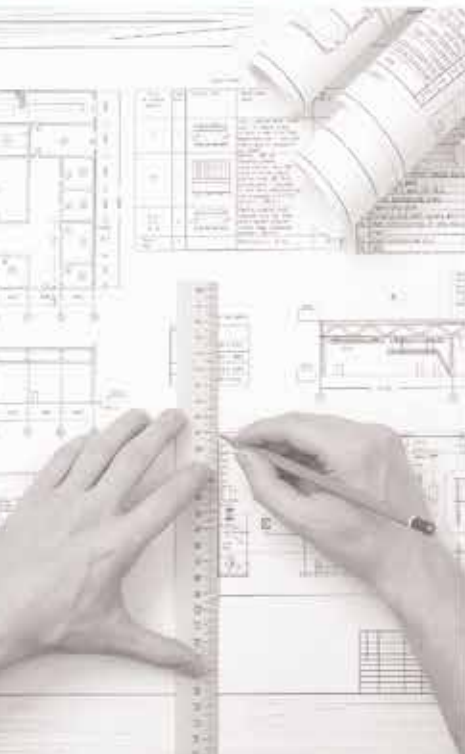
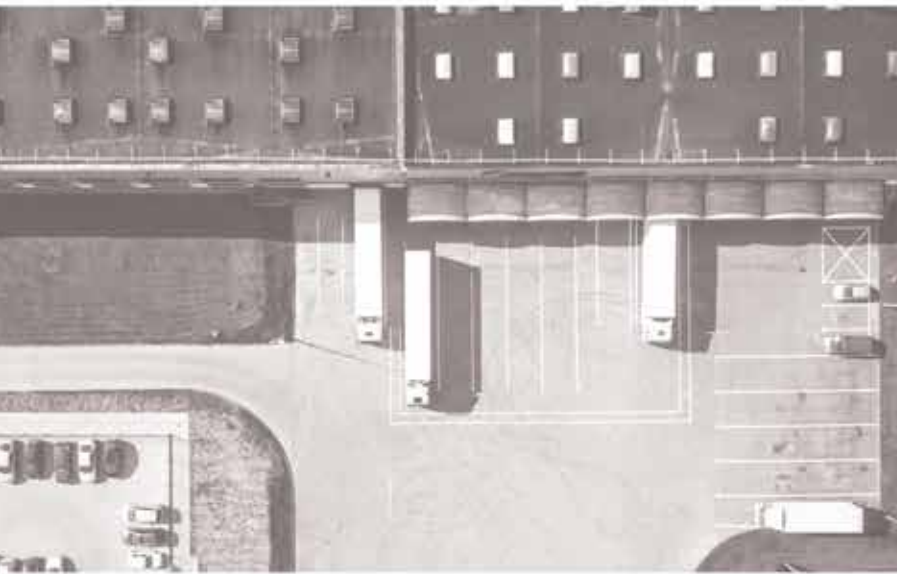




Appendix E

Visual impact assessment



Visual Impact Assessment

Area 1 of Narran-Warrambool Reserve

Prepared for DRNSW
March 2022

EMM Sydney
Ground floor, 20 Chandos Street
St Leonards NSW 2065

T 02 9493 9500
E info@emmconsulting.com.au

www.emmconsulting.com.au

Visual Impact Assessment

Area 1 of Narran-Warrambool Reserve

Report Number

J210043 VIA 1

Client

DRNSW

Date

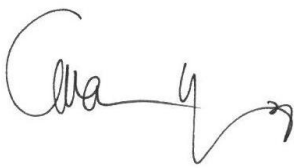
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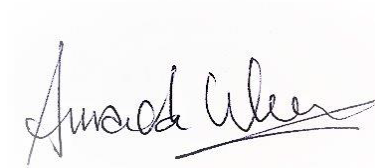
v1 Final

Prepared by

Approved by



Allan Young
National Technical Leader, Urban and Regional Planning
17 March 2022



Amanda Weston
Associate Director
17 March 2022

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

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Executive Summary

The assessment of the visual impacts of opal prospecting and mining for the purposes of this visual impact assessment is limited to activities which are predominantly conducted underground. There are certain works undertaken, and plant installed, above ground and the most prominent of these is the creation of mullock heaps.

The local receptors for any visual effects associated with opal prospecting and mining are mainly the occupants of rural residences and to a lesser extent the people using community or recreational facilities, tourist destinations and the occupants of vehicles on local roads or travelling stock routes.

The assessment has considered the relative sensitivities for the various receptors, and the potential visual effect of the prospecting and mining activities, and established the distance at which the visual impact should be considered to be adequately ameliorated by intervening landscape features and remoteness from the mining activity.

This has allowed a mapped area to be identified where, based on visual impact, mining and prospecting activity should be constrained. The recommended distances are:

Table ES1 Recommended setback distances

Receptor type	Linear, point or area	Recommended minimum 'set back' distance
Residential dwelling	Point	1 km
Community facility; commercial accommodation	Point	1 km
Recreational destination	Point; area	1 km
Travelling stock reserve	Area	500 m
Public road	Linear	200 m
Broadacre rural land (farm outbuildings)	Point	200 m

The constraints map in this visual impact assessment is based on the premise that the conditioning of a licence or lease to address visual impacts should be simple, easy to enforce and within the means of most applicants. This means that it is possible to consider the visual impacts of opal prospecting and mining within the constraints area, but only if those activities are (a) subject to separate assessment and (b) subject to more specific licence or lease conditions to address the increased risk of visual impact on local receptors.

The visual impact assessment also considers the impact of opal prospecting and mining activities on the Dark Sky region of NSW. The assessment found that there is little risk of glow impacts on astronomical observation, assuming normal mining practices, and that some minor conditions should nevertheless be included to ensure that night sky darkness is preserved.

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1 Introduction

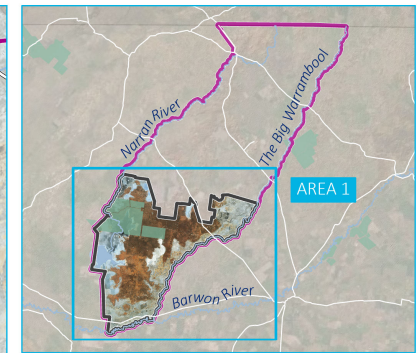
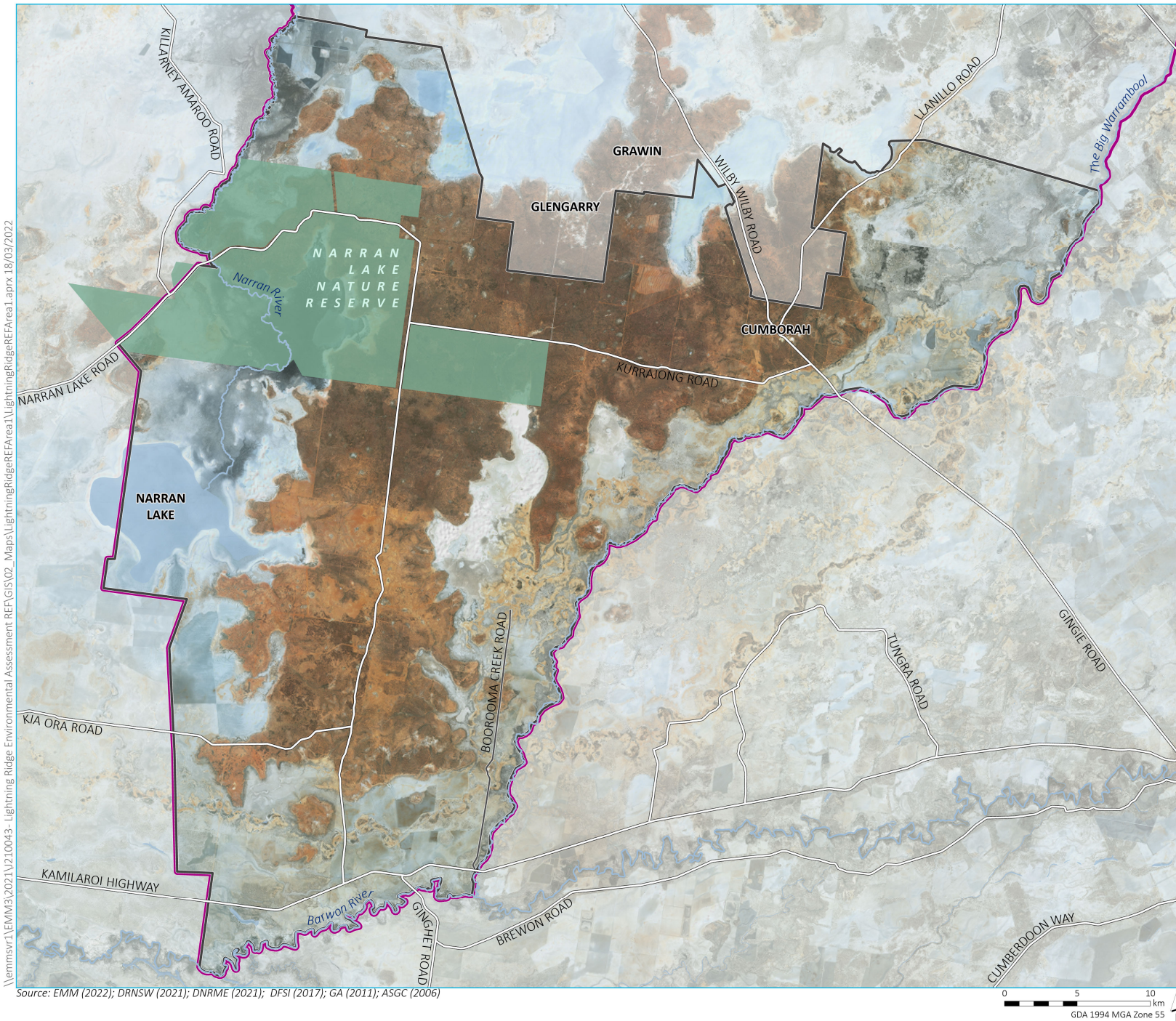
1.1 Background and context

This visual impact assessment (VIA) considers the visual impact of specific activities associated with opal prospecting and mining within Area 1 of the Narran-Warrambool Reserve (NWR).

The activities assessed are:

1. Opal prospecting by the following methods:
 - shaft sinking;
 - auger drilling;
 - percussion drilling; and
 - SIROTEM.
2. Opal mining by an underground tunnelling method.
3. Mullock stockpiling.

Area 1 of the NWR is generally the southern third of the NWR and is shown in Figure 1.1.



- KEY**
- Area 1
 - ▭ Narran- Warrambool Reserve
 - Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Named waterbody
 - NPWS reserve

Area 1
Narran-Warrambool Reserve

Review of Environmental Factors
Figure 1.1

2 Approach and methodology of assessment

2.1 Purpose

The visual landscape is important because it provides:

- a public good;
- a setting for the day-to-day lives of local communities;
- habitat for flora and fauna;
- a sense of place; and
- opportunities for aesthetic enjoyment.

A visually attractive landscape can also provide economic benefits through recreation and tourism, plus indirect benefits to health and wellbeing.

Projects are also important to communities and local economies, and there is generally some visual effect arising from development because it typically generates a new element in the landscape. Not all development has a negative visual impact and not all impacts are unacceptable. There is a need to consider the extent to which the proposed development integrates or contrasts with the local landscape, and the extent to which sensitive receptors in the vicinity will be affected by the proposed development.

The purpose of this VIA is to understand the likely interactions between the project and visual receptors in the vicinity.

2.2 Study method

This assessment has been prepared consistent with the *Guidelines for Landscape and Visual Impact Assessment*, prepared by the Landscape Institute and the Institute of Environmental Management and Assessment (2013).

The VIA needs to establish the existing nature of the landscape and visual environment. This includes the range of authorised uses which have modified the environment, such as roads, resource extraction, infrastructure etc, as well as the natural environment.

Importantly, the VIA seeks to assess only the proposed project activities, not legacy issues or the impact of historical practices. All existing infrastructure, including roads and agricultural facilities, form part of the base case.

In the following sections we consider the visual effect of the proposed development, before synthesising that information to assess the overall visual impact of the project.

The stages of the assessment are:

- describe the existing environment surrounding the project area and establish a visual catchment;
- identify and evaluate the visual effect of the project;
- identify and evaluate the visual sensitivity within the existing environment;
- integrate the consideration of visual effect and visual sensitivity findings; and
- consider feasible mitigation measures.

When assessing the visual impacts of a proposed project, there are two high-level variables to be considered:

- the visual effect; and
- the sensitivity of the receptors to the visual effect.

Visual effect is concerned with the development or activities and the extent to which they will contrast to or integrate with the existing landscape. It considers the size or scale of the change, the duration of the change, and reversibility of the change. It also considers design elements such as form, shape, texture and line relative to the host landscape.

Visual sensitivity is concerned with the people or locations likely to have visibility of the development. It considers the nature of the receptors and considers factors such as the planar distance between the receptor and the proposed development, relative elevations, the relationship of the receptor to the development, and any intervening or mitigating factors such as vegetation.

When combined, those two variables determine the significance of the overall visual impact.

In order to retain a level of objectivity, the method includes a series of tables which allow the impact of the development to be assessed against key factors. These tables and rationale are presented below.

2.2.1 Evidence gathering and understanding the locality

The travel restrictions associated with the COVID-19 public health orders have constrained the ability for site visits.

The author has the benefit of earlier opportunities to assess the visual landscape in and around Lightning Ridge (in October 2019).

Virtual evidence gathering has also been used via satellite imagery and Google street view.

2.3 Visual effect

Three factors are considered when evaluating the visual effect:

- contrast;
- integration; and
- the magnitude of the change.

Hence, a development which occupies a significant portion of a primary view, but which has high integration and low contrast within the landscape, may nevertheless have a low visual effect.

On the other hand, a development occupying only a minor proportion of a primary view but which exhibits high contrast and low integration may have a higher visual effect.

Contrast and integration are the ‘visual properties’ of the proposed development. The effect of the two visual properties can, however, only be known once we establish how much of the landscape is occupied by the proposed development, the duration and reversibility of the change. The measurement of magnitude is concerned with the size and scale of the development relative to other landscape elements, and whether there will be a complete loss of a particular characteristic of the landscape or simply a minor change.

2.3.1 Contrast

Table 2.1 Contrast

Category	Meaning
High	The scale, form, line, colour or texture of the proposed development do not reflect, borrow from or complement the existing visual landscape.
Moderate	The scale, form, line, colour or texture of the proposed development include some key elements which reflect, borrow from or complement the existing visual landscape.
Low	The scale, form, line, colour or texture of the proposed development extensively reflect, borrow from or complement the existing visual landscape.

A high contrast is less favourable than a low contrast.

2.3.2 Integration

Table 2.2 Integration

Category	Meaning
High	The existing visual landscape remains the dominant visual character because the design, siting, screening or filtering of the development makes it the recessive element.
Moderate	The existing visual landscape remains the dominant visual character, but the design, siting, screening or filtering of the development only achieves partial integration.
Low	The existing visual landscape is dominated by the development.

A high level of integration is more favourable than a low level of integration.

Once we understand the visual properties, the next step is to consider the size and sale of the proposed development.

2.3.3 Magnitude

Table 2.3 Magnitude

Category	Meaning
High	A substantial change due to total loss of elements, features or characteristics of the host landscape; and represents a generally permanent and irreversible change. Size and scale are strongly inconsistent with other landscape elements.
Moderate	A discernible change due to partial loss of elements, features or characteristics of the host landscape; and represents a generally medium-term change (less than 10 years) and landscape recovery is expected. Size and scale are moderately inconsistent with other landscape elements.
Low	An insubstantial change due to alteration of elements, features or characteristics of the host landscape; and represents a generally medium-term change (less than 10 years) and landscape integrity is broadly retained. Size and scale are consistent with other landscape elements.

A low level of magnitude is more favourable than a high level of magnitude.

2.3.4 Overall effect

It is necessary to consider the two visual properties – contrast and integration – plus the magnitude of the landscape change, in order to rank the overall visual effect.

Table 2.4 provides a simple matrix to consider the interplay between those factors. The grey boxes contain the visual effect classifications.

Table 2.4 Overall effect

Visual properties		Magnitude		
Contrast	Integration	High	Moderate	Low
High	Low	High effect	High-moderate effect	Moderate effect
High	Moderate	High effect	Moderate effect	Moderate-low effect
High	High	High effect	Moderate effect	Low effect
Moderate	Low	High effect	Moderate effect	Moderate effect
Moderate	Moderate	Moderate effect	Moderate effect	Moderate-low effect
Moderate	High	Moderate effect	Moderate effect	Low effect
Low	Low	High effect	Moderate effect	Low effect
Low	Moderate	High-moderate effect	Moderate effect	Low effect
Low	High	Moderate effect	Moderate-low effect	Low effect

Note that the visual effect is not the same as the visual impact. In order to understand the impact, we not only need to understand the visual effects associated with the proposed development, but also the visual sensitivity of local receptors to a landscape change as described by the visual effects. In short, visual effects describe the characteristics of the source and visual sensitivity describes the characteristics of the receivers.

2.4 Visual sensitivity

The ranking of visual sensitivity depends on how critically the change to the landscape is likely to impact the people living at or visiting locations from which a primary view is available to the proposed development.

Not all places where a view is possible will have residents or visitors. Those locations that do have residents or visitors also are not equal in terms of the likely duration of the view (for example from a moving vehicle versus from a living room), the number of people experiencing the view, or the importance of the amenity or view integrity to the viewpoint. In this respect, the primary view from a residential dwelling or a tourist lookout will have a higher sensitivity than a remote agricultural or forestry location.

A primary view is defined as being an arc created by sight lines from a standing human radiating out vertically and horizontally at angles of 30 degrees around the centreline of the line of sight towards the proposed development. It is recognised that views do exist beyond the 30 degree arc but this is, by convention, considered the most important part of a view. Generally, the closer to the development, the more of the view that is occupied by the proposed development.

The table used to rank the relevant local sensitivities is provided in Table 2.5.

Table 2.5 Visual sensitivity level

Land use	Less than 200 m from the development	Between 200 m and 500 m from the development	Between 500 m and 1 km from the development	More than 1 km from the development
Residential dwelling	High	High/moderate	Moderate	Low
Community facility or commercial accommodation	High	High/moderate	Moderate	Low
Designated lookout, picnic site or recreational destination	High	Moderate	Low	Low
Travelling stock reserve	Moderate	Moderate	Low	Low
Public road	Moderate	Low	Low	Low
Broadacre rural land	Low	Low	Low	Low

2.5 Visual impact

Visual impact is an aggregation of the above factors.

The broad categorisation is the summary of overall visual effect and visual sensitivity. If a receptor has no feasible line of sight, or a line of sight which is sufficiently distant or obscured to be trivial or inconsequential, then the visual impact is said to be 'nil'.

2.6 Visibility of activities

Nominally, this VIA considers the visual impact of prospecting, mining and mullock stockpiling within Area 1 of the NWR.

Noting, however, that the only form of mining considered is underground mining, the visual impact (setting aside the issue of mullock heaps which are separately considered) the only visible elements of underground mining will be the surface infrastructure and plant, such as a mechanical hoist.

Similarly, the visible elements of prospecting activities relate only to the installation of any surface plant or equipment.

Mullock stockpiles are the main element of the proposed activities which may impact the visual landscape.

2.7 Study area

The Study Area represents the area within which the majority of potential views of the project may be located.

As this review of environmental factors (REF) is considering opal prospecting and opal mining activities across all of Area 1, then Area 1 is nominally the Study Area for the proposed activities.

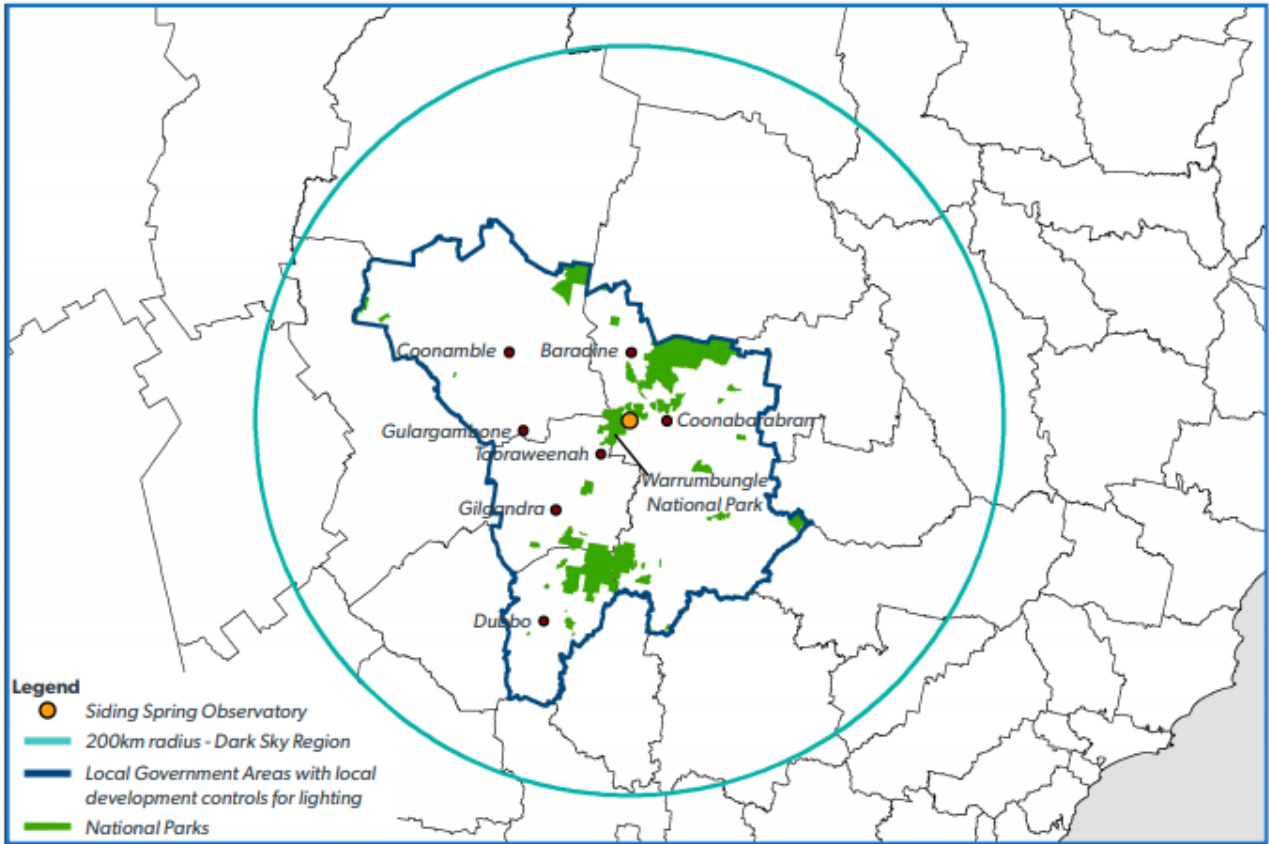
2.8 Night lighting

Area 1 is partly within the region, being a 200 km radius around Siding Spring Observatory, Coonabarabran, to which the NSW *Dark Sky Planning Guideline* (DPIE, 2016) applies. Refer to Figure 2.1.

The *Dark Sky Planning Guideline* informs the consideration of light spill from activities which may impact the activities at observatories or star-gazing. The main astronomical observatory is at Siding Spring, near Coonabarabran.

The proposed activities are small scale and unlikely to generate light spill which could conceivably increase skyglow.

The visual impact on observatories and star-gazing is therefore considered negligible. It is not assessed further in this VIA. Suggested management measures are outlined in Section 8.2.



Source: Dark Sky Planning Guideline (DPIE, 2016)

Figure 2.1 Dark Sky Planning Region

3 Site context and existing environment

3.1 Introduction

The 'state of play' in terms of the landscape and visual context needs to be described prior to considering the visual effect and impacts of the proposed development on that current setting.

3.2 Land use zoning

Land within Area 1 is zoned under Brewarrina LEP and Walgett LEP as either E1 National Parks and Nature Reserves (for Narran Lake Nature Reserve) or RU1 Primary Production.

The objectives for land zoned RU1 under Walgett LEP are:

- to encourage sustainable primary industry production by maintaining and enhancing the natural resource base;
- to encourage diversity in primary industry enterprises and systems appropriate for the area;
- to minimise the fragmentation and alienation of resource lands;
- to minimise conflict between land uses within this zone and land uses within adjoining zones; and
- to enable small-scale rural tourism uses associated with primary production and environmental conservation.

The objectives for land zoned RU1 under Brewarrina LEP are:

- to encourage sustainable primary industry production by maintaining and enhancing the natural resource base;
- to encourage diversity in primary industry enterprises and systems appropriate for the area;
- to minimise the fragmentation and alienation of resource lands; and
- to minimise conflict between land uses within this zone and land uses within adjoining zones.

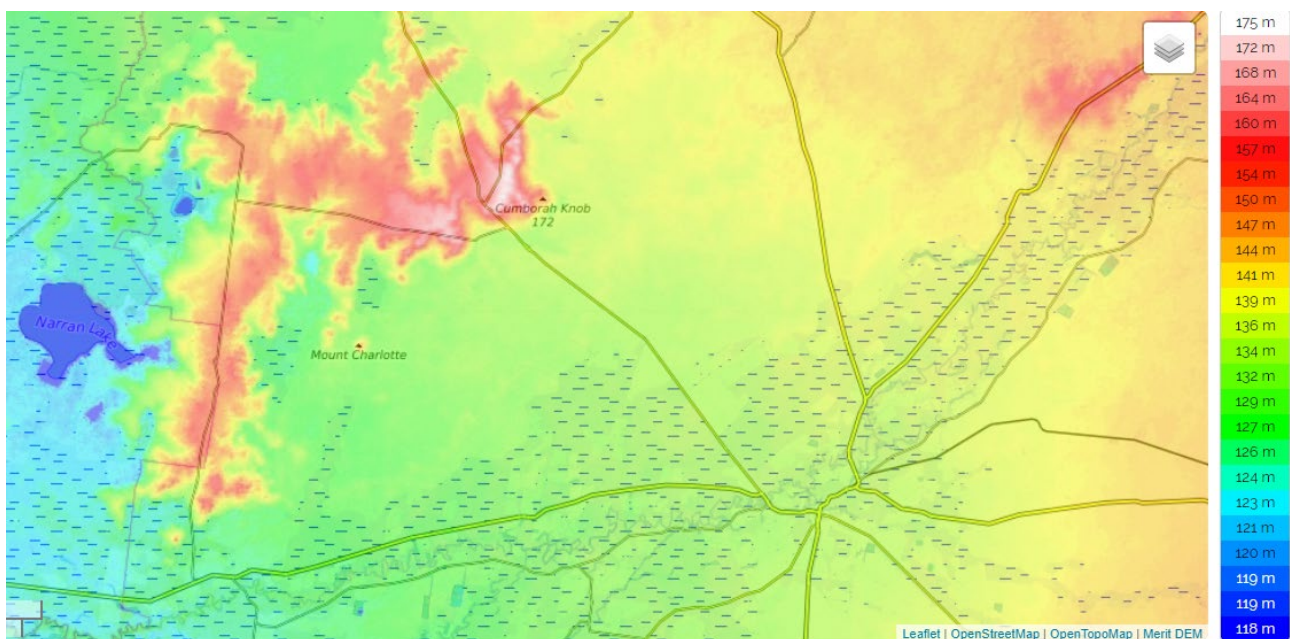
Land uses within Area 1 tend to align with those objectives. The 2016 Census conducted by the Australian Bureau of Statistics (ABS) identified the main local industries for employment (Cumborah Census District) were:

- non-metallic mining and quarrying;
- grain-sheep or grain-beef cattle farming; and
- other grain growing.

3.3 Landscape character

3.3.1 Topography

The local topography is generally flat. There are some elevated areas immediately east of Narran Lake, with the highest features being Cumborah Knob at 172 m AHD and Mount Charlotte at 156 m AHD. The majority of Area 1 has an elevation of approximately 130 m to 140 m AHD. Refer to Figure 3.1.



Source: Topographic-map.com

Figure 3.1 Area 1 Topography

3.3.2 Landscape character units

There are two main landscape character units (VCUs):

- Visual Character Unit 1: cleared and modified agricultural landscape, generally in flatter terrain; and
- Visual Character Unit 2: vegetated landscapes, predominantly at elevated rises and ridges.

i VCU 1 – cleared and modified landscapes

The cleared and modified landscapes are generally associated with land used for primary production. Within these landscapes there are also pockets of vegetated landscape, but these are typically along creeks or drainage lines where vegetation has been preserved to protect riparian systems. The VCU 1 patchwork of cleared fields is also characterised by the presence of dispersed agricultural infrastructure such as farm dams, fences, power lines and sheds.

Refer to Figure 3.2 for an example of a VCU 1 landscape type which is dominated by a cleared and modified landscape character.



Figure 3.2 Example of clear agricultural land (VCU 1)

Source: Google Earth

ii VCU 2 – Vegetated rises and ridges

The vegetated rises and ridges comprise an identifiable portion of the local landscape character. Narran Lake Nature Reserve is the largest landholding in the VCU 2 landscapes.

Refer to Figure 3.3 for an example of the landscape type which is dominated by vegetated rises and ridges.



Figure 3.3 Example of vegetated land (VCU 2)

Source: Google Earth

3.4 Towns and regional centres

The primary urban settlement within the bounds of Area 1 is the town of Cumborah. Outside Area 1, the nearest towns are Lightning Ridge and Walgett.

3.5 Rural residences

Most landholdings within Area 1 associated with agricultural land uses include a residential premises and associated outbuildings, such as equipment sheds. Refer to Figure 3.4.



Source: Six Maps

Figure 3.4 Typical rural residence with outbuildings



Source: Homehound

Photograph 3.1 Old Boorooma homestead



Source: Homely.com.au

Photograph 3.2 Kia Ora Station

3.6 Tourist destinations, lookouts and recreation locations

3.6.1 Tourist destinations

There are no promoted tourist destinations within Area 1 but there are localities immediately outside Area 1 – such as Grawin, Glengarry and Sheeppark – which can be accessed via roads transecting Area 1.

Visual impacts on vehicular sensitive receivers (whether tourists or otherwise) are addressed in the roads section.

There is farm stay accommodation offered to tourists at Kigwigil Country Escape, on “Kigwigil” property, approximately 8 km east of Cumborah.



Source: Instagram/@kigwigil.country.escape

Photograph 3.3 Kigwigil Country Escape

3.6.2 Lookouts

There are no identifiable lookouts within Area 1.

3.6.3 Recreation locations

There are some public recreational facilities, such as a cricket oval, within the town of Cumborah.

3.7 Travelling stock reserves

There are a small number of travelling stock reserves (TSRs) within Area 1. These include:

- Bunghill Tank Stock Watering Place (SWP);
- Gingie TSR SWP;
- Moramina SWP;
- Boorooma SWP;
- Rocky Tank SWP; and
- Kamilaroi Highway TSR.

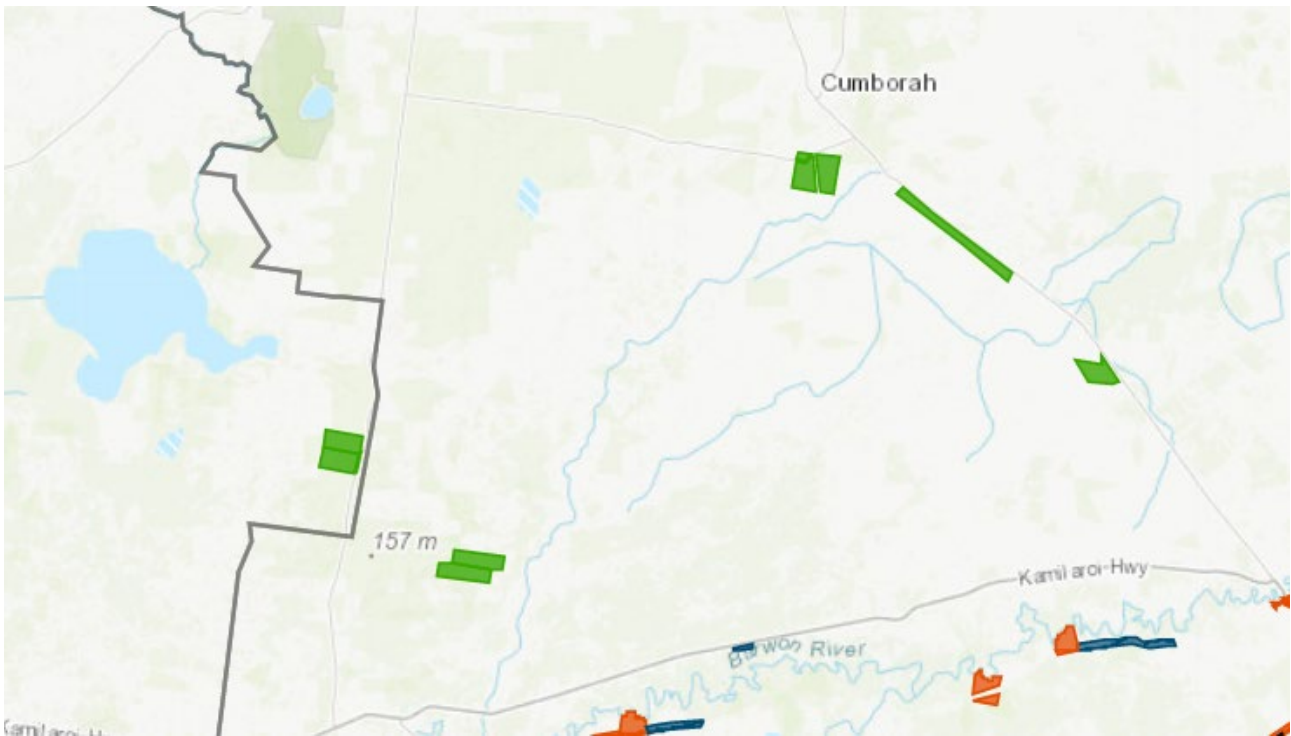
All of these – other than Kamilaroi Highway TSR – are Category 4 TSRs (green). Kamilaroi Highway TSR is Category 3 (blue). Refer to Figure 3.5.

As noted in the *Travelling Stock Reserves State-wide Plan of Management* (LLS, no date) Category 4 TSRs are described as:

TSRs, in the Western Division only, that are rarely, if ever used for travelling stock or emergency management, but are important, valued and used for other reasons such as biodiversity conservation or First Nations Peoples' heritage. These TSRs are Stock Watering Places.

Similarly, Category 3 TSRs are:

TSRs that are rarely, if ever used for travelling stock or emergency management, but are important, valued and used for other reasons such as biodiversity conservation, First Nations Peoples' heritage or recreation. These TSRs are not Stock Watering Places.



Source: Travelling Stock Reserve State Classification Map (LLS)

Figure 3.5 Travelling Stock Reserves

3.8 Roads

3.8.1 Major roads

The Kamilaroi Highway (B76) is situated at the southern extent of Area 1 and is the only classified road in the Study Area. The highway is a sealed, two-way road in this location. Refer to Photograph 3.4.



Source: Google Earth Streetview

Photograph 3.4 **Kamilaroi Highway**

3.8.2 **Minor roads**

There are several lesser local roads including:

- Gingie Road;
- Wilby Wilby Road;
- Llanillo Road;
- Narran Lake Road (refer to Photograph 3.5);
- Ginghet Road (refer to Photograph 3.6); and
- Boorooma Creek Road.



Source: Google Earth Streetview

Photograph 3.5 **Narran Lake Road**



Source: Google Earth Streetview

Photograph 3.6 **Ginghet Road**

3.9 Local community facilities

3.9.1 Cumborah

The key local community facilities are provided in the town of Cumborah.



Source: Rachael Turner

Photograph 3.7 Cumborah



Source: Rachael Turner

Photograph 3.8 **St Peter's of the Pines, Cumborah**



Source: Rachael Turner

Photograph 3.9 Cumborah Sports Ground and Community Hall

4 Visual effect

The visual effect of the proposed development is discussed below.

There are three elements which combine to create the magnitude of the effect – being contrast, integration and magnitude.

4.1 Contrast

4.1.1 Mullock stockpiles

Mullock is a colloquial term for opal mining overburden which is a by-product of opal mining. Mullock can be stockpiled in association with an individual mining operation, however it is also common practice for opal miners to stockpile mullock in communal locations colloquially known as ‘communal mullock stockpiles’ used by more than one opal miner.

In considering the potential contrast attributable to the stockpiling of extracted material, it is noted that the mullock tends to be a distinctly paler colour compared to the naturally occurring surface material. See an example from the Lightning Ridge region at Photograph 4.1, located to the north of Area 1.

Although the stockpiled material is a natural substance (rather than a built structure) and therefore does convey a texture similar to the surrounding landscape, the colour creates a noticeable contrast.

The contrast potential therefore is considered moderate.



Source: Six Maps

Photograph 4.1 Lightning Ridge mullock stockpiles in a landscape context

4.1.2 Mining surface structures

Mining surface structures tend to be minor facilities such as small sheds, mobile or stationary equipment or plant. The facilities, equipment and plant are similar in size and nature to those utilised by the agriculture industry within Area 1 and are generally smaller in bulk and scale and are generally finished in muted colour materials. Therefore, while some contrast to the host environment is evident, the contrast is considered to be low.

4.1.3 Prospecting surface structures

Prospecting surface structures tend to be minor facilities such as plant and equipment. These are not significant in terms of bulk, scale or height. Therefore, while some contrast to the host environment is evident, the contrast is considered to be low.

4.2 Integration

4.2.1 Mullock stockpiles

The existing landscape within Area 1 currently exhibits limited mullock stockpiles, concentrated in a small portion in the north. The potential for mullock stockpiles to integrate into the surrounding landscape will depend on the scale and disturbance footprint of the stockpiling.

Remnant vegetation has the capacity to screen or filter mullock stockpiles and to achieve partial integration with the existing landscape.

The integration is therefore considered to be moderate.

4.2.2 Mining surface structures

Mining surface structures tend to be minor facilities such as small sheds, mobile or stationary equipment or plant. The facilities, equipment and plant are similar in size and nature to those utilised by the agriculture industry within Area 1. These are not significant in terms of bulk, scale or height, and are unlikely to dominate the existing landscape. Therefore, the integration is considered to be high.

4.2.3 Prospecting surface structures

Prospecting surface structures tend to be equipment or plant. These are not significant in terms of bulk, scale or height, and unlikely to dominate a landscape. Therefore, the integration is considered to be high.

4.3 Magnitude

4.3.1 Mullock stockpiles

The magnitude of the development is determined by the extent to which the size and scale result in the loss of landscape elements, features or characteristics.

Area 1 comprises both relatively intact vegetated landscapes and highly modified landscapes which support agricultural activity. In this context, the presence of mullock stockpiles can, depending on the immediate environment, register a loss of some features. The magnitude largely depends on the site-specific character and the extent to which rehabilitation is possible.

A standard requirement of opal mining and prospecting titles, and ancillary activities within the NWR is for miners to stockpile mullock separately to topsoil, and to finish the rehabilitation works with the stored topsoil, not mullock. If that is achieved, it promotes both the re-establishment of vegetation and a return to a less intrusive visual element at the site. The extent to which this ideal scenario is accomplished is difficult to determine however media reports and court records (*Parkins v Lightning Ridge Miners Association Limited* [2009] NSWSC) suggest that there is a persistent issue in terms of proper rehabilitation of mines at the end of operational life.

The magnitude is therefore considered to be moderate.

4.3.2 Mining surface structures

Mining surface structures tend to be minor facilities such as small sheds, mobile or stationary equipment or plant. The facilities, equipment and plant are similar in size and nature to those utilised by the agriculture industry within Area 1. These are not significant in terms of bulk, scale or height, and are unlikely to result in negligible loss of landscape characteristics. Therefore, the magnitude is considered to be low.

4.3.3 Prospecting surface structures

Prospecting surface structures tend to be equipment or plant. These are not significant in terms of bulk, scale or height, and are unlikely to result in any material loss of landscape characteristics. Therefore, the magnitude is considered to be low.

4.4 Overall visual effect

On this basis, the overall visual effect for mullock stockpiles, mining surface structures and prospecting surface structures are described below.

4.4.1 Mullock stockpiles

Mullock stockpiles rated as moderate contrast, moderate integration and moderate magnitude. The overall visual effect is therefore considered to be moderate.

4.4.2 Mining surface structures

Mining surface structures rated as low contrast, high integration and low magnitude. The overall visual effect is therefore considered to be low.

4.4.3 Prospecting surface structures

Prospecting surface structures rated as low contrast, high integration and low magnitude. The overall visual effect is therefore considered to be low.

5 Visual impact

The visual impact is assessed here under various categories of receptor locations, such as urban residences, rural residences, roads and community facilities.

5.1 Residential dwellings

The residential dwellings located within Area 1 can be classified as either urban or rural.

5.1.1 Urban

The urban development of Cumborah, although a small settlement, includes a number of dwellings.

The dwellings are substantially separated meaning that, although the dwellings on the perimeter of the settlement are likely to have the most unimpeded view of any nominated activity, all dwellings potentially have view lines beyond the town to areas potentially available for prospecting or mining.

The visual impact diminishes with distance and therefore the likely visual impact for the activities is shown in Table 5.1. Note that this does not take into account any intervening structures, topography or vegetation which may obscure or filter the view line.

Table 5.1 Visual impact at residential premises

Activity	Distance	Sensitivity	Visual impact
Prospecting surface structures	<200 m	High	Moderate
[Visual effect = low]	200 m to 500 m	High/moderate	Moderate
	500 m to 1 km	Moderate	Low
	>1 km	Low	Low
Mining surface structures	<200 m	High	High/moderate
[Visual effect = low]	200 m to 500 m	High/moderate	Moderate
	500 m to 1 km	Moderate	Moderate
	>1 km	Low	Low
Mullock stockpiles	<200 m	High	High/moderate
[Visual effect = moderate]	200 m to 500 m	High/moderate	High/moderate
	500 m to 1 km	Moderate	Moderate
	>1 km	Low	Moderate/low

5.1.2 Rural

Rural residential premises are scattered throughout the Area 1.

The rural residential premises typically have landscaping, trees or outbuildings situated around the premises, and these may obscure or filter view lines. Nevertheless, the VIA takes a conservative position to assume that view lines are not filtered.

The visual impact diminishes with distance and therefore the likely visual impact for the activities is shown in Table 5.1.

5.1.3 Community facilities and commercial accommodation

The local community facilities and commercial accommodation within Area 1 are the town of Cumborah and the farm stay accommodation at “Kigwigil” property (Table 5.2).

Table 5.2 Visual impact at community facilities and commercial accommodation

Activity	Distance	Sensitivity	Visual impact
Prospecting surface structures	<200 m	High	Moderate
[Visual effect = low]	200 m to 500 m	High/moderate	Moderate
	500 m to 1 km	Moderate	Low
	>1 km	Low	Low
Mining surface structures	<200 m	High	High/moderate
[Visual effect = low]	200 m to 500 m	High/moderate	Moderate
	500 m to 1 km	Moderate	Moderate
	>1 km	Low	Low
Mullock stockpiles	<200 m	High	High/moderate
[Visual effect = moderate]	200 m to 500 m	High/moderate	High/moderate
	500 m to 1 km	Moderate	Moderate
	>1 km	Low	Moderate/low

5.1.4 Designated lookout, picnic site and recreational destination

The only recreational destination within Area 1 is likely to be the sporting facilities at Cumborah.

The visual impact for those recreational facilities is already captured by the consideration of residential premises within Section 5.1 above.

5.1.5 Travelling stock reserves

Travelling stock reserves are located within Area 1. These are identified by Local Land Services as being primarily low usage for stock transport but potentially supporting Aboriginal cultural heritage and biodiversity. The potential presence of Aboriginal cultural heritage values will be addressed through the separate assessment of Aboriginal cultural heritage in Area 1. From a visual perspective, it is assumed that Aboriginal cultural heritage values exist within the reserve. The visual impact at travelling stock reserves is provided in Table 5.3.

Table 5.3 Visual impact at travelling stock reserves

Activity	Distance	Sensitivity	Visual impact
Prospecting surface structures	<200 m	Moderate	Moderate
[Visual effect = low]	200 m to 500 m	Moderate	Moderate
	500 m to 1 km	Low	Low
	>1 km	Low	Low
Mining surface structures	<200 m	Moderate	Moderate
[Visual effect = low]	200 m to 500 m	Moderate	Moderate
	500 m to 1 km	Low	Low
	>1 km	Low	Low
Mullock stockpiles	<200 m	Moderate	Moderate
[Visual effect = moderate]	200 m to 500 m	Moderate	Moderate
	500 m to 1 km	Low	Low
	>1 km	Low	Low

5.1.6 Roads

There are no designated tourist roads or scenic routes within the area of theoretical visibility within Area 1 and therefore no visual impact is registered.

5.1.7 Main roads

i Kamilaroi Highway

The Kamilaroi Highway (B76) links the local regional centres of Bourke and Walgett. Note - both towns are outside of Area 1.

The Highway in this location provides a single lane in each direction with a 110 km/hr speed limit and landscaped verges with remnant vegetation. The duration of any possible line of sight is therefore extremely brief.

5.1.8 Minor roads

All of the minor public roads in Area 1 serve a very low volume of local traffic.

Sealed roads, such as Gingie Road which links Cumborah with the Kamilaroi Highway near Walgett, are likely to carry marginally more traffic than the unsealed roads. The visual impact of the project to roads is provided in Table 5.4.

Table 5.4 Visual impact at roads

Activity	Distance	Sensitivity	Visual impact
Prospecting surface structures	<200 m	Moderate	Moderate
[Visual effect = low]	200 m to 500 m	Low	Low
	500 m to 1 km	Low	Low
	>1 km	Low	Low
Mining surface structures	<200 m	Moderate	Moderate
[Visual effect = low]	200 m to 500 m	Low	Low
	500 m to 1 km	Low	Low
	>1 km	Low	Low
Mullock stockpiles	<200 m	Moderate	Moderate
[Visual effect = moderate]	200 m to 500 m	Low	Low
	500 m to 1 km	Low	Low
	>1 km	Low	Low

5.2 Broadacre rural

Broadacre rural land is a feature of much of Area 1.

The incidence of sensitive receptors in that setting is, however, based on the likely agricultural activities which require human presence. This includes activities such as mustering, repair and maintenance of fences, spraying, harvesting etc. These activities, while ongoing, are infrequent in any specific location and the presence of a receptor is generally temporary in nature.

This means that the sensitivity levels are generally low, similar to the experience of vehicle passengers. Note that the experience of receptors at rural residences are considered separately.

Within broadacre lands there can be farm workshops or storage sheds where it can be expected that a receptor may be present at those points for a period of hours but less than one day, rather than in a transitory mode such as in a tractor or farm vehicle. For those outbuildings, the impact assessment is provided in Table 5.5.

For general transitory activity on broadacre rural land the impact is considered to be low in all cases.

Table 5.5 Visual impact in broadacre rural settings (farm outbuildings)

Activity	Distance	Sensitivity	Visual impact
Prospecting surface structures	<200 m	Moderate	Moderate
[Visual effect = low]	200 m to 500 m	Low	Low
	500 m to 1 km	Low	Low
	>1 km	Low	Low
Mining surface structures	<200 m	Moderate	Moderate
[Visual effect = low]	200 m to 500 m	Low	Low
	500 m to 1 km	Low	Low
	>1 km	Low	Low
Mullock stockpiles	<200 m	Moderate	Moderate
[Visual effect = moderate]	200 m to 500 m	Low	Low
	500 m to 1 km	Low	Low
	>1 km	Low	Low

6 Other considerations

6.1 The relationship between the nominated activities

This VIA has considered opal prospecting, opal mining and mullock stockpiling as the nominated activities proposed for Area 1 (the project).

From a visual impact perspective, one of those activities – mullock stockpiling – represents a more substantial visual impact than underground mining or the four nominated methods of opal prospecting.

In reality, the activities are a sequence of events. Opal prospecting precedes opal mining, and opal mining generates the production of mullock which needs to be stockpiled.

If there are, therefore, locations which may have a significant and unacceptable visual impact due to mullock stockpiling, then the mining activity which generates the mullock should logically not occur in that area. It might further be argued that if underground opal mining is to be restricted in certain areas, then the activity of prospecting has little purpose.

Opal prospecting could conceivably have a purpose other than a precursor to opal mining, but those instances are likely to be the exception and not the rule. Broadly, an applicant for an opal prospecting licence can be assumed to have an intention to subsequently mine for opals if the prospecting activity demonstrates a workable claim.

The VIA therefore recommends that opal prospecting and opal mining be prohibited in areas where mullock stockpiling has serious and unacceptable visual impacts which cannot be readily mitigated.

6.2 Tourism

A significant component of the local economy, particularly to the north of Area 1, in Lightning Ridge, is tourism. Most websites promoting tourism to Lightning Ridge point to an 'iconic' town with historic and contemporary links to opal mining. The opal mining structures and the mullock moonscape of the local opal mining claims is part of the experience when tourists take the car door tours. Indeed, the visibility of old mines and rusting machinery is a feature within the town of Lightning Ridge itself. Refer to Photograph 6.1 and Photograph 6.2.

There is therefore an alternative visual aspect to visual elements such as mullock stockpiling.

The tourism motivation to experience a modified landscapes such as worked mineral claims appears to persist in locations such as Lightning Ridge. This may be primarily due to proximity to other services in the town of Lightning Ridge. A similar approach to mining activity as an attractant is evident in other opal mining destinations such as Cooper Pedy which promotes the local 'lunar landscape' of mullock heaps as part of the tourism appeal.

It is difficult to evaluate if the visual value of a worked opal mining claim for tourism purposes extends beyond the immediately accessible (and promoted) car door tour routes of Lightning Ridge. Five separate self-drive tours are offered. The appetite of tourists for additional areas (ie in Area 1) which provide further opal mining settings and visitor experiences of life in the opal fields has not, on the basis of desktop searches, been identified. The Orange Car Door tour to Grawin is advertised as a day trip from Lightning Ridge; other tours are immediately adjacent to the town area of Lightning Ridge. Hence the assumption is that the creation of a visual landscape, similar to those on offer via the car door tours closer to lightning Ridge, would not generate tourism benefits.



Source: EMM Consulting (A. Young)

Photograph 6.1 **Lightning Ridge town centre installation**



Source: EMM Consulting (A. Young)

Photograph 6.2 Lightning Ridge Car Door Tour landscape

7 Constrained areas mapping

For the nominated activities of opal prospecting, opal mining and mullock stockpiling, the following ‘setback’ distances are used for the purpose of mapping areas which are considered to be constrained on the basis of visual impact.

The areas mapped as incurring likely visual impact are based on those areas where a moderate or higher visual impact is identified. This area will vary depending on the receptor type (eg residential dwelling, road) and the distance at which the likely visual impact is diminished to a low level.

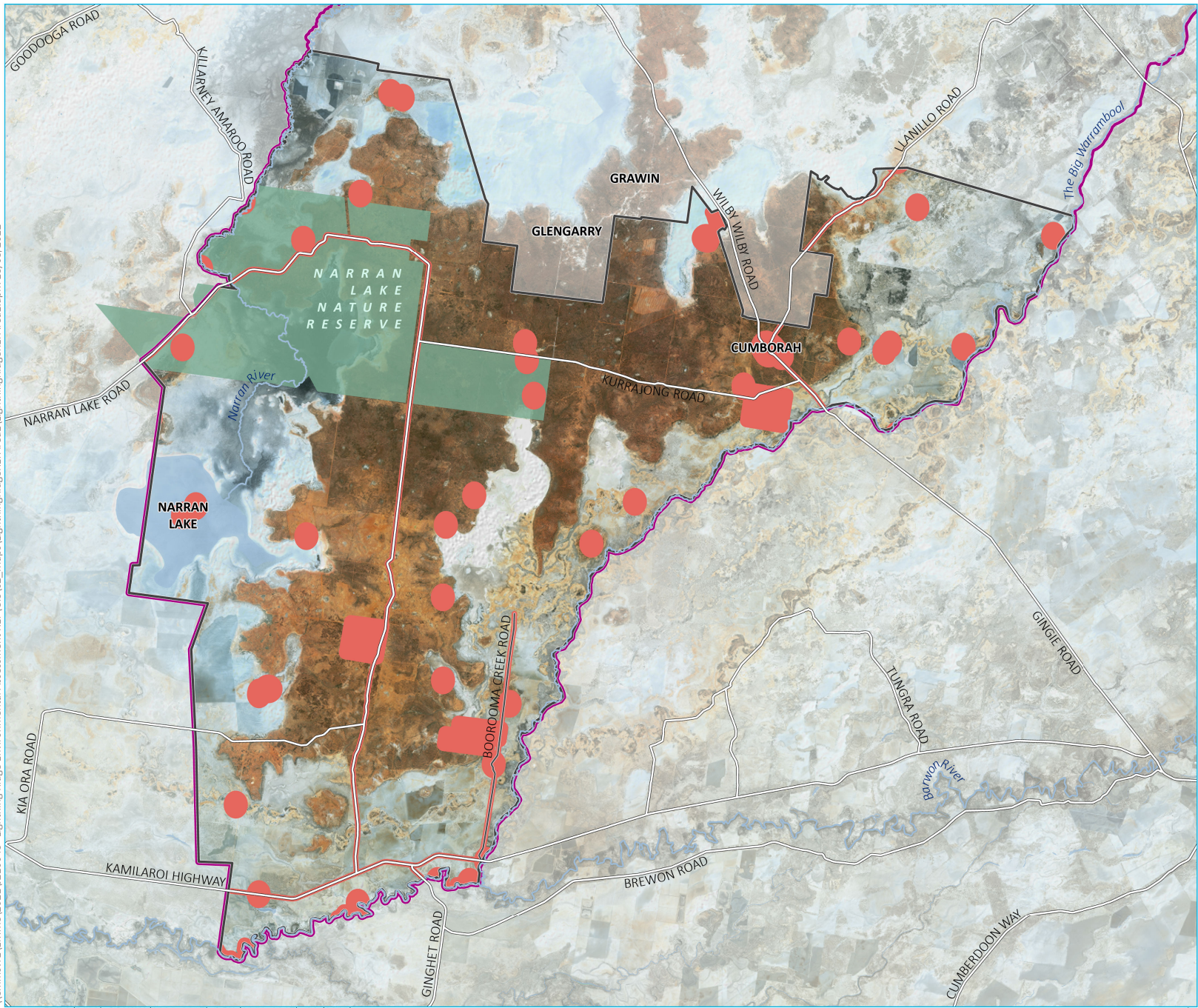
The mapped constraint areas for visual impacts are shown at Figure 7.1. Note that all spatial data within Figure 7.1 is limited by publicly available information. These points of interest should be ground-truthed to validate the location of each receptor type prior to the grant of mineral claims or opal prospecting licences.

Table 7.1 **Constraint distances by receptor type**

Receptor type	Linear, point or area	Recommended minimum ‘set back’ distance
Residential dwelling	Point	1 km
Community facility; commercial accommodation	Point	1 km
Recreational destination	Point; area	1 km
Travelling stock reserve	Area	500 m
Public road	Linear	200 m
Broadacre rural land (farm outbuildings)	Point	200 m

Note that the constraints map in this VIA is based on the premise that the conditioning of a licence or lease to address visual impact should be simple, easy to enforce and within the means of most applicants. This means that it is possible to consider the visual impacts of opal prospecting and mining within the constraints area, but only if those activities are (a) subject to separate assessment and (b) subject to more specific licence or lease conditions to address the increased risk of visual impact on local receptors.

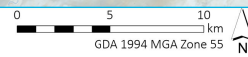
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- KEY**
- ▭ Area 1
 - ▭ Narran-Warrambool Reserve
 - Visual constraints
 - Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - ▭ Named waterbody
 - ▭ NPWS reserve

Visual constraints- setback distances

Source: EMM (2022); DRNSW (2021, 2017); DFSI (2021, 2017); GA (2011)



8 Management and mitigation

8.1 Rehabilitation of site

One of the key risks to visual impact is that rehabilitation of mining and prospecting titles and ancillary mining activities is not achieved or achieved to an unsatisfactory level.

Separate stockpiling of topsoil and its return to the disturbed surface at the rehabilitation stage will provide an appropriate mitigation measure in terms of visual impact in the longer term. The difficulty is in maintaining a topsoil stockpile over the protracted life of the claim. Weathering and other activities could easily disperse the stockpiled soil and lose the value of the initial stockpiling effort.

It may be preferable for topsoil storage to be centralised in communal stockpiles. A condition of a licence or lease could be that the topsoil is deposited at a specified communal location, and that the stored topsoil be used again for the completion of the rehabilitation stage.

The other issue is the incentive for rehabilitation to be undertaken. Security deposits are held for mineral claims and prospecting licences, being \$350 to \$500 for a prospecting licence and \$700 for an ordinary mineral claim. Additional security can be held for open cut or similar opal mining methods. While the majority of mineral claims are cancelled by the holder, and deposits returned (suggesting a satisfactory rehabilitation of the site), there are claims which lapse or expire, and in those cases the difficulty in tracing prior holders means that deposits are forfeited. The forfeited monies are held in a Legacy Mines fund which can be used to rehabilitate the claim.

It is assumed that loss of deposit due to forfeiture has a number of downside features. There would be additional administrative costs for the regulating authority; the rehabilitation of the site would be delayed while procedural fairness was observed; and the incentive to simply allow the licence/claim to lapse is increased if the proper rehabilitation of the site, including mullock stockpiles and other abandoned plant or waste, appears to the licence/claim holder to be a greater cost than the loss of deposit.

It would be preferable however for claim holders to be accountable for and appropriately incentivised to undertake all rehabilitation works, rather than a public authority. It is suggested that DRNSW consider the capacity of applicants to support a two-tiered security deposit which comprises not only a refundable bond for rehabilitation (even if left at current rates) but also a separate component which is refundable on formal notification to DRNSW that the licence or claim is to be cancelled. Both deposits would be forfeited if a licence/claim holder simply allows the licence or claim to lapse, and abandons the rehabilitation and clean up to regulator. On the other hand, proper notification and cancellation of a licence or claim would see that deposit component returned.

This may address the incidence of deposit forfeiture through lapsing of permits. The administrative and works costs to the public authority are therefore better reflected in the monies held in the Legacy Mines fund, which might further drive proper rehabilitation of sites by claim holders.

8.2 Dark Sky Region and light spill locally

As the activities can create light spill and within Area 1 activities are likely to be, in some cases, within the Dark Sky Planning Region, it is recommended that night glow impacts be minimised by a condition which references Australian Standard AS 4282-1997 *Control of the obtrusive effects of outdoor lighting*. The condition should recommend management practices such as:

- scheduling of operations, where practicable, so that evening and night-time operations at surface level are minimised to reduce the potential for direct lighting impacts to locations outside of the site;
- restriction of surface night-lighting to the minimum required for operations and safety requirements, where appropriate;
- use of unidirectional lighting techniques; and
- use of light shields to limit the spill of lighting.

8.3 Management of residual impacts

It is recommended that standard licence or lease conditions be included to require:

- Plant, structures and materials installed above ground should avoid reflective surfaces and should, as far as possible, have a finish which uses a muted, recessive colour which integrates with the surrounding landscape.
- If colour finishes cannot be modified to integrate with the surrounding landscape, the use of screening barriers or hoardings (eg hessian) is to be used.

9 Conclusion

There are certain works undertaken, and plant or structures installed, when opal prospecting or mining is undertaken. The majority of the activity is underground and therefore not generating any visual effect.

The most prominent of the above ground works which can have a visual effect are mullock heaps.

The local receptors for any visual effects associated with opal prospecting and mining are mainly the occupants of rural residences and to a lesser extent the people using community or recreational facilities, tourist destinations and the occupants of vehicles on local roads or travelling stock routes.

The assessment has considered the relative sensitivities for the various receptors, and the potential visual effect of the prospecting and mining activities, and established the distance at which the visual impact should be considered to be adequately ameliorated by intervening landscape features and remoteness from the mining activity.

This has allowed a mapped area to be identified where, based on visual impact, mining and prospecting activity should be constrained. The recommended distances are:

Table 9.1 Recommended setback distances

Receptor type	Linear, point or area	Recommended minimum 'set back' distance
Residential dwelling	Point	1 km
Community facility; commercial accommodation	Point	1 km
Recreational destination	Point; area	1 km
Travelling stock reserve	Area	500 m
Public road	Linear	200 m
Broadacre rural land (farm outbuildings)	Point	200 m

These distances, and the mapping that illustrated the areas where constraints exist, are based on the premise that the conditioning of a licence or lease to address visual impact should be simple, easy to enforce and within the means of most applicants. This means that it is possible to consider the visual impacts of opal prospecting and mining within the constraints area, but only if those activities are (a) subject to separate assessment and (b) subject to more specific licence or lease conditions to address the increased risk of visual impact on local receptors.

The visual impact assessment also considers the impact of opal prospecting and mining activities on the Dark Sky region of NSW. The assessment found that there is little risk of glow impacts on astronomical observation, assuming normal mining practices, and that some minor conditions should nevertheless be included to ensure that night sky darkness is preserved.