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Pivot Hill Quarry
Application for Clearing Permit (Purpose Permit)
M80/637

November 2024



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COMMODITY	Construction Materials
PROJECT DESCRIPTION (M80/637)	The Pivot Hill Quarry (PHQ) is a historic, small scale basalt quarry operation located 21 km south-east of Wyndham and 65km northwest of Kununurra within the Shire of Wyndham-East Kimberley (SWEK). The facility is established on a basalt inlier within the terrestrial southern boundary of the Parry Lagoons Nature Reserve (42155). Access is from the Great Northern Highway via the gravel sealed Parry Creek Road. The quarry site and laydown is obscured from the Parry Creek Road and the closest sensitive receptor, the seasonally operated Parry Creek Farm Resort, by a natural low basalt rise. The PHQ was first mined by Main Roads to supply road construction material within the Wyndham region in the 1980's. The original Mining Lease M80/618 (45ha) and associated Miscellaneous Licence L80/61 (in part over the existing Old Halls Creek access road) were applied for in August 2010. Licence 80/61 was withdrawn in December 2010 and replaced by L80/63. The Projects access was amended following consultation with the Department of Parks and Wildlife (DPaW) and a more environmentally favourable access route was identified – the route was surveyed in 2016 by DPaW staff. As a consequence, L80/63 was relinquished in November 2016. M80/637, the current granted Mining Lease at Pivot Hill, was marked out on advice from DEMIRS, in October 2017, and granted in December 2017 – this smaller Lease (18.15ha) was deemed to be more environmentally appropriate for the site and its conservation land use. The Project was referred to the EPA in January 2015 who determined the Project did not warrant formal assessment but managed under Part V Division 2 (Clearing) and Division 3 (Prescribed Premises Category 70) and DEMIRS tenure conditions. Clearing Permit 7924/1 was granted over part of M80/637 on the 21st March 2018 to clear up to 4.4ha to expand the basalt quarry. The 5-year currency of this clearing permit expired on the 31st March 2023. Category 70 Screening Operations (Registration R2490/2019/1) was issued on the 24 May 2019, and remains in force. Mining recommenced in 2018 on a campaign basis (Mining Proposal Reg Id 70274-2017) during the dry season and the screened product stockpiled to satisfy local demand. The PHQ Current Mine Plan involves the expansion of the stockpile laydown area and the continued staged extension of the basalt quarry. Material is crushed and screened on site and stockpiled for sale to local markets. The approved LOM is 10 years, but commercially governed by demand for the product within the region. The revised Mining Proposal Reg Id 70274-2017 and the associated SMO Mine Closure Plan remain in force.
THIS CLEARING PERMIT (PURPOSE) APPLICATION	This Application for a Clearing Purpose Permit is submitted for the staged clearing of up to an additional 5.0ha of native vegetation on M80/637 covering the proposed Quarry expansion and the extension of the product stockpile laydown area, which will include a transportable (16m X 12m) dome shelter. Clearing will be conducted using mechanical methods and will take place progressively over 5 years as the Project is developed.
DISTRIBUTION	DEMIRS - Native Vegetation Assessment Branch DBCA – Kununurra Office
AUTHORIZED FOR SUBMISSION	

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1. INTRODUCTION

1.1 Background to Project

The Pivot Hill Quarry was established in the 1980's as a source of road construction materials by the Department of Main Roads and the Shire of Wyndham East-Kimberley and remained largely inactive for several years except for the removal of borrow material by the SWEK. Following an extended permitting period, including referral to the EPA, Mick Guerinoni marked out the current granted mining lease M80/637 in 2017. This lease was granted on the 12th December 2017 with advice from DBCA and DEMIRS.

The Project is operated on a dry season campaign basis and is an established local supplier for basalt construction materials. Access is via the Parry Creek Road from the Great Northern Highway and is within the Shire of Wyndham-East Kimberley. The quarry is located on Pivot Hill, an elevated basaltic inlier within the Parry Lagoons Nature Reserve, 21km southeast of Wyndham (Figure 1).

The initial Mining Proposal for recommencement of the Project was approved in April 2017 (Reg Id 70247-2017) for the staged extension of the existing quarry within the Project tenure and establishment of a product screening and stockpile laydown area. A Mine Closure Plan for the Project was submitted to DEMIRS in September 2021; however, it was not assessed, and a new revision date of September 2028 was imposed. Clearing Permit 7924/1 was granted in March 2018 for the extension of the Pivot Hill Quarry and expired on the 31st March 2023 with the 4.4ha permit area allocation utilized. The approval status of Mining Proposal (Reg Id 70247-2017) is current and remains in force.

The current Mine Plan involves the proposed extension of the Pivot Hill Quarry and the product stockpile area. A non-permanent dome shelter for minor machine maintenance purposes will be established on the Laydown area. This development programme will require additional staged clearing of up to 5.0ha on M80/637. The total area of M80/637 is 18.15ha.

Biophysical surveys to support Clearing Permit applications were undertaken in 2010, March 2012 and May 2024 (JBBC 2024). The JBBC (2024) report is referenced in Attachment A. A summary of permitting and site approvals is shown in Table 1.

The Study area surveyed for this Native Vegetation Clearing (Purpose) Permit Application is shown on Figure 2 and assessment against the 10 Clearing Principles in Table 3.

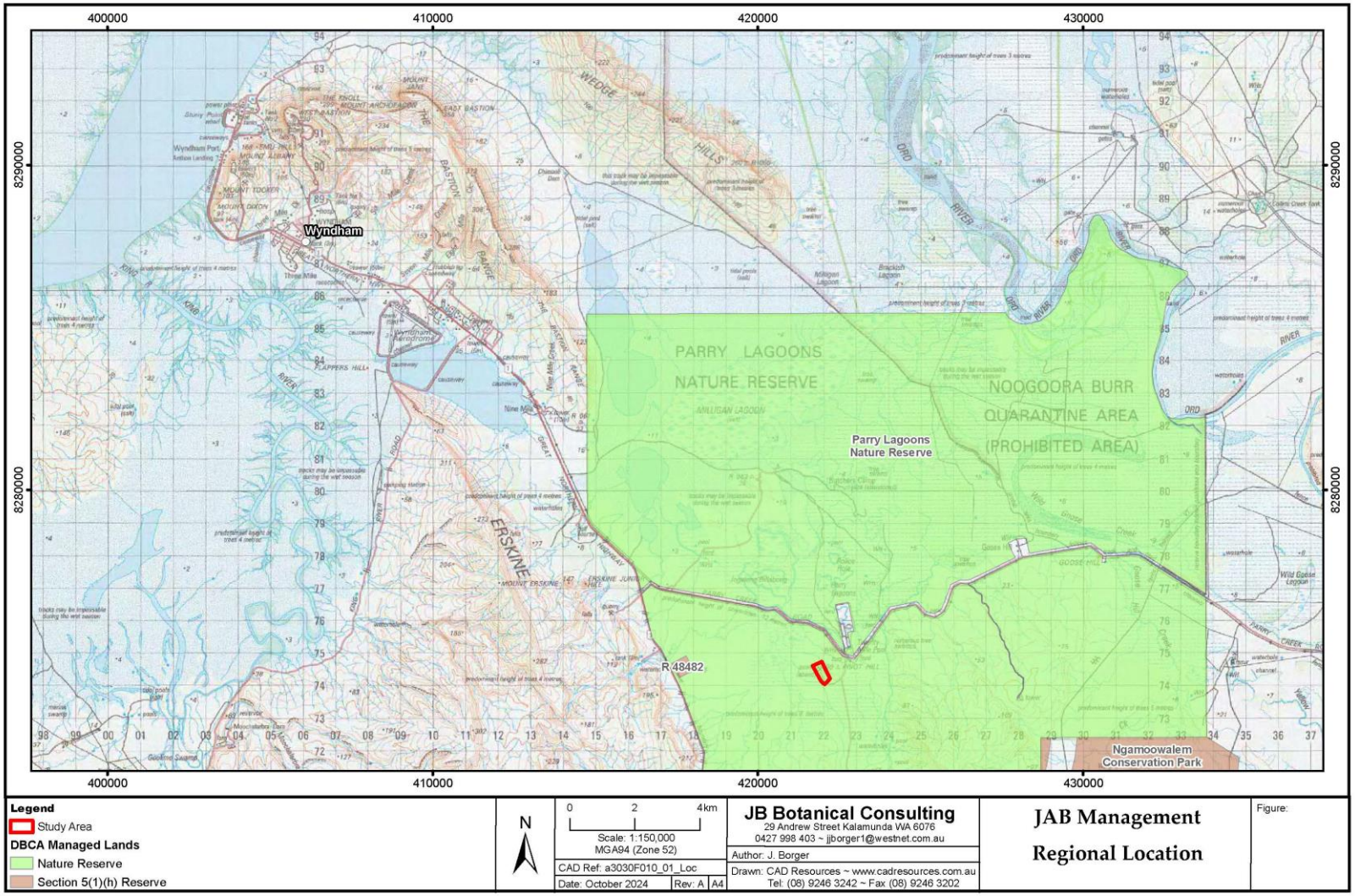

Figure 1: Pivot Hill Quarry - Regional Location and Landuse

Figure 2: Pivot Hill Quarry Site: Clearing Permit Application Survey Area

Table 1: Summary of Project Permitting and Approvals

Approval Required	By Whom	Current Status
Determination- of 22 May 2015 Pivot Hill Quarry Proposal Not Assessed; Public Advice Given	EPA	Project submitted to EPA for Section 38 referral on 13 January 2015. The EPA found that the likely environmental effects are not so significant as to warrant formal assessment and that potential impacts on flora and vegetation and terrestrial fauna can be managed under Part V Divisions 2 and 3 (Clearing and Prescribed Premises Licencing) of the *EP Act 1986*. Potential impacts on inland water quality and amenity can be managed through licencing (Cat 70) and decommissioning in accordance with the *Mining Act 1978* provisions.
Premises Registration Category 70	DWER	Registration 2490/2019/1 was granted on 24 May 2019 and remains in force.
Mining Lease M80/637	DEMIRS	Tenement Conditions associated with M80/637 including Annual Environmental Reporting and submission of a Mine Closure Plan. Tenement is owned by Micheal Guerinoni and is in good standing.
Quarry Development Approvals	DEMIRS	Mining Proposal Reg Id 70247-2017 was approved in April 2017 and remains in force.
Impact on Threatened Flora and Fauna	DBCA	No Threatened Flora or Fauna were reported in past quarry site surveys - Botanical North (2012) or by JBBC in 2024.
Search of ACHIS Data base for Registered and Located Heritage Sites	DPLH	No Registered or Located Aboriginal sites are recorded on the ACHIS Database for the PHQ tenure.
Native Title Extinguished	High Court	Native title is extinguished for Reserve 42155 due to vesting prior to 23 December 1996 (Ward High Court decision (Ref DEC (2012) Nature Reserve Management Plan 77.
Clearing Permit (Purpose)	DEMIRS	Clearing Permit 7924/1 was granted in March 2018 for the extension of the Pivot Hill Quarry and expired on the 31st March 2023 with the 4.4ha permit area allocation utilized. This Clearing Application for a new Purpose Permit applies to the Pivot Hill Quarry environs and stockpile laydown expansion on M80/637.
Pit Dewatering	DWER	Limited volumes of captured rain water are present in the quarry void post wet season rains and are reutilised for dust suppression.
5C Groundwater Well Licence	DWER	No groundwater encountered - A 5C Licence is not required for this Project
Local Authority Approvals	**SWEK**	Seasonal Use of Parry Creek Road for access and product haulage.

Decision Making Authority (DMA) Code:
EPA- WA Environmental Protection Authority
SWE – Shire of Wyndham East Kimberley, DPLH – Department of Planning Lands and Heritage
DWER-Department of Water and Environmental Regulation
DEMIRS – Department of Energy, Mines, Industry Regulation and Safety
DBCA - Department of Biodiversity, Conservation and Attractions

2. THIS PROPOSAL

This application for a Clearing Permit (Purpose) within M80/637 seeks approval for the removal of native vegetation covering up to 5.0 ha from the 18.15ha Investigation Area shown on Figure 2 to allow approved hard rock quarrying and associated activities to continue. The vegetation mapping was completed from a site survey completed in May 2024 (JBBC, 2024) and complements original flora and fauna surveying undertaken in 2012. The proposed clearing disturbance is temporary, as rehabilitation of quarry disturbed areas will be undertaken at the completion of the 10-year Life of Mine (LOM) on all disturbed areas except the final mining void.

The programme will result in the clearing of vegetation by mechanical means, with recovered vegetation tracked rolled and stockpiled for later rehabilitation use at the completion of the Project. Skeletal topsoil and root stock will be recovered and managed in accordance with JAB's clearing procedures. Clearing, if approved, is scheduled to commence in April 2024, post the wet season rains with staged clearing undertaken as required over 5 years.

2.1 Location and Ownership

The proposed clearing is located in the Kimberley Mineral Field on granted tenement M80/637 within the Parry Lagoons Nature Reserve (42155) which forms part of the Ord River floodplain. The Project tenure is located in a non-wetland area above the floodplain on an elevated basalt hill. Wetlands occur to the north, west and east of the tenure. The quarry operations are sited to preserve visual amenity from the Parry Creek Road and the seasonally operated Parry Creek Tourist Farm. The mining tenure is owned by Micheal Guerinoni and is operated by JAB Management Pty Ltd of which Mr Guerinoni is a Director.

2.2 Project Description

The current Mine Planning Schedule proposes a staged expansion of the existing basalt Quarry to the north-north-west and extension of the product stockpile area to the south-south-east. A mobile dome shelter will also be located within the laydown area for minor equipment maintenance. The basalt will be crushed and screened within the Project Tenure and stockpiled for direct sale to the regional Kimberley market. The crushed material will be transported via the unsealed Parry Creek Road, part situated within the DBCA managed Parry Lagoons Nature Reserve to the sealed Great Northern Highway.

The quarry and the proposed clearing are located within an Environmentally Sensitive Area (ESA), the nationally important wetland – Ord River Flood Plain and Parry Lagoons (DEC 2012) and adjacent to the P3 Priority Ecological Community No. 30 Vegetation Association 838. This community, which is described as grasslands, high grass savanna woodland; ghost gum and bloodwood (*Eucalyptus polycarpa* now *Corymbia polycarpa*) over spinifex and tall upland grass. *Corymbia polycarpa*, which is recorded on sandy soils over sandstone, laterite or quartzite terrain units, was not recorded within the elevated PHQ survey area which consists of fresh basalt outcrop. The PEC is highly unlikely to be present (DBCA 2023). An EPBC Protected Matters (EPBC PM) database search (DCCEEW 2024) records no Threatened Ecological Communities in the quarry tenure or buffer area.

Due to the location, limited scale of the operation, and no evidence of significant quarry related impacts on Reserve environmental values over the past 6 years of operation, it is considered that the proposed clearing for Project expansion will continue to have minimal impact on the adjacent significant lakes or wetlands. Existing mining disturbance, current tenure, and the proposed clearing application area is shown in Figure 3.

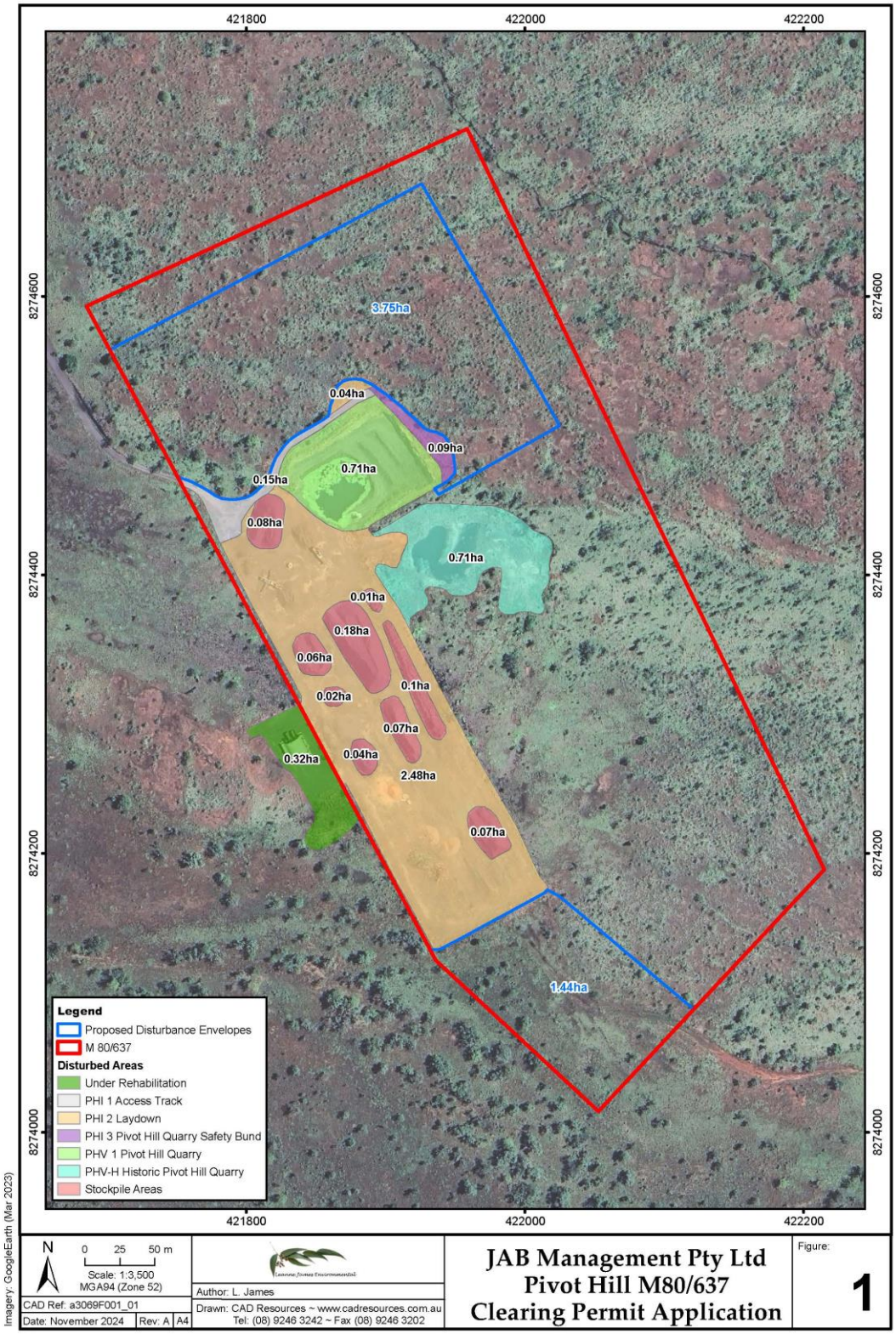

Figure 3: Pivot Hill Quarry – Current Tenure, Site Infrastructure and Proposed Disturbance Envelope

3. EXISTING ENVIRONMENT

Pivot Hill (PH) is located in the Victoria Bonaparte Bioregion (**VB1**) which covers an area of 18,876 km^2 in northern Western Australia. The Bioregion contains several large river catchments including the Ord River which terminates in the Cambridge Gulf lowlands. Parry Creek, an ephemeral tributary of the Ord River, supports important wetlands on the flood plain during the wet season. The interior of the region is dominated by the Victoria River Plateau, a large highly dissected plateau up to about 350m above sea level and composed of sandstone and other sediments. This elevated etch surface rapidly drops in elevation, often with spectacular escarpments onto the Cambridge Gulf lowlands which includes the more recently deposited Quaternary sequences of marine sediments and flood plain alluvials. Residual hilly outcrops of more resistant material such as Pivot Hill, rise locally above this floodplain and form foot slopes to the escarpments. They carry open woodlands of eucalypts or shrublands over mixed grasses.

The PH basalt outcrop consists of a mounded inlier of tholeiitic basalt covering an area of approximately 150 ha, south of the Parry Creek Road and is likely part of the Cambrian Antrim Plateau Volcanics. It forms a gently dipping, homogeneous single unweathered basalt flow or sill which shows typical vertical columnar jointing. The 18.15ha Project tenure is located near the top of Pivot Hill inlier on the southern boundary of the floodplains with the primary wetlands to the north, and east of the Project.

According to the Interim Biogeographic Regionalisation of Australia (IBRA), the PHQ is located in the Victoria Bonaparte Bioregion and Keep sub-region (Thackway and Cresswell 2017). The vegetation is described as grasslands, high grass savanna sparse tree; Bauhinia & Coolabah over Mitchell, blue & tall upland grasses (Shepherd et al, 2002). The Quarry area is located on basaltic hilly terrain (Unit 2) of the Frayne Land System (Payne and Schoknecht 2011), approximately 50m above the Parry Lagoons Wetland System, and is easily accessed via the Parry Creek - Kununurra Road and the Great Northern Highway.

3.1 Climate

The study area experiences a semi-arid tropical(monsoonal) climate with a high inter-annual variability in rainfall, runoff and recharge (CSIRO 2009). The climate is typical of the Western Australian Kimberley region with a distinct wet and dry season. The closest Bureau of Meteorology recording stations for rainfall and temperature data are located at Kununurra (BoM 2056; opened 1971 and Wyndham (BoM 1006, opened 1951). Long term mean annual rainfall of 839.3mm is recorded at Kununurra and 833.5mm at Wyndham, with the majority of the rainfall recorded between January and March. Evaporation rates far exceed rainfall the majority of the year, with an average annual evaporation rate of 2,800 millimetres. Both locations recorded slightly below average rainfall in 2023 followed by above average falls in January and March 2024. The prevailing winds range from east to southeast in the morning and are generally calm, however northly winds increase in the afternoons.

Temperatures are hot throughout the year with a mean daily maximum temperature ranging from 31.7^{o}C in June and 40.0^{o}C in November. Minimum temperatures were slightly cooler in 2023 for May, September and October. Maximum temperatures were slightly cooler than average in March and April 2024, and minimum temperature was slightly warmer in March 2024 (BOM 2024).

3.2 Landforms, Geology and Soils

Landforms in the Quarry area are described using the Land Systems approach defined by Pringle et. al. (1994) and Payne et. al. (2011) with the Quarry operations located in Unit 2 of the Frayne Land System of the WA Department of Primary Industries and Regional Development (Figure 4). This Land System is extensive in the Pivot Hill Area and comprises undulating plains with eucalypt woodlands and mixed grasses on volcanic landforms and coastal and inland erosional plains. The Land System is divided into six units. The

landform at Pivot Hill would fit best Frayne LS - Unit 2. Rounded hills consisting of mostly rock outcrop with pockets of red brown loam to brown skeletal clay soils supporting bloodwood-southern box sparse woodland or silver leaved box sparse low woodland with Tippera tall grass (*Themeda triandra, Sehima nervosum, Chrysopogon fallax*). (Payne et. al. 2011).

3.2.1 Geology

The hard-rock resource consists of outcrop of massive tholeiitic basalt covering an area of approximately 150ha, possibly part of the Cambrian Antrim Plateau Volcanics and forming a gently dipping, thick homogenous single fresh basalt flow or sill which shows typical columnar jointing. Linear, low order parallel north west trending drainage lines are located outside the mining tenure, and possibly represent original basalt flow cooling structures.

Canozoic surficial sediments, mainly alluvium derived from higher up in the Parry Creek catchment, are developed in pockets around Pivot Hill which has the appearance of a low residual basalt flow inlier.

3.2.2 Soils

The basalt inlier is locally capped by shallow ferrosol soil zones containing skeletal red brown earths and residual gravels. Several studies in the region (NALW Taskforce 2009) have identified similar soils as textured, non-saline ferrosols (<0.4Ms/cm), with pH's typically less than 6.0 and locally gravelly.

3.3 Hydrology

The floodplains of the lower Ord River represent a complex network of meandering streams, permanent pools, levee banks and seasonal wetland areas. During the wet season, drainage into the streams and rivers occurs from local catchment thunderstorms or broad scale monsoonal low-pressure systems. Water tables on the alluvial flats rise during the monsoon and fall during the dry as do the levels in the major streams which form isolated water holes and billabongs. Parry Creek (the main channel of which is located 2.2km east of the Pivot Hill Quarry) emanates from the dissected sandstones of the Victoria River Plateau and flows into the main floodplain environments north of the Parry Creek Road. Groundwater salinity data reported in WRC (2001) and covering the Carlton Plain and Mantinea Flats to the east of the Parry Creek area, ranges from 2,000mg/L (brackish) to greater than 14,000mg/L and are of a sodium chloride type. Similar fresh to brackish groundwater quality could be expected in deeper structurally controlled fractured rock aquifers, if they are present, in the Pivot Hill basalt flow substantially below the proposed mining floor.

3.3.1 Surface Drainage

Localised ephemeral drainage from Pivot Hill is largely controlled by (a) sheet flow zones on the flatter perimeter footslopes, (b) defined minor flow drainage in northwest trending fracture zones located north of the Pivot Hill quarry environment, and (c) from waters shed from high ground to the north east of the quarry. Diversion of runoff around work areas can be readily achieved using bunds or drains with clean waters directed away from operational areas into existing flow zones as mining proceeds. Tributary drainage into the Parry Creek is unlikely to be influenced by the proposed quarry extension. The runoff assessment shows that drainage from the proposed mining and stockpile areas will likely have water quality compatible with the maintenance of local land and water values and can be directed into settlement ponds or the main quarry void for reuse (dust suppression), or directed onto the southern foot slope where it will evaporate or dissipate within vegetation zones.

3.3.2 Groundwater

While information on the occurrence of groundwater in the broader region has been documented in several studies and summarised in WRC (2001), no bore data for the Pivot Hill area was found in the DOW online Hydrogeological Atlas. Unweathered heterogenous basalts typically yield low sustainable volumes in near surface associated unconfined aquifers, and groundwaters are more often associated with localised

fractured rocks at the base of flows. Limited recharge may occur by vertical infiltration, although no evidence of basal seepage was evident in the quarry or near quarry environs.

The depth to groundwater is unknown but, given the elevation of the mineable basalt resource at 20 -30m above the surrounding terrain and the absence of extensive weathering in the quarry area, the water table, if present, is below proposed mining depth. No groundwater bores are known to exist within 3km of the project site, but the Parry Creek Farm, located 1.2km to the north-east may operate bores in a different hydrogeological environment.

Flood Risks

Given mining will be confined to the dry season, potential indirect impacts through runoff from the mining operations will be minimal and managed using drainage sumps to settle any runoff prior to re-use or release to the broader environment. The sumps will be of a ramp access construction to facilitate regular cleanout and permit maintenance of freeboard prior to the wet season. No significant hydrological changes are likely to result from the proposed mining operations. Rainfall currently collects in the quarry floor during the wet season. This water may be recovered and stored on site for re-use.

Flood risks are considered to be inconsequential; the proposed mining area is elevated above the surrounding country. There is no evidence that the proposed mining operations will directly or indirectly impact the hydrogeological or ecological or wetland values of the Parry Lagoons Nature Reserve, since the mining area is elevated above the wetland ecosystems that represent the essential conservation values of the reserve. Water for dust suppression in excess of that captured in the quarry void will be trucked to site storage as required – no groundwater abstraction is proposed.

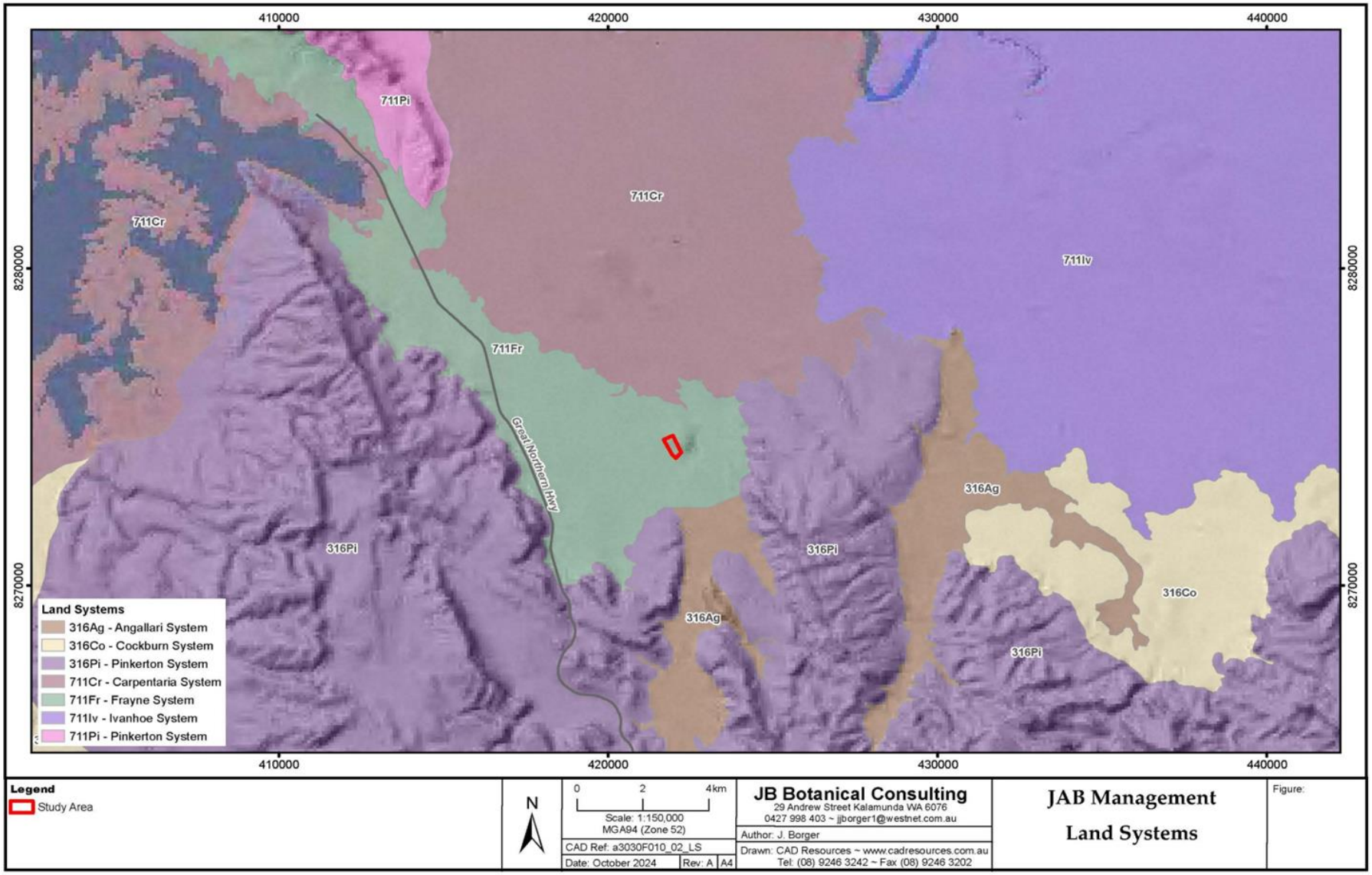

Figure 4: Pivot Hill Quarry - Frayne Land System

3.4 Flora and Fauna

The PHQ tenure lies within the in the Victoria Bonaparte IBRA bioregion in the Keep IBRA sub-region (Thackway and Creswell 2017). Pre-European Vegetation (PEV) mapping based on Beard's surveys places the survey area within 1 vegetation association (VA) 59 – Victoria Bonaparte (DBCA 2019) which is described as: Grasslands, high grass savanna sparse tree; bauhinia & coolabah over Mitchell, blue & tall upland grasses.

A 2-stage field survey was conducted by a qualified Zoologist (Mr Basil Byrne-Botanical North) in 2010 followed by a wet season survey in 2012. Jenny Borger Botanical Consulting (JBBC) completed a flora and vegetation survey and desktop fauna survey of the areas proposed for clearing, as part of the extension to the PHQ Project in May 2024. The Investigation Area is shown on Figure 2.

3.4.1 Flora

The Pivot Hill study area consisted of four vegetation Types - Plain, Footslope, Mid to Upper Slopes, and Crest. A total of 50 native taxa from 29 families and 46 genera were recorded. The majority of taxa were recorded within the best represented families being Poaceae (10 – 8 native and 2 introduced); Fabaceae (7 – 6 native and 1 introduced) and Amaranthaceae (4 native species). Two types were dominant (VTs 1 and 3) within the proposed disturbance areas. Dominant upper stratum species included *Adansonia gregorii, Lysiphyllum cunninghamii* and *Corymbia confertiflora.* The understorey was mostly dominated by grasses.

There were no threatened and one priority species – *Brachychiton tridentatus* P3 – recorded. This species was also recorded by Botanical North in 2012, east of the current survey area. One shrub was recorded within the proposed clearing area which lacked flowers and fruit and was identified from the foliage and bark.

Five weed species were identified. Weeds were mostly present within VT1 on the plain, adjacent to the cleared areas with isolated occurrences of declared weed - *Calotropis procera**(Calotrope) in the broader area of the plain. Weeds were isolated on the mid slopes to upper slopes and did not include *Calotropis* or *Cenchrus ciliaris** which are of higher concern. No Neem (*Azadirachta indica**) trees were recorded in the survey areas. Two species recorded by Botanical North (2012) are not currently listed as weeds.

An ecological community DBCA database search result (02-0324EC; DBCA 2024) indicates two priority ecological communities (PEC) are mapped as occurring in the region with Kimberley PEC No. 30 Vegetation Association 838 – Priority 3 – adjacent to Pivot Hill. This is described as: Grasslands, high grass savanna woodland; ghost gum and bloodwood (*Eucalyptus polycarpa* now *Corymbia polycarpa*) over spinifex and tall upland grass. *Corymbia polycarpa*, which is recorded on sandy soils over sandstone, laterite or quartzite, was not recorded within the survey area and the PEC is highly unlikely to be present (DBCA 2023).

An EPBC protected matters (EPBC PM) database search (DCCEEW 2024) records no threatened ecological communities in the feature or buffer area. The nationally important wetland – Parry Floodplain – is recorded as being present in the study area; however, the site is located above the floodplain and impacts from the Quarry Project would be insignificant. Current desktop and field survey evidence, suggests no floral habitat of regional significance will be permanently impacted by the proposed clearing activities. Most conservation significant flora recorded in the broader area are found in wetland habitats which are not present within the Quarry survey area.

Recommendations in respect to the management of weed spread, minimisation of disturbance to natural runoff flow patterns, and confirmation of taxa suitable for use in minesite rehabilitation trials, were identified in the recent field work and these will be incorporated into the Site Environmental Management Plan.

Further flora and vegetation information is referenced in *Detailed vegetation and flora survey and desktop fauna survey Pivot Hill Hard Rock Quarry – M80/637 (JBBC 2024)* in Attachment A.

3.4.2 Fauna - Desktop Assessment

Based on the results of the vegetation and flora survey there are two broad fauna habitats present within the site – the grass dominated plains with isolated trees to open woodland and open woodland on rocky hill slopes with minor areas of rock outcrop. No trees with hollows were observed and no hollow logs were present. Rock crevices were very small and may provide habitat for small reptiles and insects. Larger rock crevices and caves which may provide habitat for fauna such as bats and quolls were not present. No creeks or wetlands are within the study area.

The results of a DBCA Conservation Significant Fauna database search recorded 52 species including 40 birds, 7 mammals, 4 reptiles and 1 invertebrate presented in JBBC (2024 - Table 3). Records of fauna near the sites are presented in Figure 5. Conservation codes are described in JBBC (2024) - Appendix 2. Many of the birds are migratory and associated with wetlands. Threatened species are highlighted. Threatened fauna (excluding marine species) recorded in the EPBC Act Protected Matters Report Feature area (F; 5 km) or Buffer (B) zone. (NL – not listed)

There are twelve threatened species listed in the DBCA database search and nineteen in the DCCEEW protected matters search Of the DCCEEW search fauna, 8 are not listed as threatened in Western Australia and are either Specially Protected (Migratory), priority listed or not listed (Northern blue tongue skink). Of the threatened species the following have been recorded near the site or are the most likely to occur within the site:

- Northern quoll (*Dasyurus hallucatus*) – prefer habitat with hollow logs (none on site); rock crevices (no large crevices which would be suitable), caves (not present) and hollow trees (not present). It is unlikely to occur. The two records in the DBCA database search were from 1908.
- Ghost bat (*Macroderma gigas*) – no suitable hollows or caves present
- Night parrot (*Pezoporus occidentalis*) – mature spinifex habitat (DCCEEW 2024b). Very little spinifex is present in the survey area and the vegetation is unlikely to be suitable.
- The red goshawk (*Erythrotriorchis radiatus*) and grey falcon (*Falco hypoleucos*) may hunt in the area. The main prey is other birds. Both species nest in the fork of tall emergent trees – the nest is a stick platform lined with green leaves. No nests were observed.

There are several records for the priority species (WA) – Gouldian Finch (*Chloebia gouldiae*) – near Pivot Hill. The finch lives in Savannah woodlands (DCCEEW 2008) where they nest in hollows of smooth barked Eucalypt trees and feed on ripe and half-ripe grass seed including spinifex and Sorghum. They also eat insects, particularly during the breeding season. Spinifex is not common at the site and no Sorghum grasses were recorded. It is possible that they would utilise Pivot Hill for part of their diet, but highly unlikely to nest in the area. Pivot Hill is surrounded by grasslands which would be used by the birds.

A total of 3 introduced mammals could potentially occur in the near quarry habitats of the Pivot Hill Project Area (Graham 2002); of most concern are the introduced herbivores; feral cattle, donkey and pigs which have the most widespread impact on habitats through grazing and trampling. No evidence of the introduced mammals was recorded during the recent survey. Cane toads are present and represent a threat to ground dwelling fauna.

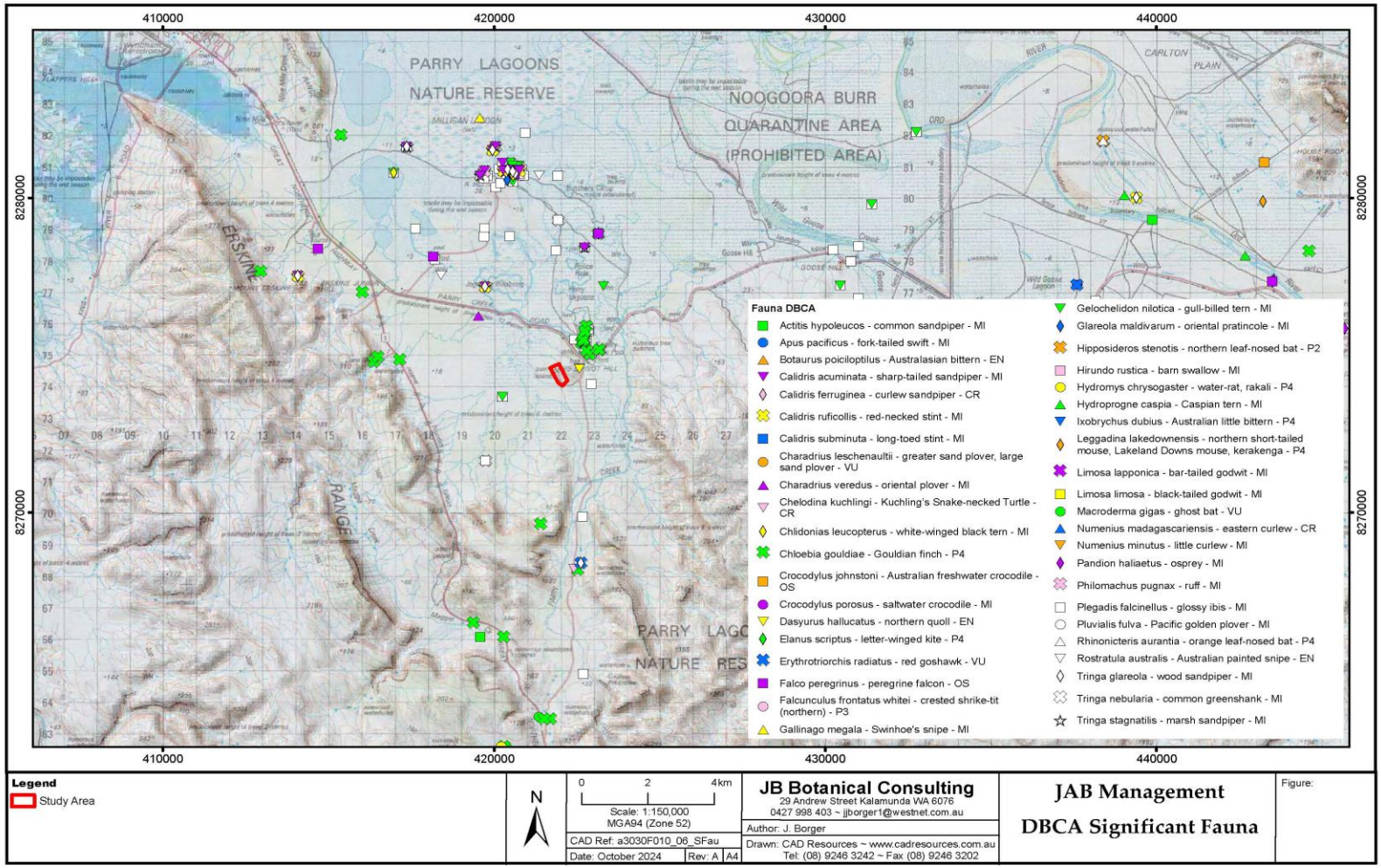

Figure 5: Location of Significant Fauna Records (DBCA, 2024)

3.5 Conservation Significance

The significance of the biota of the Pivot Hill area was assessed in three contexts – State, regional and local levels. As no threatened Flora was recorded during field surveys, the proposed extension of the mining area as part of the inforce mining approval has no significance at a state level on the fauna which potentially occur in the near mine area,

Of the Scheduled fauna species identified in the desktop study, all are in urgent need of conservation attention and Action Plans involving a range of conservation activities in conjunction with predator eradication are being managed by the DBCA with some success. The presence of Schedule 1 fauna in the quarry area, and remaining following the recommencement of mining, is considered highly unlikely, due to the lack of suitable habitat.

The LOM is of short duration (approximately 5 years) and the impact of the limited clearing on small, regional fauna is expected to be minimal, with the return of many terrestrial species back into disturbed areas after site decommissioning and rehabilitation. Threatening processes identified in the 2002 CALM Biodiversity Audit (Graham 2002) and Parry Lagoon Management Plan 77 (2012), include vegetation clearing and fragmentation, grazing pressure, feral animals (cattle, donkeys and pigs), changed fire regimes, and weed spread. Management Plans to mitigate and manage those processes relevant to mining will be developed and implemented as part of current mining programmes.

The proposed quarry expansion encompasses a Land System and vegetation associations that are relatively widespread in the region. There is no evidence that floral habitat of regional significance will be significantly impacted by the proposed expansion of the small-scale quarry operations.

The current proposal to expand the Pivot Hill Project footprint will result in short term increase to site emissions and the disturbance footprint at the site. Operational impacts can be managed through (a) minimisation of disturbance and clearing, (b) avoiding permanent changes to drainage patterns and sheet flow zones, (c) controlling weed spread, (d) reducing impacts to soils and verges by using best quality ground water during dust suppression, and (e) progressive rehabilitation of disturbed areas during operations. No assemblages of plant species are representative of TEC or PEC communities. The near quarry environment drainage lines are ephemeral and do not support riparian or wetland vegetation. Additional detail is documented in JBBC (2024) Tables 3, 8-9 and weed taxa present in Table 10, referenced in Attachment A.

4. SENSITIVE ENVIRONMENTAL RECEPTORS AND MANAGEMENT

This section provides details of any sensitive (environmental or social) receptors potentially impacted by the quarry extension clearing proposal for the Pivot Hill Project.

4.1 Overview

The environmental impact of the clearing proposal will be considered under the following headings with the proposed precautions and management procedures planned to minimise any potential impacts outside of the immediate mine site during the quarrying programme.

Bearing in mind the type and modest scale of the proposed operations, the intermittent and seasonal operational timeframe and the daylight hour operations, the impact on the environment is seen to be minimal and no change or disbenefits of regional or local significance are anticipated.

Higher risk potential impacts associated with the recommencement of quarrying operations arising from emission sources or stakeholder consultation, and outlined in previous sections include:

- Land clearing and topsoil management;
- Dust emissions from clearing, material handling, screening and transport;
- Noise and light emissions;
- Surface water management;
- Hazardous goods management;
- Flora and fauna;
- Weed management, and
- Fire management.

4.2 Land Clearing and Topsoil Management

Proposed expansion of quarry operations at Pivot Hill will require staged clearing of native vegetation and stripping of skeletal topsoil on an area up to 5.0ha within M80/637. The assessment shows that the proposed stage clearing of up to 5.0ha of vegetation is not at variance with any of the 10 principles of land clearing used in WA to assess the environmental risks of clearing. These are described in Table 3.

4.2.1 Potential Impacts

- Generation of dusts during topsoil stripping, handling, and transport;
- Reduction in area of flora and fauna habitats (biodiversity loss) and increased potential for weed spread, and
- Increased risks of loss of topsoil viability from poor placement and storage, erosion or operational contamination.

4.2.2 Management of Controls

- Annual clearing areas will be marked out prior to clearing and no clearing will be undertaken without the approval of the Registered Manager;
- Existing cleared areas will be utilised, where feasible, to reduce the requirement to clear habitat;
- Where present, topsoil will be stripped to the maximum thickness possible and stored for future rehabilitation in low stockpiles away from traffic areas, surface flow zones and works areas. Stockpiles will be monitored annually for weed spread and the location included on Closure Plans, and

- Cleared areas will be rehabilitated as soon as they are no longer required for ongoing quarry use.

4.3 Dust Emissions

Dust emissions will be generated intermittently during site clearing, blast hole drilling and blasting, loading of raw rock, crushing and screening, tramming operations, equipment movements, transport and from rehabilitated areas.

4.3.1 Potential Impacts

- Impacts on native vegetation due to dust deposition on leaves in the operations area and transport corridors.
- Wind uplift from fines stockpiles.
- Loss of visual amenity and potential contaminants in runoff zones.
- Reduced efficiency of mobile equipment and increase maintenance costs, and
- Safety and health risks to workforce and travelling public from wheel generated dust.

4.3.2 Management Controls

JAB Industries has an established Dust Management Standard Operating Procedure (**SOP**) aimed at minimising dust generation in the workplace and compliance with DEMIRS, DPAW and SWEK requirements. The SOP will be reviewed annually to include site specific requirements:

- Visual monitoring of workplace and road corridor dust levels to satisfy OH&S requirements.
- Use of water injection during blast hole drilling and water sprays during crushing campaigns.
- Imposition of speed restrictions in the works area and gravelled access roads to limit wheel dust.
- Use of mobile dust suppression water cart for work areas, stockpiles and unsealed access roads including the Parry Creek Road west to the Great Northern Highway.
- Ensuring tramming, loading, spillage cleanup and transport activities are undertaken so as to minimise dust emissions by wetting down with best available quality water, and
- Ensuring dust control and barrier equipment is fitted to screening plant and servicing requirements are followed.

The quarry is located 1.2km southwest of the nearest sensitive receptor – the Parry Creek Farm and is separated by elevated terrain. Prevailing winds during the “dry” operating season are typically from the east and southeast and away from the sensitive receptor.

4.4 Noise, Vibration and Light Emissions

Atmospheric noise emissions will result from intermittent blasting, materials handling, crushing and transport. No impacts from light dispersal will occur as the operation will only be conducted during daylight hours. Noise emissions could result in impacts to site personnel, ambiance impacts to visitors at the Parry Creek Farm and native wildlife during peak noise activities.

With the closest residence 1.2km away, noise is unlikely to be a significant amenity issue except during short blasting periods and possibly during transport (engine breaking) at the entrance to the Parry Creek Road. Blasting will be undertaken at specified times during the day, avoided during periods of low overcast and unstable atmospheric conditions, and regular consultation will be maintained with the nearby tourist farm to provide timely warning of blasts.

The plant is required to operate in accordance with the *Environmental Protection (Noise) Regulations (1997), Australian Standards* and in accordance with of the of *Work Health and Safety (Mines) Regulations (2022)* Noise will arise from the normal plant and transport operations including mobile equipment reversing

alarms. Operations will comply with regulatory requirements in respect to these activities. Vibration and damage to structures was raised in initial stakeholder consultation. No evidence has been provided of impacts from vibration from current operations at the quarry site and blasting techniques will continue to be designed in conjunction with the licenced shotfirer to minimize transient blasting noise and vibration.

Fauna species with low tolerance for disturbance and residing adjacent to the operational area may be affected although it is likely they would move away from the noise source.

Given the site's remote location, and the type and scale of the quarry, the proposed operation is not expected to result in excessive levels of nuisance noise at sensitive receiving premises (Parry Creek Farm), due to prevailing wind conditions, location in a void and the noise attenuation due to distance and barrier provided by the bulk of Pivot Hill.

4.5 Surface Water Management

Although quarrying activities will only be undertaken during the dry season, surface water management has been designed to function during the monsoon season. A detailed site runoff assessment based on a 50m grid has identified areas where runoff is concentrated due to natural terrain. Site drainage is ephemeral and not directly linked with the main Parry Creek channel.

4.5.1 Potential Impacts

- Excessive clearing of vegetation and land disturbance can change run off coefficients and alter flow paths and recharge.
- Inappropriate design of site layout and haul roads and lack of operational maintenance can result in unwanted ponding, running formation damage, erosion, localised sedimentation of drainage lines and uncontrolled release from mine sumps, and
- Contamination or mixing of storm water runoff with operational waters.

4.5.2 Management Controls

- The mine void and works area will be bunded to direct clean runoff into natural flow zones away from operational areas and stockpiles.
- Works area runoff will be directed into the mine void (for reuse) or settlement ponds located west of the operational areas.
- Settlement pond will be cleaned out at regular intervals to ensure adequate capacity is available to capture contaminated runoff.
- Access roads, where required, will have verge drains linked to silt traps, and
- Monitoring and maintenance of the sediment containment infrastructure will be the responsibility of the Registered Manager.

4.6 Weed Management

Several well-known weed species including Noogoora Burr have shown themselves to be well adapted to colonisation of disturbed ground in the East Kimberley. No WONS weed species were identified during the site inspection of the proposed project infrastructure areas although a WA Declared Pest *Calotropis procera* was recorded in the Plains environment (Botanical North 2012, JBBC 2024). Several common environmental"weeds" are present in the mine environments and proliferate after rain. Operational management strategies adopted to stop weed spread include:

- Materials (i.e. soil) should not be removed or imported for reuse where weed infestations are evident without prior spraying and follow-up monitoring.
- Existing infestations in the general project area and stockpiles will be brought to the attention of the Registered Management for action.
- Progressive rehabilitation of disturbed areas, (where feasible), will be undertaken to assist in reducing weed spread by promoting competition from local native species.
- Quarry personnel are made aware of weed management issues, quarantine requirements, and equipment hygiene requirements through the Site Induction Programme, and
- Managing weed invasions so as to control spread into native vegetation – all mobile equipment will be cleaned down prior to entry to the project site and weed assessment and control will be conducted after the wet season. Quarantine requirements will be met.

Movement of vehicles in and out of the site will be during the dry season when the potential for weed spread via caked on mud is low. However, every precaution will be taken to check vehicles and equipment entering the site for cleanliness. A weed control program will be co-ordinated with the manager.

4.7 Hazardous Goods Management

Management of explosives in accordance with relevant regulations will be the contractual responsibility of a drill and blast contractor engaged for the Project. Other than diesel fuel and lubricants, no hazardous materials or wastes will be used or generated or disposed at the quarry site.

4.8 Hydrocarbon Management

No hydrocarbons will be stored on site. Major equipment servicing will be carried out in Kununurra and refuelling and lubrication on site will utilise a fuel truck. All hydrocarbon containers used at site will be removed to JAB Industries' depot in Kununurra and disposed of appropriately.

Any hydrocarbon spillages on site are expected to be small and will be managed by collection of contaminated soil and delivery to an appropriate disposal site in the region for bioremediation.

JAB Industries require that all employees are aware of the procedures for spill management.

4.9 Fire Management

There will be no requirement for the lighting of fires on the quarry site and unauthorised lighting of fires will be prohibited.

All equipment and facilities will be fitted/provided with fire extinguishers.

In case there is a need for fire management, it will be undertaken in consultation with the DBCA Kununurra Office. Firebreaks will be constructed around at-risk facilities as required, and water trucks will be available as firefighting units.

4.10 Waste Management

Since there are no permanent facilities on site, solid waste management simply requires removal each operational day of minor domestic waste. Any industrial waste from refuelling operations will be removed on the refuelling truck and returned to the proponent's workshop in Kununurra for proper disposal. Biowastes (portaloo) will be managed as part of campaign operations.

4.11 Waste Rock and Tailings

As noted above, mine rock has a commercial value will be solid. There will be no processing tailings generated. The small amounts of dry screenings produced on site will be returned to the void as part of rehabilitation or sold as cracker dust.

Past analyses have shown that the rock, which has previously been used for road construction, does not contain appreciable sulphides and therefore does not require ARD management. Risks to the environment were also considered low because the material to be quarried naturally outcrops at the surface.

4.12 Flora, Fauna and Ecosystem

The continuing quarry operations will not directly impact of any of the prime ecological values of the Parry Lagoons Nature Reserve, since the mining area is elevated and some distance above the wetland ecosystems that represent the essential conservation values of the reserve.

Potential indirect impacts through runoff from the quarry operations will be managed using drainage sumps to settle runoff sediment prior to release to the broader environment.

Impacts will be further minimised by:

- Restricting clearing to the extent required for safe operations in the short-to-medium term.
- Rehabilitating disturbed areas as soon as is practicable.
- Salvaging skeletal topsoil and cleared vegetation for use in rehabilitation – using salvaged dead vegetation to provide fauna habitats where available.
- Managing fire risks and responding promptly to site fire events, and
- Reporting the presence of feral animals to DBCA and prohibiting pets and firearms on site.

Noise and dust impacts on flora and fauna will be localised, with no lasting impacts likely after operations cease at the site – the adaptive approach to rehabilitation can reasonably be expected to allow natural conditions and significant ecosystem function, to be re-established.

4.13 Social Impacts

The social impacts associated with the proposal are seen to be minimal and overall, the successful operation of the quarrying, crushing and screening project is likely to result in the increased benefits to local service companies and suppliers, employees, Local Government, and the local communities and will result in reduced greenhouse gas emissions that would be associated with trucking in the aggregate from a more distant external source.

4.14 Heritage

No European heritage impacts have been identified.

JAB is aware of their obligations under the *Aboriginal Heritage Act (1972)* in respect to the protection of areas of known significance and will maintain dialogue with local communities.

No Registered or located Aboriginal Heritage sites are recorded for the Project area (Attachment B).

During operations, the requirements of the Aboriginal Heritage Act will be met especially in relation to the identification of sites. If a site is identified, operations will cease to allow proper investigation and assessment.

4.15 Land Use and Community

The Pivot Hill Project is an important component of the ongoing development of raw material resources in the region that will continue to provide increased benefits to the State, the Shire of Wyndham East Kimberley and the local community.

Community liaison with the local and State Government Agencies and other stakeholders is already established and will be continued to address such matters as traffic impacts, dust and noise.

4.16 Closure and Rehabilitation Management

The Australian and New Zealand Minerals and Energy Council and the Minerals Council of Australia have jointly produced a high-level framework for the development of Mine Closure Plans. The Western Australian Department of Energy Mines, Industry Regulation and Safety (DEMIRS) has published a revised *Statutory Guideline for Mine Closure Plans and Mine Closure Plan Guidance – how to prepare in accordance with the Statutory Guidelines*. The Pivot Hill SMO Closure Plan was approved by DMIRS in April 2017 and mine closure aspects arising from the ongoing development will be discussed in the Mine Closure Plan revision required in 2028. Rehabilitation of areas cleared in accordance with this Clearing Permit Application will be identified in the MCP and a rehabilitation prescription adopted in accordance with the MCP.

The MCP guidelines recommend that final mine rehabilitation and decommissioning should ensure:

- That Stakeholders have their interests considered during the mine closure process and that the process of closure occurs in an orderly cost effective and timely manner.
- That the cost of closure is adequately represented in company accounts and the community is not left with a liability.
- There is clear transparent accountability and adequate resources for the implementation of the Closure Plan.
- The establishment of a set of indicators (i.e. completion criteria) that will demonstrate the successful completion of the closure process be developed prior to plan implementation, and
- That all statutory requirements are met.

4.17 Rehabilitation Concepts

Rehabilitation is defined as the implementation of procedures resulting in the return of an area to a sustainable biological condition such that it does not require ongoing maintenance. The primary objectives for the closure and rehabilitation of the Pivot Hill site and infrastructure are outlined below. These are:

- Ensure risks to public safety are minimised and that the community do not inherit any closure liabilities and site is returned to a condition that will support current conservation land uses.
- Stable topographic conditions are established that will support, a self-sustaining indigenous vegetation community consistent with the Land System and final land use objectives.
- Minimise off site impacts by removing deleterious materials, controlling infiltration, erosion, sedimentation and the potential degradation of existing drainages.
- Employ rehabilitation methods that are technically effective and cost efficient, rely on standard and proven engineering practices that do not require ongoing maintenance to ensure performance.
- Ensure the protection and conservation during rehabilitation works of any identified elements of the cultural and conservation estate within the mining leases.

Temporary Care and Maintenance

In the event of a Temporary Quarry Closure, the transition from operations to Care and Maintenance status will be an orderly and managed process in accordance with the provisions of the approved Plan.

4.18 Assessment of the Proposal Against the DWER's 10 Clearing Principles

A risk based summary of potential impacts associated with clearing up to 5ha at the Pivot Hill Quarry site measured against the 10 Clearing Principles (EPA 1986) is outlined in Table 2.

Table 2: Assessment of the Proposal Against the DWER's 10 Clearing Principles

Clearing Principle		Comment
1	Native vegetation should not be cleared if it comprises a high level of biological diversity.	Proposal is unlikely to be at variance with this Principle The species diversity would not be considered high with a total of 50 taxa recorded from 29 families over 6.0 hectares particularly when taken in context with other Regional Surveys (JBBC 2024). Variation within the vegetation was low, with similar suites of species occurring in most vegetation types. None of the vegetation communities have been identified as being Threatened or Priority Ecological Communities (Botanical North 2012; JBBC 2024). The fauna habitats present within the Application Area are common within similar terrain types in the local region. The Application Area is not likely to support as a high level of faunal diversity as the adjacent Parry Lagoons wetlands which are known to support a rich faunal assemblage (DEC 2009). Five weed species recorded during the flora survey (JBBC 2024). Weeds have the potential to out-compete native species and reduce the biodiversity of an area. Potential impacts to biodiversity as a result of the proposed clearing may be minimised by the implementation of a weed management programme.
2	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for, the maintenance of a significant habitat for fauna indigenous to Western Australia.	Proposal is unlikely to be at variance with this Principle The vegetation communities present within the Pivot Hill Quarry survey area are unlikely to be regionally restricted based on their Land System Classification and Beard's Pre-European vegetation mapping (87 % remaining). Some of the significant fauna listed in Table 3 and further discussed in Section 4.4 may feed in the area but are unlikely to nest/ breed due to the lack of suitable habitat such as suitable trees, rocky crevices, caves or hollow logs and areas subject to regular inundation (JBBC 2024). The fauna habitats present within the Permit Application Area are common within the local region. Many of the fauna also prefer wetland or riverine habitats which are not present in the Application Area. The Northern Quoll (*Dasyurus hallucatus* - Vulnerable) has been recorded within 5 kilometres of the Application area (Department of Biodiversity, Conservation and Attractions, 2018). The Northern Quoll is known to den in hollow logs, tree hollows and rock crevices (Department of the Environment and Energy, 2018). None of these features have been observed within the Application Area (Botanical North, 2012; JBBC 2024). Whilst the Northern Quoll may use the Application Area for foraging and dispersal, the vegetation and terrain within the area is not likely to be significant habitat for this species.
3	Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora	Proposal is not at variance with this Principle No threatened flora is recorded within the survey area (Botanical North 2012; JBBC 2024) or within the broader region as determined by DBCA database search and the DCCEEW Protected Matters Search. Priority 1 species were recorded in habitats not present within the site and are unlikely to occur. One priority species – *Brachychiton tridentatus* P3 – was recorded.
4	Native vegetation should not be cleared if it compromises the whole	Proposal is not at variance with this Principle

Clearing Principle		Comment
	or part of, or is necessary for the maintenance of a threatened ecological community	The Flora and Vegetation Surveys undertaken (Botanical North 2012 and JBBC 2024) did not identify any Threatened Ecological Communities (TEC's) in or in close proximity to the Application Area.
5	Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	Proposal is not at variance with this Principle The application area is located within the Victoria Bonaparte Bioregion of the IBRA. The vegetation association is mapped as Beard 59 of which 87 % (120,695 ha) remains at both State and Bioregional level (Government of Western Australia 2016). The Application Area is not a remnant, nor does it form part of any remnants within the district. The main threats to vegetation in this region is from pastoral, agricultural activities and altered fire regimes.
6	Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland	Proposal unlikely to be at variance with this Principle The Application Area is within the Parry Lagoons Nature Reserve (42155) in the Ord River Flood Plain Ramsar listed Wetland. The wetlands support a number of threatened species and contains significant mangrove communities (Hale 2008). The Application Area is of very limited extent, located on an elevated basaltic inlier south of the floodplain and does not contain any watercourses or areas of significant inundation (Botanical North 2012; JBBC 2024). None of the vegetation communities identified during the flora and vegetation survey were described as growing in association with a watercourse or wetland. Given there are no significant riparian areas within the Application Area, the proposed clearing of 5.0 hectares will, if approved, be on a basalt ridge and is not likely to have any impact on the Ord River Floodplain. Normal site runoff manage practices would ensure sedimentation of downstream wetland areas would not be impacted.
7	Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	Proposal unlikely to be at variance with this Principle The Application Area is located within the Parry Lagoons Nature Reserve (42155). The Reserve contains habitat that supports critical life stages of annually migrating bird species and provides breeding habitat for 16 species of wetland dependent birds (Department of Environment and Conservation, 2012). It also includes a variety of important habitats such as freshwater springs, components of rainforest, grasslands, woodland, rugged sandstone and floodplain, which support a rich faunal assemblage (Department of Environment and Conservation, 2012). The Application Area does not contain any wetlands or watercourses and based on Survey assessments (Botanical North 2012 and JBBC 2024), is not likely to represent significant fauna habitat. Existing areas of disturbance from previous quarrying activities are documented. The spread or introduction of weeds into the Nature Reserve is a risk from both recreational and mining activities in the area. There were five species of weed recorded during the recent flora surveys (JBBC 2024). Care needs to be taken to ensure that clearing activities do not increase the spread of weeds within the Nature Reserve. Potential impacts to biodiversity as a result of the proposed clearing may be minimised by the ongoing implementation of the Weed Management Programme. The proposed clearing of an additional 5.0 hectares is not likely to impact on any significant environmental values of the Parry Lagoon Nature Reserve. Given the Application Area has been previously subject to small scale historic and recent

Clearing Principle		Comment
		quarrying activities, the proposed clearing associated with this Application is not likely to impact on the future conservation use of the Nature Reserve.
8	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	Proposal is unlikely to be at variance with this principle. The Application Area lies within the Frayne Land System – Unit 2, described as undulating to low hilly basalt country with predominantly skeletal red soils. Most elements of this Land System have a low susceptibility to erosion (Payne and Schoknecht, 2011). The area to be cleared is 5.0ha and is confined to the basalt hill from which there will be low natural sediment losses and minor changes to runoff volumes. If a buffer area is maintained at the bottom of the slope on the northern side (VTs 1 & 2) this will provide some protection from any increase in runoff and sediment load.
9	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water	Proposal is unlikely to be at variance with this principle There are no permanent watercourses or wetlands within the area identified for clearing (JBBC 2024). The Application Area catchment is limited in area and located on top of a hill within the greater Ord River Floodplain. The proposed clearing of 5.0 hectares is not likely to have a significant impact on the surface water quality within local watercourses and wetland areas. There are no Public Drinking Water Source Areas or borefields within or in close proximity to the Application Area. The surrounding area remains largely uncleared and the proposed clearing of 5.0 hectares is unlikely to cause deterioration in the quality of ground water. The material being mined is naturally outcropping basalt which is unlikely to alter the geochemistry of runoff waters.
10	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	Proposal is unlikely to be at variance with this principle The climate of the region is dry hot tropical, semi-arid, with summer rainfall (DEC 2012). The Application Area catchment is small and is located on the elevated slopes of Pivot Hill and there are no permanent water courses or waterbodies within the Application Area. The surrounding habitat is wetlands within the greater Ord River Floodplain which is subject to inundation following summer rainfall. The proposed clearing of 5.0 hectares is not likely to cause an increase in the incidence or intensity of flooding in the area.

5. REFERENCES, DEFINITIONS & ACRONYMS

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6. DEFINITIONS

Application Area	Area of proposed project native vegetation clearing including buffers zones as listed in the application form.
Care and maintenance	All mining operations suspended, site being maintained and monitored. Resident caretaker – considered Managed Care and Maintenance.
Disturbed	Area where vegetation has been cleared and/or topsoil (surface cover) removed.
Disturbance type	A feature created during mining or exploration activity, e.g. waste landforms, haul roads, access roads, ROM, crusher site, borrow pits, product stockpiles.
Investigation Area.	Area of survey surrounding proposed development for baseline studies also called Environmental Survey Area - ESA.
Life of mine	Expected duration of mining and processing operations.
Orthophotography	Use of aerial photography to measure areas of disturbance.
Pits	All open excavations including active basalt, gravel, sand, clay, bauxite and salt-pan extraction areas.
Preliminary earthworks	Reshaping, capping, water/wind erosion control, rock armouring.
Rehabilitated	Areas are safe, have demonstrated stability under representative climatic conditions, non-polluting and support a functioning, self-sustaining ecosystem comprising local native species.
Relinquished	Agreed closure criteria met, government “sign-off” achieved, all obligations under the Mining Act removed and bonds retired.
Reporting period	Twelve-month period from reporting month as specified in tenement conditions e.g. if reporting month is June, reporting period would be June – May.
Revegetation	Establishment of self-sustaining vegetation cover after earthworks have been completed.
Tenement	Land tenure granted under the *Mining Act 1978* e.g. Mining Lease Exploration Licence, Prospecting Licence, Miscellaneous Licence, General Purpose Lease.
Waste landforms	Includes all mullock and waste rock disposal areas.

7. ACRONYMS

AMD	Acid Mine Drainage
BOM	Bureau of Meteorology
CPA	Clearing Permit Application
DBCA	Department of Biodiversity Conservations and Attractions
DWER	Department of Water and Environmental Regulation
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety
DOW	Department of Water now incorporated in DWER
Ec	Electrical Conductivity
EPA	Environmental Protection Authority
ESA	Environmental Survey Area
GWL	5C Groundwater Well Licence
IA	Investigation Area
JBBC	Jenny Borger Botonical Consulting
LJE	Leanne James Environmental
M	Mining Lease
mAHD	Metres above the Australian Height Datum
MCM	Managed Care and Maintenance
PEC	Priority Ecological Community
PDA	Project Development Area
PWS	Parks and Wildlife Service
ROM	Run of Mine
SWEK	Shire of Wyndham -East Kimberley
TDS	Total Dissolved Solids
TEC	Threatened Ecological Community
WA	Western Australia
WCPL	Woolard Consulting Pty Ltd
WRL	Waste Rock Landform

Units of Measurement

A	per annum
dS/m	deci Siemens per meter
ha	hectare
kL	kilolitre
m	metre
mg/L	milligrams per litre
Mt	million ton

Attachment A: Detailed Vegetation and Flora Survey and Desktop Fauna Survey – Pivot Hill Hard Rock Quarry – M80/637 (JBBC 2024)

Detailed vegetation and flora survey and desktop fauna survey

Pivot Hill Hard Rock Quarry – M80/637

2024

For JAB Management Pty Ltd

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Contents

Executive Summary

JAB Management Pty Ltd (JAB), based in Kununurra, have previously mined basalt from Pivot Hill within Tenement M80/637 to supply crushed rock for road sealing aggregate. The original Purpose Permit 7924/1 expired in March 2023. A detailed vegetation and flora assessment and basic (desktop) fauna assessment are required to support a Clearing Permit application to recommence mining activities. Pivot Hill is located 21 km south of Wyndham and 65 km north west of Kununurra with access from the Great Northern Highway via Parry Creek Road and Old Halls Creek Road. The Pivot Hill hard rock facility is situated within The Parry Lagoons Nature Reserve (42155) however the active mining area is of limited scale and is situated on elevated terrain some distance from the wetland. The survey was undertaken from 30th April to 1st May 2024.

Pivot Hill was formed from a thick, homogeneous, single fresh basalt flow and lies within the Parry's Lagoon Nature Reserve which forms part of the Ord River floodplains. Pivot Hill is elevated within the floodplain, with wetlands to the north, west and east. Pivot Hill is located within the Frayne Land System and Pre-European vegetation community 59 – Victoria Bonaparte which is described in as: Grasslands, high grass savanna sparse tree; bauhinia & coolabah over Mitchell, blue & tall upland grasses.

The results from the survey recorded:

- Fifty native species were recorded from 29 families and 46 genera with the best represented families being Poaceae (10 – 8 native and 2 introduced); Fabaceae (7 – 6 native and 1 introduced) and Amaranthaceae (4 native species).
- Five weeds were recorded including *Calotropis procera** (Calotrope) – a declared weed.
- One priority species – *Brachychiton tridentatus* P3 – was recorded.
- Four vegetation types (VT) were described from the current survey with an additional type mapped from past work (Botanical North 2012) (Figure 3-1). Two types were dominant (VTs 1 and 3) within the proposed disturbance areas. Dominant upper stratum species included *Adansonia gregorii, Lysiphyllum cunninghamii* and *Corymbia confertiflora*. The understorey was mostly dominated by grasses.
- The vegetation types are not likely to be restricted. Most conservation significant flora recorded in the broader area are found in wetland habitats which are not present within the survey area.
- The site is not likely to provide critical habitat for threatened fauna

1. Introduction

1.1 Background

JAB Management Pty Ltd (JAB), based in Kununurra, have previously mined basalt from Pivot Hill within Tenement M80/637 to supply crushed rock for road sealing aggregate. The original Purpose Permit 7924/1 expired in March 2023. A detailed vegetation and flora assessment and basic (desktop) fauna assessment are required to support a Clearing Permit application to recommence mining activities. Pivot Hill is located 21 km south of Wyndham and 65 km north west of Kununurra with access from the Great Northern Highway via Parry Creek Road and Old Halls Creek Road. The Pivot Hill hard rock facility is situated within The Parry Lagoons Nature Reserve (42155) however the active mining area is of limited scale and is situated on elevated terrain some distance from the wetland. The survey was undertaken from 30th April to 1st May 2024.

Scope of Works

JAB engaged Jenny Borger Botanical Consulting (JBBC) to undertake a detailed vegetation and flora survey of the near mine Pivot Hill environs (50 m development envelop buffer) and a desktop fauna assessment. The flora and vegetation assessment must be in accordance with the Environmental Protection Authority's (EPA's) Technical Guidance (EPA 2016). The survey included two proposed disturbance areas, one (4.19 ha) to the north and east of the current mining area, and one (1.38 ha) located south of the works area on the plain within an 18.148 ha study area (Figure 2).

As part of this scope of work, the following tasks are required:

- Desktop review of relevant background information (Botanical North 2012) pertaining to the site and surrounds, including database searches for threatened flora and fauna species and ecological communities.
- Compilation of a comprehensive list of flora species recorded as part of the field survey.
- Undertake a DCCEEW (EPBC) Protected Matters Search
- Mapping of plant communities, vegetation condition and conservation significant flora and vegetation within the proposed disturbance envelopes
- Identify weeds species present.
- Identification of potential habitat for conservation significant flora and vegetation and an assessment of likelihood of occurrence.
- Documentation of the desktop assessment, survey methodology and results into a report that addresses the 10 clearing permit principles.
- Provide the Index of Biodiversity Surveys for Assessment (IBSA) data package in GDA2020

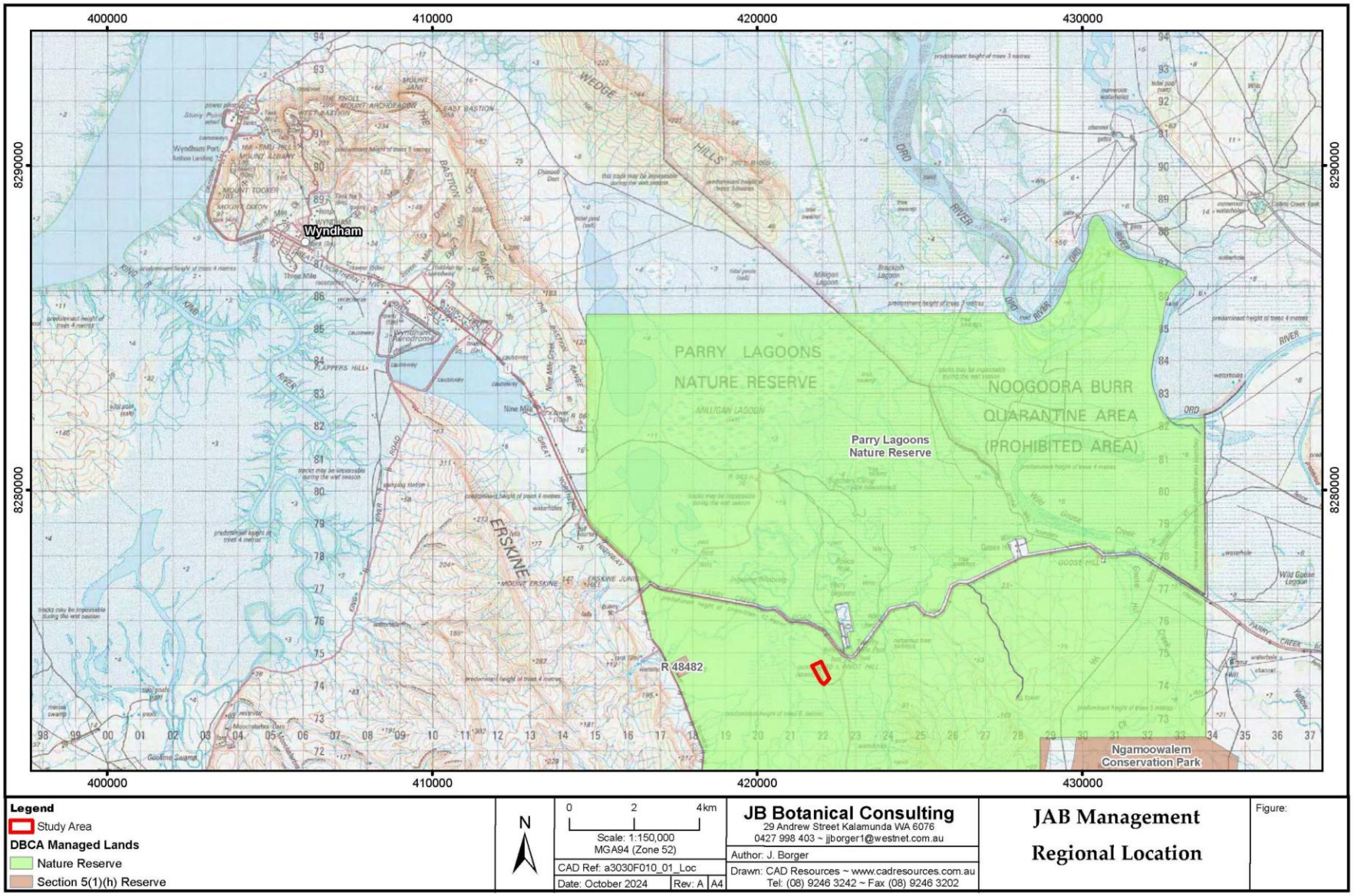


Figure 1:Regional location – Pivot Hill is located near the northern coast of Western Australia, 21 km south east of Wyndham with access from the Great Northern Highway

Figure 2: Pivot Hill Hard Rock Quarry Study Area with proposed disturbance envelopes

1.2 Environmental Setting

1.2.1 Climate

The Pivot Hill area has a semi-arid climate with distinct wet and dry seasons. The closest Bureau of Meteorology recording station for rainfall and temperature data are located at Kununurra (BoM 2056; opened 1971 and Wyndham (BoM 1006, opened 1951). The rainfall patterns are very similar for both sites with highest falls recorded from January to March and the driest period from May to October. Kununurra has a mean annual rainfall of 839.3 mm and Wyndham receives 833.5 mm. Both locations recorded slightly below average rainfall in 2023 followed by above average falls in January and March 2024.

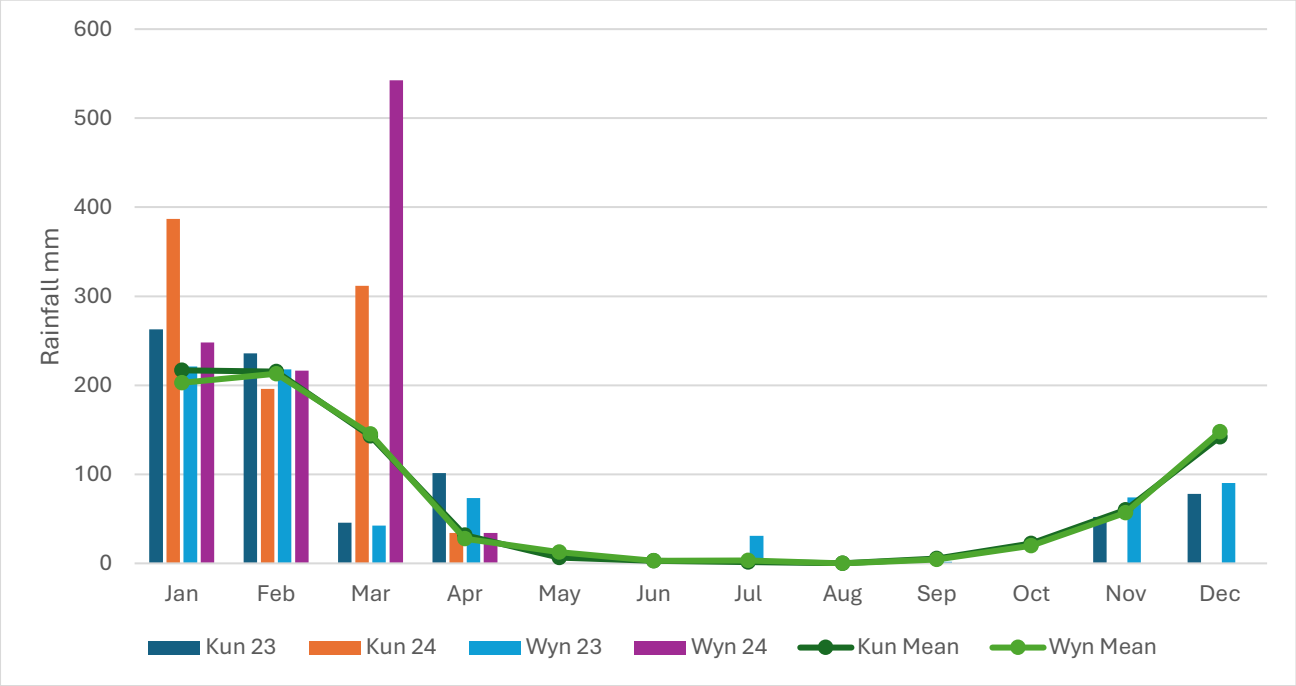


Figure 3: Monthly rainfall recorded at Kununurra (Kun) and Wyndham (Wyn) with mean monthly rainfall

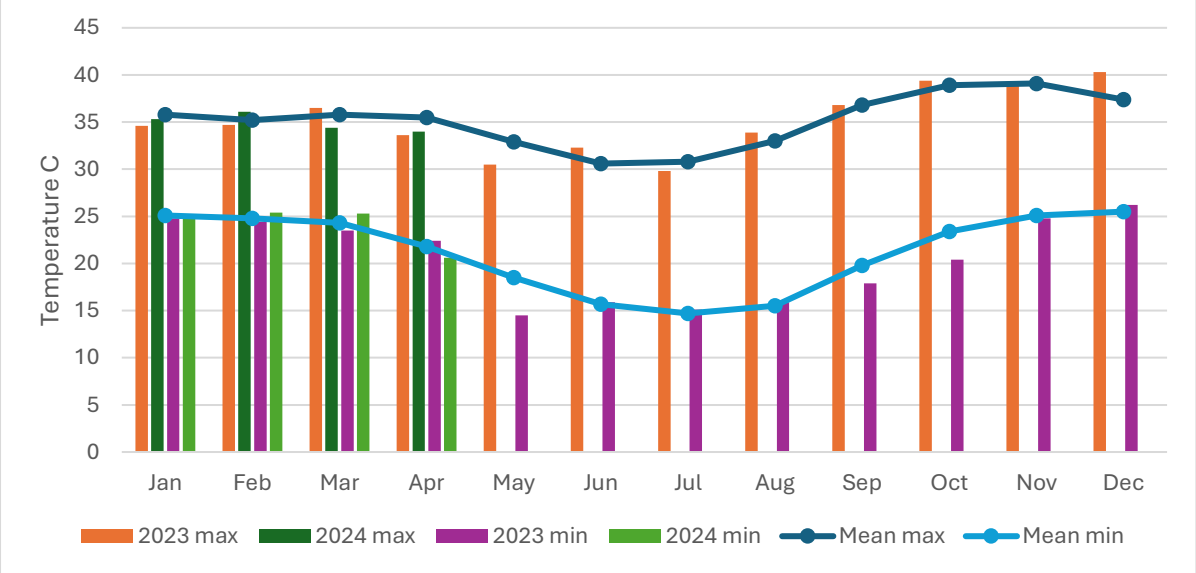


Figure 4: Mean monthly maximum and minimum temperatures with long term means for Kununurra

The mean annual maximum temperature for Kununurra is 35.1 °C (also recorded for 2023) and the mean annual minimum temperature is 21.1 °C. Minimum temperatures were slightly cooler in 2023 for May, September and October. Maximum temperatures were slightly cooler than average in March and April 2024, and minimum temperature was slightly warmer in March 2024.

1.2.2 Landform and hydrology

Pivot Hill was formed from a thick, homogeneous, single fresh basalt flow (Botanical North 2012) and lies within the Parry's Lagoon Nature Reserve which forms part of the Ord River floodplains. Pivot Hill is elevated within the floodplain, with wetlands to the north, west and east.

Land System mapping was undertaken by the Department of Agriculture and Food Western Australia (DAFWA) from a combination of historical surveys (e.g. CSIRO in the 1940s) complemented by more recent surveys from 2003 – 2011. Pivot Hill is located within the Frayne Land System (Figure 5) which is described as undulating plains with eucalypt woodlands and mixed grasses on volcanic structural benches and coastal and inland erosional plains. The Land System is divided into six units. The landform at Pivot Hill would fit best within Unit 2 – moderate to gentle slopes with brown loam to brown skeletal clay soils supporting bloodwood-southern box sparse woodland or silver leaved box sparse low woodland with Tippera tall grass (*Themeda triandra, Sehima nervosum, Chrysopogon fallax*).

1.2.3 Regional Vegetation

The Interim Biogeographic Regionalisation for Australia (IBRA) is a biogeographic regionalisation of Australia facilitated by the Australian Government's Department of Climate Change, Energy, the Environment and Water (Thackway and Creswell 2017). It is a landscape-based approach to classifying the land surface, including attributes of climate, geomorphology, landform, lithology and characteristics of fauna and flora. Pivot Hill is located within the Victoria Bonaparte IBRA region and Keep sub IBRA region. Pre-European Vegetation (PEV) mapping based on Beard's surveys places the survey area within 1 vegetation association (VA) 59 – Victoria Bonaparte (Figure 6) (DBCA 2019) which is described in as: Grasslands, high grass savanna sparse tree; bauhinia & coolabah over Mitchell, blue & tall upland grasses. The current extent is presented in Table 1.

Table 1: Pre-European vegetation extent

VA		Description	Zone	Pre-European extent (ha)	Current extent (ha)	% remaining	% current extent in all DBCA land
59		Grasslands, high grass savanna sparse tree; bauhinia & coolabah over Mitchell, blue & tall upland grasses.	Victoria Bonaparte IBRA region	138,636	120,695	87.06	11.9
			Keep IBRA subregion	138,636	120,695	87.06	11.9
			Shire of Wyndham-East Kimberley	139,155	121,178	87.08	12.16

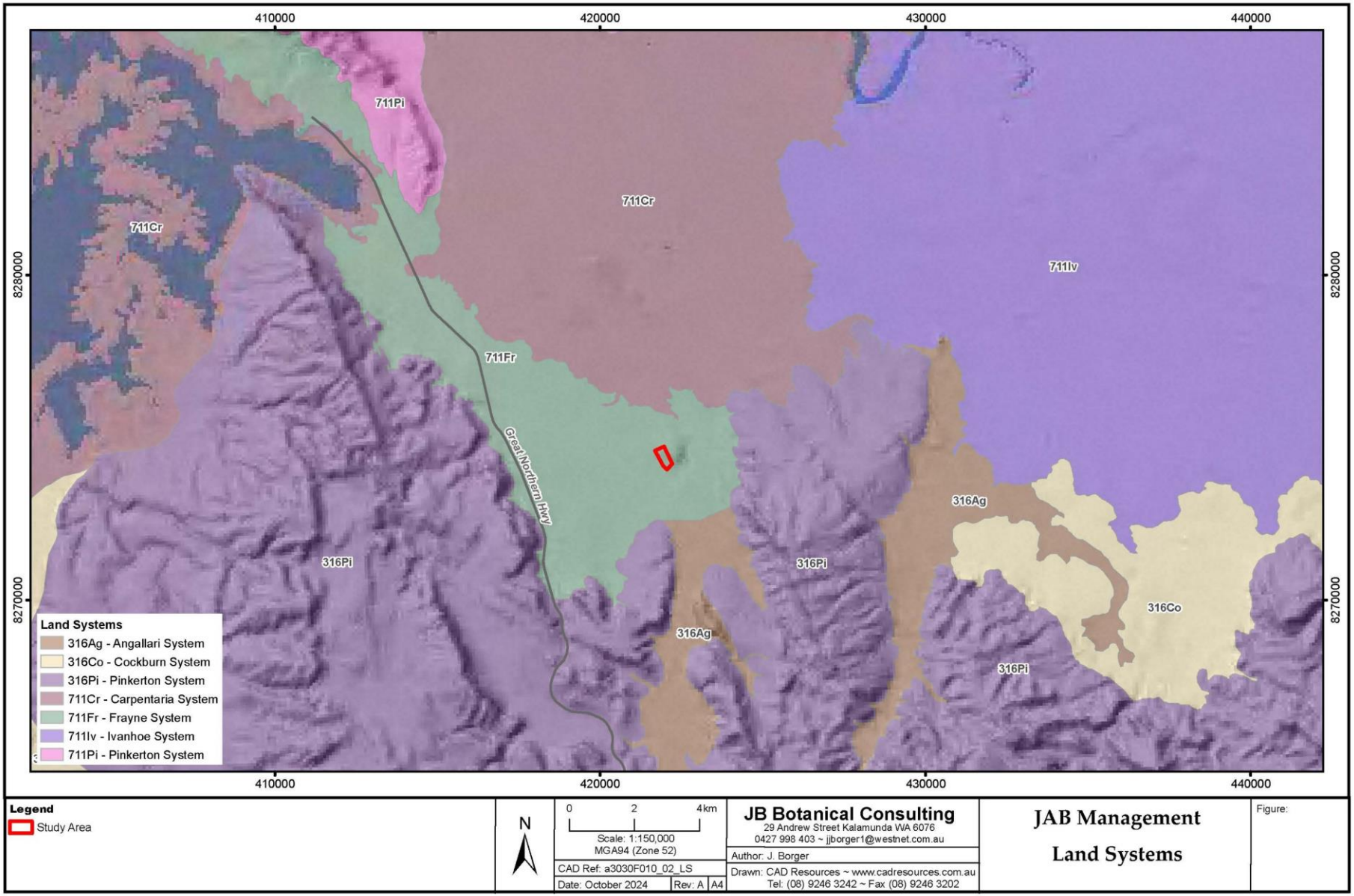


*Figure 5: **Land Systems of the Wyndham area. Pivot Hill is located within the Frayne System.***

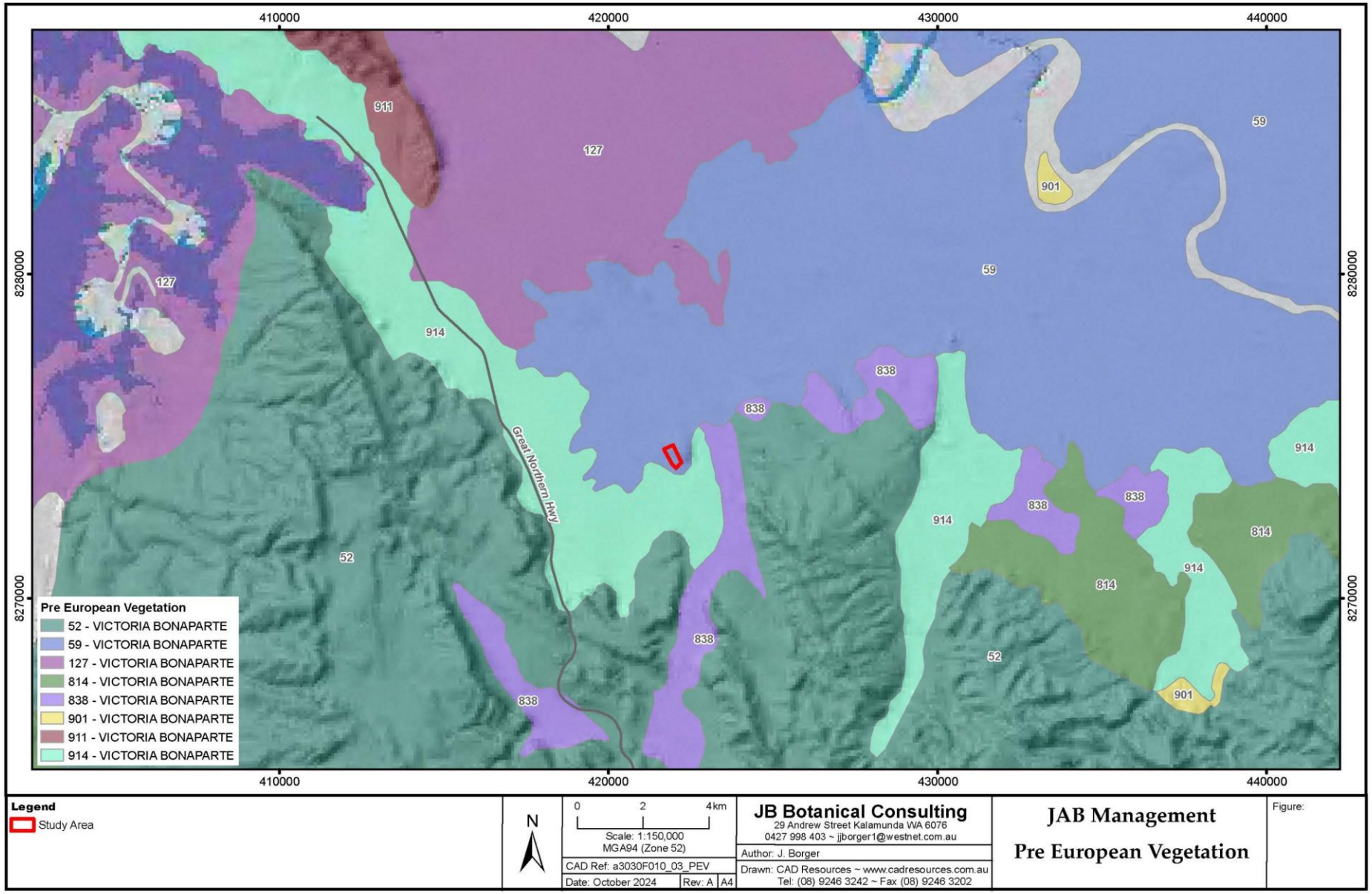


Figure 6: Pre-European vegetation mapping of the Pivot Hill area. Pivot Hill is located within Victoria Bonaparte – 59.

1.2.4 Threatened and Priority Ecological Communities

An ecological community DBCA database search result (02-0324EC; DBCA 2024) indicates two priority ecological communities (PEC) are mapped as occurring in the region with Kimberley PEC No. 30 Vegetation Association 838 – Priority 3 – adjacent to Pivot Hill (Figure 7). This is described as: Grasslands, high grass savanna woodland; ghost gum and bloodwood (*Eucalyptus polycarpa* now *Corymbia polycarpa*) over spinifex and tall upland grass. *Corymbia polycarpa*, which is recorded on sandy soils over sandstone, laterite or quartzite, was not recorded within the survey area and the PEC is highly unlikely to be present (DBCA 2023).

An EPBC protected matters (EPBC PM) database search (DCCEEW 2024) records no threatened ecological communities in the feature or buffer area. The nationally important wetland – Parry Floodplain – is recorded as being present in the study area; however, the site is located above the floodplain and impacts from the Project would be insignificant.

1.2.5 Conservation Significant Flora

The results of database searches (DBCA 17-0324NM; EPBC PM DCCEEW 2024) recorded the following flora (Table 2; Figure 8) in the Pivot Hill region. No records are located within the study area. No threatened flora was recorded in the EPBC PM database search. The likelihood of occurrence within the study area is rated as high (H), moderate (M), low (L), not likely (N). A previous survey of the Pivot Hill site (Botanical North 2012) recorded *Brachychiton tridentatus* P3 east of the area. Woodman Environmental undertook surveys of Mantinea and Carlton Plains area located east of the Parry Lagoons NR which included some similar landforms.

Table 2: Conservation Significant Flora recorded in the Pivot Hill area with likelihood of occurrence (LO)

Taxon	Code		LO
Brachychiton incanus	3	Tree 4 – 6 (-15) m high; sandy soils over sandstone or quartzite; rocky slopes, scarps and ridges	L
Brachychiton tridentatus	3	Tree to 6 m high; recorded on rocky hills and ridges in sand/ sandstone (FloraBase 1998-). Previously recorded near Pivot Hill on basalt.	H
Brachychiton tuberculatus	3	Shrub or tree, 2 – 7 m high; red or yellow sand; undulating plains. Several records closer to Kununurra	L
Croton arnhemicus	1	Shrub or small tree; variety of habitats associated with sandstone	N
Echinochloa kimberleyensis	1	Tufted or single-stemmed annual, grass-like or herb; black soils. Swamps.	N
Gomphrena longistyla	2	Lax, open annual herb to 30 cm high; bright pink ovoid to cylindrical spikes to 12 mm wide; supratidal flats near Kununurra and Wyndham populations near wetlands and seasonal creeks.	L
Goodenia brachypoda	1	Prostrate herb, red sandy loams on plains	L
Goodenia malvina	1	Erect of spreading to prostrate annual (ephemeral) herb to 0.8 m; cracking black clay in seasonally wet areas	N
Nymphaea immutabilis	2	Floating-leaved aquatic rhizomatous annual or perennial herb; permanent or ephemeral waterholes	N
Utricularia aurea	2	Submerged, aquatic perennial herb; river edges	N
Utricularia stellaris	1	Floating aquatic perennial herb; swamps, lagoons	N

Conservation codes are described in Appendix 2.

1.2.6 Conservation significant fauna

The results of a DBCA CSF database search recorded 52 species including 40 birds, 7 mammals, 4 reptiles and 1 invertebrate presented in Table 3. Records of fauna near the sites are presented in Figure 9. Conservation codes are described in Appendix 2. Many of the birds are migratory and associated with wetlands. Threatened species are highlighted. Threatened fauna (excluding marine species) recorded in the EPBC Act Protected Matters Report Feature area (F; 5 km) or Buffer (B) zone. (NL – not listed)

Table 3: Conservation significant fauna in the Wyndham – Kununurra area

Species	Common Name	Class	DBCA Code	DBCA Search	EPBC Status
Actitis hypoleucos	common sandpiper	BIRD	MI	1	
Apus pacificus	fork-tailed swift	BIRD	MI	1	
Botaurus poiciloptilus	Australasian bittern	BIRD	EN	1	
Calidris acuminata	sharp-tailed sandpiper	BIRD	MI	1	F; VU
Calidris canutus	Red Knot	BIRD	EN	NL	B; VU
Calidris ferruginea	curlew sandpiper	BIRD	CR	1	F; CR
Calidris ruficollis	red-necked stint	BIRD	MI	1	
Calidris subminuta	long-toed stint	BIRD	MI	1	
Charadrius leschenaultii	greater sand plover	BIRD	VU	1	F
Charadrius veredus	oriental plover	BIRD	MI	1	
Chlidonias leucopterus	white-winged black tern	BIRD	MI	1	
Chloebia gouldiae	Gouldian finch	BIRD	P4	1	F; EN
Cuculus optatus	oriental cuckoo	BIRD	MI	1	
Elanus scriptus	letter-winged kite	BIRD	P4	1	
Erythrotriorchis radiatus	red goshawk	BIRD	VU	1	F, EN
Falco hypoleucos	grey falcon	BIRD	VU	1	F, VU
Falco peregrinus	peregrine falcon	BIRD	OS	1	
Falcunculus frontatus whitei	crested shrike-tit (northern)	BIRD	P3	1	F, VU
Gallinago megala	Swinhoe's snipe	BIRD	MI	1	
Gelochelidon nilotica	gull-billed tern	BIRD	MI	1	
Glareola maldivarum	oriental pratincole	BIRD	MI	1	
Hirundo rustica	barn swallow	BIRD	MI	1	
Hydroprogne caspia	Caspian tern	BIRD	MI	1	
Ixobrychus dubius	Australian little bittern	BIRD	P4	1	
Limosa lapponica	bar-tailed godwit	BIRD	MI	1	F, EN
Limosa limosa	black-tailed godwit	BIRD	MI	1	F, EN
Malurus coronatus coronatus	purple-crowned fairy-wren (western)	BIRD	EN	1	B, EN
Numenius madagascariensis	eastern curlew	BIRD	CR	1	F, CR
Numenius minutus	little curlew	BIRD	MI	1	
Numenius phaeopus	whimbrel	BIRD	MI	1	
Pezoporus occidentalis	Night parrot	BIRD	CR	NL	F, EN
Pandion haliaetus	osprey	BIRD	MI	1	
Philomachus pugnax	ruff	BIRD	MI	1	

Species	Common Name	Class	DBCA Code	DBCA Search	EPBC Status
Plegadis falcinellus	glossy ibis	BIRD	MI	1	
Pluvialis fulva	Pacific golden plover	BIRD	MI	1	
Rostratula australis	Australian painted snipe	BIRD	EN	1	F, EN
Sternula albifrons	little tern	BIRD	MI	1	
Tringa brevipes	grey-tailed tattler	BIRD	MI & P4	1	
Tringa glareola	wood sandpiper	BIRD	MI	1	
Tringa nebularia	common greenshank	BIRD	MI	1	F, EN
Tringa stagnatilis	marsh sandpiper	BIRD	MI	1	
Tyto novaehollandiae kimberli	Masked Owl	Bird	P1		F, VU
Xenus cinereus	Terek sandpiper	BIRD	MI	1	
Prymnbriareus nimberlinus	Nimberline camaenid land snail	INVERTEBRATE	P3	1	
Dasyurus hallucatus	northern quoll	MAMMAL	EN	1	F, EN
Hipposideros stenotis	northern leaf-nosed bat	MAMMAL	P2	1	
Hydromys chrysogaster	water-rat, rakali	MAMMAL	P4	1	
Leggadina lakedownensis	northern short-tailed mouse	MAMMAL	P4	1	
Macroderma gigas	ghost bat	MAMMAL	VU	1	F, VU
Rhinonicteris aurantia	orange leaf-nosed bat	MAMMAL	P4	1	
Wyulda squamicaudata	scaly-tailed possum	MAMMAL	P4	1	
Chelodina kuchlingi	Kuchlings Snake-necked Turtle	REPTILE	CR	1	
Chelonia mydas	green turtle	REPTILE	VU	1	
Crocodylus johnstoni	Australian freshwater crocodile	REPTILE	OS	1	
Crocodylus porosus	saltwater crocodile	REPTILE	MI	1	
Tiliqua scincoides intermedia	Northern blue tongue skink	REPTILE	-	NL	F, CR

1.2.7 Conservation Estate

The Pivot Hill study area is located within the Parry Lagoons Nature Reserve.

1.2.8 Previous vegetation surveys in the Pivot Hill area

Botanical North (2012) undertook a survey of the broader Pivot Hill area in 2010 followed up by a wet season survey in 2012 (16 ha). A total of 100 species, from 38 families were recorded within the tenement and along the access road verge. Fabaceae (Pea family) and Poaceae (grasses) were the co-dominant families located within the site, each with 15 species. Malvaceae (Mallow) was the next most prominent family, with seven species. Nine introduced species were recorded of which two are currently listed as native species. Four vegetation communities were identified during the survey comprising Open Boab Woodland (Hillcrest), Open Boab Woodland (Hillslope), Open Woodland (Footslope) and Very Open Woodland (Plain) which are further described in Table 4.

*Table 4: **Vegetation communities (VC) described by Botanical North in the Pivot Hill area (BN 2012)***

VC	Description
1	Open woodland of Adansonia gregorii and Terminalia platyptera over Cochlospermum fraseri and Terminalia canescens over Sehima nervosum and Eriachne obtusa on hillcrests
2	Open Woodland of Adansonia gregorii, Eucalyptus confertiflora and Terminalia platyptera Cochlospermum fraseri and Hakea arborescens over mixed grassland of Sehima nervosum and Heteropogon contortus on hill slopes
3	Open Woodland of Adansonia gregorii, Bauhinia cunninghamii and Eucalyptus confertiflora over Flueggea virosa over grassland of Heteropogon contortus and Sehima nervosum on footslopes
4	Very Open Woodland of Adansonia gregorii and Bauhinia cunninghamii over grassland of Heteropogon contortus and Chloris barbata on plains

The current name for *Bauhinia cunninghamii* is *Lysiphyllum cunninghamii*.

Woodman Environmental Consulting (WEC 2016) undertook surveys within the Mantinea Plain (south of the Lower Ord River) and the Carlton Plain (north of the Lower Ord River) and located between the townships of Wyndham and Kununurra. The Study area covered a total of 24 604 ha, of which 9 428 ha is located within the Mantinea Plain, and 15 176 ha within the Carlton Plain. A total of 200 discrete native vascular flora taxa were recorded within the Study Area, representing 42 families and 112 genera. The most well represented families were Poaceae (46 taxa), Myrtaceae (22 taxa), Fabaceae (20 taxa) and Malvaceae (17 taxa). 35 vegetation types were described with the most relevant based on previous Pivot Hill survey and are described in Table 5.

*Table 5: **Vegetation types (VT)described for the Mantinea Plain and Carlton Plain which are most likely to be similar to the Pivot Hill survey area (WEC 2016).***

VT	Description
2	Low open woodland of Adansonia gregorii and Bauhinia cunninghamii over tall isolated clumps of shrubs of Carissa lanceolata, Ehretia saligna var. saligna and Terminalia canescens over low to mid grassland of mixed species including Chrysopogon fallax, Cynodon convergens, Eriachne ?sulcata and Themeda triandra over low isolated clumps of forbs of Corchorus aestuans and Heliotropium euodes on gentle slopes of low hillocks on grey-brown clay loam, with surface stones.
10	Low open woodland of Terminalia platyptera over mid isolated shrubs of Bauhinia cunninghamii and Carissa lanceolata over mid closed grassland of Aristida holathera var. holathera and Sorghum? stipoideum on low hillocks on brown sandy clay, with surface stones.
14	Mid woodland of Adansonia gregorii, Bauhinia cunninghamii and Terminalia spp. over tall isolated clumps of shrubs of Flueggea virosa subsp. melanthesoides over tall closed grassland of mixed species including Heteropogon contortus, Chrysopogon fallax, Dichanthium fecundum and Panicum decompositum on flats, in drainage lines and on adjacent floodplains on brown-grey sandy to loamy clay and clay.
29	Low open woodland of Bauhinia cunninghamii, Terminalia platyptera and Grevillea striata over mid isolated clumps of shrubs of Carissa lanceolata over low grassland of mixed species including Aristida holathera var. holathera, Eriachne obtusa and Sorghum ?stipoideum with Heliotropium euodes on floodplains to outwash areas on light brown clay.
32	Low open woodland of mixed Adansonia gregorii, Corymbia greeniana, Corymbia confertiflora and Gyrocarpus americanus subsp. pachyphyllus over tall open shrubland including Ficus aculeata var. indecora and Flueggea virosa subsp. melanthesoides over low shrubland of *Hyptis suaveolens over mid open grassland to grassland dominated by Heteropogon contortus on plains on brown sandy to loamy clay.
35	Low woodland of mixed species including Adansonia gregorii, Bauhinia cunninghamii and Corymbia confertiflora over tall mixed grassland dominated by Chrysopogon fallax sometimes with Triodia bitextura on plains to low hills on brown clay.

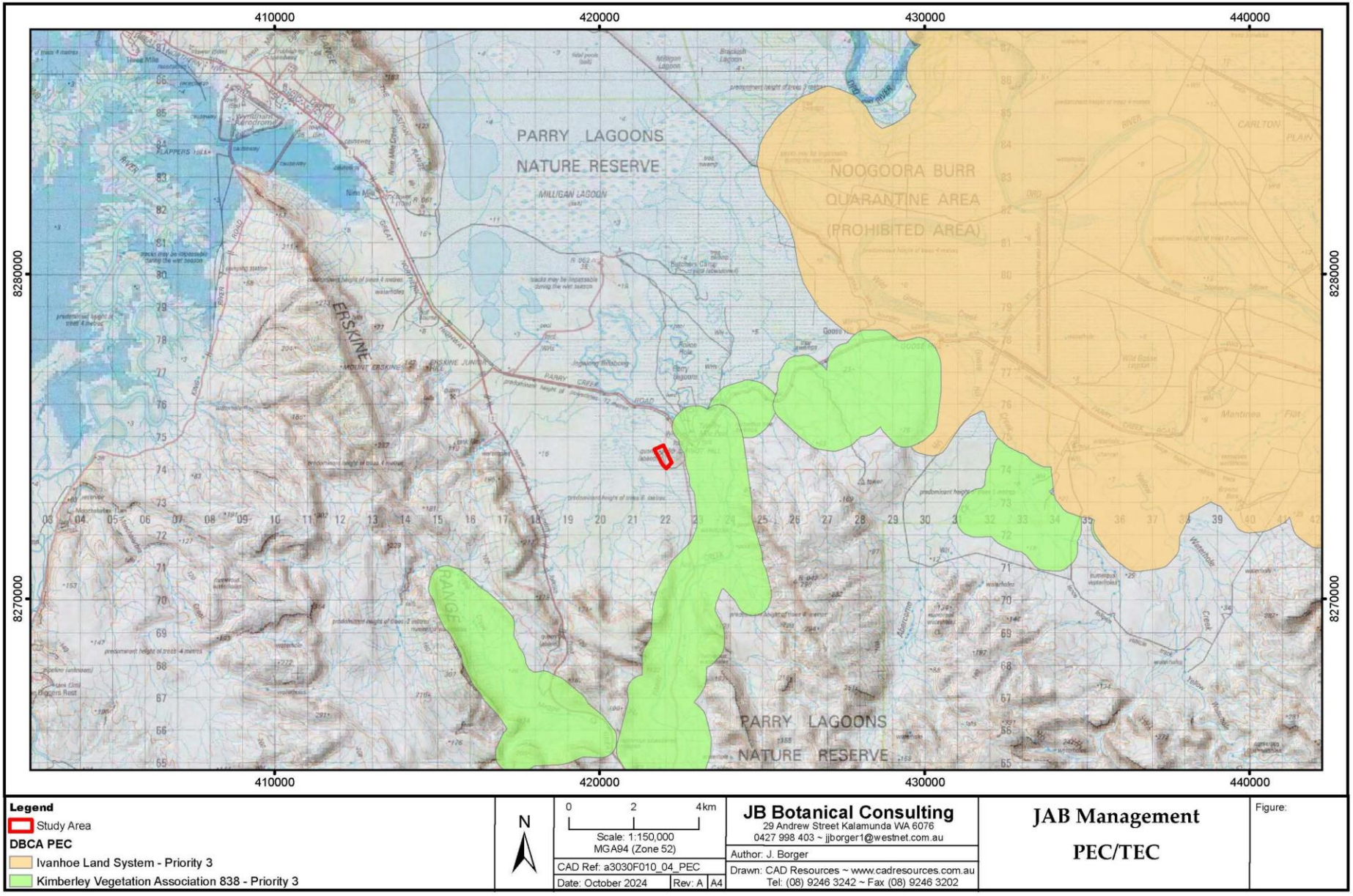


*Figure 7: **Priority Ecological Communities in the Pivot Hill area***

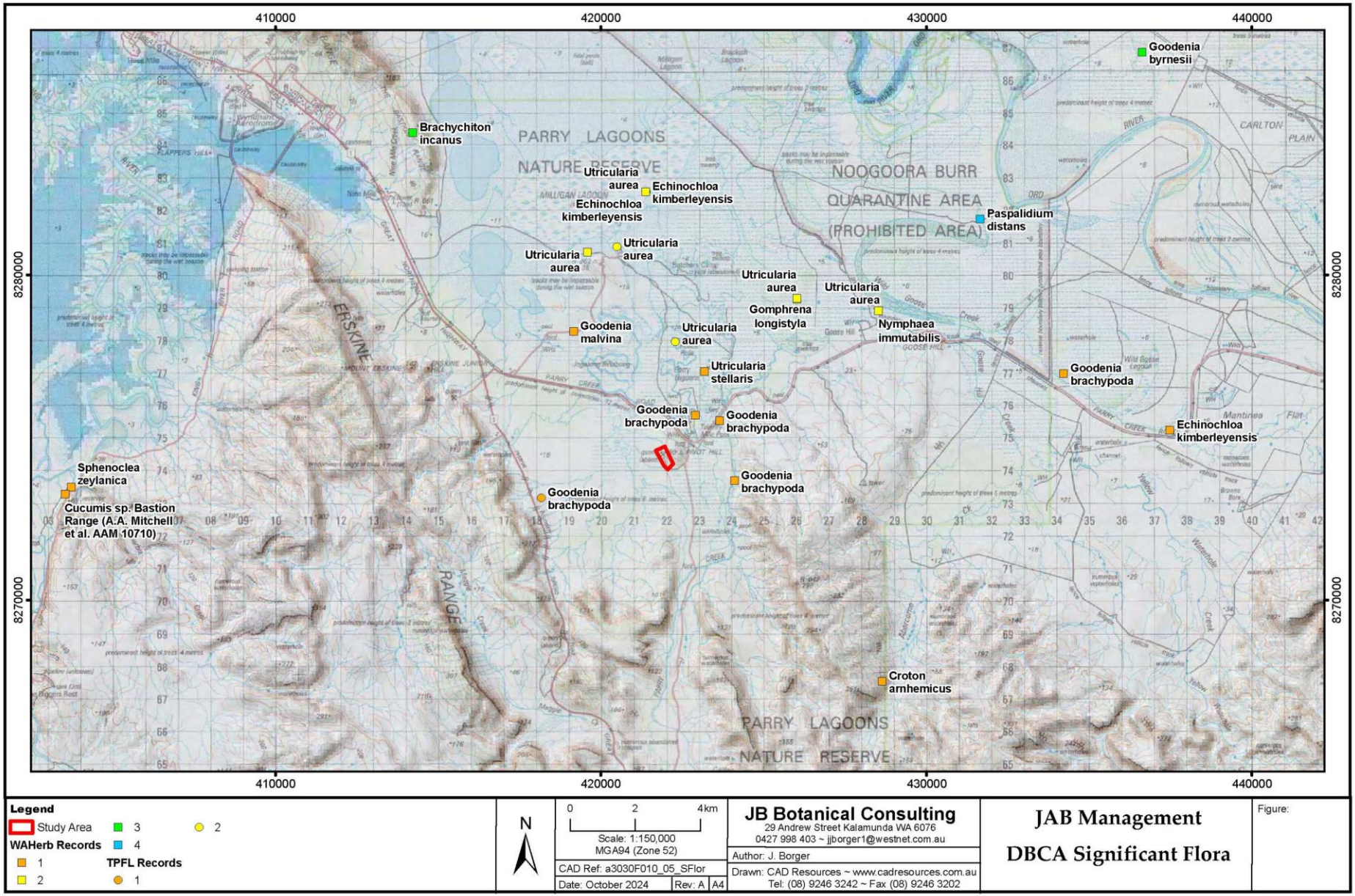


*Figure 8: **Conservation significant flora recorded in DBCA database searches. One priority species – Goodenia brachypoda P1 was recorded in adjacent areas.***

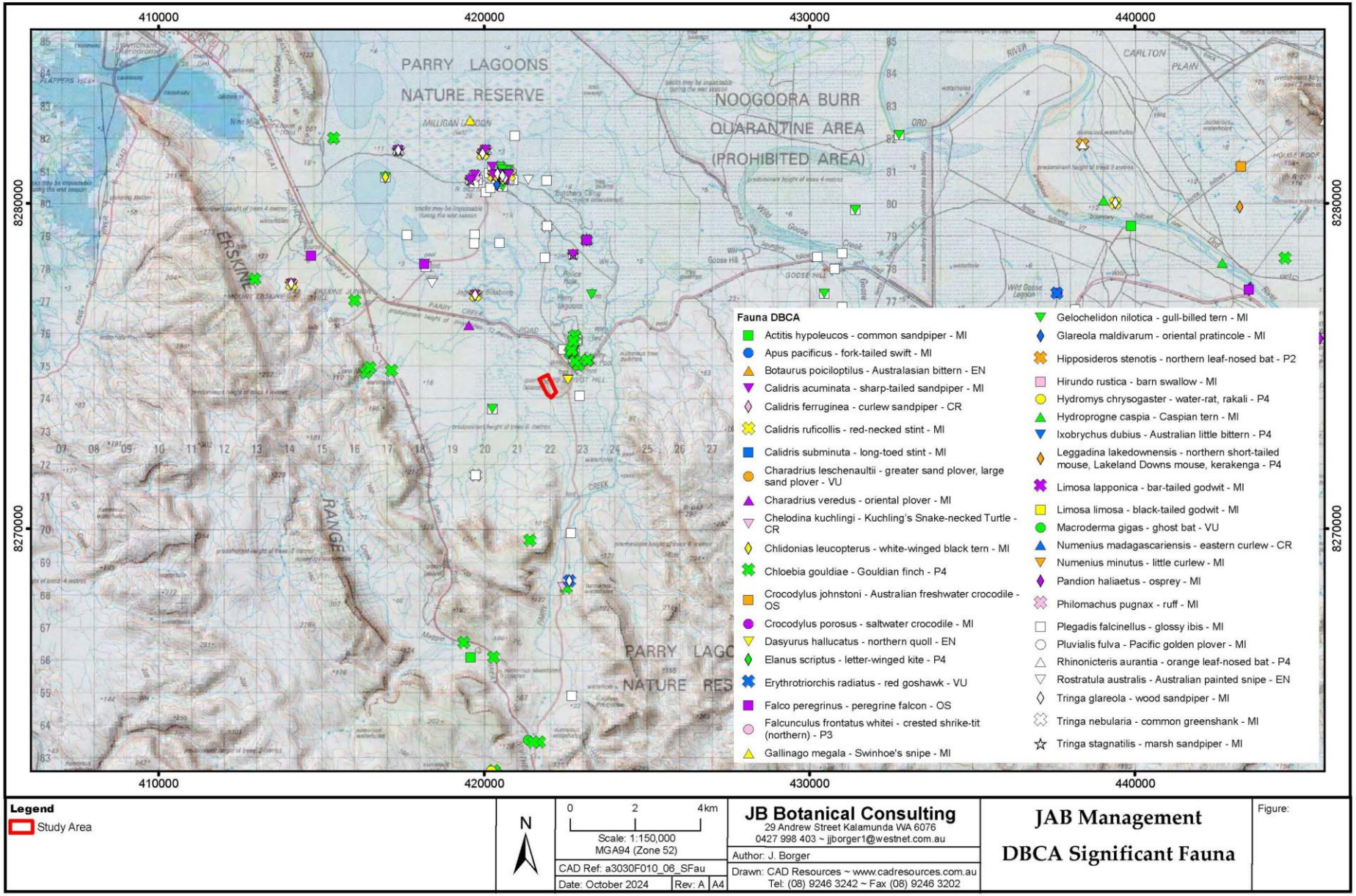


Figure 9: DBCA *Fauna database search results – the Gouldian Finch has been recorded in several locations in the local area*.

2. Methodology

JAB requested a detailed vegetation and flora assessment of two proposed disturbance areas within the Pivot Hill Quarry site. The survey was undertaken at the end of the wet season from April 30th – May 1st. The survey was delayed due to very wet conditions following substantial rainfall in March which resulted in poor access to the site.

2.1 Desktop survey

A search of databases was undertaken to assess threatened and priority flora and fauna which may occur in the area. This included database searches by DBCA (2024a, b, c) (02-0324EC, 17-0324NM, 01-0324FA), a review of available reports (Botanical North 2012; WEC 2016) relevant to the local and regional area and a search of the Commonwealth EPBC Protected Matters database with a 50 km buffer zone around the survey area. Information on land systems (Payne & Schoknecht 2011), regional vegetation (Shepherd et. al. 2002), climate (Bureau of Meteorology 2024) summarised in Section 1. Images of conservation significant flora were searched for in the Atlas of Living Australia (CSIRO 2024) and at the WA Herbarium prior to the survey.

2.2 Field survey

The field survey was undertaken by Jenny Borger (botanist) and Leanne James (environmental consultant). A map was provided of the site which was supplied to CAD Resources for digitising and georeferenced for use in the Avenza App and for GPS. The site was walked over and quadrats and relevés recorded by GPS. Due to the small area of the 2 sites, 20 m x 20 m quadrats were used with the exception of PH11 and PH12 which were 50 m x 50 m. Specimens of flora were collected for later identification/ verification (Flora Licence No. FB62000159-2). The following information was recorded:

- Location; GPS coordinates
- Photo at NW corner
- Landform
- Land surface – soil, surface rock %, litter %, fallen timber %
- Species in each stratum
- Height and cover of each stratum
- Weeds
- Vegetation condition

Vegetation was described using the National Vegetation Information system (NVIS). The codes and height classes are presented at the start of Appendix 4 – site descriptions. Vegetation condition was determined from the Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016; based on Keighery and Trudgen 1992) and presented in Table 6. Vegetation mapped for the Pivot Hill Quarry site tenure is shown in Figure 10.

Table 6: Vegetation condition scale – Eremaean and Northern Botanical Provinces

Vegetation condition	Description
Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement
Very good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely degraded	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

Table 7: Survey limitations and extent

Potential Limitation	**Extent**
Contextual information at a regional and local scale	Partly limiting. Regional information was readily available. A prior survey of the site was available which provided sufficient information in relation to basalt derived vegetation in the Parry Lagoon area. WEC (2009) undertook extensive surveys of plains to the east.
Competency/ experience	Partly limiting Jenny Borger (botanist) has 25 years' vegetation survey experience in WA including the Kimberley, Pilbara and Gascoyne. Due to the fact she has limited knowledge of the Victoria Bonaparte IBRA region, much time was spent in familiarisation with expected flora based on the previous survey and DBCA database searches prior to the survey. Leanne James has 19 years' experience in WA with 2 years within the Kimberley region.
Proportion of flora recorded and/ or collected, any identification issues	Partly limiting Most flora had flowers or fruit present. Some grasses were sterile; however old structures were present on isolated plants which aided with identification. *Brachychiton tridentatus* had no flowers or fruit present and was identified from the foliage and bark. No flora were determined to be representative of other CSF recorded within adjacent area and many of these occur in habitats not present within the site (e.g. wetlands). Specimens were collected and identified/ verified against known specimens at the WA Herbarium.
Was the appropriate area fully surveyed	Not limiting The survey areas were not extensive and were able to be adequately covered in the 2 days at site.
Access restrictions within the survey area	Not limiting Vehicle access within the site was restricted to the cleared area on the plain and limited minor tracks on the plain and adjacent to the pit. Most of the area was covered on foot.

Potential Limitation	Extent
Survey timing, rainfall, season	Partly limiting The EPA (2016) recommends the primary survey be undertaken during the wet season (January – March). Access to the site was not possible during this time due to significant rainfall, flooding and road conditions. The survey was undertaken at the end of April, 1 month later.
Disturbance that may have affected the results such as fire, flood or clearing	Partly limiting The areas to be surveyed are located within mostly intact vegetation which is adjacent to cleared areas. The plains area has likely been subjected to some pastoral impacts.

3. Results Flora and vegetation

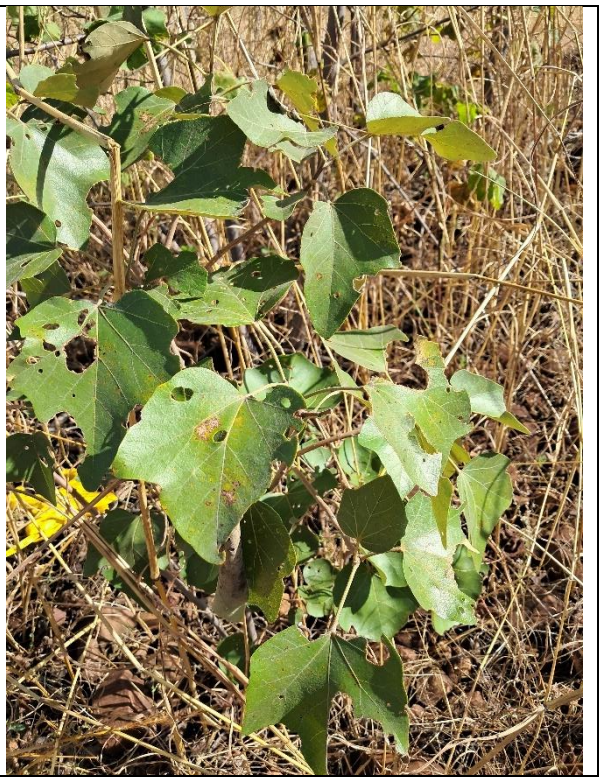
3.1 Summary

The two proposed disturbance areas (a total of 6.0 ha) were surveyed from April 30th – May 1st, 2024. A total of 55 species from 30 families were recorded and are listed in Appendix 1. Fifty native species were recorded from 29 families and 46 genera with the best represented families being Poaceae (10 – 8 native and 2 introduced); Fabaceae (7 – 6 native and 1 introduced) and Amaranthaceae (4 native species).

3.2 Conservation Significant Flora

One priority species – *Brachychiton tridentatus* P3 – was recorded. This species was also recorded by Botanical North (2012), east of the current survey area. One shrub was recorded which lacked flowers and fruit and was identified from the foliage and bark.

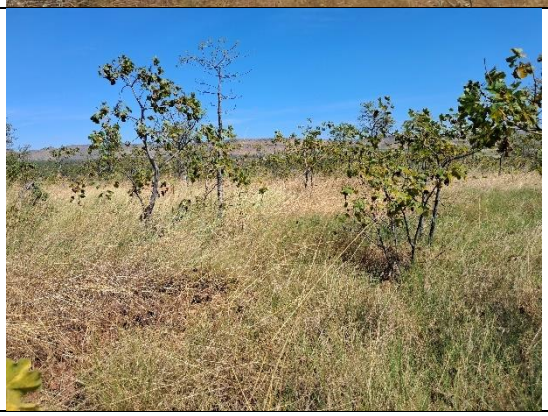
Table 8: Brachychiton tridentatus description

Family: Malvaceae Conservation code: Priority 3 Recorded distribution (FloraBase): Central and Northern Kimberley IBRA regions Description: Shrubs or small tree, with glabrous stems, leaves dull and glabrous above, pale grey stellate-velutinous below, 100 – 250 mm long x 100 – 370 mm wide, not lobed or tripartitely lobed Bark – dark grey, rough, fissured, tessellated Flowers – calyx green, pink or red, the lobes fused half or more of their length Fruits pale greenish-yellow, stellate-velutinous, about 6-7 x 3-3.5 cm. Seeds about 8-9.5 x 5.5-6.5 mm. No. plants – 1 (GPS location in Appendix 3)	

3.2 Vegetation

Four vegetation types (VT) were described from the current survey with an additional type mapped from past work (Botanical North 2012) (Figure 10). Two types were dominant (VTs 1 and 3) within the proposed disturbance areas. VTs are described in Table 9. Site descriptions are presented in Appendix 4.

Table 9: Vegetation types described for the Pivot Hill area

VT	Description	Image
1	Plain Condition: Very good; pastoral impacts and weeds present *Adansonia gregorii, Lysiphyllum cunninghamii, Cochlospermum fraseri* low open woodland over *Cochlospermum fraseri, Terminalia canescens*, *Crotalaria medicaginea var. neglecta* tall sparse shrubland over *Heteropogon contortus, Chloris barbata*, Terminalia canescens* tall tussock grassland over *Sehima nervosum, Heteropogon contortus, Boerhavia paludosa* low open tussock grassland	
2	Footslope Condition: Very good to excellent *Adansonia gregorii, Lysiphyllum cunninghamii* and *Corymbia confertiflora* open low woodland to low woodland over *Flueggea virosa* open shrubland over *Heteropogon contortus* and *Sehima nervosum* grassland	
3	Mid to upper slopes Condition: Excellent *Corymbia confertiflora, Adansonia gregorii* low open woodland to isolated low trees over *Terminalia canescens, Cochlospermum fraseri, Adansonia gregorii* tall sparse shrubland over *Heteropogon contortus, Terminalia canescens, Cochlospermum fraseri* tall tussock grassland	

VT	Description	Image
4	Crest Condition: Excellent *Heteropogon contortus* sparse tussock grassland over *Calandrinia uniflora, Spermacoce constricta, Ptilotus fusiformis, Mitrasacme exserta, Boerhavia paludosa low sparse forbland*	
5	Hillslope (outside survey area) Condition: Very good to excellent Description – Botanical North (2012) Open Woodland of *Adansonia gregorii, Corymbia confertiflora* and *Terminalia platyptera Cochlospermum fraseri* and *Hakea arborescens* over mixed grassland of *Sehima nervosum* and *Heteropogon contortus*.	
C	Cleared Condition: Totally degraded	

3.3 Weeds

Weeds were mostly present within VT1 on the plain, adjacent to the cleared areas with isolated occurrences of *Calotropis procera** in the broader area of the plain. Weeds were isolated on the mid slopes to upper slopes and did not include *Calotropis* or *Cenchrus ciliaris** which are of higher concern. No Neem (*Azadirachta indica**) trees were recorded in the survey areas. Two species recorded by Botanical North (2012) are not currently listed as weeds.

Table 10: Weeds recorded in the current and previous surveys of Pivot Hill (*indicates alien to Western Australia)

Scientific Name	Common Name	Significance	Current Survey	Botanical North(2012)
*Azadirachta indica**	Neem	Declared pest (WA)		1
*Calotropis procera**	Calotrope	Declared pest (WA)	1	1
*Cenchrus ciliaris**	Buffel grass	Major threat	1	
*Chloris barbata**	Purple top Rhodes grass	Environmental weed	1	1
*Corchorus olitorius**		Environmental weed		1
*Passiflora foetida**	Stinking passion flower	Environmental weed		1
*Physalis angulata**	Wild gooseberry	Environmental weed	1	
Portulaca oleracea	Purslane	Native/ naturalised part of range		1
*Stylosanthes hamata**	Verano stylo	Environmental weed	1	1
*Trianthema portulacastrum**	Giant pigweed	Environmental weed		1
Vigna radiata	Mung bean	Native		1

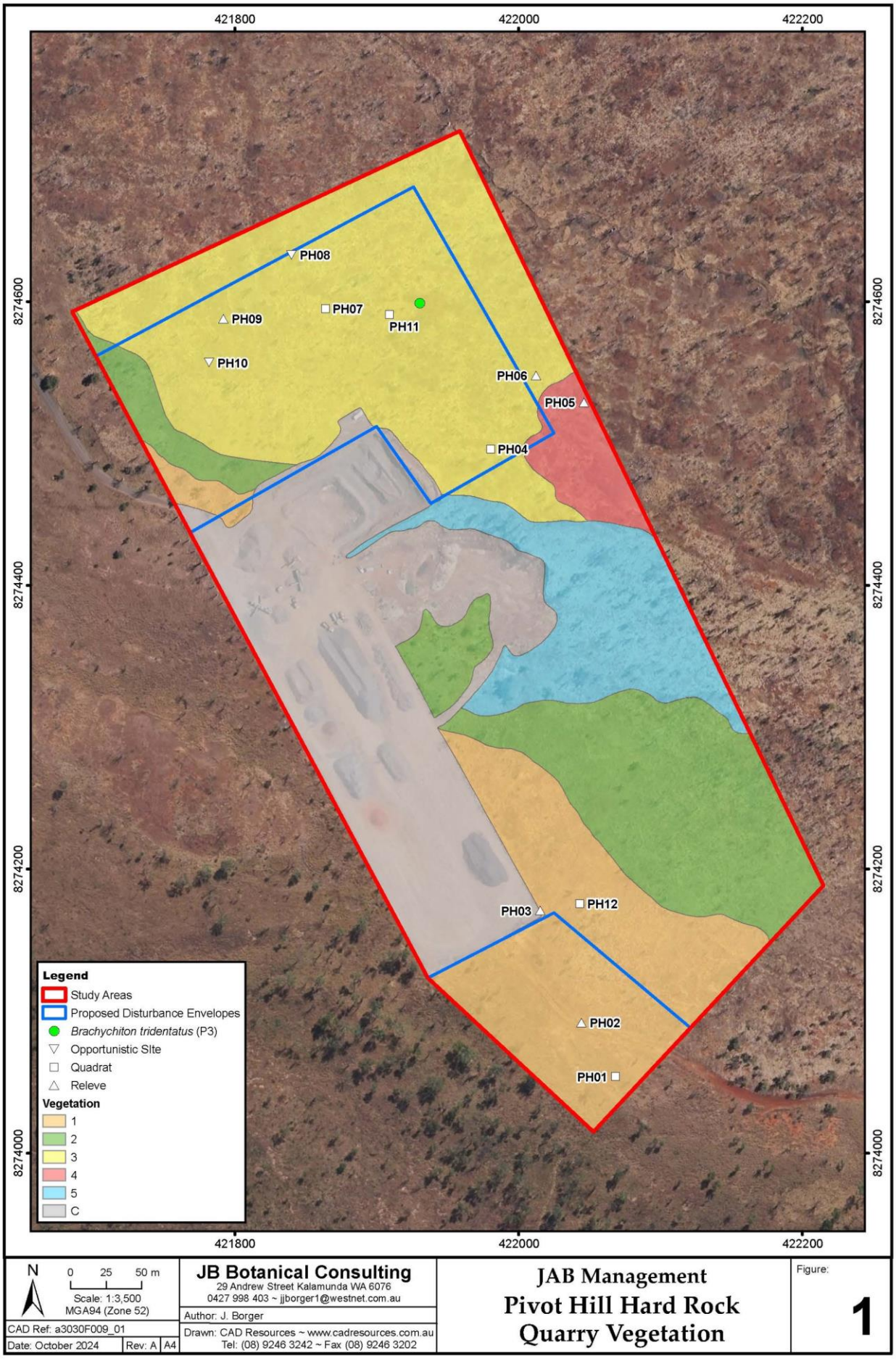


Figure 10: Vegetation mapped for the Pivot Hill Quarry area

4. Discussion

4.1 Flora

Fifty native flora from 29 families recorded from this survey (6.0 ha) is comparable to Botanical North (2012) with 100 species from 38 families (16 ha). WEC (2016) recorded 200 native taxa from 42 families within 24, 604 ha indicating that the flora within the broader region is not highly diverse. A comparison of species present by dominant families is presented in Table 11. Fabaceae and Poaceae were the best represented species at Pivot Hill, with Myrtaceae being better represented on the plains area (WEC 2016). The full species list for the WEC survey was not available so the number of species within Amaranthaceae is not obtainable.

Table 11: Comparison of flora and vegetation assessments in the Pivot Hill area

Survey	Area	Species (species/ ha)	Genera	Family	Fabaceae	Poaceae	Amaranthaceae	Myrtaceae	Malvaceae
Current survey	5.57	50 (9/ha)	46	29	7	8	4	1	3
Botanical North	16	100 (6.25/ha)	-	38	15	15	4	4	7
Woodman Environmental	24604	200 (0.005/ha)	112	42	20	46	-	22	17

4.2 Vegetation

The vegetation types (VT)recorded for the current survey are very similar to those recorded by Botanical North (2012). Dominant upper storey genera included *Adansonia, Terminalia, Corymbia* and *Lysiphyllum (Bauhinia)* which was also recorded by WEC (2016) on similar landforms. Grasses (*Heteropogon contortus* and *Sehima nervosum*) were generally dominant in the lower stratum with *Terminalia* and *Cochlospermum* dominant in the mid stratum. *Heteropogon contortus* was also recorded in WEC VTs 14 and 32. Other grasses recorded by WEC (*Chrysopogon fallax, Sorghum ?stipoideum* and *Themeda triandra)* were not observed during the current survey or by Botanical North. WEC VTs 2, 10, 29 and 35 may not be represented at Pivot Hill.

Vegetation type 4 - *Heteropogon contortus* sparse tussock grassland over *Calandrinia uniflora, Spermacoce constricta, Ptilotus fusiformis, Mitrasacme exserta, Boerhavia paludosa low* sparse forbland – which occurred on skeletal soils on a rocky outcrop on the crest of the hill lacked the upper and mid storeys present in the other vegetation types. This was not described as a separate vegetation type by Botanical North.

The vegetation is broadly representative of the described Pre-European and Land System vegetation communities. None of the VTs are likely to be restricted with the possible exception of VT 4 which would be restricted to basalt rock outcrops. VT 4 occurs at the very eastern side of the proposed disturbance area.

4.3 Conservation significant flora (CSF)

One priority species was recorded at one location – *Brachychiton tridentatus* P3. This species was also recorded by Botanical North in 2012, although the exact location is unknown but was described as east of the survey area. The plants were vegetative on both occasions with identification being based on foliage and bark characteristics. The shrub recorded in this survey may be within the proposed disturbance area. Database records place the species further west in the central and northern Kimberley where there are several records. Other CSF recorded in the local area occur within the wetland or sandy plains areas which are not present in the study area and are highly unlikely to be present.

4.4 Fauna – desktop assessment

Based on the results of the vegetation and flora survey there are two broad fauna habitats present within the site – the grass dominated plains with isolated trees to open woodland and open woodland on rocky hill slopes with minor areas of rock outcrop. No trees with hollows were observed and no hollow logs were present. Rock crevices were very small and may provide habitat for small reptiles and insects. Larger rock crevices and caves which may provide habitat for fauna such as bats and quolls were not present. No creeks or wetlands are within the area.

There are twelve threatened species listed in the DBCA database search and nineteen in the DCCEEW protected matters search (2024a). Of the DCCEEW search fauna, 8 are not listed as threatened in Western Australia and are either Specially Protected (Migratory), priority listed or not listed (Northern blue tongue skink). Of the threatened species the following have been recorded near the site or are the most likely to occur within the site:

- Northern quoll (*Dasyurus hallucatus*) – prefer habitat with hollow logs (none on site); rock crevices (no large crevices which would be suitable), caves (not present) and hollow trees (not present). It is unlikely to occur. The two records in the DBCA database search were from 1908.
- Ghost bat (*Macroderma gigas*) – no suitable hollows or caves present
- Night parrot (*Pezoporus occidentalis*) – mature spinifex habitat (DCCEEW 2024b). Very little spinifex is present in the survey area and the vegetation is unlikely to be suitable.
- The red goshawk (*Erythrotriorchis radiatus*) and grey falcon (*Falco hypoleucos*) may hunt in the area. The main prey is other birds. Both species nest in the fork of tall emergent trees – the nest is a stick platform lined with green leaves. No nests were observed.

There are several records for the priority species (WA) – Gouldian Finch (*Chloebia gouldiae*) – near Pivot Hill. The finch lives in Savannah woodlands (DCCEEW 2008) where they nest in hollows of smooth barked Eucalypt trees and feed on ripe and half-ripe grass seed including spinifex and Sorghum. They also eat insects, particularly during the breeding season. Spinifex is not common at the site and no Sorghum grasses were recorded. It is possible that they would utilise Pivot Hill for part of their diet, but highly unlikely to nest in the area. Pivot Hill is surrounded by grasslands which would be used by the birds.

5. Assessment of the proposal against the 10 clearing principles

The proposal has been assessed against the Department of Water and Environment Native vegetation clearing legislation in Western Australia based on the Environmental Protection Authority (EPA) ten clearing principles in Table 12.

*Table 12: **Assessment of the proposal against the Department of Water and Environmental Regulation's 10 clearing principles (EPA 1986)***

Clearing Principle		Comment
1	Native vegetation should not be cleared if it comprises a high level of biological diversity.	Proposal is unlikely to be at variance with this Principle The species diversity would not be considered high with a total of 50 taxa recorded from 29 families over 6.0 hectares particularly when taken in context with other Regional Surveys (JBBC 2024). Variation within the vegetation was low, with similar suites of species occurring in most vegetation types. None of the vegetation communities have been identified as being Threatened or Priority Ecological Communities (Botanical North 2012; JBBC 2024). The fauna habitats present within the Application Area are common within similar terrain types in the local region. The Application Area is not likely to support as a high level of faunal diversity as the adjacent Parry Lagoons wetlands which are known to support a rich faunal assemblage (DEC 2009). Five weed species recorded during the flora survey (JBBC 2024). Weeds have the potential to out-compete native species and reduce the biodiversity of an area. Potential impacts to biodiversity as a result of the proposed clearing may be minimised by the implementation of a weed management programme.
2	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for, the maintenance of a significant habitat for fauna indigenous to Western Australia.	Proposal is unlikely to be at variance with this Principle The vegetation communities present within the Pivot Hill Quarry survey area are unlikely to be regionally restricted based on their Land System Classification and Beard's Pre-European vegetation mapping (87 % remaining). Some of the significant fauna listed in Table 3 and further discussed in Section 4.4 may feed in the area but are unlikely to nest/ breed due to the lack of suitable habitat such as suitable trees, rocky crevices, caves or hollow logs and areas subject to regular inundation (JBBC 2024). The fauna habitats present within the Permit Application Area are common within the local region. Many of the fauna also prefer wetland or riverine habitats which are not present in the Application Area. The Northern Quoll (Dasyurus hallucatus - Vulnerable) has been recorded within 5 kilometres of the Application area (Department of Biodiversity, Conservation and Attractions, 2018). The Northern Quoll is known to den in hollow logs, tree hollows and rock crevices (Department of the Environment and Energy, 2018). None of these features have been observed within the Application Area (Botanical North, 2012; JBBC 2024). Whilst the Northern Quoll may use the Application Area for foraging and dispersal, the vegetation and terrain within the area is not likely to be significant habitat for this species.
3	Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora	Proposal is not at variance with this Principle No threatened flora is recorded within the survey area (Botanical North 2012; JBBC 2024) or within the broader region as determined by DBCA database search and the DCCEEW Protected Matters Search. Priority 1 species were recorded in habitats not present within the site and are unlikely to occur. One priority species – Brachychiton tridentatus P3 – was recorded.
4	Native vegetation should not be cleared if it compromises the whole or part of, or is necessary for the maintenance of a threatened ecological community	Proposal is not at variance with this Principle The Flora and Vegetation Surveys undertaken (Botanical North 2012 and JBBC 2024) did not identify any Threatened Ecological Communities (TEC's) in or in close proximity to the Application Area.

Clearing Principle		Comment
5	Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	Proposal is not at variance with this Principle The application area is located within the Victoria Bonaparte Bioregion of the IBRA. The vegetation association is mapped as Beard 59 of which 87 % (120,695 ha) remains at both State and Bioregional level (Government of Western Australia 2016). The Application Area is not a remnant, nor does it form part of any remnants within the district. The main threats to vegetation in this region is from pastoral, agricultural activities and altered fire regimes.
6	Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland	Proposal unlikely to be at variance with this Principle The Application Area is within the Parry Lagoons Nature Reserve (42155) in the Ord River Flood Plain Ramsar listed Wetland. The wetlands support a number of threatened species and contains significant mangrove communities (Hale 2008). The Application Area is of very limited extent, located on an elevated basaltic inlier south of the floodplain and does not contain any watercourses or areas of significant inundation (Botanical North 2012; JBBC 2024). None of the vegetation communities identified during the flora and vegetation survey were described as growing in association with a watercourse or wetland. Given there are no significant riparian areas within the Application Area, the proposed clearing of 6.0 hectares will, if approved, be on a basalt hill and is not likely to have any impact on the Ord River Floodplain. Normal site runoff manage practices would ensure sedimentation of downstream wetland areas would not be impacted.
7	Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	Proposal unlikely to be at variance with this Principle The Application Area is located within the Parry Lagoons Nature Reserve (42155). The Reserve contains habitat that supports critical life stages of annually migrating bird species and provides breeding habitat for 16 species of wetland dependent birds (Department of Environment and Conservation, 2012). It also includes a variety of important habitats such as freshwater springs, components of rainforest, grasslands, woodland, rugged sandstone and floodplain, which support a rich faunal assemblage (Department of Environment and Conservation, 2012). The Application Area does not contain any wetlands or watercourses and based on Survey assessments (Botanical North 2012 and JBBC 2024), is not likely to represent significant fauna habitat. Existing areas of disturbance from previous quarrying activities are documented. The spread or introduction of weeds into the Nature Reserve is a risk from both recreational and mining activities in the area. There were five species of weed recorded during the recent flora surveys (JBBC 2024). Care needs to be taken to ensure that clearing activities do not increase the spread of weeds within the Nature Reserve. Potential impacts to biodiversity as a result of the proposed clearing may be minimised by the ongoing implementation of the Weed Management Programme. The proposed clearing of an additional 6.0 hectares is not likely to impact on any significant environmental values of the Parry Lagoon Nature Reserve. Given the Application Area has been previously subject to small scale historic and recent quarrying activities, the proposed clearing associated with this Application is not likely to impact on the future land use of the Nature Reserve.
8	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	Proposal is unlikely to be at variance with this principle. The Application Area lies within the Frayne Land System – Unit 2, described as undulating to low hilly basalt country with predominantly skeletal red soils. Most elements of this Land System have a low susceptibility to erosion (Payne and Schoknecht, 2011).

Clearing Principle		Comment
		The area to be cleared is 6.0ha and is confined to the basalt hill from which there will be low natural sediment losses and minor changes to runoff volumes. If a buffer area is maintained at the bottom of the slope on the northern side (VTs 1 & 2) this will provide some protection from any increase in runoff and sediment load.
9	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water	Proposal is unlikely to be at variance with this principle There are no permanent watercourses or wetlands within the area identified for clearing (JBBC 2024). The Application Area catchment is limited in area and located on top of a hill within the greater Ord River Floodplain. The proposed clearing of 6.0 hectares is not likely to have a significant impact on the surface water quality within local watercourses and wetland areas. There are no Public Drinking Water Source Areas or borefields within or in close proximity to the Application Area. The surrounding area remains largely uncleared and the proposed clearing of 6.0 hectares is unlikely to cause deterioration in the quality of ground water. The material being mined is naturally outcropping basalt which is unlikely to alter the geochemistry of runoff waters.
10	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	Proposal is unlikely to be at variance with this principle The climate of the region is dry hot tropical, semi-arid, with summer rainfall (DEC 2012). The Application Area catchment is small and is located on the elevated slopes of Pivot Hill and there are no permanent water courses or waterbodies within the Application Area. The surrounding habitat is wetlands within the greater Ord River Floodplain which is subject to inundation following summer rainfall. The proposed clearing of 6.0 hectares is not likely to cause an increase in the incidence or intensity of flooding in the area.

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Appendix 1: List of Taxa

*Alien species

Family	Scientific Name
Acanthaceae	*Dicliptera armata*
Aizoaceae	*Trianthema triquetrum*
Amaranthaceae	*Ptilotus fusiformis* *Ptilotus spicatus* *Gomphrena cunninghamii* *Gomphrena canescens* subsp. *canescens*
Apocynaceae	*Calotropis procera** *Carissa lanceolata*
Bixaceae	*Cochlospermum fraseri*
Boraginaceae	*Euploca euodes*
Cleomaceae	*Arivela viscosa*
Combretaceae	*Terminalia canescens* *Terminalia platyptera*
Commelinaceae	*Commelina ensifolia*
Convolvulaceae	*Bonamia pannosa*
Cucurbitaceae	*Cucumis melo*
Cyperaceae	*Fimbristylis littoralis* *Cyperus tenuispica*
Euphorbiaceae	*Microstachys chamaelea*
Fabaceae	*Acacia holosericea* *Crotalaria medicaginea* var. *neglecta* *Crotalaria montana* var. *angustifolia* *Galactia tenuiflora* *Lysiphyllum cunninghamii* *Neptunia dimorphantha* *Stylosanthes hamata**
Goodeniaceae	*Goodenia coronopifolia*
Hernandiaceae	*Gyrocarpus americanus*
Hypericaceae	*Hypericum gramineum*
Loganiaceae	*Mitrasacme exserta*
Malvaceae	*Adansonia gregorii* *Brachychiton tridentatus P3* *Corchorus pumilio*

Family	Scientific Name
Montiaceae	*Calandrinia uniflora*
Myrtaceae	*Corymbia confertiflora*
Nyctaginaceae	*Boerhavia paludosa*
Orobanchaceae	*Buchnera linearis*
Phyllanthaceae	*Flueggea virosa* subsp. *melanthesoides* *Cathetus exilis*
Plantaginaceae	*Stemodia viscosa*
Poaceae	*Cenchrus ciliaris** *Chloris barbata** *Cynodon convergens* *Dichanthium fecundum* *Eragrostis olida* *Eriachne obtusa* *Heteropogon contortus* *Panicum decompositum* *Sehima nervosum* *Triodia* sp. (sterile)
Proteaceae	*Grevillea pyramidalis* *Hakea arborescens*
Rubiaceae	*Spermacoce constricta*
Solanaceae	*Physalis angulata**
Violaceae	*Afrohybanthus enneaspermus*

Appendix 2: Conservation codes (DBCA 2023)

Department of **Biodiversity, Conservation and Attractions**

Biodiversity and Conservation Science

CONSERVATION CATEGORY DEFINITIONS
For Western Australian Flora and Fauna

Threatened and Extinct flora are species which have been adequately searched for and are deemed to be, in the wild, threatened or extinct and have been gazetted as such.

Categories of Threatened and Extinct flora are:

T **Threatened species**

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).
Threatened fauna *is the species of fauna that are listed as critically endangered, endangered or vulnerable threatened species*
Threatened flora is the species of flora that are listed as critically endangered, endangered or vulnerable threatened species.
The assessment of the conservation status of threatened species is in accordance with the BC Act listing criteria and the requirements of Ministerial Guideline Number 1 and Ministerial Guideline Number 2 that adopts the use of the International Union for Conservation of Nature (IUCN) Red List of Threatened Species Categories and Criteria and is based on the national distribution of the species.

CR **Critically endangered species**

Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".
Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines.

EN **Endangered species**

Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".
Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines.

VU **Vulnerable species**

Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".
Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines.

Extinct species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

EX Extinct species

Species where "*there is no reasonable doubt that the last member of the species has died*", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act)

EW Extinct in the wild species

Species that *"is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form"*, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).
Currently there are no fauna or flora species listed as extinct in the wild.

SP Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

MI Migratory species

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

CD Species of special conservation interest (conservation dependent)

Species of special conservation need that are dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

OS Species otherwise in need of special protection (other specially protected)

Species otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

P <u>Priority species</u>
Priority is not a listing category under the BC Act. The Priority Flora and Fauna lists are maintained by the department and are published on the department's website.
All fauna and flora are protected in WA following the provisions in Part 10 of the BC Act. The protection applies even when a species is not listed as threatened or specially protected, and regardless of land tenure (State managed land (Crown land), private land, or Commonwealth land).
Species that may possibly be threatened species that do not meet the criteria for listing under the BC Act because of insufficient survey or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of prioritisation for survey and evaluation of conservation status so that consideration can be given to potential listing as threatened.
Species that are adequately known, meet criteria for near threatened, or are rare but not threatened, or that have been recently removed from the threatened species list or conservation dependent or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of priority status is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Priority 1: Poorly known species - known from few locations, none on conservation lands
Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on land not managed for conservation, for example, agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation.
Species may be included if they are comparatively well known from one or more locations but do not meet the adequacy of survey requirements for threatened listing and appear to be under immediate threat from known threatening processes. These species are in urgent need of further survey.

Priority 2: Poorly-known species - known from few locations, some on conservation lands
Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, for example, national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation.
Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements for threatened listing and appear to be under threat from known threatening processes. These species are in urgent need of further survey.

Priority 3: Poorly-known species - known from several locations

Species that are known from several locations and the species does not appear to be under imminent threat or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat.
Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. These species need further survey.

Priority 4: 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 are close to qualifying for vulnerable but are not listed as a conservation dependent specially protected species.
(c) Species that have been removed from the list of threatened species or lists of conservation dependent or other specially protected species, during the past five years for reasons other than taxonomy.
(d) Other species in need of monitoring

Appendix 3: GPS location of Brachychiton tridentatus

Scientific Name	Code	Zone	Easting	Northing	No.
Brachychiton tridentatus	P3	52L	421930	8274599	1

Appendix 4: Site Descriptions

NVIS foliage cover codes.

Cover Characteristics					
Foliage cover	70 – 100	30 – 70	10 – 30	< 10	~ 0 (<2)
Crown cover	>80	50 – 80	20 – 50	0.25 – 20	<0.25
% cover	>80	50 – 80	20 – 50	0.25 - <20	<0.25
Cover code	d	c	i	r	bi

Height classes defined for the NVIS.

Height		**Growth Form**				
Height Class	Height Range (m)	Tree	Shrub, chenopod shrub	Tree mallee, mallee shrub	Tussock grass	Bryophyte, lichen
8	>30	Tall	N/A	N/A	N/A	N/A
7	10 – 30	Mid	N/A	Tall	N/A	N/A
6	< 10	Low	N/A	Mid	N/A	N/A
5	<3	N/A	N/A	Low	N/A	N/A
4	>2	N/A	Tall	N/A	Tall	N/A
3	1 – 2	N/A	Mid	N/A	Tall	N/A
2	0.5 – 1	N/A	Low	N/A	Mid	Tall
1	< 0.5	N/A	Low	N/A	Low	Low

Summary of NVIS strata codes.

NVIS stratum code	**NVIS sub-stratum**	**Description**	**Growth forms**	**Height classes**
U	U1	Tallest stratum	Tree, tree mallees (mallee shrubs)	8, 7, 6, (5)
	U2	Sub-canopy layer, second tree layer		
	U3	Sub-canopy layer, third tree layer		
M	M1	Tallest shrub layer	Shrubs, low trees, mallee shrubs, low shrubs, vines	(6), 5, 4, 3
	M2	Next shrub layer		
	M3	Third shrub layer		
G	G1	Tallest ground species	Grasses, forbs, sedges, rushes, vines, lichens, low shrubs	(4, 3), 2, 1
	G2	Ground		

Growth Form Codes used in descriptions

T	Tree	U	Samphire shrub	F	Forb
M	Mallee	Z	Heath shrub	E	Fern
S	Shrub	G	Tussock grass	L	Vine
R	Rush	H	Hummock grass	V	Sedge
C	Chenopod shrub	W	Other grass	N	Lichen

<table>
<tr><th colspan="4">Pivot Hill PH01 Quadrat 30/4/2024</th></tr>
<tr><td colspan="2">GPS: 422068 E/ 8274054 N
Elevation: 18 m</td><td colspan="2">Landform: Alluvial plain; gentle slope; aspect west</td></tr>
<tr><td colspan="4">Land surface: Brown clay to clay loam, surface rock < 10 %</td></tr>
<tr><td colspan="4">Condition & disturbances: Pastoral impacts</td></tr>
<tr><td colspan="4">NVIS 6: U1^ Bauhinia cunninghamii, Adansonia gregorii\Bauhinia\^tree\7\r; M1^ Acacia holosericea\Acacia\^shrub\3\bi; G1+^ Heteropogon contortus, Chloris barbata*, Gomphrena canescens, Hypericum gramineum, Carissa lanceolata\Heteropogon\^tussock grass, herb, shrub\2\d</td></tr>
<tr><td colspan="4">Vegetation: Bauhinia cunninghamii, Adansonia gregorii open woodland over Heteropogon contortus, Chloris barbata* grassland</td></tr>
<tr><th>Height (m)</th><th>Crown cover %</th><th>Habit</th><th>Species</th></tr>
<tr><td>8 – 12</td><td>2 – 10</td><td>T</td><td>Lysiphyllum cunninghamii, Adansonia gregorii</td></tr>
<tr><td>1.2 – 2</td><td>< 2</td><td>S</td><td>Acacia holosericea</td></tr>
<tr><td>< 1.2</td><td>>70</td><td>G, H, S, V</td><td>Heteropogon contortus, Chloris barbata*, Gomphrena canescens, Hypericum gramineum, Carissa lanceolata, Neptunia dimorphantha, Fimbristylis littoralis, Bauhinia cunninghamii</td></tr>
<tr><td colspan="4">Other species: Terminalia platyptera, Physalis angulata*, Cochlospermum fraseri, Calotropis procera*, Afrohybanthus enneaspermus, Buchnera linearis, Cucumis melo</td></tr>
<tr><td colspan="2">Acacia holosericea
Adansonia gregorii
Afrohybanthus enneaspermus
Arivela viscosa (vegetative)
Buchnera linearis
Calotropis procera*
Carissa lanceolata
Chloris barbata*
Cochlospermum fraseri
Cucumis melo
Fimbristylis littoralis
Gomphrena canescens subsp. canescens
Heteropogon contortus
Lysiphyllum cunninghamii
Neptunia dimorphantha
Physalis angulata*
Terminalia platyptera</td><td colspan="2">  </td></tr>
</table>

Pivot Hill PH02 Relevé 30/4/2024			
GPS: 422044 E/ 8274092 N Elevation: 20 m			Landform: Plain; edge of alluvial plain; gentle slope, aspect west
Land surface: Brown clay to clay loam, surface rock < 10 %			
Condition & disturbances: Pastoral impacts; weeds			
Vegetation: *Adansonia gregorii, Terminalia platyptera isolated trees over Heteropogon contortus, Stylosanthes hamata*, Neptunia dimorphantha closed tussock grassland*			
Height (m)	Crown cover %	Habit	Species
6 – 10	< 2	T	*Adansonia gregorii, Terminalia platyptera*
< 1.2 m	90	G, F, S, V	*Heteropogon contortus, Stylosanthes hamata*, Neptunia dimorphantha, Ptilotus spicatus, Lysiphyllum cunninghamii, Commelina ensifolia, Cochlospermum fraseri, Crotalaria crispata, Fimbristylis littoralis*
Other species: Microstachys chamaelea, Crotalaria montana var. angustifolia, Bonamia pannosa, Crotalaria medicaginea var. neglecta, Dichanthium fecundum			

Adansonia gregorii
Bonamia pannosa
Cochlospermum fraseri
Commelina ensifolia
Crotalaria crispata
Crotalaria medicaginea var. neglecta
Crotalaria montana var. angustifolia
Dichanthium fecundum
Fimbristylis littoralis
Heteropogon contortus
Lysiphyllum cunninghamii
Microstachys chamaelea
Neptunia dimorphantha
Ptilotus spicatus
*Stylosanthes hamata**
Terminalia platyptera

Pivot Hill PH03 Relevé 30/4/2024 10.22am			
GPS: 422015 E/ 8274171 N Elevation: 23 m		Landform: Plain; edge of clearing	
Land surface: Brown clay loam; occasional basalt rocks			
Condition & disturbances: Very good; Clearing; pastoral activities; weeds			
Vegetation: *Corymbia confertiflora, Lysiphyllum cunninghamii, Adansonia gregorii open woodland over Calotropis procera*, Lysiphyllum cunninghamii isolated shrubs over Heteropogon contortus, Sehima nervosum, Cenchrus ciliaris* closed grassland*			
Height (m)	Crown cover %	Habit	Species
8 – 10	2 – 10	T	*Corymbia confertiflora, Lysiphyllum cunninghamii, Adansonia gregorii*
1 – 2	< 2	S	*Calotropis procera*, Lysiphyllum cunninghamii*
< 1	80 – 90	G, S, F	*Heteropogon contortus, Sehima nervosum, Cenchrus ciliaris*, Lysiphyllum cunninghamii, Commelina ensifolia, Galactia tenuiflora*
Other species: Chloris barbata, Stylosanthes hamata*, Physalis angulata**			
Adansonia gregorii *Calotropis procera** *Cenchrus ciliaris** *Chloris barbata** *Commelina ensifolia* *Corymbia confertiflora* *Galactia tenuiflora* *Heteropogon contortus* *Lysiphyllum cunninghamii* *Physalis angulata** *Sehima nervosum* *Stylosanthes hamata**			

Pivot Hill PH04 Quadrat 30/4/2024 10.54 am	
GPS: 421980 E/ 8274496 N Elevation: 45 m	Landform: Rocky basalt hill; gentle slope becoming steep; aspect west
Land surface: Reddish brown clay loam; surface rock (basalt)40 – 60 %; litter 10 – 30 %; fallen timber < 5 %	
Condition & disturbances: Excellent; historic mining/ pastoral impacts – old tracks; isolated weeds; low current pastoral impacts	
NVIS 6: *U1^ Adansonia gregorii\Adansonia\^tree\6\r; M1^Cochlospermum fraseri, Acacia holosericea, Adansonia gregorii, Hakea arborescens\Cochlospermum\^shrub\4\i; G1^ Heteropogon contortus, Sehima nervosum, Dichanthium fecundum, Cochlospermum fraseri, Carissa lanceolata \Heteropogon\ ^tussock grass, shrub\2\d; G2^ Calandrinia uniflora, Gomphrena canescens subsp. canescens, Spermacoce constricta, Goodenia coronopifolia, Eragrostis olida\Calandrinia\^forb, tussock grass\ 1\r*	
Vegetation: *Adansonia gregorii low open woodland over Cochlospermum fraseri, Acacia holosericea, Adansonia gregorii tall open shrubland over Heteropogon contortus, Sehima nervosum, Dichanthium fecundum closed tussock grassland over Calandrinia uniflora, Gomphrena canescens subsp. canescens, Spermacoce constricta low open forbland*	

Height (m)	Crown cover %	Habit	Species
6 – 8	2 – 10	T	*Adansonia gregorii*
1 – 4	10 – 20	S	*Cochlospermum fraseri, Acacia holosericea, Adansonia gregorii, Hakea arborescens*
0.3 – 1	> 70	G, S	*Heteropogon contortus, Sehima nervosum, Dichanthium fecundum, Cochlospermum fraseri, Carissa lanceolata*
< 0.3	10 – 30	F	*Calandrinia uniflora, Gomphrena canescens subsp. canescens, Spermacoce constricta, Goodenia coronopifolia, Eragrostis olida, Ptilotus spicatus, Boerhavia paludosa*

Acacia holosericea
Adansonia gregorii
Boerhavia paludosa
Calandrinia uniflora
Carissa lanceolata
Cochlospermum fraseri
Dichanthium fecundum
Eragrostis olida
Gomphrena canescens subsp. canescens
Goodenia coronopifolia
Hakea arborescens
Heteropogon contortus
Ptilotus spicatus
Sehima nervosum
Spermacoce constricta

Pivot Hill PH5 Relevé 30/04/2024			
GPS: 422046 E/ 8274529 N Elevation: 48 m		Landform: Basalt hill; crest; basalt outcrop; gentle slope, most drainage to north and west	
Land surface: Skeletal reddish brown clay loam; surface rock > 90 %			
Condition & disturbances: Excellent; low disturbances			
Vegetation: (mostly around edges) *Heteropogon contortus sparse tussock grassland over Calandrinia uniflora, Spermacoce constricta, Ptilotus fusiformis, Mitrasacme exserta, Boerhavia paludosa low sparse forbland*			
Height (m)	Crown cover %	Habit	Species
0.3 – 1	5 – 10	G	*Heteropogon contortus*
< 0.3	5 – 10	F	*Calandrinia uniflora, Spermacoce constricta, Ptilotus fusiformis, Mitrasacme exserta, Boerhavia paludosa*

Boerhavia paludosa
Calandrinia uniflora
Heteropogon contortus
Mitrasacme exserta
Ptilotus fusiformis
Spermacoce constricta

Pivot Hill PH6 Relevé 30/04/2024	
GPS: 422012 E/ 8274548 N Elevation: 42 m	Landform: Hill; upper slope; eastern boundary of area; slope gentle; aspect west/ north west
Land surface: Shallow soils, surface rock basalt rocks and boulders > 80 %	
Condition & disturbances: Excellent; some disturbance along old fenceline; *Adansonia* water stressed	
NVIS 6: *U1^ Adansonia gregorii\Adansonia\^tree\6\bi; M1^ Cochlospermum fraseri, Grevillea pyramidalis subsp. leucadendron\Cochlospermum\^shrub\3\i; G1+^ Heteropogon contortus, Triodia ?pungens\Heteropogon\^tussock grass, hummock grass\2\c; G2^ Euploca euodes, Mitrasacme exserta, Ptilotus fusiformis, Cochlospermum fraseri, Boerhavia paludosa\Euploca\ ^forb, shrub, tussock grass\1\c*	
Vegetation: *Adansonia gregorii isolated low trees over Cochlospermum fraseri, Grevillea pyramidalis subsp. leucadendron open shrubland over Heteropogon contortus, Triodia ?pungens tussock grassland over Euploca euodes, Mitrasacme exserta, Ptilotus fusiformis low open forbland*	

Height (m)	Crown cover %	Habit	Species
2 – 4	< 2	T	*Adansonia gregorii*
1 – 2	10 – 20	S	*Cochlospermum fraseri, Grevillea pyramidalis subsp. leucadendron*
0.3 – 1	60 – 70	G, H	*Heteropogon contortus, Triodia ?pungens*
< 0.3	10 – 20	F, S, G	*Euploca euodes, Mitrasacme exserta, Ptilotus fusiformis, Cochlospermum fraseri, Boerhavia paludosa, Galactia tenuiflora, Heteropogon contortus, Calandrinia uniflora, Spermacoce constricta, Cathetus exilis*

Adansonia gregorii
Boerhavia paludosa
Calandrinia uniflora
Cathetus exilis (vegetative)
Cochlospermum fraseri
Euploca euodes
Galactia tenuiflora
Grevillea pyramidalis subsp. leucadendron
Heteropogon contortus
Mitrasacme exserta
Ptilotus fusiformis
Spermacoce constricta
Triodia ?pungens (tentative; old seed heads)

Pivot Hill PH07 Quadrat 30/04/ 2024			
GPS: 421864 E/ 8274595 N Elevation: 32 m	Landform: Basalt hill; mid slope; moderate slope; aspect west		
Land surface: Reddish brown clay loam; surface rock (basalt) > 60 % (under vegetation); litter 30 – 40 %; fallen timber < 5 %			
Condition & disturbances: Excellent; low pastoral impacts, isolated weeds			
NVIS 6: *U1^ Adansonia gregorii\Adansonia\^tree\6\bi; M1^ Terminalia canescens, Cochlospermum fraseri\Terminalia\^shrub\3\i; G1+^ Heteropogon contortus, Chloris barbata*, Sehima nervosum, Gomphrena canescens subsp. canescens, Ptilotus fusiformis\Heteropogon\^tussock grass\2\d*			
Vegetation: *Adansonia gregorii low isolated trees over Terminalia canescens, Cochlospermum fraseri open shrubland over Heteropogon contortus, Chloris barbata*, Sehima nervosum closed tussock grassland*			
Height (m)	Crown cover %	Habit	Species
7 – 9	< 2	T	*Adansonia gregorii*
1 – 2	10 – 20	S	*Terminalia canescens, Cochlospermum fraseri*
< 1	70 – 80	G, F, S	*Heteropogon contortus, Chloris barbata*, Sehima nervosum, Gomphrena canescens subsp. canescens, Ptilotus fusiformis, Microstachys chamaelea, Stylosanthes hamata*, Bonamia pannosa, Trianthema triquetrum, Cochlospermum fraseri, Euploca euodes*	

Adansonia gregorii
Bonamia pannosa
*Chloris barbata**
Cochlospermum fraseri
Euploca euodes
Gomphrena canescens subsp. canescens
Heteropogon contortus
Ptilotus fusiformis
Microstachys chamaelea
Sehima nervosum
*Stylosanthes hamata**
Terminalia canescens
Trianthema triquetrum

PH08 (Opportunistic) 30th April 2024
GPS: 421840 E/ 8274633 N Elevation: 31 m
Ground cover a bit sparser, open patches of rocky ground

Adansonia gregorii, Terminalia canescens low open woodland over Terminalia canescens, Cochlospermum fraseri open shrubland over Heteropogon contortus, Chloris barbata, Sehima nervosum tussock grassland*

<table>
<tr><th colspan="4">Pivot Hill PH09 Relevé 30/04/2024</th></tr>
<tr><td colspan="2">GPS: 421792 E/ 8274588 N
Elevation: 26 m</td><td colspan="2">Landform: Hill, midslope; gentle to moderate slope; aspect west</td></tr>
<tr><td colspan="4">Land surface: Surface rock 60 – 70 %; some bare patches of outcrop</td></tr>
<tr><td colspan="4">Condition & disturbances: Excellent; low impacts, isolated weeds</td></tr>
<tr><td colspan="4">Vegetation: Adansonia gregorii, Terminalia canescens isolated low trees over Cochlospermum fraseri, Terminalia canescens open shrubland over Heteropogon contortus, Sehima nervosum, Gomphrena canescens subsp. canescens tussock grassland</td></tr>
<tr><td>Height (m)</td><td>Crown cover %</td><td>Habit</td><td>Species</td></tr>
<tr><td>4 – 7</td><td>< 2</td><td>T</td><td>Adansonia gregorii, Terminalia canescens</td></tr>
<tr><td>1 – 2</td><td>10 – 20</td><td>S</td><td>Cochlospermum fraseri, Terminalia canescens</td></tr>
<tr><td>< 0.9</td><td>50 – 70</td><td>G, F, L</td><td>Heteropogon contortus, Sehima nervosum, Gomphrena canescens subsp. canescens, Ptilotus fusiformis, Cucumis melo, Microstachys chamaelea, Stylosanthes hamata*, Euploca euodes, Calandrinia uniflora, Bonamia pannosa, Gomphrena cunninghamii, Corchorus pumilo</td></tr>
<tr><td colspan="2">Adansonia gregorii
Bonamia pannosa
Calandrinia uniflora
Cochlospermum fraseri
Corchorus pumilo
Cucumis melo
Euploca euodes
Gomphrena canescens subsp. canescens
Gomphrena cunninghamii
Heteropogon contortus
Microstachys chamaelea
Ptilotus fusiformis
Sehima nervosum
Stylosanthes hamata*
Terminalia canescens</td><td colspan="2">  </td></tr>
</table>

PH10 (Opportunistic) 30/04/2024
Lower midslope; rocky
GPS: 421782 E/ 8274557 N Elevation: 26 m
Patch of *Flueggea virosa* subsp. *melanthesoides* thicket under *Adansonia gregorii*

Stemodia viscosa – at gate

Pivot Hill PH11 01/05/ 2024 Quadrat 50 m x 50 m			
GPS: 421909 E/ 8274591 N Elevation: 36 m		Landform: Basalt hill; upper slope; moderate slope; aspect west	
Land surface: Strong brown (7.5YR4/6) clay loam; surface rock (basalt rocks and boulders) ^ 90 %			
Condition & disturbances: Excellent; low impacts; low weeds; 3 termite mounds			
NVIS 6: *U1^ Corymbia confertiflora, Adansonia gregorii\Corymbia\^tree\6\r; M1^ Terminalia canescens, Cochlospermum fraseri, Adansonia gregorii\Terminalia\^shrub, tree\4\r; G1+^ Heteropogon contortus, Terminalia canescens. Cochlospermum fraseri, Gomphrena canescens subsp. canescens, Lysiphyllum cunninghamii\Heteropogon\^tussock grass, shrub\3\c; G2^ Calandrinia uniflora, Heteropogon contortus, Christia australasica, Cochlospermum fraseri, Terminalia canescens\Calandrinia\^forb, tussock grass, vine, shrub\1\c*			
Vegetation: *Corymbia confertiflora, Adansonia gregorii low open woodland over Terminalia canescens, Cochlospermum fraseri, Adansonia gregorii tall sparse shrubland over Heteropogon contortus, Terminalia canescens. Cochlospermum fraseri tall tussock grassland*			
Height (m)	Crown cover %	Habit	Species
4 – 9	2 – 10	T	*Corymbia confertiflora (12), Adansonia gregorii (5)*
2 – 4	2 – 10	S, T	*Terminalia canescens (12), Cochlospermum fraseri (7), Adansonia gregorii (2)*
0.5 – 2	60 – 70	G, S	*Heteropogon contortus (50 – 60 %), Terminalia canescens (190), Cochlospermum fraseri (68), Gomphrena canescens subsp. canescens (71), Lysiphyllum cunninghamii (4)*
< 0.5	40 – 50	F, G, L, S	*Calandrinia uniflora, Heteropogon contortus, Christia australasica, Cochlospermum fraseri (10), Terminalia canescens (22), Goodenia coronopifolia, Corchorus pumilo, Neptunia dimorphantha, Bonamia pannosa, Ptilotus fusiformis, Polymeria ambigua*	
Other species: Brachychiton tridentatus (1) (outside; north side)			
Adansonia gregorii *Bonamia pannosa* *Brachychiton tridentatus P3* *Calandrinia uniflora* *Christia australasica* *Cochlospermum fraseri* *Corchorus pumilo* *Corymbia confertiflora* *Gomphrena canescens subsp. canescens* *Goodenia coronopifolia* *Heteropogon contortus* *Lysiphyllum cunninghamii* *Neptunia dimorphantha* *Polymeria ambigua* *Ptilotus fusiformis* *Terminalia canescens*			

Pivot Hill PH12 01/05/ 2024 Quadrat 50 m x 50 m			
GPS: 422043 E/ 8274176 N Elevation: 26 m		Landform: Plain; very gentle slope; aspect west	
Land surface: Strong brown clay loam; surface rock (basalt rocks) 10 – 20 %; litter 20 – 40 %; fallen timber < 1 %			
Condition & disturbances: Very good; pastoral impacts, weeds – low; increases towards cleared areas; diversity good			
NVIS 6: *U1^ Adansonia gregorii, Lysiphyllum cunninghamii, Cochlospermum fraseri\Adansonia\ ^tree\6\r; M1^ Cochlospermum fraseri, Terminalia canescens, Crotalaria medicaginea var. neglecta, Carissa lanceolata\Cochlospermum\^shrub\4\r; G1+^ Heteropogon contortus, Chloris barbata*, Terminalia canescens, Carissa lanceolata, Crotalaria medicaginea var. neglecta\^Heteropogon\ ^tussock grass, shrub\3\d; G2^ Sehima nervosum, Heteropogon contortus, Boerhavia paludosa, Terminalia canescens, Cyperus tenuispica\Sehima\^tussock grass, forb, shrub, sedge\1\i*			
Vegetation: *Adansonia gregorii, Lysiphyllum cunninghamii, Cochlospermum fraseri low open woodland over Cochlospermum fraseri, Terminalia canescens, Crotalaria medicaginea var. neglecta tall sparse shrubland over Heteropogon contortus, Chloris barbata*, Terminalia canescens tall tussock grassland over Sehima nervosum, Heteropogon contortus, Boerhavia paludosa low open tussock grassland*			
Height (m)	Crown cover %	Habit	Species
5 – 9	2 – 10	T	*Adansonia gregorii, Lysiphyllum cunninghamii, Cochlospermum fraseri*
2 – 4	2 – 5	S	*Cochlospermum fraseri, Terminalia canescens, Crotalaria medicaginea var. neglecta, Carissa lanceolata*
0.5 – 1.5	70 – 80	G, S	*Heteropogon contortus, Chloris barbata*, Terminalia canescens, Carissa lanceolata, Crotalaria medicaginea var. neglecta, Calotropis procera*, Acacia holosericea*
< 0.5	20 – 30	G, F, S, V	*Sehima nervosum, Heteropogon contortus, Boerhavia paludosa, Terminalia canescens, Cyperus tenuispica, Gomphrena canescens subsp. canescens, Neptunia dimorphantha, Stylosanthes hamata*, Buchnera linearis, Afrohybanthus enneaspermus, Cucumis melo, Chloris barbata*, Stemodia viscosa, Commelina ensifolia, Microstachys chamaelea, Ptilotus spicatus, Physalis angulata*, Dichanthium fecundum, Hypericum gramineum*
Other species: Cenchrus ciliaris, Eriachne obtusa, Terminalia platyptera*			

Acacia holosericea *Adansonia gregorii* *Afrohybanthus enneaspermus* *Boerhavia paludosa* *Buchnera linearis* *Calotropis procera** *Carissa lanceolata* *Cenchrus ciliaris** *Chloris barbata** *Cochlospermum fraseri* *Commelina ensifolia* *Crotalaria medicaginea var. neglecta* *Cucumis melo* *Cyperus tenuispica* *Dichanthium fecundum* *Eriachne obtusa* *Gomphrena canescens subsp. canescens* *Heteropogon contortus* *Hypericum gramineum* *Lysiphyllum cunninghamii* *Microstachys chamaelea* *Neptunia dimorphantha* *Physalis angulata** *Ptilotus spicatus* *Sehima nervosum* *Stemodia viscosa* *Stylosanthes hamata** *Terminalia canescens* *Terminalia platyptera*	

Attachment B: DPLH (2024) - ACHIS Search Report M80/637

Aboriginal Cultural Heritage Inquiry System

List of Aboriginal Cultural Heritage (ACH) Lodged

Search Criteria

No Aboriginal Cultural Heritage (ACH) Lodged in Mining Tenement - M 80/637

Disclaimer

Aboriginal heritage holds significant value to Aboriginal people for their social, spiritual, historical, scientific, or aesthetic importance within Aboriginal traditions, and provides an essential link for Aboriginal people to their past, present and future. In Western Australia Aboriginal heritage is protected under the *Aboriginal Heritage Act 1972*.

All Aboriginal cultural heritage in Western Australia is protected, whether or not the ACH has been reported or exists on the Register.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Planning, Lands and Heritage by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you provide the details to the Department via https://achknowledge.dplh.wa.gov.au/ach-enquiry-form and we will make every effort to rectify it as soon as possible.

Copyright

Coordinates

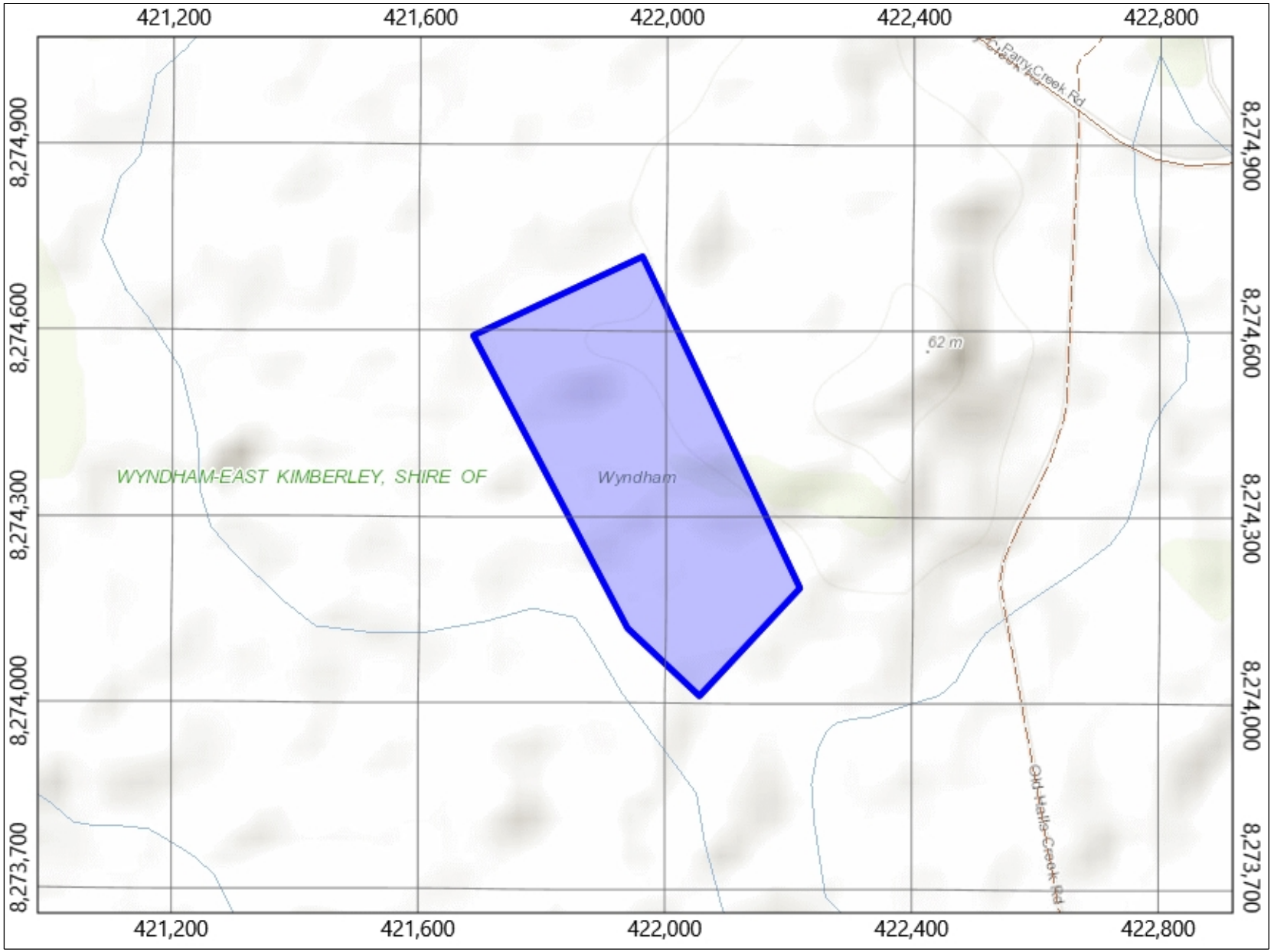
Map coordinates are based on the GDA 2020 Datum.

Basemap Copyright

Department of Planning, Lands and Heritage

Aboriginal Cultural Heritage Inquiry System

Map of Aboriginal Cultural Heritage (ACH) Lodged



Legend

- Aboriginal Cultural Heritage (ACH) Lodged
- Search Area
- Aboriginal Community
  - *Permanent*
  - *Seasonal*
  - *Town Based*
- Town
- Road
- River
- Local Government Authority

0.32 kilometres

Map Scale 1 : 9,730

MGA Zone 52 (GDA2020)

Aboriginal Cultural Heritage Inquiry System

List of Aboriginal Cultural Heritage (ACH) Register

Search Criteria

No Aboriginal Cultural Heritage (ACH) Register in Mining Tenement - M 80/637

Disclaimer

Aboriginal heritage holds significant value to Aboriginal people for their social, spiritual, historical, scientific, or aesthetic importance within Aboriginal traditions, and provides an essential link for Aboriginal people to their past, present and future. In Western Australia Aboriginal heritage is protected under the Aboriginal Heritage Act 1972.

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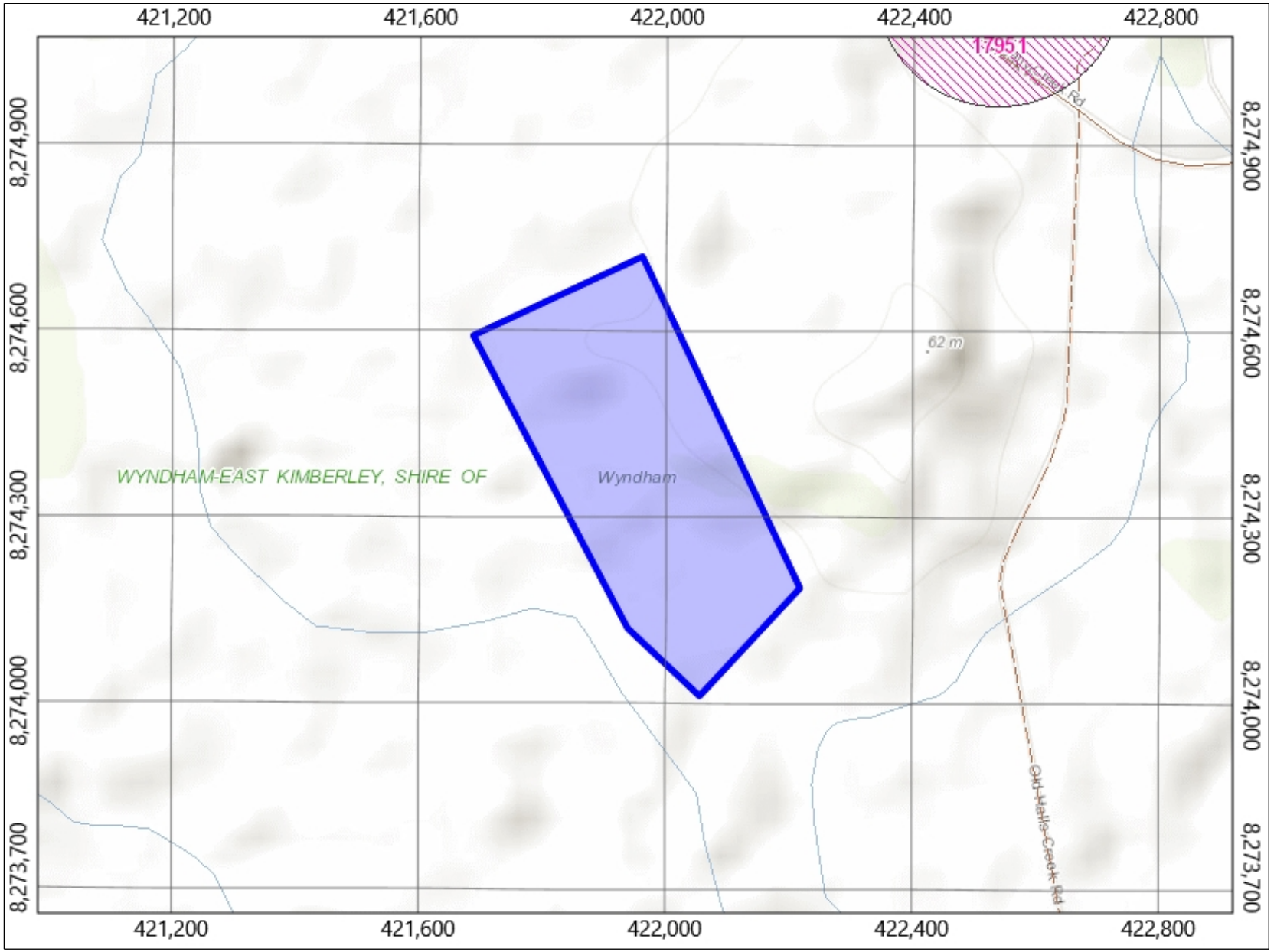
Basemap Copyright

Department of Planning, Lands and Heritage

Aboriginal Cultural Heritage Inquiry System

Map of Aboriginal Cultural Heritage (ACH) Register



Legend

- Aboriginal Cultural Heritage (ACH) Register
- Search Area
- Aboriginal Community
  - *Permanent*
  - *Seasonal*
  - *Town Based*
- Town
- Road
- River
- Local Government Authority

0.32 kilometres

Map Scale 1 : 9,730

MGA Zone 52 (GDA2020)