RED HILL QUARRY
PROPOSED DEVELOPMENT

TOODYAY RD
RED HILL

LANDSCAPE & VISUAL ASSESSMENT

Prepared for

Hanson

Prepared by

JOHN CLEARY PLANNING

July 2007

Contents

Illustrations

Part One - Introduction

1.1 Study Background

This report summarises the landscape and visual assessment of the proposed ongoing development of the existing Hanson quarry off Toodyay Road, Red Hill (see Map 1).

The proposal includes an open pit quarry, extending from the existing quarry pit in a northerly and western direction. The pit will be approximately 100m deep (centre of each pit lobe compared to the adjoining natural ground level) with cutting faces of about 33 degrees and will cover an area of up to approximately 75 hectares. It is envisaged that operations will extend over an approximate 100 year time frame. The proposed development will utilise the existing on-site infrastructure, which includes, crushers, processing area, and site office. It is envisaged that some of this infrastructure may be relocated or upgraded but that its general appearance will be retained. The stockpile area is to be enlarged by 5 hectares as part of the proposal.

The assessment has been undertaken to determine the likely visibility and appearance of the quarry development and the effect this will have on the landscape values of the area. Based on this, an evaluation of the proposal is provided, using the relevant environmental and planning framework policies.

Underlying this study is the recognition that landscape values are a vital component of people's enjoyment of the area and that these values are a strong influence on their sense of well-being and quality of life.

This study has been undertaken to enable the proponent to understand and therefore minimise the impact of the proposal on landscape values and as a requirement to address these values in the environmental assessment/approval process. It follows initial assessment of the proposal and consultation with the local community.

1.2 Site Description

The proposed quarry development lies adjacent to the existing Hanson quarry at Red Hill and extends from it, to the north and west (see Map 1). The existing development area is approximately 81ha, which includes a pit area of approximately 29 hectares. The proposed development area (the site)(in addition to the existing) is approximately 79 hectares, which includes a pit area of approximately 74 hectares. These are part of a consolidated block of land owned by Hanson (ie. Lot 11) of approximately 808ha, which also includes the former Herne Hill quarry and large, relatively natural areas.

The site lies on the shoulder of the Darling Scarp, on one of the many ridges that drops to the Coastal Plain from the higher country of the Darling Plateau to the east. It includes a gentle highpoint on this ridge and extends both west along this ridge and north down a spur that ends at Susannah Brook valley, which loops around the site in the north.

Elevations range from about 250m AHD at the high point to about 95m AHD near Susannah Brook (see Map 2). The southern, higher part of the site has gentle slopes ranging from about 0-20% and the northern part, which includes the spur, is steeper, with slopes of about 15-40%.

The site is relatively natural and is covered with open woodland and exposed rock patches. Marri dominates the tree species.

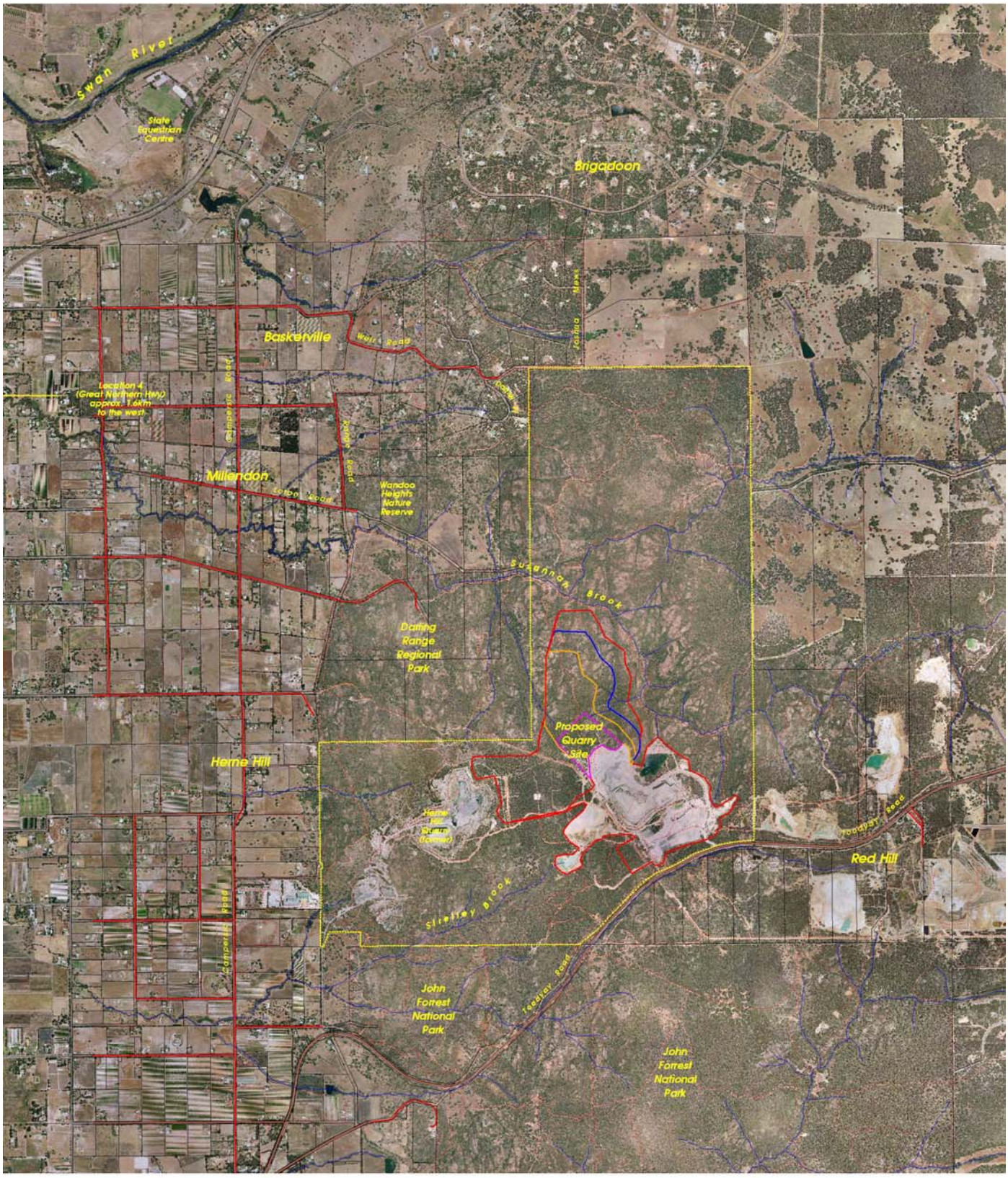
The existing Red Hill quarry area is adjacent, to the south-east of the site, the former Herne Hill Quarry lies to the west, and the remaining area owned by Hanson is semi-natural. Beyond this:

- farmland is to the north and east;
- rural residential is to the north-north-west;
- bushland (including part of the Darling Range Regional Park, which includes Wandoo Heights Nature Reserve) is to the north-west;
- rural residential to the west;
- bushland to the south (John Forest National Park);
- a waste management facility to the south-east (Red Hill); and
- bushland and extraction areas to the east.

The site is accessed by Toodyay Road, which traverses to the south of the site. There are a number of other roads in the area, mainly located 2km and beyond to the west and north, in the localities of Middle Swan, Herne Hill, Millendon, Baskerville, and Brigadoon. A number of gravel tracks and firebreaks lie around and within the site.

Views to the site from the west and east are restricted by landform and vegetation. The best views to the site are from the north and north-east. There are also views to the site from the Susannah Brook area of Millendon extending to the west on the Coastal Plain. The upper part of the site (tree cover and parts of buildings) can also been seen from long distances at other places on the Swan Coastal Plain to the west (eg. Perth) although the visual magnitude is very small.

Further description of the area is provided throughout this report. Photographs looking towards the site from a number of locations are included in Plates 3-11.


Swan River
State Equestrian Centre
Brigadoon
Baskerville
Weir Road
Location 4 (Great Northern HWY) approx. 1.6km to the west
Gnangara Road
Reids Road
Millendon
Lotus Road
Wandoo Heights Nature Reserve
Susannah Brook
Darling Range Regional Park
Proposed Quarry Site
Herne Hill
Herne Hill Quarry (former)
Toodyay Road
Red Hill
Slippery Brook
Campersic Road
John Forrest National Park
John Forrest National Park
Development Site*
Pit Boundary Stage 8
Pit Boundary Stage 4
Pit Boundary Stage 1
* includes Stage 12
Hanson Property Boundary
Property Boundary
Highway
Road
Track
Watercourse
Site Location
Hanson
0
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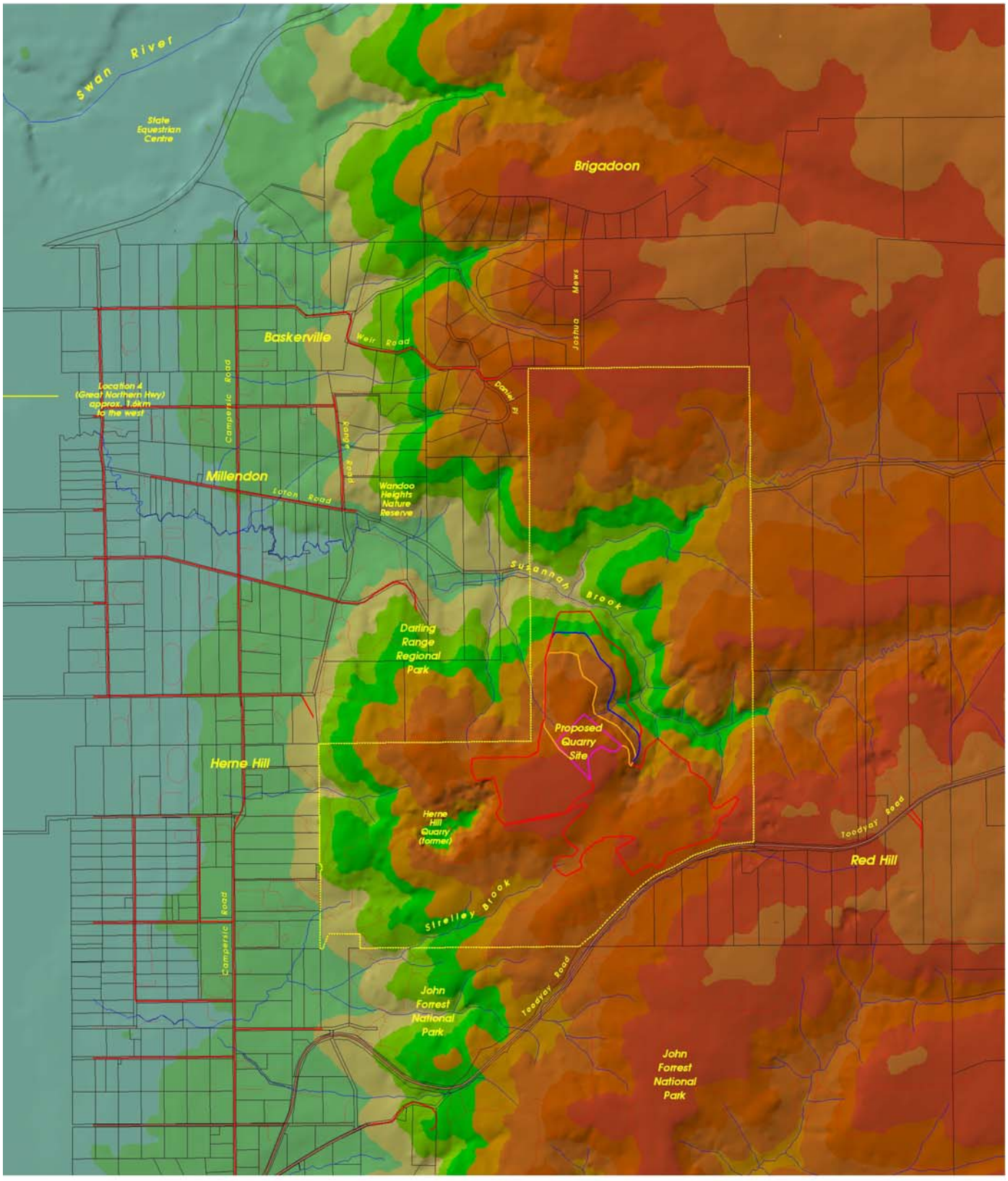
1000m
NORTH
Red Hill Quarry Development
Landscape Study
JOHN CLEARY PLANNING
Map 1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Hanson Property Boundary
Property Boundary
Highway
Road
Track
Watercourse
Elevation (m)
3 - 30
30 - 60
60 - 90
90 - 120
120 - 150
150 - 180
180 - 210
210 - 240
240 - 270
270 - 300
300 - 330
330 - 360
Landform Relief
Hanson
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1000m
NORTH
Red Hill Quarry Development
Landscape Study
JOHN CLEARY PLANNING
Map 2

1.3 Proposed Development

The proposal consists of:

- An open pit quarry, extending in two lobes from the existing quarry pit in a northerly and western direction. The pit will be approximately 100m deep (centre of each pit lobe compared to the adjoining natural ground level) with cutting faces of about 33 degrees and will cover an area of up to approximately 74 hectares beyond the existing pit area of approximately 29 hectares.
  The quarrying operation will be staged, extending into the northern lobe first, towards Susannah Brook, and into the western lobe, towards the disused Herne Hill quarry last. The western lobe does not connect to the Herne Hill quarry – the high ground between them will be maintained.
  As the quarrying progresses through the stages, faces and other cut areas where operations been completed will be progressively rehabilitated with overburden, soil and planting.
- The proposed development will utilise the existing quarry infrastructure, including:
  - primary and secondary crushers, 39mx9mx26m high and 19mx14mx28m high respectively and screening building, 66mx10mx29m high;
  - processing area, stockpile area (to be expanded as part of the proposal);
  - sprinkler system for reducing dust/dust extraction; and
  - dams, roading, parking areas, and site office.

  Most of this associated development exists and occupies an area of approximately 52 hectares. The proposal adds a 5 hectare expansion of the stockpile area.

It is envisaged that operations will extend over an approximate 100 year time frame. The layout of the proposed development is illustrated in Map 5.

1.4 Study Process

1.4.1 Assessment Method

The assessment process is based on the methodologies employed in other recent similar landscape studies (see Cleary *et al* 1999, CALM 1997, John Cleary Planning 2002). The assessment components include:

1. An assessment of values. This is essentially the target of the assessment – what we are trying to protect or what may be impacted/affected. Landscape character, landscape significance, community use, views, access and level of development/wilderness quality are all assessed. The local community may be used to identify or clarify values.
2. Impact Assessment. This includes a number of sub-components as follows:
   a. The development elements and physical changes are defined, with an emphasis on elements that will create a visual change.
   b. The areas potentially visually affected are assessed.
   c. The visibility, appearance and effect on values are assessed.

i. Key variables and effect relating to visibility and appearance are outlined and the principles that values are affected are explained.
ii. The visibility, appearance and effect on values are assessed at a range of locations, including public use areas and residences.
iii. The visibility, appearance and effect on values is summarised, addressing key questions as follows:
   - How much actual or perceived change will there be?.
   - Does the change affect the extent of the value, create rarity, or affect rare features?.
   - How does the change affect high sensitivity level use locations?.
   - How does the change affect neighbours?.

3. Planning/policy framework. The requirements of planning/policy framework are clarified/listed.
4. Evaluation. Does the proposal comply with the requirements of planning/policy framework? Have community and neighbour concerns been addressed?
5. Modifications and recommendations. Does the proposal adopt appropriate techniques for reducing the impact on values? What changes could be made to the proposal to reduce the impacts on values and achieve a better outcome?

These components relate to a management process outlined in Figure 1 (below).

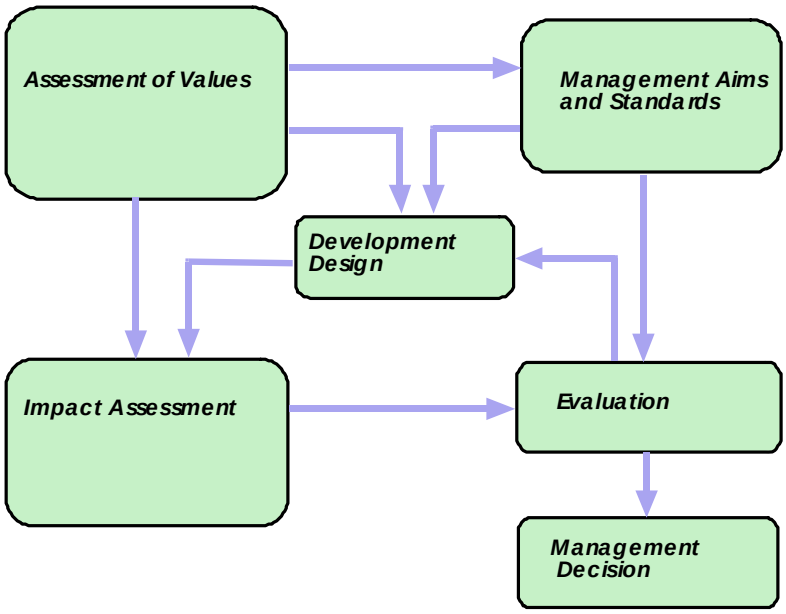


Figure 1 – Management Process for Landscape Values

Definitions used in this assessment can be found in Appendix 1.

The process for this study can also be expressed in terms of the following key questions:

Assessment of values

- What are the general characteristics of the area that are relevant to human experience?
- How do people perceive the environment, which characteristics of the environment do they value most, and which do they value most for landscape reasons?
- How do people use and experience the area?
- How can these variables be best represented for planning purposes?

Management aims and objectives

- What are the management and planning framework aims, objectives and standards apply to the study area?

Impact assessment

- What types of physical changes are likely to occur as a result of development?
- What areas will be visually affected by the proposal and what will be the visibility and appearance of the proposal from these areas?
- Given these visual characteristics, what will be the impact on existing landscape values?
- What will be the effect on recreation and tourism values?
- What will be the cumulative effect?
- What will be the effect on neighbours?

Evaluation

- Given the impact of the proposal on landscape values, will management objectives be met?
- What is current community sentiment in relation to the type of development proposed?

Recommendations, design modifications and guidelines

- What planning and design principles will minimise the impact of the proposed development given the unique characteristics of both the area and the proposal?
- If management objectives are not met, what modifications can be made to the proposal to achieve better compliance?
- What treatments will minimise the effect on neighbours?

Conclusion

- What is the final evaluation of the proposal given the assessment work completed and after possible modifications and recommendations are made?

1.4.2 COMMUNITY INVOLVEMENT

Some of the questions that need to be answered in the assessment process are better answered with involvement from the local community. Accordingly, apart from the main project consultation program, the landscape assessment included opportunities for the local community to be involved, and included:

- initial phone contact and discussions with neighbours that were potentially affected or who had expressed an interest in being involved (April –July 2007);
- two information days at the State Equestrian Centre (May 2007);
- individual meetings with some neighbours (April –July 2007).

This involvement typically allowed people to see the 3D modelling of the proposal to help them understand its visibility and appearance, and its effect on them and other values. It also provided a chance for them to discuss different aspects of the project, local features and values, concerns, and possible solutions.

The general aims and principles of consultation include that the program should:

- gather local insight into all aspects of the project, including its setting;
- create a better understanding of community interest and values;
- inform the community of the nature and effects of the proposal, allowing them to make informed, appropriate responses;
- help determine community attitudes and levels of acceptability;
- help identify and address the concerns of all interested and affected parties;
- help explore options that have the least effect on key stakeholders;
- foster a sense of ownership of the process and outcomes;

1.5 Report Structure

This report is divided into 6 main parts:

- Part 1 is introductory and describes the context and nature of the study and report and briefly explains the study process.
- Part 2 includes the assessment of values.
- Part 3 defines management objectives and standards within the planning framework that relate to landscape values.
- Part 4 includes an assessment of the impact of the development on landscape values.
- Part 5 includes an evaluation of the impact of the development based on the management objectives of the area
- Part 6 includes recommendations and design guidelines that will help minimise the impact of the development.

Part Two - Landscape Values

Landscape values in this study have been identified by a procedure that is commonly referred to as landscape assessment. This part of the report describes each step of the landscape assessment process and summarises the results.

The assessment (of landscape values) consists of three main components:

1. an understanding of community perceptions and values (see Section 2.1);
2. formulation of criteria that define the value types, particularly significant values (see Section 2.3);
3. systematic assessment of the study area using the defined criteria (see Section 2.2 to 2.7).

The assessment of landscape values reported here focuses on the aesthetic significance of natural features and rural use areas. Settlement areas are also included if relevant. Aesthetic significance is based largely on visual characteristics but also includes other relevant aesthetic values such as those associated with other sensory characteristics and scientific, social and historic aspects of places. These latter values are listed or described as appropriate but not assessed in this study.

The main components of aesthetic value in this assessment are landscape character, landscape significance, access, views, and wilderness quality. These categories of value reflect the key values generally identified by the community in discussions, workshops and responses to development proposals.

The assessment method attempts to address the values of neighbours, local community values, the values of the general community, and the values of the 'future' community.

These components fit into an overall landscape management structure that has been illustrated in Figure 1 (p6).

2.1 Community Perceptions and Values

Formal assessment of landscape values is based on knowledge of community perceptions and values. This knowledge can be gained from various sources, including:

- the large body of general perception research that already exists,
- perception testing of the local community,
- surveys, workshops and discussions with visitors, neighbours and the local community,
- documented community sentiment relating to past land use changes or proposals;
- survey of publications relating to the study area (to identify the values promoted, and any comment from the community), and
- formal aesthetic theory.

A community involvement program has been conducted for the project, which has allowed the community to be kept informed of the proposal and the related studies that are being undertaken. Subsidiary to t his, the landscape assessment included opportunities for the local community to be involved, including initial phone contact and discussions with neighbours, information days, and individual meetings with some neighbours.

The community comments generally covered:

- whether they would be directly effected;
- issues and concerns;
- values;
- possible solutions to reduce impacts.

Specific comments from this involvement related to the landscape assessment included (categorised):

Impacts

- proposed quarry is too close to streams;
- the effect on special landscape features on Hanson land;
- might see the quarry from Perth;
- the effect on area generally is a concern – people travelling, tourism;
- negative effect on Wandoo Height Nature Reserve and Darling Range Regional Park;
- too close to urban area;

Landscape Features

- lots of horse riding on fire-trails in the area;
- local wineries are an important attraction in the area;
- the State Equestrian Centre gets lots of visitors.
- waterfalls on westerly rocks in wet/winter;

General Landscape Related

- people accepted smaller quarry but big quarry is too much;
- most people think a 100 years will turn out to be 10-20 years;
- the quarry is an exception in an area of restricted development;
- lots of visual impact now without expansion;
- not happy about expansion;
- people cynical because of changing commitments;

Possible Solutions

- existing foreground trees [ie. close to observer] are generally too sparse and do not screen;
- need lots of big trees to screen;
- needs good/better rehabilitation; and
- Herne Hill quarry still an issue – rehabilitation (lowering the overall impact of axtractive industry operations the area].

There were also comments that related to more general concerns, including:

- downstream impacts;
- dust;
- sediment;
- aboriginal heritage;
- erosion;
- vibration a big issue;
- closer quarrying will make blasting stronger;
- dust and noise issues with strong easterly winds;
- dust in the stockpile/Toodyay Road area;
- effects on bore water;
- water table;
- quarry is in the wrong place [more remote would have less issues]; and
- a waste management facility is located to the south-east.

These more general concerns are assessed In the Public Environmental Review (PER) process undertaken for the project and will be addressed in the PER report.

While these comments tend to focus on issues or concerns, they do indicate values (where values are not directly highlighted). This helps get a better understanding of the types of places thought to be important, allowing validation or refinement of the criteria used to identify the most important features in the systematic assessment. They also directly help identify places that meet the criteria and can also be regarded as a direct nomination of places of value.

Understanding the range of values also helps us to classify the values, which assists with defining the assessment criteria. For example, in discussion and responses to questions relating to landscape values, people often talk about 'the local character', 'special features', access to places, views, and a 'sense of remoteness'. These have been incorporated into the assessment process as landscape character, landscape significance, access, views, and wilderness quality. Thus, the type and nature of the values assessed has been largely defined by general community sentiment.

The second main source used was community perception research conducted as part of other projects. As far as is known, there has been no community perception research relating to landscape values in the study area. There is a large body of existing research not specific to the study area that allows us to draw assumptions about aesthetic values (see reviews by Fabos and McGregor 1979, Ribe 1989, and Zube *et al* (1982). Much of this research focuses on visual aesthetic values using a psycho-physical approach to identify the relationships between environment characteristics and a person's response. While it is recognised that other, non-visual aesthetic values often play an important role in people's experience, the research relating to landscape values does not consider these to the same extent as visual values, partially due to the bias of legislative and policy requirements.

Key research (see Anderson et al 1976, Zube *et al* 1974, Williamson and Chalmers 1982) allows us to assume that landscape significance increases with:

- increased topographic ruggedness;
- increased naturalism;
- increased land use compatibility;
- increased presence of water forms and extent of water area and edge; and
- increased presence of outstanding natural features.

Other studies also suggest that landscape significance increases with:

- increased legibility of features;
- increased spatial definition;
- increased sympathy in land use response to natural features;
- increased pattern and texture in rural uses.

There are other studies that provide an insight into community perceptions and sentiment relating to landscape values (eg. Cleary *et al* 1999). Key conclusions include:

- that people regard landscape values as extremely important;
- that there is little correlation between features regarded as important for landscape reasons and those having important biological values;
- that people may be more likely to recognise places of landscape value than those having important biological values;

- that people are more likely to regard places as important if they have first-hand experience of those places;
- that the attractions of an area are more likely to be landscape features than biological features;
- that higher levels of naturalness were more highly valued;
- that impacts that are detectable but below a visual magnitude may not be recognised by people and may not impact on their experience;
- that water features are valued highly, particularly if the water body is visually enclosed.

These assumptions can be used as an indication of the sentiment of the general community (ie. the broader community not necessarily living in the area).

2.2 Landscape Character Classification& Description

Landscape character classification and description identifies and describes broad patterns of environmental characteristics (classifying them into types, units or sub-units) according to their relevance to human interaction. Typically, this classification focuses on natural character (eg. landform, vegetation, water) and land use character as two components. It addresses the 'local character' often referred to in community comment.

The site lies within the Darling Plateau Landscape Character Type (CALM 1994). This is broadly typified by rolling ridges and valleys, granite outcropping, jarrah, marri and wandoo forest and woodland and dryland farming. Adjacent, to the west, is the Swan Coastal Plain Character Type. This is broadly typified by flat sandy plains, limestone ridges, marri, banksia, melaeuca and tuart woodland, wetland chains, extensive urban development and various agricultural activities.

The area close to the site can be further classified into character units as follows (see Map 3):

Hills Semi-Natural Unit includes the bushland within the Hanson land and away from the quarry/operations areas, John Forest National Park, Darling Range Regional Park, and other blocks and patches to the north-west and east of Hanson land. These areas are relatively natural but are traversed in places by tracks and in many places have views to development of various types. In pockets where there are no tracks, and development cannot be seen, there is a sense of complete naturalness.

Hills Farming Unit includes the elevated, hilly areas to the north-east, east and south-east of the site where the land is largely cleared and is, or has been, used for farming.

Hills Rural Living Unit includes the foot-slopes of the Scarp that run from west of the site to the north, and also includes the areas accessed by Weir Road and the Brigadoon area. All these areas have rural residential settlement, some with substantial bushland coverage, with houses often positioned to take in the views either of the Swan Coastal Plain or surrounding bushland.

Plains Rural Living Unit includes rural residential lots on the Swan Coastal Plain, often of a few hectares in size, relatively flat terrain, and typically cleared except for small patches of trees. Views to the Scarp from any places within this unit.

***Plains Agricultural* Unit** includes the large lots on the Swan Coastal Plain where agricultural activities dominate land use character and residential use has a minor effect.

Industrial Unit includes the Hanson quarry areas at Herne Hill (disused) and Red Hill, as well as other extraction sites and a waste management facility to the east, where industrial land use dominates the character.

These units combine land use character and natural landscape characteristics and highlight the most dominant of these characteristics (ie. what most typifies the areas). Typically, land use character is relatively changeable and, in turn, affects the extent of natural landscape characteristics, particularly vegetation cover. Natural land use character, where the natural landscape characteristics dominate the character, is the most threatened character – history shows that it is gradually being replaced by other character as development expands.

The site is within the ***Hills Semi-Natural Unit*** and lies adjacent to the ***Industrial Unit*** (the quarry areas at Herne Hill and Red Hill).

Plate 1 – Typical landscape character of the site, showing Semi-Natural Character.

Plate 2 – Typical landscape character of the area near the site, here looking east towards the site from the Swan Coastal Plain, showing Plains Rural Living Character and Semi-Natural Character.

2.2 Landscape Significance

The assessment of landscape significance identifies and maps the characteristics or features in the study area that are most important to the experience and enjoyment of people, using criteria established through research, local community input, or other assessments and lists (See Appendix 2 for a list of sources). People often call these significant features 'special features' when they talk about the values they attach to areas or the things that should be protected.

The assessment of landscape significance in this study focuses on the aesthetic significance of natural features and rural use areas. Settlement areas are also included if relevant. Aesthetic significance in this study is based largely on visual characteristics but also includes other relevant aesthetic values such as those associated with other sensory characteristics and scientific, social and historic aspects of places. These latter values are listed or described as appropriate but not assessed in this study.

Criteria for significant visual aesthetic features:

Landform	• High points and prominent ridge crests; • Steep slopes greater than 20 percent; • Pronounced gullies; • Features - very flat plains or plateaux, rock outcrops, cliffs, caves and distinctive dune/sand formations.
Vegetation	• Areas with distinctive variation in communities, structure or species; • Feature plants of impressive size, colour or form.
Water	• Ocean, major permanent or rocky, semi-permanent water features, rivers, estuaries, waterfalls.
Coast	• Indented shoreline, coves, rocky points, short beaches with rock ends, stacks, rock pools and platforms; • Gently curved shoreline with steep natural slopes or cliffs as backdrop or very wide tidal zone.
Wildlife	• Areas with abundant, obvious wildlife.

Criteria for significant visual aesthetic rural-use features:

Texture	• Areas with strongly textured patterns for at least half the year.
Spatial definition	• Areas where native vegetation creates a sense of spatial enclosure. • Edges of blocks of remnant vegetation adjacent to spatial definition areas.
Avenue vegetation	• Remnant or introduced planting of large trees in rows with consistent density and, where adjacent to roads, dominant trunks and canopies to road edges on both sides of the road.
Remnant vegetation	• Paddock tree canopy cover of greater than ten percent. • Continuous streamside vegetation strips with trees.
Vegetation	• Feature plants of impressive size, colour or form.
Water	• Large dams with native vegetation, including trees, on their edges.

Criteria for significant visual aesthetic settlement features:

Vegetation	• Indigenous vegetation of a similar height or scale to the built form, which is visually extensive. • Feature plants of impressive size, colour or form. • Avenue planting.

Built Elements	• Structures and/or settlement that have:
	  • a high consistency in design vernacular between adjacent built forms or across settlement areas; and
	  • a high level of responsiveness to the natural environmental setting; and
	  • a high level of visual interest, particularly at a detailed scale.

Local Experience	• Areas that provide a variation in view types. • Areas that have good levels of dedicated pedestrian access.
Landmark Structures	• Distinctive structures with high integrity design, unique in their setting and reflect aspects of their setting.

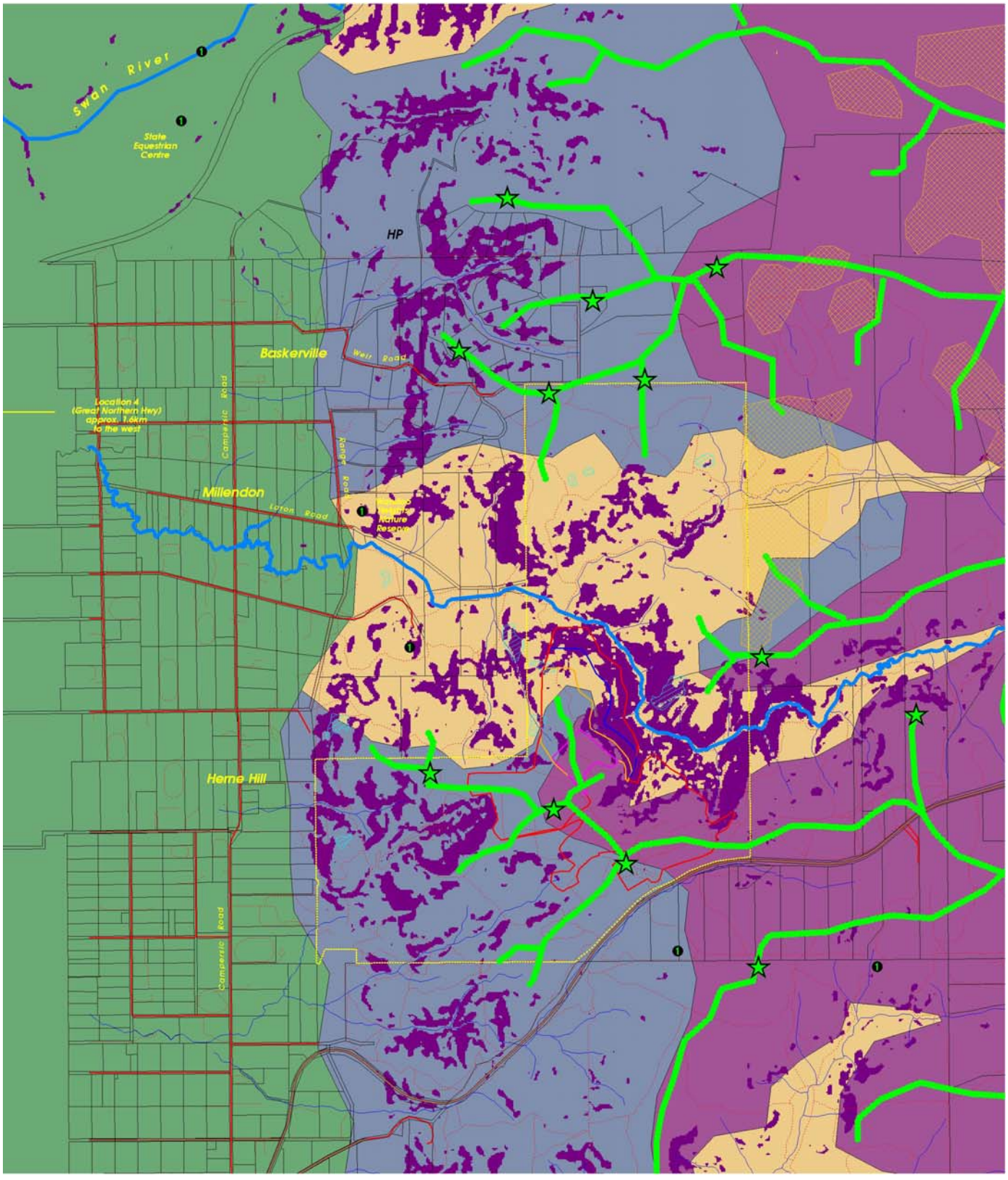
The criteria above, together with heritage lists and feedback from the community, were used to identify and map a range of significant features in the study area (Map 3), including:

- the steep vegetated slopes of the Darling Scarp and intersecting valleys;
- the ridge crests and highpoints;
- major rock outcropping;
- areas with diverse patterns of vegetation;
- Susannah Brook and the associated vegetation;
- recreation use associated with John Forest National Park and Wandoo Heights Nature Reserve (including the visitor centre);
- recreation use of the State Equestrian Centre;
- faming areas with good paddock tree coverage or enclosed with good stands of remnant vegetation;
- rural dams with surrounding trees;
- The river features of the Swan River and associated vegetation and wetlands;
- recreation associated with the Swan River, including the Bells Rapids area.

The site can also be regarded as a 'valued' landscape in the context of the EPA objectives – it contains ridgelines, a riverscape and is part of the Darling Scarp.

A list of other data sources for landscape significance is provided in Appendix 2, some of which relate to scientific, social and historic aspects of places.

Plate 3 – The view of the Susannah Brook valley highlights a number of significant landscape features, including, rock outcropping, diverse patterns of vegetation cover, major ridges and paddocks with good enclosing vegetation.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Main Stream Environment
Rural
Landscape Significance
Plain
Plateau
Scarp
Valley
Landscape Character Units & Significance
Hanson
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NORTH
Red Hill Quarry Development
Landscape Study
JOHN CLEARY PLANNING
Map 3

2.3 Community Use

The assessment of community use provides an indication of how people use an area, the likely importance of landscape values to their use, and, ultimately, adds weighting to some landscape values (eg. landscape character, views).

The assessment of community use identifies and maps the location, type and degree of community use of the area. It addresses values related to access and use that are often referred to in community comment. It includes spot (localised) use areas and access routes (air, ground, water), types of recreational and non-recreational (including industrial or residential) use, ground travel route physical characteristics (such as class, surface, markings and intended traffic type), and existing and expected volume of users. The assessment also includes the classification of use areas (sensitivity levels) and defines distance zones from these areas. These are detailed in the following sections.

2.3.1 CIRCULATION AND ACTIVITIES

The main use patterns of people in the area were identified, categorised as travel route, localised use, and neighbour use.

Access routes

The main access routes in the area, close to the site are:

- Toodyay Road, which links the Perth metropolitan area with settlement areas to the east of the Scarp (eg. Gidgegannup and Toodyay)– and provides the main access to the site;
- Campersic Road, which serves as a link road to a number of local access roads along the Scarp, north of Toodyay Road, and into Brigadoon;
- Great Northern Highway, which is the main State highway route north of Perth; and
- Local access roads such as Williams Street, Range Road, Loton Road, Weir Road, Joshua Mews, and Burgess Road which primarily provide access to residences in the area close to the site.

There is no existing public access through the site (being private land), although it has been reported that some locals use the tracks along Susannah Brook and the slopes to the north.

Localised Use

Public localised use is concentrated around the Darling Range Regional Park (including the Wandoo Heights Nature Reserve visitor centre) to the north-west, the State Equestrian Centre to the north-north-west, and wineries/breweries to the west on the Swan Coastal Plain.

Neighbours

Residential neighbours are located to the west, north-west, north and north-east, with the closest being in the Williams Street, Range Road, Loton Road, Weir Road, Joshua Mews, Burgess Road and Brigadoon areas.

The closest neighbours are on Range Road to the west (approximately 1.2km) and Daniel Place and Joshua Mews to the north (approximately 1.3km). Most of the other close neighbours are approximately 1.7km or more from the site.

2.3.2 SENSITIVITY LEVELS AND DISTANCE ZONES

SENSITIVITY LEVELS

Sensitivity levels have been assigned to use areas based on established criteria (see Appendix 4). These sensitivity level criteria are based on the volume of use and the type of use. The levels were:

Sensitivity Level	Use Area
Level 1 (highest)	Great Northern Highway.
Level 2	Toodyay Road, residences on the Scarp that are positioned for major views, close neighbours, wineries/breweries with visitor facilities.
Level 3	Residential areas, local access roads, John Forest National Park and Wandoo Heights Nature Reserve.
Level 4 (lowest)	Local tracks.

DISTANCE ZONES

Distance is an important variable in determining the influence a feature has on the experience of people visiting an area. For example, a feature located in the foreground will generally have greater visual magnitude than a similar feature located in the middleground. It is assumed that these closer features will consequently have a greater role in determining human experience (and values) than distant features. This is often and important consideration in setting management/conservation priorities.

Typical distance zones include:

- foreground (0-300m);
- close middleground (300m-1km);
- middleground (1-3km);
- distant middleground (3-6km);
- background (6-15km);
- distant background (>15km).

The site lies within the distant middleground and background of a Level 1 road (the Great Northern Highway), the foreground to middleground of Level 2 areas (Toodyay Road and Scarp residences) and the middleground of Level 3 areas (residential areas, local access roads). Further, parts of the site can be seen from distant background locations on the Swan Coastal Plain.

2.4 Views

The assessment of views and other sensory characteristics examines how people receive environmental information and how that might affect landscape values. This assessment focuses on the assessment of views, given 'views' are the dominant sensory method by which people experience places.

The assessment of 'view' focuses on *how* people visually experience their setting – their ability to see and the configuration of what they see at particular locations. Part of the assessment of views covers how people see other values.

Views can be assessed using a number of variables (see Appendix 5) that define the general view experience and key views.

2.4.1 GENERAL VIEW EXPERIENCE

General views can be categorised as:

- Plains Views – views across largely flat terrain, mostly up to close middleground views interspersed with foreground stands of trees and buildings, more distant views of the plain tend to be blocked by the visual convergence of trees, views to the Scarp from clear or elevated areas.
- Scarp Views – views from elevated positions are typically panoramic where clear of trees, either up to close middleground for valley views or distant background for views across the coastal plain.
- Plateau Views – views tend to be more confined by the terrain and vegetation, typically foreground views although longer distance views available from clear or elevated areas (such as adjacent to valleys).

Views to some parts of the site are available from some locations in each of the above categories.

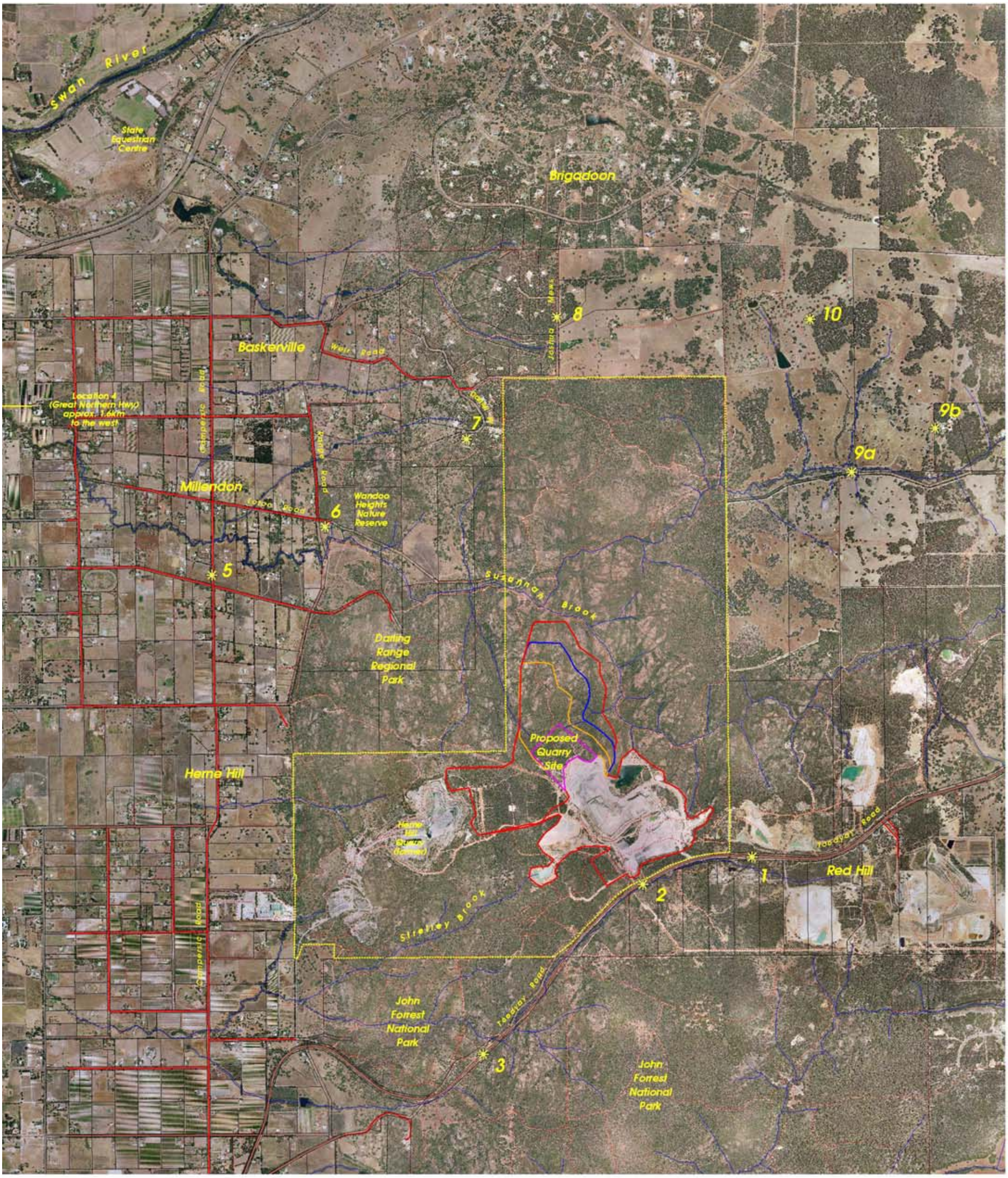
2.4.2 KEY VIEW LOCATIONS

The most important views are often called key views and there are a number of criteria that can be applied to establish these. In this assessment, key views are those that have good views of surrounding areas, are good examples of nearby views, and views that include the area of a proposed development.

A number of key view locations have been identified for this project (see Plates 3 to 11 and Map 4). These include:

- Toodyay Road to the east of the site (Location 1);
- Toodyay Road to the south of the site (Location 2);
- Toodyay Road to the south-west of the site (Location 3);
- Great Northern Highway to the west of the site (Location 4);
- Campersic Road to the north-west of the site (Location 5);
- Near the corner of Loton and Range Roads (near Wandoo Heights Nature Reserve) to the north-west of the site (Location 6);
- Daniel Place to the north of the site (Location 7);
- Joshua Mews to the north of the site (Location 8);
- Burgess Road to the north-east of the site (Location 9);

These key views cover a range of locations with available views towards the site and they are representative of views in their respective locations. They also provide a basis for assessing potential visibility and appearance of the proposed development (see Impact Assessment).



Development Site *
Pit Boundary Stage 8
Pit Boundary Stage 4
Pit Boundary Stage 1

* includes Stage 12

Hanson Property Boundary
Property Boundary
Highway
Road
Track
Watercourse

Key View Locations

Key View Locations

Hanson 0 500 1000m NORTH

Red Hill Quarry Development
Landscape Study

JOHN CLEARY PLANNING

Map 4

Plate 4 – Looking towards the site from Toodyay Road, 500m to the east of the site (Location 1).

Plate 5 – Looking towards the site from Toodyay Road, 100m to the south of the site (Location 2).

Plate 6 – Looking towards the site from Toodyay Road, 1700m to the south-west of the site (Location 3).

Plate 7 – Looking towards the site from Great Northern Highway, 6km to the west of the site (Location 4).

Plate 8 – Looking towards the site from Campersic Road, 2160m to the north-west of the site (Location 5).

Plate 9 – Looking towards the site from near the corner of Loton and Range Roads (near Wandoo Heights Nature Reserve), 1630m to the north-west of the site (Location 6).

Plate 10 – Looking towards the site from Daniel Place, 1370m to the north of the site (Location 7).

Plate 11 – Looking towards the site from Joshua Mews, 2150m to the north of the site (Location 8).

Plate 12 – Looking towards the site from near the western end of Burgess Road, 2250m to the north-east of the site (Location 9a).

2.5 Level of Development/Wilderness Quality

The level of development or wilderness quality provides an indication of the actual levels of disturbance or development (and the extent of area for these levels) rather than perceived naturalness of the area (land use character addresses that latter). Areas of high naturalness and low levels of development generally have high landscape values and it is important that these areas be appropriately managed and protected, regardless of any current, related human enjoyment.

An area can be rated based on remoteness from more disturbed/developed area and bio-physical naturalness, which is a measure of the level of disturbance/development at the site.

The site has low wilderness quality, being adjacent to the existing quarry.

Neighbouring areas are variously affected by bushland, roads and tracks, housing, vegetation clearing and the existing quarry. The areas with relatively natural character, such as John Forest National Park and Wandoo Heights Nature Reserve can be described as roaded-natural and have moderate wilderness quality where there is good separation from surrounding development.

Generally, the other areas can be classed as low to very low wilderness quality. These include, in descending quality:

- bushland with little separation from development;
- rural residential in bushland;
- cleared land with bushland patches;
- cleared land; and
- residential development.

Part Three – Planning/Policy Framework

Key planning documents include the Environmental Protection Authority (EPA) objectives for landscape, landform and visual amenity, the City of Swan Town Planning Scheme No.9 and the Western Australian Planning Commission (WAPC) Statement of Planning Policy (SPP) 2.4 - Basic Raw Materials.

EPA Objectives

The EPA's objective for landscape and landforms is:

'to maintain their integrity, ecological functions and environmental values'.

Key recommendations related to this are that:

- landscape and landforms are protected appropriately for their level of significance;
- 'land use, development areas, infrastructure and individual constructions are carefully sited and designed to complement natural settings'.

The EPA also recommends that in or near areas with valued landscapes, such as ridgelines, riverscapes and scarps, development should be carefully planned to protect key landscape values.

The EPA's objective for visual amenity is:

'to ensure that visual amenity is considered and measures are adopted to reduce adverse visual impacts on the surrounding environment as low as reasonably practicable'.

Priority is given to the retention of natural landscape character in areas of high conservation significance. The visual harmony of new development with the surrounds is also considered.

City of Swan Town Planning Scheme No.9

The northern (rectangular) section of the Hanson land (lot 11) is zoned 'Landscape' and the southern (roughly rectangular) section of the Hanson land is zoned 'Resource'.

The purpose and intent of the Landscape Zone is to ensure that development is *'compatible with and will enhance the landscape and environmental qualities of the locality'*.

A number of criteria apply to the site, including some that relate directly to landscape values:

- *'development must be compatible with the land capability and suitability including the visual and environmental qualities which the Council considers to be worthy';*
- *'land use and management practices should be compatible with the protection of landscape quality'; and*
- *'there should be strategic re-vegetation of cleared or degraded areas in order to blend development into the landscape'.*

Extractive Industry is permitted in the Landscape Zone if the Council, having regard to related provisions in the scheme, grants special approval.

The purpose of the Resource zone is 'to provide the opportunity for the extraction of basic raw materials with proper environmental safeguards'.

A number of considerations apply to the site, including:

- *'the need for strategic re-vegetation of cleared and/or degraded areas to screen the development and/or rehabilitate excavated areas;*
- *significant slopes, ridge-lines flora and fauna habitats; and*
- *measures such as buffers to minimise visual and environmental impacts on surrounding areas where possible.'*

WAPC SPP 2.4 - Basic Raw Materials

A small part of the Hanson land is designated as a Key Extraction Area and larger area is designated as a Priority Resource Location. As such, the policy requires that these areas:

- recognised as a regional resource for the long-term supply of basic raw materials; and
- not be constrained by incompatible land uses or development; or
- be protected in the town planning scheme.

Part Four - Impact Assessment

The impact assessment examines how values might be affected by the proposal. Landscape values have been assessed in Part 2 of this report. This descries the changes that the proposal will bring, the visibility and appearance of these changes, and the effect of these visual changes on landscape values of the area. The steps in this process are as follows:

- The development elements and physical changes are defined, with an emphasis on elements that will create a visual change.
- The areas potentially visually affected are assessed.
- The visibility and appearance are assessed at a range of locations, including public use areas and residences.
- The effect on values is summarised, addressing key questions as follows:
  - How much actual or perceived change will there be?.
  - Does the change affect the extent of the value, create rarity, or affect rare features?.
  - How does the change affect high sensitivity level use locations?.
  - How does the change affect neighbours?.

Part 5 (Evaluation) examines the acceptability of the assessed impacts.

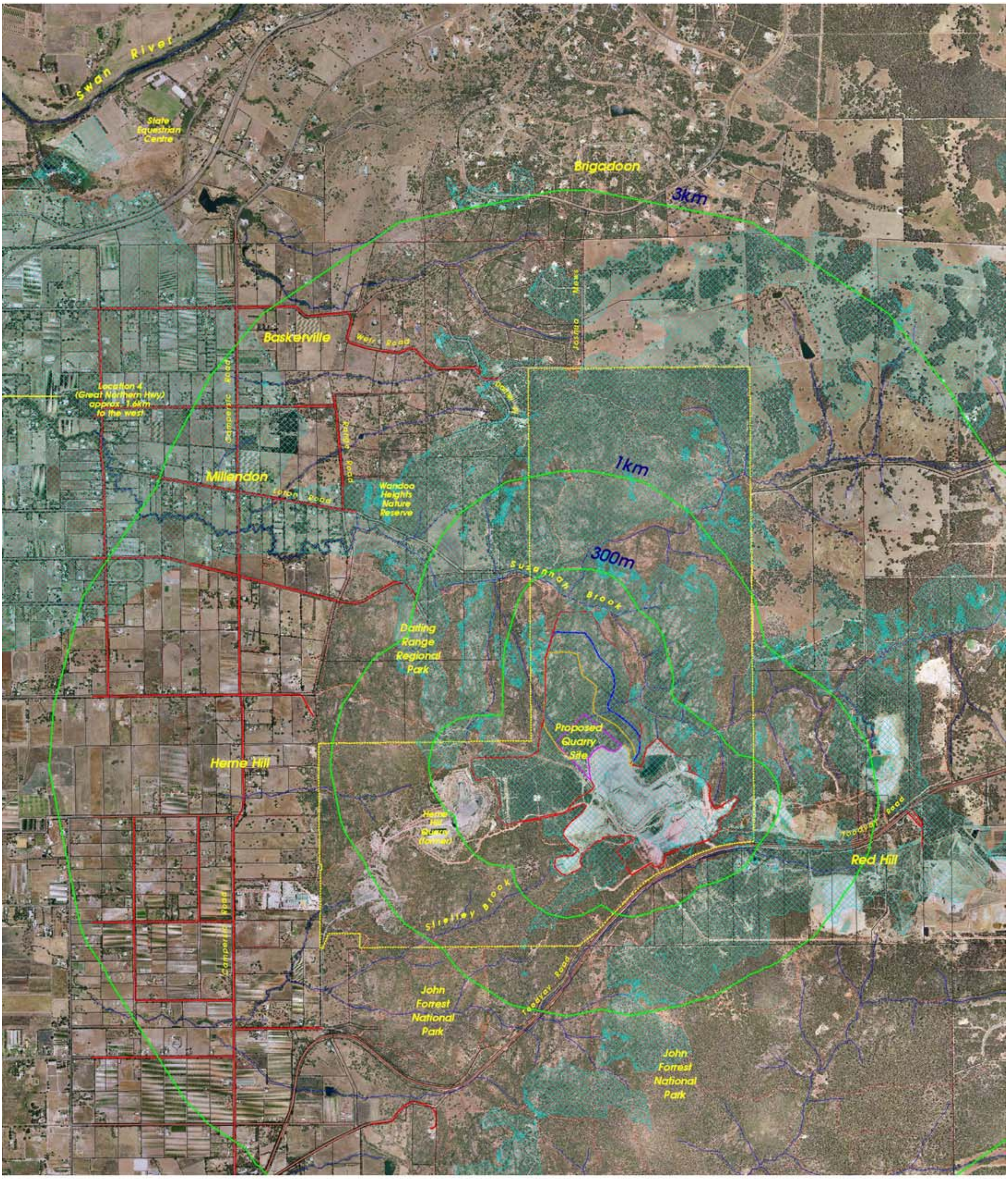
4.1 Proposed Development and Physical Changes

The proposal consists of:

- An open pit quarry, extending in two lobes from the existing quarry pit in a northerly and western direction. The pit will be approximately 100m deep (centre of each pit lobe compared to the adjoining natural ground level) with cutting faces of about 33 degrees and will cover an area of up to approximately 74 hectares beyond the existing pit area of approximately 29 hectares.
  The quarrying operation will be staged, extending into the northern lobe first, towards Susannah Brook, and into the western lobe, towards the disused Herne Hill quarry last. The western lobe does not connect to the Herne Hill quarry – the high ground between them will be maintained.
  As the quarrying progresses through the stages, faces and other cut areas where operations been completed will be progressively rehabilitated with overburden, soil and planting.
- The proposed development will utilise the existing quarry infrastructure, including:
  - primary and secondary crushers, 39mx9mx26m high and 19mx14mx28m high respectively and screening building, 66mx10mx29m high;
  - processing area, stockpile area (to be expanded as part of the proposal);
  - sprinkler system for reducing dust/dust extraction; and
  - dams, roading, parking areas, and site office.

  Most of this associated development exists and occupies an area of approximately 52 hectares. The proposal adds a 5 hectare expansion of the stockpile area.

It is envisaged that operations will extend over an approximate 100 year time frame. The layout of the proposed development is illustrated in Map 5.



Development Site*
Pit Boundary Stage 8
Pit Boundary Stage 4
Pit Boundary Stage 1

* includes Stage 12

Hanson Property Boundary
Property Boundary
Highway
Road
Track
Watercourse

Area Potentially Visually Affected
Buffer Distance

Area Potentialy Visually Affected

Hanson 0 500 1000m NORTH

Red Hill Quarry Development Landscape Study

JOHN CLEARY PLANNING

Map 5

4.2 Areas Potentially Visually Affected

The area potentially visually affected by the proposed development includes all areas that are within 'line of sight' of the site (ie. all that can be seen from the site). These areas will be affected at different times as the quarrying operation develops through the stages. The extent of this area is determined largely by the screening ability of the vegetation and terrain, the size and contrast of the project elements, and the stage of the operations.

The areas that will be potentially visually affected by the project have been mapped (Map 5). These areas have been generated regardless of vegetation cover and should be treated as indicative only. In areas of tall vegetation within this area affected, the development will generally not be visible (ie. the map shows a 'worst case scenario'). The map also shows distance zones within the areas affected. As distance increases the visual effect of the project on areas affected will generally decrease. It is possible that, at great distances, the development may be within sight but not detectable because of small visual magnitude in the respective view and low contrast at greater distances.

The areas affected can be summarised as follows:

1. Areas in the Susannah Brook valley, to the west of the Hanson land and extending to the west on the Coastal Plain, beyond the Great Northern Highway. These areas gain views to the site through the Susannah Brook valley and can see the western and northern ridges that dominate the site (see Map 2) (seen on the skyline) and the northern and western slopes of these respectively. This area is relatively narrow in the 1-3km distance zone but widens in a fan shape beyond that (to the west). Houses are scattered through this area at 'rural residential density', near or to the west of Range Road.
2. Areas on the slopes on the northern side of the Susannah Brook valley, including the ridge near the northern boundary of the Hanson land and the Daniel Place/Weir Road area. These areas gain views to the site across the Susannah Brook valley and look onto the northern ridge that dominates the site (see Map 2) and the slopes either side of this ridge. These areas also look towards the western ridge (forming the skyline) and its northern slopes. Distance from these areas to the site varies from 300m to 1.8km (the latter being on the ridge to the south of Weir Road. A substantial part of this is Hanson land. There are a number of houses in the Weir Road/Daniel Place/Abraham Close area that are potentially affected, particularly those with southerly aspects.
3. Areas on the main east-west ridge to the south and south-east of Brigadoon (and its subsidiary spurs). The higher parts of this ridge see over the ridge near Weir Road to the site and see the upper parts of the northern and western ridges on the site, and the eastern and northern slopes of these respectively. Distance from these areas to the site varies from approximately 2km to about 3.5km. This includes a number of scattered houses near Joshua Mews and to the east, on the ridges to the north of the western end of Burgess Road. Other areas to the east appear to be farmland without houses.
4. Areas to the east and south of the site. These tend to be the high points that are of similar elevation to the higher part of the site. The main exception to this is the slopes immediately opposite and to the east of the site in the Susannah Brook valley, which are on Hanson land. Distances from these areas to the site vary from approximately 200m in the Hanson land, 900m beyond that to over 3km. There are few houses in this area

generally and it appears that none are affected. Vegetation cover is high and offers good screening. The main public area affected is Toodyay Road to the south-east of the site.

Key view locations within these areas have been identified (described earlier in this report – see Map 2).

4.3 Visibility and Appearance from Key Locations

4.3.1 GENERAL CONSIDERATIONS

The visibility and appearance of the development can be discussed in relation to a number of variables, including visual magnitude, visual contrast, and duration.

Visual magnitude is largely dependent on the size of the project component, the distance between the component and observers, and the proportion of the component visible to observers. The proportion of the component visible to the observer is largely dependent on vegetation and landform screening and the position of the observer. If distance is doubled the magnitude will generally reduce to a quarter (ie. half the height by half the width).

The proposed quarry is a relatively large development and the visual magnitude will tend to be large compared to other features of the area. The magnitude will be greatest where it is viewed from close distances and from areas that look onto the site from the north.

The proposed quarry pit has two main lobes extending in two main directions – north and west. Typically, this will reduce the extent of quarry face seen from any one direction.

Cutting into the ridges will also allow the adjoining slopes to screen parts of the quarry from some directions (ie. views that do not look along the ridge lines).

Visual contrast is largely dependent on the colour and reflectivity of the project's components, the pattern of the component's elements, the backdrop to the component, and atmospheric and lighting conditions. Visual contrast will also be higher when the component is seen in the foreground, and lower at greater distances or when they are seen against a backdrop of similar colour and lightness. Where components are seen to breach the skyline, visual contrast can often be high.

The quarry is in a semi-natural setting and the contrast, when seen, between the quarried areas and the surrounding bushland is high.

Pattern/composition is the way the various parts of the quarry appear to be in relation to one another.

As described above, the main variation in the layout of the quarry is the two lobes extending in the northerly and westerly directions. These should reduce the extent of quarry face seen from any one direction.

The elevation works in two ways: the higher setting makes the site more prominent but makes it less likely people will see into the pits.

Perceived setting also depends on the layout of the quarry, the landform, and the position of the observer. The background to the development is usually of most interest.

In this case, as mentioned above, the quarry is in a semi-natural setting and the contrast, real and perceived, when seen, between the quarried areas and the surrounding bushland is high.

Duration simply refers to the visual lifespan of the component or its visible contrast or magnitude. It is expected that the quarry will be in place for a 100 year timeframe. Parts of the quarry will undergo some form of rehabilitation as quarrying progresses, so that faces will only appear active for part of the 100 years. The quarry can be classed as a permanent change and the extra contrast of the active faces as long term temporary change.

Other Variables

There are a number of other variables that will affect the visibility and appearance of the quarry, including observer related variables such as observer activity, including speed, typical view directions, and focal sightlines. For example, increased observer speed will generally narrow the focal area within the view, landform may help direct views away from the quarry, or, focal sightlines (for example along a road corridor) will reduce the likelihood of viewing the quarry where it is located at right angles to the focal view. No attempt has been made to measure these variables in this study. The discussion of views and the simulations are based on a stationary observer looking directly at the quarry and, as such, present the highest visibility potential.

4.3.2 VISIBILITY AND APPEARANCE FROM LOCATIONS WITHIN THE STUDY AREA

There are a number of areas within the study area that have views to the existing and proposed quarry, as indicated earlier, including views from residences in the area. The appearance of the proposed quarry is illustrated in the photo-simulations in Plates 12-20 on the following pages. These have been generated from the same view locations as the photographs in Plates 3-11 (see Map 4). These photo-simulations are based on the quarry with all the stages completed and before rehabilitation. Examples of the same views with typical rehabilitation are included in Plats 21-22. The difference between the appearances of the existing and proposed operations can be seen be comparing the photo-simulations with Plates 3-11. A discussion of 3Dmodeling/renderings/photo-simulation techniques and accuracy is contained in Appendix 5.

Visibility and appearance from public locations

The main public areas affected are:

- Toodyay Road, where a small part of the stockpile area and some of the screening shed will be visible (Area 1 on Map 4).
- Roads and use areas on the Coastal Plain and footslopes of the Scarp in the Susannah Brook area and to the west, where changes to the ridge lines can be seen and very small parts of the quarry faces may be detected (Area 2 on Map 4).
- The northern end of Joshua Mews, where the upper parts of the quarry will be seen (Area 3 on Map 4).

Visibility and appearance from residences

The main residential areas affected are:

- Houses on the Coastal Plain and footslopes of the Scarp in the Susannah Brook area (Area 2 on Map 4), where changes to the ridge lines can be seen and very small parts of the quarry faces may be detected. These houses do not see any of the current operations. The main changes will be the lowering of the crest of the northern and western ridges, in the order of two tree heights. Assuming the slopes on the observer sides of the pit are left intact (ie. with bushland) this change will appear to be relatively

natural but may still be detected by some people.
The lowering of these ridges will allow views to the opposite side of the site and parts of the upper faces that face the observer, on the lower eastern face of the northern lobe and the upper eastern end of the northern face of the western lobe. Where these faces are seen there will be high visual contrast with the bushland setting but the visual magnitude will relatively low, based on the face seen and viewing distance.
A moderate number of houses (approximately 30) currently unaffected by the existing quarry will be affected by the proposal.

- Houses in the Weir Road/Daniel Place/Abraham Close area (Area 4 on Map 4), where views look directly onto the existing quarry area and the proposed northern lobe, particularly the upper part.
  These are the most affected views. The northern lobe of the pit will open up views to the existing pit and will also add new pit face area. Smaller parts of the western lobe will also be seen, particularly at the eastern end (ie. the existing pit end). Micro-landform variations and vegetation affect how much is seen at each house. Typically, the lower part of the northern lobe is screened by landform and trees filter other parts.
  A small number of houses are affected (approximately 4-5) by both the existing and proposed quarrying.
- Houses at the northern end of Joshua Mews (Area 3 on Map 4), where, similarly to above, views look directly onto the existing quarry and the proposed quarry site, particularly the upper part. The existing quarry, the upper part of the northern lobe and the upper eastern end of the western lobe may be seen, notwithstanding some filtering of views through trees.
  A small number of houses are affected (approximately 2-3) by both the existing and proposed quarrying.
- Houses to the north of the western end of Burgess Road and south of Brigadoon (Area 5 on Map 4), which are less affected than houses directly to the north,
  These houses will see the upper parts of the northern and western lobes that are closest to the existing pit. Some of these seen areas will appear as replacements for existing cutting faces and some will be seen as new cutting faces, in addition to the existing disturbed area.
  As elevations decrease towards Burgess Road, the extent of seen, disturbed area decreases and will be a minor element in the view. Closer to Burgess Road, the pit is unseen.
  A small number of houses are affected (approximately 4-5) by both the existing and proposed quarrying.

This assessment above is generalised from the 3D modelling and analysis, and some site-specific modelling/rendering, which included some example residences. The visibility and appearance described can be regarded as typical for each area, including individual residences. Further detail may be required to address detailed, site-specific visibility and appearance, for example to prepare visual screening plans, and in this case, further on-site assessment will be required with residents.

Simulations from Key View Locations (following)

Plate13 – Looking towards the site from Toodyay Road, 500m to the east of the site (Location 1) with the full extent of the quarrying simulated (before rehabilitation). Foreground detail has been removed.

Plate 14 – Looking towards the site from Great Northern Highway, 6km to the west of the site (Location 4) with the full extent of the quarrying simulated (before rehabilitation). Foreground and middleground detail has been removed.

Plate 15 – Looking towards the site from Campersic Road, 2160m to the north-west of the site (Location 5) with the full extent of the quarrying simulated (before rehabilitation). Foreground detail has been removed.

Plate 16 – Looking towards the site from near the corner of Loton and Range Roads (near Wandoo Heights Nature Reserve), 1630m to the north-west of the site (Location 6) with the full extent of the quarrying simulated (before rehabilitation). Foreground detail has been removed.

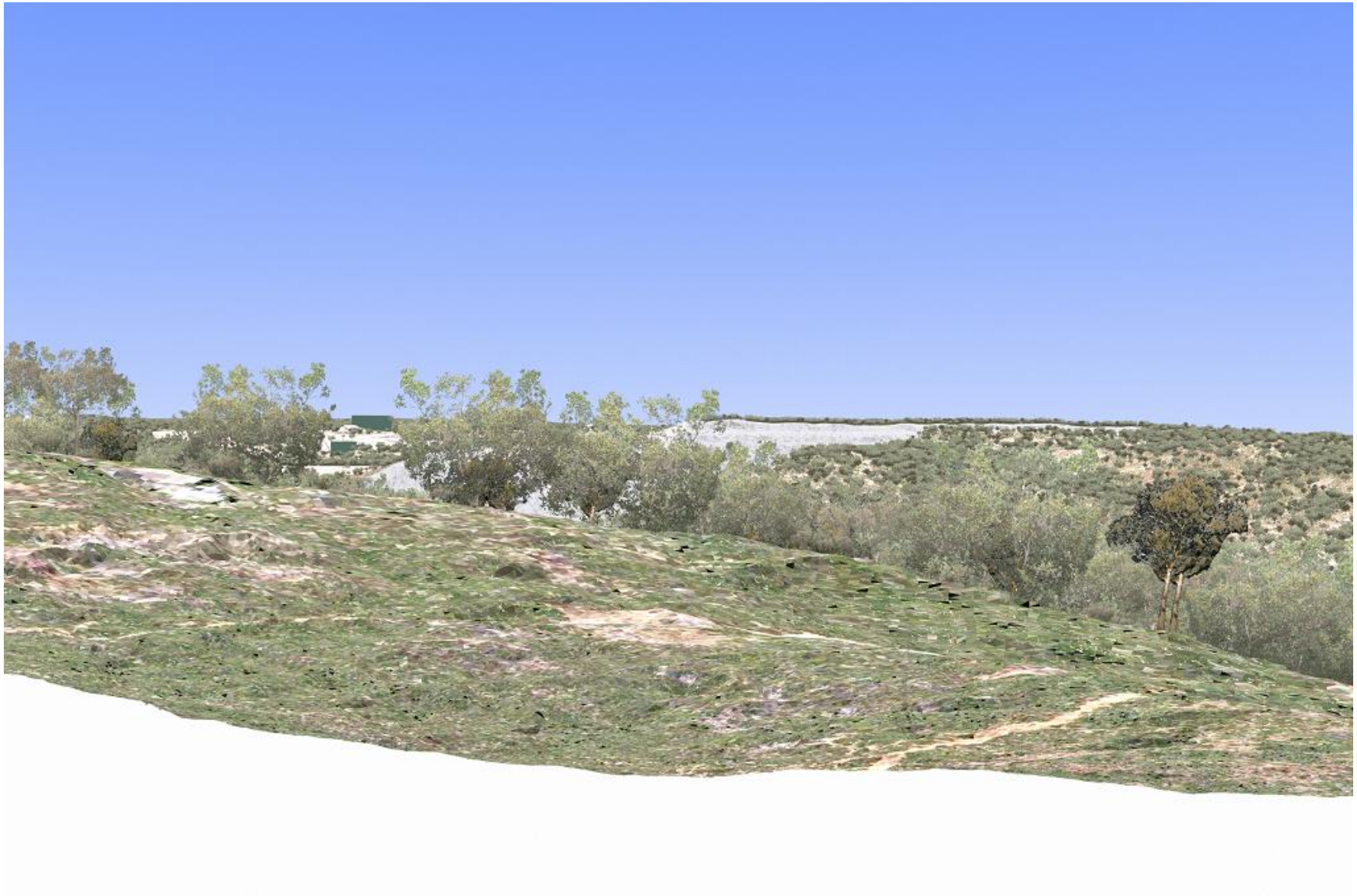


Plate 17 – Looking towards the site from Daniel Place, 1370m to the north of the site (Location 7) with the full extent of the quarrying simulated (before rehabilitation). Foreground detail has been removed.

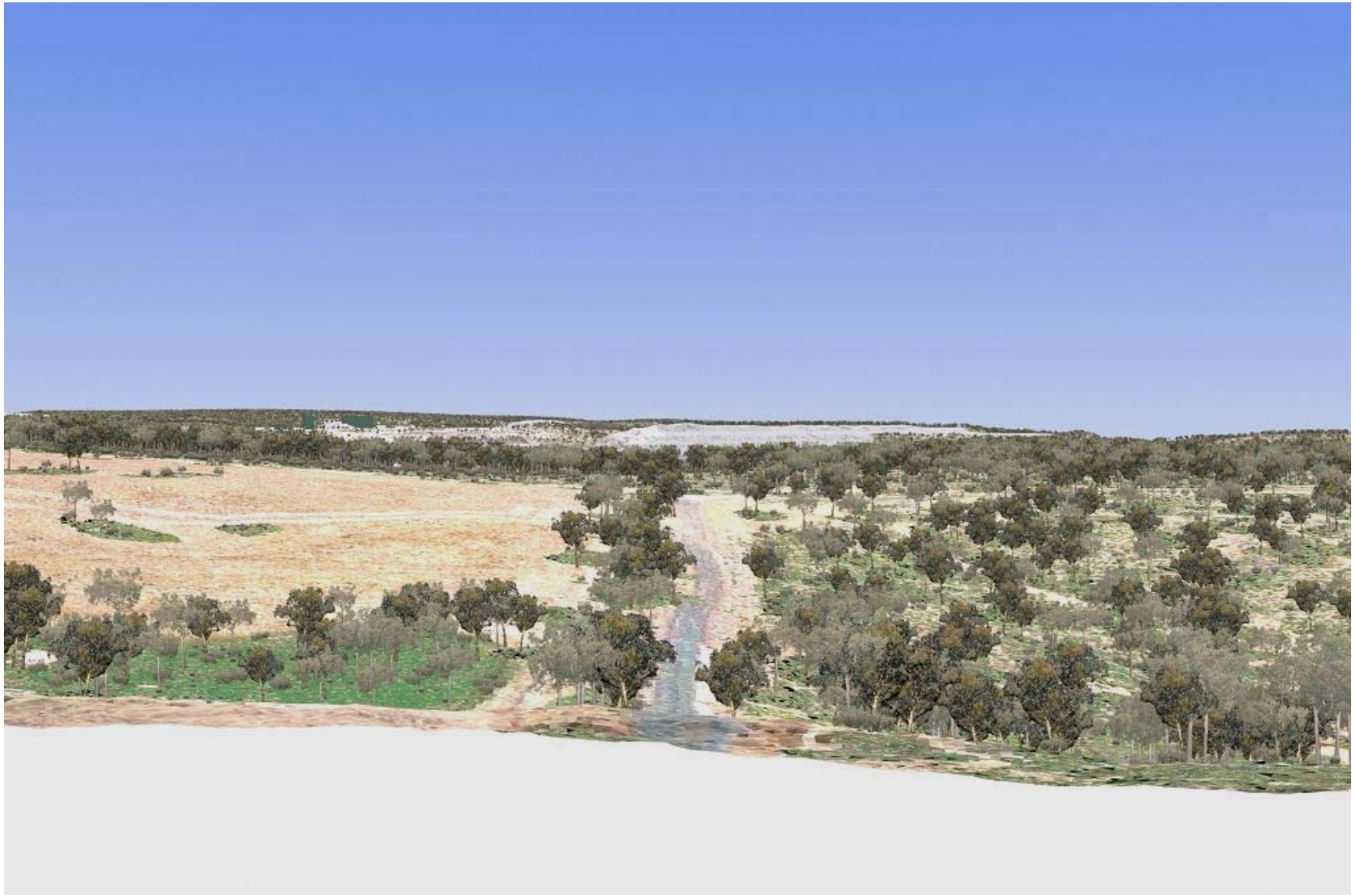


Plate 18 – Looking towards the site from Joshua Mews, 2150m to the north of the site (Location 8) with the full extent of the quarrying simulated (before rehabilitation). Foreground detail has been removed.

Plate 19 – Looking towards the site from north of Burgess Road (near the Carragher residence), 2.9km to the north-east of the site (Location 9b) with the full extent of the quarrying simulated (before rehabilitation). Foreground detail has been removed.

Plate 20 – Looking towards the site from Location 10, on a property on the south-east side of Brigadoon, with the full extent of the quarrying simulated (before rehabilitation). Foreground detail has been removed.

Simulation – Effect on Ridges (following)

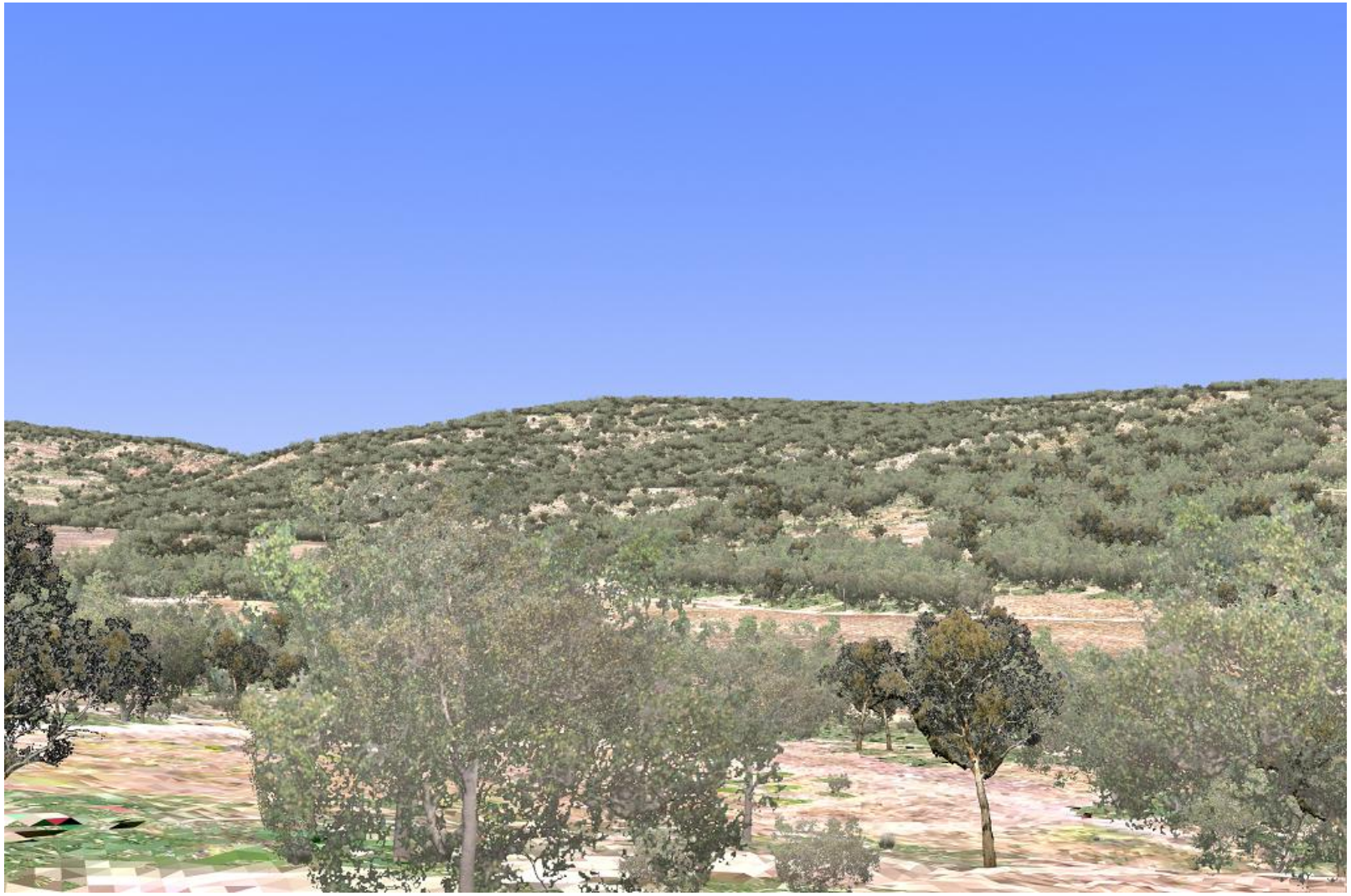


Plate 21 – Photograph looking towards the site from Location 6, with the current operations. The ridge in the middle skyline of the image will be affected by the proposal.

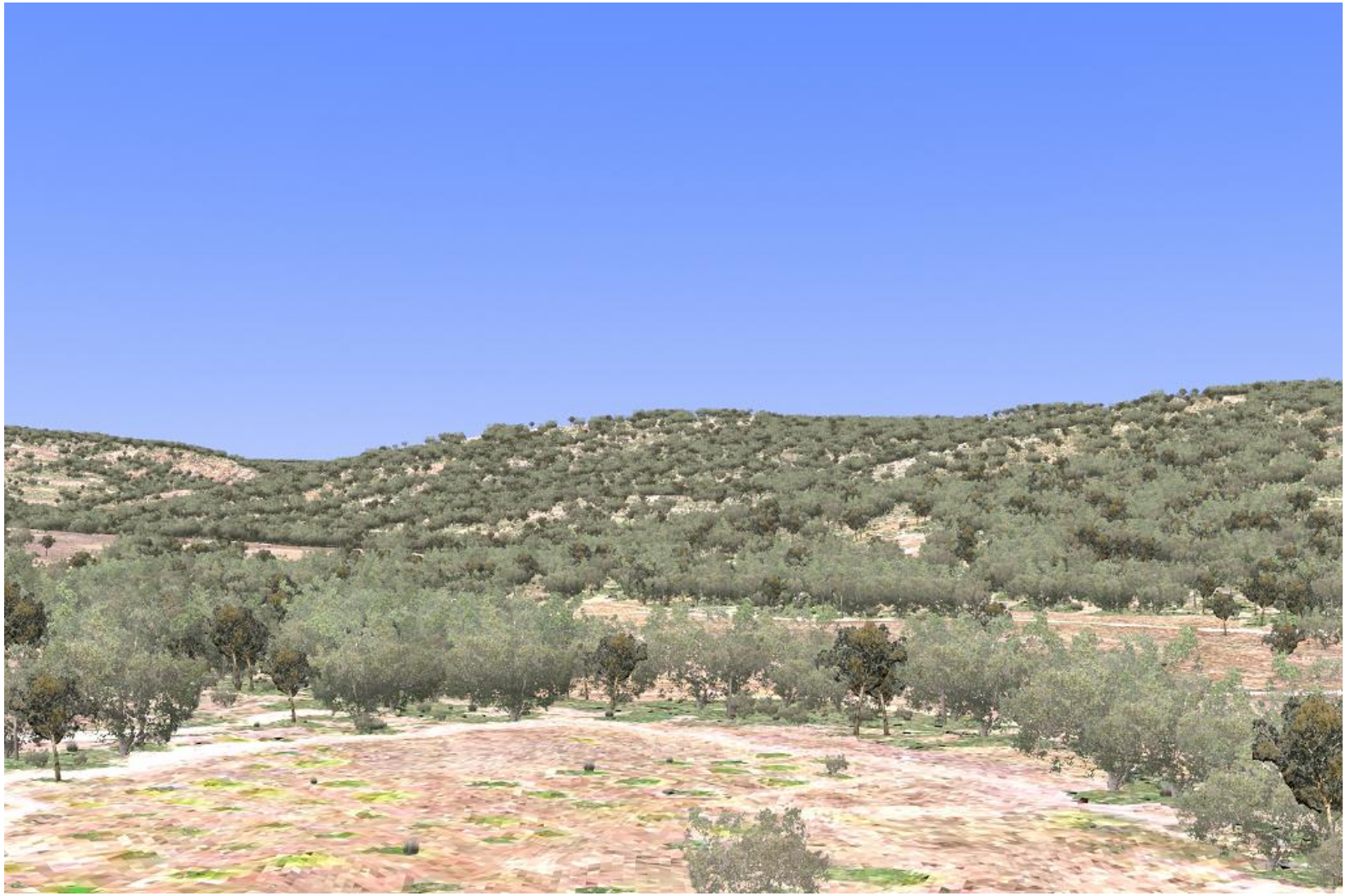


Plate 22 – Looking towards the site from Location 6, with the full extent of the quarrying simulated (before rehabilitation).

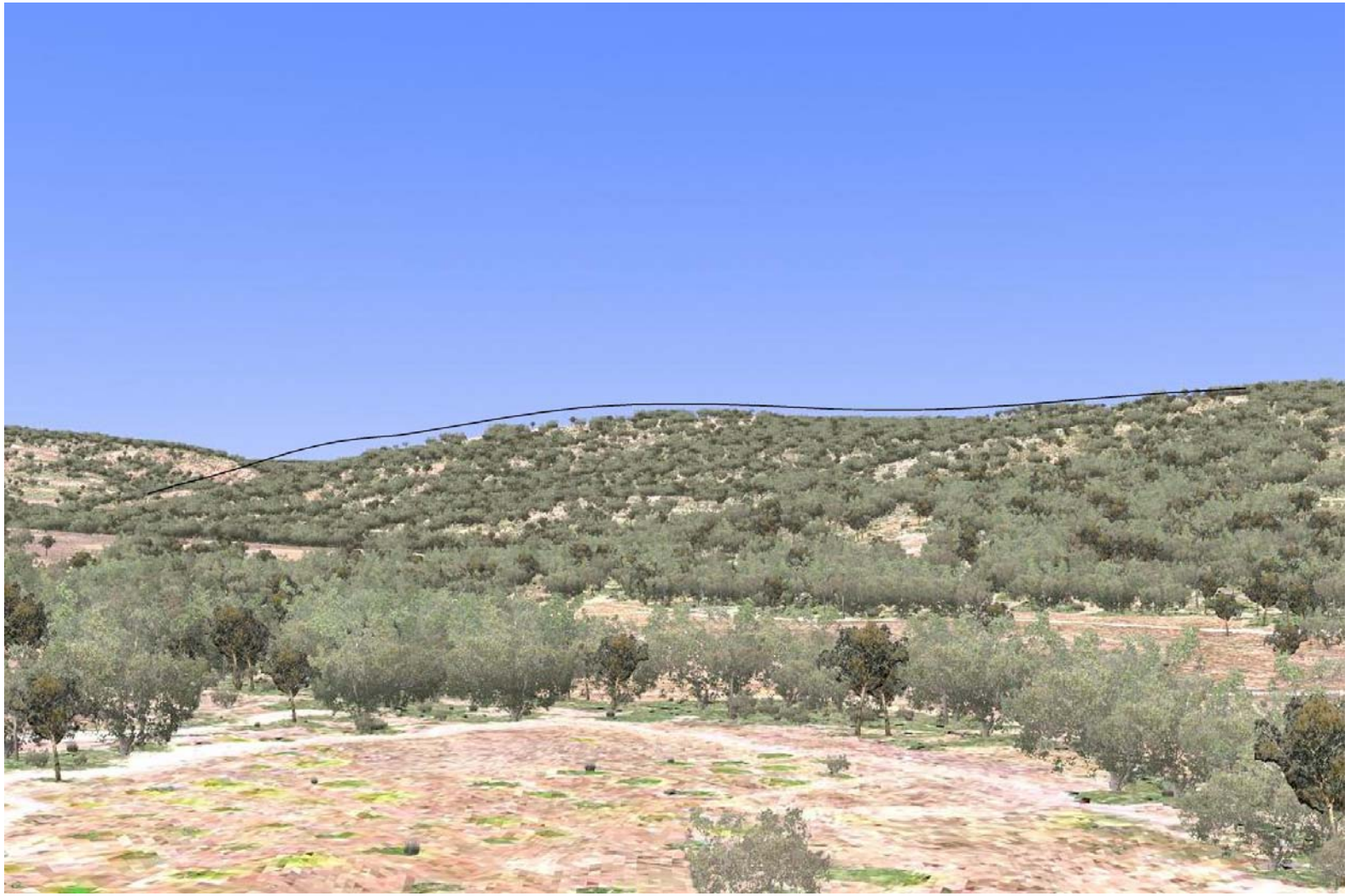


Plate 23 – Looking towards the site from Location 6, with the full extent of the quarrying simulated (before rehabilitation) and showing the line of the existing ridge..

Simulations Showing Stages and Rehabilitation (following)

Plate 24 – Looking towards the site from a location 220m east of Location 7 (below the Vaughan residence), approximately 1370m to the north of the site, with the current operations and Stage 1 of the proposal simulated.

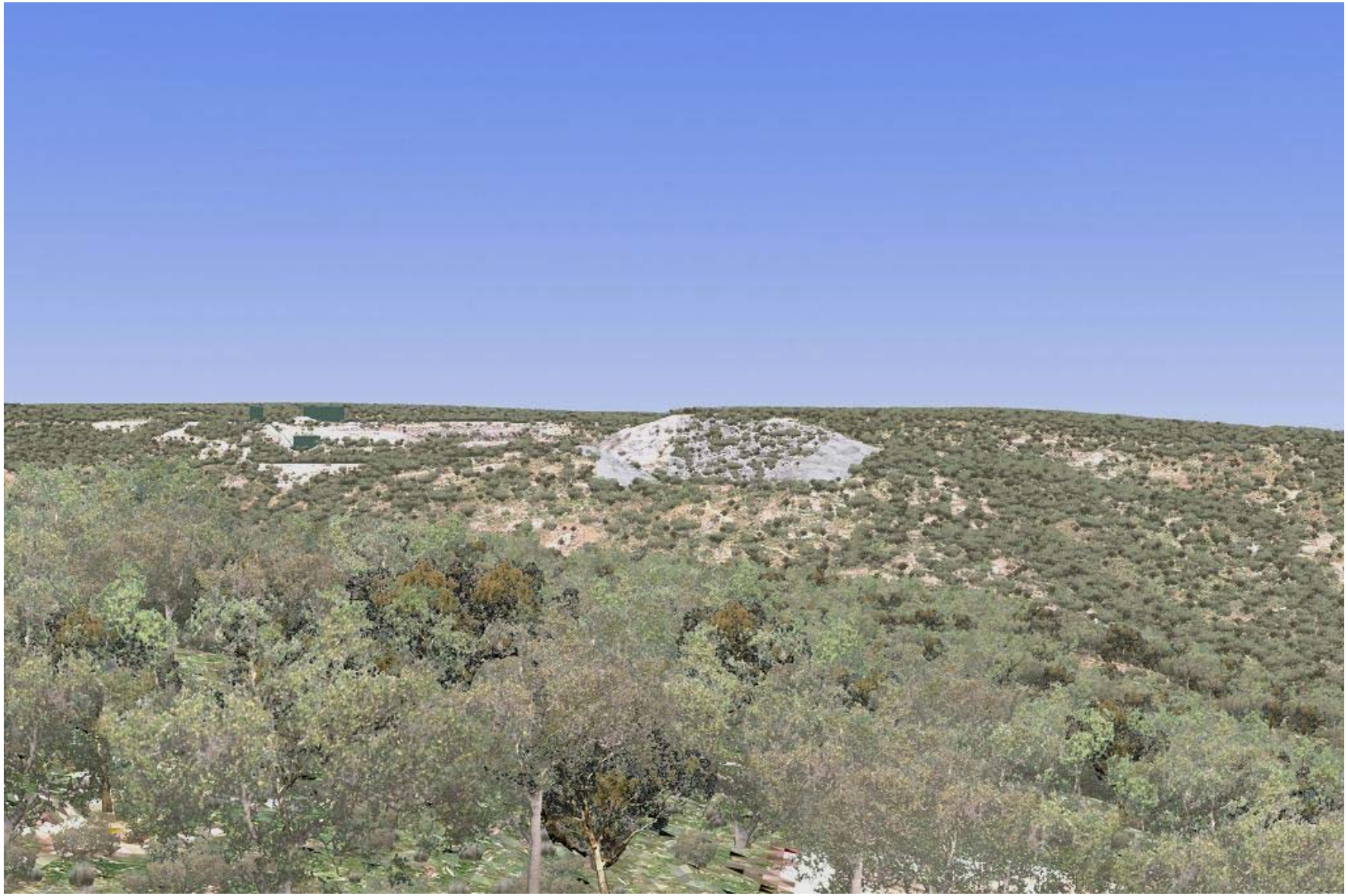


Plate 25 – Looking towards the site from the same location as Plate 24, with the current operation and Stage 1 and Stage 4 of the proposal simulated. Stage 1 is shown with semi-mature rehabilitation.

Plate 26 – Looking towards the site from the same location as Plate 24, with the current operation and Stage 1, Stage 4 and Stage 8 of the proposal simulated. Stages 1 and 4 are shown with semi-mature rehabilitation.

Plate 27 – Looking towards the site from the same location as Plate 24, with the current operation and Stage 1, Stage 4 , Stage 8 and Stage 12 of the proposal simulated. Stages 1, 4 and 8 are shown with semi-mature rehabilitation.

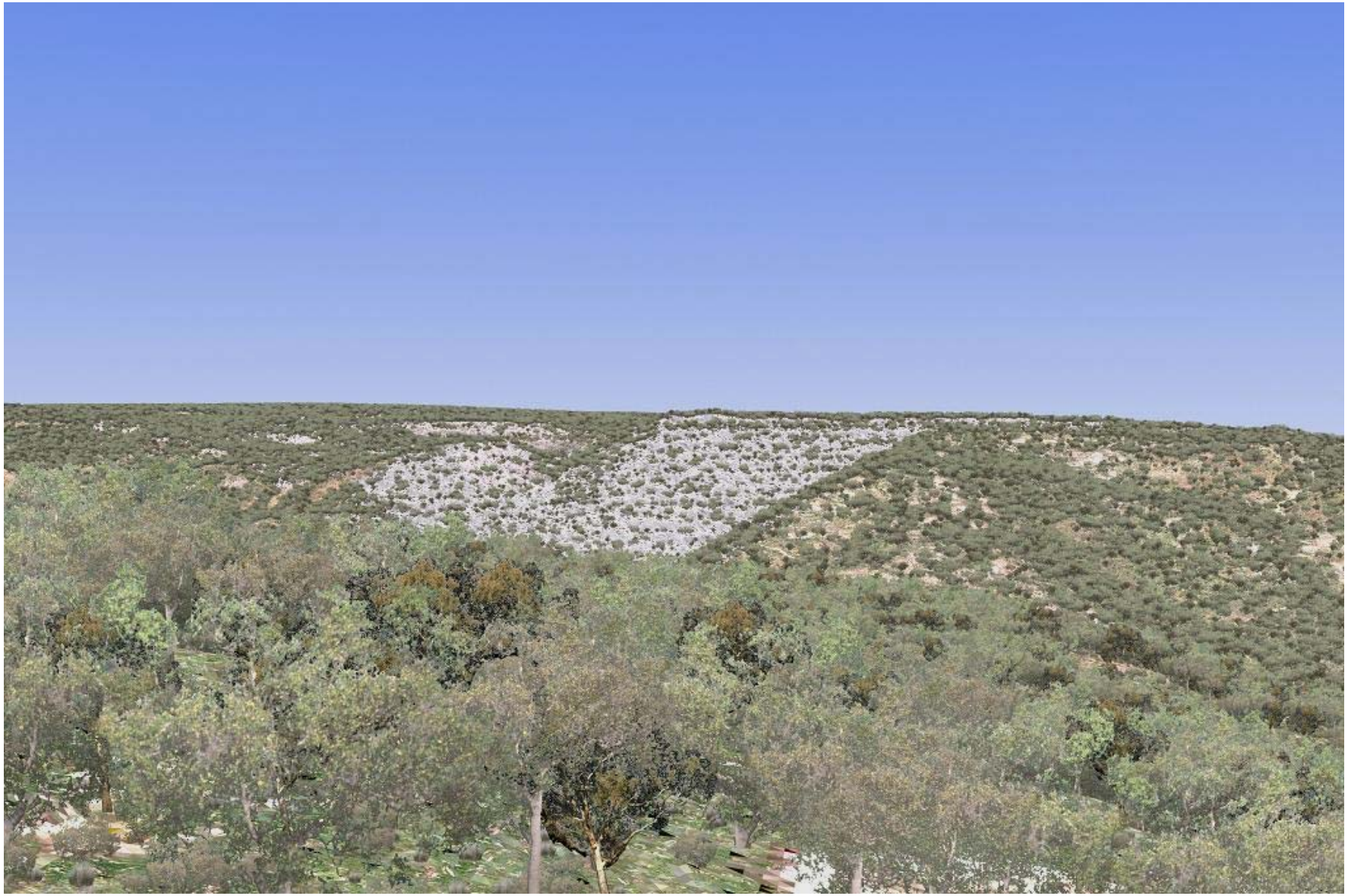


Plate 28– Looking towards the site from the same location as Plate 24, with all operations completed and the entire site shown with semi-mature rehabilitation. The buildings have been removed.

4.4 Summary of Effect on Values

4.4.1 SUMMARY OF VALUES

The assessment of values (Part 2) indicates, in summary, that:

- The site is within the *Hills Semi-Natural Unit* and lies adjacent to the *Industrial Unit* (the quarry areas at Herne Hill and Red Hill) and other *Hills Semi-Natural Unit*.
- Significant features in the study area (Map 3), include:
  - the steep vegetated slopes of the Darling Scarp and intersecting valleys;
  - the ridge crests and highpoints;
  - major rock outcropping;
  - areas with diverse patterns of vegetation;
  - Susannah Brook and the associated vegetation;
  - recreation use associated with John Forest National Park and Wandoo Heights Nature Reserve (including the visitor centre);
  - recreation use of the State Equestrian Centre;
  - faming areas with good paddock tree coverage or enclosed with good stands of remnant vegetation;
  - rural dams with surrounding trees;
  - The river features of the Swan River and associated vegetation and wetlands;
  - recreation associated with the Swan River, including the Bells Rapids area.
- The main access routes in the area, close to the site are:
  - Toodyay Road;
  - Campersic Road;
  - Great Northern Highway; and
  - Local access roads such as Williams Street, Range Road, Loton Road, Weir Road, Joshua Mews, and Burgess Road.
- Public localised use is concentrated around the Darling Range Regional Park (including the Wandoo Heights Nature Reserve visitor centre) to the north-west, the State Equestrian Centre to the north-north-west, and wineries/breweries to the west on the Swan Coastal Plain.
- The closest neighbours are on Range Road to the west (approximately 1.2km) and Daniel Place and Joshua Mews to the north (approximately 1.3km). Most of the other close neighbours are approximately 1.7km or more from the site.
- There are good views in the study area, which can be categorised as:
  - Plains Views;
  - Scarp Views;
  - Plateau Views.
- Views to some parts of the site are available from some locations in each of the above categories, particularly from the distant west, north-west, north and north east.
- The site has low wilderness quality, nearby bushland areas with good separation from development have moderate wilderness quality and other neighbouring areas have low to very low wilderness quality.

4.4.2 SUMMARY OF VISIBILITY AND APPEARANCE

The assessment of visibility and appearance indicates, in summary, that the proposed operation will be seen from the following locations:

- Toodyay Road (Area 1 on Map 4), where a small part of the stockpile area and some of the screening shed will be visible, similar to the current visibility and appearance.
- Houses (approximately 30), roads and public use areas on the Coastal Plain and footslopes of the Scarp in the Susannah Brook area (Area 2 on Map 4) and to the west, where changes to the northern and western ridge lines will be seen and small parts of the quarry faces may be detected (high visual contrast with the bushland setting but relatively low visual magnitude). These locations are currently unaffected by the existing quarry.
- Houses (approximately 4-5) in the Weir Road/Daniel Place/Abraham Close area (Area 4 on Map 4), where views look directly onto the existing quarry area and the proposed northern lobe of the pit, which will open up views to the existing pit and will also add new pit face area. Smaller parts of the western lobe will also be seen, particularly at the eastern end (ie. the existing pit end). Typically, the lower part of the northern lobe is screened by landform and trees filter other parts.
  These houses are affected by both the existing and proposed quarrying.
- Houses (approximately 2-3) and the road at the northern end of Joshua Mews (Area 3 on Map 4), where, similarly to above, views look directly onto the existing quarry and the proposed quarry site, particularly the upper part. The existing quarry, the upper part of the northern lobe and the upper eastern end of the western lobe may be seen, notwithstanding some filtering of views through trees.
  These locations are affected by both the existing and proposed quarrying.
- Houses (approximately 4-5) to the north of the western end of Burgess Road and south of Brigadoon (Area 5 on Map 4), which will see the upper parts of the northern and western lobes that are closest to the existing pit, with some of these appearing as replacements for existing cutting faces and some will be seen as new cutting faces.
  These houses are affected by both the existing and proposed quarrying.

These areas will be affected differently at different times as the quarrying operation develops through the stages. Parts of the quarry will undergo some form of rehabilitation as quarrying progresses, so that faces will only appear active for part of the expected 100 year timeframe.

4.4.3 SUMMARY OF EFFECT ON VALUES

Based on the assessment of values and the visibility and appearance, the effect on values can be summarised, addressing key questions, as in the following table:

Key Question	Assessment Outcomes

• How much actual or perceived change will there be?	• There will be detectable visual change when viewed from a number of localised areas:
	  • minor change when viewed from roads and residences in the north-west from where the existing quarry is currently not seen.
	  • substantial change (eg .doubling of size) when viewed from locations in north and north-east of the site from where the existing quarry is currently seen.
	  • minor change when viewed from Toodyay Road where parts the existing stockpile area and screening shed is currently seen.
	• The progressive rehabilitation of the disturbed areas will reduce the contrast of the change.
	• Changes seen from Toodyay Road and Joshua Mews will be in the focus of view for a short duration of the westward travel sequence. Views to the site from other roads tend to be away from the road alignment/focus.
	• A number of houses are orientated to take in views towards the site.
	• These changes are largely changes to landscape character and significant landscape features. There is no public access through the site, the wilderness quality is low, and the effect on views will stem from any perceived changed in landscape character and views to significant features.

Key Question	Assessment Outcomes
• Does the change affect the extent of the value, create rarity, or affect rare features?	• The landscape character of the site will change from 'Hill Semi-Natural with Industrial Influence' to 'Industrial'. This will affect the character as seen from key view areas, particularly to the north, north-east and north-west, with the balance between semi natural character and industrial character changing and industrial character becoming more dominant on the southern side of the Susannah Brook valley. • There are significant landscape features that will be removed by the proposed development, including patches of rock outcropping and diverse vegetation. These are not unique to the site - similar features occur in nearby areas of the Hanson land and conservation areas.
• How does the change affect high sensitivity level use locations?	• The change affects Level 1 (Great Northern Highway (mainly distant-middleground distance)) and Level 2 areas (Toodyay Road (100m-1.5km – largely existing works area) and some residences (see below).
• How does the change affect neighbours?	• The changes will affect a small number of neighbours to the north and north-east (1.2-2.4km) to a large degree, and greater number of neighbours to the north-west (1.6km+) to a small degree.

Part Five - Evaluation

5.1 Compliance with the Planning/Policy Framework

The compliance of the proposal can be evaluated against the requirements of the planning/policy framework. In this case, the key requirements for landscape values are in relation to EPA's general objectives for landscape, landform and amenity values and the site's location within the Landscape Zone in the City of Swan's Town Planning Scheme and the corresponding objectives.

The EPA's objectives for landscape, landforms and visual amenity give priority to protection in line with the level of significance, compatibility with natural areas and high conservation value, and the reduction of impacts as far as reasonably practicable, with special priority given to 'valued' landscapes.

The level of landscape significance of the site is not high – although there are significant landscape features they cannot be described as unique or rare. Although the site is semi-natural, the character is dominated by the existing quarry operations giving it a strong industrial influence.

Key issues related to the EPA objectives are:

1. Has the development been designed to reduce the impacts as far as reasonably practicable?; and
2. What special effort has been given to the 'valued' landscape?.

The design of the two lobes of the pit suggests some effort has been made to reduce the impact. The western lobe stops short of the former Herne Hill quarry, restricting any views into the proposed development from the west. The placement of the two lobes on the crest of ridges helps make the pit faces relatively unseen from the north-west. The two lobes also reduces the extent of seen disturbed area so that less is generally seen from any one view location.

On the other hand, the northern lobe is highly visible from localised areas to the north and, to a lesser extent, the north-east. It also descends to the ridge to a location close the Susannah Brook 'riverscape'.

There is nothing substantial that can be done to the pit design to reduce the visual magnitude of this northern lobe apart from reducing its size, given its location and the location of residences. If the proposed pit changes little, effort to reduce impacts would be most effective close to the residents and will need to involve substantial visual screening. Hanson has begun to provide such planting close to neighbours.

Small changes may be made to the design of the northern lobe boundary to eliminate any possible views to pit faces from locations to the north-west. Similarly it may be possible to move the move the western pit to the south to reduce the extent of visible pit face seen from the north. There should be opportunities to explore these options during the detailed design phase of the development.

Rehabilitation will also play a role in reducing impact (see photo-simulations). To be effective, rehabilitation of the pit faces will need to carry substantial vegetation. In particular, wider benches should be provided to support vegetative rehabilitation and appropriate overburden and top-soil provided to supply an adequate growing base for plants. This will reduce the contrast of the faces and the overall dominance of the quarry. Given the values of the

area and the possible effects on close neighbours, rehabilitation of the pit faces (and other disturbed areas) will require a high level of effectiveness. The Screening and Rehabilitation Plan should address these improvements.

The effort required for a 'valued' landscape is generally diminished in a case such as this, where an existing development of the same type already dominates the setting. It may be argued that the effort described above is sufficient.

In relation to the city of Swan Town Planning Scheme No.9, the objectives of the Landscape Zone give protection of the landscape values high priority. The appropriate level of protection can be determined by the importance of the identified values and also by the level of community use. In this case, the values are typical of the area and the level of community use is moderate (ie. Level 2) allowing for moderate stringency in maintaining landscape values. For example, and by contrast, if the site contained unique landscape values, was in a more natural setting and was seen at relatively close distances from a Level 1 use area, it might be expected that a very high level of protection would be given to the values.

The objectives of the Landscape Zone also give rehabilitation a high priority.

It should be noted that Extractive Industry is permitted in the Landscape Zone if the Council, having regard to related provisions in the scheme, grants special approval.

The Basic Raw Materials policy highlights the importance of this area for quarrying and provides a counterpoint for consideration of landscape values.

5.2 Other Considerations

RECREATION AND TOURISM VALUES

The proposed development does not affect any recreation activities on public land and will not affect tourism values.

CUMULATIVE EFFECT

Cumulative effect takes into account the effect on values over a large area or an extended timeframe and will stem from the level of impact of each development and the density of these developments compared to the extent of available values.

The proposed development represents a small, incremental change and contributes to the cumulative effect of extractive industries on the landscape character and significance of the broader area around the site.

5.3 Community Attitudes

Consultation with the local community indicates that there are some concerns and opposition to the proposal, particularly amongst residents that will be directly affected. Residents that believe that they will not be directly affected appear to either have few concerns, or have concerns about the effect of the proposal on the character/values of the area.

Comments recorded from this consultation reported in Section 2.1.

Residents that will be directly affected have generally indicated that they would like their concerns addressed.

Part Six - Recommendations & Design Guidelines

It is recommended that:

The detailed design of the proposed pit development should investigate:

a. the design of the northern lobe, in particular how to eliminate views to the pit faces from locations in the north-west;

b. the design of the western lobe, in particular how to eliminate views to the pit faces from locations in the north.

Given the landform of the area, and observer positions, it is likely that both of these design objectives can be achieved.

Rehabilitation techniques should be reviewed, improved, and documented in the Screening and Rehabilitation Plan. This should be ongoing, and should include improvements in the rehabilitation of pit faces, particularly those that are seen from the north and north-east. In particular, wide benches should be provided to support vegetative rehabilitation and appropriate overburden and top-soil provided to supply an adequate growing base for plants.

Adequate vegetation screening, with berms (or bunding), be provided on the Toodyay Road side of the stockpile area to minimise the visible expansion of the operations.

Visual screening, designed for the nature of the impact, should be offered to all residents on the north and north-eastern side of the quarry that are visually affected by the operations.

The entry to the site should be improved to reduce visual penetration. For example, a planting island could be used to block the existing sightline.

Appendices

Appendix 1 - Definitions

A number of terms are commonly used in discussion of the topics covered by this report. Definitions used in this report for some of these terms are provided below.

3D Modelling is a technique, usually performed on a computer, where landform and objects are accurately and mathematically defined in three-dimensional space. This allows the reconstruction of views of these landform and objects from any location using a rendering process that applies textures to 3D forms to make them appear realistic.

Aesthetics refers to personal appreciation and enjoyment of things (eg. objects, places, and processes). It can include beauty, functional and non-functional aspects of things, and does not necessarily include visual qualities.

Area Visually Affected is the all the area that is within the seen area of all the points within the 3D form of the development.

Cross Sections depict an object or area with part of the object or area cut away to highlight the profile or shape at the plane that defines the cut.

Evaluation is the process where assessment results are examined and used to make decisions about alternative futures, usually based on given standards.

Evaluation is the process where assessment results are examined and used to make decisions about alternative futures, usually based on given standards.

Impact Assessment is a process of determining how changes to the environment will affect landscape values.

Impact Assessment is a process of determining how changes to the environment will affect landscape values.

Landscape Assessment is a process of analysing and mapping environmental characteristics and, using known criteria, determining those that contribute most to the experience and enjoyment of people

Landscape refers to a person's perception or image of an environment (ie. it is a human construct). *Landscape Value* is the value they attach to a place based on their perception of that place. *Landscape Value* and *Visual Aesthetic Value* are often used synonymously.

Landscapes stem from perception. Through the process of perception people create their own 'landscapes', their interpretation of an environment (ie. 'their environment as they know it')(Meinig 1979, Zube et al 1982, Lowenthal 1978). There are two other main usages. The first refers to a scene (as in a landscape painting). The second refers to an area that has a common pattern of bio-physical features (as in a landscape ecology).

Perception is the process where environmental information is combined with a person's existing knowledge, emotional response and values.

Seen Area is a term used to describe the land surface that is potentially visible from a given point.

Sensory characteristics relate to the paths by which people receive environmental information (eg. vision, hearing, etc.).

Values are measures of the importance people attach to things and typically stem from perception.

Visual Absorption Capability describes or indexes an area's ability to visually absorb or sustain change based on variables such as landform, vegetation pattern and height, and existing land use.

Visual Absorption Capability describes or indexes an area's ability to visually absorb or sustain change based on variables such as landform, vegetation pattern and height, and existing land use.

Visual Aesthetic Value refers to the visual aspects of aesthetic value. *Aesthetic Value* refers to personal appreciation and enjoyment of things (eg. objects, places, and processes). It can include beauty, functional and non-functional aspects of things, and does not necessarily include visual qualities.

Visual characteristics relate to information received through the visual sensory path.

The terms *visual*, *aesthetics* and *landscape* are often used synonymously or combined, despite their different definitions. This study includes a *landscape* assessment that focuses on *visual characteristics* and *aesthetic values*.

Appendix 2 - Data Sources for Assessment of Aesthetic Values

		Data									
		Lists								Assessment	
		World Heritage List	Register of National Estate	Register of Heritage Places	Municipal Inventory	Classification List	Register of Aboriginal Sites	Maritime Archaeology Database	CALM	CALM	Other
		UNESCO WH Committee (Nomination doc.)	AHC	Heritage Council	Heritage Council, LGA	National Trust	AAD	WA Maritime Museum	Various informal, in documents		
Significance Sub-theme	Natural										
	Natural Aesthetic										
	Cultural – Historic										
	Cultural – Social (Non Aboriginal)									Social Recreation	
	Aboriginal										
	Maritime (Historic)										
	Scientific										

T=Text, M=Map, NA=Not Applicable

Appendix 3 - Sensitivity Level Criteria

The sensitivity levels of travel routes and use areas are an indication of the importance of those routes to the experience of people and are established on the volume of people using the area and an understanding of their preferences. Classification of sensitivity levels is based on criteria used in the Visual Management System (VMS)(Williamson & Calder 1979). The criteria can be summarised as follows.

Classification	Type of Use - Existing or Formally Proposed		
	Non-recreation use rural and forest roads	**Recreation and tourism**	**Settlement**
Level 1 High Sensitivity	National & State Highways. Links between cities and major towns.	Designated tourist roads. Major recreation sites recognised formally or informally at a national or state level, including walking tracks and lookouts. Primary access to these recreation sites or multiple level 2 use areas. Travel routes or sites through or adjacent to scenic or historic areas with recognised or assessed values of national or state importance.	Places with recognised or assessed scenic or historic values of national or state importance.
Level 2 Moderate Sensitivity	Main link roads between towns and highways.	Important but undesignated tourist and recreation roads. Recreation sites of regional importance, including walking tracks and lookouts. Primary access to these recreation sites or multiple level 3 use areas. Travel routes or sites through or adjacent to scenic or historic areas with recognised or assessed values of regional importance.	Places developed to capitalise on views or attractions
Level 3 Low Sensitivity	Minor link roads.	Local recreation use.	Residential areas other than Level 1 or 2.
Level 4 Very Low Sensitivity	Roads receiving local non-recreation use.	-	Industrial areas.

Appendix 4 - View Data Variables

The following variables were used to record and assess views:

Location	location along the access route (lat/long);
Direction of view	angle between the centreline of view and the centreline of the road (degrees);
Angle of view	field of vision (degrees);
Filtering	heavy filtered, light filtered, open;
Vegetation height	metres;
Distance to blocked view	metres;
Cause of blocked view	vegetation, landform;
Visibility of development	visible, non-visible;
Duration of view	ongoing, spot;
Viewer position	elevation difference between viewer and subject (superior, normal, inferior)
Vegetation type	species;
Photographic record	film frame numbers;
Subject of view	landmark focus, significant feature, natural landscape character;
Access characteristics	type of use, travel mode, recreation use, volume.

Appendix 5 - 3D Modeling/Rendering Techniques and Accuracy

Modelling Techniques

The techniques used for creating representations of the proposed development were as follows. Relevant digital data related to the locations, elevation and extent of existing landform and landcover features was acquired, mainly from State Government agencies. Digital data related to the proposed development elements was also obtained. All this data was either acquired in, or transformed into, the same coordinate system to provide spatial accuracy between different data and to ensure that the data accurately represented the features on the earth's surface in the development area. The coordinate system used was MGA 1994 Zone 55. This coordinate system is based on a horizontal cylinder (Transverse Mercator) projection, centred over the 147 degree meridian (Zone 55), of an approximation of the earth's shape ('GRS80' spheroid) moved slightly to suit Australia (the spheroid and the shift making up our local datum – GDA 1994).

A 3D model of the landform was created by generating a Digital Elevation Model (DEM) from the contours (10m interval, half interval accuracy). The DEM is simply a grid of heights and in this case these heights were generated at a 10m grid interval. The software allows the landform between these points to be defined by a variety of interpolation techniques, including splining, inverse distance weighting or kriging. The need for interpolation can be minimised by creating finer grids, although a 10m grid interval is considered appropriate given the contour interval.

Once the 3D landform model was created, existing and proposed land cover was added to the model. The aerial photograph was draped over the landform and then land cover elements placed over that. The land cover elements modelled were vegetation and the proposed buildings and roads. The vegetation was modelled using position, species, height, and density. The proposed buildings were modelled using models of notional design for the development and position, orientation and magnitude.

This rendered 3D model provides a relatively 'life-like' representation of the area with the proposed development in place. The model can be viewed from any position and these positions can be linked and animated to create 'drive-throughs' or 'fly-throughs'.

The rendered 3D model can be used as a base to create images of the area with the development simulated, described as follows. Photographs of the site can be taken from nominated positions (ie. the representative key views described in the assessment), recorded using the same coordinate system. The rendered images can be then placed over these photographs so that the position and scale can be matched and then the proposed development can be pasted to the photographs. The matching of rendered 3D images to the photographs is based on matching the position, heading and camera lens specifications in each method, matching the pixel size and elements in each image in the overlay process, and checking position and scale using measurement techniques (see below).

Both the rendered 3D models and the photo-simulations depict the development in particular atmospheric and lighting conditions. For effective representations, the conditions chosen should maximise the visibility of the development.

The accuracy of this modelling is considered to be very high and is discussed briefly in the following section.

Despite the realistic nature of this modelling some people still have difficulty either accepting the accuracy of the modelling or appreciating the scale (small or large) of the development. Measurement of the scale of the development can help in both these cases. As described above, it also a simple way of validating the accuracy of the modelling.

Measurement of the scale of the development is based on simple trigonometric calculations. These calculations can be been done for nominated view locations (eg. for the simulations in the assessment report) and are based on the distance between the camera (or observer) and the development, the height of the buildings, and the ground elevations of both these. These variables and calculations allow the buildings to be described as an angle of view, which in turn can be used to provide comparisons of scale.

Accuracy of Modelling Notes

Modern, computer-based 3D modelling is well known for its spatial accuracy and is a relatively well-established science. There are well-known and validated models for taking data of a particular form (for example, DEMs or points) in a known defined coordinate system and converting them accurately into a 3D global form. For example, some software uses a simple spherical globe, which is known to be a gross approximation earth's shape. Other software uses spheroid/ellipsoid definitions taken from the industry-standard EPSG tables (http://www.google.com/search?hl=en&lr=&ie=UTF-8&oe=UTF-8&q=epsg+table), and the equally well-known USGS GCTPC (http://www.google.com/search?hl=en&ie=UTF-8&oe=UTF-8&q=GCTPC) library for this task. These algorithms and definitions (or similar algorithms such as the PROJ4 library http://www.google.com/search?hl=en&lr=&ie=UTF-8&oe=UTF-8&q=PROJ4) are the heart of virtually every GIS package. This ensures some measure or repeatability between programs (at least those that use exactly the same formula). GCTPC is used in popular GIS software (such as the range of ESRI products, for internal reprojection code). Most software that creates 3D perspective views uses well-known and validated 3D perspective camera projection algorithms. These algorithms are the basis of essentially every 3D software program out today, and are well understood and vetted. We have done some informal validations (modelling landform/objects of known dimensions, comparisons with photographs and real views of same and comparisons with results from other techniques (eg. sectional views)) to assure ourselves of their spatial correctness. Based on this, and the knowledge that the algorithms themselves are well-trusted and validated, we have confidence in the spatial accuracy of our software. It is worth noting that the software we use has a camera model that is more accurate than most industry 3D software in that it approximates the lens behaviour of a real camera, as opposed to the 'perfect' virtual cameras of most 3D software.

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RED HILL QUARRY
PROPOSED DEVELOPMENT

TOODYAY RD
RED HILL

ADDENDUM

LANDSCAPE & VISUAL ASSESSMENT

Prepared for

Hanson

Prepared by

JOHN CLEARY PLANNING

February 2008

Introduction

This is an addendum to the *Red Hill Quarry Proposed Development, Landscape and Visual Assessment Report* prepared by John Cleary Planning (2007). It provides additional information for interested stakeholders in relation to the visibility and appearance of the development and the changes in these over the stages of the operation.

In particular, it illustrates, in 3D, the areas of the main stages of the operation and different configurations for the stockpile.

It contains a series of plates with explanatory captions that include:

1. plan views that show the layout of relevant elements in the other plates;
2. additional 'working' renders generated from the 3D modelling for:
    - the view from the north, across the valley from the quarry (notional location near Location 7 in the main report);
    - the view from Toodyay Road (Location 1 in the main report), to the east of the quarry;
    - images of the current views from these, or nearby locations; and
3. a sectional view through the stockpile that illustrates the position of elements, particularly height, in relation to the notional sightline from Toodyay Road.

A discussion of the techniques and accuracy of 3D modelling and rendering is provided in Appendix 5 of the main report.

The addendum is intended to assist in the interpretation of the simulations provided in the main report, in particular Plates 24-28 (the view from the north) and Plate 13 (the views from Toodyay Rd), and, more generally, to assist people understand the effect of staging, landform, vegetation, and view locations on the visibility and appearance of the proposal. The order of the plates is designed to help in this regard.

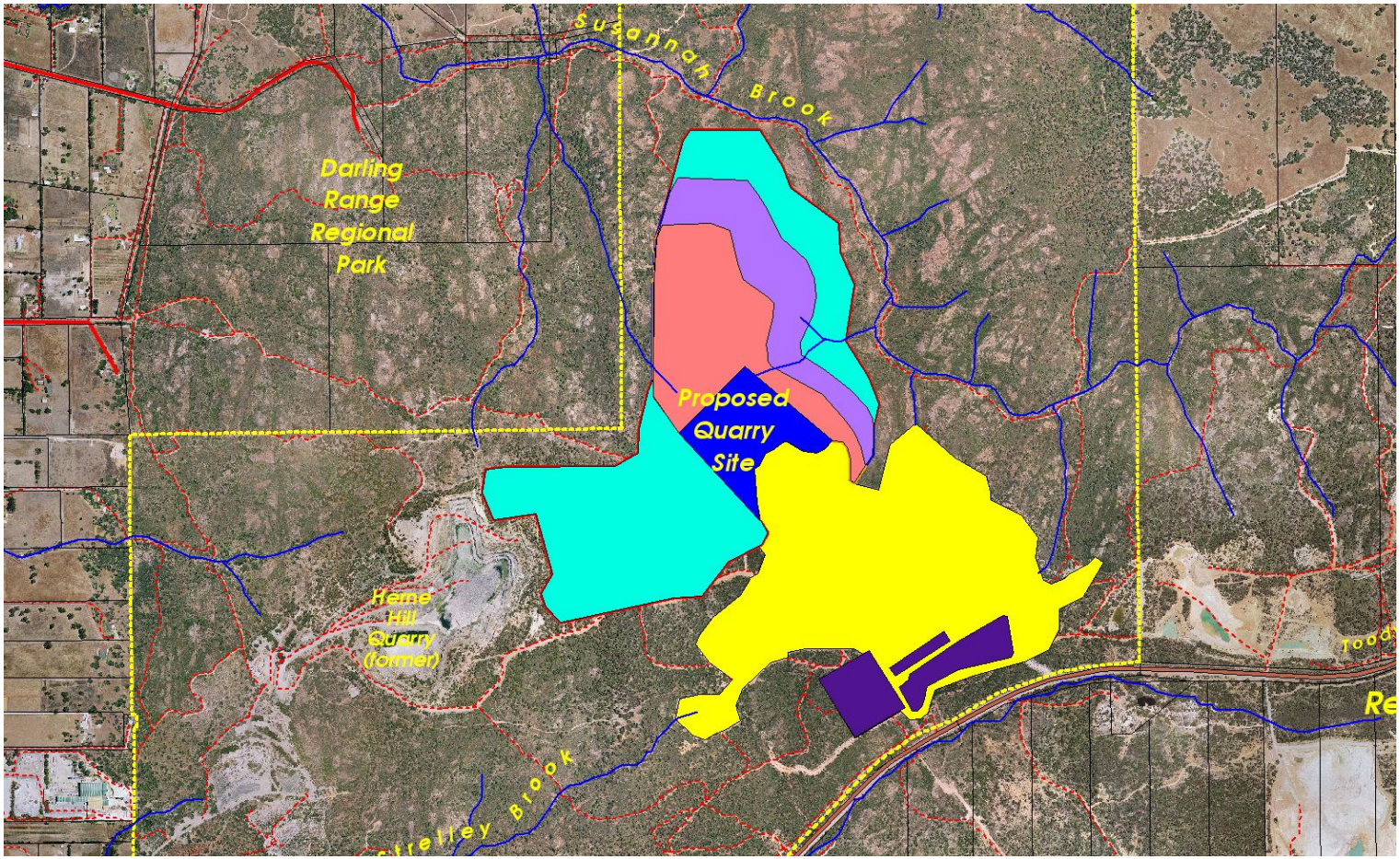


Plate 1 – This illustrates the areas of the main stages used in the simulations. Yellow is the existing disturbed area, blue is Stage 1, red is stage 4, mauve is Stage 8, teal is Stage 12, and purple is stockpiles. The same colours are used in the 3D renders that follow.

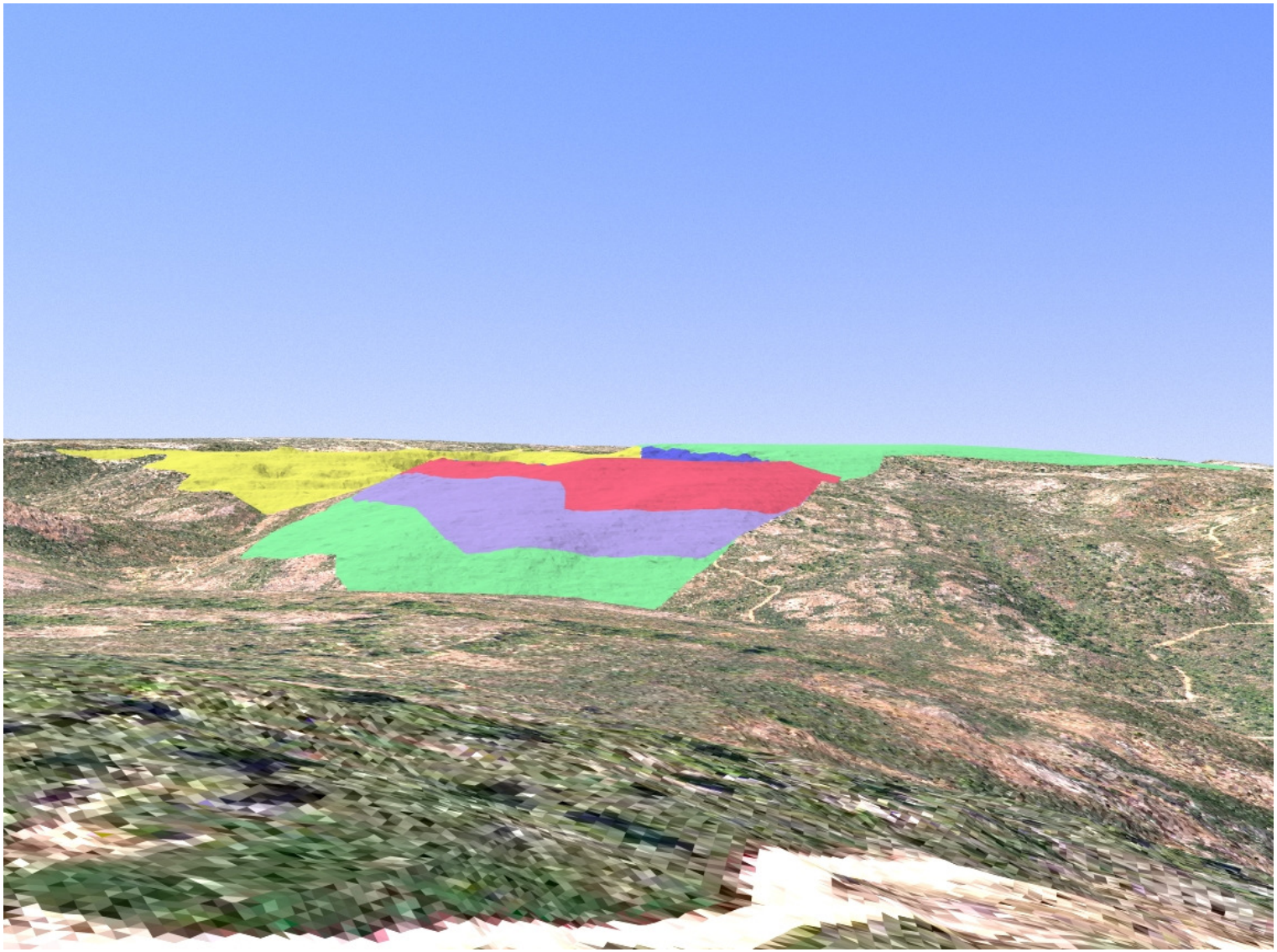


Plate 2 – This illustrates the areas of the main stages, using the same colours as in Plate 1. Trees have not been used, allowing clear delineation of the boundaries. The view is from the north, across the valley from the quarry (near Location 7 in the main report) and is at tree top canopy level. This is the same position as Plates 24-28 in the main report. The coloured areas are draped over the landform when Stage 1 quarrying is complete. The blue area of Stage 1 can just be seen in the centre of the site. The red, mauve and teal of Stages 4, 8 and 12 are draped over the existing landform, which includes the ridge that blocks most of the view to the Stage 1 area.

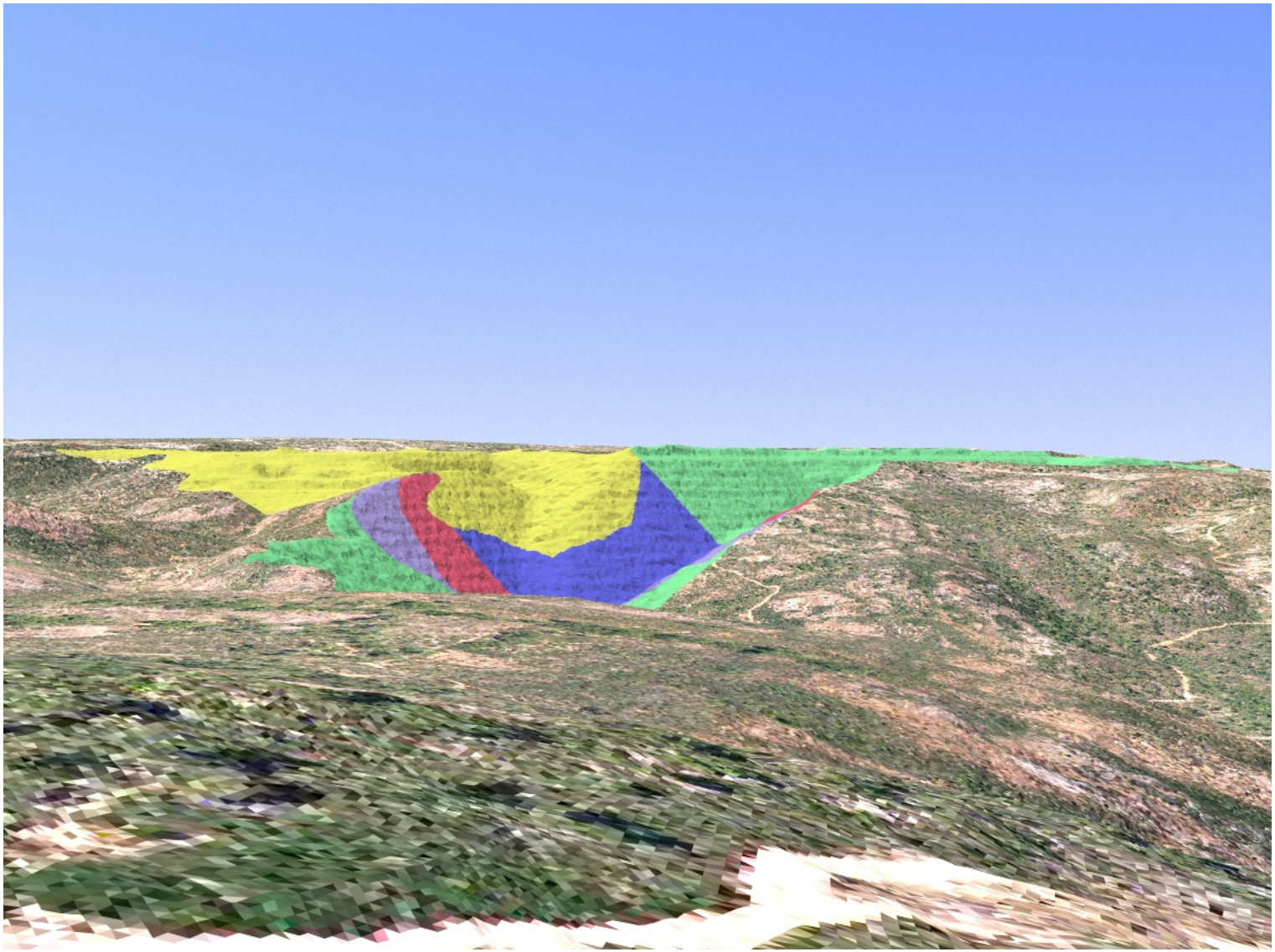


Plate 3 – This is similar to Plate 2 but the coloured areas are draped over the landform when Stage 12 quarrying is complete. The existing quarry excavation can be seen dropping through the blue, red, mauve and teal of Stages 1, 4, 8 and 12. It is important to highlight that this is Stage 12 landform – the areas of earlier stages are included to illustrate where they located.

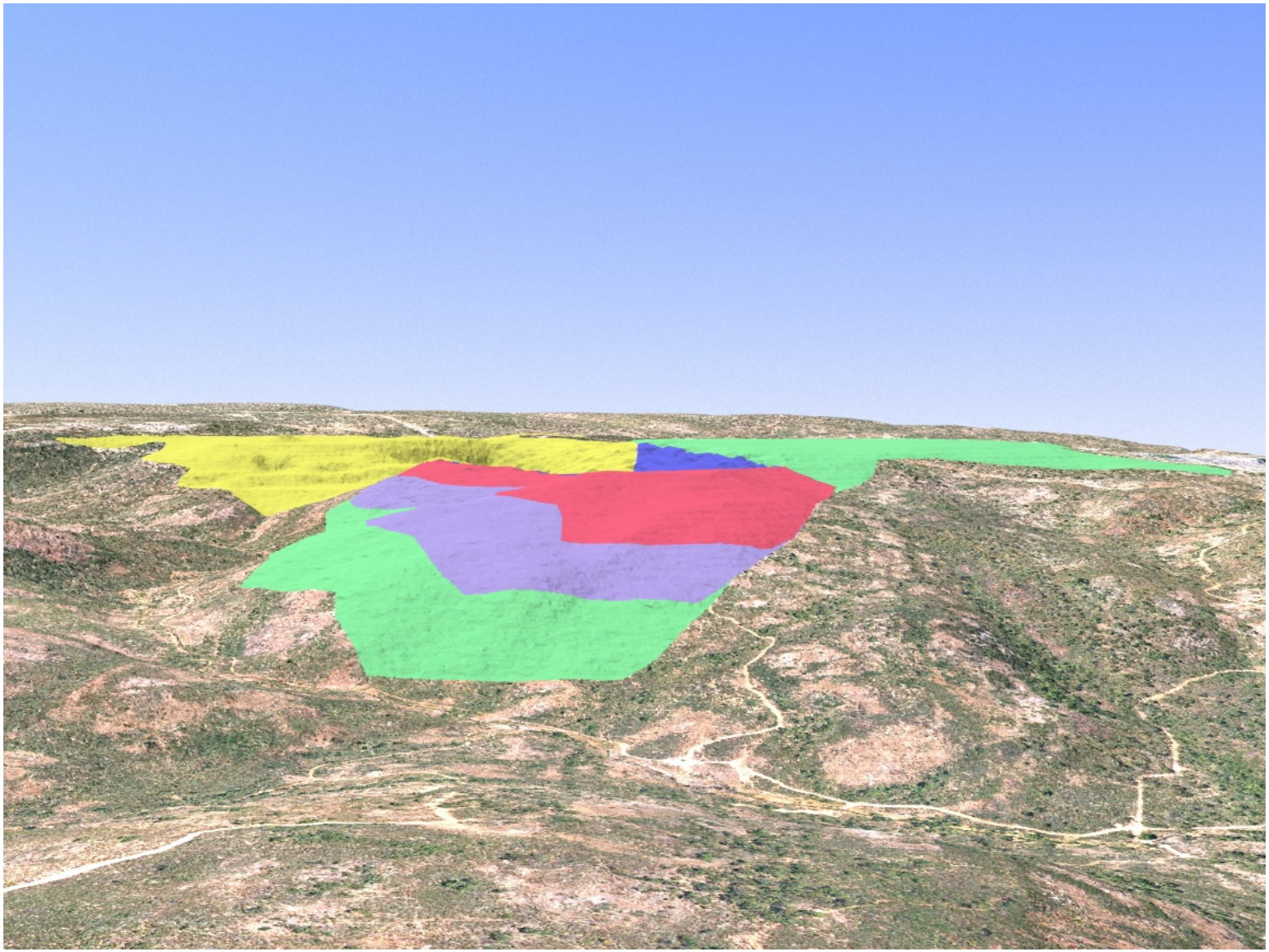


Plate 4 – This is the same as Plate 2 except that the view height has been increased 100 metres to better show the excavation of the existing quarry and Stage 1 area. From this exaggerated height, the faces of the existing quarry and Stage area can be seen behind the red of Stage 4, in the centre of the site. The red, mauve and teal of Stages 4, 8 and 12 are draped over the existing landform, which includes the ridge that blocks most of the view to the Stage 1 area. This highlights the screening effect of the ridge in the early stages of the proposed operation.

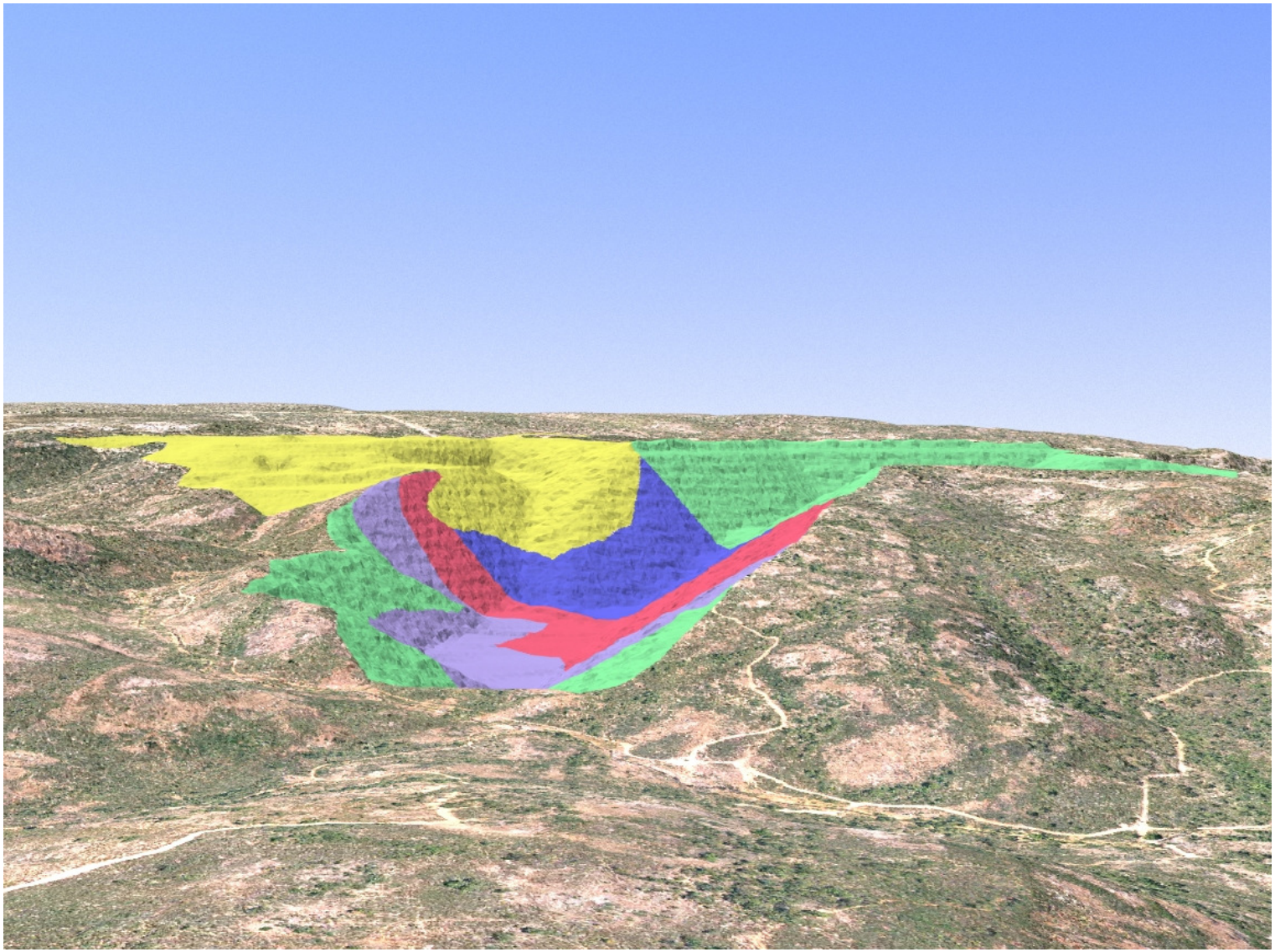


Plate 5 – Like Plate 4, this is the same as Plate 3 except that the view height has been increased 100 metres to better show the excavation and the stages. From this exaggerated height, the floor of Stages 4 and 8 and can be clearly seen (in addition to the faces as in Plate 3). Again, it is important to highlight that this is Stage 12 landform – the areas of earlier stages are included to illustrate where they located.

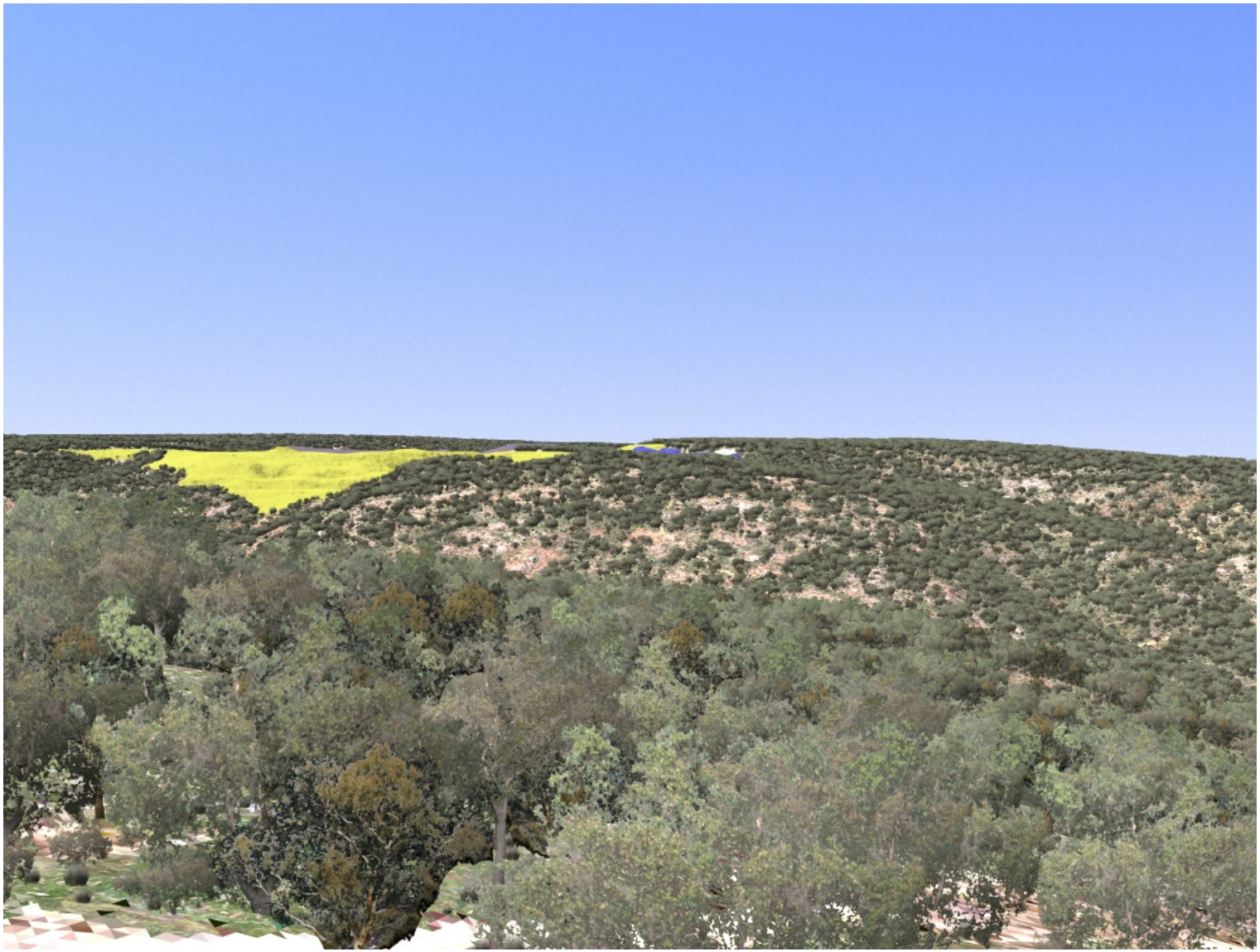


Plate 6 – This is the same as Plate 2 except that trees have been added to provide a more realistic depiction of the view. This shows that the existing trees will largely screen the Stage 1 operations from this location. This highlights the screening effect of the ridge in the early stages of the proposed operation. From this location, the existing operations (shown yellow) can be seen to the left of the ridge, up the Susannah Brook Valley.

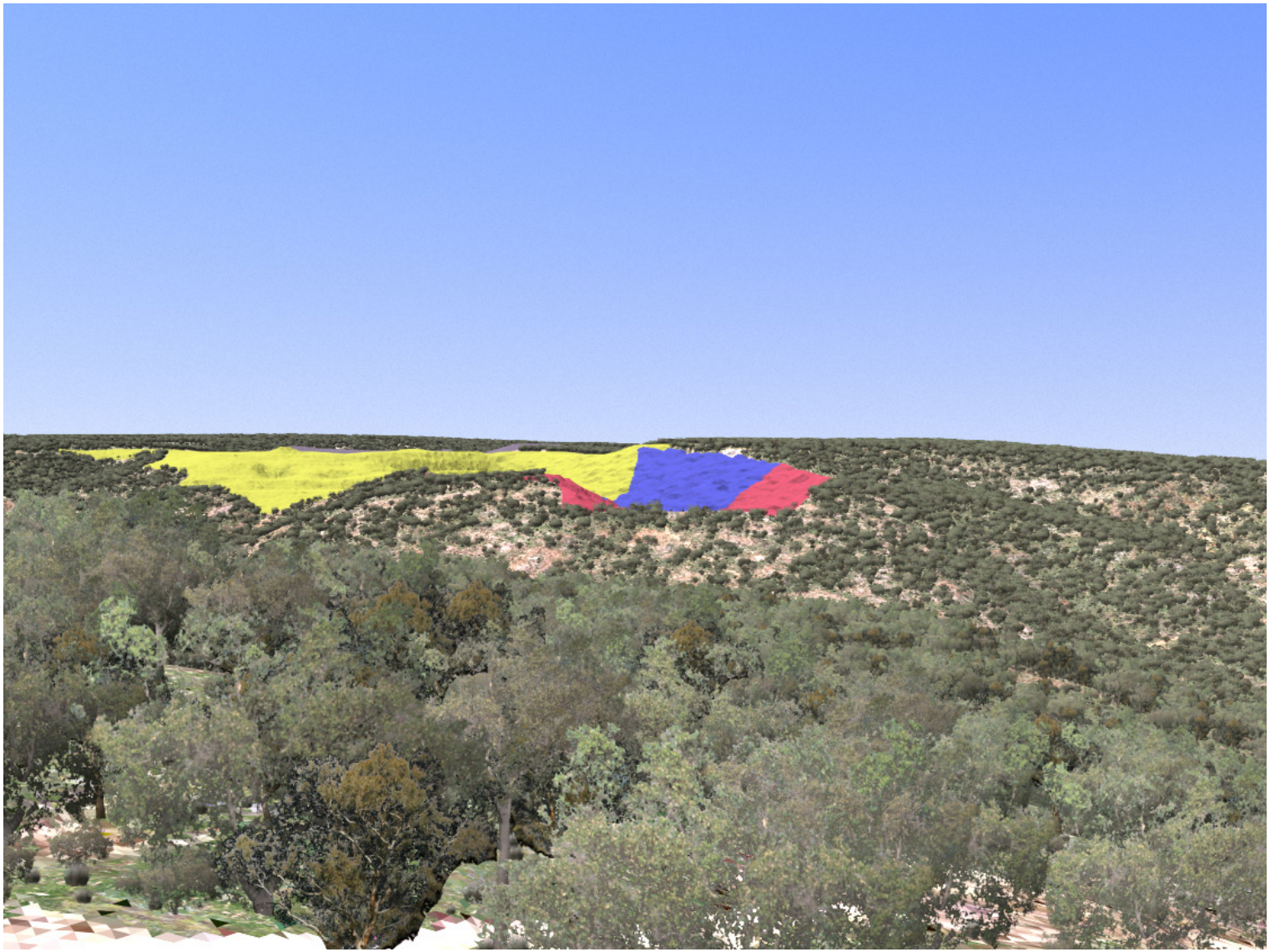


Plate 7 – This is the same as Plate 6 except that Stage 4 landform is shown and Stage 1 and 4 areas (that latter coloured red) are draped over this. While much of Stage 4 is screened by the ridge to the north (towards the view location), the excavation of Stage 4 does open up views to the north facing slopes of the Stage 1 area (shown blue) and the upper western part of the current operation. Note that the southern corner of Stage 1 appears less acute than in plan view due to the elevated nature of the south-western boundary.

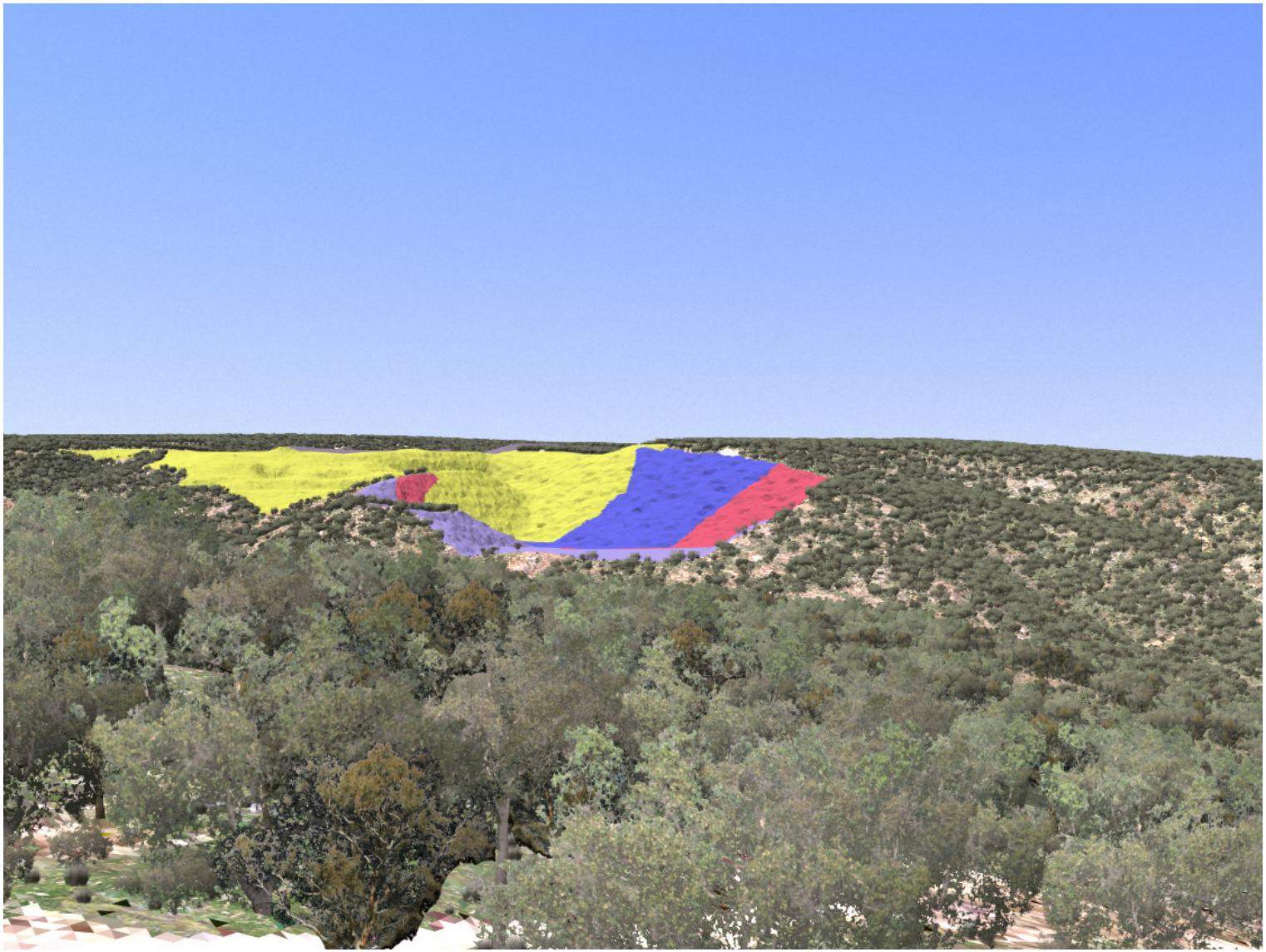


Plate 8 – This is the same as Plate 7 except that Stage 8 landform is shown and Stages 1, 4 and 8 areas (that latter coloured mauve) are draped over this. While much of Stage 8 is screened by the ridge to the north (towards the view location), the excavation of Stage 8 further opens up views to the north facing slopes of the Stages 1 and 4 areas (blue and red respectively) and the western part of the current operation.

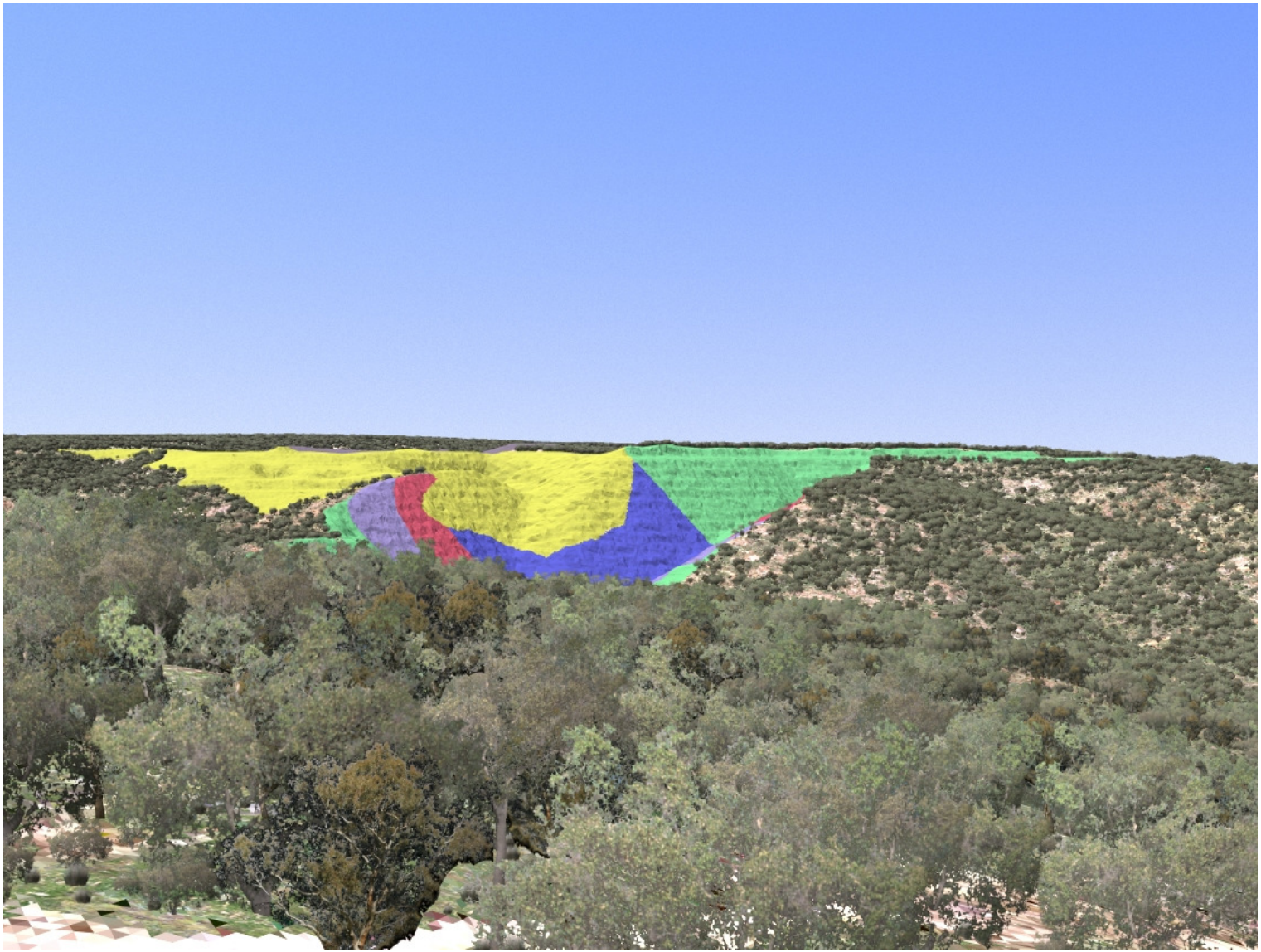


Plate 9 – This is the same as Plate 8 except that Stage 12 landform is shown and Stages 1, 4, 8, and 12 areas (that latter coloured teal) are draped over this. From this view location, much of the Stage 12 faces are screened by landform and vegetation but the upper eastern slopes of the northern lobe are clearly visible. The excavation of Stage 12 further opens up views to the north facing slopes of the Stage 1 area, the upper western facing slopes of Stages 4 and 8 areas, and much of the current operation. The Stage 12 area also intersects with the Stage 4 and 8 areas and the south-western edge of Stage 1 can now be seen falling sharply to the quarry floor, making the southern corner of the Stage 1 area appear to be relatively acute, closer to the angle in the plan view.

Plate 10 – This is the same as Plate 9 (ie. Stage 12 complete) except that colours of the stages are replaced with simulated cutting faces and rehabilitation. The rehabilitation is shown on Stages 1, 4 and 8 as seen in Plate 9. This is the same as Plate 27 in the main report.

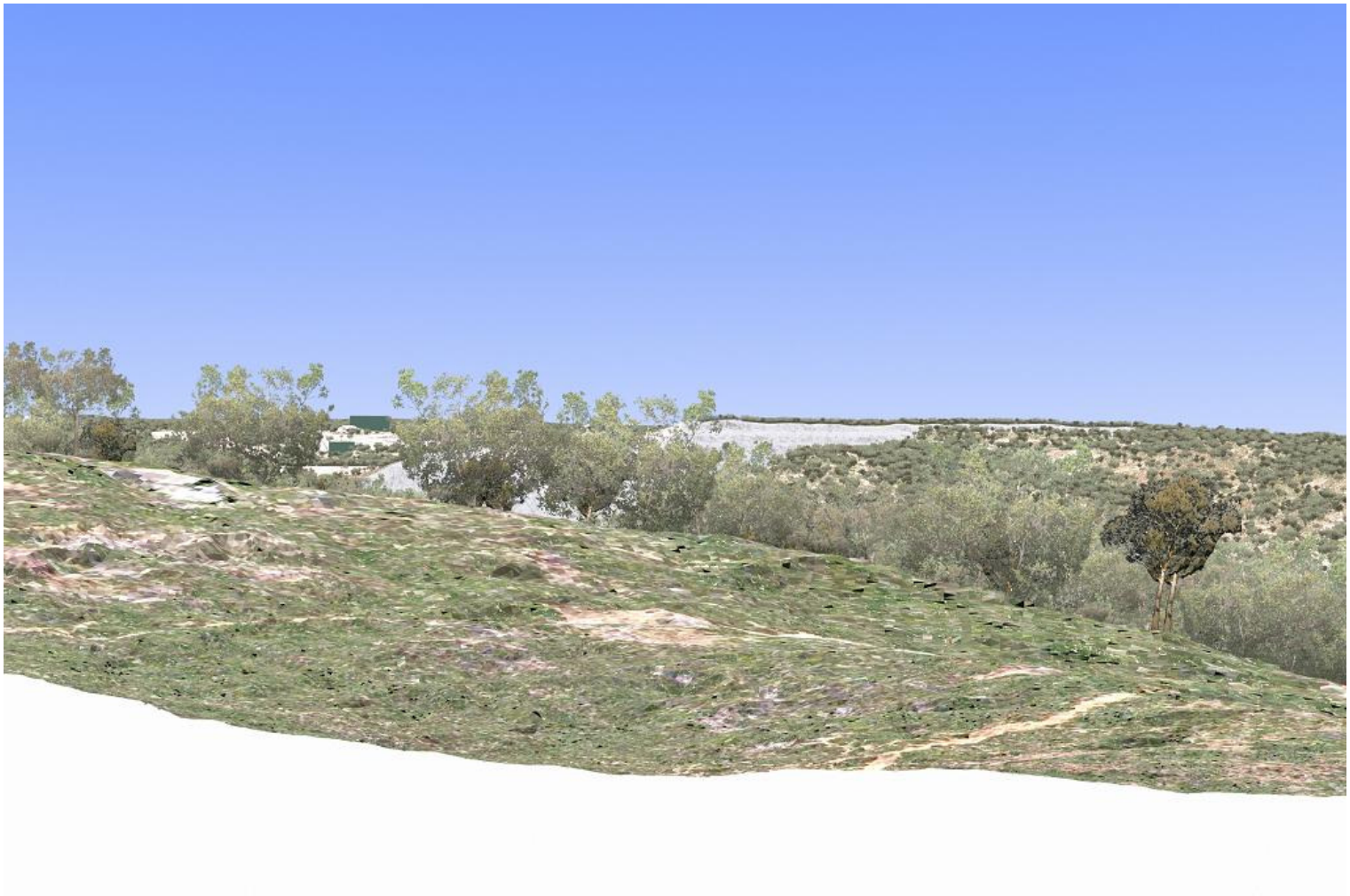


Plate 11– This is the same as Plate 10 (ie. Stage 12 complete) except that the view is from Location 7 and is at eye level. This depicts a more realistic view of the proposed than in the previous plates and shows the effects of foreground landform and vegetation. This is the same as Plate 17 in the main report.

Plate 12 – This is a photograph taken from Location 7, a little to the south of the rendering location in Plate 11. This illustrates the screening effects of foreground landform and vegetation and the limited views to the site from some locations on this south-facing slope. It also provides a visual reference for gauging the realism of the renders and highlights how the vegetation in the renders has been restricted to allow clearer views to the site (ie. show a 'worst-case scenario'). This is the same as Plate 10 in the main report.

Plate 13 – This is a rendering from the southern side of the Toodyay Highway at Location 1, showing the stockpile areas (see Plate 1 and 14) filled to 10 metres above the existing ground level with 20% batters. The stockpile that can be clearly seen and rises to the skyline is the most western one in the plan views. This is the same as Plate 13 in the main report.

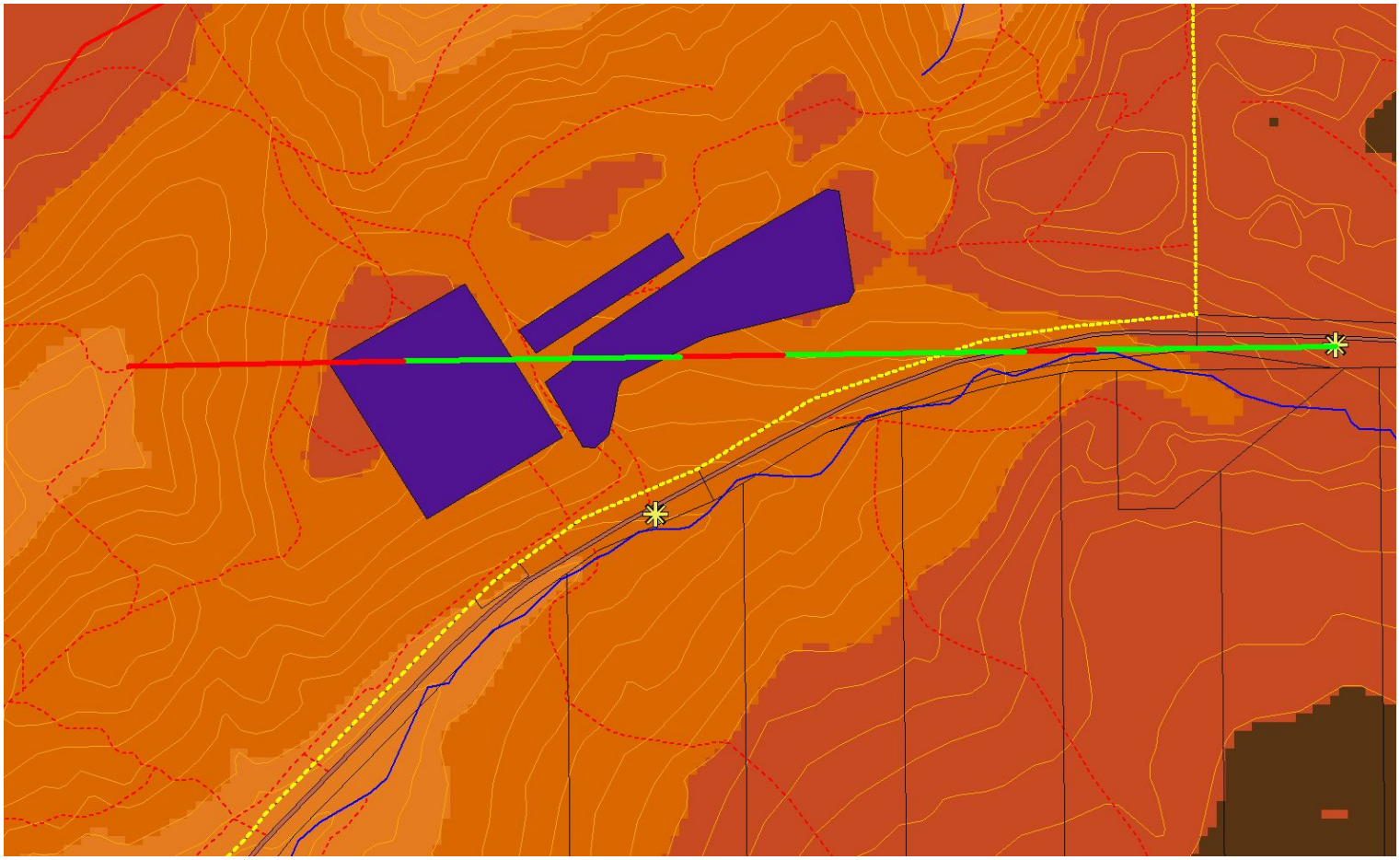
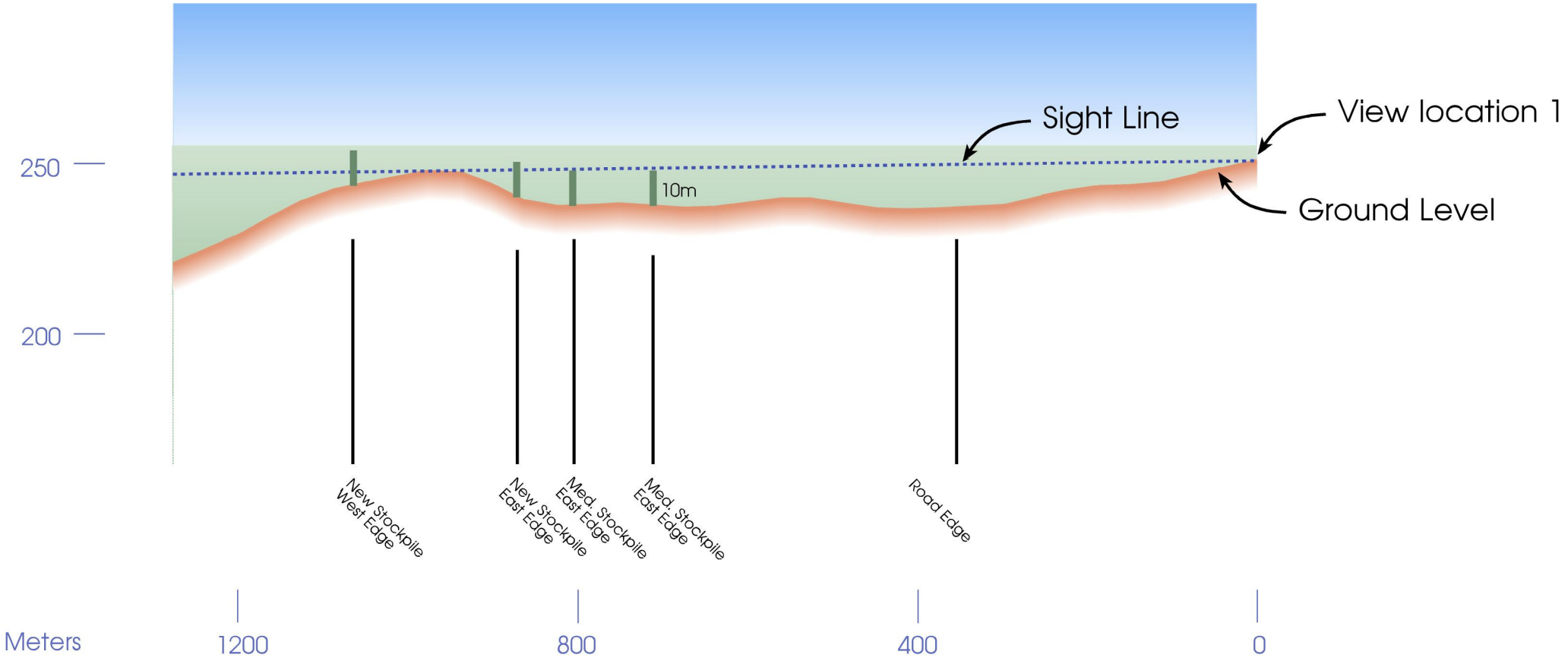


Plate 14– This is a plan view of the stockpile area showing a section line (coloured red and green) through the notional stockpiles (coloured purple) from Location 1 (at the eastern end). The green of the section line indicates where landform will likely be seen from Location 1 (red indicates unseen areas). The coloured background indicates elevation – darker colours are higher in elevation.



Section: Location 01 to stockpile site

Plate 15 – This shows the profile along the section line in Plate 14. The elevated nature of the western stockpile site can be seen. The 10 metre markers of the stockpile height indicate how this stockpile could rise above the background. The closer stockpile site is relatively low.

Plate 16 – This is similar to Plate 13 except that the western (proposed addition) stockpile has been removed. The existing stockpile height is 10 metres. This illustrates the relatively low profile of the existing stockpile area.

Plate 17 – This is similar to Plate 16 except that the height of the southern part of the existing stockpile area has been restricted to 243 metres AHD. The perceived high point of the stockpile is gone.

Plate 18 – This is similar to Plate 17 except that the height of the southern part of the existing stockpile area has been restricted to 241 metres AHD. This indicates little difference from a height of 243m AHD.

Plate 19 – This is similar to Plate 13 (ie. all stockpile areas shown) except that the height of the western stockpile area is 245m AHD and the remaining areas are 243m AHD. The stockpile is now below the skyline with a small line of vegetation showing above.

Plate 20 – This is similar to Plate 19 (ie. all stockpile areas shown) except that the height of all stockpile areas is 243m AHD. The stockpile is now further below the skyline then Plate 19, with a slightly larger line of vegetation showing above.

Plate 21 – This is similar to Plate 20 except that the height of all stockpile areas is 241m AHD. The stockpile is now further below the skyline then Plate 20, with a slightly larger line of vegetation showing above.

Plate 22 –This is a photograph taken from Location 1. This illustrates the screening effects of foreground vegetation, particularly on the southern side of the highway, in line with the stockpile. The view to the western stockpile increases closer to the site where there is a clearer view down the road axis. This image also provides a visual reference for gauging the realism of the renders and highlights how the vegetation in the renders has been restricted to allow clearer views to the site (ie. show a 'worst-case scenario'). This is the same as Plate 4 in the main report.