Report and recommendations of the Environmental Protection Authority

Warrawoona Gold Project

Calidus Resources Ltd

Report 1681

June 2020

Environmental impact assessment process timelines

Date	Progress stages	Time (weeks)
18/12/2019	EPA decides to assess – level of assessment set	
24/04/2020	Proponent provided additional information	18
04/06/2020	EPA board considered assessment	6
19/06/2020	EPA provided report to the Minister for Environment	2
24/06/2020	EPA report published	3 days
08/07/2020	Close of appeals period	2

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

In this case, the EPA met its timeline objective to complete its assessment and provide a report to the Minister.

Dr Tom Hatton
Chairman

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1. Introduction

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for Environment on the outcomes of the EPA's environmental impact assessment of the Warrawoona Gold Project (referred to in this report as the proposal). The proponent for the proposal is Calidus Resources Limited. The proposal is to construct and operate a gold mine about 20 kilometres (km) south of Marble Bar, in the Pilbara region of Western Australia.

The EPA has prepared this report in accordance with s. 44 of the *Environmental Protection Act 1986* (EP Act). This section of the EP Act requires the EPA to prepare a report on the outcome of its assessment of a proposal and provide this assessment report to the Minister for Environment. The report must set out:

(a) what the EPA considers to be the key environmental factors identified during the assessment

(b) the EPA's recommendations as to whether or not the proposal may be implemented and, if the EPA recommends that implementation be allowed, the conditions and procedures to which implementation should be subject.

The EPA may also include any other information, advice and recommendations in the assessment report as it thinks fit.

The proponent referred the proposal to the EPA on 29 October 2019. One week of public comment on the referral information commenced on 7 November 2019. The EPA decided to assess the proposal and set the level of assessment at 'Referral Information' on 18 December 2019.

EPA procedures

The EPA followed the procedures in the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2016* (State of Western Australia 2016*)* and the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual* (EPA 2020c) to the extent that it was appropriate and practicable. The EPA consulted the proponent on the application of the current procedures to its assessment of the proposal.

1.1 Assessment on behalf of the Commonwealth

The proposal was determined to be a controlled action by a delegate of the Commonwealth Minister for the Environment under the *Environment Protection and Biodiversity Conservation Act 1999* on 19 February 2020 as it will, or is likely to have, a significant impact on the following Matters of National Environmental Significance:

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

The proposal was assessed as an accredited assessment between the Commonwealth and Western Australian governments.

2. The proposal

The proponent proposes to develop the Warrawoona Gold Project, located about 20 kilometres (km) south of Marble Bar, in the Shire of East Pilbara (Figure 1). The proposal consists of four open pits and one underground mine, waste rock dump, valley fill tailings dam, mine operation centre, borefield and accommodation camp. The proponent anticipates two million tonnes per annum (Mtpa) of ore will be processed over about six years. Clearing of no more than 398 hectares (ha) of native vegetation within the 1,000 ha development envelope is proposed (Figure 2).

The main deposit to be mined is the Klondyke Pit which includes an open pit, about 2 km long by 240 metres (m) wide with a final pit floor depth of about 120 m. This pit will also include portals to access underground mines which will extend to about 400 m depth below surface. Two small satellite pits (St George east and west) will be operated immediately to the north of Klondyke. Whilst a secondary deposit located at the historical Copenhagen Pit, located 8 km to the northwest, will be extended to 190 m long, 135 m wide and 40 m deep.

The key characteristics of the proposal are summarised in Tables 1 and 2 below. A detailed description of the proposal is provided in section 2.3 of the referral report (Calidus Resources 2019).

Table 1: Summary of the proposal

Proposal title	Warrawoona Gold Project
Short description	Develop and operate a gold mine consisting of a processing facility and associated mining infrastructure, waste rock dump, tailings storage facility, borefield, and accommodation camp within the Warrawoona Gold Project area, located 20 km south of Marble Bar.

Table 2: Location and proposed extent of physical and operational elements

Element	Location	Proposed extent
Physical elements		
Mine and associated infrastructure	Figure 2	Clearing of no more than 398 ha of native vegetation within the 1,000 ha development envelope.
Operational elements		
Groundwater abstraction	-	Abstraction of no more than 1.6 gigalitres per annum (GL/a) from borefields and mine pit dewatering.
Mining waste rock	-	20 million loose cubic metres (LCM) at Klondyke and 300,000 LCM at Copenhagen.
Ore processing (waste)	-	Disposal of no more than 2 Mtpa of tailings into the tailings storage facility.

Figure 1: Regional location

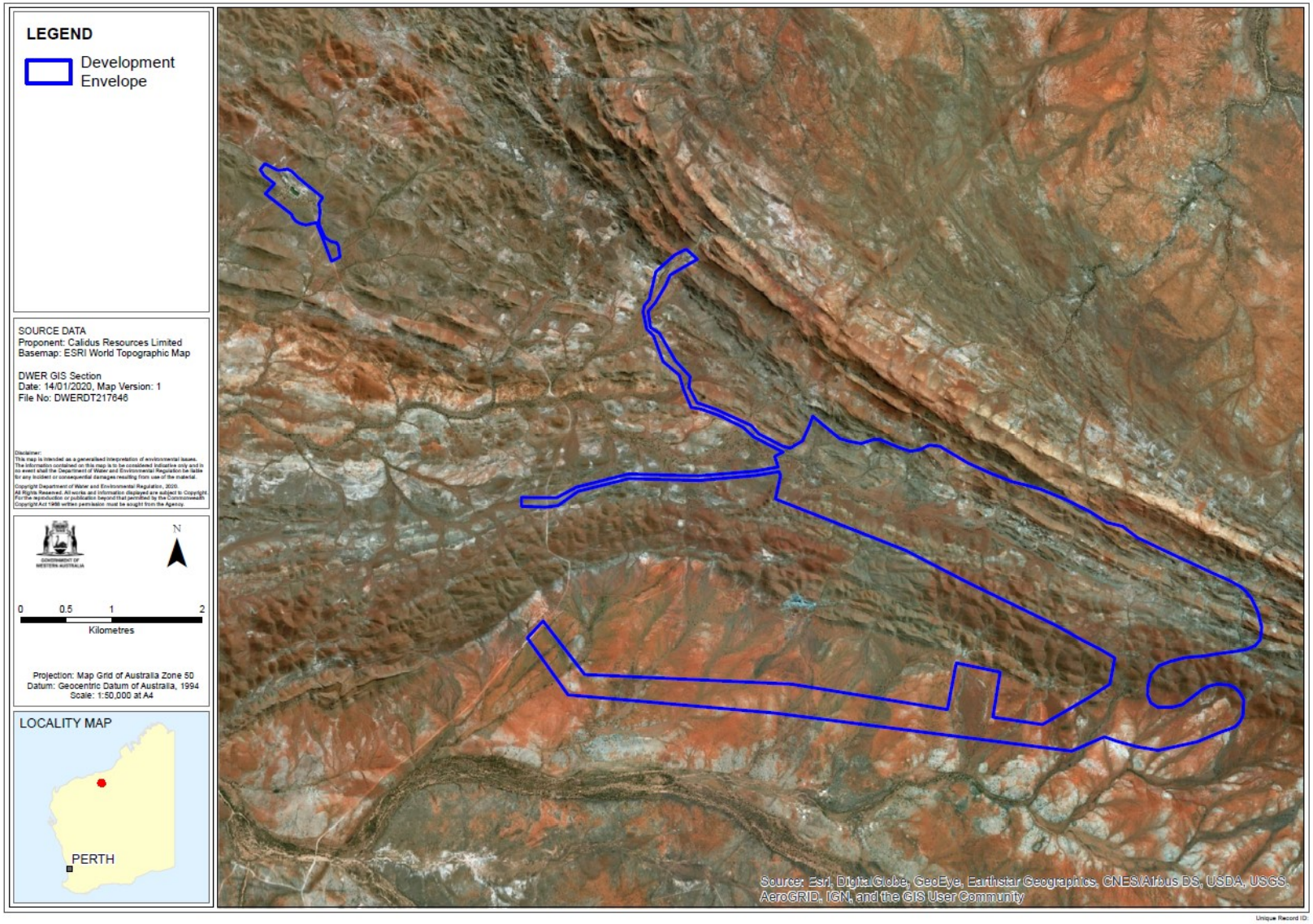


Figure 2: Development envelope

2.1 Context

The proposal is located within the Chichester sub-region of the Pilbara bioregion under the Interim Biogeographic Regionalisation for Australia (IBRA) classification (Kendrick and McKenzie 2001). The Chichester subregion has 4% of its land surface reserved under conservation tenure, including the Abydos-Woodstock reserve (70 km west), Millstream-Chichester National Park (210 km west) and Mungaroona Range Nature Reserve (140 km southwest).

The development envelope lies wholly within the Njamal (WC1999/008) registered Native Title claim. The proponent has a claim wide agreement with Njamal and has conducted exploration activities on site in accordance with this agreement and in regular consultation with the Njamal people and their representatives.

The other existing land uses in proximity to the development envelope are pastoral grazing and mining. The nearest existing mine is the Comet Gold Mine, about 20 km to the north-west, and the proposed Atlas Iron Corunna Downs Iron Ore mine 20 km to the west.

3. Consultation

The EPA advertised the referral information for the proposal for public comment in November 2019 and received two submissions, both supporting the project.

The EPA advertised the two week public consultation on Matters of National Environmental Significance in May 2020 and four submissions were received. The issues raised related to threatened fauna and mine closure, which are addressed under the Key Environmental Factors of Inland Waters (section 4.1) and Terrestrial Fauna (section 4.3).

The proponent consulted with government agencies and key stakeholders during the preparation of the supplementary report provided with the referral. The agencies and stakeholders consulted, the issues raised and the proponent's response are detailed in Table 9 of the proponent's supplementary report (Calidus Resources 2019).

The EPA considers that the consultation processes has been appropriate and that reasonable steps have been taken to inform the community and stakeholders about the proposed development. Relevant significant environmental issues identified from this process were taken into account by the EPA during its assessment of the proposal.

4. Key environmental factors

In undertaking its assessment of this proposal and preparing this report, the EPA had regard for the object and principles contained in s. 4A of the EP Act to the extent relevant to the particular matters that were considered.

The EPA considered the following information during its assessment:

- proponent's referral information and supplementary reports
- public comments received on the referral and stakeholder comments received during the preparation of the proponent's documentation
- EPA's own inquiries
- *Statement of Environmental Principles, Factors and Objectives* (EPA 2020d)
- relevant principles, policy and guidance referred to in the assessment of each key environmental factor in sections 4.1 to 4.4.

Having regard to the EP Act principles, the EPA considered that the following principles were particularly relevant to its assessment of the proposal:

1. **The precautionary principle** – Investigations on the biological and physical environment undertaken by the proponent have provided sufficient certainty to assess risks and identify measures to avoid or minimise impacts.
2. **The principle of intergenerational equity** – The EPA notes that the proponent has taken measures to avoid and minimise impacts, and together with the recommended conditions, will ensure the environment is maintained for future generations.
3. **The principle of the conservation of biological diversity and ecological integrity** – The EPA has concluded that provided the recommended conditions are imposed on the implementation of the proposal, the proposal will not compromise the biological diversity and ecological integrity of the affected areas.
4. **The principle of waste minimisation** – The EPA notes that the proponent will apply the waste hierarchy to operations.

Appendix 1 of this report provides a summary of the principles and how the EPA considered these principles in its assessment.

Having regard to the above information, the EPA identified the following key environmental factors during the course of its assessment of the proposal:

- **Inland Waters** – Potential impacts on surface water hydrology and groundwater level.
- **Flora and Vegetation** – Potential impacts from clearing up to 398 ha of native vegetation, including impact on priority flora in the development envelope.
- **Terrestrial Fauna** – Impacts to conservation significant fauna, including bats, Pilbara olive pythons and northern quolls.

- **Subterranean Fauna** – Potential impacts on stygofauna due to dewatering of habitat.

The EPA considered other environmental factors during its assessment of the proposal. These factors, which were not identified as key environmental factors, are discussed in the proponent's referral documentation (Calidus Resources 2019). Appendix 2 contains an evaluation of why these other environmental factors were not identified as key environmental factors.

The EPA's assessment of the proposal's impacts on the key environmental factors is provided in sections 4.1 to 4.4. These sections outline whether or not the EPA considers that the impacts on each factor are manageable. Section 6 provides the EPA's conclusion as to whether or not the proposal as a whole is environmentally acceptable.

Assessment on behalf of the Commonwealth

The EPA assessed the proposal on behalf of the Commonwealth Minister for Environment as an accredited assessment. The EPA has addressed Matters of National Environmental Significance (MNES) under each relevant factor and has summarised its assessment of MNES in section 6.

4.1 Inland Waters

The EPA's environmental objective for this factor is *to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.*

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- *Environmental Factor Guideline – Inland Waters* (EPA 2018)
- WA Environmental Offsets Policy (Government of Western Australia 2011)
- WA Environmental Offsets Guidelines (Government of Western Australia 2014).

The considerations for environmental impact assessment for this factor are outlined in *Environmental Factor Guideline – Inland Waters* (EPA 2018).

In addition to the current relevant policy and guidance above, the EPA gave regard to the *Statutory Guidelines for Preparing Mine Closure Plans* (DMIRS 2020) to ensure the proposal is decommissioned and rehabilitated in an appropriate manner.

EPA assessment

The EPA considers that the information provided by the proponent is adequate to determine the impacts to Inland Waters.

Surface water

There are no nationally important wetlands or Ramsar wetlands located within or adjacent to the development envelope.

The proposal is located in the upper parts of the Coongan River catchment. It straddles the Warrawoona Range, a ridgeline that forms the local catchment divide between the Brockman Hay Cutting Creek, Sandy Creek and Camel Creek systems. The total area of the catchment, which includes or is directly upstream of the footprint is about 6.8 km^2, which represents about 0.1% of the Coongan River catchment. The proposal is unlikely to have a significant impact on the functioning of Coongan River catchment.

As the proposal is located on a ridgeline in the upper reaches of the catchment there will be minimal flows entering the disturbance footprint, and this, coupled with the installation of surface water management infrastructure, means the proposal is not anticipated to significantly change levels of runoff.

No permanent pools are evident within the Brockman Hay Cutting Creek, Sandy Creek or Camel Creek catchment, and no permanent pools have been located within the development envelope.

Following mine closure, a pit lake will form at the Klondyke pit, forming a hydraulic (groundwater) sink. Backfilling to above the watertable will occur at the two St George pits (small satellite pits immediately north of Klondyke pit), and the historical Copenhagen pit to the north-west.

The Klondyke pit will be about 120 m deep, with an estimated 50 m of standing water and about 80 m of freeboard. About 70 ha of catchment is upstream of the pit, so given the expected runoff and the large capacity of potential water storage in the pit, the risk of pit overflow is negligible, even under extreme rainfall events. The groundwater quality in the vicinity of the Klondyke deposit is fresh to slightly brackish and alkaline. Modelling suggests the Klondyke pit lake will reach a salinity of between 3,000 and 4,000 milligrams per litre (mg/L) total dissolved solids within three to four years of mine closure. Concentrations of dissolved metals in the groundwater are generally low, apart from arsenic. Arsenic concentration was above the 0.01 mg/L guideline for human consumption in 56% of bores sampled, but below the guideline value of 0.5 mg/L for livestock watering in all samples analysed. The presence of arsenic at low levels in the local groundwater is naturally occurring.

The historical Copenhagen pit, which has been a pit lake since late 1980s, will also be backfilled. This pit lake has slightly elevated arsenic levels of about 0.58 mg/L. It captures seasonal flow from a creek to the west. The pit will be dewatered, re-mined and then backfilled to above the watertable. The existing creek line will be reinstated away from the pit. Backfilling and creek line reinstatement is likely to improve the environmental outcomes at the historical Copenhagen pit.

The majority of the waste rock is characterised as unweathered and is expected to be durable once exposed. However, there is some rock from the Klondyke Pit that has been identified as having potential to leach nickel and arsenic from waste rock. The majority of this material is expected to be encapsulated within the two shallow St

George pits which are above the watertable. The remaining material will be encapsulated in the main waste rock dump in designated cells. The proponent has prepared a Metalliferous Drainage Management Procedure to address the risks posed by elevated soluble nickel and arsenic.

The Tailings Storage Facility (TSF) is currently a conceptual design. The TSF will be a valley fill construction, designed to store about 10.5 million tonnes of tailings over the life of the project. The tailings will be geochemically benign and classified as non-acid forming (NAF). A modest enrichment in arsenic should occur within the TSF, chiefly associated with arsenopyrite. Concentrations are expected to be within the sub-mg/L range and will be confined to the TSF. The TSF will be a prescribed premise and would need to be licenced by the Department of Water and Environmental Regulation (DWER) under Part V of the EP Act. The Department of Mines, Industry Regulation and Safety (DMIRS) has advised that closure can be managed under the *Mining Act* 1978 as part of normal mine closure processes.

During operations run-off from the catchment areas upstream of the TSF will be directed to the reclaim pond, where it will be temporarily stored before being returned to the processing plant for use. The TSF will function as a 'zero-discharge' facility during operations and sufficient freeboard will be provided on the embankment to store runoff from upstream areas in addition to the tailings impoundment for the 1% annual exceedance probability 72-hour duration event (280 millimetres). At the cessation of mining, runoff from upstream catchment will be diverted off-site via TSF closure spillways. Three spillways have been sized to pass a probable maximum flood storm event (120 hour duration) which is acceptable from a closure scenario perspective. It is likely that suitable material will be available to construct the envisaged closure design and provide a suitably armoured outer surface to manage erosion processes. The EPA considers that the proposed TSF design is sound from closure and environmental management perspectives.

A cyanide reduction process will occur during secondary processing to reduce the concentration of weak acid dissociable cyanide discharge to less than 30 mg/L, which is lower than 50 mg/L industry standards for wildlife protection. This will reduce the risk of exposing fauna to elevated cyanide levels around the TSF.

There will be a strong hydraulic gradient between the Klondyke pit and the TSF due to the dewatering, and consequently TSF leachates may move toward the pit lake. This risk is diminished due to low cyanide levels and the benign nature of the tailings. Levels of contaminants are expected to be well within stock water standards. Additionally, there are no sensitive receptors (e.g. users of groundwater for drinking) in the vicinity.

Whilst a Mine Closure Plan is yet to be provided, the Department of Mines, Industry Regulation and Safety has advised that it can manage issues related to acid and/or metalliferous drainage for the proposal. Therefore the EPA considers that long-term risks around closure that could affect water quality can be adequately regulated, to prevent significant impacts to groundwater and surface water, through a mining proposal required under the *Mining Act 1978*.

Groundwater

Fractured rock aquifers are the most significant aquifers of the proposal area. North of the Warrawoona Range, the regional hydraulic gradient is northward towards the De Grey River. While south of the range, a southward gradient develops towards the Coongan River.

The water requirements for the mine, camp, and any make-up water at the processing plant is estimated to be 1.6 GL/a (or about 50 litres per second). Water requirements will be met through a combination of dewatering bores and dedicated production bores. Three production bores and two pit dewatering bores based in fractured rock are proposed. In the early years of the mine, up to 30 litres per second will be required from the production bores, but this will increase as dewatering rates increase. Water will not be discharged from site and any TSF decant water supplies will be reused in the plant. Surplus water from mine dewatering will be reused for processing and dust suppression.

The potential impacts from dewatering the Klondyke pit is shown in Figure 3. The highest permeability of the aquifers are located along the Klondyke shear which are identified as being potentially moderate to high permeability. Figure 3 shows the expected groundwater levels at the end of production and assumes no significant recharge over the life of mine.

Potential impacts of dewatering at the Klondyke deposit on Terrestrial Fauna, Flora and Vegetation, and Subterranean Fauna are discussed in the relevant sections.

Dewatering will also occur at the Copenhagen Pit to a depth of about 30 m below normal watertable levels during mining operations. The area of the 1 m drawdown contour extends out radially to around 500 m from the pit perimeter. Additionally, this pit has a short mine life of about four months so any groundwater drawdown impacts will only be short-lived and limited in their extent.

Given the lack of previous large scale pump trials in the local area and geology, there is a level of uncertainty how the resource will respond. The proponent proposes to monitor groundwater levels pre to post mining. Appendix 9-4 Groundwater Monitoring Procedure (Calidus Resources 2019) details the basic aspects of their proposed monitoring such as:

- quarterly baseline data collection from monitoring bores
- Klondyke Queen and Bow Bells specific water level monitoring sites (see section 4.2 Terrestrial Fauna for more details)
- three regional groundwater monitoring bores
- 5-10 monitoring bores around the embankments of the TSF and waste rock dump
- monitoring bore/s down slope of the pit to allow the monitoring of contaminants from the pit along the shear zone.

Licensing of groundwater abstraction will occur under the *Rights in Water and Irrigation Act 1914*, with management actions detailed in a Groundwater Operating Strategy to monitor groundwater levels around sensitive areas such as at bat roosts.

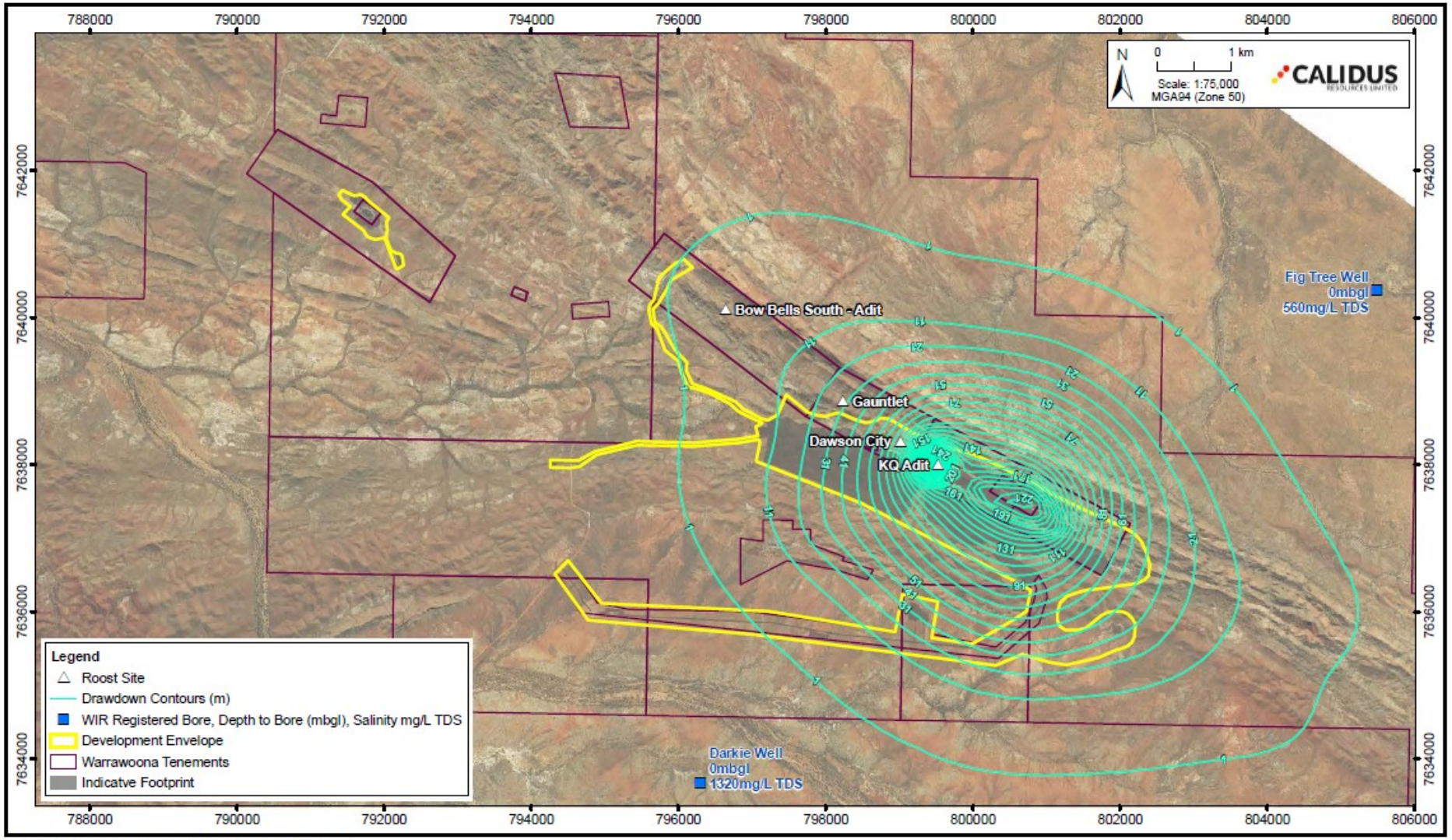
The Strategy will also contain criteria (such trigger levels and water quality standards) for managing groundwater related impacts during operations and post closure. Water quality data will also assist in determining baseline groundwater quality required to meet completion criteria post-mining. Recalibration of the groundwater model will be undertaken after 12 months of operations.

There are risks to groundwater from spills of chemicals and hydrocarbons. The risk is mitigated by the project being located away from major drainage lines, infrastructure being designed to reduce the chance of spills, and procedures being put in place to monitor and respond to spills. For example, cyanide leach tanks and associated processing plant will be located in bunded concrete containment areas. The processing plant will be designed such that process water containing cyanide is recycled and therefore kept within the area encompassed by the processing plant run-off collection drain and storage. In the event of spillages, all solutions will be contained within the process plant bunding, and the appropriate spill response procedure will be initiated. Portable pumps will be provided within the processing area for the pumping of spills within the bunded areas back to the storage tanks or emergency holding tanks.

Management and mitigation

The EPA notes that the proponent has taken steps to mitigate the impacts on surface and groundwater flows including:

- designing the proposal to incorporate surface water management throughout the site
- encapsulating the small amount of waste rock with elevated nickel and arsenic as per the Metalliferous Drainage Management Procedure
- a cyanide reduction process during secondary processing to reduce the concentration of weak acid dissociable cyanide discharge to less than 30 mg/L
- valley fill TSF design
- backfilling the new St George satellite pits to reduce environmental risk
- rehabilitating and backfilling the historical Copenhagen pit to enhance the current environment status of this area.



Source: DMIRS - Tenements, Groundwater Res. Cons. - Contours
Drawn: CAD Resources (08 9246 3242), Date: Oct 2019, CAD Ref: a2738_F001_24, Rev: A

Figure 3: Groundwater drawdowns at end of Klondyke operations

Summary

The EPA has paid particular attention to the:

- relevant principles, guidance and policy
- specific direct and indirect impacts to Inland Waters
- backfilling of the historical Copenhagen pit void
- advice from the DWER that it can manage groundwater impacts through the *Rights in Water and Irrigation Act 1914*
- advice from the DMIRS that it can manage impacts around mine closure under the *Mining Act 1978*.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Inland Waters that the impacts to this factor are manageable and would no longer be significant, provided there is:

- control through authorised extent in schedule 1 of the Recommended Environmental Conditions (Appendix 3).

The EPA notes that there is a requirement for:

- licensing of water abstraction by the DWER under the *Rights in Water and Irrigation Act 1914* with management actions detailed in a Groundwater Operating Strategy
- licensing of emissions and discharges from prescribed premises by the DWER under Part V of the EP Act.
- approval for the mining proposal by the DMIRS under the *Mining Act 1978.*

It is the EPA's view that the proposal can be adequately regulated through the *Mining Act 1978*, Part V of the EP Act and the licensing of groundwater abstraction under the *Rights in Water and Irrigation Act 1914*, rather than a condition under Part IV of the EP Act.

4.2 Flora and Vegetation

The EPA's environmental objective for this factor is *to protect flora and vegetation so that biological diversity and ecological integrity are maintained*.

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- *Environmental Factor Guideline – Flora and Vegetation* (EPA 2016a)
- *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016d)
- *WA Environmental Offsets Policy* (Government of Western Australia 2011)
- *WA Environmental Offsets Guidelines* (Government of Western Australia 2014).

The considerations for environmental impact assessment for this factor are outlined in *Environmental Factor Guideline – Flora and Vegetation* (EPA 2016a).

EPA assessment

Under the Interim Biogeographic Regionalisation for Australia (IBRA) classification, the proposal is located within the Chichester subregion. The proposal would result in clearing of up to 398 ha of native vegetation within the 1,000 ha development envelope.

The proponent has undertaken three flora and vegetation surveys relevant to the proposal between 2018 and 2020. The flora surveys covered a study area of 1,389 ha and identified 267 species and subspecies representing 45 families and 122 genera. The flora and vegetation assessment of the development envelope was undertaken at a Level 2 standard as defined by the *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016d).

Existing environment

Surveys within the study area found:

- eleven introduced flora at low densities, and with no high risk species identified
- five Priority (P) flora taxa including one P1, three P3 and one P4
- three potentially undescribed taxa
- about 94% of the vegetation in ‘Good’ to ‘Excellent’ condition.
- ten Vegetation Types (VT)
- no recorded occurrences of significant vegetation types within the 1,389 ha study area or within a 40 km radius of the study area
- limited Groundwater Dependant Vegetation (GDV).

Potential impacts

The potential impacts to flora and vegetation are outlined below.

- Clearing of up to 398 ha of native vegetation, of which 375 ha is ‘Good’ to ‘Excellent’ condition
- Clearing of one occurrence of a P3 species (*Heliotropium murinum*) and one occurrence of a P4 species (*Ptilotus mollis).*
- The project is located high in the catchment with only a minor creek line in the area to be directly or indirectly impacted. No obligate phreatophyte vegetation such as *Melaleuca argentea* or *Sesbania formosa* were found during surveys.
- Disturbing nine of the ten VT.The local significance of impact rating on each VT was ranked as low, excluding VT3, which is ranked moderate. VT3 was considered to contain some facultative GDV types. VT3 covered 69 ha or 5% of the study area and several quadrats recorded potential GDV species such as *Eucalyptus camaldulenis, Sesbania cannabina, Melaleuca glomerata* and *Cyperus vaginatis*.

- Where depth to groundwater is less than 10 m (e.g. Coongan River), facultative GDV species could be susceptible to extended drawdowns caused by dewatering. The Coongan River is located about 15 km to the west with tributaries of Camel Creek and Sandy Creek about 5 to 10 km to the south. These are located outside the predicted 1 m drawdown contour (see Figure 3), so impacts to GDV are unlikely.

Management and mitigation

Five Priority (P) flora and three undescribed species are known to occur within 5 km of the development envelope. These are outlined in Table 3.

The development envelope and disturbance footprint have been designed to reduce direct impacts to priority taxa, with the exception of a P3 species (*Heliotropium murinum*) and a P4 species (*Ptilotus mollis).* The clearing of *Heliotropium murinum* and *Ptilotus mollis* populations (outlined in Table 3) is considered to have a low level of regional impact as these species are well represented outside of the impact area and development envelope.

Table 3: Summary of key significant flora in the survey area, development envelope and disturbance footprint

Species	Conservation status	Survey area No. locations and (No. of plants)	Development envelope No. locations and (No. of plants)	Disturbance Footprint No. locations and (No. of plants)	% locations in disturbance footprint and (% of total individual plants)	Significance of local impact
Abutilon aff. *hannii*	potentially undescribed	34 (142)	3 (4)	3(3)	8.8% (2.0%)	low
Eragrostis crateriformis	P3	16 (382)	16 (382)	-	no disturbance	nil
Euphorbia clementii	P3	1 (1)	-	-	no disturbance	nil
Heliotropium murinum	P3	163 (895)	26 (70)	3 (27)	1.8% (3.0%)	low
Josephinia sp. Woodstock	P1	1 (1)	1 (1)	-	no disturbance	nil
Portulaca ?digyna	potentially undescribed	2 (7)	-	-	no disturbance	nil
Ptilotus mollis	P4	860 (6034)	289 (2134)	104 (754)	12.9% (12.0%)	low
Triumfetta aff. *appendiculata*	potentially undescribed	4 (71)	1 (18)	-	no disturbance	nil

Josephinia sp. Woodstock (P1) was found at a single record in the study area, in the southern area of the development envelope on the sand plain vegetation type. This location is a 90 km range extension and previously this species is only known from five populations across two broad localities. Observations of *Josephinia* sp. Woodstock at these other locations indicates it occurs as isolated plants along drainage lines which corresponds to this record. The recorded plant will not be directly impacted by the proposal.

Abutilon aff. hannii (potentially undescribed) appears to be uncommon in the Pilbara region, and is not currently known to occur in any conservation reserves. It should be treated as a significant species, pending taxonomic resolution. The direct impact to this species is 3 out of 34 (8.8%) known occurrences, which equates to 3 out of 142 (2%) of individuals to be directly impacted. It is unlikely the proposal will significantly impact on the conservation status of the species.

Portulaca ?digyna (potentially undescribed) *and Euphorbia clementii* (P3) were not found in the development envelope but were located in the broader study area and are not expected to be impacted by the proposal.

Ten VTs were mapped in the study area, five of which were ranked as potentially locally significant due to either low percentage of occurrences within the study area, and/or potential or known provision of habitat for significant flora taxa. Four of the VTs were noted to have a high probability of occurrence in the wider region, either through their occurrence on relatively common geology, soil types and landforms or known occurrence identified in other studies. The potentially significant VTs aren't known to represent regionally restricted vegetation, and are not representative of listed threatened or priority ecological communities.

VT8 was the only VT identified as being potentially regionally significant, as it is located in a claypan known to be relatively restricted in the region, and provides habitat for *Portulaca ?digyna*. Surveys have concluded that VT8 is not located within the development envelope.

Overall, the local significance impact of the proposal on vegetation types was ranked as low, excluding VT3, which was ranked as moderate. VT3 has been ranked as moderate of local significance due to the presence of suitable habitat for *Abutilon aff. hannii* (potentially significant) and *Eragrostis crateriformis* (P3), however no known locations of either of these two species are proposed to be directly impacted. Localised pockets of facultative GDV are also found in VT3, these are also not within in the development footprint and therefore will be avoided.

Overall, the known risks to priority and potentially significant flora are low. Significant residual impacts to Flora and Vegetation remain from the clearing of Chichester vegetation. It is recommended that the proponent make a contribution to the Pilbara Environmental Offsets Fund. This is dealt with in section 5 – Offsets.

Summary

The EPA has paid particular attention to the:

- relevant principles, guidance and policy
- limited likelihood of GDV populations to be impacted by groundwater drawdown
- design of the proposal to avoid the majority of Priority flora
- significant residual impact associated with clearing of up to 375 ha of native vegetation in 'Good' to 'Excellent' condition.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Flora and Vegetation that the impacts to this factor are manageable and would no longer be significant, provided there is:

- control through authorised extent in Schedule 1 of the Recommended Environmental Conditions (Appendix 3)
- implementation of offsets (see section 5, condition 8) to counterbalance the significant residual impact of clearing 375 ha of Chichester IBRA subregion vegetation in 'Good' to 'Excellent' condition.

4.3 Terrestrial Fauna

The EPA's environmental objective for this factor is *to protect terrestrial fauna so that biological diversity and ecological integrity are maintained.*

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- *Environmental Factor Guideline – Terrestrial Fauna* (EPA 2016c)
- *Technical Guidance: Sampling Methods for Terrestrial Vertebrate Fauna* (EPA 2010)
- *Technical Guidance: Terrestrial Fauna Surveys* (EPA 2016f)
- *Technical Guidance: Sampling of short range endemic invertebrate fauna* (EPA 2009)
- *WA Environmental Offsets Policy* (Government of Western Australia 2011)
- *WA Environmental Offsets Guidelines* (Government of Western Australia 2014).

The considerations for environmental impact assessment for this factor are outlined in *Environmental Factor Guideline – Terrestrial Fauna* (EPA 2016c).

EPA assessment

A number of terrestrial fauna surveys have been undertaken in the project area. A level 1 survey was undertaken in 2017 followed up by targeted surveys for northern quoll, Pilbara olive python, brush-tailed mulgara, night parrot and short range endemic fauna. Targeted bat surveys and monitoring have been undertaken since 2016. The level of surveys is commensurate with the terrestrial fauna at risk of the proposal and the results have provided sufficient information to describe the receiving environment and assess potential impacts.

Seven broad fauna habitat types were identified and mapped for the study area. All of the fauna habitats, excluding the claypan habitat, intersect the development envelope.

Significant fauna

Conservation significant fauna includes species listed as:

- Threatened or Specially Protected (includes migratory species) under the *Biodiversity Conservation Act 2016* (BC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- Priority species listed by the Department of Biodiversity, Conservation and Attractions.

Six species recorded during the field survey are listed as conservation significant:

- northern quoll (*Dasyurus hallucatus*) – Endangered under the BC Act and the EPBC Act
- Pilbara olive python (*Liasis olivaceus barroni*) – Vulnerable under the BC Act and the EPBC Act
- Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) – Vulnerable under the BC Act and the EPBC Act
- ghost bat (*Macroderma gigas*) – Vulnerable under the BC Act and the EPBC Act
- brush tailed mulgara (*Dasycercus blythi*) – near threatened under the BC Act
- western pebble mound mouse (*Pseudomys chapmani*) – near threatened under the BC Act.

Based on regional records and habitats identified within the study area, a further five conservation significant fauna species have the potential to occur in the study area:

- greater bilby (*Macrotis lagotis*) – Vulnerable under the BC Act and the EPBC Act. Likelihood of occurrence; likely
- spectacled hare-wallaby (*Lagorchestes conspicillatus*) – Vulnerable under the BC Act. Likelihood of occurrence; likely
- night parrot (*Pezoporus occidentalis*) – Endangered under the BC Act and the EPBC Act. Likelihood of occurrence; possible
- northern brush-tail (*Trichosurus arnhemensis*) Possum – P4 Near threatened under the BC Act. Likelihood of occurrence; possible
- long-tailed dunnart (*Sminthopsis longicaudata*) – Near threatened under the BC Act. Likelihood of occurrence; possible.

Potential impacts

Based on the results of surveys and the presence of species likely to occur, the potential significant impacts to conservation significant fauna from the proposal are:

- Significant ghost bat and Pilbara leaf-nosed bat populations which are estimated to be 500 and 1,500-2,000 individuals respectively.
- Clearing of 398 ha of foraging and/or dispersal habitat for the Pilbara leaf-nosed bat and ghost bat. The tracking study identified both species mostly used areas other than the locations where the Klondyke pit and TSF will be located.

- Loss of five temporary refuge sites not critical to the survival of the ghost bat and/or the Pilbara leaf-nosed bats. Alternate roosts are available nearby.
- Risk of abandonment of the Klondyke Queen roost by the Pilbara leaf-nosed bat due to groundwater depletion. The impact is not considered significant given the availability of the Bow Bells roost located 4 km to the NW which is the main maternity roost in the area. It is probable that the species will continue to use Klondyke Queen as a refuge during mining operations and will return to using this roost on cessation of mining and rising of the watertable.
- Clearing of 0.8 ha of rocky breakaway habitat with high density denning and foraging habitat for the northern quoll.
- Clearing of 11.1 ha of sandplain habitat that supports brush tailed mulgara and potential habitat for the night parrot and greater bilby.
- Terrestrial fauna could also be impacted from increased light, noise, and vibration from construction and operational activities. As well as vehicle strike and changes to predation due to biosecurity breaches or changes in food availability.

The assessment of the potential impacts and management on terrestrial fauna is discussed below with respect to the key subheadings:

- Bats
- Other fauna species.

Bats

Roost sites

Within the study area and surrounds there are about 30 known roost sites that support the Pilbara leaf-nosed bat and/or ghost bat. All roost sites are historic mine workings as the local geology does not support the formation of significant caves. The referral information details each of the roost sites, its values and the level of impact/mitigation from the proposal (Calidus Resources 2019). Figure 4 shows the location of the roosts in relation to the proposal.

The footprint has been developed to mitigate direct impacts to the majority of the roosts. Those that are impacted are lower priority roosts. The proposal will directly impact on five roosts (KQ488, Cuban, Kopckes Reward, Britannia and St George) as they are to be mined. The roosts are temporary refuges used occasionally by the ghost bat and Pilbara leaf-nosed bat. The loss of these roosts is not anticipated to cause a significant impact on the bat population, because their utilisation is low and there are a number of known alternative roosts available within the surrounding area.

The remaining 25 roosts will not be directly impacted and most of these are considered to be at low risk from indirect impacts from the proposal. The Klondyke Queen Roost is a maternity roost for the ghost bat and a permanent diurnal roost for the Pilbara leaf-nosed bat. The site is considered of regional significance and is discussed below in more detail.

Indirect impacts to bats

The indirect impacts to bats include, and are discussed in detail below:

- noise
- blasting
- goundwater level changes at roosts
- bat drinking, foraging areas and water supplies
- roost flooding risk.

Noise

The proposal will generate noise from blasting, heavy machinery, ore removal, processing and power generation. Noise impacts on bats will be largely associated with blasting, which will be restricted to daytime operations. Habitat most likely to be at risk are systems that support diurnal roosting, such as Klondyke Queen.

Predicted noise emissions generated by mine operations (process plant, power plants and the general mining operations) at Klondyke pit has been modelled for each nearby roost site. The modelling used a threshold of 60 decibels (dB) which is expected to be complied with at all roost sites with the exception of the Klondyke Queen roost. At 1.5 m above the entrance of Klondyke Queen roost, the noise level was modelled to be 71 dB, which could further be reduced to 69 dB with noise controls to the drill rigs and haul trucks. It is also expected that the topographical separation of a hill and creek line between the Klondyke pit and the Klondyke Queen roost will further act to shield/minimise noise and vibration impacts from reaching the roost.

As the predicted noise level modelled at the Klondyke Queen roost is based on a point 1.5 m above the ground surface, and the Klondyke Queen roost is located about 10 m below ground and away from the adit's entrance, the noise levels within the roosts are predicted to be below 55 dB(A). Even with the predicted worst-case scenario of 69-71 dB(A), this level is not expected to adversely impact the local bat population, with a study by Bullen and Cresse (2014) indicating that noise levels up to 70 dB(A), from drilling activities, did not appear to disturb bats roosting at the time. A threshold of 70 dB(A) will be applied at the entrance of Klondyke Queen roost. The monitoring and management of noise will be part of the Significant Species Management Plan.

The predicted noise levels from the proposal will be dominated by low frequency sounds (i.e. below 250 hertz). Therefore it is considered unlikely that noise emissions will interfere with higher frequency bat call signals (which are understood to be near 2 kilohertz).

Blasting

Blasting is for a short duration, with locally intense vibrations that are measured in millimetres per second (mm/s). Blasting can also cause airblast overpressure and flyrock.

Vibrations from uncontrolled blasting could result in collapse of roosts. The roosts are all in historical mine workings dating from the 1890s. For safety reasons and avoiding disturbance to bats, survey work within these historical mine workings has been limited. However, the old workings have shown a high level of resilience, as Klondyke Queen was first mined in 1896 and has survived a series of earthquakes. Since formal earthquake records began in 1963, there have been 75 earthquakes within a 100 km radius of the site, with the largest event being 5.4 Local Magnitude (ML) in 1963 near Nullagine. The closest recorded event was 3.4 ML about 10 km from the Warrawoona proposal area in November 2017. Such earthquakes would have been large enough to collapse any historical mines which are inherently unstable. Large blasts could still significantly damage roosts, whilst technical advice provided by geotechnical consultants indicated that controlled blasting is not a significant threat to overall roost stability.

Vibrations from blasting also have the potential to disturb roosting bats. Observations at other mine sites in the Pilbara indicate that bats are not disturbed by daytime blasting provided blasting controls are put in place.

The proponent will mitigate the risk of roost collapse and bat disturbance by implementing an Environmental Blasting Management Plan. The plan has a staged approach to blasting and reducing blast sizes within 500 m, and no blasting within 200 m of the Klondyke Queen roost. All blasts within 1,000 m of the Klondyke Queen roost will be monitored, recording both air overpressure and ground vibration. The plan has set a target of zero exceedances of 10 mm/s vibration at Klondyke Queen. This is a conservative target in comparison to other projects in the Pilbara, for example Rio Tinto set a less than 25 mm/s vibration limit for heritage sites (Rio Tinto 2013). 10 mm/s is typically applied to very high risk infrastructure such as buried gas pipelines.

The blast controls have been modelled to effectively mitigate the risk of airblast overpressure and flyrock.

Baseline monitoring of bats is currently being undertaken and monitoring events will be undertaken in conjunction with a staged approach to blasting. Monitoring processes and targets of the Environmental Blasting Management Plan will be detailed in a Significant Species Management Plan.

A 32 ha mining exclusion zone will be applied to the northwest of the Klondyke pit (Figure 5). This exclusion zone will provide protection from direct disturbance of important bat roosting sites, particularly maternity and diurnal roosts for the ghost and Pilbara leaf-nosed bats. Bat roosts in this area are summarised in Table 4.

The exclusion zone also protects from direct impacts on denning and foraging habitat for other species of conservation significance, such as the northern quoll and Pilbara olive python.

Activities excluded from the mining exclusion zone:

- surface blasting (note the underground mine sits below some areas of the exclusion zone, with a 200 m vertical buffer)

- permanent infrastructure.

Activities allowed in the mining exclusion zone:

- minor earth works for fauna water supply dam and light vehicle access, with a noise limit of 70 dB(A) at receiver sites (Klondyke Queen roost)
- dewatering bore within the footprint of the exclusion zone (generator will be fitted with sound proofing with a 63 dB rating at 7 m)
- monitoring activities.

Table 4: Bat roost sites within the mining exclusion zone and their significance

Roost site recorded within the mining exclusion zone	Roost significance: Pilbara leaf-nosed bat	Roost significance: ghost bat
Klondyke Queen adit	Permanent diurnal roost	Permanent maternity roost
Klondyke No 1 West	Nocturnal refuge	Night roost
Klondyke No1 East	Nocturnal refuge	Night roost
Dawson City	Nocturnal refuge	Occasional diurnal roost
Wheel of Fortune East	Nocturnal refuge	Night roost
Mullans adit	Nocturnal refuge	Possible diurnal roost

Klondyke Queen is within the mining exclusion zone which provides a 200 m buffer to the roost (Figure 6)

Groundwater level changes at roosts

Reducing the watertable can change humidity levels in bat roosts which can impact on suitability, particularly for Pilbara leaf-nosed bats. The roost with the largest predicted drawdown impact is Klondyke Queen.

The Pilbara leaf-nosed bat is dependent on humid microclimates. Dewatering of Klondyke Queen is likely to cause the bats to abandon the non-permanent diurnal roost and return to the main permanent maternity roost at Bow Bells South until groundwater levels recover. Current monitoring results indicates that Bow Bells South is likely to be the main Pilbara leaf-nosed bat roost near the proposal area.

Retention of standing water in Bow Bells South to ensure suitability for Pilbara leaf-nosed bat roosting is crucial for the ongoing success of the regional population. Bow Bells is located 4 km to the north west of Klondyke, and groundwater modelling indicates the potential for small (about 1-5 m) drawdowns at this location. This impact is not expected to be significant as submerged shafts are believed to extend a further 30 m below the current watertable.

Dewatering the Klondyke Queen is not anticipated to impact the ghost bat colony. Ghost bats have been recorded roosting and reproducing in caves that have low humidity levels. Their roosting chambers are often well above and not directly connected to the watertable with close to ambient humidity conditions present.

It is proposed that monthly monitoring of groundwater levels will be undertaken either in the roost and/or monitoring bores located in the vicinity of the roost entrance. These will be detailed as part the groundwater operating strategy and will include triggers of change. If groundwater levels are dropping below levels where the

humidity of Bow Bells South is impacted, then a temporary artificial supply of water to the roost will be required until groundwater levels return to an acceptable level.

Bat drinking, foraging areas and water supplies

Foraging studies have also revealed that the Copenhagen pit lake is not frequently visited by bats. Monitoring data is indicating that the bats prefer to forage (and drink) outside the proposal area. Monitoring of bat activity at, and utilisation of, the existing Copenhagen pit lake is ongoing.

With the dewatering of Copenhagen and the preference for bats (and other fauna) not to be attracted to the TSF as a primary water source, an alternative water source is planned to be constructed in the mining exclusion zone. A lined earthen 10 x 10 m dam will be built which will be supplied with suitable water from a nearby bore and/or flows from a small area of catchment. Its utilisation by bats will be monitored to determine if ghost bats and/or Pilbara leaf-nosed bats are using this water source. Post mining, it is proposed to be closed and rehabilitated with details outlined in a closure plan which will be submitted to the DMIRS with the mining proposal.

The development envelope is used for foraging habitat, but it is not considered key foraging habitat. Tracking data shows that ghost bats tend to leave the proposal area using flight paths outside the proposal area along the northern edge of the Warrawoona Ranges. Pilbara leaf-nosed bats also leave the proposal area, preferring to forage to the northwest of the proposal area, towards Bow Bells.

Foraging area studies in other areas of the Pilbara indicate both species of bat travel out long distances from their diurnal roosts for foraging. The Pilbara leaf-nosed bat is regularly detected out to 20 km and occasionally over 30 km from the roost (Bullen 2013). Ghost bats have been observed foraging more than 12 km from roost caves (Diete et al. 2016; Bat Call WA unpublished data). The development envelope is generally less than 1 km wide and disturbance to foraging habitat across the whole proposal area represents a small percentage of habitat. Additionally, the tracking data indicates that the disturbance footprint may not be their preferred foraging habitat.

The presence of mining infrastructure between foraging habitat and roosts is not considered to be a risk due to observations of bats flying over other operational mines. For example both species have also been shown to continue to persist long-term in close proximity to open cut operations, including:

- Pilbara leaf-nosed bat about 500 m from BHP’s Cattle Gorge
- Pilbara leaf-nosed bat about 1 km from Rio Tinto’s Paraburdoo mine
- ghost bat in caves about 250 m from Rio Tinto’s West Angelas mine
- ghost bat in caves about 1 km from BHP’s Mining Area C.

In all four cases, the foraging flight paths away from their roosts have been impacted to varying degrees without any measurable impact on the bat’s presence.

Roost flooding risk

The entrance to the Klondyke Queen underground workings is situated about 8 m above the nearby ephemeral watercourse and about 2 m above the lowest point at western end of the Klondyke pit.

All roosts are also above the ultimate tailings beach height of the TSF. The lowest roost is Dawson city, which is still 5 m above the predicted height. It is concluded that no roosting sites are at risk from flooding.

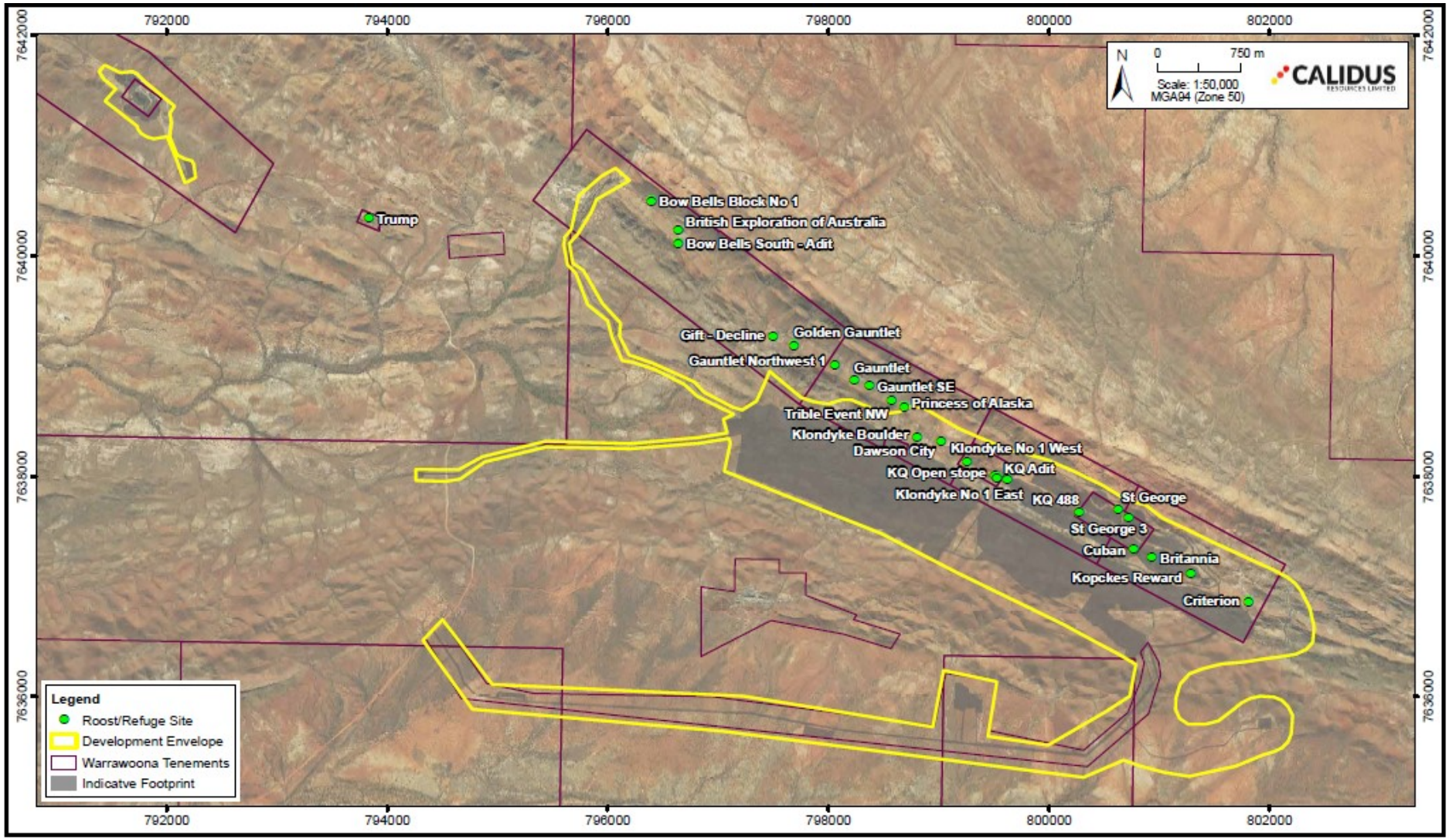


Figure 4: Bat roosting sites in the development envelope

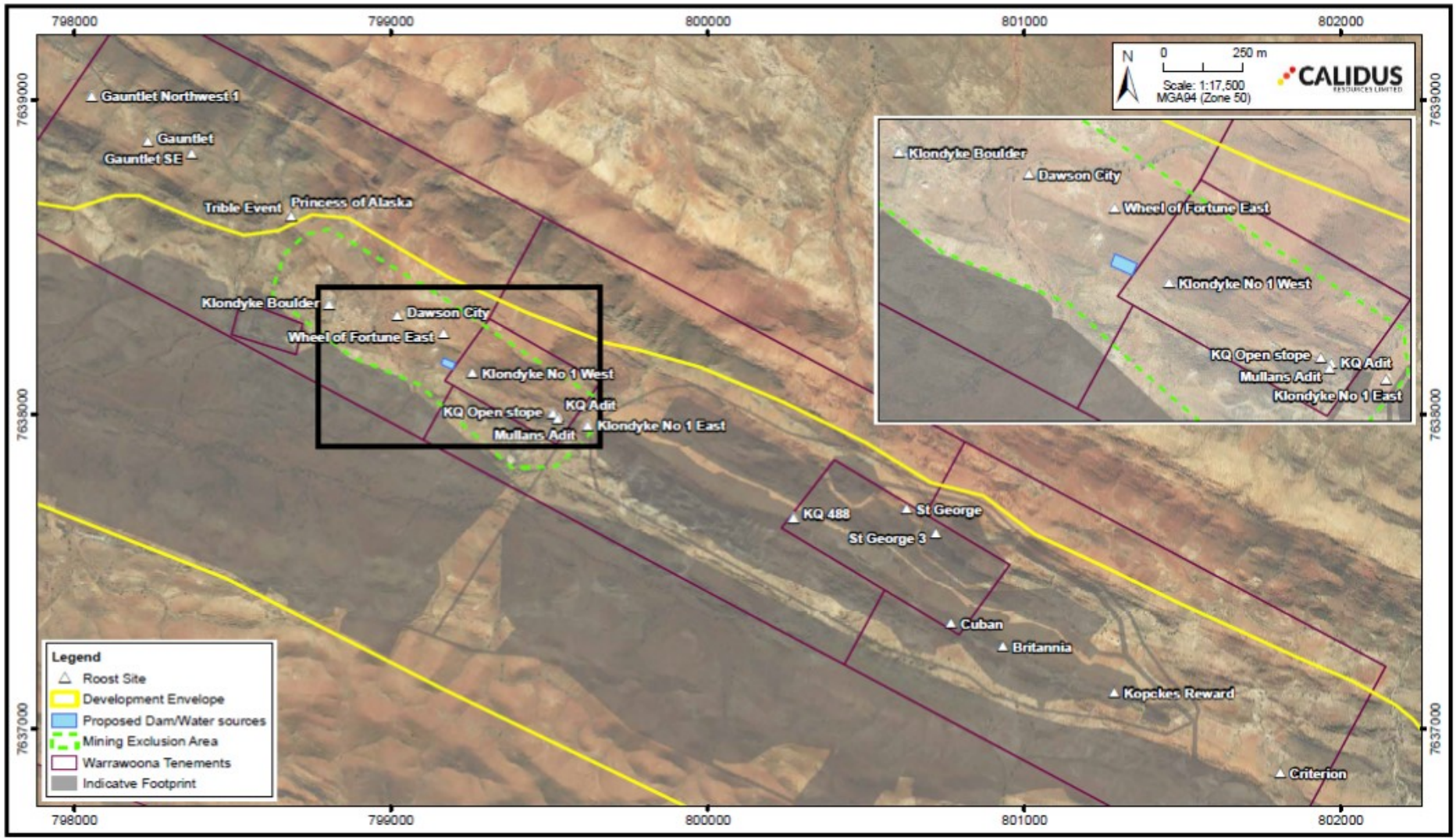


Figure 5: Mining exclusion zone

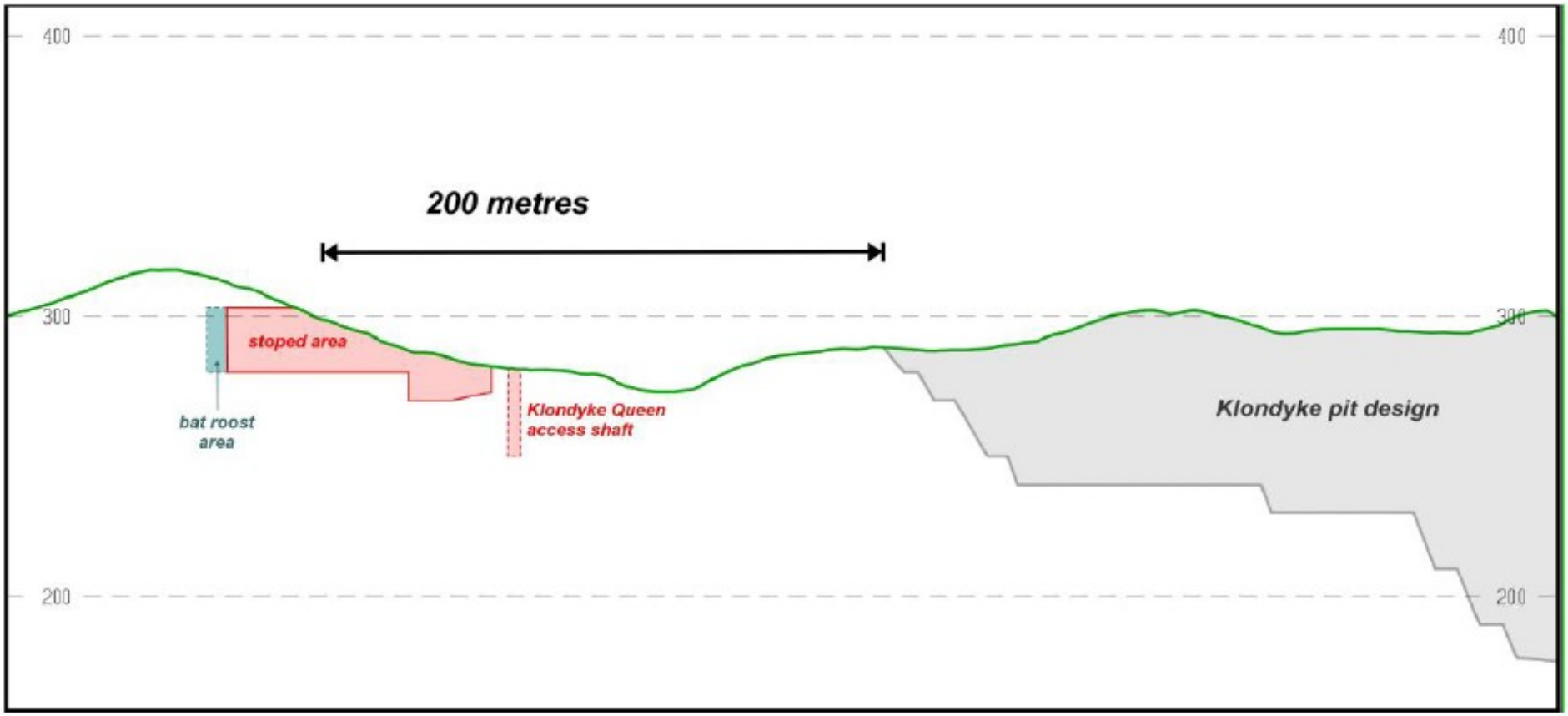


Figure 6: West-east long-section of the proposed Klondyke pit in relation to Klondyke Queen roost site

Other fauna species

Northern quoll

The targeted fauna survey estimated the population at study sites to be four to seven individuals in rocky breakaways, hillcrest/hillslope and minor drainage line habitat. Their core habitat was rocky breakaways, of which about 0.8 ha will be impacted by the proposal footprint. Around 59 ha of hillcrest/hillslope and minor drainage line habitat in the proposal footprint would be used on a transitory basis and the remaining 338 ha would be low value quoll habitat. The mining exclusion zone will retain 32 ha of key habitat for the northern quoll.

Habitat mapping has shown the key habitat type of rocky breakaways extends outside the development envelope. Given the scale of impacts, the EPA considers it unlikely that the impact to habitat for northern quoll would be significant, but should be considered from a cumulative impact perspective.

Pilbara olive python

There has been one record of the Pilbara olive python in the development envelope, which was from Klondyke Queen bat roosting site. Core habitat for the Pilbara olive python is rocky breakaways, which will have minimal disturbance (about 0.8ha). The retention of the Klondyke Queen roost and other bat roosts within the 32 ha mining exclusion zone will retain this habitat for the Pilbara olive python. The development envelope has no permanent pools or riverine vegetation which often support larger populations of Pilbara olive python.

Given the scale of impacts, the EPA considers it unlikely that the impact to key habitat for Pilbara olive python would be significant, but should be considered from a cumulative impact perspective.

Brush-tailed mulgara

There was one record of brush-tailed mulgara which was adjacent to the main road in the south west corner of the development envelope. The sandplain habitat type is the only habitat considered highly suitable to support the species within the proposal area. Disturbance to this habitat is low (11 ha, or 8% of the habitats surveyed area). Given the scale of impacts, the EPA considers it unlikely that the impact to key habitat for brush-tailed mulgara would be significant.

Greater bilby

The greater bilby was not recorded in the proposal area. There are numerous historical greater bilby records in the general area, but there is a lack of contemporary records in the vicinity. The nearest records are 15 km to the east in 2004, 12 km south in 1984, and 15 km to the north in 1984.

Their preferred habitat is sandplain and potentially stony plain. A small area of their core sandplain habitat is within the disturbance footprint (11 ha). No significant impact to the greater bilby is likely.

Risk of vehicle strike

Species such as the bilby, brush tailed mulgara, northern quoll, Pilbara olive python and bats are all prone to vehicle strikes particularly at night. Vehicle movements at night will be significantly less than during the day and generally limited to in-pit operations. Haulage of ore from Copenhagen to the processing facility adjacent to the Klondyke pit will occur over a 12 month period using on average two road trains per day, during daytime hours. Speed controls on site should also reduce vehicle related impacts. Overall the risk to the conservation status of these species from vehicle strikes is not considered significant.

Residual impacts to terrestrial fauna

Significant residual impacts to Terrestrial Fauna foraging and denning habitat remain from the proposed development. It is recommended that the proponent make a contribution to the Pilbara Environmental Offsets Fund. This is dealt with in section 5 – Offsets.

Western pebble-mound mouse

Core habitat types for the western pebble-mound mouse are hillcrest/hillslope and stony plain, which are the largest habitat extents within the proposal area and will experience the largest disturbance footprints of all habitat types (138.1 ha and 141.7 ha disturbance respectively). Given the species is a habitat specialist to these areas, the individuals within the proposal area may be negatively impacted at a local level.

Although the total disturbance area for the western pebble-mound mouse's preferred habitat, hillcrest/hillslope and stony plain, is almost 280 ha, this habitat is well represented in the region and only a small percentage of this habitat will be disturbed. Given the scale of impacts, the EPA considers it unlikely that the impact to key habitat for western pebble-mound mouse would be significant.

Short range endemic (SRE) fauna

The gorge/gully habitats within the rocky crests and slopes habitat zone (rocky breakaways) were not regarded as highly suitability for SRE species. All the gorges/gullies are relatively shallow and lacked the high degree of protection that major gorges and gullies provide elsewhere in the Pilbara.

SREs were recorded from four of the eight habitat types mapped during fauna habitat surveys of the project area and surrounds. All habitat types that recorded SRE specimens are considered widespread throughout the local area and more broadly across the Pilbara region.

Distribution of species across these habitat types is shown in Table 5.

Table 5: Potential short range endemic taxa recorded and their habitat

Higher taxon group	Lowest taxonomic identification	Hillcrests	Minor drainage line	Stony plain	Rounded hills
ARANEAE					
Selenopidae	*Karaops* sp. indet.	2	1		
ISOPODA					
Armadillidae	*Buddelundia* sp. 11	3	1		
	Buddelundia sp. indet.	1			
PSEUDOSCORPIONES					
Olpiidae	*Austrohorus* sp. CAL1	3		1	
	Indolpium sp. CAL3 'long chela'	4			
	Indolpium sp. indet1	1			
	Indolpium sp. indet2			1	
	Indolpium sp. Indet3				1

These habitat zones were mapped over aerial photography and the landscape features which the habitat zones overlaid extended beyond the development envelope.

Given the:

- disturbance footprint and development envelope consists primarily of habitats with a low to medium potential to support SRE species, which are well represented outside of the development envelope
- lack of high potential habitat
- low numbers of SRE species found during surveys,

it is unlikely that any SRE taxa recorded during surveys will be adversely impacted by the proposal.

Outcomes from environmental investigations and impact assessment have informed project design. For example:

- the establishment of the 32 ha mining exclusion zone to protect key bat roosting sites such as the Klondyke Queen adit, also protects SRE, northern quoll and Pilbara olive python habitat
- 200 m blasting buffer at the Klondyke Queen roost exceeds the 185 m recommended safe buffer
- staged blasting and blasting controls when within 1 km of Klondyke Queen roost
- placement of infrastructure such as roads and accommodation footprints to avoid sensitive sites
- commitment to less than 30 mg/L weak acid dissociable cyanide discharge at the TSF, which is 40% lower than benchmark levels currently recognised for wildlife protection
- vehicle movements at night will be generally be limited to in-pit operations reducing the chance of vehicle strike.

Summary

The EPA has paid particular attention to the:

- relevant principles, guidance and policy
- limited GDV populations in the vicinity of the predicted drawdown
- application of the mitigation hierarchy (avoidance) to the majority of fauna habitat, other than roosts which is predicted to have a low level of impact on the availability of roost sites available to bats
- direct impacts to short range endemic fauna habitat being limited in scale.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Terrestrial Fauna that the impacts to this factor are manageable and would no longer be significant, provided there is:

- control through authorised extent in Schedule 1 of the Recommended Environmental Conditions (Appendix 3)
- implementation of condition 6, which will create buffers of key roost sites by the application of a 32 ha mining exclusion zone
- Implementation of a Significant Species Management Plan, which requires baseline monitoring and a staged approach to blasting, implementation of reduced blast sizes within 500 m, and no blasting within 200m, of Klondyke Queen roost and maintaining the humidity of Bow Bells within Pilbara leaf-nosed bat roost parameters
- implementation of offsets (condition 8) to counterbalance the significant residual impact of clearing 398 ha of Chichester IBRA subregion vegetation which is foraging and denning habitat for norther quoll, Pilbara olive python, bats and habitat for brush tailed mulgara and potential habitat for night parrot and greater bilby.

4.4 Subterranean Fauna

The EPA's environmental objective for this factor is *to protect subterranean fauna so that biological diversity and ecological integrity are maintained.*

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- *Environmental Factor Guideline – Subterranean Fauna* (EPA 2016b)
- *Technical Guidance – Sampling methods for subterranean fauna* (EPA 2007)
- *Technical Guidance – Subterranean Fauna Survey* (EPA 2016e).

The considerations for environmental impact assessment for this factor are outlined in *Environmental Factor Guideline – Subterranean Fauna* (EPA 2016b).

EPA assessment

The proposal requires dewatering, which will result in the loss of subterranean fauna habitat.

A Level 2 subterranean fauna assessment within the proposal area sampled 118 locations and resulted in 1,979 subterranean fauna specimens, with 99% stygofauna (1,955 specimens) and 1% troglofauna (24 specimens). The EPA considers the surveys provide sufficient information to enable it to assess the potential impacts.

No threatened ecological communities or priority ecological communities for subterranean fauna are present within the development envelope.

Stygofauna

The stygofauna specimens resulted in 28 morphospecies and five indeterminate taxa, representing a rich stygofauna species assemblage compared to nearby surveys.

Fourteen stygofauna taxa were widespread and known to occur throughout the wider catchment or regionally. Ten stygofauna taxa were recorded from multiple locations within the proposal area, with known linear ranges spanning from 0.13 km to 17 km. Three stygofauna taxa were singleton taxa or known only from a single site, whereas the remaining taxon represented a unique higher-level taxon that could not be identified to species level.

Troglofauna

Relative to other subterranean fauna surveys within the wider east Pilbara region, the troglofauna species assemblage recorded within the proposal area is considered depauperate.

Overall, one taxon recorded is widespread in the Pilbara, one taxon was recorded from multiple sites, and two taxa were recorded as singleton records (with the two remaining groups unable to be resolved to species level).

Potential impacts

Mining and groundwater abstraction may result in the loss of individuals and the reduction in subterranean fauna habitat. Subterranean fauna may be indirectly impacted through degradation of habitat as a result of contamination.

A risk assessment for subterranean fauna was undertaken, based on current taxonomic and ecological information, and available habitat information. One troglofauna taxon and three stygofauna taxon were considered at ‘Moderate’ risk. No groups were ‘High’ risk, with all other groups receiving a ‘Low’ risk rating.

A hydrogeological assessment of ‘Moderate’ risk groups was undertaken to determine habitat connectivity. The Copenhagen subterranean habitat is limited by a high groundwater table which is very close to the surface (less than 5 metres below ground level). Consequently, potential troglofauna habitat at this deposit is limited to

surface detritals/colluvials. This habitat was considered to be well connected to surrounding areas.

At the Klondyke pit, hydrological testing showed that at least two vertical fracture zones and faults cross the Klondyke Shear within and near the deposit, although it is very likely there are more throughout the area. Such fracture zones and faults support enhanced permeability and are likely to comprise highly suitable habitat for troglofauna. Therefore, it is likely that a network of habitable rock fractures may occur to the north, north-west and south-east of the proposed pit via the Klondyke shear, and into the west via transverse/vertical fractures and faults. Potential connectivity between fractured rock habitats and superficial detrital habitats may also occur in the vicinity of weathered saprolite valley fill and alluvials near drainage lines.

Subterranean populations are also threatened by habitat as a result of contamination. Acid mine drainage can be a significant issue for subterranean fauna at some sites. The risk of acid mine drainage from the pit lake, waste rock dump and TSF is expected very low. Impacts from the post closure pit lake and seepage from the TSF are detailed in section 4.1 (Inland Waters) of this report.

Mitigation and management

The EPA notes that the size of the pit disturbance area is limited to 43.6 ha and that potential subterranean fauna habitat is likely to extend laterally and vertically beyond disturbance areas. Furthermore, most specimens were collected inside and outside of disturbance areas. Given the uncertainty around a number of singletons there is some risk that a number of species may have limited distribution but the geology of the site indicates this risk distribution restrictions is low.

Additionally, given the short timeframe of operations (six years) and drawdown modelling having some conservative parameters (e.g. assuming no significant recharge events over the mine life), the period of which subterranean fauna is exposed to risk of dewatering will be relatively short. The proponent proposes to manage groundwater abstraction via a groundwater operating strategy developed in accordance with the DWER's *Operational Policy 5.08 – Use of Operating Strategies in the Water Licensing Process*.

Given that the:

- disturbance footprint and development envelope consists primarily of habitats with a medium potential to support subterranean species
- habitat of medium to high potential are well represented outside of the development envelope
- habitat is connected,

it is unlikely that any subterranean fauna taxa recorded during surveys will be adversely impacted by the proposal.

Summary

The EPA has paid particular attention to the:

- relevant principles, guidance and policy

- subterranean fauna surveys and investigations conducted by the proponent
- limited indirect impacts to subterranean fauna habitat associated with groundwater drawdown
- connectivity of habitat to undisturbed areas
- direct impacts to subterranean fauna habitat are limited in scale.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Subterranean Fauna that the impacts to this factor are manageable and would no longer be significant, provided there is:

- control through authorised extent in Schedule 1 of the Recommended Environmental Conditions (Appendix 3).

The EPA notes that there is a requirement for:

- licensing of water abstraction by the DWER under the *Rights in Water and Irrigation Act 1914* with management actions detailed in a Groundwater Operating Strategy
- licensing of emissions and discharges from prescribed premises by the DWER under Part V of the EP Act.

It is the EPA's view that the proposal can be adequately regulated through the *Mining Act 1978*, Part V of the EP Act and the licensing of groundwater abstraction under *Rights in Water and Irrigation Act 1914*, rather than a condition under Part IV of the EP Act.

5. Offsets

Relevant policy and guidance

The EPA considers that the following policy and guidance is relevant to its assessment of offsets for the proposal:

- *WA Environmental Offsets Policy* (Government of Western Australia 2011)
- *WA Environmental Offset Guidelines* (Government of Western Australia 2014)
- *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual* (EPA 2020c).

The EPA has also considered its strategic advice on *Cumulative environmental impacts of development in the Pilbara Region – Advice of the Environmental Protection Authority to the Minister for Environment under Section 16 (e) of the Environmental Protection Act 1986* (EPA 2014), for the assessment of offsets.

EPA Assessment

Environmental offsets are actions that provide environmental benefits which counterbalance the significant residual impacts of a proposal. The EPA may apply environmental offsets where it determines that the residual impacts of a proposal are significant, after avoidance, minimisation and rehabilitation have been pursued.

Mitigation measures are assessed under the relevant environmental factor (see 4.2 – Flora and Vegetation). In applying the residual impact significance model (Government of Western Australia 2014), the EPA considers that the proposal would have a significant residual impact from:

- clearing of up to 375 ha of Chichester IBRA subregion vegetation which is in ‘Good to Excellent’ condition
- clearing of up to 398 ha of foraging and denning habitat for norther quoll, Pilbara olive python, bats and habitat for brush tailed mulgara and potential habitat for night parrot and greater bilby.

In its advice on the cumulative impacts in the Pilbara (EPA 2014), the EPA considered that without intervention, the increasing cumulative impacts of development and land use in the Pilbara region would significantly impact on biodiversity and environmental values.

The EPA considers that the clearing of native vegetation and impacts on other associated environmental values in the Pilbara Interim Biogeographic Regionalisation for Australia (IBRA) bioregion is significant where the cumulative impact may reach critical levels if not managed.

The proposal is located within the Chichester IBRA subregion. Only four per cent of the Chichester subregion is currently reserved for conservation.

Consistent with the Residual Impact Significance Model in the *WA Environmental Offsets Guidelines*, where the cumulative impact may reach critical levels if not

managed, the clearing of native vegetation in 'Good to Excellent' condition within the Chichester subregion, and impacts to foraging/roosting habitat requires an offset to counterbalance the significant residual impact of the clearing. Consistent with this, the clearing of 375 ha of 'Good to Excellent' condition native vegetation constitutes a significant residual impact that requires an offset. The area of 'Good to Excellent' vegetation condition is overlapped by 398 ha of foraging and denning habitat for northern quoll, Pilbara olive python, bats and habitat for brush tailed mulgara and potential habitat for night parrot and greater bilby. Given that, only the higher rate is applied.

Conservation areas in the Pilbara bioregion total approximately eight per cent of the area, with the remainder mostly Crown Land overlain with mining tenements and pastoral leases. The EPA recognises that the opportunity for proponents to undertake individual offsets in the Pilbara region is constrained by overlapping land tenure arrangements and limited land access to undertake on-ground offset actions. As such, traditional approaches to offsets, namely land acquisition and management offsets, are therefore limited.

In its advice on cumulative impacts in the Pilbara (EPA 2014), the EPA proposed the establishment of a strategic conservation initiative for the Pilbara as a mechanism to pool offset funds to achieve biodiversity conservation outcomes. Such an approach would provide a mechanism to overcome some of the offset implementation constraints. A pooled offset approach is consistent with the *WA Environmental Offsets Policy,* which states that environmental offsets will be focused on longer term strategic outcomes (Principle 6). Strategic approaches, such as the use of a fund, can provide a coordinating mechanism to implement offsets across a range of land tenures (Government of Western Australia 2014).

A contribution to a strategic conservation initiative focused on these or similar types of actions would allow for an outcome that counterbalances the significant residual impacts from this proposal. The EPA considers that there should be a clear target outcome for each offset project supported by the offset funds. A clear link must be drawn between the outcomes and the significant residual impacts of the individual proposal. Funds should be used for landscape scale on-ground actions in the Pilbara IBRA region and indirect actions (such as research) that will directly counterbalance the residual impacts and contribute to conservation outcomes in the region.

The EPA has stated that the type of environmental offsets in the Pilbara that contribute to a strategic conservation initiative will ensure a consistent and transparent approach and contribute to longer term strategic outcomes, with contributions based on an assessment of the significance of environmental impacts. The EPA's view is that project funding for offsets should not be used to provide substitute funding for existing government programs or proponent obligations.

Commensurate with other decisions within the Chichester IBRA subregion the EPA recommends that the following offset rates should apply in the form of a contribution to a Pilbara strategic conservation initiative for landscape-scale actions to protect Pilbara biodiversity in the Pilbara:

- $1,542 AUD (excluding GST) per hectare for clearing of, northern quoll, Pilbara olive python and bat foraging habitat, and sand plain habitat for brush-tailed mulgara in the Chichester IBRA subregion.

Summary

The EPA recommends that an offset condition (condition 8) is imposed to counterbalance the significant residual impacts of the proposal. The EPA recommends that offset contribution rate of $1,542 per hectare in the Chichester subregion be applied for the clearing of 398 ha of foraging and denning habitat for northern quolls, Pilbara olive python, bats and habitat for brush tailed mulgara and potential habitat for night parrot and greater bilby.

6. Matters of National Environmental Significance

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

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

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

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

Commonwealth policy and guidance

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

- Threatened Species Scientific Committee (2008). Commonwealth Conservation *Advice on Liasis olivaceus barroni (Olive Python (Pilbara subspecies*)). Department of the Environment, Water, Heritage and the Arts, 2008
- Hill, B. and S. Ward (2010). *National Recovery Plan for the Northern Quoll Dasyurus hallucatus.* Department of Natural Resources, Environment, the Arts and Sport, Northern Territory
- Threatened Species Scientific Committee (2016). *Approved Conservation Advice for Macroderma gigas (ghost bat)*. Canberra: Department of the Environment
- Threatened Species Scientific Committee (2016). *Approved Conservation Advice for Rhinonicteris aurantia (Pilbara form) (Pilbara Leaf-nosed Bat)*. Department of the Environment
- Department of Sustainability, Environment, Water, Population and Communities, (2012) *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*. Canberra, ACT: Commonwealth of Australia
- Department of Sustainability, Environment, Water, Population and Communities (2011). *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads*. Canberra, ACT: Commonwealth of Australia
- Department of the Environment (2015). *Threat abatement plan for predation by feral cats*. Canberra, ACT: Commonwealth of Australia
- Department of Sustainability, Environment, Water, Population and Communities (2012). *Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses*. Canberra, ACT: Commonwealth of Australia

- Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008). Threat abatement plan for predation by the European red fox. DEWHA, Canberra.

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Impacts to the environment are covered under the key environmental factors of Inland Waters, Flora and Vegetation, Subterranean Fauna, and Terrestrial Fauna, where relevant.

The proponent has described seven broad habitat types according to landforms and their importance to, and use by, MNES within the proposal area:

- **rocky breakaway** – high density denning and foraging habitat for the northern quoll, and foraging habitat for the Pilbara olive python, ghost bat, and Pilbara leaf-nosed bat
- **sandplain** – potentially supports the night parrot and greater bilby
- **medium drainage lines** – dispersal and foraging habitat for the northern quoll, Pilbara olive python, ghost bat, and Pilbara leaf-nosed bat
- **minor drainage line** – dispersal and foraging habitat for the northern quoll, Pilbara olive python, ghost bat, and Pilbara leaf-nosed bat
- **rounded hills** – potential denning habitat of the northern quoll
- **hillcrest/hillslope** – potential denning habitat of the northern quoll
- **stony plain** – potential habitat for the night parrot
- **claypan** – no known value to MNES.

The most significant habitat types for MNES within the proposal area are rocky breakaway and sandplains. The proposal has been designed to avoid impacts to these habitat types where possible, with disturbance to rocky breakaway limited to 0.8 ha and disturbance to sandplain limited to 11 ha.

Northern quoll *(Dasyurus hallucatus)*

Northern quolls were recorded in the proposal area during surveys and there are a number of other records from previous surveys undertaken in the surrounding area (less than 50 km). The targeted fauna survey estimated the population at study sites to be four to seven individuals in rocky breakaways, hillcrest/hillslope and minor drainage line habitat.

Limited areas of the proposal area would support permanent and high-density populations of the northern quoll. Their core habitat is rocky breakaways, which would have a minimal disturbance (0.8 ha). Around 59 ha of the proposal would be used on a transitory basis, and the remaining proposal area is low value habitat for the northern quoll. The retention of 32 ha via the mining exclusion zone will retain some key habitat for the northern quoll. Habitat mapping has shown the key habitat type of rocky breakaways, hillcrest/hillslope and minor drainage line habitat extends outside the development envelope.

Ghost bat *(Macroderma gigas)*

Ghost bats were detected at 23 of the 31 of sites surveyed, five of which will be directly impacted by the proposal. These are all temporary refuges which are used by the ghost bat, but are not critical to their survival given the presence of alternate roosts in the vicinity.

There is a risk of abandonment of the Klondyke Queen roost which is a maternity roost for the ghost bat. This risk is believed to be low with buffers and blasting controls to be put in place.

The proposal requires clearing of 398 ha of foraging and/or dispersal habitat for ghost bats. The tracking study showed this species mostly foraged over areas other than where the Klondyke pit and TSF will be located.

Pilbara leaf-nosed bat *(Rhinonicteris aurantia)*

The Pilbara leaf-nosed bat was detected at 30 of the 31 sites surveyed within the proposal area. Similar to the ghost bat, five low value refuge roosts will be directly impacted, but alternate roosts are available in the vicinity.

The Pilbara leaf-nosed bat is predicted to no longer use the Klondyke Queen roost primarily due to the reduced humidity levels caused by dewatering activities. The impact is not considered significant given the availability of the Bow Bells roost located 4 km to the north-west which is the main maternity roost in the area. It is probable that the species will continue to use Klondyke Queen as a refuge during this time and will return to using this roost on a diurnal basis on the cessation of mining and the rising of the watertable.

The proposal requires clearing of 398 ha of foraging and/or dispersal habitat for Pilbara leaf-nosed bat. The tracking study showed this species mostly foraged over areas other than where the Klondyke pit and TSF will be located.

Pilbara olive python *(Liacis olivaceus barroni)*

A single Pilbara olive python was recorded within the study area. It was recorded in the Klondyke Queen roost where it was hunting the bats. The development envelope has no permanent pools or riverine vegetation which often support larger populations of Pilbara olive python. The nearest other record of Pilbara olive python is about 20 km north-west of the proposal area.

Night parrot (*Pezoporus occidentalis)* and greater bilby *(Macrotis lagotis)*

There are no previous records, or sighting during surveys, of these species within the development envelope. The nearest night parrot sighting was 55 km away in 1970. There are numerous greater bilby records in the region however there has been no contemporary records in the vicinity. The nearest records are 15 km to the east in 2004, 12 km south in 1984, and 15 km to the north in 1984.

If the species were to be found in the area they would be in the sandplain habitat to the south of the main proposal area, where 11.1 ha is proposed to be cleared for an access road and camp.

Summary

The EPA has assessed the potential impacts from the proposal on MNES, and notes the proposal has been designed to avoid habitat important to MNES. The EPA has recommended the following environmental conditions to minimise impacts on MNES:

- limit the location and authorised extent of the clearing of vegetation to 398 ha in Table 2 of Schedule 1
- condition 6 to implement a 32 ha mining exclusion zone to protect key bat roosts and habitat for northern quolls and Pilbara olive python
- condition 7 to prepare and implement a Significant Species Management Plan.

The EPA considers that there will be a significant residual impact from the clearing of 398 ha of foraging and denning habit. The EPA has recommended an offset in condition 8 (see section 5) which takes into account the significant residual impact to listed fauna species.

The EPA's view is that the impacts from the proposal on the above-listed MNES are not expected to result in an unacceptable or unsustainable impact on the listed threatened species.

7. Conclusion

The EPA has considered the proposal for the Warrawoona Gold Project and has taken a holistic view of the likely residual impacts of the proposal. The EPA has considered the degree of connectivity and inter-relatedness of processes operating across systems and communities that make up the environment.

Application of the mitigation hierarchy

Consistent with relevant policies and guidance, the proponent has addressed the mitigation hierarchy by identifying measures to avoid, minimise and rehabilitate environmental impacts including:

- designing the development envelope to avoid Priority flora and fauna refugia area where possible, and locating infrastructure away from sensitive sites such as watercourses
- backfilling the historical Copenhagen pit void and new St George satellite pits
- delineating a 32 ha mining exclusion zone to provide protection from mining for important bat roosting sites, including maternity and diurnal roosts for the ghost bat and the Pilbara leaf-nosed bat, as well as core denning and foraging habitat for other species of conservation significance such as the northern quoll and the Pilbara olive python
- implementing a Significant Species Management Plan to monitor and manage impacts on significant fauna, with links to the Environmental Blasting Management Plan, which has a staged approach to blasting and reducing blast sizes within 500 m, and no blasting within 200 m and target of not exceeding a threshold of 10 mm/s vibration limit at Klondyke Queen
- managing impacts of water abstraction through a Licence under *Rights in Water and Irrigation Act 1914*, with management actions detailed in a Groundwater Operating Strategy.

Offsets

The EPA considers that the proposal's significant residual impact in the Chichester IBRA subregion due to clearing of 398 ha of foraging and denning habitat of northern quoll, Pilbara olive python and bat foraging habitat, and sand plain habitat for brush-tailed mulgara will require contribution to the Pilbara Environmental Offsets fund at $1,562/ha (2018/2019).

The EPA has recommended condition 8 (Offsets) specifying the offset requirements, and requiring the preparation and implementation of an Impact Reconciliation Procedure.

Conclusion

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

- impacts to all the key environmental factors

- EPA's confidence in the proponent's proposed mitigation measures
- relevant EP Act principles and the EPA's objectives for the key environmental factors
- EPA's view that the impacts to the key environmental factors are manageable, provided the recommended conditions are imposed.

Given the above, the EPA recommends that the proposal may be implemented subject to the conditions recommended in Appendix 3.

8. Recommendations

The EPA recommends that the Minister for Environment notes:

1. The proposal assessed is for the construction and operation of the Warrawoona Gold Project which would require up to 398 ha of clearing within a development envelope of 1,000 ha.
2. The key environmental factors identified by the EPA in the course of its assessment are Inland Waters, Flora and Vegetation, Terrestrial Fauna and Subterranean Fauna, as set out in section 4.
3. The EPA has concluded that the proposal may be implemented, provided the implementation of the proposal is carried out in accordance with the recommended conditions and procedures set out in Appendix 3. Matters addressed in the conditions include:
    a) limiting the development envelope and indicative development footprint to avoid direct impacts to sensitive areas
    b) requiring a 32 ha mining exclusion zone to protect vital bat roosts, and habitats of northern quoll and Pilbara olive python (condition 6)
    c) implementing a Significant Species Management Plan to monitor and manage impacts on significant fauna, particularly bats (condition 7)
    d) offsetting to counterbalance the residual impact to clearing of foraging and denning habitat of northern quoll, Pilbara olive python and bat foraging habitat, and sand plain habitat for brush-tailed mulgara at foraging habitat and sandplain habitat (condition 8).

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Appendix 1: Consideration of Environmental Protection Act principles

EP Act Principle	Consideration
1. The precautionary principle *Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In application of this precautionary principle, decisions should be guided by –* *a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and* *b) an assessment of the risk-weighted consequences of various options.*	This principle is a fundamental and relevant consideration for the EPA when assessing and considering the impacts of the proposal. In considering this principle, the EPA notes that Flora and Vegetation, Terrestrial Fauna, Subterranean Fauna and Inland Waters could be significantly impacted by the proposal. The assessment of these impacts is provided in this report. Investigations into the biological and physical environment undertaken by the proponent have provided sufficient scientific certainty to assess the risks and identify measures to avoid or minimise impacts. The EPA notes that the proponent has identified measures to avoid or minimise impacts. The EPA has recommended conditions to ensure these measures are implemented by the proponent. The EPA notes that there may be a threat of serious or irreversible harm given the scale of operations and the residual impacts at bioregional scale. The application of the Pilbara Environmental Offsets Policy addresses this issue.
2. The principle of intergenerational equity *The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.*	This principle is a relevant consideration for the EPA when assessing and considering the impacts of the proposal on the environmental factor of Inland Waters. The EPA notes that the proponent has identified measures to avoid or minimise impacts. The EPA has considered these measures during its assessment and has concluded that provided the recommended conditions are imposed on the implementation of the proposal, the environmental values will be protected and the health, diversity and productivity of the environment will be maintained for the benefit of future generations.

EP Act Principle	Consideration
	Mine closure can be managed under the *Mining Act 1978*, as per DMIRS guidelines with objectives for a safe, stable, non-polluting landform that is capable of sustaining post mining landuse will help ensure future generations are not disadvantage by the development. The backfilling of the historical Copenhagen Pit lake and the rehabilitation of waste stockpiles will enhance the environmental outcomes at this site.
3. The principle of the conservation of biological diversity and ecological integrity *Conservation of biological diversity and ecological integrity should be a fundamental consideration.*	This principle is a fundamental and relevant consideration for the EPA when assessing and considering the impacts of the proposal on the environmental factors of Flora and Vegetation and Terrestrial Fauna. The EPA notes that the proponent has identified measures to avoid or minimise impacts by avoiding waterways, most bat roosts and most populations of Priority flora. The EPA has considered these measures during its assessment. The EPA notes that impacts may affect biological diversity and ecological integrity in regards to cumulative impacts to the Chichester IBRA subregion. The EPA has considered to what extent the potential impacts from the proposal can be ameliorated by recommended conditions, including offsets. The EPA has concluded that given the nature of the impacts that the proposed offsets are likely to ameliorate the impacts of the loss of biological diversity and ecological integrity as the Pilbara Environmental Offsets Fund is part of a broader conservation program for the region.
4. Principles relating to improved valuation, pricing and incentive mechanisms *(1) Environmental factors should be included in the valuation of assets and services.*	In considering this principle, the EPA notes that the proponent will take responsibility for preventing pollution and ensuring the rehabilitation and ongoing management of the proposal.

EP Act Principle	Consideration
(2) The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement. *(3) The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.* *(4) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimize costs to develop their own solution and responses to environmental problems.*	The integration of rehabilitation and closure planning into operating mine planning will ensure cost-effective measures and mechanisms to reduce liability and risks with mine closure are identified and implemented. The EPA has had regard to this principle during the assessment of the proposal.
5. The principle of waste minimisation *All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.*	Major waste streams for this proposal include waste rock, waste for landfill (inert and putrescible) treated wastewater and hydrocarbon/ hazardous waste. Landfill and waste treatment will be managed via the proponent's Landfill Management Procedure and Bioremediation Procedure In considering this principle, the EPA notes that the proponent proposes to apply waste management principles by: • minimising the size of the TSF and waste rock dump • re-using the topsoil and cleared vegetation in rehabilitation • disposing putrescible wastes in a purpose-built landfill within the waste rock landform • reducing landfill by reusing and recycling materials where possible • minimising packaging wastes associated with reagents by importing in bulk and requiring return of packaging to suppliers. The EPA has had regard to this principle during the assessment of the proposal.

Appendix 2: Evaluation of other environmental factors

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
Land			
Terrestrial Environmental Quality	Potential impacts include: • spills and accidental discharges • low levels of cyanide in decant water • metalliferous drainage from waste dumps • erosion from vegetation clearing.	DMIRS A Waste Rock Dump (WRD) and Tailings Storage Facility (TSF) closure procedure has been developed to manage the environmental risks associated with those two landforms. A Metalliferous Drainage Management Procedure has been developed to address the risks posed by elevated soluble nickel and arsenic that has been identified because of the waste rock characterisation studies. Mine Closure Planning has not been finalised but risks are manageable.	Terrestrial Environmental Quality was not identified as a preliminary key environmental factor when the EPA decided to assess the proposal. Having regard to the: • Proponent's design of the proposal, and intention to operate the proposal, to minimise risk of impacts to Terrestrial Environmental Quality. • Development envelope being located away from watercourses and high environmental value assets. • Management measures to protect fauna from interactions with the TSF: o minimising the area of water in the TSF o twice daily monitoring of usage of the TSF decant by fauna o procedures for the rescue of fauna o a cyanide reduction during secondary processing to reduce the concentration of weak acid dissociable cyanide discharge to less than 30 milligrams per litre. • Low level of heavy metals in overburden. • Generally low levels of metals in waste rock.

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
			• Nickel Arsenic Zone (NAZ) being identified in the Hanging Wall lithology and comprising about 10% of the total waste rock volume. The NAZ may be a source of soluble metals but it will be identified and encapsulated above the watertable. • Waste rock has been characterised as non acid forming. • Water quality being typically turbid after heavy rainfall events so any impact from clearing would be hard to identify. Application of buffers from watercourses, contouring and drainage controls will help mitigate impacts. • Significance considerations in the *Statement of Environmental Principles, Factors and Objectives* (EPA 2020d), the EPA considers it is unlikely that the proposal would have a significant impact on Terrestrial Environmental Quality and that the impacts to this factor are manageable via rehabilitation and closure management processes. Accordingly, the **EPA did not consider Terrestrial Environmental Quality to be a key environmental factor** at the conclusion of its assessment.

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
Air			
Air Quality	Dust deposition on vegetation and sensitive receptors such as the mine camp, neighbouring gold mine and public road area.	There were no agency or public comments on air quality.	Air Quality was not identified as a preliminary key environmental factor when the EPA decided to assess the proposal. Having regard to: • Modelling of air quality impacts on the region and key sensitive receptor locations indicates that with standard dust mitigation actions in place the proposal will have no significant impact on the air quality in the region or at receptor locations. • *Environmental Factor Guideline – Air Quality* (EPA 2020a) • the significance considerations in the *Statement of Environmental Principles, Factors and Objectives* (EPA 2020d), the EPA considers it is unlikely that the proposal would have a significant impact on Air Quality and that the impacts to this factor are manageable. Accordingly, the **EPA did not consider Air Quality to be a key environmental factor** at the conclusion of its assessment.

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
Greenhouse Gas Emissions	The proposal is estimated to produce on average about 44,000 tCO_2e annually peaking at 59,000 t CO_2e in year 4 of the Project. Clearing of 398 ha of spinifex and open shrublands (<10t CO_2 e/ha) will result in <5,000 tCO_2e.	There were no agency or public comments on greenhouse gas emissions.	The proponent is investigating greenhouse gas efficiency measures such as the camp to be part powered by renewable energy, gas fired power station instead of diesel generators and solar lighting. Having regard to: • the significance considerations in the *Statement of Environmental Principles, Factors and Objectives* (EPA 2020d) • the scope 1 emissions do not exceed 100,000 tpa CO2-e • *Environmental Factor Guideline – Greenhouse Gas Emissions* (EPA 2020b) • the small scale and short term nature of the mine, the EPA consider it is unlikely the proposal would have a significant impact on Greenhouse Gas Emissions and that the impacts to this factor are manageable. Accordingly, the **EPA did not consider Greenhouse Gas Emissions to be a key environmental factor** at the conclusion of its assessment.

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
People			
Social Surroundings	There are no registered Aboriginal sites or other heritage places located within the development envelope. Ongoing consultation and involvement with the Njamal Traditional Owners. Noise impacts on sensitive receptors such campsite, Marble Bar town site and any residences located along access route	There were no agency or public comments on social surroundings or registered heritage sites.	Social Surroundings was not identified as a preliminary key environmental factor at the level of assessment. Having regard to: • ongoing heritage surveys and consultation with Traditional Owners and where possible protection of identified sites • the remoteness of the site and the long history of gold mining at the site • noise modelling indicating no impact on surrounding population, and the noise levels at the camp being within guidelines • the significance considerations in the *Statement of Environmental Principles, Factors and Objective*s (EPA 2020d), the EPA considers it is unlikely that the proposal would have a significant impact on Social Surroundings and that the impacts to this factor are manageable. Accordingly, the **EPA did not consider Social Surroundings to be a key environmental factor** at the conclusion of its assessment.

Appendix 3: Identified Decision-Making Authorities and Recommended Environmental Conditions

Identified Decision-making Authorities

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

Section 45(1) requires the Minister for Environment to consult with decision-making authorities (DMAs), and if possible, agree on whether or not the proposal may be implemented, and if so, to what conditions and procedures, if any, that implementation should be subject.

The following decision-making authorities have been identified:

Decision-Making Authority	Legislation (and Approval)
1. Minister for Environment	*Biodiversity Conservation Act 2016* (Taking of flora and fauna)
2. Minister for Water	*Rights in Water and Irrigation Act 1914* (Water abstraction licence)
3. Chief Executive Officer, Department of Water and Environment Regulation	*Environmental Protection Act 1986* (Works Approval and Licence)
4. Department of Mines Industry Regulation and Safety Executive Director, Resource and Environmental Compliance Division	*Mining Act 1978* (Mining proposal)
5. State Mining Engineer	*Mines Safety and Inspection Act 1994* (Mine safety)
6. Chief Dangerous Goods Officer	*Dangerous Goods Safety Act 2004* (Dangerous goods)
7. Chief Health Officer, Department of Health	*Health Act 1911 and Health (Treatment of Sewage and Disposal of Effluent and Liquid waste) Regulations 1974 – Sewage treatment permit*
8. Chief Executive Officer, Shire of East Pilbara	*Building Act 2011* *Planning and Development Act 2005*

Note: In this instance, agreement is only required with DMAs 1 and 2 since these DMAs are Ministers.

Recommended Environmental Conditions

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

WARRAWOONA GOLD PROJECT

Proposal:	Develop and operate an open cut and below ground gold mine, processing facility, associated mining infrastructure, waste rock dumps, tailings storage facility, borefield, and accommodation camp within the Warrawoona Gold Project area located 20 kilometres south of Marble Bar.
Proponent:	Calidus Resources Limited Australian Company Number 006 640 553
Proponent Address:	Suite 12, 11 Ventor Ave WEST PERTH WA
Assessment Number:	2229

Report of the Environmental Protection Authority: 1681

Pursuant to section 45 of the *Environmental Protection Act 1986,* it has been agreed that the proposal described and documented in Schedule 1 may be implemented and that the implementation of the proposal is subject to the following implementation conditions and procedures:

1 Proposal Implementation

1-1 When implementing the proposal, the proponent shall not exceed the authorised extent of the proposal as defined in Schedule 1, unless amendments to the proposal and the authorised extent of the proposal have been approved under the EP Act.

2 Contact Details

2-1 The proponent shall notify the CEO of any change of its name, physical address or postal address for the serving of notices or other correspondence within twenty-eight (28) days of such change. Where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State.

3 Time Limit for Proposal Implementation

3-1 The proponent shall not commence implementation of the proposal after five (5) years from the date of this Statement, and any commencement, prior to this date, must be substantial.

3-2 Any commencement of implementation of the proposal, on or before five (5) years from the date of this Statement, must be demonstrated as substantial by providing the CEO with written evidence, on or before the expiration of five (5) years from the date of this Statement.

4 Compliance Reporting

4-1 The proponent shall prepare, and maintain a Compliance Assessment Plan which is submitted to the CEO at least six (6) months prior to the first Compliance Assessment Report required by condition 4-6, or prior to implementation of the proposal, whichever is sooner.

4-2 The Compliance Assessment Plan shall indicate:

(1) the frequency of compliance reporting;

(2) the approach and timing of compliance assessments;

(3) the retention of compliance assessments;

(4) the method of reporting of potential non-compliances and corrective actions taken;

(5) the table of contents of Compliance Assessment Reports; and

(6) public availability of Compliance Assessment Reports.

4-3 After receiving notice in writing from the CEO that the Compliance Assessment Plan satisfies the requirements of condition 4-2, the proponent shall assess compliance with conditions in accordance with the Compliance Assessment Plan required by condition 4-1.

4-4 The proponent shall retain reports of all compliance assessments described in the Compliance Assessment Plan required by condition 4-1 and shall make those reports available when requested by the CEO.

4-5 The proponent shall advise the CEO of any potential non-compliance within seven (7) days of that non-compliance being known.

4-6 The proponent shall submit to the CEO the first Compliance Assessment Report fifteen (15) months from the date of issue of this Statement addressing

the twelve (12) month period from the date of issue of this Statement and then annually from the date of submission of the first Compliance Assessment Report, or as otherwise agreed in writing by the CEO.

The Compliance Assessment Report shall:

(1) be endorsed by the proponent's Chief Executive Officer or a person delegated to sign on the Chief Executive Officer's behalf;

(2) include a statement as to whether the proponent has complied with the conditions;

(3) identify all potential non-compliances and describe corrective and preventative actions taken;

(4) be made publicly available in accordance with the approved Compliance Assessment Plan; and

(5) indicate any proposed changes to the Compliance Assessment Plan required by condition 4-1.

5 Public Availability of Data

5-1 Subject to condition 5-2, within a reasonable time period approved by the CEO of the issue of this Statement and for the remainder of the life of the proposal the proponent shall make publicly available, in a manner approved by the CEO, all validated environmental data (including sampling design, sampling methodologies, empirical data and derived information products (e.g. maps)), management plans and reports relevant to the assessment of this proposal and implementation of this Statement.

5-2 If any data referred to in condition 5-1 contain particulars of:

(1) a secret formula or process; or

(2) confidential commercially sensitive information,

the proponent may submit a request for approval from the CEO to not make these data publicly available. In making such a request the proponent shall provide the CEO with an explanation and reasons why the data should not be made publicly available.

6 Mining Exclusion Zone

6-1 The proponent shall manage the implementation of the proposal to meet the following outcome:

(1) implementation of a Mining Exclusion Zone (**MEZ**) as shown in Figure 2 of Schedule 1 to ensure there is no surface mining activities within the **MEZ** as a result of the proposal.

7 Significant Species Management Plan

7-1 Prior to **ground disturbing activities**, unless otherwise agreed by the CEO, the proponent shall finalise and submit a revision of the Significant Species Management Plan (CRL-ENV-PLN-006-19 Rev 2, May 2020) in consultation with the agency responsible for the administration of the *Biodiversity Conservation Act 2016* (being at the time of this Statement the Department of Biodiversity, Conservation and Attractions). The Significant Species Management Plan shall, when implemented, meet the following environmental objective:

(1) avoid where possible, otherwise minimise direct and indirect impacts to significant fauna and their habitat, including, but not limited to:

(a) Pilbara leaf-nosed bat;

(b) ghost bat;

(c) Pilbara olive python; and

(d) northern quoll.

7-2 The Significant Species Management Plan required by condition 7-1 shall:

(1) specify the environmental objective to be achieved, as specified in condition 7-1;

(2) specify **management actions** to meet the environmental objective;

(3) specify **management targets**;

(4) specify monitoring to determine if **management targets** are being met;

(5) provide the format and timing for the reporting of monitoring results against **management targets** to demonstrate that condition 7-1 has been met over the reporting period in the Compliance Assessment Report required by condition 4-6;

(6) specify in accordance with condition 7-5 a process for revision of **management actions** and changes to revised proposal activities, in the event that the **management targets** are not achieved. The process shall include an investigation to determine the cause of the management target(s) not being achieved.

7-3 The Significant Species Management Plan required by condition 7-1 must include provisions required by condition 7-2 to address impacts to significant fauna and their habitat including, but not limited to:

(1) clearing of habitat;

(2) fragmentation of habitat;

(3) vehicle strike;

(4) collision with fencing;

(5) managing feral animals;

(6) minimising light and noise impacts;

(7) maintaining humidity at ambient levels suitable for Pilbara leaf-nosed bat at Bow Bells South roost;

(8) managing impacts on the **MEZ** by excluding surface blasting and permanent infrastructure; and

(9) maintaining a 70 decibel A noise limit and 10 millimetres per second vibration limit at Klondyke Queen roost.

7-4 After receiving notice in writing from the CEO that the Significant Species Management Plan satisfies the requirements of conditions 7-2 and 7-3, the proponent must:

(1) implement the Significant Species Management Plan, or any subsequent approved versions; and

(2) continue to implement the Significant Species Management Plan until the CEO has confirmed by notice in writing that the proponent has demonstrated the objectives specified in condition 7-1 have been met.

7-5 In the event that monitoring, tests, surveys or investigations indicate exceedance of **management targets** specified in the Significant Species Management Plan, the proponent must:

(1) report the exceedance in writing to the CEO within seven (7) days of the exceedance being identified;

(2) implement the management target contingency actions specified in the Significant Species Management Plan within twenty-four (24) hours and continue implementation on those actions until the CEO has confirmed by notice in writing that it has been demonstrated that the management

target are being met and the implementation of the contingency actions is no longer required;

(3) investigate to determine the cause of the management target being exceeded;

(4) investigate to provide information for the CEO to determine potential environmental harm that occurred due to the management target being exceeded; and

(5) provide a report to the CEO within twenty-one (21) days of the exceedance being reported as required by condition 7-5(1). The report must include:

(a) details of contingency actions implemented;

(b) the effectiveness of the contingency actions implemented, against the management target;

(c) the finding of the investigations required by conditions 7-5(3) and 7-5(4);

(d) measures to prevent the management target being exceeded in the future;

(e) measures to prevent, control or abate the environmental harm which may have occurred; and

(f) justification of the management target remaining, or being adjusted based on better understanding, demonstrating that outcomes would continue to be met.

7-6 The proponent:

(1) may review and revise the Significant Species Management Plan; or

(2) must review and revise the Significant Species Management Plan as and when directed by the CEO.

7-7 The proponent must implement the latest revision of the Significant Species Management Plan required in condition 7-1 which the CEO has confirmed by notice in writing, satisfies the requirements of conditions 7-1, 7-2 and 7-3.

8 Offsets

8-1 In view of the significant residual impacts and risks as a result of implementation of the proposal, the proponent shall contribute funds to the **Pilbara**

Environmental Offsets Fund calculated pursuant to condition 8-2, subject to any reduction approved by the CEO under condition 8-10.

8-2 The proponent's contribution to the **Pilbara Environmental Offsets Fund** shall be paid biennially, with the amount to be contributed calculated based on the clearing undertaken in each year of the biennial reporting period in accordance with the rates in condition 8-3. The first biennial reporting period shall commence from **ground disturbing activities** of the environmental values identified in condition 8-3.

8-3 Calculated on the 2018-2019 financial year, the contribution rates are:

(1) $1,542 (excluding GST) per hectare foraging and denning habitat for northern quoll, Pilbara olive python, bats and habitat for brush tailed mulgara and potential habitat for night parrot and greater bilby within the Chichester IBRA subregion.

9-4 From the commencement of the 2018-2019 financial year, the rates in condition 8-3 will be adjusted annually each subsequent financial year in accordance with the percentage change in the **CPI** applicable to that financial year.

10-5 Prior to **ground disturbing activities**, the proponent shall prepare and submit an Impact Reconciliation Procedure to the CEO.

8-6 The Impact Reconciliation Procedure required pursuant to condition 8-5 shall:

(1) state that clearing calculation for the first biennial reporting period will commence from **ground disturbing activities** in accordance with condition 8-2 and end on the second 30 June following commencement of **ground disturbing activities**;

(2) state that clearing calculations for each subsequent biennial reporting period will commence on 1 July of the required reporting period, unless otherwise agreed by the CEO;

(3) include a methodology to calculate the amount of clearing undertaken during each year of the biennial reporting period for each of the environmental values identified in condition 8-3; and

(4) indicate the timing and content of the Impact Reconciliation Reports.

8-7 The proponent shall not commence **ground disturbing activities**, unless otherwise agreed by the CEO, until the CEO has confirmed in writing that the Impact Reconciliation Procedure satisfies the requirements of condition 8-6.

8-8 The proponent shall submit an Impact Reconciliation Report in accordance with the Impact Reconciliation Procedure approved in condition 8-7.

8-9 The Impact Reconciliation Report required pursuant to condition 8-8 shall provide the location and spatial extent of the clearing undertaken during each year of each biennial reporting period.

8-10 The proponent may apply in writing and seek the written approval of the CEO to reduce all or part of the contribution payable under condition 8-2 where:

(1) a payment has been made to satisfy a condition of an approval under the *Environment Protection and Biodiversity Conservation Act 1999* in relation to the proposal;

(2) the payment is made for the purpose of counterbalancing impacts of the proposal on matters of national environmental significance; and

(3) the payment is made for the purpose of counterbalancing the significant residual impacts to the environmental value identified in condition 8-3.

Schedule 1

Table 1: Summary of the proposal

Proposal Title	Warrawoona Gold Project
Short Description	Develop and operate an open cut and below ground gold mine, processing facility, associated mining infrastructure, waste rock dumps, tailings storage facility, borefield, and accommodation camp within the Warrawoona Gold Project area, located 20 kilometre south of Marble Bar.

Table 2: Location and authorised extent of physical and operational elements

Element	Location	Authorised extent
Physical elements		
Mine and associated infrastructure	Figure 1	Clearing no more than 398 ha of native vegetation within the 1,000 ha development envelope.
Operational elements		
Groundwater abstraction		Abstraction of no more than 1.6 gigalitres per annum from borefields and mine pit dewatering.
Waste rock		20 million loose cubic metres (LCM) at Klondyke and 300,000 LCM at Copenhagen.
Ore processing (waste)		Disposal of no more than 2 million tonnes per annum of tailings into the tailings storage facility.

Table 3: Abbreviations and Definitions

Acronym or Abbreviation	Definition or Term
CEO	The Chief Executive Officer of the Department of the Public Service of the State responsible for the administration of section 48 of the *Environmental Protection Act 1986*, or his delegate.
CPI	The All Groups Consumer Price Index numbers for Perth compiled and published by the Australian Bureau of Statistics.
EP Act	*Environmental Protection Act 1986*
Ground disturbing activity	Activities that are associated with the substantial implementation of a proposal including but not limited to, digging (with mechanised equipment), blasting, earthmoving, vegetation clearance, grading, gravel extraction, construction of new or widening of existing roads and tracks.
ha	Hectare
IBRA	Interim Biogeographic Regionalisation for Australia
Management actions	Identified actions undertaken to mitigate the impacts of implementation of a proposal on the environment and achieve the condition environmental objective.
Management target	A measurable boundary of acceptable impact with proposal or sites specific parameters, that assesses the efficacy of management actions against the condition environmental objective and beyond which

	management actions have to be reviewed and revised. Proposal- or site-specific parameters may include location, scale, time period, specific species/ population/community and a relative benchmark (e.g. baseline or reference).
MEZ	Mining Exclusion Zone, 32 ha area where surface mining activities such as blasting and permanent infrastructure are excluded to provide protection from direct disturbance of important bat roosting sites. Monitoring and minor works such as maintaining access tracks and bores is permitted.
Pilbara Environmental Offsets Fund	The special purpose account that has been created pursuant to section 16(1)(d) of the *Financial Management Act 2006* by the Department of Water and Environmental Regulation.

Figures (attached)

Figure 1: Development envelope
Figure 2: Mining Exclusion Zone

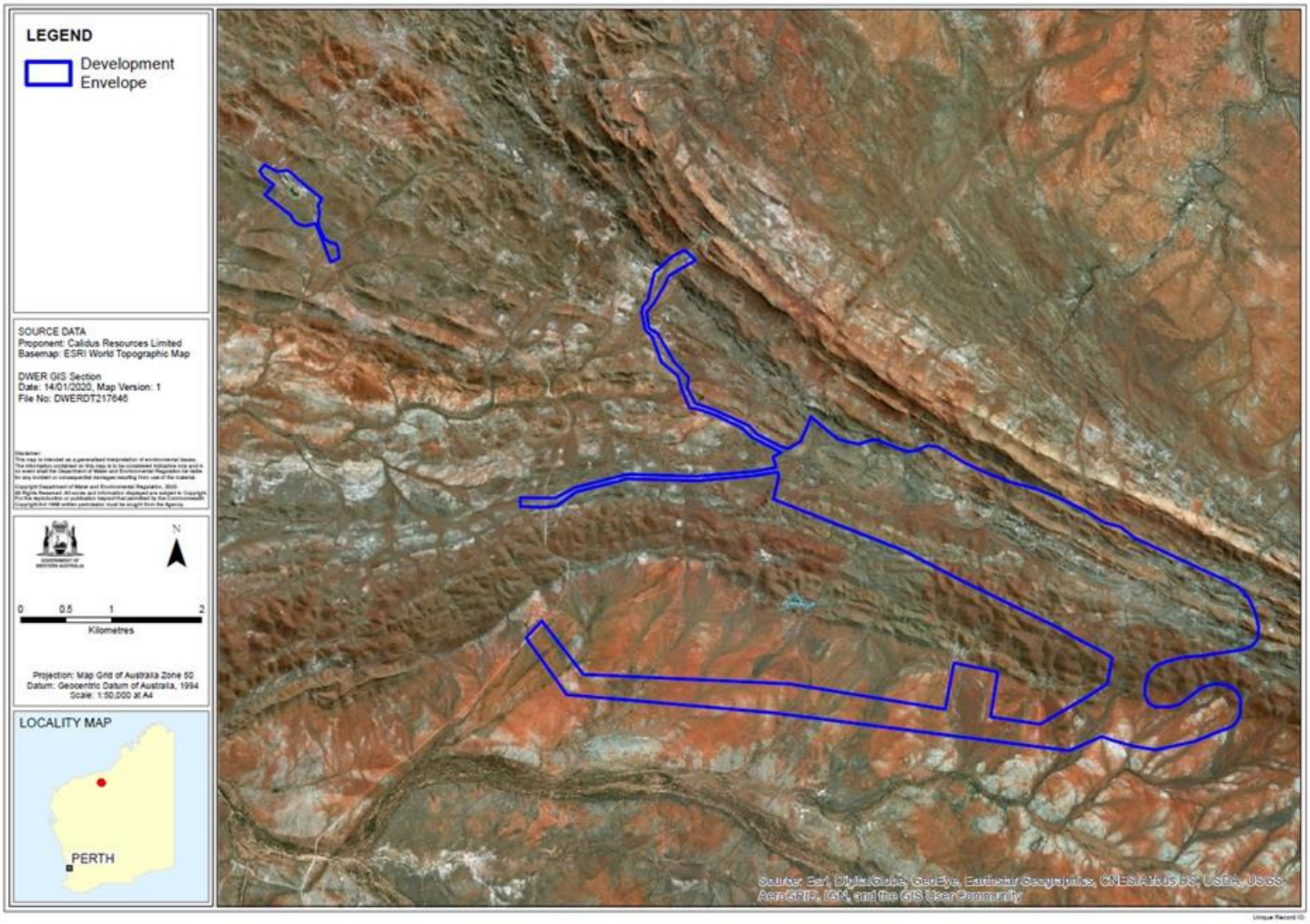

Figure 1: Development envelope

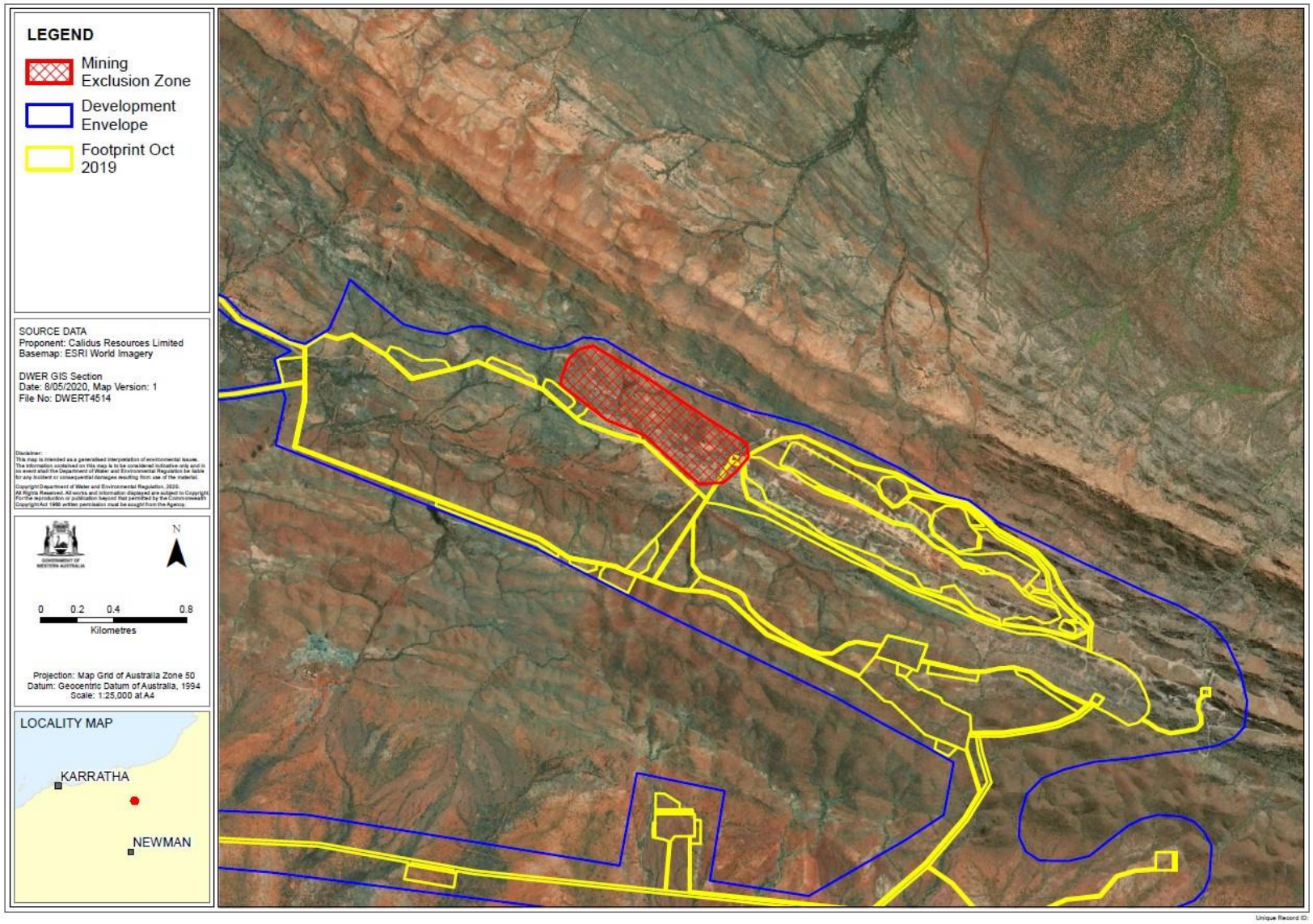

Figure 2: Mining Exclusion Zone

Schedule 2

Geographical spatial data

Coordinates defining the areas shown in Figure 1 and 2 are held by the Department of Water Environmental Regulation, under reference numbers DWERDT286713 and DWERDT286711.

All co-ordinates are in metres, listed in Map Grid of Australia Zone 50 (MGA Zone 50), datum of Geocentric Datum of Australia 1994 (GDA94).