Invertebrate Solutions

20th October 2020
Dr Tim Moulds
Director Invertebrate Solutions Pty Ltd
PO Box 14
Victoria Park, WA 6979
Reference: 2019ISJ08-F03-20201020

Munglinup Graphite Project Short Range Endemic Impact Assessment Technical Memorandum.

Attention Belinda Bastow
Director
Integrate Sustainability Pty Ltd

Dear Belinda,

In response to the request by Integrate Sustainability Pty Ltd on behalf of MRC Graphite Ltd (MRCG) on 7th August 2019 to provide an impact assessment for Short Range Endemic (SRE) invertebrates for the Munglinup Graphite Project on the south coast region of Western Australia Invertebrate Solutions makes the following response in the form of a technical memorandum.

Introduction

The Munglinup Graphite Project (the Project) is located 105km west of Esperance, 85km east of Ravensthorpe and 4km north of the town of Munglinup in the South Coast region of Western Australia (Figure 1). The proposed Project is situated within Mining Reserve R24714 and is covered by mining and exploration tenure M74/245 and tenure L74/55, L74/56, G74/9. The proponent, MRC Graphite Pty Ltd (MRCG), proposes to mine for graphite in open cut pits over a 10-15-year project life. Associated infrastructure including waste rock landforms, a tailings storage facility, processing plant and run-of-mine and low-grade stockpiles, power generation, workshops, administration buildings and roads (haul and LV) are proposed. The proposed activities encompass a development envelope of 650ha with an indicative disturbance footprint of 350ha within this development envelope.

A single season baseline survey for SRE invertebrates was undertaken at the MRCG Project area in October 2019 by Invertebrate Solutions (Invertebrate Solutions 2020). This comprised 30 sites throughout the Project Survey area that were actively sampled for SRE invertebrates including litter sifting and hand searching of appropriate microhabitats. The survey included a desktop assessment to determine the potential SRE species in the survey area using a combination of records held by the Western Australian Museum, previous studies within the MRCG project area (Biota 2018) and other relevant information.

Legend

- Dekstop Study Area
- SRE Survey Area
- Development Envelope

0 3.75 7.5 15 km

Scale: 1:500,000 @ A4

N

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP

- LOCALITY MAP SOURCED FROM LANDGATE 2006
- TRAVELLERS ATLAS 2006 9TH EDITIION

Invertebrate Solutions
m +61 (0) 429 792 834
s +61 (0) 405 561 978
e tim@invertebratesolutions.com
w www.invertebratesolutions.com

PROJECT ID	DATE
MRC Graphite Project	9/01/2020

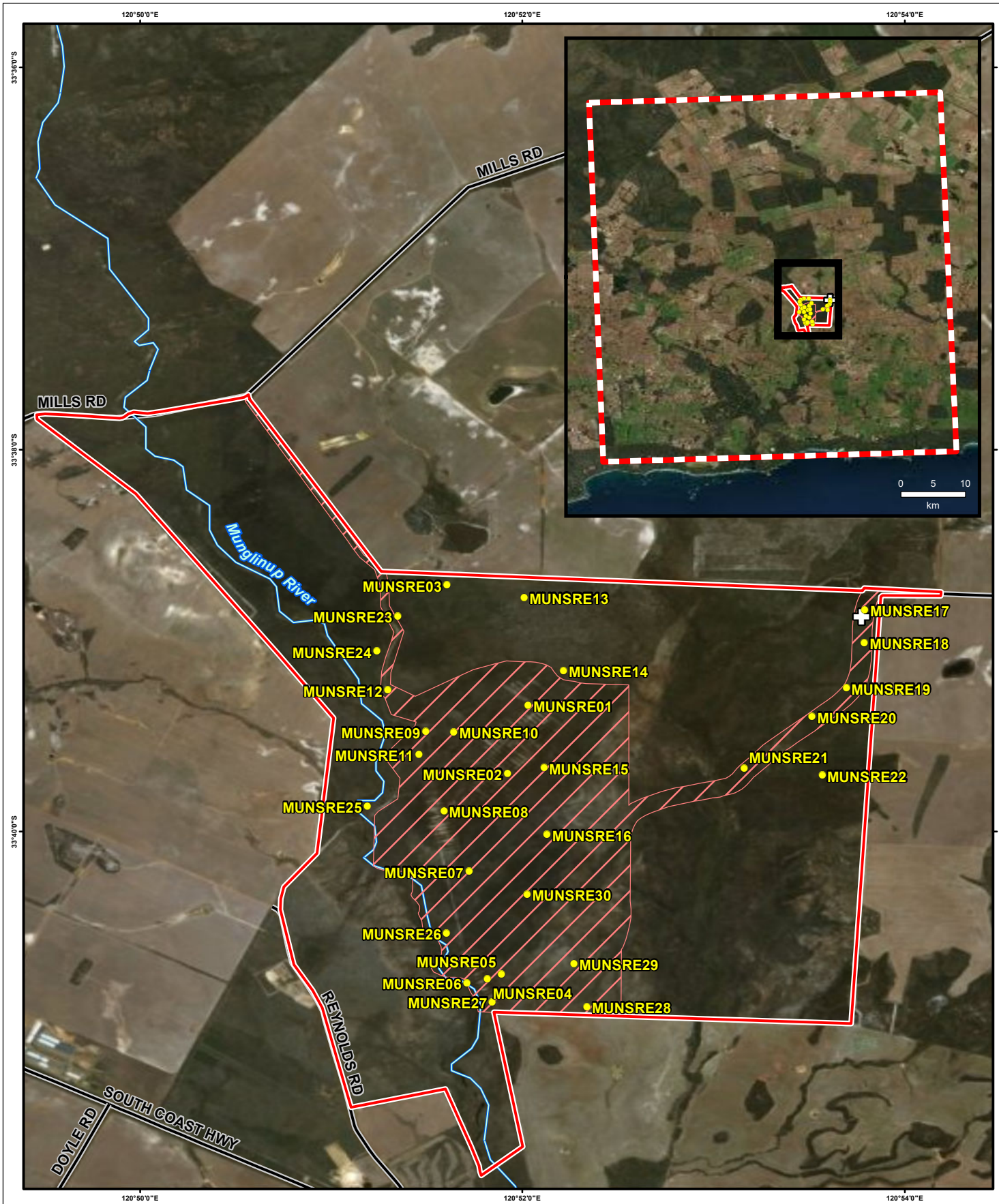
HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	TM	TM	0

Client: MRC Graphite

Figure 1
Location of the MRC Graphite Project, Munglinup, W.A.

C:\GIS\Jobs\Invertebrate Solutions\Munglinup Graphite Project\Figures\MGP_F01 Location of the MRC Project_200109.mxd



Legend

- Dekstop Study Area
- SRE Survey Area
- Development Envelope
- Road
- Watercourse
- Opportunistic Mygalomorph Spider Record
- SRE Survey Site

- LOCALITY MAP SOURCED FROM LANDGATE 2006
- ORTHOPHOTO SOURCED FROM OPEN SOURCE

0 0.375 0.75 1.5 km

Scale: 1:50,000 @ A4

N

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP

Invertebrate Solutions
m +61 (0) 429 792 834
s +61 (0) 405 561 978
e tim@invertebratesolutions.com
w www.invertebratesolutions.com

PROJECT ID	DATE
MRC Graphite Project	9/01/2020

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	TM	TM	0

Client: MRC Graphite

Figure 2

Short Range Endemic Invertebrate Survey Sites at the Munglinup Graphite Project

ENVIRONMAPS t: 0406 590 006
Environmental Mapping Solutions www.environmaps.com.au

C:\GIS\Jobs\Invertebrate Solutions\Munglinup Graphite Project\Figures\MGP_F02 Short Range Endemic invertebrate Survey Sites at the MRC Project_200109.mxd

Baseline SRE Invertebrate Survey of the Munglinup Project Area

The desktop assessment recorded three Confirmed SRE species, one Likely SRE species and three Possible SRE species (Invertebrate Solutions 2020). The species are summarised below:

- Two land snails (*Bothriembryon bradshawi, and B. aff. praecelsus*) – Possible SRE species
- Three Idiopid trapdoor spiders (*Bungulla fusca, Eucanippe bifida and Gaius hueyi*) – Confirmed SRE species
- One Idiopid trapdoor spider (Idiopidae sp. indet.) – Possible SRE species
- One Paradoxosomatid millipede (*Antichiropus rex*) – Likely SRE species

Of these seven species identified in the Desktop Study Area, one was recorded in the field survey; the millipede *Antichiropus rex*. The remaining six Confirmed and Possible SRE species (four mygalomorph spiders and two land snails) were not recorded. The remaining species identified from desktop resources were found to be widespread (Invertebrate Solutions 2020).

The SRE field survey (invertebrate Solutions 2020) recorded 247 individual specimens representing 25 taxa of invertebrates from six classes, 11 orders and 19 families that have the potential to contain SRE taxa. No Confirmed SRE species were recorded during the field survey.

Four species were identified as Likely SRE species:

- the isopod *Acanthodillo sp. indet.*
- the isopod *Pseudodiploexochus sp. indet.*
- the isopod *Paraplatyarthrus sp. indet.*
- the millipede *Antichiropus rex*?

The majority of species recorded are widespread across the southern coast or the south west of Western Australia.

Potential Impacts to SRE Invertebrates

The potential impacts of development on invertebrates may be categorised as:

- Direct impacts; and
- Indirect impacts.

Direct impacts are the obvious and unavoidable destruction or degradation of habitat, generally native vegetation that occurs due to clearing and earthworks (e.g. infrastructure areas etc.). Indirect impacts are generally gradational, and more difficult to predict and manage because they may occur at moderate to large distances from the project footprint. These impacts may be expressed some time after development has begun.

The zone of influence for indirect impacts may be considerably larger than areas of direct impact. Potential indirect impacts of development include:

- Risk of extinction from reduction and/or fragmentation in habitat;
- Dust deposition;
- Alteration of surface hydrology regimes, sedimentation, and water quality (e.g. under and proximal to roads and infrastructure);
- Surface water contamination from equipment and infrastructure; and
- Vibration disturbance from operational activities.

This impact assessment is based primarily upon and the project components as outlined by MRCG with the main components of the Munglinup Graphite Project reviewed to assess the potential severity of impact to potential SRE habitats. In evaluating the relevance of these factors to the Project, consideration was given to the magnitude, duration and spatial extent of the impacts, where known. This assessment has taken the approach of considering these broad categories of potential impacts and evaluating their occurrence and relative severity. The impacts were then assigned a level of either 'Low', 'Moderate', or 'High' according to their potential degree to adversely affect the EPA's objective to maintain representation, diversity, viability and ecological function at the species, population and assemblage level for SRE fauna.

Where an impact is designated as 'Low' no further consideration to this factor is required if all assumptions made throughout this report are correct.

Munglinup Graphite Project SRE preliminary impact assessment

This preliminary impact assessment is based primarily upon the Project description provided by MRCG (2020) (Appendix 1) and the introduction.

Local impacts during construction and operation

The potential impacts to SRE fauna within the MRCG Project Area are summarised in Table 1 and Table 2. The assessment of the impact to SRE fauna at both the local and regional (South Coast) scale from each disturbance

mechanism takes into account both the likelihood of the impact occurring, its duration and severity, the potential consequence to SRE fauna and the likelihood of SRE fauna being present.

Direct impacts

The only direct impact to SRE fauna is from vegetation clearing within the MRCG Project Area. This direct impact is considered to be a Low impact locally to SRE species as no Confirmed SRE taxa were recorded during the field survey (Invertebrate Solutions 2020), although four Likely SRE species were recorded.

Two Likely SRE species, (*Pseudodiploexochus* sp. indet. and *Paraplatyarthrus* sp. indet.) were recorded from within the Development Area but within the laterally continuous Mallee Shrubland or Eucalyptus Woodland habitats (Invertebrate Solutions 2020, Figure 4). These species are both highly cryptic and naturally occur in low abundances within the landscape making them difficult to detect and due to the absence of a reliable taxonomic framework no further detail is available regarding their specific distribution, only that they are known to occur in higher rainfall areas, deep in leaf litter or soil and are highly likely to occur well beyond the limited extent of the Development Envelope in the local region (Invertebrate Solutions 2020).

The remaining Likely SRE species were also recorded within the laterally continuous Mallee Shrubland or Eucalyptus Woodland habitats, with only a single specimen of the Likely SRE isopod species *Acanthodillo* sp. indet. recorded from the Proteaceous Kwongan Shrubland habitat that is largely outside of the MRCG Development Envelope (Invertebrate Solutions 2020, Figure 4). The impacts from vegetation clearing can be minimised through clearly marked boundaries for clearing during construction, fencing of remnant native vegetation during construction and operation to avoid unnecessary trampling by machinery, vehicles or people and education/induction personnel across all phases of the operation to avoid damage to adjacent vegetation.

Given the small size of the project, and given similar habitat values are present in surrounding contiguous vegetation it is considered unlikely that the MRCG Project would result in significant local impacts to any SRE species from direct land clearing.

Table 1 Risk of direct impact to SRE invertebrates from the MRCG Project

Direct disturbance mechanism	Potential of Impact to SRE Fauna locally	Potential of Impact to SRE Fauna Regionally (SCP)
Vegetation clearing directly removing and/or disturbing SRE habitat	**Low**	**Low**

Indirect impacts

The indirect impact of the clearing of native vegetation causing fragmentation of the remaining vegetation may lead to the restriction of genetic flow for SRE species that have limited dispersal capabilities. This indirect impact is considered to be the Low/Moderate impacts from the MRCG Project. Habitat fragmentation has a much greater potential to impact upon SRE species due to their inherent lack of dispersal capability that allows other more mobile species to move between remnant vegetation patches in an agricultural mosaic. This impact is largely unavoidable but is mitigated by the proposed Development Envelope not entirely dissecting the remnant

vegetation and the retention of some corridors on the northern edge of the SRE survey area to the north of the proposed development envelope.

Increased weed incursion into native bushland can have a significant impact upon SRE species that rely on sometimes small microhabitats within the landscape. This has the potential to cause a Moderate impact to SRE fauna and is considered to be Low/Moderate indirect impact to SRE fauna for the Munglinup Project. This impact can be managed through management and mitigation measures including site wide weed control and vehicle hygiene requirements.

If not managed appropriately, increasing sedimentation and alteration of surface hydrology has the potential to affect SRE fauna such as mygalomorph (spiders that live in burrows at ground level). Sedimentation can be managed by appropriate stormwater runoff design and during construction via management and mitigation measures.

Table 2 Risk of indirect impact to SRE invertebrates from the MRCG Project

Indirect disturbance mechanism	Potential of Impact to SRE Fauna locally	Potential of Impact to SRE Fauna Regionally (SCP)
Habitat fragmentation and genetic isolation due to vegetation clearing and construction works	**Low/Moderate**	**Low**
Weed incursion during mine construction and operation	**Low/Moderate**	**Low**
Increased sedimentation during mine construction works	**Moderate**	**Low**
Alteration of surface hydrology during mine construction and operation	**Low**	**Low**
Hydrocarbon spills during construction and/or operations	**Low**	**Low**
Vibration disturbance from operational activities	**Low**	**Low**
Vibration disturbance from construction activities	**Low**	**Low**
Noise during construction works	**Low**	**Low**
Noise during operations	**Low**	**Low**

Contamination of surface and groundwater during construction and operations may also have impact upon SRE habitat, but risks of contamination can be minimised by employing management and applying mitigation measures to minimise and prevent contamination. The potential for contamination during construction is

limited to isolated areas of chemical storage and small quantities of hydrocarbons where machinery or generators are working. Risks will be minimised by measures included in a Construction Environmental Management Plan (CEMP). The risk of contamination during operations is minimal with appropriate drainage design including having oil skimmer on workshop and emergency spill response protocols in place to minimise the likelihood of large spills moving beyond operational areas into native vegetation. Where management measures are implemented, the risk of hydrocarbon contamination to SRE species and habitat is anticipated to be Low.

Vibration and noise from the construction and ongoing operation of the mine is expected to be minimal, especially beyond the immediate vicinity of the pits and processing areas. These impacts are considered to be Low.

Regional significance and cumulative impacts

At a regional scale across the South Coast of Western Australia, the direct and indirect impacts are generally considered to be low due to the very small size of the MRCG Project, and given similar habitat values are present in surrounding vegetation and surrounding conservation estates. Habitat fragmentation is the impact, either direct or indirect, that is considered to potentially be the most significant at a regional scale and this impact is still considered to be Low. Other anticipated impacts including altering local hydrology and weed incursion are considered to be extremely small in the scale of the South Coast.

Cumulative impacts on the South Coast will be low, albeit some minor fragmentation of one patch of remnant vegetation (Table 2). The primary cumulative impacts from the project developments is land clearance. It is anticipated that the MRCG Project will not add significantly to the cumulative impacts to SRE fauna in the local area, especially since none of the habitats identified would provide habitat isolates that would be likely to contain SRE taxa within the limited extent of the MRCG Project Area. All the vegetation units are laterally continuous within the region and not limited to the Project Area.

Conclusions and Recommendations

The Munglinup Graphite Project area was surveyed for SRE invertebrates in October 2019 and was found to contain no Confirmed SRE species and four Likely SRE species. The Likely SRE species were all located within the laterally continuous Mallee Shrubland or Eucalyptus Woodland habitats, with only a single specimen of the Likely SRE isopod species *Acanthodillo* sp. indet. recorded from the Proteaceous Kwongan Shrubland habitat that is largely outside of the project Development Envelope.

The only direct impact to SRE fauna is from vegetation clearing within the Project Area that will directly remove habitat used by SRE species. This direct impact is considered to be a Low with impacts from vegetation clearing to be minimised through clearly marked boundaries for clearing during construction, fencing of remnant native vegetation during construction to avoid unnecessary trampling by machinery, vehicles or people and education/induction of construction and mining personnel to avoid damage to adjacent vegetation. Given the small size of the project, and given similar habitat values are present in surrounding contiguous vegetation it is considered unlikely that the MRCG Project would result in significant local impacts to any SRE species from direct land clearing.

The indirect impact of the clearing of native vegetation causing fragmentation of the remaining vegetation may lead to the restriction of genetic flow for SRE species that have limited dispersal capabilities. This is considered to be the most indirect impact from the MRCG Project, however, it is mitigated by the proposed Development Envelope not entirely dissecting the remnant vegetation and will leave some corridors on the northern edge of the SRE survey area to the north of the proposed development envelope. Other indirect impacts are considered to be Low and are not considered to result in significant local impacts.

At a regional scale across the South Coast of Western Australia, the direct and indirect impacts are generally considered to be low due to the very small size of the MRCG Project, and given similar habitat values are present in surrounding vegetation and surrounding conservation estates. Habitat fragmentation is the impact, either direct or indirect, that is considered to potentially be the most significant at a regional scale and this impact is still considered to be Low.

Sincerely

Dr Tim Moulds

Director and Principal Ecologist

Invertebrate Solutions Pty Ltd

0429792834

tim@invertebratesolutions.com

Limitations and Exclusions

This study was limited to the extent of information made available to Invertebrate Solutions at the time of undertaking the work. Information not made available to this study, or which subsequently becomes available may alter the conclusions made herein.

The opinions, conclusions and any recommendations in this report are based on information reviewed at the date of preparation of the report. Invertebrate Solutions has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared. The opinions, conclusions and any recommendations in this report are based on assumptions made by Invertebrate Solutions described in this report (this section and throughout this report). Invertebrate Solutions disclaims liability arising from any of the assumptions being incorrect.

References

EPA (2016). Technical guidance. Sampling of short range endemic invertebrate fauna. Environmental Protection Authority: Perth. 35 pp.

Invertebrate Solutions. (2020). Survey for Short Range Endemic Fauna for the MRCG Graphite Project, Munglinup, Western Australia. Unpublished report to MRCG Graphite Ltd, September 2020.

MRC Graphite Ltd (2020). Munglinup Graphite Project description. Accessed 15th January 2020 at HYPERLINK "\\\\192.168.0.11\\Client_Project\\MRC\\Munglinup Graphite\\Task 1 - Baseline Surveys\\04 - SRE\\Level 2 SRE Survey\\Reports\\www.mineralcommodities.com\\operations-projects\\australia\\munglinup-graphite-project\\"www.mineralcommodities.com/operations-projects/australia/munglinup-graphite-project/

Appendix 1

The Munglinup Graphite Project

The Munglinup Graphite Project (the Project) is located 105km west of Esperance, 85km east of Ravensthorpe and 4km north of the town of Munglinup in the South Coast region of Western Australia. Graphite within the project area has been identified, studied and historically mined by several companies over the last 100 years. The Project is situated within Mining Reserve R24714 and is covered by tenures M74/245 and E74/565.

The Munglinup graphite deposits have been held and explored by several companies, prospectors and groups over the last 100 years. The first exploration shafts were constructed before 1917; mining records indicate that a small amount of graphite was extracted during the 1920s and later likely used as part of the war effort. The small, shallow prospecting shafts which were targeted at that time are located over the known ore zones.

The operation will have a nominal throughput of 400ktpa and produce an average of 50ktpa of high purity graphite concentrate. Initial mine life is 14 years.

Processing will be via a reasonably standard flotation circuit with a trommel front end, a rougher and five cleaner flotation stages with attritioning between stages. Tailings will be thickened and sent to a conventional tailings storage facility.

Graphite concentrate will be sold in concentrate form as well as being used as potential feedstock for further downstream, value add processing currently being assessed by MRC.

Geology

The Munglinup Graphite deposits occur within a zone of graphitic schists in a sequence of hornblende and hornblende-garnet gneisses. Graphite occurs in layers “seams” in metamorphosed carbonaceous schists and gneisses. Within the gneissic rock mass, rocks containing the Munglinup graphite deposits consist of a succession of tightly folded metasedimentary rocks with a consistent dip to the southeast. All known intersections of graphitic material occur within saprolite consisting of clays, quartz, graphite (up to 42% flake) and goethite. Weathering extends down to at least 60m with individual graphitic horizons varying in thickness up to a maximum of 14m.

Five areas/prospects of graphite mineralisation have been identified within the Lease namely Halberts Main Zone, White’s, McCarthy’s, Harris and Halberts South Zone.

Mining

A simplified small tonnage, open pit mining operation has been envisaged for the Munglinup Graphite Project. 130t to 150t class excavators and 100t rigid frame trucks will comprise the main load and haul fleet with auxiliary bulldozers, graders, rollers, and loaders. At this stage no drill and blast activities are anticipated with exploration drilling showing the mineralisation and host rock to the modelled depth is free dig.

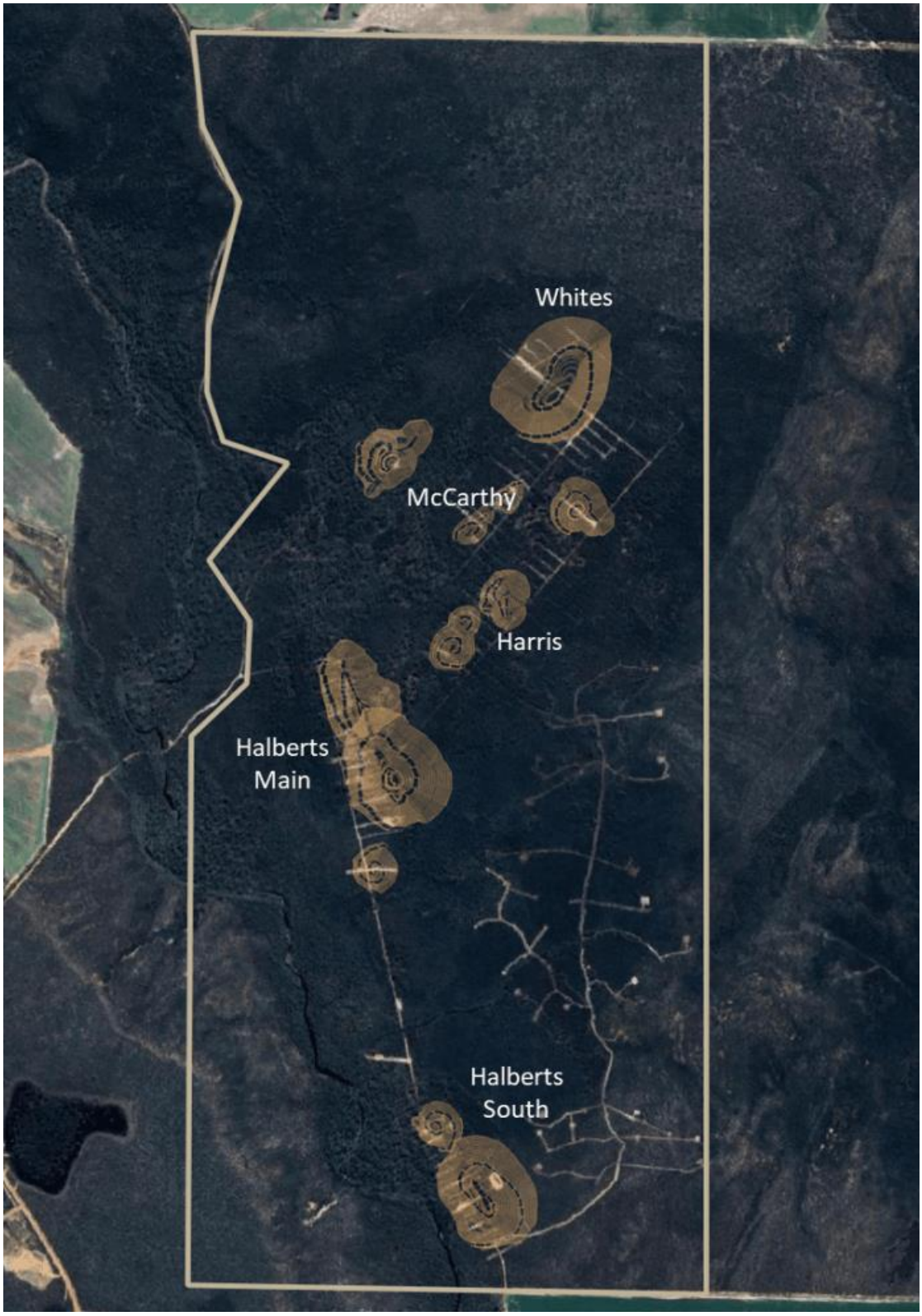


Plate 1 Mining areas for the Munglinup Graphite Project

Processing

Ore from the open pits will be transported to the ROM Pad where it will be stockpiled and processed through the processing plant. The processing plant is designed to treat 400ktpa of ore. Ore will be scrubbed, followed by grinding, with graphite recovered by flotation. The ore processing will include inter-stage repolishing re-grind milling of flotation cleaners' concentrates to improve liberation and hence product purity, whilst protecting the size of the graphite flakes. The flotation concentrate is then dewatered, dried and bagged.

The processing plant will have a dedicated tails thickener and concentrate thickener. The overflow from both thickeners will gravitate to the process water pond for re-use within the process plant. Water demand is estimated to average 22~48m^3/h.

www.invertebratesolutions.com