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Clarification of matters raised by DCCEEW re Ghost bat presence at McPhee Creek.

David,

Atlas Iron Pty Ltd (Atlas) have requested clarification from Bat Call WA of several points of discussion raised by DCCEEW relating to McPhee Creek project Ghost bat (PGb) presence and management (SOW (Atlas 2023)). The SOW requests a series of responses to the following points of discussion.

1. Provide an overview of current knowledge of the PGb's diurnal foraging habits, with reference to:
 - a. Which habitat types mapped in the Study Area would be considered as 'critical habitat' with reference to current DCCEEW guidance
 - b. Current understanding of nightly foraging range from diurnal roosts, specifically if the following can be clarified and distinguished: (i) maximum distance from roost, (ii) total flight distance, (iii) theoretical maximum available foraging habitat accessible from a single diurnal roost (i.e. foraging range)
 - c. Observations of PGb's foraging habits within different parts of the foraging range, including whether the 500 m outside the diurnal roosting cave is of particular importance or significance to PGb
 - d. The effect of cleared areas interspersed amongst foraging habitat on the quality of the foraging habitat or the PGb's foraging patterns (if any is known).
2. 'A review of PGb ecology, threats, and survey requirements' (Bat Call 2021) references examples of avoidance buffers of varying radii (100, 200, 250 and 500 m) "being found to be adequate" for certain purposes. Please expand on what objectives these buffers were

- found to be adequate for, and whether it is possible that other buffers (or even other mitigations) could be used to achieve the same objective with respect to limiting impacts on PGb (e.g., protection of important habitat features (roosts), disturbance to bat individuals from human visitation, separation of bats from indirect impacts such as noise/light/dust/vibration).
3. Provide an updated prediction of impacts to bats if cave CMPC-08 is closed during mining operations and breeding season in addition to CMPC-10 and CMPC-25 being closed, e.g. are bats likely to relocate to another roost? What is the longer-term impact on the regional population?
 4. Provide an overview of the current understanding of habitat requirements for transiting to other roosts. For example, whether transiting requires suitable foraging habitat to be present along the length of the transit, or whether PGb appear to be able to make this transition despite habitat fragmentation.
 5. Commentary on whether the following additional mitigations (compared to the ERD/RTS) are considered sufficient:
 - a. Retain cave CMPC-08 with 50 m avoidance buffer
 - b. Monitoring of blast vibration impacts at CMPC-08
 - c. Closure of cave CMPC-08
 - d. Expand avoidance buffers around caves CMPC-10 from 50 m to 253 m and CMPC-25 from 50 m to 282 m.

In addressing these points of discussion in the following paragraphs, my comments are based on the following hierarchy of objectives. Firstly, protect the caves considered to be critical habitat for the MNES species, in this case the PGb. Secondly, protect PGb that may be roosting in these caves. Thirdly understand the impact of the project on the PGb's foraging areas surrounding the caves in question and maintain adequate area for the future.

Item 1. Comments regarding foraging habitat at and near McPhee.

The development envelope at McPhee (DE) is an area of 4,465 ha that is aligned north to south and 5.5 km long by 4 km wide. It is made up of high, medium and low value PGB foraging habitat (Atlas 2022). High value habitats include productive wooded areas including gorge/gully, breakaway/cliff, drainage line and wooded hillcrest/hillslope (after Bat Call 2021; Atlas 2022) areas that total 1,060 ha, not all of which is proposed to be cleared. Moderate and lower value foraging habitats at McPhee include rocky foothills with thin or minimal woodland coverage and spinifex plains over sand and stony substrates with minimal woodland coverage. These assessments are supported by recent field work results using VHF and/or GPS satellite tagged bats. These recent studies have shown that bats regularly forage up to 12 km from their diurnal roost caves and prefer more productive areas with scattered, patchy or more continuous woodland coverage. Maximum flight path distances flown in a night are typically in excess of 20 km and can be over 40 km (author's unpublished data, draft manuscript submitted for review). Of the area surrounding McPhee within range of the project's PGB roost caves, some 70,000 ha, I assess over two thirds, over 50,000 ha, as high value for PGB foraging. This is based on numerous past visits to the region supplemented by a review of available aerial imagery. The 1,060 ha therefore represents only ~2% of that available to PGB at McPhee. Significantly, current field work involving numerous personal observation sessions at PGB roost entrances has shown that the species does not begin to forage from the ground immediately upon exiting the roost but departs the local area and begins to forage from the ground some distance away. This is supplemented by satellite tracking GPS tagged PGB (authors unpublished recent data, draft manuscript submitted for review) and VHF and GPS data from Augusteyn *et al.* (2018, Figure 5). These studies show initial foraging from the ground very occasionally begins at distances of over 400 m and usually over 750 m from the roost. The PGB then remain at greater distances until returning to the roost. VHF data from Biologic (2019) also supports this. An additional comment can be made regarding foraging by PGB's at cleared areas within the high value areas. Once cleared of trees and large shrubs the bats are only likely to use the periphery of the cleared area, however, observations during the clearing activities have sometimes shown that PGB can be temporarily attracted to forage, presumably due to the number of terrestrial prey disturbed by the clearing that become easy prey (author's unpublished observations).

Item 2. General comments regarding buffers around PGB roosts at McPhee.

Category 2 roosts such as the isolated CMPC-08, -10 and -25 at McPhee are those with regular diurnal occupancy, typically between 25 and 75 % of days (Bat Call 2021, Sect 5.1). Category 3 are those with occasional diurnal occupancy. Note also that Cat. 2 roosts are designated as critical habitat (Bat Call 2021 Sect 5.1). There are no other critical habitat roosts identified such as PGB Cat. 1 caves or apartment blocks including Cat. 2 and Cat. 3 caves at McPhee.

Following numerous discussions on the subject with several proponents and based on field work at several unrelated projects acceptable buffers can be proposed around PGB critical habitat roosts that remain open during mining operations. These buffers are acceptable based on the following:

1. Category 2 and 3 caves are not permanently occupied therefore it has been proven that the PGB can easily relocate away if disturbed by the pre-mining or pit development operations.
2. Retention of roosting viability of the Cat. 2 and 3 caves can be shown by Geotech Engineering assessment and /or professional Blast Engineering planning before and during the occurrence of mining operations nearby.
3. Blast planning shall be based on maximum Peak Particle Velocity (PPV) limits that provide protection for any roosting bats, reproducing females in particular, that remain in open roosts when mining ops are nearby. The limiting PPV for critical habitat caves shall be 10 mm/sec from 1st October to 31st December to protect heavily pregnant females and newborn young. For critical habitat caves from 1st January to 30th September the limiting PPV shall be based on retaining the roost as viable. When no professional engineering assessments are available, the default conservative limit shall be 25 mm/sec for Cat. 2 caves and 50 mm/sec for Cat 3 caves. With professional Geotech assessment and blast engineering modelling, these limits may be higher (Bat Call 2021, sect 6.2.3) as set by those assessments. The Cat 2 caves at McPhee have been assessed as remaining viable as roost structures with PPV levels of up to 100 mm/sec (Martin 2022), albeit with the possibility of low levels of ceiling rock dislodgement (see also PSM 2022).
4. It is well documented that high or unusual levels of ambient noise have been shown to cause PGB to temporarily abandon diurnal roosts. Bat Call (2021, sect 6.2.2) recommends current best practice for sound levels at Cat. 2 roost entrances of 70 dB(Z) during mining operations. This is based on Bullen and Creese (2014) supplemented by more recent unpublished author's observations.

5. As noted above, current field work involving personal observation sessions at PGB roost entrances has shown that the species does not begin to forage from the ground immediately upon exiting the roost but departs the local area (see comments under item 1 above).

If during mine planning, limits for avoidance buffers, continuous ambient noise or in-ground vibration as defined above (default or specific) are not able to be met, an acceptable solution is to close off the entrances. PPV limits designed to retain the cave as a viable roost post mining to allow recolonisation shall then be enforced. It is expected that noise and vibration levels during the project will necessitate temporary closure at CMPC-08, CMPC-10 and CMPC-25. I recommend that while construction and mining operations are underway in proximity to the caves, and the displacement of bats is considered likely, the caves be closed to PGB occupation during the October to December breeding season to avoid impacts to breeding PGB individuals while mining is carried out at the project. Caves may also be closed year-round during mining operations to minimise impacts to PGB individuals. Cave closure is viable due to the proximity of two historical underground mines proven to support roosting PGB, CMPC-12 and -26 (both are over 2.5 km south of the DE) plus two other major PGB hubs (Warrawoona and Nullagine historic mine roosts, both within 40 km) that will allow the bats to relocate away during the mining operations and return to the retained DE caves once mining is completed.

Item 3. Impact of temporary closure of specific roosts. CMPC-08, CMPC-10 and CMPC-25.

These three natural caves, together with the two historical abandoned asbestos and copper mines to the south, CMPC-12 and -26, constitute the identified critical roosting habitat at and adjacent to the DE. With the closure of the three caves and the level of noise, dust and in-ground vibration during mining operations including mine closure possible, it is foreseen that the local population of PGB at McPhee will relocate away from the DE and the colony within the DE will contract to close to zero. Experience has shown at other iron ore projects with PGB colonies pre-mining, e.g. Poondanno project (Bullen and Creese 2014), 30 kilometres south-east of Port Hedland, that has been mined out for approximately seven years, that this level of abandonment is not permanent and the PGB return to roost in the viable caves that are retained (author's unpublished observations). Further numerous caves in mined out Pisolite mesas along the Robe River (Bat Call 2017), 50-year-old Hamersley Range adits in iron stone (author's unpublished data) and East

Pilbara abandoned underground gold mines (Bat Call 2021) support healthy PGB colonies providing further evidence to the recolonisation ability of the PGB. It is also believed that the ranges that extend to the north, west and south of McPhee may contain additional Cat. 2 roost caves although to date there has been virtually no survey work to confirm this. Any long-term impact of the McPhee project on the regional PGB population is therefore foreseen to be minimal, limited only to the potential loss of one or more non-critical habitat Cat. 3 or 4 caves and the loss of high value foraging habitat within the DE.

Item 4. Current understanding of habitat requirements for transiting to other roosts.

Currently there is limited data on the routes taken by PGB when transiting to other roosts. Recent GPS field work supported by data in Augusteyn (2018) indicate that long distance flights away from an initial diurnal roost involve a number of foraging stops at high and medium quality sites. It can be inferred from this together with the nightly flight distances covered noted above, that there are no specific habitats required to support commuting long distances.

Item 5. Additional comments relevant to Atlas's proposed additional mitigations for the three Cat 2 caves.

- a. Subject to mine planning, cave CMPC-08 may be retained with a small avoidance buffer of approximately 50 m, however as noted above, this distance will be contingent on the closure of the cave to PGB for the duration of mining operations together with PPV limits consistent with retaining the cave's structure as a viable diurnal roost, see item 2 above.
- b. Blast monitoring, PGB usage monitoring and cave entry protocols are recommended to be applied to cave CMPC-08 if it is to be retained.
- c. Regarding closure, see a. above.
- d. Small buffers of 50 m or larger around caves CMPC-10 and -25 can be defined but with the same contingencies as for -08 above including optional closure.

Best regards



Bob Bullen

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