Section 1 - Introduction

This section introduces the proposal to develop a hard rock quarry to be known as the Gunlake Quarry and centred on a rural property located approximately 8km northwest of Marulan.

This section includes:

- *an outline of the scope and format of the document;*
- *an introduction to the Proponent;*
- *relevant background to the Project including a review of the history of hard rock quarrying and relevant information on ongoing and approved quarrying developments in the Marulan area;*
- *a discussion on the proposed approach towards environmental management and documentation; and*
- *identification of the personnel involved in the Project design, document preparation and specialist consultant investigations.*

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1.1 Scope

This *Environmental Assessment* has been prepared by Olsen Environmental Consulting Pty. Limited to support an application for project approval (Application Number 07_0074.) The application has been made by Gunlake Quarries ("the Proponent") a Division of Rollers Australia Pty Limited.

The Proponent proposes to develop and operate a hard rock quarry and associated processing plant producing 500,000tpa of finished products. Tests have determined that the quarry material is suitable for use in a full range of quarry products, including concrete and sealing aggregates, rail ballast, manufactured sand and road base.

The quarry will be located on company land and will be known as the Gunlake Quarry Project ("the Project"). The land is currently owned by others and is currently under an Option Agreement with the Proponent, however, it is planned that by the time the Project commences the land will be owned by an associated entity of the Proponent. A copy of the application for project approval is included as **Appendix 1**.

For the purposes of this document, the area that encompasses the proposed quarry, overburden emplacement and surface infrastructure associated with the Project is referred to as the "Project Site". **Figure 1.1** places the Project Site in its setting within the Southern Tablelands region of southern New South Wales, approximately 145km southwest of Sydney. **Figure 1.2** presents the local setting of the Project Site, approximately 8km northwest of Marulan.

The Project, if approved, would produce up to 500,000t of finished products annually. The proposed quarry has an expected life of over 100 years. Approval is being sought for an initial period of 30 years.

The Project would involve a number of component activities, all of which are described in this *Environmental Assessment*, namely:

- Hard rock quarrying by open cut methods;
- installation and/or construction of Project Site infrastructure and services, eg. power supply, water management structures, internal access roads;
- installation of crushing/screening plant;
- crushing, screening and stockpiling of the quarried rock;
- upgrading of current local roads and construction of a purpose-built public road over a privately-owned property and a Crown Road Reserve as part of a proposed By-pass road;
- the transportation of finished products from the quarry to the Hume Highway in order to access widely distributed markets north and south of Marulan. Initial road

transport (predicted to be for 3 to 5 years) will occur along Brayton Road, however an alternative connection to the Hume Highway will be built via a privately-owned property and a Crown Road Reserve linking Brayton Road and Red Hills Road. Initial access to and from the quarry will be via Brayton Road. The proposed By-pass road will enable all finished product that is destined for markets north of Marulan to be transported via Red Hills Road. Brayton Road would continue to be used for the ongoing long term transport of finished products to markets located south of Marulan. The By-pass road will enable all returning vehicles (empty) from markets both north and south of Marulan to access the quarry via Red Hills Road;

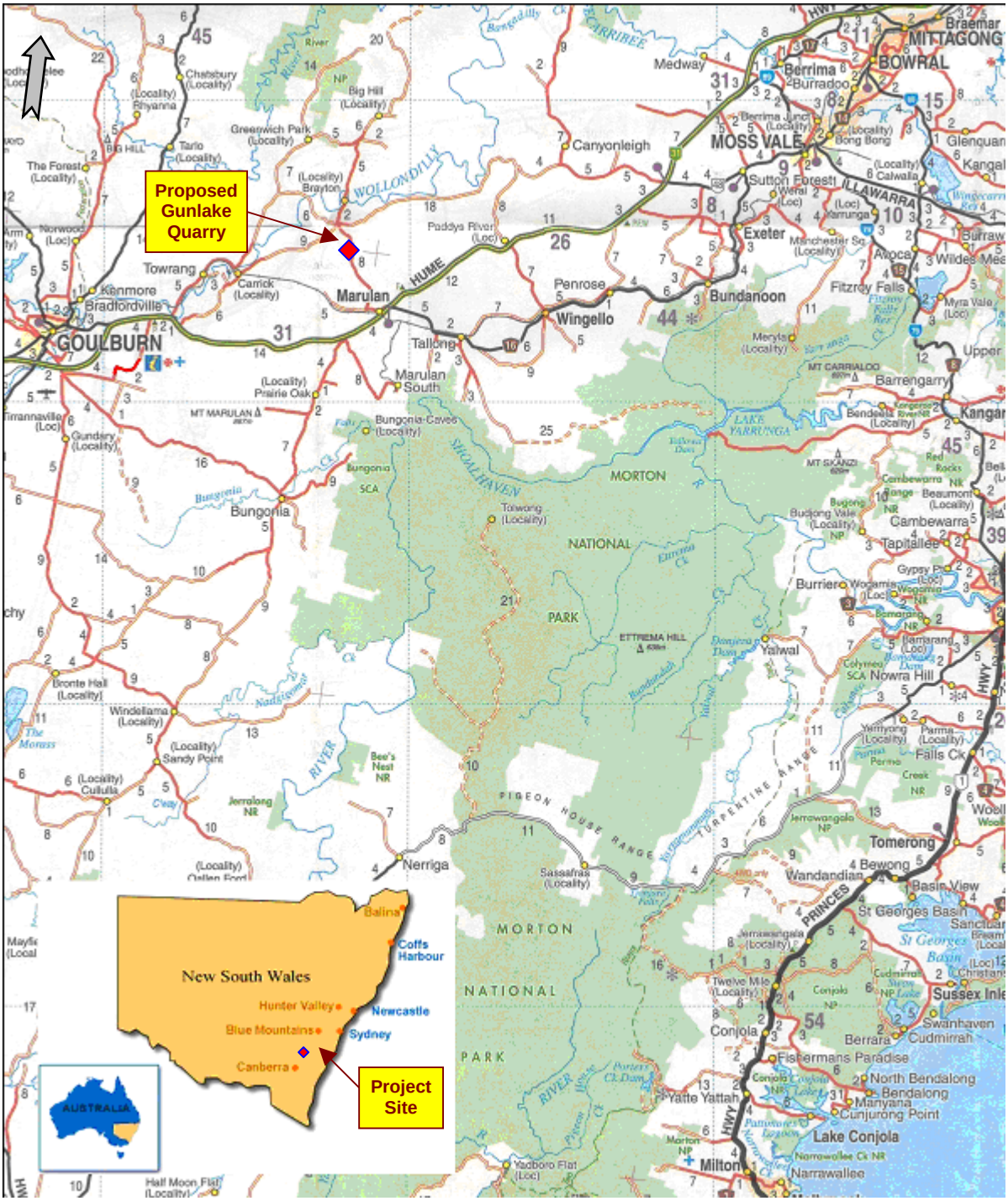
- final rehabilitation of the areas of surface disturbance within the Project Site should the Project not proceed after the initial 30 year period.

The finished products will be used at a number of widely distributed locations, none of which require approval as part of the Project.

The Project is classified as a Major Project in accordance with the State Environmental Planning Policy (Major Projects) (2005). Consequently, the Minister for Planning is the approval authority and an *Environmental Assessment* report is required to be submitted to support the project approval application.

In addition to describing the Project, the *Environmental Assessment* also provides relevant background information and a description of the existing environment within and surrounding the Project Site and adjacent to the proposed transport routes. The environmental safeguards and/or procedures that would be adopted to minimise or ameliorate the impacts associated with all proposed activities are outlined, together with the predicted impacts once those safeguards are adopted.

The information presented in this document covers all aspects of the planning, development, operation, rehabilitation and environmental management and monitoring of the Project at a level of detail consistent with industry standards, the scale of the proposed operations and the potential for environmental impact. These aspects are presented in a manner that addresses the specific requirements of the Director-General of the Department of Planning and other State and local government agencies, together with those issues raised during the community consultation process.



Gunlake Quarry Project

Figure 1.1 Project Site Location

Gunlake Quarry Project

Figure 1.2 Local Setting

1.2 Format of the Report

The *Environmental Assessment* includes six sections of text, a reference section, glossary and a set of Appendices. The key environmental issues, the risks posed by these, and their relative importance to the assessment of the Project, have been identified through consultation with government authorities, local stakeholders, surrounding landowners and specialist consultant assessments.

The format of the *Environmental Assessment* is as follows.

Section 1: introduces the Project, the Proponent and Project Site and briefly describes the history of hard rock quarrying in the Marulan district. Background information is provided to the Project including information on existing, approved and proposed quarries and related developments within the Marulan district. The section concludes with an outline of the ongoing environmental management and documentation proposed for the Project and information on the management of investigations for the *Environmental Assessment*.

Section 2: describes the Proponent's objectives and proposed quarrying, rock processing, finished product transportation, waste management and rehabilitation activities.

Section 3: provides a description of the process used to identify and prioritise the key environmental issues for assessment with reference to the Director-General's requirements for the Project, stakeholder consultation through the Project planning stages and an environmental issues assessment undertaken to establish a priority list of the specific environmental issues identified.

Section 4: presents a description of a range of environmental features of the local environment that may or would be influenced by the Project. The design and operational safeguards, and where appropriate, the management procedures that have been incorporated into the Project design to protect the local environment, are also presented. This section also analyses the potential impact the Project would have on the physical, biological and social environment once the safeguards and procedures are adopted. Section 4 has been prepared in two Parts as follows.

- Part A: presents background information on topography, climate, land ownership and land use which influence the impact of the Project on a range of other environmental parameters.
- Part B: focuses on the key environmental issues and the environmental impacts associated with the development and operation of the Project.

Section 5: provides a draft statement of commitments the Proponent is prepared to implement with respect to environmental management and monitoring for the entire Project.

Section 6: provides a conclusion to the document which justifies the Project in terms of biophysical, economic and social considerations and records the consequences of not proceeding with the Project.

Section 7: list the various source documents referred to for information and data used during the preparation of the *Environmental Assessment*.

Section 8: presents a glossary of acronyms, symbols and units and technical terms, used throughout the *Environmental Assessment.*

Appendices: present the following additional information.

1. A copy of the Proponent's application for project approval.
2. An itemised and tabulated summary of the Director-General's Requirements, including the requirements provided by the various government agencies consulted, and reference to the section within the *Environmental Assessment* or *Specialist Consultant Studies Compendium* where these are addressed.
3. A SEPP 33 hazardous substance and dangerous goods risk screening based on the document entitled *Applying SEPP 33, 2nd edition,* (DUAP, 1997).

The *Specialist Consultant Studies Compendium* supports the *Environmental Assessment.* The contents of the studies contained within are summarised into the appropriate sections of the *Environmental Assessment*.

1.3 The Proponent, Project Site and Project Terminology

1.3.1 The Proponent

Gunlake Quarries is a division of Rollers Australia Pty Limited whose present main activity is the hiring of specialised road construction equipment throughout NSW, Northern Victoria and Southern Queensland with regional depots in Tamworth, Orange, Wagga Wagga and Albury. Rollers Australia is owned and managed by the O'Neil family and is based in Sydney.

For over 60 years, two generations of the O'Neil family have been involved in the quarrying industry and are known and respected throughout Australia. The present generation of the O'Neil family established Gunlake Constructions and Rollers Australia in the 1990's and is now entering the concrete industry in Sydney with its first plant at Smeaton Grange in operation since September 2007. The Company is preparing an application for approval of a second plant that will be located in the Blacktown area and which is planned to be operating by mid 2008. These activities will be undertaken by another division of Rollers Australia Pty Limited, Gunlake Concrete.

1.3.2 The Project Site

The area of land on which quarrying and quarrying-related activities are proposed is referred to throughout this document as the "Project Site". The Project Site covers an area of approximately 230ha (see **Figure 1.3**). The Project Site lies within the County of Argyle, Parish of Billyrambija and incorporates:

Lot	Deposited Plan	Title	Whole/Part
48	750003	Auto Consol 14176-39	Part
111	750053	Auto Consol 14176-39	Part
52	750003	Auto Consul 10774-211	Part
50	750003	Auto Consul 10774-211	Part
149	750003	Auto Consul 10774-211	Whole
73	750003	Auto Consul 7907-112	Whole
74	750003	Auto Consul 7907-112	Whole
260	750053	Auto Consul 7907-112	Whole
53	750003	Auto Consul 14176-38	Whole
148	750053	Auto Consul 14176-38	Whole
10	254042	Auto Consul 13729-90	Part
42	750003	Volume 12203 Folio 65	Part
76	750003	Volume 12203 Folio 66	Part
54	750003	Volume 1589 Folio 245	Part
1	750003	Volume 2300 Folio 46	Whole
1	328725	Folio Identifier 1/328725	Part

The proposed By-pass road to connect to the Hume Highway (Freeway) passes through Lot 1 of Deposited Plan 868065.

1.3.3 Proposed Transport Routes

It is proposed that the finished products will be hauled by road from the Project Site direct to the Sydney market and to other markets to the north and south of Marulan. Approximately 80% of the products will be transported to the north of Marulan.

The proposed finished products transport routes from the Project Site to the Hume Highway (Freeway) will operate in two distinct Stages.

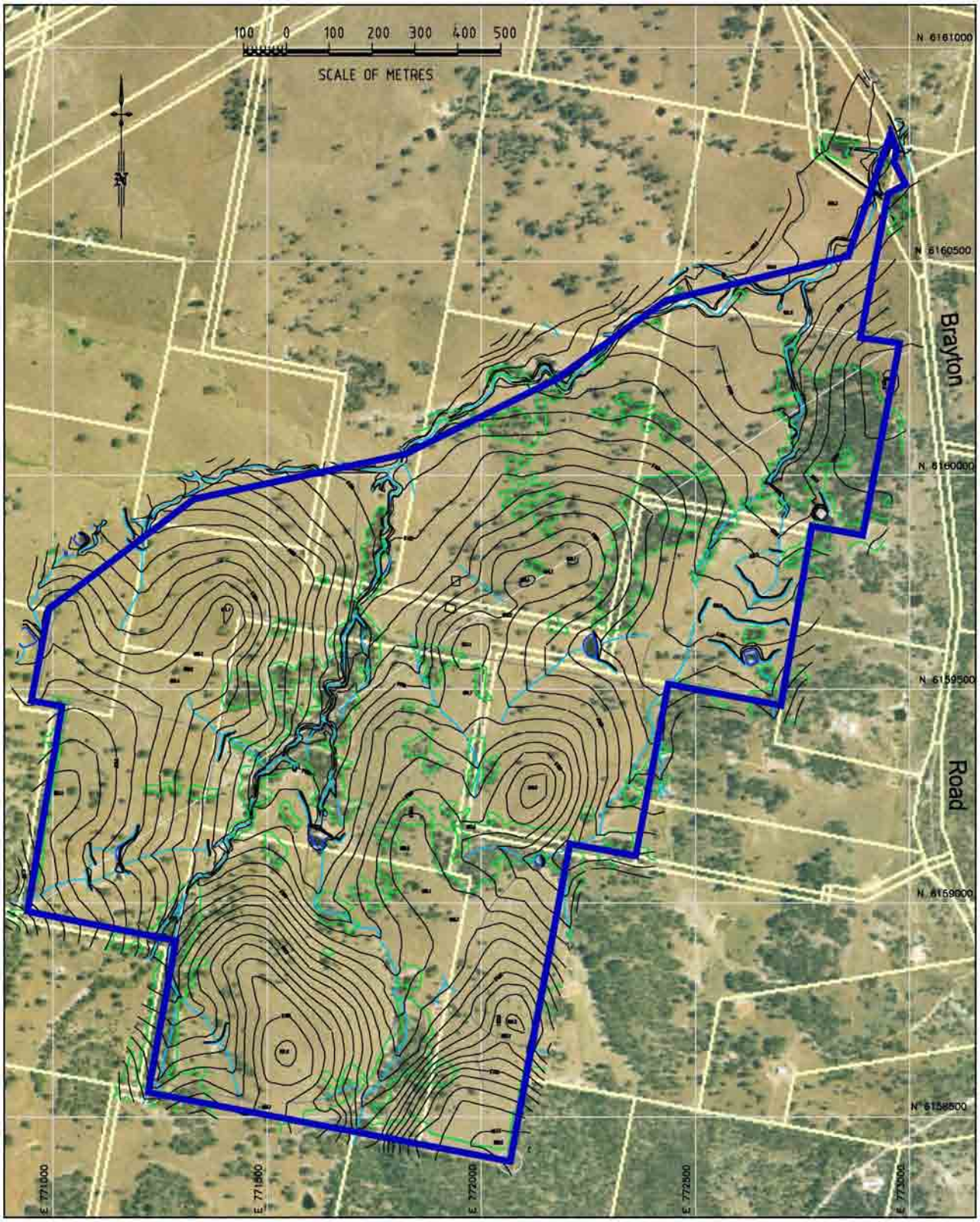
Stage 1 will operate in the initial years of the quarry development and cater for up to an average of 25 truck movements per day. This is likely to last for approximately 3 to 5 years during which time the Hume Highway (Freeway) would be accessed via Brayton Road and the northern sector of Marulan to connect with the interchange near the RTA Checking Station. All loaded trucks will access the Hume Highway via this interchange. Empty trucks from the north will enter Brayton Road from the Interchange. Empty trucks from the south (approximately 2 - 3 per day) would off-load near the Highway Service Centre and travel through Marulan town centre to access Brayton Road.

As production increases, a bypass route north of Marulan will be constructed to allow product destined for northern markets and all returning trucks (from both north and south) to bypass Marulan.

Stage 2 will involve the construction of this By-pass road to connect Brayton Road to Red Hills Road and will involve an estimated 100 truck movements per day. This Stage will be implemented when truck movements servicing the Gunlake Quarry exceed an average 25 truck movements per day. Loaded trucks travelling north on the Hume Highway (Freeway) (approximately 50 per day) will use this By-pass road. Loaded trucks travelling to markets located south of Marulan (averaging 25 per day for the life of the quarry) will continue to access the Hume Highway through the Marulan interchange.

Trucks returning from the north (approximately 50 per day) during Stage 2 will offload from the Highway interchange and traverse a new roundabout at the intersection of Brayton Road and George Street. They will then proceed back to the north to enter Red Hills Road via a left hand turn. Returning trucks from the south (an average of 25 per day) will also enter Red Hills Road via the same left hand turn. There will be no empty trucks on Brayton Road between Marulan and the new By-pass road during Stage 2.

Both the activities within the Project Site and the use of the proposed transport routes are fully assessed in this *Environmental Assessment.*



Gunlake Quarry Project

Figure 1.3 Project Site

1.3.4 Project Terminology

The Project component areas regularly referred to throughout this document are described as follows.

Project Site: (230ha)	The area relevant to the major projects application.
Limit of quarrying: (6ha)	The area bound by the indicative limit of the quarry pit.
Site facilities area: (1.5ha)	The area incorporating offices, amenities, workshops, a fuel storage and parking areas for the Project workforce.
Rock handling and Aggregate processing area: 4ha)	The area where rock from the quarry is stockpiled, crushed, screened and stockpiled as product and then loaded into trucks for despatch from the Project Site.
Overburden emplacement: (1ha)	Area designated for the out-of-quarry emplacement / storage of overburden removed from the quarry to expose the hard rock before quarrying.
Soil stockpile areas:	The stockpiling of topsoil and subsoil for rehabilitation of the disturbed areas.

1.4 Project Background

1.4.1 Introduction

This sub-section provides a brief overview of the history of hard rock quarrying in NSW as well as relevant information on operational and proposed quarries within the Marulan district.

1.4.2 History of Hard Rock Quarrying in NSW

Quarry products have been supplied into the Sydney and wider NSW market from quarries located close to and surrounding Sydney. Quarries have historically been located in the Penrith Lakes, Prospect, Peats Ridge and Kiama areas. Many of these quarries are approaching the end of their life and access to new hard rock resources is required to ensure a continuing supply of finished product. The Marulan area has been identified by the quarry industry and the NSW Government as the most suitable area for the next generation of hard rock quarries in NSW.

Readymix Holdings Pty Limited have proposed the Lynwood Quarry approximately 2km south of Gunlake. Readymix propose to produce up to 5Mtpa of finished product from the Lynwood Quarry. For the last 20 years Readymix have operated the Johnniefelds Quarry which is located approximately 2km north east of the proposed Gunlake Quarry and produces up to 0.5 Mtpa of finished product.

Boral Resources (NSW) Pty Ltd has a proposal for the South Marulan Quarry which will be located approximately 10km southeast of Marulan and immediately north of the Blue Circle Southern Cement limestone mine. Boral intend to produce up to 3.5Mtpa of finished product from the South Marulan Quarry.

Figure 1.4 presents the various locations of the existing and proposed quarry operations in the Marulan district.

1.5 Environmental Management and Documentation

1.5.1 Environmental Management

Ongoing environmental management at the proposed Gunlake Quarry Project, including Gunlake's performance with respect to this *Environmental Assessment* and the implementation of any licence or project approval conditions, would be the responsibility of the Quarry Manager. The Quarry Manager would also be responsible for day-to-day on-site supervision including the integrated implementation of all environmental safeguards identified in this document and additional documentation developed throughout the life of the quarry.

The Quarry Manager would report directly to Mr Edward O'Neil, a Director of Rollers Australia Pty Limited. Mr O'Neil has been heavily involved in the planning and environmental assessment of the proposed Gunlake Quarry. He has been the face of the Proponent in liaison with the general community and Government Agencies. Subsequent to approval, he will continue to be involved in the construction and the day to day operation of the quarry.

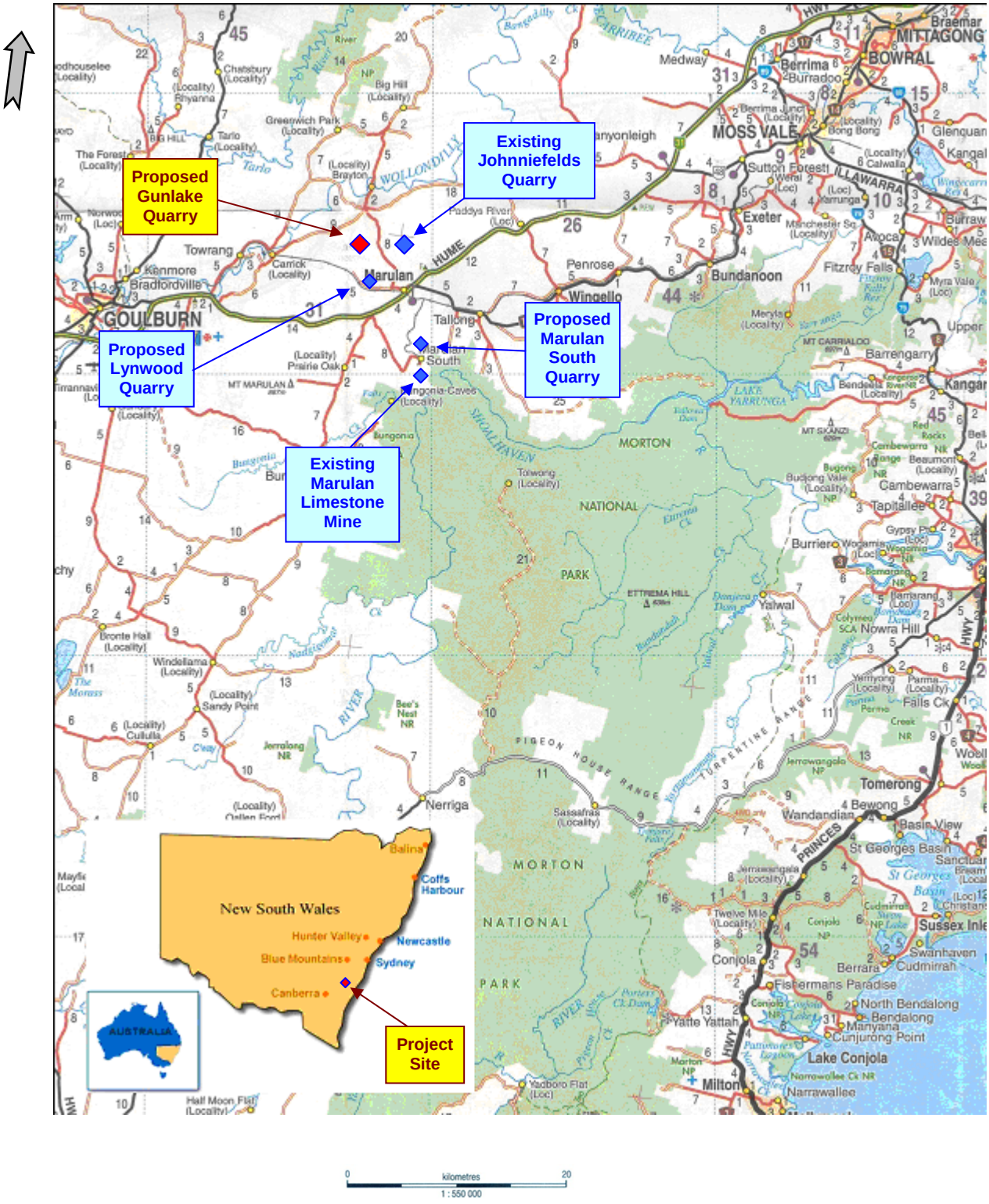
Gunlake would contract environmental expertise as required to oversee various environmentally-related tasks on the Project Site.

The Proponent is committed to undertaking all component activities in a responsible and pro-active manner which:

(i) enables the co-existence of the various land uses in the area;

(ii) is environmentally and socially responsible; and

(iii) minimises any real or perceived impacts on other members of the community. Central to this approach would be regular contact with neighbours, an open-door policy, and a willingness to openly discuss actual or perceived problems and to implement appropriate changes to operational procedures.



Gunlake Quarry Project

Figure 1.4 Existing and Proposed Quarries

1.5.2 Environmental Documentation

Successful environmental management invariably involves regular, organised documentation to ensure that, irrespective of personnel changes, all aspects of planning, environmental control, monitoring and responses to problems are properly recorded.

Gunlake will develop an Environmental Management Plan (EMP) for the Gunlake Quarry. The EMP will record the systems and processes that the Proponent will implement to ensure that the Gunlake Quarry is operated in an environmentally responsible manner. The EMP will include descriptions of how commitments made in this Environmental Assessment will be achieved and how approval and environmental licensing conditions will be met.

The EMP will also detail the monitoring regime that will provide the data necessary to determine compliance with environmental performance criteria. The monitoring will also enable early identification of developing environmental issues that were unplanned or unpredicted.

1.6 Management of Investigations

The preparation of this document has been managed by Mr David Olsen, B.Agri.Sci (Hons), Principal of Olsen Environmental Consulting Pty. Limited. Initial work was undertaken by Ms Valerie Smith of Valerie Smith and Associates.

On behalf of the Proponent, Mr Edward O'Neil, Mr Julian O'Neil, Mr Simon O'Neil, Mr Rodney O'Neil and Mr John Harvey provided further technical information on the Project, assisted with the incorporation of environmental controls into the proposal and assisted with finalising the document.

Additional quarry design and geological information has been provided by Valerie Smith and Associates.

Strong emphasis has been placed upon a multi-disciplinary team approach to the design of the Project, the description of the existing environment and resultant impact assessment. The following consultancy firms were commissioned by the Proponent to prepare nominated specialist consultant studies for the Project.

- Noise and Vibration Assessment: Heggies Pty Ltd
  (Mr Dick Godson – BSc(Eng), MSc(Eng), MIEAust, CPEng, MAusIMM, MAAS, MIExpE).
- Air Quality Assessment: Heggies Pty Ltd
  (Mr Ronan Kellaghan – B.Sc (Hons)).
- Traffic and Transport Assessment: Christopher Hallam and Associates Pty Ltd

(Mr Chris Hallam – BE (Uni. of Sydney, MEngSc (Traffic and Transport(Uni. Of NSW)).

- Aboriginal Heritage Assessment: AASC
  (Mr Rob Paton - BA (Honours) Department of Prehistory and Anthropology, ANU).
- Flora and Fauna Assessment: Ecotone Ecological Consultants Pty Ltd
  (Mr Stefan Rose –B.SC (Biol. Sci.), M.Env.Stud., MAIBiol, MECA)).
- Hydrological Assessment: Larry Cooke and Associates Pty Ltd.
  (Mr Larry Cooke –MSc (Hydrology and Groundwater Management)).
- Soils, Agricultural and Surface Water Assessment: SEEC Morse McVey and Associates
  (Mr Mark Passfield – BSc (Hons Engineering Geology and Geotechnics)).

Section 2 - Description of the Proposal

This section outlines Gunlake Quarries', a division of Rollers Australia Pty Ltd, (Gunlake) objectives and proposal for the development and operation of a proposed hard rock quarry off Brayton Road, Marulan to be known as the Gunlake Quarry. The rock resource is described and the quarrying operation and sequence, together with processing activities, are detailed. The proposed saleable products transport arrangements are described. This section also describes Gunlake's proposal with respect to hours of operation, infrastructure and services, safety, waste management, product transportation and progressive rehabilitation. The section concludes with a review of the feasible development alternatives considered during the planning phase for this proposal.

The proposal is described in sufficient detail to provide the reader with an overall understanding of the nature and extent of activities proposed, how the various activities would be undertaken and to enable an assessment of the potential impacts on the surrounding environment.

Details of the safeguards and mitigation measures that Gunlake would implement to protect and manage surface water, groundwater, soil, noise, air quality, Aboriginal heritage, flora, fauna, traffic, visual and socio-economic components are set out in Section 4 Part B of this document.

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2.1 Introduction

2.1.1 Objectives

Gunlake Quarries, which is the Proponent for this development, is a division of Rollers Australia Pty Limited. The Proponent plans to develop a hard rock quarry approximately 8km north west of Marulan. Tests have determined that the resource contains material suitable for use in a full range of quarry products including concrete and sealing aggregates, rail ballast, manufactured sand and roadbase. The proposed quarry has an expected life of over 100 years and approval is being sought for an initial 30 year period.

Studies undertaken by the Department of Mineral Resources (2000) demonstrated that the future demands of the Sydney Region for hard rock aggregates cannot be met within 100km radius of Sydney due to the depletion of resources and land use pressures. The Penrith Lakes Scheme, which is a major source of hard rock product is due for depletion around 2010.

Gunlake Quarries would be an independent quarry producer and proposes to provide aggregates for its own operations in Sydney as well as other potential markets. Gunlake is in the process of establishing concrete plants in the Sydney Region with its first plant in operation at Smeaton Grange in the growing southwest area and its next plant proposed for the Blacktown area positioned to supply the northwest growth area. The Blacktown plant is planned to be operational by mid 2008.

The proposed Gunlake Quarry will provide Gunlake operations with secure, long-term supplies of aggregate and manufactured sand. Gunlake believes it is important to establish its own hard rock resource. Purchase of aggregates from the major suppliers would be at a higher cost than from the proposed Gunlake Quarry. The higher cost may affect the long term viability of Gunlake's planned concrete operations.

Readymix operate the Johnniefelds Quarry approximately 2.2km east of the proposed Gunlake Quarry. Boral and Readymix have planned new hard rock quarries in the Marulan area, to be known as the Marulan South Quarry and the Lynwood Quarry respectively. These quarries have been designed to provide these companies with their own secure sources of hard rock aggregates for their operations. The EIS for the Readymix Lynwood Quarry identified that the purchase of aggregates from non-Readymix quarries was not a viable option for Readymix based on the issues discussed above.

It is widely understood and accepted in the quarry industry that each major concrete producer must have its own secure long-term hard rock resource. The Gunlake Quarry will provide security of supply for Gunlake's concrete operations.

In relation to roadbase products, the Sydney demand for fine crushed rock will have to be satisfied in the near future, by quarries located well outside the Sydney region. Existing roadbase quarries will soon be exhausted and future new subdivision work, together with other road and highway requirements for crushed rock will have to be supplied from more distant

sources. The Gunlake Quarry will be one of these sources and is proposed to fill part of the increased demand particularly to the southwest and northwest growth areas of Sydney.

Gunlake Quarry's objectives for the development and operation of the proposed Gunlake Quarry are to:

(i) develop and operate a safe quarry producing concrete and sealing aggregates, rail ballast, manufactured sands and road base;

(ii) commence production by mid 2008 initially to meet 100,000tpa production increasing to a maximum of up to 500,000tpa ;

(iii) develop and operate the quarry in a manner that complies with all statutory requirements;

(iv) undertake all activities in an environmentally responsible manner, employing a level of control and integrating safeguards that would ensure compliance with appropriate criteria/goals or reasonable community expectations at all times;

(v) establish and/or maintain markets for saleable products;

(vi) provide a further boost to the local economy of Marulan and surrounding districts through employment opportunities and the supply of services required for the operation of the quarry; and

(vii) achieve the above objectives in a cost-effective manner and thereby ensure the ongoing viability of the proposed quarry.

2.1.2 Project Site Layout

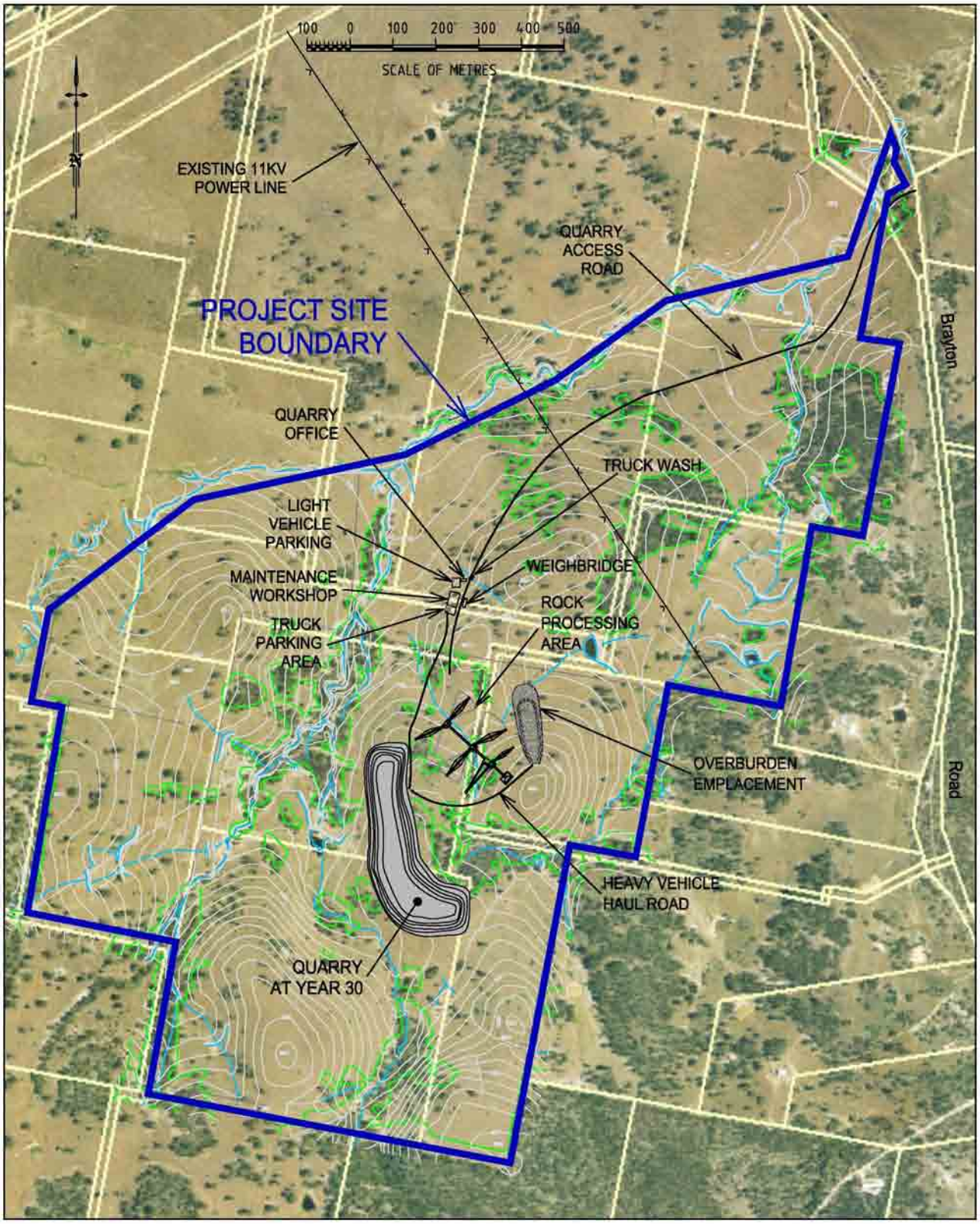
Figure 2.1 presents the proposed Project Site layout and identifies the following components.

- The quarry area and overburden emplacement.
- Site facilities area, including the quarry office and workshop.
- Rock processing plant area including stockpiling, crushing, screening and truck loading facilities.
- Quarry entrance and internal roads.

All available reclaimable topsoil will be used for preparing disturbed surface areas for revegetation.

In order to assist with the description of proposed activities, the area covering the quarry, overburden emplacement, soil stockpiling, product stockpiling and loading and the quarry office and site facilities area is referred to as the "quarry area". The Project Site contains other areas where drainage and surface water management features would be installed and areas that would remain undisturbed.

The details of the Project layout are more fully described in sections 2.3, 2.4 and 2.5.



Gunlake Quarry Project

Figure 2.1 Project Site Layout

2.1.3 Proposed Transport Routes

The Project also includes the transportation of saleable products from the Project Site direct to the Sydney market and to other markets north and south of Marulan.

Initially haulage would be via the existing Brayton Road to the Hume Highway Interchange near the truck checking station north of Marulan. Products will be hauled both north and south on the highway, with approximately 80% or more to the north.

As production increases, a By-pass road will be constructed north of Marulan to allow product destined for northern markets and all returning trucks from both the north and south to bypass Marulan. There will also be some upgrading and modification works on the Hume Highway for which Gunlake Quarries seeks a cost sharing agreement as discussed in Section 4B.1.5.2

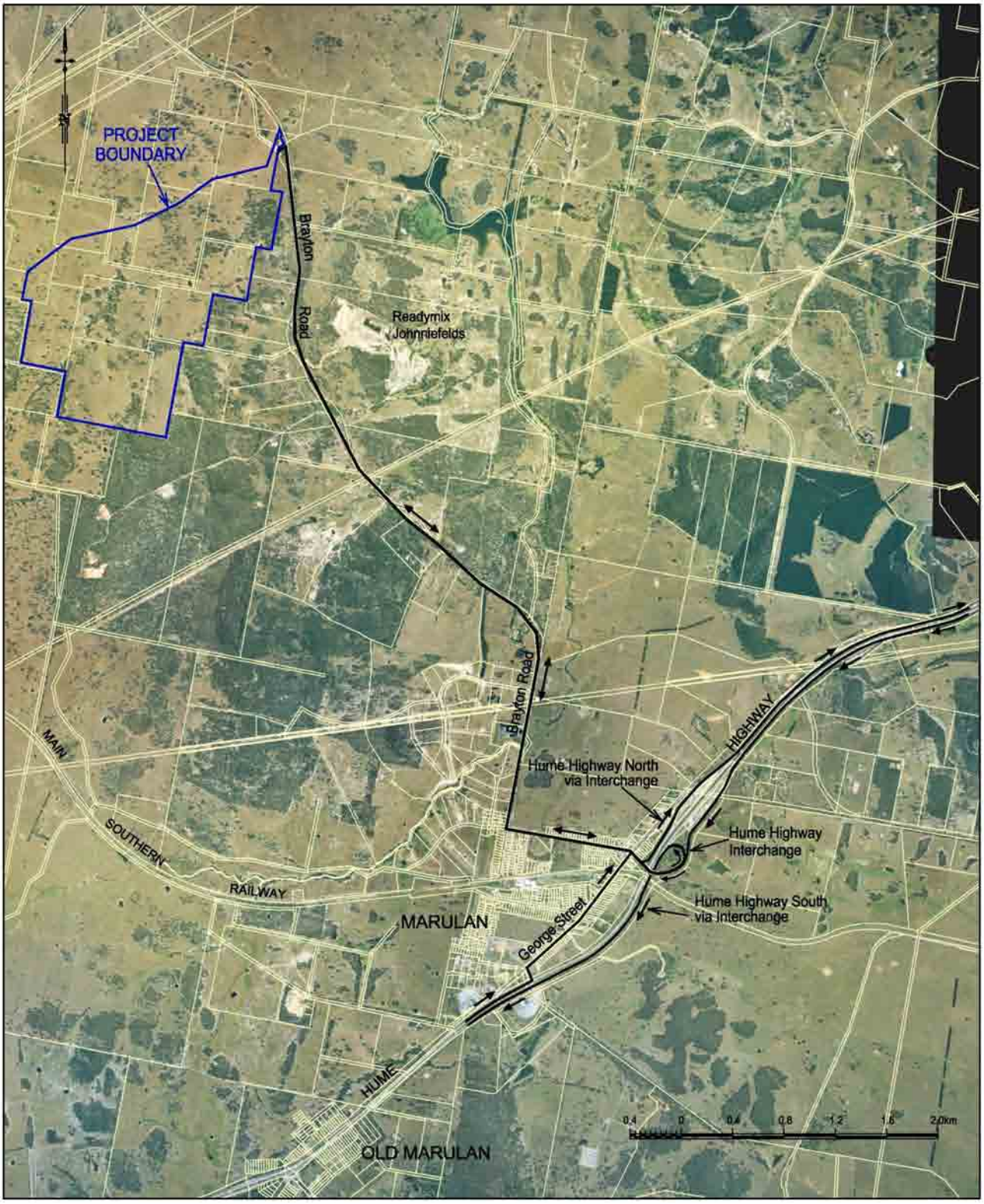
The By-pass road will provide a connection with the Hume Highway and involves the construction of a road over land which Gunlake has an Option Agreement over and a Crown Road Reserve to link Brayton Road with Red Hills Road. The proposed construction of the By-pass road will be timed for when quarry sales growth would result in truck movements through Marulan exceeding an average of 25 truck movements per day. It is anticipated that this will occur within 3 to 5 years from the commencement of production from the quarry. The cost of this new road and the proposed upgrade of existing roads would be offset against Gunlake's proposed levy as discussed in Section 4B.1.5.2.

After construction of the By-pass road, truck movements using the Brayton Road route will continue to average 25 per day for the life of the quarry. This is because southbound trucks will still need to use Brayton Road to access the Hume Highway interchange, enabling journeys south on the Highway. However, trucks returning from the south would continue north on the Highway, past the Marulan interchange and turn left into Red Hills Road.

Trucks returning from the north will leave the Highway at the Marulan interchange and make a U-turn at a new roundabout constructed at the intersection of Brayton Rd and George Street. They will then proceed north on the Highway and make a left hand turn at Red Hills Road.

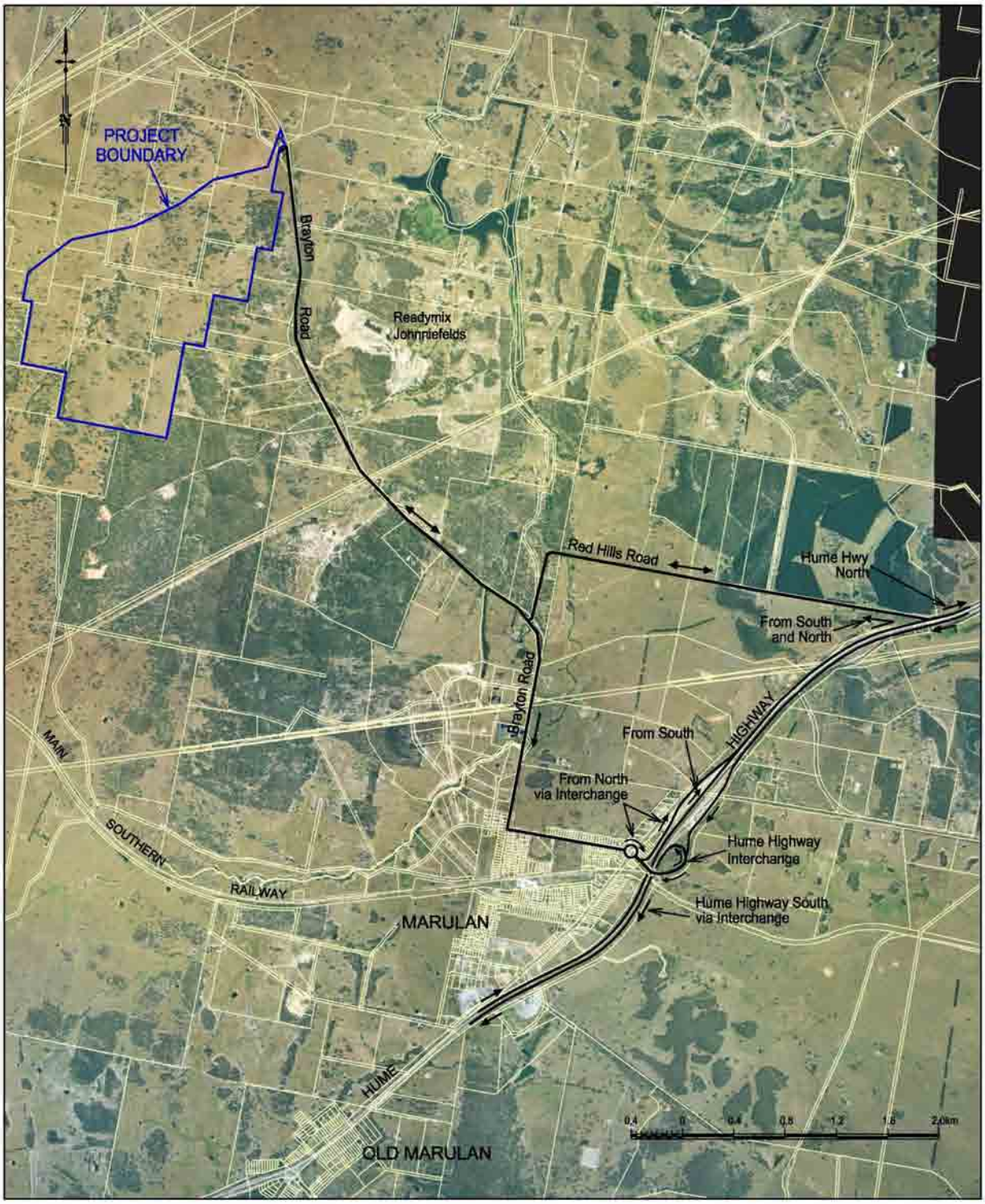
Gunlake's previous experience has demonstrated the effectiveness of road transport from quarry site direct to concrete plant locations. The proposed hours of haulage for the trucking fleet are timed to avoid, as far as possible, peak hour conditions on highways and roads, and not only provide economic efficiency, but also reduce traffic congestion in industrial areas where concrete plants are located. Rail haulage of quarry product is not feasible for the Gunlake Quarry Project. The eventual annual quantity of 500,000t is to be delivered to widely dispersed locations locally and in Sydney. Predominantly it will be supplied on an on-demand, just-in-time basis, which is standard throughout the industry and for these reasons means that direct road transport must be used.

Figure 2.2 and **Figure 2.3** show the location of the proposed saleable product transport routes in Stage 1 and Stage 2 respectively.



Gunlake Quarry Project

Figure 2.2 Stage 1 Saleable Products Transport Routes



Gunlake Quarry Project

Figure 2.3 Stage 2 Saleable Products Transport Routes

Section 2.6.4 provides greater detail on the location, orientation and construction of the proposed saleable products transport routes.

2.1.4 Project Outline

The Project, if approved, would involve the following activities.

- Construction of the quarry entrance and the quarry access road from Brayton Road.
- Quarrying by open cut methods over an area of approximately 6ha. The quarry limits have been defined by drilling and a review of economic, geological and environmental considerations as described in Sections 2.2 and 2.3.
- Programmed placement of overburden materials from the processing area to the overburden emplacement area.
- Programmed placement of overburden from the quarry pit into the initial northern and eastern sections of the pit.
- On-site crushing and stockpiling of the quarried rock within a defined processing area east of the quarry pit. The proposed overburden bund wall will screen the processing facilities.
- The staged construction / establishment of two saleable product transport routes between the Project Site and the Hume Highway to the east. This would involve modifications to the existing intersections on public roads where Red Hills Road joins the Hume Highway and at the intersection of Brayton Road and George Street where a new roundabout is proposed. It would also involve construction of a new section of road to connect Brayton Road to Red Hills Road. A section of Brayton Road would be widened and new intersections established at the quarry entrance and where the new By-pass road joins Brayton Road. The timing of construction of the By-pass road will be production dependent and will enable Gunlake to operate at the maximum planned tonnages while at the same time restricting project-related truck movements through the edge of Marulan to an average 25 truck movements per day.
- Transportation of saleable products by truck to variously located markets.
- Management of surface water and sediment and soil erosion control.
- Installation of a range of services, structures and transportable buildings.
- Progressive rehabilitation of the quarry pit and other disturbed areas.

In addition to the above activities, the proposed hard rock quarry would be operated with comprehensive systems to manage and monitor groundwater, surface water, noise, blasting, air quality, visibility, Aboriginal heritage, flora, fauna, traffic, visual and socio-economic aspects.

An overview of the principal activities to be undertaken throughout the quarry life is outlined as follows.

Overburden Emplacement Bund Wall The overburden emplacement bund wall will be located approximately 350m to the east of the initial section of the quarry. It will eventually contain approximately 120,000m^3 of overburden.

Quarried Rock Haul dump trucks would transport rock from the quarry face via a heavy vehicle haul road to the proposed processing and stockpile area.

Stockpiling and Dispatch Crushed rock would then be selectively stockpiled for further blending, if necessary, before being loaded by front-end loader into road haulage trucks for transport to the various market locations.

Saleable Product Transport Route The quarry access road would start from Brayton Road at the northeastern corner of the Project Site. This road would provide access to the quarry facilities and the rock processing areas. It would also enable trucks to enter and leave the property in order to haul saleable products to various markets. The saleable products transport routes will incorporate a section of the existing Brayton Road and a new section of By-pass road to connect with Red Hills Road. The Hume Highway will enable trucks to access markets both north and south of Marulan.

Topsoil and Water Management Gunlake has developed a Conceptual Soil and Water Management Plan (SWMP). A more detailed SWMP will be prepared following project approval and will incorporate conditions imposed and contain detailed drawings of engineering structures. Soil material is limited on site and the SWMP describes the proposed management of this resource to assist rehabilitation of the Project Site. The SWMP describes water management proposals based on separation of clean and dirty water and treatment before discharge from site. The Project's water supply is based on utilisation of captured surface and ground waters.

Site Facilities Area The site facilities area would accommodate transportable offices, shower-room, crib room, fuel and lubricants storage facility, stores and first aid buildings, enclosed workshop facility, equipment laydown and parking area and a light vehicle car park for the projected quarry workforce of up to 20 employees.

Power Supply The existing rural power supply crossing the Project Site will provide power to the site office. Underground and overhead cables will reticulate power to various site locations.

Water Supply Potable water and water for ablutions will be roof runoff captured in tanks. This will be augmented as required by water trucked in from off site. Dust suppression water will consist of collected surface runoff water and groundwater. This will be stored around the Project Site in appropriately located dams. There will be a number of sedimentation and clean water dams which would constitute part of the surface water control system. Water would be obtained from these dams when available.

2.1.5 Planning Context and Required Approvals

2.1.5.1 Planning Instruments

The proposed Gunlake Quarry Project has been assessed in relation to the relevant planning instruments that affect the site. These include the Environmental Planning and Assessment Act 1979 (EP&A Act), EP&A Act Regulations (2000), a number of State Environmental Planning Policies (SEPPs) and Mulwaree Shire Local Environmental Plan (1995) as amended.

Part 3A of the EP&A Act defines the assessment and approval process for development that is defined as a "Major Project", replacing development that was previously defined as "State Significant Development". The Gunlake Quarry Project is a Major Project as defined in State Environmental Planning Policy (Major Projects) 2005.

Environmental Planning Instruments, other than State Environmental Planning Policies (SEPPs), do not apply to a Major Project under Clause 75(R) of the EP&A Act. The applicable SEPPs to the Gunlake Quarry Project are discussed in the following paragraphs.

SEPP (Major Projects) 2005.
This SEPP identifies development to which the assessment and approval process under Part 3A of the EP&A Act applies. Under this SEPP, the Minister for Planning is the consent authority for development classified as a Major Project.

Clause 6(1) of the SEPP identifies projects under Part 3A as development that, in the opinion of the Minister, is development as listed in either Schedule 1, 2 or 3 of the SEPP. Clause 7(1)(a) and (b) of Schedule 1 includes extractive industries as a Major Project under Part 3A as follows:

7(1) Extractive Industries

(1) Development for the purposes of extractive industry that:

(a) extracts more than 200,000 tonnes of extractive materials per year, or,

(b) extracts from a total resource (the subject of the development application) of more than 5 million tonnes.

The proposed Gunlake Quarry is planned to produce up to 500,000tpa and has a resource of approximately 180Mt. Consequently, the application will be assessed under Part 3A of the EP&A Act.

SEPP (Mining, Petroleum Production and Extractive Industries) 2007.
This SEPP applies to the Gunlake Quarry Project and consolidates and updates many existing planning provisions related to mining, petroleum production and extractive industries. It also introduces new provisions to ensure that potential environmental and social impacts are adequately addressed during the assessment and determination of development proposals.

The provisions of SEPP No 11, Traffic Generating Developments, have been integrated into the new SEPP. The new SEPP also combines a number of other existing SEPPs eg SEPP No 37 Continuing Mining and Extractive Industries and SEPP No 45 Mining Permissibility into one consistent set of rules.

SEPP No 33 Hazardous and Offensive Development.
This SEPP requires the consent authority to consider whether a proposal is a potentially hazardous industry or a potentially offensive industry. The consent authority is required to consider the specifics of the proposal, the location and intensity of the proposed activity to determine whether the proposed development may be classified as potentially hazardous or potentially offensive as defined in the SEPP.

Regional Environmental Plan (REP) No 1 2007. Drinking Water Catchments.
This REP applies to the hydrological catchments of Warragamba, Metropolitan, Woronora, Grose River Blue Mountains and Shoalhaven. The proposed quarry is within the Warragamba catchment.

The objectives of the REP are to ensure that developments within Sydney's water catchment area do not have a detrimental impact on the quality of drinking water supply.

Mulwaree Shire Local Environmental Plan (LEP) 1995.
Under this LEP, the proposed Gunlake Quarry and processing site is zoned 1(a) Rural. The objectives of this zoning include provision for the promotion, enhancement and conservation of valuable deposits of minerals, coal, petroleum, and extractive materials by controlling the location of development for other purposes in order to ensure the efficient extraction of these deposits.

Extractive industries are permissible under the 1(a) zoning with development consent. The Crown Road reserve forming part of the proposed Marulan By-pass and Red Hills Road is zoned 1(a) Rural. A new LEP for the LGA is planned to be exhibited soon. Under the new draft LEP, extractive industries remain a permitted use in the rural zone.

Mulwaree Settlement Strategy.
The former Mulwaree Council adopted a Settlement Strategy for the entire Local Government Area (LGA) including the Marulan area. This Strategy has been adopted by the now Goulburn – Mulwaree Council and planning and environmental studies are currently underway to refine the Strategy. The Strategy recognises the importance of the hard rock resource around Marulan. The Gunlake Quarry Project is consistent with the aims and objectives of the Strategy as the Project involves the development of the hard rock resource and appropriate management actions to avoid significant effects on adjacent land uses.

SEPP 44 Koala Habitat Protection.
State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44) encourages the conservation and management of natural vegetation that provides habitat for Koalas, to ensure a permanent free-living population over the species' present range and to reverse the current trend of Koala population decline.

SEPP 44 helps to identify "potential Koala habitat", namely "areas of native vegetation where the trees of the types listed in Schedule 2 (SEPP 44 – Feed Tree Species) constitute at least 15% of the total number of trees in the upper or lower strata of the tree component".

If more than 15% of the trees in the area are Schedule 2 tree species, then an assessment must be made by a qualified person to determine whether the area contains "core koala habitat", a term applied to "an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population". If Schedule 2 tree species are not present or if they constitute less than 15% of the total number of trees present, then no further provisions of the Policy apply.

SEPP No 55 Remediation of Land.
State Environmental Planning Policy No 55 – Remediation of Land provides for a state-wide planning approach to the remediation of contaminated land. The SEPP specifies certain considerations that are relevant in determining development applications in general. A determining authority must consider whether land subject to a development application is contaminated and other related issues that flow from that consideration.

Sydney to Canberra Corridor Strategy.
This Strategy was originally published by the Department of Planning in 1995 and recently updated and republished (September 2007). It outlines the broad strategic future planning direction for the land corridor along the Hume and Federal Highways. The Strategy is not detailed as it focuses on providing a development framework for those with planning responsibilities in the corridor.

The Gunlake Quarry is located within the central sector of the corridor. The Strategy has a number of key objectives relating to encouraging population in the central sector and developing the central sector as the major regional centre for the corridor. It also has a key objective of fostering local economic development and employment growth and maximising local employment opportunities to decrease reliance on commuting, provided that development is compatible with environmental considerations.

The Strategy also identifies the economic importance of minerals and extractive resources in the corridor and recommends that steps should be taken to ensure that these resources are not sterilised by competing land uses. The extractive resources are identified as a key strategic economic resource for the Region and Sydney.

The Gunlake Quarry Project is compatible with the aims and objectives of the Strategy. It is economically beneficial and provides employment opportunities in the region and will be managed with due consideration for potential environmental impacts. It will not adversely impact surrounding land uses.

2.1.5.2 Planning Approvals

The following approvals are required for the proposed Gunlake Quarry to proceed.

(i) **Project Approval – Minister for Planning.** Project approval is required in accordance with Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for all activities associated with the development and operation of the quarry.

(ii) **Environment Protection Licence – Department of Environment and Climate Change.** An environment protection licence is required under Section 47 of the *Protection of the Environment Operations Act 1997* to develop and operate the quarry.

(iii) **Roads and Traffic Authority.** An approval under Section 75 of the *Roads Act 1993* would be required from the RTA. The Hume Highway is a classified State road. Roadwork must not be undertaken on a classified State road that involves the deviation or alteration of the road, or the construction of a bridge, tunnel or level crossing unless the plans and specifications of the proposed work have been approved by the RTA.

(iv) **Road Construction Permit – Goulburn Mulwaree Council.** In addition to RTA approval, the approval of Goulburn Mulwaree Council is required under Section 138 of the *Roads Act 1993* in order to carry out road modifications along Red Hills Road, the roundabout at the intersection of Brayton Road and George Street, the Crown Road Reserve, Brayton Road and around the mine entrance and the construction of public road intersections between the Project Site and the Hume Highway.

(v) **Water Licence - Department of Water and Energy.** A licence is required under Section 116 of the *Water Act 1912* to permit the incidental "extraction" of groundwater during mining activities. Gunlake will apply for all licences required for the extraction and use of surface and groundwater.

(vi) **Construct road on Crown Road Reserve - Department of Lands.** Approval will be required from the Department of Lands to construct the By-pass road along the Crown Road Reserve to connect Brayton Road and Red Hills Road.

Gunlake would seek approval from the Council for the installation on the Project Site of an aerated wastewater treatment system (AWTS) that will provide secondary treatment effluent suitable for disposal by irrigation.

2.1.6 Project Timetable

The following list provides an indicative Project timetable that Gunlake envisages could be followed from the submission of the *Environmental Assessment* for review in February 2008.

- February 2008 – *Environmental Assessment* made publicly available and Department of Planning receives submissions from the community and government agencies.
- April 2008 – Gunlake provides responses to the Department of Planning to specific issues raised in submissions.

- May 2008 – Minister issues project approval.
- June 2008 – Commence site establishment involving pre-stripping, on-site road construction, occupy the offices, and position service buildings.
- August 2008 – Quarrying commences.
- September 2008 – Removal of first saleable products and transportation to various market locations, followed by 30 years of quarrying rock to market up to 500,000t of saleable product each year.

At the completion of 30 years of activity, Gunlake may wish to continue further hard rock quarrying. This would require an additional project approval at that time.

2.2 Geology and Quarry Planning Considerations

2.2.1 Geology

The deposit is located regionally within the Bindook Volcanic Complex of Devonian age. This Complex comprises a north-northeast trending series of volcanic units located north of the intrusive Marulan Granite. **Figure 2.4** places the Gunlake Quarry into a regional geology context and shows the extent of the Bindook Complex.

Resource investigations undertaken by Gunlake Quarries included both core and percussion drilling and testing of bulk surface samples for compliance with the principal tests in AS 2758.1 – 1998, "*Aggregates and Rock for Engineering Purposes. Part 1. Concrete Aggregates*".

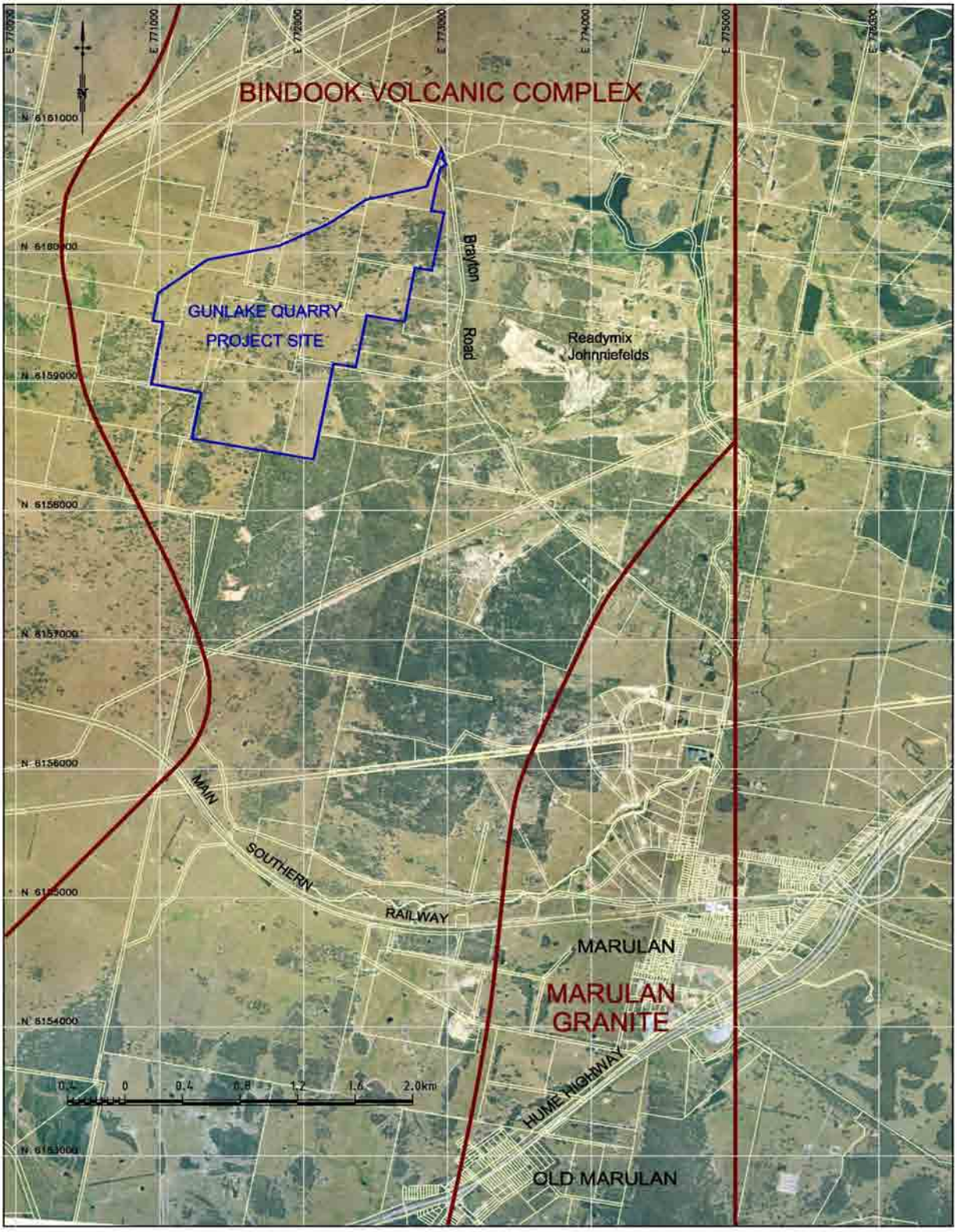
Testing of rock samples showed that the hard rock to be quarried during the Gunlake Quarry Project is suitable for concrete aggregate. The tests also provided data to assist the Quarry Manager to develop procedures to ensure ongoing satisfactory specification achievement.

The tests also showed that the rock was extensively fractured. The extent of the fracturing did not detrimentally affect aggregate quality, however blasting would be assisted and the blasted rock fragments would be less than $1m^3$ in size.

Figure 2.5 shows the location of the various exploration boreholes in the vicinity of the Project Site.

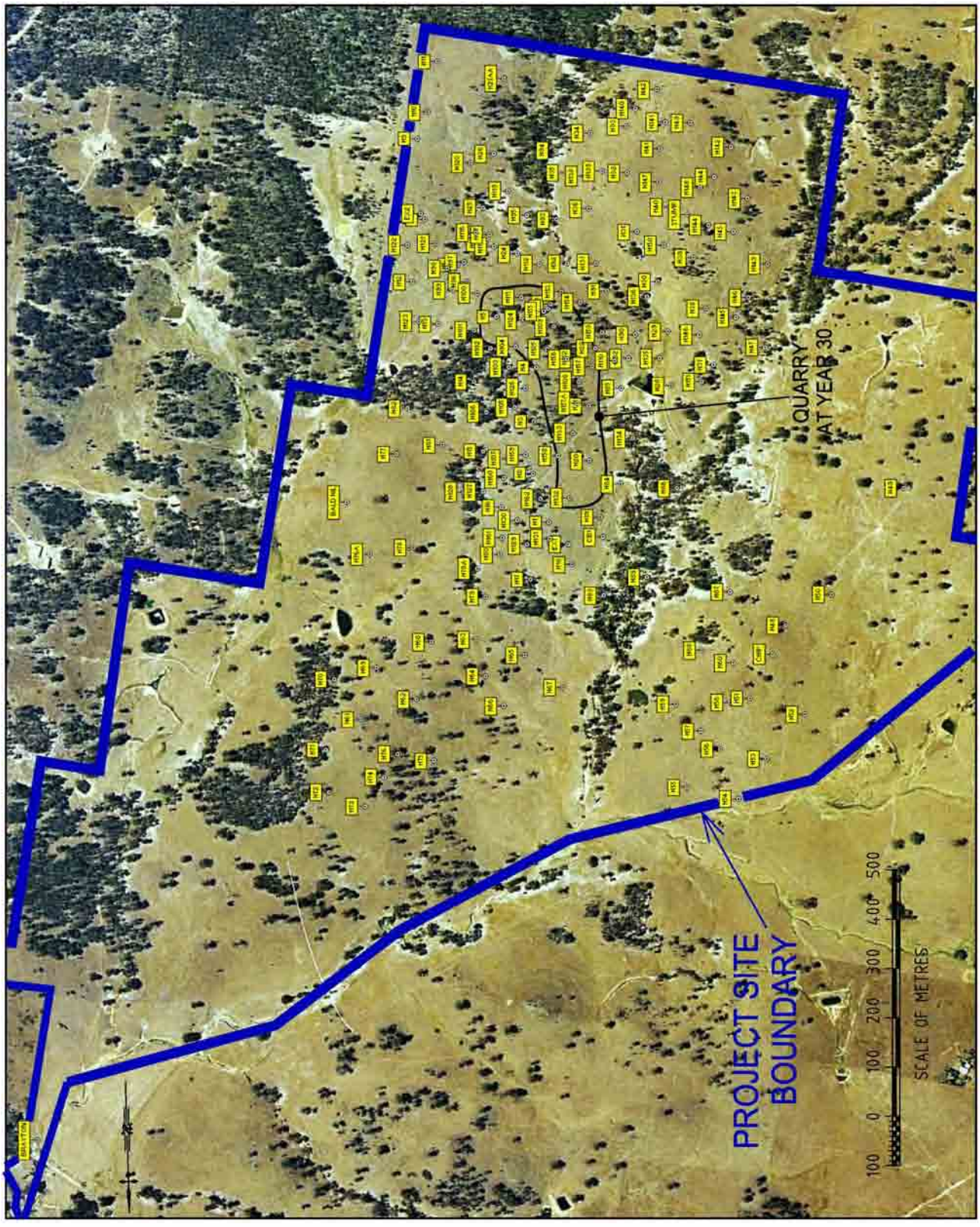
2.2.2 Hard Rock Resource

Extensive drilling carried out on the site has demonstrated a resource of approximately 180Mt of tuffaceous rhyodacite to a depth of well over 100m below the surface within the Bindook Volcanic Complex of Devonian Age. Tests have determined that the material is suitable for use in a range of quarry products, including concrete and sealing aggregates, rail ballast, manufactured sand, and roadbase.



Gunlake Quarry Project

Figure 2.4 Regional Geology



Gunlake Quarry Project

Figure 2.5 Exploration Borehole Location

2.3 Quarry Planning and Construction Activity

2.3.1 Quarry Planning Considerations

2.3.1.1 Economic Quarry Planning Considerations

The viability of mining the tuffaceous rhyodacite on the Project Site is determined by a number of economic factors as follows:

(i) **Depth of Hard Rock**

The average depth of hard rock over the life of the proposed quarry (in excess of 100m) represents a depth at which, given the overall quantity, the proposed quarry would remain economically viable.

(ii) **Depth to Hard Rock**

The site is characterized by shallow depth to the hard rock reserve. Typically the quarry site has a thin (<25mm) topsoil cover with approximately 2.0m of overburden.

(iii) **Rock Hardness**

The rock has been tested and is suitable for a range of quarry products. It is also fractured to an extent that reduces the blasting requirement during quarrying.

2.3.1.2 Geological Quarry Planning Considerations

The tuffaceous rhyodacite occurs at the surface in the proposed quarry area. The quarry has been planned to commence at a location that enables easy access to the hard rock and minimises the amount of excavation required prior to quarry production commencing.

The extremities of the quarry area are determined by the resource distribution and the physical constraints and requirements for machinery operating within the quarry boundary and concurrently on different benches.

2.3.1.3 Environmental Quarry Planning Considerations

Although the limits of the proposed quarry area have been set with predominantly economic and geological considerations in mind, the following environmental considerations have influenced the overall quarry planning process.

(i) **Agricultural land**

The area selected for quarrying has a low agricultural potential predominantly limited to restricted grazing. The overburden emplacement bund wall will have low agricultural potential and the void left after the quarry is finished will have negligible agricultural potential. Final slopes of the bund wall would typically be up to a maximum 2.5:1grade, which would allow the areas to be used for grazing.

(ii) **Ecological**

The proposed quarry site does not support much native vegetation and is typically covered by the odd isolated tree and a variable groundcover consisting predominantly of introduced species. The vegetation cover does not provide high quality fauna habitat.

2.3.2 Vegetation Clearing

Clearing of the vegetation within the quarry area would be undertaken using a progressive campaign basis with the extent of clearing undertaken in each campaign being just sufficient for the subsequent year of quarry development.

There are some trees to be cleared within the areas to be disturbed. The bulk of the vegetation is pasture which would be retained in the topsoil as it is collected during soil stripping activities. When appropriate, and where weeds are sufficiently dense in areas to be cleared, weed spraying would be conducted prior to soil stripping activities.

In order to prevent erosion and sedimentation, the following activities, where warranted, would be undertaken prior to any major vegetation clearing and surface disturbance.

- Construction of a temporary diversion bank on the upslope boundary of the area to be cleared. The diversion bank would divert clean water from the upslope areas into natural drainage lines or to designated storage dams within the Project Site.

- Construction of one or more catch drains or banks on the downslope boundary of the area to be cleared. Runoff collected by the catch drains or banks would be directed to sediment basins and/or storage dams from which it would be drawn for dust suppression purposes.

The size and location of these structures would vary depending on the surface area and location of disturbance but would be based on the structure designs and construction notes identified in the Landcom publication, "Soils and Construction Volume 1" 4th Edition March 2004. Further details of the planned surface water management structures are presented in Section 4B.2.

2.3.3 Soil Removal and Management

2.3.3.1 Introduction

The soil materials within the proposed areas of disturbance were assessed by SEEC Morse McVey and Associates (SEEC) to determine constraints and opportunities for the proposed development and the potential for the soils to be used in site rehabilitation.

The assessment was based on field and laboratory examinations of key physical and chemical attributes and is described in greater detail in Section 4B.2.2.

The SEEC assessment determined the following general features of the site soils:

- Dispersible (Sediment Type D) for the most part,
- Moderately to very highly erodible,
- Moderately acidic in the topsoils,
- Non-saline to slightly saline,
- Low to moderate cation exchange capacities,
- Calcium:magnesium ratios that infer low calcium to calcium deficient soils,
- Very low phosphorus levels,
- Very low to moderate potassium levels,
- Very high variability for use in the walls of sediment basins and site specific testing was recommended.

The phosphorus, potassium and calcium levels of the soils will be improved during rehabilitation in areas sown to permanent pasture. Areas to be planted with native vegetation may not require application of fertilizer, however, this would be determined at the time of planting.

SEEC developed a Conceptual Soil and Water Management Plan (SWMP) (Refer Section 4B.2.3). The conceptual SWMP will be upgraded to a detailed version following project approval when more project design detail is available for inclusion in the SWMP. Construction and operation of the Gunlake Quarry will be undertaken in accordance with the detailed SWMP.

Figure 2.6 shows the various components of the conceptual SWMP for the Project Site while **Figure 2.7** shows the various components of the conceptual SWMP for the By-pass road route.

2.3.3.2 Soil Stockpiling

Quarry Area and Overburden Emplacement

Wherever practicable, stripped topsoil and subsoil would be directly replaced on completed sections of the final landform.

When stockpiling is necessary, topsoil and subsoil would be stockpiled separately within topsoil stockpile areas (**Figure 2.6** and **Figure 2.7**) not exceeding 2m and 3m in height respectively. In the event it is necessary to construct subsoil stockpiles greater than 3m high, they would be provided with a cover of topsoil and seeded with a non-persistent cover crop.

Individual subsoil and topsoil stockpiles would be constructed using an excavator loading into the dump trucks, with the dimensions of each stockpile reflecting the method of construction, the area available and avoidance of natural or created drainage lines. All stockpiles will be seeded using a non-persistent cover crop to reduce erosion potential and assist in the maintenance of the biological viability of the soil resource. During stockpile establishment, the surfaces would be left with a rough surface to assist in runoff control, seed retention and germination.

The positioning of the topsoil and subsoil stockpiles would accommodate surface topography in order to avoid the occurrence of overland and/or concentrated surface water flows which might otherwise result in stockpile erosion. However, where natural protection from surface water flows is not readily achievable, Gunlake will install upslope protection earthworks such as contour banks or straw bale protection. Where appropriate, silt-stop fencing or similar protection would be placed immediately downslope of stockpiles and retained until such time as a stable cover of vegetation has developed.

The boundaries of the proposed soil stockpile areas nominated on **Figure 2.6** and **Figure 2.7** are indicative and minor adjustments may occur once operations are underway.

Internal Roads

Topsoil would be stripped along the alignment of internal roads and windrowed along the downslope side of each road and positioned away from any culverts. The topsoil windrow would be typically <1m high. This soil would be used to top-dress the sides of the roads once constructed and will provide a suitable medium for the growth of grasses and trees for landscaping and soil stabilisation purposes.

Subsoils would not be stripped from within the alignment of the internal roads. The subsoil will provide the sub-base for road construction and will be prepared by ripping and removal of any rocks and unsuitable base material. The removed rock material will be placed along the side of the roads and will be covered with topsoil prior to the establishment of vegetation. Any large rocks will be positioned around culverts and utilised as required in roadside stabilisation and/or support for the road edge.

Connection to Red Hill Road

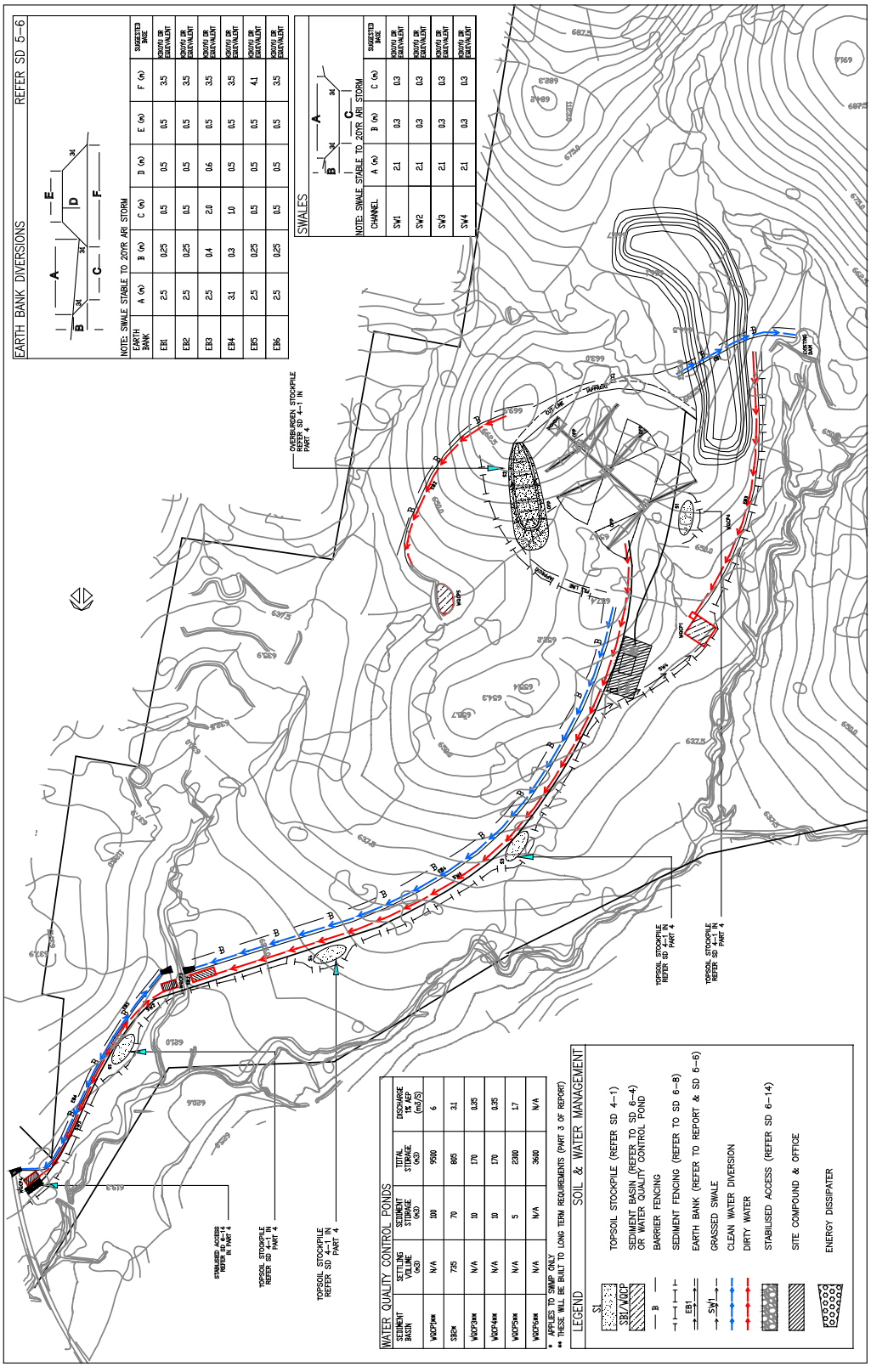
Topsoil from within the re-alignment would be stripped and stockpiled adjacent to the road ready to be replaced at the completion of the use of that section of road. If insufficient area is available, some stockpiles will be established on the Gunlake property immediately west of Jaorimin Creek. Limited quantities of subsoil would also be stripped from within the re-alignment to a depth consistent with the depth needed for road construction when the road is boxed out.

Other Areas of Disturbance

Soils stripped from other areas of disturbance on the Project Site such as the processing area and site facilities area would be placed in separate stockpiles just beyond the edge of the area stripped.

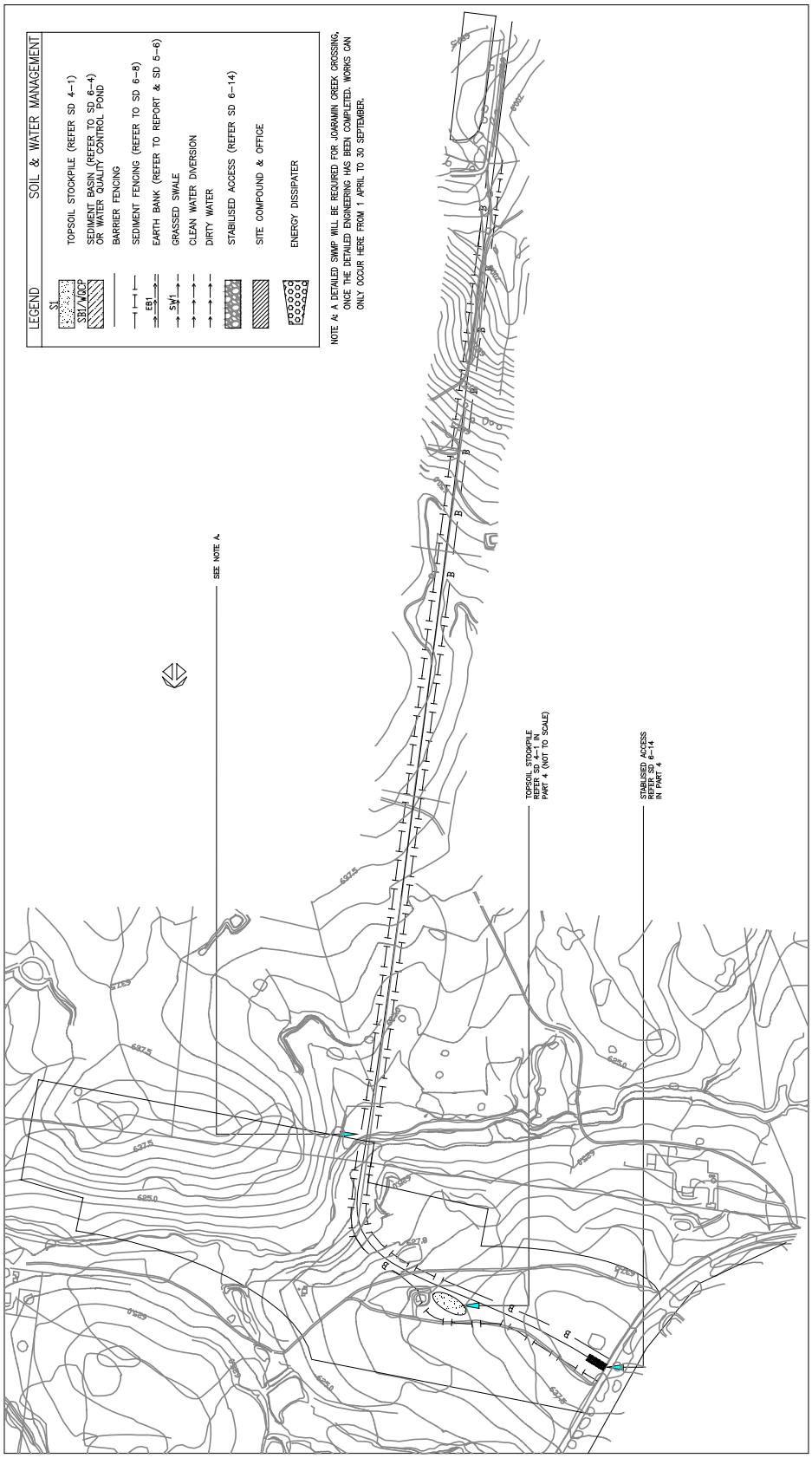
Each stockpile would then be available for re-spreading over the overburden emplacement bund wall or over other disturbed areas following decommissioning of the respective areas of activity. Topsoil and subsoil from the sites of storage dams, sediment basins or other water management structures would be pushed aside to enable their construction and, on completion of construction activities, replaced on the completed surfaces and revegetated, where necessary.

Following stockpile establishment, the operation of machinery on the topsoil and subsoil stockpiles would be avoided in order to prevent compaction and to maintain soil aggregation.



Gunlake Quarry Project

Figure 2.6 Project Site SWMP



Gunlake Quarry Project

Figure 2.7 By-pass Road Route SWMP

2.3.3.3 Soil Inventory and Reconciliation

In order to effectively manage the stripped topsoil and subsoil, Gunlake would maintain an inventory of all soils stripped, re-spread and/or stockpiled throughout the life of the quarry. This soil inventory would serve several purposes including:

- ensuring appropriate volumes of soil are stripped consistent with the soil requirements of the final landform;
- identifying the age of various stockpiles on the Project Site and therefore assist in minimising the length of time soils remain stockpiled; and

assisting Gunlake in using the most appropriate soils for the different elements of the final landform.

Regular reconciliation of soil availability and requirements would ensure sufficient topsoil and subsoil would be available especially as the quarry nears completion.

2.3.4 Staged Construction

2.3.4.1 Introduction

The Gunlake Quarry will be constructed in five distinct stages in order to limit the amount of land disturbed at any one time and to provide a logical and timely development and installation sequence. The following paragraphs include reference to project components identified on **Figure 2.6** and **Figure 2.7**. More details of these 5 Stages are described in the SEEC Report summarised in Section 4B.2.3.

Stage 1. Securing the Site.
This will involve establishing a stabilised site access, which will be constructed in accordance with the procedures identified on Standard Drawing 6-14 in the SEEC Report. Construction of the barrier and sedimentation fencing shown on **Figure 2.6** and **Figure 2.7** will identify Project Site areas where access is prohibited. These fences will be constructed in accordance with Standard Drawing 6-8 in the SEEC Report. Earth Banks (EB) 4, 5 and 6 will be constructed and will function to direct clean water away from the roadworks. The Earth Banks will be constructed in accordance with Standard Drawing 5-6 in the SEEC Report.

Water Quality Control Ponds (WQCP) 1, 3, 4 and 5 and Sediment Retention Basin (SB) 2 would be constructed during this Stage. Topsoil from the areas to be disturbed for the construction of (WQCP's) 1, 3, 4 and 5 and Sedimentation Basin 2 will be stripped and stockpiled. Soil will be stockpiled at the locations shown on **Figure 2.6** and these will be constructed in accordance with Standard Drawing 4-1 in the SEEC Report. The stockpiles may be located at alternative locations deemed suitable by site management provided they conform to the general principles outlined in the SEEC Report. Once constructed all disturbed areas will be revegetated as described in Section 2.11.

During Stage 1, Earth Banks (EB) 1, 2 and 3 will also be constructed in accordance with Standard Drawing 5-6 in the SEEC Report. The location of EB1 may vary from that shown on **Figure 2.6** and will be progressively relocated further south as the quarry pit develops.

Stage 2. Site Construction.
This Stage involves the construction of site facilities, utilities, services and associated drainage systems including the quarry haul roads, services, buildings, the crushing and screening plant in the processing area, and car parks.

During this Construction Stage all stormwater from disturbed areas will be drained to a suitable sediment retention structure. Diversion drains additional to those shown on **Figure 2.6** may be required.

When the works are completed in each area the site will be progressively stabilised using material stockpiled in S3, S4 and S5. These areas will be seeded and fertilised in accordance with the procedures outlined in Section 2.11. When all lands north and east of the office buildings are stabilised, sediment and barrier fencing will be removed from that area.

The stabilised access structure at Brayton Road will be removed when the likelihood of tracking sediment onto the road becomes very low.

Stage 3. Quarry Preparation and Operation.
This Stage will require stripping and stockpiling of topsoil and overburden, construction of WQCP 6 and the commencement of quarry operations. It will also involve the implementation of the Water Cycle Management Plan. **Figure 4B.11** details the components of the Conceptual Water Management Plan for the Project Site.

Topsoil and overburden will be removed from areas to be disturbed in the first 12 months of quarry operations. These materials will be stockpiled separately in S1 (topsoil) and S2 (overburden).

EB1 will divert water away from the area disturbed for the initial quarry activity. WQCP 6 will be established during the early phase of quarrying and will remain fully operational throughout the life of the quarry. It will function to ensure in-pit water does not flow into the external environment.

Stage 4. Construction of the By-pass Road.
Stage 4 will commence with installation of structures to control water flow and sedimentation followed by stripping and stockpiling of topsoil from all areas to be disturbed.

This Stage will involve the construction of the alternative transport route to connect Brayton Road with Red Hills Road and to bypass Marulan. **Figure 2.7** shows the components of the SWMP for this section of road. Gunlake Quarry will adopt similar procedures used for the quarry access road. In addition a site specific SWMP will be developed for the Jaorimin Creek crossing once detailed engineering requirements have been developed.

Stage 5. Final Landscaping and Rehabilitation.
This Stage will be implemented progressively as works are completed. Detailed rehabilitation and vegetation proposals are discussed in Section 2.11.

Gunlake propose to be quarrying for many years and their current plans envisage an initial 30 year development of a resource capable of supporting well over 100 years of quarrying depending on the rate of extraction. Should Gunlake decide not to proceed with their long term plans or decide to close the operation early, they would implement a programme to remove buildings, the crushing and screening plant, hard stand areas (car and vehicle parks) and haul roads. The Marulan By-pass road would remain.

2.3.4.2 Soil and Overburden Removal

Soil and overburden would be removed by an excavator loading into 50t dump trucks. Blasting would not be required, as this work will involve the removal of up to approximately 25mm of topsoil and 2.0m of overburden.

Stripped topsoil and overburden will be stockpiled at the locations shown on **Figure 2.6** and **Figure 2.7**. Site conditions may require the location of the stockpiles to be moved at the discretion of site management. This would only be done in accordance with the principles outlined in the SEEC Report.

In the quarry pit area, overburden would be removed progressively in front of the initial quarry bench. This will occur generally about two months in advance of the drilling in preparation for rock production blasting.

2.3.4.3 Overburden Emplacement

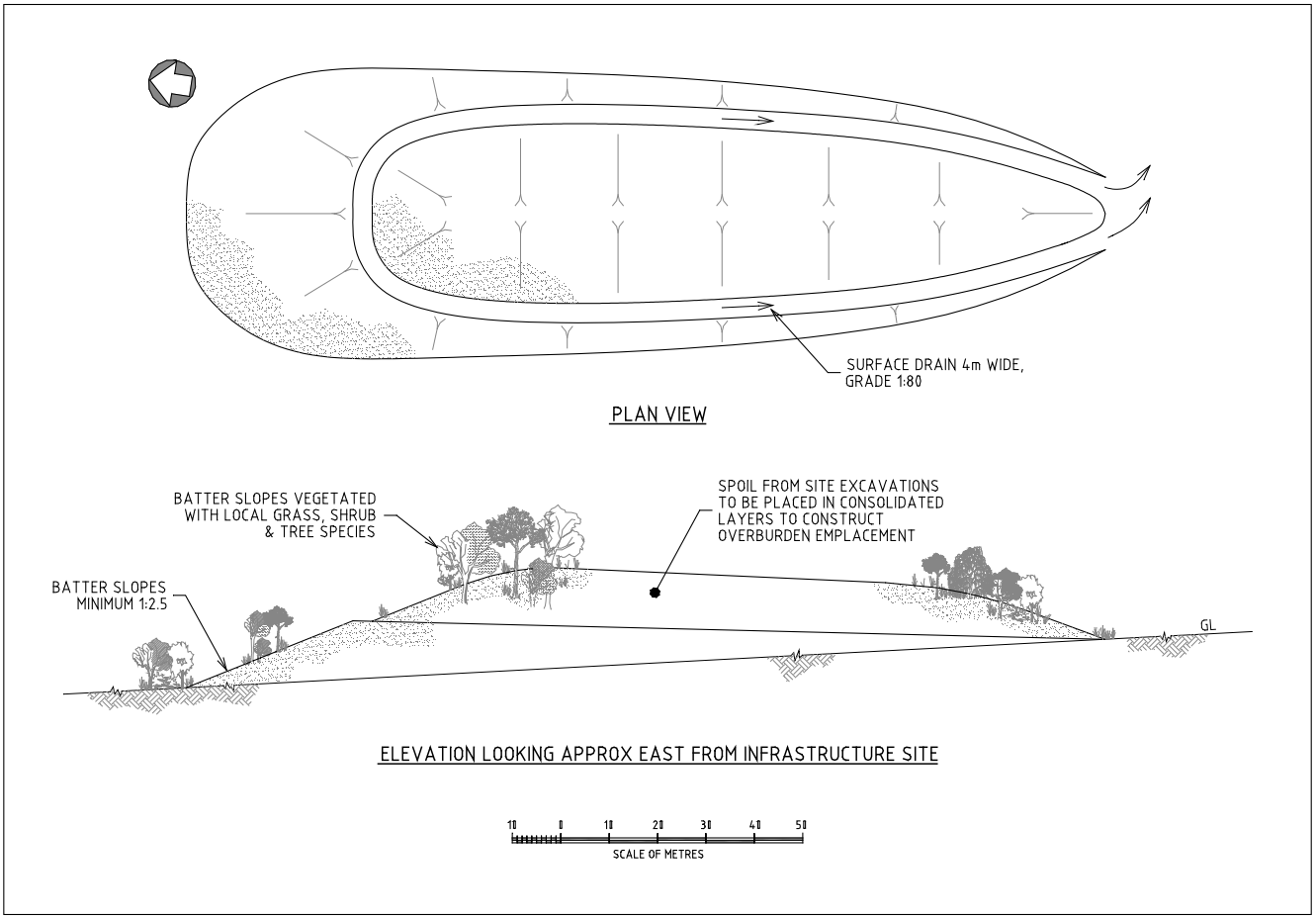
Figure 2.8 provides detail of the configuration of the overburden emplacement bund wall following initial construction of the processing area. The overburden for the bund wall will be obtained from the processing area during levelling of that area prior to construction and the initial quarry pit development.

At its highest point following final re-shaping, the out-of-quarry overburden emplacement would have an elevation of 662m AHD which would place it approximately 13m above the surrounding natural ground level to the north of the emplacement. It would be blended into surrounding ground level on the southern side of the emplacement.

Overburden from the quarry area will be back-filled into the initial quarry pit development.

Rock Extraction

Once the overburden is removed conventional drill and blast techniques will be used to quarry the rock from the face heights of approximately 13m. The quarrying will commence at the northern end of the quarry and proceed in a southerly direction.



Gunlake Quarry Project

Figure 2.8 Overburden Emplacement Design

Drilling in preparation for quarrying would be undertaken using a hydraulic drill. Drilling would prepare approximately 12,000t of rock material for each subsequent blast. Blasting and drilling will be approximately once a week.

The annual explosives usage at maximum production would be approximately 81t. This would be principally in the form of ANFO and Rioflex type products. These would be delivered to site and placed in the drill holes on the day of each blast. Explosives and detonators would not be stored on site.

Error! Not a valid bookmark self-reference. identifies typical blast design parameters to be adopted within the quarry to achieve compliance with relevant guidelines for airblast overpressure and ground vibration at surrounding residences.

Table 2.1 Typical Blast Design Parameters

Parameter	Details
Bench Height	13m
Sub-drill	0m
Blast Hole diameter	76 mm
Blast Hole Spacing	2.5m
Blast Hole inclination	10^{o}
Burden	2.5m
Stemming Length (Using 10mm aggregate)	2.5m
Maximum Instantaneous Charge (MIC)	49kg (for 13m bench)

The drilling program once commenced, would be approximately once per week.

Blast design, loading and firing would be undertaken by an explosives contractor or a suitably qualified and experienced blasting engineer holding a shotfirer's certificate issued by the DPI-MR. Each blast would be designed to provide an adequate level of fragmentation within acceptable environmental impact criteria.

The blast design parameters outlined in **Drilling** in preparation for quarrying would be undertaken using a hydraulic drill. Drilling would prepare approximately 12,000t of rock material for each subsequent blast. Blasting and drilling will be approximately once a week.

The annual explosives usage at maximum production would be approximately 81t. This would be principally in the form of ANFO and Rioflex type products. These would be delivered to site and placed in the drill holes on the day of each blast. Explosives and detonators would not be stored on site.
Error! Not a valid bookmark self-reference. identifies typical blast design parameters to be adopted within the quarry to achieve compliance with relevant guidelines for airblast overpressure and ground vibration at surrounding residences.

Table 2.1 are based on conservative predictive formulae. Blast design is an evolving outcome-orientated process and refinements to blast designs would be implemented on the basis of monitoring results and the achievement of specific blasting objectives.

Table 2.2 presents an estimate of cumulative overburden removal and saleable product.

Table 2.2 Approximate Cumulative Overburden (m^3) and Saleable Product (t)

Year	1	5	10	20	30
Overburden (m^3)	120,000**	131,294	261,177	306,293	306,293
Saleable Product (t)	100,000	850,000	3,750,000	8,750,000	13,750,000

Note: ** Includes approximately111,000 m^3 from processing area and 9,000m^3 from quarry pit.

2.3.5 Quarrying Sequence

Quarrying will proceed generally from north to south. **Figure 2.9** shows the sequential quarry development and overburden emplacement at the end of Years 1, 5, 10, 20 and 30.

Initial access into the quarry pit would be via a haul road constructed on the northern side of the quarry area.

During Year 1, it is planned for quarrying to be confined to the first bench as indicated in **Figure 2.9** and it will cover approximately 1.4ha.

During Year 5, it is planned that quarrying will still be confined to the first bench, however the affected area will increase to approximately 1.8ha. Access will still be via the haul road at the northern end of the quarry.

During Year 10, it is planned that the first bench of the quarry will have extended to approximately 4.4ha. The first bench will define the full extent of the quarry and subsequent benches will be contained within the boundary of the first bench. Subsequent benches will be numbered in descending order. A second and third quarry bench are planned to have commenced by the conclusion of Year 10. At the conclusion of Year 10 it is planned that the second bench will cover approximately 1.4ha and the third bench approximately 1.1ha.

Additional haul roads within the quarry pit will be constructed to enable access and egress to and from each bench.

At the conclusion of Year 20, the first bench will be fully extracted (6.0ha) together with benches two, three, four and five.

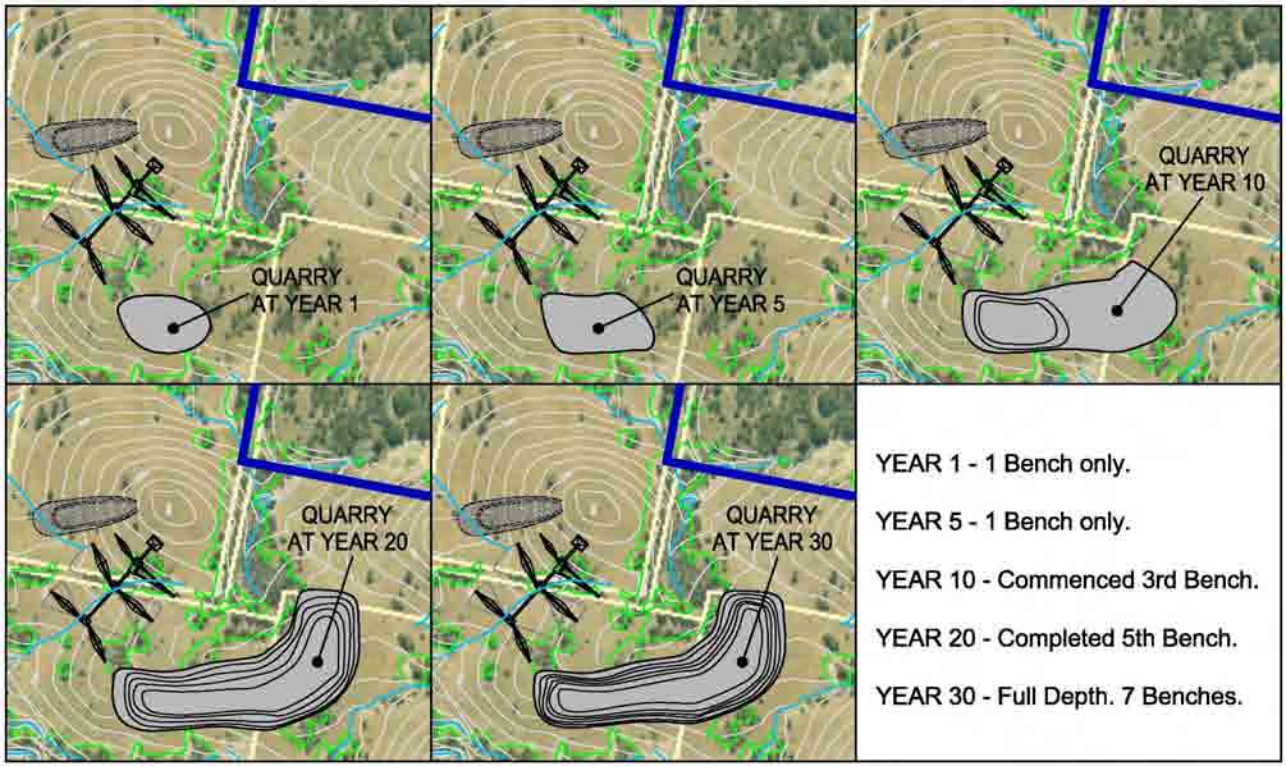
At the conclusion of Year 30, benches one to seven will have been fully quarried.

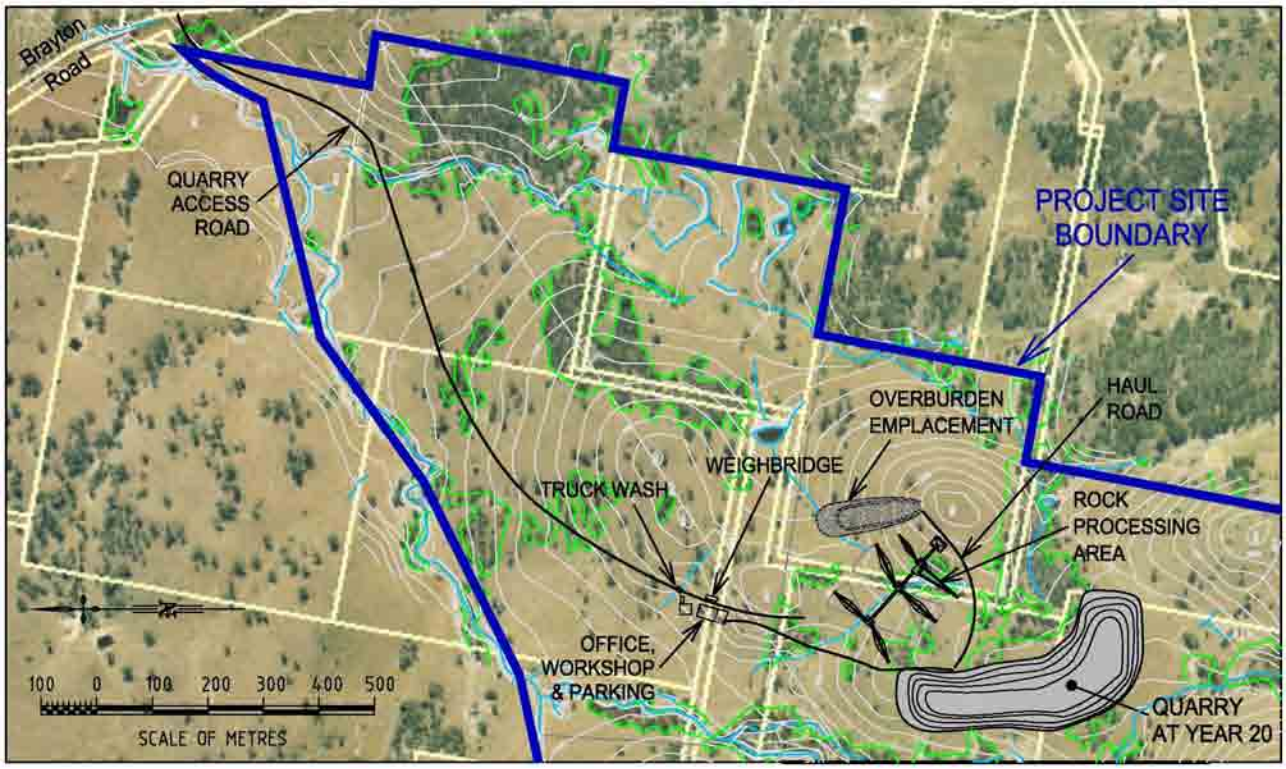
2.3.6 Quarrying Equipment

The quarrying equipment fleet to be used on site is listed in **Table 2.3**. This equipment may be augmented by dry hire of a Cat D10R Dozer or equivalent from time to time as required.

Table 2.3 Quarrying Equipment Fleet

Item (or equivalent)	No. on site	Function
Face Loader (Komatsu WA600-6)	1	Loading quarried stone onto dump trucks for delivery to process area.
50 t Dump Trucks (Caterpillar 773)	2	Hauling rock to process area.
Front end loader (Komatsu WA500-3)	1	Loader and moving material within the process area.
Drilling Rig (Atlas Copco Hydraulic rig)	2	Pre-blast rock drilling.
Excavator (Caterpillar 345BL)	1	General site work.
Grader (Caterpillar 12H)	1	General site work
Tip Truck	1	General site work.
Maintenance Truck	1	
Water Truck	1	





Gunlake Quarry Project

Figure 2.9 Sequential Quarry Development

2.4 Rock Processing

The processing of rock would be undertaken within the processing area to be located northeast of the quarry pit. A heavy vehicle haul road will connect the quarry pit and the processing area. The locations of the processing area and the haul road are shown on **Figure 2.1**.

The rock processing plant will have a rated capacity of approximately 300tph. This will enable production of up to 500,000tpa of saleable product.

The processing equipment and saleable products stockpiles would be visually and acoustically screened by the overburden emplacement bund wall.

A mobile crushing plant will be used for all site preparation and road construction and for initial production of product during the first 2 years (estimated) while the main crushing plant is being built and commissioned.

The rock processing area would cover approximately 4ha. An indicative layout is shown on **Figure 2.10** and typical cross sections are presented in **Figure 2.11**.

The processing area would contain the following components.

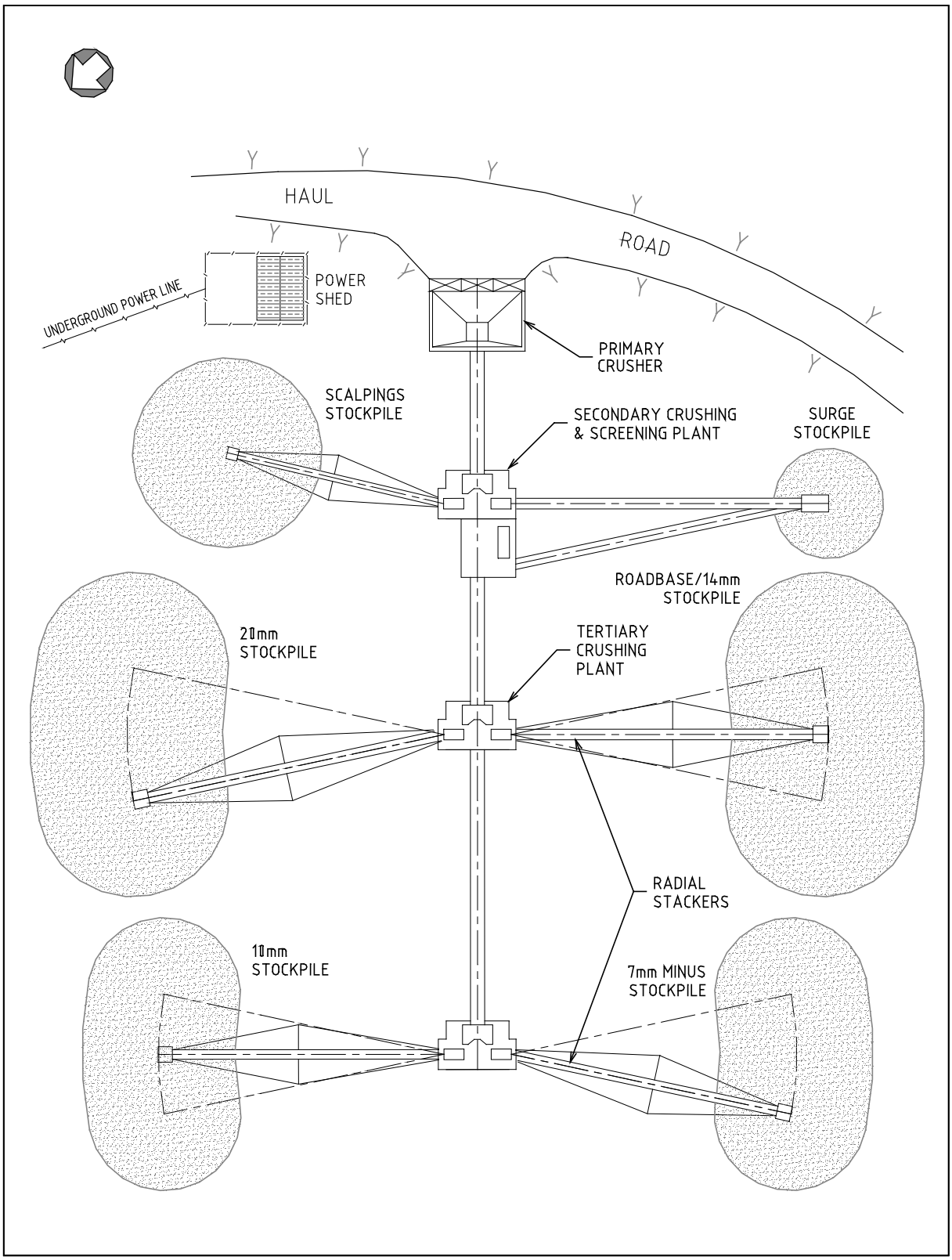
- Primary crusher.
- Secondary crusher and screens.
- Tertiary crusher and screens.
- Main screen.
- Interconnecting conveyors.
- Various product stockpiles.

The processing area will have a prepared hard surface of crushed rock material and will be used to stockpile various products and for load out by front end loader into road haul trucks for eventual delivery to markets.

The processing equipment will be electrically powered and this will be supplied via an underground cable to a power shed located immediately north east of the process area.

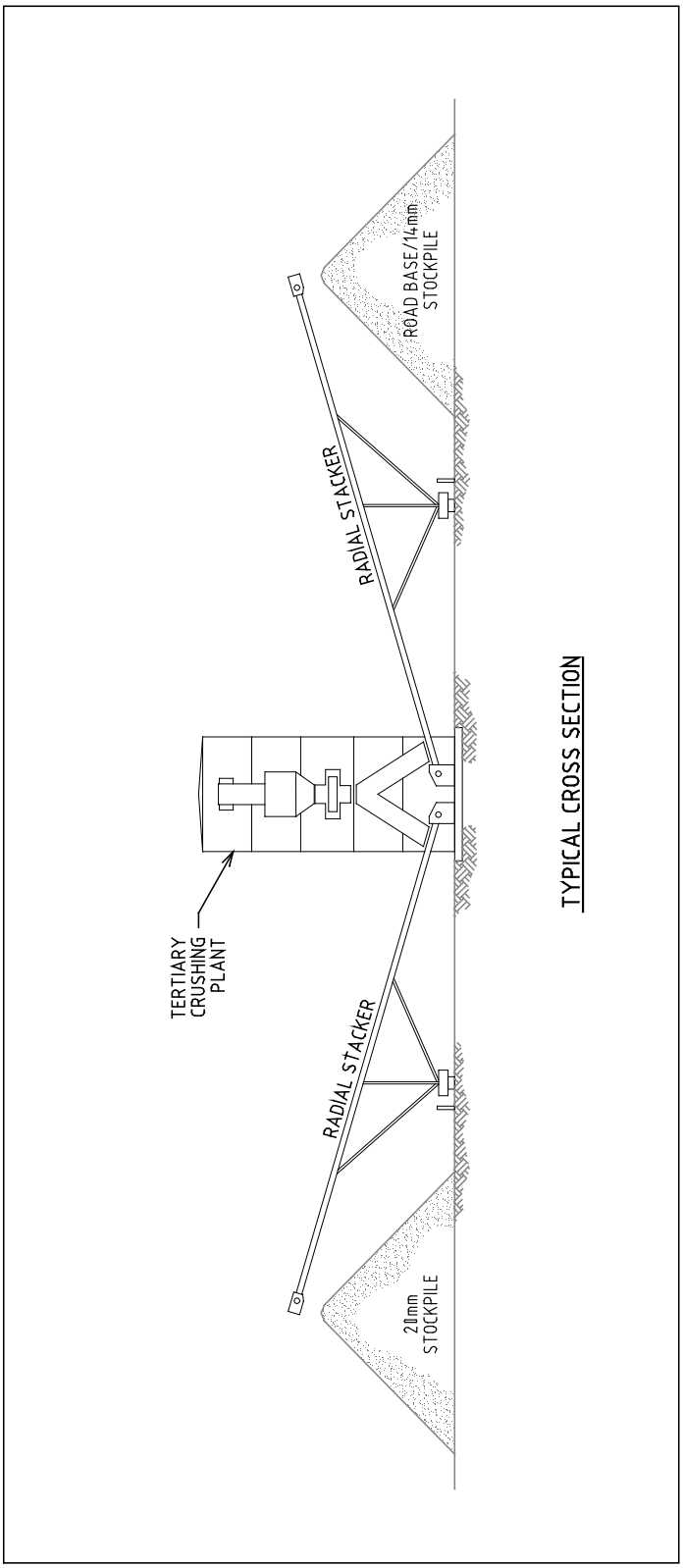
Quarried rock will be delivered to the primary crusher by 50t dump trucks. The rock will pass over an apron feeder, onto a scalping screen and then through the primary jaw crusher and be crushed to a size of 250mm minus. Scalpings will be stockpiled via a conveyor.

From the primary crusher a conveyor will carry the rock through another screening process then to a secondary gyratory cone crusher. The final stage of crushing will be through a tertiary crusher for finished product of nominated sizes onto stockpiles. The screened rock throughout the crushing process will allow rock of specific sizes to be sorted for further processing and



Gunlake Quarry Project

Figure 2.10 Rock Processing Area General Arrangement



Gunlake Quarry Project

Figure 2.11 Rock Processing Area Cross Section

stockpiling. Typical finished products from the processing plant will include Roadbase, 20mm, 14mm, 10mm, and 7mm minus.

The processing plant will feature atomised water dust suppression systems at all discharge points. There will also be atomised water sprays for dust control at the tipping point into the apron feeder and at the primary crusher input and discharge. The product conveyors will be covered. All screens will be enclosed to provide dust and noise attenuation.

A front end loader will load the various products into road trucks for transport from site. Prior to leaving the Project Site, the trucks will pass through a truck wash station and over a weighbridge located near the quarry office. The location of these facilities is shown on **Figure 2.1**.

The processing plant would be approximately 8 to 10m high with its top positioned at approximately 660m AHD. The out of pit emplacement and topography would virtually eliminate lines of site to the east and north of the Project Site.

On entry to the Project Site, the driver of each saleable product haulage truck will register with the Site Office. This will enable inventory control and also enable Gunlake to manage external contract drivers. Loaded trucks will be covered with tarpaulins to retain product and the tail gates will be locked to avoid unplanned opening should the vehicle air lines brake open.

2.5 Infrastructure and Services

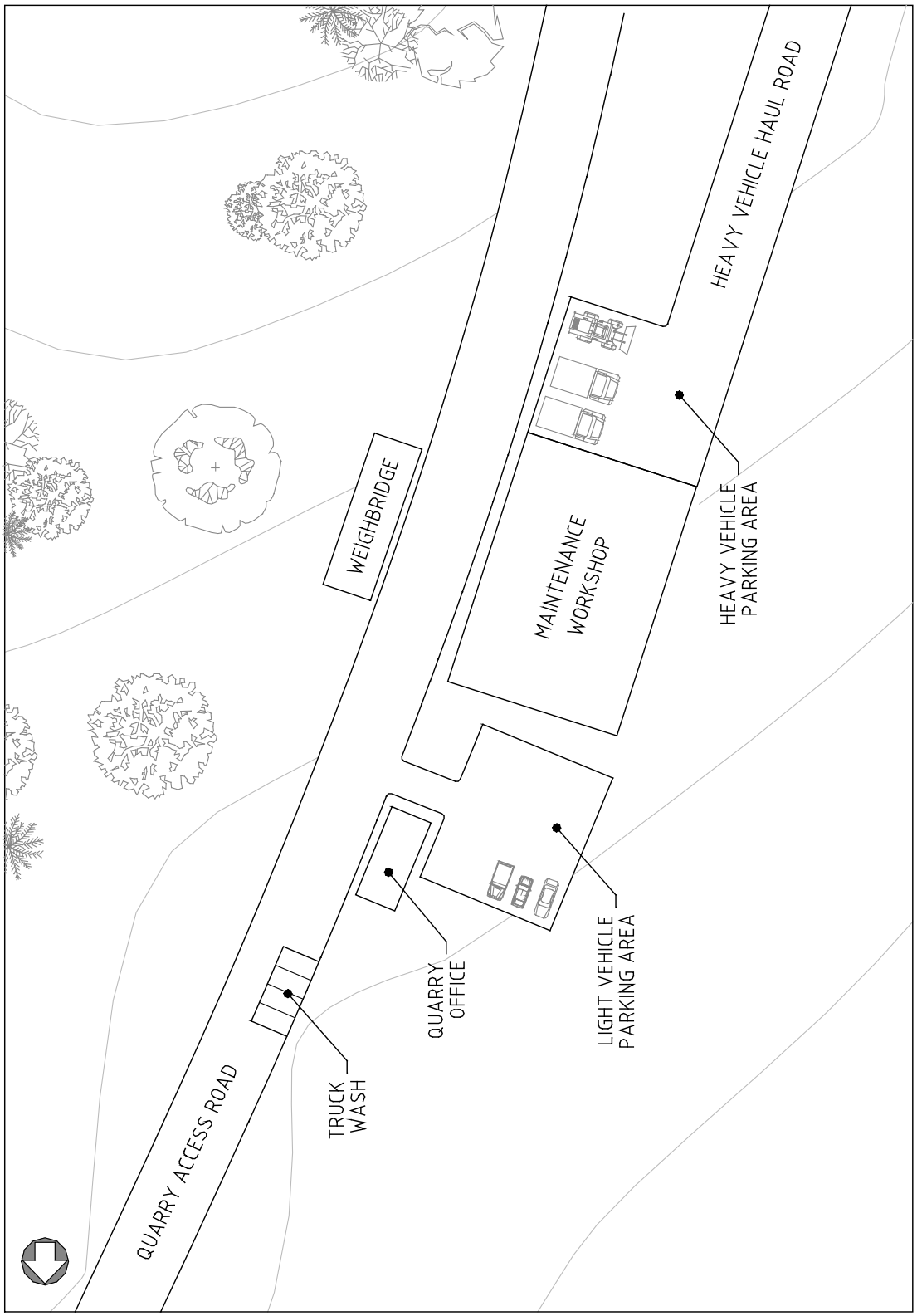
2.5.1 Introduction

The principal infrastructure and services required to support the Gunlake Quarry would be located mainly within the site facilities area (see **Figure 2.1** and **Figure 2.9**). The roads required for the quarry development are described in Section 2.6.

2.5.2 Buildings

Figure 2.12 presents the conceptual layout of the buildings and other facilities to be constructed or installed within the site facilities area including:

- site office;
- toilet and ablution facilities;
- weighbridge;
- truck wash
- crib hut;
- hardstand and truck parking area;
- light vehicle parking area;
- bunded fuel bay;



Gunlake Quarry Project

Figure 2.12 Infrastructure and Services

- maintenance workshop, wash bay; and
- light vehicle parking facilities.

All buildings with the possible exception of the maintenance workshop would be of a demountable style.

2.5.3 Potable and Ablutions Water Requirements

Potable water, ie. water for drinking purposes, and water for toilets and showering would be transported from Marulan to supplement rainwater collected off buildings and stored in tanks. Based on water requirements at similar sized quarries, it is expected that up to 350kL of water would be required each year for these purposes at Gunlake Quarry.

2.5.4 Operational Water Requirements

Water required for operational purposes would be obtained from the various sedimentation and fresh water dams that form part of the site surface water and quarry pit management system.

Processing Plant.
Gunlake Quarry estimates that up to 3.2L of water will be used for every product tonne. At peak production of 500,00tpa of saleable product, the operational water requirement is 1.6MLpa. This water will be lost from the site as it will adhere to the product or evaporate.

Road and Hardstand Areas Dust Suppression.
The heavy haul road between the truck parking area, the quarry and the processing area will not be sealed and will require watering for dust suppression. Based on an average daily consumption of 35,000L the annual requirement for this water would be approximately 12.7MLpa.

Irrigating Pasture
In order to dispose of excess site water, Gunlake propose to irrigate pasture. Approximately 10ha of irrigated pasture will be established to enable disposal of approximately 50MLpa by irrigation.

A site water balance has been fully discussed in Section 4B.2.4

Initial start up drinking water supply will be delivered to site and water in existing dams will be used for dust suppression until specific site dams can be utilised.

2.5.5 Electricity

The Project will be powered by electricity from the State Supply Grid. Mobile plant will be powered by diesel fuel.

There is an existing 11kV power line crossing the Project Site. Its location is shown on **Figure 2.1.** This line will be accessed by a pole mounted transformer where it crosses the site access

road and will provide electric power supply for the Project. Power will be reticulated around the site by underground and overhead cable and will supply the site office workshop area and the rock processing plant. Gunlake predicts that the annual electricity consumption at full production will be 3,089,000kwh.

2.5.6 Communications

Off-site and on-site communications would be by a combination of phone/fax lines installed to service quarry management and contract staff in the site facilities area, mobile communications and 2-way radio. Wireless-based Internet access would be provided.

2.5.7 Sewerage

All domestic waste water will be collected and treated in a purpose built waste water management system. Due to the shallow, clay rich soils, Gunlake will install an aerated wastewater treatment system (AWTS) that will provide secondary treatment effluent suitable for disposal by irrigation.

A dedicated 1000m^2 irrigation field will be established to accommodate the predicted wastewater generated on site. The location of this irrigation field is shown on **Figure 4B.11**.

2.5.8 Fuel

Fuel storage and refuelling facilities for the mobile quarry fleet, comprising storage for 50KL diesel in a WorkCover-approved self-bunded fuel tank and a refuelling bay would be located adjacent to the Maintenance Workshop (**Figure 2.12**). The quarry equipment fleet will obtain fuel via two bowsers. There would also be up to approximately 5kL of oil stored in self-bunded containers.

It is estimated that the equipment fleet of the proposed Gunlake Quarry would use approximately 199kL of diesel in the first year of production, rising to 455kL at full production for quarrying and rock processing activities.

The annual off-site project-related fuel usage at full production would include:

- 1,125kL for saleable products transportation by road between the Project Site and the widely located customer locations, based on 0.015L per net tonne kilometre; and,

- 8kL for private vehicles and deliveries.

2.5.9 Explosives

Blasting consumables would not be stored on site and will be delivered as required. Blasting will occur approximately once per week. The amount of rock prepared from a blast will vary between 12,000t and 6,000t.

Blasting will utilise Rioflex of Anfo explosives material. Typically there will be three rows of holes each 25m long with a total burden of 8.4m to a depth of 13m and a total of 27 holes. Each hole would be filled with 40kg of explosive material.

2.6 Transportation

2.6.1 Introduction

The bulk of transport activities associated with the Project would revolve around the road transportation of saleable products from the Project Site to widely distributed markets. There would be a small number of additional transport movements associated with fuel deliveries, service vehicles and employees travelling to and from the Project Site. This sub-section:

- describes the transport activities during the site establishment phase;
- describes the road construction activities on the Project Site and along the haulage routes connecting to the Hume Highway (Freeway); and
- outlines the proposed haulage routes and road intersection upgrading activities between the Gunlake Quarry and the Hume Highway (Freeway).

2.6.2 Site Establishment

During the three month period of the construction stage, the typical types and number of vehicle movements entering and exiting the Project Site are anticipated to comprise:

- low loaders (0 to 3 per day);
- heavy vehicles (0 to 5 per day); and
- light vehicles (10 to 20 per day).

These vehicles would travel from Marulan via Brayton Road.

The upgrade of the intersection of the quarry access road and Brayton Road would be constructed concurrently with the quarry entrance and internal roads. The section of Brayton Road between the quarry access road and the Johnniefelds quarry would be upgraded at this time.

The construction of the By-pass road is production dependent and is planned to be constructed between 3 and 5 years after the Project has commenced. At that time the intersection of the By-pass road and Brayton Road would also be constructed.

The By-pass Road crosses two very different watercourses:

- Joarimin Creek, which is a fourth order stream, and,
- Two small drainage depressions.

Joaramin Creek crossing will require a significant crossing and the aim of the culvert/bridge design will be to maintain the natural morphological features of the stream as much as possible. The aim of the design will be to maintain the natural morphological features of the stream as much as possible. The NSW Fisheries (2003) outline the policy and guidelines that apply for providing fish-friendly crossings. The design would also consider the requirements of DECC, DWE and SCA.

Comprehensive guidelines for crossings such as this are contained in Witheridge 2002 and Faithfull and Witheridge 2003.

Any drainage depressions will be crossed using a small box culvert structure. There is no riparian zone associated with the drainage depression.

A Road Construction Management Plan would be prepared to ensure appropriate procedures are in place for the management of both quarry-related and public traffic during road construction activities. This Plan would be submitted to both Goulburn Mulwaree Council and the RTA in support of Gunlake's Section 138 Permit Application relating to the various road construction activities.

2.6.3 Quarry Entrance and Internal Roads

The layout of the internal roads on the Project Site is shown on **Figure 2.9**.

Quarry Access Road

The quarry entrance would be located off Brayton Road at the north-eastern corner of the Project Site generally at the location where an existing entrance gate is located. The Quarry Access Road would provide access to the site facilities area and rock processing plant and stockpiles. The road within the Project Site would be constructed with an overall width of 8m comprising a 7m wide sealed surface and unsealed 0.5m shoulders on both sides.

Construction of the quarry entrance and the quarry access road would be part of the first activities undertaken on the Project Site following receipt of project approval and all relevant approvals, permits and licences.

Construction of the quarry access road would involve the removal and stockpiling of surface topsoil, the installation of any required roadside drainage controls, and the placement of suitable sub-base and base-coarse materials preferentially sourced from the early development stages of the quarry area.

The creek crossing will be box culvert or possibly a prefabricated concrete bridge and will be designed in detail before the Project commences. The aim of the design will be to maintain the natural morphological features of the stream as much as possible. The NSW Fisheries (2003) outline the policy and guidelines that apply for providing fish-friendly crossings. The design would also consider the requirements of DECC, DWE and SCA.

Comprehensive guidelines for crossings such as this are contained in Witheridge 2002 and Faithfull and Witheridge 2003.

Special measures will be adopted in a detailed Soil and Water Management Plan for this creek crossing, following the guidelines of Chapter 5, Landcom, 2004.

Heavy Vehicle Haul Road

Throughout the life of the quarry, a heavy vehicle haul road would be maintained to provide access between the truck parking area, the quarry and the rock processing area. The heavy vehicle haul road will be the route for transfer of rock from the quarry pit to the rock processing plant. It will also enable heavy vehicles to access the truck parking area and the maintenance workshop for parking overnight or for maintenance and refuelling.

This haul road would be extended and re-aligned during the life of the quarry, as required and because it will not be sealed, it would be watered regularly to suppress dust. The road would be up to approximately 15-20m wide and constructed with suitable overburden material from the quarry area. Earthen windrows up to 50% of the maximum wheel height on site would be constructed on one or both sides of the road as a safety measure.

Gunlake would construct and maintain a haul road to provide a transport route for vehicles to access and leave the quarry. The location of the haul road should not vary as quarrying progresses.

The haul road would be hard rock material left in-situ and would be:

- a minimum of three times the width of the largest haul truck (typically 15m to 20m wide for dual access roads);
- sheeted with suitable overburden materials recovered during quarrying operations; and,
- established with a gradient of between 10^{o} to 15^{o}.

Run-off water leaving haul roads and haul roads and any sediment it contains would be directed to sumps within the quarry area or to purpose-built sediment basins adjacent to the haul road.

Other Roads

The development of the Gunlake Quarry would require the construction of a network of temporary unsealed haul roads to permit the transportation of topsoil, subsoil and overburden. Gunlake intends to minimise the number of internal roads constructed.

2.6.4 Proposed Saleable Product Transport Route

Figure 2.2 and **Figure 2.3** show the proposed saleable product transport routes and proposed intersections. The route was identified by Gunlake with the assistance of Chris Hallam and Associates Pty Ltd whose detailed assessment of the route is summarised as Part 4B.1 in the Environmental Assessment and included as Part 1 in the *Specialist Consultant Studies Compendium*.

It is proposed that the finished products will be hauled by road from the Project Site direct to the Sydney market and to other markets to the north and south of Marulan. Approximately 80% of the products will be transported to the north of Marulan.

The proposed saleable products transport routes from the Project Site to the Hume Highway (Freeway) will operate in two distinct stages.

Stage 1 will operate in the initial years of the quarry development and cater for up to an average of 25 truck movements per day. This is estimated to be between 3 to 5 years during which time the Hume Highway (Freeway) would be accessed via Brayton Road to the Marulan interchange near the RTA Checking Station. All loaded trucks will access the Hume Highway via this interchange. Trucks returning from the north will enter Brayton Road from the interchange. Trucks from the south (approximately 2 – 3 per day) would off-load near the Highway Service Centre and travel through Marulan town centre to access Brayton Road.

As production increases, a By-pass route north of Marulan will be constructed to allow product destined for northern markets and all returning trucks (from north and south) to bypass Marulan.

Stage 2 will involve the construction of this new by-pass road to connect Brayton Road to Red Hills Road and will involve an estimated 100 truck movements per day. This Stage will be implemented before truck movements exceed an average 25 truck movements per day through Marulan. Trucks travelling north on the Hume Highway (Freeway) will use this new By-pass road. Trucks travelling to markets located south of Marulan (an average of 25 per day for the life of the quarry) will continue to access the Hume Highway through the Marulan interchange as in Stage 1. However, during Stage 2, there will be no haulage on this route outside the hours of 6am-6pm Monday to Saturday.

Trucks returning from the north during Stage 2 will off load at the Marulan interchange and perform a U-turn at a new roundabout constructed at the Brayton Road and George Street intersection prior to travelling north and turn left into Red Hills Road. Trucks from the south will also enter Red Hills Road via the same left hand turn. There will be no returning trucks on Brayton Road between Marulan and the new By-pass road during Stage 2.

Both the activities within the Project Site and the use of the proposed transport routes are fully assessed in this *Environmental Assessment*.

Gunlake has commenced consultation with Goulburn Mulwaree Council to develop a road maintenance and capital improvement agreement to cover transport route impacts associated with the movement of finished product. As is further discussed in Section 4B.1.5.2, the cost of the new By-pass road and the proposed upgrade of existing roads would be off-set against Gunlake's proposed levy. In addition Gunlake will seek a cost sharing agreement for the costs associated with the Hume Highway modifications and intersection upgrade.

Road design standards were obtained from various guides and standards including the Road and Traffic Authority's "Road Design Guide", "Guide to Traffic Generating Developments" and "Route Assessment Guidelines for Restricted Access Vehicles". In addition Goulburn Mulwaree Council has recently drafted provisions for heavy vehicle generating development.

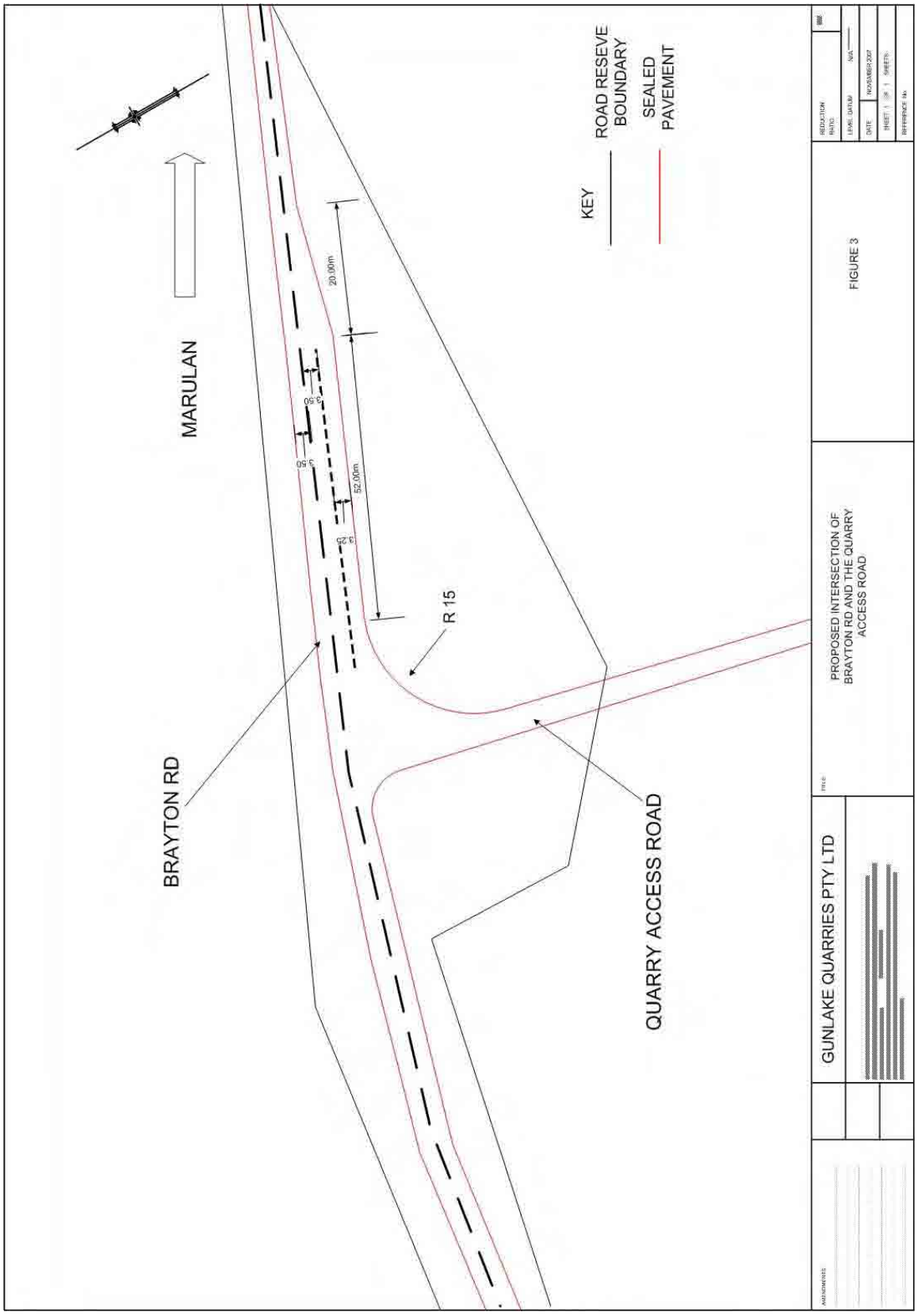
It is proposed to provide a 7m wide carriageway on all sections of upgraded and new road. The upgraded and new road sections would consist of 6m of sealed road surface with 0.5m of sealed and 0.5m of unsealed shoulder on both sides of the road. This construction will provide 7m of sealed carriageway as required by the Council draft provisions for heavy vehicle generating development. Where new culverts or bridges are constructed or where existing ones are extended there will be an 8m wide distance from barrier to barrier.

New intersection or intersection upgrades will be required at the intersection of the Quarry Access Road with Brayton Road, the intersection of the By-pass road with Brayton Road, the intersection of Red Hills Road with the Hume Highway and a new roundabout at the intersection of George Street and Brayton Road. **Figure 2.13**, **Figure 2.14**, **Figure 2.15** and **Figure 2.16** detail the proposed new and upgraded intersections.

Table 2.4 shows the improvements to the saleable product transport routes proposed to address identified traffic matters.

Table 2.4 Proposed Transport Route Improvements

Road Section	**Proposed Road Improvements**
Brayton Road	7m seal from site access to Johnniefelds Quarry entry. New intersection at Access Road and By-pass Road junctions.
By-pass road	New 7m sealed carriageway road connecting Brayton Road and Red Hills Road.
Red Hills Road	Upgrade to 7m total seal where required.
Hume Highway (Freeway)	New intersection at Red Hills Road junction
Brayton Road and George Street Intersection	New roundabout



Gunlake Quarry Project

Figure 2.13 Brayton Road and Quarry Access Road Intersection

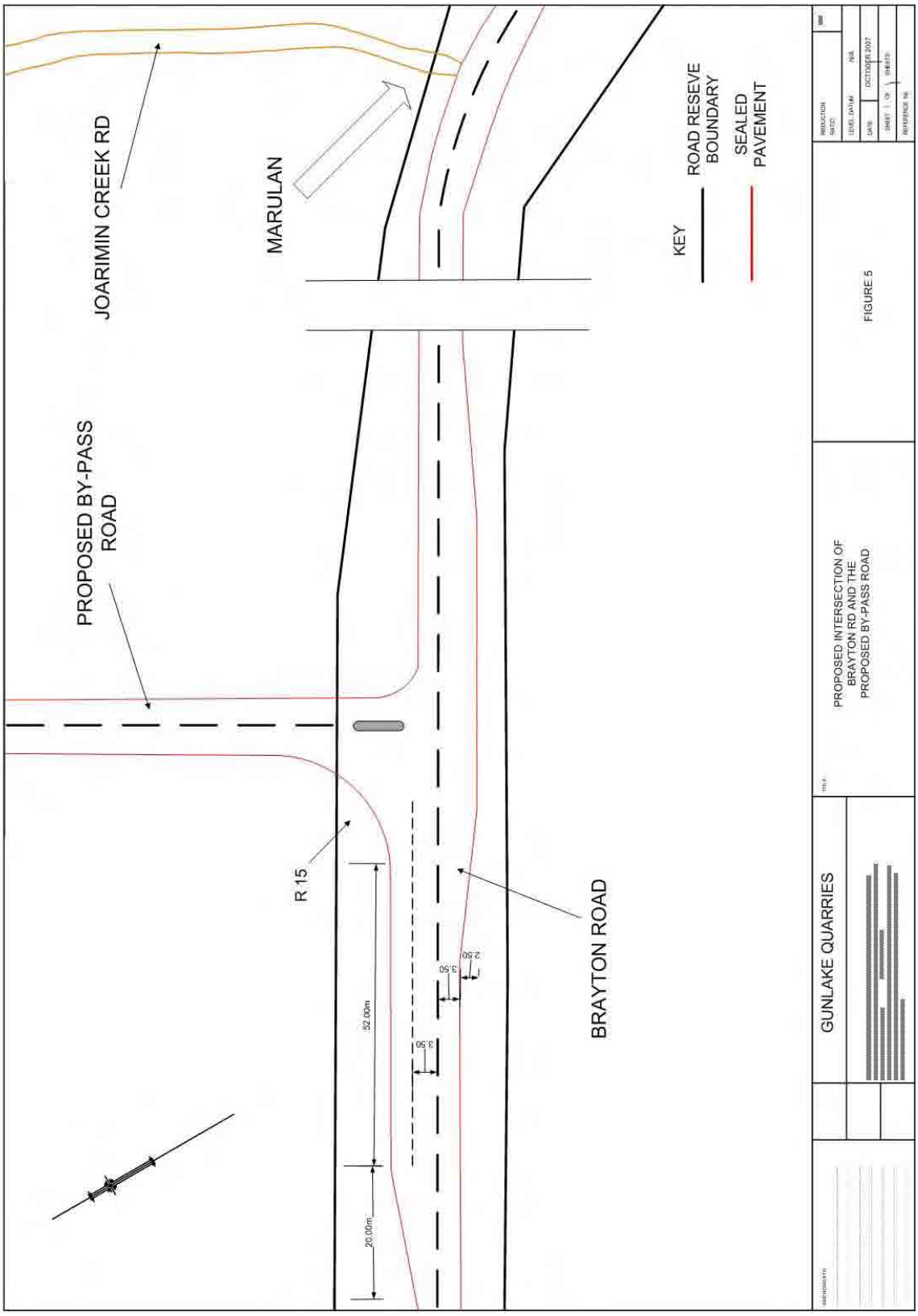


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Figure 2.14 Brayton Road/Bypass Road Junction

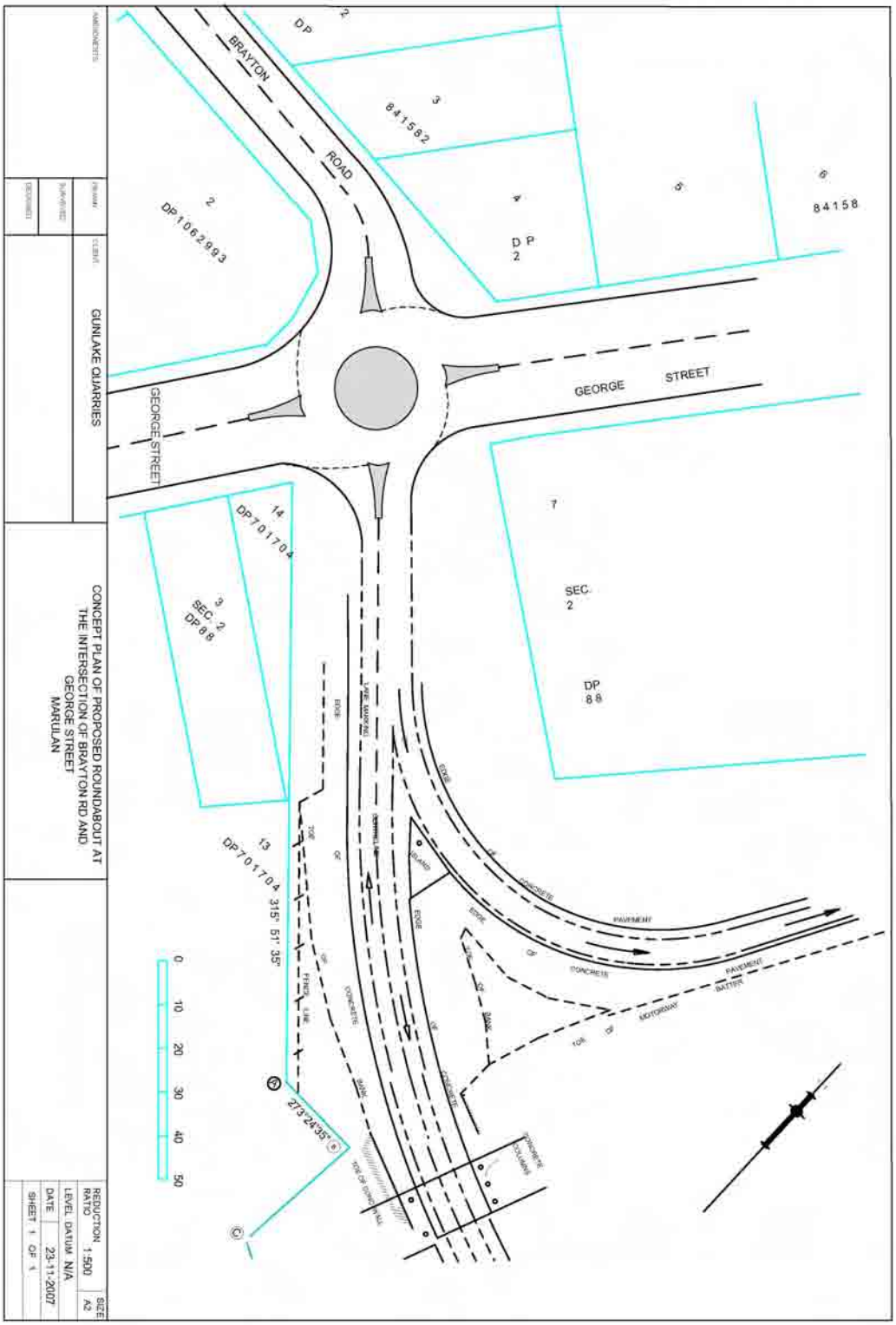

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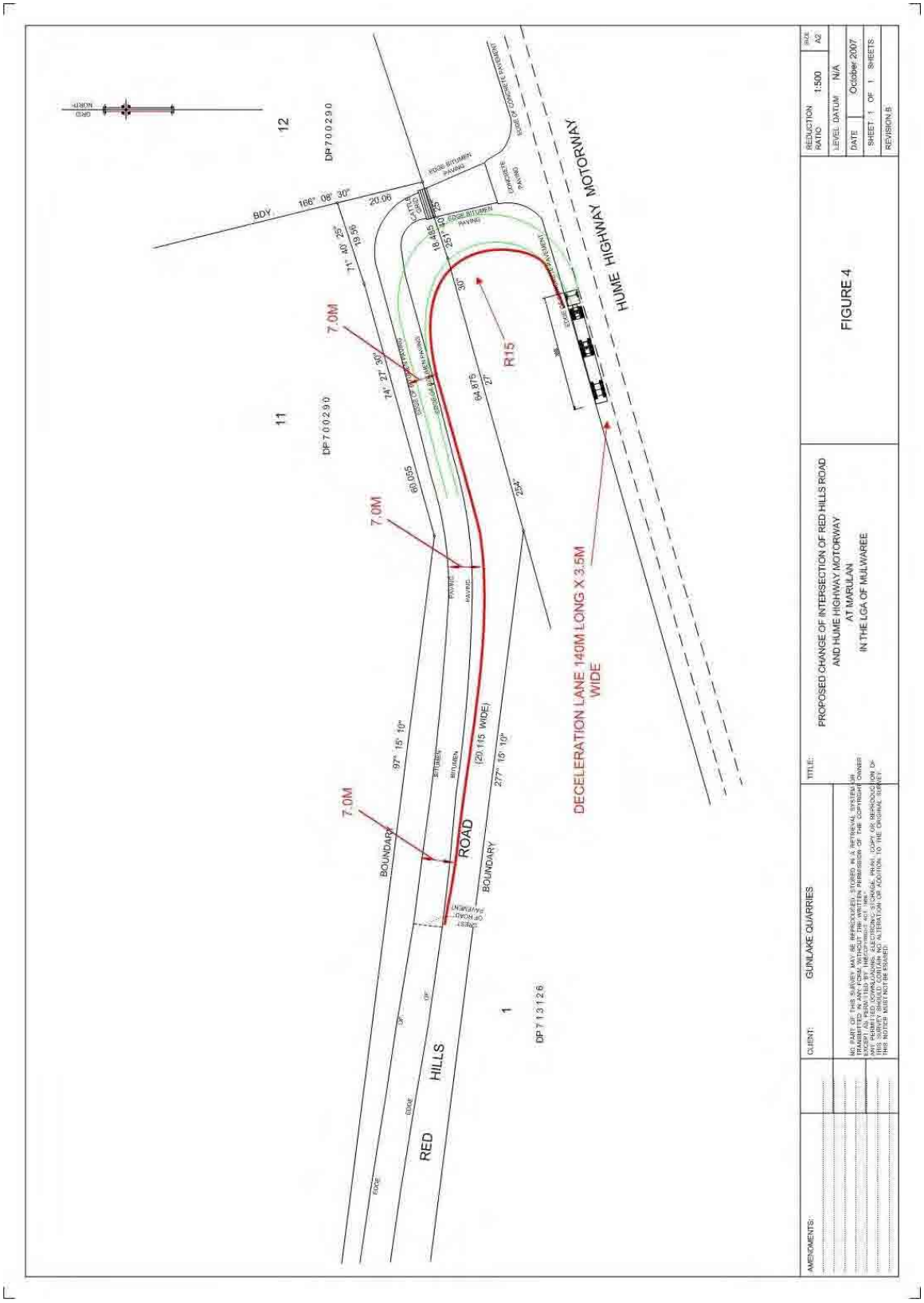
Figure 2.15 George Street and Brayton Road Intersection Roundabout



Gunlake Quarry Project

Figure 2.16 Hume Highway / Red Hills Road Intersection

2.7 Hours of Operation and Project Life

The hours of operation for the Gunlake Quarry would vary according to the activity. **Table 2.5** details operating hours of the various activities proposed.

Table 2.5 Proposed Operating Hours - Gunlake Quarry

Task	Proposed Hours
Overburden removal	7am to 6pm Monday to Saturday
Drilling	7am to 6pm Monday to Saturday.
Blasting	8am to 5pm Monday to Friday
Quarrying and Processing	7am to 6pm Monday to Saturday
Maintenance	24 hours 7 days.
Truck Loading and Haulage**	9pm Sunday to 6pm Saturday

Note:** After construction of the By-pass road there will be no haulage through Marulan outside the hours 6am to 6pm Monday to Saturday.

Gunlake is seeking approval to supply 500,000tpa of aggregate from the Gunlake Quarry for a period of 30 years. This level of production would not exhaust the hard rock resource within that time period.

2.8 Employment

2.8.1 Site Establishment

Construction of the quarry entrance, internal roads, public road intersections, site facilities area and processing area would be undertaken prior to the quarrying, processing and transportation of any saleable products.

This construction work is expected to take approximately 3 months with an estimated workforce of up to 10 full-time equivalent persons. Minor modifications to the processing plant will be undertaken during the first three years of operation mainly converting the mobile processing plant into fixed plant. This will be essentially a maintenance activity and will not form part of the initial construction activity.

2.8.2 Operations

The quarry would be operated with a typical workforce of 20 full-time employees. **Table 2.6** identifies the projected quarry workforce required to produce 500,000tpa of saleable products, using the quarrying equipment fleet identified in Section 2.3.6 and working the projected one-shift quarrying and processing operation.

Table 2.6 Indicative Direct Employment for the Proposal

Position/Function	Full-time
Quarry Manager	1
Office Staff	3
Workshop	3
Equipment Operators	10
Apprentices	3
TOTALS	**20**

In addition to the on-site employees, 25 persons would be employed in saleable product transportation. The 20 on-site personnel would be direct employees of Gunlake whereas the 25 truck drivers may be a mix of Gunlake employees and private contractors.

Quarry support personnel would also be expected to visit the quarry on an "as needs" basis including cleaners, rubbish removal contractors, specialist tradespersons and sales representatives, environmental and quarry planning consultants, as well as Gunlake's senior management personnel.

The quarry workforce would comprise a core workforce with experience in hard rock quarrying or related industries. Gunlake would implement a policy that encourages employment of local district personnel.

2.9 Waste Management

The principal wastes that would be generated by the Project can be categorised as non-production and production wastes.

Non-production wastes would include:

- general domestic-type wastes from the on-site buildings and routine maintenance consumables;
- fencing materials;
- oils and greases; and
- sewage.

Production wastes would include:

- overburden from the development of the quarry;
- potentially contaminated water from the maintenance workshop, washdown pad and fuel storage areas: and
- tyres

2.9.1 Management of Non-Production Wastes

2.9.1.1 Domestic-type Wastes and Routine Maintenance Consumables

All paper and general wastes originating from the site facilities area, together with routine maintenance consumables from the daily servicing of equipment would be disposed of in 205L drums and 240L mobile garbage bins located adjacent to the various buildings. These bins would generally be collected weekly and the contents placed in large waste storage receptacles or dumpsters positioned adjacent to the maintenance workshop to await removal by a licensed industrial waste collection contractor. Industrial waste collection would be undertaken monthly, or more frequently if required.

Separate collection systems would be employed for recyclables such as paper and cardboard, drink containers and ferrous and non-ferrous metals, each of which would be despatched off-site at appropriate intervals.

2.9.1.2 Oils and Greases

Routine maintenance of quarrying and earthmoving equipment would generally be undertaken in the maintenance workshop within the quarry facility area, or at equipment maintenance facilities away from the site. Within the maintenance workshop, waste oil would be collected and pumped to bulk storage tanks by oil evacuation pumps. Emergency or breakdown maintenance of equipment may also be necessary within the quarry pit, on the overburden emplacement bund wall, along the heavy vehicle haul road or within the processing area. Under these circumstances, oils and grease would be pumped from this equipment to a tank on a service vehicle using an evacuation pump and then transferred to the bulk storage tank at the maintenance workshop. All parts and packaging would be collected and transferred to the maintenance workshop for disposal, or recycling.

Waste oils and grease would be stored in a bunded area at the maintenance workshop and collected by a licensed waste recycling contractor approximately once every month for recycling.

The quarry machinery and plant will have auto greasing capability and waste grease will not be a large item. If any waste grease is generated it will be handled with the waste oil.

2.9.1.3 Fencing Materials

Fencing materials removed as part of site establishment would be either set aside for re-use or the wire coiled and delivered to a location or facility that manages metals for recycling.

2.9.1.4 Sewage

Gunlake would install adequate toilet and ablution facilities within the site facilities area for the site workforce and visitors. These facilities would incorporate an aerated wastewater treatment system (AWTS) that will provide secondary treatment effluent suitable for disposal by irrigation and Gunlake would irrigate the effluent within a designated area on the Project Site.

All domestic wastewater will be collected and treated in the AWTS. Due to the shallow, clay-rich soils, an AWTS is the best treatment system and will provide secondary treated effluent suitable for disposal by irrigation.

These facilities would be serviced by a licensed waste collection and disposal contractor, as required. A dedicated 1000m^2 irrigation field will be established to accommodate the predicted wastewater generated on site. The location of this irrigation field is shown on **Figure 4B.9**.

SEEC Morse McVey estimated that 1,000L/day of domestic wastewater will be generated by the offices and workshop. The required irrigation area is taken as the largest value given by hydraulic and nutrient balances as described in DLG, 1998. These balances are included in Appendix 8 of the Morse McVey Report (Specialist Consultant Studies Compendium Part 2, Volume II Environmental Assessment). Based on the phosphorus balance, the largest value is 690m^3. A dedicated irrigation field would be provided and serviced by semi-fixed, surface spray irrigation. The irrigation area has been selected to have a soil cover no less than 500mm and is no closer than 100m to a watercourse.

The irrigation area will be fenced off from public access and signs would be installed informing staff that treated wastewater is being reused for irrigation.

2.8.3 Management of Production Wastes

2.8.3.1 Overburden

During the construction of the rock process area pad and the intial quarry area all overburden will be placed in an overburden emplacement bund wall on the north east side of the rock processing area (**Figure 2.8**). Approximately 120,000 cubic metres of overburden material will be placed in the bund wall. This consists of 111,000 cubic metres removed from the surface of the rock processing area and 9,000 cubic metres from the initial quarry area.

Subsequent to the buiding of the bund wall, overburden from the quarry area will be placed within the quarry and will be generated at approximately 9,315 cubic metres per year at full production. The overburden does not contain sulphidic rock material or soils.

2.8.3.2 Potentially Contaminated Water

There is potential to generate water contaminated with hydrocarbons around the maintenance workshop, washdown pad and fuel storage areas. This water will be directed to pass through an oil separator. Collected oils will be collected and stored with other waste hydrocarbons and recycled by a licensed contractor. Uncontaminated water will pass from the oil separator into the surface water collection system.

2.8.3.3 Tyres

Quarry trucks and machinery will generate a small number of waster tyres. It is expected that there will be approximately 10 waste tyres per annum. Waste tyres will be stored on site and will be sent to appropriately licensed land fills as required.

2.8.4 Waste Classification

Table 2.7 classifies the waste materials according to Section 3 of the Department of Environment and Conservation publication, *"Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes"*.

Table 2.7 Waste Stream Classification

Waste Stream	Classification
Domestic type wastes and routine maintenance consumables. Separated into recyclable and putrescible materials.	The recyclables are Non-liquid inert wastes. The putrescible materials are non-liquid solid wastes. (Table 1 of the Guidelines).
Fencing materials. Recycled or directed to licensed landfill.	Non-liquid inert waste (Table 1 Guidelines. Building and demolition waste).
Oils and greases. Collected, stored on site and collected by a recycling contractor as required).	Liquid. Group A waste. Beneficially re-used. (Table 5 Guidelines).
Sewage Treatment. Spray irrigation to defined and prepared area.	Liquid. Group A waste. Beneficially re-used. (Table 5 Guidelines).
Overburden.	Non-liquid. Inert waste (Table 1 of Guidelines).
Potentially contaminated water. Hydrocarbons removed. Uncontaminated water directed to surface water system.	Oils and greases recycled. Liquid. Group A waste. Beneficially re-used. (Table 5 Guidelines).
Tyres	Non-liquid. Inert waste (Table 1 of Guidelines).

2.9 Safety / Security Management

2.9.1 Introduction

Gunlake would implement procedures and controls to protect the safety of its own or contracted employees, visitors to the quarry, the public as well as local land owners and land users. Measures would also be implemented to ensure the security of the quarry facilities and equipment from unauthorised access or use.

It is Gunlake's policy that each person employed on or visiting the Project Site is provided with a safe and healthy working environment and to achieve this, Gunlake would implement a recruitment, induction and training program to achieve the following objectives:

- To ensure compliance with statutory regulations and maintain constant awareness of new and changing regulations.
- To eliminate or control safety and health hazards in the working environment in order to achieve the highest possible standards for occupational safety.
- To ensure the suitability of prospective employees through a structured recruitment procedure.
- To provide relevant occupational health and safety working practices and job training.
- To conduct regular safety meetings and provide an open forum for input from all employees.
- To provide effective emergency arrangements for all employees and general public protection.
- To maintain good morale and safety awareness through regular employee assessment and counselling, if required.
- To ensure all contractors adopt Gunlake's policy objectives and maintain safety standards at all times while working on its premises.
- To develop public awareness of the safety standards and objectives at the proposed Gunlake Quarry.

Central to all aspects of site security and safety at the proposed Gunlake Quarry would be:

- the adoption of a pro-active approach to employee and public safety;
- strict compliance at all times with the requirements of the:
  - Dangerous Goods Act 1975
  - Occupational Health and Safety Act 2000
  - Occupational Health and Safety regulations 2001
  - All other relevant legislation and Australian Standards, and,
  - WorkCover Authority;
- an Occupational Health and Safety Policy to cover all component activities at the quarry.

An Occupational Health and Safety Management System and a Major Hazard Management System would be developed.

2.9.2 Safety / Security Measures

Gunlake would implement the following measures in association with the development of the quarry:

(i) Erection or maintenance of stock fencing, where required, around the areas of activity within the Project Site. This fencing will enclose the quarry access road, the overburden emplacement bund wall, the processing area and the quarry pit. Internal fencing would also be established and/or maintained to enable the continuation of agricultural activities in those areas not designated for quarry-related activities or natural regeneration.

(ii) Maintain a lockable gate at the quarry entrance at Brayton Road. This would be the only public access point to the Project Site and would be locked whenever quarrying and associated activities are not being undertaken. Security cameras would be installed around the office workshop, processing plant and where vehicles are parked.

(iii) Position security/warning signs at strategic locations around or within the Project Site indicating the presence of earthmoving and mining equipment, deep excavations and steep slopes. The positioning of signs would depend on the location of the quarrying activities at any one time. Signs identifying blasting procedures and times would also be installed adjacent to the quarry access road and entrance. The signs would be positioned to alert employees/visitors entering the site and passing motorists of the proposed time of the blast on or before that day, if one is to be initiated.

(iv) Employee induction in safe working practices and regular follow-up safety meetings and reviews.

(v) Installation of bunds along the margins of internal haul roads created on slopes to a height of half of the height of the largest wheel on site.

(vi) Implement appropriate controls with respect to the use of explosives to ensure compliance with statutory requirements at all times.

(vii) Ensure that Gunlake's blasting contractor utilises correct blasting procedures to contain the fragmented rock and to minimise the generation of ground and air vibrations.

(viii) Ensure all earthmoving equipment is fitted with appropriate safety equipment eg. rollover protection structures and seatbelts, an operating reversing alarm (or other approved warning device) and an approved location and method of operation for the fire suppression system, all of which would be maintained in good condition and operated safely at all times.

(ix) Ensure all size reduction and screening equipment at all times complies with all relevant requirements and standards.

(x) Strictly complying with all project approval and licence conditions.

(xi) Erection of advisory signage, such as "Trucks Entering 200m", on public roads prior to intersection with the proposed saleable product transport route.

(xii) Ensure all trucks transporting product from the quarry are roadworthy, well maintained and are driven in a safe and courteous manner.

2.10 Rehabilitation and Decommissioning

2.10.1 Introduction

Gunlake would adopt a progressive approach to the rehabilitation of disturbed areas within the Project Site to ensure that, where practicable, areas where quarrying or overburden placement are completed are quickly shaped and vegetated to provide a stable landform.

At the completion of 30 years of quarrying, there will still be hard rock reserves at the Gunlake Quarry. Although it is difficult to predict the proposed development at that time. It is highly likely that further quarrying would occur. Consequently, Gunlake do not propose to develop a final rehabilitation plan at this stage. If, during the operational life of the quarry, it is decided to no longer operate at the Gunlake Quarry, a closure rehabilitation plan would be developed at that time.

2.10.2 Objectives

Gunlake's rehabilitation objectives for all areas of quarry-related disturbance within the Project Site can be defined in the short term and long term.

In the short term, the objectives would be to stabilise all earthworks, drainage lines and disturbed areas no longer required for quarry-related activities in order to minimise erosion and sedimentation, and to reduce the visibility of the activities from surrounding properties and the local road network. Erosion control would be achieved by the early establishment of a ground cover while appropriately positioned tree lot plantings would assist in creating a visual screen to adjacent vantage points.

In the long term, Gunlake's objectives are to:

- provide a low maintenance, geotechnically stable and safe landform, which is commensurate with the future land uses on and around the Project Site;
- blend the created landforms with the surrounding landform as far as possible; and
- revegetate with native tree, shrub and grass species and/or pasture species.

2.10.3 Final Landform

Figure 2.17 presents the conceptual final landform within the Project Site at the completion of the 30 year quarry life.

The overburden emplacement bund wall would be rehabilitated to create a hill in the final landform. The created hill would have slopes no greater than 1:2.5.

The crest of the hill formed by the overburden emplacement would be approximately 662m AHD, ie. approximately 13m above current surface levels on its eastern side and approximately 11m above current surface levels on the western side. The base of the quarry area would be at approximately 582m AHD. Where required, surface water would be directed off the overburden emplacement bund wall via rock flumes. These would prevent gully erosion by dissipating energy and providing a non-eroding surface. Surface runoff water would be directed around the quarry.

The final landform would also incorporate a series of contour banks whose spacing and ultimate dimensions would be a function of the final slopes and catchment areas. The spacing and dimensions of these structures would be determined at the time of installation in consultation with the local officers of Soil Services however, would typically range between 50m and 100m.

2.10.4 Decommissioning Activities

On cessation of quarrying and processing activities, a number of structures and facilities would be decommissioned and removed as part of the rehabilitation of the Project Site including:

- the processing plant;
- various fuel storage, workshop and site buildings; and
- roads not to be maintained in the final landform.

Aggregate Processing Plant

In the event Gunlake does not intend to re-use the plant, they would attempt to identify a buyer for the plant in its entirety or in part. Should Gunlake successfully negotiate the sale, the plant would be separated into various sections and transported by road to its intended destination.

Following the removal of all retrievable saleable products, the landform within the aggregate processing area would be profiled to blend with the surrounding landform. Topsoil would be returned and the area seeded and fertilised to enable agricultural activity to be resumed.

Miscellaneous Buildings and Structures

All demountable buildings and structures erected on the Project Site would be transported off site. The workshop constructed on site may be retained for use during the resumption of agricultural activities on the Gunlake property.

A thorough inspection of the soil directly below and surrounding fuel storage and refuelling areas would be conducted to ensure any contaminated soil is identified. Gunlake would conduct a Phase 1 Hydrocarbon Contamination assessment and undertake appropriate action as determined by that review.

If any contaminated soil is identified at that time, it would be remediated and treated in accordance with DECC requirements.

Roads

The access to the processing area would be rehabilitated and agricultural activity restored. The road material would be removed and placed in the quarry pit and the stockpiled topsoil originally removed from the road area would be spread across the reformed road alignment.

2.10.5 Final Land Use

SEEC Morse McVey and Associates (SEEC) assessed the agricultural value of the land affected by the project. Their report is included in the *Specialist Consultant Compendium* and discussed in Section 4B2.2.

SEEC classified the land in Agricultural Suitability Classes 4 and 5. **Class 4** include lands best suited for grazing. Cultivation of occasional crops is possible in some areas, especially during favourable seasons. However, this can increase the erosion hazard substantially. Production levels are likely to be low. **Class 5** lands are suited to occasional light grazing, best under natural bushland. Other agricultural pursuits are not recommended.

SEEC concluded that the development of the quarry, its access road and the Marulan bypass would not affect any lands of significant agricultural value.

Figure 2.17 presents Gunlake's proposed final land use.

The property would be returned to agricultural use for grazing. Many of the water dams created to manage surface water during site operations would be retained for stock water. Surface runoff will be directed around the quarry pit to minimise the amount of water retained and maximise the amount of water re-directed to other dams on the property. Soil conservation treatment of the property would be discussed with Soil Services.

Following rehabilitation there will be two main new landforms on the Project Site:

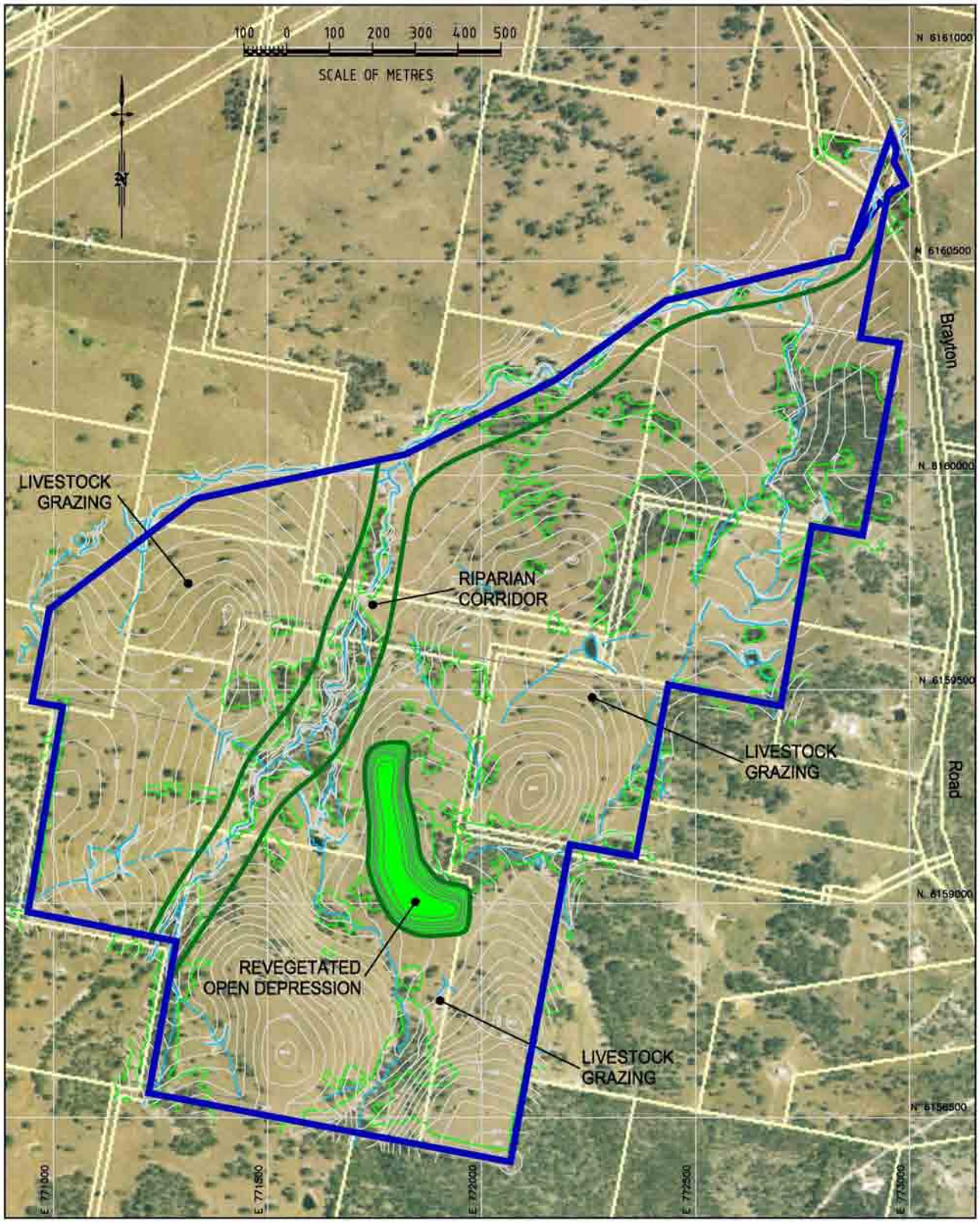
- The bund wall, and,
- The void representing the quarry pit.

2.10.6 Rehabilitation Procedures

All rehabilitation activities would be undertaken progressively throughout and at the conclusion of the life of the Gunlake Quarry. This will ensure that the direct transfer of subsoil and topsoil is maximised and the area of land remaining to be rehabilitated at the end of the quarry life is minimised.

2.10.6.1 Overburden Emplacements

Rehabilitation of areas disturbed as a result of overburden placement activities would be undertaken in the following five stages.



Gunlake Quarry Project

Figure 2.17 Final Landform and Land use

Stage 1. Overburden Placement and Shaping

Placement and shaping of the overburden to create slopes with gradients less than 1:2.5 would be undertaken in a manner which, wherever practicable, ensures that any friable or weathered materials are placed below the subsoil and topsoil layers as a cover over the more competent materials. This would avoid the exposure of large rocks on the final surface. An initial assessment of overburden materials did not identify any risk of acid generation or soluble salt formation and consequently, no specific handling or storage requirements would be required.

Stage 2. Subsoil and Topsoil Replacement

Subsoil and topsoil would be placed on the shaped landform in the reverse order to stripping, ie. subsoil then topsoil, with the materials being preferentially sourced from active stripping areas. If no such activity is being undertaken at the time, the soil material would be sourced from previously established stockpiles. The thickness of the topsoil and subsoil layers to be replaced would be determined on the basis of the actual volumes of these materials stripped as part of the quarrying activities. The subsoil layer would be spread on an even but roughened surface which has been ripped along the contour to break any compacted and/or smooth surfaces. Ripping would also assist the keying of the subsoil materials into the final land surface, encouraging ingress of water and minimising erosion.

Stage 3. Drainage Installation

Contour banks would be progressively installed on the rehabilitated landform. The dimensions of the individual banks would be determined on the basis of the individual sub-catchment areas, but would be typically less than 0.7m high and less than 3.0m^2 cross sectional area. Flumes would be constructed on the slopes of the final landform within the overburden emplacement to assist in controlling the flow of water off these slopes.

Stage 4. Agricultural Land Pasture Sowing

The topsoiled surface of those areas designated for a post-quarrying agricultural land use would be sown with a mixture of pasture species appropriate for the season. **Table 2.8** contains a proposed pasture mix for cool and warm seasons. The actual seed and fertilizer mix would be determined in conjunction with agronomists from the local Department of Primary Industries - Agriculture (DPI-A).

Stage 5. Native Vegetation Establishment

The topsoil surfaces of those areas designated for a post-quarrying habitat enhancement land use (**Figure 2.17**) would be initially stabilised with a non-persistent cover crop. A selection of locally occurring tree species would then be planted on those sections. The seed for these trees would be collected from trees occurring in the Marulan District. The seed would be used to raise nursery tube stock for planting in the prepared areas. The list of suitable tree species is included in **Table 2.9**. These were species identified in Appendix 1 of the Flora and Fauna Impact Assessment as being suitable for revegetation. Subject to the extent of establishment of natural vegetation from replaced topsoil, seed of locally occurring shrub species may also be broadcast to encourage the re-establishment of the shrub layer.

2.10.6.2 Water Management Structures

Where practicable, water management structures such as contour banks and drains would be constructed with longitudinal gradients, which permit the transfer of water at non-erosive velocities ie. <1:200 (V:H). Consequently, specialised rehabilitation treatments would generally not be required. Similarly, flumes constructed on the slopes of the bund wall emplacement would be retained and allowed to revegetate naturally. However, in the event that unacceptable levels of erosion are observed, fast growing species identified as having a particular soil conservation application and/or specialised treatments such as bitumen/jute meshing or rock lining would be implemented.

Table 2.8 Pasture Species Seed Mix

Season	Pasture Species	Rate (kg/ha)	Fertilizer
Warm Season Grasses	Bombatsi Panic	1-2	250kg/ha Di-ammonium phosphate
	Green panic[*2]	2-4	
	Rhodes Grass[*2]	1-2	
	Purple Pigeon Grass	1-2	
Annual Legumes	Subterranean Clover	4-5	
Cool Season Legumes[*1]	Barrel (Sephi) medic	2-4	
	Snail (sava) medic[*2]	3-5	
	Wooly Pod Vetch	4-6	
	Serradella (Elagara)	1-2	
	Lucerne	0.5	
Cool Season Grasses	Phalaris (Sirolan or Holdfast)	1-2	
	Wallaby Grass	0.3-1	
Notes: [*1] Inoculated with appropriate rhozobia [*2] Specific Soil Conservation application			

Table 2.9 lists the tree species that would provide the basis for all site revegetation.

Table 2.9 Tree Species Suitable for Revegetation

Scientific Name	Common Name
Eucalyptus amplifolia	Cabbage Gum
Eucalyptus blakelyi	Blakely'S Red Gum
Eucalyptus bridgesiana	Apple Gum
Eucalyptus cinerea	Argyle Apple
Eucalyptus eugenoides	Thin-leaved Stringybark
Eucalyptus macrorhyncha	Red Stringybark
Eucalyptus melliodora	Yellow Box
Eucalyptus rossii	White Gum
Eucalyptus sieberi	Silver Top Ash
Eucalyptus viminalis	Ribbon Gum
Leptospermum polygalifolium	Lemon-scented Tea-tree
Leptsospermum trinervium	Paperbark Tea-tree

Figure 2.18 shows a cross section of the quarry pit and a typical sketch of the revegetation treatment proposed for the remnant benches. Overburden will be strategically placed on the benches and covered with available topsoil material. These areas will be fertilised and either seeded or planted with nursery raised tubestock of the species listed in **Table 2.9**.

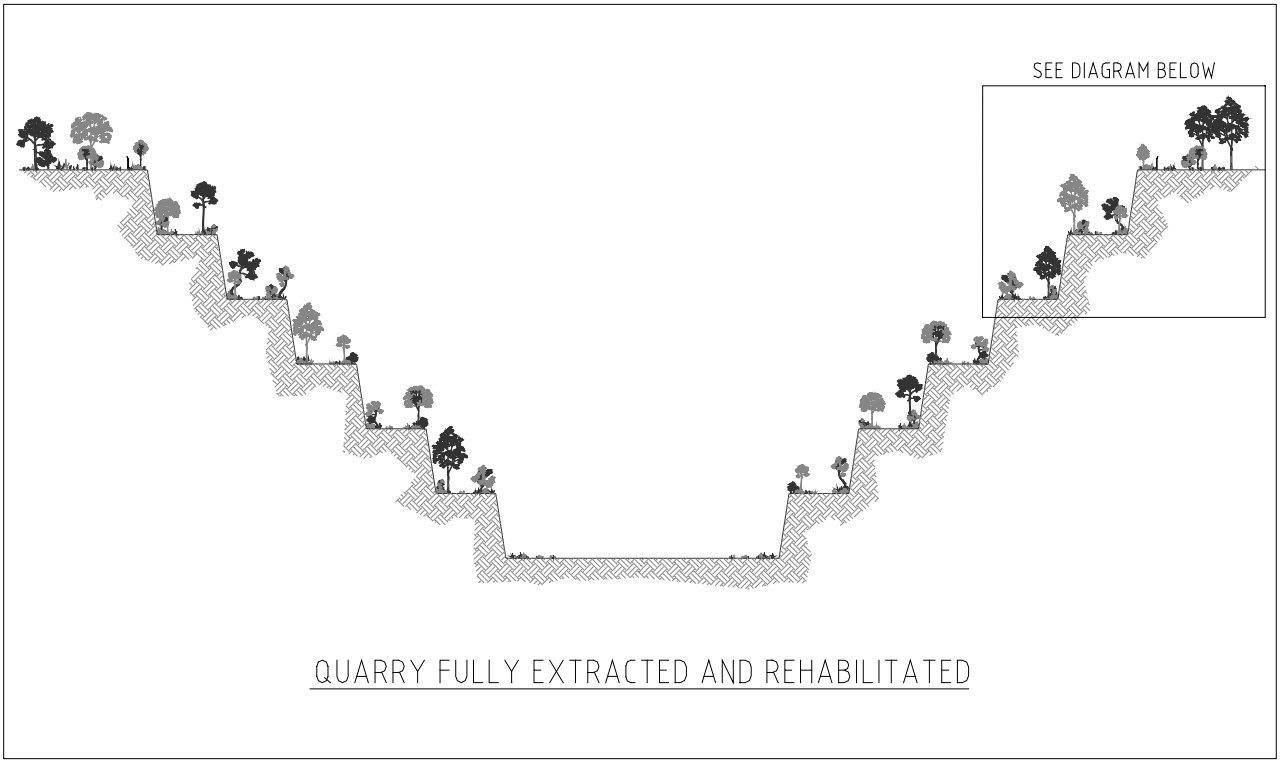
2.10.6.3 Other Disturbed Areas

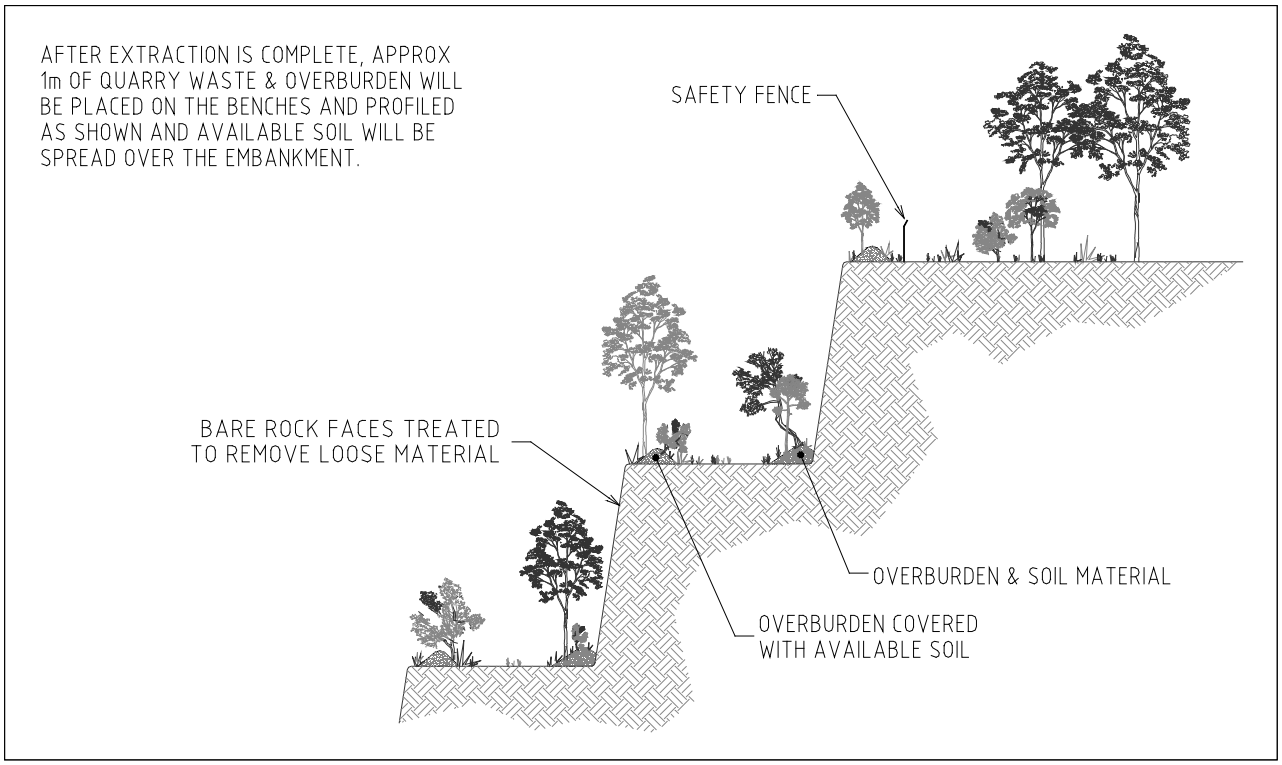
On completion of all quarry-related and associated activities, Gunlake would:

- remove, rip or otherwise rehabilitate all on-site roads not required for ongoing management of the property;
- rip the compacted rock on hardstand areas, shape the area to the designed landform, replace previously stockpiled subsoil and topsoil and apply seed and fertilizer;
- install appropriate drainage controls; and
- re-install fencing and gates at appropriate locations.

2.10.7 Rehabilitation Monitoring and Maintenance

Gunlake would undertake an ongoing monitoring and maintenance program throughout and beyond the operation of the proposed Gunlake Quarry. Areas being rehabilitated would regularly be inspected and assessed against the short and long term rehabilitation objectives outlined in Section 2.11.2. During regular inspections, aspects of rehabilitation to be monitored would involve:





Gunlake Quarry Project

Figure 2.18 Quarry Pit Revegetation

- evidence of any erosion or sedimentation from areas with establishing vegetation cover;
- success of initial grass cover establishment;
- success of tree and shrub plantings and direct seeding;
- adequacy of drainage controls; and
- general stability of the rehabilitation site.

Where rehabilitation success appears limited, maintenance activities would be initiated. These may include re-seeding, and where necessary, re-topsoiling and/or the application of specialised treatments such as composting mulch to areas with poor vegetation establishment. Tree guards would be placed around planted seedlings should grazing by native animals be excessive. If drainage controls are found to be inadequate for their intended purpose or compromised by grazing stock or wildlife, these would be replaced and/or temporary fences installed to exclude grazing of native vegetation by native or domestic fauna.

Should areas of excessive erosion and sedimentation be identified, remedial works such as importation of additional fill, subsoil or topsoil material or redesigning of water management structures to address erosion would be undertaken.

It is envisaged post-quarrying rehabilitation monitoring and maintenance would be undertaken for at least 2 years following the completion of all rehabilitation. The exact period would reflect seasonal conditions during that period. In any event, maintenance would continue until such time as the objectives have been achieved.

2.10.8 Noxious Weed Management

Gunlake would take the necessary precautions to prevent excessive development of weeds within the rehabilitated areas. When appropriate, this would include campaign weed spraying prior to the stripping of topsoil. The appropriate noxious weed control or eradication methods and programs would be undertaken in consultation with the DPI-A and/or the local Goulburn Mulwaree Council Noxious Weeds Inspector.

2.10.9 Offset Strategies

The Project does not involve significant clearing of native vegetation.

Gunlake propose to undertake some replanting of riparian corridor habitat in the major creek lines on the Project Site. These creek lines are not adversely affected by the proposal, however, Gunlake will seek to enhance the local habitat resource by undertaking re-establishing riparian habitat along sections of creek line that have been adversely affected by previous land use.

The Department of Natural Resources has undertaken an assessment of Riparian Corridor Objective Setting in the general area of the proposed Gunlake Quarry. They classified Chapman's Creek as a Category 2 Stream – Terrestrial and Aquatic Habitat Classification. The proposed revegetation will be consistent with the recommendations of this Category 2 classification.

2.11 Development Alternatives

2.11.1 Introduction

An *Environmental Assessment* needs to analyse any feasible alternatives to carrying out the proposed development or activity, having regard to its objectives, including the consequences of not carrying out the development or activity. The following alternatives were considered by Gunlake during the planning stages for the Project but were rejected in favour of the components incorporated earlier in this section.

The "no development" option, ie. the consequences of not developing the proposed Gunlake Quarry, are discussed in Section 6 of this document.
The consideration of feasible alternatives to the activities proposed relate principally to:

- the Project Site layout and design;
- the proposed aggregate transport system route; and
- hard rock supply source.

2.11.2 Project Site Layout and Design

The Project Site layout and design represents a practical use of the site with minimised heavy quarry vehicle travel distances and visual and acoustic screening.

The critical parameter for layout and design is the location of the quarry pit. A number of different locations were possible and the selected site provides ready access to the hard rock resource while the surrounding topography and vegetation provides screening and buffer zones to the proposed activity.

Once the quarry pit was selected the Project Site layout and design reflected a practical selection of the location for the access haul road, site offices and processing area.

The location of the out of quarry overburden emplacement was based on providing a visual and acoustic screen to the operations especially the rock processing area.

2.11.3 Proposed Aggregate Transport System and Route

Given the need to service diverse and relatively small markets, trucking was the only viable option for transport of saleable product. Rail transport was not a viable alternative.

There is no road alternative to Brayton Road.

2.11.4 Hard Rock Supply Source

It is widely recognised that concrete plants require their own supply source of hard rock. This enables the plant to operate with a secure supply source and with the ability to receive aggregate on a "just-in-time" basis. This concrete plant can then operate within closely developed areas without the need for on site storage of aggregate.

2.11.5 Trucks Returning to Site

Selection of a suitable route for trucks to return to site during Stage 2 of the development (ie. after the construction of the By-pass Road) was dependent on satisfying the requirements of the Roads and Traffic Authority, Goulburn-Mulwaree Council and Gunlake.

Gunlake investigated a sequence of possible truck return routes as follows:

- Continuation of trucking through the Marulan Interchange,
- Construction of a U-turn facility at the Marulan Interchange,
- Utilising an existing U-turn facility at Portland Avenue, and,
- Construction of a new roundabout at the intersection of George Street and Brayton Road.

After consideration of all these possible options and discussions with the RTA and Council, Gunlake was encouraged to select the George Street roundabout. Further details of each option and their potential impacts are described in Section 4B.

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