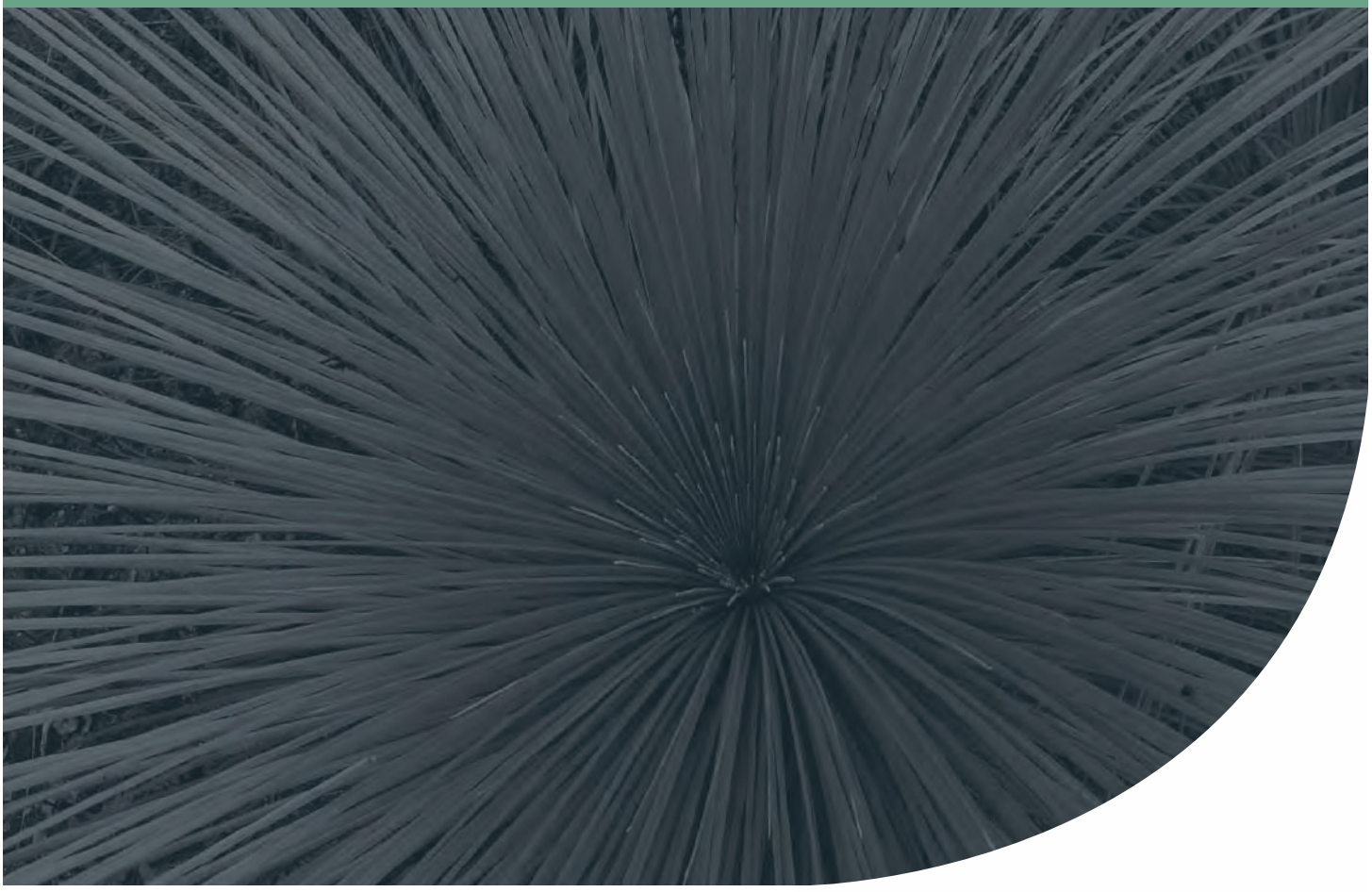
Visual Impact Assessment

Lot 9 Brookton Highway, Karragullen

Project No: EP20-040

Prepared for Vinci Gravel Supplies Pty Ltd
May 2021



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Executive Summary

Vinci Gravel Supplies Pty Ltd (the proponent) proposes to expand their existing gravel quarry at Lot 9 Brookton Highway, Karragullen (herein referred to as 'the site'). The site is 48.23 hectares (ha) in size and is located within the City of Armadale (CoA) municipality, 15 kilometres (km) east of Armadale Town Centre.

The CoA has previously granted approval for stages 1 to 4 of the gravel extraction and processing quarry, and the proponent is now seeking development approval (DA) and an Extractive Industry License (EIL) for a further expansion of the quarry, hereafter referred to as 'stage 5'. Stage 5 extends over 5 ha in total, divided into stage 5a (3.14 ha) and stage 5b (1.86 ha) located adjacent to the existing approved stage 4 to the west.

The site is currently zoned 'Rural' under the Metropolitan Region Scheme (MRS) and 'General Rural' under the CoA *Town Planning Scheme* (TPS) *No. 4* and is bounded by broad acre rural landholdings zoned 'General Rural' to the north and south, Midgegooroo National Park and Korong National Park to the north and east, and Brookton Highway and Canning Road to the south and west. Several scenic tracks are located in close proximity to the site including Springdale Road to the north-west and the Munda Biddi Cycle Track to the east. The landscape character of the area is dominated by the rolling low hills, broad open pasture, orchard and plantation trees and mature remnant native trees. The skylines are generally hills clad in woodland intersected by houses, sheds and linear planted orchards that punctuate an open character.

This Visual Impact Assessment (VIA) has been prepared to determine the likely visual impact of the proposed quarry expansion on the existing views from the surrounding landscape. The assessment process further aims to provide broad design advice to assist the proponent in best managing any visual impact that may be determined.

The preparation of the VIA has been undertaken in accordance with the method outlined within the Western Australian Planning Commission (WAPC) *Visual Landscape Planning in Western Australia Manual* (WAPC 2007) (Visual Landscape Manual) with consideration of the state planning framework requirements. In addition to this, consultation has been undertaken throughout the design process with the CoA with provided recommendations and advice adopted within this VIA.

A landscape character assessment was undertaken on the site and general surrounds and identified the following:

- The site and general area are located within the Darling Plateau – Darling Uplands landscape character type (LCT) (as identified within the *Reading the Remote: Landscape Characters of Western Australia* (Reading the Remote) (CALM et al 1994)). The site is located within rolling low hills dissected by deeply eroded, steep-sided valleys and studded with granite outcrops and boulders which protrude from the landscape. Vegetation is dominated by jarrah, marri and banksia forest, interspersed with areas of cleared pastoral and farming land and heath and herblands occurring on the rough granite outcrops.

- At a more local level, two landscape character units (LCU) are identified within the site and surrounds, as outlined below:
  - Natural LCU, large areas of intact remnant vegetation appearing along roadsides and associated with Midgegooroo National Park and Korong National Park with low visual penetration through undisturbed forests.
  - Rural LCU, including features such as rolling hills of cleared paddocks used for agricultural and fruit orchard purposes and existing buildings.

The overall management objective of the VIA is to ensure that stage 5 is designed and implemented in such a way that the existing landscape character at both the regional level (i.e. LCT in accordance with (Reading the Remote) (CALM et al 1994)) and local level (i.e. LCU in accordance with the Visual Landscape Manual (WAPC 2007) is protected and maintained.

To ensure the proposed quarry expansion does not detract from the scenic quality of the land and achieve the visual landscape objectives, management/mitigation measures have been recommended for stage 5, and include:

- Retention of a total of 35.55 ha native vegetation within the higher areas of the site to keep a naturally appearing vegetated backdrop, limiting the existing vegetated horizon line associated with the Korong and Midgegooroo National Parks being broken.
- The quarry expansion and operation areas being located a minimum 20 m from the northern and western boundaries of the site to allow for screening of the quarry, particularly Brookton Highway to the south-west.
- Staging excavation activities, beginning at the easternmost extent of the expansion. This enables vegetation associated with stage 5b, which is located closest to Brookton Highway, to remain during the stage 5a excavation activities and provide screening.
- Large visually prominent machinery such as the front-end loader used to load product into trucks and the gravel screener will operate from behind the 4 m high pit face which will be maintained at all times during activities.
- Ongoing rehabilitation works following the completion of each extraction stage whereby topsoil is replaced onto the previously excavated stage. This will allow blending of the bare orange-coloured post-mined pits by overlaying topsoil directly after pit closure that is darker in tone, reducing the overall visibility of the excavated areas.
- Restoration and reinstatement of the expansion site will be undertaken progressively upon the completion of each extraction stage. Upon pit closure, the landform will be returned to a gently sloping surface in alignment with the existing upland topography.
- Undertaking revegetation activities to enrich the local landscape and to mitigate the visual impacts associated with stage 5. This is proposed to include:
  - Planting of a visual screening strip to the west of the internal haul road with clusters of up to two (2) to three (3) trees species (proposed to be a mixture of native *Eucalyptus wandoo Eucalyptus patens, Eucalyptus lane-poolei, Eucalyptus laeliae and Corymbia calophylla*, determined based on existing vegetation within the site and surrounds) in a linear arrangement with a native understory for low visual penetration. At approximately 12 years maturity, this vegetation is expected to block views of the quarry expansion from the Canning Road and Brookton Highway users in the near views.

- Previously excavated portions of the site extending over 8.19 ha (existing approved quarry stages) will be revegetated via infill planting and direct seeding of local native species to align with existing natural vegetation within the surrounding National Parks. This incorporates the 4.9 ha conditioned under Clearing Permit Approval 8273-1. The remaining 3.29 ha comprises additional revegetation areas (i.e not already required as part of previous approvals) to counterbalance the residual impact of the stage 5 expansion site. In the short to medium term (6-9 years), this planting will blend with the existing remnant native vegetation to the north and east and will break up views of the quarry for Canning Road and Brookton Highway users in the distant views.
- Stage 5a and 5b extraction areas will be progressively revegetated on a yearly basis via direct seeding of local native species to align with surrounding native vegetation.

The desktop and site assessment identified that the existing quarry is visible and that stage 5 (particularly stage 5b) may be visible at times by users driving along Brookton Highway in an easterly direction (depending on location) when climbing a soft ridgeline in front of the site. In particular, at one location from Ferguson Road (Viewpoint 10) and two locations along Brookton Highway (Viewpoints 12 and 13), where the height of the viewer and clearing of vegetation for agricultural land uses over the ridgeline in the foreground and middle grounds enabled glimpses of the existing open quarry pit within the site. Stage 5 will not be visible from Brookton Highway to users south of the site and Canning Road users to the north of the site, due to the presence of dense vegetation within landholdings and road reserves (in addition to vegetation retained within the site). Due to a valley landform and the height and form of existing vegetation, stage 5 will not be visible from the scenic Munda Biddi Cycle track to the east of the site, Springdale Road walking trail and vehicle access tracks to the north west of the site.

The assessment of the proposed management measures, as shown within the cross-sections and photomontages, indicates that there will be short-to-medium term visual impacts associated with the stage 5 quarry expansion area, however staging of works (and starting at the easternmost point) will reduce the prominence of the quarry for the time it takes to complete stage 5a, while progressive topsoil application and rehabilitation will reduce the prominence of stage 5b. Rehabilitation/planting associated with Zone 1 and Zone 2 will be beneficial for mid-to-distant views, while rehabilitation of stage 5a will help minimise impacts for near views as stage 5b is being progressed. In general, the visual impact of the proposed stage 5 expansion will be synonymous with openings of a natural appearance associated with wetlands, granite outcrops and cleared paddocks, through the progressive rehabilitation of previously excavated stages.

Based on the existing landform and vegetation and proposed management measures, the existing visual quality of both the rural and natural landscape character units can be maintained and protected in the long-term and short-to-medium term impacts can be minimised, achieving the objectives determined for this VIA.

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Planting list for revegetation areas

Abbreviation Tables

Table A1: Abbreviations – General terms

General terms	
DA	Development application
EIL	Extractive Industry License
LCT	Landscape character type
LCU	Landscape character unit
LPS	Local Planning Strategy
TPS	Town Planning Scheme
VIA	Visual impact assessment

Table A2: Abbreviations – Organisations

Organisations	
DBCA	Department of Biodiversity Conservation and Attractions
CoA	City of Armadale
DWER	Department of Water and Environmental Regulation
DPLH	Department of Planning Lands and Heritage
WAPC	Western Australian Planning Commission

Table A3: Abbreviations – units of measurement

Units of measurement	
cm	Centimetre
ha	Hectare
m	Metre
m^2	square metre
m AHD	m in relation to the Australian height datum
mm	Millimetre

Table A4: Key definitions

Key definitions	
Cross-section	Vertical profiles through a portion of the landscape. Cross-sections help to illustrate the relationship between landform and other landscape characteristics such as vegetation cover and land use.
Original photomontage	Technique of selecting, editing and piecing together a sequence of photos from a particular point to form a continuous whole.
Photomontage (3D perspective)	Computer simulated images of a proposed development using the original photomontage as a base, to assess changes to the visual landscape.
Viewshed or seen area analysis	The land visible from a point or a series of points. Viewshed analysis identifies an area of landscape that would be visible assuming no vegetation cover or built structures, based on the height of the stage 5 quarry extent (pit wall) compared to the existing landform.

1 Introduction

1.1 Background

Vinci Gravel Supplies Pty Ltd (the proponent) intends to expand an existing gravel quarry within Lot 9 Brookton Highway in Karragullen (referred to as the 'site'), as shown in **Figure 1**. The site is approximately 48.23 hectares (ha) in size and is located within the City of Armadale (CoA) municipality, approximately 15 kilometres (km) east of Armadale Town Centre.

The CoA has previously granted conditional approval for stages 1 to 4 of the gravel extraction and processing quarry, and the proponent is now seeking development approval (DA) and an Extractive Industry License (EIL) for a further expansion of the quarry, hereafter referred to as 'stage 5'. Stage 5 extends over 5 ha in total, divided into stage 5a (3.14 ha) and stage 5b (1.86 ha) located adjacent to stage 4 to the west, and is shown in **Figure 1**. The pit will be mined in an east to west direction with ongoing rehabilitation works undertaken progressively within completed cells. The proposed staging and development plan is provided in **Appendix A,** and shows the stage 5a and 5b excavation pits, internal haul road, vehicle/machinery compound, revegetation zones and visual screening areas.

The site is currently zoned 'Rural' under the Metropolitan Region Scheme (MRS) and 'General Rural' under the City of Armadale Town Planning Scheme (TPS) No. 4 and is bounded by broad acre rural landholdings zoned 'General Rural' to the north and south, Midgegooroo National Park and Korong National Park to the north and east, and Brookton Highway and Canning Road to the south and west respectively. Several scenic tracks are located in close proximity to the site including Springdale Road to the north-west and the Munda Biddi Cycle track to the east.

As a component on the DA and EIL processes, the proponent has held discussions with the CoA with regards to visual impact concerns. In particular, CoA have raised concerns about the potential detrimental impact of the development on the landscape views from Brookton Highway and Canning Road, as well as adjacent rural residential landowners.

1.2 Purpose of this report

The CoA have asked the proponent to demonstrate that there will be no adverse amenity impacts on nearby land uses.

The aim of this visual impact assessment (VIA) report is to obtain, review, measure and determine the likely visual impact of the stage 5 quarry expansion on the existing views from the surrounding landscape, with particular consideration of surrounding rural residential dwellings, Brookton Highway and Canning Road. The assessment also aims to provide design advice to assist the proponent in best managing any visual impact that may be determined. Specifically, this report:

- Identifies and maps the proposed quarry design (**Section 2**).
- Identifies the existing visual landscape characteristics of the site and surrounds (prior to any works) and visual landscape objectives (**Section 3**).
- Assesses the visual impact created by the proposed expansion, through viewshed analysis and site assessment (including photomontages) and identifies key views of the site (**Section 4**).
- Outlines visual design strategies for the stage 5 expansion (**Section 4.2**).
- Outlines the visual management measures that will be employed by as part of the stage 5 expansion to mitigate potential impacts, with cross-sections and 3D perspectives photomontages to demonstrate these measures (**Section 6**).

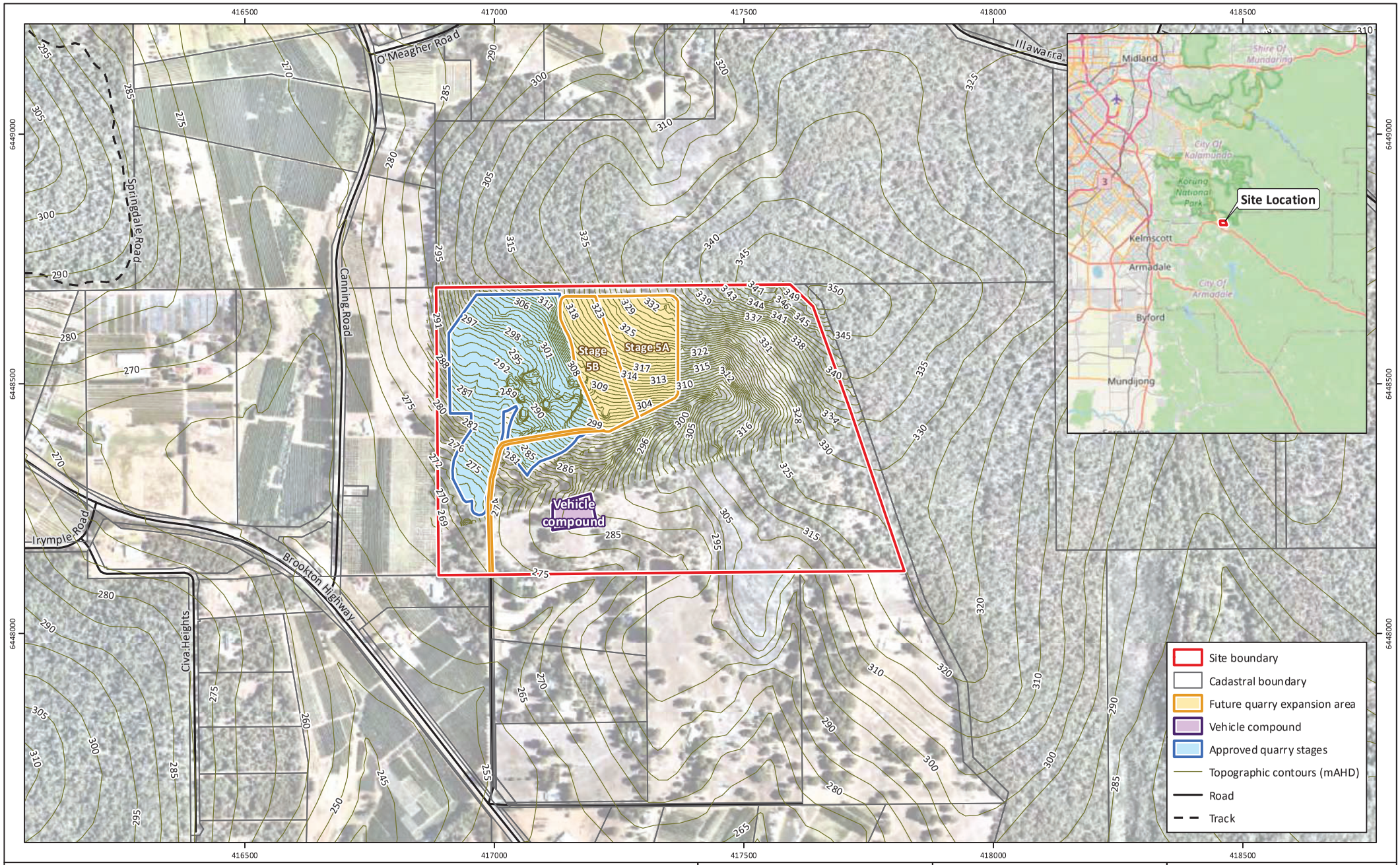

Figure 1: Site Location and Quarry Staging Plan

Project:	Visual Impact Assessment Lot 9 Brookton Highway, Karragullen
Client:	Vinci Gravel Supplies Pty Ltd

Plan Number:	**EP20-040(12)--F24a**
Drawn:	GAR
Date:	26/05/2021
Checked:	BRB
Approved:	KK
Date:	26/05/2021

N

0 100 200 300
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used
©Landgate (2021). Nearmap Imagery date: 6/01/2021

1.3 Applied method

The preparation of the VIA has been undertaken in accordance with the method outlined within the Western Australian Planning Commission (WAPC) *Visual Landscape Planning in Western Australia Manual* (WAPC 2007) (Visual Landscape Manual) with consideration of the state planning framework requirements. An outline of the visual landscape planning process is shown in **Plate 1**.

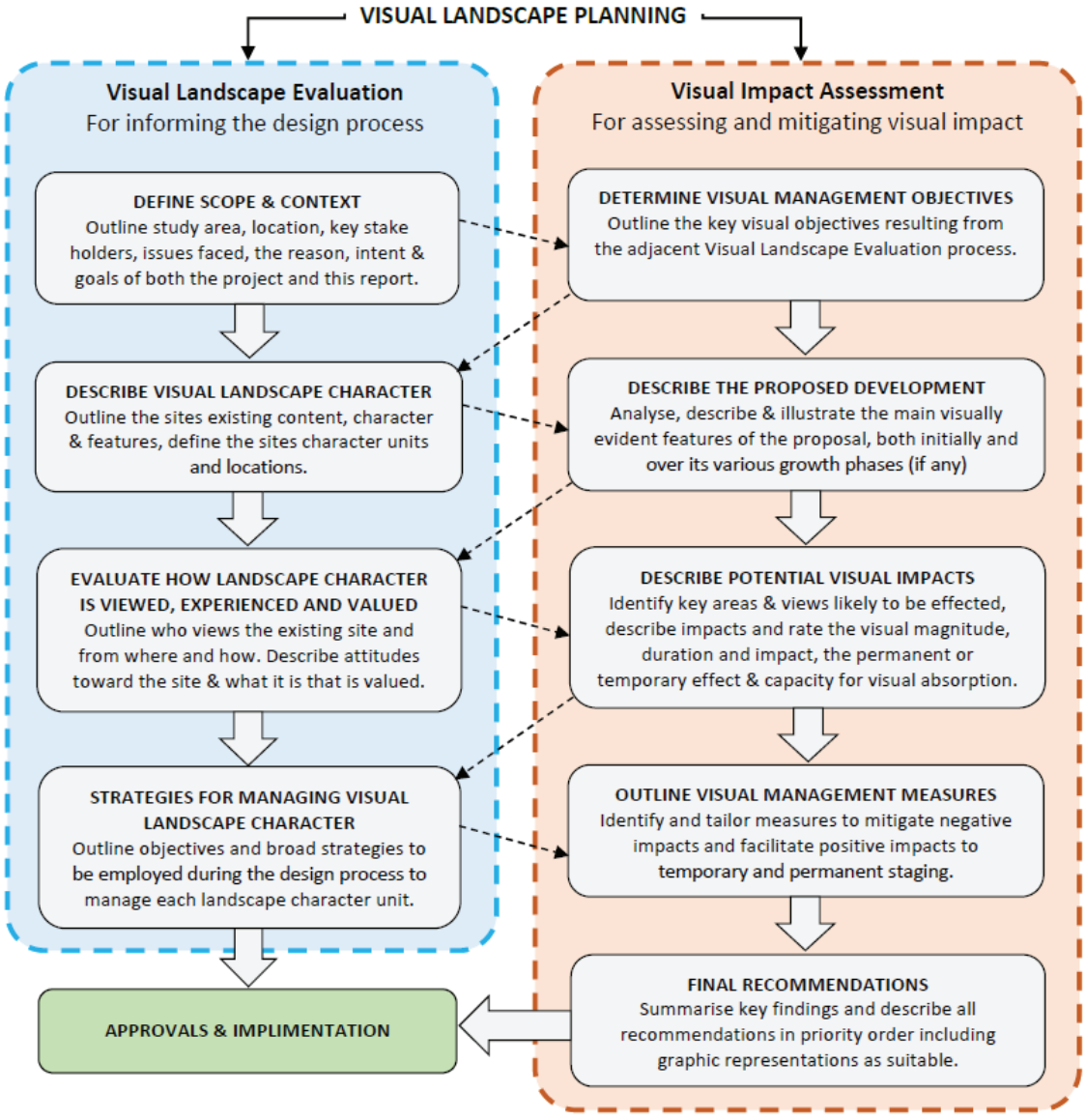

Plate 1: Visual landscape planning process as outlined within Visual Landscape Planning in Western Australia Manual (WAPC 2007)

1.4 Planning context

1.4.1 City of Armadale extractive industries license

The *City of Armadale Extractive Industries Local Law* (City of Armadale 2000) establishes the need for extractive industries to operate under a license. The CoA has previously issued EILs for stages 2 to 4 of the existing gravel quarry, subject to specific conditions. The proponent is currently preparing an EIL for approval by the CoA for stage 5 of the quarry.

1.4.2 City of Armadale development approval

Local and regional planning schemes provide guidance on what types of development and building activities require local government planning approval. Under the CoA TPS No. 4, activities involving the extraction of raw materials are to be addressed as part of a formal DA application. A summary of the planning approval's history for previous extraction phases within the site is provided in **Table 1**.

Table 1: Planning approvals history

Extractive stage	Date of Approval	CoA Reference	Details
Stage 1	28 October 2003	A117566: PRR	DA granted for proposed extractive industry renewal subject to conditions.
Stage 2	29 July 2014	PR5514; 10.2013.355.1	DA granted for expansion of existing extractive industry (gravel quarry) subject to conditions.
Stage 3	5 April 2016	PR5514; 10.2015.379.1	DA granted for expansion of industry – extractive (gravel) subject to conditions.
Stage 4	24 May 2018	PR5514; 10.2017.154.1	DA granted for industry extractive (gravel) – stage four extraction area subject to conditions. Conditions 2 & 4 subsequently revised 26 February 2019 through State Administrative Tribunal (SAT) review (DR148/2018).

The stage 5 quarry proposal will be subject to assessment and approval from the Western Australian Planning Commission (WAPC) through the DA process. The proponent has prepared or commissioned the following technical reports to support the stage 5 DA and EIL applications for the site:

- *Detailed Flora and Vegetation Survey - Lot 9 Brookton Highway, Karragullen* (Emerge Associates 2021a)
- *Environmental Management Plan - Lot 9 Brookton Highway, Karragullen* (Emerge Associates 2021b)
- *Level 1 Fauna Assessment - Lot 9 Brookton Highway, Karragullen* (Emerge Associates 2020b)
- *Targeted Black Cockatoo Habitat Assessment - Lot 9 Brookton Highway, Karragullen* (Emerge Associates 2021c)
- *Acoustic Assessment - Lot 9 Brookton Highway, Karragullen* (Lloyd George Acoustics 2021)

1.4.3 City of Armadale Local Planning Strategy

The CoA has adopted the *City of Armadale Local Planning Strategy – Town Planning Scheme No. 4* (2016) (LPS) as a means to focus and guide development in accordance with TPS No. 4. The site is zoned 'General Rural' under CoA TPS 4 and within the LPS it is found within the 'Rural Hills Visual Landscape Strategy' area. Visual amenity is highlighted as a key issue within this strategy area, as summarised below:

- *The Armadale Hills helps define the sense of place and identity of the City and provides the wider regional community with a local tourist destination, recreational opportunities and visual and topographical relief from the more developed coastal plain areas of the Perth Metropolitan Area.*
- *The remaining rural areas of the Armadale Hills will be increasingly valued over time and also face greater development pressures with potential for negative impacts upon the visual landscape values.*
- *Future land capability and servicing assessments of land use and development proposals in the remaining rural hills areas will include special consideration of suitability of the specific site and particularly its impact on the visual landscape values of the surviving bushland and rural landscapes.*

1.4.4 Visual Landscape Planning in Western Australia

The *Visual Landscape Planning in Western Australia* (WAPC 2007) (Visual Landscape Manual) is a manual that has been developed to guide state agencies, local governments, developers and the community on techniques for incorporating visual landscape planning into the planning system. The manual explains fundamental planning tools of visual landscape evaluation and visual impact assessment (WAPC 2007). It provides guidelines for siting and design in relation to a range of landscape types and land uses, including development proposals. The methodology for this VIA follows the guidelines set out in the manual.

The Visual Landscape Manual outlines the main issues associated with a development/building located on important landscape features which should be considered in a proposal and include:

- Location and siting of development/building
- Development/building form and size
- Development/building height and roofline
- Materials and colour palette
- Screening/buffering of development/buildings
- Ancillary structures
- Consideration of roads and access drives
- Fencing and firebreaks.

1.4.5 Environmental Protection Act 1986

1.4.5.1 Part IV Environmental Protection Act 1986 (WA)

Part IV of the *Environmental Protection Act 1986* (EP Act) provides for the consideration of proposals that could result in a significant adverse impact on the environment. The proposed expansion will likely require referral to the Environmental Protection Authority (EPA) pursuant to Section 38 of the EP Act, on the basis that the proposal may impact on the following key environmental factors:

- Land – Flora and vegetation (the removal of intact native vegetation representative of the Yarragil Complex).
- Land – Terrestrial fauna (impacts to roosting, foraging and potential breeding habitat for the three species of threatened black cockatoo; CBC, FRTBC and BC (listed as endangered and vulnerable under the BC Act)).
- Water – Inland waters (e.g. uncontrolled runoff into Stinton Creek tributary and waterway management requirements).
- People – Social surroundings (visual amenity, dust and noise).

The proponent met with the Office of the EPA (OEPA) on 9 April 2021 to discuss the proposed expansion, specifically whether it is likely to warrant referral to the EPA under Part IV Section 38 of the EP Act to make the determination on whether it is a 'significant proposal'. The details discussed during the pre-referral meeting included: potential impacts, possible preliminary key environmental factors, stakeholder consultation, proposed management measures and possible assessment pathways, including possible level of assessment.

On review of the pre-referral information, the EPA did not raise any concerns with regards to the level of environmental investigations undertaken and the assessment of impacts to key environmental factors. It was considered likely that the proposed expansion can be adequately regulated through other state and federal environmental and planning approvals without the need for further regulation through Part IV Section 38 of the EP Act. The OEPA is interested in the outcome of the other environmental approvals including native vegetation clearing permit approval under Part V of the EP Act and approval under the EPBC Act given potential impacts on Matters of National Environmental Significance. In general, the OEPA noted no immediate concern to see a referral of the proposed expansion, particularly given there has been no previous community interest with the existing gravel extraction activities.

1.4.5.2 Part V Environmental Protection Act 1986 (WA)

A native vegetation clearing permit pursuant to Part V of the EP Act will be sought from the Department of Water and Environmental Regulation (DWER). It is noted that clearing permit ref. CPS 8273/1 (area permit) was previously granted by the DWER in June 2019 to facilitate the stage 4 quarry operations, and required the revegetation of approximately 4.9 ha of previously mined cells. Revegetation activities have commenced within previously disturbed portions of the site in accordance with CPS 8273/1, and infill planting and direct seeding will continue to occur at the densities required to reach the completion criteria, in accordance with the EMP (Emerge Associates 2021b) prepared for stage 5.

DWER regulates industrial emissions and discharges to the environment through a works approval and licensing process, under Part V of EP Act. Industrial premises with potential to cause emissions and discharges to air, land or water are known as 'prescribed premises' and trigger regulation pursuant to the EP Act. Prescribed premises categories are outlined in Schedule 1 of the *Environmental Protection Regulations 1987*.

The relevant prescribed premise for the quarry operations is category 70 (Part 2, Schedule 1), defined as '*screening etc. of material: premises on which material extracted from the ground is screened, washed, crushed, ground, milled, sized or separated.*' Category 70 applies to operations with a production or design capacity of 'more than 5,000 but less than 50,000 tonnes per year.' Should the annual extraction volumes of the proposed operations fall within this range a prescribed premises registration will be sought pursuant to Part V, Division 3 of the EP Act.

2 Stage 5 Quarry Extraction Activities

With the gravel resource in the stage 4 extraction area soon to be exhausted, the proponent is seeking approval to continue extraction of gravel within the site. The stage 5 quarry is proposed to be located to the east of the approved stage 4 extraction area and is shown in **Figure 1**. The proposed staging and development plan is provided in **Appendix A,** and shows the stage 5a and 5b excavation pits, internal haul road/access track, vehicle/machinery compound as well as revegetation zones and visual screening areas.

It is proposed that stage 5 will be cleared and mined on a staged basis (stages a and b) moving in a westerly direction. Progressive rehabilitation works will occur on a yearly basis following the closure of previously extracted areas of the pit, with the backslope to be rehabilitated in the first instance. Managing the extraction this way will ensure that the active pits are not as visually prominent in the landscape. It is projected that the gravel will be extracted at a rate of approximately 16,000m^3 a year (dependent on market demand) to a depth of 10 m, or as driven by the depth of the gravel resource. The quarry pit design and excavation methodology are consistent with the previously approved stages 1 to 4 and is summarised below:

- Topsoil will be removed (approximately 50 mm thick) and stockpiled in windrows so that it can be spread as a part of the gradual rehabilitation process. The topsoil stockpiles will be no more than 2 m high and 20 m wide with batters of 1:6.
- A bulldozer will rip the gravel and then blade it into a raw material stockpile. No over-excavation is to be undertaken below pit finished floor levels. The ultimate depth of excavation will be to a maximum of 10 m below the natural surface and batters of 1:3 (vertical: horizontal) will be maintained throughout the operation.
- The raw gravel material will subsequently be crushed by a mobile (tracked) impact crusher.
- Trucks will enter and cart material from the pit throughout the extraction period. Site access will continue to occur through a 6 m wide compacted gravel driveaway (internal haul road/access track) that traverses over a right-of-carriageway easement, which extends from Brookton Highway over three adjoining properties to the site.
- A pit face (south-west and south-east) of 4 m high or greater will be maintained at all times to provide a noise barrier to the houses located to the south and west of the pit.
- Infrastructure and production plant equipment will include gravel crusher, excavator and conveyor located within the confines of stage 5. Other man-made forms include the overburden and main sediment dam.
- Upon completion of extraction, the pit floor will be ripped prior to topsoil replacement. The area will be rehabilitated in accordance with the *Environmental Management Plan - Lot 9 Brookton Highway, Karragullen* (Emerge Associates 2021b), discussed further in **Section 6.1.3**.
- The existing cleared mineral earth 3 m wide firebreak located generally around all the internal boundaries of the site will be maintained at all times. The location is varied to avoid existing remnant vegetation.

3 Existing Landscape Character Assessment

Landscape values are a measure of the importance that the community places on the landscape at any particular place. Landscape values are a combination of the physical environment and the public perception of the environment.

The character of the landscape surrounding the site has been described in the subsequent sections based on broad landscape character types (LCT) and finer scale landscape character units (LCU). These are a useful way of describing patterns of characteristics such as landform, vegetation, water and land forms, as well as individual features, which can be used to understand how the extraction associated with stage 5 may work within the existing landscape, and views from the Brookton Highway/Canning Road and other important viewing locations.

3.1 Site context

The site is bounded by broad acre rural landholdings zoned 'General Rural' to the north and south, Midgegooroo National Park and Korong National Park to the north and east, and Brookton Highway and Canning Road to the south and west, as shown in **Figure 2**. Several scenic tracks are located in proximity (over 2 km) to the site including Springdale Road to the north-west and the Munda Biddi Cycle Track to the east. A number of existing individual dwellings are visible in the vicinity of the site, adding some built elements to the largely rural and natural character of the area. The dominant elements that comprise the district landscape character the site is found within can be summarised as:

- Undulating and rolling landforms with deep valleys, generally restricting views to the foreground and midground.
- Large rural landholdings supporting mixed uses including residential, orchard production, viticulture and industrial with clusters of remnant marri/jarrah forest. Land is divided into properties and paddocks by low wire or wooden post fences (visually permeable).
- Large blocks of native vegetation comprising mature native jarrah and marri within national parks. Gradual and naturally appearing transitions between agricultural and other land uses with forested land.
- Built form of a very low density with occasional punctuating low lightly coloured tin sheds and water tanks. Powerlines and infrastructure evident along roads and along property fence lines.
- Wide vehicular carriageways with remnant vegetation within road reserves.

A review of historical aerial imagery indicates the majority of the site supported relatively undisturbed native vegetation until 1974, after which gravel quarry activities began within the western portion of the site. The southern portion of the site was cleared circa 1974 for agricultural purposes including livestock grazing, with the exception of scattered paddock trees. Several small clearing events have occurred associated with the historic expansion of the quarry and construction of vehicle tracks through the northern portion of the site between 1977 and 2001. There is evidence of vegetation regrowth within the south-eastern portion of the site, however several bare ground areas are still evident due to historical clearing.

A detailed flora and vegetation survey was conducted by Emerge Associates between April to December 2020 (Emerge Associates 2021a) and identified that the northern and central portions of

the site support remnant native vegetation ranging from 'excellent' to 'very good' condition, meaning vegetation is relatively intact. The stage 5 clearing footprint was reduced to the minimum amount required to support the stage 5 excavation operations, with a total of 35.55 ha native vegetation proposed to be retained and protected within the broader site. The implementation of the EMP (Emerge Associates 2021b) will ensure that the biological diversity and ecological integrity of retained vegetation is maintained within and adjacent to the site. The extent of the clearing area will be clearly defined before any clearing activities commence to ensure there will be no encroachment of disturbance activities into vegetation proposed to remain undisturbed. Clearing of native vegetation will occur progressively as required for each extraction stage and rehabilitated upon closure, as detailed further in **Section 6.1.3** and in accordance with any clearing permit.

3.2 Landscape character type

Reading the Remote: Landscape Characters of Western Australia (Reading the Remote) (CALM et al 1994) provides a regional assessment of the varied and unique landscapes in Western Australia and is a common means of determining the broad landscape character classifications that may be applicable at a regional level. The LCT for the site is identified as the Darling Uplands (as shown in **Figure 2**) which can be generally described as the following:

- Undulating and steeply sloping terrain of distinct appearance with isolated peaks or hills and well-defined valleys. Several watercourses deeply dissect the surface of the Darling Uplands with irregular slopes, contributing to the extensive weathering evident over its surface.
- Vegetation is dominated by forests of jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) with a dense understory of smaller shrubs, climbers and herbaceous species including native *Banksia spp.*, *Hakea spp*. and grass trees (*Xanthorrhoea preissii*) with a low visual permeability.
- The forested areas are interspersed with areas of cleared pastoral and farming land, and heath and herblands occurring on the rough granite outcrops or groups of boulders.

3.3 Landscape character units

The (LCU is a smaller unit used to describe the appearance of the basic landscape elements such as landform, vegetation, human land use and water bodies. The LCT has common characteristics at a regional scale, while variations of the LCT can be mapped at a local scale and are called LCUs. At a more local scale, two LCUs have been identified for the site and broader area based on descriptions provided within the Visual Landscape Manual (WAPC 2007), including:

- Rural landscape
- Natural landscape

The rural landscape is the dominant unit in the western part of the broader area, with the natural landscape more evident to the east as part of the Midgegooroo National Park and Korong National Park to the north and east of the site respectively. The two landscape units are shown in **Figure 2** and are discussed in further detail in **Section 3.3.2** below.

3.3.1 Rural landscape character unit

The 'rural' LCU is the dominant unit in the broader area to the west (as seen in **Figure 2**) and can be described as the following:

- Large areas of cleared paddocks on undulating hills, used for agricultural purposes (i.e. grazing of horses and cattle). In these areas, native vegetation is largely removed, although may be present in patches or as paddock trees.
- Irregular rural buildings (homestead, sheds, water tanks and associated buildings), with variable colour and texture.
- Vertical but variable fencing and horizontal but random unsealed roads servicing rural lots and also providing access tracks within the Midgegooroo National Park and Korong National Park.

Farming structures and planted fruit orchards are visible within the broader area off Canning Road, shown in **Plate 2** and **Plate 3.** The areas identified as having a 'rural' LCU in relation to the site are shown in **Figure 2**. Viewpoint locations described in the plates are shown in **Figure 3** and **Figure 4**.

Plate 2: Viewpoint 6 – Fruit orchard and tin storage shed in foreground to midground with windbreak planting/retained vegetation along fence line. Other farming structures with light coloured walls/roof evident in the background, looking south-east from Littelys Road (north-west of the site).

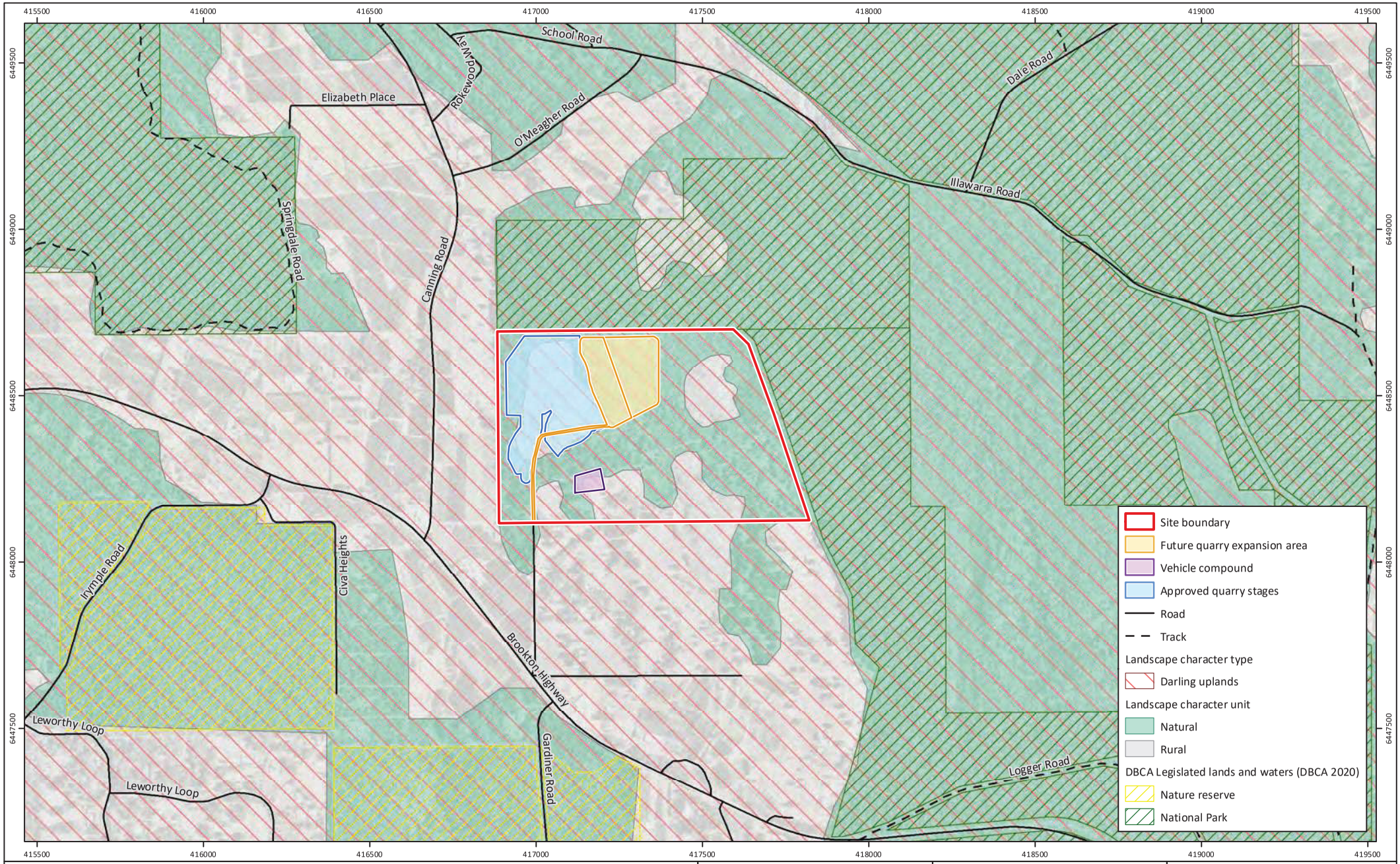

Figure 2: Landscape Character Units

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Client:	Vinci Gravel Supplies Pty Ltd

Plan Number:
EP20-040(12)--F25a

Drawn:	GAR
Date:	26/05/2021
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N

0 250 500
Metres

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Plate 3: Viewpoint 10 – Residential buildings over rolling hills and cleared paddocks evident within the broader area with the existing gravel quarry in the background, looking east from Ferguson Road (west of the site).

3.3.2 Natural landscape character unit

The 'natural' LCU is largely associated with the Midgegooroo National Park and Korong National Park, located to the north and west of the site, and further to the south (as seen in **Figure 2, Plate 4** and **Plate 5**) and can be described as the following:

- Large areas of intact remnant vegetation with variable texture and colour with openings of a natural appearance associated with wetlands and granite outcrops. Eucalyptus trees over 10 meters in height with an understory of low heath and shrubby herblands. Visual penetration into forest is moderate.
- Open forest and woodland offer structural diversity in colour and texture. Grey jarrah and marri trunks with vertical fibrous bark, mottled dark grass tree trunks with glossy green shoots, olive green leaved Banksia. Blackened fire damaged limbs and trunks of trees are interspersed throughout the forest.
- Views are broken by cavities resulting from grey granite and limestone outcrops, cleared pastoral land with sporadic roofing and farming infrastructure, large patches of pale orange in gravel pits and mines, geometric pine plantations, cleared power corridors and meandering walking tracks and bitumen roads.

The areas identified as having a 'natural landscape character' within the vicinity of the site are depicted in **Figure 2.**

Plate 4: Viewpoint 1 – Jarrah and marri forest within the Korong National Park off a gravel firebreak connecting onto the scenic Canning Mills Road, showing a diversity in colour and texture, and variable height of vegetation.

Plate 5: Viewpoint 25 – Views from Heath Road looking east towards the roadside native vegetation, demonstrating typical textured and diverse jarrah and marri forest (to the east of the site).

4 Principles and Objectives for Assessment

4.1 Visual landscape objectives

The overall management objective is to ensure that the stage 5 quarry expansion is designed and constructed in such a way that the existing landscape character at both the regional level (i.e. LCT in accordance with (Reading the Remote) (CALM et al 1994)) and local level (i.e. LCU in accordance with the Visual Landscape Manual (WAPC 2007) is protected and maintained.

Specific management objectives (as determined by Emerge Associates) relevant to each LCU are provided in **Table 2**.

Table 2: Landscape character management objectives

Landscape character unit	Management objectives
Rural	• To maintain and protect the quality of views of the rural landscape (including built form and rolling hills) and to integrate the gravel quarry into the landscape unit in such a way that existing views are protected. This includes maintaining the Armadale Hills experience (including components such as views of cleared paddocks on undulating hills, rows of planted orchards and granite/limestone outcroppings).
Natural	• To maintain the visual quality of the natural landscape including maintaining and protecting the: ○ The natural backdrop of the jarrah and marri forested ridgeline. ○ The quality of the views of natural features provided for users within Midgegooroo National Park and Korong National Park.

4.2 Visual Design Strategies

Upon identifying the key visual elements for the stage 5 expansion area, as described in **Section 2**, the following broad strategies are recommended as part of the design process to assist in the mitigation of any visual impact:

- Retain the vegetation within the higher areas of the site to keep a naturally appearing vegetated backdrop, to limit the existing vegetated horizon line associated with the Korong and Midgegooroo National Parks being broken.
- Retain existing vegetation between stage 5 and the Brookton Highway to the maximum extent possible, in particular stands of dense, taller remnant vegetation to assist with screening of the quarry.
- Ensure the distant views of stage 5 to align with the current viewing experience along Canning Road and Brookton Highway, and where possible are improved when compared to the current quarry.
- Blend the bare earth of the quarry pit (typically orange in colour) through progressive rehabilitation, including return of topsoil which is darker in tone, and replanting native species.

5 Landscape Visual Impact Assessment

5.1 Viewshed analysis

A viewshed analysis was performed to determine which locations in the vicinity of the site would have potential views of the stage 5 expansion area and considered the 'seen area' of the quarry, and is based on:

- The maximum height of the quarry wall associated with the currently approved quarry extent.
- The maximum height of the quarry wall associated with the stage 5 expansion.

A viewshed or 'seen area' is defined as:

A portion of the landscape that can be seen from one or more observer positions. The extent of the area that can be viewed is normally limited by landform, vegetation and distance. (WAPC 2007)

The viewshed applicable to the proposed building was based on:

- Identifying potentially significant visual receptors, these included major roads in proximity to the site; Brookton Highway and Canning Road, minor roads such as Gardiner Road, Ferguson Road and Logger Road, walking tracks through adjacent reserves such as Springdale Road through Korong National Park and surrounding rural residential dwellings surrounding the site.
- Identifying the extent of the 'seen area', where the quarry may be visible based on existing topographic contours only. The visible area is based on two scenarios, namely the maximum height of the quarry wall associated with the existing approved quarry extent and the maximum height of the quarry wall following the completion of the stage 5 quarry expansion, and any land equal to or greater than those heights.
- Overlaying the receptors on the viewshed to determine locations that would have a potential view of the stage 5 area.

Vegetation (and height of vegetation) is not considered as part of the viewshed analysis.

The outcomes of the viewshed analysis are shown in **Figure 3** (existing quarry) and **Figure 4** (stage 5 quarry expansion). The distance zones used for the viewshed analysis were sourced from the Visual Landscape Manual (WAPC 2007), and include the 'foreground' (from the site to 500 m) and 'middleground' (500 m to 6 km). Further views (e.g. greater than 6 km) were not considered in detail, as at that scale the stage 5 quarry is not likely to be distinguishable from the surrounding landscape features, particularly given the patchwork of human built form elements visible in the broader regional context.

The results of the viewshed analysis indicate that the majority of the potential visible areas are located within approximately the first 4 km of the site, and the 'seen area' for stage 5 is less than the existing quarry within approximately 500 m of the site.

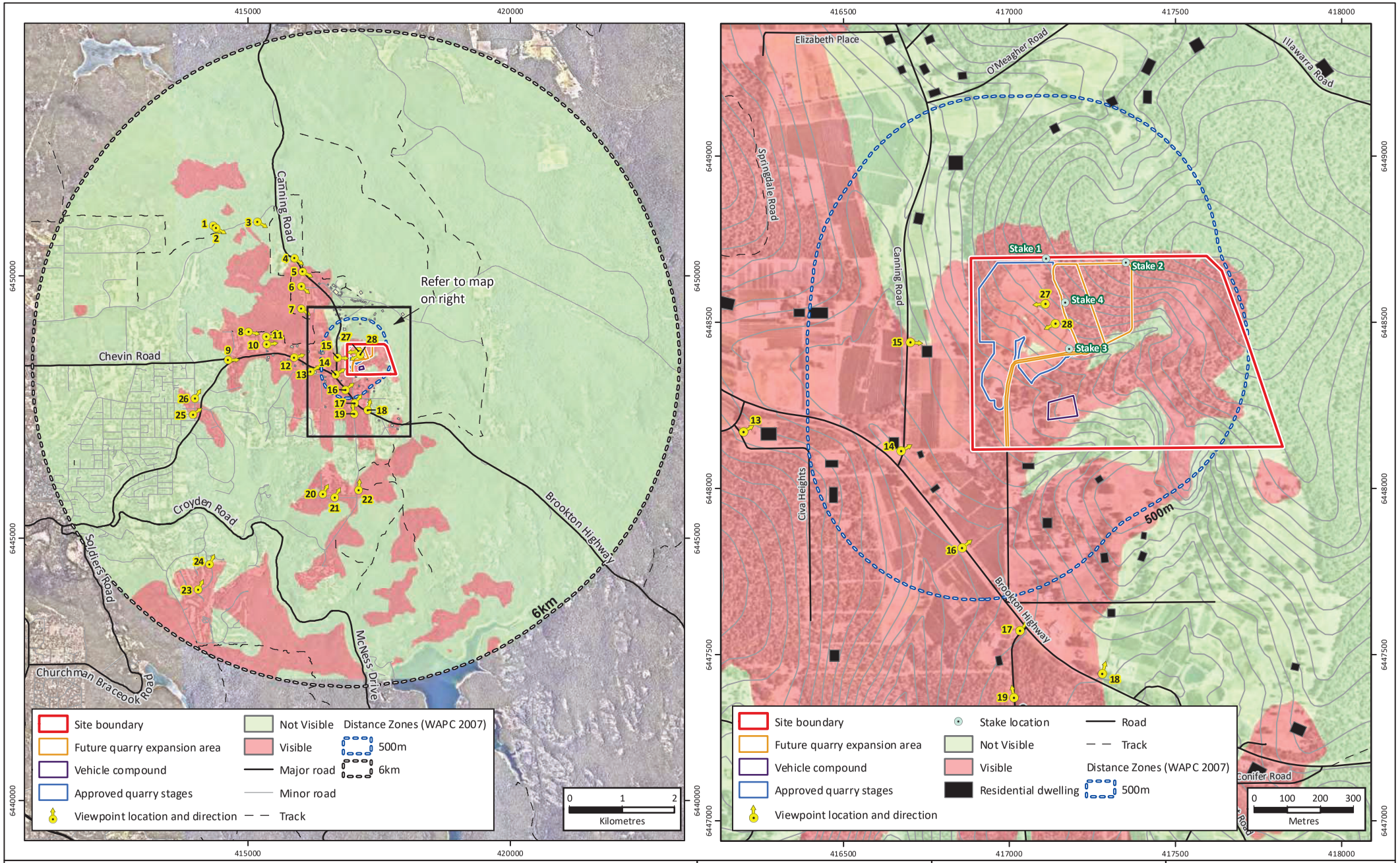

Figure 3: Viewshed Analysis - Existing Quarry

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Lot 9 Brookton Highway, Karragullen
Client: Vinci Gravel Supplies Pty Ltd

Plan Number:
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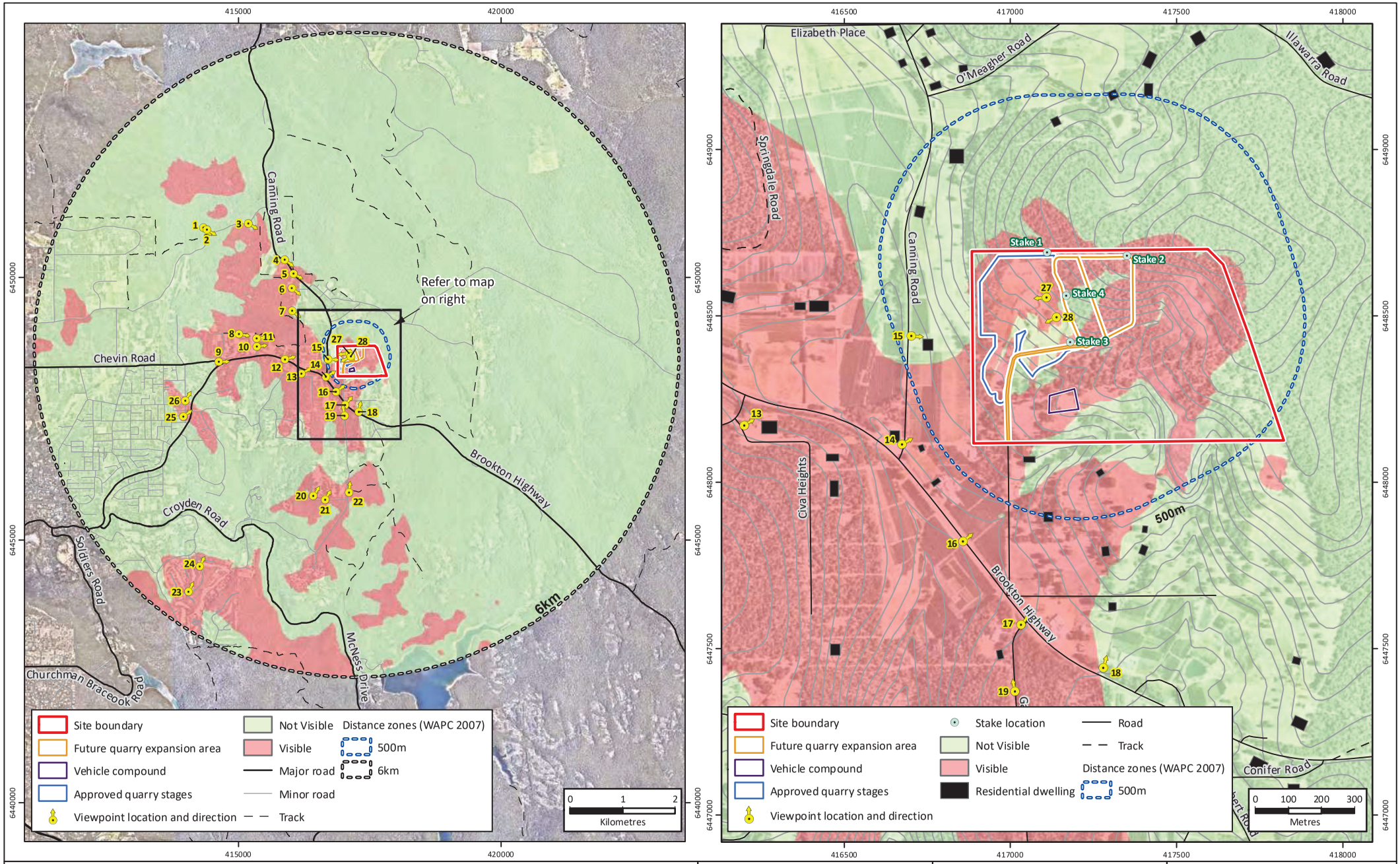

Figure 4: Viewshed Analysis - Stage 5 Quarry Expansion

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Client: Vinci Gravel Supplies Pty Ltd

Plan Number:
EP20-040(12)--F27a
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5.2 Site assessment

Following the viewshed analysis, a site visit was undertaken by a landscape architect and environmental consultant from Emerge Associates, on 28 January and 29 January 2021 to ground truth the outcomes from the viewshed analysis and determine locations where the stage 5 quarry expansion may be visible (based on the presence of existing vegetation and other features). The site visit included walking portions of the scenic walking trails such as Springdale Road in addition to several locations along Brookton Highway and Canning Road with various photos taken at a number of viewpoint locations. The viewpoint locations and associated photos are shown in **Figure 5** to **Figure 7**.

The photos were captured using a 50 mm digital SLR camera (and crop factor) with a focal length of approximately 75 mm which is generally equivalent to that recommended in the Visual Landscape Manual (WAPC 2007) (which suggests a 35 mm camera with a focal length of 90 mm) for representing what the human eye sees. Where relevant, photos have been assembled into a photomontage (referenced as 'original photomontage') to represent the breadth of the view (e.g. panorama) at certain viewpoints rather than taking a panorama or wide-angle view photo. This is in accordance with the Visual Landscape Manual (WAPC 2007).

To assist in understanding the visibility of stage 5 from the various viewpoints, four 7 m high aluminium poles with high visibility vests tied to the top were installed at prominent locations within the stage 5 quarry footprint as shown in **Plate 6**. The poles were generally aligned with the outer corners of the stage 5 footprint as shown in **Figure 3** and **Figure 4**, at the following locations:

- Stake 1 (-32.0950°S, 116.1215°E)
- Stake 2 (-32.0952°S, 116.1240°E)
- Stake 3 (-32.0975°S, 116.1223°E)
- Stake 4 (32.0962°S, 116.1222°E)

The poles were used to help understand the likely visibility of stage 5 at the different viewpoint locations (particularly given the presence of existing vegetation and topography, which made it difficult in locations to locate the existing quarry extent within the landscape).

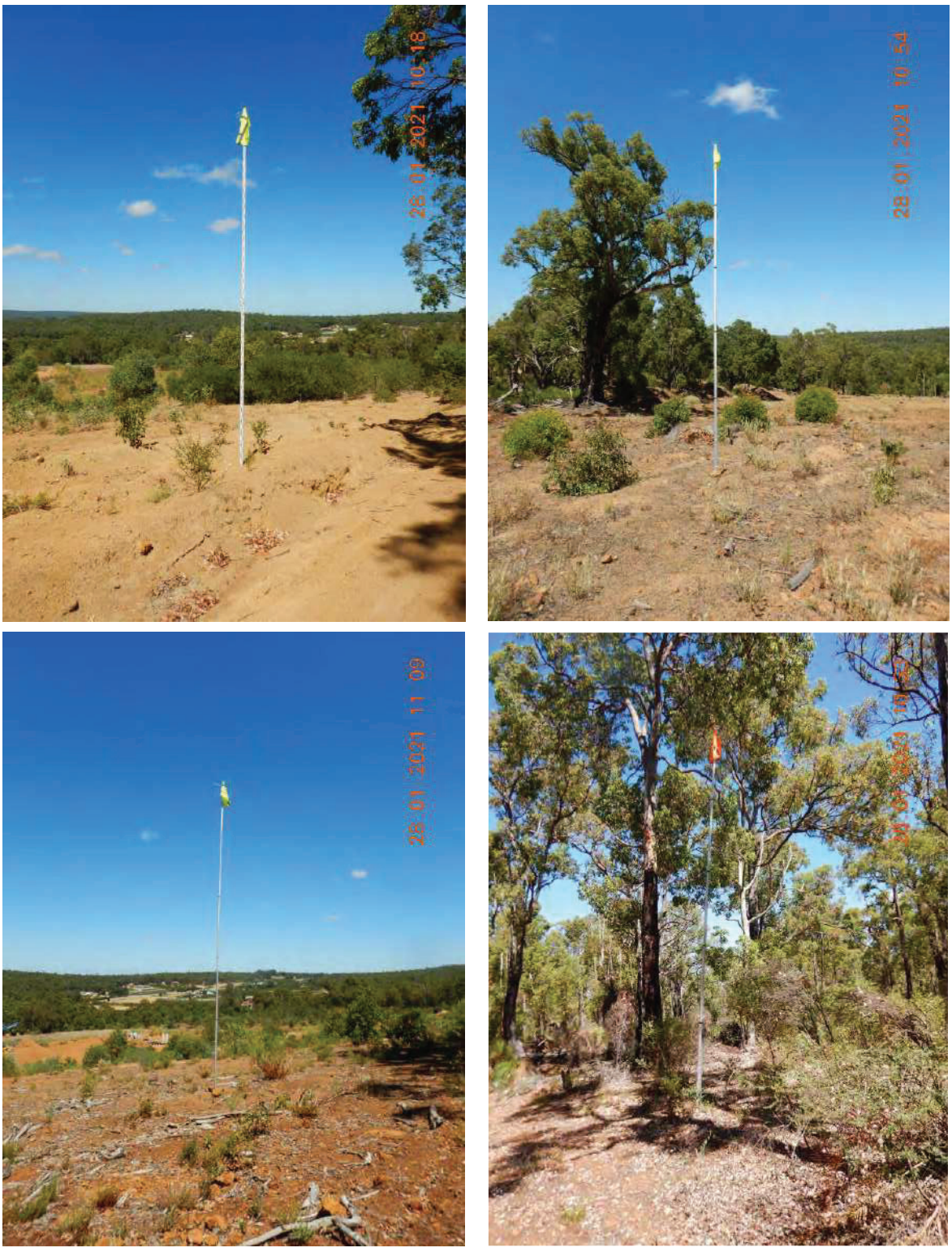

Plate 6: 7 m poles with high visibility flags located within the existing and proposed quarry sites.

5.3 Viewpoint analysis

Viewpoints were selected at various locations along major and minor roads and rural residential access tracks and driveways surrounding stage 5 and were based on 'seen/visible' and 'unseen/not visible' areas identified in the viewshed analysis, as well as other potential viewing locations identified during the site visit along scenic walking trails such as Springdale Road and from within the existing quarry facing towards the surrounding residential dwellings to the west of the site.

Table 3 summarises whether any part of stage 5 is likely to be visible from the viewpoints based on the visibility of any of the poles. Each viewpoint location is shown in **Figure 5** to **Figure 7** along with the original photomontage from each viewpoint captured during the site visit.

Table 3: Likely visibility of stage 5 quarry expansion based on outcomes of the site visit

Visible	Viewpoint location												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Yes/No	N	N	N	N	N	N	N	N	N	**Y**	N	**Y**	**Y**
	14	15	16	17	18	19	20	21	22	23	24	25	26
Yes/No	N	N	N	N	N	N	N	N	N	N	N	N	N

While the viewshed analysis (**Figure 3** and **Figure 4**) indicates that the existing and proposed quarry may be visible at a number of locations (based on landform alone), the site visit indicated that existing vegetation at the boundary of the site and within the broader area (particularly along roads and associated with the national parks) shields the views of the existing quarry. It was determined that stage 5 has the potential to be visible at three (3) of the 26 viewpoints.

5.4 Summary of likely impacts

The site assessment and viewpoint analysis, confirmed the 'natural' and 'rural' LCUs are present at the local level, and that the visual characteristics of views associated with the site and general location are:

- The natural vegetated and rural nature of the site, consisting of remnant patches of jarrah and marri forest vegetation with variable texture and colour with openings of a natural appearance associated with granite outcrops and cleared paddocks.
- Larger rural residential lots along Brookton Highway with views of low orchards over rolling hills intersected by roofing and farming infrastructure, large patches of pale bare earth (orange in colour) associated with gravel pits and mines, cleared power corridors and main roads.
- Large blocks of retained marri/jarrah forest vegetation associated with Midgegooroo National Park and Korong National Park to the north and east of the site.
- Higher density residential development with a natural aesthetic to the west of the site.

Upon assessing the viewshed analysis and having visited the site and its surrounds, a series of key views to the site have become evident. These have formed the key assessment points for considering how the visual impact of stage 5 could be mitigated and are discussed further in the following sections.

The desktop and site assessment identified that stage 5 may be visible at times by users driving along Brookton Highway in an easterly direction when climbing a soft ridgeline in front of the site

(depending on location). In particular, one location at Ferguson Road (Viewpoint 10) and two points along Brookton Highway (Viewpoints 12 and 13) where clearing of vegetation for agricultural land uses in the foreground and middle ground enabled glimpses of the existing open pit within the site. Due to a valley landform and the height and form of existing vegetation along roadsides and within abutting National Parks, the existing stage 4 and proposed stage 5 will not be visible from the scenic Munda Biddi Cycle Track to the east of the site, Springdale Road walking trail and vehicle access track to the north west of the site, or Canning Road to the north of the site.

To minimise the potential visual impact of stage 5 on the surrounding landscape, mitigation measures have been proposed further in **Section 6.1**.

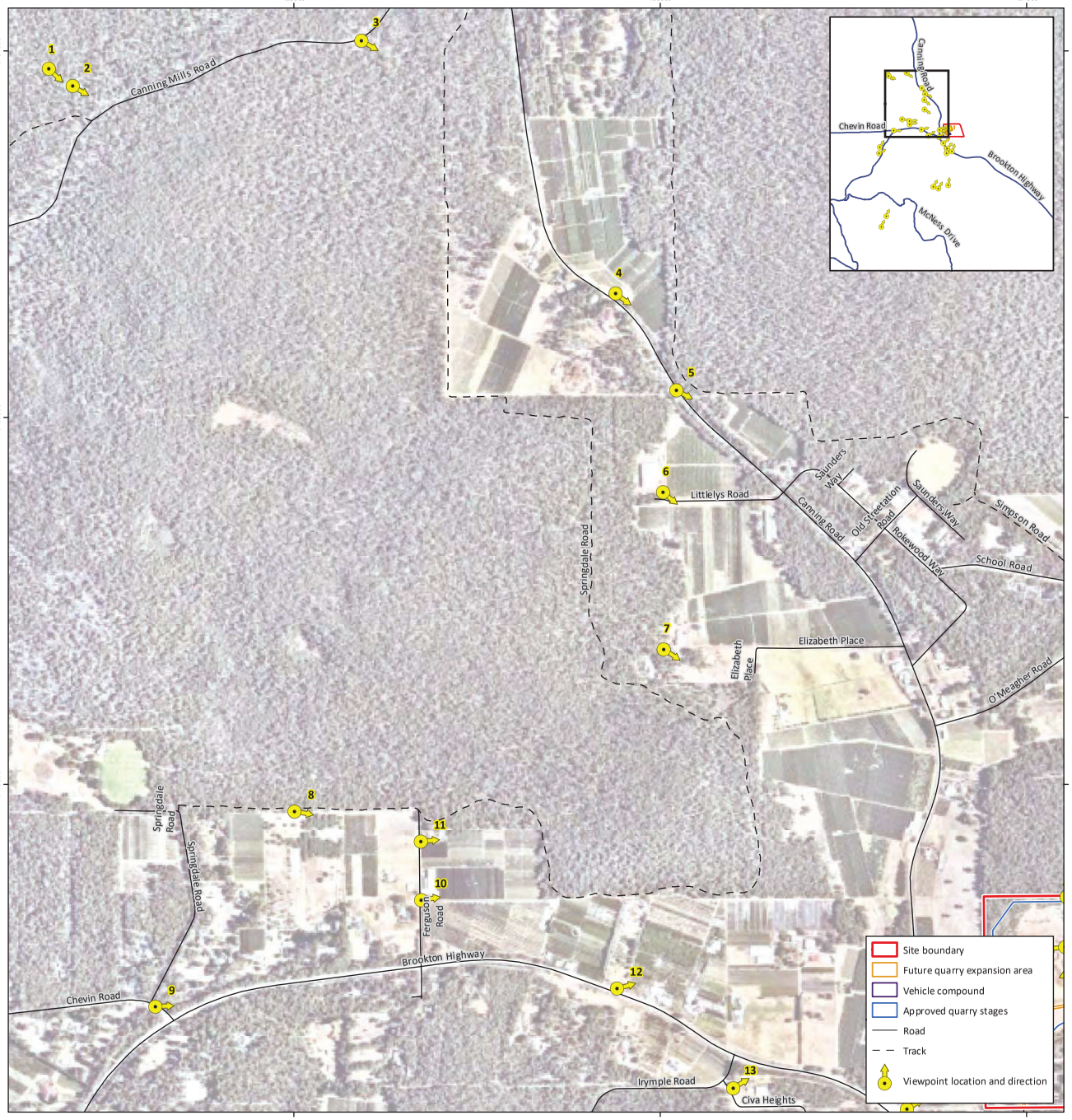

Figure 5: **North Viewpoint Location Plan and Original Photomontages (Viewpoint 1-10)**

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Lot 9 Brookton Highway, Karragullen
Client: Vinci Gravel Supplies Pty Ltd

Plan Number: EP20-040(12)--F28a
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Checked: BRB
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N

0 100 200 300 400
Metres
Scale: 1:12,000@A3
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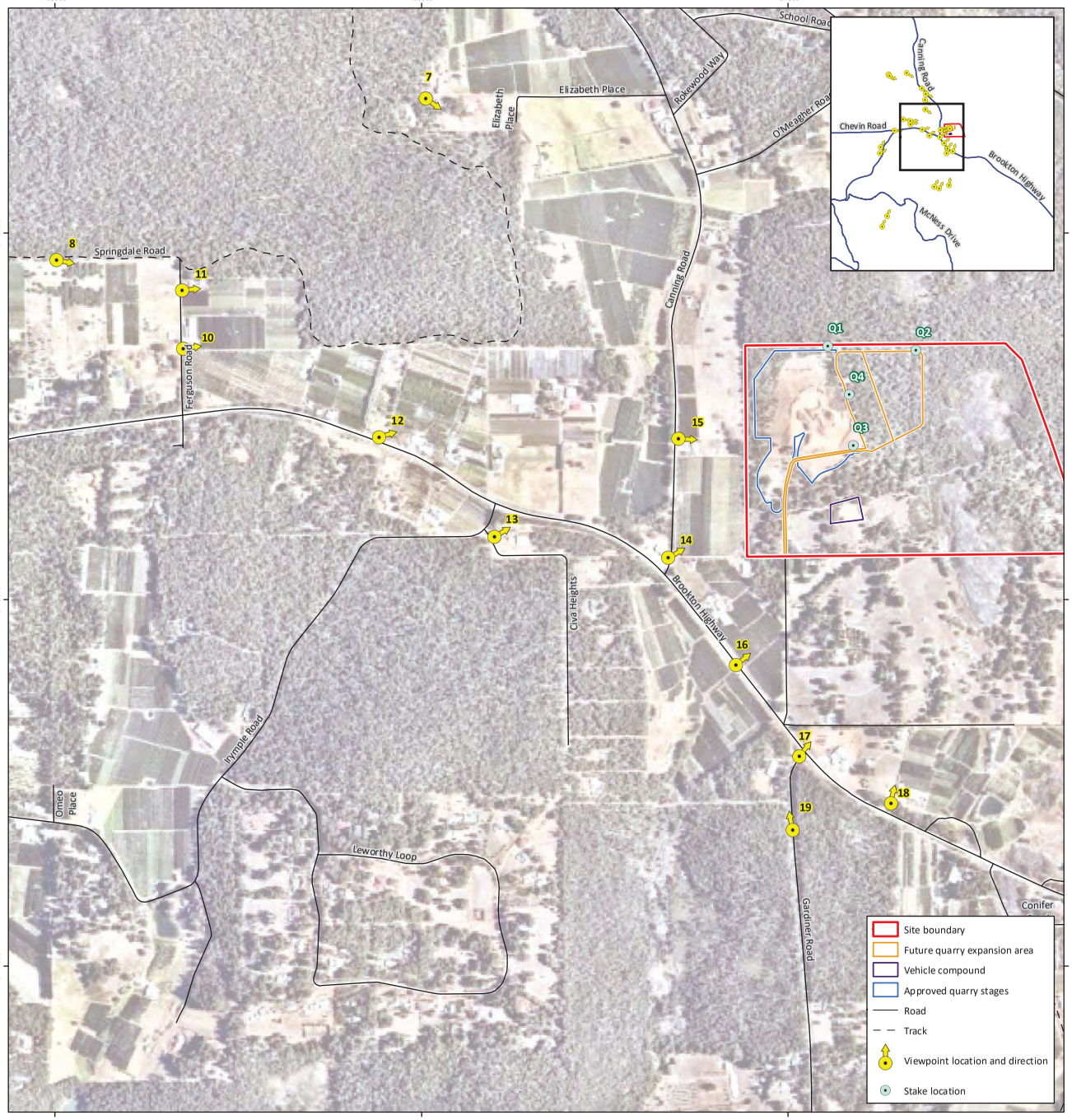

Figure 6: **Central Viewpoint Location Plan and Original Photomontages (Viewpoint 11-19)**

Project: Visual Impact Assessment
Lot 9 Brookton Highway, Karragullen

Client: Vinci Gravel Supplies Pty Ltd

Plan Number: EP20-040(12)-F29a
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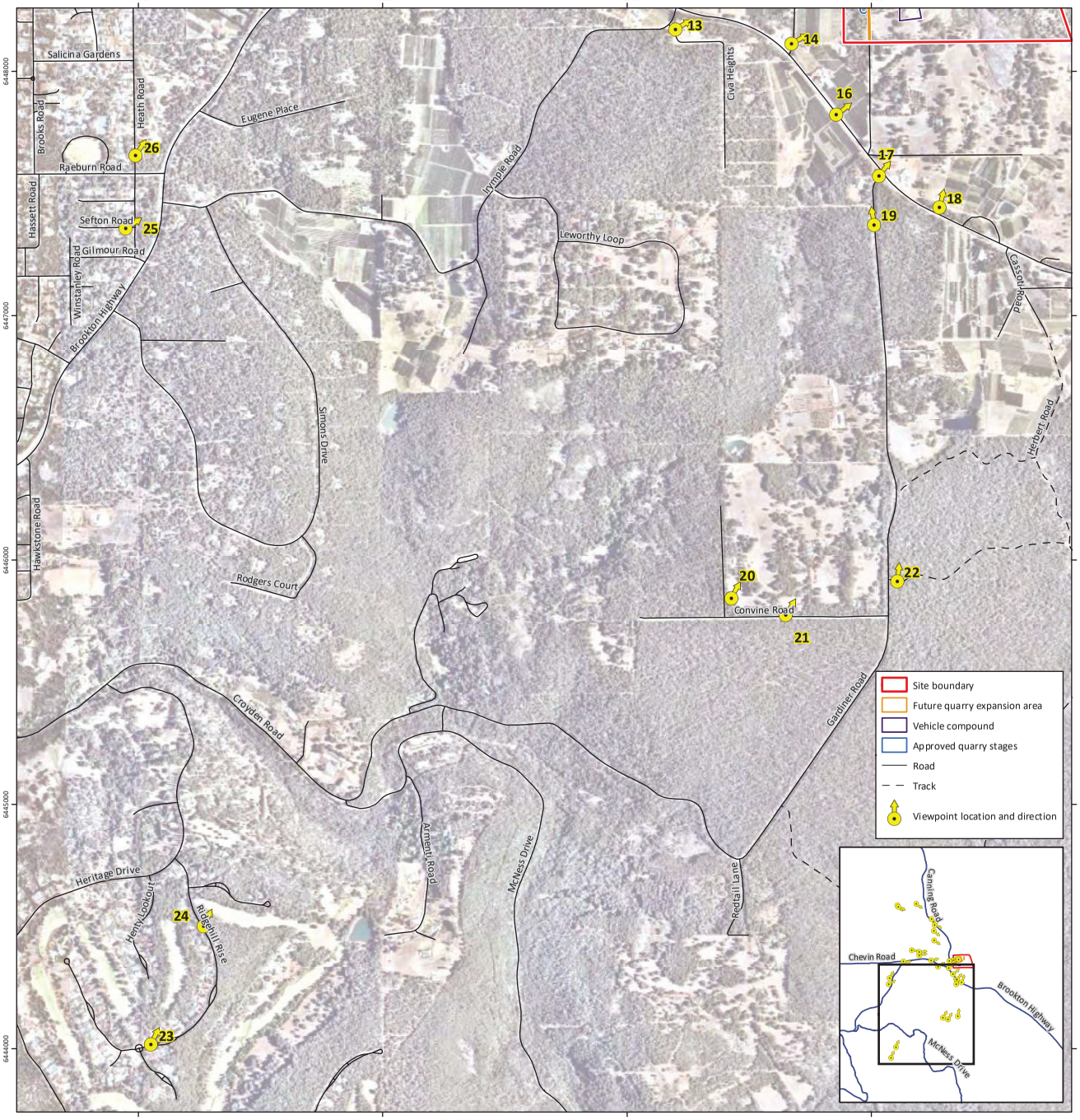

Figure 7: **South Viewpoint Location Plan and Original Photomontages (Viewpoint 20-26)**

Project: Visual Impact Assessment
Lot 9 Brookton Highway, Karragullen
Client: Vinci Gravel Supplies Pty Ltd

Plan Number: EP20-040(12)--F30a
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Metres
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6 Evaluation of Visual Impact Assessment

6.1 Visual mitigation and management measures

To ensure the stage 5 does not detract from the scenic quality of the land (and achieve the visual landscape objectives outlined within **Section 4.1**), specific mitigation measures have been recommended for stage 5. The recommendations have also considered the revegetation and acoustic requirements as outlined within the Acoustic Assessment (Lloyd George Acoustics 2021) and the Environmental Management Plan (Emerge Associates 2021b).

The potential visual impact from the stage 5 expansion can be minimised by utilising a staged mining approach with retention of vegetation between stages, progressively revegetating completed stages and retaining an existing vegetation buffer between the extraction area and the site boundary the north. The mitigation measures are further detailed in **Sections 6.1.1** to **6.1.3** below.

6.1.1 Proposed Stage 5 location and staging

The stage 5 expansion pit will be located a minimum 20 m from the northern and western boundaries of the site (as shown in **Figure 8**) enabling the retention of stands of taller remnant vegetation between stage 5 and Brookton Highway to the west. This will provide screening for between Canning Road/Brookton Highway and the quarry. A total of 35.55 ha native vegetation will be retained within the site, with the majority extending over the higher areas of the site to keep the vegetated backdrop and limit the existing vegetated horizon line associated with the Korong and Midgegooroo National Parks being broken.

Stage 5 extraction activities will begin at the easternmost extent, gradually expanding in a westerly direction, with progressive rehabilitation works to be undertaken following the completion of each extraction stage. The staged approach allows for vegetation to remain closest to Brookton Highway for the longest period of time, providing screening of the quarry activities. Once the Stage 5a area is exhausted, the remaining vegetation within Stage 5b will be removed, however at the same time Stage 5a will be overlain with topsoil and progressively rehabilitated so the pit is less prominent visually.

As part of the VIA, a 'worst case' scenario has been assumed whereby market demand is high for gravel and stage 5a is exhausted within 3 years of approval, after which excavation activities commence immediately over stage 5b. It is possible that stage 5a is excavated for a period of greater than 3 years, allowing for a longer time to lapse between stages and therefore more time for the existing revegetation areas to mature and contribute to screening/blending measures.

The pit will be mined in a southwest direction, to ensure that the pit face provides a noise barrier to the houses located to the south and west of the pit. All large visually prominent machinery such as the front-end loader used to load product into trucks and the gravel screening machinery will operate from behind a minimum 4 m high pit face at all times.

6.1.2 Topsoil replacement and landform reinstatement

Topsoil at the site will be stripped and stockpiled separately, prior to quarrying activities commencing. The dimensions of the topsoil stockpiles will not exceed two metres in height and will be located so as to not be visually prominent. Following the completion of each stage, stockpiled topsoil will be placed over the graded bare earth. This will allow blending of the bare mineral earth (typically a stark orange colour) with the topsoil that is darker in tone, thereby reducing the overall visibility.

Whilst the site is not known to contain any unique geological features or landforms, the extraction activities will focus on returning the post-mined landform to a gently sloping surface in alignment with the existing upland topography. During operations 1: 3 batters will be maintained within the pit. However, following the completion of each stage, restoration and reinstatement of the pit will commence. In areas where extraction is completed, and prior to the ultimate re-forming of the area for subsequent revegetation, slopes around the perimeter of the excavation area will be re-contoured to achieve stable gradients (less than 1:4 vertical to horizontal batter) and the pit floor will have at least a 1:100 fall, refer to **Figure 9** and also **Appendix A**.

6.1.3 Revegetation

An EMP (Emerge Associates 2021b) has been prepared to support the DA and EIL applications for stage 5 of the quarry, and outlines vegetation management activities to be undertaken during extraction and rehabilitation measures following completion of extraction. The EMP outlines three distinct rehabilitation zones which are depicted on **Figure 8** and outlined below:

- Zone 1 – Visual screening
- Zone 2 – Native revegetation of existing stages
- Zone 3 – Native revegetation of stage 5a and 5b.

A general planting list has been provided within **Appendix B**, with each zone outlined in detail in the following sections.

6.1.3.1 Visual screening (Zone 1)

Zone 1 comprises an area of 0.67 ha to the west of the internal haul road/access track, as shown in **Figure 8**. The purpose of this planting is to reduce any visual impacts associated with the extraction area through the use of dense vegetative screening. Zone 1 was originally planted in 2015 in accordance with previous development approval conditions and will continue to be revegetated with native species via direct seeding and infill planting to reach the completion criteria as outlined in the EMP (Emerge Associates 2021b). Recent site inspections indicate trees planted in 2019 as part of previous rehabilitation efforts are now at 6 m in height.

6.1.3.2 Native revegetation (Zone 2, 3)

Zone 2 consists of the stage 4 quarry pit and other disturbed areas extending over 8.19 ha within the western portion of the site, as shown in **Figure 8**. Revegetation activities have already commenced within portions of zone 2, conditioned under the clearing permit (CPS 8273/1). Recent site inspections indicate vegetation planted in 2019 as part of previous rehabilitation efforts are now at 4 m in height. A mix of infill planting and direct seeding will occur for areas where the plant density is not achieving the completion criteria.

Zone 3 consists of the proposed stage 5a and 5b extraction areas extending over 4.99 ha, as shown in **Figure 8**. The objective is to progressively revegetate these extraction areas via direct seeding of local native species, based on those present in areas of remnant vegetation within the site and nearby national parks.

Native revegetation areas (Zones 2 and 3) will be planted with a native density of approximately 0.8 plants / 1 m^2 and a species richness of no less than 15 species of tree, shrub and herbs. In the short to medium term, it is expected that this planting will blend with the existing remnant native vegetation to the north and east and will blend the view of the quarry with existing vegetation for distant views from Canning Road and Brookton Highway.

6.1.3.3 Other planting

Further revegetation activities will include infill planting of tree species (proposed to be *Eucalyptus wandoo, Eucalyptus patens, Eucalyptus lane-poolei, Eucalyptus laeliae and Corymbia calophylla,* based on existing vegetation within the site and surrounds) in a linear arrangement immediately adjacent to the western boundary of the site and will include clusters of up to 2 to 3 trees, 5 m apart at a density of 0.5 trees / 1 m^2 interspersed with a native scrub understory. At approximately 12 years maturity, this vegetation is expected to block views of stage 5 from Canning Road and Brookton Highway in the near view. As part of this VIA, this planting has been considered as part of 'Zone 1' when considering benefits of this planting.

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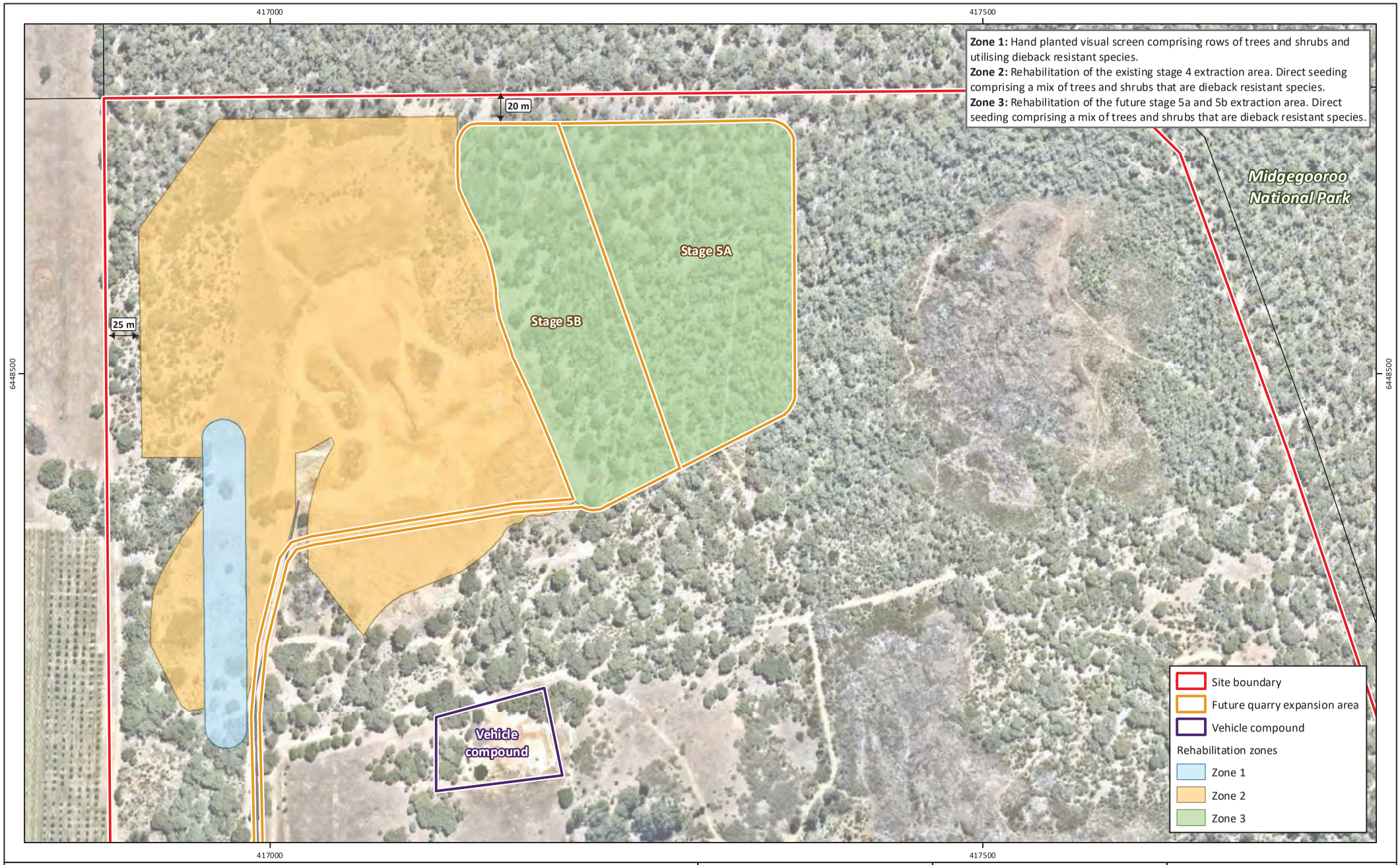

Figure 8: Rehabilitation Zones

Project:	Visual Impact Assessment Lot 9 Brookton Highway, Karragullen
Client:	Vinci Gravel Supplies Pty Ltd

Plan Number:
EP20-040(12)--F64a

Drawn:	GAR
Date:	26/05/2021
Checked:	BRB
Approved:	KK
Date:	26/05/2021

N

0 50 100 150
Metres
Scale: 1:3,500@A4
GDA 1994 MGA Zone 50

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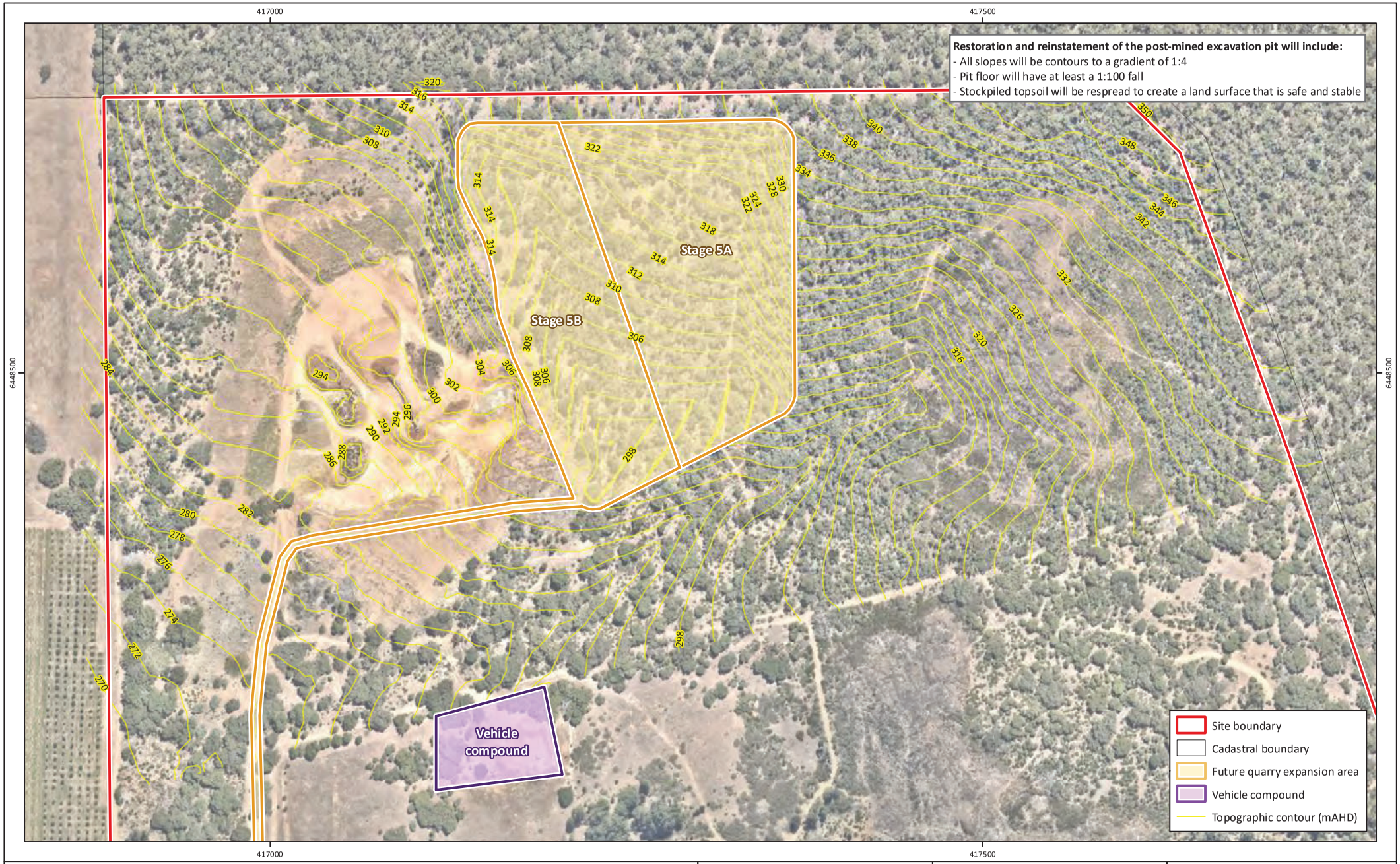

Figure 9: Quarry Closure Contours

Project: Visual Impact Assessment
Lot 9 Brookton Highway, Karragullen
Client: Vinci Gravel Supplies Pty Ltd

Plan Number:
EP20-040(12)--F65a

Drawn:	GAR
Date:	26/05/2021
Checked:	BRB
Approved:	KK
Date:	26/05/2021

N

0 50 100 150
Metres
Scale: 1:3,500@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

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6.2 Assessment of visual impact management measures

To help 'test' the appropriateness of the proposed management measures, Emerge Associates have prepared a number of cross-sections as well as design montages (3D perspectives) which provide a visual depiction of the 'mitigated' scenario. These are to help demonstrate where the stage 5 expansion area is located within the landscape in comparison to the existing vegetation, as well as how the proposed management measures (described above) will assist with minimising visual impacts. The cross-sections and design montages (3D photo perspectives) are discussed further below.

The visual impact assessment has determined that the existing gravel quarry will not be visible from Brookton Highway to the south and Canning Road to the north due to the presence of vegetation within landholdings and road reserves (in addition to vegetation retained within the site), as detailed within **Table 3**. Viewpoints 16 to 19, located approximately 1 km to the south of the stage 5 quarry expansion area along Brookton Highway, demonstrates that the pit is located behind existing stands of vegetation (along the road, within landholdings) when viewed from the south, as shown in **Figure 6.**

6.2.1 Cross-sections

Three cross sections have been prepared for stage 5, associated with the three viewpoints where it was determined stage 5 would be visible. This is to help illustrate the relationship between existing landform and other landscape characteristics such as vegetation cover and land use and the proposed mitigation measures.

One point was chosen from the Ferguson Road (Viewpoint 10) to depict a stationary view experienced from a residential landholding (Lot 3 Brookton Highway) located on top of the ridgeline at 292 m AHD to the west of the site. Due to the expanse of clearing for orchards and pasture in the valley landform, Viewpoint 10 has a distant view of the quarry. Two points were chosen along Brookton Highway (Viewpoints 12 and 13) located at 280 m AHD and 273 m ADH respectively, to depict how the quarry is glimpsed through gaps in roadside vegetation whilst driving in an easterly direction.

The cross sections provide additional detail regarding the stage 5 location and extent within the topographic contours and the visual effect of revegetation and screening areas. The locations of the cross-sections were determined in consultation with the City of Armadale and includes close and distant viewpoints. A reference plan showing the locations of each of the cross sections has been provided in **Plate 7**, with the detailed cross-sections provided in **Plate 8** to **Plate 10.** A summary of each cross-section, the relevant viewpoints and the natural features and management measures shown is provided in **Table 4** (and includes consideration of 'Image 1' presented as part of the photomontages). The cross-sections depict the three zones of revegetation planting as discussed in **Section 6.1.3** and shown in **Figure 8**.

Table 4: Summary of cross-sections prepared for the site and outcomes demonstrated with each cross-section.

Cross-section (see Plate 8 to Plate 10)	Characteristics and/or management measures
1 (A to AA) Viewpoint 10 (see **Plate 8**) (Location of cross section shown on **Plate 7**)	• Existing agricultural landscape (orchards, cleared paddocks etc.) provide limited screening for viewers on Ferguson Road. • Existing (historic) excavation pit (Zone 2) will be visible until revegetation/planting establishes within Zone 1 and Zone 2. • Demonstrates that whilst the residential lots 1113-1119 Brookton Highway and 1143 Brookton Highway are situated at a lower elevation than stage 5 (maximum 319 mAHD), due to the mature remnant vegetation abutting Canning Road, approximately 20 m in height, the quarry will be blocked from the line of site. **Implementation of management measures:** • Stage 5a will be concealed by existing mature vegetation >12 m in height that will be retained in the stage 5b area. • When Stage 5b commences, until vegetation within Zone 2 grows to at least 9 m in height, all of stage 5 will be visible. Revegetation within Zone 2 will assist with screening the existing quarry.
2 (B to BB) Viewpoint 12 (See **Plate 9**) (Location of cross section shown on **Plate 7**)	• Existing agricultural landscape (orchards, cleared paddocks etc.) provide limited screening for viewers on Brookton Highway that may glimpse the site through gaps in mature vegetation. • Existing (historic) excavation pit (Zone 2) will be visible until revegetation/planting establishes within Zone 1 and Zone 2. • Demonstrates that residential lots 1143, 1153, 1189, 1759 and Lot 2 Brookton Highway are situated at a lower elevation than stage 5 (maximum 324 mAHD) and due to the existing topography or mature remnant vegetation abutting Canning Road and along the boundary of the site, approximately 20 m in height, the quarry will likely be blocked from the line of site. **Implementation of management measures:** • From Brookton Highway, stage 5a will be concealed by existing mature vegetation >12 m in height that will be retained in the stage 5b area. • From Brookton Highway, when Stage 5b commences, and until vegetation within Zone 2 grows to at least 9 m in height, all of stage 5 will be visible. Revegetation within Zone 2 will assist with screening the existing quarry.
3 (C to CC) Viewpoint 13 (see **Plate 10**) (Location of cross section shown on **Plate 7**)	• Existing agricultural landscape (orchards, cleared paddocks etc.) provide limited screening for viewers on Brookton Highway that may glimpse the site through gaps in mature vegetation. • Existing (historic) excavation pit (Zone 2) is generally screened by the existing mature vegetation adjacent to the site boundary. • Demonstrates that whilst Lot 2 Brookton Highway is situated at a lower elevation than stage 5 (maximum 329 mAHD), due to the mature remnant vegetation abutting site boundary, approximately 20 m in height, the quarry will be largely blocked from the line of site. **Implementation of management measures:** • Stage 5a will be concealed by existing mature vegetation >12 m in height that will be retained in the stage 5b area. • When Stage 5b commences, all of stage 5 will be visible. Revegetation within Zone 2 will assist with screening stage 5 but not until the vegetation is at least 9 m in height.

Vinci Quarry Visual Impact Assessment- Plate 7: Section Reference Plan

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6.2.2 Design montage (3D photo perspective)

As outlined within **Section 5**, original site montages have been created for all viewpoints and are provided to **Figure 5** to **Figure 7**. The original site montages helped to identify key viewpoints (10, 12 and 13) in which the stage 5 expansion area may be visible to viewers, for which design montages (3D photo perspectives) have been prepared to demonstrate the appropriateness of the proposed management measures discussed in **Section 6.1**.

The design montages (3D perspectives) are a simulation/computer generated technique, and have been prepared based on overlaying the quarry footprint in 'plan' view and using this and the flags to identify the extent of the quarry pit face that would be visible at the various locations. The existing colour of the bare mineral earth (orange) was then used to indicate the likely visibility of the quarry. Vegetation height within the site has been accurately indicated based on assumed growth over time and height compared to existing features.

Three montages were prepared for each cross section provided in **Plate 8** to **Plate 10,** demonstrating the current conditions (Image 1), implementation of stage 5a implementation (Image 2) and implementation of stage 5b (Image 3). The quarry stages and associated revegetation activities depicted in each photomontage are outlined in **Table 5** below.

Table 5: Quarry stages and revegetation activities

Image	Timeframe	Quarry activities	Revegetation activities
1	Current	Existing	• Zone 1 and boundary planting currently at 6 years growth with vegetation 6 m high.
2	Current	Stage 5a extraction activities commenced.	• Topsoil spreading over Zone 2, indicated by a darker tone. • Zone 1 and boundary planting currently at 6 years growth with vegetation 6 m high.
3	3 years	Stage 5a exhausted, Stage 5b extraction activities commenced	• Topsoil spreading over Stage 5A, indicated by a darker tone. • Zone 1 and boundary planting is now at 9 years growth, vegetation estimated to be 9 m high (based on existing growth). • Zone 2 revegetation at 3 years growth with vegetation 3 m high.

As discussed in **Section 6.1.1**, a 'worst case' scenario has been assumed whereby stage 5a is exhausted within 3 years, after which extraction activities with stage 5b commence immediately. It is possible gravel will continue to be extracted from stage 5a for a longer duration of 5 to 7 years before the pit moves in a westerly direction, allowing additional time for vegetation within Zone 1 and Zone 2 to mature and increase in height.

The following three locations were regarded as key views in the viewshed analysis and site assessment, and 3D perspective photomontages and cross-sections have been prepared for each.

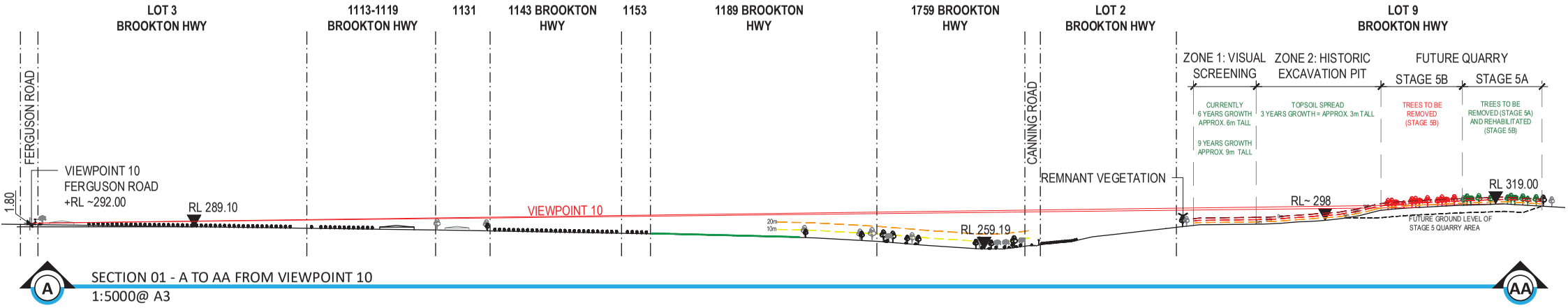
6.2.2.1 Viewpoint 10 (Plate 8)

This location is accessible by Ferguson Road, a minor access road off Brookton Highway and is representative of views of a number of existing residences to the west of the site will likely experience. The viewpoint is located approximately 1.8 km to the west of the site, and due to the lack of taller native vegetation between Ferguson Road and the site, stage 5 would be visible from this location. The 3D perspective photomontage shows:

- **Image 1:** Under current conditions, the stage 4 (existing) quarry area, represented by the bare mineral earth (orange-coloured), and extraction-related machinery is visible in the background. These features are partially hidden by the six-metre-tall vegetation associated with Zone 1 and the boundary planting. A black and blue conveyor belt within the site appears above the tree line.
- **Image 2:** Stage 5a extraction activities have commenced however is located behind vegetation associated with the uncleared stage 5b. Only partial glimpses of stage 5a is likely due to retained vegetation providing a screen. Application of topsoil within Zone 2 will blend existing bare mineral earth with surrounding native vegetation and granite outcrops. The planting within Zone 1 is currently 6 m high and conceals the lower westernmost portions of the existing quarry. This vegetation minimises the 'scar' in the forested tree line imposed by the previous vegetation clearing.
- **Image 3:** Closure of the stage 5a pit after 3 years and commencement of stage 5b extraction activities, with progressive topsoil spreading occurring within stage 5a. Planting within Zone 1 continues to increase in height and is now 9 m, and will assist with reducing the extent of the quarry face from stage 5b that is visible. Revegetation within Zone 2 provides a green cover blending the existing quarry so it is no longer visible, but does not provide any screening to stage 5a or 5b. Overall, the removal of vegetation from stage 5b creates a larger 'scar' in the jarrah and marri forested ridgeline, however the extent to which this is noticeable in the background is minimal due to the blending from the topsoil spread and rehabilitation activities.

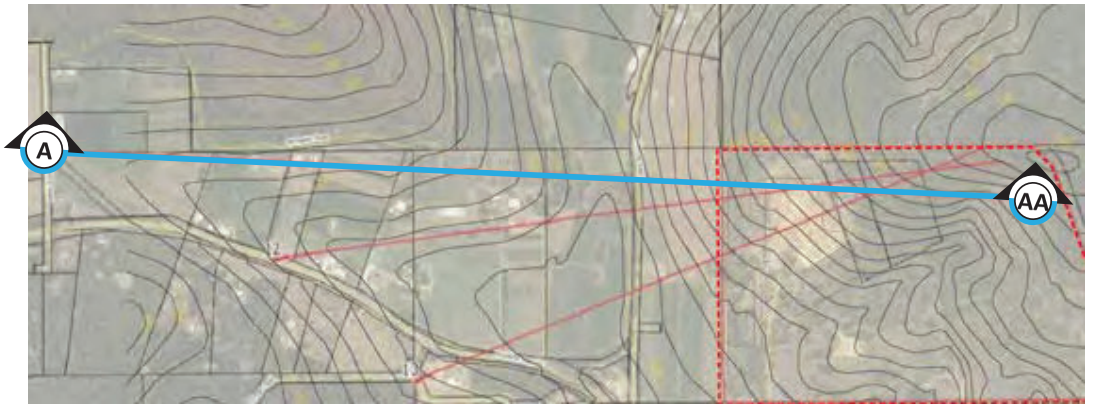
For this viewpoint, the rural LCU objective would apply, and with particular relevance to viewpoint 10, the objective will be maintaining the rural grassed hills and the natural backdrop of the Korong National Park and Midgegooroo National Park. This objective can be met with progressive topsoil spreading and revegetation of the extraction areas via direct seeding of local native species. This will enable the views of the current exposed quarry face to blend with the native vegetation in the midground and background. While stage 5b will be visible in the short to medium term, the visual impact will not be as prominent as the existing quarry area.

The 3D perspective photomontages and cross-sections for Viewpoint 10 are provided in **Plate 8.**



SECTION 01 - A TO AA FROM VIEWPOINT 10
1:5000@ A3

Image 1 - Existing site montage



Section location plan

Image 2 - Stage 5a quarry activities commenced
Photomontage of view assuming stage 5a excavation activities commenced, visual screening strip is at 6 years growth and topsoil spreading over revegetation areas.

Image 3 - Stage 5b quarry activities commenced
Photomontage of view assuming topsoil spreading over 5a, stage 5b excavation activities commenced, visual screening strip at 9 years growth.

Vinci Quarry Visual Impact Assessment- Plate 8: Viewpoint 10
Sections and Montages

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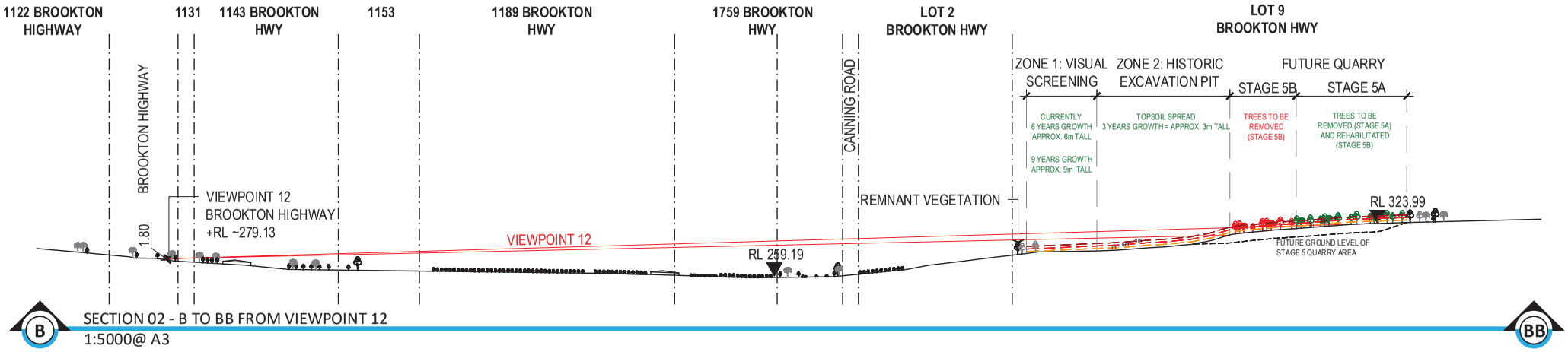
6.2.2.2 Viewpoint 12 (Plate 9)

This location is accessible by users of Brookton Highway whilst driving in an easterly direction and is synonymous of views drivers may have when glimpsed through gaps in the existing vegetation. The viewpoint is located at 279 m AHD approximately 1.3 km to the west of the site. Whilst stands of remnant vegetation exists within residential landholdings, the quarry is situated on a ridgeline of higher elevation, and therefore stage 5 will be visible over the treetops from this location. The 3D perspective photomontage shows:

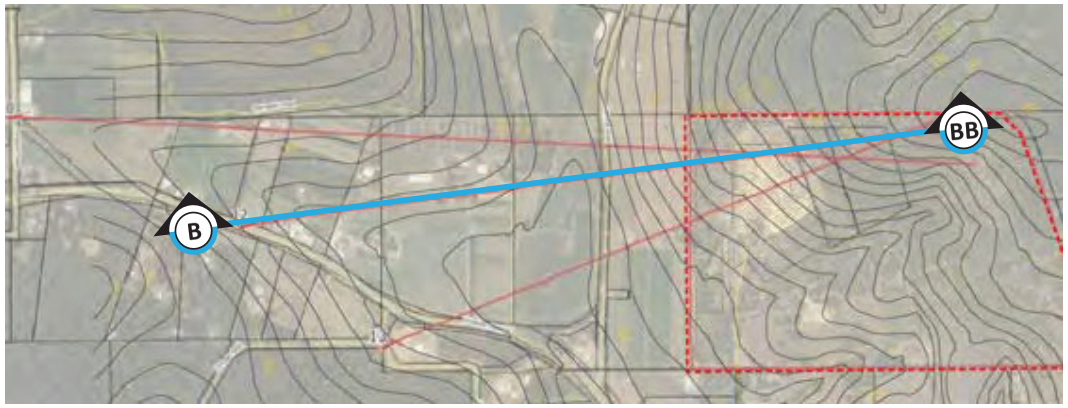
- **Image 1:** Under current conditions, the stage 4 (existing) quarry area, represented by the bare mineral earth (orange-coloured), and extraction-related machinery is visible in the background. These features are partially hidden by the six-metre-tall vegetation associated with Zone 1 and the boundary planting. A black and blue conveyor belt within the site appears above the tree line.
- **Image 2:** Stage 5a extraction activities have commenced however are located behind vegetation associated with the uncleared stage 5b. Only partial glimpses of stage 5a is likely due to retained vegetation providing a screen. Application of topsoil within Zone 2 will blend existing bare mineral earth with surrounding native vegetation and granite outcrops and existing planting within Zone 1 (6 m high) will conceals the lower westernmost portions of the existing quarry.
- **Image 3:** Closure of the stage 5a pit after 3 years and commencement of stage 5b extraction activities, with progressive topsoil spreading occurring within stage 5a. Planting within Zone 1 continues to increase in height and is now 9 m, and will assist with reducing the extent of the quarry face from stage 5b that is visible, however overall a larger area that is unvegetated will be visible compared to existing conditions. Revegetation within Zone 2 provides a green cover blending the existing quarry so it is no longer visible, and will provide some screening of stage 5b. Blending from the topsoil application in stage 5a will reduce visibility (and ongoing rehabilitation will also improve outcomes, as demonstrated in the cross but is not shown in the image).

For this viewpoint, the rural LCU objective would apply, and the visual mitigation objective will be equivalent to viewpoint 10, maintaining and protecting the rural grassed hills and the natural backdrop of the Korong National Park and Midgegooroo National Park. This objective can be achieved with the planting in Zone 1 and native revegetation areas in Zones 2 and Zone 3 (as it becomes established) minimising the extent of the quarry that will be visible and blending the previously excavated areas with the existing vegetation. The short to medium term view of the quarry will be similar to that of other cleared agricultural paddocks nestled in amongst areas of vegetation. The 3D perspective photomontages and cross-sections for Viewpoint 12 are provided in **Plate 9.**



SECTION 02 - B TO BB FROM VIEWPOINT 12
1:5000@ A3

Image 1 - Existing site montage



Section location plan

Image 2 - Stage 5a quarry activities commenced

Photomontage of view assuming stage 5a excavation activities commenced, visual screening strip is at 6 years growth and topsoil spreading over revegetation areas.

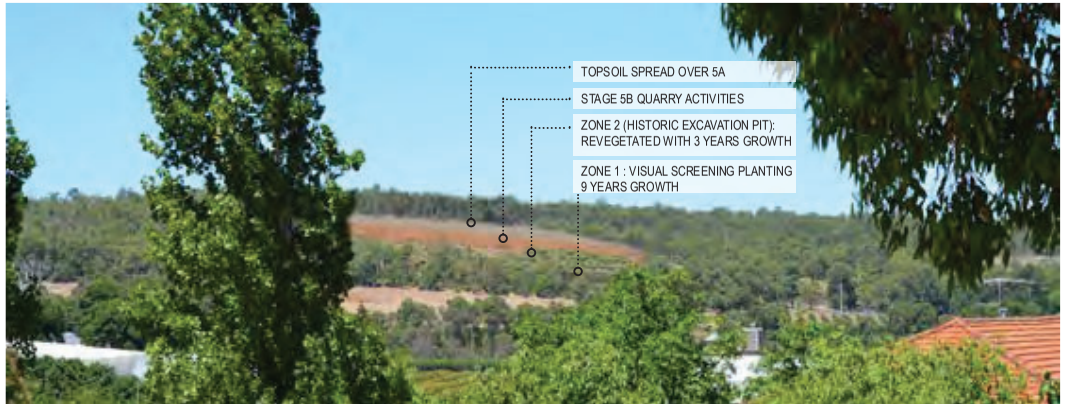


Image 3 - Stage 5b quarry activities commenced

Photomontage of view assuming topsoil spreading over 5a, stage 5b excavation activities commenced, visual screening strip at 9 years growth.

Vinci Quarry Visual Impact Assessment- Plate 9: Viewpoint 12

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6.2.2.3 Viewpoint 13 (Plate 10)

This location is accessible from Brookton Highway off Civa Heights whilst driving in an easterly direction. The viewpoint is located at 273 m AHD approximately 1 km to the south-west of the site. While existing vegetation within the Brookton Highway and Canning Road reserves conceals the majority of the existing quarry from view, stage 5 may be visible over the treetops located at a higher elevation. The 3D perspective photomontage shows:

- **Image 1:** Under current conditions, only glimpses of the existing quarry are visible in the middle ground and are largely hidden by existing remnant vegetation present within the site along the property boundary and within residential lots in front of the site. While the viewer is closer, the quarry is considerably less prominent in this location than at Viewpoints 10 and 12.
- **Image 2:** Stage 5a extraction activities have commenced however are located behind vegetation associated with the uncleared stage 5b. Only partial glimpses of stage 5a is likely due to retained mature vegetation providing a screen. The glimpses of the existing quarry are further blended through the application of topsoil.
- **Image 3:** Closure of the stage 5a pit after 3 years and commencement of stage 5b extraction activities, with progressive topsoil spreading occurring within stage 5a. The quarry face will be more visible once the vegetation associated with stage 5b is removed, with rehabilitation/planting associated with Zone 1 and Zone 2 have minimal impact. Blending from the topsoil application in stage 5a will reduce visibility of the cleared area and look like a granite outcrop type feature (and ongoing rehabilitation will also improve outcomes, as demonstrated in the cross but is not shown in the image).

For this viewpoint, the natural and rural LCU objective would apply, and maintaining and protecting the presence of the jarrah and marri forested ridgeline will be important and will help draw the viewer's eye. This objective can be met through the progressive revegetation of the extraction areas (particularly stage 5a and 5b). The 3D perspective photomontages and cross-sections for Viewpoint 12 are provided in **Plate 10**

Overall, there will be short-to-medium term visual impacts associated with the stage 5 quarry expansion area, however staging of works (and starting at the easternmost point) will reduce the prominence of the quarry for however long it takes to complete stage 5a, while progressive topsoil application and rehabilitation will reduce the prominence of stage 5b. Rehabilitation/planting associated with Zone 1 and Zone 2 will be beneficial for mid-to-distant views, while rehabilitation of stage 5a will help minimise impacts for near views. Based on the measures outlined within **Section 6.1** and shown within the 3D perspective photomontages within **Plate 8** to **Plate 10**, the visual quality of both the existing rural and natural landscape can be maintained and protected, therefore the landscape objectives outlined within **Section 4.1** can be achieved.

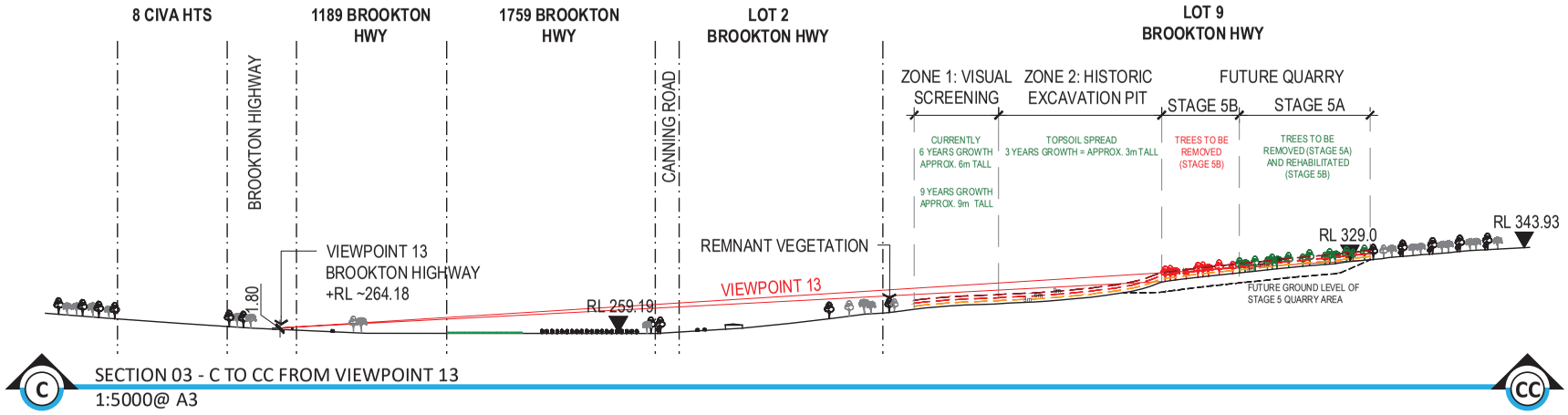
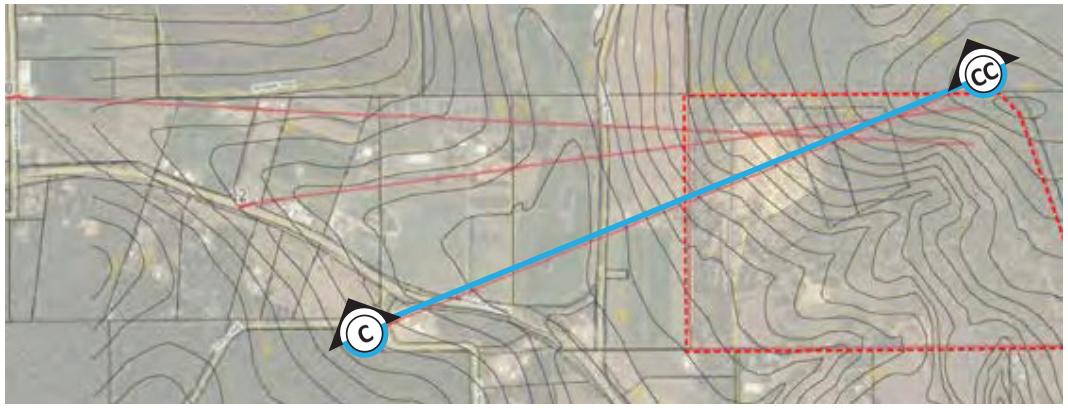


Image 1 - Existing site montage



Section location plan

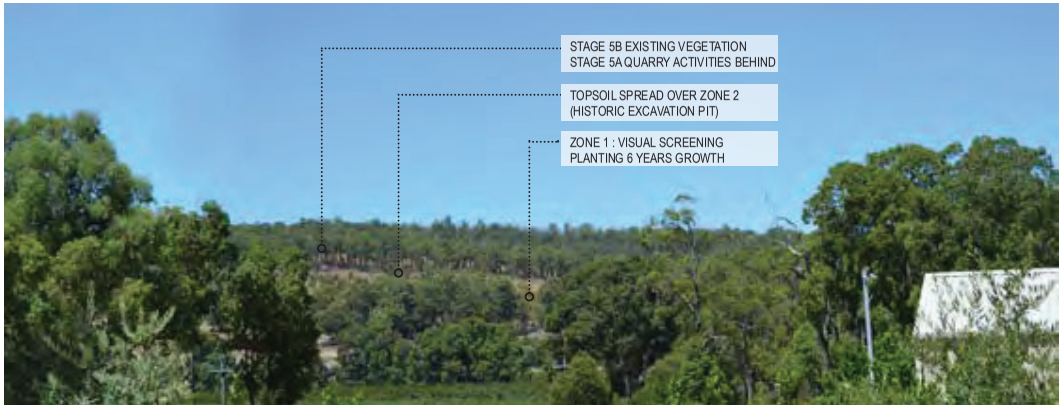


Image 2 - Stage 5a quarry activities commenced

Photomontage of view assuming stage 5a excavation activities commenced, visual screening strip is at 6 years growth and topsoil spreading over revegetation areas.

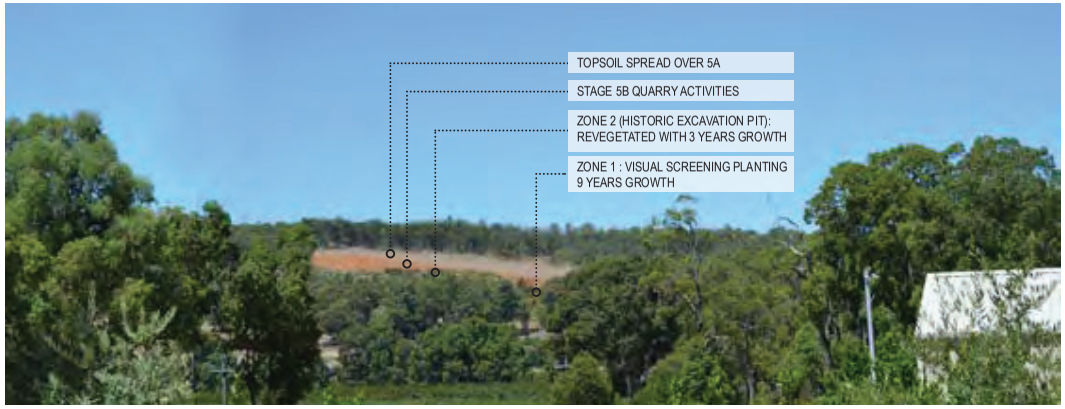


Image 3 - Stage 5b quarry activities commenced

Photomontage of view assuming topsoil spreading over 5a, stage 5b excavation activities commenced, visual screening strip at 9 years growth.

Vinci Quarry Visual Impact Assessment- Plate 10: Viewpoint 13

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7 Conclusion

Vinci Gravel Supplies Pty Ltd (the proponent) proposes to expand their existing gravel quarry at Lot 9 Brookton Highway, Karragullen. The site is 48.23 hectares in size and is located within the City of Armadale (CoA) municipality, 15 kilometres east of Armadale town centre.

The CoA have asked the proponent to demonstrate that there will be no adverse amenity impacts on nearby land uses. Accordingly, this VIA has been prepared to determine the likely visual impact of the proposed quarry expansion on the existing views within the surrounding Armadale Hills landscape and has used a number of the methods outlined within the Visual Landscape Manual (WAPC 2007) to assess the visual impact and recommended management measures. The VIA specifically:

- Identifies the existing visual landscape characteristics of the site (prior to any works) and identifies visual landscape objectives.
- Identifies and maps the proposed expansion in the context of the existing landscape.
- Outlines visual design strategies for the proposed expansion.
- Assesses the visual impact created by the proposed expansion, through a viewshed analysis and site assessment, determining key views with regard to existing landform and vegetation that require further assessment/consideration.
- Outlines visual management measures that could be used to minimise visual impacts and provides an assessment of these management measures through the use of photomontages and cross-sections.

It is important to note, that the VIA process and associated development design has been undertaken in consultation with the CoA and feedback provided during the preparation of this VIA has been adopted throughout the process.

The desktop and site assessment identified that the existing quarry is visible and that stage 5 (particularly stage 5b) may be visible at times by users driving along Brookton Highway in an easterly direction (depending on location) when climbing a soft ridgeline in front of the site, and from residences to the west that are located on a small ridge with existing cleared agricultural landscapes providing views towards the site. Stage 5 will not be visible from Brookton Highway to users south of the site and Canning Road users to the north of the site, due to the presence of dense vegetation within landholdings and road reserves (in addition to vegetation retained within the site). Due to a valley landform and the height and form of existing vegetation, stage 5 will also not be visible from the scenic Munda Biddi Cycle Track to the east of the site, Springdale Road walking trail and vehicle access tracks to the north west of the site.

The assessment of the proposed management measures, as shown within the cross-sections and photomontages, indicates that there will be short-to-medium term visual impacts associated with the stage 5 quarry expansion area, however staging of works (and starting at the easternmost point) will reduce the prominence of the quarry for however long it takes to complete stage 5a, due to existing vegetation providing screening to the new quarry face. Progressive topsoil application and/or rehabilitation and planting in Zones 1 (visual screening to internal haul road/access track), Zone 2 (existing quarry area) and Zone 3 (stage 5a and 5b) will reduce the prominence of stage 5,

particularly stage 5b, over time. Rehabilitation/planting associated with Zone 1 and Zone 2 will be beneficial for mid-to-distant views, while rehabilitation of stage 5a will help minimise impacts for near views as stage 5b is being progressed. In general, the visual impact of the proposed stage 5 expansion will be synonymous with openings of a natural appearance associated with wetlands, granite outcrops and cleared paddocks, through the progressive rehabilitation of previously excavated stages.

Based on the existing landform and vegetation and proposed management measures, the existing visual quality of both the rural and natural landscape character units can be maintained and protected in the long-term and short-to-medium term impacts can be minimised, achieving the objectives determined for this VIA.

8 References

8.1 General references

City of Armadale 2000, *Extractive Industries Local Law*.

City of Armadale 2016, *City of Armadale Local Planning Strategy - Town Planning Scheme No. 4*, Armadale

Emerge Associates 2020b, *Level 1 Fauna Assessment Lot 9 Brookton Highway, Karragullen*, EP20-040(04)--003 MS, Version 1.

Emerge Associates 2021a, *Detailed Flora and Vegetation Survey - Lot 9 Brookton Highway, Karragullen*, EP20-040(04)--002 RAW, Version 1.

Emerge Associates 2021b, *Environmental Management Plan - Lot 9 Brookton Highway, Karragullen* EP20-040(12)--007 BRB, 1.

Emerge Associates 2021c, *Targeted Black Cockatoo Assessment Lot 9 Brookton Highway, Karragullen*, EP20-040(05)--009 SCM, Version 1.

Lloyd George Acoustics 2021, *Vinci Quarry Expansion Stage 5 Noise Assessment - Lot 9 Brookton Highway, Karragullen*, 20115962-01.docx, Rev 0.

Western Australian Planning Commission (WAPC) 2007, *Visual Landscape Planning in Western Australia - a manual for evaluation, assessment, siting and design*, Perth.

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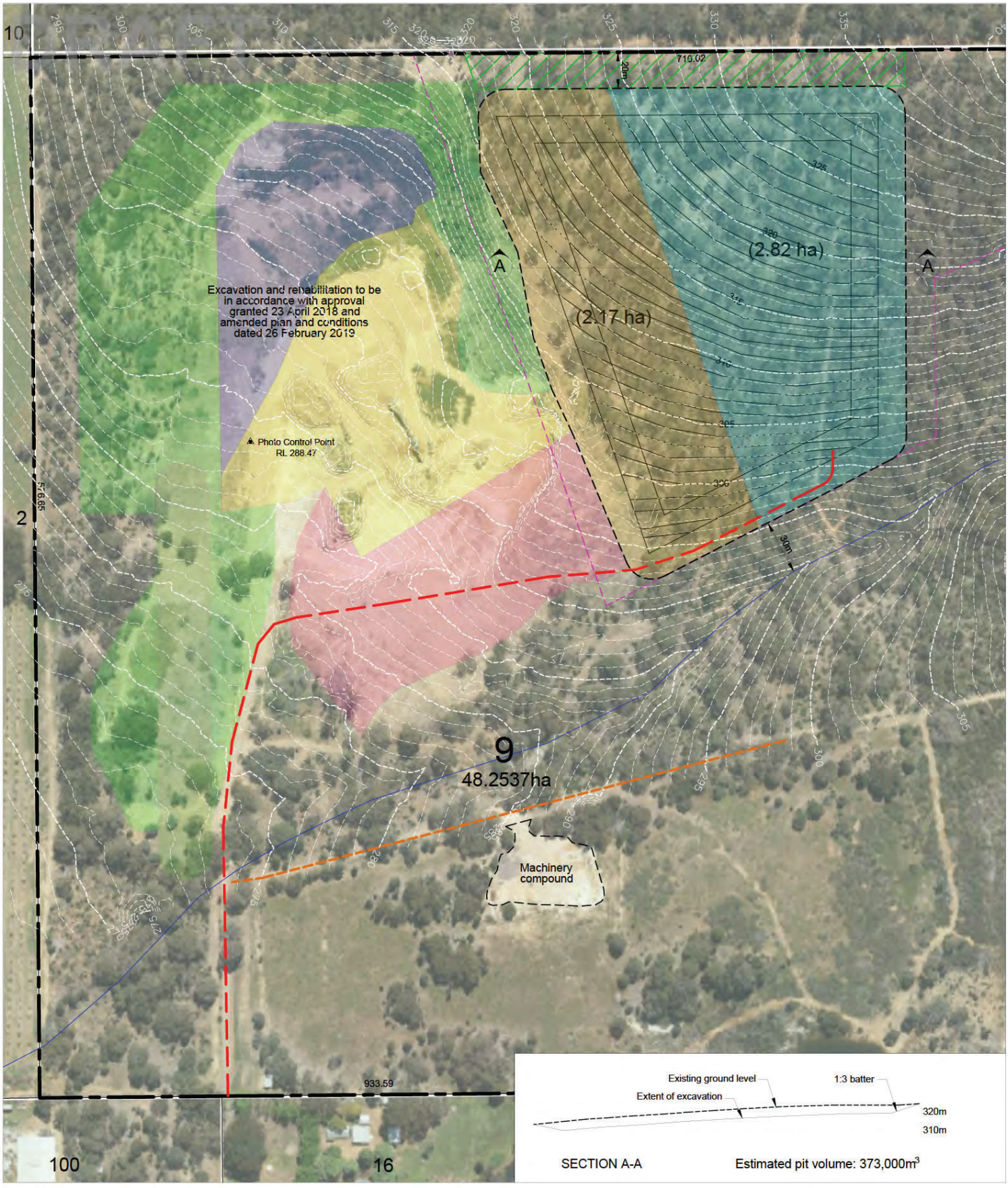
Appendix A

Proposed staging plan



LEGEND

Subject site	Revegetation commitment	Proposed extraction area
Extent of gravel resource	Extraction area	Stage 1 extraction area
Existing contours (1m interval)	Rehabilitation area	Stage 2 extraction area
Existing gravel driveway	Direct seeded area	Retained vegetation buffer
Existing creekline	Visual screen planting	

2019 Approved areas:

Proposed areas:

Proposed access track

Proposed finished level

DEVELOPMENT SITE PLAN
PROPOSED EXTRACTION AREAS

Lot 9 on D042350, Brookton Highway, Karagullen

Date: 3 February 2021 Scale: 1:2000 @ A3 File: 20-112 PL2A Staff: AL / LC Checked: AL

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Appendix B

Planting list for revegetation areas

Table B1: Revegetation plant species list

Form	Species	
Groundcovers	*Hardenbergia comptoniana* *Kennedia coccinea* *Orthrosanthus laxus* *Dampiera linearis*	*Burchardia congesta* *Clematis pubescens* *Kennedia prostrata* *Conostylis aculeata*
Shrubs	*Allocasuarina humilis* *Calothamnus quadrifidus* *Hakea amplexicaulis* *Hakea lissocarpha* *Mirbelia dilatata* *Hakea petiolaris*	*Acacia drummondii* *Acacia huegelii* *Acacia preissiana* *Hemiandra pungens* *Hibbertia racemosa* *Acacia lateriticola* *Acacia pulchella*
Trees	*Eucalyptus patens* *Eucalyptus lane-poolei* *Eucalyptus laeliae*	*Eucalyptus wandoo* *Corymbia calophylla*