



# CHAPTER 21

## LAND USE AND TENURE



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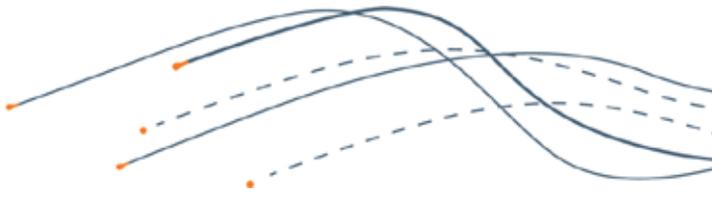
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## 21 Land Use and Tenure

The land within the boundary of the proposed mining lease covers an area of 8,458 ha and is held under freehold tenure by six different families. In addition, the mining lease include portions of four road reserves under the care, control and management of the Wudinna District Council (DC).

The land is currently utilised for ongoing agricultural activity, including grazing and mixed crops such as wheat and barley.

This chapter provides an overview of the existing environmental values relevant to land use and tenure within the boundary of the proposed mining lease and the surrounding area. Existing land use and tenure arrangements are summarised and the chapter identifies how altered land use practices during construction, operation and closure of the proposed mine may impact on existing environmental values. Where relevant, management and / or mitigation measures that would minimise impacts and risks are identified.

### 21.1 Applicable Legislation and Standards

The relevant legislation relating to land use and tenure for the proposed mine is as follows:

- *Mining Act 1971*
- *Natural Resource Management Act 2004*
- *Development Act 1993*

Further information regarding the requirements and relevance of the legislation is provided in Chapter 4, Statutory Framework. Specifically, the *Development Act 1993* establishes a framework for considering land use impacts. The Development Plan outlines planning and development objectives for the Wudinna DC, specifying land use zoning across the region.

The proposed mining lease will be located within the Primary Production Zone, as is the majority of the surrounding area. The overriding objective of the Primary Production Zone is to maintain productive, efficient primary production activities through the protection of existing agricultural enterprises from conflicting land uses. The exploration and development of mineral resources is anticipated in the zone, including the establishment of associated processing activities. Significant expansion of residential land use is not envisaged.

The township of Warrambo is located within the Settlement Zone, with the exception of the grain handling facility which is located within the Bulk Handling Zone. The objective of the Settlement Zone is to establish low-density residential development and small-scale services to support local residents and the surrounding agricultural industry.

Dust generated at the proposed CEIP Mine was identified as a potential retardant to crop growth, however, there are no specified limits for dust deposition on crops in South Australia. In the absence of local guidelines, the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DEC 2005) was adopted. The limits imposed for dust deposition on crops are a maximum total of 4 g/m<sup>2</sup>/month and / or a maximum increase of 2 g/m<sup>2</sup>/month over background levels (DEC 2005).

## 21.2 Assessment Method

Existing land use was identified via a desktop review of:

- Wudinna DC Development Plan
- Eyre and Western Region Plan
- Aerial photography
- Land use data and information from the Land Services Group and the Department of Planning, Transport and Infrastructure

The accuracy of desktop information has been confirmed from numerous field visits undertaken in the subject area since 2008. Field studies have included geotechnical works, flora and fauna, groundwater, air quality, noise, visual, traffic and Aboriginal heritage investigations, in addition to numerous exploration drilling programmes between September 2008 and October 2014.

Potential impacts associated with dust deposition on crops were determined based on the air quality modelling presented in Chapter 15 and a literature review to determine likely impacts to crops. Remaining impacts and risks were identified based on engagement with relevant stakeholders (refer to Chapter 5, Stakeholder Consultation) and a review of the identified existing and envisaged land use arrangements.

Impacts to land use will occur during construction, operation and closure of the proposed mine. As land use impacts are considered to represent a social issue, the criteria outlined in Table 6-2 have been utilised for categorising the level of land use impact as a result of the construction, operation and closure of the proposed mine.

## 21.3 Existing Environment

This section provides an overview of the existing environment within the proposed mining lease and the surrounding region in relation to land use and management. Existing and envisaged land uses are identified, as well as any easements or known restrictions on the land. Land use surrounding the proposed mining lease is depicted in Figure 21-1.

The Eyre Peninsula is triangular in shape and bound by the Spencer Gulf to the east and the Great Australian Bight to the west. Major townships are located at each point of the triangle; Port Lincoln to the south, Ceduna to the west and Whyalla and Port Augusta to the east. Eleven local government areas are located on the Eyre Peninsula with the proposed mining lease being located entirely within the Wudinna DC.

The Eyre Peninsula is relatively remote and sparsely populated. It is economically driven by primary production activities, including cropping, grazing, fishing and aquaculture. Emerging industries in the region include tourism, mining and renewable energy (Regional Development Australia 2011). The key land uses observed in the region surrounding the proposed mining lease are discussed below.

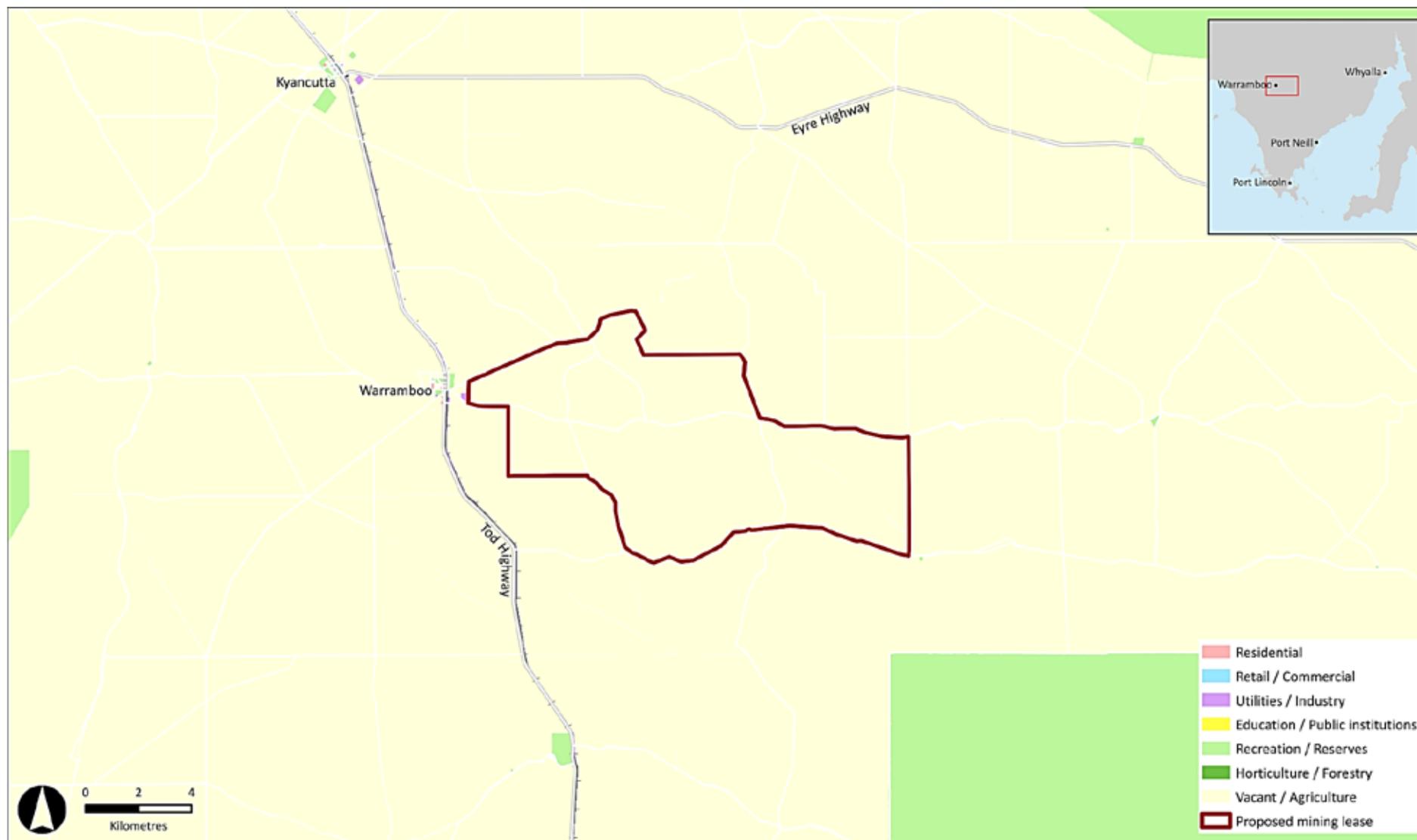


Figure 21-1 Land Use

### 21.3.1 Primary Production and Agriculture

The current use of the land located within the proposed mining lease is dryland farming, including mixed crops such as wheat and barley. The area forms part of the Western Eyre Peninsula Agricultural District which was responsible for a total crop production of 932,850 t in the 2013/14 season (PIRSA 2014).

The Eyre Peninsula as a whole is responsible for the production of more than 45% of South Australia's wheat crop and 20% of its barley crop (Plate 21-1). Annual crop volumes of all grains are in excess of 2.2 Mt, with the value of the agricultural industry exceeding \$450 M (Regional Development Australia 2011).

A range of infrastructure has been established on the Eyre Peninsula to support the ongoing operation of the agriculture industry. Viterra is the principal grain distribution organisation offering a grain storage and handling network throughout South Australia, operating 32 grain handling and storage sites on the Eyre Peninsula, including export facilities at Port Lincoln and Thevenard (Viterra 2013).

Underpinning its importance to the local economy, the overwhelming majority (approximately 75%) of land on the Eyre Peninsula including the land within the proposed mining lease, is utilised for agricultural purposes.



Plate 21-1 Farming Activity near Wudinna

### 21.3.2 Nature Conservation

A number of conservation areas and nature reserves are prevalent across the Eyre Peninsula, covering approximately 14% of the total land mass (refer to Figure 21-2). Those of most relevance to the proposed mine site in respect to proximity are discussed below.

#### Hambidge Wilderness Protection Area

Hambidge Wilderness Protection Area (WPA) (Plate 21-2) is located approximately 3.8 km southeast of the proposed mining lease boundary. It covers approximately 38,000 ha and was proclaimed a WPA under the *Wilderness Protection Act 1992* in 2004, one of the first to be proclaimed on mainland South Australia.

The vegetation of the Hambidge WPA is dominated by mallee, low woodland and shrubland. It receives minimal visitor use, with the majority of visitors entering to visit a viewing point locally known as Prominent Hill (DEH 2007).



Plate 21-2 Hambidge Wilderness Protection Area

#### Heritage Agreement 869

A heritage agreement (HA 869), pursuant to Section 23 of the *Native Vegetation Act 1991* (SA) exists in respect to approximately 260 ha of land in the northern part of the proposed mining lease, as depicted in Figure 21-2. HA 869 (Plate 21-3) is located within sections 25 and 29, hundred of Warramboe (CT 5359/856 and CT 5550/29 respectively) and was established by the landowners for the conservation of native vegetation and native fauna after the land could no longer be utilised for agricultural purposes.

Currently, the condition of native vegetation communities and habitat values within HA 869 are degraded as a result of historic clearance and salinity impacts to the land. Further information on the current condition of and potential impacts to, HA 869, including native vegetation and fauna are discussed in Chapters 12 and 11 respectively.

The HA 869 is binding on all current and future owners of the land; however, the Minister for Sustainability, Environment and Conservation may terminate HA 869 by agreement with the owner of the land and with consent from the Native Vegetation Council. No other heritage agreements pursuant to the Native Vegetation Act exist within or adjoining the proposed mining lease.



Plate 21-3 Vegetation within HA 869

### 21.3.3 Mineral Exploration and Extraction

Mineral exploration across the Eyre Peninsula has been ongoing for decades and the region has been marked as a potential major new iron ore province in Australia. Other minerals such as uranium, graphite, mineral sands and kaolin have also been identified, demonstrating the diversity of commodities discovered (Deloitte 2013).

The Eyre Peninsula is considered highly prospective for mineral exploration and extraction. There are currently a number of advanced mining projects such as Middleback Ranges (Iron Chieftain and Iron Duke). A number of developing projects have been identified by the Department of State Development (DSD) by the Regional Mining and Infrastructure Planning project including the CEIP (refer Plate 21-4), Fusion, Gum Flat, Uley and Poochera (Deloitte 2013).



Plate 21-4 Exploration Drilling within EL 4849



Figure 21-2 Nature Conservation

The proposed mining lease is primarily located within Exploration Licence (EL) 4849, held by Iron Road; however, a small portion of EL 4815 held by Lincoln Minerals Limited encroaches into the south-western corner. As previously indicated in Figure 1-2, the proposed mining lease comprises an area of approximately 8,458 hectares, of which the area within EL 4815 is 77.4 hectares (less than 1% of the total proposed mining lease area).

Pursuant to section 80(2) of the Mining Act, IRD Mining Operations Pty Ltd, as the proponent of the proposed mining lease, has entered into Dual Tenement Agreements with Iron Road Limited and Lincoln Minerals to authorise the application for and the grant of, the proposed mining lease over the respective 'common areas' of EL 4849 and EL 4815.

In addition to the above, the area surrounding EL 4849 is subject to four other exploration licences, two of which are held by companies other than Iron Road. One Petroleum Exploration Licence (PEL) is also in the area with a portion of its northeast boundary crossing into the south of the proposed mining lease boundary. Tenement details are set out in Table 21-1 (SARIG 2015).

**Table 21-1 ELs and PELs Adjoining EL 4849 (as at September 2015)**

Tenement No	Licensee	Granted Date	Expiry Date	Location	Area (km <sup>2</sup> )
EL 4849	Iron Road Limited	9/02/2012	8/02/2017	Warrambo area, approximately 160 km southeast of Streaky Bay	663
EL 5496	Iron Road Limited	13/10/2014	12/10/2016	Lock area, approximately 65 km southwest of Kimba	34
EL 5521	Peninsula Resources Limited	1/12/2014	30/11/206	Caralue area, approximately 40 km southwest of Kimba	520
EL 4815	Lincoln Minerals Limited	21/12/2011	20/12/2015	Nantuma area, approximately 130 km southeast of Streaky Bay	372
PEL 153	Energy Exploration Pty Limited	28/04/2014	27/04/2019	Extends from Elliston to Darke Peak, central Eyre Peninsula	4,593

#### 21.3.4 Townships and Residential Areas

The proposed mining lease does not encompass a town or residential areas although the small township of Warrambo is located approximately 750 m west. The townships nearest to the proposed mining lease boundary are listed in Table 21-2.

**Table 21-2 Proximity of Townships**

Suburb (SSC)	Township(s)	Distance to Proposed Development	Estimated Population*
Warrambo	Warrambo	0.75 km	300
	Kyancutta	13 km	
Wudinna	Wudinna	25 km	557
Lock	Lock	30 km	432
Darke Peak	Darke Peak	43 km	271

\* Population of entire suburb (SSC) as defined by ABS (2013).

### 21.3.5 Land Tenure

The proposed mining lease covers a total area of approximately 8,458 ha (as per a licensed survey undertaken in February 2015 by Alexander Symonds, Surveying Consultants) comprising 11 parcels of land held under freehold title by six separate families within the hundred of Warrambo. A summary of the property ownership details is included in Table 21-3, together with information on known lease arrangements that exist with other parties.

**Table 21-3 Existing Property Ownership**

Ownership	Title Reference	Section ID
Leanne Fay Traeger Leased to Iron Road Limited Sub-leased to CG, CE & T Sampson	CT Volume 5474 Folio 844	Section 12
DK and BM Murphy Nominees Pty Ltd	CT Volume 5328 Folio 6	Section 13
GA Veitch Pty Ltd Leased to L & G Veitch	CT Volume 5945 Folio 769	Section 20
	CT Volume 5184 Folio 280	Section 21
	CT Volume 5429 Folio 702	Section 23
David John Murphy and Wendy Karen Murphy	CT Volume 5971 Folio 434	Section 22
	CT Volume 5255 Folio 886	Section 24
Colin Geoffrey Sampson and Carmen Elizabeth Sampson	CT Volume 5359 Folio 856	Section 25
	CT Volume 5550 Folio 29	Section 29
Daniel John Van de Vorstenbosch and Patricia Kate Van de Vorstenbosch	CT Volume 5391 Folio 108	Section 35
Fred Heath Nominees Pty Ltd	CT Volume 5566 Folio 577	Section 34

### Easements and Restrictions on Land

Two easements exist within the proposed mining lease boundary, both in favour of the ETSA Corporation. The easements are 30 m wide and traverse sections 12 and 13 (CT 5328/6 and CT5474/844) in order to accommodate ElectraNet's 132 kV transmission line from the Yadnarie Substation to Wudinna. The location of easements is shown in Figure 21-3.

To support the development of the proposed mine, electricity infrastructure currently located within the easements will be relocated outside the mining lease boundary by ElectraNet and the easements extinguished. Additional electricity infrastructure (SA Power Networks distribution lines) are located throughout the proposed lease to supply electricity to existing residential properties. This distribution infrastructure will be realigned where required to provide continued supply to existing residences.

### 21.3.6 Future Land Use Change

The proposed mining lease is located within a rural area and is not in close proximity to a town or urban settlement designated for significant growth. Planning policy aims to preserve rural land for agricultural use, therefore it is unlikely that urban land uses would be proposed adjacent to, or at the site in the future. As such, land use change to a more intensive, sensitive use such as residential development is not anticipated in the area surrounding the proposed mining lease. Engagement with Wudinna DC and local landowners has not identified any plans to alter the land use from the existing agricultural activities, beyond the obvious changes that will be required to support the mining operation.

### 21.3.7 Post Mining Land Use

After the completion of mining operations, rehabilitation of land will be undertaken with the intent that as much of the area as practicable will be returned to productive agricultural use. Infrastructure that is useful to support agricultural activity (e.g. roads, rail, water, communications) will be retained on site, while infrastructure considered to be of no future use will be dismantled and removed.

Areas not amenable to agricultural use, such as the mine pit and integrated waste landform (IWL) slopes will be made safe and vegetated where practicable to reduce erosion and impacts to visual amenity. The base case for closure of the IWL is establishment of native vegetation, however, options for agricultural and/or other uses will be investigated during the life of the mine. The pit will remain as a void and, over time, a hypersaline pit lake will form. Refer to Chapter 3 for an overview of the mine closure plan and post mining land use.

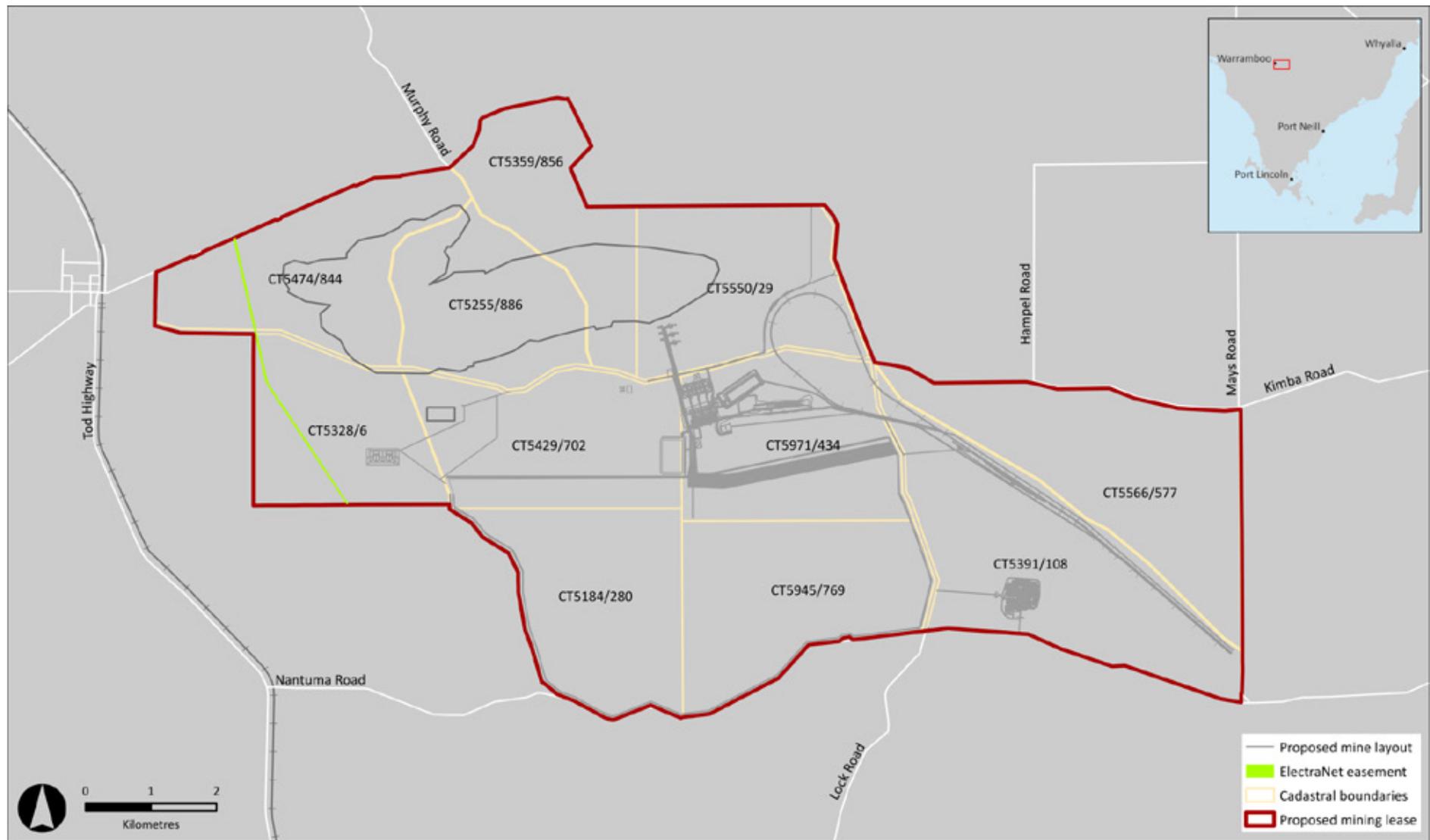


Figure 21-3 Land Tenure and Restrictions

### 21.3.8 Summary of Key Environmental Values

Agriculture is the predominant land use within the proposed mining lease and the ongoing sustainable operation of the region for agricultural purposes is identified as the principal objective in relation to land use and tenure. Reinforcing the importance of agriculture, the proposed mine is located within the Primary Production Zone of the Wudinna DC Development Plan. The Primary Production Zone envisages the long-term development of efficient and sustainable primary production including a mix of cropping and grazing. Mineral exploration and development is anticipated in the Zone, recognising the potential of the region to support mining enterprises.

The area surrounding the boundary of the proposed mining lease is sparsely populated with 53 residential properties identified within a 5 km radius, including those within the Warramboos township located approximately 750 m west of the mining lease boundary.

## 21.4 Context and Views of Affected Parties

Stakeholders relevant to land use and tenure include directly impacted landowners, adjacent and surrounding landowners and communities, the agricultural industry, Wudinna DC and the Eyre Peninsula NRM Board. Some people residing in the Warramboos township and farms in the area have expressed concerns about a possible change in the use of their own land due to the associated potential negative impacts of mining, such as an increase in dust, noise and traffic. Other stakeholders have identified a number of concerns relevant to land use within the proposed mining lease, including:

- Loss of property and livelihood
- The reduction of agricultural production on the Eyre Peninsula
- Residential land supply in Wudinna
- The state of the land following closure
- Loss of amenity and impacts to a rural lifestyle

Impacts and risks relating to the key existing environmental values and the issues identified by relevant stakeholders are discussed in Section 21.7.

All issues raised by stakeholders across the entire CEIP are presented in Chapter 5, Stakeholder Consultation and summarised in Table 5-2. Impacts and risks relevant to each of the existing environmental values associated with land use and tenure and potential issues identified by stakeholders are discussed below and summarised in Table 21-5. All impact events across the entire CEIP are presented in the Impact and Risk Register in Appendix C.

## 21.5 Potentially Impacting Events

Considering the views and contexts of affected parties and the issues identified during technical studies, an assessment of Source, Pathway, Receptor (SPR) has been undertaken, as per the methodology outlined in Chapter 6, Assessment Methodology, to determine which potential impact events are considered applicable to this project. Potential impact events associated with the construction, operation and closure of the proposed mine that have a confirmed SPR linkage which effects land use and tenure include:

- Reduced area of productive land available for agriculture as a result of the mine (IM\_21\_01).
- Post-mining land use is not acceptable to stakeholders (IM\_21\_02).
- Loss of stability in the IWL during construction, operation and closure results in slumping onto surrounding productive land (IM\_21\_03).
- Loss of stability in the IWL post closure results in slumping onto surrounding productive land (IM\_21\_04).

- Land quality reduced off-lease as a consequence of microclimatic changes adjacent IWL (wind, shade) (IM\_21\_05).

The impact and risk register presented in Appendix C provides confirmation of a SPR for each of the potential impact events (PIMs) considered above and therefore follows each through as actual impact events (IMs) with a complete impact and risk assessment. The following was not considered to have a confirmed linkage:

- The establishment of tall structures restricting aerial agricultural practices resulting in lost agricultural productivity (PIM\_21\_02).

The use of aircraft for agricultural purposes has not been observed within the local study area, nor have any concerns been identified by landowners or stakeholders. While the IWL represents a significant vertical element, it is of a similar form to other natural landforms in the area. Other tall built structures will be in the central area of the mine site, well away from adjoining land. Any impact to aerial agricultural operations would be minimal.

A number of impact events that may affect adjoining land use are discussed in other chapters. Most notably, these include:

- Deposition of saline materials running off the IWL results in salinisation of surface soils on the proposed mining lease (IM\_13\_03).
- Seepage from IWL into groundwater increases salinity of groundwater and reduces land quality off the proposed mining lease (IM\_13\_06).
- Deposition of sediments from erosion of slopes of IWL affects productive land off the proposed mining lease (IM\_13\_09, IM\_13\_10).
- Dust deposition from IWL (including salts, metals) on agricultural land off-lease resulting in reduced productivity (IM\_15\_05, IM\_15\_06).
- Contamination of surface water from acid metalliferous drainage on agricultural land (IM\_18\_01).
- Deposition of saline materials running off IWL results in salinisation of surface soils off the proposed mining lease (IM\_18\_04).
- High levels of permeability in IWL leads to localised elevated GW table outside the proposed mining lease and impacts on productive land (IM\_21\_04, IM\_21\_05).

## 21.6 Control Measures to Protect Environmental Values

This section identifies design measures and management or control strategies which will be implemented to mitigate the level of impact and risk associated with land use and tenure such that it is considered to be ALARP.

### 21.6.1 Design Measures

The following design control measures have been incorporated to minimise impacts and risks to land use and tenure as a result of the construction, operation and closure of the proposed mine:

- The final proposed IWL design requires significantly less land (approximately 3,000 ha less) than the preliminary tailings storage and waste rock facility designs considered, resulting in a reduced requirement for loss of agricultural land.
- Air quality and dust management design measures as described in Chapter 15 Air Quality, to minimise dust deposition on cropping land and residential properties surrounding the proposed mining lease.
- Noise and blasting design measures as described in Chapter 16 Noise, to minimise noise emissions affecting the amenity of surrounding residential properties.

- Traffic management design measures as described in Chapter 8 Traffic, to minimise conflict with existing agricultural operations on local roads associated with the movement of stock and heavy machinery.
- Surface water management design measures as described in Chapter 18 Surface Water, to minimise runoff and the transport of saline material that may reduce the quality of land in surrounding agricultural properties.

### 21.6.2 Management Strategies and Commitments

In order to minimise and mitigate impacts to surface water during construction, operation and closure activities, control and management strategies would be incorporated into the PEPR and implemented for relevant project phases. Key control and management strategies are outlined in Table 21-4.

Table 21-4 Control and Management Strategies: Land Use and Tenure

Control and Management Strategies	Project Phase
Develop and implement a soil management programme to manage soil compaction, loss of topsoils and subsoils and loss of soil quality as outlined in Chapter 13.	Construction, Operation, Closure
Air quality and dust management measures to minimise dust emissions as outlined in Chapter 15.	Construction, Operation, Closure
Noise and blasting management measures to minimise noise emissions as described in Chapter 16.	Construction, Operation, Closure
Traffic management measures to support the safe and convenient movement of vehicles in the region as described in Chapter 8.	Construction, Operation, Closure
Water management strategies to restrict the spread of saline water as outlined in Chapter 18.	Construction, Operation, Closure
Implementation of management measures outlined within the conceptual IWL design for rehabilitation and closure to minimise impacts on surrounding landscape, including: <ul style="list-style-type: none"> <li>• Undertaking progressive rehabilitation wherever practicable to stabilise the IWL and reduce risk of erosion and visual impacts.</li> <li>• Undertaking rehabilitation trials during operation to determine optimal rehabilitation strategies, including the potential for cropping the upper flat surface.</li> <li>• Methods for integrating the final IWL into the broader landscape.</li> <li>• Trials and modelling to demonstrate that the final IWL is resilient and sustainable (physically and biologically).</li> </ul>	Construction, Operation, Closure

## 21.7 Impact and Risk Assessment

This section identifies and assesses impact and risks associated with existing land use and tenure values as a result of the construction, operation and closure of the proposed mine. Impact events (confirmed by presence of a SPR) are those which are predicted to occur as a result of the development, whilst risk events would not be expected as part of the normal operation of the project, but could occur as a result of uncertainty in the impact assessment process. Although the risks may or may not eventuate, the purpose of the risk assessment process is to identify management and mitigation measures required to reduce the identified risks to a level that is ALARP. This assessment has been undertaken in accordance with the methodology outlined in Chapter 6.

Impact and risk events were identified through technical studies and stakeholder consultation. Impact events can include multiple SPR and where practical have been grouped together to minimise duplication of information. Risks are events that would not be expected as part of the normal operation of the project, but could occur as a result of either uncertainties with the impact assessment, or as a result of faults, failures and unplanned events. A summary of impact and risk events relating to land use and tenure is presented in Table 21-5 at the end of this section (with Impact IDs). A complete register of impact and risk events by source, pathway and receptor is provided in Appendix C.

Impacts and risks are assessed following the application of the design measures outlined in Section 21.6. Where required, management measures are proposed to reduce the impact to a level that is ALARP. Through the adoption of design modification or specific mitigation measures, all identified impacts and risks were categorised as medium or lower and considered to be ALARP. The key environmental risks would be monitored through the environmental management framework.

### 21.7.1 Reduced Area of Productive Land Available for Agriculture

As the predominant land use in the area is agricultural, changing the land use to mining will result in the loss of productive agricultural land within the proposed mining lease. Areas that can be rehabilitated for agricultural use will be lost on a temporary basis for the life of the mine, whilst 5,174 ha will be lost on a permanent basis. The permanent loss of productive land will occur in areas unable to be rehabilitated, such as the mine pits and the IWL. Temporary loss of land will occur in areas designated for agricultural rehabilitation, such as internal roads, hardstand areas and the processing facilities. Refer to Chapter 3, Proposed Mining Description, for an overview of the mine closure concept. Some areas within the proposed mining lease not required by Iron Road may be made available to local farmers for cropping and / or grazing which will support the continued operation of land in accordance with established land management practices. However, any areas available for agricultural purposes will not be determined until after the commencement of mining.

Further loss of productive agricultural land will occur due to other components of the CEIP (e.g. railway line, port). Combined, the proposed CEIP Mine and CEIP Infrastructure will result in the permanent loss of approximately 7,050 ha of productive agricultural land, less than 0.2% of all productive land in the Eyre Peninsula NRM Region (DWLBC 2003). Additionally, the proposed mine is located in the northern portion of the Eyre Peninsula where rainfall and crop productivity are lower than in the south. As such, the overall loss of productive agricultural land and subsequent reduction of supply in agricultural products is considered to represent a **negligible** impact to the overall agricultural industry and is not considered to adversely affect the sustainability of the agricultural industry on the Eyre Peninsula.

The extent of the proposed mining lease has been selected to ensure that it adequately meets the needs of Iron Road for its mining and processing operations and it is not expected that additional land will be required. It is, however, considered **possible** that minor boundary changes could occur, but the consequence of any such changes on agricultural production would be insignificant. The overall risk is therefore considered to be **low**.

### 21.7.2 Post Mining Land Use is Not Acceptable to Stakeholders

The overall objective for closure of the proposed mine is to leave the site in a state that requires no ongoing obligations or maintenance. Where practicable, the land will be rehabilitated for agricultural purposes and returned to a productive use. A permanent loss of productive land will occur in areas unable to be totally rehabilitated, such as the open pits and slopes of the IWL. The overall site will be made safe, as described in the public safety chapter and the IWL progressively rehabilitated. Some infrastructure such as access roads or hardstand areas may remain in place following closure of the mine if they are beneficial for future land users. Post-mining land use is likely to be similar to current land use practices, with the exception of 5,174 ha of lost productive land (the mine pits and the IWL) that is unable to be rehabilitated. Consequently, post-mining land use is expected to be compatible with local land use and the impact of the above impact event is considered to be negligible.

The overarching objective for closure of the mine is to leave the area in a state that minimises ongoing obligations or maintenance and rehabilitate as much of the land as practicable for agricultural purposes. Despite this, there is some uncertainty that areas within the final landform at the mine site will be capable of supporting the envisaged closure usage. If failure were to occur, the consequences are considered to be **moderate**, localised to the mine site and able to be remediated in the long term. As previously outlined, rehabilitation trials will be progressively undertaken during operations to determine preferred rehabilitation strategies on the various landforms present at the mine site upon closure. As such, the likelihood of widespread failure of rehabilitation in mine closure is considered to be **unlikely**. As such, the risk associated with an unsuccessful rehabilitation strategy is **medium**.

### 21.7.3 Loss of Stability of Integrated Waste Landform

The IWL is proposed to be located in the southern part of the proposed mining lease, adjacent to a number of agricultural properties thereby representing a significant alteration to the existing landform. Failure of the embankments, or final landform could result in the slippage of the landform onto adjacent agricultural properties, reducing the total area of available productive land. The IWL has been designed based on the physical properties of the existing landscape in accordance with standard industry practice. A regular inspection programme will be implemented to identify any faults or failures within the structure. As such, a structural failure or collapse of embankment during construction, operation or closure resulting in the loss of productive land is not anticipated to occur and is therefore considered to represent a **negligible impact**.

Post-closure, the IWL is expected to be inherently stable which is discussed further in Chapter 7 Public Safety and Appendix S. Again a **negligible** impact is expected.

A structural failure of the IWL could potentially occur as a result of surface water erosion, wind erosion, poor consolidation of material, seismic events or through poor design. The geotechnical stability of the IWL during construction and operation was considered in Appendix S. This is important to Iron Road as the IWL needs to support the waste spreader and conveyor equipment. The assessment confirms the proposed design has an adequate factor of safety. In the event that a minor structural failure should occur during construction, operation or closure, the consequences are considered to be **minor**, with reparable damage to third party property. Given the design standards and the inspection programme to be implemented, a minor structure failure of the integrated landform affecting adjoining property is considered to be **unlikely**. As such, the overall risk to adjacent property associated with a structural failure of the IWL is considered to be **low**.

Long term erosion modelling has been undertaken to confirm the stability of the IWL (Appendix S) and this will be verified by trials during operation and closure. As such, if a structural failure occurred post closure, impacts on adjoining land would again be **minor**. Such an event would continue to be **unlikely** given the stability of the landform would have been further tested and modified if necessary, during operation and closure. Consequently, the risk is considered to be **low**.

The implications of landform slippage on public safety are discussed in Chapter 7.

#### 21.7.4 Shading of Adjacent Agricultural Land

Once fully established, infrastructure within the area of the mining lease (in particular the IWL) will represent significant vertical elements within the landscape. The IWL is adjacent to agricultural properties which rely on sufficient access to sunlight for crop growth. The extent of shadowing on adjoining properties was determined based on the sun position during winter (21 June) and summer (21 December). The winter sun position represents the worst case scenario with regard to maximum extent of shadowing, whilst the summer sun position represents the best case scenario and minimum extent of shadowing.

In summer between the hours of 9 am and 3 pm the majority of shading from the IWL is predicted to occur within the mining lease boundary (refer Figure 21-4). Agricultural land within an area of approximately 500 m west of the IWL will be shaded for more than an hour per day during summer. During winter some shading of adjacent properties outside of the area of the mining lease will occur at all times. At 9.00 am, shadowing would extend approximately 500 m west and 300 m south of the IWL. At 12.00 pm, the effect of shadowing will be minimal, extending approximately 100 m south. At 3.00 pm, shadowing effects will extend approximately 250 m southeast of the IWL, including land to the east of the boundary of the mine. Small areas of land located south of the IWL will be completely shaded in winter. The extent of daily winter shading is depicted in Figure 21-5. Areas outside of the mining lease boundary will be permanently shaded by the IWL between 9 am and 3 pm in winter.

Shading can affect crop productivity. However, the success or otherwise of crops is more likely to be dominated by factors of rainfall, soil type and management such as fertiliser, herbicide and pesticide application. This is consistent with general farming knowledge and observations of crop success in the shadow of Darke Peak (a local +200m high steep-sided hill) (pers. comm. T. Scholz). While any reduction in crop yield may be small, it still represents a long-term negative change to agricultural land within the local study area and is therefore rated as a **medium impact**.

The final IWL may differ in shape to the landform modelled for shadow impacts as the closure concept is refined throughout the life of the mine. As such, shadow impacts may differ from those presented above. As the overall height and footprint of the IWL are not anticipated to change, the consequences of an altered landform shape are considered to be **minor**, with effects to neighbouring properties able to be rectified. It is considered **unlikely** that the final IWL will result in a discernible change to predicted shadow impacts as the model was based on the maximum vertical and horizontal profile of the proposed landform. As such, the overall risk is considered to be **low**.

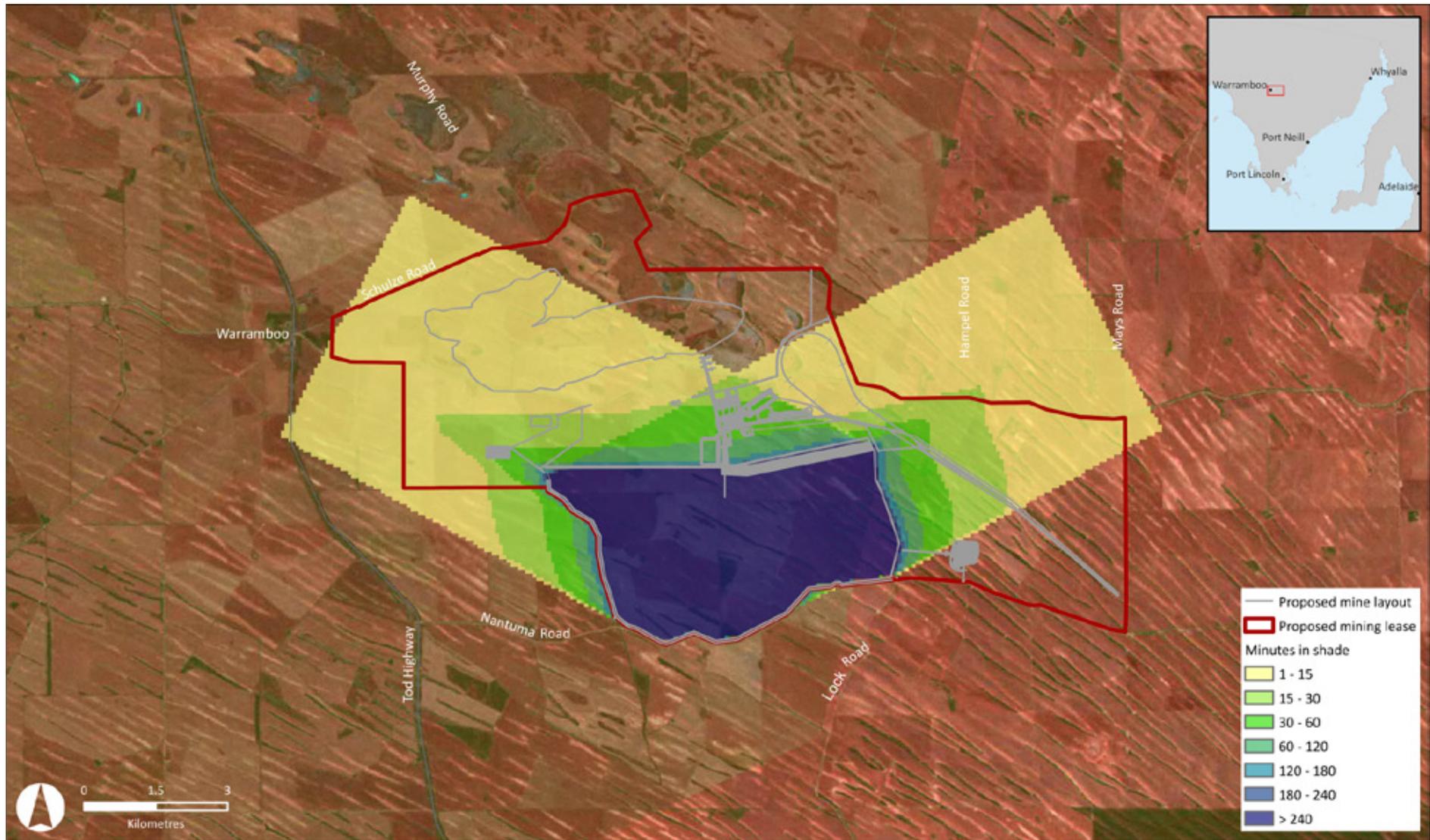


Figure 21-4 Extent of Shading Predicted to be Caused by Integrated Landform (summer)

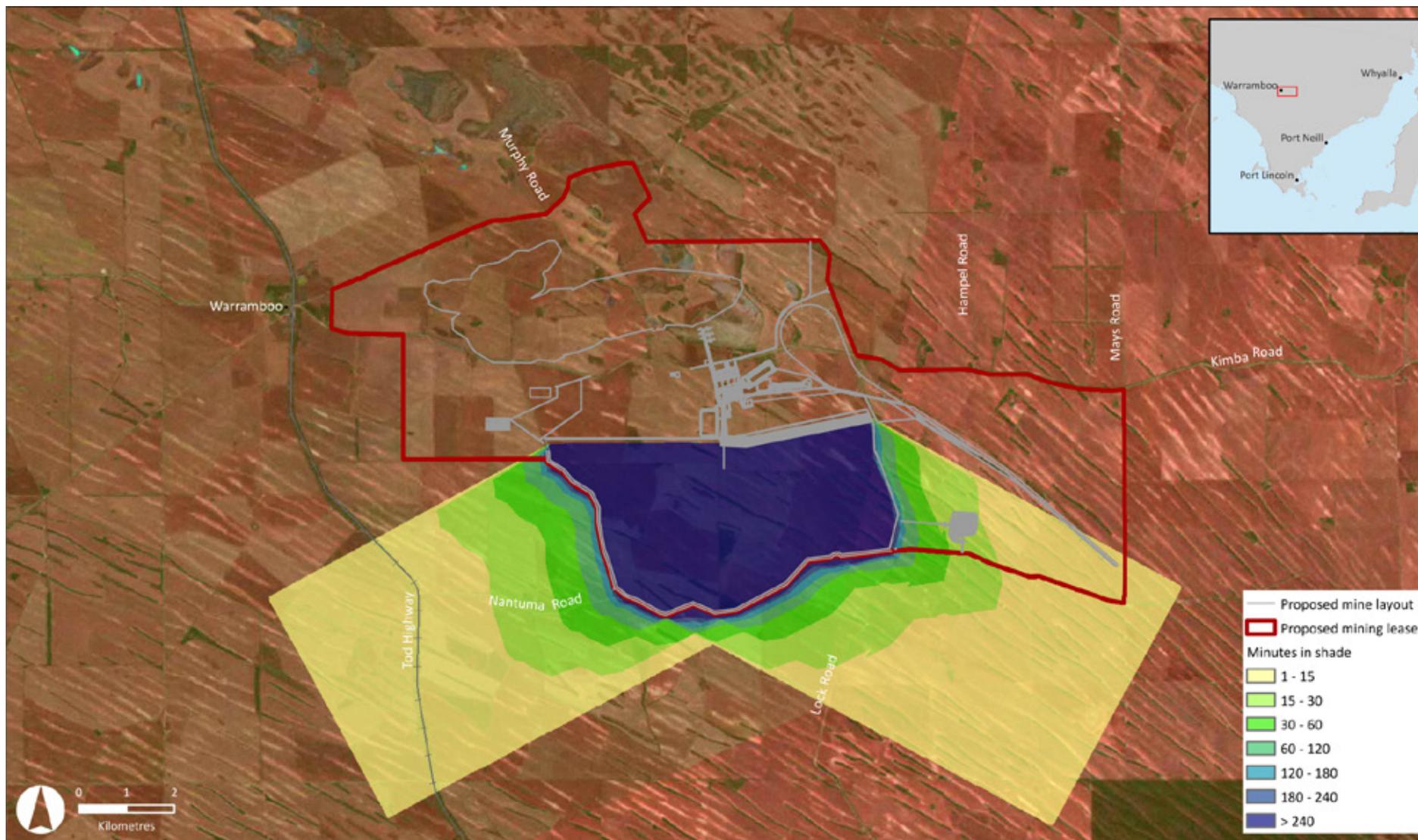


Figure 21-5 Extent of Shading Predicted to be Caused by Integrated Landform (winter)

### 21.7.5 Summary of Impacts and Risks

With the implementation of design and management measures, all residual impacts have been categorised as medium, or negligible. Similarly, all risks have been reduced to a level of medium or lower. The impacts and risks were considered to be ALARP and not warrant further specific control measures other than the environmental management controls and measures outlined here. A summary of each of the identified impacts and risks associated with land use and tenure at the proposed mine site are presented in Table 21-5.

Table 21-5 Impact and Risk Summary: Land Use and Tenure

Impact ID	Impact Event	Level of Impact <sup>1</sup>	Level of Risk <sup>2</sup>
IM_21_01	Reduced area of productive land available for agricultural land as a result of mine.	Negligible	Low
IM_21_02	Post mining land use is not acceptable to stakeholders.	Negligible	Medium
IM_21_03	Loss of stability in the IWL during construction, operation and closure results in slumping onto surrounding productive land or vegetation.	Negligible	Low
IM_21_04	Loss of stability in the IWL post closure results in slumping onto surrounding productive land or vegetation.	Negligible	Low
IM_21_05	Land quality reduced off-lease as a consequence of microclimatic changes adjacent IWL (wind, shade)	Medium	Low

<sup>1</sup> Impact events are expected to occur are part of the project. Level of impact is assessed post control strategies, as per the impact assessment methodology provided in Chapter 6.

<sup>2</sup> Level of risk reflects the risk that the assessment of impact is incorrect due to uncertainties in the assessment method, the control strategies, or in assumptions used. Risk is assessed post control strategies, as per the risk assessment methodology provided in Chapter 6.

#### Justification and Acceptance of Residual Impact and Risk

With the implementation of design and operational management measures, all impacts associated with land use and tenure are considered to be **negligible**, other than shading from the IWL. The medium risk rating reflects that this is a small but long-term off-lease impact. Similarly, all risks have been reduced to a level of **low** or **medium**. The impacts and risks are considered to be ALARP.

## 21.8 Proposed Outcomes

In accordance with the methodology presented in Chapter 6, outcomes have been developed for all impact events with a confirmed linkage between SPR. Each outcome is supported by measureable assessment criteria that will be used to assess compliance against the proposed outcomes during the relevant phases (construction, operation, closure) of the mine. Proposed outcomes and measurement criteria have been developed for each of the impact events identified with a confirmed linkage and these are presented in Table 21-6.

Table 21-6 Outcomes and Assessment Criteria: Land Use and Tenure

Proposed Outcome	Impact ID	Impact Event	Draft Outcome Measurement Criteria	Draft Leading Indicator Criteria
Agricultural production continues to occur on land within the proposed mining lease where this does not compromise mining and associated activities.	IM_21_01	Reduced area of productive land available for agricultural land as a result of mine.	Annual review of land use within the proposed mining lease during construction, operation and closure demonstrates it is not reasonably practicable (e.g. for security or safety reasons) to allow more land to be leased for agricultural purposes.	None proposed
All land on the proposed mining lease affected by mining and associated activities is progressively rehabilitated to achieve the agreed post mining land use.	IM_21_02	Post mining land use is not acceptable to stakeholders.	Independent audit at mine completion demonstrates all reasonable actions have been taken to maximise the area of land within the proposed mining lease that can be returned to agricultural use, where this use has been agreed with stakeholders.  As progressive rehabilitation occurs, independent audit of rehabilitated portions of the proposed mining lease confirm they are suitable for the agreed post mining land use.  Independent audit at mine completion confirms all land within the proposed mining lease is suitable for the agreed post mining land uses.	None proposed
No adverse impacts on adjacent land use or unauthorised damage to public or private property and infrastructure due to geotechnical failure of the IWL during construction, operation and closure.	IM_21_03	Loss of stability in the IWL during construction, operation and closure results in slumping onto surrounding productive land or vegetation.	Monthly review of quality assurance data confirms the IWL has been constructed to design specifications.  Monthly physical examination of IWL shows slumping has not occurred onto adjoining land.	None proposed
IWL is geotechnically stable and safe.	IM_21_04	Loss of stability in the IWL post closure results in slumping onto surrounding productive land or vegetation.	Ecosystem Function Analysis at representative sites on rehabilitated areas demonstrates that rehabilitation will achieve sustainability thresholds.  Landform modelling based on established IWL material parameters and geometry confirms alignment with outcomes from conceptual modelling.  Independent audit at mine completion of quality assurance data confirms the IWL has been constructed to design specifications.	None proposed
No impacts to	IM_21_05	Land quality	Crop yields on areas outside of the	None proposed

Proposed Outcome	Impact ID	Impact Event	Draft Outcome Measurement Criteria	Draft Leading Indicator Criteria
agricultural productivity for third party land users as a result of mining operations, including: <ul style="list-style-type: none"> <li>• reduction in crop yield;</li> <li>• reduction in grain quality; or</li> <li>• adverse health impacts to livestock other than where agreed between the tenement holder and the affected user.</li> </ul>		reduced off-lease as a consequence of microclimatic changes adjacent IWL (wind, shade).	proposed mining lease are comparable with adjacent properties or compensation is duly paid.	

## 21.9 Findings and Conclusion

Impacts to land use and tenure within the boundary of the proposed mining lease and the local study area are expected as part of the proposed development. Impacts include the loss of property for directly-affected landowners and the loss of productive agricultural land.

Risks to land use will be alleviated wherever possible through the implementation of control and management strategies. The key risk identified in relation to land use and tenure was the potential for the desired post-mining land uses to be not achieved to the satisfaction of stakeholders.