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24 April 2017

Office of the Environmental Protection Authority  
Locked Bag 10  
East Perth WA 6892

**Attention:** Cameron Hanush

Dear Cameron

**Re: Sheffield Resources Limited, Thunderbird Mineral Sands Project Approvals  
Minor or Preliminary Works**

Sheffield Resources Limited's (Sheffield) proposed Thunderbird Mineral Sands Project (Project) is currently being formally assessed by the Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act 1986* (EP Act) at the level of Public Environmental review (EPA Assessment N<sup>o</sup>.2073).

The proposed Thunderbird Mineral Sands Project is located on the Dampier Peninsula within the west Kimberley region of Western Australia. The Mine Site Development Envelope is located approximately 75 km west south west of Derby and 95 km north east of Broome. It is accessed from the Great Northern Highway via a proposed 30 km long Site Access Road. The Mine Site Development Envelope is located within the Mt Jowlaenga Pastoral Lease (H910623) and Yeeda Pastoral Lease (H649773), both of which are held by the Yeeda Pastoral Company Pty Ltd.

The Project is a greenfield project and will comprise:

- Mining of heavy mineral sands over a 40 plus year period from the Thunderbird deposit. The initial rate of mining will allow excavation of a nominal 7.5 million tonnes per annum (Mtpa) of ore for the first four years, before increasing to a nominal 15 Mtpa of ore for the remainder of the Project life.
- Onsite primary and secondary processing of ore to produce a range of saleable mineral sands products (LTR ilmenite, primary zircon, zircon concentrate, titano-magnetite and HiTi88 Leucoxene).
- Abstraction and reinjection of groundwater from the Broome Sandstone Aquifer to allow mining and supply ore processing needs.
- Development of infrastructure to support the Project including power generation facilities, accommodation village, administration and maintenance buildings, internal roads, communications infrastructure and waste storage and disposal facilities.
- Upgrade and extension of the existing pastoral road (Mt Jowlaenga Road) from the Great Northern Highway to form a 30 km Site Access Road.
- Transport of mineral sands products from the Mine Site via the Site Access Road and Great Northern Highway to Derby and Broome Ports for storage prior to export.
- Export of bulk mineral sands products from Derby Port via King Sound and packaged mineral product from Port of Broome to international customers.

While the Project is under formal assessment, Sheffield propose to undertake minor or preliminary works in order to allow collection of additional site specific information to further progress refinement of engineering designs for key aspects of the Project. The minor or preliminary works will be undertaken within the Mine Site Development Envelope (Figure 1).

It is expected that the proposed minor or preliminary works can be assessed and the environmental impacts adequately managed under approval processes managed by the following regulatory authorities:

- Department of Mines and Petroleum (DMP) – Mining Proposal for the proposed minor or preliminary works to develop geotechnical investigation trenches and construct an accommodation village and associated infrastructure to support the workforce required to undertake the investigation works.
- Department of Environment Regulation (DER) – Works Approval and Licence application for the proposed minor or preliminary works to construct a Waste Water Treatment Plant (WWTP) with spray field and a small landfill.
- Department of Water (DoW) – Licence to construct a water well and Groundwater Licence to develop a water supply for the accommodation camp.

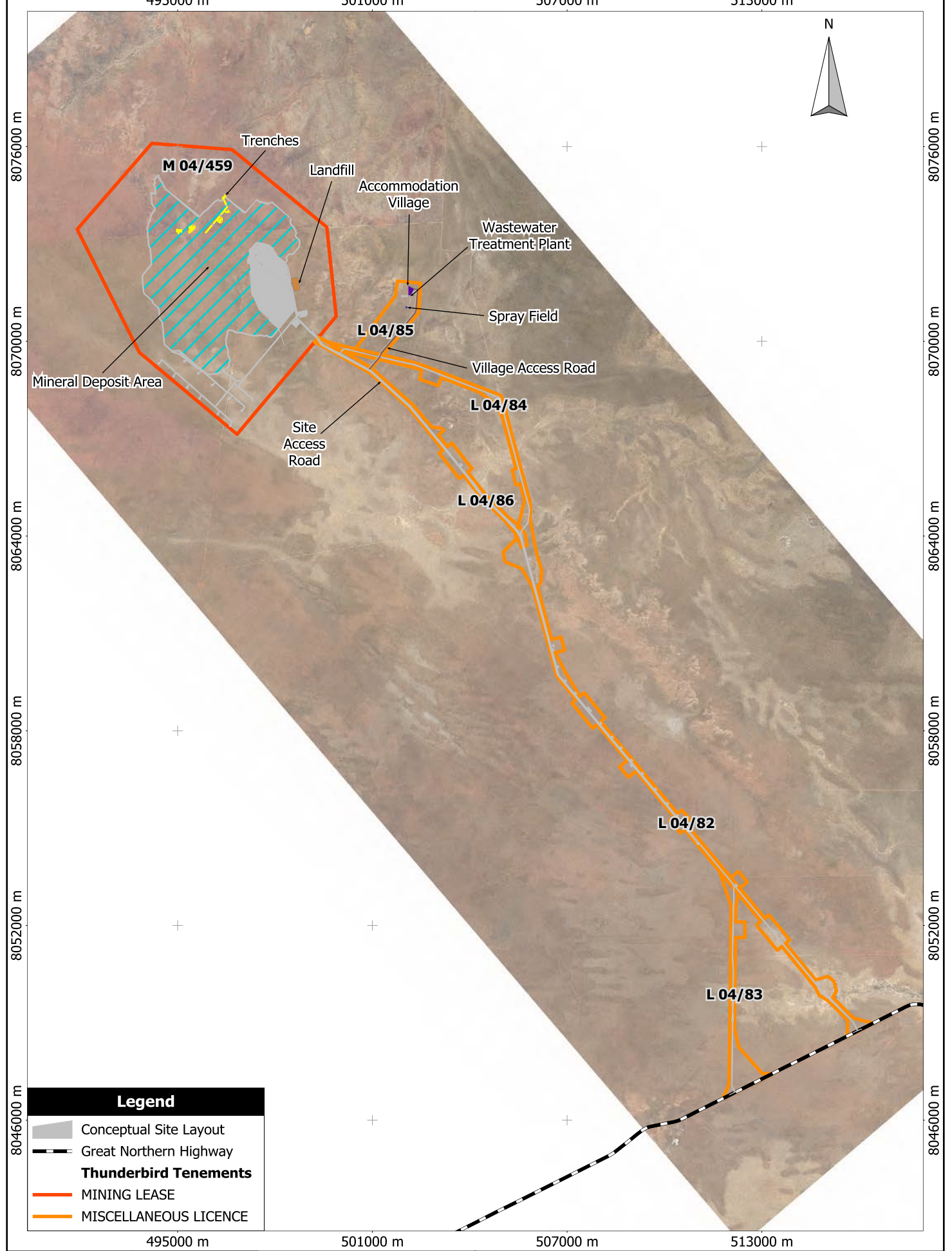
Sheffield understands that the EPA's consent is required prior to proceeding with these applications. This letter therefore addresses all of the aspects associated with the proposed minor or preliminary works (as per Section 3.5.1 of the EPA Guidelines and Procedures Manual, 2017) to show that whilst they are associated with the implementation of the Project, they are not of a scale or significance that would compromise the EPA's assessment or the Minister's future decision relating to the Project.

## 1. BACKGROUND

Sheffield proposes to develop a number of geotechnical investigation trenches within the Thunderbird deposit footprint (Figure 2). This will allow collection of geotechnical information to further inform mine design, equipment selection and suitability of mine waste for construction materials. Associated with this, Sheffield will need to build a small accommodation village to house the workforce for the estimated 12 week period required to complete such works.

The accommodation village will require supporting infrastructure including a WWTP with spray field, a small landfill, and an access road from the accommodation village to the Site Access Road. The geotechnical investigation trenches and accommodation village are directly associated with the implementation of the Project and are required in order to refine engineering design in advance of the construction phase of the Project.

Building an onsite accommodation village will allow Sheffield to accommodate personnel close to the proposed development area and remove constraints that would result from accommodating personnel in either Broome or Derby which are both over 150 km by road. Sheffield believes that undertaking minor or preliminary works will not commit Sheffield in any manner to further implementation of the overall proposal should the Project not proceed.



**Legend**

- Conceptual Site Layout
- Great Northern Highway
- Thunderbird Tenements**
- MINING LEASE
- MISCELLANEOUS LICENCE

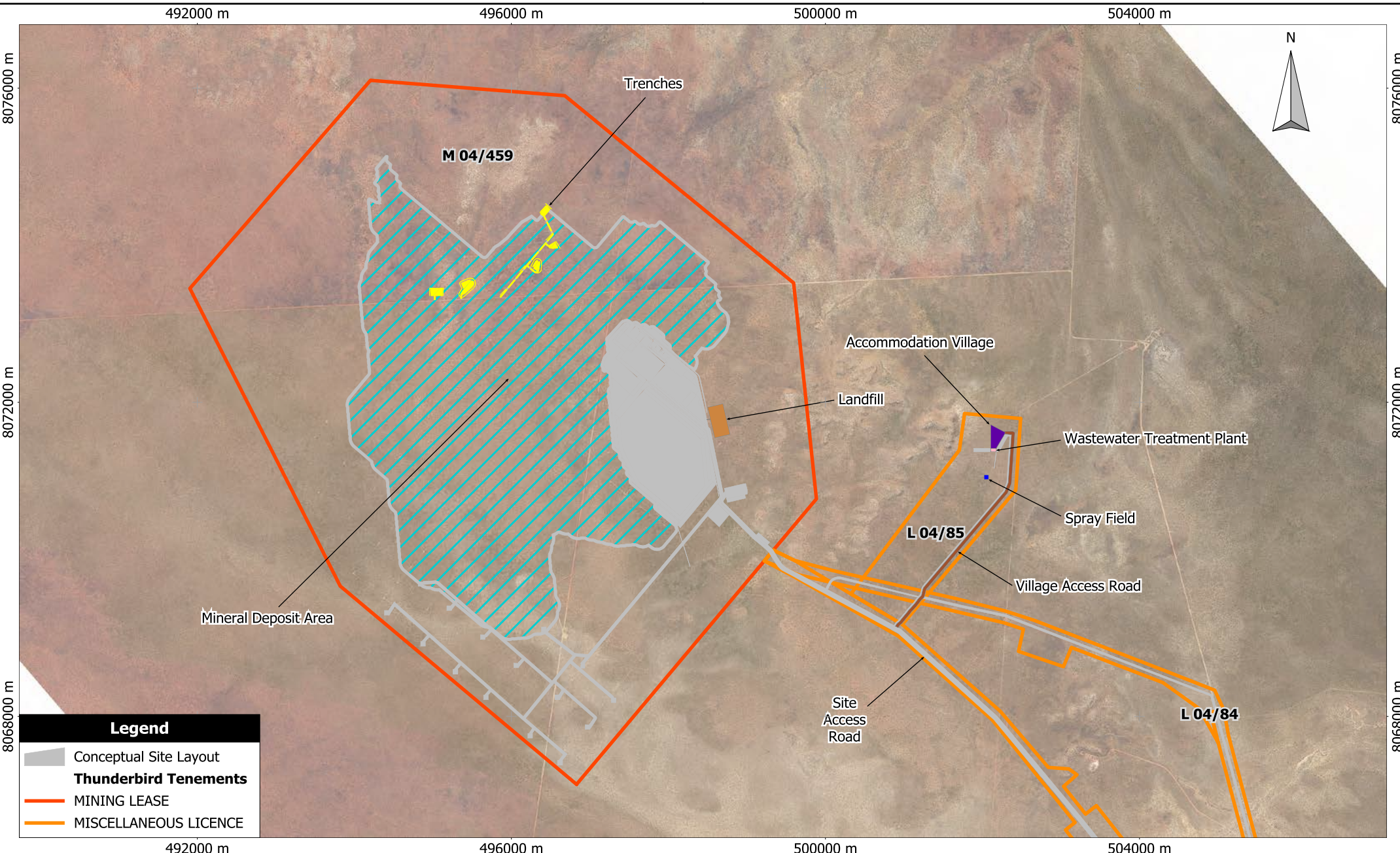
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 Grid: Australia MGA94 (51)

0 5 km

Sheffield Resources Limited  
 Thunderbird Mineral Sands Project

**Figure 1**  
**Minor or Preliminary Works Site Layout**

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**Legend**

- Conceptual Site Layout
- Thunderbird Tenements**
- MINING LEASE
- MISCELLANEOUS LICENCE

Scale: 1:63000  
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 Air Photo Date: 2015  
 Grid: Australia MGA94 (51)

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Sheffield Resources Limited  
 Thunderbird Mineral  
 Sands Project

**Figure 2**  
 Minor or Preliminary Works  
 Infrastructure Layout

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## 2. PROPOSED MINOR OR PRELIMINARY WORKS

### 2.1 GEOTECHNICAL INVESTIGATION TRENCHES

Two geotechnical investigation trenches will be developed within the footprint of the Thunderbird deposit. Sheffield will excavate about 180,000 bcm in total, from both trenches. These trenches will be used to:

- Confirm geological assumptions used in Project planning.
- Collect information to determine mine design and safe pit wall angles.
- Assist in equipment selection.
- Assist in the characterisation of waste rock as suitable construction material.

Development of the trenches and the characterisation of the waste rock will require a workforce of 60 people and is estimated to take 12 weeks to complete.

#### 2.1.1 Mining of Trenches

The proposed dimensions of the trenches are shown in Table 1 and the locations are shown in Figure 3.

**Table 1: Characteristics of Proposed Geotechnical Investigation Trenches**

Trench No.	Volume Excavated (bcm)		Length (m)	Width (m)	Depth (m)
	Ore	Waste			
THTP005	31,000	1,200	125	75	15
THTP006	39,000	107,000	225	125	25

Water required for dust suppression during excavation of the trenches will be obtained from existing bores that have previously been used to supply water for exploration purposes. These bores are licenced under GWL 182830(1) to allow abstraction of up to 95,000 kL/yr.

#### 2.1.2 Processing of Material from Geotechnical Trenches

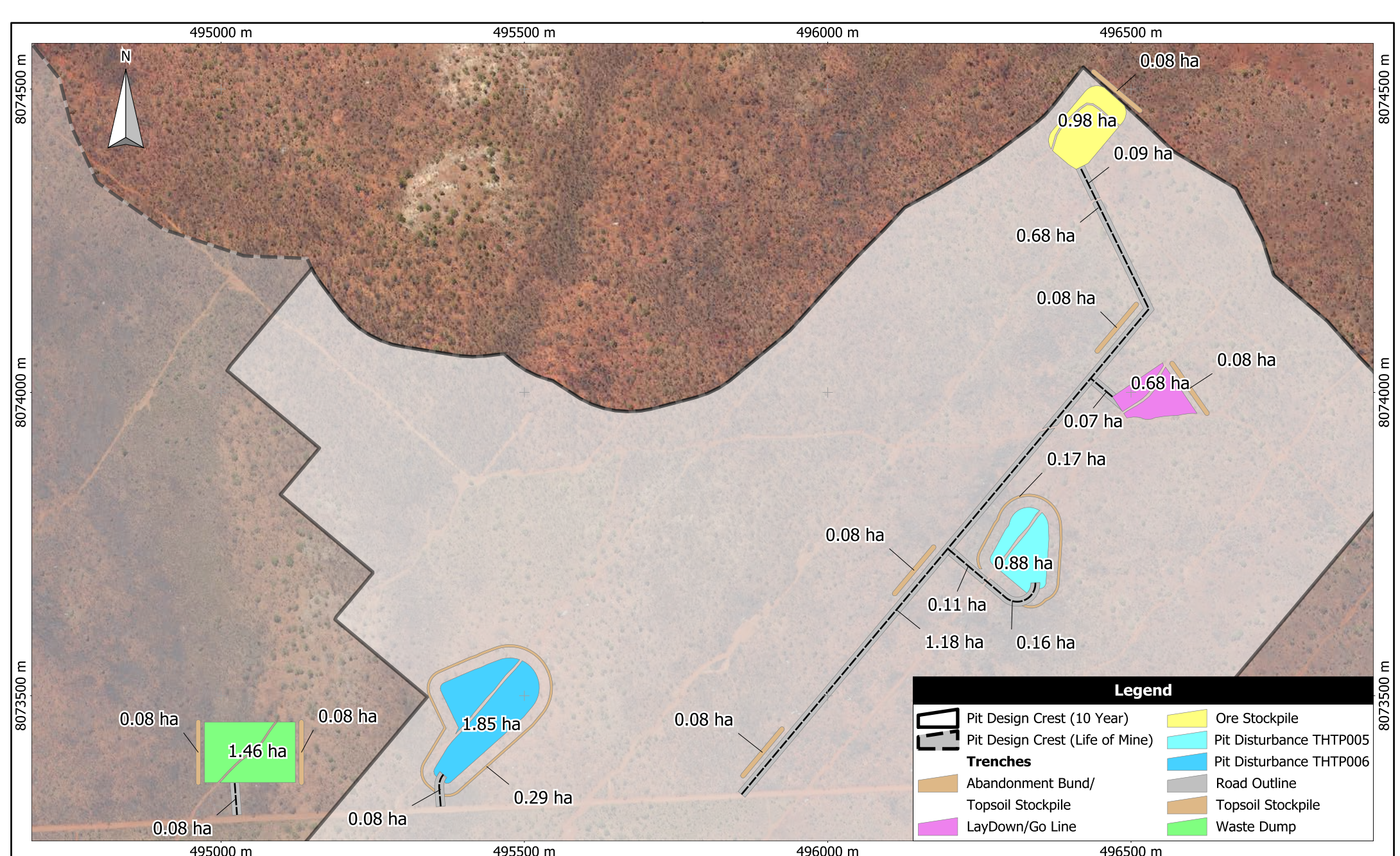
The ore and waste will be screened using a portable grizzly to initially screen off coarse oversize material (+300mm) (Figure 4). Following that, a mobile screening plant such as the McCloskey plant (Figure 5) will be used to dry screen the minus 300 mm material into the following size factions:

- -300 mm to +100mm.
- -100 mm to +12 mm.
- -12 mm to +5 mm.

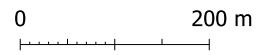
The fractions will be stockpiled in separate piles. Waste and ore will be loaded by excavator or wheel loaders and transported in Moxy type trucks (Figure 6).

Approximately 15,000 tonnes of ore will be screened initially and then the undersize from this (approx. 7,500 tonnes) will be used as samples to provide approximately 1,000 kg of representative material for offsite testing via a scrubber trommel unit.

Approximately 15,000 tonnes of waste will be screened initially to determine the percentages of material that report to the size factions required for construction materials. Representative 100 to 150 kg samples from these size factions will be taken for offsite testing of the materials for construction properties.



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 Air Photo Date: 2015  
 Grid: Australia MGA94 (51)



Sheffield Resources Limited  
 Thunderbird Mineral  
 Sands Project

**Figure 3**  
**Proposed Trench Locations**

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**Figure 4: Grizzly Screen**



**Figure 5: McCloskey Screening Plant**



**Figure 6: Moxy Truck**

## **2.2 ACCOMMODATION VILLAGE AND LANDFILL**

The accommodation village will be built to accommodate the 60 personnel required for the minor or preliminary works provisions.

The minor or preliminary works village will consist of 60 accommodation rooms and supporting facilities including an administration office area, kitchen and dining area, wet mess, laundry, potable water storage tanks, fuel tanks and recreational facilities.

Temporary power will be supplied via acoustic enclosed gensets and self banded fuel tanks of an adequate size for the village and connected to a site main switchboard. Water will be provided by a bore to be constructed near to the Accommodation Village. Potable water storage tanks will be constructed. Access to the village buildings and infrastructure will be controlled to minimise ingress from unauthorised personnel, station livestock and native animals.

A landfill site will be developed to dispose of waste materials from the accommodation village and the minor or preliminary works.

## **2.3 WASTE WATER TREATMENT PLANT AND SPRAY FIELD**

Waste water from accommodation, messing and services will be collected via piping into suitably located pump pits and pumped to the balance tank at the WWTP. Pump pits will have duty / standby macerating pumps, control panel and alarms.

Waste water will be treated using a MAK Water designed WWTP processing 30 m<sup>3</sup>/day<sup>1</sup>. The WWTP will consist of a 100 m<sup>3</sup> balance tank and an Activated Sludge Bioreactor with waste streams directed to a sludge tank and a 50 m<sup>3</sup> treated effluent tank. The WWTP will include the use of an enhanced nutrient removal system to lower phosphorous and nitrogen in the effluent. The WWTP will have remote monitoring and control capabilities.

The treated effluent will be discharged by pump to a spray field with an area of approximately 2 ha via above ground HDPE piping and impact sprinklers. Vegetation within the spray field will not be cleared and the WWTP and irrigation area will be fenced and signposted.

## **2.4 ACCESS ROADS**

An access road (approximately 3.2 km long and 10 m wide) is proposed to connect the accommodation village to the Site Access Road. Improvements to the Site Access Road at the Great Northern Highway turn off will be made to allow transport of infrastructure and machinery to the site.

## **3. PROPOSED LAND DISTURBANCE**

The total land disturbance for minor or preliminary works components is estimated to be 21.9 ha as is shown in Table 2. Disturbance will be under 10 ha per tenement.

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<sup>1</sup> The capacity of the MAK water plant will be more than 30 m<sup>3</sup>/day, but it will be capable of processing 30 m<sup>3</sup>/day.



**Table 2: Estimated Land Disturbance for Minor or Preliminary Works Components**

Project Component	Tenement	Estimated Disturbance (ha)
Geotechnical Investigation trenches and infrastructure	M 04/459	9.3 ha
Landfill	M 04/459	0.6 ha
<i>Tenement M 04/459 Total</i>		<i>9.9 ha</i>
Accommodation Village	L 04/85	4 ha
Village Access Road	L 04/85	4 ha
WWTP and spray field	L 04/85	2 ha
<i>Tenement L 04/85 Total</i>		<i>10 ha</i>
Site Access Road upgrades	L 04/82 and L 04/86	2 ha
<i>Tenement L 04/82 and L 04/86 Total</i>		<i>2 ha</i>
<b>TOTAL</b>		<b>21.9 ha</b>

#### 4. ENVIRONMENTAL FACTORS

Each of the Key Environmental Factors and Integrating Environmental Factors identified for the Mine Site Development Envelope by the EPA in the Environmental Scoping Document are discussed below with reference to the minor or preliminary works and how they meet the EPA objectives.

##### 4.1 KEY ENVIRONMENTAL FACTOR – FLORA AND VEGETATION

A total of 255 vascular plant taxa, representative of 129 genera and 44 families were recorded in the survey area (the survey area was larger than the Mine Site Development Envelope, within which the location of the minor or preliminary works lies).

A total of 15 vegetation communities were defined and mapped. Two of the pindan vegetation communities accounted for approximately 86% of the surveyed area and were considered the most representative of the Mine Site Development Envelope. The other main communities mapped were associated with the drainage channels and rocky hills.

No Threatened flora pursuant to Schedule 1 of the *Wildlife Conservation Act 1950* or *Environment Protection and Biodiversity Conservation Act 1999* were recorded within the Mine Site Development Envelope. Two Priority taxa were recorded by Mattiske (2016); *Triodia caelestialis* (P3) was recorded widely as a groundcover and *Pterocaulon intermedium* (P3) was recorded infrequently and not associated with any specific landform, soil type or vegetation community. Given the widespread distribution of both taxa within the survey area and the scarcity of surveys in the less-accessible parts of the Dampier Peninsula, there is a reasonable expectation that more of these taxa would be found outside the Mine Site Development Envelope beyond known records (Mattiske 2016).

About 21.9 ha of vegetation is proposed to be cleared for minor or preliminary works. This is predominantly in the W8 vegetation community, which is the most representative of the Mine Site Development Envelope (accounting for 86% of the surveyed area when combined with W6 and W8a). Minor clearing in the W1 and W12 communities will also occur, as will development of infrastructure in already cleared areas (for example the minor road upgrades proposed for the Site Access Road).

Vehicle and machinery hygiene practices will be implemented and soil movement will be restricted. No residual impacts to flora and vegetation are expected to remain post rehabilitation. The potential impacts to flora and vegetation from the construction of the minor or preliminary works are anticipated to be minimal.

## 4.2 KEY ENVIRONMENTAL FACTOR – TERRESTRIAL FAUNA

Fauna surveys recorded a total of 20 mammals, 118 birds, 44 reptiles and 8 amphibians occurring within the Mine Site Development Envelope or surrounding areas. Of note was an approximate 80 km range extension of *Lerista apoda* (Dampier Land Limbless Slider) from coastal areas of the west coast of the Dampier Peninsula.

Nine conservation significant fauna species were recorded within the wider survey area, however, only three were recorded within the Mine Site Development Envelope. These were the Greater Bilby, the Short-tailed Mouse, and the Rainbow Bee-eater (Ecologia 2012a, 2014a, 2015). One confirmed Priority 1 *Varanus sparnus* individual was recorded during the haul road survey outside the Mine Site Development Envelope. Eleven further individuals were also identified during this survey however they were not able to be identified definitively in the field as either *V. sparnus* or *Varanus brevicauda*. It is considered likely that *V. sparnus* occurs within the Mine Site Development Envelope.

Clearing for the minor or preliminary works will predominantly result in clearing of the Pindan Shrubland habitat type which is the most extensive habitat type in the Mine Site Development Envelope. Minor areas of the Savannah Woodland, and Sandstone Range and Foothills will also be cleared.

Death, injury or entrapment of fauna during clearing and utilisation of the trenches will be minimised through the implementation management measures such as employing fauna spotters during clearing, installing egress ramps from the trenches, restriction of off-road driving and enforcing speed limits. To reduce the potential of entrapment during the minor or preliminary works, artificial water sources and domestic waste facilities will be fenced and putrescible wastes will be regularly covered, and open holes, trenches, landfill, and any water holding facilities will be inspected regularly for fauna. Night-time construction activities will not be undertaken for the minor or preliminary works, therefore minimising the likelihood of vehicle strike to the Greater Bilby and other nocturnal species.

Impacts on terrestrial vertebrate fauna (including conservation significant species) and short range endemics are likely to be incidental due to the small area of clearing proposed and the availability of habitat inside and outside the Mine Site Development Envelope. No residual impacts to terrestrial fauna are expected to remain post rehabilitation. The potential impacts to terrestrial fauna from the construction of the minor or preliminary works are anticipated to be minimal.

## 4.3 KEY ENVIRONMENTAL FACTOR – HYDROLOGICAL PROCESSES

The water table on the Dampier Peninsula is deep inland and becomes progressively shallower on the coastal plain where discharge occurs at coastal springs in the mud flats around Broome. The Baskerville anticline divides groundwater flows, with water flowing northward north of the anticline and south to south west in areas south of the anticline. Groundwater in the Mine Site Development Envelope is typically 20 m below ground level.

The Mine Site Development Envelope is located on sandy soils with low runoff generation and there are no defined watercourses within the main mine development areas. The nearest watercourses are the Fraser River South, which has a visible channel from approximately 10.5 km downstream of the mineral deposit area. There are no year round surface water bodies within the Mine Site Development Envelope. The nearest ephemeral pools are approximately 25 km downstream on Fraser River South (Laws 1991; MBS 2016a).

Roads and access tracks will be constructed with appropriate surface water drainage structures to minimise impacts on surface water flows. Excavation for the trenches will not occur below the water table, as although Trench 2 is 25 m deep, the water table in this location is lower than 25 m. No residual impacts to hydrological processes are expected to remain post rehabilitation. The potential impacts to hydrological processes from the minor or preliminary works are anticipated to be minimal.

#### 4.4 KEY ENVIRONMENTAL FACTOR – INLAND WATER QUALITY

Groundwater in the Broome Sandstone Aquifer is predominantly of sodium – chloride type, with elevated levels of bicarbonate in some areas. Silica levels are high, with reported values of 18 to 119 mg/L. Nitrate levels are frequently over 40 mg/L, probably as a result of nitrate fixation by native acacias and termite activity. A saltwater interface occurs within the Broome Sandstone aquifer along the coastline (Laws 1991).

No surface water quality monitoring data is available for the Mine Site Development Envelope or elsewhere on the Dampier Peninsula. Given the lack of industry and other sources of potential contamination, surface runoff is expected to be of good quality suitable for livestock and agricultural use.

All hydrocarbon and chemical storages will be designed and constructed in accordance with Australian Standards AS1940 and AS1692. The WWTP will be constructed, operated and maintained in accordance with the local government and Department of Health regulations and permitting requirements as issued by the Shire of Broome. Excavation for the trenches will not occur below the water table.

The minor or preliminary works are not expected to impact inland water quality. No residual impacts to inland water quality are expected to remain post rehabilitation.

#### 4.5 KEY ENVIRONMENTAL FACTOR – HERITAGE

No registered Aboriginal sites or other heritage places of significance are located within the Mine Site Development Envelope.

Aboriginal heritage surveys to support exploration activities have been undertaken in consultation with Traditional Owners annually since 2012. The outcomes of the surveys were:

- The Project area has been extensively and comprehensively surveyed, and all areas considered sensitive to Aboriginal cultural values in the Mine Site Development Envelope and surrounds have been covered.
- Aboriginal sites and areas of Aboriginal cultural value have been identified and mapped.
- Avoidance buffer zones have been determined by Native Title claimants (AHA 2016).

The Mine Site Development Envelope, and therefore the minor or preliminary works within the envelope, will not impact these sites. No impacts to heritage from the minor or preliminary works are anticipated.

#### 4.6 INTEGRATING FACTOR - REHABILITATION AND DECOMMISSIONING

Based on the relatively small size of the impact footprint (21.9 ha) and the extensive habitat connectivity within the adjoining areas, it is anticipated that rehabilitation and closure of the minor or preliminary works can be undertaken effectively. All infrastructure associated with the minor or preliminary works will be removed and the site will be rehabilitated, except where the areas are the subject of future approvals granted for the Project. Revegetation will be managed to ensure that suitable vegetation communities will re-establish which are appropriate to the area and its pastoral landuse

Decommissioning and Rehabilitation of the minor or preliminary works will be addressed within the Mining Proposal submitted to DMP to obtain approval for development of the accommodation village under the *Mining Act 1978*. This will ensure that Sheffield will be able to rehabilitate any activities carried out under minor or preliminary works should the Project not proceed.

#### 4.7 INTEGRATING FACTOR - OFFSETS

Under both the WA Environmental Offsets Guidelines and the Australian Government's Environmental Offsets Policy, environmental offsets are required where a project is likely to cause significant residual impacts. The

potential impacts from the minor or preliminary works are anticipated to be minimal, with no significant residual impacts expected following rehabilitation. Therefore offsets are not considered appropriate to this application for minor or preliminary works.

## **5. ENVIRONMENTAL IMPACT ASSESSMENT**

Information regarding each of the Key and Integrating Environmental Factors is contained in Table 3, including a description of the potential environmental impact and preliminary management and mitigation actions for the minor or preliminary works. Table 4 summarises the reasoning behind the assessment of the environmental factors for the minor or preliminary works.

**Table 3: Assessment of Likely Impact on Environmental Factors by the Minor or Preliminary Works**

Environmental Factor	EPA Objective*	Potential Impacts of Minor or Preliminary Works	Preliminary Mitigation and Management Actions
<b>Flora and Vegetation</b>	To maintain representation, diversity, viability and ecological function at the species, population and community level.	<ul style="list-style-type: none"> <li>• Localised loss of vegetation from clearing.</li> <li>• Introduction of new weed species due to increased vehicle movement in the local area.</li> <li>• Vegetation damage due to increased fire risk.</li> </ul>	<ul style="list-style-type: none"> <li>• Clearing activities will be managed to ensure clearing is strictly limited to that necessary for the minor or preliminary works.</li> <li>• Disturbance will be minimised through careful design of site layout.</li> <li>• Vehicle and equipment hygiene procedures will be implemented to minimise entry of weed and soil borne diseases.</li> <li>• Vehicles and construction equipment will keep to designated roads.</li> <li>• Firefighting equipment will be located on site and personnel trained in fire response.</li> <li>• Dust control measures will be implemented.</li> <li>• Speed limits will be implemented to minimise dust emissions.</li> <li>• Decommissioning and rehabilitation of the disturbed area will be addressed within a site wide Mine Closure Plan to be prepared as part of project approvals needed under the Mining Act 1978. Closure criteria will consider EPA objectives for this factor.</li> </ul>

Environmental Factor	EPA Objective*	Potential Impacts of Minor or Preliminary Works	Preliminary Mitigation and Management Actions
<b>Terrestrial Fauna</b>	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	<ul style="list-style-type: none"> <li>• Fragmentation of vertebrate fauna habitat resulting in displacement of fauna.</li> <li>• Habitat clearing causing disturbance of conservation significant fauna species.</li> <li>• Vehicle strike causing injury or death of native fauna.</li> <li>• Increase in pest species impacting native fauna.</li> <li>• Altered fire regime impacting native fauna.</li> <li>• Light and noise pollution disrupting native fauna.</li> <li>• Fauna entrapment leading to injury or death.</li> </ul>	<ul style="list-style-type: none"> <li>• Clearing activities will be managed to ensure clearing is strictly limited to that necessary for operations.</li> <li>• Speed limits will be implemented for operational areas and the Site Access Road in order to minimise the risk of fauna injury or mortality from vehicle strike.</li> <li>• Personnel will be required to adhere to speed limits and drive to road/weather conditions to minimise risks of fauna injuries or death due to vehicle traffic</li> <li>• Travel between dusk and dawn on the Site Access Road and village access road will be limited to essential travel with driving speed limits set to reduce the potential for road strikes.</li> <li>• The site induction program will provide information on fauna of conservation significance, including their appearance and habitats.</li> <li>• Domestic waste facilities will be fenced and putrescible wastes will be regularly covered.</li> <li>• Firefighting equipment will be located on site and emergency personnel will be trained in fire response.</li> <li>• Vehicles will not be permitted to leave access tracks or cleared areas.</li> <li>• All machinery and vehicles undertaking clearing activities will be fitted with firefighting equipment.</li> <li>• The project site induction will include information on the prevention and management of fires.</li> <li>• Equipment design will be specified to be within Australian standard noise limits.</li> <li>• Open holes, trenches, the refuse impoundment, and any water holding facilities will be inspected regularly for fauna.</li> </ul> <p>Management measures specific to the conservation significant Greater Bilby:</p> <ul style="list-style-type: none"> <li>• Speed limits implemented for Project areas.</li> <li>• Travel on the Site access Road between dusk and dawn restricted to essential vehicles</li> <li>• Topsoil stockpiles not located within 5 m of Site Access Road.</li> <li>• Pre clearance surveys undertaken less than 1 month prior to land clearing</li> <li>• Presence of Greater Bilbies in active burrows identified.</li> <li>• Inactive burrows to be manually collapsed at least 2 weeks prior to land clearing.</li> <li>• Greater Bilby capture and relocation program implemented 1 week prior to land clearing for active, occupied burrows.</li> <li>• Fauna spotter present during land clearing activities.</li> <li>• Clearing in accordance with internal Clearing Permit requirements.</li> </ul>

Environmental Factor	EPA Objective*	Potential Impacts of Minor or Preliminary Works	Preliminary Mitigation and Management Actions
			<ul style="list-style-type: none"> <li>• Land rehabilitated on completion of use of non-deposit areas.</li> <li>• Vegetation established via topsoil replacement, seeding and or planting.</li> <li>• Fence domestic waste facilities.</li> </ul>
<b>Hydrological Processes</b>	To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected	<ul style="list-style-type: none"> <li>• Infrastructure causing localised reduction in surface water volumes.</li> <li>• Infrastructure changing local drainage patterns and increasing flood risk.</li> <li>• Surface water management structures causing localised erosion and sedimentation</li> </ul>	<ul style="list-style-type: none"> <li>• Roads and access tracks will be constructed with appropriate surface water drainage structures to minimise impacts on surface water flows.</li> </ul>

Environmental Factor	EPA Objective*	Potential Impacts of Minor or Preliminary Works	Preliminary Mitigation and Management Actions
<p><b>Inland Water Quality</b></p>	<p>To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected</p>	<ul style="list-style-type: none"> <li>• Accidental spills causing contamination of surface water and groundwater.</li> <li>• Poor waste management causing contamination of surface water and groundwater.</li> <li>• Release of poor quality water causing contamination of surface water and groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>• The generator will be located in a bund that complies with Australian Standards AS1940 and AS1692.</li> <li>• All hydrocarbon and chemical storages will be designed and constructed in accordance with Australian Standards AS1940 and AS1692.</li> <li>• Equipment and vehicles including surface mobile equipment shall be subject to a regular maintenance program to reduce the likelihood of spills and leakages occurring.</li> <li>• The transport, storage or use of any designated Dangerous Good or substance will be conducted in accordance with Dangerous Goods permits as required and in accordance with Dangerous Goods Safety Act 2004, Dangerous Goods Safety (Road and Rail Transport of Non-Explosives) Regulations 2007 and Dangerous Goods Safety (Explosives) Regulations 2007.</li> <li>• Spill kits will be located at strategic locations and employees trained in their use.</li> <li>• Spills will be contained, remediated, investigated and reported to the relevant authorities as required.</li> <li>• WWTP will be constructed, operated and maintained in accordance with the Department of Environment Regulation (DER) Works Approval, Environmental Licence and local government and Department of Health regulations and permitting requirements as issued by the Shire of Broome.</li> <li>• Effluent produced by the WWTP will be irrigated to the environment</li> <li>• The WWTP will be fitted with alarms and be able to be shut down the plant should a failure occur.</li> <li>• WWTP will be regularly inspected and discharge suspended if it is discovered they are operating below the required standard.</li> <li>• The WWTP will have contingency storage capacity for up to two days of normal flow if discharge is suspended while any problems are addressed.</li> <li>• Effluent discharge from the WWTP will be managed to allow effluent to infiltrate or evaporate and prevent surface ponding or runoff from the irrigation area.</li> <li>• Domestic wastes will be disposed of into a purpose built onsite landfill.</li> <li>• The landfill will have a boundary fence to prevent fauna access (specifically feral animals) and to create a wind barrier.</li> <li>• An entrance/exit gate within the boundary fence will be kept closed other than when waste is being deposited.</li> <li>• Recyclable wastes will be collected in a laydown area and transported offsite for recycling.</li> </ul>



Environmental Factor	EPA Objective*	Potential Impacts of Minor or Preliminary Works	Preliminary Mitigation and Management Actions
<b>Heritage</b>	To ensure that historical and cultural associations are not adversely affected.	<ul style="list-style-type: none"> <li>• Ground disturbance causing impacts to unknown Aboriginal heritage sites.</li> <li>• Project activities causing impacts to groundwater and groundwater dependent ecosystems.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain buffer zones around important Aboriginal sites and areas with Aboriginal heritage values in the Mine Site footprint and surrounds.</li> <li>• Continue consultation with Traditional Owners.</li> <li>• Disturbance of Aboriginal heritage sites to be consistent with agreements with Native Title claimants and Aboriginal Heritage Act 1972.</li> </ul>
<b>Rehabilitation and Decommissioning</b>	To ensure that premises are closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed outcomes and land uses, and without unacceptable liability to the State.	<ul style="list-style-type: none"> <li>• Wind and water erosion of disturbed areas.</li> <li>• Ineffective establishment of vegetation and habitat.</li> <li>• Disruption to or poor re-establishment of local drainage paths.</li> <li>• Safety risks associated with infrastructure.</li> </ul>	<ul style="list-style-type: none"> <li>• Decommissioning and rehabilitation of the disturbed area will be addressed within a site wide Mine Closure Plan to be prepared as part of project approvals needed under the Mining Act 1978. Closure criteria will consider EPA objectives for this factor.</li> <li>• Monitoring will be implemented once areas are rehabilitated to ensure progression towards completion criteria.</li> <li>• Annual payments will be made to the Mining Rehabilitation Fund.</li> </ul>
<b>Offsets</b>	To counterbalance any significant residual environmental impacts or uncertainty through the application of offsets.	N/A	N/A

\* For consistency of assessment, the Environmental Factors and associated EPA Objectives stated are consistent with those included in the Environmental Scoping Document and Public Environmental Review documents for the Project. They do not reflect the amended Environmental Factors and EPA Objectives published in December 2016.

**Table 4: Summary of Assessment of Environmental Factors for Minor or Preliminary Works**

<b>Environmental Factor</b>	<b>Significant Impact</b>	<b>Comments</b>
<b>Flora and Vegetation</b>	No	9.9 ha of vegetation clearing on M 04/459. 10 ha of vegetation clearing on L 04/85. 2 ha of vegetation clearing on L 04/82 and L 04/86 combined.  Two Priority species present, but widespread throughout the Mine Site Development Envelope and likely to occur outside the Mine Site Development Envelope and in addition to known records. No Threatened Ecological Communities or Priority Ecological Communities. Impacts can be mitigated using standard mining industry practices.
<b>Terrestrial Fauna</b>	No	Small area of clearing proposed. Short term disturbance. Habitat readily available outside the disturbance area.
<b>Hydrological Processes</b>	No	Proposed works minor in nature, and do not intersect the water table.
<b>Inland Water Quality</b>	No	Proposed works minor in nature, and are not expected to impact inland water quality.
<b>Heritage</b>	No	Close consultation with the Traditional Owners has not identified sites of cultural heritage significance within the proposed disturbance area.
<b>Rehabilitation and Decommissioning</b>	No	Disturbance can be mitigated with good project planning and implementation of site specific rehabilitation measures.
<b>Offsets</b>	No	N/A

## 6. CONCLUSION

Sheffield is seeking environmental approval from the EPA for the minor or preliminary works needed to develop a number of geotechnical investigation trenches within the Thunderbird deposit. These trenches will allow Sheffield to continue to progress design of the Project. To facilitate the trenching work, Sheffield will need to make improvements to sections of the Site Access Road, establish an accommodation village, WWTP with spray field, landfill, and develop road access to the accommodation village.

Sheffield considers the development of the minor or preliminary works will not have a significant impact upon the environment. Any impacts will be readily reversible through rehabilitation given the small land disturbance area, short duration and simple nature of the works proposed. Sheffield does not believe that implementation of the requested works will alter or affect the EPA's decision in relation to the Environmental Factors currently under formal assessment through the PER process.

Sheffield considers that the potential environmental impacts relating to the minor or preliminary works can be adequately managed under the Part V of the *Environmental Protection Act 1986* and *Mining Act 1978* processes managed by DER and DMP respectively.

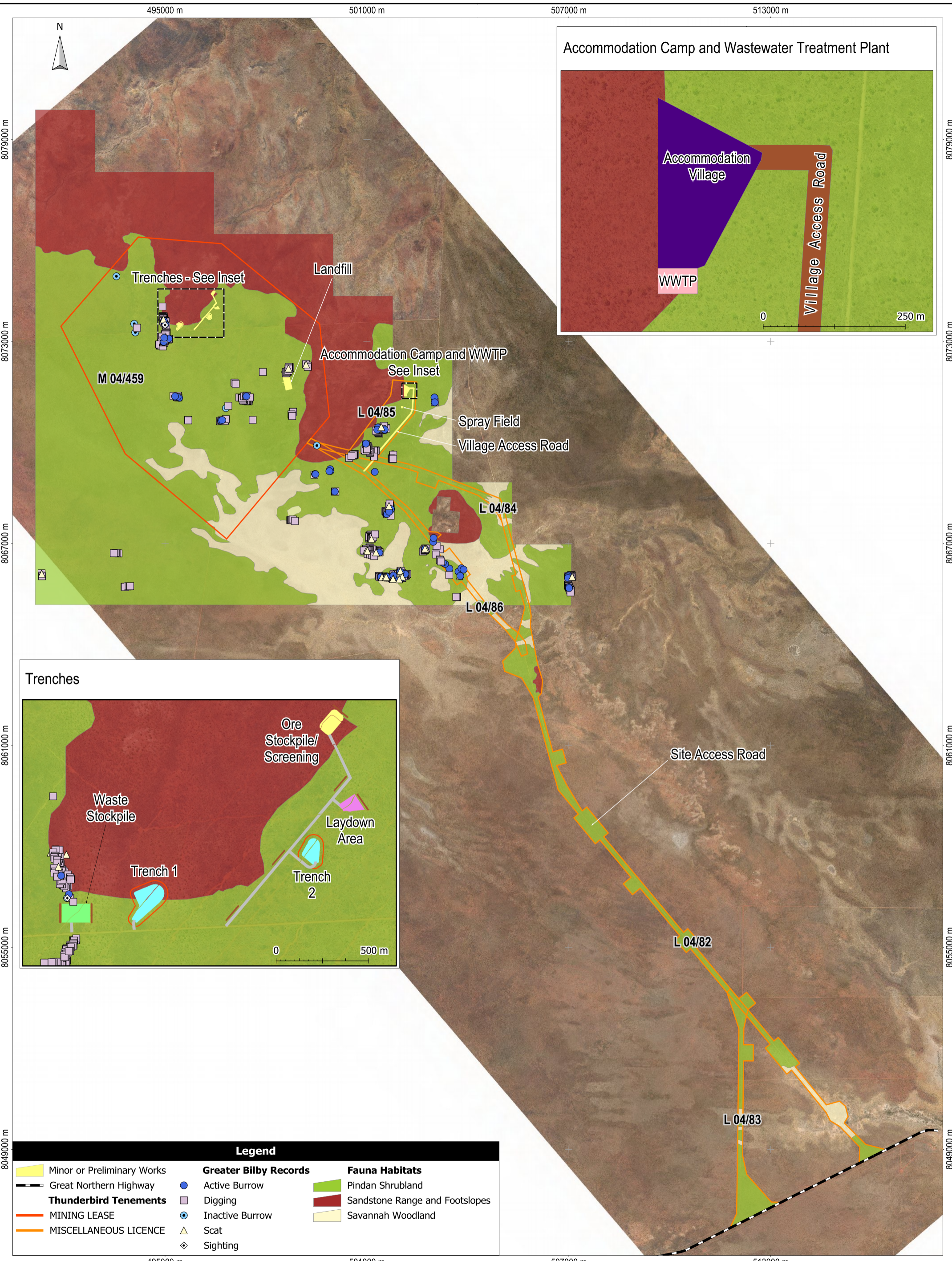
If you have any queries, please contact me on (08) 9226 3166.

Yours sincerely  
**MBS Environmental**



**Kate Thomson**  
Senior Environmental Scientist

Cc: Office of Environmental Protection Authority – Mr Chris Stanley and [registrar@epa.wa.gov.au](mailto:registrar@epa.wa.gov.au)  
Sheffield Resources – Messrs Wayne Groeneveld, Jim Netterfield and Stuart Pether



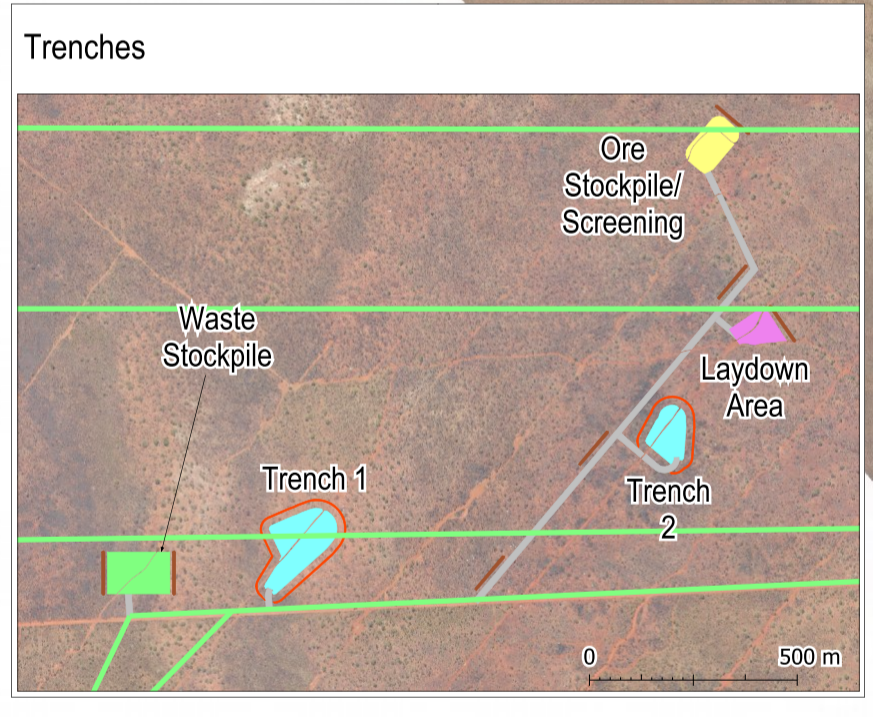
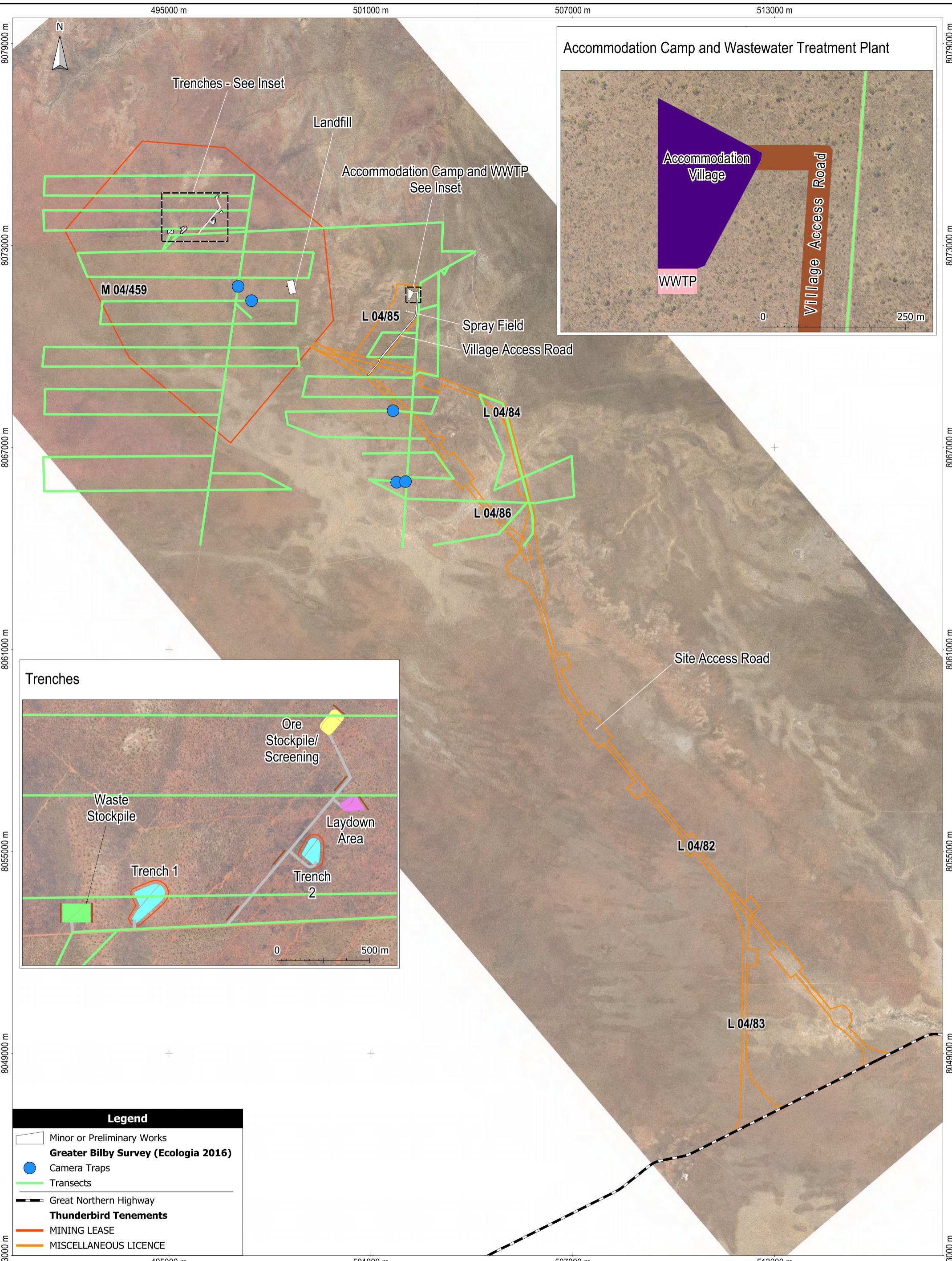
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 Grid: Australia MGA94 (51)

Sheffield Resources Limited  
 Thunderbird Mineral Sands Project

**Figure 1**  
 Greater Bilby Records Over  
 Minor or Preliminary Works Site Layout

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Legend	
	Minor or Preliminary Works
<b>Greater Bilby Survey (Ecologia 2016)</b>	
	Camera Traps
	Transects
<b>Thunderbird Tenements</b>	
	MINING LEASE
	MISCELLANEOUS LICENCE

Scale: 1:100000  
 Original Size: A3  
 Air Photo Date: 2015  
 Grid: Australia MGA94 (51)

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 Thunderbird Mineral Sands Project

**Figure 2**  
**Greater Bilby Transect and Camera Trap Locations Over Minor or Preliminary Works Site Layout**

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