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Dear Sarah

Peer Review of: Biologic (2016) Mining Area C – Southern Flank Environmental Impact Assessment for Ghost Bat

This report is my review of the revised (V4 031116) version of the environmental impact assessment (EIA) for ghost bats (*Macroderma gigas*) undertaken by Biologic Environmental Survey. It provides comment on:

- (1) The scientific validity of survey work undertaken for BHP Billiton Iron Ore to support the environmental impact assessment process, including methods and outcomes;
- (2) Conclusions drawn on the ghost bat's ecology and demography within the Hamersley Ranges; and
- (3) Conclusions reached on the likely impacts to the ghost bat if the Southern Flank project is to proceed.

It considers:

- Relevant government guidelines and information on the ghost bat, including listing advice and recovery plans as appropriate;
- Published literature on the ghost bat;
- Unpublished work on the ghost bat undertaken for BHP Billiton Iron Ore; and
- Any details of any other information relevant for this scope.

Peer review process:

Copies of the available literature on ghost bats, both published grey (44 references in total; see Attachment 1: 'Documents considered during the review'), were scanned for new information, then the previous EIA's on Pilbara ghost bats was read in chronological sequence, using Google Earth to provide a geographic setting for relevant localities. Next, the EIA was appraised in terms of the: articulation of the rationale, information-base, appropriateness of the component studies, relevance and reliability of the methodologies applied, technical quality/reliability of analyses, assays and specialists used, awareness of relevant literature/knowledge (on Pilbara ghost bats, its populations elsewhere in Australia and on biology of other predatory bats such as *Megaderma*), logical connection between data, analysis/assay, and interpretations. Finally, the validity/sensitivity of the conclusions was considered, especially where data from Kimberley, Northern Territory and Queensland ghost bats were used to fill pivotal knowledge-gaps like foraging distances.

As reported in Biologic (2013, 2014, 2015, this EIS), all field studies and survey work carried out to underpin this EIA complied with DEWHA, EPA, DPAW guidelines and requirements for Australia's

threatened bats (e.g. TSSC 2016, EPA-DEC 2010, EPA 2004), and took into account available information on the ghost bat in scientific literature, grey literature and recovery plans.

Scientific validity of the conclusions reached in Biologic's EIA document

The ghost bat is a difficult species to study in the field. It is cryptic, nocturnal and evasive. Even its echolocation calls are brief, of low intensity, and emitted sparingly as they are supplemented by vision and used in the context of an ambushing foraging strategy. Consequently, the biologists researching Pilbara ghost bat (numbers, occurrence, breeding patterns, recruitment, demography, population trends, genetic diversity, threats, roost requirements, roost usage and foraging ecology) for BHP Billiton have assessed and implemented a variety of direct and indirect methods.

They have carried out extensive on-ground searches for ghost bat caves throughout the relevant Development Envelope and elsewhere in the region. They have investigated the caves using traditional as well as state-of-the-art methodologies, including ultrasound recorders, low light cameras, radar devices and atmospheric monitoring devices, as well as midden scat metrics and assays (rate of accumulation, prey content, ghost bat DNA, ghost bat hormone levels), to assess:

- The role and importance of the caves individually, and their seasonal usage patterns, in terms of cave dimensions, shape, temperature and humidity; and
- Several conservation-critical population parameters, including genetic diversity both locally and across the Hamersley subregion, overall population size compared to the genetically distinct Chichester population, individual movement distance, which caves are used by pregnant females, evidence of population bottlenecks.

All surveys, assays and identifications were carried out by professional scientists with current, specialist peer-reviewed experience in both the application and the interpretation of the relevant techniques; the assays were carried out in professional laboratories.

The studies have considerably extended knowledge relevant to the management of Pilbara ghost bats, and conclusions drawn in the EIA are scientifically conservative, robust and consistent with data on ghost bats in other parts of Australia. The strategy of ephemeral, vagrant cave-use identified by the EIA's authors accords with the intermittent cave-use patterns observed, and makes ecological sense given the numerous, small, relatively dry, natural cave systems of the Hamersley subregion, the Pilbara's locally unpredictable climate and its generally unproductive environments compared to the Kimberley, Northern Territory and Queensland.

Where uncertainties remain and where further studies are required to provide a basis for impact decisions, the EIA considers optional scenarios for the Hamersley population conservatively, objectively and transparently. For instance, the Hamersley population estimate from the field survey (300 – 400) is used in the assessment, rather than the 'provisional' census-population estimate of 700-800 derived from the scat genetic analysis (p. 46).

The discussion of potential impacts on the estimated 25 ghost bats that use the "Indicative Additional Impact Area" achieved by the "Modified Indicative Additional Impact Area" (pp. 50-55 & pp. 47-49) is another example of the EIA's scientifically robust approach to appraising the likely effects, especially given the potential for cumulative impacts (pp. 57-58). As the proponent points out in the EIA (p. 50), removal of 5 of 12 maternal/day roosts from the "Modified Indicative Additional Impact Area" (Figure 4.4), exacerbated by 47% removal of the surrounding energy-efficient foraging habitats (Figure 4.5), will reduce the carrying capacity of Mining Area C for Ghost Bats.

In the broader context of the Ghost Bat population in the Hamersley subregion (i.e. the genetic entity recognised by EPA/EPBC guidelines), and the mitigation actions listed in the EIA, this proposed extension to Mining Area C may well have no lasting implications for *Macroderma gigas* recruitment and genetic continuity.

Sincerely,



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Attachment 1: Documents considered during the review

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