

Shree Minerals
Nelson Bay River Mine
Environmental Impact Statement (EPBC Act)

Proposed contribution to orchid baseline research

The EIS guidelines include the following requirements relating to threatened orchid species:

Hydrological impacts are of particular interest, noting that the extent of likely hydrological impacts is not clear from referral documentation.

Survey requirements are outlined below:

1. Targeted surveys. The proponent must conduct seasonal targeted surveys both inside and adjacent to the site impacted by the development before and during development. These surveys need to be assessed against existing population records to determine the significance of the development impact. Surveys 1- 3 years after fire are highly recommended in this region given the nature of the fire regimes and orchid's response to fire. These surveys must be conducted between late October and early November (a month later for *D. lanceolata*).

2. The proponent must conduct baseline research into the mycorrhizal requirements of impacted orchids. It is widely accepted that mycorrhizal distribution directly influences orchid distribution. Currently, little is known about orchid mycorrhizal distribution patterns other than being patchy across the landscape and sensitive to changes in hydrology and soil organic content. Orchids maintain a mycorrhizal association throughout their life but may survive on tuber storage reserves for up to two years if the mycorrhizal association is lost.

Research required to mitigate against this impact is mycorrhizal distribution assessment studies using orchid seed as 'baits' for mycorrhizal presence. This allows the testing for mycorrhizal presence/absence along transects across the landscape for a variety of orchids and habitats. This can also be used to detect potential sites for reintroduction post development. Seed 'baits' are placed in the soil in May (start of the growing season) and retrieved in October for scoring and assessment.

3. The proponent must conduct baseline research into pollinator requirements of impacted orchids. Orchids have a variety of pollination mechanisms some more elaborate than others. The *Prasophyllum* sp. here are self-pollinated and the development is unlikely to impact on fruit set. The pollination mechanism for *Caladenia dianeama* is considerably more complex as they require a specific native wasp for pollination. Wasp presence can be surveyed through recording fruit set rates and by pollinator 'baiting' studies where flowers are used (during Oct and Nov) as 'baits' to attract wasps. Although these species were not located within the immediate impact zone, this work is highly recommended to determine if the habitat may contain suitable pollinator populations.

The guidelines relate these requirements to the following species:

- *Caladenia dienema* Windswept Spider-orchid
- *Prasophyllum secutum* Northern Leek-orchid
- *Pterostylis rubenachii* Arthur River Greenhood
- *Prasophyllum pulchellum* Pretty Leek-orchid
- *Prasophyllum favonium* Western Leek-orchid
- *Diuris lanceolata* Snake Orchid.

As described in the EIS, there will be no impacts on threatened orchids and this requirement is therefore not relevant to the approval decision for the project. Nevertheless, to enhance the understanding of orchid biology in northwestern Tasmania, Shree Minerals will commission that research during the initial years of the mine's operations, as a best practice environmental management contribution to orchid science. The research will assist with the ongoing management and protection of threatened orchid species in northwestern Tasmania.

This document describes the approach that will be followed.

1. Research approach

This approach is based on the EIS guidelines and also on a submission on the draft guidelines prepared by Dr Nigel Swarts for the Tarkine National Coalition and provided to Shree Minerals by Scott Jordan of the Coalition. Shree Minerals gratefully acknowledges those sources.

1.1 Project background to the study

A targeted (flowering time) survey for threatened orchid species was undertaken in the spring of 2010 (reported in the EIS). A population of *Prasophyllum pulchellum* was found just outside the mine lease boundary. No threatened orchids were found inside the lease.

Nevertheless, as a conservative orchid protection measure it will be assumed that threatened orchids could occur anywhere within the wet heathland within the western part of the lease. Whether particular orchid populations (if they exist) were or were not flowering at the time of the 2010 survey is therefore immaterial to the orchid protection measures that will be implemented. Shree Minerals will protect the entire wet heathland orchid habitat in the western part of the lease (see attached map). The mine and its associated infrastructure lie in the eastern part of the lease. Knowledge of the location of any particular orchid populations within the wet heathland adds no value to those protection measures and repeat orchid surveys are therefore unnecessary for that purpose.

The purpose of further orchid surveys will be to inform this scientific research study, not to inform the mine's orchid habitat protection measures.

Potential impacts on threatened orchids could arise from two causes - either direct or indirect.

The first potential cause is direct physical impact on orchid habitat. This will not occur.

The mine infrastructure has been specifically designed to avoid direct impacts on the wet heathland that lies in the western part of the mine lease (west of West Creek). This design work involved reconfiguring the waste rock dump to make it lie entirely to the east of West Creek (a change from the original EPBC referral documentation to the EIS documentation). There will be no disturbance of, or in the vicinity of, the wet heathland.

The second potential cause is indirect impacts on the orchid habitat through alterations to the hydrogeological regime of the wet heathland. This will not occur either.

As described in the EIS, the wet heathland is a groundwater recharge area. Groundwater beneath the heathland flows away from it, not towards it. Groundwater therefore makes no contribution to the soil water of the heathland. The heathland plants are shallow rooted species in peaty soil. Their soil water is fed from above by rainfall, not from the water table below.

While the presence of the mine pits in the eastern part of the lease will cause a drawdown of the water table, this drawdown will diminish rapidly with distance from the pits. Even if the diminishing drawdown extends as far as to below the wet heathland, because that heathland is a groundwater recharge area its hydrology would not be affected. Consequently, the presence of the mine pits will not affect any threatened orchid species that occur in that heathland.

There is therefore no significant likelihood of the wet heathland soil water, and hence the ecosystems dependent on it, including threatened orchid species, being affected by the dewatering of the mine pits.

The EIS guidelines relate the orchid baseline research to impacted orchids. There will be no impacts on orchids and these studies are therefore not required. Nevertheless, Shree Minerals recognises the research opportunity that the presence of the mine will provide, and accordingly has undertaken to fund the research anyway when the mine is operating.

1.2 Biological background to study

Dr Swarts provided the following background to the study:

Terrestrial orchids are unique organisms with many species having highly specific environmental interactions both above and below ground.

Above the ground orchids can have one to one associations with insect pollinators essential for reproduction to occur.

Below the ground, due to orchid's tiny seed which lack storage reserves, all orchids form an association with a mycorrhizal fungus which is essential for germination and growth to occur.

Orchids are perennial herbs with a winter wet growing season, a short flowering period in spring early summer and an underground dormant period as a tuber throughout the warmer summer and early autumn months. As a consequence of the specific nature of these interactions and life history characteristics, many orchids are intrinsically rare and coupled with anthropogenic induced change are now facing the very real threat of extinction.

The northwest of Tasmania, particularly the region from Arthur River to Sandy Cape, is a terrestrial orchid hotspot containing many species endemic to that region and also to Tasmania. The incidence of orchid rarity in that region is extremely high with up to a third of the species having some form of conservation status. Populations of endangered species are facing a variety of threats from habitat fragmentation/loss, altered fire regimes, spread of weeds, genetic effects of small population size, loss of mycorrhizal fungus and pollinators.

Many of these taxa also suffer from inadequate representation within reserves, unverified or imprecise location data, limited population data and a poor understanding of ecological requirements.

Consequently, until more recently, it has not been possible to assess the effects of management and development and/or whether populations are in decline. As many orchids do not emerge or flower every year or can only be identified for a brief period when in flower, it can be difficult to assess the impact of proposed developments through one off impact assessment surveys. This makes it more difficult to protect the habitat of threatened orchids.

Although the mine project will not impact any populations of threatened orchid species, this study will provide use information to assist impact management where that might occur in other areas of north-western Tasmania.

1.3 Expert to be commissioned

Shree Minerals will commission an appropriate orchid biology expert to undertake the survey.

1.4 Species to be included

Orchids have specific habitat requirements. Although the guidelines relate the research to 6 orchid species, as described in the EIS only two of the species have suitable habitat and occur in the vicinity of the mine site (*Caladenia dienema* and *Prasophyllum pulchellum*). The other species occur at distances beyond any credible influence of the mine. Distances to recorded locations are shown in Table 1.

Table 1: Distances from mine site to threatened orchid species observations

Orchid species	Nearest distance from mine site (km)
<i>Caladenia dienema</i> Windswept Spider-orchid	0.1
<i>Prasophyllum secutum</i> Northern Leek-orchid	4.8
<i>Pterostylis rubenachii</i> Arthur River Greenhood	4.8
<i>Prasophyllum pulchellum</i> Pretty Leek-orchid	0.2
<i>Prasophyllum favonium</i> Western Leek-orchid	3.3
<i>Diuris lanceolata</i> Snake Orchid.	3.4

This research program will be confined to *Caladenia dienema* and *Prasophyllum pulchellum* and any additional threatened orchid species that may be found in or in the vicinity of the mine lease during the study.

1.5 Targeted surveys to be conducted

Targeted surveys for *Caladenia dienema* and *Prasophyllum pulchellum* have already been undertaken (reported in the EIS). Only *Prasophyllum pulchellum* was found in the survey.

Although the nearest *Caladenia dienema* recorded observation was within the survey area, this species was not found. It is possible that this record is an error because the location places the population in thick woodland, which is not the preferred habitat of the species.

A repeat targeted spring survey of the survey area will be undertaken as a preliminary to this research project. Any orchid plants found will be GPS located for the benefit of the research project.

1.6 Study populations

Mycorrhizal distribution assessment study

If population(s) of threatened orchid species are found within the mine survey area during the repeat survey, appropriate population(s) will be selected for the mycorrhizal distribution assessment study, which would commence the following May.

If no populations of these species are found within the survey area, Shree will nevertheless support an expansion of the survey area beyond the mine site to find an appropriate candidate population(s) for the mycorrhizal research.

Pollinator requirement study

A repeat targeted spring survey of the survey area will be undertaken. If population(s) of threatened orchid species dependent on insect pollination are found within the mine survey area during that survey, appropriate population(s) will be selected for the pollinator study.

If no populations of these species are found within the survey area, Shree will nevertheless support an expansion of the survey area beyond the mine site to find an appropriate candidate population(s) for the pollinator research.

1.7 Study methodology

The studies will be undertaken in accordance with the broad description provided by the guidelines, although the detailed methodology of the studies will be determined by the commissioned expert, in consultation with Shree Minerals.

The studies will commence in the first year of the mine's operations, following the approval of the mine project. It is anticipated that the studies will take at least 3 years to complete.

1.8 Reporting

On completion of the studies, a report will be prepared by the commissioned expert and this will be provided by Shree Minerals to the Environment Assessment Branch of the Department of Sustainability, Environment, Water, Population and Communities (Commonwealth) and the Resource Management and Conservation Division of the Department of Primary Industries, Parks, Water and Environment for their use and distribution as they see fit.

The commissioned expert will also publish scientific paper(s) on the research as they see fit.

