



Miralga Creek Project:  
Short-Range Endemic Invertebrate Fauna  
Impact Assessment

Biologic Environmental Survey  
DRAFT Report to Atlas Iron Ltd  
February 2020



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## EXECUTIVE SUMMARY

The proposed Miralga Creek Project is located approximately 100 kilometres (km) south-east of Port Hedland in the Pilbara Region of Western Australia. Atlas Iron Limited (Atlas Iron) is seeking to construct and operate an iron ore mine and associated supporting infrastructure at this site. In support of this Proposal and associated environmental approvals, Biologic Environmental Survey Pty Ltd (Biologic) was commissioned by Atlas Iron to undertake a terrestrial short-range endemic invertebrate fauna Environmental Impact Assessment (EIA). Database searches were performed to identify conservation significant SRE fauna species that occur within the Study Area and Development Envelope and fauna habitat types of the Study Area were mapped. Additionally, a detailed summary of the recent survey work completed by Biologic (2019) within the proposed Miralga Creek Project Study Area is also presented. The results from this report formed the basis for an assessment of the potential impacts on SRE species identified from the proposed development under the relevant legislation.

### Impact Assessment

Combined results from a desktop survey and targeted field survey indicate that a total of six Confirmed and/ or Potential SRE invertebrates have been recorded in the Development Envelope, predominantly within the Gorge/ Gully and Hillcrest/ Hillslope habitats. Two Confirmed and four Potential SRE species have been recorded in the Development Envelope; however, only three taxa are considered of conservation significance with respect to this Project. These are *Karaops* sp. indet., *Antichiropus apricus* and *Antichiropus forcipatus*. Pseudoscorpions Olpiidae sp. indet, *Xenolpium* sp. indet. and isopod *Buddelundia* 'sp. 11' are not considered of conservation significance due to the extent of records beyond the Development Envelope and Study Area, and the small proportion of suitable habitat that will be affected by the Project.

Some habitat loss and degradation are expected to occur in all the habitat types present in the Study Area, including those considered of higher suitability for SRE taxa (i.e. Gorge/ Gully and Hillcrest/ Hillslope), however the proportion of loss compared to the amount of habitat that will remain is minimal. All habitat types present in the Study Area extend into the surrounding area, so the regional magnitude of habitat loss is low to negligible.

Potential SRE taxa, *Karaops* sp. indet., is regarded as being at moderate risk of impact from the current Proposal as these records are only known from within the Development Envelope (in Gorge/ Gully and Hillcrest/ Hillslope habitat) and further molecular work would be required to determine whether these records are the same species as records beyond the Study Area. However, it is still regarded as highly likely that whichever species these records represent will occur throughout the local, connected extent of Gorge/ Gully and Hillcrest/ Hillslope habitat which continues beyond the Study Area.

The millipede species' *Antichiropus apricus* and *Antichiropus forcipatus*, both Confirmed SREs, were found within the Development Envelope in the major drainage habitat but are at low risk of impact by the current Proposal as both species have been recorded outside the Study Area.

All three taxa of conservation significance have a potential range that extends far beyond the Study Area.

## 1. INTRODUCTION

### 1.1 Background

Atlas Iron Pty Ltd (Atlas) commissioned Biologic Environmental Survey (Biologic) to undertake a short-range endemic (SRE) invertebrate fauna impact assessment for the development of the proposed Miralga Creek Project (the Project). The Project is located approximately 100 kilometres (km) south-east of Port Hedland in the Pilbara bioregion of Western Australia. The Project area covers approximately 7,880 hectares (ha), hereafter referred to as the Study Area (Figure 1.1). This Assessment is based on data obtained and analysed during an SRE invertebrate fauna baseline survey recently conducted over the area (Biologic, 2019). Atlas required the Assessment to facilitate future environmental approvals for the Project.

### 1.2 Project Description

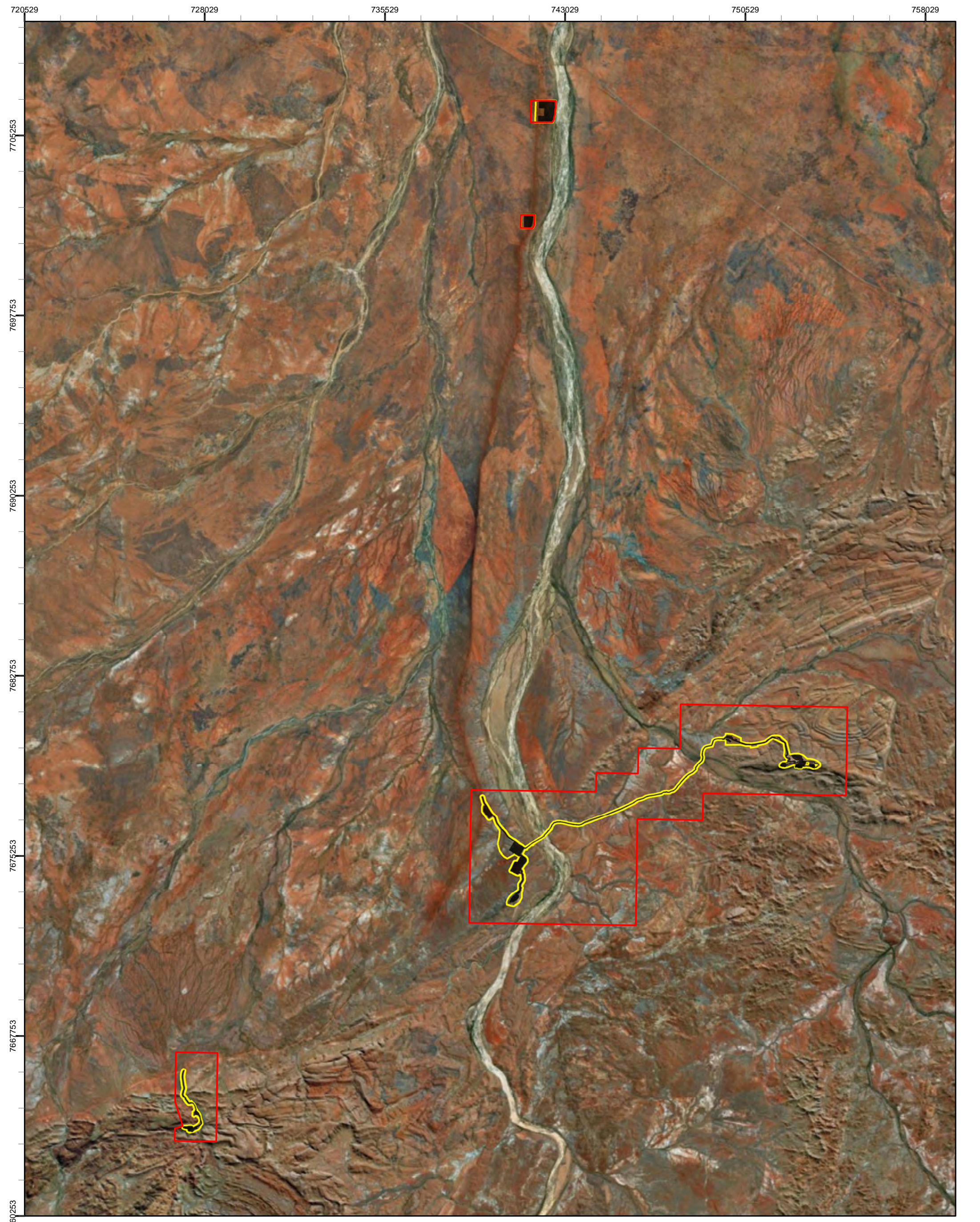
The Project will involve the construction and operation of an iron ore mine and associated supporting infrastructure. Specifically, the Project will comprise three orebodies: Miralga Creek, Miralga West, and Sandtrax. The proposed impact area for the Project includes five open-cut, above groundwater pits, three at Miralga Creek and one each at Miralga West and Sandtrax, covering a total area of 28 ha. The Project will also include a stockyard, screening and crushing plant, explosives magazine and other infrastructure. Once crushed, ore will be hauled from the Project via haulage trucks along the existing Abydos East Link road, which was originally developed and used to service the now closed Abydos DSO project, to Marble Bar Road and on to Utah Point west of Port Hedland.

The area to be assessed as part of this Environmental Impact Assessment (EIA) is comprised of a 621.3 ha Development Envelope that is contained completely within the Study Area (Figure 1.1). The Indicative Disturbance Footprint, which covers approximately 285 ha, is contained entirely within the Development Envelope, and is the area in which all infrastructure will be developed and contained (Table 1.1).




**Table 1.1: Breakdown of the Indicative Disturbance Footprint**


Infrastructure Component	Area (ha)	Proportion of Study Area (%)
Haul Road	74.32	0.94
Laydown	10.22	0.13
Magazine	0.92	0.01
Pit	27.83	0.36
Ramp	25.08	0.32
Rockfall Area	2.37	0.03
ROM	29.43	0.37
Stockpile (Mineralised Waste)	0.63	0.01
Stockyard	73.45	0.94
Waste Dump	40.69	0.52
<b>TOTAL</b>	<b>284.94</b>	<b>3.62</b>






**Legend**

-  Study Area
-  Development Envelope
-  Indicative Disturbance Footprint




biologic  
Environmental Survey

N



1:140,000

0 1.5 3 6 km



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**Miralga Creek Vertebrate Fauna**  
**Impact Assessment**  
**Fig. 1.1: Study Area**

Coordinate System: GDA 1994 MGA Zone 50  
Projection: Transverse Mercator  
Datum: GDA 1994  
Size A3. Created 21/01/2020



### 1.3 Scope and Objectives

The objective of this EIA was to identify and assess the potential impact of the Project on SRE invertebrate habitat, and SRE invertebrate fauna within the Study Area. This will be achieved by:

- Identification of Confirmed and Potential SRE species and relevant habitats. This assessment will be specific to the species of conservation significance identified as potentially occurring within the Study Area and/ or those that have previously been recorded within the Study Area;
- Assessing the importance of habitat types within the Study Area for conservation significant species;
- Identification of potential impacts (both direct and indirect) for the SRE species;
- Assessment of the significance of these potential impacts on SRE species and habitats identified; and
- Identification of areas within and outside the Study Area where strategies can be implemented to manage and/or mitigate the potential impacts of the development activities on SRE species and habitats.

This EIA was carried out in a manner consistent with the following documents developed by the Western Australian Environmental Protection Authority (EPA):

- EPA (2016a) Environmental Factor Guideline: Terrestrial Fauna;
- EPA (2016b) Technical Guidance: Sampling of Short-Range Endemic Invertebrate Fauna;
- EPA (2016d) Technical Guidance: Terrestrial Fauna Surveys; and
- EPA (2018) Statement of Environmental Principles, Factors and Objectives.

#### 1.3.1 Short-range endemic (SRE) fauna

Endemism refers to the restriction of a species to a particular area, whether it is at the continental, national or local scale, the latter being commonly referred to as short-range endemism (Allen *et al.*, 2006; Harvey, 2002). Short-range endemism is influenced by several factors including life history, physiology, habitat requirements, dispersal capabilities, biotic and abiotic interactions and historical conditions which not only influence the distribution of a species, but also the tendency for differentiation and speciation (Ponder & Colgan, 2002).

In recent years a number of taxonomic groups of invertebrates have been highlighted as comprising a high proportion of species likely to be regarded as SREs (i.e. Harvey, 2002; terrestrial snails, Johnson *et al.*, 2004; Mygalomorph spiders, Main *et al.*, 2000; freshwater snails, Ponder & Colgan, 2002). This identification of restricted taxonomic groups has led to SRE invertebrate fauna being recognised as a potentially significant biodiversity issue, and that

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SRE fauna “may be at a greater risk of changes in conservation status as a result of habitat loss or other threatening processes” (EPA, 2016c).

Harvey (2002) proposed a range criterion for terrestrial SRE species at less than 10,000 km<sup>2</sup> (or 100 km x 100 km), which has been adopted by regulatory authorities in Western Australia (EPA, 2016c). SRE invertebrate species often share similar biological, behavioural, and life history characteristics that influence their restricted distributions and limit their wider dispersal (Harvey, 2002). For example, burrowing taxa such as mygalomorph spiders and *Urodacus* scorpions may only leave their burrows (or a narrow home territory around the burrow) as juveniles dispersing from the maternal burrow, or when males search for a mate. In other cases, SRE taxa are dispersal-limited because of their slow pace of movement and cryptic habitats (*i.e.* isopods, millipedes and snails), while some specialised taxa can be limited by very specific habitat requirements, such as selenopid spiders within fractured rocky outcrops.

An increasingly large number of terrestrial invertebrates are known to exhibit short-range endemism in Western Australia. While protection for listed species (species of conservation significance) and/ or Threatened or Priority Ecological Communities is provided under state and federal legislation, the majority of SRE species and communities are not currently listed. This is due largely to incomplete taxonomic or ecological knowledge. As such, the assessment of conservation significance for SRE is guided primarily by expert advice provided by the Western Australian Museum (WAM) and other taxonomic experts.

## 2. ASSESSMENT METHODS

### 2.1 Desktop Assessment

A desktop assessment comprising a review of relevant databases was completed to identify key impact factors, namely habitat types and conservation significant SRE invertebrate fauna, for consideration within this EIA. Five databases were searched for records of SRE invertebrate fauna known or likely to occur within the Study Area as detailed in Table 2.1.

**Table 2.1: Details of database searches conducted**

Database	Search Area	Data Access/Receival Date
DBCA (2019) NatureMap	Circle of radius 40 km centred on the coordinates: -20.9873, 119.3628	11/04/2019
ALA (2019) Atlas of Living Australia Species Occurrence Search	Circle of radius 40 km centred on the coordinates: -20.9873, 119.3628	11/04/2019
WAM (2019a) Arachnid/Myriapod Database	Circle of radius 40 km centered on the coordinates: -20.9873, 119.3628	04/04/2019
WAM (2019c) Mollusc Database	Circle of radius 40 km centered on the coordinates: -20.9873, 119.3628	15/04/2019
WAM (2019b) Crustacean Database	Circle of radius 40 km centered on the coordinates: -20.9873, 119.3628	04/04/2019

### 2.2 Assessment of Conservation Significance

#### 2.2.1 Short-range Endemic Invertebrate Fauna

The SRE status categories used in this report broadly follow the WAM's revised categorisation for SRE invertebrates. This system is based upon the 10,000 km<sup>2</sup> range criterion proposed by Harvey (2002) and uses three broad categories to deal with varying levels of taxonomic certainty that may apply to any given taxon (Table 2.).



**Table 2.2: SRE categorisation used by Harvey (2002) and WAM**

Distribution	Taxonomic Certainty	Taxonomic Uncertainty
<10 000km <sup>2</sup>	<b>Confirmed SRE</b> A known distribution of <10,000km <sup>2</sup> . The taxonomy is well known. The group is well represented in collections and/ or via comprehensive sampling.	<b>Potential SRE</b> Patchy sampling has resulted in incomplete knowledge of geographic distribution. Incomplete taxonomic knowledge. The group is not well represented in collections. Category applies where there are significant knowledge gaps.
>10 000km <sup>2</sup>	<b>Widespread (not an SRE)</b> A known distribution of >10,000km <sup>2</sup> . The taxonomy is well known. The group is well represented in collections and/ or via comprehensive sampling.	SRE Sub-categories may apply: <ul style="list-style-type: none"> <li>• Data Deficient</li> <li>• Habitat Indicators</li> <li>• Morphology Indicators</li> <li>• Molecular Evidence</li> <li>• Research &amp; Expertise</li> </ul>

Under this system, "Potential SRE" status is the default categorisation for species within the typical SRE taxonomic groups including mygalomorph spiders, selenopid spiders, land snails, pseudoscorpions, scorpions, and isopods, unless sufficient evidence exists to confirm Widespread or Confirmed SRE status.

Potential SRE status is sub-categorised by what is currently known about the species in question; *i.e.* whether there are B) habitat indicators, C) morphology indicators, D) molecular evidence, or E) a weight of general knowledge and experience with the group that suggests a reasonable likelihood that the species could be SRE. In terms of SRE likelihood, the more evidence that exists under subcategories 'B', 'C', 'D', and 'E', the greater the likelihood that further investigation would confirm that the species is an SRE.

However, the Potential SRE category 'A' - data deficient is unique; this category indicates that the current information is insufficient to adequately assess the SRE status of the taxa in question. In such cases, where the SRE status cannot be Confirmed, a conservative approach would be unable to assess the species as high potential to be SRE where:

- A. the taxonomy of the genus (or family) requires significant review in order to make any statement on SRE status, and/or
- B. the genus is not known to include any Confirmed SRE species within the region (subject to the extent of prior sampling / taxonomic effort).

To avoid confusion with other Potential SRE species for which there is some certainty and/or some precedent for their SRE status, this report represents the WAM's "Potential SRE -

category 'A' - data deficient" only as "Data Deficient". The results from taxonomists are also presented within the broader context of the results from habitat assessment, habitat connectivity, and other ecological information collected during the survey. This approach aims to provide a more holistic assessment of SRE likelihood at scales relevant to the project, as well as the standard SRE range criterion of <10,000 km<sup>2</sup> (Harvey, 2002)

### 2.2.2 SRE Habitats

SRE invertebrate fauna habitat assessments were conducted during the current surveys in accordance with the relevant guidelines (BHP, 2017; EPA, 2016b). Habitat assessments are conducted to determine the suitability of each site to support SRE invertebrates, and hence the likelihood that the site may contain SRE fauna. These assessments are based on three major factors influencing the suitability of habitats for SRE species including the: degree of isolation, level of protection, and habitat complexity (Figure 2.).

**Isolation:** based on the level of connectivity between sites, which share similar habitat characteristics. Isolation is the most important factor when it comes to the level of risk, as any fauna with limited dispersal characteristics, regardless of the habitat preference, will likely be, at least, an isolated population. Examples include islands and mountaintops; in the Pilbara, peaks like Mt. Meharry have been shown to harbour significant SRE species (Durrant, 2011).

**Protection:** this primarily relates to protection from solar exposure; however, protection from disturbance is also very important for the long-term viability of SRE habitats and communities, *i.e.* protection from fire, flood and invasive species.

Protection is provided at two levels; the site level where the structural composition of the site (aspect, slope *etc.*) can provide protection from exposure and disturbance by providing physical barriers (*e.g.* gorges and gullies); and the habitat level where certain microhabitat characteristics, associated with habitat complexity, provide more direct protection, particularly from exposure (*i.e.* leaf litter, rocky substrates, canopy cover and soil depth).

**Habitat complexity:** this factor drives species richness and often abundance at a site, *i.e.* the more complex a site is, the more species and individuals it is likely to contain. This is particularly important, as several SRE groups are predators; therefore, the richness and abundance of prey species are critical to their survival.

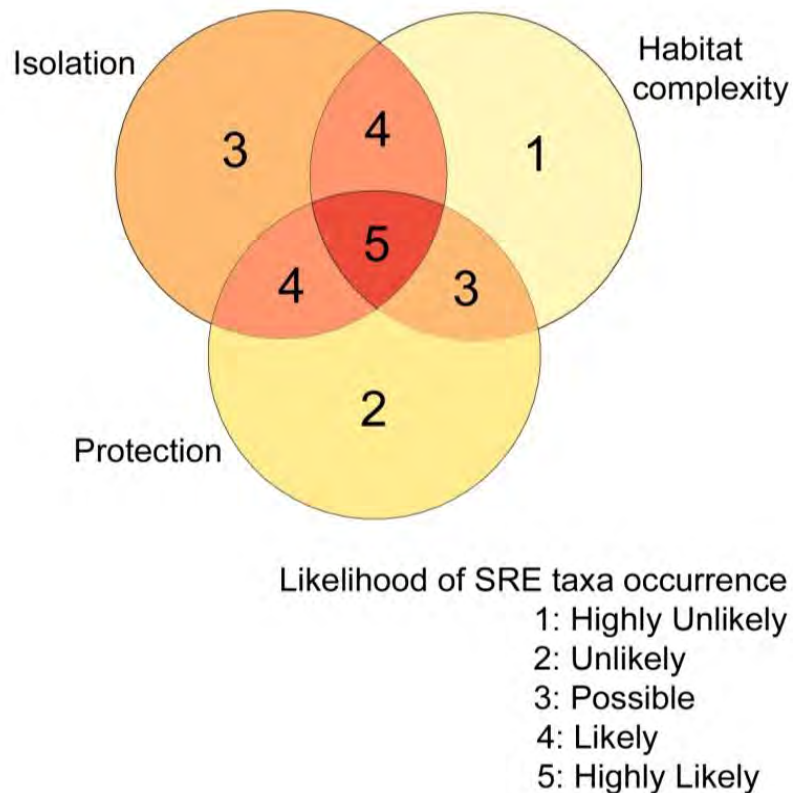
Complexity, with respect to SREs, is based around microhabitat type:

- Leaf litter: both depth and structural variation;
- Rocky substrates: loose rocks and crevices;
- Vegetation variation: flora richness and structural variation; and
- Soil: depth and structural variation.

Likewise, the complexity of the habitat is important to detritivore SRE taxa (such as isopods, millipedes and some snails) which rely upon decaying leaf litter, woody debris and organic

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matter for survival. Examples in the Pilbara include deep gullies and gorges, where many of these areas contain most of the above microhabitat types, and therefore tend to be the richest areas. Isolation is the most important factor when it comes to the level of risk, as any fauna with limited dispersal characteristics, regardless of the habitat preference, will likely be, at least, an isolated population. Examples include islands and mountaintops; in the Pilbara, peaks like Mt Meharry have been shown to harbour significant SRE species (Durrant, 2011).

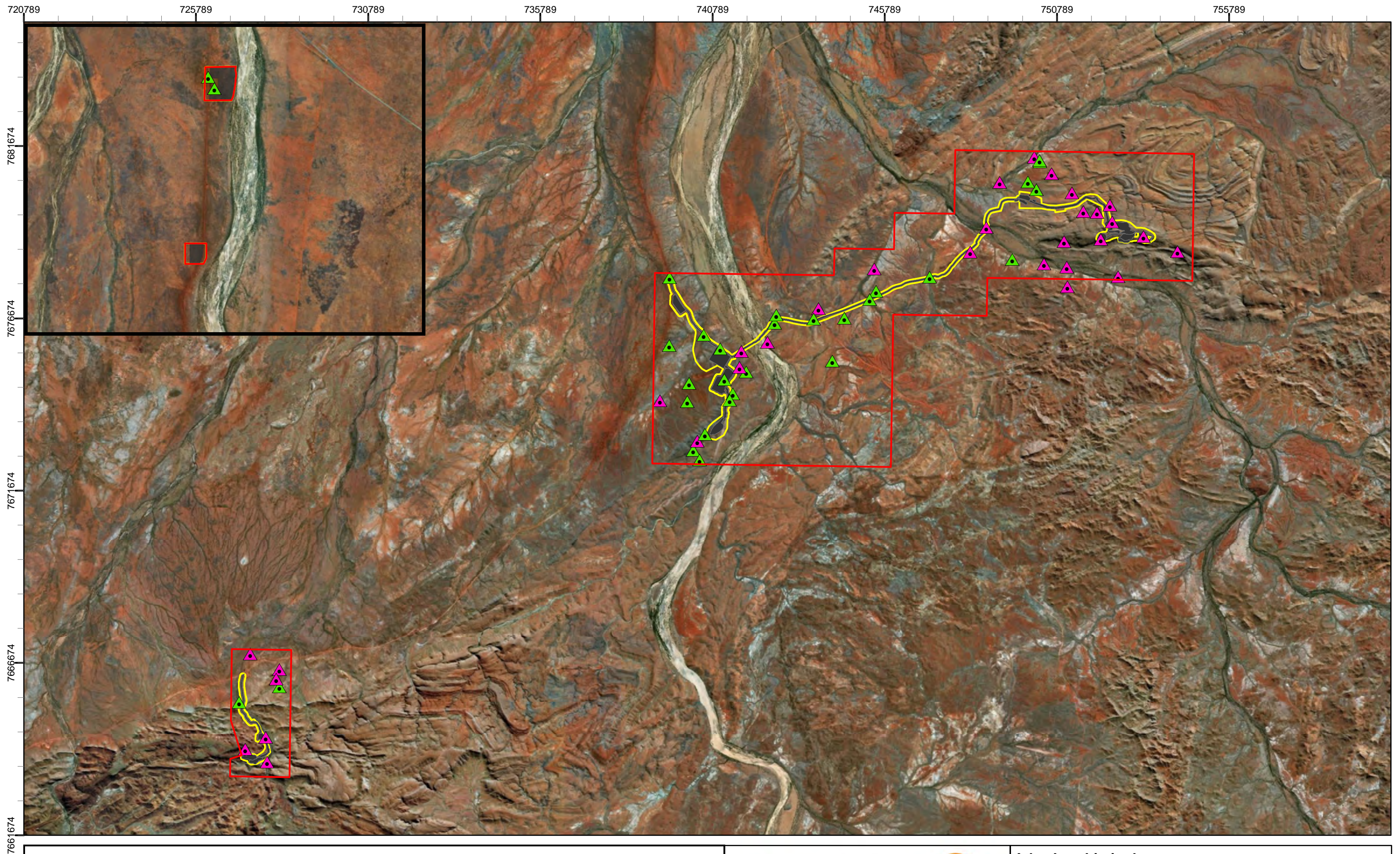


**Figure 2.1: Factors influencing the suitability of habitats for SRE invertebrate fauna**

### 2.3 Survey

Biologic (2019) conducted a baseline SRE invertebrate survey of the Study Area in May and July of 2019. Sixty-one sites were visited and SRE habitat assessment was conducted at each site (Appendix A). Of these, 32 sites were sampled for SRE invertebrates (Figure 2.1). Invertebrate specimens were collected from 29 of the 32 of the sites sampled (Appendix B).



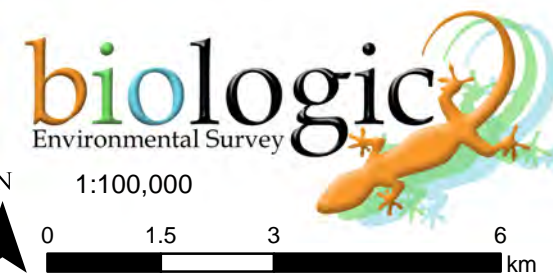


# Legend

- Study Area
- Indicative Disturbance Footprint
- Development Envelope

## Sites

- ▲ Habitat Assessment and Sample Site
- ▲ Habitat Assessment Only



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Miralga Creek SRE Invertebrate Fauna  
Impact Assessment  
**Fig. 2.1: Sampling and habitat assessment sites from  
the Miralga Creek SRE Invertebrate Survey**

Coordinate System: GDA 1994 MGA Zone 50  
Projection: Transverse Mercator  
Datum: GDA 1994  
Size A3. Created 16/09/2019



### 3. RESULTS

#### 3.1 Survey adequacy

There are several general limitations to obtaining a complete picture of SRE invertebrate fauna in the Pilbara. These limitations are largely related to the cryptic habits of the target fauna and their low population densities which make them difficult to detect in the environment. Despite this, it is not considered that the current survey experienced any specific constraints in relation to the number of samples obtained, the assessment of suitable SRE habitat types or the sampling and preservation methods used to detect the target fauna.

The identification of SRE invertebrate species, the interpretation of species' distributions and the resulting categorisation of their respective SRE status is dependent on the current state of taxonomic and ecological knowledge of the target groups at the time of survey. Owing to ongoing developments in regional sampling coverage and taxonomic information, the SRE status, distributions and habitat preferences of the taxa described herein may be subject to change over time. Several SRE invertebrate taxa comprising juvenile and female specimens (e.g. Selenopidae spiders and Olpiidae pseudoscorpions) were unable to be conclusively identified to species as they did not have the diagnostic features for identification. Many target groups require mature individuals or males for species confirmation.

#### 3.2 Major SRE invertebrate habitat types

Based on the SRE habitat assessments made at each site, the Study Area was characterised into six broad habitat types; these were Low Stony Hills, Stony Plain, Sandy Plain, Drainage Line, Gorge/ Gully and Hillcrest/ Hillslope (Table 3.1). All the habitats present are known to extend beyond the Study Area into the immediate surrounding area, and more broadly across the Pilbara region.

The habitat regarded as most suitable for SRE invertebrate fauna within the Study Area is the Gorge/ Gully habitat (high suitability) due to the steep rocky landforms which provide consistent shade and complex microhabitats. The high level of shelter and complexity of these habitats also offers some protection from fire, and areas where water can be retained long after rainfall resulting in dense pockets of vegetation with stable detrital microhabitats. Where these landform and vegetation factors combine, particularly when highly fragmented or isolated, they often provide the most suitable habitats for SRE invertebrate fauna.

Hillcrest/ Hillslope habitats are regarded as being moderate to high suitability for SRE invertebrate fauna, comprising open (exposed) slopes and hill crests that often feature rocky substrate, with exposed bedrock, and skeletal red soils. These habitats are generally dominated by sparse open vegetation (scattered *Eucalyptus* woodlands, *Acacia* and *Grevillea* scrublands and *Triodia* low hummock grasslands) that can provide pockets of protection from exposure, particularly where hill slopes are south facing. Whilst Hillcrest/ Hillslope habitats are not usually

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highly complex, landform or vegetation features can provide more protected microhabitats that are highly suitable for SRE fauna, such as Confirmed SRE millipede species (genus *Antichiropus*) which use pockets of soil at the base of *Corymbia hamersleyana* (usually mallee form) on hillcrests and upper slopes (Biologic, 2016).

Major drainage habitats can be densely vegetated and extensive but tend to be prone to disturbances from flooding. These areas are dominated by dense shrubland and groves/thickets of *Acacia* (Mulga and other *Acacia* species) and *Eucalyptus/ Corymbia* species. Slope and aspect are irrelevant to SRE suitability here; instead, the density and structure of vegetation influences complexity of detrital microhabitats and the amount of shelter available. Isolation is generally low, as the groves and drainage line habitats form an interconnected network of vegetation-based habitats along the course of the drainage line and flood plains. These types of habitats are generally considered to provide dispersal corridors for some SRE fauna, and the suitability of this habitat is considered moderate.

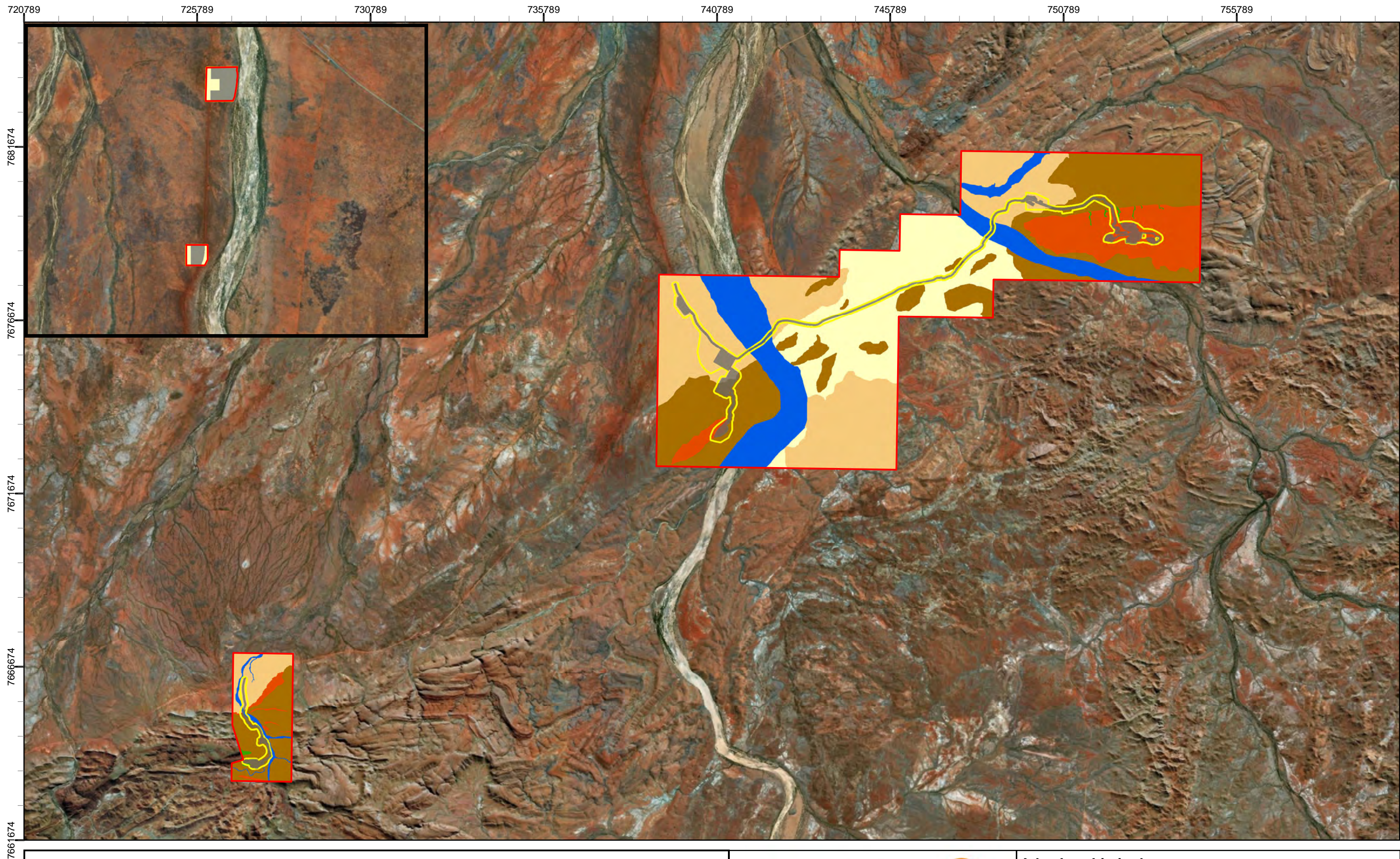
Sandy plains tend to provide little protection and are often widespread and connected. However, they do provide suitable habitat for trapdoor spiders and scorpions and contain patches of detrital microhabitats and deep soils which are suitable substrate for burrowing taxa. Therefore, Sandy plains are regarded as providing low to moderate suitability for SRE fauna.

The remaining broad habitats; Low Stony Hills and Stony Plain, are regarded as providing low suitability for SRE fauna. These habitats comprise low undulating stony hills and open, flat habitats on detrital or alluvial plains. They typically do not feature significant vegetation groves/thickets, drainage features, or rocky outcrops. Moderately dense shrubland on the plains can provide patches of detrital microhabitats throughout; however, the low levels of habitat complexity, shelter, and isolation generally make these areas unsuitable for SRE species. The SRE suitability of these habitat zones is low; however, they can contain patches of suitable microhabitat that connect with adjacent habitats such as Hillcrest/ Hillslope habitats.










**Table 3.1: SRE invertebrate habitat within the Study Area**

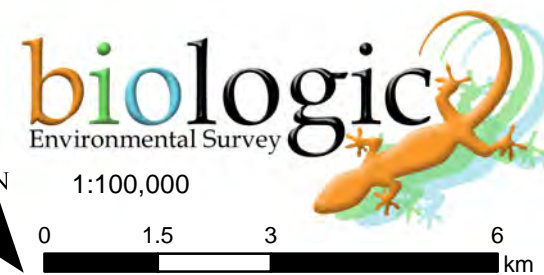
Habitat	Habitat Suitability Rank*	Justification
<b>Gorge/ Gully</b>	High	Narrower, more meandering courses of river gorges provides plenty of sheltered aspects, complex microhabitats within rocks, dense vegetation, and higher persistence of moisture.
<b>Hillcrest/ Hillslope</b>	Moderate - High	These habitats are generally dominated by sparse open vegetation that can provide pockets of protection from exposure, particularly where hill slopes are south facing.
<b>Major Drainage Line</b>	Moderate	Isolation is generally low as the groves and drainage line habitats form an interconnected network of vegetation-based habitats along the course of the drainage line and flood plains. These types of habitats are generally considered to provide dispersal corridors for some SRE fauna.
<b>Sandy Plain</b>	Low - Moderate	Moderately dense shrubland on the plains can provide patches of detrital microhabitats throughout; however, the low levels of habitat complexity, shelter, and isolation generally make these areas unsuitable for SRE species.
<b>Stony Plain</b>	Low	The low levels of habitat complexity, protection and isolation generally make these areas unsuitable for SRE species.
<b>Low Stony Hills</b>	Low	The low levels of habitat complexity, shelter, and isolation generally make these areas unsuitable for SRE species.





### Legend

	Study Area	<b>SRE Habitat</b>		Hillcrest/ Hillslope		Sandy Plain	
	Indicative Disturbance Footprint		Drainage Line		Low Stony Hills		Stony Plain
	Development Envelope		Gorge/Gully				



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**Miralga Creek SRE Invertebrate Fauna**  
**Impact Assessment**  
**Fig. 3.1: SRE invertebrate habitat within the Study Area**

Coordinate System: GDA 1994 MGA Zone 50  
 Projection: Transverse Mercator  
 Datum: GDA 1994

Size A3. Created 16/09/2019



### 3.3 SRE invertebrate records from database searches and recent survey

The database searches identified 668 records belonging to taxonomic groups prone to short-range endemism that were not already known to be Widespread. The total included 26 mygalomorph spiders, 1 selenopid spider, 294 pseudoscorpions, 187 scorpions, 67 myriapods, 9 gastropods and 120 isopods (Appendix C). Four taxa (34 specimens) recorded in the database searches are regarded as Confirmed SRE, with the rest regarded as Potential SRE or Data Deficient. Two of the Confirmed SRE taxa, *Antichiropus apricus* and *Antichiropus forcipatus*, have been recorded from within the Development Envelope, and two Potential SRE taxa, *Haplochneres* sp. indet. and *Synsphyronus* `8/2 wide Pilbara`, were recorded within the Study Area (Table 3.2)

A total of 184 invertebrate specimens were collected from the Study Area during the current survey (Table 3.2), comprising one mygalomorph spider, seven selenopid spiders, 48 pseudoscorpions, eight scorpions, 90 snails and 29 isopods. From these specimens, 27 taxa were identified, of which eighteen are currently regarded as Potential SREs (Table 3.2) and the remaining nine as Widespread. Of the eighteen Potential SRE taxa, all are regarded as 'data deficient' due to taxonomic constraints but all taxa satisfy other requirements to be regarded as Potential SRE. No Confirmed SRE taxa were recorded during the survey.

From the combined database searches and survey collections, two Confirmed SRE (*Antichiropus apricus* and *Antichiropus forcipatus*), and four Potential SRE invertebrate taxa (*Karaops* sp. indet., *Olpidae* sp. indet., *Xenolpium* sp. indet., *Buddelundia* `sp. 11`) were recorded in the Development Envelope. These were collected in either Gorge/ Gully or Hillcrest/ Hillslope habitats (Table 3.2, Figure 3.2). All taxa collected in the Study Area, however, are considered likely to occur within the Development Envelope, due to proximity of sampling sites and connectedness of habitat.

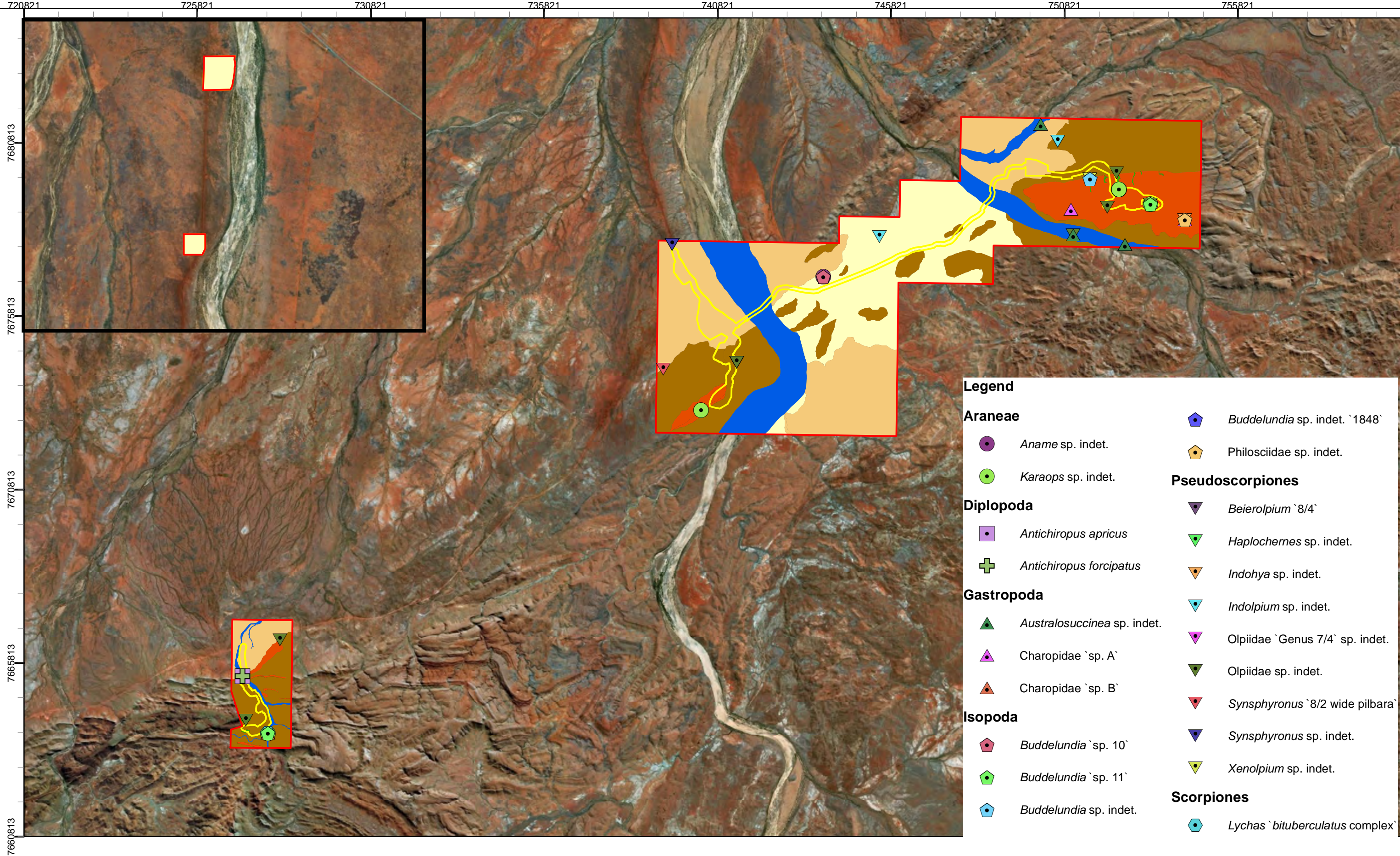
**Table 3.2: SRE invertebrates recorded from within the Study Area**

Higher ID	Lowest ID	Records in Study Area	Recorded in Development Envelope	Habitat	SRE status	Reference
<b>Araneae</b>						
Nemesiidae	<i>Aname</i> sp. indet.	1	No	Sandy Plain	Potential SRE	Biologic, 2019
Selenopidae	<i>Karaops</i> sp. indet.	7	Yes	Gorge/ Gully, Hillcrest/ Hillslope	Potential SRE	Biologic, 2019
<b>Pseudoscorpiones</b>						
Chernetidae	<i>Haplochernes</i> sp. indet.	2	No	Stony Plain	Potential SRE	WAM, 2019a
Garypidae	<i>Synsphyronus</i> `8/2 wide Pilbara`	2	No	Low Stony Hills	Potential SRE	WAM, 2019a
	<i>Synsphyronus</i> sp. indet.	1	No	Stony Plain	Potential SRE	Biologic, 2019
Hyidae	<i>Indohya</i> sp. indet.	1	No	Hillcrest/ Hillslope	Potential SRE	Biologic, 2019
Olpiidae	<i>Beierolpium</i> `8/4`	1	No	Hillcrest/ Hillslope	Potential SRE	Biologic, 2019
	<i>Indolpium</i> sp. indet.	4	No	Gorge/ Gully, Hillcrest/ Hillslope, Low Stony Hills, Drainage Line	Potential SRE	Biologic, 2019
	Olpiidae `Genus 7/4`	9	No	Hillcrest/ Hillslope	Potential SRE	Biologic, 2019
	Olpiidae sp. indet.	9	Yes	Gorge/ Gully, Hillcrest/ Hillslope, Drainage Line	Potential SRE	Biologic, 2019
	<i>Xenolpium</i> sp. indet.	3	Yes	Gorge/ Gully, Hillcrest/ Hillslope	Potential SRE	Biologic, 2019
<b>Scorpiones</b>						
Buthidae	<i>Lychas</i> `bituberculatus complex`	2	No	Gorge/ Gully	Potential SRE	Biologic, 2019
<b>Diplopoda</b>						
Paradoxosomatidae	<i>Antichiropus apricus</i>	1	Yes	Drainage Line	Confirmed SRE	WAM, 2019a
	<i>Antichiropus forcipatus</i>	1	Yes	Drainage Line	Confirmed SRE	WAM, 2019a
<b>Isopoda</b>						
Armadillidae	<i>Buddelundia</i> `sp. 10`	3	No	Sandy Plain	Potential SRE	Biologic, 2019
	<i>Buddelundia</i> `sp. 11`	2	Yes	Gorge/ Gully, Hillcrest/ Hillslope	Potential SRE	Biologic, 2019



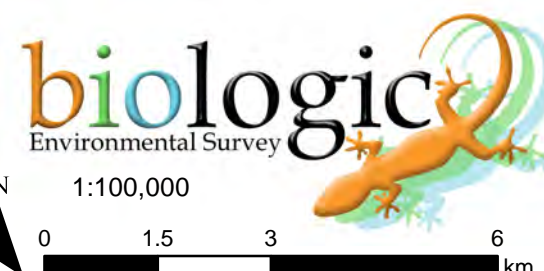
Higher ID	Lowest ID	Records in Study Area	Recorded in Development Envelope	Habitat	SRE status	Reference
	<i>Buddelundia</i> sp. indet.	1	No	Gorge/ Gully	Potential SRE	Biologic, 2019
	<i>Buddelundia</i> sp. indet. `1848`	14	No	Sandy Plain	Potential SRE	Biologic, 2019
Philosciidae	Philosciidae sp. indet.	1	No	Hillcrest/ Hillslope	Potential SRE	Biologic, 2019
<b>Gastropoda</b>						
Charopidae	Charopidae `sp. A`	7	No	Hillcrest/ Hillslope	Potential SRE	Biologic, 2019
	Charopidae `sp. B`	3	No	Gorge/ Gully, Drainage Line	Potential SRE	Biologic, 2019
Succineidae	<i>Australosuccinea</i> sp. indet.	9	No	Drainage Line	Potential SRE	Biologic, 2019





### Legend

<span style="border: 1px solid red; display: inline-block; width: 20px; height: 10px;"></span> Study Area	<span style="background-color: blue; display: inline-block; width: 20px; height: 10px;"></span> Drainage Line	<span style="background-color: brown; display: inline-block; width: 20px; height: 10px;"></span> Low Stony Hills
<span style="border: 1px solid yellow; display: inline-block; width: 20px; height: 10px;"></span> Development Envelope	<span style="background-color: green; display: inline-block; width: 20px; height: 10px;"></span> Gorge/Gully	<span style="background-color: yellow; display: inline-block; width: 20px; height: 10px;"></span> Sandy Plain
	<span style="background-color: orange; display: inline-block; width: 20px; height: 10px;"></span> Hillcrest/ Hillslope	<span style="background-color: tan; display: inline-block; width: 20px; height: 10px;"></span> Stony Plain



**Atlas Iron Limited**  
**Miralga Creek SRE Invertebrate Fauna**  
**Impact Assessment**  
**Fig. 3.2: SRE invertebrate fauna recorded within the Study Area**

Coordinate System: GDA 1994 MGA Zone 50  
Projection: Transverse Mercator  
Datum: GDA 1994

Size A3. Created 16/09/2019



### 3.4 SRE invertebrates recorded from within the Development Envelope

#### 3.4.1 Diplopoda: Paradoxosomatidae

##### *Antichiropus apricus*

There is a single record of this recently described millipede from within the Development Envelope (Car *et al.*, 2019). It was collected from Drainage Line habitat in the Sandtrax region of the Study Area (Figure 3.2); however, based on our understanding of *Antichiropus* habitat use and preference in the Pilbara, it is more likely that this individual was dispersing through the drainage lines. It is likely that the species' preferred habitat is the surrounding more highly suitable habitats, such as Gorge/ Gully and Hillcrest/ Hillslope habitats where more stable, protected leaf litter microhabitats are available. All *Antichiropus* millipedes described from the Pilbara so far have highly restricted ranges, and all are considered Confirmed SRE. While no other records were found in the database search, *A. apricus* has been recorded from Marble Bar, 55 km to the east of this record (Car *et al.*, 2019).

##### *Antichiropus forcipatus*

Similar to the above, there is a single record of this millipede, also recently described (Car *et al.*, 2019), from the same location in the Sandtrax area (Figure 3.2). This millipede was not found elsewhere in the Study Area; however, there are 21 records of *A. forcipatus* from the WAM database search at several locations up to 14km south-west of the Study Area, predominantly from the nearby Abydos minesite.

#### 3.4.2 Araneomorphae: Selenopidae

##### *Karaops* sp. indet.

Selenopid spiders are generally considered to have a reasonable likelihood of being SRE, due to their habitat specialisation within the cracks and crevices of rocky outcrops. Selenopid spiders, *Karaops* sp. indet., were collected from two sites (SMRC-020 & SMRC-105) within the Development Envelope, a Gorge/ Gully site and a Hillcrest/ Hillslope site at Miralga Creek. The five specimens collected were juveniles or females and could not be identified to species level. They are classified as Potential SRE, WAM categories 'A' (Data Deficient) and 'E' (Research and Expertise).

*Karaops* sp. indet. were also collected from within the Study Area, but outside the Development Envelope, at a Hillcrest/ Hillslope site (SMRC-036) at Miralga West, and at a Gorge/ Gully site (SMRC-001) at Sandtrax. There is another record of a *Karaops* sp. indet. from the WAM database at Abydos.

Molecular analysis would be required to resolve the species identity of the *Karaops* specimens from within the Development Envelope and potentially align them to those from elsewhere in the Study Area and species described in the greater Pilbara region.

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### 3.4.3 Pseudoscorpiones: Olpiidae

#### Olpiidae sp. indet.

There are two records of this taxon from within the Development Envelope in Hillcrest/ Hillslope habitat in Miralga Creek. These and seven other records of Olpiidae sp. indet. from within the Study Area are likely to represent multiple species of either *Indolpium* or *Euryolpium*, both of which contain Potential SRE taxa.

This taxon is regarded as a Potential SRE (WAM Category 'A' Data Deficient and 'E' Research and Expertise) but molecular analysis would be required to define these specimens further.

#### *Xenolpium* sp. indet.

A single specimen of this taxon was recorded from within the Development Envelope, in Gorge/ Gully habitat (SMRC-021) at Miralga Creek. Two more specimens were collected in Hillcrest/ Hillslope habitat (SMRC-105) within the Study Area. The genus *Xenolpium* is found throughout the Pilbara and is poorly known taxonomically; however, it is regarded as likely to contain SRE species. Molecular work would be required to determine if these specimens align with other Olpiidae records from the local area.

This taxon is regarded as a Potential SRE (WAM Category 'A' Data Deficient and 'E' Research and Expertise) but molecular analysis would be required to define these specimens further.

### 3.4.4 Isopoda: Armadillidae

#### *Buddelundia* `sp. 11`

A single female specimen of this taxon was recorded from Hillcrest/ Hillslope habitat within the Development Envelope at Miralga Creek, and from another site in Gorge/ Gully habitat in the Study Area at Sandtrax. *Buddelundia* `sp. 11` is regarded as a species complex containing species with restricted distributions (S. Judd, pers. comm.). While this taxon is considered a Potential SRE, 36 records of this species complex were found in the WAM database search, from several sites to the south-west of the Study Area.

This taxon is regarded as a Potential SRE (WAM Categories 'A' Data Deficient, 'B' Habitat Indicators and 'E' Research and Expertise).



## 4. ASSESSMENT OF POTENTIAL IMPACTS

This Proposal will result in a variety of different impact sources (Table 4.1). Potential impacts on SRE invertebrate fauna and habitats from the proposed development may include the following:

1. Direct impacts comprising the loss of SRE individuals or populations, the removal of SRE habitat, or complete degradation of SRE habitat values arising from:
  - Mining and earthworks;
  - Construction of infrastructure, OSAs/ stockpiles/ dumps; and
  - Vegetation clearing.
2. Indirect impacts *i.e.* more subtle or gradual degradation of SRE habitat values via changes to the physical condition of habitats and microhabitats associated with vegetation, landforms, and drainage features. Indirect impacts may include:
  - Habitat fragmentation (creation of barriers to species movement, increased edge effects);
  - Alteration to surface drainage patterns or groundwater hydrology (via effects on drainage and vegetation-based habitats);
  - Spread of introduced flora or fauna species that may degrade the quality of terrestrial habitats;
  - Alteration of fire regimes (effects on vegetation-based habitats);
  - Spills and contamination (localised effects); and
  - Vibration, noise and dust (localised effects near active mining areas).

The impacts, as discussed below, consider the cumulative impacts from disturbance within the local area.

### 4.1 Direct

Direct impacts reduce the diversity and abundance of species in an area through direct mortality or displacement of individuals or populations (EPA, 2016a). The impact source most commonly causing direct impacts to fauna is the removal, fragmentation or modification of habitat (EPA, 2016a). Unlike terrestrial vertebrate fauna, the removal of habitat during mining and its associated processes (clearing, dumping, construction of infrastructure) usually results in the direct mortality of SRE species due to their small size, and limited speed and means of dispersal.

The direct impacts are focused on the direct reduction of populations where the Proposal is likely to disturb known records of SRE taxa and the reduction of the extent of suitable habitat. All SRE taxa known or considered likely to occur within the Study Area, will have a population reduction and reduction of extent of habitat.

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#### 4.1.1 Habitat loss

The removal of habitat, including native vegetation, topsoil and landforms associated with ground disturbance and vegetation-clearing activities is considered the most significant impact of this Proposal. The Indicative Disturbance Footprint for the Project is estimated to be approximately 285 ha. The main areas of direct land disturbance are associated with the construction of a Waste Rock Disposal (WRD) (40.69 ha), and a Mining Pit (27.83 ha).

Some habitat loss and degradation will be expected to occur throughout most of the habitats present, including those considered of high to moderate significance, namely Gorge/ Gully, Hillcrest/ Hillslope and Major Drainage (9.97%, 12.03% and 0.7% of the total area of habitat type in the Study Area impacted, respectively) (Table 4.1). The Hillcrest/ Hillslope habitat has the largest proportion (12.03%) within the Study Area which will be impacted by the development, followed by the Sandy Plain habitat (10.49%). However, there is habitat connectivity outside of the Development Envelope in the Study Area and beyond. In addition, none of the habitat types are restricted to the Study Area. For most Potential SRE taxa present, the habitats within the Study Area represent only a portion of their wider extent throughout the local area.

**Table 4.1: The types and values of fauna habitats within the Study Area, and the estimated quantity of each that will be potentially impacted by the Project**

Habitat Type	Habitat Value Score	Total in Study Area		Total in Development Envelope		% of Study Area habitat in the Development Envelope
		ha	%	ha	%	%
Gorge/ Gully	High	11.64	0.15	1.16	0.19	9.97
Hillcrest/ Hillslope	Moderate - High	791.47	10.04	95.24	15.33	12.03
Drainage Line	Moderate	1,000.13	12.69	19.76	3.18	1.98
Sand Plain	Low - Moderate	1640.13	20.81	171.98	27.68	10.49
Stony Plain	Low	2,223.98	28.22	202.93	32.66	9.12
Low Stony Hills	Low	2,213.78	28.09	130.24	20.96	5.88
<b>Total</b>		<b>7881.13</b>		<b>621.32</b>		

#### 4.2 Indirect

Habitat fragmentation is expected to impact on all SRE invertebrate taxa, although this is dependent on the extent of each species' distribution. Similarly, the impact on dispersal corridors, such as Major Drainage Lines, will vary depending on a species' requirements.

Other indirect impacts most likely to have an effect, albeit varied depending on the species, are alteration to surface drainage patterns and alteration to fire regimes. The former is related to the impact of increased surface water movement, either in volume or persistence, and how this

may impact on the availability or nature of dispersal corridors used by SRE invertebrate fauna. However, this is probably more relevant to species found within the low-lying areas, such as Sand Plains, Drainage Areas/ Floodplain, Mulga Woodland and Major Drainage Line. The alteration of fire regimes is more likely to affect species within vegetated habitats, or where leaf litter is an important microhabitat for the species. Any increase in frequency or intensity of fires is likely to have an impact on species with these habitat requirements.

### 4.3 Assessment of scale of impact

The terms “significant impact” and “significant effect” are not defined in the EP Act 1986. Therefore, the prediction of significance for each potential impact identified in the Study Area is assessed using criteria considered by the EPA in their referral process (EPA, 2018). These criteria are considered for each impact on each conservation significant species. In summary, the magnitude for every potential impact source to every species is assessed as one of the following:

1. Negligible- displacement or loss of condition in individual animals;
2. Low- loss of individuals but no measurable change in population size;
3. Moderate- demonstrable change in population; or
4. High- population persistence threatened.

### 4.4 Species of Conservation Concern

Two Confirmed and four Potential SRE species have been recorded in the Development Envelope; however, only three taxa are considered of conservation significance with respect to this Project. These were the Confirmed SRE millipedes *Antichiropus apricus* and *Antichiropus forcipatus* and Potential SRE *Karaops* sp. indet. Pseudoscorpions Olpiidae sp. indet, *Xenolpium* sp. indet. and isopod *Buddelundia* ‘sp. 11’ are not considered of conservation significance due to the extent of records beyond the Development Envelope and Study Area, and the small proportion of suitable habitat that will be affected by the Project. All other Potential SRE taxa recorded from the Study Area which are likely to occur within the Development Envelope are not considered of conservation significance for the same reasons.

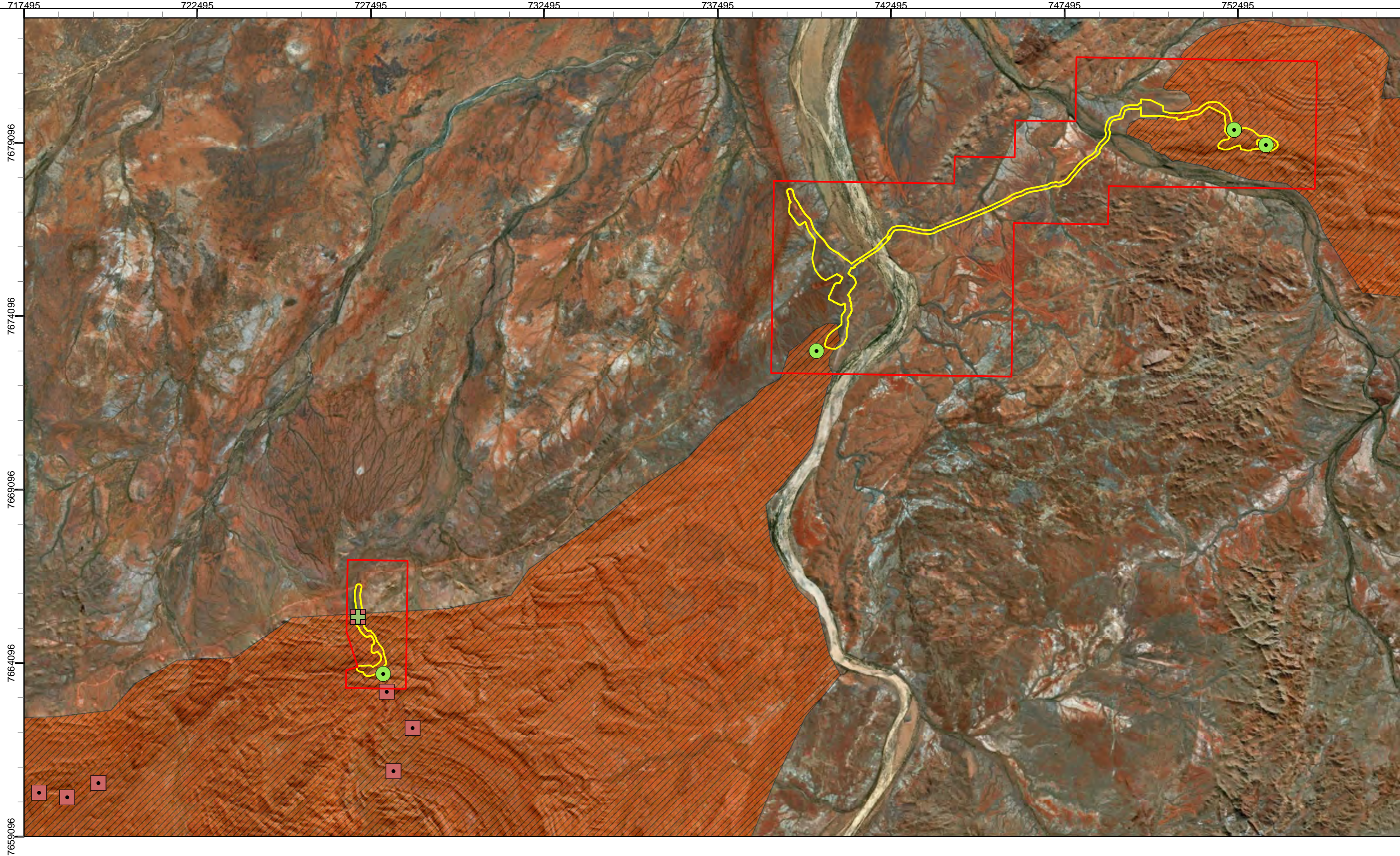
Confirmed SREs *Antichiropus apricus* and *Antichiropus forcipatus* have been recorded from within the Development Envelope in Major Drainage habitat; however, both species can be regarded as likely to prefer the more stable, protected leaf litter microhabitats within the Hillcrest/ Hillslope habitats. Neither species are considered to be adversely impacted by the current Proposal as they have been recorded outside the Study Area and the impact on their preferred habitat is considered of low magnitude due to the small extent of the area affected compared to the current likely distribution of both species (Figure 4.1). The risks of indirect impacts from changes to surface hydrology, exotic pests, weeds, increased fire incidents, and spills/ contamination would be expected to be low and would be managed by current and proposed environmental management procedures.

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Potential SRE *Karaops* sp. indet. was recorded from the Gorge/ Gully habitat in the Development Envelope. It is highly likely that this taxon occurs outside of the Development Envelope as this taxon is highly likely to occur throughout the connected extent of the Gorge/ Gully and Hillcrest/ Hillslope habitats within, and extending beyond, the Study Area (Figure 4.1). Additionally, *Karaops* will likely be able to occur in some areas of rocky terrain within areas of Low Stony Hills.

In the absence of molecular studies to demonstrate the species presence beyond the Study Area we have taken a conservative approach and consider that *Karaops* sp. indet. may be limited to the Study Area. If this is the case, the removal of habitat from clearing and mining activities would be considered to have a Moderate impact. If it's presence beyond the Study Area was confirmed in the future, this assessment may reduce the impact to Low impact, as was the case for both *Antichiropus* species. Indirect impacts from changes to surface hydrology, exotic pests, weeds, increased fire incidents, and spills/ contamination would be expected to be low and would be managed by current and proposed environmental management procedures.







# Legend

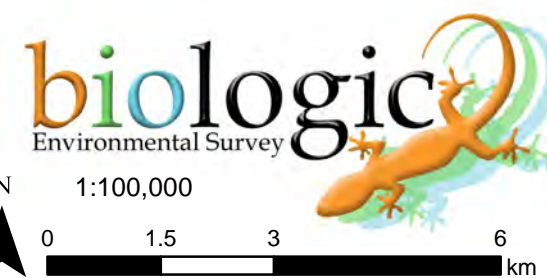
-  Potential Range
-  Study Area
-  Development Envelope

## Araneae

-  *Karaops sp. indet.*

## Diplopoda

-  *Antichiropus apricus*
-  *Antichiropus forcipatus*



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**Fig. 4.1: Extrapolated potential range for species of conservation significance**

Coordinate System: GDA 1994 MGA Zone 50  
 Projection: Transverse Mercator  
 Datum: GDA 1994

Size A3. Created 16/09/2019



## 5. CONCLUSION

This EIA provides a summary and analysis of the results of database searches and recent survey work for SRE invertebrate fauna in the Study Area. The SRE Invertebrate Fauna Survey conducted by Biologic (2019) is deemed adequate to assess potential impacts of the current Proposal on the SRE fauna of the Study Area.

The removal of habitat, including native vegetation, topsoil and landforms associated with ground disturbance and vegetation-clearing activities is considered the most significant impact of this Proposal. Hillcrest/ Hillslope is the habitat within the Study Area with the highest proportion that will be affected by the Development Envelope (12.03%), however, the extent of clearing associated with the current Proposal is considered minimal in relation to the extent of available SRE habitat outside the Development Envelope and the Study Area.

*Karaops* sp. indet., is regarded as being at moderate risk of impact from the current Proposal as these records are only known from within the Development Envelope (in Gorge/ Gully and Hillcrest/ Hillslope habitat) and further molecular work would be required to determine whether these records are the same species as records beyond the Study Area. However, it is still regarded as highly likely that whichever species these records represent will occur throughout the local, connected extent of Gorge/ Gully and Hillcrest/ Hillslope habitat which continues beyond the Study Area.

The millipede species *Antichiropus apricus* and *Antichiropus forcipatus*, both Confirmed SREs, were found within the Development Envelope and are likely to occur throughout the local extent of connected Gorge/ Gully and Hillcrest/ Hillslope habitat where other records are known. As such, they are considered to be at low risk of impact by the current Proposal.

All three taxa of conservation significance have a potential range of connected habitat that extends well beyond the Development Envelope and the Study Area.

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Appendix A: SRE sampling sites

Site ID	Latitude	Longitude	Date	Habitat type	Drainage	Slope	Aspect	Rocky outcrop amount	Rock size	Vegetation litter	Shade	Soil type	Soil availability	Burrow type	Last fire
SMRC-01	-21.1128	119.1936	12/05/2019	Major Drainage Line	Creek	Very Steep	Flat	Extensive Outcropping	Pebbles (5-10cm)	Few Large Patches	Medium 40-60%	Silty Loam	Few Large Patches	Scorpion	Old (6+ yr)
SMRC-02	-20.9852	119.4152	12/05/2019	Low Stony Hills	Negligible	Moderate	Flat	Limited Outcropping	Boulders (>61cm)	Few Small Patches	Negligible <5%	Silty Loam	Scarce	None	Old (6+ yr)
SMRC-03	-21.0845	119.1885	12/05/2019	Major Drainage Line	Creek	Flat	Flat	Negligible	Small Rocks (11-20cm)	Scarce	Low 5-20%	Clay Loam	Few Large Patches	None	Moderate (3 to 5 yr)
SMRC-04	-20.9824	119.4293	12/05/2019	Major Drainage Line	River	Flat	North/ East	Negligible	Pebbles (5-10cm)	Few Large Patches	Low to Med 20-40%	Sand	Evenly Spread	None	Old (6+ yr)
SMRC-05	-21.0972	119.1856	12/05/2019	Major Drainage Line	Creek	Flat	Flat	Limited Outcropping	Pebbles (5-10cm)	Scarce	Low 5-20%	Clay Loam	Many Small Patches	None	Old (6+ yr)
SMRC-06	-20.9727	119.4243	13/05/2019	Hillcrest/ Hillslope	Gully	Low	South/ West	Major Outcropping	Large Rocks (21-60cm)	Many Small Patches	Low to Med 20-40%	Silty Loam	Many Small Patches	None	Old (6+ yr)
SMRC-07	-21.0033	119.3245	12/05/2019	Stony Plain	Negligible	Low	South/ West	Negligible	Gravel (1-4cm)	Few Small Patches	Negligible <5%	Clay Loam	Few Small Patches	None	Moderate (3 to 5 yr)
SMRC-08	-20.9599	119.4061	13/05/2019	Stony Plain	Negligible	Flat	Flat	Negligible	Gravel (1-4cm)	Few Small Patches	Negligible <5%	Sandy Loam	Many Large Patches	None	Moderate (3 to 5 yr)
SMRC-09	-21.1063	119.1931	9/05/2019	Low Stony Hills	Negligible	Low	Flat	Negligible	Small Rocks (11-20cm)	Many Large Patches	Low to Med 20-40%	Clay Loam	Few Small Patches	None	Old (6+ yr)
SMRC-10	-20.9514	119.4055	13/05/2019	Major Drainage Line	River	Flat	Flat	Negligible	Pebbles (5-10cm)	Scarce	Low to Med 20-40%	Sandy Clay Loam	Few Large Patches	None	Old (6+ yr)
SMRC-11	-21.0885	119.1967	13/05/2019	Hillcrest/ Hillslope	Negligible	Steep	North/ East	Major Outcropping	Boulders (>61cm)	None Discernible	Negligible <5%	Clay Loam	None Discernible	None	Recent (0 to 2 yr)
SMRC-12	-21.0295	119.3114	14/05/2019	Hillcrest/ Hillslope	Negligible	Steep	East	Major Outcropping	Boulders (>61cm)	Scarce	Negligible <5%	Loamy Sand	Scarce	None	Recent (0 to 2 yr)
SMRC-13	-21.1095	119.1875	13/05/2019	Gorge/ Gully	Gully	Steep	South	Extensive Outcropping	Boulders (>61cm)	Few Small Patches	High 80-100%	Clay Loam	Scarce	None	Old (6+ yr)
SMRC-14	-21.0320	119.3132	14/05/2019	Low Stony Hills	Negligible	Moderate	East	Major Outcropping	Small Rocks (11-20cm)	None Discernible	Negligible <5%	Loamy Sand	None Discernible	None	Recent (0 to 2 yr)
SMRC-15	-20.9992	119.3139	13/05/2019	Stony Plain	Sheet Flow	Flat	Flat	Negligible	Small Rocks (11-20cm)	Few Small Patches	Low 5-20%	Clayey Sand	Evenly Spread	None	Old (6+ yr)
SMRC-16	-21.0167	119.3019	15/05/2019	Low Stony Hills	Creek	Flat	Flat	Negligible	Negligible	Few Small Patches	Low 5-20%	Loamy Sand	Many Large Patches	None	Recent (0 to 2 yr)
SMRC-17	-20.9606	119.4161	11/05/2019	Low Stony Hills	Negligible	Low	North	Limited Outcropping	Large Rocks (21-60cm)	Scarce	Negligible <5%	Clay Loam	Scarce	None	Old (6+ yr)
SMRC-18	-21.0119	119.3100	15/05/2019	Low Stony Hills	Negligible	Flat	Flat	Negligible	Gravel (1-4cm)	Few Small Patches	Negligible <5%	Clay Loam	Few Large Patches	None	Recent (0 to 2 yr)
SMRC-19	-20.9920	119.3458	10/05/2019	Sandy Plain	Negligible	Flat	Flat	Negligible	Negligible	Many Small Patches	Low 5-20%	Clayey Sand	Evenly Spread	None	Old (6+ yr)
SMRC-20	-20.9680	119.4274	16/05/2019	Low Stony Hills	Gully	Moderate	South	Extensive Outcropping	Boulders (>61cm)	Scarce	Med to High 60-80%	Clay Loam	None Discernible	None	Old (6+ yr)
SMRC-21	-20.9700	119.3924	14/05/2019	Major Drainage Line	River	Flat	North	Negligible	Small Rocks (11-20cm)	Many Small Patches	Med to High 60-80%	Sand	Evenly Spread	None	Old (6+ yr)
SMRC-22	-20.9655	119.4193	16/05/2019	Low Stony Hills	Gully	Steep	South	Extensive Outcropping	Large Rocks (21-60cm)	Scarce	Medium 40-60%	Clay Loam	Scarce	None	Old (6+ yr)
SMRC-23	-20.9801	119.4149	14/05/2019	Major Drainage Line	River	Low	North	Negligible	Small Rocks (11-20cm)	Many Small Patches	Low 5-20%	Loamy Sand	Evenly Spread	None	Old (6+ yr)
SMRC-24	-21.0010	119.3317	16/05/2019	Major Drainage Line	River	Flat	Flat	Negligible	Pebbles (5-10cm)	Scarce	Low 5-20%	Sand	Evenly Spread	None	Old (6+ yr)
SMRC-25	-20.9782	119.3997	14/05/2019	Low Stony Hills	Negligible	Low	North	Limited Outcropping	Pebbles (5-10cm)	None Discernible	Negligible <5%	Clay Loam	None Discernible	None	Moderate (3 to 5 yr)
SMRC-26	-20.9872	119.3618	17/05/2019	Sandy Plain	Sheet Flow	Low	South	Moderate Outcropping	Boulders (>61cm)	Few Small Patches	Negligible <5%	Clay Loam	None Discernible	None	Recent (0 to 2 yr)
SMRC-27	-20.7261	119.3226	14/05/2019	Sandy Plain	Sheet Flow	Flat	Flat	Negligible	Negligible	None Discernible	Negligible <5%	Sandy Clay Loam	Evenly Spread	None	Recent (0 to 2 yr)
SMRC-28	-21.0056	119.3499	17/05/2019	Sandy Plain	Sheet Flow	Flat	South/ West	Negligible	Negligible	Many Small Patches	Negligible <5%	Sand	Evenly Spread	None	Old (6+ yr)
SMRC-29	-20.7288	119.3243	14/05/2019	Sandy Plain	Negligible	Flat	Flat	Negligible	Gravel (1-4cm)	None Discernible	Negligible <5%	Sandy Clay Loam	Evenly Spread	None	Old (6+ yr)
SMRC-30	-20.9794	119.4086	18/05/2019	Major Drainage Line	Sheet Flow	Low	Flat	Negligible	Pebbles (5-10cm)	Many Small Patches	Negligible <5%	Sandy Clay Loam	Many Small Patches	None	Moderate (3 to 5 yr)
SMRC-31	-20.9526	119.4070	15/05/2019	Low Stony Hills	Sheet Flow	Flat	Flat	Negligible	Pebbles (5-10cm)	Many Small Patches	Negligible <5%	Clayey Sand	Many Large Patches	None	Old (6+ yr)
SMRC-32	-21.0146	119.3223	18/05/2019	Stony Plain	Negligible	Very Steep	West	Major Outcropping	Gravel (1-4cm)	Few Small Patches	Low to Med 20-40%	Clayey Sand	Scarce	None	Recent (0 to 2 yr)
SMRC-33	-20.9579	119.4037	15/05/2019	Sandy Plain	Creek	Low	South	Negligible	Small Rocks (11-20cm)	Scarce	Negligible <5%	Sandy Loam	Few Large Patches	None	Moderate (3 to 5 yr)
SMRC-34	-20.9757	119.4458	19/05/2019	Hillcrest/ Hillslope	Seep	Cliff	North	Extensive Outcropping	Large Rocks (21-60cm)	Scarce	High 80-100%	Clay Loam	None Discernible	None	Old (6+ yr)
SMRC-35	-20.9766	119.3879	15/05/2019	Sandy Plain	Negligible	Moderate	North	Moderate Outcropping	Large Rocks (21-60cm)	Few Small Patches	Negligible <5%	Clay Loam	Scarce	None	Moderate (3 to 5 yr)
SMRC-36	-21.0271	119.3125	18/05/2019	Stony Plain	Negligible	Steep	South/East	Major Outcropping	Pebbles (5-10cm)	Scarce	High 80-100%	Clay Loam	Scarce	None	Recent (0 to 2 yr)
SMRC-37	-20.9833	119.3767	15/05/2019	Sandy Plain	Sheet Flow	Flat	Flat	Negligible	Pebbles (5-10cm)	Few Small Patches	Low 5-20%	Sandy Loam	Many Small Patches	None	Moderate (3 to 5 yr)
SMRC-39	-20.9943	119.3530	15/05/2019	Sandy Plain	Negligible	Flat	Flat	Negligible	Pebbles (5-10cm)	None Discernible	Negligible <5%	Clay Loam	Evenly Spread	None	Recent (0 to 2 yr)
SMRC-41	-20.9894	119.3601	15/05/2019	Sandy Plain	Sheet Flow	Flat	Flat	Negligible	Negligible	Scarce	Negligible <5%	Sandy Loam	Evenly Spread	None	Recent (0 to 2 yr)
SMRC-43	-20.9946	119.3445	15/05/2019	Stony Plain	Sheet Flow	Flat	Flat	Negligible	Gravel (1-4cm)	None Discernible	Negligible <5%	Sandy Clay Loam	Evenly Spread	None	Recent (0 to 2 yr)
SMRC-45	-20.9959	119.3336	15/05/2019	Stony Plain	Negligible	Moderate	West	Limited Outcropping	Gravel (1-4cm)	Few Small Patches	Negligible <5%	Clay Loam	Scarce	None	Moderate (3 to 5 yr)
SMRC-47	-20.9938	119.3341	15/05/2019	Low Stony Hills	Negligible	Low	Flat	Negligible	Gravel (1-4cm)	None Discernible	Negligible <5%	Clay Loam	Few Small Patches	None	Moderate (3 to 5 yr)
SMRC-49	-21.0089	119.3259	16/05/2019	Low Stony Hills	Sheet Flow	Moderate	South	Extensive Outcropping	Small Rocks (11-20cm)	None Discernible	Negligible <5%	Clay Loam	None Discernible	None	Recent (0 to 2 yr)

Site ID	Latitude	Longitude	Date	Habitat type	Drainage	Slope	Aspect	Rocky outcrop amount	Rock size	Vegetation litter	Shade	Soil type	Soil availability	Burrow type	Last fire
SMRC-51	-21.0077	119.3240	16/05/2019	Low Stony Hills	Sheet Flow	Low	North	Major Outcropping	Small Rocks (11-20cm)	None Discernible	Negligible <5%	Clay Loam	Scarce	None	Recent (0 to 2 yr)
SMRC-53	-21.0109	119.3199	16/05/2019	Hillcrest/ Hillslope	Negligible	Low	West	Negligible	Pebbles (5-10cm)	None Discernible	Negligible <5%	Clay Loam	Scarce	None	Recent (0 to 2 yr)
SMRC-55	-21.0254	119.3146	16/05/2019	Low Stony Hills	Negligible	Very Steep	South	Extensive Outcropping	Small Rocks (11-20cm)	None Discernible	Negligible <5%	Clay Loam	None Discernible	None	Recent (0 to 2 yr)
SMRC-57	-21.0163	119.3214	16/05/2019	Stony Plain	Negligible	Steep	North/ East	Major Outcropping	Small Rocks (11-20cm)	None Discernible	Negligible <5%	Clay Loam	None Discernible	None	Recent (0 to 2 yr)
SMRC-59	-21.0029	119.3186	16/05/2019	Stony Plain	Sheet Flow	Flat	Flat	Negligible	Gravel (1-4cm)	Scarce	Low 5-20%	Sandy Clay Loam	Many Small Patches	None	Moderate (3 to 5 yr)
SMRC-61	-20.9843	119.3041	16/05/2019	Stony Plain	Sheet Flow	Flat	Flat	Negligible	Gravel (1-4cm)	Few Small Patches	Low to Med 20-40%	Clay Loam	Many Small Patches	None	Old (6+ yr)
SMRC-63	-21.0021	119.3043	16/05/2019	Low Stony Hills	Sheet Flow	Flat	Flat	Negligible	Gravel (1-4cm)	Scarce	Low 5-20%	Clay Loam	Few Large Patches	None	Recent (0 to 2 yr)
SMRC-65	-21.0931	119.1968	16/05/2019	Hillcrest/ Hillslope	Negligible	Low	West	Limited Outcropping	Pebbles (5-10cm)	None Discernible	Negligible <5%	Clay Loam	Scarce	None	Moderate (3 to 5 yr)
SMRC-67	-21.0911	119.1958	16/05/2019	Low Stony Hills	Negligible	Moderate	South/East	Major Outcropping	Small Rocks (11-20cm)	Scarce	Low to Med 20-40%	Clay Loam	Scarce	None	Moderate (3 to 5 yr)
SMRC-69	-21.0169	119.3096	17/05/2019	Low Stony Hills	Negligible	Low	North/ West	Negligible	Pebbles (5-10cm)	None Discernible	Negligible <5%	Clay Loam	Scarce	None	Moderate (3 to 5 yr)
SMRC-100	-20.9638	119.4267	17/07/2019	Sandy Plain	Gully	Moderate	North	Major Outcropping	Small Rocks (11-20cm)	Few Large Patches	Low 5-20%	Clay Loam	Few Large Patches	None	Moderate (3 to 5 yr)
SMRC-101	-20.9813	119.3613	17/07/2019	Hillcrest/ Hillslope	Creek	Low	North	Negligible	Gravel (1-4cm)	Few Small Patches	Low 5-20%	Clay Loam	Evenly Spread	None	Old (6+ yr)
SMRC-102	-20.9734	119.4142	18/07/2019	Low Stony Hills	Negligible	Cliff	South	Extensive Outcropping	Boulders (>61cm)	Few Small Patches	Med to High 60-80%	Sandy Clay Loam	Few Small Patches	None	Old (6+ yr)
SMRC-103	-20.9657	119.4232	19/07/2019	Major Drainage Line	Gully	Low	North	Extensive Outcropping	Boulders (>61cm)	Many Small Patches	Low 5-20%	Clay Loam	Few Small Patches	None	Old (6+ yr)
SMRC-104	-20.9582	119.3959	19/07/2019	Hillcrest/ Hillslope	Creek	Low	North	Moderate Outcropping	Small Rocks (11-20cm)	Few Small Patches	Low 5-20%	Sand	Evenly Spread	None	Old (6+ yr)
SMRC-105	-20.9718	119.4362	20/07/2019	Low Stony Hills	Negligible	Moderate	South	Major Outcropping	Boulders (>61cm)	Few Small Patches	Low to Med 20-40%	Sandy Clay Loam	Few Small Patches	None	Old (6+ yr)
SMRC-106	-20.9558	119.4103	20/07/2019	Stony Plain	Creek	Moderate	South/ West	Extensive Outcropping	Boulders (>61cm)	Scarce	Negligible <5%	Clay Loam	Scarce	None	Moderate (3 to 5 yr)
SMRC-107	-20.9524	119.4069	20/07/2019	Major Drainage Line	Negligible	Low	North	Limited Outcropping	Pebbles (5-10cm)	Many Small Patches	Low 5-20%	Loamy Sand	Many Large Patches	None	Old (6+ yr)

## Appendix B: SRE invertebrate fauna collected from the Study Area during the survey (Biologic, 2019)

Site	Date	Latitude	Longitude	Habitat type	Sampling method	Class	Order	Family	Genus	Species	No. specimens	SRE Status
SMRC-019	17/05/2019	-20.9920	119.3458	Sandy Plain	Pitfall Trap	Arachnida	Araneae	Nemesiidae	<i>Aname</i>	sp. indet.	1	Potential SRE
SMRC-105	20/07/2019	-20.9718	119.4362	Hillcrest/ Hillslope	Hand collected	Arachnida	Araneae	Selenopidae	<i>Karaops</i>	sp. indet.	1	Potential SRE
SMRC-036	18/05/2019	-21.0271	119.3125	Hillcrest/ Hillslope	Hand collected	Arachnida	Araneae	Selenopidae	<i>Karaops</i>	sp. indet.	1F	Potential SRE
SMRC-020	16/05/2019	-20.9680	119.4274	Gorge/ Gully	Hand collected	Arachnida	Araneae	Selenopidae	<i>Karaops</i>	sp. indet.	1	Potential SRE
SMRC-020	16/05/2019	-20.9680	119.4274	Gorge/ Gully	Hand collected	Arachnida	Araneae	Selenopidae	<i>Karaops</i>	sp. indet.	1	Potential SRE
SMRC-020	16/05/2019	-20.9680	119.4274	Gorge/ Gully	Hand collected	Arachnida	Araneae	Selenopidae	<i>Karaops</i>	sp. indet.	1	Potential SRE
SMRC-001	12/05/2019	-21.1128	119.1936	Gorge/ Gully	Hand collected	Arachnida	Araneae	Selenopidae	<i>Karaops</i>	sp. indet.	1	Potential SRE
SMRC-020	16/05/2019	-20.9680	119.4274	Gorge/ Gully	Hand collected	Arachnida	Araneae	Selenopidae	<i>Karaops</i>	sp. indet.	1	Potential SRE
SMRC-101	17/07/2019	-20.9813	119.3613	Hillcrest/ Hillslope	Hand collected	Arachnida	Pseudoscorpiones	Garypidae	<i>Synsphyronus</i>	'8/1 Pilbara'	1M, 3J	Widespread
SMRC-103	19/07/2019	-20.9657	119.4232	Major Drainage Line	Hand collected	Arachnida	Pseudoscorpiones	Garypidae	<i>Synsphyronus</i>	'8/2 Pilbara'	1M, 1F	Widespread
SMRC-100	17/07/2019	-20.9638	119.4267	Gorge/ Gully	Hand collected	Arachnida	Pseudoscorpiones	Garypidae	<i>Synsphyronus</i>	'8/2 Pilbara'	2M, 2F	Widespread
SMRC-019	16/05/2019	-20.9655	119.4193	Gorge/ Gully	Hand collected	Arachnida	Pseudoscorpiones	Garypidae	<i>Synsphyronus</i>	'8/2 Pilbara'	9F	Widespread
SMRC-016	15/05/2019	-21.0167	119.3019	Minor Drainage Line	Hand collected	Arachnida	Pseudoscorpiones	Garypidae	<i>Synsphyronus</i>	'8/2 wide Pilbara'	1M, 1F	Potential SRE
SMRC-034	19/05/2019	-20.9757	119.4458	Hillcrest/ Hillslope	Leaf Sieving	Arachnida	Pseudoscorpiones	Hyidae	<i>Indohya</i>	sp. indet.	1M	Potential SRE
SMRC-032	18/05/2019	-21.0146	119.3223	Hillcrest/ Hillslope	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae	<i>Beierolpium</i>	'8/4'	1F	Potential SRE
SMRC-032	18/05/2019	-21.0146	119.3223	Hillcrest/ Hillslope	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae	'Genus 7/4'	sp. indet.	6M, 1F, 2J	Potential SRE
SMRC-106	20/07/2019	-20.9558	119.4103	Boulders/ Rockpiles	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae	<i>Indolpium</i>	sp. indet.	1F	Potential SRE
SMRC-101	17/07/2019	-20.9813	119.3613	Medium Drainage Line	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae	<i>Indolpium</i>	sp. indet.	1F	Potential SRE
SMRC-106	20/07/2019	-20.9558	119.4103	Boulders/ Rockpiles	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae	<i>Indolpium</i>	sp. indet.	1J	Potential SRE
SMRC-020	16/05/2019	-20.9655	119.4193	Gorge/ Gully	Hand collected	Arachnida	Pseudoscorpiones	Olpiidae	<i>Indolpium</i>	sp. indet.	1J	Potential SRE
SMRC-023	14/05/2019	-20.9801	119.4149	Major Drainage Line	Hand collected	Arachnida	Pseudoscorpiones	Olpiidae		sp. indet.	1	Potential SRE
SMRC-011	13/05/2019	-21.0885	119.1967	Ironstone Outcrops	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae		sp. indet.	1J	Potential SRE
SMRC-105	20/07/2019	-20.9718	119.4362	Hillcrest/ Hillslope	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae		sp. indet.	3J	Potential SRE
SMRC-100	17/07/2019	-20.9638	119.4267	Gorge/ Gully	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae		sp. indet.	1J	Potential SRE
SMRC-006	13/05/2019	-20.9727	119.4243	Hillcrest/ Hillslope	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae		sp. indet.	1J	Potential SRE
SMRC-013	13/05/2019	-21.1095	119.1875	Gorge/ Gully	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae		sp. indet.	1M	Potential SRE
SMRC-032	18/05/2019	-21.0146	119.3223	Hillcrest/ Hillslope	Hand collected	Arachnida	Pseudoscorpiones	Olpiidae		sp. indet.	1J	Potential SRE
SMRC-021	16/05/2019	-20.9655	119.4193	Gorge/ Gully	Hand collected	Arachnida	Pseudoscorpiones	Olpiidae	<i>Xenolpium</i>	sp. indet.	1M, 1F	Potential SRE
SMRC-105	20/07/2019	-20.9718	119.4362	Hillcrest/ Hillslope	Hand collected	Arachnida	Pseudoscorpiones	Olpiidae	<i>Xenolpium</i>	sp. indet.	1M	Potential SRE
SMRC-001	19/05/2019	-21.1128	119.1936	Gorge/ Gully	Pitfall Trap	Arachnida	Scorpiones	Buthidae	<i>Lychas</i>	'bituberculatus complex'	1F	Potential SRE
SMRC-001	12/05/2019	-21.1128	119.1936	Gorge/ Gully	Leaf Sieving	Arachnida	Scorpiones	Buthidae	<i>Lychas</i>	'bituberculatus complex'	1J	Potential SRE
SMRC-017	14/05/2019	-20.9606	119.4161	Hillcrest/ Hillslope	Pitfall Trap	Arachnida	Scorpiones	Buthidae	<i>Lychas</i>	'harveyi complex'	1M	Widespread
SMRC-001	19/05/2019	-21.1128	119.1936	Gorge/ Gully	Pitfall Trap	Arachnida	Scorpiones	Urodacidae	<i>Urodacus</i>	'pearcei'	1J	Widespread
SMRC-001	15/05/2019	-21.1128	119.1936	Gorge/ Gully	Pitfall Trap	Arachnida	Scorpiones	Urodacidae	<i>Urodacus</i>	'pearcei'	1M	Widespread
SMRC-009	15/05/2019	-21.1063	119.1931	Stony Plain	Pitfall Trap	Arachnida	Scorpiones	Urodacidae	<i>Urodacus</i>	'pearcei'	1M	Widespread
SMRC-001	19/05/2019	-21.1128	119.1936	Gorge/ Gully	Pitfall Trap	Arachnida	Scorpiones	Urodacidae	<i>Urodacus</i>	'pearcei'	1M	Widespread
SMRC-001	13/05/2019	-21.1128	119.1936	Gorge/ Gully	Pitfall Trap	Arachnida	Scorpiones	Urodacidae	<i>Urodacus</i>	'pearcei'	1J	Widespread
SMRC-004	12/05/2019	-20.9824	119.4293	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Camaenidae	<i>Rhagada</i>	cf. <i>richardsonii</i>	4	Widespread
SMRC-030	18/05/2019	-20.9794	119.4086	Drainage Area/ Floodplain	Hand collected	Gastropoda	Eupulmonata	Camaenidae	<i>Rhagada</i>	cf. <i>richardsonii</i>	1	Widespread
SMRC-035	15/05/2019	-20.9766	119.3879	Boulders/ Rockpiles	Hand collected	Gastropoda	Eupulmonata	Camaenidae	<i>Rhagada</i>	cf. <i>richardsonii</i>	1	Widespread
SMRC-023	14/05/2019	-20.9801	119.4149	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Camaenidae	<i>Rhagada</i>	cf. <i>richardsonii</i>	4	Widespread
SMRC-021	15/05/2019	-20.9700	119.3924	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Camaenidae	<i>Rhagada</i>	cf. <i>richardsonii</i>	1	Widespread



Site	Date	Latitude	Longitude	Habitat type	Sampling method	Class	Order	Family	Genus	Species	No. specimens	SRE Status
SMRC-021	19/05/2019	-20.9700	119.3924	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Camaenidae	<i>Rhagada</i>	cf. <i>richardsonii</i>	2	Widespread
SMRC-002	12/05/2019	-20.9852	119.4152	Ironstone Outcrops	Hand collected	Gastropoda	Eupulmonata	Camaenidae	<i>Rhagada</i>	cf. <i>richardsonii</i>	15	Widespread
SMRC-034	19/05/2019	-20.9757	119.4458	Breakaway/ Cliff	Hand collected	Gastropoda	Eupulmonata	Charopidae		`sp. A`	1	Potential SRE
SMRC-102	18/07/2019	-20.9734	119.4142	Breakaway/ Cliff	Hand collected	Gastropoda	Eupulmonata	Charopidae		`sp. A`	1	Potential SRE
SMRC-001	12/05/2019	-21.1128	119.1936	Gorge/ Gully	Leaf Sieving	Gastropoda	Eupulmonata	Charopidae		`sp. A`	5	Potential SRE
SMRC-004	12/05/2019	-20.9824	119.4293	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Charopidae		`sp. B`	1	Potential SRE
SMRC-001	12/05/2019	-21.1128	119.1936	Gorge/ Gully	Leaf Sieving	Gastropoda	Eupulmonata	Charopidae		`sp. B`	2	Potential SRE
SMRC-010	13/05/2019	-20.9514	119.4055	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Lymnaeidae	<i>Austropeplea</i>	sp. indet.	3	Widespread
SMRC-021	14/05/2019	-20.9700	119.3924	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Lymnaeidae	<i>Austropeplea</i>	sp. indet.	3	Widespread
SMRC-004	12/05/2019	-20.9824	119.4293	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Lymnaeidae	<i>Austropeplea</i>	sp. indet.	1	Widespread
SMRC-004	12/05/2019	-20.9824	119.4293	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Lymnaeidae	<i>Austropeplea</i>	sp. indet.	11	Widespread
SMRC-023	14/05/2019	-20.9801	119.4149	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Lymnaeidae	<i>Austropeplea</i>	sp. indet.	4	Widespread
SMRC-001	12/05/2019	-21.1128	119.1936	Gorge/ Gully	Leaf Sieving	Gastropoda	Eupulmonata	Pupillidae	<i>Gastrocopta</i>	sp. indet.	1	Widespread
SMRC-001	12/05/2019	-21.1128	119.1936	Gorge/ Gully	Leaf Sieving	Gastropoda	Eupulmonata	Pupillidae	<i>Pupoides</i>	sp. indet.	20	Widespread
SMRC-004	12/05/2019	-20.9824	119.4293	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Succineidae	<i>Australosuccinea</i>	sp. indet.	2	Potential SRE
SMRC-010	13/05/2019	-20.9514	119.4055	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Succineidae	<i>Australosuccinea</i>	sp. indet.	3	Potential SRE
SMRC-023	14/05/2019	-20.9801	119.4149	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Succineidae	<i>Australosuccinea</i>	sp. indet.	4	Potential SRE
SMRC-019	15/05/2019	-20.9920	119.3458	Sand Plain	Pitfall Trap	Malacostraca	Isopoda	Armadillidae	<i>Buddelundia</i>	`sp. 10`	1M	Potential SRE
SMRC-019	17/05/2019	-20.9920	119.3458	Sand Plain	Pitfall Trap	Malacostraca	Isopoda	Armadillidae	<i>Buddelundia</i>	`sp. 10`	2F	Potential SRE
SMRC-105	20/07/2019	-20.9718	119.4362	Hillcrest/ Hillslope	Hand collected	Malacostraca	Isopoda	Armadillidae	<i>Buddelundia</i>	`sp. 11`	1F	Potential SRE
SMRC-001	12/05/2019	-21.1128	119.1936	Gorge/ Gully	Leaf Sieving	Malacostraca	Isopoda	Armadillidae	<i>Buddelundia</i>	`sp. 11`	1F	Potential SRE
SMRC-022	16/05/2019	-20.9655	119.4193	Gorge/ Gully	Hand collected	Malacostraca	Isopoda	Armadillidae	<i>Buddelundia</i>	sp. indet.	1J	Potential SRE
SMRC-019	15/05/2019	-20.9920	119.3458	Sand Plain	Pitfall Trap	Malacostraca	Isopoda	Armadillidae	<i>Buddelundia</i>	sp. indet. `1848`	2M, 2F	Potential SRE
SMRC-019	14/05/2019	-20.9920	119.3458	Sand Plain	Pitfall Trap	Malacostraca	Isopoda	Armadillidae	<i>Buddelundia</i>	sp. indet. `1848`	4M, 3F	Potential SRE
SMRC-019	17/05/2019	-20.9920	119.3458	Sand Plain	Pitfall Trap	Malacostraca	Isopoda	Armadillidae	<i>Buddelundia</i>	sp. indet. `1848`	1M, 2F	Potential SRE
SMRC-104	19/07/2019	-20.9582	119.3959	Medium Drainage Line	Hand collected	Malacostraca	Isopoda	Armadillidae	<i>Buddelundia</i>	sp. `mw`	2F, 1J	Widespread
SMRC-009	13/05/2019	-21.1063	119.1931	Stony Plain	Pitfall Trap	Malacostraca	Isopoda	Armadillidae	<i>Buddelundia</i>	sp. `mw`	2F	Widespread
SMRC-007	12/05/2019	-21.0033	119.3245	Stony Plain	Hand collected	Malacostraca	Isopoda	Armadillidae	<i>Buddelundia</i>	sp. `mw`	2F	Widespread
SMRC-019	14/05/2019	-20.9920	119.3458	Sand Plain	Pitfall Trap	Malacostraca	Isopoda	Armadillidae	<i>Buddelundia</i>	sp. `mw`	1F	Widespread
SMRC-034	19/05/2019	-20.9757	119.4458	Breakaway/ Cliff	Hand collected	Malacostraca	Isopoda	Philosciidae		sp. indet.	1F	Potential SRE

### Appendix C: Results of database searches for SRE invertebrates within 40km of the Study Area

Higher Taxon	Lower ID	Records	Study Area	Habitat type if known
<b>Confirmed SRE</b>				
<b>Pseudoscorpiones</b>				
Feaellidae	<i>Feaella tealei</i>	2	No	
<b>Diplopoda</b>				
Paradoxosomatidae	<i>Antichiropus apricus</i>	1	Yes	Drainage Line
	<i>Antichiropus forcipatus</i>	22	Yes	Gorge/ Gully, Drainage Line
<b>Gastropoda</b>				
Camaenidae	Camaenidae Gen. nov. cf. `Z` n.sp.	3	No	Gorge/ Gully
<b>Potential SRE</b>				
<b>Mygalomorphae</b>				
Barychelidae	<i>Aureocrypta</i> `MYG318-DNA`	1	No	Breakaway/Cliff
	Barychelidae sp. indet.	1	No	
	<i>Synothele</i> `MYG127`	1	No	Gorge/ Gully
	<i>Synothele</i> `MYG334`	2	No	
	<i>Synothele</i> sp. indet.	2	No	Gorge/ Gully
Halonoproctidae	<i>Conothele</i> sp. indet.	2	No	Gorge/ Gully
Nemesiidae	<i>Aname</i> `MYG001 group`	2	No	Gorge /Gully, Drainage Line
	<i>Aname</i> `MYG099`	1	No	
	<i>Aname</i> sp. indet.	1	No	Drainage Line
<b>Araneomorphae</b>				
Selenopidae	<i>Karaops</i> sp. indet.	1	No	
<b>Pseudoscorpiones</b>				
Atemnidae	<i>Oratemnus</i> sp. indet.	1	No	
Cheiridiidae	Cheiridiidae sp. indet.	1	No	
Chernetidae	<i>Haplochernes</i> sp. indet.	4	Yes	
Chthoniidae	<i>Austrochthonius</i> sp. indet.	6	No	Gorge/ Gully
	<i>Tyrannochthonius</i> `sp. AB A`	1	No	
	<i>Tyrannochthonius</i> `sp. AB B`	1	No	
	<i>Tyrannochthonius</i> `sp. AB`	1	No	
	<i>Tyrannochthonius</i> sp. nov. nr aridus`	16	No	Gorge/ Gully
Garypidae	<i>Synsphyronus</i> `PSE093, 8/1 Pilbara`	8	No	
	<i>Synsphyronus</i> sp. indet.	6	Yes	

Scorpiones				
Buthidae	<i>Lychas`bituberculatus` complex`</i>	77	No	
	<i>Lychas`hairy tail complex`</i>	70	No	
	<i>Lychas`Pilbara 1`</i>	3	No	
	<i>Lychas`sp. 1`</i>	2	No	
	<i>Lychas`sp. 2`</i>	5	No	
	<i>Lychas`sp. 3`</i>	1	No	
	<i>Lychas`sp. 6`</i>	2	No	
Urodacidae	<i>Urodacus`micros`</i>	4	No	
	<i>Urodacus`sp. 5`</i>	1	No	
	<i>Urodacus`sp. Pilbara 8`</i>	14	No	
Diplopoda				
Paradoxosomatidae	<i>Antichiropus`DIP005`</i>	3	No	Drainage Line
	<i>Antichiropus`DIP011`</i>	1	No	
	<i>Antichiropus`DIP037`</i>	2	No	
	<i>Antichiropus`sp. indet.`</i>	1	No	Gorge/ Gully
	<i>Antichiropus`spathion`</i>	1	No	
Trigoniulidae	<i>Austrostrophus`sp. indet.`</i>	18	No	Gorge/ Gully, Breakaway/Cliff
	<i>Austrostrophus`stictopygus`</i>	11	No	Gorge/ Gully, Breakaway/Cliff
Isopoda				
Armadillidae	<i>Buddelundia`sp. 11`</i>	27	No	
	<i>Buddelundia`sp. 18`</i>	22	No	
	<i>Buddelundia`sp. 31`</i>	1	No	
	<i>Buddelundiinae`sp.`abydos`</i>	12	No	