Western Australian Birds. Volume 2: Passerines (Blue-winged Pitta to Goldfinch)*. Western Australian Museum, Perth.

Lee, A.K. (1995). *The Action Plan for Australian Rodents*. Environment Australia, Canberra.

Magnus, Z. (2006) Wildlife Roadkill Mitigation Information Kit, *A Guide for Local Government and Land Managers*. Report prepared for Sustainable Living Tasmania, Hobart, Tasmania.

Maxwell, S., Burbidge, A.A. and Morris, K. (1996). *Action Plan for Australian Marsupials and Monotremes*. Environment Australia, Canberra.

Menkhorst, P. and Knight, F. (2004). *A field guide to the mammals of Australia*. 2nd Edition. Oxford University Press, South Melbourne.

Orrell, P. and Morris, K. (1994). *Chuditch Recovery Plan 1992 – 2001*. Department of Conservation and Land Management, Perth, Western Australia.

Soderquist, T.R. and Serena, M. (2000). Juvenile behaviour and dispersal of chuditch (*Dasyurus geoffroii*) (Marsupialia: Dasyuridae). *Australian Journal of Zoology* 48(5) 551 – 560.

Storr, G.M., Smith, L.A. and Johnstone, R.E. (1983). *Lizards of Western Australia. II. Dragons and Monitors*. W.A. Museum, Perth.

Storr, G.M., Smith, L.A. and Johnstone, R.E. (2002). *Snakes of Western Australia*. W.A. Museum, Perth.

Storr, G.M., Smith, L.A. and Johnstone, R.E. (1990). *Lizards of Western Australia. III. Geckoes and Pygopods*. W.A. Museum, Perth.

Storr, G.M., Smith, L.A. and Johnstone, R.E. (1999). *Lizards of Western Australia. I. Skinks*. 2nd edition. W.A. Museum, Perth.

Threatened Species Scientific Committee (TSSC) (2009). *Commonwealth Conservation Advice on* Calyptorhynchus banksii naso *(Forest Red-tailed Black Cockatoo)*. Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/67034-conservation-advice.pdf. Accessed 1 May 2011.

Tyler, M.J. (1998). *The Action Plan for Australian Frogs.* Environment Australia, Canberra.

Tyler, M.J. and Doughty, P. (2009). *Field Guide to Frogs of Western Australia*. Fourth Edition. Western Australian Museum, Perth.

Van Dyck and Strahan, R. (Ed.) (2008). *The Mammals of Australia*. 3rd Edition. Australian Museum/Reed Books, Sydney.

Williams, K. and Mitchell, D. (2002). *Jarrah Forest 1(JF1 – Northern Jarrah Forest subregion*). In: *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002.* Ed by J.E. May and N.L. McKenzie. Dept. of Conservation and Land Management, Western Australia.

Appendix 1. EPBC Protected Matters Search Tool results.

Species listed for the area within 10km of 31º 36' 04'' S and 116º 19' 39'' E on the EPBC Protected Matters Search Tool.

Species	Status	Author's Comment
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo	Vulnerable	Recorded in the study area in 2012.
Calyptorhynchus latirostris Carnaby's Black-Cockatoo	Endangered	Recorded in the study area in 2012.
Leipoa ocellata Malleefowl	Vulnerable & Migratory	Locally extinct in the vicinity of the study area.
Rostratula australis Australian Painted Snipe	Vulnerable & Migratory	No suitable habitat in study area, therefore not likely to occur.
Bettongia penicillata Woylie	Endangered	Locally extinct in the vicinity of the study area.
Dasyurus geoffroii Chuditch	Vulnerable	May possibly occur in the study area.
Fork-tailed Swift *Apus pacificus*	Migratory (marine)	May possibly occur in the study area.
Great Egret *Ardea alba*	Migratory (wetland & marine)	No suitable habitat in study area, therefore not likely to occur.
Cattle Egret *Ardea ibis*	Migratory (wetland & marine)	No suitable habitat in study area, therefore not likely to occur.
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Migratory (terrestrial)	No suitable habitat in study area, therefore not likely to occur.
Rainbow Bee-eater *Merops ornatus*	Migratory (terrestrial)	Likely to occur in the study area.

Appendix 2. DEC Threatened and Priority Fauna Database results.

Species listed for the area within 8km of 31º 36' 04'' S and 116º 19' 39'' E on the DEC Threatened and Priority Fauna Database.

Species	Status	DEC records	Author's Comments
Calyptorhynchus latirostris Carnaby's Black-Cockatoo	Schedule 1	Records from Julimar (1999) and Morangup (2001 & 2003).	Recorded in the study area in 2012.
Dasyurus geoffroii Chuditch	Schedule 1	Record from Moondyne (2001).	Likely to occur in the study area.
Idiosoma nigrum Shield-backed Trapdoor Spider	Schedule 1	Undated records from Morangup.	May possibly occur in the study area.
Morelia spilota imbricata Carpet Python	Schedule 4	Record from Moondyne (1982).	Likely to occur in the study area.
Macropus irma Western Brush Wallaby	Priority 4	Record from Morangup (2003).	Likely to occur in the study area.

APPENDIX F

Weed Management Plan

landinsights
PLANNING DESIGN ENVIRONMENT

"SCHIST PIT" CLAY QUARRY

WEED MANAGEMENT PLAN

LOT 1 MORANGUP ROAD, MORANGUP

PREPARED FOR AUSTRAL BRICKS (WA) PTY LTD

AUGUST 2023

Prepared by:

Land Insights

PO Box 289

Mt Lawley WA 6929

Phone: (08) 9271 8506

Document details:

Document History:

Date	Document Name	Document Manager	Summary of Document Revision	Client Delivered
Jun-23	935 – Schist Pit Weed Management Plan	SR	Initial Draft for client review	Jun-23
Aug-23	935 – Schist Pit Weed Management Plan	SR	Final for submission	Aug-23

Table of Contents

Appendices

1 Introduction

1.1 Background and purpose

This report presents the Weed Management Plan for the "Schist Quarry" operated by Austral Bricks (WA) Pty Ltd. The quarry is located at Lot 1 Morangup Road, Morangup. The purpose of the Weed Management Plan is to set out the procedures in which weeds will be managed within the operation area. It has been prepared in accordance with the advice in the *Australian Weeds Strategy 2017 to 2027* (Invasive Plants and Animals Committee, 2016).

The Weed Management Plan supplements the weed management set out in the Environmental Management and Offset Strategy ("EMOS") (Land Insights, 2015). The EMOS was prepared as a condition of the approval issued by the Commonwealth under the *Environmental Protection and Biodiversity Conservation Act 1999*. While the EMOS has a focus on the protection and management of the offset area, it also provides actions to manage edge effects on the vegetation surrounding the operation and to the property as a whole. This Weed Management Plan focuses on the operation area and the vegetation adjacent to the operation area.

1.2 Objectives

The objectives of the Weed Management Plan are to:

- Reduce the risk of introduction and spread of weeds within the quarry operational area.
- To reduce the occurrence and risk of "edge effects" on the vegetation surrounding the operation .
- Eliminate *Declared Plant* species as listed under the *Biosecurity and Agriculture Management Act 2007* and *Weeds of National Significance* as listed by the Commonwealth Department of Climate Change, Energy, the Environment and Water located within the operation area and the vegetation adjacent to the operation.

1.3 Location

Lot 1 is situated approximately 80km to the north-east of Perth and approximately 25km to the south-west of Toodyay. It is approximately 5km from the closest rural residential estate (located to the south-west and another to the north of the site). The operation ("the site") is located in the centre of Lot 1.

Plans associated with the operation are provided at Appendix A.

1.4 Context

A "weed" is defined in the *Australian Weeds Strategy 2017 to 2027* (Invasive Plants and Animals Committee, 2016) as "a plant that requires some form of action to reduce its negative effects on the economy, the environment as well as human health and amenity". They are generally considered as plants that are not native to an area and are not desirable.

"Environmental weeds" are plants that establish themselves in natural ecosystems and can lead to a modification of natural processes and a decline of native communities and species.

Some weed species are included on a list of "Declared Plants" or as "Weeds of National Significance". These are described further below.

- "Declared Plants" are controlled under the *Biosecurity and Agriculture Management Act 2007*. The list is regulated by the Department of Primary Industries and Regional Development (DPIRD). Weeds listed as a Declared Plant are required to be controlled as they pose a significant risk to the WA economy. It should be noted however that some weed species are not listed under this Act as they have an agricultural role. A list of Declared Plants is at the following link https://www.agric.wa.gov.au/declared-plants/declared-plant-control-table
- "Pest Plants" are identified by local government under the *Biosecurity and Agriculture Management Act 2007* in addition to weeds already listed as a Declared Plant. They will be listed under a local law prepared by the respective local government authority.
- "Weeds of National Significance" (WoNS) are listed by the Commonwealth Department of Agriculture, Water and the Environment. A list of the WoNS is provided in Appendix A and a list is available at https://weeds.org.au/weeds-profiles/ Nomination as a WoNS recognises a species as "a priority current and future weed threat to Australia, requiring coordinated and strategic management along with shared stakeholder investment to develop and implement best practice to prevent, eradicate, contain and/or minimise its impacts in different parts of the nation" (Invasive Plants and Animals Committee, 2016). All WoNS have individual national strategic management plans which can be referred to if any are identified on Midland Brick properties.

1.5 Operation

The quarry is located in the centre of Lot 1. Excavation has been ongoing over the last 60 years. The current development footprint is known as the "Operation Area" and encompasses the active pit area, stockpiling areas, access tracks, drainage basins and administrative areas. Future stages (labelled as "Stages 1 to 4") have been identified to the south-east of the existing excavation area. In general, the excavation occurs in a south-easterly direction.

Excavation of clay takes place in a sequence of steps which can be broadly broken down into the following:

- Earthworks Campaign (i.e., removal of topsoil and overburden, excavation of clay to stockpile)
- Carting Campaign (transport of clay from the pit or stockpiles to the factories)
- Rehabilitation.

2 Site description

2.1 Climate

The south-west of Western Australia experiences a Mediterranean climate which is characterised by warm, dry summers and cool, wet winters.

The rainfall and temperature data for the region has been obtained from the Bureau of Meteorology "Climate Data Online" services. The average rainfall from the closest station which is the Toodyay station is 520mm. A majority of rainfall is from May to August.

The mean temperature information is from the closest station which is the Northam station. It states that the hottest month is January with an average maximum of 34.2°C and the coldest month is July with an average minimum of 5.4°C.

The prevailing winds throughout the majority of the year are predominantly from the east in summer months and from the west in winter (Bureau of Meteorology, 2022).

2.2 Topography and landform

The topography of the site is variable and undulating with high points and valleys throughout. slightly undulating with a moderate to steep slope throughout. There is a high point at the north-eastern corner and another at the south-eastern corner at approximately 280 metres AHD (Australian Height Datum). These areas are divided by a watercourse which drains towards the northern end of the lot where it reaches a low point of 195m AHD.

The operation area is located in the centre of Lot 1. The natural topography surrounding the pit is at approximately 245m AHD at the north-eastern corner of the operation to approximately 270m AHD at the southern end. The land generally slopes up to the south, down to the west, east and north.

2.3 Geology

The site sits on the Darling Plateau which lies east of the Swan Coastal Plain and the Darling Scarp. It is characterised by an undulating hilly landscape and lateritic uplands with major valleys along the scarp. The general area is part of the Pre-Cambrian meta sedimentary complex known as the Jimperding Metamorphic Belt.

The 500 metres grid Regolith of WA as mapped by DPIRD identifies the geology as "residual or relict materials including ferruginous siliceous and calcareous duricrust" across the southern extent of Lot 1 and "exposed rock, saprolite and saprock" across the northern extent. The geological formation is described as

"dissected lateritic terrain with valleys and plateau remnants" and the geology as "deeply weathered mantle over granitic rocks".

The 1:500 000 State interpreted bedrock geology as mapped by DMIRS (2022) is "Yilgarn Craton Granites". It is described as "granitic rock, metamorphosed". The Yilgarn Craton Granites are located in a band through the centre of Lot 1 and is associated with the quarry operation.

2.4 Soils

Lot 1 is divided by three different soil-landscape units. Generally speaking, the north-west corner is the "Clackline Steep Rocky Hills" subsystem and "Michibin" subsystem, the centre of the property (including a majority of the operation) is the "Leaver" subsystem, the creeklines are the "Pindalup" subsystem and the southern portion of Lot 1 is the "Yalanbee" subsystem. The soil-landscape units are shown on Figure 1 below.

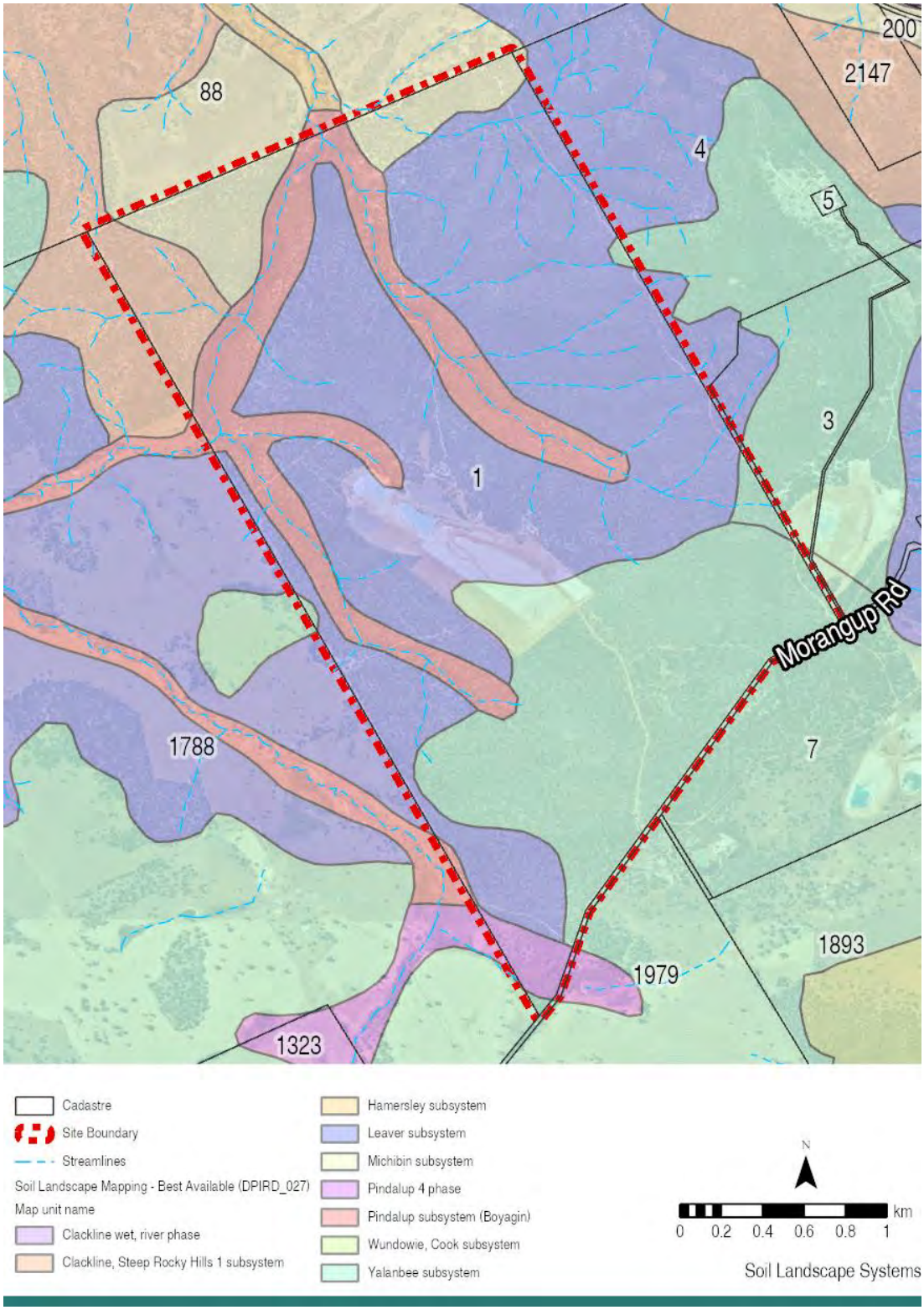
The soil-landscape units mapped across the site are described further in the table below.

Table 2.1 – Soil-Landscape Units

NAME	CODE	DESCRIPTION	LOCATION
Clackline Steep Rocky Hills subsystem	253CcR1	Areas of rock outcrop and steep rocky hills.	Northern portion of Lot 1.
Michibin subsystem	253CcMN	Red and yellowish brown loams and clays, often gravelly with rocky areas and lateritic crests.	Northern portion of Lot 1.
Leaver subsystem	253ByLV	Gravelly yellow and red duplexes, gravelly deep clayey sands and sandy loams over laterite and clay.	Centre of Lot 1, including the operation.
Pindalup subsystem	253ByPN	Alluvial red and yellow duplex and uniform fine soils which are often gravelly.	Associated with the creeklines.
Yalanbee subsystem	253WnYA	Pisolitic gravelly, yellowish brown soils that vary in texture from loamy sands to clays, with pockets of pale sands and areas of outcropping laterite.	Southern end of Lot 1.

Source: DPIRD, 2022

Figuire 1 – Soil-landscape Units



Generalised soil qualities of each soil-landscape unit are described in the table below.

Table 2.2 – Soil Qualities

SOIL-LANDSCAPE UNIT	WATER EROSION	WIND EROSION	WATERLOGGING	FLOOD	SALINITY
Clackline Steep Rocky Hills subsystem	Low risk	Moderate risk	Low risk	Low risk	Low risk
Michibin subsystem	Moderate risk	Moderate risk	Low risk	Low risk	Low risk
Leaver subsystem	Low risk	High risk	Low risk	Low risk	Low risk
Pindalup subsystem	High risk	Low risk	High risk	High risk	High risk
Yalanbee subsystem	Low risk	High risk	Low risk	Low risk	Low risk

Source: DPIRD, 2022

2.5 Vegetation

Existing vegetation

Lot 1 is predominantly covered on remnant vegetation except for the cleared areas associated with the quarry operations, access roads and firebreaks.

A spring *Flora and Vegetation Assessment* was undertaken by Del Botanics in October 2012 of the proposed quarry expansion area. The survey identified three vegetation communities within the survey area:

- "Marri/Jarrah Woodland with a diverse understorey" – Open Forest of *Corymbia calophylla* and *Eucalyptus marginata*, over shrubland of *Banksia sessilis, Banksia armarta* and *Allocasuarina humilis* over herbland of *Hibbertia hypericoides, Gompholobium marginatum* and *Banksia nivea*
- "Powderbark woodland with diverse understorey" – Woodland of *Eucalyptus accedens* over shrubland of *Xanthorrhoea acanthostachya, Melaleuca parviceps, Jacksonia restioides* over herbland of *Hibbertia hypericoides* and *Baekea camphorosmae*

- "Wandoo woodland with diverse understorey" – Woodland of *Eucalyptus wandoo* over shrubland of *Banksia sessilis* and *Leptospermum erubescens*, over herbland of *Banksia nivea, Hibbertia hypericoides* over open grassland of *Neurachne alopecuroidea*

The Flora and Vegetation Assessment (Del Botanics, 2013) rated the vegetation condition within the survey area as "Excellent", "Very Good" and "Good". Tracks located through the survey area were rated as "Completely Degraded".

The Survey recorded four introduced flora species.

The next stage of the pit expansion has already been cleared in accordance with the Clearing Permit issued by DWER. Any further expansion of the pit area will require a new Clearing Permit to be applied for in accordance with the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

In addition to the above flora survey undertaken in 2012, an additional spring flora survey was conducted across two different areas identified for potential offsets in 2013 (Del Botanics, 2014). The results of this survey provide an indication of the types of vegetation found across the remainder of Lot 1. Four vegetation types were identified in the survey and no Threatened or Priority species were observed. The vegetation types included Dampland, Jarrah-Marri woodland, Powderbark woodland and Wandoo woodland.

Regional vegetation

The Biogeographic Regionalisation of Australia (IBRA) divides Australia into "bioregions" based on major biological and geographical/geological attributes. Western Australia has 26 biogeographic regions and 53 subregions based on dominant landscape characteristics of climate, lithology, geology, landform and vegetation. The site is located within the Northern Jarrah Forest (NJF) subregion of the Jarrah Forest Bioregion.

The site is located in the Drummond Botanical Subdistrict within the the southwest Botanical Province as described by Beard (1990). Flora composition has been described by Beard (1990) as predominantly consisting of Banksia Low Woodlands on leached sands with Melaleuca swamps where ill drained and Woodlands of Eucalyptus spp. on less leached soils.

Vegetation Mapping

The pre-European system association is mapped by the Department of Primary Industries and Regional Development (DPIRD) as "East Darling 3003" across the southern half of the site and "East Darling 4" across the northern half of the site.

They are described as follows and depicted in Figure 2 below.:

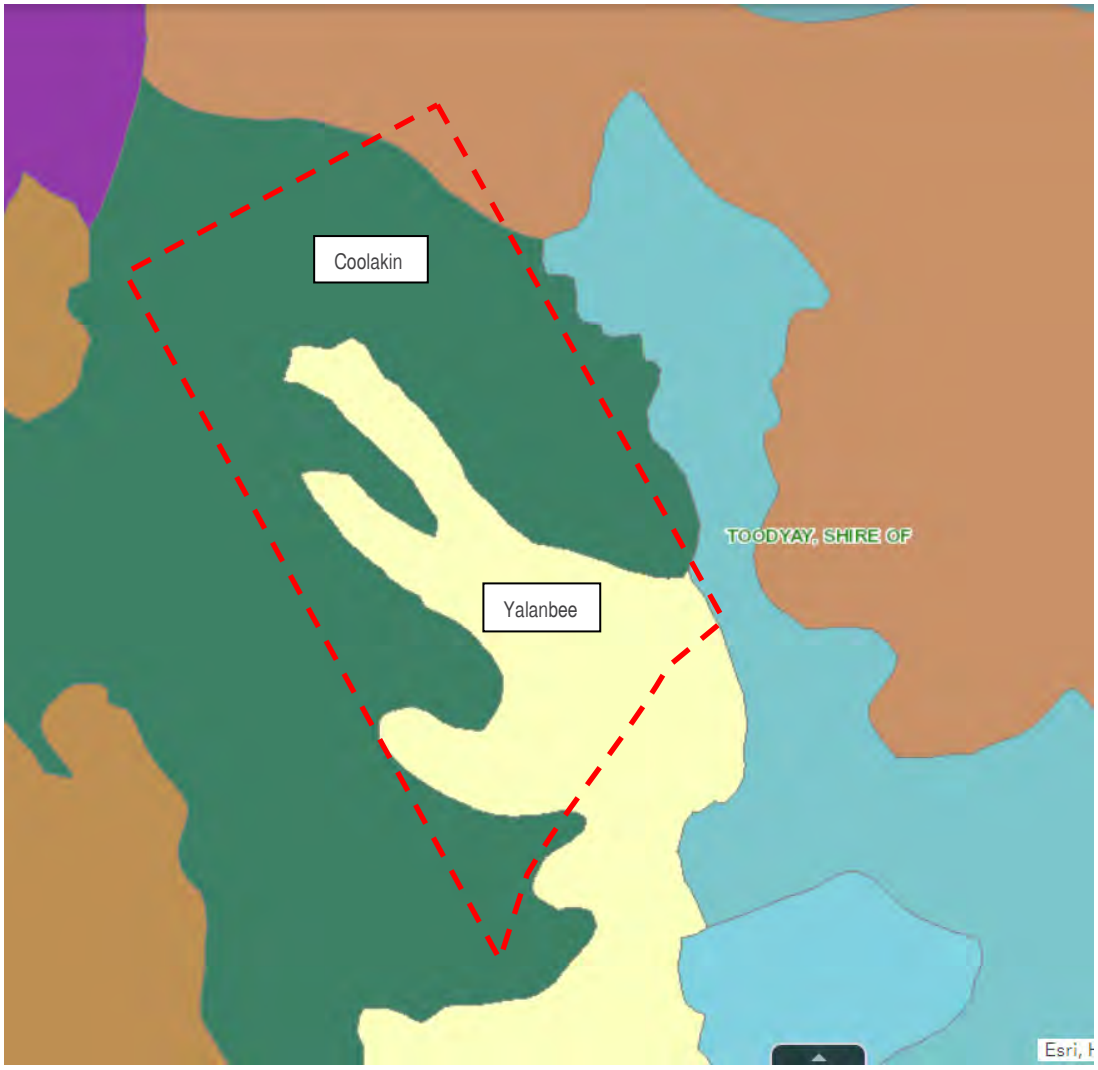
- "East Darling 3003" – Mainly Jarrah and Marri.
- "East Darling 4" – Jarrah, Marri and Wandoo

Figure 2 – Pre-European Vegetation Mapping

The pre-European vegetation complex is mapped by the Department of Biodiversity, Conservation and Attractions (DBCA) on the SLIP database based on the mapping undertaken by Mattiske and Havel (1998). There are two vegetation complexes mapped across the site:

- "Yalanbee 5" – "Mixture of open forest of *Eucalyptus marginata subsp. thalassica– Corymbia calophylla* and woodland of *Eucalyptus wandoo* on lateritic uplands in semiarid and perarid zones."
- "Coolakin" – "Woodland of Eucalyptus wandoo with mixtures of *Eucalyptus patens, Eucalyptus marginata subsp. thalassica* and *Corymbia calophylla* on the valley slopes in arid and perarid zones."

Figure 3 – Vegetation Complexes



Future extraction areas are mainly located within the “East Darling 3003” and “Yalanbee 5” vegetation mapping areas.

There are no Bush Forever Areas located on the site.

Environmentally Sensitive Areas

There are no “Environmentally Sensitive Areas” (ESA) located within or directly surrounding the site. Future excavation areas are not located within an ESA.

Threatened Species and Communities

No Threatened Flora, Priority Flora or Threatened Ecological Communities were recorded during the Flora and Vegetation Assessment of the proposed expansion area (Del Botanics, 2013) and the proposed offset areas (Del Botanics, 2014). A threatened Flora Assessment was undertaken by Del Botanics (2013) for *Caladenia huegelii* (Grand Spider Orchid), *Thelymitra stellata* (Star Sun Orchid) and *Thelymitra dedmaniarum* (Cinnamon Sun Orchid). The survey did not record any Threatened Flora species within the survey area.

Clearing Permits

There is currently one active Clearing Permit on the site issued by DWER in 2015. This permit is CPS 5495/2 which permitted clearing of native vegetation to facilitate expansion of the pit area.

EPBC Approval

In 2013, a referral was submitted to the Commonwealth government under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC). The Department decided it was a “controlled action” and that it required further assessment. An approval was issued by the Department in September 2014. The area approved to clear includes not only the current stage but the future expansion for the next 40-50 years. The EPBC approval expires in December 2069.

As required by the conditions of approval, an offset was provided which comprised of a Conservation Covenant over an area of 130 hectares located on Lot 1. This will protect this area from clearing in perpetuity.

As is also required as a condition of approval, an Environmental Management and Offset Strategy was prepared which provides for the management of the offset area and the vegetation directly surrounding the pit.

2.6 Weed Species

The weed species present on the property have been confirmed through two separate flora surveys undertaken:

- A spring *Flora and Vegetation Assessment* (Del Botanics, 2013) was conducted across the proposed expansion area to the east, west and south of the operation
- A spring *Flora and Vegetation Assessment Offset Areas 1 and 2* (Del Botanics, 2014) was conducted across large portions of the eastern and western side of the property.

The weed species identified in these surveys are as follows:

- *Ursinia anthemoides* (Asteraceae family)
- *Hypochaeris glabra* (Asteraceae family)
- *Lotus angustissimus* (Fabaceae family)
- *Juncus acutus* (Juncaceae family)
- *Aira caryophyllea* (Poaceae family)
- *Briza maxima* (Poaceae family)
- Aira caryophyllea (Poaceae family)
- *Lysimachia arvensis* (Primulaceae family)
- *Typha orientalis x Typha domingensis* (Typhaceae family)
- *Oxalis ap* (Oxalidaceae family)

The above list are typical agricultural and common weeds and it should be noted that no Declared Plants or Weeds of National Significance were identified in the surveys.

2.7 Native fauna

The vegetation surrounding the excavation is likely to support a range of native fauna species. A *Level 1 Fauna Survey and Targeted Black-Cockatoo and Chuditch Survey* was undertaken by Western Wildlife in 2012. The purpose of the survey was to support a Clearing Permit application under the EP Act and referral under the Commonwealth EPBC Act. It was conducted over the proposed expansion areas to the south and the surrounding areas.

The survey identified three main habitats within the area surveyed:

- Wandoo woodland (located at the eastern and western sides of the existing pit area)
- Jarrah-Marri woodland (located to the south of the existing pit area)
- Revegetation areas.

It is likely that these habitats also occur across the remainder of Lot 1 and surrounding the extraction area. The report by Western Wildlife (2012) notes that these habitats are widely represented in the surrounding area and the woodland habitats are likely to support relatively intact faunal communities.

No further clearing is proposed as part of this application for the next 10 years of extraction.

Conservation significant fauna species

The fauna survey by Western Wildlife (2012) identified the following species of conservation significance 1 that may occur in the study area:

- Carpet Python
- Peregrine Falcon
- Forest Red-tailed Black-Cockatoo
- Baudin's Black-Cockatoo
- Carnaby's Black-Cockatoo
- Fork-tailed Swift
- Rainbow Bee-eater
- Chuditch.

The species of conservation significance 2 that may occur in the study area are:

- Dell's Skink
- Barking Owl
- Masked Owl
- Crested Shrike-tit
- White-browed Babbler
- Quenda
- Western Brush Wallaby

The report also notes that there are eight birds and three small mammals of conservation significance 3 that may be present in the study area.

The survey by Western Wildlife (2012) included a targeted assessment of black cockatoo habitat and a targeted trapping survey for Chuditch. All four of these species are listed as conservation significance 1 species that may occur in the study area.

The following conclusions are made regarding the black-cockatoo and Chuditch survey:

- The study area is a potential roosting habitat for Forest Red-Tailed Black-Cockatoos
- The study area is within n the known or predicted breeding range of both the Forest Red-tailed Black-Cockatoo and Carnaby's Black-Cockatoo, though it is on the very north-eastern edge of the Forest Red-tailed Black-Cockatoos breeding range. Baudin's Black-Cockatoo does not breed in the area.
- The majority of trees with potential large hollows were located within the Wandoo woodland located to the east of the existing pit (it should be noted that following the outcomes of this survey the future extraction areas were modified to avoid a majority of these trees).
- No evidence of breeding was found.
- The study area represents foraging habitat for the Forest Red-tailed Black-Cockatoo, Baudin's Black-Cockatoo and Carnaby's Black-Cockatoo.
- No Chuditch were trapped or recorded on camera traps during the field survey.

2.8 Water resources

Hydrological mapping

The site sits on the Darling Plateau which lies east of the Swan Coastal Plain and the Darling Scarp. The hydrological zone is the "Eastern Darling Range" which is described as "moderately to strongly dissected lateritic plateau on granite with eastward-flowing streams in broad shallow valleys." This description also accurately describes the landform of Lot 1 which is undulating and dissected by watercourses located in shallow valleys across the site.

The site is located within a "Proclaimed Surface Water Area" under the *Rights in Water and Irrigation (RIWI) Act 1914.* It is not located in a "Proclaimed Groundwater Area" under the RIWI Act 1914.

Hydrological mapping relating to the site (as provided by DWER) are listed below:

- Surface Water Area – "Avon River Catchment"
- Surface Water Subarea – "Avon River Catchment"
- Hydrographic Catchment Basin – "Swan Coastal"
- Hydrographic Catchment - "Swan Avon_Main Avon"

- Hydrographic Subcatchment - “Avon River Catchment”
- Surface Water Management Area – “Avon River Catchment”
- Surface Water Management Subarea - “Avon River catchment”

There are no Public Drinking Water Source Areas (PDWSA’s), wetlands, floodplain areas or Floodplain Development Control Areas located on or surrounding the property. The site is located on the western edge of the “Avon River Management Area” which is identified under the *Waterways Conservation Act 1976*. The Department currently does not have an active management plan for this area at present.

Surface water features

A number of watercourses intersect the site. The watercourse on the eastern side of Lot 1 is a tributary of the Avon River and is known as Mortigup Brook (Level 5). It flows from the eastern boundary in a north-west direction and leaves the site to the north where it continues to the Avon River. Another tributary of the Avon River is located on the western side of the Lot which is known as the Morangup Brook (Level 4 watercourse). It flows across the north-west corner of Lot 1. Another minor watercourse extends along the western boundary of the Lot, to the west of the operation area. A small drainage line flows from the outside of the pit towards this watercourse.

The operation is considered to be adequately separated from the surrounding watercourses. It is approximately 180 metres from the minor watercourse to the west, approximately 550 metres from Morangup Brook and approximately 440 metres from Mortigup Brook.

Further information on water management is provided in the attached Water Management Plan (Land Insights, 2022). The requirements of DWER’s *Water Quality Protection Note (WQPN) No. 15 – Basic Raw Material Extraction* is addressed in Chapter 5.13 below which provides a risk assessment against the criteria of the WQPN. A risk assessment is also contained in Chapter 3.

There are no wetlands located on the site. There are no wetlands as mapped by the “Directory of Important Wetlands in Australia”. The Avon River located over 1.3km to the north and north-east of the site is mapped by the “Directory of Important Wetlands in Australia”.

2.9 Surrounding Land Uses

Surrounding land uses comprise other extractive industry and rural land uses. Directly to the south and east are two other clay quarries. A hard rock quarry is located to the north.

The site is approximately 5km to the north-east of the closest rural residential area and approximately 13 to the west of the Toodyay townsite. It is approximately 1.4km from the closest rural dwelling.

3 Weed Control Options

3.1 Introduction

The Commonwealth Department of Climate Change, Energy, the Environment and Water recommends in the *Australian Weeds Strategy 2017 to 2027* that there are four weed management options depending on the stage of invasion, as follows:

1. Prevention -
2. Eradication
3. Containment
4. Asset protection.

While the Australian Weeds Strategy is aimed at addressing weeds at a national level, the principles can also apply at a regional or local level.

Prevention of weed spread is largely addressed at a national and state/territory level through border controls and biosecurity. However, at a local-level, Austral Bricks have this management plan to reduce the potential for disease and weeds to enter or exit their clay operations. Prevention is recommended where there is minimal weed invasion.

Eradication of weeds is possible if weed populations are small or if the weed has only recently been introduced to the country, state or region. As is stated in the Australian Weeds Strategy (Invasive Plants and Animals Committee, 2016), "eradication at the local level tends to be less feasible, since on-going invasion tends to occur from adjacent areas, where the weed is not subject to the same high level of control". This needs to be taken into consideration as, although one aim of weed management is to eradicate certain from the property (such as Declared Pests and Weeds of National Significance), there is the risk that they will return or that they will not be entirely eradicated as invasion can occur from adjoining areas.

Containment of weeds aims to completely prevent further spread of a weed species beyond the boundary of existing infestations or to slow the spread. It may include reduction of the density or area of the infestation. Containment is recommended when there is a rapid increase in weed distribution and abundance.

Asset protection is generally applied to weed species that are widespread and abundant. Most likely they have existed in Australia for many decades and, over this time, have spread across large portions of their potential range. Eradication or containment of these species is considered to be impractical (Invasive

Plants and Animals Committee, 2016). Instead, the goal becomes effectively managing weed threats to protect certain high-value assets. This form of weed management is a cost/benefit approach in which the feasibility and cost-effectiveness of controlling the weed needs to be considered. This is largely the case on properties which have a high number of agricultural weeds. These weeds exist on agricultural properties which have been previously cleared and used for rural purposes. Therefore, control and elimination of these weeds is not considered practical.

Weed management at the Schist Quarry will focus on the prevention of weed introduction through biosecurity measures and eradication and containment of Declared Pests and Weeds of National Significance and asset protection where agricultural weeds are present within the operational area.

3.2 Weed prevention

As is mentioned in the chapter above, the first weed management option is to "prevent" the introduction and infestation of weeds in an area.

In the context of the Schist Quarry, the preferred management option is to prevent the introduction and infestation of weeds within the operation and the vegetation adjacent to the operation.

Actions 1 to 5 in Table 4.1 below address prevention of weed infestation and biosecurity.

3.3 Weed eradication and containment

As is mentioned in the chapter above, the management of weeds on the site will prioritise "prevention" of weed infestation. The results of the flora surveys (Del Botanics, 2013 and 2014) note that there are no Declared Weeds or WoNS. Furthermore, the survey notes that the vegetation on the property is in good condition and has a low proportion of weed species compared to native species. As a result, there are no requirements to physically "eradicate" or "contain" weeds in vegetation directly adjoining the operation.

Should any Declared Weeds or WoNS be found on the property, the following weed control methods can be used as recommended by the *Australian Weeds Strategy 2017 to 2027* (Invasive Plants and Animals Committee, 2016):

- Physical – the removal of the weed by physical or mechanical means, such as cutting, hand pulling, digging, mowing, tilling or burning. Hand pulling or digging can be useful for small infestations, particularly in highly sensitive areas or for herbicide-resistant weeds. Cutting and removal of woody weeds is often used in combination with chemical control (herbicide treatment of the cut stump).
- Chemical – involves the use of herbicides. Chemical weed control is generally considered to be an effective and practical form of weed control. Herbicides can be selective (targeting a particular

group of plants, such as grasses or broadleafs) or nonselective, and can either destroy or reduce the growth of treated weeds.

- Biological – the introduction of a weed's natural enemies, such as insects, pests, fungi or diseases to reduce weed spread or growth. Biological control can reduce the impact and spread of a weed, but not eliminate it.

In the context of the Schist Quarry, the most effective means of weed control will be chemical control. No specific actions relating to eradication or containment of weeds is provided, however this can be updated should any Declared Weeds or WoNS be found.

3.4 Declared Plants – Weed Control

Actions for controlled Declared Plants as listed by the DPIRD are listed on their website at https://www.agric.wa.gov.au/declared-plants/declared-plant-control-table This resource provides a detailed description of the Declared Plant, the control methods and timing. There have been no Declared Plants identified within the operation or the vegetation adjoining the operation.

Actions 6, 7 and 8 in Table 4.1 below address control of Declared Weeds and WoNS.

3.5 Weeds of National Significance – Weed Control

There are currently 32 Weeds of National Significance (WoNS) which are listed on the Weeds Australia website at https://weeds.org.au/weeds-profiles/ This resource provides a detailed description of the weed, the control methods and timing. There have been no WoNS identified within the operation or the vegetation adjoining the operation.

Actions 6, 7 and 8 in Table 4.1 below address control of Declared Weeds and WoNS.

4 Weed Management

4.1 Introduction

The Weed Management Plan aims to describe the measures that will be used by Austral Bricks at the Schist Quarry operation. The focus of the management is on the operational area (including the haul road) and the vegetation adjoining the operational area. Weed management at the Schist Quarry will focus on the *prevention* of weed introduction through biosecurity measures and *eradication* and *containment* of Declared Plants and Weeds of National Significance.

4.2 Weed Management Plan

The Weed Management Plan actions, responsibilities and timing is presented in Table 4.1 below.

Table 4.1 – Weed Management Plan for the Schist Quarry

MANAGEMENT/ACTION	RESPONSIBILITY	TIMING
1. Ensure no weed contaminated or suspect soil or plant particles is brought to the operation area.	Quarry Manager, Environmental Manager	Ongoing
2. Ensure the operation is kept secure with perimeter fencing, signs and locked gates to avoid rubbish dumping from trespassers.	Quarry Manager	Ongoing
3. Keep vehicles to tracks and operational areas to reduce the risk of spreading weeds around the property and vegetation adjoining the operation.	Quarry Manager, Team	Ongoing
4. Comply with the Waste Management Plan for the operation.	Quarry Manager, Team	Ongoing
5. Weed affected soils are not used for rehabilitation.	Quarry Manager, Environmental Manager	Ongoing
6. The operation and the vegetation adjoining the operation will be inspected annually for the presence of any Declared Plants and Weeds of National Significance. The inspection will be undertaken by the Quarry Manager or Environmental Manager.	Quarry Manager, Environmental Manager	Annually.
7. Declared Plants and Weeds of National Significance will be removed as appropriate (according to the control methods listed by DPIRD and Weeds Australia).	Quarry Manager, Environmental Manager	As required.
8. Any Declared Plants or Weeds of National Significance will be controlled as a priority if found on the property.	Quarry Manager, Environmental Manager	As required.

5 References

Bureau of Meteorology (2022), Climate Data Online, Accessed from http://www.bom.gov.au/climate/data/

Del Botanics, (2013), *Flora and Vegetation Assessment – Lot 1 Morangup Road, Morangup,* Del Botanics, WA.

Del Botanics, (2013), *Threatened Flora Assessment – Lot 1 Morangup Road, Morangup,* Del Botanics, WA.

Del Botanics, (2014), *Flora and Vegetation Assessment Offset Areas 1 and 2 – Lot 1 Morangup Road, Morangup,* Del Botanics, WA.

Department of Water and Environmental Regulation, (2017), *Guidance Statement: Risk Assessments,* Department of Water and Environmental Regulation, Perth, WA.

Invasive Plants and Animals Committee, (2016), *Australian Weeds Strategy 2017 to 2027*, Commonwealth of Australia, Canberra.

Weeds Australia, (2022), *Weeds of National Significance (WONS),* Accessed from *https://weeds.org.au/weeds-profiles/*

Western Australian Planning Commission, (2003), *State Planning Policy 2.0 – Environment and Natural Resources Policy*, Western Australian Planning Commission, Perth, WA.

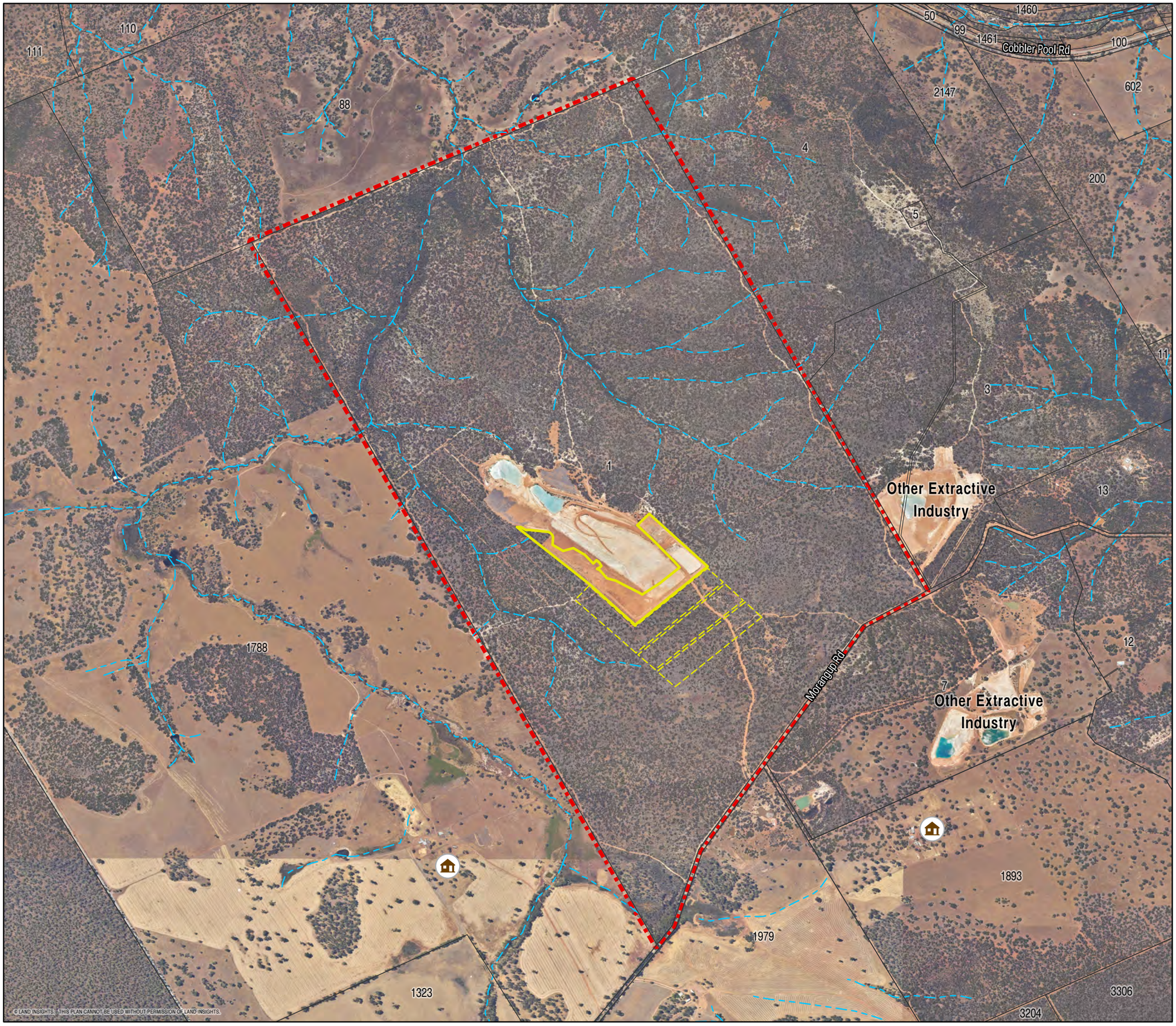
Western Australian Planning Commission, (2021), *State Planning Policy 2.4: Basic Raw Materials,* Western Australian Planning Commission, Perth, WA.

Western Wildlife, (2012), *Austral Bricks Morangup Rd Quarry, Shire of Toodyay – Level 1 Fauna Survey & Targeted Black Cockatoo and Chuditch Survey, August 2012,* Western Wildlife, WA.

Government of Western Australia, (2022), *SLIP Portal*, Accessed from https://maps.slip.wa.gov.au/landgate/locate/

APPENDIX A

Plans



Cadastre

Site Boundary

Streamlines

Existing Stage

Future Stages

Houses

0 100 200 300 400 500

Metres

1:20,000 @ A3

NOTE: AREAS AND DISTANCES SUBJECT TO SURVEY

Project: 935
Projection: GDA 1994 MGA Zone 50
Date Exported: 15/08/2023 5:59 PM
Layout Name: Context Plan

PO Box 289 Mt Lawley WA 6929
Ph: 9271 8506
admin@landinsights.com.au
landinsights.com.au

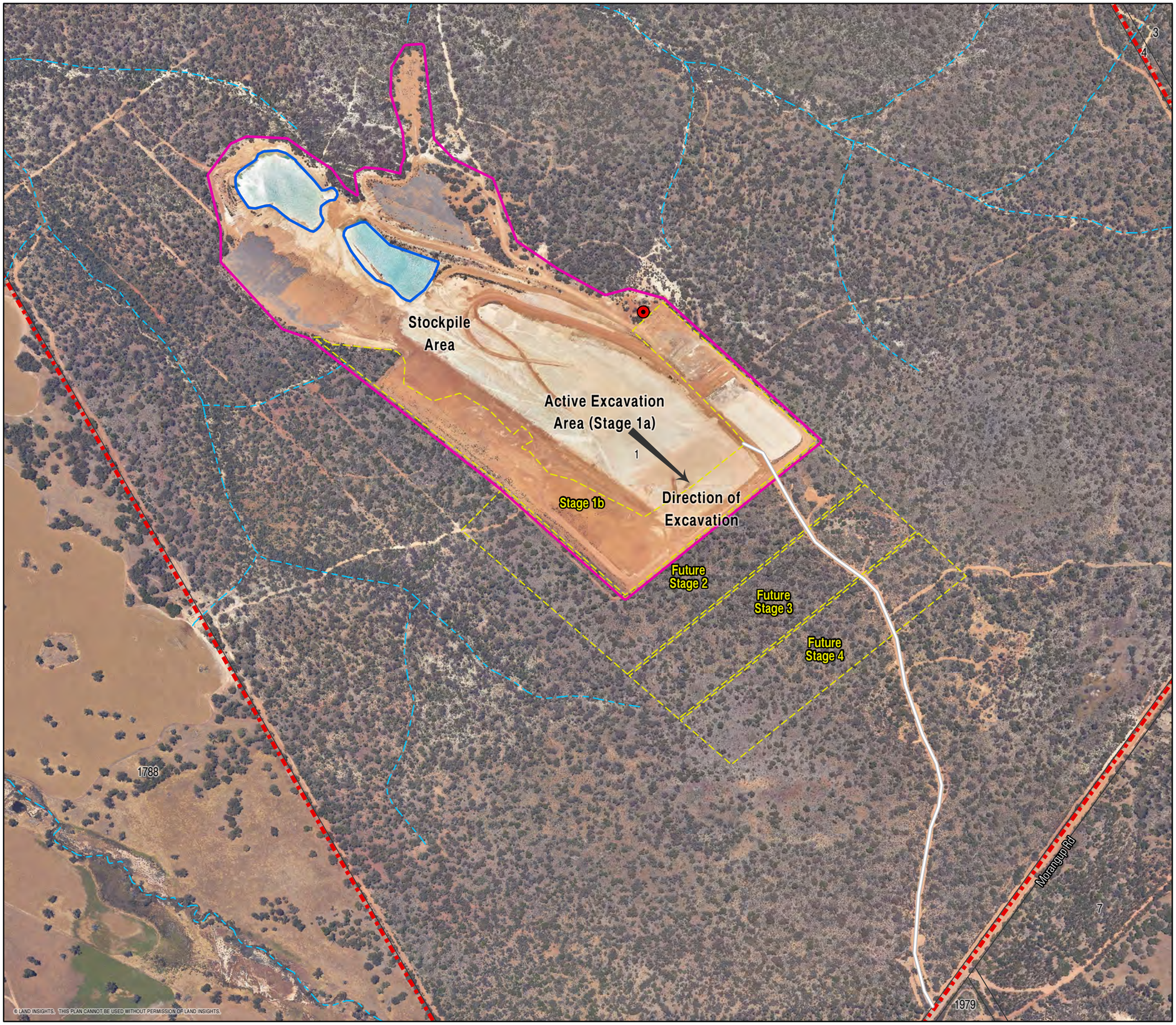
Context Plan

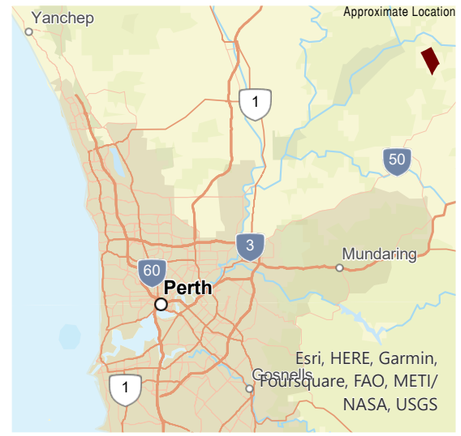
LOT 1 MORANGUP ROAD, MORANGUP

MORANGUP SCHIST PIT

AUSTRAL BRICKS

Path: E:\OneDrive - Land Insights\Drafting Jobs\935 Austral Morangup\935 Morangup.aprx





- Cadastre
- Site Boundary
- Streamlines
- Existing Stage
- Future Stages
- Haul Road
- Extraction Operation Area
- Drainage Basins
- Transportable Location (approx)

0 40 80 120 160 200
Metres
1:7,500 @ A3

NOTE: AREAS AND DISTANCES SUBJECT TO SURVEY

Project: 935
Projection: GDA 1994 MGA Zone 50
Date Exported: 24/08/2023 6:32 PM
Layout Name: Extraction Plan Detail

landinsights
PLANNING DESIGN ENVIRONMENT
PO Box 289 Mt Lawley WA 6929
Ph: 9271 8506
admin@landinsights.com.au
landinsights.com.au

Extraction Plan - Detail

LOT 1 MORANGUP ROAD, MORANGUP

MORANGUP SCHIST PIT

AUSTRAL BRICKS

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APPENDIX G

Phytophthora Dieback Hygiene Management Plan

Austral Bricks

Morangup

Phytophthora Dieback Hygiene Management Plan – Version 1.2 12/09/2023

GLEVAN
CONSULTING

Disclaimer

This report has been prepared in accordance with the scope of work agreed between the Client and Glevan Consulting and contains results and recommendations specific to the agreement. Results and recommendations in this report should not be referenced for other projects without the written consent of Glevan Consulting.

Procedures and guidelines stipulated in various Department of Environment and Conservation and Dieback Working Group manuals are applied as the base methodology used by Glevan Consulting in the delivery of the services and products required by this scope of work. These guidelines, along with overarching peer review and quality standards ensure that all results are presented to the highest standard.

Glevan Consulting has assessed areas based on existing evidence presented at the time of assessment. The Phytophthora pathogen may exist in the soil as incipient disease. Methods have been devised and utilised that compensate for this phenomenon; however, very new centres of infestation, that do not present any visible evidence, may remain undetected during the assessment.

Author evan.brown@glevan.com.au

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1. INTRODUCTION

The tracks and firebreaks associated with Austral Bricks' Morangup pit operations were recently assessed for the presence of Phytophthora Dieback and were observed to contain multiple infestations. Annual firebreak maintenance and periodic clearing activities occur within the study area and to prevent further disease spread / introduction within the study area, a Hygiene Management Plan (HMP) is required. An HMP will identify the necessary hygiene requirements, including cleandown requirements, the location of Clean on Entry Points, timing of activities and vehicle movement and soil movement restrictions.

2. PROJECT DESCRIPTION

The study area is located in the Darling Range, just south of the Avon River, approximately 15 km south west of Toodyay. The study area is accessed via gates on Morangup Road.

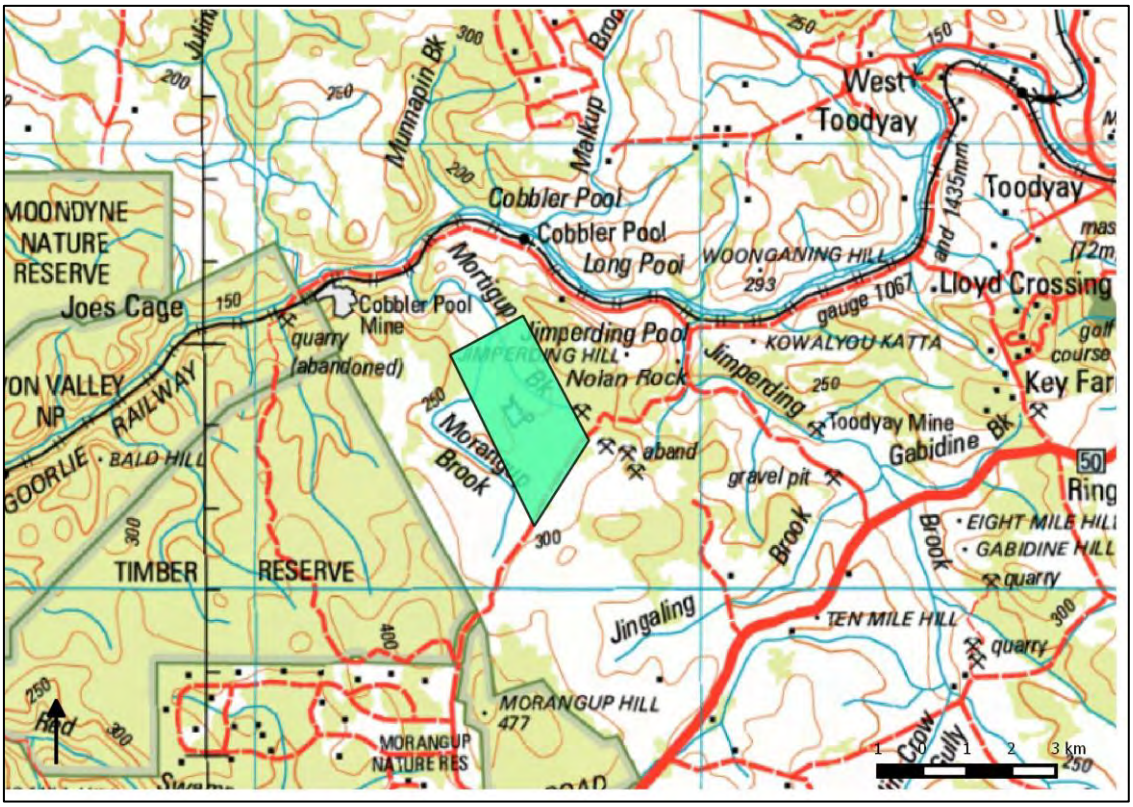

Figure 1 Study Area

2.1 Dieback and the Study Area

The pathogen *Phytophthora cinnamomi* is an agent of environmental disease found in vulnerable areas of Western Australia. Phytophthora Dieback is the common name for the observable disease that results from the interaction between the pathogen (*P. cinnamomi*) and the vegetation hosts (susceptible plant species within vulnerable areas). All land with an annual average rainfall of more than 400 millimetres and suitable soil composition is considered vulnerable to Phytophthora Dieback. This large area stretches approximately from Perth, Bunbury and Augusta in the west to Narrogin, Ravensthorpe and Esperance in the east, and as far north as Kalbarri.

The study area is comprised of approximately 23.9 km of drivable tracks and firebreaks. The following Phytophthora Dieback occurrence categories are used in the assessment for the presence of the disease.

Table 1 - Phytophthora Dieback occurrence categories

Infested	Areas that have plant disease symptoms consistent with the presence of Phytophthora Dieback.
Uninfested	Areas free of plant disease symptoms that indicate the presence of Phytophthora Dieback.
Uninterpretable	Areas where indicator plants are absent or too few to determine the presence or absence of Phytophthora Dieback.
Temporarily Uninterpretable	Areas that are sufficiently disturbed so that Phytophthora Dieback occurrence mapping is not possible at the time of inspection.
Not yet resolved	Areas where the interpretation process has not confidently determined the status of the vegetation.
Disease Risk Road	Where the disease status of the road is unknown due to recent use under unknown hygiene conditions and where there is a reasonable likelihood that viable inoculum and incipient disease is now present.
Excluded	An area of high disturbance where natural vegetation is unlikely to recover.

A Phytophthora Dieback assessment of the study area was undertaken in June and July 2018 by Glevan Consulting. A total of 12 infested sections, comprising a total length of 2925m were mapped during the assessment. An additional 3.0 km was classified as a Disease Risk Road (DRR). All of the main access track that was not classified as infested was classified as DRR. The main access road was observed to contain several infestations that did not appear to have been previously mapped and has been subject to unhygienic use, meaning there is a reasonable likelihood that viable inoculum and incipient disease is present along many of the sections that currently appear uninfested.

A total of 3975m of tracks/firebreaks were observed to be uninterpretable due to an insufficient coverage of indicator species, largely associated with the presence of Wandoo forest. The remainder (14 km) of the study area was observed to be uninfested and protectable. The 'protectability' of the uninfested areas was determined using the criteria developed by DPaW (Department of Parks and Wildlife, 2015).

2.2 Scope of the Hygiene Management Plan

This HMP identifies the key project management issues and outlines the actions required when accessing and / or conducting operations within the study area. The purpose of the HMP is to provide management actions to manage the potential introduction and spread of *Phytophthora cinnamomi*, the pathogen that causes Phytophthora Dieback. The plan will allocate responsibility and timelines for the implementation of management actions identified.

This HMP will be relevant for all future activity within the study area. However, it is recommended that all actions should be incorporated into the project specific Environmental Management Plan (EMP) to be developed by the contractor.

2.3 Scope of Activities

The study area is an operational quarry that involves the use of heavy machinery, large trucks and light vehicles. Annual firebreak maintenance and periodic expansion of the mining area also occurs within the study area. Such activities involve:

- soil movement
- clearing of vegetation;
- stripping and stockpiling of topsoil

3. Project Hygiene Requirements

The tracks and firebreaks within the study area are a mixture of uninterpretable, uninfested, infested and DRR, resulting in a significant number of category changes. In total, there are 28 separate sections, requiring 30 inspection/COE points. The clean on entry points associated with these sections are detailed in Table 2 and the location of each point is shown on the Hygiene Map in section 7.

Table 2 - Clean on Entry points

COE Points	COE type	Comments
COE 1, 15, 16,17, 18.	DRR/ uninfested	Boundary between DRR and uninfested area. Inspect, and cleandown where necessary, when entering the uninfested from the DRR.
COE 2, 3 ,4, 5, 6, 7, 8, 9, 10, 13, 14, 19, 20, 21, 22, 23, 24, 25, 29.	Infested/ uninfested	Boundary between infested and uninfested sections. Inspect, and cleandown where necessary, when entering the uninfested from the infested section.
COE 11, 12, 26, 27, 28.	Uninfested/ uninterpretable	Boundary between uninfested and uninterpretable sections. Inspect, and cleandown where necessary, when entering the uninfested from the uninterpretable section.
COE 30.	Infested/ uninterpretable	Boundary between infested and uninterpretable sections. Inspect and cleandown where necessary, when entering the uninterpretable from the infested section.

Clean on entry points are not required on the main access track or the tracks that the border the pit as it is not practical to have COE points on these tracks. The infested section on the track bordering the western side of the pit is associated with a creekline and there is potential for soil and mud to adhere to vehicles and machinery when traversing this section. It is recommended that a culvert be installed, or that blue metal aggregate be placed in the crossing to prevent contact with the wet soil/mud.

When performing an inspection at a designated COE point it is important to consider whether the dry brush-down method of cleaning will be sufficient, as this is the preferred method of clean-down. Wash-downs increase soil moisture levels in the immediate area, creating more favourable conditions for the pathogen and should only be performed when a dry brush down will not adequately clean the

vehicle/machine. In addition, the use of water may result in the clean on entry point surface becoming muddy, therefore increasing the likelihood that material will be picked up on tyres and tracks while exiting the COE point.

To reduce the likelihood of a washdown being required, only access the areas or perform operations in dry soil conditions. Also, ensure vehicles and machinery are clean when initially arriving on site, as this will also significantly reduce the likelihood that a wash-down will be required. It is unlikely that vehicles and machinery will become dirty traveling from the factory/depot to the site, so the inspection (and cleandown if necessary) should be performed before departure, rather than on arrival. The term 'clean' means that the vehicle/machine is not carrying and clods/slurry of soil or plant material. A thin, dry film of grime/dust is not considered to present a risk and does not need to be removed.

4. OBJECTIVES and TARGETS

The overall purpose of the HMP is to provide management actions using industry best practice to deliver the key objectives, being to:

- prevent the introduction and spread of dieback in the study area
- prevent the spread of dieback from unprotectable areas to protectable areas within the Project area.

Dieback is spread through the movement of infested material, including soil, plant material and water, and as such the actions that will allow these to occur are the focus areas for management.

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Table 3 - Projects Objectives and Targets

Objective	Target	Performance indicator
Prevent the spread of dieback from Dieback Infested areas to the remaining areas within the study area	No movement of vegetation and topsoil from Dieback Infested areas to the remainder of the Project area.	No incidents that may have resulted in the movement of dieback infested materials outside of Dieback Infested areas. Environmental Incident Register.
	No movement of material from uninterpretable to uninfested sections of the Project area.	No incidents that may have resulted in the movement of materials from uninterpretable areas to uninfested areas. Environmental Incident Register
	No incidents of vehicles or machinery entering native vegetation beyond the native vegetation clearing approval area.	Inspections of clearing boundaries. Environmental Incident Register.
	No water draining from infested to uninterpretable or uninfested, or from uninterpretable to uninfested sections of the study area.	Inspections of study area to ensure all water is contained within each category. Environmental Incident Register.
	No movement of vehicles from infested or DRR to uninterpretable or uninfested areas, or from uninterpretable to uninfested sections of the study area without an audited clean-down.	Inspections of vehicle movements. Vehicle Clean-Down Register.
Prevent the introduction and spread of dieback into the study area	All vehicles and machinery are free of soil and plant material before arriving on site.	Vehicle Clean-Down Register.

Table 4 - Dieback Management Actions

DIEBACK MANAGEMENT ACTIONS		
Project Component • **Management Action**	**Responsible Person**	**Timing**
Induction and training • Provide training (including vehicle cleaning) during site inductions to all relevant personnel working on the site.	Project Manager	Prior to clearing and firebreak maintenance for the duration of the Project
Pre-clearing / Firebreak maintenance activity • Provide clear maps indicating areas to be cleared including dieback status of each area. Make maps available to all relevant personnel. • Hygiene boundaries will be reassessed and demarcated by a suitably qualified dieback interpreter after 12 month expiry.	Project Manager	Prior to clearing commencing
Clearing / Firebreak maintenance • Clear vegetation in a staged manner; specifically, clear the uninterpretable or infested areas separately from uninfested areas. • Remove soil and plant material when moving all vehicles, machinery and equipment from infested or uninterpretable into uninfested, and from infested to uninterpretable. • Restrict movement of machines and other vehicles to the limits of the areas in which they are required to work. • Avoid movement of soil in wet conditions.	Project Manager or Representative and all personnel	During clearing and firebreak maintenance for the duration of the project.

Improving road surface in high risk areas • Add limestone layer to tracks to create a 'green bridge' over infested areas where trespassers are known to travel. Target the tracks towards the eastern boundary where there are several infested sections. • Install a culvert and build up road, or place blue metal aggregate on section of track that intersects infested creekline on western boundary of pit.	Project Manager or Representative	As soon as possible.
Protection of priority vegetation • Conduct phosphite treatment on vegetation within the offset area. Target the vegetation immediately surrounding the disease front. Note that current demarcation employs a 20m buffer, meaning the disease front will be approximately 20m from the demarcation.		
Record Keeping • A log is to be maintained on site, indicating arrival and departure times and dates when vehicles and plant or other machinery enter any Dieback Free area. The log should record the vehicle/machinery check for soil material and wash down where required. Each check and wash down should be signed by driver. • Have on site a copy of the HMP.	Project Manager or Representative	During clearing and firebreak maintenance for the duration of the project.

5. MONITORING AND MAINTENANCE

The achievement of performance targets (listed in Table 3) will be measured through monitoring as described in Table 5. The achievement of key performance indicators and targets requires maintenance activities, which are also described in Table 5.

Table 5 - Dieback Hygiene Plan monitoring guidelines

DIEBACK MONITORING GUIDELINES				
Project Component	**Monitoring activity**	**Responsible Person**	**Timing and duration**	**Record log**
Vehicles (including plant, machinery and equipment)	Vehicle inspections	Project Manager or Representative	For all vehicle movements across hygiene categories.	Vehicle Clean-Down Register
Incident management	Record keeping of breaches related to dieback management	All personnel	All incidents to be recorded and reported.	Environmental Incident Register

6. NON-COMPLIANCE ACTIONS

Actions will be enacted if non-compliance to this Hygiene Management Plan is detected in accordance with Table 6.

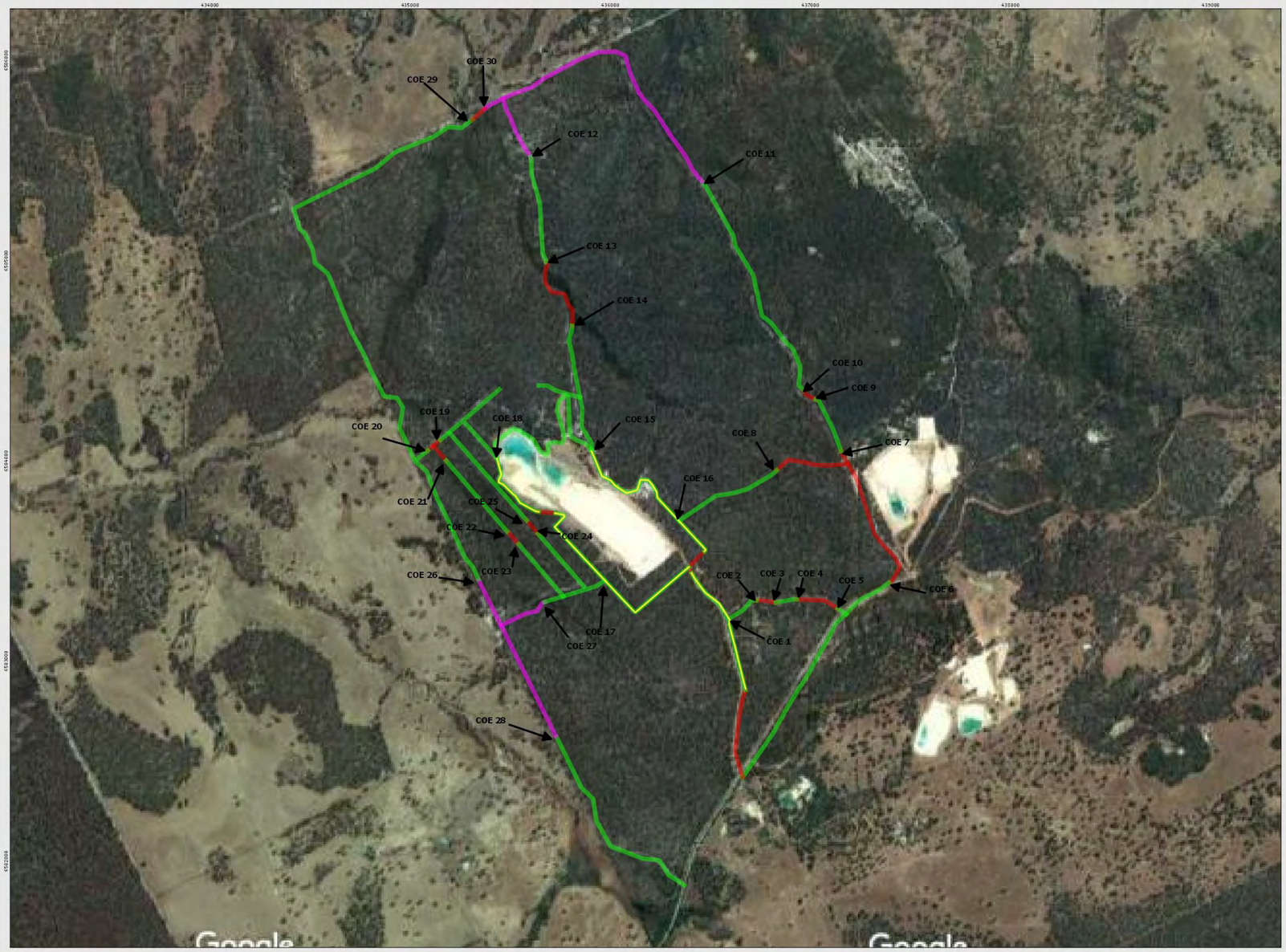
Table 6 - Non-compliance actions

Non-compliant activity	Response
Records indicate movement of soil or plant material from infested or uninterpretable areas into designated uninfested; or, no records tracking soil and plant material movement.	Investigate cause and review procedures, create Incident Report.
Vehicles or machinery found to be entering native vegetation in or around the study Area without authorisation, or found in other areas contrary to the hygiene procedures	Investigate incursion and review procedures, create Incident Report.
Potential dieback hazard observed or reported within Project Area.	Clean up potential dieback hazard. Investigate dieback hazard to determine cause, create Incident Report. Review procedures. Ensure all personnel are trained in hygiene procedures. Implement control measures to contain any new areas of potential infestation in accordance with the DMP.
Soil and/or plant material present on vehicles, machinery, plant, tools or footwear.	Wash down affected vehicles, machinery, plant, tools and footwear. Investigate breach and review procedures. Ensure all personnel are trained in hygiene procedures.

7. Hygiene Map

Austral Bricks Morangup

Clean on Entry Point Locations Map



OCCURRENCE CATEGORIES

INFESTED
Determined by a registered interpreter to have plant disease symptoms consistent with the presence of Phytophthora cinnamomi

UNINFESTED
Determined by a qualified interpreter to be free of plant disease symptoms which indicates the presence of Phytophthora cinnamomi

UNINTERPRETABLE
Where susceptible plants are absent or too few to enable the interpretation of Phytophthora cinnamomi presence or absence

TEMPORARILY UNINTERPRETABLE (included within assessment area)
Areas of temporary disturbance where natural vegetation is likely to recover

NOT YET RESOLVED (included within assessment area)
Areas where Phytophthora cinnamomi occurrence diagnosis cannot be easily made within the required timeframe because of inconsistent evidence

EXCLUDED (excluded from assessment area)
Areas of long-term high disturbance where natural vegetation has been cleared and is unlikely to recover.

OVERLAYS

HIGH IMPACT (current and predicted-forest areas only)
(Demarcated to include Very High Impact areas which may occur within)
Where the overstorey impact from Phytophthora cinnamomi is greater than 10 % or predicted to be greater than 10 % in less than 50 years

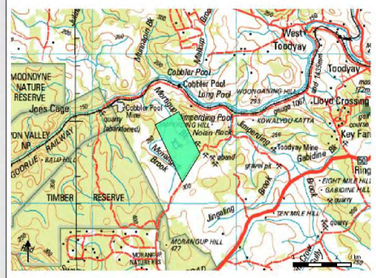
VERY HIGH IMPACT (current-forest areas only)
(Delineated but not demarcated within High Impact areas)
Where the overstorey impact from Phytophthora cinnamomi is greater than 50%, and including areas where post epidemic recovery of overstorey is occurring

DISEASE RISK ROAD

PROJECT BOUNDARY

Map details

Assessment completion	Interpreters	Map produced by	Expires
July 2018	MS	SR	July 2019



Projection - Tranverse Mercator Central Meridian 117E Zone 50
Horizontal datum - GDA 1994

Project name 18-0340-LandInsights-AustralQuarry.qgs

N

1:10,000

Area Statement	
Occurrence Category	Length (m)
Infested	2925
Uninfested	14000
Uninterpretable	3975
Disease Risk Road	3000
Total	23900

GLEVAN CONSULTING

8. Clean-down sites (clean on entry points)

8.1 Clean-down site

Designated clean down points will ensure:

- either that the effluent will fall directly onto infested soil or that effluent is captured i.e. sump, for later transport and disposal.
- Cleaned objects enter uninfested areas without becoming re-infested; and
- Safe entry and departure of vehicles and plant and use by operators.

8.2 Safety

Ensure all safety precautions are taken. Refer to the relevant operating manual for specific safety instructions before cleaning.

- Place the vehicle or machinery in a safe position. It should be stable and immobile.
- Stop the engine, apply the park brake, chock the wheels and lower all implements or secure/chock them if they need to be up for cleaning.
- Ensure the area is free of obstructions and objects that may cause injury.
- Have a qualified operator present if parts of the vehicle or machinery need to be moved during cleaning.
- Move the vehicle or machinery with caution.

8.3 General clean-down guidelines

The following points are general guidelines only:

- Examine the item to determine how much mud, soil and plant material has built up.
- Perform dry brushdown where possible, only perform washdown when necessary i.e. when dry brushdown method will not successfully remove build-up.
- Identify any areas that require special attention (e.g. radiators, spare tyres, behind guards and protective plates). Some of these may be difficult to locate and access. Remove the necessary guards or belly plates to access these areas for cleaning.
- Identify any areas that may be cleaned with compressed air rather than water. Clean these first.
- Check that all areas have been cleaned.

- Replace the guards. (Remember that belly plates and other guards on heavy machinery may need to be replaced before moving the machinery.)
- Move the clean vehicle or machinery carefully, avoiding recontamination. If necessary, wash any remaining mud, soil or plant material from the tyres or tracks.
- Record the details of the cleaning on the appropriate forms or in the vehicle or machinery logbook.
- Present the vehicle or machinery to an inspector if required.

No clean-down guidelines can detail all the parts to check. This is because there are:

- Numerous different models and new models
- Different attachments (e.g. different types of blades on dozers)
- Different modifications, either in the factory or by previous owners
- Varying conditions of the machinery (e.g. rusted parts allowing entry of contaminants into sections that are usually sealed).

Examine the item you are cleaning very carefully for any areas that could be contaminated, even if these areas are not listed in the guidelines, and clean them thoroughly.

9. Bibliography

Department of Parks and Wildlife. (2015). *FEM047 Phytophthora Dieback Interpreter's Manual for lands managed by the department.* Unpublished.

APPENDIX H

Water Management Plan

landinsights
PLANNING DESIGN ENVIRONMENT

"SCHIST PIT" CLAY QUARRY

WATER MANAGEMENT PLAN

LOT 1 MORANGUP ROAD, MORANGUP

PREPARED FOR AUSTRAL BRICKS (WA) PTY LTD

AUGUST 2023

Prepared by:

Land Insights

PO Box 289

Mt Lawley WA 6929

Phone: (08) 9271 8506

Document details:

Document History:

Date	Document Name	Document Manager	Summary of Document Revision	Client Delivered
July-23	935 – Schist Pit Water Management Plan	SR	Initial Draft for client review	July-23
Aug-23	935 – Schist Pit Water Management Plan	SR	Final for submission	Aug-23

Table of Contents

Appendices

1 Introduction

1.1 Background and purpose

This report presents the Water Management Plan for the "Schist Quarry" operated by Austral Bricks (WA) Pty Ltd. The quarry is located at Lot 1 Morangup Road, Morangup. It sets out the drainage management procedures during normal operation and the guidelines in the event of a storm or emergency.

This Water Management Plan is an update to the "Water Management Plan" prepared in 2017 for the operation. An updated report has been prepared for the following reasons:

- To incorporate best practice water management
- To incorporate relevant recommendations from Guidelines and policies prepared since 2017
- To accompany an application for a renewal of the Extractive Industry Licence for the operation.

1.2 Objectives

The objectives of the Water Management Plan are to:

- Ensure that extractive industry activities do not have an adverse impact on significant water resources
- Provide for the management of water within the operation area.

1.3 Location

Lot 1 is situated approximately 80km to the north-east of Perth and approximately 25km to the south-west of Toodyay. It is approximately 5km from the closest rural residential estate (located to the south-west and another to the north of the site). The operation ("the site") is located in the centre of Lot 1.

Plans associated with the operation are provided at Appendix A.

1.4 Context

This Water Management Plan has been prepared in accordance with the following policy documents:

- "State Planning Policy 2.4 – Planning for Basic Raw Materials Guidelines" (WAPC, 2014)
- "State Planning Policy 2.9 – Water Resources (WAPC, 2006)
- "Draft State Planning Policy 2.9 – Planning for Water" (WAPC, 2021)
- "Draft State Planning Policy 2.9 – Planning for Water Guidelines" (WAPC, 2021)
- "Water Quality Protection Note (WQPN) No. 15 – Basic Raw Materials Extraction "(DWER, 2019)

Further information on the above policies is provided in Chapter 3 of this document.

1.5 Operation

The quarry is located in the centre of Lot 1. Excavation has been ongoing over the last 60 years. The current development footprint is known as the "Operation Area" and encompasses the active pit area, stockpiling areas, access tracks, drainage basins and administrative areas. Future stages (labelled as "Stages 1 to 4") have been identified to the south-east of the existing excavation area. In general, the excavation occurs in a south-easterly direction.

Excavation of clay takes place in a sequence of steps which can be broadly broken down into the following:

- Earthworks Campaign (i.e., removal of topsoil and overburden, excavation of clay to stockpile)
- Carting Campaign (transport of clay from the pit or stockpiles to the factories)
- Rehabilitation.

Further information on the excavation process is below.

Earthworks campaign

The "Earthworks Campaign" refers to the excavation and stockpiling of material. During the earthworks campaign, topsoil and overburden is removed and clay is excavated and placed into stockpiles located within the Operation Area.

Earthworks take place as and when required throughout the year but generally during the dry months. The timing of excavation depends on weather conditions, market demand and operational requirements (such as the rate of excavation of other clay quarries). During Excavation Campaigns, excavation will generally take place for six days a week during the approved operation times. Excavation will most likely take place over approximately 16 weeks in total per annum, usually divided into 2 or 3 "campaigns". It should be noted that although excavation is identified to occur anytime throughout the area it should be noted that for large stretches of time there will be no excavation activities on site.

As vehicles usually operate from the pit floor, the walls of the pit also act as a noise and dust barrier for most of the excavation process. The depth of the Schist Quarry is approximately 14 metres. There will be a relatively short period where vehicles are located at the ground level (when clearing vegetation and stripping topsoil and overburden for new stages), however the extensive vegetation surrounding the quarry will provide a further noise and dust barrier. Additional dust management will be in place for the operation as set out in this report.

No processing (crushing, screening etc) will occur on the site. No blasting will be required to facilitate excavation.

Cartage campaigns

The "Cartage Campaign" refers to the removal or transport of clay from the site where it is taken to the Austral Bricks brickmaking factories. Clay resource is currently carted to the Cardup factory and the Bellevue factory.

Loading and carting from the site will largely occur during September to May (i.e. during the drier months) although it can occur anytime throughout the year depending on the need for clay. It is expected that carting will occur over two separate campaigns each year, lasting approximately 3-4 weeks for each campaign.

Carting from the site depends on the market demand for bricks, as well as the types of clay and colour of clay. Therefore, there may be some variation from the truck numbers and the number of days that carting will be required each month (i.e. some months will have more carting days than other months).

The Stockpile Area (and the area where trucks will be loaded with clay) is located within the existing Operation Area. All vehicles and trucks enter the site from the main access at Morangup Road and travel down the haul road to the Operation Area. Having one access into and out of the site helps to reduce impact to surrounding vegetation and is a management technique used to help mitigate potential dust and noise impacts.

Rehabilitation

Rehabilitation of the quarry will involve recontouring the slopes to a safe and stable condition, revegetating with local vegetation and creating dams created from the lowest parts of the landscape.

2 Site description

2.1 Climate

The south-west of Western Australia experiences a Mediterranean climate which is characterised by warm, dry summers and cool, wet winters.

The rainfall and temperature data for the region has been obtained from the Bureau of Meteorology "Climate Data Online" services. The average rainfall from the closest station which is the Toodyay station is 520mm. A majority of rainfall is from May to August.

The mean temperature information is from the closest station which is the Northam station. It states that the hottest month is January with an average maximum of 34.2°C and the coldest month is July with an average minimum of 5.4°C.

The prevailing winds throughout the majority of the year are predominantly from the east in summer months and from the west in winter (Bureau of Meteorology, 2022).

2.2 Topography and landform

The topography of the site is variable and undulating with high points and valleys throughout. slightly undulating with a moderate to steep slope throughout. There is a high point at the north-eastern corner and another at the south-eastern corner at approximately 280 metres AHD (Australian Height Datum). These areas are divided by a watercourse which drains towards the northern end of the lot where it reaches a low point of 195m AHD.

The operation area is located in the centre of Lot 1. The natural topography surrounding the pit is at approximately 245m AHD at the north-eastern corner of the operation to approximately 270m AHD at the southern end. The land generally slopes up to the south, down to the west, east and north.

2.3 Geology

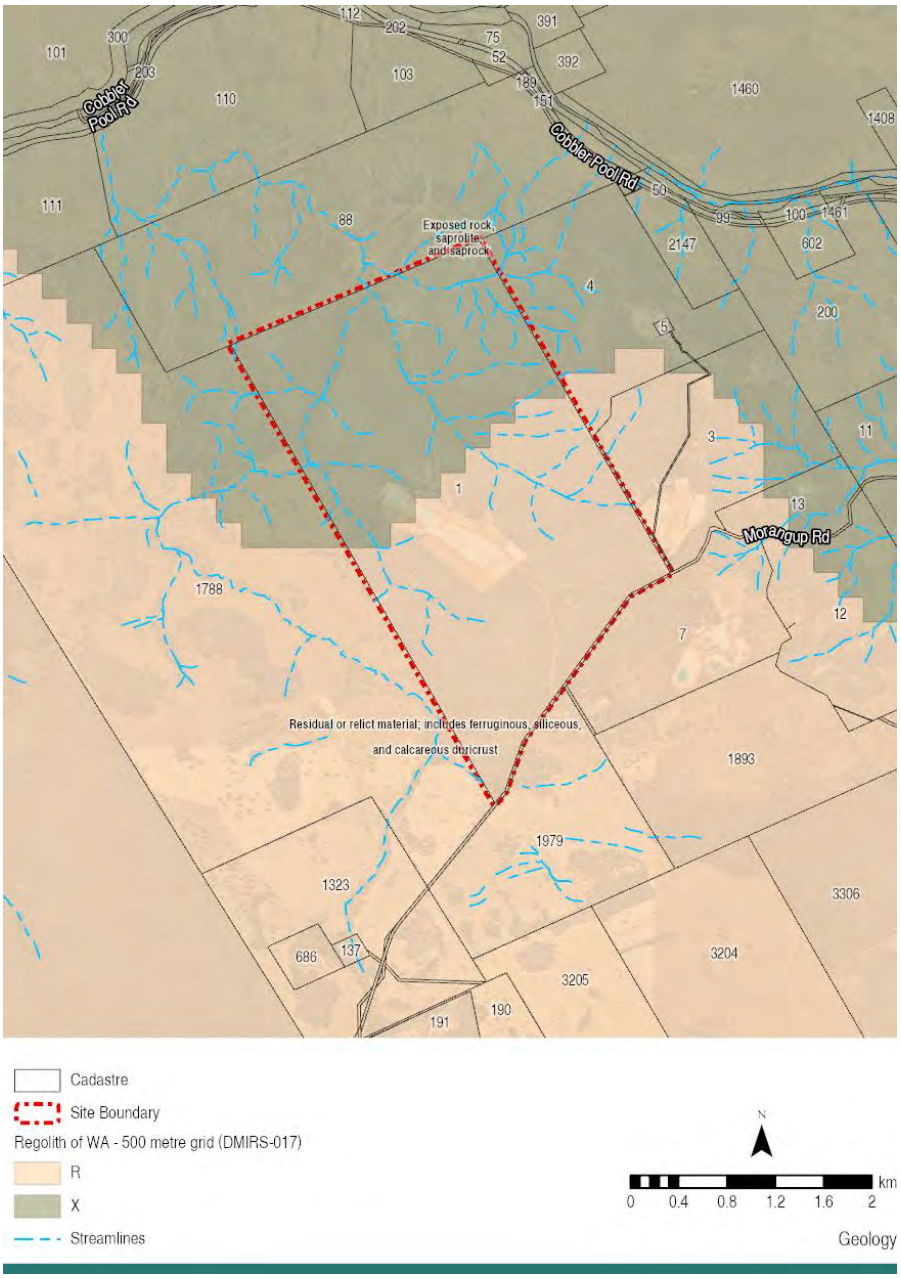
The site sits on the Darling Plateau which lies east of the Swan Coastal Plain and the Darling Scarp. It is characterised by an undulating hilly landscape and lateritic uplands with major valleys along the scarp. The general area is part of the Pre-Cambrian meta sedimentary complex known as the Jimperding Metamorphic Belt. The belt extends 120 kilometers in a north-westerly direction from York to Clackline and onto Chittering where it becomes the Chittering Metamorphic Belt (Stass Environmental, 2015).

The 500 metres grid Regolith of WA as mapped by DPIRD identifies the geology as "residual or relict materials including ferruginous siliceous and calcareous duricrust" across the southern extent of Lot 1 and

"exposed rock, saprolite and saprock" across the northern extent. The geological formation is described as "dissected lateritic terrain with valleys and plateau remnants" and the geology as "deeply weathered mantle over granitic rocks". The Regolith of WA is shown in Figure 1 below.

The 1:500 000 State interpreted bedrock geology as mapped by DMIRS (2022) is "Yilgarn Craton Granites". It is described as "granitic rock, metamorphosed". The Yilgarn Craton Granites are located in a band through the centre of Lot 1 and is associated with the quarry operation.

Figure 1 – Regolith of WA



2.4 Soils

Lot 1 is divided by three different soil-landscape units. Generally speaking, the north-west corner is the "Clackline Steep Rocky Hills" subsystem and "Michibin" subsystem, the centre of the property (including a majority of the operation) is the "Leaver" subsystem, the creeklines are the "Pindalup" subsystem and the southern portion of Lot 1 is the "Yalanbee" subsystem.

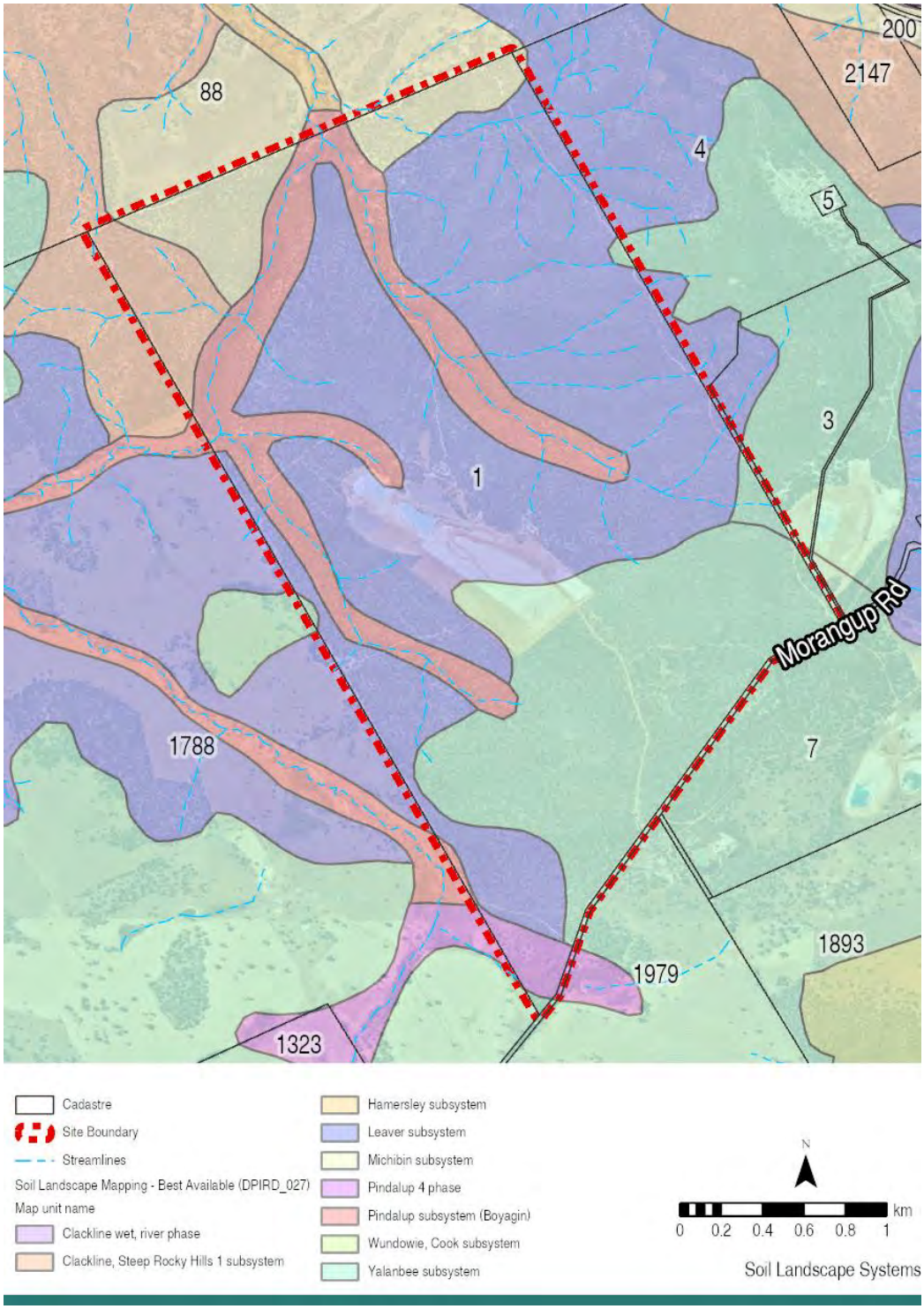
The soil-landscape units mapped across the site are described further in the table below and shown in Figure 2.

Table 4.2 – Soil-Landscape Units

NAME	CODE	DESCRIPTION	LOCATION
Clackline Steep Rocky Hills subsystem	253CcR1	Areas of rock outcrop and steep rocky hills.	Northern portion of Lot 1.
Michibin subsystem	253CcMN	Red and yellowish brown loams and clays, often gravelly with rocky areas and lateritic crests.	Northern portion of Lot 1.
Leaver subsystem	253ByLV	Gravelly yellow and red duplexes, gravelly deep clayey sands and sandy loams over laterite and clay.	Centre of Lot 1, including the operation.
Pindalup subsystem	253ByPN	Alluvial red and yellow duplex and uniform fine soils which are often gravelly.	Associated with the creeklines.
Yalanbee subsystem	253WnYA	Pisolitic gravelly, yellowish brown soils that vary in texture from loamy sands to clays, with pockets of pale sands and areas of outcropping laterite.	Southern end of Lot 1.

Source: DPIRD, 2022

Figure 2 – Soil-landscape Units



Generalised soil qualities of each soil-landscape unit are described in the table below.

Table 4.3 – Soil Qualities

SOIL-LANDSCAPE UNIT	WATER EROSION	WIND EROSION	WATERLOGGING	FLOOD	SALINITY
Clackline Steep Rocky Hills subsystem	Low risk	Moderate risk	Low risk	Low risk	Low risk
Michibin subsystem	Moderate risk	Moderate risk	Low risk	Low risk	Low risk
Leaver subsystem	Low risk	High risk	Low risk	Low risk	Low risk
Pindalup subsystem	High risk	Low risk	High risk	High risk	High risk
Yalanbee subsystem	Low risk	High risk	Low risk	Low risk	Low risk

Source: DPIRD, 2022

Acid sulphate soils

It is not considered that acid sulphate soils are an issue at the site. The acid sulphate soil mapping by DWER does not show a risk across the site. There is no evidence of acid sulphate soils from the groundwater and surface water testing undertaken at the site.

2.5 Water resources

Hydrological mapping

The site sits on the Darling Plateau which lies east of the Swan Coastal Plain and the Darling Scarp. The hydrological zone is the "Eastern Darling Range" which is described as "moderately to strongly dissected lateritic plateau on granite with eastward-flowing streams in broad shallow valleys." This description also accurately describes the landform of Lot 1 which is undulating and dissected by watercourses located in shallow valleys across the site.

The site is located within a "Proclaimed Surface Water Area" under the *Rights in Water and Irrigation (RIWI) Act 1914.* It is not located in a "Proclaimed Groundwater Area" under the RIWI Act 1914.

Hydrological mapping relating to the site (as provided by DWER) are listed below:

- Surface Water Area – "Avon River Catchment"
- Surface Water Subarea – "Avon River Catchment"

- Hydrographic Catchment Basin – “Swan Coastal”
- Hydrographic Catchment - “Swan Avon_Main Avon”
- Hydrographic Subcatchment - “Avon River Catchment”
- Surface Water Management Area – “Avon River Catchment”
- Surface Water Management Subarea - “Avon River catchment”
- Groundwater Area and Sub Area – “Karri”

There are no Public Drinking Water Source Areas (PDWSA’s), wetlands, floodplain areas or Floodplain Development Control Areas located on or surrounding the property.

The site is located on the western edge of the “Avon River Management Area” which is identified under the *Waterways Conservation Act 1976*. The Department currently does not have an active management plan for this area at present.

Surface water features

As can be seen from the above, the operation is located within the surface water catchment for the Avon River. The River is considered to be a significant water resource in the local/surrounding area. A number of watercourses intersect the site which flow towards the Avon River. The watercourse on the eastern side of Lot 1 is a tributary of the Avon River and is known as Mortigup Brook (Level 5). It flows from the eastern boundary in a north-west direction and leaves the site to the north where it continues to the Avon River. Another tributary of the Avon River is located on the western side of the Lot which is known as the Morangup Brook (Level 4 watercourse). It flows across the north-west corner of Lot 1. Another minor watercourse extends along the western boundary of the Lot, to the west of the operation area. A small drainage line flows from the outside of the pit towards this watercourse. The watercourses across the site are shown on the plans at Appendix A.

The operation is considered to be adequately separated from the surrounding watercourses. It is approximately 180 metres from the minor watercourse to the west, approximately 550 metres from Morangup Brook and approximately 440 metres from Mortigup Brook.

Further information on water management is provided in the attached Water Management Plan (Land Insights, 2022). The requirements of DWER’s *Water Quality Protection Note (WQPN) No. 15 – Basic Raw Material Extraction* is addressed in Chapter 5.13 below which provides a risk assessment against the criteria of the WQPN. A risk assessment is also contained in Chapter 3.

There are no wetlands located on the site. There are no wetlands as mapped by the “Directory of Important Wetlands in Australia”. The Avon River located over 1.3km to the north and north-east of the site is mapped by the “Directory of Important Wetlands in Australia”.

Groundwater

The groundwater aquifers in the region are characterised by low permeability, fractured and deeply weathered rocks of metamorphic or granitoid origin with localised shallow aquifers where deeper sequences of sediments have been deposited by recent erosion. Groundwater in the region is inferred to flow to the north-west based on general topography and surface water bodies (DWER, 2019).

The site is located within the hydrological zone of the “Eastern Darling Range”. The groundwater characteristics for this hydrological zone are described as being mainly low-yielding saprolite aquifers with paloeochannels and sandy Eocene aquifers in some valleys. Groundwater discharge may occur in drainage lines and on valley floors in cleared areas and discharge associated with dolerite dykes may occur on mid to upper slopes landscapes.

The site is not located within a “Proclaimed Groundwater Area” under the RIWI Act 1914. The groundwater resources mapped in the area include fractured rock and paleochannel.

No evidence of seepages or water table have been observed in the pit and no groundwater has been encountered during excavations. The water in the drainage basins is captured from surface water runoff.

Salinity

There has been no observable or measurable impacts of the excavation on salinity of surface or groundwater. Water quality results from the drainage basins within the pit area have indicated that salinity levels are below 1,000mg/L which is considered “fresh” water. Salinity results from 2018 were between 200mg/L and 410mg/L and, similarly, total dissolved solids results ranged from 190mg/L to 380mg/L. pH results from 2018 ranged from between 5.5 and 5.7. As can be seen from the above water quality tests, there is no evidence of salinity buildup on the site during the past 60 years of operation.

In some landforms, salinity levels in water runoff can be a cause for concern if there are relatively high salinity levels in the clay being excavated. The resulting farm dam that is constructed from the rehabilitation could then contain saline water and not be useful for agricultural use, or water filtration into the ground could contribute to groundwater salinity. In this case, the water quality results indicate that there is a very low risk that the excavations at the site will contribute to increased salinity in surface or groundwater.

Significant water resources

Policy Measure (i) in State Planning Policy 2.9 (WAPC, 2006) is to "protect significant environmental, recreational and cultural values of water resources". While some tributaries are located on the property, it is considered that the closest 'significant water resources' to the site is the Avon River which is located approximately 3 kilometres to the north of the quarry. The Avon River is also a Registered Aboriginal Heritage Site.

2.6 Vegetation

Existing vegetation

Lot 1 is predominantly covered on remnant vegetation except for the cleared areas associated with the quarry operations, access roads and firebreaks.

A spring *Flora and Vegetation Assessment* was undertaken by Del Botanics in October 2012 of the proposed quarry expansion area. The survey identified three vegetation communities within the survey area:

- "Marri/Jarrah Woodland with a diverse understorey" – Open Forest of *Corymbia calophylla* and *Eucalyptus marginata*, over shrubland of *Banksia sessilis, Banksia armarta* and *Allocasuarina humilis* over herbland of *Hibbertia hypericoides, Gompholobium marginatum* and *Banksia nivea*
- "Powderbark woodland with diverse understorey" – Woodland of *Eucalyptus accedens* over shrubland of *Xanthorrhoea acanthostachya, Melaleuca parviceps, Jacksonia restioides* over herbland of *Hibbertia hypericoides* and *Baekea camphorosmae*
- "Wandoo woodland with diverse understorey" – Woodland of *Eucalyptus wandoo* over shrubland of *Banksia sessilis* and *Leptospermum erubescens*, over herbland of *Banksia nivea, Hibbertia hypericoides* over open grassland of *Neurachne alopecuroidea*

The Flora and Vegetation Assessment (Del Botanics, 2013) rated the vegetation condition within the survey area as "Excellent", "Very Good" and "Good". Tracks located through the survey area were rated as "Completely Degraded".

The Survey recorded four introduced flora species.

The next stage of the pit expansion has already been cleared in accordance with the Clearing Permit issued by DWER. Any further expansion of the pit area will require a new Clearing Permit to be applied for in accordance with the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

In addition to the above flora survey undertaken in 2012, an additional spring flora survey was conducted across two different areas identified for potential offsets in 2013. The results of this survey provide an indication of the types of vegetation found across the remainder of Lot 1. Four vegetation types were identified in the survey and no Threatened or Priority species were observed. The vegetation types included Dampland, Jarrah-Marri woodland, Powderbark woodland and Wandoo woodland.

Environmentally Sensitive Areas

There are no "Environmentally Sensitive Areas" (ESA) located within or directly surrounding the site. Future excavation areas are not located within an ESA.

Threatened Species and Communities

No Threatened Flora, Priority Flora or Threatened Ecological Communities were recorded during the Flora and Vegetation Assessment of the proposed expansion area (Del Botanics, 2013) and the proposed offset areas (Del Botanics, 2014). A threatened Flora Assessment was undertaken by Del Botanics (2013) for *Caladenia huegelii* (Grand Spider Orchid), *Thelymitra stellata* (Star Sun Orchid) and *Thelymitra dedmaniarum* (Cinnamon Sun Orchid). The survey did not record any Threatened Flora species within the survey area.

2.7 Surrounding Land Uses

Surrounding land uses comprise other extractive industry and rural land uses. Directly to the south and east are two other clay quarries. A hard rock quarry is located to the north.

The site is approximately 5km to the north-east of the closest rural residential area and approximately 13 to the west of the Toodyay townsite. It is approximately 1.4km from the closest rural dwelling.

2.8 Separation Distances

The following sensitive receptors have been identified surrounding the site:

- Neighbouring rural property to the west – Approximately 1.4km from the operation (865 Morangup Road, Morangup)
- Neighbouring rural property to the south – Approximately 1.6km from the operation (1012 Morangup Road, Morangup)
- Rural properties to the east – Closest is approximately 3km from the operation (575 Lovers Lane, Morangup)
- Rural properties to the north – Closest is approximately 3.3km from the operation (535 Cobbler Pool Road, Morangup).

The EPA's *Guidance Statement No. 3 – Separation Distances between Industrial and Sensitive Land Uses* provides a guideline on the separation distances and buffers for a range of industrial land uses to sensitive land uses (such as residential dwellings). It should be noted that the distances in the policy

assume the land use is not managed and, should best practice environmental management take place, these distances can be reduced.

The operations on site fit into the category “clay extraction or processing”. The potential impacts are listed as “noise” and “dust”. The separation distance is “500-1000 metres, depending on size and processing”, however this can be less with appropriate environmental management.

As can be seen from the above list, the clay operations far exceed the recommended separation distance. All surrounding sensitive land uses are over 1000 metres from the operations.

2.9 Heritage

Aboriginal Heritage

A search of the Aboriginal Heritage Database indicated that there is one Registered Heritage Sites located on the site. This site is the “Avon River” (ID 15979) and is mapped across the Morangup Brook (which is located across the north-western corner of Lot 1). The heritage site is located at least 550 metres from the operation and will not be directly disturbed by the excavation. Water management on site will protect the watercourse and heritage site from indirect impact. There are no Other Heritage Sites located on or directly surrounding the operation.

Heritage Sites

No heritage sites as identified by the Heritage Council (State Heritage Office) are located on or adjoining the property.

3 Water Quality

3.1 Introduction

Water quality tests have been undertaken on the water contained within the detention basins on a number of occasions. This chapter provides an analysis and review on the water quality test results.

It should be noted that all of the below results have previously been provided to the Shire, including a more detailed review and analysis of the results. The below is a summary of the results and the discussion.

3.2 Water quality results

A summary of the water quality test results is provided in the table below. The following analytes have been tested for on different occasions:

- Total Nitrogen (TN)
- Total Phosphorus (TP)
- pH
- Total suspended solids (TSS)
- Turbidity
- Total dissolved solids (TDS)
- Electrical conductivity (EC)
- Salinity
- Colour
- Biological oxygen demand (BOD).

Table 3.1 – Water Quality Test Results

YEAR	TN	TP	pH	TSS	TURBIDITY	TDS	EC	SALINITY	COLOUR	BOD
Units	*mg/L*	*mg/L*	*N/A*	*mg/L*	*NTU*	*mg/L*	*µS/cm*	*mg/L*	*TCU*	*mg/L*
2014	0.5	<0.05	6.3	<5	2.7		470		<3	
	0.3	<0.05	5.8	9	10		910		<3	
2017	0.4	0.06	5.95	<5	1.2					2.0
	0.5	0.03	5.75	<5	0.9					2.0

YEAR	TN	TP	pH	TSS	TURBIDITY	TDS	EC	SALINITY	COLOUR	BOD
Aug 2018	0.5	<0.05	5.4	65	100	390	640	410	<5	<5
	0.5	<0.05	5.6	64	110	400	670	430	<5	<5
Oct 2018	0.5	<0.05	5.6	27	29	380	630	410	<5	<5
	0.4	<0.05	5.7	29	26	380	640	410	<5	<5
	0.3	<0.05	5.5	<5	1.3	190	320	200	<5	<5

TCU – True Colour Units

HU – Hazen Units (1 TCU = 1 HU)

NTU – Nephelometric Turbidity Units

3.3 Water quality discussion

The test results above indicate that in general the quality of the water within the basins is good and meets a majority of water quality criteria from the Australian and New Zealand Environment and Conservation Council (ANZECC) Guidelines. A brief comment on each analyte is provided below, as well how these results relate to the water management of the operation.

Nutrients

Nutrient results of TN and TP show low levels of nutrients in the water basins. This is most likely reflective of the vegetative nature of the surrounding area.

pH

The pH of the water is relatively consistent and all results have been above 5, indicating that the water is not acidic and is closer to a neutral pH.

Total suspended solids and turbidity

TSS and turbidity measure the level of particles in the water such as soil (clay and silt), bacteria, organic material etc. This analyte is typically of most interest for an extractive industry operation due to the nature of the operation. Mechanical movement of soil and water runoff from disturbed areas will usually result in elevated levels of TSS/turbidity in the water and is one of the main reasons why water from the operation is retained on site and not permitted to flow outside of the operation.

As is expected, the TSS and turbidity results are occasionally above the ANZECC trigger levels of upland and lowland rivers in south-west Western Australia (10-20NTU), however they have only been exceeded in the testing undertaken in 2018. An explanation for the higher TSS and turbidity levels in 2018 was due to the higher than average rainfall received that winter.

Salinity, electrical conductivity and total dissolved solids

Salinity levels of all water test results have consistently been below 1000mg/L, suggesting that the water in the basins is fresh and not saline. Less than 1000 mg/L is considered fresh drinking water and 600 mg/L is the National Health and Medical Research Council guidelines for TDS (NHMRC, 2011), and therefore it can reasonably be concluded that the salinity levels for all samples is well below the guidelines for fresh drinking water.

Conclusion

As can be seen from the above, the water quality within the basins is generally considered good quality and within expected ranges. As a result, the current water management on site is considered to be satisfactory and it is recommended that current management continues. 0

4 Policy Context

4.1 State Planning Policy 2.9 – Water Resources

"State Planning Policy 2.9 – Water Resources" was prepared by the WAPC in 2006. The objectives of the Policy are to:

- "protect, conserve and enhance water resources that are identified as having significant economic, social, cultural and/or environmental values.
- assist in ensuring the availability of suitable water resources to maintain essential requirements for human and all other biological life with attention to maintaining or improving the quality and quantity of water resources.
- promote and assist in the management and sustainable use of water resources."

The Policy provides a range of "Policy Measures" to guide and assist decision-makers in the consideration of water resources in decision-making. Policy Measures are provided for surface water, groundwater, wetlands, waterways, estuaries and total water cycle management.

In general, SPP 2.9 provides for a response to the potential impact of development on water resources that is proportionate to the significance of the water resource concerned with a particular focus on those resources considered 'significant'. For example, Policy Measure (i) is to "protect significant environmental, recreational and cultural values of water resources". In addition, the language throughout the Policy is aspirational with a focus on aiming to prevent or ameliorate impact where appropriate.

The Policy makes specific reference to decision-making and advises that "where there is demonstratable adverse and unacceptable impact on the quality and quantity of significant water resources, planning decisions-makers should ensure that planning proposals and applications either do not proceed or are modified so that significant water resources are protected, conserved and enhanced". In accordance with the general goals and aims of this Policy, it is important that significant water resources and potential threats of are identified.

Policy Measures of relevance to this application are addressed in Table 3.1 below. It should be noted that the Policy Measures relate to all forms of development including building and construction, therefore only those of most relevance to this particular land use are addressed below.

Table 3.1 – Relevant Policy Measures from SPP 2.9

POLICY MEASURE	COMMENT
General Measures	
Protect significant environmental, recreational and cultural values of water resources.	Significant water resources in close proximity to the site is the Avon River located approximately 3 kilometres to the north of the site. The Avon River is also a Registered Aboriginal Heritage Site.

Aim to prevent or, where appropriate, ameliorate the following potential impacts: • *any adverse effects on water quality and quantity and, as a minimum, proposed development should aim to maintain water quality and ensure water quantity is compatible with the receiving waters;*	All stormwater runoff will be retained in the detention ponds located within the operation area and will not intersect the groundwater. As a result, there will be no adverse effects on water quality of water resources. While a detailed water balance model has not been undertaken, it is reasonable to conclude that as native vegetation has been removed to facilitate operation and these plants would have originally removed water from the catchment, that there is likely to not be a significant difference is water quantity of the surface water catchment as a result of the water retention on site.
• *increased nutrient loads into receiving waters;*	Extractive industry does not contribute to nutrient levels.
• *increased acidity and leaching of acid sulfate soils;*	As is stated above, there is a low risk of acid sulphate soils occurring within the operation.
• *the removal of associated native vegetation important for long-term management of the water resource, particularly vegetation associated with wetlands and waterways respectively;*	There are no wetlands within or surrounding the operation and the operation does not intersect any watercourses. Therefore, no vegetation associated with wetlands or watercourses will be cleared.
• *increased erosion, sedimentation and turbidity, particularly at the construction phase of development;*	All stormwater runoff will be retained in the detention ponds located within the operation area. As a result, there will be no adverse effects on water quality of water resources.
• *any potential adverse effects on environmental water requirements and, as a minimum, proposed development should aim to maintain natural flow regimes and variability;*	While a detailed water balance model has not been undertaken, it is reasonable to conclude that as native vegetation has been removed to facilitate operation and these plants would have originally removed water from the catchment, that there is likely to not be a significant difference is water quantity of the surface water catchment as a result of the water retention on site.
• *excessive build-up of organic matter;*	There will be no build up of organic matter from the operation.
• *pollution and contamination;*	All stormwater runoff will be retained in the detention ponds located within the operation area. As a result, there will be no adverse effects on water quality of water resources.
• *salinity over and above the natural levels; and*	There have been no observable or measurable impacts of the excavation on salinity of surface or groundwater from water quality testing.

POLICY MEASURE	COMMENT
• *any potential cumulative impacts.*	All stormwater runoff will be retained in the detention ponds located within the operation area to minimise and avoid impacts to water resources. This contributes to the reduction in cumulative impacts.
Surface and Groundwater Resources	
Recognise the hydrological importance of groundwater and surface catchments with regards to water management and the associated value of catchment planning on a regional, district and local scale.	The operation is located within the Avon River surface water catchment area. The risk assessment in this report has been undertaken against WQPN 15.
Protect, manage, conserve and enhance surface and groundwater catchments and recharge areas supporting significant ecological features or having identified environmental values, by ensuring, where possible, appropriate management or limiting inappropriate land use/s to maintain water quality and quantity for existing and future environmental and human uses.	As is stated above, the Avon River is the significant water feature in the local area. Water management as set out in this management plan provides for the protection of this feature.
Ensure the availability of water resources is compatible with the future requirements of the proposed and surrounding land use through an assessment of quantity and quality requirements for both the development and the environment.	The operation is well separated from the closest sensitive residences and other land uses which may utilise water (such as rural properties). While a detailed water balance model has not been undertaken, it is reasonable to conclude that as native vegetation has been removed to facilitate operation and these plants would have originally removed water from the catchment, that there is likely to not be a significant difference is water quantity of the surface water catchment as a result of the water retention on site. There have been no queries or complaints in relation to the availability of surface or groundwater resources since the operation commenced over 60 years who, therefore it can reasonably be concluded that the operation does not significantly impact on the availability of water resources.
Take into account the potential adverse impacts that development may have on catchment areas and encourage development to participate in catchment management activities.	The risk of impact has been considered in this management plan. Appropriate management actions are also provided.
Wetlands, Waterways and Estuaries	
Protect, manage, conserve and enhance the environmental functions and values of waterways and estuaries. The natural alignment of waterways should be retained except where adjustments are unavoidable and do not compromise the natural environmental values.	The operation does not intercept any existing watercourses. The protection of watercourses is provided for in this management plan by the retention of stormwater runoff within the operation.
Ensure adequate and appropriate buffering of wetlands, waterways and estuaries to maintain or enhance the environmental attributes, functions and values of the water resource and minimise the impact of nearby land uses, both existing and future.	The operation is considered to be adequately separated from the nearest watercourses.

4.2 Draft State Planning Policy 2.9 – Planning for Water

The "Draft State Planning Policy 2.9 – Planning for Water" was prepared by the WAPC in 2021. The intent of the Policy is "ensure that planning and development considers water resource management and includes appropriate water management measures to achieve optimal water resource outcomes". It provides guidance for the consideration of water resources for planning applications and decision-makers. The Policy Measures include consideration of environmental values, social and cultural values, riverine flooding, infrastructure and supply.

It should be noted that no "important environments" (including "Sensitive Water Resource Areas") are mapped within or directly surrounding the operation. The closest Sensitive Water Resource mapped near the site is the Avon River. The operation is approximately 2km from this area.

4.3 Draft State Planning Policy 2.9 – Planning for Water Guidelines

The "Draft State Planning Policy 2.9 – Planning for Water Guidelines" were prepared by the WAPC in 2021. The draft Guidelines provide support for decision-makers, planners, proponents and referral agencies in the following:

1. "Determining appropriate land use planning practices in relation to water resources across Western Australia
2. Specifying the requirements to be met at each stage of the planning process
3. Ensuring that necessary water resource management measures are incorporated into land development."

It should be noted however that a majority of the Guidelines apply to land development (residential, rural residential, industrial etc) and intensification of land use, and does not specifically include recommendations for extraction of basic raw materials. More relevant information relating to extraction of basic raw materials is provided in WQPN No. 15.

The most relevant parts of the Guidelines to this site are Chapter 5 (which provides information relating to the purpose and content of a water management report). Chapter 5 states that "The information contained within a WMP should demonstrate achievement of the SPP 2.9 outcomes" which are addressed above.

4.4 Water Quality Protection Note 15 – Basic Raw Materials Extraction

"Water Quality Protection Note No 15 – Basic Raw Materials Extraction" was prepared by DWER in 2019. The Note applies to extraction of basic raw materials and associated processing activities (stockpiling, crushing, screening etc.) It provides a comprehensive list of recommendations for a variety of situations and scenarios where protection of water resources needs to be considered for extractive industry.

The recommendations from the WQPN have been incorporated into this management plan.

The guidelines and recommendations from WQPN No. 15 are addressed in the Table below. A risk assessment for the clay extraction operation has been undertaken using the water management considerations from WQPN No. 15 (DWER, 2019) and based on the likelihood, consequence and risk criteria provided in “Guidance Statement: Risk Assessments” (DWER, 2017).

The purpose of the risk assessment is to provide a clear link between the WQPN Policy considerations and the management controls. It also demonstrates the effectiveness of the management controls by providing an assessment of risks using the DWER Guidance Statement. It should be noted that some considerations from the WQPN (such as dust, site rehabilitation, refuelling etc.) are addressed in their own separate management plans. The considerations that are identified as being relevant to the site (such as management of surface water, stormwater runoff etc.) are considered further in the management section.

Table 3.2 – WQPN No. 15 Risk Assessment

WQPN 15 CONSIDERATIONS	WQPN 15 POLICY RECOMMENDATION	POTENTIAL IMPACT	CONTEXT	PROPOSED CONTROL	RESIDUAL RISK		
					L	C	Risk
Public drinking water source areas.	The Policy makes recommendations if an operation is proposed within a public drinking water source area.	No PDWSAs are mapped across the site.	Not applicable – The site is not located within a public drinking water source area.	N/A	N/A		
Clearing control catchments (Country Areas Water Supply Act 1947).	BRM activities within clearing control catchments need to be assessed for potential salinity impacts.	No further clearing of remnant vegetation is proposed. Future clearing is likely to only be required for clearing of regrowth growing within the operation area is proposed.	Not applicable – the site is not located within a Clearing Control Catchment area.	N/A	N/A		
Near waterways.	The Policy states that extraction should be above the 1 in 100 flood level, outside of areas subject to waterlogging or flooding and to have adequate buffers to waterways.	There is not considered to be any impact to areas prone to flooding or waterlogging. Inadequate separation distances to watercourses can potentially have impact on water quality (turbidity, salinity etc).	The site is not located within areas subject to waterlogging or flooding. The site is approximately 180 metres from the watercourse to the west and approximately 440 metres from the watercourse to the east.	Actions 1, 2 and 3	Rare	Minor	Low
BRM extraction within waterways (in-stream mining).	The Policy provides recommendations for BRM operations which extract from riverbeds or from pits in floodplains.	N/A	Not applicable – in-stream mining or extraction in waterways is not proposed.	N/A	N/A		

WQPN 15 CONSIDERATIONS	WQPN 15 POLICY RECOMMENDATION	POTENTIAL IMPACT	CONTEXT	PROPOSED CONTROL	RESIDUAL RISK		
					L	C	Risk
Wetlands.	The Policy recommends contacting DBCA to discuss wetlands.	N/A	There are no wetlands located on the site.	N/A	N/A		
Groundwater.	Assessment of groundwater requires consideration of acid sulphate soils and the maintenance of a vertical separation to the groundwater table.	Potential impact to groundwater quality (such as salinity, hydrocarbons).	Extraction will be least 2m above the watertable at all times. No dewatering of groundwater will be required.	Actions 4 and 5	Unlikely	Slight	Low
Landscape.	The Policy recommends that land selected should be gently sloping (between 1 in 20 and 1 in 50) so runoff and wastes can be more easily managed, but erosion is avoided. It also recommends that rocky and steep slopes, and land prone to erosion should be avoided.	Potential for exacerbated erosion which can also potentially lead to turbidity in surface water features.	The existing pit is still being excavated and the expansion areas are located on sloping land. Water management ensures that all runoff is retained on site and not permitted to flow outside the excavation area. Wind erosion risk will be low for the pit area as the clay soils form a crust when dry and stick together when wet. The final landform will be recontoured to safe and stable slopes following decommissioning.	Action 16	Unlikely	Minor	Med

WQPN 15 CONSIDERATIONS	WQPN 15 POLICY RECOMMENDATION	POTENTIAL IMPACT	CONTEXT	PROPOSED CONTROL	RESIDUAL RISK		
					L	C	Risk
Other land uses.	This aspect relates to separation distances to sensitive land uses and the avoidance of infrastructure.	N/A	No permanent infrastructure is located on site. The closest sensitive land uses are well over 1000 metres from the operation area (the closest is 1,400 metres away).	N/A	N/A		
Construction.	The Policy recommends that existing tracks and roads should be used where possible, that any waterway crossings are constructed appropriately and that access should be designed to have the least impact on surface water features and vegetation.	N/A	No waterway crossings are proposed.	N/A	N/A		
Solid waste.	The Policy makes reference to the requirements of the *Environmental Protection (Unauthorised Discharges) Regulations 2004*.	Inadequate control of waste on site can have detrimental impact on surface water and their environs.	Austral Bricks stores and appropriately disposes of wastes from the site in accordance with the Waste Management Plan.	Refer to Waste Management Plan (Land Insights, 2023)	Rare	Slight	Low

WQPN 15 CONSIDERATIONS	WQPN 15 POLICY RECOMMENDATION	POTENTIAL IMPACT	CONTEXT	PROPOSED CONTROL	RESIDUAL RISK		
					L	C	Risk
Water supply.	The Policy refers to the need for a licence under the *Rights in Water and Irrigation Act 1914* to construct a bore, and abstract groundwater or surface water in a Proclaimed Surface or Groundwater Area. It also makes recommendations regarding water supply.	N/A	The site is not located within a Proclaimed Groundwater Area, however it is located within a Proclaimed Surface Water Area. There is no need for abstraction groundwater for the operation. Water to be used for the operation (dust suppression etc) is captured within the onsite dams.	N/A	N/A		
Wastewater.	The Policy makes recommendations relating to wastewater treatment and management.	Potential impact largely relates to pathogens and nutrients on water supplies.	Portable toilets will be managed in accordance with the manufacture's specifications. There will be no discharge to the environment.	Refer to Waste Management Plan (Land Insights, 2023)	Rare	Slight	Low
Stormwater.	This aspect of the Policy aims to ensure that stormwater from the operational areas is retained on site. It also recommends that ponds are used to manage turbidity (i.e. settling ponds) and that they are designed to handle up to a 2 hour, 1 in 10 (10 per cent) annual exceedance probability event.	Potential impact of stormwater runoff relates to impacts on surface water quality (e.g. turbidity, salinity etc) and impacts on hydrological regimes (such as surface water quantity, flow rates, groundwater recharge etc).	All stormwater is retained onsite and is diverted to the detention basins.	Actions 1, 2, 3 and 6	Rare	Slight	Low

WQPN 15 CONSIDERATIONS	WQPN 15 POLICY RECOMMENDATION	POTENTIAL IMPACT	CONTEXT	PROPOSED CONTROL	RESIDUAL RISK		
					L	C	Risk
Dust	The Policy refers to the obligations of a proponent under the EP Act 1984 and mentions the DWER *A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities* (2011).	Potential impact to water quantity if bore or surface water is required for dust suppression.	Dust is managed on site in accordance with the Dust Management Plan (Land Insights, 2023).	Refer to Dust Management Plan (Land Insights, 2023).	Rare	Slight	Low
Toxic and hazardous substances.	The Policy makes recommendations for the storage and handling of chemicals, pesticides and fuel.	Potential for impact from hydrocarbons.	Refuelling is managed in accordance with the Refuelling Management Plan (Land Insights, 2023).	Refer to the Refuelling Management Plan (Land Insights, 2023).	Rare	Slight	Low
Vehicles.	This aspect relates to the cleaning and maintenance of vehicles.	Potential for impact from hydrocarbons and chemicals.	Cleaning and maintenance of vehicles is in accordance with the Refuelling Management Plan (Land Insights, 2023).	Refer to Refuelling Management Plan (Land Insights, 2023).	Rare	Slight	Low
Accidents and emergency response.	The Policy makes recommendations about spills and the need for a contingency plan.	Potential impact from hydrocarbons and chemicals.	No chemicals are used in the clay extraction operation and Austral Bricks operates within a Refuelling Management Plan (Land Insights, 2023) for the site which includes procedures for spills.	Refer to Refuelling Management Plan (Land Insights, 2023).	Rare	Slight	Low

WQPN 15 CONSIDERATIONS	WQPN 15 POLICY RECOMMENDATION	POTENTIAL IMPACT	CONTEXT	PROPOSED CONTROL	RESIDUAL RISK		
					L	C	Risk
Monitoring.	The Policy recommends that monitoring occurs as appropriate for the site (i.e. monitoring of surface water if required etc.)	Potential for impact if there are issues which go unnoticed.	The Water Management Plan (Land Insights, 2023) includes actions relating to monitoring of water in the basins.	Actions 7 and 8	N/A		
Closure, rehabilitation and subsequent land uses.	This section of the Policy makes recommendations with regards to mine closure plans and the consideration of the end use of a site.	Potential for impact to water sources if the site is not properly rehabilitated, such as erosion and turbidity.	Closure, decommissioning and site rehabilitation is provided in the Rehabilitation Management Plan (Land Insights, 2023).	Refer to Rehabilitation Management Plan (Land Insights, 2023).	Rare	Slight	Low

5 Risk Assessment

5.1 Introduction

A risk assessment for the Schist Quarry is presented in this chapter. It considers the risks to water quality and the potential impact to water sources off-site. The assessment has considered in detail the potential hazards, the risk factors and the proposed controls in accordance with WQPN No. 15. Relevant guidance is also taken from WQPN No. 77 (DWER, 2022) which provides guidance on risk assessments for the consideration of development in PDWSAs. Although the site is not located with a PDWSA, the description of potential hazards and impacts are also applied to this site (where relevant).

The criteria used for the determination of 'likelihood', 'consequence' and 'risks' is from "Guidance Statement: Risk Assessments" (DWER, 2017). A copy of the criteria has been provided in Tables 4.4, 4.5 and 4.6 below.

The purpose of the risk assessment is to demonstrate that risk identified as "medium", "high" or "extreme" can be effectively managed.

5.2 Water Management Risk Assessment

Table 5.1 below presents the risk assessment against the relevant considerations from WQPN No. 15. It lists the potential hazard, the inherent risk (i.e. with no controls) and the residual risk (with management controls in place).

Table 5.1 – Water risk assessment

POTENTIAL IMPACT WITHOUT MANAGEMENT	CIRCUMSTANCES OR EVENT	CONSIDERATION FOR LIKELIHOOD (WITHOUT MANAGEMENT)	LIKELIHOOD	CONSEQUENCE	MAXIMUM RISK	PROPOSED CONTROL	EFFECTIVENESS	RESIDUAL LIKELIHOOD	RESIDUAL RISK
Surface water source									
Salinity Increase in surface water salinity levels due to the extraction of clay soils with a high salt content ("liberation" of salt from the soil) which has the potential to runoff into the surface water.	Water runoff.	Unknown frequency but potential with rainfall events.	Unlikely	Slight	Low	Water runoff will be retained within the operation area. Clay and water testing will continue to take place. Clay which exceeds desired salinity levels is not excavated.	Adequate	Rare	Low
Turbidity Increase in turbidity levels due to water runoff from the disturbed/operational areas.	Water runoff	Unknown frequency but potential with rainfall events.	Possible	Minor	Medium	Water runoff will be retained within the operation area.	Adequate	Rare	Low
Pathogens Wastewater and pathogens entering water sources.	Ablution facility leak	Unknown frequency	Unlikely	Slight	Low	Ablution facilities will be maintained and managed in accordance with the manufacturer's specifications. There will be no intentional wastewater runoff.	Adequate	Rare	Low
Changes to hydrological regimes such as water runoff from the surface water catchment.	Intersection of water features and capturing water from surface water catchment.	The extraction area captures a portion of the surface water from the catchment area.	Possible	Minor	Medium	Ensure the operation area doesn't expand outside of the approved area.	Adequate	Unlikely	Medium

POTENTIAL IMPACT WITHOUT MANAGEMENT	CIRCUMSTANCES OR EVENT	CONSIDERATION FOR LIKELIHOOD (WITHOUT MANAGEMENT)	LIKELIHOOD	CONSEQUENCE	MAXIMUM RISK	PROPOSED CONTROL	EFFECTIVENESS	RESIDUAL LIKELIHOOD	RESIDUAL RISK
Direct disturbance and modification to surface water features.	Physical disturbance	Not likely as no surface water features within the operation area.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Groundwater source									
Hydrocarbons Hydrocarbons from fuel spills and leaks from refuelling entering water sources.	Fuel spill or leak	Only during excavation and carting times.	Possible	Minor	Medium	Refer to the Refuelling Management Plan. No fuels and oils are stored on site.	Adequate	Rare	Low
Salinity Increase in groundwater salinity levels due to the extraction of clay soils with a high salt content ("liberation" of salt from the soil) which has the potential to infiltrate into permeate into groundwater.	Infiltration into the groundwater.	Unknown frequency.	Unlikely	Minor	Medium	Salinity levels in the water retained on site is considered 'fresh'. The clay on the base of the operation area provides an impermeable barrier. Clay and water testing will continue to take place. Clay which exceeds desired salinity levels is not excavated.	Adequate	Rare	Low
Interception of groundwater which can lead to contamination.	If excavation digs to the groundwater table.	Unknown frequency	Unlikely	Minor	Medium	The operation lies above the groundwater table and does not intersect or impact on groundwater. There will be no pumping, dewatering, changes to recharge or alterations to flow as a result of the operation.	Adequate	Rare	Low

Table 5.2 – Likelihood Criteria

Almost certain	Likely	Possible	Unlikely	Rare
The risk event is expected to occur in most circumstances.	The risk event will probably occur in most circumstances.	The risk event could occur at some time.	The risk event will probably not occur in most circumstances.	The risk event may only occur in exceptional circumstances.

Source: DWER 2017

Table 5.3 – Consequence Criteria

	Slight	Minor	Moderate	Major	Severe
Environment	• On-site impact: minimal (No discernible adverse impact). • Off-site impacts local scale: minimal • Off-site impacts wider scale: not detectable	• On-site impacts: low level (discernible effect on the environment but no adverse impact) • Off-site impacts local scale: minimal • Off-site impacts wider scale: not detectable • Minor number of individuals of species may be affected locally.	• On-site impacts: mid level (Minor adverse affect to the environment) • Off-site impacts local scale: low level • Off-site impacts wider scale: minimal • Moderate loss of individuals of species locally.	• On-site impacts: high level (moderate impact to the environment) • Off-site impacts local scale: mid level • Off-site impacts wider scale: low level • Short term impact to an area of high conservation value or special significance^ • Moderate damage to ecosystem function and major loss of individuals of species locally.	• On-site impacts: catastrophic (significant impact to the environment) • Off-site impacts local scale: high level or above • Off-site impacts wider scale: mid level or above • Mid to long term or permanent impact to an area of high conservation value or special significance^ • Significant long-term damage/loss of ecosystem function and loss of individuals of species locally.

Source: DWER 2017

^ Determination of areas of high conservation value or special significance should be informed by the Guidance Statement: Environmental Siting.

* 'onsite' means within the Lot boundary.

Table 5.4 – Risk Matrix Ratings

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

Source: DWER 2017

6 Water and Drainage Management

6.1 Introduction

This chapter sets out the various drainage control and water management actions implemented at the Schist quarry. The purpose of this chapter is to describe actions which can be efficiently and effectively understood and actioned by Austral Brick staff and contractors.

6.2 Site location and separation distances

While there are some watercourses across Lot 1, the closest significant water resource is the Avon River which is approximately 3km from the quarry. Other watercourses and the separation distances from the quarry are listed below:

- Morangup Brook – 550 metres
- Mortigup Brook – 440 metres
- Minor watercourse to the west – 180 meters

Some minor drainage lines are located around the operation area which direct water along slopes to these watercourses. While some drain from near the perimeter of the operation, they are not intercepted by the operation and no water flows from the operation into them. Schedule 2 of the SPP 2.9 provides guidance for the determination of appropriate waterway buffers. It states that existing mechanisms for identifying foreshore management and protection areas is generally based on a setback of 30 metres for waterways. It is considered that the quarry is sufficiently separated from the closest watercourses, particular as the entire separation distance is heavily vegetated.

6.3 Surface water runoff

All stormwater drainage will be contained within the operation area and is not permitted to flow into surrounding vegetation or watercourses. Rainwater which falls into the operation will be directed into existing pit areas and drainage basins. This method is consistent with the recommendations from *Water Quality Protection Note No. 15.*

Water detention basins already exist within the pit area to capture water runoff. These are created from previously extracted areas. As extraction progresses the old pit areas are used as water detention basins before they are recontoured and rehabilitated. It is important to note that as the operation needs to ensure that it has the capacity to retain water on site that large portions of the existing operation are still required for drainage purposes before

Overburden excavated from the pit is used to create bunds around the pit area. These serve to prevent runoff from leaving the excavation area. Bunding is constructed to direct water into the drainage basins. Water which lands within the excavation area flows down the batter slopes and is directed to the detention

ponds at the lowest part of the pit. This ensures that rainwater which falls within the operation area is not permitted to flow into surrounding vegetation and the surrounding watercourse.

The plan at Appendix A shows the site contours and the direction of water flow within and surrounding the operation.

6.4 Monitoring

Water quality will continue to be tested annually from the dams located within the operation area. This will test for salinity, pH, nutrients and turbidity.

6.5 Refuelling

The operation operates in accordance with a Refuelling Management Plan (Land Insights, 2023) for the operation. The objective of the plan is to minimise risk to surface water and groundwater from fuel spills and leaks.

6.6 Management of waste

The operation operates in accordance with a Waste Management Plan (Land Insights, 2023) for the operation. The objective of this plan is to provide actions to manage and dispose of waste appropriately.

6.7 Water Management Plan

The water management actions, responsibilities and timing are presented in Table 5.1 below.

Table 5.1 – Water management plan

MANAGEMENT/ACTION	RESPONSIBILITY	TIMING
1. Ensure run-off from operational areas is contained within the operation area through the placement of bunds and diversion drains.	Quarry Manager, Team	Ongoing
2. Clay stockpiles will be located within the operation area and water from this area will also be diverted to the drainage basins.	Quarry Manager, Team	Ongoing
3. Maintain current separation distances to nearest surface water features.	Quarry Manager	Ongoing
4. Ensure groundwater table is not intercepted throughout excavation.	Quarry Manager	Ongoing
5. Maintain the excavation surface at least 2 metres above the groundwater table.	Quarry Manager	Ongoing
6. Ensure that there is capacity in the detention basins for high rainfall events.	Quarry Manager	Ongoing

	MANAGEMENT/ACTION	RESPONSIBILITY	TIMING
7.	Test the water quality of the basins on an annual basis.	Quarry Manager, Environmental Manager	Annually
8.	Test the salt content and pH of clay as part of Austral Brick's quality assurance standard procedures.	Raw Materials Manager, Quarry Manager	Ongoing
9.	Ensure that if any basin is reaching capacity that water quality tests are undertaken prior to any discharge occurring.	Quarry Manager	If required
10.	Comply with the Refuelling Management Plan.	Quarry Manager, Team	Ongoing
11.	Comply with the Waste Management Plan.	Quarry Manager, Team	Ongoing
12.	Ensure site workers and contractors have access to a portable toilet.	Quarry Manager	If required.
13.	Continue training programmes on water management requirements to all workers and contractors.	Quarry Manager, Environmental Manager, Team	Ongoing
14.	Any significant adverse water management issues to be recorded, investigated and remediated internally.	Quarry Manager, Environmental Manager, Team	Ongoing
15.	Water retained on site can be used for dust suppression if required.	Quarry Manager, Team	Ongoing
16.	Rehabilitate the site in accordance with the Rehabilitation and Decommissioning Management Plan.	Quarry Manager, Environmental Manger, Team	When required.

7 References

ANZECC, (2000), Australian and New Zealand Guidelines for Fresh and Marine Water Quality, ANZECC, Canberra, ACT.

Bureau of Meteorology (2022), Climate Data Online, Accessed from http://www.bom.gov.au/climate/data/

Department of Water and Environmental Regulation, (2017), *Guidance Statement: Risk Assessments,* Department of Water and Environmental Regulation, Perth, WA.

Department of Water and Environmental Regulation, (2019), *Water Quality Protection Note (WQPN) No. 15 – Basic Raw Materials Extraction,* Department of Water and Environmental Regulation, Perth, WA.

Environmental Protection Authority, (2005), *Guidance Statement No.3: Separation Distances Between Industrial and Sensitive Land Uses,* Environmental Protection Authority, Perth, WA.

Government of Western Australia, (2023), *SLIP Portal*, Accessed from https://maps.slip.wa.gov.au/landgate/locate/

NHMRC, (2011) *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy*, National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra.

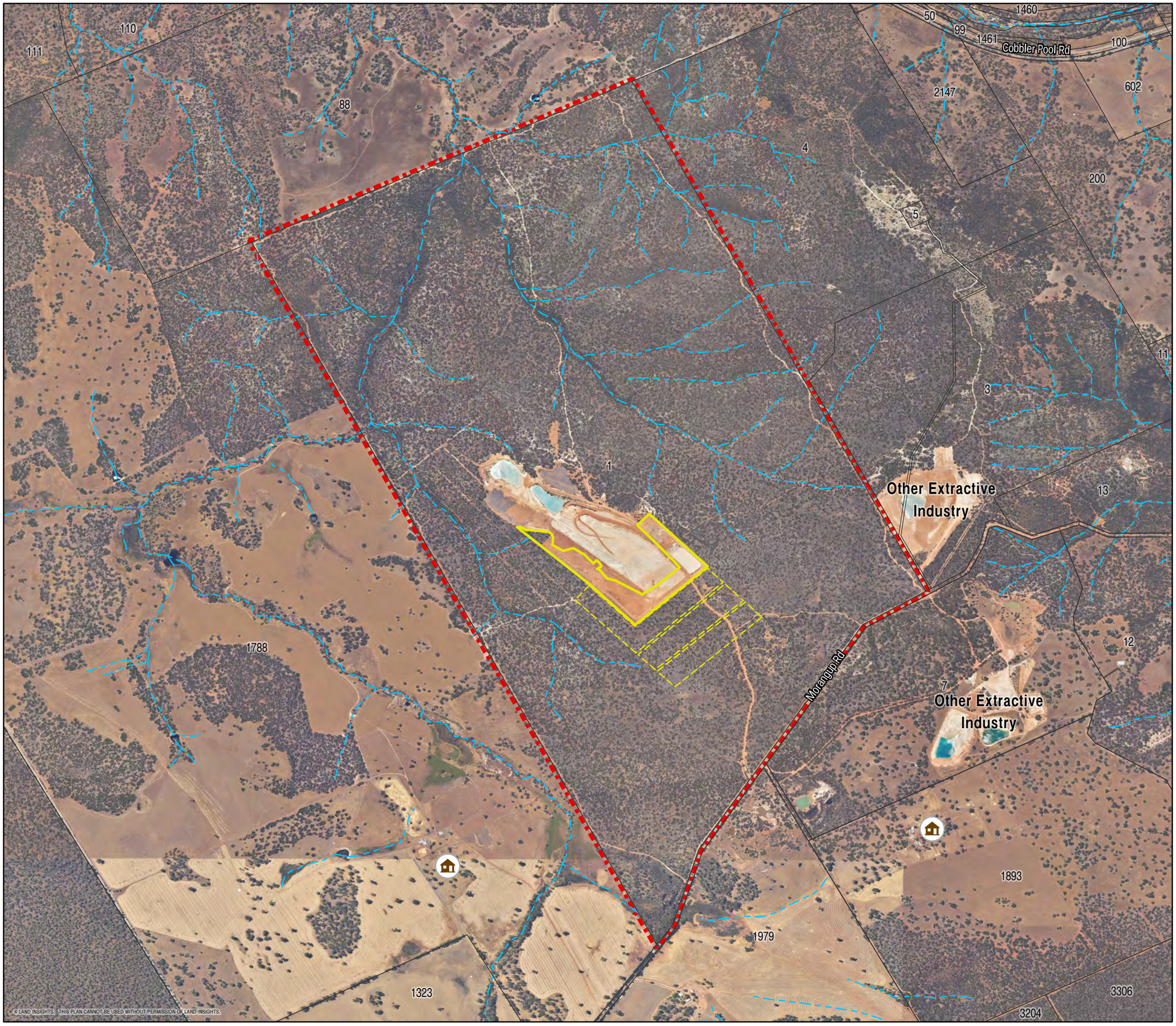
Western Australian Planning Commission, (2021), *Draft State Planning Policy 2.9: Planning for Water Guidelines,* Western Australian Planning Commission, Perth, WA.

Western Australian Planning Commission, (2021), *State Planning Policy 2.4 – Planning for Basic Raw Materials Guidelines*, Western Australian Planning Commission, WA.

Western Australian Planning Commission, (2021), *Draft State Planning Policy 2.9: Planning for Water Guidelines,* Western Australian Planning Commission, Perth, WA.

APPENDIX A

Plans



Cadastre

Site Boundary

Streamlines

Existing Stage

Future Stages

Houses

0 100 200 300 400 500

Metres

1:20,000 @ A3

NOTE: AREAS AND DISTANCES SUBJECT TO SURVEY

Project: 935
Projection: GDA 1994 MGA Zone 50
Date Exported: 15/08/2023 5:59 PM
Layout Name: Context Plan

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Context Plan

LOT 1 MORANGUP ROAD, MORANGUP

MORANGUP SCHIST PIT

AUSTRAL BRICKS

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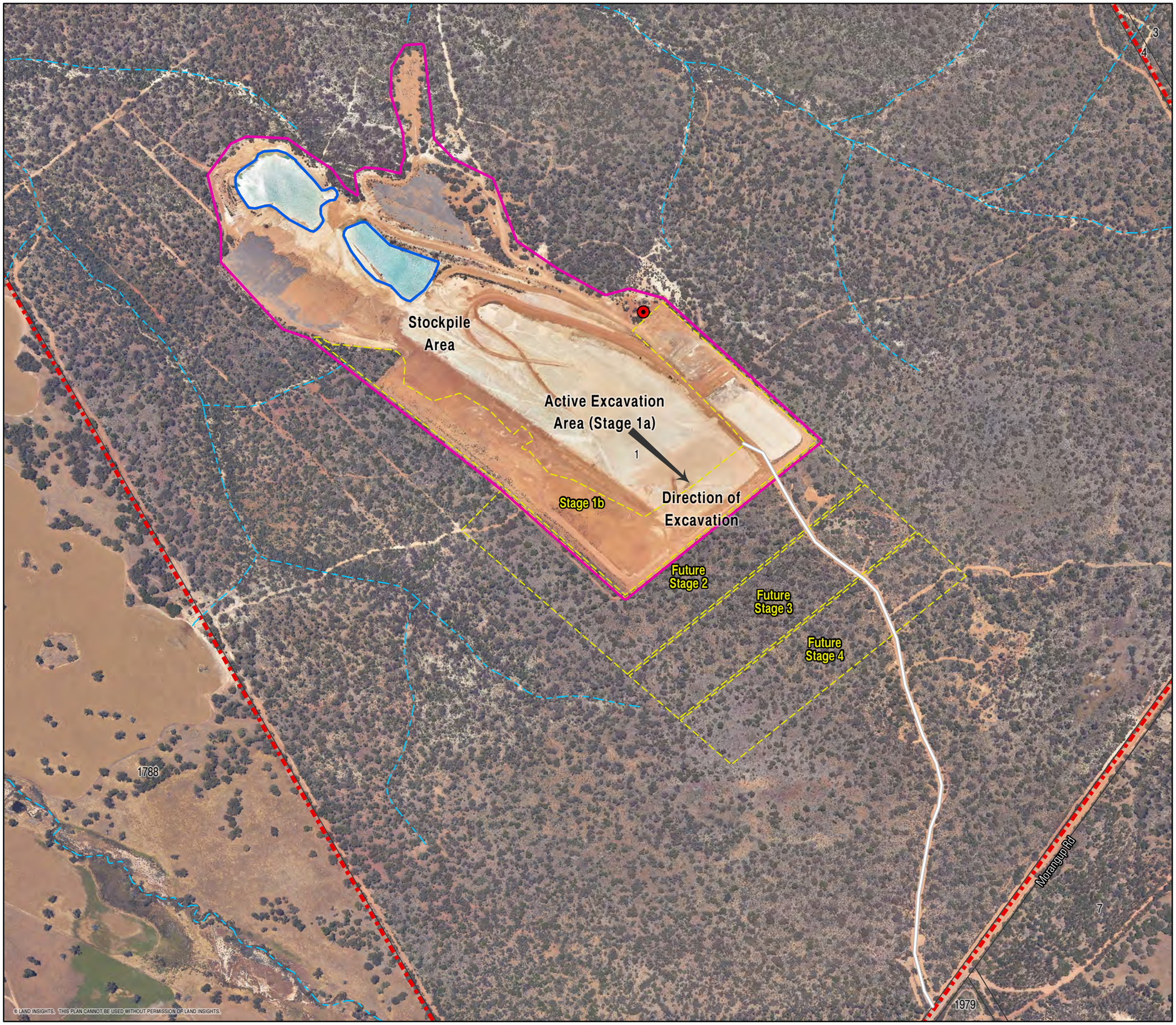

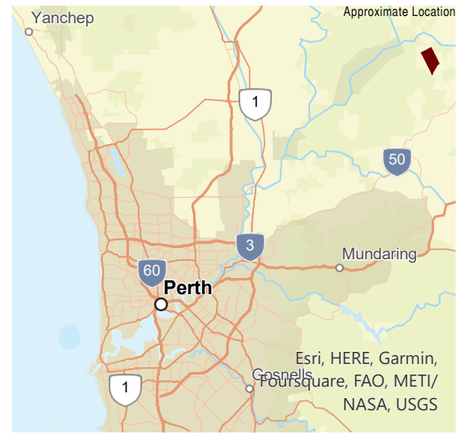

- Cadastre
- Site Boundary
- Streamlines
- Existing Stage
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- Haul Road
- Extraction Operation Area
- Drainage Basins
- Transportable Location (approx)

0 40 80 120 160 200
Metres
1:7,500 @ A3

NOTE: AREAS AND DISTANCES SUBJECT TO SURVEY

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Extraction Plan - Detail

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MORANGUP SCHIST PIT

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APPENDIX I

Refuelling Management Plan

landinsights
PLANNING DESIGN ENVIRONMENT

"SCHIST PIT" CLAY QUARRY

REFUELLING MANAGEMENT PLAN

LOT 1 MORANGUP ROAD, MORANGUP

PREPARED FOR AUSTRAL BRICKS (WA) PTY LTD

AUGUST 2023

Prepared by:

Land Insights

PO Box 289

Mt Lawley WA 6929

Phone: (08) 9271 8506

Document details:

Document History:

Date	Document Name	Document Manager	Summary of Document Revision	Client Delivered
Jun-23	935 – Schist Pit Refuelling Management Plan	SR	Initial Draft for client review	Jun-23
Aug-23	935 – Schist Pit Refuelling Management Plan	SR	Final for submission	Aug-23

Table of Contents

Appendices

1 Introduction

1.1 Background and purpose

This report presents the Refuelling Management Plan for the "Schist Pit" clay quarry operated by Austral Bricks (WA) Pty Ltd located at Lot 1 Morangup Road, Morangup. It outlines the procedures to follow to reduce the risk of spills and leaks and the response in the event of a hydrocarbon spill.

Hydrocarbon leaks and spills have the potential to adversely impact on the environment and human health. Spills and leaks can pollute groundwater and surface water, ultimately impacting native flora and fauna and other users of water resources. In addition, spills and leaks can result in the site being classified as a contaminated site and higher closure/remediation costs. It is therefore in the best interests of everyone that hydrocarbon spills and leaks are cleaned and treated appropriately and in a timely way.

While no fuel, chemicals or lubricants are stored within the operation area, machinery and vehicles used for the operation are refuelled within the quarry using mobile tankers. This management plan provides a list of actions should any spills or leaks occur during refuelling.

1.2 Objectives

The objectives of the Refuelling Management Plan are:

- To reduce the potential for a fuel spill or leak
- To protect soil and water resources from fuels
- To provide a procedure to clean any fuel spills and leaks.

1.3 Context

Refuelling will be done in accordance with the appropriate legislation and in accordance with the Department of Mines, Industry Regulation and Safety (DMIRS) and Department of Water and Environmental Regulation's (DWER) procedures and standards. This method is used on most mine and construction sites and used at other Austral Bricks operations.

The site operator is obligated under a range of legislation to ensure the correct safety procedures are in place with regards to fuels/hydrocarbons and chemicals. Austral Bricks also ensures that operators and site workers are properly trained in operating procedures and in the sue of the spill kits. Occupational health and safety legislation ensures an employer provides a safe working environment in which employees are not exposed to hazards in the workplace. Environmental legislation makes it an offence to cause harm or pollution to the environment and specifically lists "petrol, diesel or other hydrocarbon" as "materials that must not be discharged into the environment" under the *Environmental Protection (Unauthorised Discharges) Regulations 2004*.

1.4 Location

Lot 1 is situated approximately 80km to the north-east of Perth and approximately 25km to the south-west of Toodyay. It is approximately 5km from the closest rural residential estate (located to the south-west and another to the north of the site). The operation ("the site") is located in the centre of Lot 1.

Plans showing the operation and the context are provided at Appendix A.

2 Refuelling Procedures and Risks

2.1 Operations

The quarry is located in the centre of Lot 1. Excavation has been ongoing over the last 60 years. The current development footprint is known as the "Operation Area" and encompasses the active pit/excavation area, stockpiling areas, access tracks, drainage basins and administrative areas. Future stages (labelled as "Stages 1 to 4") have been identified to the south-east of the existing excavation area. In general, the excavation occurs in a south-easterly direction.

Excavation of clay takes place in a sequence of steps which can be broadly broken down into the following:

- Earthworks Campaign (i.e., removal of topsoil and overburden, excavation of clay to stockpile)
- Carting Campaign (transport of clay from the pit or stockpiles to the factories)
- Rehabilitation.

Further information on the excavation process is below and plans are provided at Appendix A.

Earthworks campaign

The "Earthworks Campaign" refers to the excavation and stockpiling of material. During the earthworks campaign, topsoil and overburden is removed and clay is excavated and placed into stockpiles located within the Operation Area.

Earthworks take place as and when required throughout the year but generally during the dry months. The timing of excavation depends on weather conditions, market demand and operational requirements (such as the rate of excavation of other clay quarries). During Excavation Campaigns, excavation will generally take place for six days a week during the approved operation times. Excavation will most likely take place over approximately 16 weeks in total per annum, usually divided into 2 or 3 "campaigns". It should be noted that although excavation is identified to occur anytime throughout the area it should be noted that for large stretches of time there will be no excavation activities on site.

As vehicles usually operate from the pit floor, the walls of the pit also act as a noise and dust barrier for most of the excavation process. The depth of the Schist Quarry is approximately 14 metres. There will be a relatively short period where vehicles are located at the ground level (when clearing vegetation and stripping topsoil and overburden for new stages), however the extensive vegetation surrounding the quarry will provide a further noise and dust barrier. Additional dust management will be in place for the operation as set out in this report.

No processing (crushing, screening etc) will occur on the site. No blasting will be required to facilitate excavation.

Cartage campaigns

The "Cartage Campaign" refers to the removal or transport of clay from the site where it is taken to the Austral Bricks brickmaking factories. Clay resource is currently carted to the Cardup factory and the Bellevue factory.

Loading and carting from the site will largely occur during September to May (i.e. during the drier months) although it can occur anytime throughout the year depending on the need for clay. It is expected that carting will occur over two separate campaigns each year, lasting approximately 3-4 weeks for each campaign.

Carting from the site depends on the market demand for bricks, as well as the types of clay and colour of clay. Therefore, there may be some variation from the truck numbers and the number of days that carting will be required each month (i.e. some months will have more carting days than other months).

The Stockpile Area (and the area where trucks will be loaded with clay) is located within the existing Operation Area. All vehicles and trucks enter the site from the main access at Morangup Road and travel down the haul road to the Operation Area. Having one access into and out of the site helps to reduce impact to surrounding vegetation and is a management technique used to help mitigate potential dust and noise impacts.

Rehabilitation

Rehabilitation of the quarry will involve recontouring the slopes to a safe and stable condition, revegetating with local vegetation and creating dams created from the lowest parts of the landscape.

Progressive rehabilitation of the quarry is outlined in the Rehabilitation Management Plan. In general, progressive recontouring takes place as excavation progresses. However, as all water runoff is required to be retained on site and the catchment area receives a large amount of water, much of the previous operation area is required for drainage and water management.

2.3 Refuelling Procedure

Machinery and vehicles used for the operation (such as loaders and bulldozers) will be refuelled within the operation area from mobile tankers when required. As no fuel, chemicals or lubricants associated with this operation are stored on the property, this considerably reduces the risk of spills and leaks occurring. The use of mobile fuel tanks to refuel machinery and vehicles presents a much lower risk to the environment as operation only occurs for a few weeks a year.

Refuelling will be undertaken in the operation area to allow for containment if a spill does occur.

The main risk of contamination is the minor drips that occur during removal of the hoses etc. The action required to address all spills is provided below.

2.4 Site Hydrology

Hydrological mapping

The site sits on the Darling Plateau which lies east of the Swan Coastal Plain and the Darling Scarp. The hydrological zone is the "Eastern Darling Range" which is described as "moderately to strongly dissected lateritic plateau on granite with eastward-flowing streams in broad shallow valleys." This description also accurately describes the landform of Lot 1 which is undulating and dissected by watercourses located in shallow valleys across the site.

The site is located within a "Proclaimed Surface Water Area" under the *Rights in Water and Irrigation (RIWI) Act 1914.* It is not located in a "Proclaimed Groundwater Area" under the RIWI Act 1914.

Hydrological mapping relating to the site (as provided by DWER) are listed below:

- Surface Water Area – "Avon River Catchment"
- Surface Water Subarea – "Avon River Catchment"
- Hydrographic Catchment Basin – "Swan Coastal"
- Hydrographic Catchment - "Swan Avon_Main Avon"
- Hydrographic Subcatchment - "Avon River Catchment"
- Surface Water Management Area – "Avon River Catchment"
- Surface Water Management Subarea - "Avon River catchment"
- Groundwater Area and Sub Area – "Karri"

There are no Public Drinking Water Source Areas (PDWSA's), wetlands, floodplain areas or Floodplain Development Control Areas located on or surrounding the property. The site is located on the western edge of the "Avon River Management Area" which is identified under the *Waterways Conservation Act 1976*. The Department currently does not have an active management plan for this area at present.

Surface water features

A number of watercourses intersect the site. The watercourse on the eastern side of Lot 1 is a tributary of the Avon River and is known as Mortigup Brook (Level 5). It flows from the eastern boundary in a north-west direction and leaves the site to the north where it continues to the Avon River. Another tributary of the Avon River is located on the western side of the Lot which is known as the Morangup Brook (Level 4 watercourse). It flows across the north-west corner of Lot 1. Another minor watercourse extends along the western boundary of the Lot, to the west of the operation area. A small drainage line flows from the outside of the pit towards this watercourse.

The operation is considered to be adequately separated from the surrounding watercourses. It is approximately 180 metres from the minor watercourse to the west, approximately 550 metres from Morangup Brook and approximately 440 metres from Mortigup Brook.

Further information on water management is provided in the attached Water Management Plan (Land Insights, 2022). The requirements of DWER's *Water Quality Protection Note (WQPN) No. 15 – Basic Raw Material Extraction* is addressed in Chapter 5.13 below which provides a risk assessment against the criteria of the WQPN. A risk assessment is also contained in Chapter 3.

There are no wetlands located on the site. There are no wetlands as mapped by the "Directory of Important Wetlands in Australia". The Avon River located over 1.3km to the north and north-east of the site is mapped by the "Directory of Important Wetlands in Australia".

Groundwater Description

The groundwater aquifers in the region are characterised by low permeability, fractured and deeply weathered rocks of metamorphic or granitoid origin with localised shallow aquifers where deeper sequences of sediments have been deposited by recent erosion. Groundwater in the region is inferred to flow to the north-west based on general topography and surface water bodies (DWER, 2019).

The site is located within the hydrological zone of the "Eastern Darling Range". The groundwater characteristics for this hydrological zone are described as being mainly low-yielding saprolite aquifers with paloeochannels and sandy Eocene aquifers in some valleys. Groundwater discharge may occur in drainage lines and on valley floors in cleared areas and discharge associated with dolerite dykes may occur on mid to upper slopes landscapes.

The site is not located within a "Proclaimed Groundwater Area" under the RIWI Act 1914. The groundwater resources mapped in the area include fractured rock and paleochannel.

No evidence of seepages or water table have been observed in the pit and no groundwater has been encountered during excavations. The water in the drainage basins is captured from surface water runoff.

Salinity

There has been no observable or measurable impacts of the excavation on salinity of surface or groundwater. Water quality results from the drainage basins within the pit area have indicated that salinity levels are below 1,000mg/L which is considered "fresh" water. Salinity results from 2018 were between 200mg/L and 410mg/L and, similarly, total dissolved solids results ranged from 190mg/L to 380mg/L. pH results from 2018 ranged from between 5.5 and 5.7. As can be seen from the above water quality tests, there is no evidence of salinity buildup on the site during the past 60 years of operation.

In some landforms, salinity levels in water runoff can be a cause for concern if there are relatively high salinity levels in the clay being excavated. The resulting farm dam that is constructed from the rehabilitation could then contain saline water and not be useful for agricultural use, or water filtration into the ground could contribute to groundwater salinity. In this case, the water quality results indicate that there is a very low risk that the excavations at the site will contribute to increased salinity in surface or groundwater.

2.5 Soils

Lot 1 is divided by three different soil-landscape units. Generally speaking, the north-west corner is the "Clackline Steep Rocky Hills" subsystem and "Michibin" subsystem, the centre of the property (including a majority of the operation) is the "Leaver" subsystem, the creeklines are the "Pindalup" subsystem and the southern portion of Lot 1 is the "Yalanbee" subsystem.

The soil-landscape units mapped across the site are described further in the table below.

Table 2.1 – Soil-Landscape Units

NAME	CODE	DESCRIPTION	LOCATION
Clackline Steep Rocky Hills subsystem	253CcR1	Areas of rock outcrop and steep rocky hills.	Northern portion of Lot 1.
Michibin subsystem	253CcMN	Red and yellowish brown loams and clays, often gravelly with rocky areas and lateritic crests.	Northern portion of Lot 1.
Leaver subsystem	253ByLV	Gravelly yellow and red duplexes, gravelly deep clayey sands and sandy loams over laterite and clay.	Centre of Lot 1, including the operation.
Pindalup subsystem	253ByPN	Alluvial red and yellow duplex and uniform fine soils which are often gravelly.	Associated with the creeklines.

NAME	CODE	DESCRIPTION	LOCATION
Yalanbee subsystem	253WnYA	Pisolitic gravelly, yellowish brown soils that vary in texture from loamy sands to clays, with pockets of pale sands and areas of outcropping laterite.	Southern end of Lot 1.

Source: DPIRD, 2022

Generalised soil qualities of each soil-landscape unit are described in the table below.

Table 2.2 – Soil Qualities

SOIL-LANDSCAPE UNIT	WATER EROSION	WIND EROSION	WATERLOGGING	FLOOD	SALINITY
Clackline Steep Rocky Hills subsystem	Low risk	Moderate risk	Low risk	Low risk	Low risk
Michibin subsystem	Moderate risk	Moderate risk	Low risk	Low risk	Low risk
Leaver subsystem	Low risk	High risk	Low risk	Low risk	Low risk
Pindalup subsystem	High risk	Low risk	High risk	High risk	High risk
Yalanbee subsystem	Low risk	High risk	Low risk	Low risk	Low risk

Source: DPIRD, 2022

2.6 Environmental risks

The refuelling risk assessment in Table 2.3 below is based on the criteria defined in "Guidance Statement: Risk Assessments" (DWER, 2017). The risk assessment below lists the activity(s) which have the potential to cause impact, the inherent risk (i.e. with no controls) and the residual risk (with controls in place). \

The "risk" is determined by considering the likelihood and consequence of the environmental impact. The likelihood and consequence criteria are defined in the Guidance Statement. A copy of the criteria has been provided in the tables below. The matrix used to determine the risk rating is also based on the matrix used in the Guidance Statement and a copy of this table is provided in Table 2.3 below.

The purpose of the risk assessment is to demonstrate that risk identified as “medium”, “high” or “extreme” can be effectively managed. As is stated in the “Guidance Statement: Risk Assessments” (DWER, 2017), a “low risk” is considered acceptable and generally not controlled through regulation.

The risk of environmental impact from refuelling and servicing of machinery and vehicles is considered to be low when following best practice procedures and the appropriate legislation and policies. Further information on management is provided below.

Table 2.3 – Refuelling risk assessment

ACTIVITY AND POTENTIAL EMISSION	POTENTIAL RECEPTORS AND POTENTIAL PATHWAY	POTENTIAL ADVERSE IMPACT	INHERENT RISK			PROPOSED CONTROL	RESIDUAL RISK		
			L	C	Risk		L	C	Risk
Leaks and spills of hydrocarbons from mobile refuelling of trucks and machinery.	Soil, surface water and groundwater. Surface runoff, direct discharges to land and infiltration through soils.	Potential contamination of soil, surface water, groundwater.	Possible	Minor	Med	As set out in this management plan.	Rare	Slight	Low

Table 2.4 – Likelihood Criteria

Almost certain	Likely	Possible	Unlikely	Rare
The risk event is expected to occur in most circumstances.	The risk event will probably occur in most circumstances.	The risk event could occur at some time.	The risk event will probably not occur in most circumstances.	The risk event may only occur in exceptional circumstances.

Source: DWER 2017

Table 2.5 – Consequence Criteria

	Slight	Minor	Moderate	Major	Severe
Environment	• On-site impact: minimal (No discernible adverse impact). • Off-site impacts local scale: minimal • Off-site impacts wider scale: not detectable	• On-site impacts: low level (discernible effect on the environment but no adverse impact) • Off-site impacts local scale: minimal • Off-site impacts wider scale: not detectable • Minor number of individuals of species may be affected locally.	• On-site impacts: mid level (Minor adverse affect to the environment) • Off-site impacts local scale: low level • Off-site impacts wider scale: minimal • Moderate loss of individuals of species locally.	• On-site impacts: high level (moderate impact to the environment) • Off-site impacts local scale: mid level • Off-site impacts wider scale: low level • Short term impact to an area of high conservation value or special significance^ • Moderate damage to ecosystem function and major loss of individuals of species locally.	• On-site impacts: catastrophic (significant impact to the environment) • Off-site impacts local scale: high level or above • Off-site impacts wider scale: mid level or above • Mid to long term or permanent impact to an area of high conservation value or special significance^ • Significant long-term damage/loss of ecosystem function and loss of individuals of species locally.

Source: DWER 2017

^ Determination of areas of high conservation value or special significance should be informed by the Guidance Statement: Environmental Siting.

* 'onsite' means within the Lot boundary.

Table 2.6 – Risk Matrix Ratings

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

Source: DWER 2017

3 Refuelling Management

3.1 Introduction

Table 3.1 below provides the actions to be followed in the event of a hydrocarbon spill or leak. It includes actions for the following:

- General actions to maintain machinery and vehicles
- Actions for when a spill is identified
- Actions to manage a minor spill or leak
- Actions to manage a large spill or leak
- Reporting requirements.

3.2 Management Plan

The Refuelling Management Plan actions, responsibilities and timing is presented in Table 3.1 below.

Table 3.1 – Refuelling Management Plan

MANAGEMENT/ACTION	RESPONSIBILITY	TIMING
General		
1. No fuels, lubricants or chemicals will be stored within the operation area. They are brought to the quarry as required.	Quarry Manager	Ongoing
2. Major servicing of all machinery is to be done off site.	Quarry Manager	Ongoing
3. Service all machinery and equipment in accordance with the maintenance schedule prescribed.	Quarry Manager	Ongoing
4. Regularly inspect fuel, oil and hydraulic fluids on machinery for wear or faults.	Quarry Manager	Ongoing
5. Ensure refuelling and lubricating occurs in designated areas within the pit area.	Quarry Manager	Ongoing
6. Ensure that equipment for the containment and clean-up of spills is provided on site.	Quarry Manager	Ongoing
7. Maintain the operation area in a tidy manner.	Quarry Manager	Ongoing
When a Spill is identified		
8. Isolate the spill area and identify the spilt substance.	All workers and contractors.	As soon as a spill or leak is identified.
9. Ensure the source of the spill is restricted or stopped.	All workers and contractors.	As soon as a spill or leak is identified.

	MANAGEMENT/ACTION	RESPONSIBILITY	TIMING
10.	The spill or leak should be contained by placing soil and clay resource around it.	All workers and contractors.	As soon as a spill or leak is identified.
11.	Contact the Quarry Manager to advise them that a spill has occurred.	All workers and contractors.	Once the spill is contained.
Minor spills			
12.	Minor spills should be scooped up with the clay resource.	Quarry Manager	In the event of a minor spill.
13.	The clay resource containing the spill should be sent to the brickworks site and burnt with the clay during the firing process.	Quarry Manager	In the event of a minor spill.
Large spills			
14.	Large spills can be absorbed using polypropylene pads and scooped up with the clay resource.	Quarry Manager	In the event of a large spill.
15.	Depending on advice from DWER, soils containing large spills can be removed from the site and disposed of at an appropriate location/facility.	Quarry Manager	In the event of a large spill.
Reporting			
16.	All spills and leaks incidents are to be reported to the Quarry Manager and followed up with an incident form.	Quarry Manager	In the event of a spill or leak.
17.	The incident form is to be followed up and investigated to determine the cause of the spill and to assist with prevention of future incidents.	Quarry Manager	In the event of a spill or leak.
18.	The Quarry Manager is to report the incident to DWER and follow up any additional reporting or remediation requirements.	Quarry Manager	In the event of a spill or leak.

4 References

Department of Water and Environmental Regulation, (2017), *Guidance Statement: Risk Assessments,* Department of Water and Environmental Regulation, Perth, WA.

Department of Water and Environmental Regulation, (2019), *Water Quality Protection Note (WQPN) No. 15 – Basic Raw Materials Extraction,* Department of Water and Environmental Regulation, Perth, WA.

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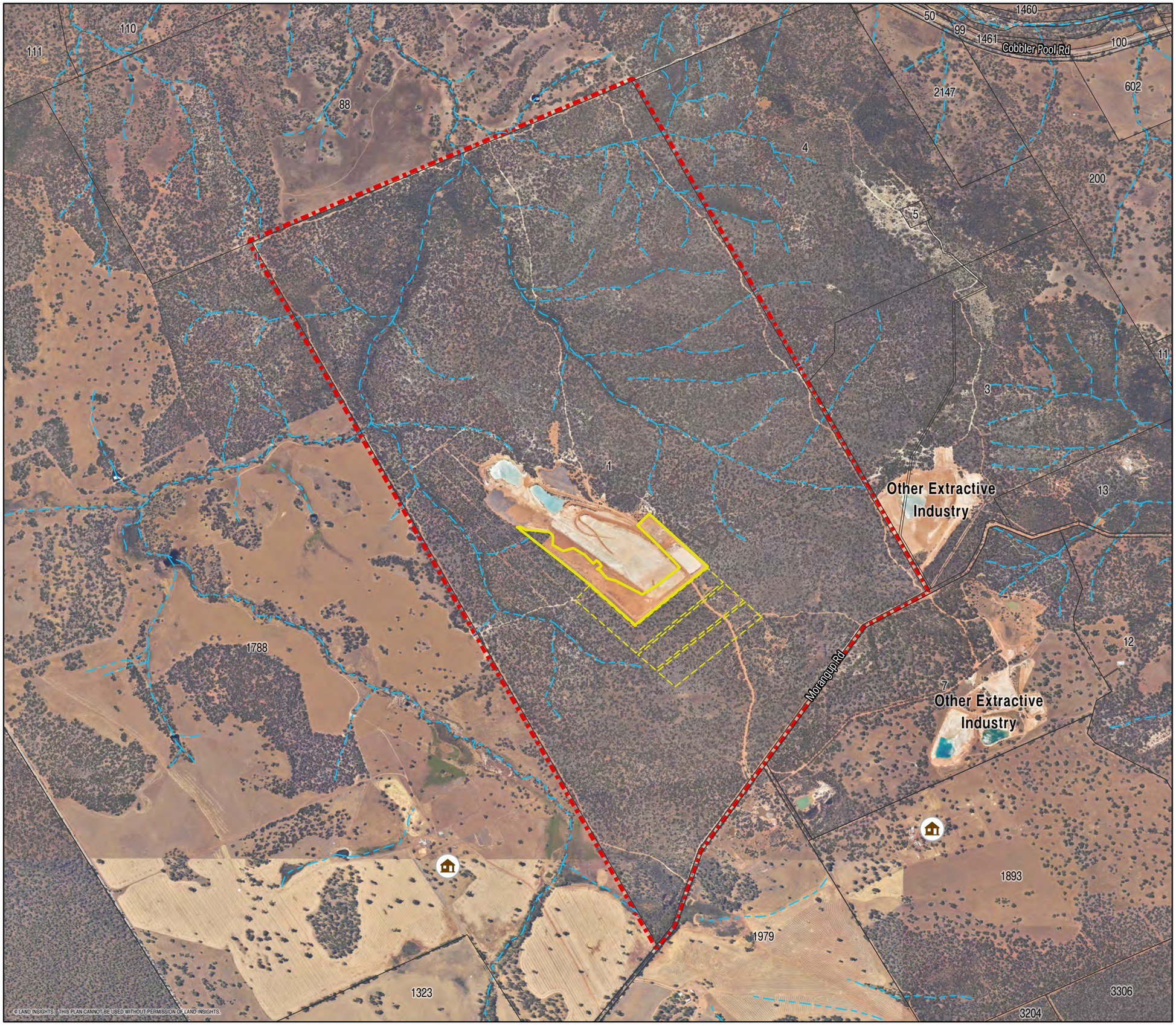

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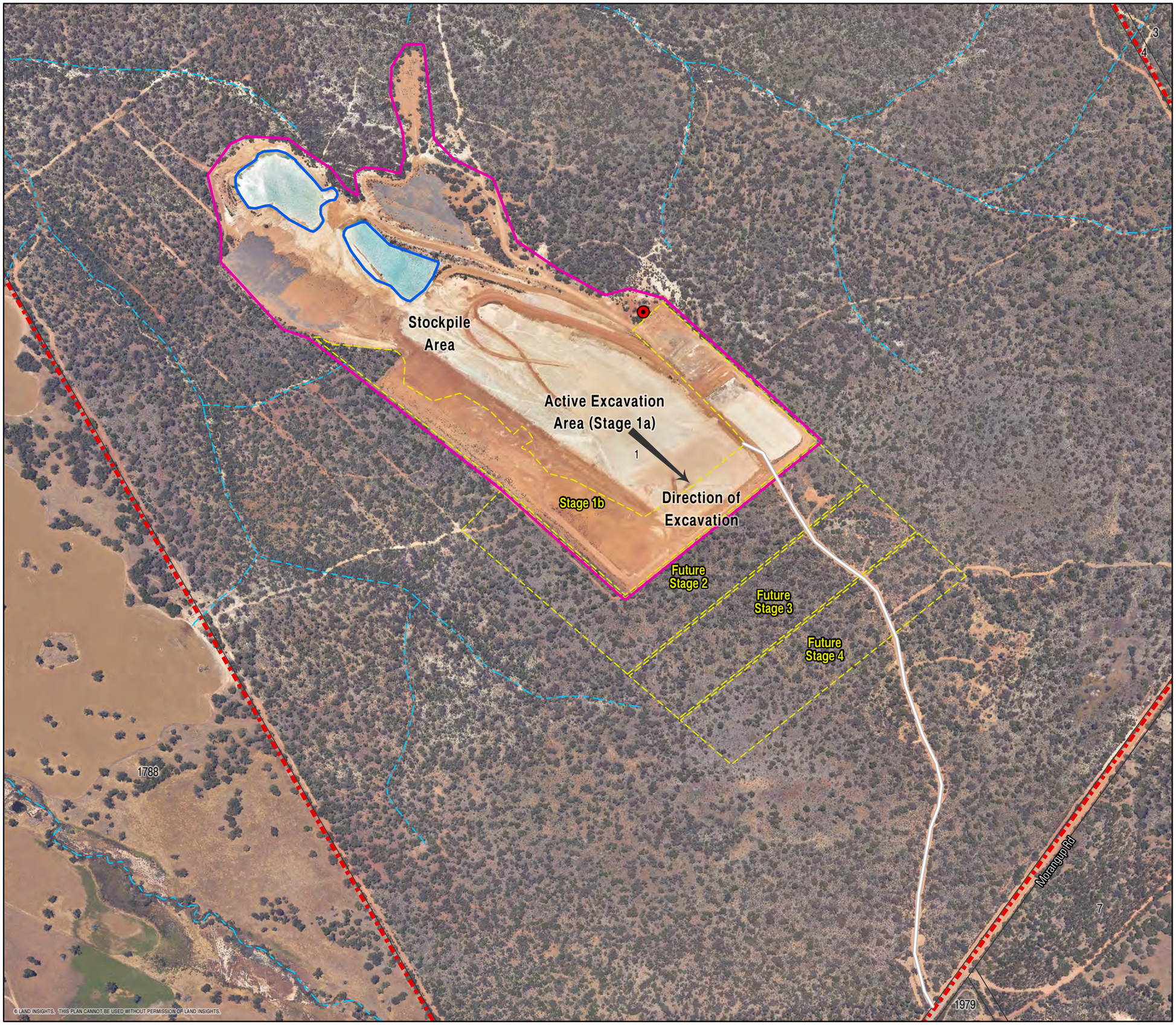

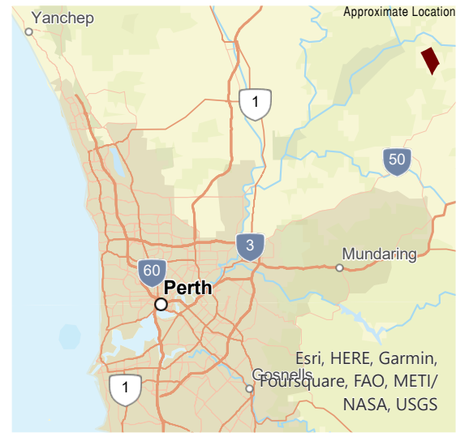

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admin@landinsights.com.au
landinsights.com.au

Extraction Plan - Detail

LOT 1 MORANGUP ROAD, MORANGUP

MORANGUP SCHIST PIT

AUSTRAL BRICKS

Path: E:\OneDrive - Land Insights\Drafting Jobs\935 Austral Morangup\935 Morangup.aprx

APPENDIX J

Waste Management Plan

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PLANNING DESIGN ENVIRONMENT

"SCHIST PIT" CLAY QUARRY

WASTE MANAGEMENT PLAN

LOT 1 MORANGUP ROAD, MORANGUP

PREPARED FOR AUSTRAL BRICKS (WA) PTY LTD

AUGUST 2023

Prepared by:

Land Insights

PO Box 289

Mt Lawley WA 6929

Phone: (08) 9271 8506

Document details:

Document History:

Date	Document Name	Document Manager	Summary of Document Revision	Client Delivered
Jun-23	935 – Schist Pit Waste Management Plan	SR	Initial Draft for client review	Jun-23
Aug-23	935 – Schist Pit Waste Management Plan	SR	Final for submission	Aug-23

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1 Introduction

1.1 Background and purpose

This report presents the Waste Management Plan for the "Schist Pit" clay quarry operated by Austral Bricks (WA) Pty Ltd located at Lot 1 Morangup Road, Morangup. The purpose of the Waste Management Plan is to set out the actions to manage waste and rubbish.

Extraction of clay is a low waste operation. As a result, there will be minimal waste produced on site and it will largely be limited to some rubbish by site workers. Waste can also occur when trespassers access the site and this will also be managed accordingly.

1.2 Objectives

The objectives of the Waste Management Plan are:

- To ensure that the operation is kept clean and tidy
- To ensure that waste and rubbish generated by the operation and trespassers is disposed of appropriately.

1.3 Location and Operation

Lot 1 is situated approximately 80km to the north-east of Perth and approximately 25km to the south-west of Toodyay. It is approximately 5km from the closest rural residential estate (located to the south-west and another to the north of the site). The operation ("the site") is located in the centre of Lot 1.

2 Context

2.1 Unauthorised access dumping of rubbish

The potential for dumping of rubbish occurs from trespassers entering the site illegally. Although site security is in place, the risk of trespassers entering the site is always a possibility at extractive industry operations. The site will be fenced and the gates locked. Signs will be located on the site perimeter to warn the public that the site is an open pit to deter trespassers from entering the site.

Any illegally dumped material will be removed promptly and removed to an approved landfill site.

2.2 Solid domestic waste and light industrial waste

The quarry will only be operational intermittingly throughout the year so the potential for creating waste is small. Solid domestic waste and light industrial waste will be stored in appropriate containers and removed from the quarry frequently to an approved landfill site.

2.3 Wastewater disposal

A portaloo is located on site when it is operational (i.e. during earthworks and carting campaigns). It is cleaned as required by health regulations.

2.4 Operation

The quarry is located in the centre of Lot 1. Excavation has been ongoing over the last 60 years. The current development footprint is known as the "Operation Area" and encompasses the active pit area, stockpiling areas, access tracks, drainage basins and administrative areas. Future stages (labelled as "Stages 1 to 4") have been identified to the south-east of the existing excavation area. In general, the excavation occurs in a south-easterly direction. Clay is excavated from a pit located in the centre of Lot 1. It is stockpiled on site and placed onto trucks which transport the clay to one of the Austral Bricks brickmaking factories.

Excavation of clay takes place in a sequence of steps which can be broadly broken down into the following:

- Earthworks Campaign (i.e., removal of topsoil and overburden, excavation of clay to stockpile)
- Carting Campaign (transport of clay from the pit or stockpiles to the factories)
- Rehabilitation.

3 Waste Management Plan

3.1 Waste Management Actions

The Waste Management Plan actions, responsibilities and timing are presented in Table 3.1 below.

Table 3.1 – Waste Management Plan

MANAGEMENT/ACTION	RESPONSIBILITY	TIMING
1. Keep the site tidy and remove rubbish from the quarry to an approved waste disposal facility as required.	Quarry Manager	Ongoing
2. Recycle waste where possible.	Quarry Manager	Ongoing
3. Gates will be locked at all times when the site is not operational to reduce the potential for trespassers.	Quarry Manager	Ongoing
4. Maintain signage to warn the public that there is an extractive industry operation on the site.	Quarry Manager	Ongoing
5. Clean portaloos as required and in accordance with the manufacturers instructions.	Quarry Manager	Ongoing
6. Maintain fences around the site perimeter.	Quarry Manager	Ongoing

APPENDIX K

Bushfire Management Plan

Bushfire management plan/Statement addressing the Bushfire Protection Criteria coversheet

Site address: Lot 1 Morangup Road, Morangup

Site visit: Yes ☑ No ☐

Date of site visit (if applicable): Day 9th Month December Year 2020

Report author or reviewer: Ian Macleod

WA BPAD accreditation level (please circle):

Not accredited ☐ Level 1 BAL assessor ☐ Level 2 practitioner ☑ Level 3 practitioner ☐

If accredited please provide the following.

BPAD accreditation number: 39131 Accreditation expiry: Month November Year 2021

Bushfire management plan version number: 1.0

Bushfire management plan date: Day 20th Month January Year 2021

Client/business name: Brickworks Building Products

	Yes	No
Has the BAL been calculated by a method other than method 1 as outlined in AS3959 (tick no if AS3959 method 1 has been used to calculate the BAL)?		✔
Have any of the bushfire protection criteria elements been addressed through the use of a performance principle (tick no if only acceptable solutions have been used to address all of the bushfire protection criteria elements)?	✔	

Is the proposal any of the following (see SPP 3.7 for definitions)?	Yes	No
Unavoidable development (in BAL-40 or BAL-FZ)		✔
Strategic planning proposal (including rezoning applications)		✔
High risk land-use		✔
Vulnerable land-use		✔

None of the above ☐

Note: Only if one (or more) of the above answers in the tables is yes should the decision maker (e.g. local government or the WAPC) refer the proposal to DFES for comment.

Why has it been given one of the above listed classifications (E.g. Considered vulnerable land-use as the development is for accommodation of the elderly, etc.)?

The information provided within this bushfire management plan to the best of my knowledge is true and correct:

Signature of report author or reviewer 

Date 20th January 2021

Bushfire Management Plan

Austral Bricks Quarry

Lot 1 Morangup Road, Morangup

Shire of Toodyay

Planning Stage:	Internal development planning
Planning Development Type:	Extension of existing quarry

Job Number:	200850
Assessment Date:	9 December 2020
Report Date:	20 January 2021

BPP Group Pty Ltd t/a Bushfire Prone Planning
ACN: 39 166 551 784 | ABN: 39 166 551 784

Level 1, 159-161 James Street
Guildford WA 6055

PO Box 388
Guildford WA 6935

08 6477 1144 | admin@bushfireprone.com.au

DOCUMENT CONTROL

PREPARATION		
Author:	Ian Macleod (BPAD Level 2 - No. 39131)	Ian Macleod
Co-Author:	Select.	
Review/Authorise:	Kathy Nastov (BPAD Level 3 - No. 27794)	K. Nastov

VERSION HISTORY		
Version	Version Details	Date
1.0	Original Document Issue	20 January 2021
-		

BMP (Standard DA-Non-Tourism) Template v8.5

DISTRIBUTION				
Destination	Version	No. Copies	Hard Copy	Electronic Copy
Person/Business: Tanya Gilders/Brickworks Building Products-Austral Bricks Email: Tanya.Gilders@australbricks.com.au	1.0		☐	☒
Person/Business: Email:			☐	☐

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EXECUTIVE SUMMARY

This Bushfire Management Plan is developed to assist with internal planning for the expansion of an existing clay quarry at Lot 1 Morangup Road, Morangup in the shire of Toodyay. Austral Bricks are the owners of the quarry and the extracted clay is used predominantly for the manufacture of bricks. There are some small deposits of gravel which is used for road construction and maintenance. The quarry is generally operational between the months of October to April for 2 to 3 weeks at a time as required. No machinery or other assets remain onsite when the quarry is not in use.

The proposed quarry extraction areas are staged and run from north west to south east. Management of potential bushfire hazards will be the same for each stage, with the expectation that larger areas of low bushfire threat vegetation will be present as the quarry expands.

A Conservation Covenant is placed over an area of the subject lot which is to the east of the existing and proposed quarry sites. This area abuts the eastern boundary of the subject lot and is approximately 130.3 hectares in size (See Figure 1.1).

Reports for the development site describe the existence or possible existence of threatened and priority flora and fauna species. Dieback is also present onsite. The assessments and bushfire protection measures detailed this BMP, assume that environmental approval will be achieved or clearing permit exemptions will apply for the proposed quarry extensions.

Once decommissioned, the site will be revegetated with local species to fit with the existing landscape. Some areas will be progressively rehabilitated whilst the site is in operation, where possible.

The existing lot is entirely vegetated with native vegetation, classified as Forest, and has an extreme bushfire hazard level, except for the existing quarry site which is generally free of vegetation. The impact of the topography, and slopes under the classified vegetation, will be dependent on a bushfire's direction of travel. Slopes in the range of zero to seventeen degrees do exist onsite and bushfire travelling upslope will have increased intensity and rate of spread. Intense bushfire behaviour is possible, particularly if vegetation within the lot is ignited by bushfire in the adjoining lots and they are involved together.

However, the existence of a large Asset Protection Zone (APZ) within the quarry site removes the threat of greater levels of radiant heat or flame contact upon any assets and temporary buildings, if located in this area.

The primary bushfire threat from bushfire prone vegetation remaining within the proposed lot will be embers. This threat can be mitigated by the application of appropriate building location, design, bushfire construction standards and the ongoing maintenance of the APZ to ensure that buildings and assets will not be impacted by consequential fire from combustible materials used, stored or accumulated within the APZ.

This type of development is not considered a vulnerable land use. However, as there is only one compliant access/egress route available from the site, it is recommended that a suitable shelter in place building be located onsite in a safe area that is subject to a potential radiant heat level of less than 10kW/m2. Application of the bushfire construction standard to this building will mitigate the risks from radiant heat impact and ember attack to a level which is considered acceptable.

Morangup Road provides legal access to two different destinations. From the subject lot the road is sealed to the west and joins up with Toodyay Road. To the east, the road is gravel and winds steeply down to Lovers Lane where a bitumen road is available to access Toodyay Road to the south or River Road to the north.

Morangup Road, to the west of the subject site, complies with the acceptable solution for public roads. The gravel portion of Morangup Road to the east of the subject lot is generally 6 metres wide but narrow in sections and has a steep grade in areas (1:4.5). This section of road does not comply with the requirements of the Guidelines for Planning in Bushfire Prone Areas. There are no alternative routes available (including provision of an emergency access way) to provide an additional access route to a different destination.

The private driveway to the quarry site is approximately 1100 metres long and is a minimum of 8 metres wide. A turnaround area is available inside the site gate at about 100 metres from Morangup Road. A further turnaround area is required 500 metres from the current turnaround area, which will leave 500 metres to the quarry site where turnaround areas are currently available. No passing bays are required.

A dedicated static water supply (dam) is available in the southern corner of the lot. The supply is signposted as a Fire Emergency Water supply for the wider community and is accessible from inside the lot via a gravel track, or from Morangup Road via a locked gate (Lock stamped D21). It is recommended that a turnaround area be installed at the dam, suitable for 3.4 type fire appliances.
A further static water supply, with suitable access and fittings (if required), should be considered within the quarry site to protect any onsite assets. This could either be an existing dam within the quarry, or a 10,000 litre water tank

dedicated for fire fighting purposes. The water supply should have the required access and turnaround areas (See Appendix 3) and be suitable to the requirements of the Shire of Toodyay.

As there is one acceptable access/egress route only available from the quarry, additional measures are recommended to improve the bushfire performance of the site. The first is to provide an onsite safer location, as stated above, for users when it is deemed too late to evacuate safely. A second measure is to establish a Bushfire Emergency Plan for the site to give guidance to occupants during a local bushfire event.

This is an existing development site. The application of the requirements and recommendations of this Bushfire Management Plan will assist in reducing the current risk to users of the quarry during a localised bushfire.

1 PROPOSAL DETAILS

1.1 Description and Associated Plans and Maps

Landowner / Proponent:	Austral Bricks
Bushfire Prone Planning Commissioned to Produce the Bushfire Management Plan (BMP) By:	Austral Bricks
For Submission To:	Austral Bricks
Purpose of the BMP:	Internal planning to inform the construction of the proposed development
'Development' Site Total Area:	Approximately 65 hectares
Description of the Proposed Development/Use:	
Materials extracted from the existing quarry are clay for use in the manufacturing of bricks and small deposits of gravel to be used for road construction and maintenance. The quarry is generally operational between the months of October to April for 2 to 3 weeks at a time as required. No machinery or other assets remain onsite when the quarry is not in use.	
Staged Development and Management of Potential Bushfire Hazard Issues	
The quarry extraction areas are staged and run from north west to south east. Management of potential bushfire hazards will be the same for each stage, with the expectation that larger areas of low bushfire threat vegetation will be present as the quarry expands.	

Figure 1.1

Austral Bricks
Existing & Proposed Quarry Site

Lot 1 on Diagram 34893
Lot 1 Morangup Road
MORANGUP
SHIRE OF TOODYAY

COBBLER POOL RD

Mortigup Brook

Conservation Area

Stage 1 (Existing)

Stage 2

Stage 3

Stage 4

Morangup Brook

MORANGUP RD

------ LEGEND ------

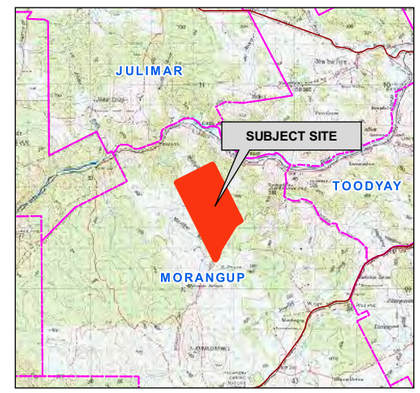
Quarry

- Stage 1 (Existing)
- Stage 2
- Stage 3
- Stage 4
- Subject Area
- Subject Lot
- Cadastre
- Conservation Area
- Existing Driveway
- Waterways

0 200 400 600 800 1000

Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 14-01-2021
SCALE (A3): 1 : 18000

BUSHFIRE PRONE PLANNING

Figure 1.2

Austral Bricks
Bushfire Prone Areas Map

Lot 1 on Diagram 34893
Lot 1 Morangup Road
MORANGUP
SHIRE OF TOODYAY

PLUNKETT RD
PARKLAND DR
MALKUP BROOK RD
Malkup Brook
JULIMAR RD
HARDERS CHITTY RD
Avon River
RIVER RD
COBBLER POOL RD
Mortigup Brook
LOVERS LANE
SOUTH BRK
QUARRY RD
Morangup Brook
MORANGUP RD
Jimperding Brook
Jingaling Brook
TOODYAY RD
WATTLE WAY
ECHIDNA RD
MCKNOE DR
FERNIE RD
SALT VALLEY RD
Jim Crow Gully

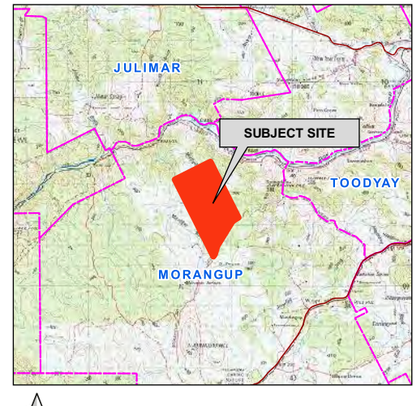
------ LEGEND ------

- Bush Fire Prone Areas 2019
- Subject Area
- Subject Lot
- Cadastre
- Waterways

0 1000 2000 3000 4000

Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

BUSHFIRE PRONE PLANNING

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 14-12-2020
SCALE (A3): 1 : 60000

1.2 Existing Documentation Relevant to the Construction of this Plan

This section acknowledges any known reports or plans that have been prepared for previous planning stages, that refer to the subject area and that may or will impact upon the assessment of bushfire risk and/or the implementation of bushfire protection measures and will be referenced in this Bushfire Management Plan.

Table 2.1: Existing relevant documentation.

RELEVANT EXISTING DOCUMENTS		
Existing Document	Copy Provided by Client	Title
Structure Plan	N/A	
Environmental Report	Yes	Flora and Vegetation Assessment Lot 1 Morangup Road, Morangup (Del Botanics Nov 2012). Austral Bricks Morangup Rd Quarry, Shire of Toodyay: Level 1 Fauna Survey & targeted black cockatoo and chuditch survey (Western Wildlife August 2012). Dieback Interpretation Report, Lot 1 Morangup Road, Morangup (Del Botanics May 2017).
Landscaping (Revegetation) Plan	No	
Bushfire Risk Assessments	No	

2 ENVIRONMENTAL CONSIDERATIONS

2.1 Native Vegetation – Restrictions to Modification and/or Clearing

Many bushfire prone areas also have high biodiversity values. SPP 3.7 policy objective 5.4 recognises the need to consider bushfire risk management measures alongside environmental, biodiversity and conservation values (Guidelines s2.3).

There is a requirement to identify any need for onsite modification and/or clearing of native vegetation and whether this may trigger potential environmental impact/referral requirements under State and Federal environmental legislation. Confirmation that any proposed native vegetation modification and/or clearing is acceptable, should be received from the relevant agencies by the proponent and provided to the bushfire consultant for inclusion in the Bushfire Management Plan if it will influence the required bushfire planning assessments and outcomes. The following table details any potential environmental restrictions of which the author of this report is aware.

Table 2.2: Native vegetation and potential environmental considerations and restrictions.

NATIVE VEGETATION MODIFICATION / CLEARING - POTENTIAL ENVIRONMENTAL RESTRICTIONS IDENTIFIED				
Environmental Considerations / Features	Potential Mapping Data Source (SLIP / Local Planning)	Relevant to Proposed Development	Data Applied	Action Required
Onsite clearing of native vegetation is required.		Yes		
Environmental impact/referral requirements under State and Federal environmental legislation may be triggered.		Possible		
National Park / Nature Reserve	DBCA-011	No-Confirmed by Bushfire Consultant	Relevant Database Reviewed by Bushfire Consultant	None
Conservation Covenant	DPIRD-023	Yes-Confirmed by Proponent	Evidence Submitted by Proponent	Proponent to Seek Advice
Bush Forever Site	DPLH-019	No-Confirmed by Bushfire Consultant	Relevant Database Reviewed by Bushfire Consultant	None
RAMSAR Wetland	DBCA-010	No-Confirmed by Bushfire Consultant	Relevant Database Reviewed by Bushfire Consultant	None
Geomorphic and Other Wetland	DBCA-011-019, 040, 043, 044	No-Confirmed by Bushfire Consultant	Relevant Database Reviewed by Bushfire Consultant	None
Threatened and Priority Ecological Communities (TECs or PECs)	DBCA-038	No-Confirmed by Bushfire Consultant	Relevant Database Reviewed by Bushfire Consultant	None
Threatened and Priority Flora including Declared Rare Flora (DRFs)	DBCA-036	Yes-Confirmed by Proponent	Evidence Submitted by Proponent	Proponent to Seek Advice

Threatened and Priority Fauna	DBCA-037	Yes- Confirmed by Proponent	Relevant Database Reviewed by Bushfire Consultant	Proponent to Seek Advice
Land Identified as significant through a Local Biodiversity Strategy	LG - Intramaps	Not Known	Data Not Readily Available to Bushfire Consultant	Proponent to Seek Advice

Statement of how the identified environmental feature(s) is dealt with in this Bushfire Management Plan (and the location of relevant information):

A Conservation Covenant is placed over an area of the subject lot which is to the east of the existing and proposed quarry sites. This area abuts the eastern boundary of the lot and is approximately 130.3 hectares in size (See Figure 1.1).

Reports for the development site describe the existence or possible existence of threatened and priority flora and fauna. Dieback is also present onsite.

It is advised that the proponent seek further advice from an Environmental Consultant or the WA Department of Biodiversity Conservation and Attractions for further information on the requirement for referral of the proposal.

The assessments and bushfire protection measures detailed the BMP, assume that environmental approval will be achieved or clearing permit exemptions will apply for the proposed quarry extensions.

Development Design Considerations

Establishing development in bushfire prone areas can adversely affect the retention of native vegetation through clearing associated with the creation of lots and/or asset protection zones. Where loss of vegetation is not acceptable or causes conflict with landscape or environmental objectives, it will be necessary to consider available design options to minimise the removal of native vegetation.

Table 2.3: Development design.

MINIMISE THE REMOVAL OF NATIVE VEGETATION	
Design Option	Assessment / Action
Reduction of lot yield	N/A
Cluster development	N/A
Construct building to a standard corresponding to a higher BAL as per BCA (AS 3959:2018 and/or NASH Standard)	N/A
Modify the development location	N/A
The subject site is a quarry where clay is extracted for use in building products. The site is governed by the location and availability of access to the clay.	
IMPACT ON ADJOINING LAND	
Is this planning proposal able to implement the required bushfire protection measures within the boundaries of the land being developed so as not to impact on the bushfire and environmental management of neighbouring reserves, properties or conservation covenants?	Yes
The proposed bushfire protection measures will not impact the onsite Conservation Covenant area or the bushfire and environmental management of neighbouring lots.	

2.2 Retained Vegetation / Re-vegetation / Landscape Plans (including POS)

Riparian zones, wetland/foreshore buffers, road verges and public open space may have plans to re-vegetate or retain vegetation as part of the proposed development.

All retained/planned vegetation and its management will be considered in the development of this Bushfire Management Plan.

Is re-vegetation of riparian zones and/or wetland or foreshore buffers and/or public open space a part of this Proposal?	No
N/A	
Is the requirement for ongoing maintenance of existing vegetation in riparian zones and/or wetland or foreshore buffers and/or public open space a part of this Proposal?	No
N/A	
Has a landscape plan been developed for the proposed development?	No
N/A	

3 POTENTIAL BUSHFIRE IMPACT ASSESSMENT

3.1 Assessment Input

3.1.1 Fire Danger Index (FDI) Applied

AS 3959:2018 Table 2.1 specifies the fire danger index values to apply for different regions. The values used in the model calculations are for the Forest Fire Danger Index (FFDI) and for which equivalent representative values of the Grassland Fire Danger Index (GFDI) are applied as per Appendix B. The values can be modified if appropriately justified.

Table 3.1: Applied FDI Value

FDI VALUE			
Vegetation Areas	As per AS 3959:2018 Table 2.1	As per DFES for the Location	Value Applied
All Vegetation Areas	80	N/A	80

3.1.2 Vegetation Classification and Effective Slope

Classification: Bushfire prone vegetation identification and classification has been conducted in accordance with AS 3959:2018 s2.2.3 and the Visual Guide for Bushfire Risk Assessment in WA (DoP February 2016).

When more than one vegetation type is present, each type is identified separately, and the applied classification considers the potential bushfire intensity and behaviour from the vegetation types present and ensures the worst case scenario is accounted for – this may not be from the predominant vegetation type.

The vegetation structure has been assessed as it will be in its mature state (rather than what might be observed on the day). Areas of modified vegetation are assessed as they will be in their natural unmodified state (unless maintained in a permanently low threat, minimal fuel condition, satisfying AS 3959:2018 s2.2.3.2(f) and asset protection zone standards). Vegetation destroyed or damaged by a bushfire or other natural disaster has been assessed on its revegetated mature state.

Effective Slope: Refers to the ground slope under each area of classified vegetation and is described in the direction relative to the view from the building or proposed development site. Effective slope is not the same as 'average slope', rather it is the slope which most significantly influences fire behaviour. This slope has a direct and significant influence on a bushfire's rate of spread and intensity.

Where there is a significant change in effective slope under an area of classified vegetation, that will cause a change in fire behaviour, separate vegetation areas will be identified to enable the correct assessment.

When the effective slope, under a given area of bushfire prone vegetation, will be different relative to multiple proposed development sites, then the effective slopes corresponding to the different locations, are separately identified.

Planned Re-vegetation/Landscaping Considerations/Public Open Space Management

Once decommissioned, the site will be revegetated with local species to fit with the existing landscape. Some areas will be progressively rehabilitated whilst the site is in operation, where possible.

Table 3.2: Vegetation classification and effective slope.

ALL VEGETATION WITHIN 150 METRES OF THE PROPOSED DEVELOPMENT				
Vegetation Area	Identified Vegetation Types [1] or Description if 'Excluded'	Applied Vegetation Classification [1]	Effective Slope (degrees)[2] (AS 3959:2018 Method 1)	
			Assessed	Applied Range
1	Open forest A-03	Class A Forest	2 upslope	upslope or flat
2	Open forest A-03	Class A Forest	2 downslope	downslope >0-5
3	Open forest A-03	Class A Forest	8 downslope	downslope >5-10
4	Open forest A-03	Class A Forest	13 downslope	downslope >10-15
5	Open forest A-03	Class A Forest	17 downslope	downslope >15-20
6	Open heath C-11	Class D Scrub	2 downslope	downslope >0-5
-	Areas cleared of vegetation.	Excluded as per Section 2.2.3.2 (e) Non	N/A	N/A
Representative photos of each vegetation area, descriptions and classification justification, are presented on the following pages. The areas of classified vegetation are defined, and the photo locations identified on Figure 3.1, the vegetation and topography map.				
Note[1]: Described and classified as per AS 3959:2018 Table 2.3 and Figures 2.3 and 2.4 (A)-(H) Note[2]: Effective slope measured as per AS 3959:2018 Section 2.2.5 and Appendix B Part B4				

VEGETATION AREA 1	
AS 3959:2018 Vegetation Classification Applied:	Class A Forest
Vegetation Types Present:	Open forest A-03
Description/Justification:	Marris, jarrah, wandoo with average height of 12-15 metres and foliage cover of approximately 30%. Saplings, dryandra and grass trees and low heath understorey, sparse in areas.

Photo ID: 1a

Photo ID: 1b

Photo ID: 1c

Photo ID: 1d

Photo ID: 1e

Photo ID: 1f

VEGETATION AREA 2	
AS 3959:2018 Vegetation Classification Applied:	Class A Forest
Vegetation Types Present:	Open forest A-03
Description/Justification:	Marris, jarrah, wandoo with average height of 12-15 metres and foliage cover of approximately 30%. Saplings, dryandra and grass trees and low heath understorey, sparse in areas.

Photo ID: 2a

Photo ID: 2b

Photo ID: 2c

Photo ID: 2d

Photo ID: 2e

Photo ID: 2f

VEGETATION AREA 3	
AS 3959:2018 Vegetation Classification Applied:	Class A Forest
Vegetation Types Present:	Open forest A-03
Description/Justification:	Marris, jarrah, wandoo with average height of 12-15 metres and foliage cover of approximately 30%. Saplings, dryandra and grass trees and low heath understorey, sparse in areas.

Photo ID: 3a

Photo ID: 3b

Photo ID: 3c

Photo ID: 3d

VEGETATION AREA 4	
AS 3959:2018 Vegetation Classification Applied:	Class A Forest
Vegetation Types Present:	Open forest A-03
Description/Justification:	Marris, jarrah, wandoo with average height of 12-15 metres and foliage cover of approximately 30%. Saplings, dryandra and grass trees and low heath understorey, sparse in areas.

Photo ID: 4a

Photo ID: 4b

Photo ID: 4c

VEGETATION AREA 5	
AS 3959:2018 Vegetation Classification Applied:	Class A Forest
Vegetation Types Present:	Open forest A-03
Description/Justification:	Marris, jarrah, wandoo with average height of 12-15 metres and foliage cover of approximately 30%. Saplings, dryandra and grass trees and low heath understorey, sparse in areas.

Photo ID: 5a

VEGETATION AREA 6	
AS 3959:2018 Vegetation Classification Applied:	Class C Shrubland
Vegetation Types Present:	Open heath C-11
Description/Justification:	Areas of revegetation. Low shrubs, assessed in mature state as Open Heath.

Photo ID: 6a

Photo ID: 6b

Photo ID: 6c

VEGETATION AREA	
AS 3959:2018 Vegetation Classification Applied:	Excluded as per Section 2.2.3.2 (e) Non Vegetated Areas
Vegetation Types Present:	Non-vegetated
Description/Justification:	Areas cleared for quarry site

Photo ID: 7a

Photo ID: 7b

Photo ID: 7c

Photo ID: 7d

Photo ID: 7e

Photo ID: 7f

VEGETATION AREA	
AS 3959:2018 Vegetation Classification Applied:	Excluded as per Section 2.2.3.2 (e) Non Vegetated Areas
Vegetation Types Present:	Non-vegetated
Description/Justification:	Areas cleared for quarry site

Photo ID: 7g

Photo ID: 7h

Figure 3.1

Existing Topography & Classified Vegetation

Lot 1 on Diagram 34893
Lot 1 Morangup Road
MORANGUP
SHIRE OF TOODYAY

AREA 3 Class (A) Forest Effective Slope >5-10°
AREA 2 Class (A) Forest Effective Slope >0-5°
AREA 6 Class (C) Shrubland Effective Slope >0-5°
AREA 4 Class (A) Forest Effective Slope >10-15°
AREA 5 Class (A) Forest Effective Slope >15-20°
AREA 1 Class (A) Forest Effective Slope 0°
Morangup Brook
MORANGUP RD

------ LEGEND ------

- Photos
- Elevation (m)
- Waterways
- Subject Area
- Subject Lot
- 150m Assessment Area
- Cadastre

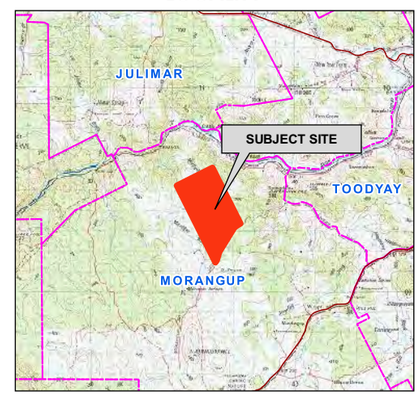
Classified Vegetation

- Class A - Forest
- Class C - Shrubland
- Exclusion 2.2.3.2

0 50 100 150 200 250 300 350 400

Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 14-12-2020
SCALE (A3): 1 : 6500

BUSHFIRE PRONE PLANNING

Figure 3.2

Post Development Topography & Classified Vegetation

Lot 1 on Diagram 34893
Lot 1 Morangup Road
MORANGUP
SHIRE OF TOODYAY

AREA 3 Class (A) Forest Effective Slope >5-10°
AREA 2 Class (A) Forest Effective Slope >0-5°
AREA 6 Class (C) Shrubland Effective Slope >0-5°
AREA 4 Class (A) Forest Effective Slope >10-15°
AREA 5 Class (A) Forest Effective Slope >15-20°
AREA 1 Class (A) Forest Effective Slope 0°
Stage 1 (Existing)
Stage 2
Stage 3
Stage 4
Morangup Brook
MORANGUP RD

225m 240m 275m 290m 220m 215m 245m 255m 260m 230m 235m 265m 270m 280m 285m 295m 250m

------ LEGEND ------

- Elevation (m)
- Waterways
- Quarry
- Subject Area
- Subject Lot
- 150m Assessment Area

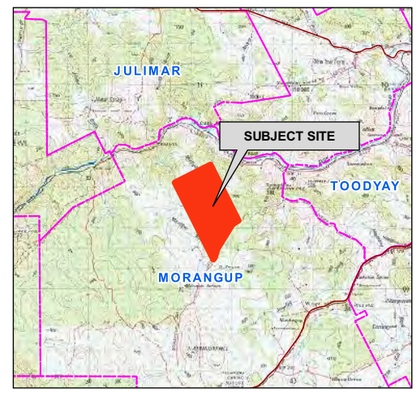
Classified Vegetation

- Class A - Forest
- Class C - Shrubland
- Exclusion 2.2.3.2

0 50 100 150 200 250 300 350 400

Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

BUSHFIRE PRONE PLANNING

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 16-12-2020
SCALE (A3): 1 : 6500

3.1.3 Vegetation Separation Distance

The vegetation separation distance is the horizontal distance measured from the relevant parts of an existing building or a future building's planned location (within a lot), to the determined edge of an area of classified vegetation.

This separation distance applied to determining a Bushfire Attack Level (BAL) can be either:

- The *measured distance* – for which the location of the building relative to the edge of classified vegetation must be known. This will result in single determined BAL that will apply to a building. (The measured distance is a required calculation input); or
- A *calculated minimum and maximum distance (range)* that will correspond to each individual BAL. The calculated distances provide an indicative (or achievable) BAL for which the determined BAL will be dependent on the known location of the building relative to the edge of classified vegetation.

  The calculated range of distances corresponding to each BAL can be presented in different formats (tables or a BAL contour map), dependent on the form of information that is most appropriate for the proposed development/use. These distance ranges corresponding to BAL(s) will be presented in Section 3.2: 'Assessment Output".

For the proposed development/use, the applicable vegetation separation distances will be presented within the Bushfire Management Plan in this location:	In Section 3.2 'Assessment Output' as a table containing the calculated ranges of distance corresponding to each BAL and illustrated as a BAL Contour Map.

3.2 Assessment Output

UNDERSTANDING THE RESULTS OF THE BUSHFIRE IMPACT ASSESSMENT

Bushfire Attack Levels (BALs) – Their Application in the Building Environment is Different to the Planning Environment

In the building environment, a *determined BAL* is required for the proposed construction at the building application stage. This is to inform approval considerations and establish the bushfire construction standards that are to apply. An indicative BAL is not acceptable for a building application.

In the planning environment, through the application of SPP 3.7 and associated Guidelines, the deemed to satisfy requirement for a proposed 'development site' or sites (defined by the LPS Amendment Regulations 2015 as "that part of a lot on which a building that is the subject of development stands or is to be constructed"), is that a BAL-29 or lower rating can be achieved once all works associated with the proposal are completed. For planning approval purposes, an *indicative BAL* can provide the required information.

Determined Bushfire Attack Level

A determined BAL is to apply to an existing building or the 'development site' on which the building is to be constructed and not to a lot or building envelope. Its purpose is to state the potential radiant heat flux to which the building will be exposed, thereby determining the construction standard to be applied.

A determined BAL cannot be given for a future building whose design and position on the lot are unknown or the vegetation separation distance has not been established. It is not until these variables have been fixed that a determined BAL can be stated, and a BAL Certificate can be issued.

The one exception is when a building *of any dimension* can be *positioned anywhere* on a proposed lot (within R-Code building setbacks) or within a defined building envelope, and always remain subject to the same BAL, regardless of the retention of any existing classified vegetation either onsite or offsite.

Indicative Bushfire Attack Level

If a BAL is not able to achieve 'determined' status it will be an indicative BAL. It indicates the BAL that can be achieved by the proposed development/use. However, it is conditional upon an assessment variable(s) being confirmed at a later stage (e.g. the building location is established/changed, or vegetation is modified/removed to establish the vegetation separation distance).

A BAL certificate cannot be issued for an indicative BAL – unless that BAL cannot vary (refer to 'Determined BAL' above).

In table form, a single or a range of indicative BAL(s) may be presented. If a single indicative BAL is stated for a defined area (i.e. the lot or building envelope), this will be the highest indicative BAL impacting the defined area.

In BAL contour map form (refer to Section 3.2.2), the illustrated BAL contours visually identify areas of land for which if any part of an existing or proposed building is located on that land and within the BAL contours, then the highest BAL affecting that building (or part of the land on which the building will be constructed), will be the indicative BAL that is to apply.

The BAL can only become a determined BAL once the actual location of that building on the land is known and/or the required minimum vegetation separation distance corresponding to the relevant BAL contour is established (refer to Table 3.x).

3.2.1 Bushfire Attack Level Results - BAL Contour Map Format

INTERPRETATION OF THE BUSHFIRE ATTACK LEVEL (BAL) CONTOUR MAP

The contour map will present different coloured contour intervals extending from the areas of classified bushfire prone vegetation. These represent the different bushfire attack levels that will exist at varying distances away from the classified vegetation in the event of a bushfire in that vegetation.

The areas of classified vegetation to be considered in developing the BAL contours, are those that will remain as the intended end state of the subject development once earthworks, clearing and/or landscaping and re-vegetation have been completed (or each stage completed).

Each bushfire attack level corresponds to a set range of radiant heat flux that is generated by a bushfire. That range is defined by the AS 3959:2018 BAL determination methodology.

The width of each shaded BAL contour is a diagrammatic representation of the separation distances from the classified vegetation that correspond to each BAL for each separately identified area of classified vegetation. They have been calculated by the application of the unique site variables including vegetation types and structure, ground slope and applied fire weather.

(Refer to Section 3.2 'Understanding the Results of the Bushfire Impact Assessment' for the explanation of how BAL(s) for buildings will be assessed from the BAL Contour Map).

Construction of the BAL Contours

VEGETATION AREAS APPLIED TO THE DEVELOPMENT OF THE BAL CONTOUR MAP

All identified areas of classified vegetation have been applied to the development of the BAL Contour Map.

VEGETATION SEPARATION DISTANCES APPLIED

The distances that have been applied to illustrating the width of each BAL contour shown in Figure 3.2 is stated in Table 3.3. These correspond to each Bushfire Attack Level and are specific to the proposed development site.

Table 3.3: Vegetation separation distances applied to construct the BAL contours.

BAL CONTOUR MAP – APPLIED VEGETATION SEPARATION DISTANCES								
Derived from the Application of Method 1 BAL Determination Methodology (AS 3959:2018 Section 2, Table 2.5)[1]								
Vegetation Area	Vegetation Classification	Effective Slope (degree range)	BAL and Corresponding Separation Distance (m)					
			BAL-FZ	BAL-40	BAL-29	BAL-19	BAL12.5	BAL-LOW
1	Class A Forest	upslope or flat	<16	16-<21	21-<31	31-<42	42-<100	>100
2	Class A Forest	downslope >0-5	<20	20-<27	27-<37	37-<50	50-<100	>100
3	Class A Forest	downslope >5-10	<26	26-<33	33-<46	46-<61	61-<100	>100
4	Class A Forest	downslope >10-15	<33	33-<42	4-<56	56-<73	73-<100	>100
5	Class A Forest	downslope >15-20	<42	42-<52	52-<68	68-<87	87-<100	>100
6	Class C Shrubland	downslope >0-5	<7	7-<10	10-<15	15-<22	22-<100	>100
Note[1] All the assessment inputs applied are presented in Section 3.1.								

Vegetation Area	Vegetation Class	Vegetation Type	Effective Slope
1	A	Forest	0
2	A	Forest	>0-5
3	A	Forest	>5-10
4	A	Forest	>10-15
5	A	Forest	>15-20
6	C	Shrubland	>0-5

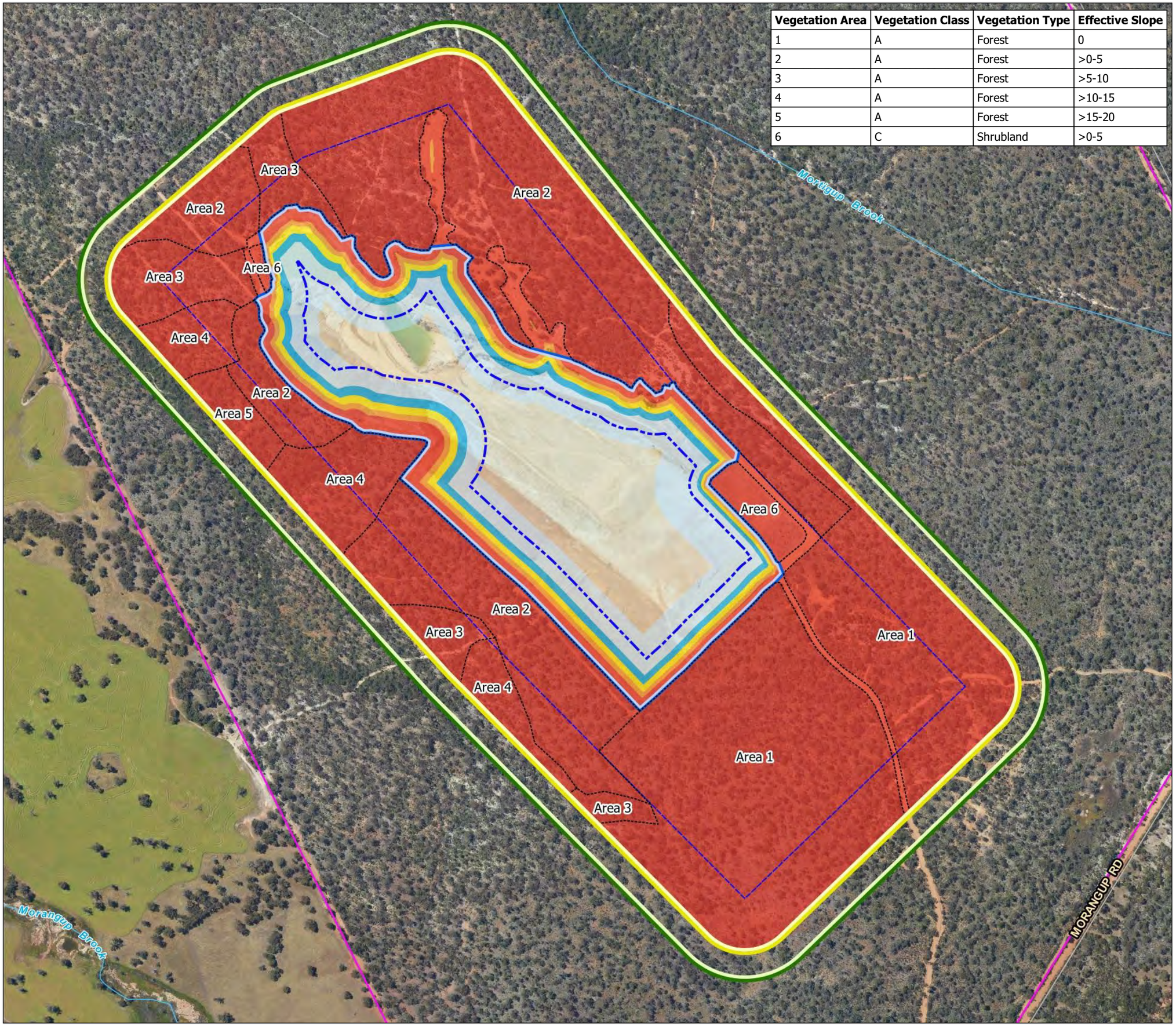


Figure 3.3

Existing Quarry BAL Contour Map

Lot 1 on Diagram 34893
Lot 1 Morangup Road
MORANGUP
SHIRE OF TOODYAY

------ LEGEND ------

- Waterways
- Subject Area
- Asset Protection Zone (APZ)
- Subject Lot
- 100m BAL Buffer
- 150m Assessment Area
- Vegetation Outline

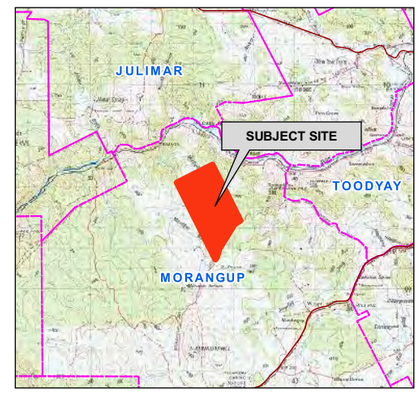
Bushfire Attack Levels

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW
- Radiant Heat Potential (10kW-m2)

0 50 100 150 200 250 300 350 400

Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 16-12-2020
SCALE (A3): 1 : 6500

BUSHFIRE PRONE PLANNING

Vegetation Area	Vegetation Class	Vegetation Type	Effective Slope
1	A	Forest	0
2	A	Forest	>0-5
3	A	Forest	>5-10
4	A	Forest	>10-15
5	A	Forest	>15-20
6	C	Shrubland	>0-5

Figure 3.4

Post Development BAL Contour Map

Lot 1 on Diagram 34893
Lot 1 Morangup Road
MORANGUP
SHIRE OF TOODYAY

------ LEGEND ------

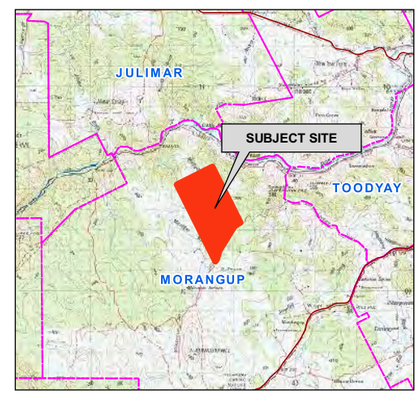
- Waterways
- Quarry
- Subject Area
- Asset Protection Zone (APZ)
- Subject Lot
- 100m BAL Buffer
- 150m Assessment Area
- Vegetation Outline

Bushfire Attack Levels

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW
- Radiant Heat Potential (10kW-m2)

0 50 100 150 200 250 300 350 400
Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 16-12-2020
SCALE (A3): 1 : 6500

BUSHFIRE PRONE PLANNING

3.2.2 Bushfire Attack Level Results - Derived from The BAL Contour Map

Bushfire Attack Level ratings reduce with increased separation distance from classified vegetation. The required separation distances from vegetation to achieve different BAL ratings is dependent upon the vegetation type and the slope of the ground under the vegetation. The existing quarry site is surrounded by forest type vegetation with varying degrees of slope under the vegetation.

BAL ratings are related to the potential radiant heat flux from a bushfire. That is, areas rated as BAL-29 are subject to a radiant heat flux of 29kW/m^2 or lower, similarly for BAL-40, BAL-19 and BAL-12.5. Areas assessed as BAL-LOW are greater than 100 metres from classifiable vegetation. These BAL-LOW areas however are still subject to radiant heat flux from a bushfire. The BAL ratings for the quarry reduces from BAL-FZ close to the existing classified vegetation to BAL-LOW within the pit.

There are no buildings currently located on the site. When the site is operational there is a crib room and portaloo located at the light vehicle parking area. This area is currently subject to BAL ratings of BAL-FZ and BAL-40.

3.2.3 Determined Separation Distances Corresponding to 10kW/m^2 of Radiant Heat Flux

Acceptable solutions with regard to radiant heat exposure during a bushfire emergency event can apply to certain 'vulnerable' land uses. These solutions establish the requirements for safer onsite shelter locations to be subject to radiant heat flux no greater than 10 kW/m^2 for a building or 2 kW/m^2 for an open area.

This type of development is not considered a vulnerable land use. However, as there is only one compliant access/egress route available from the site, it is recommended that a suitable shelter in place building be located onsite in a safe area that is subject to a potential radiant heat level of less than 10kW/m^2.

Table 3.4: Specific vegetation separation distances for 10kW/m^2 application.

SEPARATION DISTANCES CORRESPONDING TO 10 kW/m^2 OF RADIANT HEAT FLUX		
BAL Determination Methodology Applied[1]		Method 1 as per AS 3959:2018 s2.2.6 and Table 2.5 and Method 2 as per AS 3959:2018 Appendix B.
Vegetation Area	Vegetation Classification	Separation Distance Corresponding to 10 kW/m^2 (metres)
1	Class A Forest	63.2
2	Class A Forest	75.3
3	Class A Forest	89.9
4	Class A Forest	107.6
5	Class A Forest	126.6
6	Class C Shrubland	36.7
Note[1] Assessment inputs applied are presented in Section 3.1. AS 3959:2018 method 2 calculation input/output summary data is presented for reference in Appendix 4		

The separation distances in the above table are depicted in Figures 3.3 and 3.4 of this Plan.

4 IDENTIFICATION OF BUSHFIRE HAZARD ISSUES

In response to the Bushfire Management Plan requirements established by Appendix 5 of the Guidelines for Planning in Bushfire Prone Areas (WAPC 2017 v1.3), the following statements are made to assist in the understanding of whether the proposal is likely to be able to comply with the bushfire protection criteria now or in subsequent planning stages.

Spatial Context - Broader Landscape Considerations	
Wider road network and access constraints	Morangup Road does provide legal access to two different destinations. From the subject lot the road is sealed to the west and joins up with Toodyay Road. To the east, a gravel roads winds down to Lovers Lane where a bitumen road is available to access Toodyay Road to the south or River Road to the north. The gravel portion of Morangup Road is steep and/or narrow in sections and may not be suitable for trucks. This section of road does not comply with the requirements of the Guidelines for Planning in Bushfire Prone Areas.
Proximity of settlements and emergency services	The subject lot is located in a rural setting with mixed farming and areas of native vegetation. The nearest settlement is Morangup at approximately 4 kilometres to the south-west. The nearest fire station is Morangup Bush Fire Brigade located approximately 9 kilometres to the south-west on Wallaby Way, Morangup. Emergency Services are also available at Toodyay, Julimar and Wundowie.
Bushfire prone vegetation types and extent (including conserved vegetation)	Land extending to the north, east and south of the subject lot is mostly farmland with interspersed areas of uncleared native vegetation. To the west sits a large area of native forest type vegetation. The subject lot is wholly forested with the exception of the quarry site, similarly for the abutting lot to the east. Abutting lots to the south, west and north have a mixture of farmland and areas of native vegetation. The forest vegetation in and surrounding the subject lot can produce significant embers and firebrands during a bushfire event.
Topography and fire behaviour interactions.	Topography within and near to the subject lot is undulating with some steep slopes evident along creek beds (up to 17 degrees measured). Bushfire rates of spread can double for every ten degrees of upslope while downslopes will slow the rate of spread.
Potential for extreme fire behaviour and pyro convective events.	Possible but limited likelihood due to the fragmentation of areas of forest type vegetation which are interspersed with cleared areas and pastured lands.
Environmental Considerations	
Constraints to implementing required and/or additional bushfire protection measures	The environmental considerations have not identified any issues that affect primary bushfire protection measures.
Provision of Access Within the Subject Site	
Potential constraints	No constraints to the existing onsite access route exist.
Potential Bushfire Impacts	
Flame and radiant heat and ability to establish an Asset Protection Zone (APZ)	Excavation of the quarry pit has created a large area where the potential radiant heat flux level is less than 10kW/m^2. This area will not be subject to extreme radiant heat flux levels or flame contact from burning native vegetation. This area can provide for the location of a suitable shelter in place building able to accommodate the maximum number of persons expected onsite. Application of the bushfire construction standard to this building will mitigate the risks from radiant heat impact and ember attack to a level which is considered acceptable.

Embers/firebrands, smoke and fire-driven wind	These will impact the subject site. The appropriate protection measures of building construction and strict management of the APZ will mitigate the risk to what is considered an acceptable level (See Figures 3.3 and 3.4 for APZ).

5 ASSESSMENT AGAINST THE BUSHFIRE PROTECTION CRITERIA ESTABLISHED BY THE GUIDELINES

For a development application that is not a 'Tourism Land Use' to be considered compliant with SPP 3.7, it must satisfy (achieve) the intent of each of the four elements of the bushfire protection criteria. These criteria are established by the *Guidelines for Planning in Bushfire Prone Areas WAPC 2017 v1.3*). Compliance can be achieved by either:

- Meeting all applicable acceptable solutions corresponding to each element (i.e. the minimum bushfire protection measures that are deemed to satisfy planning requirements); or
- Where an acceptable solution cannot be met, by developing a performance solution that satisfies the established requirements.

5.1 Local Government Variations to Apply

Local governments may add to or modify the acceptable solutions of the Bushfire Protection Criteria (BPC) and/or apply technical requirements that vary from those specified in the Guidelines for Planning in Bushfire Prone Areas (WAPC). In such instances, this Proposal will be assessed against these variations and/or any specific local government technical requirements for emergency access and water. Refer to Appendices 2 and 3 for relevant technical requirements.

Will local or regional variations (endorsed by WAPC / DFES) to the applicable acceptable solutions established by the *Guidelines* or the *Position Statement: Tourism land uses in bushfire prone areas WAPC October 2019,* apply to this Proposal?	No

5.2 Summary of Assessment Against the Bushfire Protection Criteria

SUMMARISED OUTCOME OF THE ASSESSMENT AGAINST THE BUSHFIRE PROTECTION CRITERIA					
Element of the Bushfire Protection Criteria	Basis for the Proposal Achieving Full Compliance with SPP 3.7			The Proposal Cannot Achieve Full Compliance with SPP 3.7	
	Acceptable Solutions Met	Achieves the Intent of the Element			
	All applicable solutions are fully met	All applicable solutions are not fully met. A merit based assessment and/or a bushfire performance comparison of the proposals residual risk with that of the residual risk of the acceptable solution is conducted (refer Note 4)	A performance principle-based solution is applied	Bushfire planning development type that may not require full compliance is applied	An improvement in bushfire performance compared to the existing development is detailed (refer Note 4)
1. Location	✓			N/A	
2. Siting and Design of Development	✓				
3. Vehicular Access					✓
4. Water	✓				

Note: The development proposal has been assessed:

1. Against the requirements established in Appendix 4 of the *Guidelines for Planning in Bushfire Prone Areas, WAPC 2017 v1.3 (Guidelines)*. The Guidelines are found at https://www.planning.wa.gov.au/8194.aspx; and
2. Applying the interpretation guidance provided in *Position Statement: Planning in bushfire prone areas – Demonstrating Element 1: Location and Element 2: Siting and design (WAPC Nov 2019)*.
3. Applying any endorsed variations to the Guideline's acceptable solutions and associated technical requirements that have been established by the local government. If known and applicable these have been stated in Section 5.1 with the detail included as an appendix if required by the local government.
4. When non-compliant with SPP 3.7 and when appropriate, by utilising additional compliance pathways that include the application of merit based assessment and comparative bushfire performance. The validity of this approach is derived from relevant decisions made by the responsible authorities (refer Appendix 2).

5.3 Assessment Detail

Element 1: Location	
Intent: To ensure that strategic planning proposals, subdivision and development applications are located in areas with the least possible risk of bushfire to facilitate the protection of people, property and infrastructure.	
Compliance: How the proposed development achieves the intent of Element 1:	By fully meeting all applicable acceptable solutions established by the bushfire protection criteria (Guidelines v1.3 WAPC 2017)
ASSESSMENT (COMPLIANCE) STATEMENTS For each applicable acceptable solution, the following statements present the results of the assessment of the proposed development/use against the requirements established by the *Guidelines (WAPC 2017 v1.3)* and apply the interpretation guidance established by the *Position Statement: Planning in bushfire prone areas – Demonstrating Element 1: Location and Element 2: Siting and design (WAPC Nov 2019)*.	
Acceptable Solution: A1.1: Development Location	

ASSESSMENT AGAINST THE REQUIREMENTS ESTABLISHED BY THE GUIDELINES

This quarry site is an existing development and its location is governed by the availability and accessibility of the materials required from the quarry. The whole of the subject lot, with the exception of the quarry site, consists of bushfire prone vegetation. Abutting lots have varying vegetation types ranging from farmland to areas of native forest vegetation.

The site has an extreme bushfire hazard level however, there are large areas in the quarry that are subject to a BAL rating of BAL-29 or less which is compliant with Acceptable Solution A1.1 in the Guidelines.

ASSESSMENT AGAINST THE REQUIREMENTS ESTABLISHED BY THE POSITION STATEMENT

The position statement establishes that:

- The source of risk (the hazard) to be considered in Element 1 is the "level of bushfire exposure" from the type and extent of bushfire prone vegetation and the topography of the land on which it exists; and
- "Consideration should be given to the site context" which includes the land both "within and adjoining the subject site". The "hazards remaining within the site should not be considered in isolation of the hazards adjoining the site, as the potential impact of a bushfire will be dependent on the wider risk context."

The position statement also recognises:

- That the proposed development site and its surrounding land may be part of an area "identified for development or intensification of land use prior to the release of SPP 3.7"; consequently
- Consideration by decision-makers "should also be given to improving bushfire management of the site and surrounding area, thereby reducing the vulnerability of people property and infrastructure to bushfire"; and
- The application of mitigation measures to lessen the risk to the broader area would include improvements to the local road network (including emergency access ways), improvements/additions to firefighting water supply and increasing separation distance from the hazard.

The Hazard Within the Subject Lot

The existing lot is entirely vegetated with native vegetation, classified as Forest, and has an extreme bushfire hazard level, except for the existing quarry site which is generally free of vegetation. The impact of the topography, and slopes under the classified vegetation, will be dependent on a bushfire's direction of travel. Slopes in the range of zero to seventeen degrees do exist onsite and bushfire travelling upslope will have increased intensity and rate of

spread. Intense bushfire behaviour is possible, particularly if vegetation within the lot is ignited by bushfire in the adjoining lots and they are involved together.

However, the existence of a large Asset Protection Zone (APZ) within the quarry site removes the threat of greater levels of radiant heat or flame contact upon any assets and temporary buildings, if located in this area.

The primary bushfire threat from bushfire prone vegetation remaining within the proposed lot will be embers. This threat can be mitigated by the application of appropriate building location, design, bushfire construction standards and the ongoing maintenance of the APZ to ensure that buildings and assets will not be impacted by consequential fire from combustible materials used, stored or accumulated within the APZ.

The Hazard Adjoining the Subject Lot

- To the west of the subject lot adjoins farmland consisting of crops, grasses and remnant areas of forest or woodland.
- To the north of the subject lot adjoins farmland consisting grasses for grazing of stock and remnant areas of forest or woodland.
- To the east similar forest vegetation to that on the subject lot continues for approximately 1.5 kilometres before reaching grazing land and areas of remnant forest.
- To the south the development site is separated from areas of bushfire prone vegetation and other quarries by Morangup Road. Vegetation to the south is patchwork areas of crops, grazing and remnant native vegetation.

Bushfire hazards external to the site range from moderate to extreme. Due to the wide availability of fuel and the possibility of spotting from external forest and woodland vegetation, a bushfire could approach the subject site from any direction.

The Potential to Reduce Bushfire Risk to Existing Land Use

When considered in the broader context of existing land use within the surrounding area, the existing, and proposed extension to, the quarry site can potentially contribute to reducing the level of risk from bushfire to existing landowners.

This can be achieved in various ways and the following assessment points are made for the subject lot:

- Large rural residential lots potentially contain large areas of retained native vegetation that are difficult to practically maintain in a lower threat state over time. They provide for the uninterrupted passage of a bushfire across the landscape. The extension of the existing quarry site reduces the amount of bushfire prone vegetation onsite and therefore reduces the available fuel to be burnt and could impede the progress of a local bushfire event;
- The subject lot currently provides a signposted Fire Emergency Water supply for the wider community. This is located in the southern corner of the lot. Further water supplies can be made available for firefighting helitacs and land crews from within the quarry site. As there is no reticulated water supply in this area, the potential positive impact of increased static water supply that will be potentially available for firefighting purposes should be considered.

Element 2: Siting and Design of Development

Intent: To ensure that the siting and design of a development (note: not building/construction design) minimises the level of bushfire impact.

Compliance: How the proposed development achieves the intent of Element 2:	By fully meeting all applicable acceptable solutions established by the bushfire protection criteria (Guidelines v1.3 WAPC 2017)

ASSESSMENT (COMPLIANCE) STATEMENTS

For each applicable acceptable solution, the following statements present the results of the assessment of the proposed development/use against the requirements established by the *Guidelines (WAPC 2017 v1.3)* and apply the interpretation guidance established by the *Position Statement: Planning in bushfire prone areas – Demonstrating Element 1: Location and Element 2: Siting and design (WAPC Nov 2019)*.

Acceptable Solution: A2.1: Asset Protection Zone

THE APZ - DEVELOPMENT SITING AND DESIGN PLANNING REQUIREMENTS

The necessary outcome of bushfire planning for development siting and design, is to ensure that a building can be located within the developable portion of any lot (i.e. outside those parts of the lot that form the required R-Code building setbacks, or any other excluded area), and be subject to potential radiant heat from a bushfire not exceeding 29 kW/m^2 (i.e. a maximum BAL of BAL-29).

This will be achieved when the size of the "low fuel area immediately surrounding a building", the asset protection zone (APZ), is large enough. This requires a certain separation distance to exist between the building and areas of classified vegetation. These are the BAL-29 APZ dimensions and they will vary dependent on site specific parameters.

The APZ should be contained solely within the boundaries of each lot, except in instances where the neighbouring lot(s) or adjacent public land will be managed in a low-fuel state on an ongoing basis, in perpetuity.

Where possible, planning for siting and design should incorporate elements that include non-vegetated areas (e.g. roads/parking/drainage) and/or formally managed areas of vegetation (public open space/recreation areas/ services installed in a common section of land), as either part of the required APZ dimensions or to additionally increase separation distances to provide greater protection. These elements create robust and easier managed asset protection zones.

THE ASSESSMENT

Future buildings in the quarry site can be surrounded by an APZ that will ensure the potential radiant heat impact of a bushfire does not exceed 29 kW/m^2 (BAL-29). The required APZ specifications of width, location and management can be achieved.

APZ Width: The required APZ dimensions to ensure buildings are subject to a maximum BAL of BAL-29 (measured from any external wall or supporting post or column to the edge of the classified vegetation), has been determined in Section 3.2 of this BMP and are:

BAL-29 APZ Dimensions		
Future building on subject site (permanent or temporary)	Building to Vegetation Area 1	Minimum 21 metres
	Building to Vegetation Area 2	Minimum 27 metres
	Building to Vegetation Area 3	Minimum 33 metres
	Building to Vegetation Area 4	Minimum 42 metres
	Building to Vegetation Area 5	Minimum 52 metres
	Building to Vegetation Area 6	Minimum 10 metres

Element 2: Siting and Design of Development

APZ Location: Asset protection zones of the widths stated above can be contained solely within the boundaries of the lot. The APZ is located around the extents of the cleared quarry site and does not include recently revegetated areas.

APZ Management: All vegetation that will require modification/removal and future management is onsite and therefore under the control of the landowner.

Any retained vegetation within the APZ will be managed in accordance with the technical requirements established by the Schedule 1: 'Standards for Asset Protection Zones (Guidelines). The APZ specifications are also detailed in Appendix 1 and the Shire of Toodyay may have additional requirements established by their Fire-break Notice.

THE APZ – REQUIRED DIMENSIONS TO SATISFY FUTURE BUILDING (AND ONGOING MANAGEMENT)

It is important for the landowner to be aware that the APZ dimensions that will be required to be physically established and maintained on the site surrounding relevant future buildings, temporary or permanent, may be different to those stated above for the BAL-29 APZ - which is the minimum dimension a planning proposal needs to show can be established to comply with SPP 3.7.

The actual APZ dimensions to be physically established and maintained, will be based on which of the following establishes the larger APZ dimension:

- The dimensions corresponding to the determined BAL of a building (refer to Section 3.2 for explanation of the 'planning' versus 'building' requirements and 'indicative' versus 'determined' BAL); or
- The APZ dimensions established by the local government's Firebreak Notice; or
- In the case of a required 'Shelter in place building' The dimensions corresponding to a radiant heat flux level of 10kW/m^2.

If the dimensions of the APZ that are to be established are known at this time, they will be stated below.

Onsite buildings will be of a temporary nature and will be removed when the site is not in operation. The first three tables below denote the minimum vegetation separation distances for varying acceptable BAL ratings. These can be used to locate the applicable buildings onsite. Note that buildings should be constructed to the maximum BAL rating of the area that they are located within.

The fourth table denotes the required vegetation separation distance to achieve a potential radiant heat flux level of 10kW/m^2 or lower. These are the minimum required separation distances for shelter in place buildings. The different BAL ratings for the site and the 10kW/m^2 or lower area are shown in Figures 3.3 and 3.4.

The Minimum APZ Dimensions to be Established and Maintained Achievable BAL for the Proposed Development/Use is BAL-29		
Applicable to Following Building(s): Crib Room Portaloo	Building to Vegetation Area 1	Minimum 21 metres
	Building to Vegetation Area 2	Minimum 27 metres
	Building to Vegetation Area 3	Minimum 33 metres
	Building to Vegetation Area 4	Minimum 42 metres
	Building to Vegetation Area 5	Minimum 52 metres
	Building to Vegetation Area 6	Minimum 20 metres

Element 2: Siting and Design of Development

The Minimum APZ Dimensions to be Established and Maintained Achievable BAL for the Proposed Development/Use is BAL-19		
Applicable to Following Building(s): Crib Room Portaloo	Building to Vegetation Area 1	Minimum 31 metres
	Building to Vegetation Area 2	Minimum 37 metres
	Building to Vegetation Area 3	Minimum 46 metres
	Building to Vegetation Area 4	Minimum 56 metres
	Building to Vegetation Area 5	Minimum 68 metres
	Building to Vegetation Area 6	Minimum 20 metres

The Minimum APZ Dimensions to be Established and Maintained Achievable BAL for the Proposed Development/Use is BAL-12.5		
Applicable to Following Building(s): Crib Room Portaloo	Building to Vegetation Area 1	Minimum 42 metres
	Building to Vegetation Area 2	Minimum 50 metres
	Building to Vegetation Area 3	Minimum 61 metres
	Building to Vegetation Area 4	Minimum 73 metres
	Building to Vegetation Area 5	Minimum 87 metres
	Building to Vegetation Area 6	Minimum 22 metres

The Minimum APZ Dimensions to be Established and Maintained Maximum Potential Radiant Heat Level of 10kW/m^2 for Shelter in Place Building		
Applicable to Following Building(s): Shelter in place building	Building to Vegetation Area 1	Minimum 63.2 metres
	Building to Vegetation Area 2	Minimum 75.3 metres
	Building to Vegetation Area 3	Minimum 89.9 metres
	Building to Vegetation Area 4	Minimum 107.6 metres
	Building to Vegetation Area 5	Minimum 126.6 metres
	Building to Vegetation Area 6	Minimum 36.7 metres

Element 3: Vehicular Access	
Intent: To ensure that the vehicular access serving a subdivision/development is available and safe during a bushfire event.	
Compliance: How the proposed development achieves the intent of Element 3:	By meeting all applicable acceptable solutions except A3.2 for which a performance solution has been developed.
ASSESSMENT (COMPLIANCE) STATEMENTS For each applicable acceptable solution, the following statements present the results of the assessment of the proposed development/use against the requirements established by the *Guidelines (WAPC 2017 v1.3).*	
Acceptable Solution: A3.1: Two Access Routes	
Morangup Road provides legal access to two different destinations. From the subject lot the road is sealed to the west and joins up with Toodyay Road. To the east, the road is gravel and winds steeply down to Lovers Lane where a bitumen road is available to access Toodyay Road to the south or River Road to the north.	
Acceptable Solution: A3.2: Public Road	
Morangup Road, to the west of the subject site, complies with the acceptable solution. The gravel portion of Morangup Road to the east of the subject lot is generally 6 metres wide but narrow in sections and has a steep grade in areas (1:4.5). This section of road does not comply with the requirements of the Guidelines for Planning in Bushfire Prone Areas. There are no alternative routes available (including provision of an emergency access way) to provide an additional access route to a different destination.	
Acceptable Solution: A3.3: Cul-de-sacs (including a dead-end road)	
N/A	
Acceptable Solution: A3.4: Battle-axe	
N/A	
Acceptable Solution: A3.5: Private Driveways	
The private driveway to the quarry site is approximately 1100 metres long and is a minimum of 8 metres wide. A turnaround area is available inside the site gate at about 100 metres from Morangup Road. A further turnaround area is required 500 metres from the current turnaround area, which will leave 500 metres to the quarry site where turnaround areas are currently available. No passing bays are required. The construction technical requirements established by the Guidelines and/or the local government can and will be complied with. These requirements are set out in Appendix 2.	
Acceptable Solution: A3.6: Emergency Access Way	
N/A	
Acceptable Solution: A3.7: Fire Service Access Routes	
N/A	
Acceptable Solution: A3.8: Firebreak Width	
The subject lot will comply with the requirements of the local government annual firebreak notice issued under s33 of the Bush Fires Act 1954.	

Element 4: Water	
Intent: To ensure water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from bushfire.	
Compliance: How the proposed development achieves the intent of Element 4:	By fully meeting all applicable acceptable solutions established by the bushfire protection criteria (Guidelines v1.3 WAPC 2017)
ASSESSMENT (COMPLIANCE) STATEMENTS For each applicable acceptable solution, the following statements present the results of the assessment of the proposed development/use against the requirements established by the *Guidelines (WAPC 2017 v1.3).*	
Acceptable Solution: A4.1: Reticulated Areas	
N/A	
Acceptable Solution: A4.2: Non-Reticulated Areas	
N/A	
Acceptable Solution: A4.3: Non-Reticulated Areas – Individual Lots	
A dedicated static water supply (dam) is available in the southern corner of the lot. The supply is signposted as a Fire Emergency Water supply for the wider community and is accessible from inside the lot via a gravel track, or from Morangup Road via a locked gate (Lock stamped D21). A turnaround area should be installed at the dam, suitable for 3.4 type fire appliances. A further static water supply, with suitable access and fittings (if required), should be considered within the quarry site to protect any onsite assets. This could either be an existing dam within the quarry (if acceptable to the Shire of Toodyay), or a 10,000 litre water tank dedicated for fire fighting purposes only. This water supply should have the required access and turnaround areas (See Appendix 3) and be suitable to the requirements of the Shire of Toodyay.	

5.4 Addressing Non-Compliance with Applicable Acceptable Solutions

Where the proposed development/use is unable to fully comply with all required planning elements, for which a corresponding set of acceptable solutions has been established, there are several methodology options that potentially can be applied to progress the proposal for consideration by the decision makers.

These are established by SPP 3.7 (and the associated Guidelines) as risk and merit based assessments, specific DPLH Position Statements or through precedence set by previous planning application cases progressing through relevant State reviewing bodies.

THE ACCEPTABLE SOLUTION(S) UNABLE TO BE COMPLIED WITH	
Acceptable Solution	Brief Description of Non-Compliance
A3.2 Public road	The eastern section of Morangup Road exceeds the maximum allowable grade and is narrower than 6 metres in places. This portion of the road is therefore not compliant with the technical requirements for public roads.

THE METHODOLOGY APPLIED TO PROGRESS THE ASSESSMENT OF THE PROPOSED DEVELOPMENT /USE		
Methodology Options	Applied	Information location
Develop a Performance Assessment	☒	Section 5.4.1 of the BMP

5.4.1 Performance Assessment

The acceptable solutions for vehicular access requires two different access routes connected to the public road network that provide safe access and egress to two different destinations and which are available to the public at all times and under all weather conditions. The public roads must meet the technical requirements as set out in Table 4 of the Guidelines for Planning in Bushfire Prone Areas.

Currently, the section of Morangup Road located to the east of the subject site is not compliant with the technical requirements for public roads. The trafficable surface is less than the required 6 metres wide in places and the maximum grade exceeds the stated 1 in 10.

This section of road could be upgraded to comply with the necessary 6 metre trafficable width. However, the grade of the road will still not comply with the technical requirements.

The following attributes are considered for a basic performance assessment of the existing access/egress routes for the site, with respect to response to a bushfire event:

The Existing Vehicular Access/Egress Routes		
Attributes		Bushfire Consultant Assessment - Site Characteristics
1	The availability of a safer offsite location (area or building) as a destination (for occupants) or origin (for emergency services).	Two offsite safer locations (destinations) are available within the broader locality. These are townsites that can function as safe areas away from the bushfire potentially impacting the subject site and where water and amenities are available. To the west the nearest townsite is Wooroloo at a distance of approximately 26kms from the proposed development site. To the west the nearest townsite is Toodyay at a distance of approximately 17kms, which is a larger settlement with a greater supply of facilities.
2	The availability of different routes to and from a safer offsite location (destination / origin).	Two different routes are available to two different destinations. However, the route to the east is not compliant with the acceptable solution 3.2 Public Roads and may be unsuitable for some vehicles.
3	Total travel distances (time)to access a site or egress to a safer location.	Assuming a driving speed of 60km/hr, the travel time from the proposed development to Wooroloo is 26 minutes and 17 minutes to Toodyay.
4	The planned users (persons) and their degree of vulnerability	It is expected that people working at or visiting the quarry site will be fit and able to respond during a. bushfire emergency event.
5	The planned users (persons) knowledge of the action to take in response to a bushfire event in the vicinity.	A Bushfire Emergency Plan is not required by the Guidelines for Planning in Bushfire Prone Areas to be developed for the proposed site. Site occupants may be unsure of best action to take.
6	The types of adjoining / adjacent bushfire prone vegetation.	The vegetation adjacent to the development site is forest type vegetation having an extreme bushfire hazard level.
7	The extent of bushfire prone vegetation adjoining / adjacent to the access/egress routes – as part of the consideration of the broader landscape and the potential for landscape scale fire and increased intensity.	Vegetation along the proposed access road and in the broader landscape is generally forest or areas of pasture or crops. The bushfire hazard level ranges from moderate to extreme. There is the possibility for trees to fall across and block the roads.
8	The slope of the land under adjoining/adjacent bushfire prone vegetation.	The topography of the land around the subject site is generally undulating and may add to the intensity of a bushfire event.
9	The management of fuel levels in adjoining/adjacent bushfire prone vegetation.	Vegetation fuel loads varies throughout the site. There is no evidence of recent prescribed burning adjoining the quarry site.

The Existing Vehicular Access/Egress Routes		
Attributes		Bushfire Consultant Assessment - Site Characteristics
10	Road design/construction - width, gradient, clearances and load rating	The existing Morangup Road to the west of the subject site is constructed to the technical requirements. The portion of Morangup Road to the east of the subject site does not comply with the technical requirements. The road is narrow and/or has a steep grade in places.
11	Road design/construction – surface materials and visibility (corners, crests)	Morangup Road to the west of the subject site is sealed with bitumen and has no tight corners or steep crests. Morangup Road to the east of the subject site is gravel and has one tight corner.

From the above assessments it can be seen that risks exist while using Morangup Road, in either direction, during a bushfire event. It may well be feasible that the safest course of action during a bushfire event is to shelter onsite until the passage of the fire front, and then leave the site when safe to do so.

Recommended additional bushfire protection measures to reduce the residual risk to users of the existing quarry development are stated in the Table below.

5.5 Additional Bushfire Protection Measures

The following bushfire protection measures are recommended to be implemented and maintained. They are additional to those established by the relevant acceptable solutions applied to the existing development or use.

The relevant acceptable solutions are those against which this planning proposal has been assessed in Section 5.3 of this Bushfire Management Plan.

5.5.1 Additional Measures to Improve Bushfire Performance

SUMMARY OF ADDITIONAL BUSHFIRE PROTECTION MEASURES (TREATMENTS) RECOMMENDED TO BE APPLIED	
Treatment Category	Description
Onsite Safer Location	• An onsite shelter building to be provided which will be able to accommodate the maximum number of persons onsite at any one time. • The onsite shelter building is to be located within the 10kW/m^2 area as shown on the BAL Contour Map (Figure 3.3). • The onsite shelter building is to be constructed to a BAL rating of BAL-12.5 as a minimum.
Emergency Management	• A Bushfire Emergency Plan to be created for the site. • All staff and truck drivers to be trained in the shelter in place/evacuation procedures contained within the Bushfire Emergency Plan. • Additional formal training is recommended for site managers in the application of the Bushfire Emergency Plan

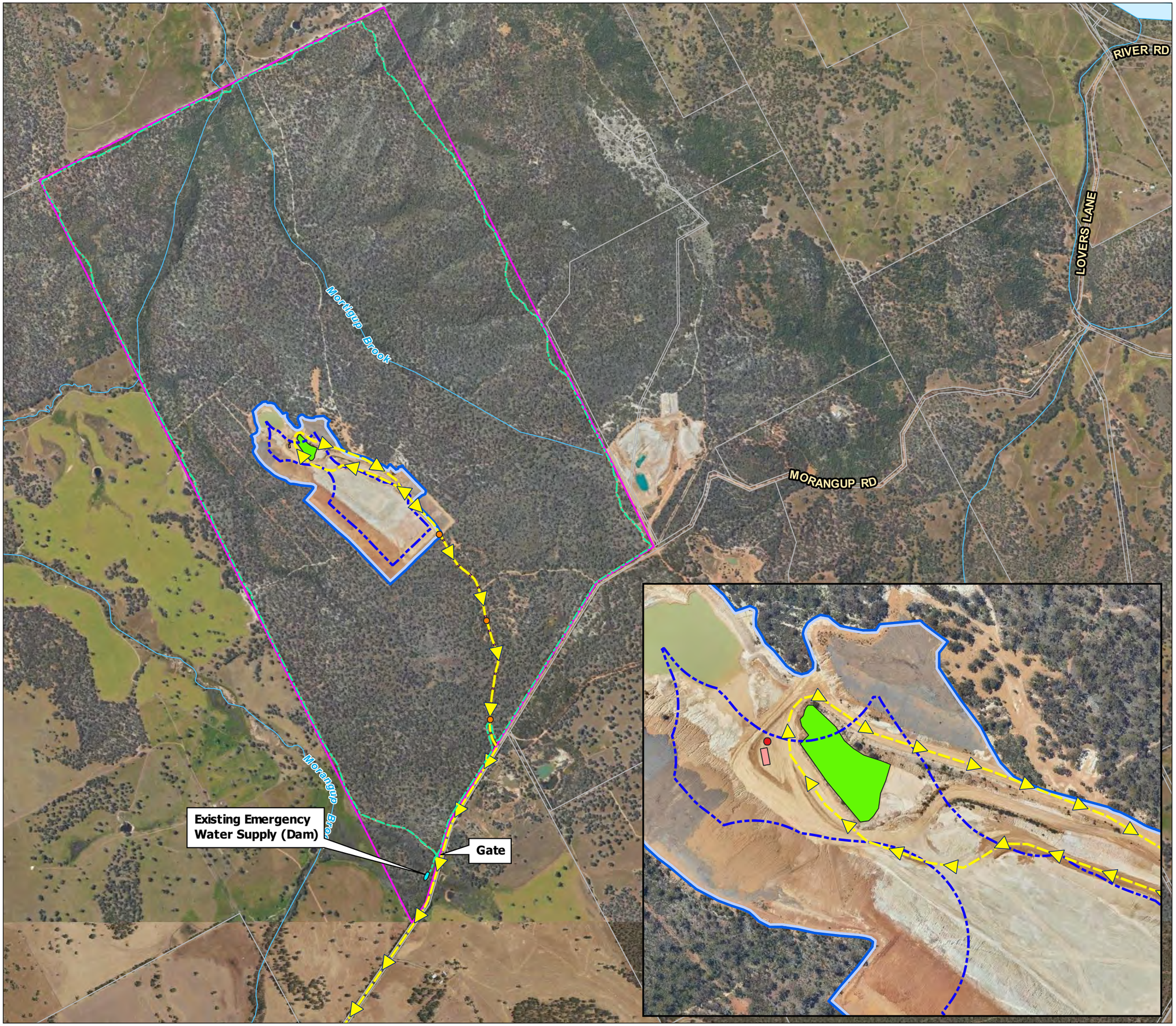
Application of the above proposed treatments will reduce the current risk to users and improve bushfire performance for the existing quarry site.

For future planning purposes a Risk Assessment and Treatment Plan may be required.

Figure 5.1

Existing Quarry
Lot Bushfire Management Map

Lot 1 on Diagram 34893
Lot 1 Morangup Road
MORANGUP
SHIRE OF TOODYAY



------ LEGEND ------

- Onsite Shelter Building (Indicative)
- Radiant Heat Potential (10kW-m2)
- Asset Protection Zone (APZ)
- Subject Lot
- Access-Egress
- Turnaround Area
- Firebreak
- Waterways

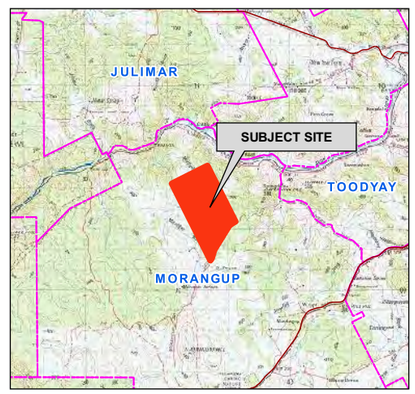
Static Firefighting Water Supply

- Existing
- Potential
- Water Tank (Indicative)

0 200 400 600 800 1000

Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

BUSHFIRE PRONE PLANNING

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 19-01-2021
SCALE (A3): 1 : 18000

6 RESPONSIBILITIES FOR IMPLEMENTATION AND MANAGEMENT OF THE BUSHFIRE PROTECTION MEASURES

Table 6.1: BMP Implementation responsibilities and recommendations.

Landowner (Developer) – Recommended Implementations	
No.	Implementation Actions
1	The local government may condition a development application approval with a requirement for the landowner/proponent to register a notification onto the certificate of title and deposited plan. This will be done pursuant to Section 70A *Transfer of Land Act 1893* as amended ('Factors affecting use and enjoyment of land, notification on title'). This is to give notice of the bushfire hazard and any restrictions and/or protective measures required to be maintained at the owner's cost. This condition ensures that: 1. Landowners/proponents are aware their lot is in a designated bushfire prone area and of their obligations to apply the stated bushfire risk management measures; and 2. Potential purchasers are alerted to the Bushfire Management Plan so that future landowners/proponents can continue to apply the bushfire risk management measures that have been established in the Plan.
2	The entity responsible for having the BMP prepared should ensure that anyone listed as having responsibility under the Plan has endorsed it and is provided with a copy for their information and informed that it contains their responsibilities. This includes the landowners/proponents, local government and any other authorities or referral agencies ('Guidelines' s4.6.3).
3	Establish the Asset Protection Zone (APZ) surrounding future and temporary buildings to the largest dimension as determined by either: As per the dimensions stated in Element 2: Siting & Design of Development - Acceptable Solution: A2.1: Asset Protection Zone, in this Plan, The APZ should be of a size corresponding to the BAL construction standard of the building. Where the building is to be a shelter in place building it is recommended that this building be located in an area where the maximum radiant heat level is 10kW/m^2 or less. Establish the APZ to the standards established by the Guidelines (refer to Appendix 1) or as varied by the local government through their Firebreak Notice (refer to the following responsibility). This is the responsibility of the developer.
4	The subject lot is to be compliant with the Shire of Toodyay Fire-break Notice issued under s33 of the Bushfires Act 1954. This may include specifications for asset protection zones that differ from the Guideline's APZ Standards, with the intent to better satisfy local conditions. When these are more stringent than those created by the Guidelines, or less stringent and endorsed by the WAPC and DFES, they must be complied with. Refer to Appendix 1.
5	Install the required emergency static water supply and associated vehicle access, to the standards stated in the relevant acceptable solution and applying the guidance provided in Appendix 3, or to the specific requirements of the local government.
6	Upgrade the private driveway to the standards stated in the BMP.
7	Prior to any future building work, inform the builder of the existence of this Bushfire Management Plan and the responsibilities it contains, regarding the required construction standards. This will be: • The standard corresponding to the determined BAL, as per the bushfire provisions of the Building Code of Australia (BCA); and/or

	• A higher standard because the BMP establishes that the construction standard is to correspond to a higher BAL as an additional bushfire protection measure.

Table 6.3: Ongoing management responsibilities for the Landowner/Occupier.

6.2 Landowner/Occupier - Ongoing	
No.	Ongoing Management Actions
1	Maintain the Asset Protection Zone (APZ) surrounding future and temporary buildings to the largest dimension as determined by either: As per the dimensions stated in Element 2: Siting & Design of Development - Acceptable Solution: A2.1: Asset Protection Zone, in this Plan, The APZ should be of a size corresponding to the BAL construction standard of the building. Where the building is to be a shelter in place building it is recommended that this building be located in an area where the maximum radiant heat level is 10kW/m^2 or less. Maintain the APZ to the standards established by the Guidelines (refer to Appendix 1) or as varied by the local government through their Firebreak Notice (refer to the following responsibility).
2	Comply with the Shire of Toodyay Fire-break Notice issued under s33 of the Bush Fires Act 1954. This may include specifications for asset protection zones that differ from the Guideline's APZ Standards, with the intent to better satisfy local conditions. When these are more stringent than those created by the Guidelines, or less stringent and endorsed by the WAPC and DFES, they must be complied with. Refer to Appendix 1.
3	Maintain vehicular access routes within the lot to the required surface condition and clearances as stated in the BMP.
4	Maintain the emergency water supply and its associated fittings and vehicular access in good working condition.
	Ensure that any builders (of future structures on the lot) are aware of the existence of this Bushfire Management Plan and the responsibilities it contains regarding the application of construction standards corresponding to a determined BAL.
	Ensure all future buildings the landowner has responsibility for, are designed and constructed in full compliance with: 1. the requirements of the WA Building Act 2011 and the bushfire provisions of the Building Code of Australia (BCA); and 2. with any identified additional requirements established by this BMP or the local government.
	It is recommended to implement and maintain, the additional bushfire protection measures contained in Section 5.5 of this Bushfire Management Plan, in addition to the measures that are established by the acceptable solutions.

Table 6.4: Ongoing management responsibilities for the Local Government.

6.3 Local Government - Ongoing	
No.	Ongoing Management Actions
1	Monitor landowner compliance with the Bushfire Management Plan and the annual Fire-break Notice.

APPENDIX 1: TECHNICAL REQUIREMENTS FOR ONSITE VEGETATION MANAGEMENT

A1.1 Requirements Established by the Guidelines – Standards for Asset Protection Zones

(Source: Guidelines for Planning in Bushfire Prone Areas - WAPC 2017 v1.3 Appendix 4, Element 2, Schedule 1 and Explanatory Note E2.1)

DEFINING THE ASSET PROTECTION ZONE (APZ)

Description: An APZ is an area surrounding a building that is managed to reduce the bushfire hazard to an acceptable level (by reducing fuel loads). The width of the required APZ varies with slope and vegetation and varies corresponding to the BAL rating determined for a building (lower BAL = greater dimensioned APZ).

For planning applications, the minimum sized acceptable APZ is that which is of sufficient size to ensure the potential radiant heat impact of a fire does not exceed 29kW/m² (BAL-29). It will be site specific.

For subdivision planning, design elements and excluded/low threat vegetation adjacent to the lot(s) can be utilised to achieve the required vegetation separation distances and therefore reduce the required dimensions of the APZ within the lot(s).

Defendable Space: The APZ includes a defendable space which is an area adjoining the asset within which firefighting operations can be undertaken to defend the structure. Vegetation within the defendable space should be kept at an absolute minimum and the area should be free from combustible items and obstructions. The width of the defendable space is dependent on the space, which is available on the property, but as a minimum should be 3 metres.

Establishment: The APZ should be contained solely within the boundaries of the lot on which the building is situated, except in instances where the neighbouring lot or lots will be managed in a low-fuel state on an ongoing basis, in perpetuity.

The APZ may include public roads, waterways, footpaths, buildings, rocky outcrops, golf courses, maintained parkland as well as cultivated gardens in an urban context, but does not include grassland or vegetation on a neighbouring rural lot, farmland, wetland reserves and unmanaged public reserves.

[Note: Regardless of whether an Asset Protection Zone exists in accordance with the acceptable solutions and is appropriately maintained, fire fighters are not obliged to protect an asset if they think the separation distance between the dwelling and vegetation that can be involved in a bushfire, is unsafe.]

Schedule 1: Standards for APZ

Fences: within the APZ are constructed from non-combustible materials (e.g. iron, brick, limestone, metal post and wire). It is recommended that solid or slatted non-combustible perimeter fences are used.

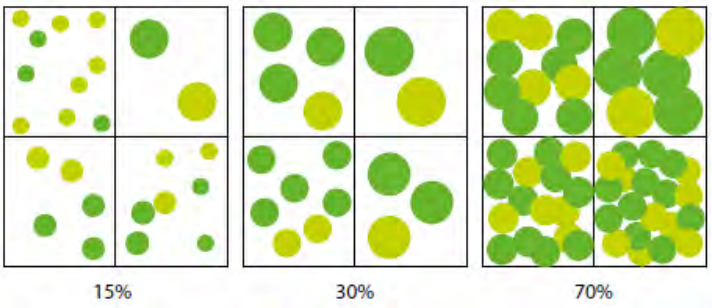
Objects: within 10 metres of a building, combustible objects must not be located close to the vulnerable parts of the building i.e. windows and doors.

Fine Fuel Load: combustible dead vegetation matter less than 6 mm in thickness reduced to and maintained at an average of two tonnes per hectare (example below).

Example: Fine fuel load of 2 t/ha
(Image source: Shire of Augusta Margaret River's Firebreak and Fuel Reduction Hazard Notice)

Trees (> 5 metres in height): trunks at maturity should be a minimum distance of 6 metres from all elevations of the building, branches at maturity should not touch or overhang the building, lower branches should be removed to a height of 2 metres above the ground and or surface vegetation, canopy cover should be less than 15% with tree canopies at maturity well spread to at least 5 metres apart as to not form a continuous canopy. Diagram below represents tree canopy cover at maturity.

Tree canopy cover – ranging from 15 to 70 per cent at maturity



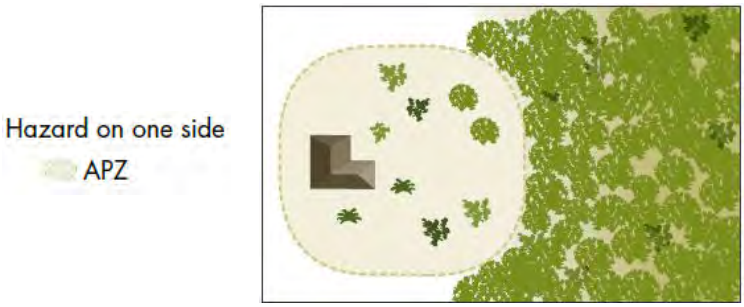
(Source: Guidelines for Planning in Bushfire Prone Areas 2017, Appendix 4)

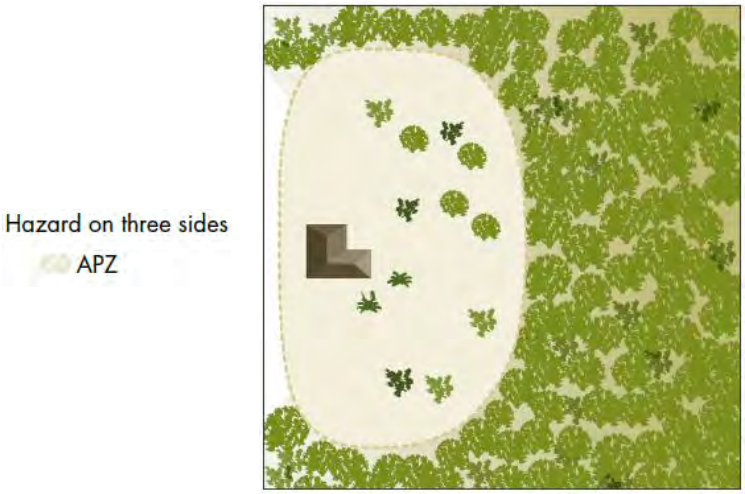
Shrubs (0.5 metres to 5 metres in height): should not be located under trees or within 3 metres of buildings, should not be planted in clumps greater than 5m2 in area, clumps of shrubs should be separated from each other and any exposed window or door by at least 10 metres. Shrubs greater than 5 metres in height are to be treated as trees.

Ground covers (<0.5 metres in height): can be planted under trees but must be properly maintained to remove dead plant material and any parts within 2 metres of a structure, but 3 metres from windows or doors if greater than 100 mm in height. Ground covers greater than 0.5 metres in height are to be treated as shrubs.

Grass: should be managed to maintain a height of 100 mm or less.

The following example diagrams illustrate how the required dimensions of the APZ will be determined by the type and location of the vegetation.





A1.2 Requirements Established by the Local Government – the Firebreak Notice

The local government's current Firebreak Notice is available on their website, at their offices and is distributed as ratepayer's information. It must be complied with.

These requirements are established by the local government's Firebreak Notice created under s33 of the Bushfires Act 1954 and issued annually (potentially with revisions). The Firebreak Notice may include additional components directed at managing fuel loads, accessibility and general property management with respect to limiting potential bushfire impact.

If Asset Protection Zone (APZ) specifications are defined in the Firebreak Notice, these may differ from the Standards established by the Guideline's, with the intent to better satisfy local conditions. When these are more stringent than those created by the Guidelines, or less stringent and endorsed by the WAPC and DFES, they must be complied with.

The APZ dimensions to be physically established and maintained, will be based on which of the following establishes the larger APZ dimension:

- The dimensions corresponding to the determined BAL of a building (refer to Section 3.2 explanation of the 'planning' versus 'building' requirements and 'indicative' versus 'determined' BAL(s)); or
- The APZ dimensions established by the local government's Firebreak Notice.

A1.3 Requirements Recommended by DFES – Property Protection Checklists

Further guidance regarding ongoing/lasting property protection (from potential bushfire impact) is presented in the publication 'DFES – Fire Chat – Your Bushfire Protection Toolkit'. It is available from the Department of Fire and Emergency Services (DFES) website.

A1.4 Requirements Established by AS 3959:2018 – 'Minimal Fuel Condition'

This information is provided for reference purposes. This knowledge will assist the landowner to comply with Management Requirement No. 3 set out in the Guidance Panel at the start of this Appendix. It identifies what is required for an area of land to be excluded from classification as a potential bushfire threat.

"Australian Standard - AS 3959:2018 Section 2.2.3.2: Exclusions - Low threat vegetation and non-vegetated areas:

The Bushfire Attack Level shall be classified BAL-LOW where the vegetation is one or a combination of the following:

a) Vegetation of any type that is more than 100m from the site.

b) Single areas of vegetation less than 1ha in area and not within 100m of other areas of vegetation being classified vegetation.

c) Multiple area of vegetation less than 0.25ha in area and not within 20m of the site or each other or other areas of vegetation being classified vegetation.

d) Strips of vegetation less than 20m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20m of the site or each other, or other areas of vegetation being classified vegetation.

e) Non-vegetated areas, that is, areas permanently cleared of vegetation, including waterways, exposed beaches, roads, footpaths, buildings and rocky outcrops.

f) *Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a minimal fuel condition, (means insufficient fuel available to significantly increase the severity of a bushfire attack – for example, recognisable as short cropped grass to a nominal height of 100mm), mangroves and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairways), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and windbreaks (single row of trees)."*

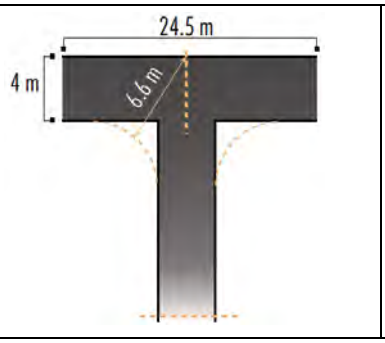
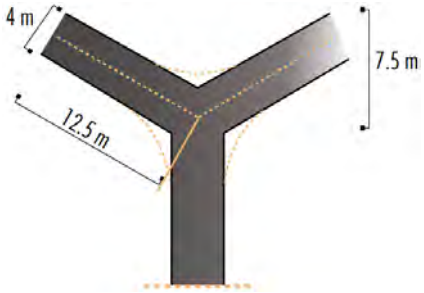
APPENDIX 2: TECHNICAL REQUIREMENTS FOR VEHICULAR ACCESS

Each local government may have their own standard technical requirements for emergency vehicular access, and they may vary from those stated in the Guidelines.

When required, these are stated in Section 5.1 of this bushfire management plan.

Requirements Established by the Guidelines – The Acceptable Solutions

(Source: Guidelines for Planning in Bushfire Prone Areas WAPC 2017 v1.3, Appendix 4)

VEHICULAR ACCESS TECHNICAL REQUIREMENTS - PART 1
Acceptable Solution 3.5: Private Driveways The following requirements are to be achieved: • The design requirements set out in Part 2 of this appendix; and Where the house site is more than 50 metres from a public road: • Passing bays every 200 metres with a minimum length of 20 metres and a minimum width of two metres (ie combined width of the passing bay and constructed private driveway to be a minimum six metres); • Turn-around areas every 500 metres and within 50 metres of a house, designed to accommodate type 3.4 fire appliances to turn around safely (ie kerb to kerb 17.5 metres); • Any bridges or culverts are able to support a minimum weight capacity of 15 tonnes; and • All weather surface (i.e. compacted gravel, limestone or sealed).
  
Acceptable Solution 3.8: Firebreak Width Lots greater than 0.5 hectares must have an internal perimeter firebreak of a minimum width of three meters or to the level as prescribed in the local firebreak notice issued by the local government.

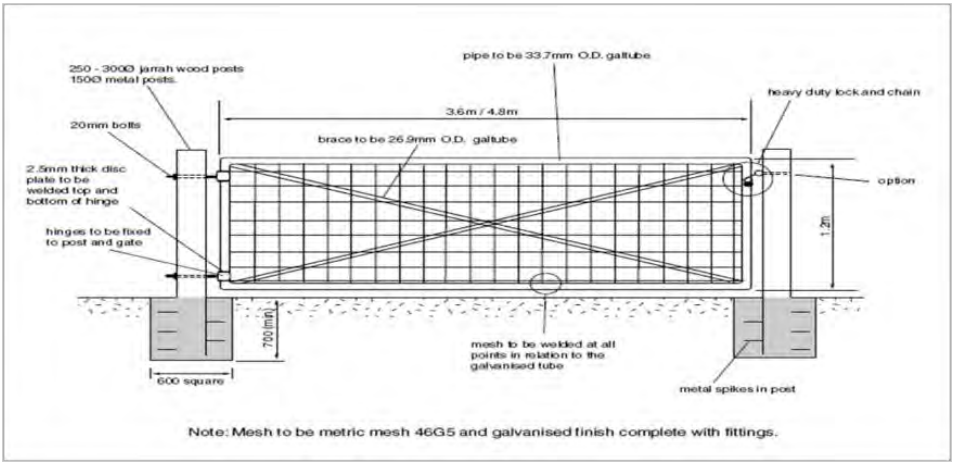
VEHICULAR ACCESS TECHNICAL REQUIREMENTS - PART 2					
Technical Component	Vehicular Access Types				
	Public Roads	Cul-de-sacs	Private Driveways	Emergency Access Ways	Fire Service Access Routes
Minimum trafficable surface (m)	6*	6	4	6*	6*
Horizontal clearance (m)	6	6	6	6	6
Vertical clearance (m)	4.5	4.5	4.5	4.5	4.5
Maximum grade <50 metres	1 in 10	1 in 10	1 in 10	1 in 10	1 in 10
Minimum weight capacity (t)	15	15	15	15	15
Maximum cross-fall	1 in 33	1 in 33	1 in 33	1 in 33	1 in 33
Curves minimum inner radius (m)	8.5	8.5	8.5	8.5	8.5
* A six metre trafficable surface does not necessarily mean paving width. It could, for example, include four metres of paving and one metre of constructed road shoulders. In special circumstances, where 8 lots or less are being serviced, a public road with a minimum trafficable surface of four metres for a maximum distance of ninety metres may be provided subject to the approval of both the local government and DFES.					

VEHICULAR ACCESS TECHNICAL REQUIREMENTS – GATES AND SIGNS EXAMPLES

Gates

Design and construction to be approved by the local government.

- Minimum width 3.6m
- Emergency access way gates must not be locked.
- Fire service access route gates may be locked but only with a common key that is available to local fire service personnel.
- Bollards will be to the local government specifications



Signs

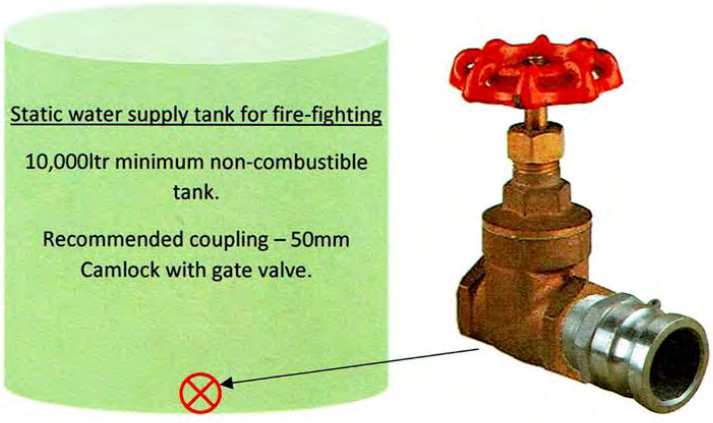
Design and construction to be approved by the local government.

- Minimum height above ground of 0.9m.
- Lettering height to be 100mm.
- To display the words (as appropriate) "Emergency Access Only" or "Fire Service Access – No Public Access".
- Size 600mm x 400mm.
- Sign colour red, base (white) area is reflective background.
- Rounded corners, radius 20mm.
- White key-line 3mm wide, 3mm from outside edge.
- Suggested mounting hole 6mm diameter.

Non-Reticulated Areas – Single Lot Subdivision

Each local government may have their own standard technical requirements for firefighting water supplies, and they may vary from those stated in the Guidelines.

Table A4.2: Non-reticulated areas – Subdivision (single lot) water supply technical requirements.

TECHNICAL REQUIREMENTS FOR STATIC WATER SUPPLY (EXAMPLE ONLY – CHECK WITH LOCAL GOVERNMENT)	
Application:	Single lots above 500 m^2 need a dedicated static water supply on the lot. This solution is only for use if creating one additional lot and cannot be applied cumulatively.
Volume:	Minimum 10,000 litres per tank dedicated to firefighting purposes. The storage tank must not facilitate sharing the water for domestic use due to the potential of contamination from firefighting foam.
Tank Construction:	Above ground tanks constructed using concrete or metal.
Pipe Construction:	Galvanised or copper (PVC if buried at least 300mm below ground).
Vehicle Access:	Hardstand and turnaround area suitable for a 3.4 appliance (i.e. kerb to kerb 17.5metres) is provided at the tank.
Couplings:	Tanks are to be fitted with a full flow valve and a 50mm or 100mm cam-lock coupling of metal/alloy construction (example below).
Signage:	Multiple buildings and/or firefighting water supplies may require directional signage to guide firefighters to the emergency water supplies.
Responsibility:	A procedure must be in place to ensure that water tanks are maintained at or above designated capacity always.
[Sources: Guidelines for Planning in Bushfire Prone Areas WAPC 2017 v1.3, Appendix 4, Element 4 with example construction / coupling requirements from various sources including FESA (DFES) Operational Circular 07/2011 and Planning for Bushfire Protection Guidelines WAPC 2010]	
	

DETERMINING 10 KW/M² SEPARATION DISTANCES

Vegetation Area 1

Calculated December 16, 2020, 1:38 pm (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	80	Rate of spread	2.4 km/h
Vegetation classification	Forest	Flame length	19.8 m
Understorey fuel load	25 t/ha	Flame angle	63 °, 68 °, 73 °, 75 °, 77 ° & 82 °
Total fuel load	35 t/ha	Elevation of receiver	8.82 m, 9.17 m, 9.460000000000001 m, 9.56 m, 9.640000000000001 m & 9.800000000000001 m
Vegetation height	n/a	Fire intensity	43,400 kW/m
Effective slope	0 °	Transmissivity	0.843, 0.822, 0.796, 0.775, 0.764 & 0.712
Site slope	0 °	Viewfactor	0.4235, 0.3149, 0.2132, 0.144, 0.1168 & 0.0313
Flame width	100 m	Minimum distance to < 40 kW/m²	22.9 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	29.9 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	41.2 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	54.9 m
		Minimum distance to < 10 kW/m²	63.2 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Vegetation Area 2

Calculated December 15, 2020, 6:14 pm (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	80	Rate of spread	3.38 km/h
Vegetation classification	Forest	Flame length	26.22 m
Understorey fuel load	25 t/ha	Flame angle	61 °, 66 °, 70 °, 73 °, 74 ° & 81 °
Total fuel load	35 t/ha	Elevation of receiver	11.46 m, 11.97 m, 12.32 m, 12.54 m, 12.6 m & 12.95 m
Vegetation height	n/a	Fire intensity	61,280 kW/m
Effective slope	5 °	Transmissivity	0.83, 0.8080000000000001, 0.783, 0.763, 0.754 & 0.699
Site slope	0 °	Viewfactor	0.4294, 0.3207, 0.2167, 0.1462, 0.1185 & 0.0319
Flame width	100 m	Minimum distance to < 40 kW/m²	29.4 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	37.6 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	50.6 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	66 m
		Minimum distance to < 10 kW/m²	75.3 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Vegetation Area 3

FPA AUSTRALIA | FLAMESOL

Calculated December 15, 2020, 6:16 pm (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	80	Rate of spread	4.78 km/h
Vegetation classification	Forest	Flame length	35.3 m
Understorey fuel load	25 t/ha	Flame angle	58 °, 62 °, 66 °, 70 °, 71 ° & 79 °
Total fuel load	35 t/ha	Elevation of receiver	14.96 m, 15.58 m, 16.12 m, 16.58 m, 16.68 m & 17.32 m
Vegetation height	n/a	Fire intensity	86,527 kW/m
Effective slope	10 °	Transmissivity	0.8169999999999999, 0.795, 0.771, 0.752, 0.744 & 0.6860000000000001
Site slope	0 °	Viewfactor	0.4371, 0.3259, 0.2203, 0.1485, 0.12 & 0.0326
Flame width	100 m	Minimum distance to < 40 kW/m²	37.8 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	47.4 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	62.1 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	79.3 m
		Minimum distance to < 10 kW/m²	89.90000000000001 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Vegetation Area 4

FPA AUSTRALIA | FLAMESOL

Calculated December 15, 2020, 6:18 pm (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	80	Rate of spread	6.75 km/h
Vegetation classification	Forest	Flame length	48.11 m
Understorey fuel load	25 t/ha	Flame angle	54 °, 58 °, 62 °, 66 °, 68 ° & 78 °
Total fuel load	35 t/ha	Elevation of receiver	19.46 m, 20.4 m, 21.24 m, 21.97 m, 22.3 m & 23.53 m
Vegetation height	n/a	Fire intensity	122,175 kW/m
Effective slope	15 °	Transmissivity	0.804, 0.782, 0.76, 0.743, 0.734 & 0.6820000000000001
Site slope	0 °	Viewfactor	0.4447, 0.3312, 0.2232, 0.1503, 0.1216 & 0.0328
Flame width	100 m	Minimum distance to < 40 kW/m²	48.6 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	59.6 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	76.2 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	95.7 m
		Minimum distance to < 10 kW/m²	107.6 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated December 15, 2020, 6:19 pm (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	80	Rate of spread	9.529999999999999 km/h
Vegetation classification	Forest	Flame length	66.2 m
Understorey fuel load	25 t/ha	Flame angle	52 °, 56 °, 61 °, 66 °, 68 ° & °
Total fuel load	35 t/ha	Elevation of receiver	20.8 m, 21.08 m, 20.96 m, 20.32 m, 19.6 m & 0 m
Vegetation height	n/a	Fire intensity	172,510 kW/m
Effective slope	20 °	Transmissivity	0.793, 0.772, 0.751, 0.734, 0.725 & 0
Site slope	5 °	Viewfactor	0.4506, 0.3356, 0.2263, 0.1523, 0.1234 & 0
Flame width	100 m	Minimum distance to < 40 kW/m²	60.4 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	72.7 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	91.2 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	113.2 m
		Minimum distance to < 10 kW/m²	126.6 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Vegetation Area 6

FPA AUSTRALIA | FLAMESOL

Calculated December 15, 2020, 6:22 pm (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	80	Rate of spread	4.04 km/h
Vegetation classification	Shrubland	Flame length	9.07 m
Understorey fuel load	15 t/ha	Flame angle	66 °, 72 °, 77 °, 80 °, 81 ° & 85 °
Total fuel load	15 t/ha	Elevation of receiver	4.14 m, 4.31 m, 4.41 m, 4.46 m, 4.47 m & 4.51 m
Vegetation height	m	Fire intensity	31,357 kW/m
Effective slope	5 °	Transmissivity	0.873, 0.858, 0.836, 0.8129999999999999, 0.801 & 0.74
Site slope	0 °	Viewfactor	0.4074, 0.3019, 0.2026, 0.1372, 0.1116 & 0.0301
Flame width	100 m	Minimum distance to < 40 kW/m²	11 m
Windspeed	45 km/h	Minimum distance to < 29 kW/m²	14.8 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	21.8 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	30.9 m
		Minimum distance to < 10 kW/m²	36.7 m

Rate of Spread - Catchpole et al. 1998

Flame length - Byram, 1959

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

APPENDIX 5: ALTERNATIVE PATHWAYS FOR COMPLYING WITH SPP 3.7

Bushfire Prone Planning, for applicable proposals, is sometimes required to apply argument for the application of compliance pathways that differ from those established by the Guidelines for Planning in Bushfire Prone Areas (WAPC v1.3) - these being meeting the acceptable solutions and developing performance principle-based solutions (alternative solutions).

These additional pathways include the application of merit based assessment and comparative bushfire performance. The validity of this approach is derived from relevant Tribunal hearings and Court cases. A key recent decision highlights many relevant factors and is detailed below.

The Tribunal decision in Bunnings Group Limited and Presiding Member of the Metro North West JDAP [2019] WASAT 121 references many of these and made its decisions. These include the following paraphrased relevant decisions. Decision makers will need to refer to the actual proceedings.

- [153] In considering the requirements of State Planning Policy 1: State Planning Framework (SPP1) in the application of SPP3.7, there is no basis on which provisions lower in the hierarchy (the Guidelines) should necessarily prevail over provisions higher in the hierarchy (SPP3.7).
- [141] The intent and objectives of policy (SPP3.7) can be infringed by the inflexible application of the provisions of the Guidelines.
- [99] The existence of the principle that policy should not be inflexibly applied means that it is open to the Tribunal to consider the proposed development through the applications of a merits review.
- [145] Application of the precautionary principle requires caution in departing from policy but doesn't preclude approval and provides for assessment on merit and the use of discretion.
- [122] One should be slow to depart from policies unless satisfied that good reason exists.
- [123] It cannot be accepted that, simply because a proposal contemplates a solution that is not contemplated by the Guidelines, the Tribunal cannot approve that proposal. To accept that proposition would amount to inflexibly applying policy.
- [230] The Tribunal finds a sound basis for departing from SPP 3.7 cl. 6.6.2 and Elements 1 and 2 of the Guidelines while being able to accord with the intent and relevant objectives SPP 3.7.
- [231] Finds against the inflexible application of SPP 3.7 and associated Guidelines.

Key to considerations is the Intent of SPP 3.7 which is:

> *"... to implement effective risk-based land use planning and development to preserve life and reduce the impact of bushfire on property and infrastructure".*

Applying this risk based approach requires an appreciation that the overarching requirement is for:

1. Identification, analysis and evaluation of the risks from the threats of bushfire;
2. Comparison of these to the residual level of risk that will exist after any proposed bushfire protection measures are implemented (i.e. risk treatments); with
3. The intent being to arrive at a tolerable level of risk for the particular land use.

APPENDIX L

Dust Management Plan

landinsights
PLANNING DESIGN ENVIRONMENT

"SCHIST PIT" CLAY QUARRY

DUST MANAGEMENT PLAN

LOT 1 MORANGUP ROAD, MORANGUP

PREPARED FOR AUSTRAL BRICKS (WA) PTY LTD

AUGUST 2023

Prepared by:

Land Insights

PO Box 289

Mt Lawley WA 6929

Phone: (08) 9271 8506

Document details:

Document History:

Date	Document Name	Document Manager	Summary of Document Revision	Client Delivered
Jun-23	935 – Schist Pit Dust Management Plan	SR	Initial Draft for client review	Jun-23
Aug-23	935 – Schist Pit Dust Management Plan	SR	Final for submission	Aug-23

Table of Contents

Appendices

1 Introduction

1.1 Background and purpose

This report presents the Dust Management Plan for the "Schist Quarry" operated by Austral Bricks (WA) Pty Ltd. The quarry is located at Lot 1 Morangup Road, Morangup ("the site"). The purpose of the Dust Management Plan is to accompany the Clay Excavation Management Plan prepared by Land Insights to support an application for renewal of the Extractive Industry Licence.

Dust management was previously addressed in the "Extractive Industry Licence and Clay Extraction Management Plan" prepared by Land Insights in 2013. This Dust Management Plan presents an update to the 2013 report. It has been prepared for the following reasons:

- To incorporate best practice dust management actions.
- To incorporate relevant recommendations from the "Draft Guideline: Dust Emissions" released by the Department of Water and Environmental Regulation (DWER) in 2021, as well as recommendations from "A Guideline for Managing the Impacts of Dust and Associated Contaminants From Land Development Sites, Contaminated Sites, Remediation and Other Related Activities" (Department of Environment and Conservation, 2011).
- To accompany an application for a renewal of the approvals for the operation.

1.2 Objectives

This Dust Management Plan outlines the appropriate procedures implemented by Austral Bricks to manage any potential for dust generation.

The objectives of the Dust Management Plan are:

- To manage the potential for dust generation
- To minimise the likelihood of any dust created dispersing past the lot boundaries
- To provide a process in the event of a dust-related complaint.

1.3 Location

Lot 1 is situated approximately 80km to the north-east of Perth and approximately 25km to the south-west of Toodyay. It is approximately 5km from the closest rural residential estate (located to the south-west and another to the north of the site). The operation ("the site") is located in the centre of Lot 1.

Plans associated with the operation are provided at Appendix A.

1.4 Context

Dust is particulate matter (PM) comprising very small solid particles that may become airborne by natural forces (such as wind) or mechanical forces (earth-moving, stockpiling, haulage) (DWER, 2021). Dust particles are generally referred to as either "fine" or "course". According to the "Draft Guidelines: Dust Emissions" (DWER, 2021), fine dust particles (PM10 and PM2.5) that are readily inhaled are associated with a range of chronic health effects and fine and course dust particles can cause acute health effects (such as eye or breathing irritation).

In terms of guidelines and best practice dust management in Western Australia, there are two main documents which can be referred to for dust management controls. The current guideline for dust management is "A Guideline for Managing the Impacts of Dust and Associated Contaminants from land Development Sites, Contaminated Sites, Remediation and Other Related Activities" (Department of Environment and Conservation, 2011). However, the recommendations from this document are not specific to extractive industries and therefore have only been used where relevant for the site. It has therefore been supplemented with the information from the draft "Guidelines: Dust Emissions" (DWER, 2021) where appropriate. In addition, the risk assessment has been undertaken based on "Guidance Statement: Risk Assessments" (Department of Environment Regulation, 2017).

1.5 Operation

The quarry is located in the centre of Lot 1. Excavation has been ongoing over the last 60 years. The current development footprint is known as the "Operation Area" and encompasses the active pit area, stockpiling areas, access tracks, drainage basins and administrative areas. Future stages (labelled as "Stages 1 to 4") have been identified to the south-east of the existing excavation area. In general, the excavation occurs in a south-easterly direction.

Excavation of clay takes place in a sequence of steps which can be broadly broken down into the following:

- Earthworks Campaign (i.e., removal of topsoil and overburden, excavation of clay to stockpile)
- Carting Campaign (transport of clay from the pit or stockpiles to the factories)
- Rehabilitation.

Further information on the excavation process is below.

Earthworks campaign

The "Earthworks Campaign" refers to the excavation and stockpiling of material. During the earthworks campaign, topsoil and overburden is removed and clay is excavated and placed into stockpiles located within the Operation Area.

Earthworks take place as and when required throughout the year but generally during the dry months. The timing of excavation depends on weather conditions, market demand and operational requirements (such as the rate of excavation of other clay quarries). During Excavation Campaigns, excavation will generally take place for six days a week during the approved operation times. Excavation will most likely take place over approximately 16 weeks in total per annum, usually divided into 2 or 3 “campaigns”. It should be noted that although excavation is identified to occur anytime throughout the area it should be noted that for large stretches of time there will be no excavation activities on site.

As vehicles usually operate from the pit floor, the walls of the pit also act as a noise and dust barrier for most of the excavation process. The depth of the Schist Quarry is approximately 14 metres. There will be a relatively short period where vehicles are located at the ground level (when clearing vegetation and stripping topsoil and overburden for new stages), however the extensive vegetation surrounding the quarry will provide a further noise and dust barrier. Additional dust management will be in place for the operation as set out in this report.

No processing (crushing, screening etc) will occur on the site. No blasting will be required to facilitate excavation.

Cartage campaigns

The “Cartage Campaign” refers to the removal or transport of clay from the site where it is taken to the Austral Bricks brickmaking factories. Clay resource is currently carted to the Cardup factory and the Bellevue factory.

Loading and carting from the site will largely occur during September to May (i.e. during the drier months) although it can occur anytime throughout the year depending on the need for clay. It is expected that carting will occur over two separate campaigns each year, lasting approximately 3-4 weeks for each campaign.

Carting from the site depends on the market demand for bricks, as well as the types of clay and colour of clay. Therefore, there may be some variation from the truck numbers and the number of days that carting will be required each month (i.e. some months will have more carting days than other months).

The Stockpile Area (and the area where trucks will be loaded with clay) is located within the existing Excavation Area. All vehicles and trucks enter the site from the main access at Morangup Road and travel down the haul road to the Excavation Area. Having one access into and out of the site helps to reduce

impact to surrounding vegetation and is a management technique used to help mitigate potential dust and noise impacts.

Rehabilitation

Rehabilitation of the quarry will involve recontouring the slopes to a safe and stable condition, revegetating with local vegetation and creating dams created from the lowest parts of the landscape.

Progressive rehabilitation of the quarry is outlined in the Rehabilitation Management Plan. In general, progressive recontouring takes place as excavation progresses. However, as all water runoff is required to be retained on site and the catchment area receives a large amount of water, much of the previous operation area is required for drainage and water management.

2 Site description

2.1 Surrounding Land Uses

Surrounding land uses comprise other extractive industry and rural land uses. Directly to the south and east are two other clay quarries. A hard rock quarry is located to the north.

The site is approximately 5km to the north-east of the closest rural residential area and approximately 13 to the west of the Toodyay townsite. It is approximately 1.4km from the closest rural dwelling.

2.2 Separation Distances

The following sensitive receptors have been identified surrounding the site. They are also shown on the Context Plan at Appendix A.

- Neighbouring rural property to the west – Approximately 1.4km from the operation (865 Morangup Road, Morangup)
- Neighbouring rural property to the south – Approximately 1.6km from the operation (1012 Morangup Road, Morangup)
- Rural properties to the east – Closest is approximately 3km from the operation (575 Lovers Lane, Morangup)
- Rural properties to the north – Closest is approximately 3.3km from the operation (535 Cobbler Pool Road, Morangup).

The EPA's *Guidance Statement No. 3 – Separation Distances between Industrial and Sensitive Land Uses* provides a guideline on the separation distances and buffers for a range of industrial land uses to sensitive land uses (such as residential dwellings). It should be noted that the distances in the policy assume the land use is not managed and, should best practice environmental management take place, these distances can be reduced.

The operations on site fit into the category "clay extraction or processing". The potential impacts are listed as "noise" and "dust". The separation distance is "500-1000 metres, depending on size and processing", however this can be less with appropriate environmental management.

As can be seen from the above list, the clay operations far exceed the recommended separation distance. All surrounding sensitive land uses are over 1000 metres from the operations.

It should also be noted that operational management, including dust and noise management and protection of visual amenity, are provided for this operation to support the continued operation of the site. These management plans are attached to this application.

2.3 Climate

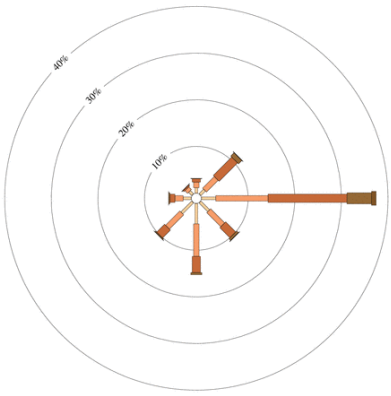
The south-west of Western Australia experiences a Mediterranean climate which is characterised by warm, dry summers and cool, wet winters.

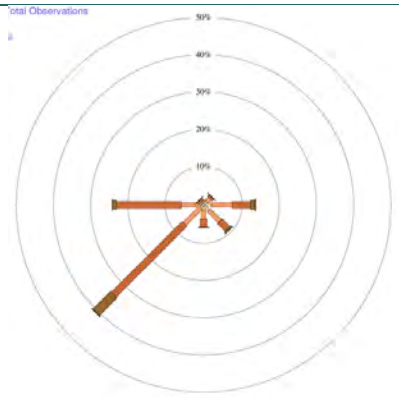
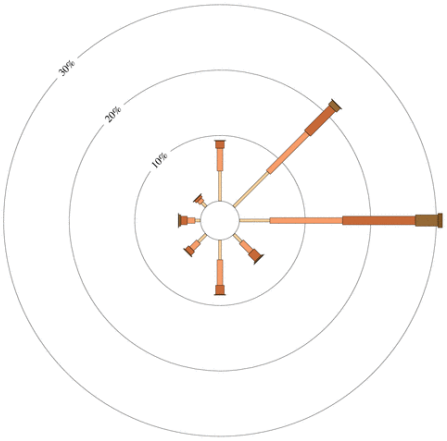
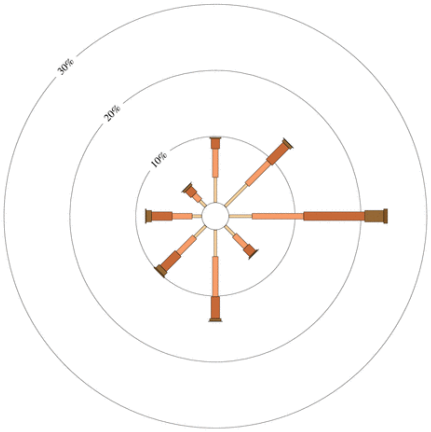
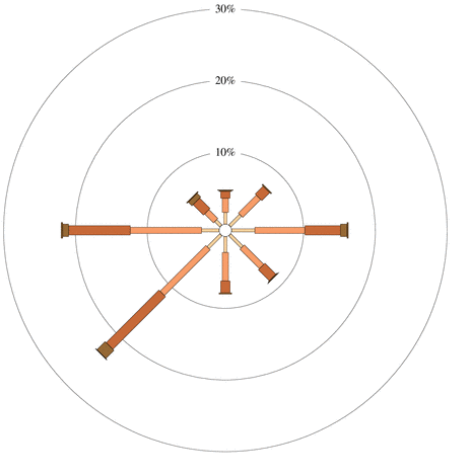
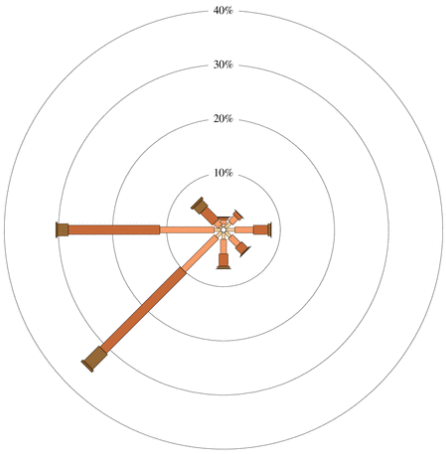
The rainfall and temperature data for the region has been obtained from the Bureau of Meteorology "Climate Data Online" services. The average rainfall from the closest station which is the Toodyay station is 520mm. A majority of rainfall is from May to August.

The mean temperature information is from the closest station which is the Northam station. It states that the hottest month is January with an average maximum of 34.2oC and the coldest month is July with an average minimum of 5.4°C.

The prevailing winds throughout the majority of the year are predominantly from the east in summer months and from the west in winter (Bureau of Meteorology, 2022). Wind roses for the Perth Airport are shown below.

Table 2.1 – Wind Roses for the Perth Airport

TIME OF YEAR	WIND ROSE	TIME OF YEAR	WIND ROSE
Summer 9am		Winter 9am	

TIME OF YEAR	WIND ROSE	TIME OF YEAR	WIND ROSE
Summer 3pm		Winter 3pm	
Autumn 9am		Spring 9am	
Autumn 3pm		Spring 3pm	

2.4 Topography and landform

The topography of the site is variable and undulating with high points and valleys throughout. slightly undulating with a moderate to steep slope throughout. There is a high point at the north-eastern corner and another at the south-eastern corner at approximately 280 metres AHD (Australian Height Datum). These areas are divided by a watercourse which drains towards the northern end of the lot where it reaches a low point of 195m AHD.

The operation area is located in the centre of Lot 1. The natural topography surrounding the pit is at approximately 245m AHD at the north-eastern corner of the operation to approximately 270m AHD at the southern end. The land generally slopes up to the south, down to the west, east and north.

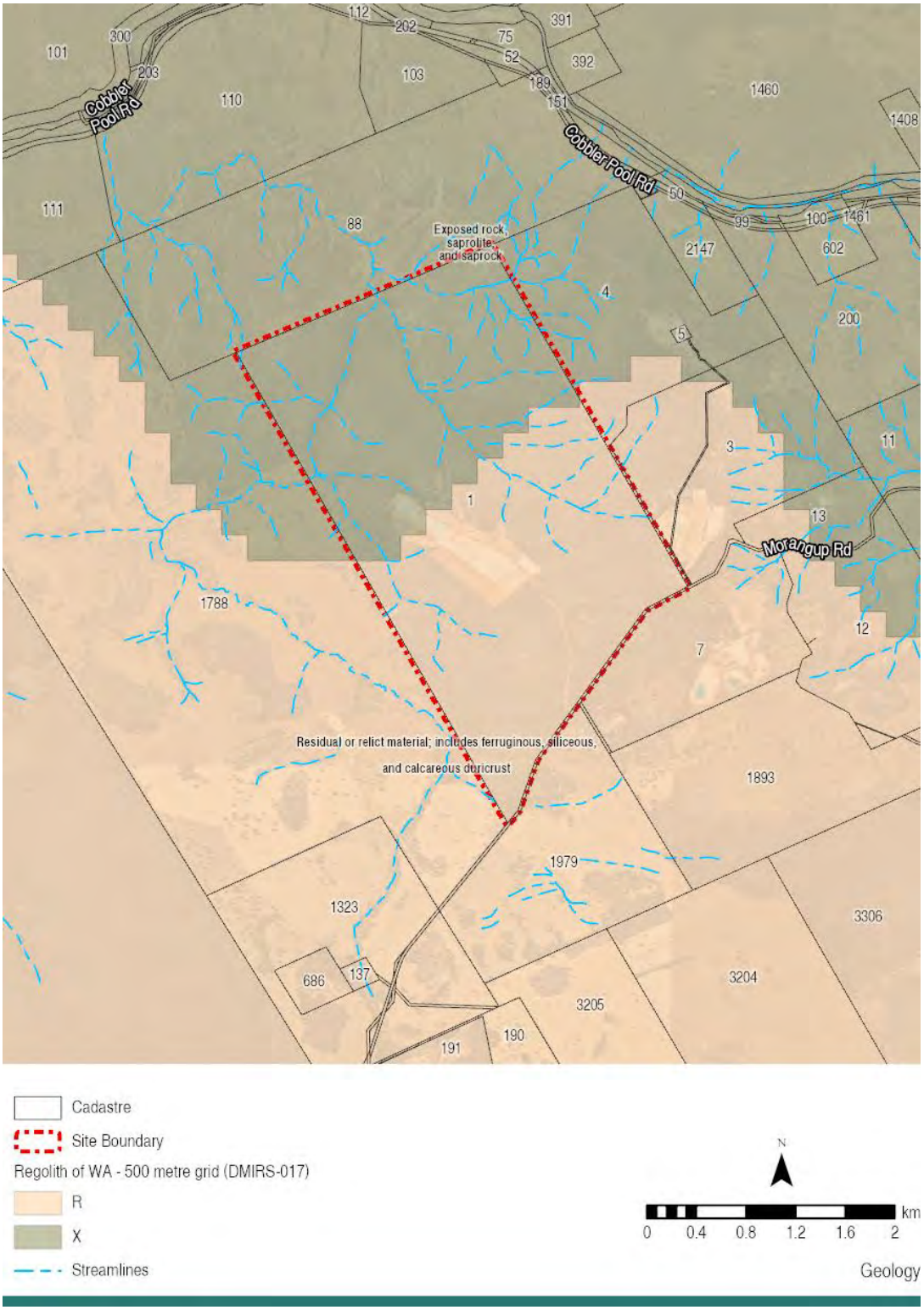
2.5 Geology

The site sits on the Darling Plateau which lies east of the Swan Coastal Plain and the Darling Scarp. It is characterised by an undulating hilly landscape and lateritic uplands with major valleys along the scarp. The general area is part of the Pre-Cambrian meta sedimentary complex known as the Jimperding Metamorphic Belt. The Belt extends 120km in a north westerly direction from York to Clackline and

The 500 metres grid Regolith of WA as mapped by DPIRD identifies the geology as “residual or relict materials including ferruginous siliceous and calcareous duricrust” across the southern extent of Lot 1 and “exposed rock, saprolite and saprock” across the northern extent. The geological formation is described as “dissected lateritic terrain with valleys and plateau remnants” and the geology as “deeply weathered mantle over granitic rocks”. The Regolith of WA is shown in Figure 1 below.

The 1:500 000 State interpreted bedrock geology as mapped by DMIRS (2022) is “Yilgarn Craton Granites”. It is described as “granitic rock, metamorphosed”. The Yilgarn Craton Granites are located in a band through the centre of Lot 1 and is associated with the quarry operation.

Figure 1 – Regolith of WA



2.6 Soils

Lot 1 is divided by three different soil-landscape units. Generally speaking, the north-west corner is the "Clackline Steep Rocky Hills" subsystem and "Michibin" subsystem, the centre of the property (including a majority of the operation) is the "Leaver" subsystem, the creeklines are the "Pindalup" subsystem and the southern portion of Lot 1 is the "Yalanbee" subsystem.

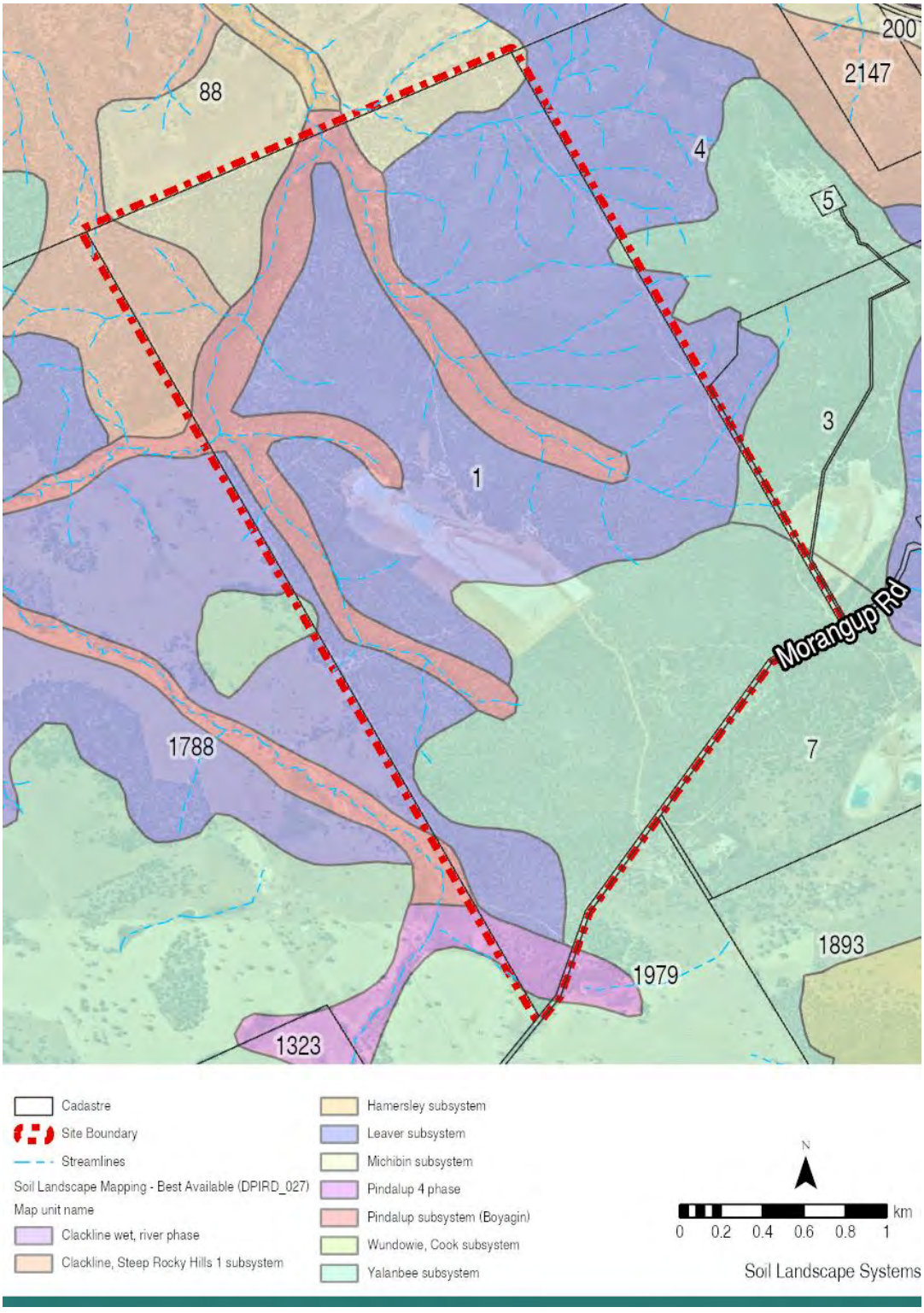
The soil-landscape units mapped across the site are described further in the table below and are shown in Figure 2 below.

Table 2.2 – Soil-Landscape Units

NAME	CODE	DESCRIPTION	LOCATION
Clackline Steep Rocky Hills subsystem	253CcR1	Areas of rock outcrop and steep rocky hills.	Northern portion of Lot 1.
Michibin subsystem	253CcMN	Red and yellowish brown loams and clays, often gravelly with rocky areas and lateritic crests.	Northern portion of Lot 1.
Leaver subsystem	253ByLV	Gravelly yellow and red duplexes, gravelly deep clayey sands and sandy loams over laterite and clay.	Centre of Lot 1, including the operation.
Pindalup subsystem	253ByPN	Alluvial red and yellow duplex and uniform fine soils which are often gravelly.	Associated with the creeklines.
Yalanbee subsystem	253WnYA	Pisolitic gravelly, yellowish brown soils that vary in texture from loamy sands to clays, with pockets of pale sands and areas of outcropping laterite.	Southern end of Lot 1.

Source: DPIRD, 2022

Figure 2 – Soil-landscape Units



Generalised soil qualities of each soil-landscape unit are described in the table below.

Table 2.3 – Soil Qualities

SOIL-LANDSCAPE UNIT	WATER EROSION	WIND EROSION	WATERLOGGING	FLOOD	SALINITY
Clackline Steep Rocky Hills subsystem	Low risk	Moderate risk	Low risk	Low risk	Low risk
Michibin subsystem	Moderate risk	Moderate risk	Low risk	Low risk	Low risk
Leaver subsystem	Low risk	High risk	Low risk	Low risk	Low risk
Pindalup subsystem	High risk	Low risk	High risk	High risk	High risk
Yalanbee subsystem	Low risk	High risk	Low risk	Low risk	Low risk

Source: DPIRD, 2022

2.7 Vegetation

Lot 1 is predominantly covered on remnant vegetation except for the cleared areas associated with the quarry operations, access roads and firebreaks.

A spring *Flora and Vegetation Assessment* was undertaken by Del Botanics in October 2012 of the proposed quarry expansion area. The survey identified three vegetation communities within the survey area:

- "Marri/Jarrah Woodland with a diverse understorey" – Open Forest of *Corymbia calophylla* and *Eucalyptus marginata*, over shrubland of *Banksia sessilis, Banksia armarta* and *Allocasuarina humilis* over herbland of *Hibbertia hypericoides, Gompholobium marginatum* and *Banksia nivea*
- "Powderbark woodland with diverse understorey" – Woodland of *Eucalyptus accedens* over shrubland of *Xanthorrhoea acanthostachya, Melaleuca parviceps, Jacksonia restioides* over herbland of *Hibbertia hypericoides* and *Baekea camphorosmae*
- "Wandoo woodland with diverse understorey" – Woodland of *Eucalyptus wandoo* over shrubland of *Banksia sessilis* and *Leptospermum erubescens*, over herbland of *Banksia nivea, Hibbertia hypericoides* over open grassland of *Neurachne alopecuroidea*

The Flora and Vegetation Assessment (Del Botanics, 2013) rated the vegetation condition within the survey area as “Excellent”, “Very Good” and “Good”. Tracks located through the survey area were rated as “Completely Degraded”.

The Survey recorded four introduced flora species.

The next stage of the pit expansion has already been cleared in accordance with the Clearing Permit issued by DWER. Any further expansion of the pit area will require a new Clearing Permit to be applied for in accordance with the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

2.8 Native fauna

The vegetation surrounding the excavation is likely to support a range of native fauna species. Based off the results of the *Level 1 Fauna Survey and Targeted Black-Cockatoo and Chuditch Survey* undertaken by Western Wildlife in 2012, there are at least three fauna habitats across Lot 1 as follows:

- Wandoo woodland (located at the eastern and western sides of the existing pit area)
- Jarrah-Marri woodland (located to the south of the existing pit area)
- Revegetation areas.

The report by Western Wildlife (2012) notes that these habitats are widely represented in the surrounding area and the woodland habitats are likely to support relatively intact faunal communities.

The fauna survey by Western Wildlife (2012) also listed a number of conservation significance 1 that may occur in the study area including the Carpet Python, Peregrine Falcon, Forest Red-tailed Black-Cockatoo, Baudin’s Black-Cockatoo, Carnaby’s Black-Cockatoo, Fork-tailed Swift, Rainbow Bee-eater and the Chuditch.

The report also notes that there are seven conservation significant 2 species and eight birds and three small mammals of conservation significance 3 that may be present in the study area.

2.10 Water resources

Hydrological mapping

The site sits on the Darling Plateau which lies east of the Swan Coastal Plain and the Darling Scarp. The hydrological zone is the "Eastern Darling Range" which is described as "moderately to strongly dissected lateritic plateau on granite with eastward-flowing streams in broad shallow valleys." This description also accurately describes the landform of Lot 1 which is undulating and dissected by watercourses located in shallow valleys across the site.

The site is located within a "Proclaimed Surface Water Area" under the *Rights in Water and Irrigation (RIWI) Act 1914.* It is not located in a "Proclaimed Groundwater Area" under the RIWI Act 1914.

Hydrological mapping relating to the site (as provided by DWER) are listed below:

- Surface Water Area – "Avon River Catchment"
- Surface Water Subarea – "Avon River Catchment"
- Hydrographic Catchment Basin – "Swan Coastal"
- Hydrographic Catchment - "Swan Avon_Main Avon"
- Hydrographic Subcatchment - "Avon River Catchment"
- Surface Water Management Area – "Avon River Catchment"
- Surface Water Management Subarea - "Avon River catchment"

There are no Public Drinking Water Source Areas (PDWSA's), wetlands, floodplain areas or Floodplain Development Control Areas located on or surrounding the property. The site is located on the western edge of the "Avon River Management Area" which is identified under the *Waterways Conservation Act 1976*. The Department currently does not have an active management plan for this area at present.

Surface water features

A number of watercourses intersect the site. The watercourse on the eastern side of Lot 1 is a tributary of the Avon River and is known as Mortigup Brook (Level 5). It flows from the eastern boundary in a north-west direction and leaves the site to the north where it continues to the Avon River. Another tributary of the Avon River is located on the western side of the Lot which is known as the Morangup Brook (Level 4 watercourse). It flows across the north-west corner of Lot 1. Another minor watercourse extends along the western boundary of the Lot, to the west of the operation area. A small drainage line flows from the outside of the pit towards this watercourse. The watercourses across the site are shown on the plans at Appendix A.

The operation is considered to be adequately separated from the surrounding watercourses. It is approximately 180 metres from the minor watercourse to the west, approximately 550 metres from Morangup Brook and approximately 440 metres from Mortigup Brook.

Further information on water management is provided in the attached Water Management Plan (Land Insights, 2022). The requirements of DWER's *Water Quality Protection Note (WQPN) No. 15 – Basic Raw Material Extraction* is addressed in Chapter 5.13 below which provides a risk assessment against the criteria of the WQPN. A risk assessment is also contained in Chapter 3.

There are no wetlands located on the site. There are no wetlands as mapped by the "Directory of Important Wetlands in Australia". The Avon River located over 1.3km to the north and north-east of the site is mapped by the "Directory of Important Wetlands in Australia".

Western Darling Range

"Moderately dissected lateritic plateau on granite with deeply incised valleys, includes the Darling Scarp on the western margin. Soils are formed in laterite, lateritic colluvium & weathered in-situ granite & gneiss."

Coastal Plain

"Coastal & fixed sand dunes & calcarenite. Non-calcareous sands, podsolised soils with low-lying wet areas. Further inland, alluvial deposits, colluvial deposits adjacent to the Darling Scarp. Clayey to sandy alluvial soils with wet areas."

The site is located within a "Proclaimed Surface Water Area" under the *Rights in Water and Irrigation (RIWI) Act 1914.* The site lies on the eastern extent of the "Serpentine Groundwater Area" which is a "Proclaimed Groundwater Area" under the RIWI Act 1914.

There are no Public Drinking Water Source Areas (PDWSA's), Geomorphic Wetlands of the Swan Coastal Plain, floodplain areas or Floodplain Development Control Areas located on or surrounding the property.

3 Screening Analysis

3.1 Introduction

Appendix B of the "Draft Guidelines: Dust Emissions" (DWER, 2021) provides a questionnaire to help determine if additional and more detailed information is required for a proposed development. The outcomes of the questionnaire are provided below.

3.2 Results

Question 1 – Description of dust emissions

A description of the activities, potential dust sources and proposed controls are provided in Table 4.1 below.

Question 2 – Identification of current dust impacts

No community complaints have been received since the site commenced operation over 60 years ago. This is an impeccable track record. No other records of dust impacts (such as ambient monitoring, negative community feedback or dust diaries) have occurred throughout the site's operation.

Question 3 – Changes to emissions

There are no proposed changes to the existing operation that are likely to increase the dust emissions or change the configuration of any dust source, apart from the slow progression of excavation in a south-easterly direction.

Question 4 – Separation Distances

No sensitive land uses are located within 500 metres of the operation.

Question 5 – Special case factors

The draft Guidelines lists the "special case factors" to be considered for new and existing sites. Most of the special case factors do not apply. The only possible factor to consider is the "dust impacts from other nearby sources" as there are other extractive industry operations adjoining the site. However, as the nearest sensitive land uses are over 1,000 metres from the general area, it is not considered that the cumulative operation of the quarries will have an impact on overall dust emissions, especially when considering that the quarries will rarely operate simultaneously.

Conclusion

The result of the above questionnaire is that a detailed dust assessment is not required for the proposed development. Therefore, an operational dust analysis and an assessment of the existing dust levels and dust characteristics has not been undertaken.

4 Risk Assessment

4.1 Introduction

A risk assessment for the Schist Quarry is presented in this chapter. It considers the potential for dust generation and the potential impact off-site. The assessment has considered in detail the activities associated with the operation, the risk factors and the proposed controls.

There are three different components to the below risk assessment which provide a thorough consideration of the potential issues and risks as follows:

1. The assessment commences with a review of the "factors" from Chapter 7 of the "Draft Guidelines: Dust Emissions" (DWER, 2021). This provides an overarching look of the factors that are considered in a dust emission assessment and helps lead into the site classification and the overall risk assessment.
2. The "site classification" has been determined using the current guideline for dust management – "A Guideline for Managing the Impacts of Dust and Associated Contaminants from land Development Sites, Contaminated Sites, Remediation and Other Related Activities" (Department of Environment and Conservation, 2011). It should be noted that the recommendations from this document are not specific to extractive industries and therefore a more detailed management plan is provided in this document.
3. Following this is a more detailed risk assessment of the specific activities that take place for the operation. The assessment has been prepared based on the consequence, likelihood and risk definitions provided in "Guidance Statement: Risk Assessments" (Department of Environment Regulation, 2017).

4.2 Draft Guideline: Dust Emissions

The "Draft Guideline: Dust Emissions" (DWER, 2021) provides information on the "factors" to be considered in a dust emission assessment. Each of the factors listed in Chapter 7 of the Guidelines is provided in Table 4.1 below. Commentary on the operation against these factors is also provided in the table below.

Table 4.1 – Dust emission assessment

FACTOR	COMMENT	CONCLUSION
Location and proximity to sensitive receptors	The following sensitive receptors have been identified surrounding the site. • Neighbouring rural property to the west – Approximately 1.4km from the operation (865 Morangup Road, Morangup) • Neighbouring rural property to the south – Approximately 1.6km from the operation (1012 Morangup Road, Morangup) • Rural properties to the east – Closest is approximately 3km from the operation (575 Lovers Lane, Morangup) • Rural properties to the north – Closest is approximately 3.3km from the operation (535 Cobbler Pool Road, Morangup). "Guidance Statement No. 3 – Separation Distances Between Industrial and Sensitive Land Uses" (EPA, 2005) provides a guideline on the separation distances and buffers for a range of industrial land uses to sensitive land uses. The operations on site fit into the category "clay extraction or processing". The potential impacts are listed as "noise" and "dust". The separation distance is "500-1000 metres, depending on size and processing", however this can be less with appropriate environmental management. The operation meets the recommended separation distance.	It is considered that there is a low risk that dust will impact on sensitive receptors as the nearest sensitive receptor is located further than the recommended separation distance.
Management of dust sources and activities.	Management of dust sources and activities (proposed controls) are set out in Table 4.3 below.	It is considered that there is a low risk of dust affecting nearby sensitive receptors when the Dust Management Plan is implemented as is demonstrated in the dust risk assessment in Table 4.3.

FACTOR	COMMENT	CONCLUSION
Characteristics of the dust.	As is explained above, the Screening Analysis for the proposed operation concluded that a detailed analysis of the dust is not required. To provide further information on the wind erosion risk of clay soils, Austral Bricks has commissioned a study into the wind erosion potential of clay soils once a clay pit is established (Appendix B). The "Clay Pit Wind Erosion Study" (Ramboll, 2019) states that clay soils are particularly prone to "soil crusting" which is when moisture in the soil turns surface aggregates into crusts. This natural crusting binds the erodible material, producing a sealed surface that requires much higher wind speeds for particle dislodgment. Clay-rich soil with relatively high moisture content is very prone to crusting. A crusted surface has a finite availability of erodible material that once removed means that wind erosion from that source is likely to be negligible until a disturbance significant enough to generate new erodible material occurs.	The Clay Pit Erosion Study (Ramboll, 2019) confirms that there is a low risk of dust being created when the site is inactive.
Potential dust impacts from other nearby sources.	Potential dust impacts from other nearby sources (i.e. within 500-1000m of the site) are the other extractive industries located adjacent to the site on Lots 3 and 7 Morangup Road. These quarries are also managed in accordance with Dust Management Plans.	The adjoining quarries are also managed in accordance with their own Dust Management Plans. There are no sensitive receptors located within 1,000 metres of all potential sources. Therefore the potential risk from other sources is considered to be low.
Topography and complexity of terrain.	The topography of Lot 1 is undulating with a few watercourses dissecting the landscape and some hills to the south-west of the pit and along the eastern boundary. The existing quarry is located approximately 14 metres below natural ground level. The remainder of the lot surrounding the quarry is extensively vegetated.	The clay extraction operation is well screened from nearby sensitive receptors by the topography and vegetation.

FACTOR	COMMENT	CONCLUSION
Size and/or complexity of the facility.	The existing Operation Area (including the area cleared for the next stage) is outlined on the attached plans. The operation is not complex as there is only extraction, carting and rehabilitation, with no processing of the recourse on site. Earthworks and carting occur in campaigns and for a majority of the year the site has no activity.	The small scale of the operation is considered to have a low risk on nearby sensitive receptors.
Whether the proposal is in a Strategic Industrial Area.	The site is not located within a Strategic Industrial Area.	N/A – This factor is not relevant.
Whether the proposal is in an area that has an established risk-based approach and regulatory context.	The proposal is not within an area with an established risk-based approach and regulatory context.	N/A – This factor is not relevant.
Compliance history of existing premises.	No community complaints have been received since the site commenced operation over 60 years ago. This is an impeccable track record. No other records of dust impacts (such as ambient monitoring, negative community feedback or dust diaries) have occurred throughout the site's operation.	The compliance history for the site is good and therefore is not a concern.
Other considerations	The local area experiences a Mediterranean climate which experiences cool, wet winters and hot dry summer. A majority of rain occurs in the Winter months (May-August) and summer months can be typically dry. The prevailing winds throughout the majority of the year are predominantly from the east (morning) and the south-west (afternoon) (Bureau of Meteorology, 2022).	The closest sensitive land uses (rural dwellings) are to the west and south, however considering the physical barriers and the separation distances, it is considered unlikely that there will be a low risk of dust impact from the prevailing wind on nearby sensitive residences.

4.3 Site classification

The site classification has been prepared for the site in accordance with DWER's Guidelines (2011) and has been classified as "negligible risk". This is due to the fact that although there is a large area exposed or open at one time and the activities largely involve earthworks, the separation distances to sensitive land uses are satisfactory and there is low impact from prevailing winds. The classification is provided in the table below. The table below is reproduced from Appendix 1 of the Guidelines. The total score is 46 which fits into "Classification 1 – score under 199 – considered Negligible Risk".

Table 4.2 – Site classification assessment

ITEM	SCORE	COMMENT
PART A – Nature of site		
Nuisance potential of soil, when disturbed	Medium – 4	The activities on site that will likely "disturb" the soil are excavation activities, loading trucks with clay, recontouring and vehicles moving across the site. For the remainder of the time (when the site is not operational) the soil will not be disturbed.
Topography and protection provided by undisturbed vegetation	Sheltered and screened - 1	The quarry is surrounded by extensive vegetation on all sides. The topography of the site is undulating, providing further protection. Most disturbance activities take place at depth and are surrounded by the quarry walls.
Area of site disturbed by the works	More than 10ha – 9	This includes the current quarry and future stages.
Type of work being done	Bulk earthworks – 9	Extraction activities.
PART B – Proximity of site to other land uses		
Distance of other land uses from site	More than 1km – 1	The nearest sensitive receptor is over 1,000 metres from the operation.
Effect of prevailing wind direction on other land uses	Not affected – 1	It is considered that the nearest sensitive receptors are a sufficient distance from the site so that prevailing winds will not affect dust impact.

Source: *A Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites, Remediation and Other Related Activities* (Department of Environment and Conservation, 2011)

Reflecting the very low risk of dust impact on a site classified as "negligible risk", the Guidelines do not recommend that any management provisions or contingency actions are required.

4.5 Risk assessment

The overall dust risk assessment in Table 4.3 below is based on the criteria defined in "Guidance Statement: Risk Assessments" (DWER, 2017). The risk assessment below lists the activity(s) which have the potential to cause dust impact, the inherent risk (i.e. with no controls) and the residual risk (with controls in place). It uses the outcomes of the "Dust Emission Assessment" from the draft "Guidelines: Dust Emissions" in Chapter 4.2 above and the "Site Classification Assessment" from the 2011 Guidelines as a base. The "likelihood" and "consequence" determined in the below risk assessment can be supported by both of the assessments in Chapters 4.2 and 4.3 above.

The "risk" is determined by considering the likelihood and consequence of the environmental impact. The likelihood and consequence criteria are defined in the Guidance Statement. A copy of the criteria has been provided in Tables 4.4 and 4.5 below. The matrix used to determine the risk rating is also based on the matrix used in the Guidance Statement and a copy of this table is provided in Table 4.6 below.

The purpose of the risk assessment is to demonstrate that risk identified as "medium", "high" or "extreme" can be effectively managed. As is stated in the "Guidance Statement: Risk Assessments" (DWER, 2017), a "low risk" is considered acceptable and generally not controlled through regulation.

Table 4.3 – Dust risk assessment

ACTIVITY/DUST SOURCE	POTENTIAL IMPACT	INHERENT RISK			PROPOSED CONTROL	RESIDUAL RISK		
		L	C	Risk		L	C	Risk
Vehicle and truck movements entering and exiting the site.	Dust and mud tracked onto Morangup Road. When dry, the mud and dust on the road can be disturbed and dispersed into the air when vehicles drive over.	Possible	Minor	Med	Refer to Table 6.1 – Dust Management Plan	Unlikely	Slight	Low
Machinery and vehicle movements on internal access tracks throughout the site.	Dust can be generated by machinery and vehicles driving along gravel access tracks. Dust particles in the air could move off-site (i.e. outside of the property owned by Austral Bricks).	Possible	Slight	Low	Refer to Table 6.1 – Dust Management Plan	Possible	Slight	Low
Clearing vegetation and stripping topsoil and overburden	Dust can be generated from clearing vegetation and moving topsoil and overburden to stockpiles. Dust particles in the air could potentially move off-site (i.e. outside of the property owned by Austral Bricks).	Possible	Minor	Med	Refer to Table 6.1 – Dust Management Plan	Unlikely	Slight	Low
Excavation of clay and tipping clay onto stockpile.	Dust can be generated by the excavation of clay and tipping onto stockpiles. Dust particles in the air could potentially move off-site (i.e. outside of the property owned by Austral Bricks).	Possible	Minor	Med	Refer to Table 6.1 – Dust Management Plan	Rare	Slight	Low
Loading clay onto trucks during carting campaign.	Dust can be generated by moving raw material (clay) from the stockpile onto trucks. Dust particles in the air could potentially move off-site (i.e. outside of the property owned by Austral Bricks).	Possible	Minor	Med	Refer to Table 6.1 – Dust Management Plan	Unlikely	Slight	Low

ACTIVITY/DUST SOURCE	POTENTIAL IMPACT	INHERENT RISK			PROPOSED CONTROL	RESIDUAL RISK		
		L	C	Risk		L	C	Risk
Recontouring and rehabilitation of the operation area.	Dust can be generated by earthworks (moving overburden to batter slopes) and machinery/vehicles driving along access tracks.	Possible	Minor	Med	Refer to Table 6.1 – Dust Management Plan	Rare	Slight	Low
Exposed excavation areas and other open areas	Dust can be generated when strong winds blow across the exposed areas.	Rare	Slight	Low	No particular dust control required. Wind erosion of an undisturbed clay pit "is unlikely to present a significant risk of generating nuisance dust at nearby receptors" as stated by Ramboll (2019) as the clay soil is particularly prone to soil crusting.	Rare	Slight	Low
Stockpiles (overburden and clay)	Dust can be generated when strong winds blow across stockpiles.	Rare	Slight	Low	No particular dust control required. Wind erosion of an undisturbed clay pit "is unlikely to present a significant risk of generating nuisance dust at nearby receptors" as stated by Ramboll (2019) as the clay soil is particularly prone to soil crusting.	Rare	Slight	Low

Table 4.4 – Likelihood Criteria

Almost certain	Likely	Possible	Unlikely	Rare
The risk event is expected to occur in most circumstances.	The risk event will probably occur in most circumstances.	The risk event could occur at some time.	The risk event will probably not occur in most circumstances.	The risk event may only occur in exceptional circumstances.

Source: DWER 2017

Table 4.5 – Consequence Criteria

	Slight	Minor	Moderate	Major	Severe
Environment	• On-site impact: minimal (No discernible adverse impact). • Off-site impacts local scale: minimal • Off-site impacts wider scale: not detectable	• On-site impacts: low level (discernible effect on the environment but no adverse impact) • Off-site impacts local scale: minimal • Off-site impacts wider scale: not detectable • Minor number of individuals of species may be affected locally.	• On-site impacts: mid level (Minor adverse affect to the environment) • Off-site impacts local scale: low level • Off-site impacts wider scale: minimal • Moderate loss of individuals of species locally.	• On-site impacts: high level (moderate impact to the environment) • Off-site impacts local scale: mid level • Off-site impacts wider scale: low level • Short term impact to an area of high conservation value or special significance^ • Moderate damage to ecosystem function and major loss of individuals of species locally.	• On-site impacts: catastrophic (significant impact to the environment) • Off-site impacts local scale: high level or above • Off-site impacts wider scale: mid level or above • Mid to long term or permanent impact to an area of high conservation value or special significance^ • Significant long-term damage/loss of ecosystem function and loss of individuals of species locally.
Public Health and Amenity	• Local scale: minimal to amenity.	• Local scale impacts: low level impact to amenity.	• Adverse health effects: low level or occasional medical treatment • Local scale impacts: mid level impact to amenity.	• Adverse health effects: mid level or frequent medical treatment • Local scale impacts: high level impact to amenity.	• Loss of life • Adverse health effects: high level or ongoing medical treatment • Local scale impacts: permanent loss of amenity.

Source: DWER 2017

^ Determination of areas of high conservation value or special significance should be informed by the Guidance Statement: Environmental Siting.

* 'onsite' means within the Lot boundary.

Table 4.6 – Risk Matrix Ratings

Likelihood	Consequence				
	Slight	**Minor**	**Moderate**	**Major**	**Severe**
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

Source: DWER 2017

5 Dust Control Actions

5.1 Introduction

The Dust Management Plan aims to describe the measures that will be used by Austral Bricks to reduce the creation and effect of dust. It includes actions relating to dust control measures, corrective procedures and complaints protocol. This chapter describes the dust control actions in detail to provide context on how these methods operate to reduce the creation and have more effective control of dust. The specific actions relating to each dust source is then listed in Table 5.1. The purpose of the actions set out in Table 5.1 is to provide items which can be efficiently and effectively understood and actioned by Austral Bricks staff and contractors.

The plan has been prepared in accordance with "A Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites, Remediation and Other Related Activities" (Department of Environment and Conservation, 2011), the "Draft Guideline: Dust Emissions" (DWER, 2021), best practice in mine/quarry management and experience.

5.2 Site layout/design

The quarry is located in the centre of a large property approximately 685 hectares in size. It is surrounded on all sides with extensive vegetation making the operation well screened from surrounding areas. The next stages will continue to be well-screened with native vegetation.

The location of the stockpile area has also been carefully considered. It is located within the existing pit area so that it is located in the low part of the operation, well-screened by the surrounding pit face.

The haul road through the property is also surrounded by vegetation, meaning that the potential for dust to move off site is low.

5.3 Complaints procedure

The complaints procedure is described below. It is also important that all complaints are recorded. The following activities will be conducted:

- Complaints made to the operator will be documented and dealt with expeditiously.
- Complaints received either directly from the complainant or via the Shire of Toodyay will be reviewed by the operator and interested parties to assess:
    - (i) the legitimacy of the complaint;
    - (ii) the aspects of the operation that triggered the complaint;

(iii) management actions required to address the issues raised to bring operations into line with conditions imposed on the extractive operation by the Shire of Toodyay under the Extractive Industries Licence.

- Actions deemed necessary to bring operations into line with relevant legislation, regulation and license conditions will be undertaken immediately and before works are recommenced.
- Summaries of complaints and actions taken to address each specific issue will be recorded in the Complaints Register (See Appendix C).

Complainants and the Shire of Toodyay will be notified in writing of the date, time and nature of the complaint received, results of the investigation, remedial actions undertaken and date and time of recommencement of works. If any complaints are received, necessary action will take place to help rectify the issue.

The complaints response is applicable at all times (i.e. not just during site operation) and there will always be a prompt response from Austral Bricks whether onsite or not. Complaints are generally sent to the Shire of Toodyay. The Shire will then contact Austral Bricks as required should a complaint be received by them.

It should be noted that this complaints procedure has worked very well for Austral Bricks at numerous other sites in the past.

5.4 Dust suppression

Dust suppression is generally achieved through the use of a "dust suppression agent", most commonly water. The application of water over areas prone to the generation of dust helps to reduce the likelihood that small dust particles which will be picked up by the wind. Water will be used as a dust supressing agent on days where excavation and carting take place. Chemical dust suppressants (such as Dustex) can also be used on unsealed tracks if they are planned to be unused for extended periods.

Water will be available from the two detention basins located at the base of the pit area. There is a substantial amount of water available in the basins and it is very unlikely that the basins will dry. Watering will be undertaken as required utilising a water cart. The water cart will have a capacity of between 12,000 to 18,000 litres. The frequency and amount of water applied will be dependent upon local conditions and observable dust generation. The quantity of water to be used will vary as conditions will change from day to day.

5.6 Monitoring weather conditions

The Quarry Manager will review the predicted weather conditions from the Bureau of Meteorology on the day before excavation and carting is scheduled to take place. The purpose is to check whether strong winds or adverse weather conditions are predicted. The Quarry Manager will make a decision at the pre-start meeting on the morning of operation to advise whether the scheduled activities will occur.

During the course of the day, the Quarry Manager will check weather conditions. If weather conditions are adverse (i.e. particularly strong winds are making dust management difficult), then operations will stop until the weather improves.

5.7 Visual inspections

The Quarry Manager visits the site each day that the site is operational (i.e. excavating or carting). When the site is not being worked it is attended every quarter for inspection by the Quarry Manager. The visual monitoring is undertaken when required. It is in the interest of Austral Bricks to make sure that dust management is adequate, and they are committed to this.

5.8 Dust management during non-operational periods

The site will only be operational for a limited time each year. For the majority of the year the site will be non-operational. During these times Austral Bricks will adhere to the following procedures:

- Continue to respond to complaints as described above
- Visually inspect the site each quarter by the Quarry Manager.

During non-operational times wind erosion of an undisturbed clay pit "is unlikely to present a significant risk of generating nuisance dust at nearby receptors" as stated by Ramboll (2019) in the "Clay Pit Wind Erosion Study". The clay soil is particularly prone to soil crusting which means that the wind erosion is likely to be negligible until "a disturbance significant enough to generate new erodible material occurs". Therefore, no additional dust management is required during non-operational times except for those listed above.

5.9 Vehicle movements

The stockpile area is located within the pit area. Trucks enter the site at Morangup Road, travel along the gravel haul road and access the pit area for the stockpiles. There is only one haul road into and out of the site.

The haul road is comprised of gravel which is not unlike a typical rural road. While some gravel dust is likely to be kicked up from vehicle movements along the gravel haul road, it is not expected or anticipated that the dust will travel off-site. The speed limit for trucks and vehicles is reduced throughout the site to reduce the potential for dust generation along the gravel roads. The road is also over the recommended

separation distance to the nearest sensitive receptors and surrounded by extensive vegetation on either side.

All trucks will be covered by a tarp to control dust generation during transport.

Trucks only access the site during carting campaigns or when clay is needed at the factories (i.e. it is not a continuous operation occurring every day throughout the year). Therefore, the potential for dust generation from vehicle movements is not continuous or every day.

The access at Morangup Road is sealed with bitumen for a distance of approximately 110 metres. This helps to reduce dust and mud from vehicle and truck tyres before they enter onto Morangup Road.

Machinery and vehicles will be maintained in good working condition. Internal access roads and the crossover will also be maintained in good condition.

5.10 Dust Management Plan

The Dust Management Plan actions, responsibilities and timing is presented in Table 5.1 below. The actions are listed against each separate activity/dust source so that the specific dust management and controls for those activities can be understood. These activities have also been considered in the overall dust risk assessment presented in Table 4.3.

It should be noted that the risk assessment from Chapter 4 demonstrated that all activities can be managed to a “low” risk of impact. In accordance with the DWER Guidance Statement on risk assessments, a “low risk” is considered acceptable and generally not controlled through regulation. Therefore, the dust controls measures set out below are considered suitable for the risk of impact. Additional dust control and dust monitoring is not considered necessary given the low risk of impact.

Table 5.1 – Dust Management Plan

ACTIVITY	MANAGEMENT/ACTION	RESPONSIBILITY	TIMING
General	Maintain all equipment in good condition.	Quarry Manager	Ongoing
	Continue training programmes on dust control requirements to all workers and contractors.	Quarry Manager	Ongoing
	All non-conformances and dust related complaints immediately reported to the Quarry Manager.	Quarry Manager, Environmental Manager WA	Ongoing
	Comply with the "Complaints Procedure" at all times.	Quarry Manager, Environmental Manager WA	Ongoing
	Following substantiated complaints, the source of any excessive dust will be identified and work practices will be modified or re-scheduled to reduce or eliminate the risk of future events.	Quarry Manager	Ongoing
	A notice should be placed on site with contact details of the Quarry Manager and details as to where dust complaints are to be addressed. It will be displayed at all times.	Quarry Manager	Ongoing
	Ensure that all site operators are trained to observe whether dust is leaving the property boundary or if adverse weather conditions are present.	Quarry Manager	Ongoing
	Ensure that all site operators are trained in procedures should dust be observed leaving the boundary or if there are adverse weather conditions such as when to stop operations or when to increase dust management measures (such as wetting down areas etc.)	Quarry Manager	Ongoing
	Should dust visibly cross the site boundary at any time, dust suppression measures shall be increased immediately and if works are taking place they shall be modified accordingly. Should dust continue to be generated all works shall cease immediately and the site shall be sufficiently stabilised by application of water until the wind conditions are appropriate to resume works.	Quarry Manager Staff Contractors	Ongoing
	When winds are sufficiently strong to negate the effects of dust management, operations will cease until conditions improve and compliance can be achieved.	Quarry Manager	Ongoing
	Maintain all equipment in good condition.	Quarry Manager	Ongoing

ACTIVITY	MANAGEMENT/ACTION	RESPONSIBILITY	TIMING
	All non-conformances and dust related complaints immediately reported to the Quarry Manager.		
Vehicle and truck movements entering and exiting the site (potential to leave dust and mud on Morangup Road).	Quarry Manager to review the Bureau of Meteorology forecast regarding wind and temperature at the pre-start team meeting and discuss the likely weather impacts (and to decide whether the conditions mean that operations should not commence for the day or should be monitored for worsening conditions).	Quarry Manager	Ongoing
	Vehicle and machinery exiting the site should be inspected to ensure they are not carrying clods/slurry of soil (this is also part of the dieback management for the site).	Quarry Manager	Ongoing
	Cover truck loads with a tarp before exiting the site.	Quarry Manager	Ongoing – during carting.
	Quarry Manager to inspect the site on excavation and carting days to review dust management.	Quarry Manager	Ongoing – On excavation and carting days
	Maintain the sealed crossover to Morangup Road in good condition.	Quarry Manager	Ongoing
Machinery and vehicle movements on internal access tracks throughout the site.	Quarry Manager to review the Bureau of Meteorology forecast regarding wind and temperature at the pre-start team meeting and discuss the likely weather impacts (and to decide whether the conditions mean that operations should not commence for the day or should be monitored for worsening conditions).	Quarry Manager	Ongoing
	Watercarts will be utilised during dry weather conditions to wet down access tracks to prevent dust generation. Water for the carts should be obtained from the pond onsite.	Quarry Manager	Ongoing – during excavation and carting.
	Chemical dust suppressants (such as Dustex) can be used on unsealed areas if they are planned to be unused for extended periods.	Quarry Manager	Ongoing
	Keep vehicle speed limits low throughout the site.	Quarry Manager	Ongoing
	Quarry Manager to inspect the site on excavation and carting days to review dust management.	Quarry Manager	Ongoing – on carting days

ACTIVITY	MANAGEMENT/ACTION	RESPONSIBILITY	TIMING
Clearing of vegetation and stripping of topsoil and overburden	Quarry Manager to review the Bureau of Meteorology forecast regarding wind and temperature at the pre-start team meeting and discuss the likely weather impacts (and to decide whether the conditions mean that operations should not commence for the day or should be monitored for worsening conditions).	Quarry Manager	Ongoing
	Watercarts will be utilised during dry weather conditions to wet down access tracks to prevent dust generation. Water for the carts should be obtained from the pond onsite.	Quarry Manager	Ongoing – during clearing and stripping.
	Quarry Manager to inspect the site to review dust management during clearing and stripping activities.	Quarry Manager	Ongoing – during activities.
Excavation of clay and tipping onto stockpile.	Quarry Manager to review the Bureau of Meteorology forecast regarding wind and temperature at the pre-start team meeting and discuss the likely weather impacts (and to decide whether the conditions mean that operations should not commence for the day or should be monitored for worsening conditions).	Quarry Manager	Ongoing
	Watercarts will be utilised during dry weather conditions to wet down access tracks to prevent dust generation. Water for the carts should be obtained from the pond onsite.	Quarry Manager	Ongoing – during excavation.
	Freshly excavated clay is damp. This will reduce the amount of dust generated.	Quarry Manager	Ongoing
	Quarry Manager to inspect the excavation area to review dust management.	Quarry Manager	Ongoing – during excavation.
Loading clay onto trucks during carting campaign	Quarry Manager to review the Bureau of Meteorology forecast regarding wind and temperature at the pre-start team meeting and discuss the likely weather impacts (and to decide whether the conditions mean that operations should not commence for the day or should be monitored for worsening conditions).	Quarry Manager	Ongoing
	Watercarts will be utilised during dry weather conditions to wet down access tracks to prevent dust generation. Water for the carts should be obtained from the pond onsite.	Quarry Manager	Ongoing – during carting

ACTIVITY	MANAGEMENT/ACTION	RESPONSIBILITY	TIMING
	Quarry Manager to inspect the stockpiling area on carting days to review dust management.	Quarry Manager	Ongoing – during carting
Recontouring and rehabilitation of the operation area.	Quarry Manager to review the Bureau of Meteorology forecast regarding wind and temperature at the pre-start team meeting and discuss the likely weather impacts (and to decide whether the conditions mean that operations should not commence for the day or should be monitored for worsening conditions).	Quarry Manager	Ongoing
	Watercarts will be utilised during dry weather conditions to wet down access tracks to prevent dust generation. Water for the carts should be obtained from the pond onsite.	Quarry Manager	Ongoing – during rehabilitation.
	Quarry Manager to inspect the operation area to review dust management.	Quarry Manager	Ongoing – during rehabilitation.
Exposed excavation areas and other open areas	Allow a dry crust to form on the exposed operation areas	Quarry Manager	Ongoing
	Quarry Manager inspect the site each quarter when non-operational to check that a crust has formed on the surface and that there are no obvious dust issues.	Quarry Manager	Every 3-4 months when non-operational.
Stockpiles (overburden and clay)	Allow a dry crust to form on the exposed operation areas	Quarry Manager	Ongoing
	Quarry Manager inspect the site each quarter when non-operational to check that a crust has formed on the surface and that there are no obvious dust issues.	Quarry Manager	Every 3-4 months when non-operational.
Training and complaints management	Continue training programmes on dust control requirements to all workers and contractors.	Quarry Manager	Ongoing
	All non-conformances and dust related complaints immediately reported to the Quarry Manager.	Quarry Manager, Environmental Manager WA	Ongoing
	Comply with the “Complaints Procedure” at all times.	Quarry Manager, Environmental Manager WA	Ongoing
	Following complaints, the source of any excessive dust will be identified and work practices will be modified or re-scheduled to reduce or eliminate the risk of future events.	Quarry Manager	Ongoing

ACTIVITY	MANAGEMENT/ACTION	RESPONSIBILITY	TIMING
	A notice should be placed on site with contact details of the Quarry Manager.	Quarry Manager	Ongoing

6 References

Bureau of Meteorology (2022), Climate Data Online, Accessed from http://www.bom.gov.au/climate/data/

Department of Environment and Conservation (DWER), (2011), *Guidelines for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites, Remediation and Other Related Activities*, Department of Water and Environmental Regulation, Perth, WA.

Department of Water and Environmental Regulation, (2017), *Guidance Statement: Risk Assessments,* Department of Water and Environmental Regulation, Perth, WA.

Department of Water and Environmental Regulation, (2021). *Draft Guideline – Dust Emissions*, Department of Water and Environmental Regulation, Perth, WA.

Environmental Protection Authority, (2005), *Guidance Statement No.3: Separation Distances Between Industrial and Sensitive Land Uses,* Environmental Protection Authority, Perth, WA.

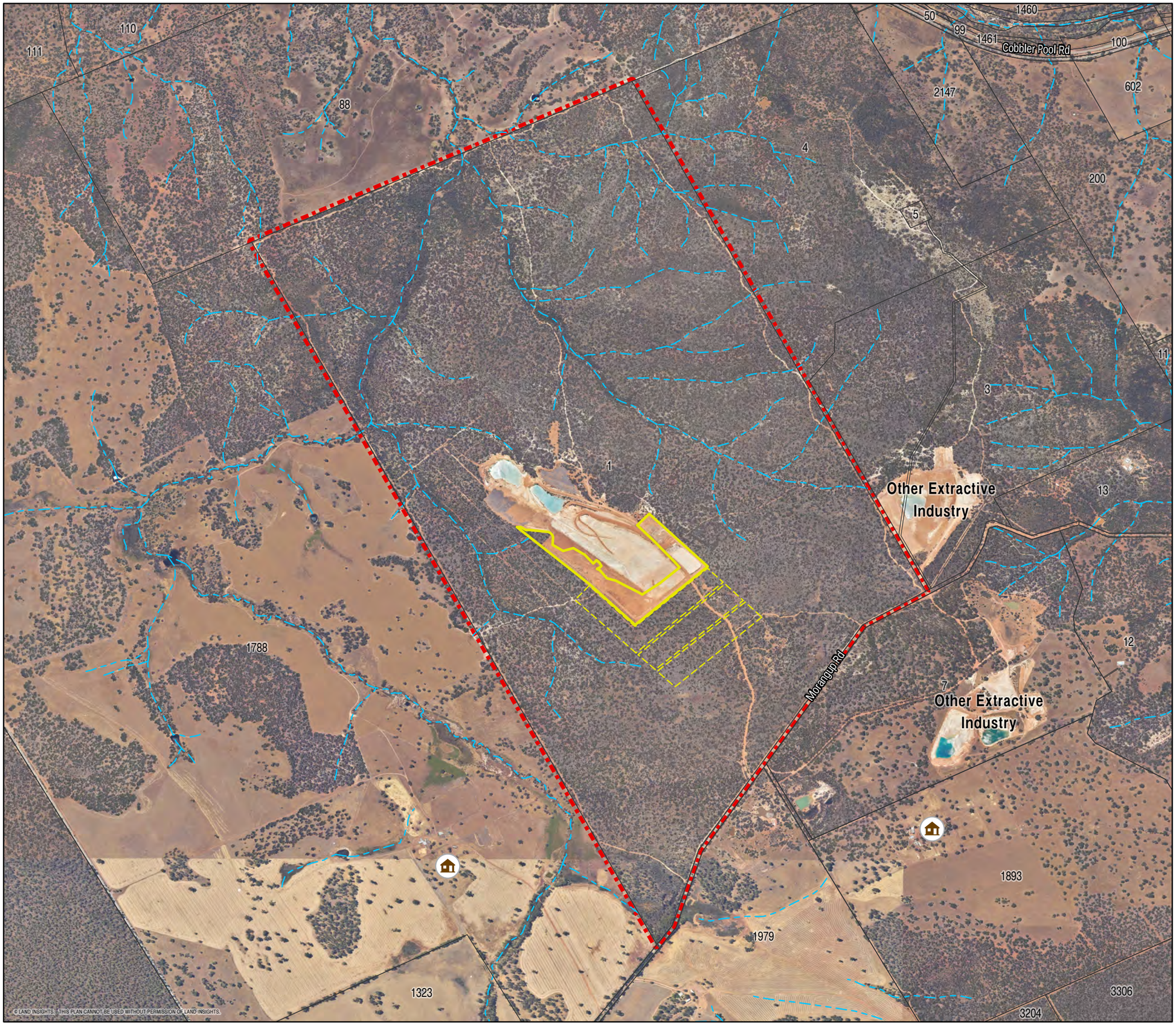
Environmental Protection Authority, (2015), *Draft Environmental Assessment Guideline for Separation Distances Between Industrial and Sensitive Land Uses,* Environmental Protection Authority, Perth, WA.

Government of Western Australia, (2022), *SLIP Portal*, Accessed from https://maps.slip.wa.gov.au/landgate/locate/

Ramboll, (2019), *Clay Pit Wind Erosion Study*, Austral Bricks (WA) Pty Ltd, Perth, WA.

APPENDIX A

Plans



Cadastre

Site Boundary

Streamlines

Existing Stage

Future Stages

Houses

0 100 200 300 400 500

Metres

1:20,000 @ A3

NOTE: AREAS AND DISTANCES SUBJECT TO SURVEY

Project: 935
Projection: GDA 1994 MGA Zone 50
Date Exported: 15/08/2023 5:59 PM
Layout Name: Context Plan

PO Box 289 Mt Lawley WA 6929
Ph: 9271 8506
admin@landinsights.com.au
landinsights.com.au

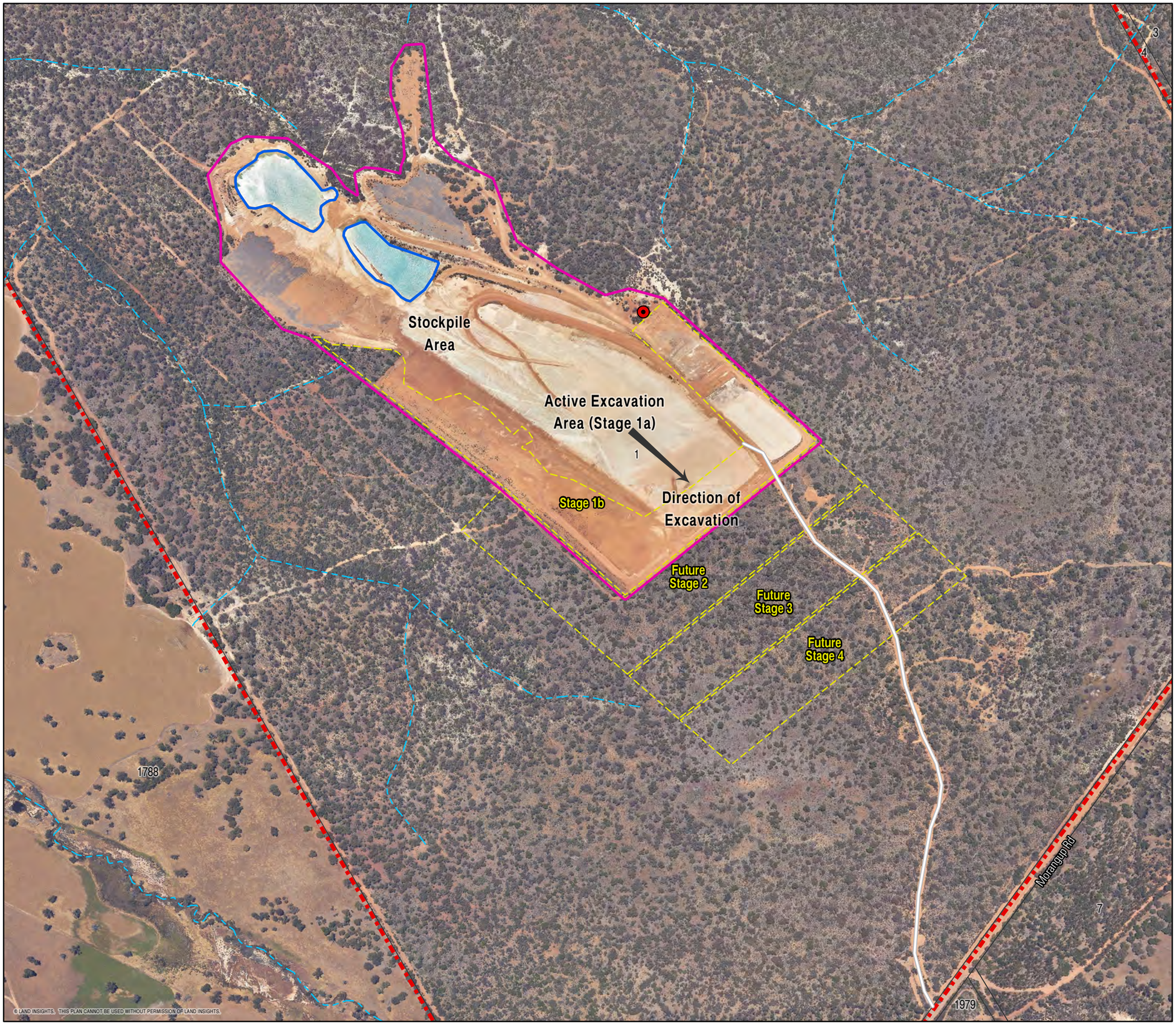
Context Plan

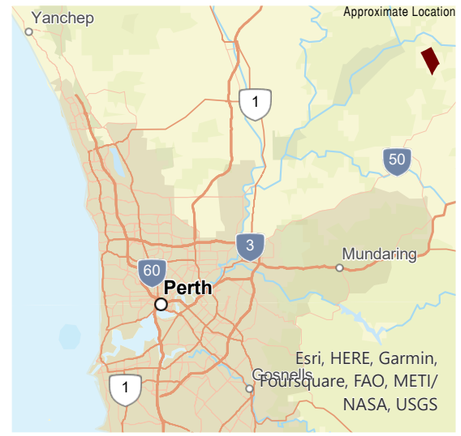
LOT 1 MORANGUP ROAD, MORANGUP

MORANGUP SCHIST PIT

AUSTRAL BRICKS

Path: E:\OneDrive - Land Insights\Drafting Jobs\935 Austral Morangup\935 Morangup.aprx





- Cadastre
- Site Boundary
- Streamlines
- Existing Stage
- Future Stages
- Haul Road
- Extraction Operation Area
- Drainage Basins
- Transportable Location (approx)

0 40 80 120 160 200
Metres
1:7,500 @ A3

NOTE: AREAS AND DISTANCES SUBJECT TO SURVEY

Project: 935
Projection: GDA 1994 MGA Zone 50
Date Exported: 24/08/2023 6:32 PM
Layout Name: Extraction Plan Detail

landinsights
PLANNING DESIGN ENVIRONMENT
PO Box 289 Mt Lawley WA 6929
Ph: 9271 8506
admin@landinsights.com.au
landinsights.com.au

Extraction Plan - Detail

LOT 1 MORANGUP ROAD, MORANGUP

MORANGUP SCHIST PIT

AUSTRAL BRICKS

Path: E:\OneDrive - Land Insights\Drafting Jobs\935 Austral Morangup\935 Morangup.aprx

APPENDIX B

Clay Pit Wind Erosion Study

ENVIRONMENT
& HEALTH

MEMO

Project name Clay Pit Wind Erosion Study
Project no. 318000871
Client Austral Bricks
Memo no. 001
Version Draft
To Matthew Gordon
From Martin Parsons

Prepared by Nathalie Fischer
Checked by Martin Parsons
Approved by John Miragliotta

Date 04/12/2019

Ramboll
Level 7
41 St Georges Terrace
Perth
Western Australia 6000
Australia

T +61 8 9225 5199
https://ramboll.com

1 Introduction

Austral Bricks WA Pty Ltd (Austral Bricks) has requested Ramboll Australia Pty Ltd (Ramboll) assess the risks associated with wind erosion of an undisturbed clay pit located in Upper Swan, WA. Clay for brick production is planned to be extracted from the pit for approximately two weeks a year, when a dust management plan will be in place. For the remainder of the year, there will be no operations and the pit is planned to be kept undisturbed.

2 Soil Characterisation

Clay is a natural material formed by the mechanical and chemical breakdown of rocks (US EPA 1995a). The percentage of clay, silt and sand present in soil determines its texture. Table 1 presents a summarised list of soil classification by texture class as outlined in the Unified Soil Classification System (USCS). Soil stability is directly related to the fineness of texture, i.e., it is clay content dependent (Chepil 1957).

Table 1 Soil textures and composition (Carlile et al. 2001)

Texture Class	Mean % Sand	Mean % Silt	Mean % Clay
Sands	86.8	6.1	7.2
Sandy loams	68.3	13.2	18.5
Loams	51.5	28.1	20.3
Clay loams	27.5	34.1	38.4
Light clays	44.6	13.1	42.3
Clays	21.4	15.7	62.9

3 Wind Erosion

Fugitive dust is the term used for atmospheric dust generated by mechanical disturbance of granular material on exposed surfaces. Turbulent air currents associated with wind speeds of over 4 to 5 m/s are often able to generate

Ramboll Australia Pty Ltd.
ACN 095 437 442
ABN 49 095 437 442

fugitive dust from soil surfaces, and this process is called wind erosion (US EPA 1995b).

Erodibility of soil by wind occurs in dry conditions and depend primarily on the soil structure and its stability (Chepil 1957). Soil particles are transported by wind in three ways:

- Suspension: small sized particles (< 100 µm) become airborne and depending on the wind speed can travel many kilometres before deposition,
- Saltation: middle sized particles (100−500 µm) bounce on the surface travelling some meters,
- Surface creep: larger particles (500−2,000 µm) roll and slide across the surface, moving no more than a few meters (DERM 2011, Chepil 1957, NRETA 2007).

Particles with an equivalent diameter of 100 µm are the most erodible by wind as compared to larger or smaller ones. Particles larger than 10,000 µm are considered non-erodible. Despite clay composing of smaller particles as compared with sane or loam, clay-rich soil has the capacity to clump together forming soil clods, which form aggregates large and heavy enough to resist wind erosion. Sand-rich soils, with low silt, clay, and organic-matter content, are the most susceptible to erosion as they form the weakest clods (DERM 2011, Burton 2004).

Several Australian states and territories departments have published documents encouraging clay spreading and mixing into sandy topsoils to increase soil aggregation and mitigate wind erosion (Young et al. 2017, DPIPWE 2014). The Agriculture and Food division of the WA Department of Primary Industries and Regional Development states that, the spreading of clay-rich soil at about 75-100 tonnes per hectare is recommended to control wind erosion (DPIRD 2019). A study conducted in South Australia showed that clay spreading on very sandy post-fire soils presented immediate results in the form of reduced wind erosion (DEW 2019).

When not disturbed, moisture in the soil can turn surface aggregates into crusts. Clay soils, especially the ones rich in magnesium and/or sodium, are particularly prone to soil crusting. This natural crusting binds the erodible material, producing a sealed surface that requires much higher wind speeds for particle dislodgment. Clay-rich soil with relatively high MC is very prone to crusting. Typically, the moisture content (MC) of raw material used in the brick manufacturing varies from 3 to 15%. When MC is greater than 10%, particulate matter (PM) emissions during grinding and screening operations are low, and some industries use no control measures for dust suppression (US EPA 1997).

A crusted surface has a finite availability of erodible material that once removed means that wind erosion from that source is likely to be negligible until a disturbance significant enough to generate new erodible material occurs. Dust monitoring of stockpiles and exposed areas conducted during erosion events have shown a rapid decrease of particulate emission rates, with recorded half-life of a few minutes (US EPA 2006).

4 Conclusion

Due to factors outlined above, an undisturbed clay pit has a very low wind erosion potential. Wind erosion of an undisturbed clay pit with no operations is unlikely to present a significant risk of generating nuisance dust at nearby receptors.

5 References

Burton, T 2004, Indiana Soils: Evaluation and Conservation Online Manual, Chapter Vi. Soil Erosion and Compaction, Purdue University, Purdue Agronomy: Crop, Soil and Environmental Sciences, viewed 3 December 2019, <https://www.agry.purdue.edu/soils_judging/new_manual/ch6-wind.html>.

Carlile, P et al. 2001, Estimating soil particle size distributions and percent sand, silt and clay for six texture classes using the Australian Soil Resource Information System point database, CSIRO Land and Water, Canberra, ACT.

Chepil, WS 1957, 'Erosion of Soil by Wind', Yearbook of Agriculture, pp. 308–314.

DERM 2011, Wind Erosion, Department of Environment and Resource Management, Queensland Government, <https://www.qld.gov.au/__data/assets/pdf_file/0021/65217/wind-erosion.pdf>.

DEW 2019, Study shows clay protects post-fire soils, Natural Resources Adelaide and Mt Lofty Ranges , Department for Environment and Water, Government of South Australia, viewed 4 December 2019, <https://www.naturalresources.sa.gov.au/adelaidemtloftyranges/news/190826-clay-spreading-protects-post-fire-soils-pinery>.

DPIPWE 2014, Wind Erosion, Department of Primary Industries, Parks, Water and Environment, Tasmanian Government, viewed 3 December 2019, <https://dpipwe.tas.gov.au/agriculture/land-management-and-soils/soil-management/soil-erosion/soil-erosion-types/wind-erosion>.

DPIRD 2019, Managing wind erosion in southern Western Australia, Department of Primary Industries and Regional Development: Agriculture and Food, Government of Western Australia, viewed 4 December 2019, <https://www.agric.wa.gov.au/wind-erosion/managing-wind-erosion-southern-western-australia>.

GRDC 2011, Spread, delve, spade, invert: a best practice guide to the addition of clay to sandy soils, Grains Research and Development Corporation and Agricultural Bureau of South Australia, Kingston, ACT.

NRETA 2007, Erosion and Sediment Control Guidelines: Built Environment, Department of Natural Resources, Environment and the Arts, Northern Territory Government, Darwin.

US EPA 1995a,'Chapter 11.25 Clay Processing', in, AP-42: Compilation of Air Emissions Factors.

US EPA 1995b,'Chapter 13.2 Introduction to Fugitive Dust Sources', in, AP-42: Compilation of Air Emissions Factors.

US EPA 1997,'Chapter 11.3 Bricks and Related Clay Products', in, AP-42: Compilation of Air Emissions Factors.

US EPA 2006,'Chapter 13.2.5 Industrial Wind Erosion', in, AP-42: Compilation of Air Emissions Factors.

USDA 2008, Soil Quality Indicators, United States Department of Agriculture, Natural Resources Conservation Service.

Young, M-A et al. 2017, Emergency measures to curb wind erosion, Primary Industries and Regions South Australia (PIRSA).

APPENDIX C

Complaints Register

ENVIRONMENTAL COMPLAINTS FORM – Complaint No XX

PLAINTIFF: **POSITION:**

COMPANY **ADDRESS**

PHONE NO: **MOBILE NO:**

DATE: **TIME:**

PLANT: **KILN SPEED:**

WIND SPEED: **WIND DIR:**

PRODUCT IN DRYER: **PRODUCT IN KILN:**

EXTERNAL TEMP:

COMPLAINT

INVESTIGATION

OUTCOMES & RECOMMENDATIONS

Harper Street, Caversham, WA, 6055
Telephone: (08) 9261 9999
Facsimile: (08) 9279 6566

APPENDIX M

Noise Management Plan

landinsights
PLANNING DESIGN ENVIRONMENT

"SCHIST PIT" CLAY QUARRY

NOISE MANAGEMENT PLAN

LOT 1 MORANGUP ROAD, MORANGUP

PREPARED FOR AUSTRAL BRICKS (WA) PTY LTD

AUGUST 2023

Prepared by:

Land Insights

PO Box 289

Mt Lawley WA 6929

Phone: (08) 9271 8506

Document details:

Document History:

Date	Document Name	Document Manager	Summary of Document Revision	Client Delivered
Jun-23	935 – Schist Pit Noise Management Plan	SR	Initial Draft for client review	Jun-23
Aug-23	935 – Schist Pit Noise Management Plan	SR	Final for submission	Aug-23

Table of Contents

Appendices

1 Introduction

1.1 Background and purpose

This report presents the Noise Management Plan for the "Schist Quarry" operated by Austral Bricks (WA) Pty Ltd. The quarry is located at Lot 1 Morangup Road, Morangup. The purpose of the Noise Management Plan is to accompany the Clay Excavation Management Plan prepared by Land Insights to support an application for renewal of the Extractive Industry Licence. This Noise Management Plan outlines the appropriate procedures implemented by Austral Bricks to manage any potential for noise generation and to reduce the creation and effect of noise.

In this report, noise-generating activities are considered in the context of its potential impact on noise sensitive premises, such as residential dwellings. The potential for noise generation can be managed through the implementation of appropriate noise management procedures adopted as part of a Noise Management Plan.

Noise management was previously addressed in the "Extractive Industry Licence and Clay Extraction Management Plan" prepared by Land Insights in 2013. This Noise Management Plan presents an update to the 2013 report. It has been prepared for the following reasons:

- To incorporate best practice noise management actions.
- To incorporate relevant recommendations from the "Draft Assessment of Environmental Noise Emissions Guideline" released by the Department of Water and Environmental Regulation (DWER) in 2021 (in addition to the existing requirements of the *Environmental Protection (Noise) Regulations 1997*).
- To accompany an application for a renewal of the approvals for the operation.

1.2 Objectives

This Noise Management Plan outlines the appropriate procedures implemented by Austral Bricks to manage any potential for dust generation.

The objectives of the Noise Management Plan are:

- To manage the potential for noise generation to ensure compliance with the *Environmental Protection (Noise) Regulations 1997*
- To reduce the potential for noise to impact on noise sensitive premises
- To provide a process in the event of a noise-related complaint.

1.3 Legislation and guidelines

Environmental noise in Western Australia is governed by the *Environmental Protection Act 1986*, through the *Environmental Protection (Noise) Regulations 1997* (the Regulations).

Regulation 7 of the Regulations defines the prescribed standard for noise emissions as follows:

> *7. (1) Noise emitted from any premises or public place when received at other premises –*
>
> *(a) Must not cause or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and*
>
> *(b) Must be free of –*
>
> *i. tonality;*
>
> *ii. impulsiveness; and*
>
> *iii. modulation,*
>
> *when assessed under Regulation 9.*

Regulation 7(2) states that a "noise emission is taken to significantly contribute to a level of noise if the noise emission…exceeds a value which is 5 dB below the assigned level".

"Noise sensitive premises" are set out in Schedule 1, Part C of the Regulations. They include, but are not limited to, premises occupied solely or mainly for residential or accommodation purposes and rural premises. Furthermore, a "highly sensitive area" is defined in the Regulations as an area of noise sensitive premises comprising a building used for a noise sensitive purpose (such as a residential or accommodation building). Therefore, the assigned noise levels applicable to this site are those set out in Regulation 8 (3) Table 1 of the Regulations for "noise sensitive premises: highly sensitive area".

A range of facts sheets have been prepared by DWER to assist with the interpretation of the Regulations. The "Draft Assessment of Environmental Noise Emissions Guideline" (DWER, 2021) was prepared to provide further guidance.

The other guideline regularly used to determine impact on sensitive land uses is the Environmental Protection Authority's "Guidance Statement No. 3 Separation Distances Between Industrial and Sensitive Landuses" (EPA, 2005). It states that "land uses considered to be potentially sensitive to emissions from industry and infrastructure include residential developments, hospitals, hotels, motels, hostels, caravan parks, schools, nursing homes, child care facilities, shopping centres, playgrounds, and some public buildings".

The separation distance for “clay extraction” is 500-1,000 metres. These distances are guidelines only depending on size and scale of a proposal. This Noise Management Plan provides management actions to address potential noise impacts.

1.4 Location

Lot 1 is situated approximately 80km to the north-east of Perth and approximately 25km to the south-west of Toodyay. It is approximately 5km from the closest rural residential estate (located to the south-west and another to the north of the site). The operation (“the site”) is located in the centre of Lot 1.

Plans associated with the operation are provided at Appendix A.

1.5 Operation

The quarry is located in the centre of Lot 1. Excavation has been ongoing over the last 60 years. The current development footprint is known as the “Operation Area” and encompasses the active pit area, stockpiling areas, access tracks, drainage basins and administrative areas. Future stages (labelled as “Stages 1 to 4”) have been identified to the south-east of the existing excavation area. In general, the excavation occurs in a south-easterly direction.

Excavation of clay takes place in a sequence of steps which can be broadly broken down into the following:

- Earthworks Campaign (i.e., removal of topsoil and overburden, excavation of clay to stockpile)
- Carting Campaign (transport of clay from the pit or stockpiles to the factories)
- Rehabilitation.

Further information on the excavation process is below.

Earthworks campaign

The “Earthworks Campaign” refers to the excavation and stockpiling of material. During the earthworks campaign, topsoil and overburden is removed and clay is excavated and placed into stockpiles located within the Operation Area.

Earthworks take place as and when required throughout the year but generally during the dry months. The timing of excavation depends on weather conditions, market demand and operational requirements (such as the rate of excavation of other clay quarries). During Excavation Campaigns, excavation will generally take place for six days a week during the approved operation times. Excavation will most likely take place over approximately 16 weeks in total per annum, usually divided into 2 or 3 “campaigns”. It should be

noted that although excavation is identified to occur anytime throughout the area it should be noted that for large stretches of time there will be no excavation activities on site.

As vehicles usually operate from the pit floor, the walls of the pit also act as a noise and dust barrier for most of the excavation process. The depth of the Schist Quarry is approximately 14 metres. There will be a relatively short period where vehicles are located at the ground level (when clearing vegetation and stripping topsoil and overburden for new stages), however the extensive vegetation surrounding the quarry will provide a further noise and dust barrier. Additional dust management will be in place for the operation as set out in this report.

No processing (crushing, screening etc) will occur on the site. No blasting will be required to facilitate excavation.

Cartage campaigns

The "Cartage Campaign" refers to the removal or transport of clay from the site where it is taken to the Austral Bricks brickmaking factories. Clay resource is currently carted to the Cardup factory and the Bellevue factory.

Loading and carting from the site will largely occur during September to May (i.e. during the drier months) although it can occur anytime throughout the year depending on the need for clay. It is expected that carting will occur over two separate campaigns each year, lasting approximately 3-4 weeks for each campaign.

Carting from the site depends on the market demand for bricks, as well as the types of clay and colour of clay. Therefore, there may be some variation from the truck numbers and the number of days that carting will be required each month (i.e. some months will have more carting days than other months).

The Stockpile Area (and the area where trucks will be loaded with clay) is located within the existing Operation Area. All vehicles and trucks enter the site from the main access at Morangup Road and travel down the haul road to the Operation Area. Having one access into and out of the site helps to reduce impact to surrounding vegetation and is a management technique used to help mitigate potential dust and noise impacts.

Rehabilitation

Rehabilitation of the quarry will involve recontouring the slopes to a safe and stable condition, revegetating with local vegetation and creating dams created from the lowest parts of the landscape.

Progressive rehabilitation of the quarry is outlined in the Rehabilitation Management Plan. In general, progressive recontouring takes place as excavation progresses. However, as all water runoff is required to be retained on site and the catchment area receives a large amount of water, much of the previous operation area is required for drainage and water management.

2 Site description

2.1 Surrounding Land Uses

Surrounding land uses comprise other extractive industry and rural land uses. Directly to the south and east are two other clay quarries. A hard rock quarry is located to the north.

The site is approximately 5km to the north-east of the closest rural residential area and approximately 13 to the west of the Toodyay townsite. It is approximately 1.4km from the closest rural dwelling.

2.2 Separation Distances

The following sensitive receptors have been identified surrounding the site. They are also shown on the Context Plan at Appendix A.

- Neighbouring rural property to the west – Approximately 1.4km from the operation (865 Morangup Road, Morangup)
- Neighbouring rural property to the south – Approximately 1.6km from the operation (1012 Morangup Road, Morangup)
- Rural properties to the east – Closest is approximately 3km from the operation (575 Lovers Lane, Morangup)
- Rural properties to the north – Closest is approximately 3.3km from the operation (535 Cobbler Pool Road, Morangup).

The EPA's *Guidance Statement No. 3 – Separation Distances between Industrial and Sensitive Land Uses* provides a guideline on the separation distances and buffers for a range of industrial land uses to sensitive land uses (such as residential dwellings). It should be noted that the distances in the policy assume the land use is not managed and, should best practice environmental management take place, these distances can be reduced.

The operations on site fit into the category "clay extraction or processing". The potential impacts are listed as "noise" and "dust". The separation distance is "500-1000 metres, depending on size and processing", however this can be less with appropriate environmental management.

As can be seen from the above list, the clay operations far exceed the recommended separation distance. All surrounding sensitive land uses are over 1000 metres from the operations.

It should also be noted that operational management, including dust and noise management and protection of visual amenity, are provided for this operation to support the continued operation of the site. These management plans are attached to this application.

2.3 Climate

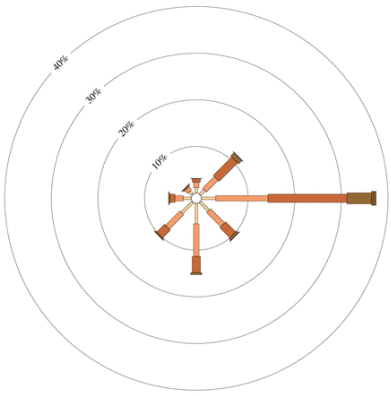
The south-west of Western Australia experiences a Mediterranean climate which is characterised by warm, dry summers and cool, wet winters.

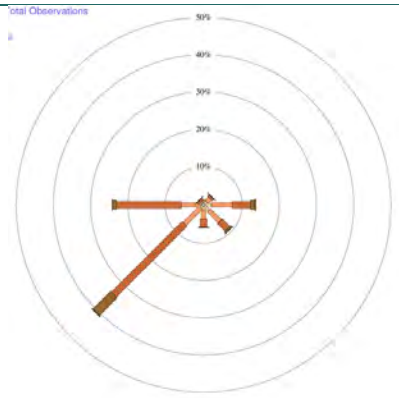
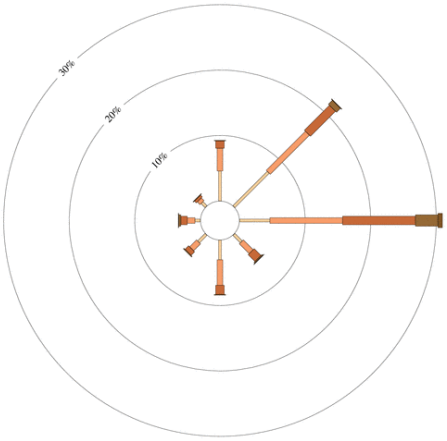
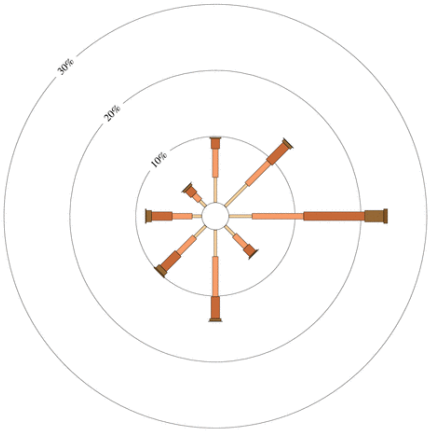
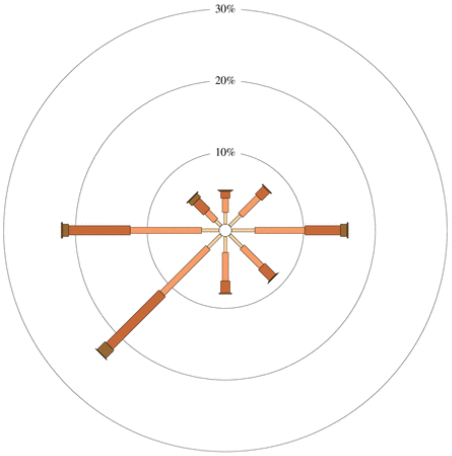
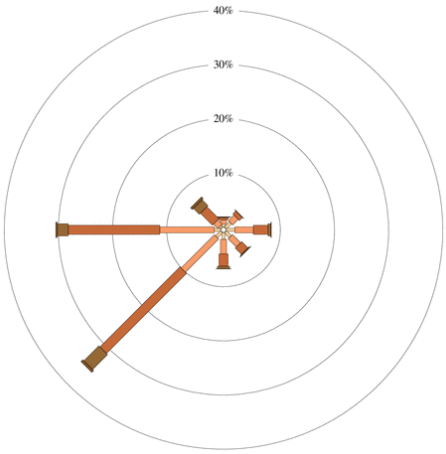
The rainfall and temperature data for the region has been obtained from the Bureau of Meteorology "Climate Data Online" services. The average rainfall from the closest station which is the Toodyay station is 520mm. A majority of rainfall is from May to August.

The mean temperature information is from the closest station which is the Northam station. It states that the hottest month is January with an average maximum of 34.2°C and the coldest month is July with an average minimum of 5.4°C.

The prevailing winds throughout the majority of the year are predominantly from the east in summer months and from the west in winter (Bureau of Meteorology, 2022). Wind roses for the Perth Airport are shown below.

Table 2.1 – Wind Roses for the Perth Airport

TIME OF YEAR	WIND ROSE	TIME OF YEAR	WIND ROSE
Summer 9am		Winter 9am	

TIME OF YEAR	WIND ROSE	TIME OF YEAR	WIND ROSE
Summer 3pm		Winter 3pm	
Autumn 9am		Spring 9am	
Autumn 3pm		Spring 3pm	

2.4 Topography and landform

The topography of the site is variable and undulating with high points and valleys throughout. slightly undulating with a moderate to steep slope throughout. There is a high point at the north-eastern corner and another at the south-eastern corner at approximately 280 metres AHD (Australian Height Datum). These areas are divided by a watercourse which drains towards the northern end of the lot where it reaches a low point of 195m AHD.

The operation area is located in the centre of Lot 1. The natural topography surrounding the pit is at approximately 245m AHD at the north-eastern corner of the operation to approximately 270m AHD at the southern end. The land generally slopes up to the south, down to the west, east and north.

Existing contours within the operation area were surveyed by Scanlan Surveys in 2020. A copy of the plan is provided at Appendix A. Generalised slope showing areas above and below a slope of 25% is displayed on the plan below.

2.5 Vegetation

Lot 1 is predominantly covered on remnant vegetation except for the cleared areas associated with the quarry operations, access roads and firebreaks.

A spring *Flora and Vegetation Assessment* was undertaken by Del Botanics in October 2012 of the proposed quarry expansion area. The survey identified three vegetation communities within the survey area:

- "Marri/Jarrah Woodland with a diverse understorey" – Open Forest of *Corymbia calophylla* and *Eucalyptus marginata*, over shrubland of *Banksia sessilis, Banksia armarta* and *Allocasuarina humilis* over herbland of *Hibbertia hypericoides, Gompholobium marginatum* and *Banksia nivea*
- "Powderbark woodland with diverse understorey" – Woodland of *Eucalyptus accedens* over shrubland of *Xanthorrhoea acanthostachya, Melaleuca parviceps, Jacksonia restioides* over herbland of *Hibbertia hypericoides* and *Baekea camphorosmae*
- "Wandoo woodland with diverse understorey" – Woodland of *Eucalyptus wandoo* over shrubland of *Banksia sessilis* and *Leptospermum erubescens*, over herbland of *Banksia nivea, Hibbertia hypericoides* over open grassland of *Neurachne alopecuroidea*

The Flora and Vegetation Assessment (Del Botanics, 2013) rated the vegetation condition within the survey area as "Excellent", "Very Good" and "Good". Tracks located through the survey area were rated as "Completely Degraded".

The Survey recorded four introduced flora species.

The next stage of the pit expansion has already been cleared in accordance with the Clearing Permit issued by DWER. Any further expansion of the pit area will require a new Clearing Permit to be applied for in accordance with the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

2.6 Native fauna

The vegetation surrounding the excavation is likely to support a range of native fauna species. Based off the results of the *Level 1 Fauna Survey and Targeted Black-Cockatoo and Chuditch Survey* undertaken by Western Wildlife in 2012, there are at least three fauna habitats across Lot 1 as follows:

- Wandoo woodland (located at the eastern and western sides of the existing pit area)
- Jarrah-Marri woodland (located to the south of the existing pit area)
- Revegetation areas

The report by Western Wildlife (2012) notes that these habitats are widely represented in the surrounding area and the woodland habitats are likely to support relatively intact faunal communities.

The fauna survey by Western Wildlife (2012) also listed a number of conservation significance 1 that may occur in the study area including the Carpet Python, Peregrine Falcon, Forest Red-tailed Black-Cockatoo, Baudin's Black-Cockatoo, Carnaby's Black-Cockatoo, Fork-tailed Swift, Rainbow Bee-eater and the Chuditch.

The report also notes that there are seven conservation significant 2 species and eight birds and three small mammals of conservation significance 3 that may be present in the study area.

3 Risk Assessment

3.1 Introduction

A noise risk assessment for the Schist Quarry is presented in this chapter. It considers the potential for noise generation and the potential impact off-site. The assessment has considered in detail the activities associated with the operation, the risk factors and the proposed controls.

There are three different components to the below risk assessment which provide a thorough consideration of the potential issues and risks as follows:

1. A screening analysis based on Appendix A of the "Draft Guideline: Assessment of Environmental Noise Emissions" (DWER, 2021).
2. The assessment commences with a review of the "factors" from the "Draft Guideline: Assessment of Environmental Noise Emissions" (DWER, 2021). This provides an overarching look of the factors that are considered in a noise emission assessment and helps lead into the site classification and the overall risk assessment.
3. Following this is a more detailed risk assessment of the specific activities that take place for the operation. The assessment has been prepared based on the consequence, likelihood and risk definitions provided in "Guidance Statement: Risk Assessments" (Department of Environment Regulation, 2017).

3.2 Screening Analysis

The Draft Assessment of Environmental Noise Emissions Guideline (DWER, 2021) includes a "screening analysis" which is used to help determine if detailed noise assessments are required for a proposed development. All separation distances to the nearest sensitive premises exceeds the minimum distance set out in Guidance Statement No. 3, the closest being approximately 1.4km to the south-west of the operation.

3.3 Draft Guideline: Dust Emissions

The "Draft Guideline: Assessment of Environmental Noise Emissions" (DWER, 2021) provide information on the factors to be considered in a noise emission assessment. This includes the following:

- The context of the noise emissions
- The nature of the noise emissions
- The control and management of noise emissions
- Known or demonstrated compliance.

A review of the above factors is provided in Table 3.1 below. It should be noted that the below is based on the excavation and carting operations (as the construction noise from removal of topsoil and construction of noise bunds does not need to comply with Regulation 7/operational noise).

Table 3.1 – Noise emission assessment

FACTOR	COMMENT	CONCLUSION
The context of the noise emissions: • Background noise • Time of day and activity of the receiver • Distance, topography and meteorological conditions between the emitter and receivers • The types of receptors, including current and potential • Contributing and cumulative noise sources.	All noise sensitive premises are over 1,000 metres from the operation, the closest being approximately 1.4km to the south-west which far exceeds the recommended separation distance from EPA Guidance Statement No. 3. The property and surrounding areas have an undulating landscape and Lot 1 is heavily vegetated in all directions around the operations, providing adequate physical buffers. Operation of the quarry will be between daylight hours of between 7am and 6pm Monday to Saturday. There are no plans to increase the number of sensitive receptors within 1km of the site. Potential background noise and cumulative noise is from the other nearby extraction sites which are also sufficiently surrounded by vegetation.	It is considered that there is a low risk that noise will impact on noise sensitive premises.
The nature of the noise emissions • The characteristics of the noise emission • Received noise/vibration levels • How the noise emission is perceived by receivers.	An acoustic assessment has not been undertaken to determine specific noise levels are there is considered to be a low risk that there will be noise impact on sensitive receptors. The characteristics of the noise from clay operations has been measured for other operations.	It is considered that risk of impact on nearby sensitive receptors is low.

FACTOR	COMMENT	CONCLUSION
The control and management of noise emissions • Whether the noise management measures set out in a detailed noise emission assessment are acceptable, reasonable and practical • Whether the noise management measures are likely to be effective in reducing noise levels to meet the Noise Regulations or other standards and noise values outlined in the guideline.	The risk of noise impact to sensitive receptors is considered to be low due to the separation distances and physical buffers being present. Nevertheless, additional noise management is provided in this management plan.	It is considered that there is a low risk of noise affecting nearby sensitive receptors when the Noise Management Plan is implemented.
Known or demonstrated compliance: • By the occupier and premises with the provisions of the EP Act • With the Noise Regulations or other standards and noise values outlined in the guideline with the screening and detailed noise emission assessment process set out in the guideline.	The site has historically been used for extractive industry for over 60 years and no noise complaints have been received.	The compliance history for the site is good and therefore is not a concern.

3.4 Risk assessment for operation

The risk assessment for the noise generating activities on the site is provided in Table 3.2 below. The assessment criteria is based on that set out in "Guidance Statement: Risk Assessments" (DWER, 2017). It lists the activity(s) which have the potential to cause noise impact and the residual risk. It should be noted that the risk assessment is based on the impact on the nearest noise sensitive residence (located at the south-east of the site). The risk of impact to residences located further away will be less.

The "risk" is determined by considering the likelihood and consequence of the environmental impact. The likelihood and consequence criteria are defined in Tables 3.3 and 3.4 below.

Table 3.2 – Noise risk assessment

ACTIVITY	POTENTIAL IMPACT	INHERENT RISK			PROPOSED CONTROL	RESIDUAL RISK		
		L	C	Risk		L	C	Risk
Clearing vegetation ("construction noise")	Noise from machinery could exceed acceptable day-time levels and impact on the nearest noise sensitive premises. The likelihood of impact without any noise management is unlikely as noise impact will probably not occur in most circumstances, but clearing and stripping topsoil/overburden are considered to have the greatest risk of noise impact as they are on the natural surface level. The consequence of impact without management is minor as it could have low scale impact to amenity as the separation distances are adequate.	Unlikely	Minor	Med	Refer to Table 4.1 – Noise Management Plan. Following implementation of noise management, the likelihood of impact is rare as it is considered to only have a risk of occurring in exceptional circumstances. The consequence of impact is slight as there will be minimal impact to amenity.	Rare	Slight	Low
Stripping topsoil and overburden to construct bunds ("construction noise").	Noise from machinery could exceed acceptable day-time levels and impact on the nearest noise sensitive premises. The likelihood of impact without any noise management is unlikely as noise impact will probably not occur in most circumstances, but clearing and stripping topsoil/overburden are considered to have the greatest risk of noise impact as they are on the natural surface level. The consequence of impact without management is minor as it could have low scale impact to amenity as the separation distances are adequate.	Unlikely	Minor	Med	Refer to Table 4.1 – Noise Management Plan. Following implementation of noise management, the likelihood of impact is rare as it is considered to only have a risk of occurring in exceptional circumstances. The consequence of impact is slight as there will be minimal impact to amenity.	Rare	Slight	Low

ACTIVITY	POTENTIAL IMPACT	INHERENT RISK			PROPOSED CONTROL	RESIDUAL RISK		
		L	C	Risk		L	C	Risk
Excavation of clay and stockpiling within the stockpile area ("operational noise").	Noise from machinery could exceed acceptable day-time levels and impact on the nearest noise sensitive premises. The likelihood of impact without any noise management is unlikely as noise impact will probably not occur in most circumstances as excavation and stockpiling is generally below the natural ground level. The consequence of impact without management is slight as it could have minimal impact to amenity as the separation distances are adequate.	Unlikely	Slight	Low	Refer to Table 4.1 – Noise Management Plan. Following implementation of noise management, the likelihood of impact is rare as it is considered to only have a risk of occurring in exceptional circumstances. The consequence of impact is slight as there will be minimal impact to amenity.	Rare	Slight	Low
Loading and carting clay ("operational noise").	Noise from machinery could exceed acceptable day-time levels and impact on the nearest noise sensitive premises. The likelihood of impact without any noise management is unlikely as noise impact will probably not occur in most circumstances as loading of clay is generally done below the natural ground level. The consequence of impact without management is slight as it could have minimal impact to amenity as the separation distances are adequate.	Unlikely	Slight	Low	Refer to Table 4.1 – Noise Management Plan. Following implementation of noise management, the likelihood of impact is rare as it is considered to only have a risk of occurring in exceptional circumstances. The consequence of impact is slight as there will be minimal impact to amenity.	Rare	Slight	Low

ACTIVITY	POTENTIAL IMPACT	INHERENT RISK			PROPOSED CONTROL	RESIDUAL RISK		
		L	C	Risk		L	C	Risk
Transport into and out of the site ("operational noise")	Noise from trucks from the site could exceed acceptable day-time levels and impact on the nearest noise sensitive premises. Note that the assessment is only required to consider trucks up to the property boundary and does not consider noise impact along roads. The likelihood of impact without any noise management is unlikely as noise impact will probably not occur in most circumstances as the haul road is surrounded by vegetation and adequately separated from sensitive residences. The consequence of impact without management is slight as it could have minimal impact to amenity as the separation distances are adequate.	Unlikely	Slight	Low	Refer to Table 4.1 – Noise Management Plan. Following implementation of noise management, the likelihood of impact is rare as it is considered to only have a risk of occurring in exceptional circumstances. The consequence of impact is slight as there will be minimal impact to amenity.	Rare	Slight	

Table 3.3 – Likelihood Criteria

Almost certain	Likely	Possible	Unlikely	Rare
The risk event is expected to occur in most circumstances.	The risk event will probably occur in most circumstances.	The risk event could occur at some time.	The risk event will probably not occur in most circumstances.	The risk event may only occur in exceptional circumstances.

Source: DWER 2017

Table 3.4 – Consequence Criteria

	Slight	Minor	Moderate	Major	Severe
Public Health and Amenity	• Local scale: minimal to amenity.	• Local scale impacts: low level impact to amenity.	• Adverse health effects: low level or occasional medical treatment • Local scale impacts: mid level impact to amenity.	• Adverse health effects: mid level or frequent medical treatment • Local scale impacts: high level impact to amenity.	• Loss of life • Adverse health effects: high level or ongoing medical treatment • Local scale impacts: permanent loss of amenity.

Source: DWER 2017

^ Determination of areas of high conservation value or special significance should be informed by the Guidance Statement: Environmental Siting.

* 'onsite' means within the Lot boundary.

Table 3.5 – Risk Matrix Ratings

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

Source: DWER 2017

4 Noise Control Actions

4.1 Introduction

The Noise Management Plan aims to describe the measures that will be used by Austral Bricks to reduce the creation and effect of noise. It includes actions relating to dust control measures, corrective procedures and complaints protocol.

The plan has been prepared in accordance with the "Draft Assessment of Environmental Noise Emissions Guideline" (DWER, 2021), the *Environmental Protection (Noise) Regulations 1997*, best practice in mine/quarry management and experience.

4.2 Site layout/design

The quarry is located in the centre of a large property approximately 685 hectares in size. It is surrounded by significant areas of native vegetation on all sides. The surrounding landform is undulating, meaning that the operation is well screened with physical barriers such as vegetation and topography.

4.3 Complaints procedure

The complaints procedure is described below. It is also important that all complaints are recorded. The following activities will be conducted:

- Complaints made to the operator will be documented and dealt with expeditiously.
- Complaints received either directly from the complainant or via the Shire of Toodyay will be reviewed by the operator and interested parties to assess:
    - (i) the legitimacy of the complaint;
    - (ii) the aspects of the operation that triggered the complaint;
    - (iii) management actions required to address the issues raised to bring operations into line with conditions imposed on the extractive operation by the Shire of Toodyay under the Extractive Industries Licence.
- Actions deemed necessary to bring operations into line with relevant legislation, regulation and license conditions will be undertaken immediately and before works are recommenced.
- Summaries of complaints and actions taken to address each specific issue will be recorded in the Complaints Register (See Appendix C).

Complainants and the Shire of Toodyay will be notified in writing of the date, time and nature of the complaint received, results of the investigation, remedial actions undertaken and date and time of

recommencement of works. If any complaints are received, necessary action will take place to help rectify the issue.

The complaints response is applicable at all times (i.e. not just during site operation) and there will always be a prompt response from Austral Bricks whether onsite or not. Complaints are generally sent to the Shire of Toodyay. The Shire will then contact Austral Bricks as required should a complaint be received by them.

It should be noted that this complaints procedure has worked very well for Austral Bricks at numerous other sites in the past.

4.4 Operational controls

Austral Bricks are aware of their responsibilities to reduce potential impact from noise and already undertake the following:

- Limit carting to campaigns which will mean that there will be no carting for a majority of the year. This operational procedure is used to reduce the amount of time that noise-generating activities take place on site.
- Limit excavation to campaigns which will mean that there will be no excavation for a majority of the year.
- There will be no blasting or processing on site.
- All equipment used for excavation is relatively new and well maintained which aims to minimise noise generation.
- All vehicles use broadband reversing beepers to reduce noise emissions.
- Operations will only take place during the approved hours of operation which are within the hours stipulated by the Regulations.
- Comply with the complaints procedure as described above.

4.5 Noise Management Plan

The Noise Management Plan actions, responsibilities and timing is presented in Table 4.1 below. The actions are listed against each separate activity/noise source so that the specific noise management and controls for those activities can be understood. These activities have also been considered in the overall noise risk assessment presented in Table 3.3.

It should be noted that the risk assessment from Chapter 3 demonstrated that all activities can be managed to a “low” risk of impact. In accordance with the DWER Guidance Statement on risk assessments, a “low risk” is considered acceptable and generally not controlled through regulation. Therefore, the dust controls measures set out below are considered suitable for the risk of impact. Additional dust control and dust monitoring is not considered necessary given the low risk of impact.

Table 4.1 – Noise Management Plan

MANAGEMENT/ACTION	RESPONSIBILITY	TIMING
1. Adhere to the "daylight hours" as set out in the Noise Regulations, with work conducted in the hours identified in the application or on the approval.	Quarry Manager, Team	Ongoing
2. All machinery and vehicles being fitted with appropriate noise suppression equipment to reduce noise levels so far as is practicable, with machines the quietest reasonably available.	Raw Materials Manager, Quarry Manager	Ongoing
3. All machinery is equipped with broadband beepers instead of the traditional reversing beepers.	Quarry Manager	Ongoing
4. Maintain all equipment in good condition.	Quarry Manager	Ongoing
5. Comply with the "Complaints Procedure" at all times.	Quarry Manager, Environmental Manager WA	Ongoing
6. All noise and vibration related complaints immediately reported to the Quarry Manager.	Quarry Manager, Environmental Manager, Team	Ongoing
7. Following substantiated complaints, the source of any excessive noise or vibration will be identified and work practices will be modified or re-scheduled to reduce or eliminate the risk of future events.	Quarry Manager, Environmental Manager	Ongoing
8. Continue training programmes on noise control requirements to all workers and contractors, including any new methods as proposed by this plan.	Raw Materials Manager, Quarry Manager, Environmental Manager	Ongoing
9. A notice should be placed on site with contact details of the Quarry Manager and details as to where dust complaints are to be addressed. It will be displayed at all times.	Quarry Manager	Ongoing

5 References

Bureau of Meteorology (2023), Climate Data Online, Accessed from http://www.bom.gov.au/climate/data/

Department of Environment and Conservation (DWER), (2011), *Guidelines for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites, Remediation and Other Related Activities*, Department of Water and Environmental Regulation, Perth, WA.

Department of Water and Environmental Regulation, (2017), *Guidance Statement: Risk Assessments,* Department of Water and Environmental Regulation, Perth, WA.

Department of Water and Environmental Regulation, (2021). *Draft Guideline – Dust Emissions*, Department of Water and Environmental Regulation, Perth, WA.

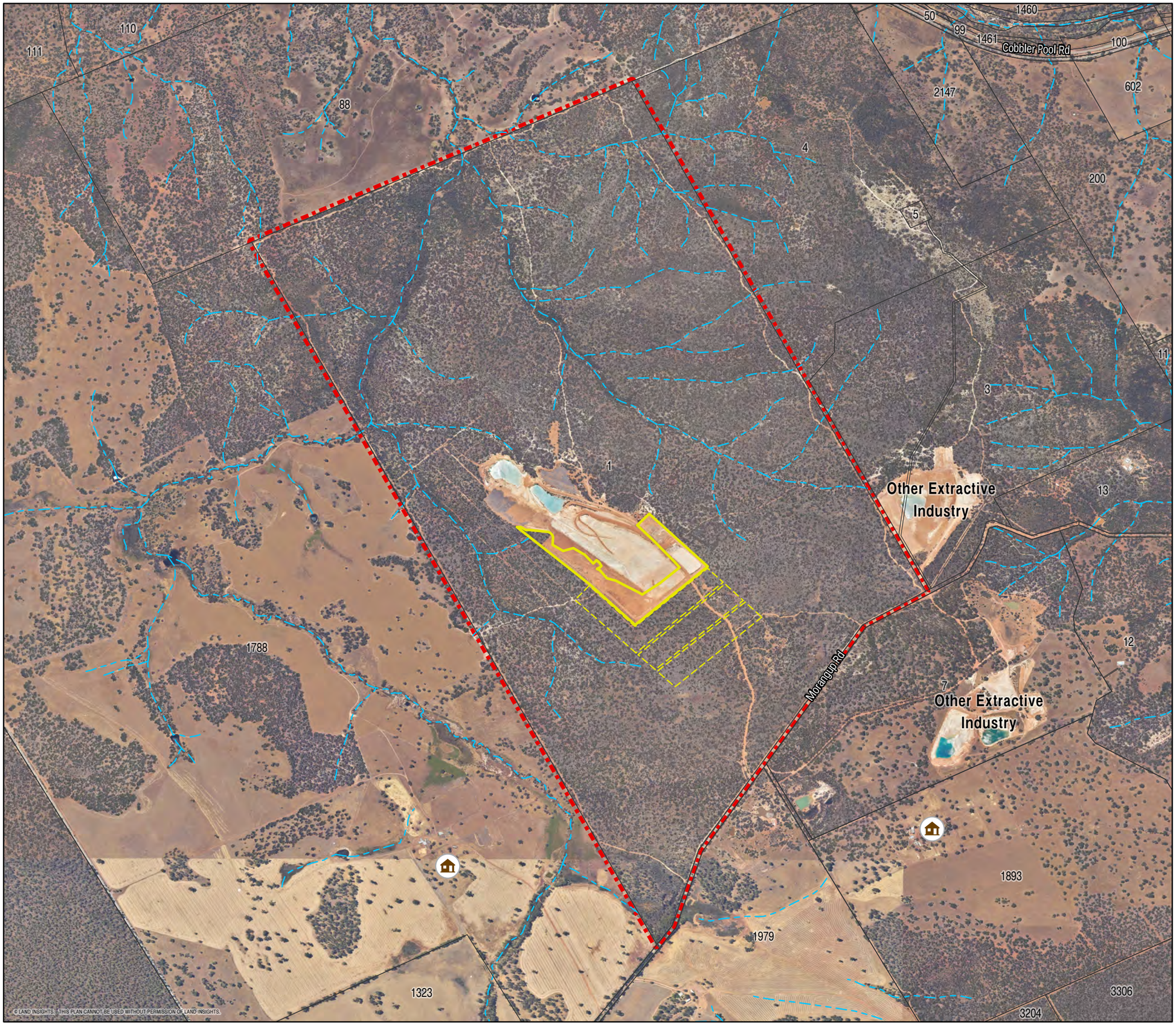
Environmental Protection Authority, (2005), *Guidance Statement No.3: Separation Distances Between Industrial and Sensitive Land Uses,* Environmental Protection Authority, Perth, WA.

Environmental Protection Authority, (2015), *Draft Environmental Assessment Guideline for Separation Distances Between Industrial and Sensitive Land Uses,* Environmental Protection Authority, Perth, WA.

Government of Western Australia, (2023), *SLIP Portal*, Accessed from https://maps.slip.wa.gov.au/landgate/locate/

APPENDIX A

Plans



Cadastre

Site Boundary

Streamlines

Existing Stage

Future Stages

Houses

0 100 200 300 400 500

Metres

1:20,000 @ A3

NOTE: AREAS AND DISTANCES SUBJECT TO SURVEY

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Projection: GDA 1994 MGA Zone 50
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Ph: 9271 8506
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Context Plan

LOT 1 MORANGUP ROAD, MORANGUP

MORANGUP SCHIST PIT

AUSTRAL BRICKS

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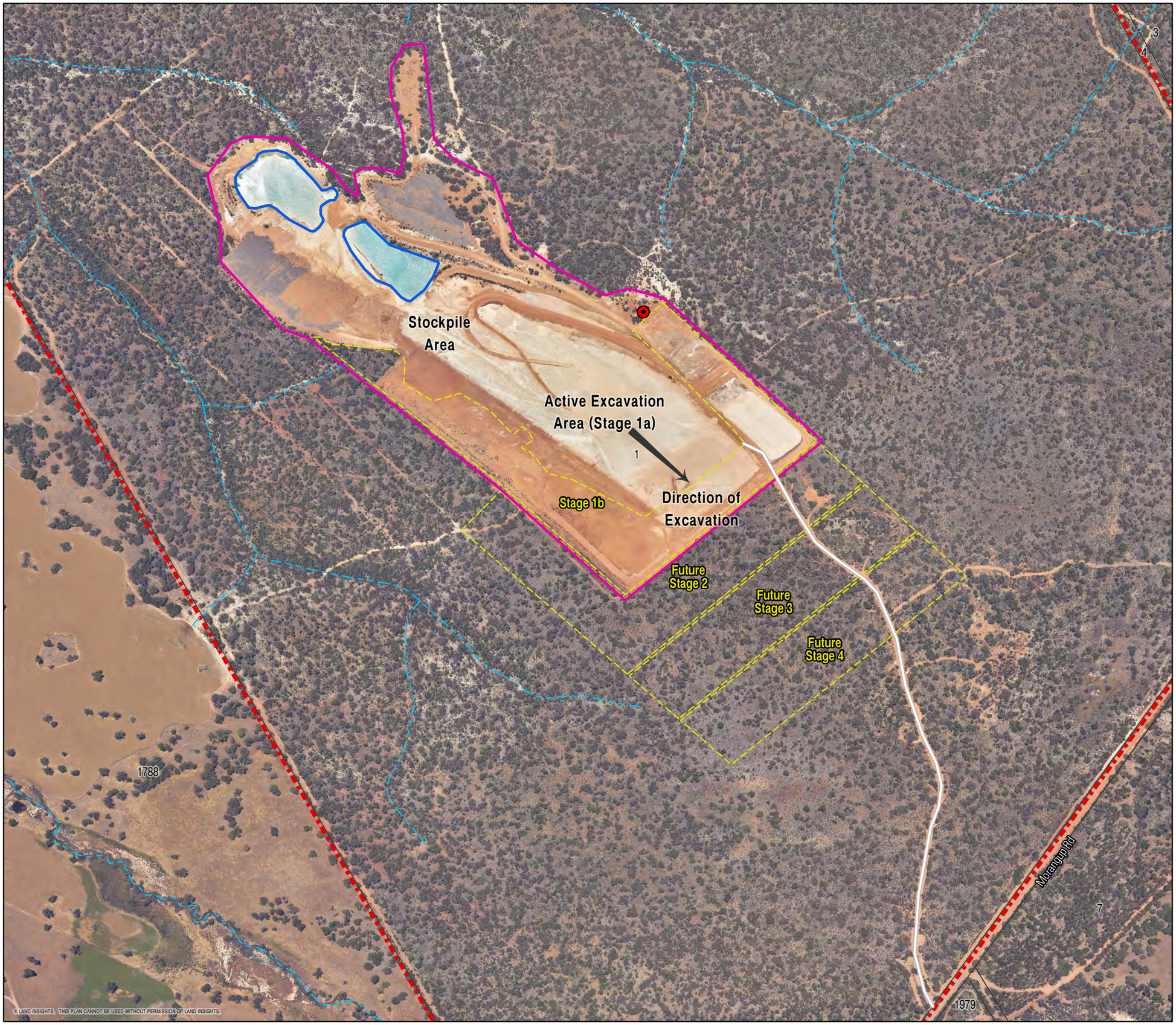

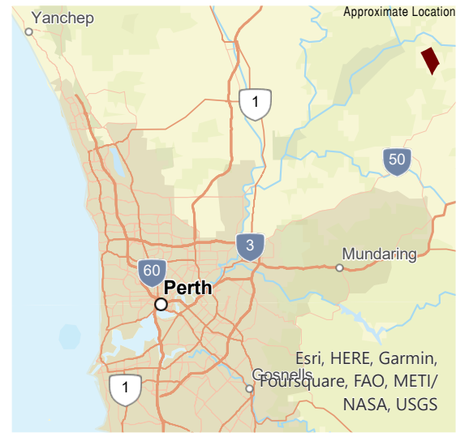

- Cadastre
- Site Boundary
- Streamlines
- Existing Stage
- Future Stages
- Haul Road
- Extraction Operation Area
- Drainage Basins
- Transportable Location (approx)

0 40 80 120 160 200
Metres
1:7,500 @ A3

NOTE: AREAS AND DISTANCES SUBJECT TO SURVEY

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PLANNING DESIGN ENVIRONMENT
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Ph: 9271 8506
admin@landinsights.com.au
landinsights.com.au

Extraction Plan - Detail

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MORANGUP SCHIST PIT

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APPENDIX N

Visual Amenity Management Plan

landinsights
PLANNING DESIGN ENVIRONMENT

"SCHIST PIT" CLAY QUARRY

VISUAL AMENITY MANAGEMENT PLAN

LOT 1 MORANGUP ROAD, MORANGUP

PREPARED FOR AUSTRAL BRICKS (WA) PTY LTD

AUGUST 2023

Prepared by:

Land Insights

PO Box 289

Mt Lawley WA 6929

Phone: (08) 9271 8506

Document details:

Document History:

Date	Document Name	Document Manager	Summary of Document Revision	Client Delivered
Jun-23	935 – Schist Pit Visual Amenity Management Plan	SR	Initial Draft for client review	Jun-23
Aug-23	935 – Schist Pit Visual Amenity Management Plan	SR	Final for submission	Aug-23

Table of Contents

Appendices

1 Introduction

1.1 Background and purpose

This report presents the Visual Amenity Management Plan for the "Schist Quarry" operated by Austral Bricks (WA) Pty Ltd. The quarry is located at Lot 1 Morangup Road, Morangup. The purpose of the Visual Amenity Management Plan is to accompany the Clay Excavation Management Plan prepared by Land Insights to support an application for renewal of the Extractive Industry Licence. The Visual Amenity Management Plan provides actions to reduce impact of the operation from the road (public realm) and from neighboring properties and surrounding residents.

Extractive industries involve bulk earthworks and the creation of pit areas of various depths below the natural ground level and stockpiling of clay, either in the pit area or on the natural ground level. It can also involve the removal and planting of vegetation which can change the views into and out of a site. In addition, the end use usually results in a change in land contours once the operation is decommissioned.

Visual management was previously addressed in the "Extractive Industry Licence and Clay Extraction Management Plan" prepared by Land Insights in 2013. This Visual Amenity Management Plan presents an update to the 2013 report. It has been prepared for the following reasons:

- To update with best practice visual management.
- To take into account new stages of excavation
- To accompany an application for a renewal of the approvals for the operation.

1.2 Objectives

The objective of the Visual and Amenity Management Plan is:

- To reduce the impact of the operation on the visual amenity from neighbouring properties and the public realm.
- To reduce the potential for the clay extraction operation to have a visual impact.

1.3 Context

While the visual amenity of a location can be subjective, it is generally the aim for extractive industry to have minimal visual impact from the public realm (including roads and public places) and on surrounding residents and private landholdings where possible. If the operation cannot be successfully hidden using the natural topography, this is usually achieved through a "visual screen" such as bund walls and screening vegetation.

Visual amenity impact is generally guided by two key documents prepared by the State Government – "Visual Landscape Planning in Western Australia: A Manual for Evaluation, Assessment, Siting and

Design" (DPLH, 2007) and "Guidance Statement No.3: Separation Distances Between Industrial and Sensitive Land Uses" (EPA, 2005). More specific guidance relating to extractive industry is provided in the "State Planning Policy 2.4 Planning for Basic Raw Materials Guidelines" (WAPC, 2021).

The Visual Landscape Planning Manual provides advice on techniques for incorporating visual landscape planning into the planning system. As a general rule, the Manual states that "mining and extractive uses should avoid sites that are prominent in important views, especially where they are located at the focal point of views." It also states that the "visibility of mines, quarries and industry should be assessed from the property boundaries, from near and distant residences and from neighbourhood vantage points such as public roads". This guidance was used during the pre-planning for the quarry operation to ensure that it was well-screened from the road and surrounding areas. The Manual will continue to be used to minimise visual amenity impact from future operations on the site.

In terms of reducing visual impact and amenity, the Manual recommends the following for quarries and mines:

- Use natural topography and existing vegetation for screening purposes
- Plant additional vegetation to enhance screening
- The working faces of mines or quarries may be oriented to minimise their public visibility.
- Access roads should be aligned to avoid providing a direct view of operations from nearby public view locations such as roads, lookouts or recreation sites.

Guidance Statement No. 3 provides guidance on the separation distances and buffers for a range of industrial land uses to sensitive land uses. The operations on site fit into the category "Clay extraction or processing". The separation distance is given as "500-1000 metres, depending on size and processing", however this can be less with appropriate environmental management. The potential impacts listed in the Guidance Statement are noise and dust. These are managed through the Noise Management Plan and Dust Management Plan.

1.4 Location

Lot 1 is situated approximately 80km to the north-east of Perth and approximately 25km to the south-west of Toodyay. It is approximately 5km from the closest rural residential estate (located to the south-west and another to the north of the site). The operation ("the site") is located in the centre of Lot 1.

Plans associated with the operation are provided at Appendix A.

1.5 Operation

The quarry is located in the centre of Lot 1. Excavation has been ongoing over the last 60 years. The current development footprint is known as the "Operation Area" and encompasses the active pit area,

stockpiling areas, access tracks, drainage basins and administrative areas. Future stages (labelled as "Stages 1 to 4") have been identified to the south-east of the existing excavation area. In general, the excavation occurs in a south-easterly direction.

Excavation of clay takes place in a sequence of steps which can be broadly broken down into the following:

- Earthworks Campaign (i.e., removal of topsoil and overburden, excavation of clay to stockpile)
- Carting Campaign (transport of clay from the pit or stockpiles to the factories)
- Rehabilitation.

2 Visual Assessment

2.1 Introduction

As is discussed in Guidance Statement No. 3, separation distances and buffers serve the function of providing distance to sensitive land uses (such as residential dwellings). Impact on views and amenity are outlined in the Visual Landscape Planning Manual. Views into and out of the site/operation area should be considered in a visual assessment as the topography and vegetation can usually provide adequate screening.

2.2 Surrounding Land Uses

Surrounding land uses comprise other extractive industry and rural land uses. Directly to the south and east are two other clay quarries. A hard rock quarry is located to the north.

The site is approximately 5km to the north-east of the closest rural residential area and approximately 13 to the west of the Toodyay townsite. It is approximately 1.4km from the closest rural dwelling.

2.3 Separation Distances

The following sensitive receptors have been identified surrounding the site.

- Neighbouring rural property to the west – Approximately 1.4km from the operation (865 Morangup Road, Morangup)
- Neighbouring rural property to the south – Approximately 1.6km from the operation (1012 Morangup Road, Morangup)
- Rural properties to the east – Closest is approximately 3km from the operation (575 Lovers Lane, Morangup)
- Rural properties to the north – Closest is approximately 3.3km from the operation (535 Cobbler Pool Road, Morangup).

The EPA's Guidance Statement No. 3 – Separation Distances between Industrial and Sensitive Land Uses provides a guideline on the separation distances and buffers for a range of industrial land uses to sensitive land uses (such as residential dwellings). It should be noted that the distances in the policy assume the land use is not managed and, should best practice environmental management take place, these distances can be reduced.

The operations on site fit into the category "clay extraction or processing". The potential impacts are listed as "noise" and "dust". The separation distance is "500-1000 metres, depending on size and processing", however this can be less with appropriate environmental management.

As can be seen from the above list, the clay operations far exceed the recommended separation distance. All surrounding sensitive land uses are over 1000 metres from the operations.

It should also be noted that operational management, including dust and noise management and protection of visual amenity, are provided for this operation to support the continued operation of the site. These management plans are attached to this application.

2.4 Site features

Topography and landform

The topography of the site is variable and undulating with high points and valleys throughout. slightly undulating with a moderate to steep slope throughout. There is a high point at the north-eastern corner and another at the south-eastern corner at approximately 280 metres AHD (Australian Height Datum). These areas are divided by a watercourse which drains towards the northern end of the lot where it reaches a low point of 195m AHD.

The operation area is located in the centre of Lot 1. The natural topography surrounding the pit is at approximately 245m AHD at the north-eastern corner of the operation to approximately 270m AHD at the southern end. The land generally slopes up to the south, down to the west, east and north.

Vegetation

Lot 1 is predominantly covered on remnant vegetation except for the cleared areas associated with the quarry operations, access roads and firebreaks. The operation is surrounded by extensive vegetation in all directions and is substantially shielded from the road and adjoining properties.

Vegetation comprises Marri/Jarrah Woodland, Powderbark Woodland and Wandoo Woodland as was confirmed in the “Flora and Vegetation Assessment” (Del Botanics, 2013).

There is no clearing required to expand the site into the next stage as it has been cleared and prepared for excavation already. Any further expansion of the pit area will require a new Clearing Permit to be applied for in accordance with the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

2.5 Compliance history

It should be noted that no complaints have been received in the past 60 plus years of operation regarding visual amenity impacts.

2.6 Conclusion

Based off the information above, it can reasonably be concluded that the impact of the clay extraction operation on visual amenity from the public realm and adjoining land is low. A review against the recommendations in the Visual Landscape Planning Manual (DPLH, 2007) is provided in Table 2.1 below.

Table 2.1 – Visual impact assessment summary

RECOMMENDATION	COMMENT
Use natural topography and existing vegetation for screening purposes.	The site is undulating and the operation is surrounded by substantial and expansive vegetation, providing adequate screening from surrounding areas.
Plant additional vegetation to enhance screening.	As the pit is already surrounded by a substantial amount of vegetation, no additional screening vegetation is required.
The working faces of mines or quarries may be oriented to minimise their public visibility.	The site is undulating and the operation is surrounded by substantial vegetation and is not publicly visible.
Access roads should be aligned to avoid providing a direct view of operations from nearby public view locations such as roads, lookouts or recreation sites.	The main haul road is of adequate distance and orientation and surrounded by vegetation on both sides so that the pit area can not been seen from it.
Separation distances to neighbouring properties are met.	Nearest sensitive premises are adequately separated from the operation.

3 Visual Amenity Management

3.1 Introduction

The Visual Amenity Management Plan describes the measures that will be used by Austral Bricks to reduce the impact on visual amenity.

The plan has been prepared in accordance with "Visual Landscape Planning in Western Australia: A Manual for Evaluation, Assessment, Siting and Design" (DPLH, 2007), "Guidance Statement No.3: Separation Distances Between Industrial and Sensitive Land Uses" (EPA, 2005), "State Planning Policy 2.4 Planning for Basic Raw Materials Guidelines" (WAPC, 2021) as well as best practice in mine/quarry management and experience.

3.2 Visual Amenity Management Plan

The actions, responsibilities and timing relating to visual amenity is presented in Table 3.1 below.

Table 3.1 – Visual amenity management plan

	MANAGEMENT/ACTION	RESPONSIBILITY	TIMING
1.	Establish new screening bunds again using overburden when moving into a new excavation area.	Quarry Manager	Prior to moving into a new excavation area.
2.	Excavations for most of the time will be below ground level. The walls of the pit will help screen the pit area from surrounding properties.	Quarry Manager	Ongoing
3.	Comply with the Dust Management Plan for the operation to ensure that no visible dust passes the site boundary.	Quarry Manager and Environmental Manager	Ongoing
4.	Rehabilitate the site in accordance with the Rehabilitation and Decommissioning Management Plan at the end of the operation.	Quarry Manager and Environmental Manager	Ongoing

4 References

Bureau of Meteorology (2022), Climate Data Online, Accessed from http://www.bom.gov.au/climate/data/

Department of Environment and Conservation (DWER), (2011), *Guidelines for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites, Remediation and Other Related Activities*, Department of Water and Environmental Regulation, Perth, WA.

Department for Planning and Infrastructure, (2007), *Visual Landscape Planning in Western Australia: A Manual for Evaluation, Assessment, Siting and Design,* Department of Planning, Lands and Heritage, WA.

Department of Water and Environmental Regulation, (2017), *Guidance Statement: Risk Assessments,* Department of Water and Environmental Regulation, Perth, WA.

Department of Water and Environmental Regulation, (2021). *Draft Guideline – Dust Emissions*, Department of Water and Environmental Regulation, Perth, WA.

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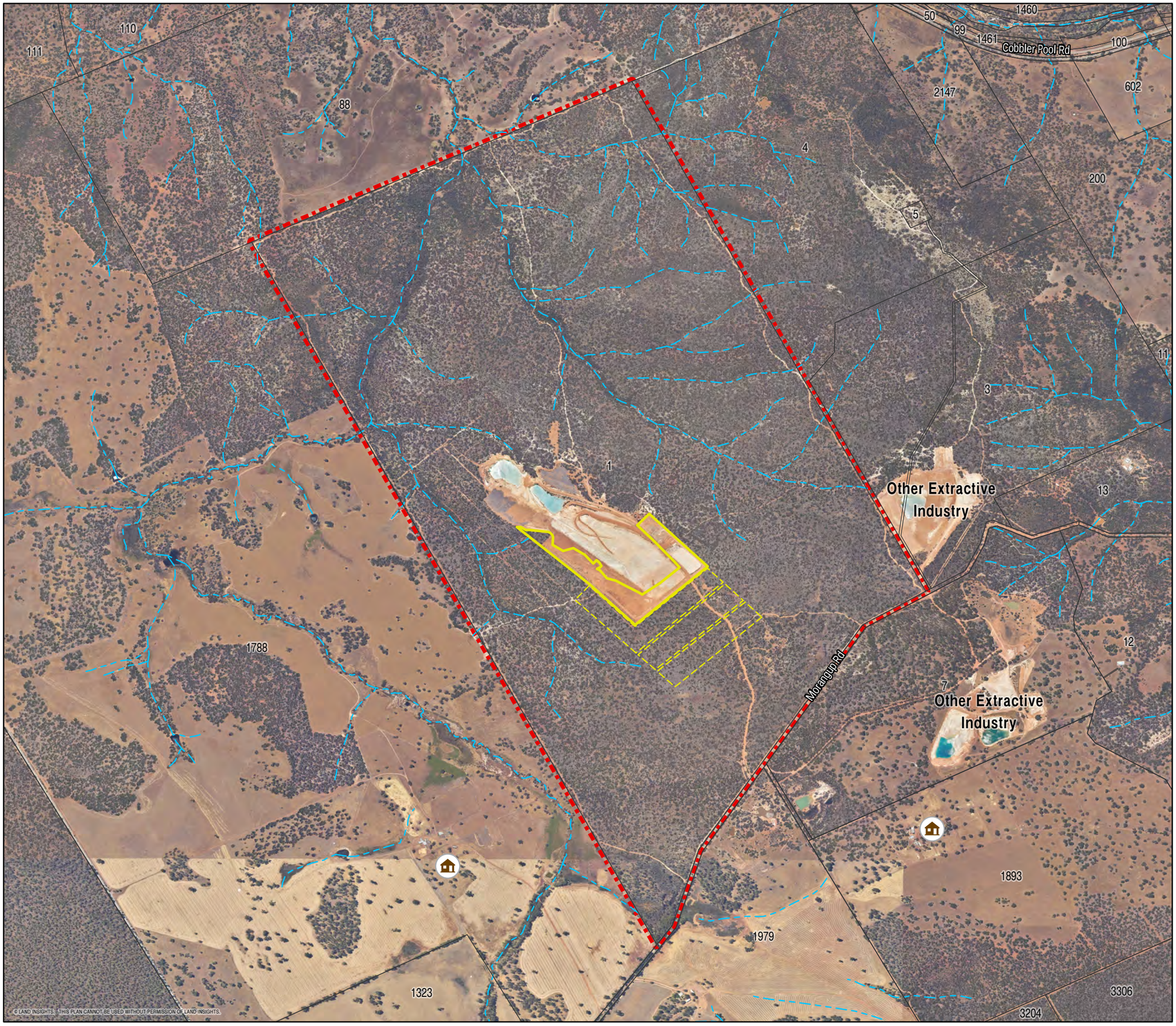
Government of Western Australia, (2021), *SLIP Portal*, Accessed from https://maps.slip.wa.gov.au/landgate/locate/

Ramboll, (2019), *Clay Pit Wind Erosion Study*, Austral Bricks (WA) Pty Ltd, Perth, WA.

Western Australian Planning Commission, (2021), *State Planning Policy 2.4 Planning for Basic Raw Materials Guidelines*, Western Australian Planning Commission, WA.

APPENDIX A

Plans



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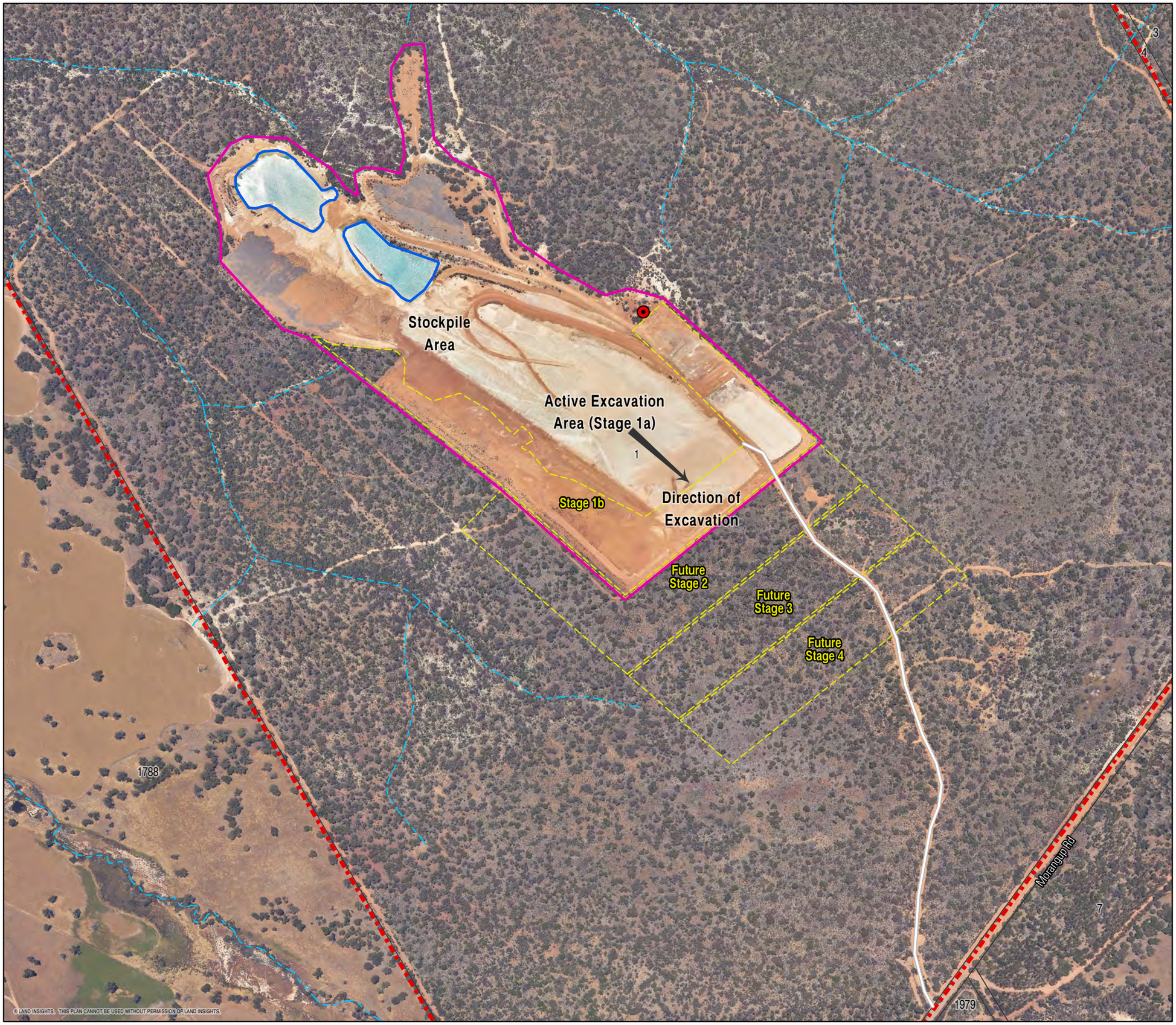

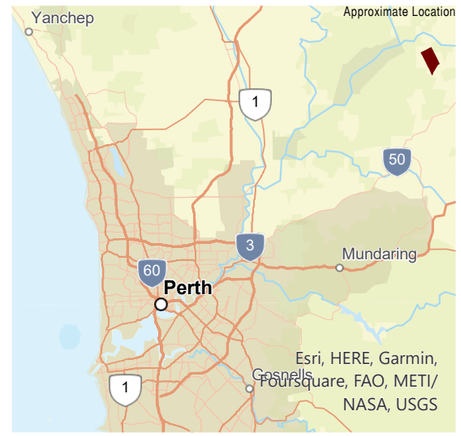

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