

OBERON QUARRIES

Proposed Extended Life of Operations
and Development Changes to Oberon
Quarry – Environmental Impact
Statement

January 2015

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Development Changes to Oberon Quarry –
Environmental Impact Statement

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Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Oberon Quarries Pty Limited

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Report No. **1296/R31/FINAL**
Date: **January 2015**



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Executive Summary

Background

An Environmental Impact Statement (EIS) was prepared in 1992 by Resource Planning Pty Limited to support the development application (DA 92/164) for the operation of the quarry. The Minister for Planning, following a Commission of Inquiry, granted development consent for the quarry subject to a range of conditions on 1 October 1993. The development consent as approved provides for the maximum annual production rate of 400,000 tonnes, with a maximum daily production limit of 2000 tonnes. The consent also limits the maximum average annual rate to 200,000 tonnes over any consecutive 10 year period within the 20 year life of the quarry.

Since 1995 Oberon Quarries Pty Limited (Oberon Quarries) has produced crushed aggregates from a high quality hard rock quarry at 'Langley Heights' on Shooters Hill Road, approximately 4 kilometres south of Oberon. Oberon Quarries has established roads, a crushing and processing plant, administration facilities and water management infrastructure, and extracted 2.7 million tonnes (Mt) from a 12.7 Mt approved high quality basalt resource.

Extraction occurs from below the skyline and within the perimeter of Racecourse Hill. This visually and acoustically screens the ongoing extraction operations from the surrounding area. Runoff from the extraction and processing areas is contained and diverted to a series of sedimentation dams. The existing water management system is designed to accommodate runoff from a Probable Maximum Precipitation (PMP) rainfall event for an area of 21 hectares.

Oberon Quarries has been operating for the last 20 years with negligible environmental impact and no community complaints since 2010.

The Project

In order to improve efficiency and environmental performance of the quarry operations, in addition to furthering the life of the quarry for extraction of proven reserves, Oberon Quarries is seeking consent to extend the life of the quarry DA 92/164 under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for an additional 30 years. The Project is declared to be a State Significant Development under the provisions of the State Environmental Planning Policy (State and Regional Development) 2011, and the Minister for Planning and Environment will be the consent authority for the development.

In addition to the continuation of the life of the quarry, there are also several proposed changes to operations at the site which are summarised as follows:

- retaining the current maximum production level of 400,000 tonnes per annum (tpa) and removing the requirement for production to not exceed an annual average of 200,000 tpa over a 10 year period;
- replacement of some of the existing screening plant, reconfiguration of the alignment of screens and the inclusion of an additional cone crusher;
- inclusion of a second diesel fuel storage tank of approximately 28,000 litre capacity;
- inclusion of a 1.0 hectare extension to the existing extraction area to avoid the sterilisation of approximately 500,000 tonnes of high quality basalt resource;
- inclusion of a Finlay 750e Hydrasander (or equivalent) to separate silt and clay from sand size particles in the crusher fines;

- duplication of approximately a 180 metre section of the internal haul road to improve road safety;
- continued extraction of the high quality basalt from the existing extraction areas as required, with extraction at times occurring on the upper and lower benches; and
- removal of redundant development consent conditions.

All other aspects of the approved quarry remain unchanged from current operations and will continue to be managed in accordance with existing site practices.

Risk Assessment

An environmental risk assessment was completed for the site during the development of the Preliminary Environmental Assessment (Umwelt, 2013) and through the review of the site for the annual Conditions Compliance Report required for the site under Condition 27 of DA 92/164 (completed March 2014). Findings of the assessment and the compliance review indicated that the proposed changes to the quarry site will not result in any significant adverse impacts on the surrounding area or fundamentally change quarry operations from those approved under DA 92/164 and subsequent modifications.

Consultation

Community and agency consultation is a fundamental element of the preparation of an EIS and necessary to assist in the determination of the relevant issues to be addressed. Oberon Quarries' approach to consultation has been to identify and then consult with the key agencies, stakeholders and community regarding the Project to assist in appropriately defining the scope of the EIS and to enable the ongoing operations to be responsive to community concerns. Issues raised during the consultation process have been considered during the preparation of the EIS.

The consultation program consisted of briefings with key government agencies to discuss key issues and proposed management measures. These agencies included the Department of Planning and Infrastructure (now the Department of Planning and Environment), Oberon Council, the Environmental Protection Authority (EPA)/Office of the Environment and Heritage (OEH) and the NSW Office of Water (NOW). Key stakeholders and the community (i.e. the surrounding landholders within the vicinity of the quarry) were engaged via individual meetings. During the meetings the Project and the potential impact on the community and environment were outlined and feedback sought on the proposed ongoing operations for incorporation in the EIS as appropriate.

Key Environmental and Community Issues

This EIS has identified potential impacts and key risks associated with the ongoing operations, as well as the mitigation measures proposed to ensure that any impacts associated with the proposed ongoing operations are reduced as far as is feasibly practical. An overview of the key risks and summary of environmental impacts from the detailed assessments is provided below.

Land Resources

The proposed 1.0 hectare extension area is located on Racecourse Hill plateau adjacent to the existing extraction area and is void of native vegetation with the area exhibiting improved grasslands for grazing of sheep and an exotic cypress windbreak. The land use surrounding the site is also grazing. There will be no impact on agricultural viability as a result of the extension.

All other physical modifications are proposed within existing operational areas; therefore they do not result in impacts on land resources which have not already been approved as part of the current operations.

Noise

A detailed noise assessment was undertaken which included the direct noise impacts associated with the ongoing operations and the cumulative noise impacts. The quarry has been operating without noise complaints for many years however has been generating noise levels under certain meteorological conditions in excess of the target project-specific noise level (PSNL) of 35 dB(A). Inclusion of new crushing and screening plant is estimated to reduce the existing noise at the nearby residential receivers by 3 dB to 6 dB, when compared to the current operations.

Modelling indicates that during the day, evening and night time period noise levels will not exceed the target PSNL of 35 dB(A) under calm conditions or under conditions associated with significant wind conditions as defined by the Industrial Noise Policy (INP) (EPA, 2000) at all surrounding residences except for the following:

- Under non-significant 3 metres per second (m/s) westerly winds noise levels of up to 41 dB(A) may be experienced at Location 1 (Hackfath) during quarry operations and 42 dB(A) during quarry operations and product dispatch. This is a 1 dB reduction in noise levels from existing operations under the same non-significant wind conditions. Mr Hackfath has stated that he does not find existing noise levels intrusive.
- Under temperature inversion conditions with a 2 m/s southerly drainage flow product dispatch on the private quarry haul road during evening and night time periods could result in noise levels of 38 dB(A) at Location 5 (Langley Heights). It is noted there is a commercial agreement between Oberon Quarries and the owner of Location 5.

Oberon Quarries is committed to the continuation of minimising the noise impacts from its operations and will implement mitigation and management measures to achieve this.

Blasting

Oberon Quarries' blasting operations (i.e. overpressure and vibration limits) are generally undertaken in accordance with DA 92/164.

Oberon Quarries has developed a Blasting Management Plan to control blasting operations at the site. The plan has been developed based on previous blast designs for the quarry. Over the last 18 years of operation no adverse blasting impacts have been reported by any surrounding resident. In 2012, blast overpressure limits were exceeded on two occasions. As part of the Blasting Management Plan, Oberon Quarries has implemented measures to ensure that such exceedances do not occur in the future. These procedures include ensuring that sufficient distance is maintained between the blast hole and the quarry face, halving the number of holes to be detonated in any blast from that used in 2012 and utilising two blast monitors for each blast. In addition the Quarry Manager has undertaken blasting training so that all blasts configurations and delays used can be thoroughly checked before the blasts are detonated. No adverse blasting impacts are predicted to occur as a result of the ongoing operations.

To minimise the potential for off-site impacts, the Maximum Instantaneous Charge (MIC) for any blast is varied depending on distance to nearest residence. The closest residence is 400 metres to the north of the quarry blasting area. Site laws developed for blasting at the site indicate that blast overpressure is the limiting factor in terms of charge size. Blast

overpressure limits can be complied with at 400 metres with a MIC of 45 kilograms or less. MIC can increase to 120 kilograms where the distance to the nearest residence is 550 metres or greater. Oberon Quarries uses 89 millimetre diameter drill holes which are filled with explosive to within 2 metres to 2.5 metres of the surface. The upper 2 metres to 2.5 metres of the drill hole is then filled with stemming material to minimise fly rock and prevent excessive blasting impacts. The explosive used weighs approximately 7.47 kilograms per metre length of drill hole. To limit the MIC, the depth of drill hole is varied to take into account the MIC that can be triggered. A Nonel delay system is used to control how many holes are detonated instantaneously thus controlling the MIC.

If blasting is to take place within 400 metres from a residence, a 45 kilogram MIC which would comply with blast overpressure and vibration criteria can be achieved by drilling an 8 metre deep hole 89 millimetres in diameter. The hole would then be filled with 6 metres of explosive (45 kilograms) and then using stemming material to fill the upper 2 metres of the hole. The Nonel delay system would then be used to ensure that only one hole is detonated at any one instance.

Where residences are 550 metres from blasting, a MIC of up to 120 kilograms can be used. This could involve two 10.5 metre holes with 8 metres of explosive and 2.5 metres of stemming being detonated simultaneously or a single 18.5 metres hole, comprising 16 metres of explosive and 2.5 metres of stemming material being detonated.

Maximum bench height at the quarry is less than 15 metres indicating that all blasting can be undertaken with a MIC of 120 kilograms or less if required.

Oberon Quarries has and will continue to manage its blasting impacts through ongoing monitoring and review of the blast design, so that the overpressure and vibration criteria are not exceeded at private residences unless agreed with the resident. With the ongoing adoption of appropriate controls and checks no adverse impacts from blasting are predicted to occur on residences, property or stock as a result of the proposed Project.

Air Quality

To assess the potential air quality impacts associated with the Project a detailed air quality assessment has been undertaken. The assessment includes the direct air quality impacts associated with the ongoing operations and the predicted cumulative air quality impacts.

There is no significant increase in footprint, maximum production levels or the overall nature of the already approved development. Modelling of predicted dust emissions from the Project are predicted to be below the EPA's PM₁₀, total suspended solids (TSP) and depositional dust goals.

The cumulative impact assessment found that EPA's annual depositional dust criteria are not expected to be exceeded at any of the surrounding residences. The annual cumulative PM₁₀ and TSP goals will also not be exceeded at any residence.

Given the nature of the infrastructure on site and the blasting regime and management measures, emissions from diesel and NO_x from blasting are likely to be negligible.

Oberon Quarries will continue to implement air quality mitigation and management measures to minimise any potential dust impacts.

Visual

A visual assessment was undertaken for the proposed Project to identify the potential visual amenity impacts. This assessment included a review of the surrounding topography and

travelling to key vantage locations. The assessment concluded that the natural topography, existing bunds, existing vegetation and distance of the quarry from surrounding residences and vantage points, heavily restrict the visibility of the quarry. The ongoing operations will not result in visual impacts above those considered as part of the 1993 development consent.

Surface Water

With the exception of the 1.0 hectare extension, the proposed Project components are located within the quarry's existing dirty water management system. Water within the quarry's existing water management system is captured within a series of on-site dams. Sediment Dams 1 and 2 have been constructed to have sufficient surcharge capacity to contain 1600 m³ runoff which is in excess of the runoff from the processing plant area from a 1 in 100 year 24 hour rainfall event of 154 millimetres of rain. The quarry floor has been designed to contain runoff from the 20 hectare extraction area from a Probable Maximum Flood event which is the equivalent of 380 millimetres of rainfall in 1 hour. This system can be readily augmented to accommodate runoff from the proposed 1.0 hectare extension area. Water from the dams is utilised onsite for dust suppression.

The existing water management system includes diversion drains, catch drains, level spreaders, sedimentation dams and a 2 megalitres (ML) Storage Dam. Diversion drains have been constructed around the disturbance area and are vegetated. Catch drains along the haul roads have been constructed with rock weirs and convey sediment-laden water to a series of sedimentation ponds.

In addition to the diversion drains and sedimentation dams, Oberon Quarries implements localised sediment and erosion controls in accordance with *Managing Urban Stormwater – Soils and Construction* (Landcom, 2001), to reduce the impacts on the water quality in the quarry's dirty water management system, as required. No additional surface water impacts are therefore anticipated due to the Project.

Monitoring of Racecourse Creek downstream of the quarry over the last 19 years has shown that the quarry is not having any adverse impact on water quality in the creek.

Oberon Quarries currently holds a Part 2 surface water licence under the *Water Act 1912* (80SL051088, WAL 34279) for the extraction of water from Racecourse Creek which forms part of the Fish River Water Source. Water is pumped when needed from Racecourse Creek to the quarry at a rate of 2 L/s.

Groundwater

Several small springs are located towards the base of Racecourse Hill in Tertiary gravels that are located between the basalt and the underlying less pervious granitic material. Springs to the north and west of the quarry are located approximately 40 metres below the top of Racecourse Hill at 1100 metres Australian Height Datum (AHD) and are thought to be fed by water infiltrating to the underlying alluvial gravel sediments that occur between the basalt and granite. The Tertiary gravel groundwater aquifer is elevated above the surrounding valley landforms and is confined to Racecourse Hill.

The Project will not disturb the gravel layer that underlies the basalt resource but will remove the basalt from within the approved extraction area. Groundwater springs located around the northern perimeter of Racecourse Hill are fed by groundwater flows from gravel layer and will not be directly impacted by quarry operations.

With the exception of the proposed 1.0 hectare extension area, the ongoing operation of the quarry does not seek to change the extent or the depth of extraction. Extraction of the

approved basalt resource will remove the fractured rock aquifer within the extraction area. As extraction progresses, surface runoff ponded on the quarry floor will infiltrate the underlying fractured basalt. Extraction of the lower bench of basalt material is expected to commence in 2014 and will result in water within the jointing in the basalt draining to the quarry water management system.

During an average rainfall year it is estimated that runoff from the quarry area will be approximately 150 ML/year with seepage from the basalt fractured rock aquifer contributing less than 2 ML/year (i.e. 1.3 per cent) of the total runoff.

No additional regional groundwater impacts are predicted to occur as a result of the Project and therefore the groundwater impacts are not expected to change from that approved by the 1993 development consent.

NOW has advised that an aquifer interference licence is not required for continued operations at the site.

Traffic and Transport

The distribution of product will be via the approved haul roads and the public road network. It is noted that sections of these roads and a number of intersections were upgraded by Oberon Quarries in accordance with the 1993 development consent. It is also noted that Titania Road was upgraded, at Council's request, to a higher standard than the consent required.

No issues in regard to traffic congestion, flow capacity or sight distance have been identified at any of the intersections upgraded by Oberon Quarries. Traffic volumes on these roads have not increased significantly since consent for the quarry was granted in 1993. As the Project does not change the maximum production limits from the quarry (i.e. 400,000 tpa and 2000 tonne per day), no increase in peak traffic impacts are predicted to occur as a result of the ongoing operations. No additional traffic flow or intersection capacity impacts are anticipated due to the ongoing operations.

Oberon Quarries will continue to pay Oberon Council a tonnage based road maintenance contribution to help maintain the public roads used by the quarry.

Ecology

The Project proposed changes to the quarry include a 1.0 hectare extension area and the duplication of an approximate 180 metre section of the internal haul road. These areas are located within the Project area as defined in the 1992 EIS. An ecological survey of the site in September 2013 found that the new haul road area has previously been cleared, and the 1.0 hectare extension area supports no native trees or vegetation. Vegetation within the proposed extension area comprises a short windbreak of exotic cypress with the remainder of the area supporting improved pasture.

No suitable habitat for threatened flora species, endangered species or threatened ecological communities (TECs) was identified during the survey. Given the lack of suitable habitat for threatened flora species, endangered species or TECs in the proposed disturbance areas, and the small size of the areas, the removal of proposed disturbance areas is unlikely to significantly impact on any threatened flora species, endangered species or TECs.

The Project will not result in any additional ecological impacts on ecological values, threatened species or ecological communities. It will have a similar low impact on the flora and fauna to that assessed and approved by the 1993 development consent (DA 92/164).

Aboriginal Archaeology

The proposed extension to the extraction area has been subject to previous archaeological assessment but does not contain any recorded Aboriginal archaeological sites. Furthermore, it is in a landform that was assessed (Resource Planning, 1992) as being unlikely to contain additional subsurface deposits. In addition, the proposed extension to the extraction area has been disturbed by vegetation clearance and grazing activities in a way that remains clear and demonstrable. Therefore, in accordance with the requirements of the due diligence code, it is not necessary to undertake further archaeological investigations.

Rehabilitation, Decommissioning and Closure

Progressive construction of the final landform will be undertaken once the extraction of the first and second benches has been completed within sections of the quarry pit and as space on the pit floor allows. The final landform will be created by placing the interburden material from the extraction area against the wall of the quarry and on the quarry floor and then by pushing the overburden bund located around the rim of the extraction area onto the quarry floor. Benches will also be covered with overburden material. The rehabilitated quarry floor will then be seeded with improved pasture. Woodlots of native trees will be established to provide shelter for stock and habitat for native fauna. Benches will be planted with native trees.

As the lower bench still needs to be extracted to a sufficient extent to enable rehabilitation of the benches and quarry floor to be undertaken, it is envisaged that it will be approximately 10 years before any significant rehabilitation works can be undertaken without interfering with quarrying operations and without quarrying operations interfering with rehabilitation activities. During this time disturbed areas will be within the perimeter of Racecourse Hill and will drain to the quarry water management system.

The ongoing operation of the quarry will not alter the timing of when the rehabilitation works can be completed without sterilising sections of the identified high quality hard rock resource that are yet to be extracted. Continued operations will not result in any changes to the final landform from that approved by the 1993 development consent except for the inclusion of the 1 hectare extension area.

As there is in excess of 10 Mt of hard rock resource remaining within the currently approved extraction area, decommissioning of the processing plant is not expected to occur for at least 30 years. Decommissioning will be planned and conducted in an appropriate manner. Where possible, and as agreed by the landholder, dams and roads will not be decommissioned.

Greenhouse Gas and Energy

A greenhouse gas and energy assessment undertaken identified the annual direct and indirect emissions of greenhouse gas from the ongoing operations equate to approximately 0.000008 per cent of annual global greenhouse gas emissions (based on its projected Scope 1 emissions).

Oberon Quarries recognises the future will be a carbon constrained world and is committed to reducing the greenhouse gas emissions from its operations and has identified a number of mitigation measures it proposes to implement as part of the Project to minimise its greenhouse gas emissions and energy usage.

Socio Economic

Oberon Quarries supports the local economy through the supply of rock products for road, building and other construction activities in the region. Oberon Quarries is also a valuable source of employment through the provision of 15 jobs at the quarry and 10 jobs for truck drivers, as well as associated indirect jobs and regular engagement of local service contractors. At a production level of 200,000tpa, the Project will provide for the continued employment of approximately 25 people. This will increase to approximately 35 people plus associated indirect jobs at a production level of 400,000 tpa.

The Project will not result in any significant adverse changes to the potential socio-economic impacts of the quarry. Oberon Quarries' continued operation will provide ongoing employment opportunities at the quarry for those currently employed and new employment opportunities as production increases to 400,000 tpa. It will also provide ongoing opportunities for contractors and other providers servicing the quarry.

Oberon Quarries has also identified that some of the traditional suppliers of high quality hard rock to the Sydney market have recently exhausted their reserves and ceased operations. Limiting the supply of high quality hard rock quarry products from Oberon Quarries' operations would further impose increased price pressures on the supply of quarry products to the Sydney, Bathurst, Blue Mountains and local hard rock markets.

Consultation with surrounding landholders indicates that quarry operations are not adversely impacting on land use or amenity of the surrounding area. There are no anticipated increased impacts on any neighbouring land uses, including agricultural activities, as a result of the Project.

Justification for the Project

The proposed changes to the quarry as part of the Project are either administrative matters, or are changes which will result in improved overall environmental, social and economic performance of quarry operation. These changes will not result in any substantial changes to the quarry operations or the environmental impacts associated with the current operations from those approved under development consent (DA 92/164). The ongoing operation of the quarry will allow for the continued supply of high quality hard rock materials to the surrounding region from this regionally significant resource. This high quality hard rock quarry product is suitable for use in nearly all quarry product applications.

The continued operation of the quarry and the beneficial reuse of the <5 millimetre material will provide a continued net return (i.e. better utilisation) on the capital, energy and resources which have already been invested as part of establishing the quarry (e.g. road upgrades, buildings, quarry infrastructure and water management infrastructure).

Oberon Quarries is an important contributor to local employment through the provision of direct and indirect employment. The ongoing operation of the quarry will maintain the existing employment of 25 full-time employment positions. This is envisaged to increase to 35 full-time employment positions at a production level of 400,000 tpa.

The Project will have limited if any substantial additional environmental impacts from that approved in 1993.

If approval for the Project is not granted, the opportunity to extract and supply in excess of 10 Mt of high quality basalt resource from this site to markets in Central Tablelands, Bathurst, Blue Mountains and Sydney areas will be lost as will the ability to use a fully established and environmentally sustainable quarry operation that will provide ongoing direct

employment for 25 people increasing to approximately 35 people as the quarry reaches maximum production levels.

Mitigation Measures

Oberon Quarries will continue to undertake quarry operations in a manner that is consistent with current operations and environmental controls.

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- 9 Greenhouse Gas and Energy Calculation Spreadsheets**

1.0 Introduction

Since 1995 Oberon Quarries Pty Limited (Oberon Quarries) has produced crushed aggregates from a high quality hard rock quarry at 'Langley Heights' on Shooters Hill Road, approximately 4 kilometres south of Oberon, (refer to **Figure 1.1**). Oberon Quarries has established roads, a crushing and processing plant, administration facilities and water management infrastructure, and extracted 2.7 million tonnes (Mt) from a 12.7 Mt approved high quality basalt resource.

Development consent (DA 92/164) for the quarry was originally granted (subject to a range of conditions) on 1 October 1993 by the Minister for Planning, following a Commission of Inquiry. Consent was originally granted for a 20 year period and has recently been modified to extend the timeframe to 13 May 2016 (MOD 5).

In order to improve efficiency and environmental performance of the quarry operations, in addition to furthering the life of the quarry for extraction of proven reserves, Oberon Quarries is seeking consent to extend the life of the quarry DA 92/164 under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for an additional 30 years. The Project is declared to be a State Significant Development under the provisions of the State Environmental Planning Policy (State and Regional Development) 2011, and the Minister for Planning and Environment will be the consent authority for the development.

In addition to the continuation of the life of the quarry, there are also several proposed modifications to operations at the site which are summarised as follows:

- removal of the 10 year annual average production rate limitation from the consent allowing a maximum annual production rate of 400,000 tonnes per annum (tpa) each year;
- replacement of one of the existing screening plants, reconfiguration of the alignment of screens and the inclusion of an additional cone crusher;
- inclusion of a second diesel fuel storage tank of approximately 28,000 litre capacity;
- inclusion of a 1.0 hectare extension to the existing extraction area to avoid the sterilisation of approximately 500,000 tonnes of high quality basalt resource;
- inclusion of a Finlay 150e Hydrasander (or equivalent) to separate silt and clay from sand size particles in the crusher fines;
- duplication of approximately a 180 metre section of the internal haul road to improve road safety; and
- continued extraction of the high quality basalt from the existing extraction areas as required, with extraction at times occurring on the upper and lower benches.

The proposed extended life of the quarry and the above proposed changes to the development are hereafter referred to as the Project.

Figure 1.2 illustrates the location of the proposed physical changes to the quarry. All proposed changes are within the Project Area assessed as part of the 1992 EIS completed for the original granting of DA 92/164.

All other aspects of the approved quarry remain unchanged from current operations and will continue to be managed in accordance with existing site practices. **Section 3.0** provides further details on each of the proposed modifications.

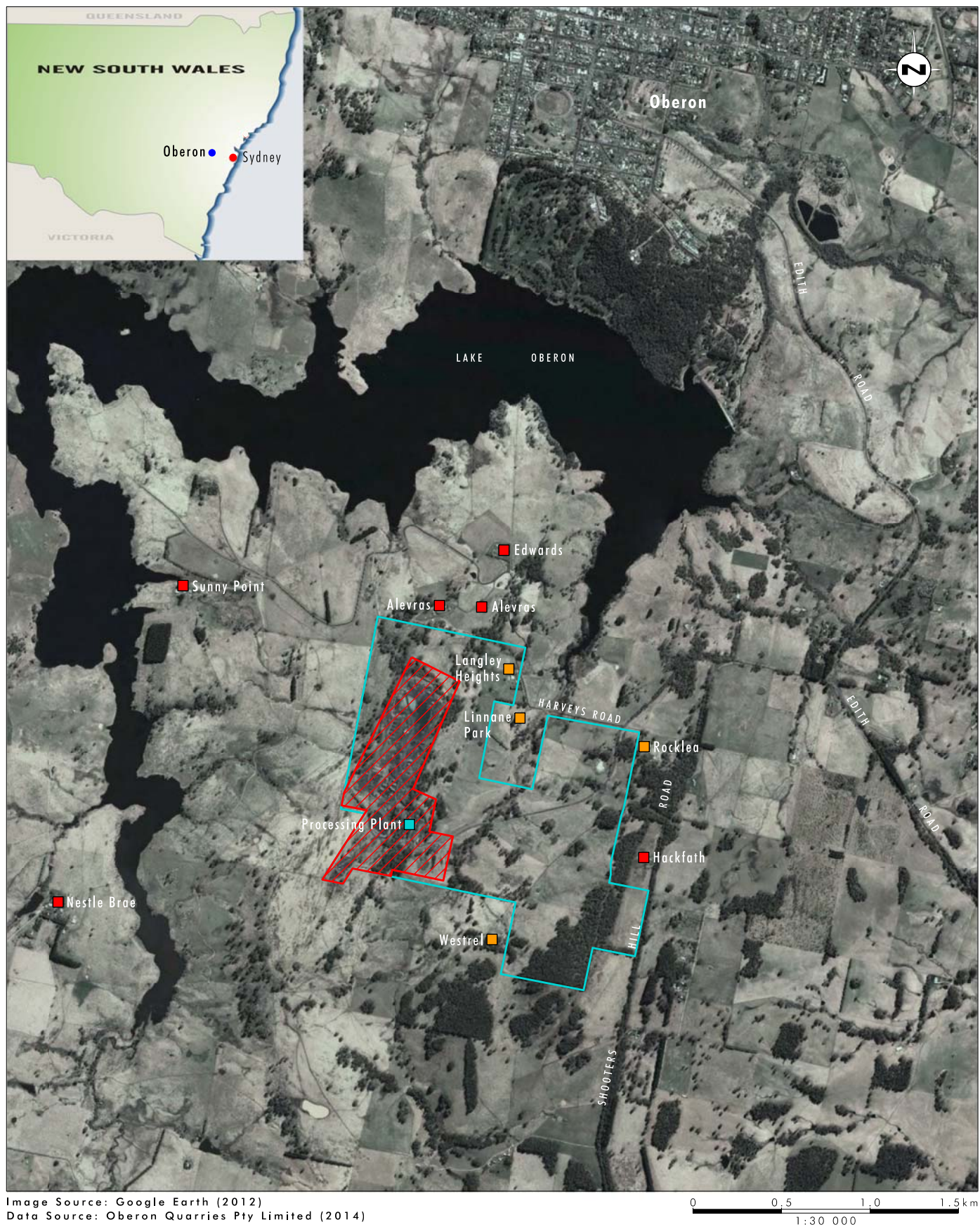
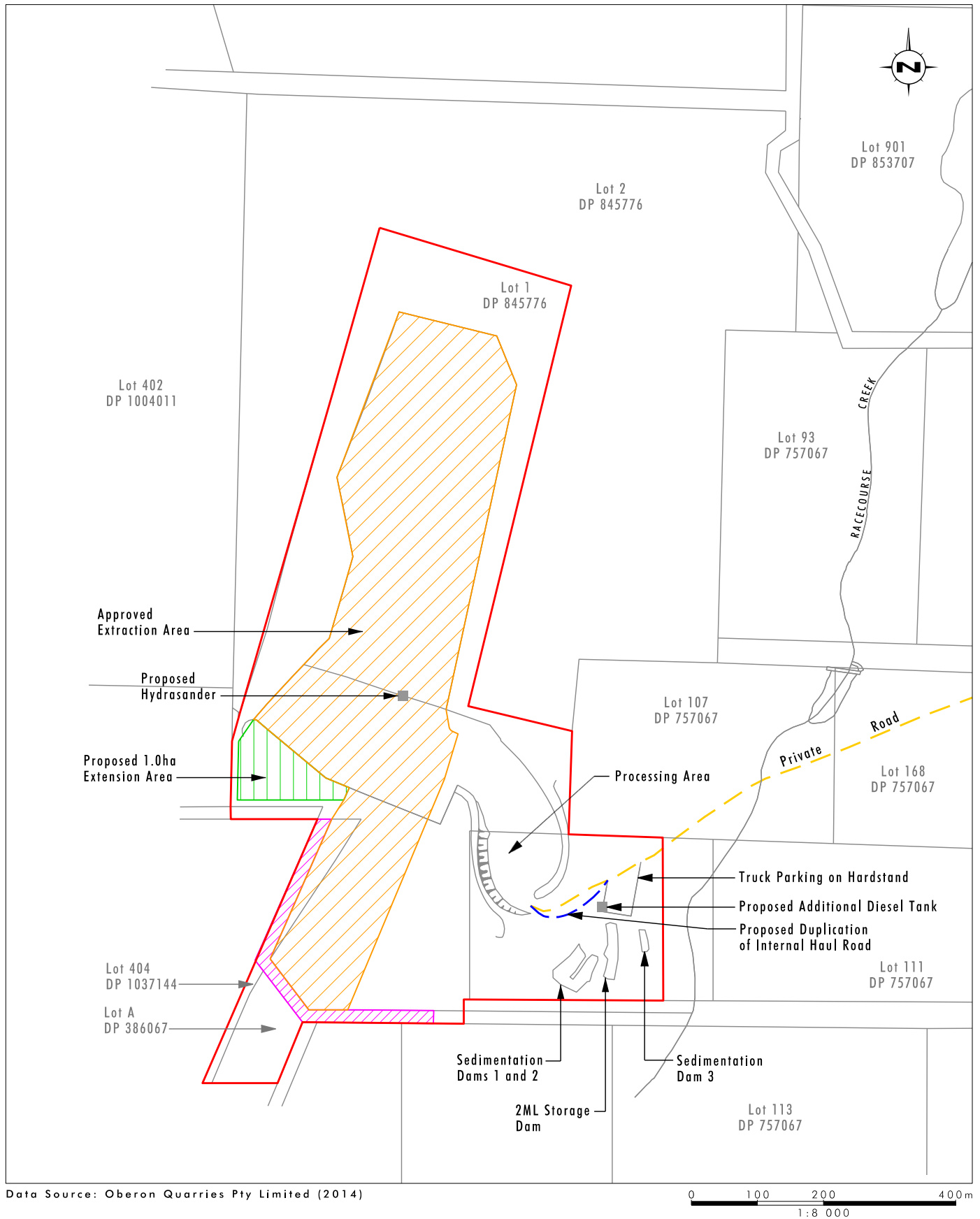


Image Source: Google Earth (2012)
Data Source: Oberon Quarries Pty Limited (2014)

Legend

- Project Area
- Langley Heights Property
- Private Residence
- Residence Owned by Oberon Quarries or Associated with Quarry
- Processing Plant

FIGURE 1.1
Locality Map



Legend

- Project Area
- Crown Road Reserve
- Approved Extraction Area
- Proposed Extension (1.0ha)
- Right of Carriageway (12m wide)
- Proposed Duplication of Internal Haul Road

FIGURE 1.2

Proposed Development Changes

These changes will not result in any significant adverse impacts of quarry operations on the surrounding area or fundamentally change quarry operations from those approved under DA 92/164 and subsequent modifications.

Oberon Quarries has been operating for the last 20 years with negligible environmental impact and no community complaints have been received by Oberon Quarries since 2010.

1.1 Background

DA 92/164 for the quarry was originally granted (subject to a range of conditions) on 1 October 1993 by the Minister for Planning. Since 1995 Oberon Quarries has produced crushed aggregates from the high quality hard rock quarry at 'Langley Heights'.

A Conditions Compliance Review Report of quarry operations was completed in March 2014 (Umwelt, 2014). The report assessed the compliance status of Oberon Quarries operations against DA 92/164 and other relevant environmental approvals and licences, for operations undertaken during the 2013 calendar year. The report findings are based upon visual observations of the site and its vicinity, interviews with site personnel and interpretation of the documentation provided by Oberon Quarries.

The report notes that Oberon Quarries generally achieved a high level of compliance with the conditions of DA 92/164 and Environment Protection Licence (EPL) 4442. The majority of the non-compliance issues identified related to administrative issues rather than being related to unacceptable impacts on the environment.

In terms of environmental management of the quarry and Oberon Quarries' environmental performance, Oberon Quarries' management demonstrated that it is aware of and is committed to ensuring the operation of the quarry is within its environmental performance requirements. The quarry is well managed with appropriate environmental controls in place. A number of improvements to the environmental management practices of the site were identified. It was found that the quarry had low potential to impact adversely on the surrounding environment due to the position of the quarry in the landscape, the soil and water management system that was put in place when the quarry was first established, and the extensive buffer zones which separate the quarry from the surrounding sensitive receivers.

1.2 The Applicant

The applicant for the proposed modification is Oberon Quarries Pty Limited. Oberon Quarry is an independent quarry owned and operated by Oberon Quarries, producing and supplying crushed aggregates and road base material from a high quality hard rock quarry at 'Langley Heights' since 1995.

1.3 Structure of the Environmental Impact Statement

This Environmental Impact Statement (EIS) has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Oberon Quarries. The purpose of the EIS is to identify and assess the environmental impacts associated with the proposed ongoing operations and changes and set out appropriate environmental controls to mitigate any adverse impacts that the proposed operations may have. This EIS has been prepared in accordance with the requirements of the EP&A Act and the Environmental Planning and Assessment Regulation

2000 (EP&A Regulation) (refer to the EIS Statement of Authorship in **Appendix 1**). An overview of the structure of this EIS is provided below:

- the **Executive Summary** provides a brief overview of the Project and the key outcomes of the EIS;
- **Section 1.0** introduces the Project, outlines the key objectives of the Project, provides a summary of the Project details, and outlines the structure of the EIS;
- **Section 2.0** provides a detailed description of the existing approved operations;
- **Section 3.0** contains a description of the proposed Project;
- **Section 4.0** describes the planning context for the Project, including the applicability of Commonwealth and State legislation;
- **Section 5.0** contains a description of the stakeholder engagement and the environmental risks and community issues identified as part of this process for consideration in the EIS;
- **Section 6.0** contains a description of the existing environment and a comprehensive analysis and assessment of the issues relevant to the Project, including project-specific and cumulative impacts;
- **Section 7.0** includes a summation of the mitigation and measurement measures proposed to be adopted throughout the life of the Project;
- **Section 8.0** summarises the key conclusions arising from the detailed environmental assessment. This section provides the Project justification and demonstrates the Project outcomes with reference to the principles of Ecologically Sustainable Development (ESD); and
- **Sections 9.0 and 10.0** provide a list of references cited in the EIS and a list of acronyms and abbreviations.

2.0 Existing Operations

2.1 Licensing and Approvals

2.1.1 Development Consent

Oberon Quarries operates under development consent DA 92/164 which was originally granted on 1 October 1993 by the Minister for Planning. Subsequent modifications of DA 92/164 have been approved in 1999, 2004, 2007 and September 2013. As outlined in **Section 1.0**, DA 92/164 provides for a 10 year annual average production rate of 200,000 tonnes and a maximum annual production rate of 400,000 tpa. The approved project disturbance footprint covers an area of approximately 21 hectares. All quarrying operations (i.e. extraction, crushing, stockpiles, weighbridge, office, maintenance and administration buildings) are undertaken within this disturbance footprint. DA 92/164 also required Oberon Quarries to upgrade and seal Titania Road, upgrade three intersections between the quarry and Sydney Road, and pay a road maintenance levy. All of these requirements have been complied with. The development consent currently provides for the continuation of quarrying operations until 13 May 2016.

Approved modifications to the quarry operations (approved under DA 92/164) are detailed below.

2.1.1.1 1999 Modification

On 3 November 1999, Oberon Quarries lodged an application under Section 96(2) of the EP&A Act seeking modification of the site to include:

- temporary stockpiling of product on the top of Racecourse Hill;
- stockpiling of material on the hardstand area;
- modification of plant layout;
- changes to the extraction sequence;
- relocation of the workshop and office buildings from the hardstand area to the processing area; and
- modification of the extraction area.

On 13 April 2000, the Minister approved the temporary stockpiling of material on top of Racecourse Hill for a period of four years but deferred the other matters in the application. Approval of the temporary stockpiling of material on top of Racecourse Hill increased the disturbance footprint of the quarry by 3.5 hectares (i.e. making the disturbance footprint of the quarry 21 hectares in total).

2.1.1.2 2004 Modification

On 1 June 2001, Oberon Quarries lodged an application under Section 96(2) of the EP&A Act seeking modification of the site to include:

- stockpiling of material on the hardstand area;
- modification of plant layout;

- changes to the extraction sequence;
- relocation of the workshop and office buildings from the hardstand area to the processing areas;
- modification of the extraction area;
- removal of the requirement to enclose the crushers;
- extension of the hours of operations (processing and haulage); and
- changing the noise emissions levels for trucks on the haul road.

On 3 August 2001, the Department requested a range of additional information on the proposed modification. Additional information was provided on 20 May 2004 following the completion of negotiations to resolve the boundary concerns with the adjoining property, the closure and creation of a Crown Road reserve, and the purchase of 'Westrel' (which was the last of the three non-quarry owned dwellings that were subject to possible acquisition requirements by the development consent to be purchased).

Oberon Quarries amended the application to the Department on 25 June 2004 seeking approval for the following:

- alteration to the plant layout;
- continued use of the administration building and workshop in the processing area;
- changes to the extraction sequence and hence the sequence of rehabilitation;
- extension of the extraction area to the south by 3.5 hectares;
- removal of the requirement to enclose the primary and secondary crushers;
- extension of the hours of operations (processing and haulage);
- changing the noise emissions levels for trucks on the haul road; and
- extension of the duration of the temporary stockpiling on top of Racecourse Hill.

The Minister approved the amended application on 17 November 2004.

2.1.1.3 2007 Modification

On 21 March 2007, Oberon Quarries lodged an application with the Department under section 96(1A) of the EP&A Act to modify Condition 29(1) of DA 92/164 to reduce the road maintenance levy from \$0.57/tonne (indexed) to \$0.39/tonne (indexed) of product hauled from the quarry.

Oberon Quarries requested a reduction in the road levy as:

- Titania Road was upgraded, at Council's request, to a higher standard than the consent required (cost of \$1.3 million rather than the estimated \$790,000); and
- Council had requested Oberon Quarries to use Titania Road (designated heavy vehicle route) and the Oberon heavy vehicle bypass for deliveries to Oberon and Bathurst rather than the shorter approved transport route using Edith Road. This resulted in additional transport costs for Oberon Quarries.

The Council and Oberon Quarries agreed to the proposed changes to the road levy. The Minister approved the modification on 28 May 2007.

2.1.1.4 September 2013 Modification

Oberon Quarries sought to modify DA 92/164 under Section 75W of the EP&A Act to extend the development consent period to 13 May 2016. No modifications other than to extend the duration of consent were sought. Modification to extend the life of the quarry until May 2016 was approved on 27 September 2013.

2.1.2 Environment Protection Licence

Oberon Quarries holds EPL 4442 for the quarry operations which provides water discharge and blast monitoring criteria along with requirements for annual reporting.

2.2 Land Use and Land Ownership

The quarry is located in cleared land that is used for sheep and cattle grazing. Pasture in the area is mainly improved. The proposed 1.0 hectare extension area has been cleared of native vegetation and is currently used for grazing. The area supports improved pasture and exotic cypress species.

The quarry extraction and processing areas are located on Lot 1 DP845776 which is owned by CGCS Pty Limited and leased by Oberon Quarries. CGCS Pty Limited has provided land owner's consent for lodging the development application for the proposed extension to quarrying. As shown on **Figure 2.2**, the private haul road traverses land owned by Mr B Lang and a Crown Road easement that is located between Lot 94 DP 757067 and Lot 108 DP 757067. Mr B Lang has provided land owner's consent and has applied to purchase the section of Crown Road reserve located between Lots 94 and 108 and is currently seeking land owner's consent from NSW Trade & Investment – Crown Lands in the event that the purchase is not finalised before the development application is determined.

At the time the development was originally approved, four private residences were located within 1.2 kilometres of the quarry (refer to **Figure 2.1**). All of these properties ('Linnane Park', 'Rocklea', 'Westrel' and 'Langley Heights') are now owned by Oberon Quarries and related parties.

Oberon Quarries has also purchased a small area of land (Lot 2 DP 1087170) that formed part of a 'give-and-take' boundary adjustment between Lot 3 DP 1087170 and Lot 32 DP 1158178 to the west (refer to **Figure 2.2**).

Land Titles for properties surrounding the area of quarry operations are illustrated on **Figure 2.2** and listed in **Table 2.1**.



Image Source: Google Earth (2012)
Data Source: Oberon Quarries Pty Limited (2014), Resource Planning (1992)

Legend

- Project Area
- Private Residences
- Residence Owned by Oberon Quarries or Associated with Quarry

FIGURE 2.1

Private Residences in the
Vicinity of Oberon Quarry as at 2013



Image Source: Google Earth (2012)
Data Source: Oberon Quarries Pty Limited (2014)

Legend
 Project Area
 Right of Carriageway (12m Wide)

FIGURE 2.2
Land Ownership

Table 2.1 – Land Titles for Properties Surrounding the Area affected by Oberon Quarries Operations

Land Title	Property Name	Owner	Direction from Quarry Operations
Lot 2 DP 845776 (formerly part Portion 213)	Langley Heights	B A Lang	North
Lot 401 DP 1105551 (Formerly in Lot 401 DP 1004011)	–	J Alevras	North
Lot 32 DP 1158178 (Formerly Lot 402 DP 1004011)	Sunny Point	Mawhood	West and South
Lot 3 DP 1087170 (Formerly Lot 1 DP 854776, Lot 404 DP1037144 and Lot A DP 386067)	–	CGCS Pty Limited	South-west
Lot 112 DP 757067	–	B P Mawhood	South
Lot 113 DP 757067	Westrel	Oberon Quarries Pty Ltd	South-east
Lot 111 DP 757067	Langley Heights	B A Lang	East
Lot 107 DP 757067	Langley Heights	B A Lang	East
Lot 108 DP 757067	Langley Heights	B A Lang	East
Lot 109 DP 757067	Langley Heights	B A Lang	East
Lot 1 DP 1011321	–	J Hackfath	East
Lot 3 DP 1085858 (Formerly Lot 2 DP 1011321)	Langley Heights	B A Lang	East
Lot 93 DP 757067	Linnane Park	Oberon Quarries Pty Ltd	East
Lot 94 DP 757067	Langley Heights	B A Lang	East
Lot 166 DP 757067		B A Lang	South-east
Lot 3 DP 1011321		B A Lang	South-east
Lot 3 DP 845776		B A Lang	East
Lot 1 DP 137154		Oberon Quarries Pty Ltd	East
Lot 900 DP 853707		B & J Lang	East
Lot 901 DP 853707		B & J Lang	East
Lot 1 DP 796785	Nestle Brae	Island Creek Pastoral Company Pty Ltd	South-west

Since quarrying commenced in 1995, three new residences have been constructed in the vicinity of the quarry. Two residences, belonging to Mr Tony Alevras, are located approximately 1.3 kilometres due north of the processing plant (refer to **Figure 2.1**) and approximately 400 metres north of the northern limit of the extraction area. The residences are shielded from ongoing quarry activities by intervening topography, including Racecourse Hill. The plateau on the top of Racecourse Hill extends approximately 40 metres above the elevation of the processing plant area and is in excess of 50 metres higher than the land the new residences have been constructed on. Neither the processing plant nor the extraction area is visible from these residences. The overburden bund at the northern end of the quarry extraction area is visible from these residences as shown on **Plate 1**. This bund is unlikely to



PLATE 1
View of Alevras Residence looking south towards the quarry



PLATE 2
View from Hackfath Residence looking west towards the quarry

be disturbed until the northern end of the quarry is rehabilitated at which time the stockpiled material will be pushed into the quarry and incorporated into the final landform.

The third residence, belonging to Mr John Hackfath, is located adjacent to Shooters Hill Road and is approximately 1.3 kilometres to the east of the processing plant (refer to **Figure 2.1**). The ground elevation at this residence is approximately 75 metres higher than that at the processing plant. Sections of the processing plant and haul road are visible from this residence as shown on **Plate 2**.

2.3 Existing Operations

Basalt from the high quality hard rock quarry at Langley Heights is won by drilling and blasting operations. Blasted rock is loaded into off-road rear dump trucks using an excavator, and is transported to the crushing and screening plant for processing. Product is stockpiled within the processing area and on the quarry floor from where it is loaded into highway trucks for transport to markets in the Oberon, Bathurst, Blue Mountains and Western Sydney areas. Transport is via a sealed haul road to Shooters Hill Road and then via Edith/Jenolan Caves Road to Titania Road and then via other sealed roads that form part of the State road system to the market areas.

2.3.1 Extraction Area

The approved extraction area is approximately 1000 metres long and 200 metres wide and occupies an area of approximately 20 hectares (refer to **Figure 1.2**).

Extraction is confined to the basalt plateau on top of Racecourse Hill. The quarry floor is located below the skyline and is bounded on all sides by natural topography, except for a narrow cutting on the eastern hillside above the processing area, which provides haul road access to the quarry floor.

At present, approximately 65 per cent of the area of the first bench has been extracted. Extraction of the second bench is planned to commence in 2015. The quarry floor at present is approximately 8 to 10 metres below the top of Racecourse Hill. The final quarry floor will be approximately 20 metres below the top surface of the hill, when the two benches have been extracted.

Oberon Quarries has approval to extract the basalt resource from two benches each having a depth of 8 to 10 metres. A layer of weathered basalt and clayey interburden is located between the upper and lower basalt flows that form the quarry resource. Following the extraction of each bench and when sufficient room is available, sections of the quarry floor are utilised for stockpiling product and for the construction of additional primary sedimentation dams. Interburden material, fines and overburden is placed around the rim of the quarry and on the quarry floor for later incorporation into the rehabilitated landform.

A considerable quantity of material has been generated during the excavation of the first bench, due to the occurrence of overburden and the production of crusher fines. In the past this material has been stockpiled around the edge of the extraction area and on top of Racecourse Hill, however, the crusher fines are now stockpiled within the quarry extraction area.

2.3.2 Crushing and Screening/Processing Area

The processing area is located to the east of the extraction area (refer to **Figure 2.3**). Establishment of the processing area required the excavation and removal of approximately

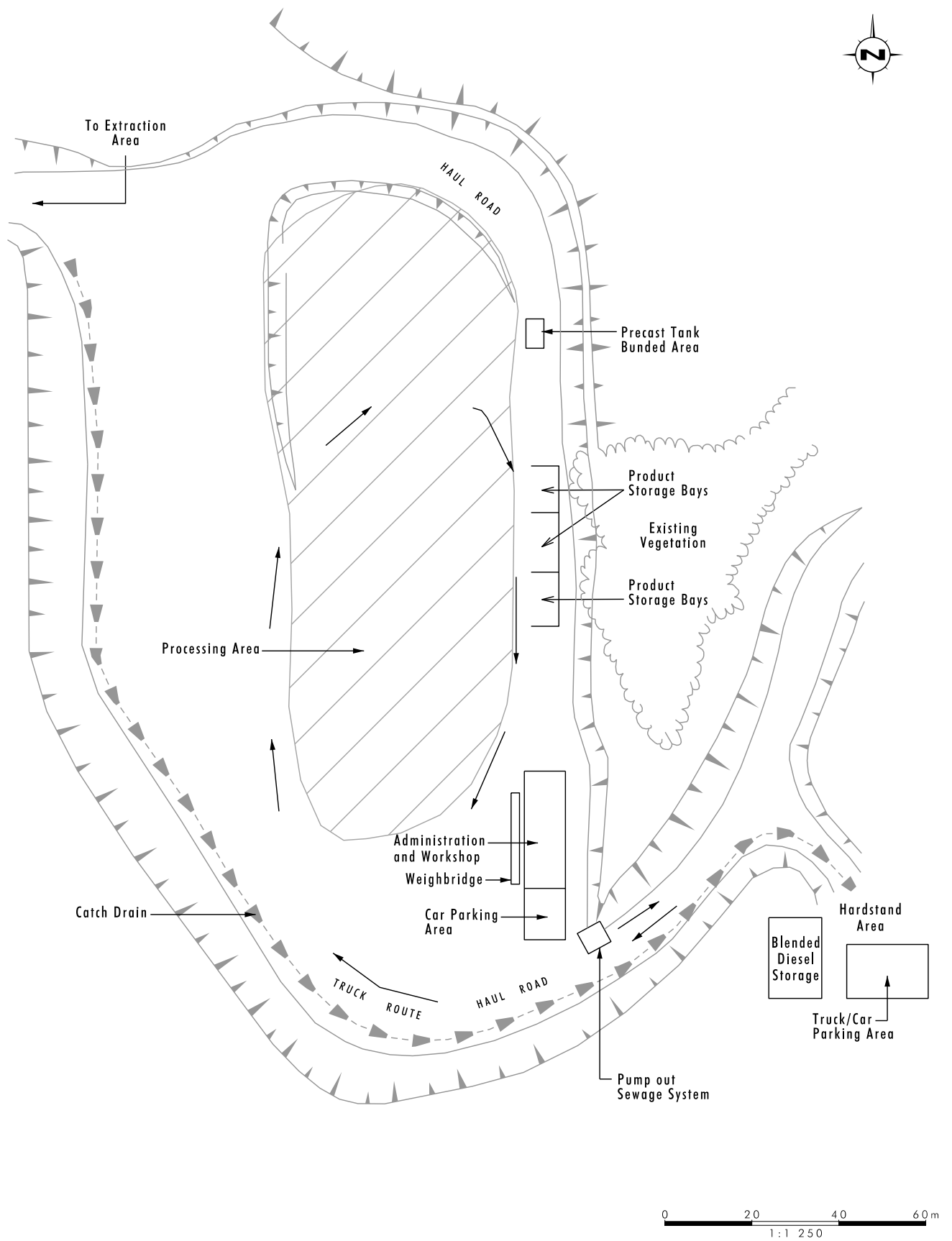


FIGURE 2.3

Schematic Layout of Crushing and Screening/Processing Area

4 to 5 metres of soil and weathered rock from a bench on the eastern side of Racecourse Hill. The area was excavated to form a relatively level and acoustically shielded platform for the crushing and processing plant. Topsoil and overburden material stripped from the processing area was used to fill low sections adjacent to the processing area, to construct a hardstand area beside the quarry entrance which is used for truck parking and refuelling activities and to create an earthen acoustic bund along the eastern side of the processing area to reduce noise emissions in this direction.

2.3.3 Plant Layout and Components

The quarried basalt rock is taken from the extraction area to the processing area by dump trucks. The dump trucks unload the basalt into the hopper above the primary feeder. The feeder controls the rate of supply of rock to a primary jaw crusher, which reduces the size of the larger rock pieces. Material from the primary crusher then passes over a scalping screen, which removes the clay fraction from the finer sections of the raw feed before entering the 3 inch JTY crusher. The crushed rock is then conveyed to a Canica crusher from where it passes over screens to separate and stockpile the material into the required sizes. The processed crushed rock is delivered to small product stockpiles by conveyor. **Figure 2.4** illustrates the processing plant layout.

2.3.4 Product Stockpiles

Stockpiles of finished product accumulate under each of the discharge conveyors. There are five live stockpiles, each with a capacity of approximately 600 to 1000 tonnes.

Material is transferred from the live stockpiles to product stockpile bays located in the processing area, with each bay having a stockpile capacity of approximately 3000 tonnes. Excess product which cannot be stockpiled within the processing area is stored on the quarry floor.

In the past, <5 millimetre diameter material has been stored on the southern end of Racecourse Hill and on the quarry floor. Oberon Quarries has developed markets for the <5 millimetre material (i.e. utilising the material in the production of road base material (Dense Grade Base (DGB 20 millimetres)) and has gradually reduced the quantity of <5 millimetre material stored on site, such that it is now only stored on the quarry floor within the extraction area.

2.3.5 Facilities

Administration and weighbridge facilities are also located within the processing area (refer to **Figure 2.3**), which includes a toilet/washroom. A Council approved pump-out sewerage system is located beside the administration centre.

Parking areas have been provided within the processing area and the hardstand area at the entrance to the quarry.

Fuel is stored in an above-ground storage tank which is bunded and covered in accordance with the Council approval. The tank has a capacity of approximately 28,000 litres and the bunded area has a capacity of approximately 120 per cent of the tank capacity.

2.3.6 Hours of Operation

The approved hours of operation at Oberon Quarry are as per Condition 16 of DA 92/164 and are dependent on the activity being undertaken as detailed in **Table 2.2**. Hours of operation will not change as a result of the proposed changes to the quarry.

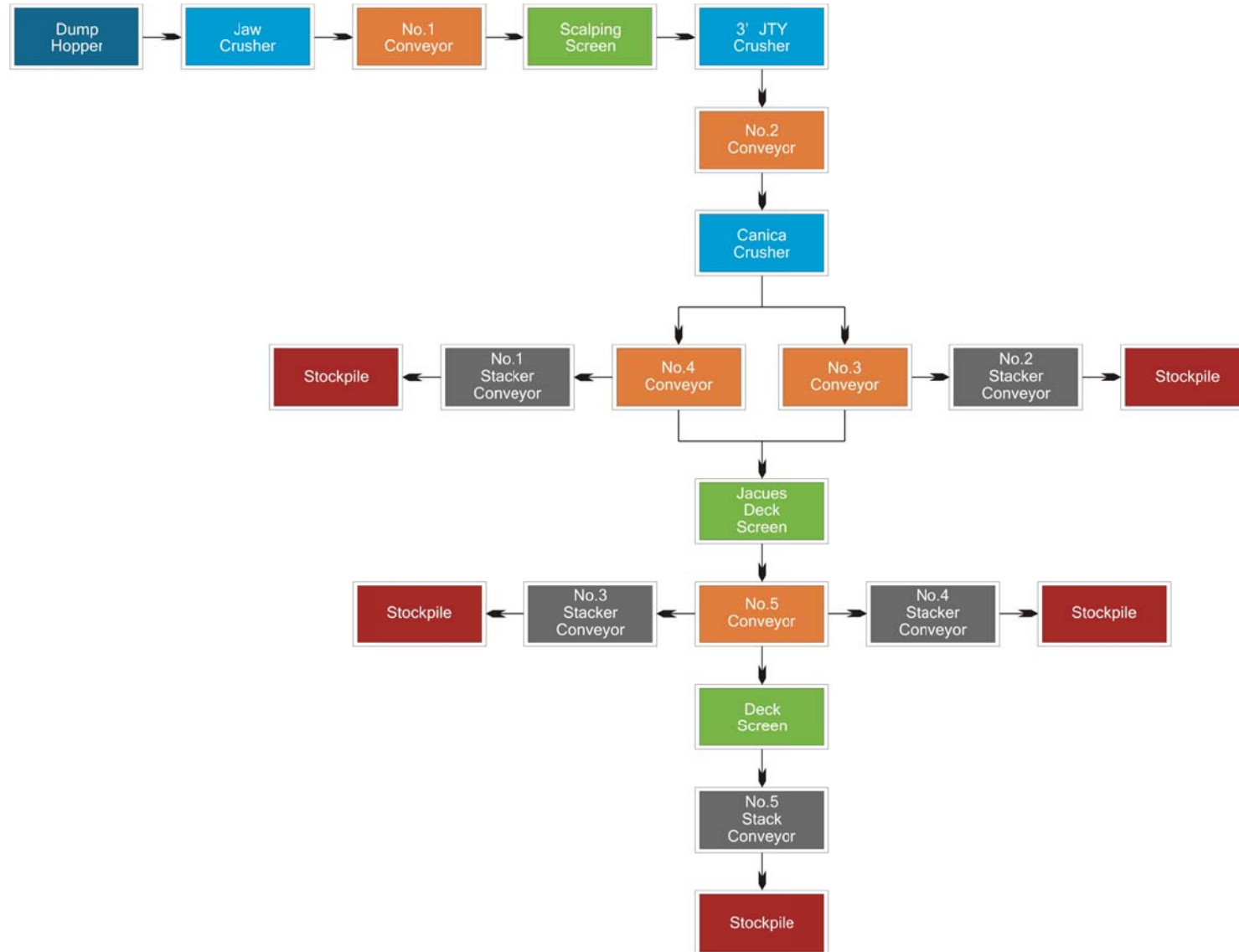


FIGURE 2.4

Schematic of Existing
Processing Plant Layout

Note: Not to scale

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Table 2.2 – Approved Hours of Operation

Activity	Approved Hours of Operation
Quarrying and Processing Areas	7.00 am to 6.00 pm, Mondays to Fridays 7.00 am to 5.00 pm, Saturdays No quarrying or processing shall be undertaken on Sundays or public holidays.
Loading Haul Trucks	6.00 am to 10.00 pm, Mondays to Fridays 6.00 am to 5.00 pm, Saturdays No loading of haul trucks shall be undertaken on Sundays or public holidays.
Product Delivery	6.00 am to 10.00 pm, Mondays to Fridays 6.00 am to 5.00 pm, Saturdays No product delivery trucks are to enter the quarry prior to 6.00 am on any day. During the periods 6.00 am to 7.00 am and 6.00 pm to 10.00 pm a maximum of 4 laden delivery trucks shall leave the site per hour (total 8 truck movements per hour).
Construction of Haul Road and Quarry Infrastructure	7.00 am to 6.00 pm Mondays to Fridays 7.00 am to 4.00 pm Saturdays No construction shall be undertaken on Sundays or public holidays.
Maintenance	7.00 am to 6.00 pm Mondays to Fridays 7.00 am to 4.00 pm Saturdays

2.4 Geology

2.4.1 Regional Geology

The quarry is located on a high quality basalt cap which was once part of a larger lava sheet which covered most of the Oberon area. Through weathering and erosional processes, most of the lava flow has been removed to expose the underlying older rock units of Silurian and Ordovician (460 million years old) and Carboniferous (320 million years old) ages (refer to **Figure 2.5**).

Regionally the younger Carboniferous material has intruded through the older rocks to form major units like the Bathurst Granite and Oberon Granite.

The past 19 years of quarrying operations have refined Oberon Quarries' knowledge of the geology within the Project Area. Oberon Quarries has identified four discrete geological layers:

- 0 to 0.2 metres – consists of topsoil;
- 0.2 to 8.0 metres – consists of basalt with a fractured nature;
- 8.0 to 10 metres – comprises a layer of interburden material mixed within an otherwise high quality hard rock resource. This layer of interburden thins towards the south and is non-existent at the southern quarry face; and
- 10 to 20 metres – comprises basalt of a massive nature (i.e. not fractured).

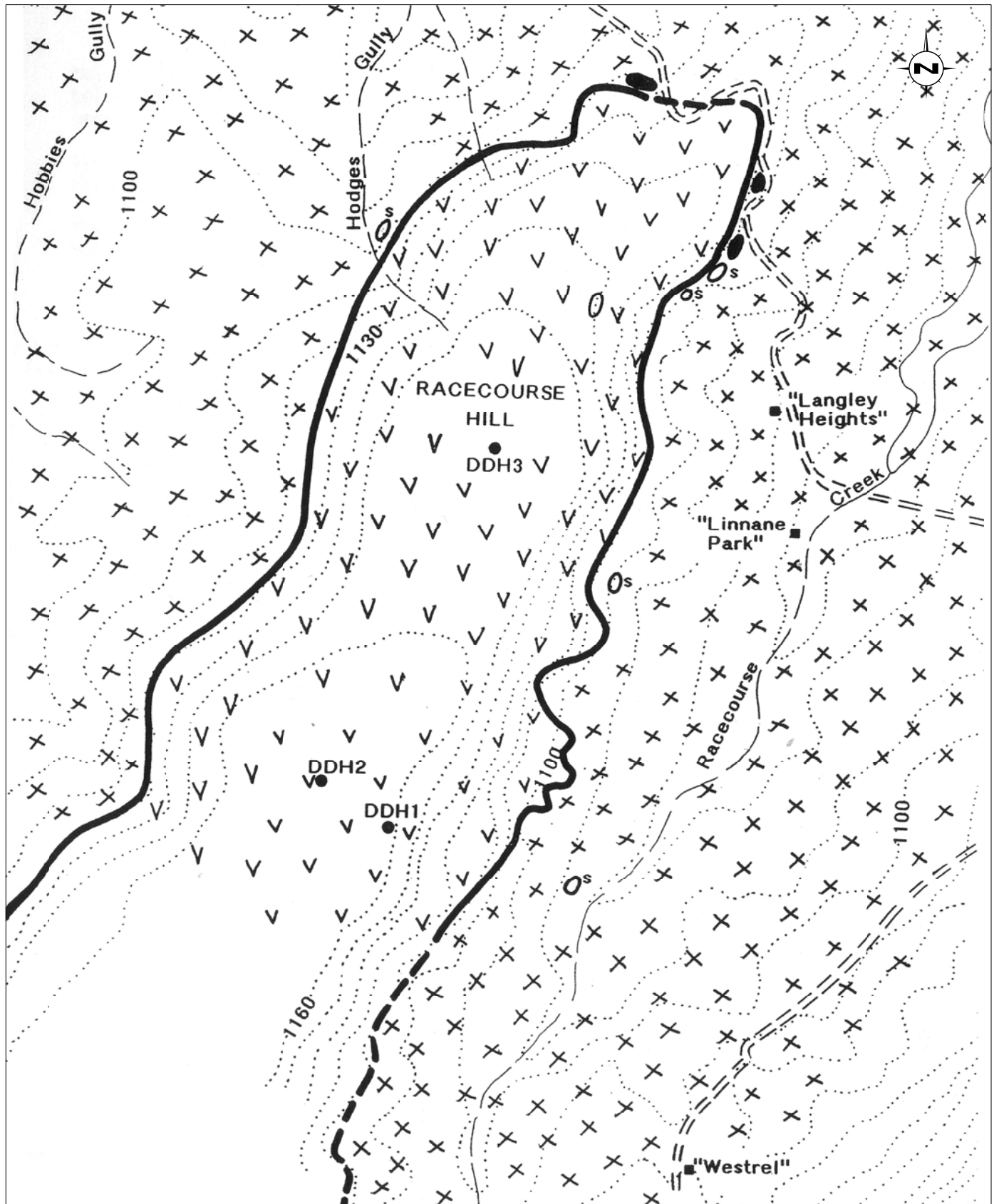


Image Source: Resource Planning (1992)

0 100 250 500m
1:10 000

Legend

- V V V Basalt - Tertiary
- X X X Granite - Carboniferous
- Basalt Boundary
- Alluvial Gravel Deposit
- Spring/Dam
- Drill Hole Location

FIGURE 2.5

Site Geology

2.4.2 Site High Quality Basalt Reserves

The 1992 EIS notes the probable high quality hard rock reserves within the Racecourse Hill deposit of approximately 39.7 Mt based on three drill cores and field mapping. It is estimated that approximately 12.7 Mt existed within the approved 20 hectare extraction area. Since 1995 Oberon Quarries has extracted approximately 2.7 Mt of basalt leaving approximately 10 Mt of resource in the approved extraction area and an additional approximately 27 Mt of basalt reserves within the remainder of the Racecourse Hill deposit.

The annual average product sale tonnage has ranged from approximately 138,000 tpa to 237,000 tpa, with an annual average product sales tonnage of approximately 159,000 tpa.

Oberon Quarries proposes to disturb an additional 1.0 hectare of the Project Area for the extraction of resources (refer to **Figure 1.2**). The quarry design will be altered to include extraction in this area should approval be granted.

2.5 Product Transport

Distribution of product from the quarry is via the approved haul roads and the public road network. The road network used is for trucks to travel via the private haul road and Oberon Quarry Road to Shooters Hill Road. Once on Shooters Hill Road trucks travel approximately 700 metres to Edith Road where the trucks turn right and travel approximately 2.1 kilometres and then turn left into Titania Road intersection. The trucks travel approximately 4.5 kilometres along Titania Road to Duckmaloi Road. At Duckmaloi Road the trucks either turn left to supply markets in Oberon and Bathurst via the Oberon heavy vehicle bypass (see **Figure 2.6**) or right to supply markets in the Blue Mountains and Sydney. The locations of the haul routes used by quarry traffic are shown on **Figure 2.6**.

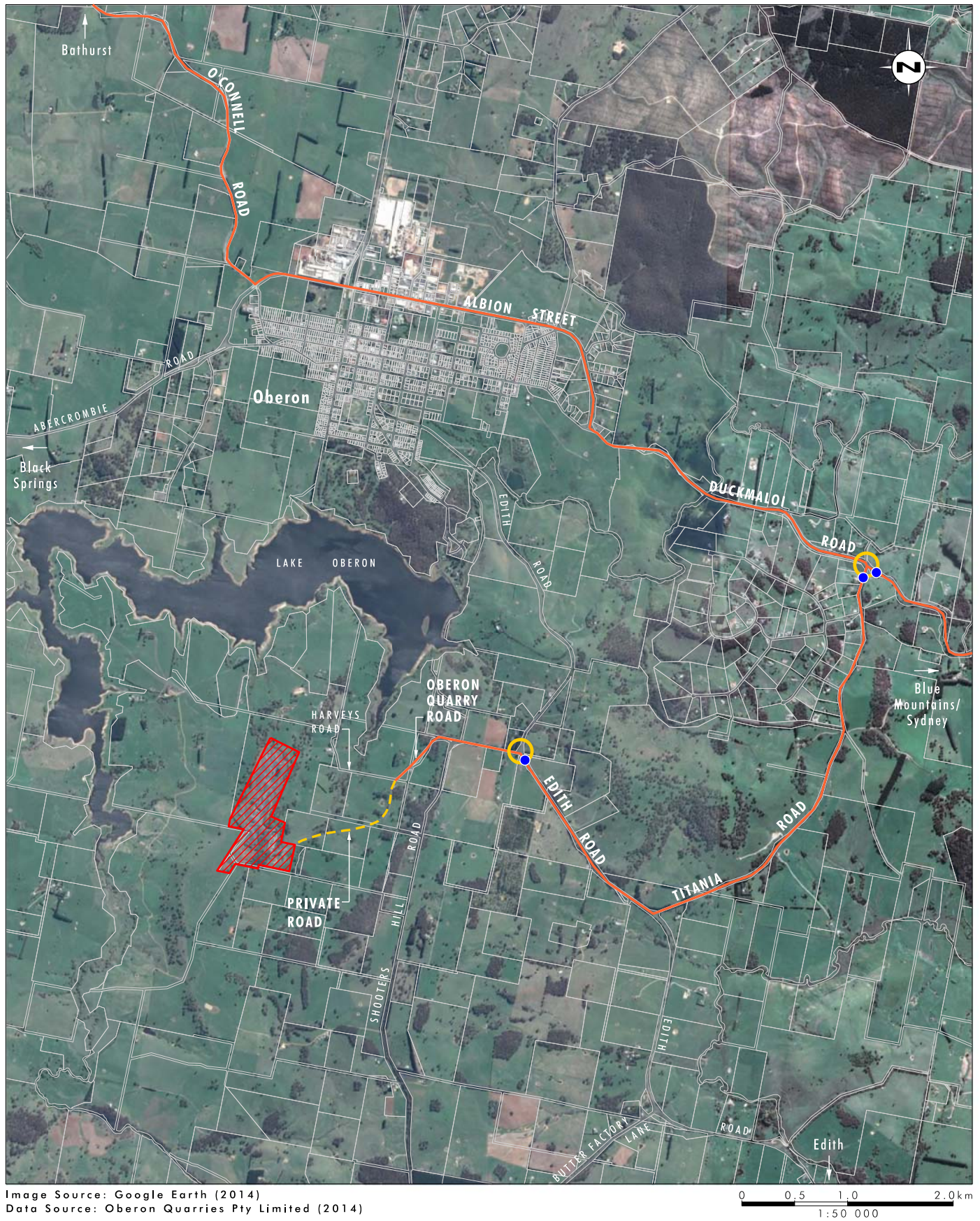
It typically takes approximately 5 minutes to load a truck at the quarry making the maximum rate of laden truck movements from the quarry during peak times approximately 12 trucks per hour with the same number of unladen trucks returning to the quarry.

The quarry typically transports product approximately 300 days per year. At a maximum annual production level of 400,000 tonnes per year as permitted under the current consent and a typical average payload of approximately 29 tonnes per trip, average laden truck movements would be approximately 46 trucks per day.

Under the existing consent, production from the quarry is limited to a maximum of 2000 tonnes per day which is approximately 70 laden truck movements per day. Oberon Council on infrequent occasions undertakes short haul transport of product from the quarry for local road works using smaller trucks. These trucks typically range from six-wheelers which can carry 12 tonnes of product per load through to dog and trailer which carry up to 32 tonne of product per load. For short haul projects six-wheelers are typically used. Depending on the size and payload of the trucks in use at the time, the number of laden truck movements may be up to approximately 80 to 90 per day.

During 2013, approximately 62 per cent of product was supplied to Oberon, Bathurst and the Blue Mountains and approximately 38 per cent was delivered to markets in Sydney.

Titania Road and intersections at Oberon Quarry Road and Shooters Hill Road, Shooters Hill Road and Edith Road, Edith Road and Titania Road and Titania Road and Duckmaloi Road were upgraded by Oberon Quarries as required by the 1993 development consent. At the time all intersections were upgraded to a rural type BA standard and have adequate site distance from all approaches.



Legend

- Project Area
- Oberon Heavy Vehicle Bypass
- Right of Carriageway (12m Wide)
- Attended Survey Site
- Automatic Traffic Counter

FIGURE 2.6

Oberon Quarries Haul Routes

Titania Road was upgraded, at Council's request, to a higher standard than the consent required so that it could be used as the heavy vehicle transport route for trucks in addition to quarry trucks. The cost of this upgrade was \$1.3 million rather than the estimated \$790,000.

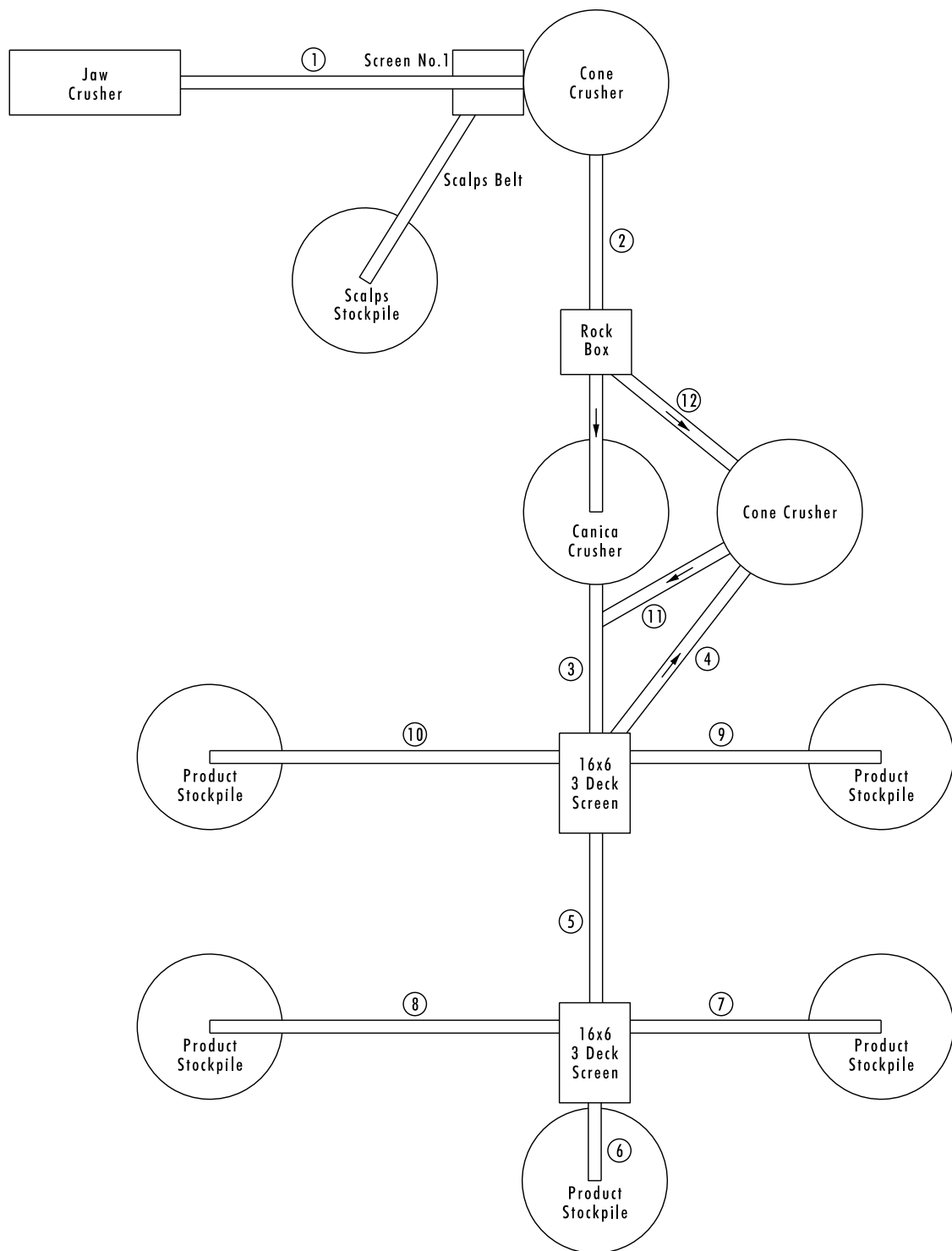
In accordance with consent requirements, Oberon Quarries pays Oberon Council a tonnage based and indexed road maintenance contribution for wear and tear on roads (i.e. road pavement damage). This road maintenance contribution was reduced by agreement with Oberon Council and modification to development consent in 2007 in consideration of Oberon Quarries trucks travelling the longer distance via Titania Road to Oberon and Bathurst rather than travelling directly to Oberon via Edith Road.

3.0 Project Description, Alternatives and Justification

3.1 Description of Project

As discussed in **Section 1.0**, Oberon Quarries is seeking, under Part 4 of the EP&A Act, to extend the life of the quarry approved under DA 92/164 to facilitate ongoing extraction of proven reserves. In addition Oberon Quarries seeks a number of proposed changes to quarrying as follows:

- extend the life of the consent for a further 30 years to allow for the continued economic extraction of the remaining 10 Mt of basalt reserves within the area approved for extraction and subsequent rehabilitation of the site;
- allow extraction of up to the approved current maximum of 400,000 tpa every year with a maximum daily production rate limit of 2000 tonnes;
- remove redundant requirements from approved quarry operations such as landscaping and screening requirements associated with the 'Westrel', Linnane Park' and 'Rocklea' properties, as these properties are now owned by Oberon Quarries;
- replacement of some of the existing screening plant, reconfiguration of the alignment of screens and the inclusion of an additional cone crusher. Modification of the crushing and screening plant is planned to consist of replacing the 3 inch JTY crusher with a Giro crusher and modifications to the conveyor and screen layouts as shown on **Figure 3.1**. This will be reviewed and may be revised as planning and equipment specifications are finalised. The equipment to be installed will be more energy efficient than the existing plant and result in reduced environmental impacts such as air quality due to production of less fines (a by-product of the crushing process). Upgrading the plant as proposed is expected to reduce noise impacts by 3 dB(A) to 6 dB(A) (refer to **Section 6.3**);
- installation of a second diesel fuel storage tank with a capacity of approximately 28,000 litres (refer to **Figure 1.2**). The second tank will be located within the existing truck parking area and will comply with the requirements of the EPA's *Storage and Handling Liquids: Environmental Protection Participant's Manual* (EPA, 2007). The installation of a second tank minimises the operational risk associated with running out of fuel as each delivery can only currently be ordered when the existing 28,000 litre diesel tank is almost empty;
- a 1.0 hectare extension to the existing 20 hectare extraction area. This proposed extension is located adjacent to the middle of the western boundary of the Project Area. The resources in this area are bounded by Crown Road reserve along its southern and western boundaries and would otherwise be sterilised if not extracted as part of the quarry operations. It is estimated there is approximately 500,000 tonnes of high quality hard rock resource in this area (refer to **Figure 1.2**). The proposed extension is within the project footprint that was considered as part of the 1992 EIS;
- produce and supply manufactured sand using a Hydrasander or equivalent. The crusher fines will be put into the raw feed hopper of the Hydrasander by front-end loader. Material greater in diameter than 5 millimetres will be directed to a stockpile while material <5 millimetres will be directed to a Terex/Finlay 150e Hydrasander (or equivalent) screen and dewatering system (refer to **Figure 3.2**). The <5 millimetre material will be processed by the Hydrasander to separate the silt and clay fraction from the crusher fines and produce a clean washed manufactured sand product with a



Legend

② Conveyor Belt Number

FIGURE 3.1

Schematic of Modified
Processing Plant Layout

Note: Not to scale

File Name (A4): R31/1296_139.dgn
20140110 11.07

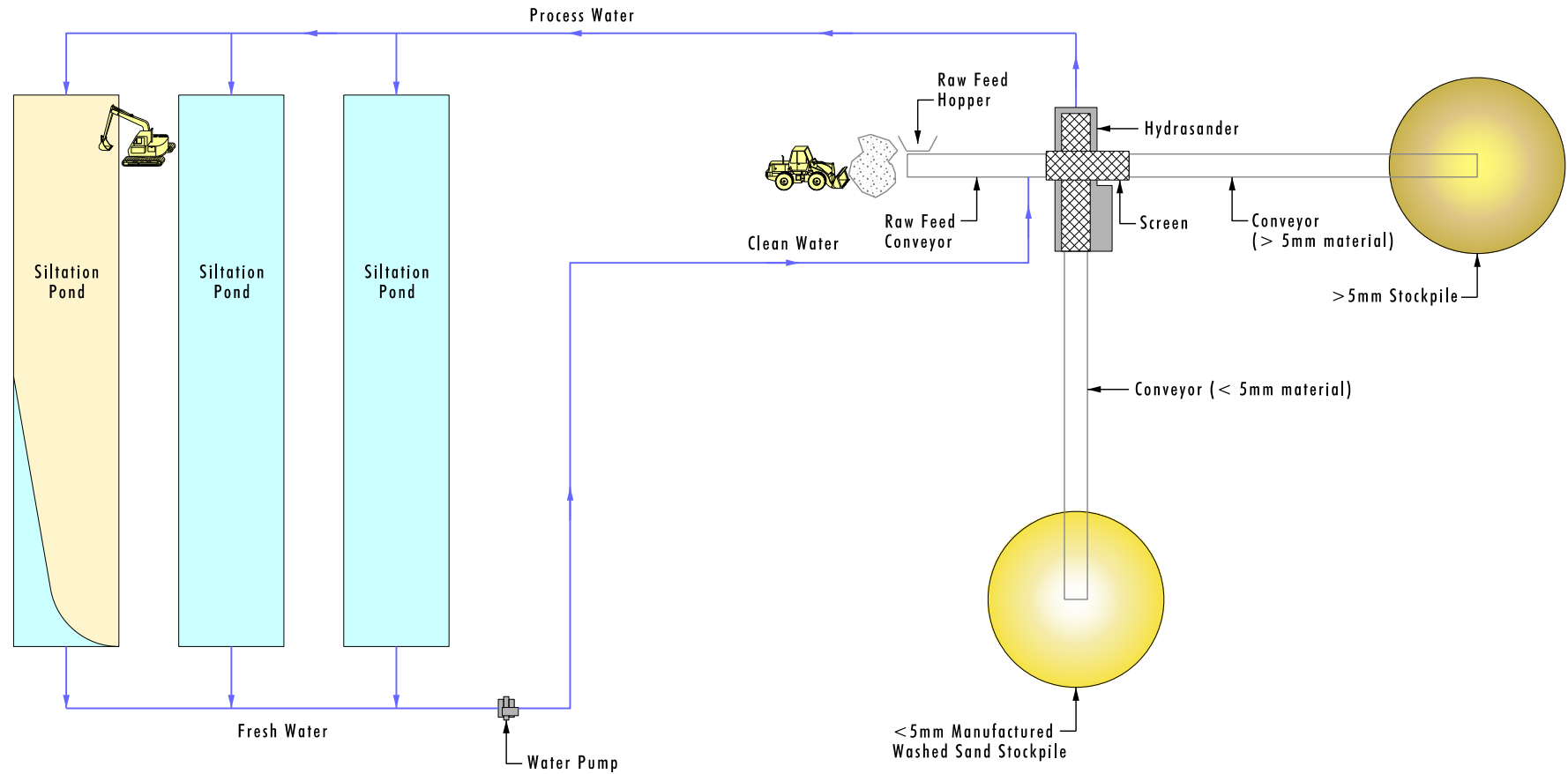


FIGURE 3.2
Manufactured Sand
Washing Process

Note: Not to Scale

File Name (A4): R31/1296_140.dgn
20140110 11.08

diameter of <5 millimetres. The process water from the Hydrasander will be continuously recycled and make up water will be provided from stormwater collected on site. The process will be designed and operated as a zero discharge system, i.e. there will be no water discharges offsite from the washing process. The process water will be managed in a multi-celled siltation pond. The multi-celled siltation pond will allow the silt and clay fraction to settle out and allow for the reuse of the water and for the recovery of the silt and clay material which will be blended with other on site materials to create a road base product (refer to **Figure 3.2**);

- construct approximately a 180 metre section of internal haul road between the weighbridge and the truck parking area to provide dedicated ingress and egress routes up the steep section of the existing haul road adjacent to the processing area. The existing haul road between the weighbridge and the truck parking area is steep, narrow and provides limited sight distance for vehicles and pedestrians entering and leaving the processing area. This presents a significant safety issue for simultaneous vehicle movements over this section of the internal haul road, with the likelihood/risk of an incident increased at a production rate of 400,000 tpa. The new internal haul road will be used for vehicles entering the quarry while the existing alignment will be used for vehicles departing the quarry (refer to **Figure 1.2**); and
- the continued extraction of the high quality basalt from the existing approved extraction areas as required. This will minimise double handling of interburden material and allow for variability in the quality of the rock and client requirements to be accommodated in the supply of the final product. It will also provide contingency for extraction during periods of prolonged rainfall when parts of the quarry floor may be flooded.

All other aspects of the approved quarry will remain unchanged from current operations and will continue to be managed in accordance with existing site practices.

3.2 Alternatives to the Project

There are no identified feasible alternatives to allow the life of quarry to be extended as proposed; the extension of the quarry is within the Racecourse Hill deposit. The 'do nothing' option is not considered feasible in relation to the life of DA 92/164, which is due to lapse on 13 May 2016, given that the quarry has operated for nearly 20 years with minimal environmental impact, there is approximately 10 Mt of reserves remaining in the current approval area and the necessary infrastructure to quarry this resource has been established and continues to be operational. Should the consent lapse, operations at the quarry will cease, with approximately 25 to 35 full-time jobs lost and the loss of a significant supply of high quality hard rock materials to the Sydney, Bathurst, Blue Mountains and local construction and infrastructure markets.

Oberon Quarries has also identified that some of the traditional suppliers of high quality hard rock to the Sydney market have recently exhausted their reserves and ceased operations. Limiting the supply of high quality hard rock quarry products by Oberon Quarries would further impose increased price pressures on the supply of quarry products to the Sydney, Bathurst, Blue Mountains and local hard rock markets. Removal of the 200,000 tpa average annual production limit over a 10 year period will assist also with minimising price pressures on the supply of quarry products to the Sydney and the Central Tablelands hard rock markets with potential to result in significant industry benefits through continuity of supply of additional product and increased competition for an additional 30 years.

As identified in **Section 6.0**, allowing the quarry to extract and process up to 400,000 tonnes of product per year is considered feasible without resulting in significant additional

environmental impacts. Assessment for the Project indicates that it is consistent with the principles of ESD (refer to **Section 8.0**).

On this basis, it would be reasonable to conclude that with continuation of appropriate mitigation and management measures as outlined in **Section 6.0**, the benefits of the Project outweigh the potential impacts. Oberon Quarries therefore considers that not proceeding with the Project is not an appropriate alternative.

3.3 Benefits of Ongoing Operations

The extended life of operations and changes to the development will provide for the continued operation of the quarry. The quarry is a regionally significant resource with reserves of 10 Mt within the currently approved extraction area and is well positioned to supply high quality hard rock materials to the surrounding region and Sydney markets. This high quality hard rock quarry product is suitable for use in nearly all quarry product applications.

Oberon Quarries has already invested significant capital, energy and resources in establishing the existing quarrying operations (e.g. road upgrades, buildings, quarry infrastructure and water management infrastructure). The ongoing operation of the quarry will maximise the return from environmental and financial investment in these assets when compared to a greenfield project.

Oberon Quarries is an important contributor to local employment through the provision of direct and indirect employment.

4.0 Planning Considerations

The following section identifies relevant State and Commonwealth legislation and discusses the application of these planning provisions to the Project.

4.1 Commonwealth Legislation

Table 4.1 provides a review of relevant Commonwealth environment and planning legislation and its application to the Project.

Table 4.1 – Summary of Commonwealth Legislation and Relevance to the Project

Act	Comments	Relevant Licences/ Approvals/Assessments
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	Under the EPBC Act the approval of the Commonwealth Minister for the Environment (head of the Department of the Environment (DoE)) is required for any action that may have a significant impact on Matters of National Environmental Significance (MNES), including: • World Heritage Properties; • National Heritage Places; • Ramsar wetlands; • cetaceans, migratory species, threatened species, critical habitats or ecological communities listed in the EPBC Act; • Commonwealth land; • marine areas or reserves; • nuclear actions; and • a water resource, in relation to coal seam gas development and large coal mining development.	The proposed Project will result in the addition of 1.0 hectare to project disturbance area. This area is located in the Project Area assessed as part of the 1992 EIS and supports no native vegetation. A recent ecological assessment of this area has also been completed and no significant species, populations or communities or ecological MNES were identified in the area. The proposed development also does not impact any other MNES, therefore, the Project is not considered to be a controlled action requiring approval under the EPBC Act. The Project will not require referral to the DoE.

**Table 4.1 – Summary of Commonwealth Legislation and Relevance to the Project
(cont)**

Act	Comments	Relevant Licences/ Approvals/Assessments
<i>Native Title Act 1993</i>	The Native Title Act is administered by the National Native Title Tribunal (NNTT). The NNTT is responsible for maintaining a register of native title claimants and bodies to whom native title rights have been granted. These native title holders and claimants must be consulted prior to the granting of a mining lease over land to which the native title claim or right applies. This Act prescribes that native title can be extinguished under certain circumstances, including the granting of freehold land.	A search was undertaken of the NNTT's National Native Title Register, Register of Native Title Claims, Unregistered Claimant Applications and Register of Indigenous Land Use Agreements on 25 January 2013. The search revealed one active claimant application for the Project Area, Gundungurra Tribal Council Aboriginal Corporation #6. This claim applies to the whole of the Oberon Local Government Area (LGA), in which the quarry is located. As there is a Crown land road reserve within the Project Area (refer to Figure 1.2), Native Title is still active. However, the quarrying operations do not extend into these Crown land areas and as such Native Title does not apply to the Project.

4.2 New South Wales Legislation

There are a number of legislative instruments in NSW which regulate the environmental impact of development. The primary instrument is the EP&A Act which regulates the environmental assessment and approval process for development in the State. The application of the EP&A Act and subordinate legislation to the Project is discussed in **Sections 4.2.1** and **4.3**. The operation of other environmental legislation on the Project is **Section 6.0** in relation to specific Project impacts where relevant.

Section 4.2.2 discusses the key strategic policies that have relevance to the design and operation of the Project which have been considered in the environmental assessment of the Project. In addition to the policies discussed there are a large number of impact specific guidance documents and policies that have been considered as part of the environmental assessment of the Project which are identified and discussed in the relevant impact assessment sections in **Section 6.0**.

4.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act is the primary legislation governing environmental planning and assessment for NSW.

The objectives of the EP&A Act are set out in Section 5 of the Act and are:

- (a) to encourage:
 - (i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,
 - (ii) the promotion and co-ordination of the orderly and economic use and development of land,
 - (iii) the protection, provision and co-ordination of communication and utility services,
 - (iv) the provision of land for public purposes,
 - (v) the provision and co-ordination of community services and facilities, and
 - (vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and
 - (vii) ecologically sustainable development, and
 - (viii) the provision and maintenance of affordable housing, and
- (b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and
- (c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

In order to meet these objectives, the EP&A Act prescribes a number of approval and assessment pathways for new development and modifications to existing development. These pathways are determined by environmental planning instruments prepared under Part 4 of the Act.

4.2.1.1 Approval Pathway

State Significant Development

As discussed in **Section 1.0**, the quarry is currently subject to DA 92/164 issued under the EP&A Act. The Project will extend the lifetime of the quarry for extraction of proven reserves for 30 years, and will result in a number of other modifications to the site (refer to **Section 3.0**), as such, the Project will require further assessment and approval under the EP&A Act before it can be carried out.

DP&I (now DP&E) has confirmed the Project is a State Significant Development and therefore development consent under Part 4 of the EP&A Act is required before the Project can be carried out. The Minister for Planning and Environment is the consent authority for State Significant Development.

Permissibility

As State Significant Development, the Project is permissible provided it is not wholly prohibited by an environmental planning instrument. The quarry site and adjoining properties are currently zoned RU1 Primary Production under the provisions of the Oberon Local Environmental Plan (LEP) 2013. Extractive industries and subdivisions are permitted within land zoned RU 1 Primary Production with the consent of Oberon Council.

4.2.1.2 Assessment Requirements

As State Significant Development, the Project is subject to the general assessment requirements under Part 4 of the EP&A Act as amended by the requirements under Part 4 Division 4.1 of that Act. The requirements are discussed below.

Section 79C Matters for Consideration

Under Part 4, the consent authority, in this case the Minister or his delegate, must have regard to the matters set out in section 79C of the Act. These are matters for consideration by the Minister and where they have been addressed in this EIS is provided in **Table 4.2**.

Table 4.2 – Section 79C Matters for Consideration

Matters for Consideration	Relevant EIS Section
(a) The provisions of: Any environmental planning instrument.	Section 4.2.2
Any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Director-General has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved).	Section 4.2.2
Any development control plan.	Not applicable due to Clause 11 of State and Regional Development SEPP 2011
Any planning agreement that has been entered into under section 93F or any draft planning agreement that a developer has offered to enter into under section 93F.	Section 6.9
The regulations (to the extent that they prescribe matters for the purposes of this paragraph).	Table 4.3
Any coastal zone management plan (within the meaning of the <i>Coastal Protection Act 1979</i>) that apply to the land to which the development application relates.	N/A – the Project is not subject to any coastal management plan
(b) The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality.	Section 6.0
(c) The suitability of the site for the development.	Section 8.1
(d) Any submissions made in accordance with this Act or the regulations.	Comments to be received on the EIS during exhibition period
(e) The public interest.	Section 8.3

In addition to the requirements under section 79C, the consent authority must also have regard to an EIS which meets the requirements of section 78(8A) of the EP&A Act. Specifically, section 78A(8A) requires the EIS to be prepared in accordance with the requirements of Schedule 2 of the EP&A Regulation. The requirements of Schedule 2 of the EP&A Regulation and where they are addressed in the EIS are set out in **Table 4.3** below.

Table 4.3 – Schedule 2 EP&A Regulation Requirements

Regulation Clause	Requirement	Where addressed in EIS
Clause 6(a)	Name, Address and Professional qualifications of person preparing the EIS.	Appendix 1
Clause 6(b)	Name of the Consent Authority.	Section 1.0
Clause 6(c)	Address of Land.	Section 1.0 and Section 2.2
Clause 6(d)	Description of development.	Section 3.0
Clause 6(e)	Assessment of the environmental impact of the Project.	Section 6.0
Clause 6(f)	A declaration that the EIS has been prepared in accordance with the Schedule, contains all available information relevant to the environmental assessment of the Project and that the information contained in the EIS is neither false nor misleading.	Appendix 1
Clause 7(1)(a)	Summary of the EIS.	Executive Summary
Clause 7(1)(b)	A statement of the objectives of the development.	Section 1.0
Clause 7(1)(c)	An analysis of any feasible alternatives to the carrying out of the development, having regard to its objectives, including the consequences of not carrying out the development.	Section 3.1
Clause 7(1)(d)(i)	A full description of the development, activity or infrastructure.	Section 2.0 and Section 3.0
Clause 7(1)(d)(ii)	A general description of the environment likely to be affected by the development.	Section 2.0 and Section 6.1
Clause 7(1)(d)(iii)	The likely impact on the environment of the development.	Section 6.0
Clause 7(1)(d)(iv)	A full description of the measures proposed to mitigate any adverse effects of the development on the environment.	Section 6.0
Clause 7(1)(v)	A list of any approvals that must be obtained under any other Act or law before the development may be lawfully carried out.	Section 4.0
Clause 7(1)(e)	A compilation of the mitigation measures referred to in Clause 7(1)(d)(iv).	Section 7.0
Clause 7(1)(f)	The reasons justifying the carrying out of the development in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development.	Section 8.4

The EIS has also addressed the Director-General's Requirements (DGRs) provided for the Project. DP&I issued DGRs for the Project on 18 December 2013. The DGRs outline the specific requirements to be addressed by this EIS. A copy of the DGRs is contained in **Appendix 2**. A checklist of the DGRs and where they have been addressed within the EIS is presented in **Table 4.4**. The specific government agency requirements included as an attachment to the DGR's has been addressed where relevant, throughout the EIS and the relevant specialist studies.

Table 4.4 – Director-General's Requirements for the Environmental Impact Statement

General Requirements	Relevant EIS Section
The Environmental Impact Statement (EIS) for the proposal must include:	
an executive summary;	Executive Summary
- a detailed description of the proposal, including: - identification of the resource; - description of the site; - a history of previous quarrying operations on the site; - the proposed works (including rehabilitation works); - the duration and intensity of extraction operations; - any likely interactions between the proposed operations and existing/ approved development and land use in the area; and - a detailed justification for the proposal.	Section 2.0, Section 3.0 and Section 6.0
consideration of all relevant environmental planning instruments, including Part 3 of the <i>Mining, Petroleum Production and Extractive Industry State Environmental Planning Policy 2007</i>, and identification and justification of any inconsistencies with these instruments;	Section 4.0
risk assessment of the potential environmental impacts of the proposal, identifying the key issues for further assessment;	Section 5.1
- detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment, which includes: - a description of the existing environment, using sufficient baseline data; - an assessment of the potential impacts of all stages of the proposal, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and - a description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the proposal; and	Section 2.0, Section 4.0, Section 6.0 and Section 7.0
a conclusion justifying the proposal on economic, social and environmental grounds, taking into consideration whether the proposal is consistent with the objects of the <i>Environmental Planning and Assessment Act 1979</i>; and	Section 3.0 and Section 8.0
a signed declaration from the author of the EIS, certifying that the information contained within the document is neither false nor misleading.	Appendix 1

Table 4.4 – Director-General’s Requirements for the Environmental Impact Statement (cont)

General Requirements	Relevant EIS Section
Key Issues	
The EIS must also assess the potential impacts of the proposal during the establishment, operation and decommissioning of the proposal. The EIS must describe what measures would be implemented to avoid, minimise, mitigate, offset, manage and/or monitor the potential impacts on:	
• Land Resources – including a detailed assessment of the potential impacts on: – soils and land capability, including an assessment of activities that would cause erosion and the measures proposed to minimise erosion and sedimentation; – landforms and topography, including cliffs, rock formations, steep slopes, etc; and – land use, including agricultural, forestry, conservation lands.	Section 2.3, Section 6.1 and Section 6.2
• Water Resources – including: – identification of any licensing requirements or other approvals under the <i>Water Act 1912</i> and/or <i>Water Management Act 2000</i>; – an assessment of the potential impacts on the quality and quantity of existing surface and ground water resources; – a description of the measures proposed to ensure that the proposal can operate in accordance with the requirements of any relevant Water Sharing Plan or water source embargo; – an annual site water balance for representative years of the proposed life of the project; and – a detailed description of the proposed water management system, water monitoring program and other measures to mitigate surface and groundwater impacts;	Section 6.7 and Section 6.8
• Air Quality – including a quantitative assessment of potential: – construction and operational impacts, with a particular focus on dust emissions (including PM10 emissions, and dust generation from transport of quarry products), as well as diesel and blast fume emissions; – reasonable and feasible mitigation measures to minimise dust, diesel and blast fume emissions, including evidence that there are no such measures available other than those proposed; and – monitoring and management measures, in particular air quality monitoring;	Section 6.5
• Noise, Vibration & Blasting – including a quantitative assessment of potential: – construction, operational and off-site transport noise impacts; – blasting impacts on people, livestock and property; – reasonable and feasible mitigation measures, including evidence that there are no such measures available other than those proposed; and – monitoring and management measures;	Section 6.3 and Section 6.4

Table 4.4 – Director-General’s Requirements for the Environmental Impact Statement (cont)

General Requirements	Relevant EIS Section
• Biodiversity – including: – accurate estimates of any vegetation clearing on site or for any road upgrades; – a detailed assessment of potential impacts of the proposal on any threatened species or populations or their habitats, endangered ecological communities and groundwater dependent ecosystems; and – a detailed description of the measures to maintain or improve the biodiversity values within the site in the medium to long term;	Section 6.10
• Traffic & Transport – including: – accurate predictions of the road traffic generated by the project; – an assessment of potential traffic impacts on the safety and efficiency of the road network; and – a detailed description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network in the surrounding area over the life of the project;	Section 6.9
• Heritage – including: – an Aboriginal cultural heritage assessment (addressing both cultural and archaeological significance) which must demonstrate effective consultation with Aboriginal communities in determining and assessing impacts, and developing and selecting mitigation options and measures;	Section 6.11 and Section 6.12
• Visual – including: – a detailed assessment of the: ▪ changing landforms on the site during the various stages of the project; and o potential visual impacts of the project on private landowners in the surrounding area as well as key vantage points in the public domain, including lighting impacts; and – a detailed description of the measures that would be implemented to minimise the visual impacts of the project;	Section 6.6
• Waste – including: – accurate estimates of the quantity and nature of the potential waste streams of the proposal, including reject material and the overburden emplacement strategy; and – a description of measures that would be implemented to minimise production of other waste, and ensure that that waste is appropriately managed;	Section 6.14
• Hazards – paying particular attention to public safety, including bushfires and transport or storage of any dangerous goods; and	Section 6.15 and Section 6.16

Table 4.4 – Director-General’s Requirements for the Environmental Impact Statement (cont)

General Requirements	Relevant EIS Section
• Social & Economic – including an assessment of the: – potential direct and indirect economic benefits of the project for local and regional communities and the State; – potential impacts on local and regional communities, including: ▪ increased demand for local and regional infrastructure and services; and ▪ impacts on social amenity; – a detailed description of the measures that would be implemented to minimise the adverse social and economic impacts of the project, including any infrastructure improvements or contributions and/or voluntary planning agreement or similar mechanism; and – a detailed assessment of the costs and benefits of the proposal as a whole, and whether it would result in a net benefit for the NSW community; and	Section 6.17
• Rehabilitation – including the proposed rehabilitation strategy for the site, having regard to the key principles in the Strategic Framework for Mine Closure, including: – rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria; – nominated final land use, having regard to any relevant strategic land use planning or resource management plans or policies; and – the potential for integrating this strategy with any other rehabilitation and/or offset strategies in the region.	Section 6.18
Environmental Planning Instruments	
The EIS must assess the proposal against the relevant environmental planning instruments, including (but not limited to): • <i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007;</i> • <i>State Environmental Planning Policy (Infrastructure) 2007;</i> • <i>State Environmental Planning Policy No. 33 – Hazardous and Offensive Development;</i> • <i>State Environmental Planning Policy No. 44 – Koala Habitat Protection;</i> • <i>State Environmental Planning Policy No. 55 – Remediation of Land;</i> • <i>Oberon Local Environmental Plan 1998;</i> and • relevant development control plans and section 94 plans, strategies and management plans.	Section 4.0

Table 4.4 – Director-General’s Requirements for the Environmental Impact Statement (cont)

General Requirements	Relevant EIS Section
Consultation During the preparation of the EIS, you must consult with Council and should consult with the relevant local, State and Commonwealth government authorities, service providers and community groups, and address any issues they may raise in the EIS. In particular, you should consult surrounding landowners and occupiers that are likely to be impacted by the proposal. Details of the consultations carried out and issues raised must be included in the EIS.	Section 5.0

4.2.2 Environmental Planning Instruments

The environmental planning instruments that are applicable to the Project are discussed in **Sections 4.2.2.1 and 4.2.2.2.**

4.2.2.1 Oberon Local Environmental Plan 2013

Under the Oberon LEP 2013, the Project site is located within an area classified as RU1 Primary Production. The objectives of the RU1 Primary Production zone are outlined below:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To enable other forms of development associated with primary production activities, which may require an isolated location or which support tourism or recreational activities.

The Project (extractive industries) is permissible with consent within the RU1 Primary Production zone and the Project is considered to be consistent with the objectives of the zone.

4.2.2.2 State Environmental Planning Policies

The following State Environmental Planning Policies (SEPPs) are relevant to the consideration of the development application for the Project.

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) Amendment (Resource Significance) 2007

The Extractive Industries SEPP regulates the permissibility and assessment requirements for mining, petroleum production and extractive industries and related development. As set out in **Section 4.2.1.1**, Oberon LEP 2013 provides that the Project is permissible with consent under the current zoning of the land.

Clause 7, Part (3)(a) Extractive Industry, of Part 2, states that:

development for any of the following purposes may be carried out with development consent:

- (a) Extractive industry on land on which development for the purposes of agriculture or industry may be carried out (with or without development consent).

As noted above, the Oberon LEP 2013 provides that the Project is permissible with consent under the current zoning of the land.

Clause 7, Part (4)(a) Co-location of industry:

If the extractive industry is being carried out with development consent on any land, development for any of the following purposes may also be carried out with development consent on that land:

- (a) the processing of extractive material.

Oberon Quarries is currently approved to extract resources and process high quality aggregate on site. The introduction of a Hydrasander will require approval under the Extractive Industries SEPP for the processing of manufactured sand from aggregate.

Clause 12 requires that before determining an application for consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must:

- (a) consider:
 - i. the existing uses and approved uses of land in the vicinity of the development (refer to **Section 2.2** and **Section 6.1**)
 - ii. whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development (refer to **Section 6.1** and **Section 6.17**), and
 - iii. any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses (refer to **Section 6.1** and **Section 6.17**), and
- (b) evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a) (i) and (ii) (refer to **Section 3.0**, **Section 6.17** and **Section 8.0**), and
- (c) evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a) (iii) (refer to **Section 3.1**).

Clause 14 of the Extractive Industries SEPP requires that the consent authority, before granting consent for development for the purposes of mining, petroleum production or extractive industry, must consider whether or not the consent should be issued subject to conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure the following:

- (a) that impacts on significant water resources, including surface and groundwater resources, are avoided, or are minimised to the greatest extent practicable (refer to **Section 6.7** and **Section 6.8**),
- (b) that impacts on threatened species and biodiversity, are avoided, or are minimised to the greatest extent practicable (refer to **Section 6.10**),
- (c) that greenhouse gas emissions are minimised to the greatest extent practicable (refer to **Section 6.13**).

Also, in determining a development application for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider an assessment of the greenhouse gas emissions (including downstream emissions) of the development, and must do so having regard to any applicable State or National policies, programs or guidelines concerning greenhouse gas emissions. **Section 6.13** presents the greenhouse gas emissions assessment for the Project.

Clause 15 requires that the consent authority must consider:

- the efficiency or otherwise of the development in terms of resource recovery; and
- whether or not the consent should be issued subject to conditions aimed at optimising the efficiency of resource recovery and the reuse or recycling of material.

The current operations and proposed modifications have been developed to optimise the recovery of resources from within the existing approved project area. **Sections 2.3 and 6.14** provide details on resource recovery and waste management.

Clause 16 of the mining SEPP requires the consent authority to consider whether or not the extractive industry under consideration should be subject to conditions restricting the use of public roads for transport or other extractive industry related traffic. Oberon Quarries' current operation has approval for the utilisation of public roads for the transport of product from the site. Transport is via a sealed haul road to Shooters Hill Road, Edith/Jenolan Caves Road, Titania Road and other sealed roads that form part of the State road system to the market areas. **Section 6.9** provides further details on existing traffic and transport for the operation and potential impacts as a result of the Project.

Clause 17 requires the consent authority determining a development for a mining development to have regard to whether or not to impose specific conditions regarding rehabilitation of land affected by the extractive industry. Progressive rehabilitation will be undertaken when possible throughout the site and progressive construction of the final landform will be undertaken once the extraction of the first and second benches has been completed within sections of the quarry pit and as space within the pit floor allows. The ongoing operation of the quarry will not alter the timing of when the rehabilitation works can be completed. **Section 6.18** provides detail on rehabilitation, decommissioning and closure for the ongoing operations.

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (SEPP Infrastructure) aims to streamline the approval process for infrastructure projects in NSW. In addition to this, it also provides for consultation with relevant public authorities pertaining to defined developments during the assessment process or prior to development commencing.

There will be no impacts on any public infrastructure; therefore this SEPP is not applicable.

State Environmental Planning Policy No 33 – Hazardous and Offensive Development

SEPP No. 33 requires the consent authority to consider whether an industrial proposal is a potentially hazardous industry or a potentially offensive industry.

The Project includes provision of an additional diesel fuel tank; however, this will not alter the existing operations substantially and would not alter this classification. Therefore, no further consideration of SEPP 33 will be required.

State Environmental Planning Policy No 44 – Koala Habitat Protection

SEPP No. 44 restricts a Council from granting development consent for proposals on land identified as core koala habitat without preparation of a plan of management.

The ecological assessment of the Project Area has determined that the area does not provide core koala habitat; consequently the requirement for preparation of a koala plan of management does not apply.

State Environmental Planning Policy No 55 – Remediation of Land

SEPP 55 aims to provide a State-wide planning approach to the remediation of contaminated land and to reduce the risk of harm to human health and the environment by consideration of contaminated land as part of the planning process. Under SEPP 55, a consent authority

must not consent to the carrying out of development on land unless it has considered any potential contamination issues.

There are no contaminated sites currently recorded within the Project Area; however, some activities carried out at the quarry have the potential to cause contamination if not properly managed. Contamination risks on site will be managed.

4.3 Other State Legislation

If approved, the Project will be subject to a number of separate regulatory approval processes. As an existing operation, a number of these additional approvals are already held; however, they may require modification to cover the Project.

Due to the Project being State Significant Development, the assessment and approval process for a number of these approvals is aligned with the development application assessment process under Part 4. Section 89K of the EP&A Act requires that a number of approvals, if required for a State Significant Development, must be granted consistent with the terms of any development consent granted for the development; where these approvals apply to the Project, they are discussed in **Section 4.3.1** below. Section 89J removes the requirement for a number of approvals for approved State Significant Developments; these approvals are discussed further in **Section 4.3.2**.

A summary of other relevant environmental and planning legislation that applies to the Project that is not subject to section 89J and 89K of the EP&A Act is discussed in **Section 4.3.3**.

4.3.1 Approvals Legislation to be Applied Consistently

If development consent for the Project is granted under Part 4 of the EP&A Act, the following approvals identified in **Table 4.5**, which are required for the Project, must not be refused by the relevant authority and must be substantially consistent with the terms of the development consent.

Table 4.5 – Approvals Legislation to be applied consistently with Development Consent

Act	Comments	Relevant Licences/ Approvals/Assessments
<i>Protection of the Environment Operations Act 1997</i> (POEO Act)	The POEO Act is administered by OEH and requires licences for environmental protection including waste, air, water and noise pollution control.	Oberon Quarries currently holds EPL 4442 which provides for an extractive activity with a production rate of between 100,000 and 500,000 tpa. New noise limits have been identified as part of the noise assessment for the ongoing operations and it is envisaged these will be incorporated into the EPL. No other changes to the EPL are required as a result of ongoing operations.

**Table 4.5 – Approvals Legislation to be applied consistently with
Development Consent (cont)**

Act	Comments	Relevant Licences/ Approvals/Assessments
<i>Roads Act 1993</i>	The Roads Act is administered by the Roads and Maritime Services (RMS), local council or the Department of Lands (DoL). RMS has jurisdiction over major roads, the local council over minor roads, and the DoL over road reserves. Under the Act applications are required to be made to the Minister for the closure of Crown roads and for works on public roads.	There are no known Crown Roads within the quarry's extraction area. Access to the quarry will continue to be via Quarry Road which connects to Shooters Hill Road. No upgrades or modifications to the existing roads are proposed and as such no approval under the Roads Act will be required.

The various matters regulated by the above approvals legislation are assessed in **Section 6.0**.

4.3.2 Approvals Legislation which Does Not Apply

Under section 89J of the EP&A Act, if development consent is granted for the Project under Part 4 of the EP&A Act, the following authorisations listed in **Table 4.6**, which may otherwise have been relevant, will not be required to carry out the Project.

Table 4.6 – Authorisations which Do Not Apply

Act	Approval
<i>Coastal Protection Act 1979</i>	Concurrence under Part 3 of the Act (use of coastal zone).
<i>Fisheries Management Act 1994</i>	A permit under section 201 (dredging or reclamation work), s. 205 (harming marine vegetation) or s. 219 (blocking of fish passage).
<i>Heritage Act 1977</i>	An approval under Part 4 (effect on interim heritage orders and listing on State Heritage Register), or an excavation permit under section 139 (disturbance or excavation of relic) and Division 8 Part 6 of the Act.
<i>National Parks and Wildlife Act 1974</i>	An Aboriginal heritage impact permit under s. 90 (Aboriginal Heritage Impact Permit).
<i>Native Vegetation Act 2003</i>	An authorisation referred to in section 12 (to clear native vegetation or State protected land).
<i>Rural Fires Act 1997</i>	A bushfire safety authority under section 100B (bushfire safety authority).
<i>Water Management Act 2000</i>	A water use approval under section 89; a water management work approval under section 90; an activity approval (other than an aquifer interference approval) under section 91.

The various matters regulated by the above approvals legislation are assessed in **Section 6.0**.

4.3.3 Other Potentially Relevant Legislation

Table 4.7 presents an overview of other potentially relevant legislation/licences/approvals/assessments.

Table 4.7 – Other Potentially Relevant Legislation

Act	Comments	Relevant Licences/ Approvals/Assessments
<i>Dams Safety Act 1978</i>	This Act requires that the NSW Dams Safety Committee (DSC) periodically review large dams that may constitute a hazard to human life and property. These dams are known as prescribed dams and are listed in Schedule 1 of the Act. Any new prescribed dams are to be designed to the satisfaction of the DSC.	The proposed modifications do not require the construction of any new or additional dams that would require approval under the Dams Safety Act. The provisions of the Dams Safety Act do not apply to this project.
<i>Water Management Act 2000 (WM Act)</i>	The WM Act regulates the taking, interception, storage and use of surface water and groundwater within areas subject to water sharing plans.	There will be no changes to impacts on water as a result of the proposed modifications. The provisions of the WM Act do not apply to the proposed extension and changes.
<i>Water Act 1912 (Water Act)</i>	The Water Act has been repealed by the WM Act; however, certain licensing provisions of the Water Act still apply. The Water Act is administered by the NSW Office of Water (NOW). The licensing provisions of the Water Act apply to water sources that are not subject to a water sharing plan gazetted under the WM Act. A permit and/or licence must be obtained to extract surface water and/or groundwater not covered by a water sharing plan under the WM Act (i.e. Part 2 and Part 5 of the WM Act respectively).	Oberon Quarries currently holds a Part 2 surface water licence under the Water Act (80SL051088) for the extraction of water from Racecourse Creek. No other licensing or approvals in regard to the Water Act are required.
<i>Threatened Species Conservation Act 1995 (TSC Act)</i>	Under the EP&A Act, impacts on threatened species listed under the TSC Act are required to be assessed.	The Project will result in an additional 1.0 hectare of disturbance. This area is located in the Project Area assessed as part of the 1992 EIS and has been cleared of native vegetation. The area supports improved pasture and exotic cypress species. An ecological assessment of this area has been completed and no significant species, populations or communities were found. Therefore, no further assessment or approvals under the TSC Act are therefore required.

5.0 Consultation and Identification of Key Environmental Risks and Community Issues

5.1 Risk Assessment

An environmental risk assessment was completed for the site during the development of the Preliminary Environmental Assessment (Umwelt, 2013) and through the review of the site for the annual Conditions Compliance Report required for the site under Condition 27 of DA 92/164 (Umwelt, 2014). Findings of the assessment and the compliance review indicated that the proposed changes to the quarry site will not result in any significant adverse impacts on the surrounding area or fundamentally change quarry operations from those approved under DA 92/164 and subsequent modifications.

5.2 Consultation

Community and agency consultation is a fundamental element of the preparation of an EIS and necessary to assist in the determination of the relevant issues to be addressed. Oberon Quarries' approach to consultation has been to identify and then consult with the key agencies, stakeholders and community regarding the Project to assist in appropriately defining the scope of the EIS and to enable the ongoing operations to be responsive to community concerns. Issues raised during the consultation process have been considered during the preparation of the EIS.

5.2.1 Community Engagement

Key stakeholders and the community (i.e. the surrounding landholders within the vicinity of the quarry) have been engaged via individual meetings. During the meetings the ongoing operations and the potential impact on the community and environment were outlined and feedback was sought on the proposed ongoing operations for incorporation in the EIS as appropriate. A summary of the consultation undertaken is contained in **Table 5.1**.

Table 5.1 – Community Engagement

Agency/ stakeholder	Date	Form of Consultation	Outcomes/Comments
Key stakeholders and Community (Tony Alevras, John Hackfath, Graham Bell and Stan Edwards)	21 June 2013	Meetings and phone conversations	Individual meetings with surrounding landholders within the vicinity of the quarry. All community stakeholders that the Project was discussed with (on 21 June 2013) supported the ongoing operation of the quarry and raised no objections.
Warrick, Mark and Ian Mawhood	31 July and 1 August 2013	Phone conversations	Identified no issues with quarry operation of past 18 years.

5.2.2 Aboriginal Cultural Heritage Consultation

On 4 September 2013, a letter was sent to Gundungurra Aboriginal Heritage Association Inc. (GAHA) and Gundungurra Tribal Council Aboriginal Corporation (GTCAC) requesting information regarding the Aboriginal cultural values associated with the proposed Oberon

Quarry extraction area extension. It was requested that this advice be provided by 2 October 2013.

On 19 September 2013, Sharyn Halls (GAHAI) was contacted by phone and she provided the following information:

- it was understood that the proposal was for a 1.0 hectare extension to the existing quarry; and
- no specific cultural information was provided for Racecourse Hill. However, it was noted that the general Oberon area was significant because their families had lived in the area and Oberon formed part of a songline through the region.

An attempt was also made to phone Sharon Brown (GTCAC) on 19 September and 4 October 2013. However, she was not able to be contacted.

Further details on Aboriginal party consultation requirements are provided in **Section 6.11.2**.

5.2.3 Government Agencies and Authorities Consultation

The consultation program to date has consisted of briefings and discussions with key government agencies to discuss key issues and proposed management measures. These agencies included the DP&I, Oberon Council, the Environmental Protection Authority (EPA)/ Office of Environment and Heritage (OEH), and NOW. A summary of the consultation undertaken is contained in **Table 5.2**.

Table 5.2 – Summary of Agency and Community Stakeholder Consultation

Agency/ stakeholder	Date	Form of Consultation	Outcomes/Comments
DP&I	15 January 2013	Email	DP&I initially confirmed that the Project would be assessed as a modification under Section 75W of the EP&A Act.
DP&I	July/August 2013	Phone conversations	DP&I subsequently confirmed the Project should be assessed in two stages due to the 30 year extension to operations that was being sought. The initial stage was for a modification for extension of quarry life for 2 years which has subsequently been granted. The second stage was for a 30 year extension and other associated changes to the development as a State Significant Development under Part 4 of the EP&A Act.
EPA/OEH	21 June 2013	Phone conversation	The EPA raised a number of concerns relating to the on-site diesel fuel storage facility it identified as part of a site inspection undertaken a number of years ago (i.e. the location of the filling point outside of the bund wall and the absence of a concrete apron). Since the EPA's inspection Oberon Quarries has undertaken rectification works to address both of the above issues. No other issues of concern were raised.

Table 5.2 – Summary of Agency and Community Stakeholder Consultation (cont)

Agency/ stakeholder	Date	Form of Consultation	Outcomes/Comments
NOW	27 June 2013 and 1 August 2013	Phone conversation and email	Attention drawn to NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011 Water Sharing Plan. No specific requirements identified.
Oberon Council	21 June 2013	Meeting	Overall Council supported the ongoing operation of the quarry. Council however was concerned about the refuelling of trucks in Oberon. As part of the Project, Oberon Quarries is seeking approval to construct a second 28,000 litre diesel tank to minimise the risk of running out of fuel and therefore the need to undertake refuelling in Oberon. No other issues of concern were raised.

6.0 Environmental Assessment

6.1 Landform, Topography and Land Use

The Project is located approximately 4 kilometres south of Oberon in the Central Tablelands of NSW (refer to **Figure 1.1**). The quarry is located in the catchment of Lake Oberon.

The topography of the surrounding area is a relatively flat high altitude plateau with rolling hills largely consisting of grazing land.

The quarry site occupies the northern end of Racecourse Hill with the processing area located on a natural bench on the eastern slopes of the hill. Racecourse Hill is an elongated flat top hill oriented approximately north-south. Extraction is confined to the high quality basalt resource that is located within the rim of Racecourse Hill. There is a 0 to 0.2 metre layer of soil overlying the weathered basalt resource being extracted.

The hill has a relief of 100 metres above Lake Oberon with a maximum elevation of 1167 metres AHD. The highest elevation of the surrounding section of the Tablelands is Norway Trig (1237 metres AHD) which is located approximately 1.6 kilometres south-east of Racecourse Hill.

At present the quarry floor is approximately 8 to 10 metres below the top surface of Racecourse Hill with extraction of the upper layer extending to the northern boundary of the approved extraction area and only limited extraction being undertaken in the southern extraction area. The final quarry floor will be located approximately 20 metres below the skyline and will be bounded on both sides by natural topography, except for a narrow cutting on the eastern side above the processing area which provides haul road access to the quarry floor.

Racecourse Creek flows in a north-easterly direction on the eastern side of Racecourse Hill to Lake Oberon. The eastern side of the valley formed by Racecourse Creek rises up to 1190 metres AHD onto Shooters Hill Road.

The Fish River and Lake Oberon form a valley on the western side of Racecourse Hill. A number of gullies drain the northern and western sides of Racecourse Hill. These include Hodges Gully and Hobbies Gully (Resource Planning, 1992).

The proposed 1.0 hectare extension area is also located on the plateau adjacent to the existing extraction area and is largely cleared of native vegetation with improved grasslands for grazing of sheep (refer to **Figure 1.2**). The land use surrounding the site is also grazing. There will be no impact on agricultural viability as a result of the extension.

There are no forestry or conservation lands in the Project Area or immediate surrounds.

6.2 Soils

As part of the EIS completed in 1992 for the original project approval for the quarry, a soils assessment was completed and is summarised below. As discussed in **Section 3.0**, the ongoing operations will not result in any significant change to the approved quarry operations. The 1.0 hectare extension of the quarry is located on land assessed as part of the 1992 EIS. The area is on previously modified land will not result in any significant environmental impacts.

6.2.1 Previous Soil Mapping

The Soil Conservation Service has mapped soil landscapes of the area at a scale of 1:250,000 (Kovac, Lawrie, and Murphy B.N. (1989)). The quarry site is located within the Porters Retreat Soil Landscape described by Kovac and Lawrie (1990) as being dominated by Krasnozems (Gn 4.11, Gn 3.11, Dr 4.11) on mid to upper slopes, with chocolate soils (Gn 4.31) midslope, and red podzolic soils (Dr 2.11) and yellow solodic soils on lower slopes. General soil descriptions for this soil landscape unit given by Kovac and Lawrie (1990) are outlined below:

Krasnozems

- Topsoil: Dark reddish brown to brown loam to fine sandy clay loam weak to moderate structure; pH 6.0-7.0; to 35 centimetres depth.
- Subsoil Diffuse to clear change to dark reddish brown sandy clay to light clay with moderate structure pH 6.0-6.5.

Chocolate Soils

- Topsoil Brown loam, fine sandy with weak structure, pH 5.5, to 10 centimetres depth.
- Subsoil Dark brown clay loam with moderate to strong structure, pH 5.5-6.0.

Kovac and Lawrie (1990) describe the Kraznozems as having low to moderate topsoil erodibility, moderate permeability, high available water-holding capacity, moderate shrink – swell potential and no mass movement hazard.

The proposed haul route, traversing ‘Langley Heights’ on granitic parent material is mapped by Kovac, Lawrie and Murphy (1989) as part of the Lake Oberon Soil Landscape. Kovac and Lawrie (1990) describe this landscape as comprising the undulating low hills with granite boulders south of Oberon. Dominant soils are noted as yellow podzolic soils (Dy 4.21, Dy 3.41, Dy 2.21) and siliceous sands (Uc 4). A general soil description for the yellow podzolic soils within the landscape as described by Kovac and Lawrie (1990) is provided below.

Yellow Podzolic Soils

- Topsoil Brown sandy loam with weak structure or single-grained, pH 5.5-6.5. A2 horizon, may be bleached (dry) yellowish brown sandy loam, pH 6.0.
- Subsoil Clear to gradual change to yellowish brown sandy clay loam with moderate structure, pH 5.0-6.0.

Kovac and Lawrie (1990) describe the yellow podzolic soils as being well drained, moderately permeable, low to moderate available water-holding capacity, moderate to high topsoil erodibility, low to moderate subsoil erodibility, and low shrink-swell potential.

These soils are also described as having low chemical fertility and known nitrogen and phosphorus deficiencies.

6.2.2 Previous Soil Surveys

As part of the EIS completed in 1992, detailed soil profile descriptions were undertaken on a single toposequence transect considered representative of the soils to be affected by

proposed quarry operations. Soils have been classified into Principle Profile Forms according to Northcote (1979) and an approximate correlation between these classifications and Great Soil Groups has also been given.

Krasnozems soils (Principal Profile Form Gn 4.11) occur on the flat plateau area (Sites S3 and S4 on **Figure 2.5**). These soils are characterised by shallow depth (25-30 centimetres), and gradational texture change with profile depth. Topsoil texture is fine sandy clay loam and subsoils are generally light clay material.

Side slope areas are dominated by Structured Loams (Um 6.13 and 6.14). Soils with Principal Profile Form Um 6.13 occur on the flat mid-slope area proposed to locate the processing plant (Site S2 on **Figure 2.5**). Soil depth in this area varies from 2 metres to 4 metres and there is minimal texture differentiation throughout the profile. Topsoil material was noted at the survey site to have a silty clay loam texture and subsoil texture was noted to be fine sandy clay loam. These soils are crumbly in a moist condition.

In the lower slope area (Site S1 on **Figure 2.5**) Principle Profile Form Um 6.14 occurs on colluvial material. Characteristics of these soils are similar to those occurring upslope although subsoil material is brighter reddish brown. Survey Site S1 was located near to the basalt/granite contact and it is expected that granitic soils would occur down slope from this location and are likely to have typical profile forms similar to the Yellow Podzolic soils described by Kovac and Lawrie (1990) (refer to **Section 6.2.1**).

6.2.3 Erosion and Sediment Control

Current site infrastructure and management practices successfully manage sediment and erosion control for the operation. Surface water management infrastructure at the quarry has been established and fully operational since 1995. The existing water management system at the site includes diversion drains, catch drains and sedimentation dams. Diversion drains have been constructed around the disturbance area and are vegetated. Catch drains have been constructed with rock weirs and convey sediment-laden from the extraction area to a series of sedimentation dams. Refer to **Section 6.7** for further detail.

Sediment and erosion control measures will be expanded to incorporate the 1.0 hectare extension area. Sediment and erosion control is currently well managed and will be continued for the life of the quarry operations.

6.3 Noise

A detailed noise assessment has been undertaken which includes the direct noise impacts associated with the ongoing operations and the cumulative noise impacts.

As discussed in **Section 2.2**, there are four private residences that are located within 1 kilometre and 1.3 kilometres of the processing area, being:

- two residences (belonging to Tony Alevras), which were constructed after the quarry commenced operations and are located approximately 1.3 kilometres due north of the processing plant;
- one new residence (belonging to John Hackfath), which was constructed after the quarry commenced operations and is located off Shooters Hill Road, approximately 1.3 kilometres to the east of the processing plant. The ground elevation at this residence is approximately 75 metres higher than that at the processing plant. Sections of the processing plant and haul road are visible from this residence; and

- ‘Langley Heights’ (belonging to the Lang family), is located approximately 1 kilometre north-east of the processing plant. This residence is associated with the quarry and it is owned by the owner of the land on which the quarry operates (refer to **Figure 2.1**).

Discussions with Mr Alevras and Mr Hackfath indicate that neither of them have any issue in regard to noise from quarry operations.

A comprehensive noise assessment for the Project was completed by Umwelt. A summary of the key findings of the assessment is provided below, with the full assessment report included in **Appendix 3**.

6.3.1 Existing Noise Environment

Minimum background noise levels in the area surrounding the quarry were reported in Section 5.8 of the EIS (Resource Planning, 1992) as ranging from 37 to 49 dB(A) in the day-time and 30 to 36 dB(A) at night.

Due to the rural nature of the area surrounding Oberon Quarries’ operations, the existing background noise environment has been assumed for the purposes of the Noise Impact Assessment, set out in **Appendix 3**, to be at or below 30 dB(A), if the quarry did not exist. For the purposes of the noise impact assessment a background noise level, otherwise referred to as Rating Background Level (RBL), of 30 dB(A) has been adopted for the day, evening and night-time periods, as per the NSW Industrial Noise Policy (INP) (EPA, 2000).

6.3.2 Assessment Criteria

Operational Noise

The INP sets out two forms of noise criterion; intrusiveness and amenity. The intrusiveness criterion specifies that the LAeq 15 minute noise level from any new source should not exceed the RBL by more than 5 dB(A). The RBL is defined as the overall single-figure background level representing each measurement period (day, evening and night) over the whole monitoring period.

The amenity criteria is intended to ensure that the total LAeq noise level from all industrial sources does not exceed specified levels. For rural residences, the relevant recommended acceptable amenity levels for each measurement period are:

- Daytime (7.00 am – 6.00 pm) – 50 dB(A) LAeq;
- Evening (6.00 pm – 10.00 pm) – 45 dB(A) LAeq; and
- Night (10.00 pm – 7.00 am) – 40 dB(A) LAeq.

The project-specific intrusive criteria derived from the assessed RBLs are presented in **Table 6.1** below along with the relevant amenity criteria.

Table 6.1 - Intrusive and Amenity Assessment Criteria

Location	Time Period	Noise Criterion – dB(A)	
		Intrusiveness LAeq, 15min	Amenity LAeq, Period
Rural Residential Areas	Day	35	50
	Evening	35	45
	Night	35	40

* Day period is 7.00 am – 6.00 pm; Evening is 6.00 pm – 10.00 pm; Night is 10.00 pm – 7.00 am

The project-specific noise criteria for the ongoing operations, as defined by the INP, are the more stringent of the intrusive and amenity criteria. Therefore, in this case, the project-specific noise criteria for the ongoing operations are the intrusive criteria for all measurement periods and all locations.

In those cases where the INP project-specific assessment criteria are exceeded, it does not automatically follow that all people exposed to the noise would find it noticeable or unacceptable. In subjective terms, exceedances of the criteria can be generally described as follows:

- negligible noise level increase (less than 1 dB(A) (not noticeable by all people);
- marginal noise level increase (between 1 dB(A) and 2 dB(A)) (not noticeable by most people);
- moderate noise level increase (between 3 dB(A) and 5 dB(A)) (not noticeable by some people and may be noticeable by others); and
- appreciable noise level increase (greater than 5 dB(A)) (noticeable by most people).

It should be noted that the INP does not set mandatory limits, but requires operations to seek to achieve the criteria. Where INP criteria cannot be achieved by applying feasible and reasonable measures, there is scope to apply alternative criteria.

The project-specific noise criteria and assumed project specific acquisition criteria are outlined in **Table 6.2**.

Table 6.2 - Project Specific Noise Criteria and Assumed Acquisition Criteria

Location	Time Period	Project Specific Noise Criteria dB(A)	Assumed Acquisition Criteria dB(A)
Rural Residential Areas	Day	35 _{LAeq, 15 min}	40 _{LAeq, 15 min}
	Evening	35 _{LAeq, 15 min}	40 _{LAeq, 15 min}
	Night	35 _{LAeq, 15 min}	40 _{LAeq, 15 min}

* Day period is 7.00 am – 6.00 pm; Evening is 6.00 pm – 10.00 pm; Night is 10.00 pm – 7.00 am

Cumulative Noise Criteria

To limit continuing increases in noise levels, the EPA has established the amenity criteria as the maximum ambient noise level goal from all noise sources within an area. The limiting amenity criteria applicable to cumulative noise impacts from all operations during the day,

evening and night-time periods is 50 LAeq, Period, 45 LAeq, Period, and 40 LAeq, Period respectively at all residential locations.

Sleep Disturbance

The sleep disturbance criteria are based on the guideline publication of the EPA Noise Guide for Local Government (DECCW, 2010a), which suggests that to prevent sleep disturbance, the LA1,1minute or L_{Amax} level of a noise source should not exceed the LA90 background noise level by more than 15 dB when measured outside the bedroom window. Further guidance on the potential for 'awakening reactions' is provided in the EPA Environmental Criteria for Road Traffic Noise (EPA, 1999), which states that internal maximum noise levels below 50-55 dB(A) are unlikely to cause awakening reactions. Based on the adopted night-time RBL, the sleep disturbance criterion is 45 dB(A) L_{Amax} for the ongoing operations.

Road Traffic Noise

The criteria for the assessment of noise from traffic on public roads are set out in the EPA's *NSW Road Noise Policy* (EPA, 2011). To apply these criteria, the classification of the road needs to be determined. In terms of the *NSW Road Noise Policy*, Edith Road and Titania Road are considered to be a sub-arterial road. Sub-arterial roads are those which provide connection between arterial and local roads, may support arterial roads during peak periods, and/or may have been designed as local streets but can serve major traffic generating developments or support non-local traffic and are the local Council's management responsibility (EPA, 2011). Oberon Quarry Road and Shooters Hill Road are considered to be local roads. Local roads are those which provide vehicular access to abutting property and surrounding streets, provide a network for the movement of pedestrians and cyclists, and enable social interaction in a neighbourhood, should connect, where practicable, only to sub-arterial roads and are the local council's management responsibility (EPA, 2011).

Based on the *NSW Road Noise Policy*, the road traffic noise assessment criteria for residential land uses are shown in **Table 6.3**.

Table 6.3 - Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of Project/Land Use	Assessment Criteria – dB(A)	
		Day (7 am – 10 pm)	Night (10 pm – 7 am)
Freeway/arterial/sub-arterial roads	Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	LAeq, (15 hour) 55 (external)	LAeq, (9 hour) 50 (external)
	Existing residences affected by noise from redevelopment of existing freeway/arterial/subarterial roads	LAeq, (15 hour) 60 (external)	LAeq, (9 hour) 55 (external)
	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments		

Table 6.3 - Road Traffic Noise Assessment Criteria for Residential Land Uses (cont)

Road Category	Type of Project/Land Use	Assessment Criteria – dB(A)	
		Day (7 am – 10 pm)	Night (10 pm – 7 am)
Local roads	Existing residences affected by noise from new local road corridors	LAeq, (15 hour) 55 (external)	LAeq, (9 hour) 50 (external)
	Existing residences affected by noise from redevelopment of existing local roads		
	Existing residences affected by additional traffic on existing local roads generated by land use developments		

The *NSW Road Noise Policy* also suggests where the noise assessment criteria target has been exceeded then all feasible and reasonable measures should be applied.

6.3.3 Noise Modelling

Noise Modelling Methodology

Noise levels for the ongoing operations have been calculated using the Environmental Noise Model (ENM). This model has been endorsed by the EPA for environmental noise assessment. ENM takes account of noise attenuation due to geometric spreading, atmospheric absorption, shielding and the effect of acoustically soft ground. It can also be used to predict noise levels under various meteorological conditions, defined by a combination of temperature gradient, wind speed and wind direction.

The model uses sound power level data for all relevant items of plant and equipment as detailed in the noise impact assessment (refer to **Appendix 3**). The sound power levels adopted are based on measurements of on-site plant and equipment. The sound power levels adopted for the new screen, crusher and Hydrasander are based on currently feasible, reasonable and achievable noise emissions levels. A TAPM meteorological data set has been used to derive the various meteorological conditions used to predict the noise impacts from the ongoing operation of the quarry, as a local Bureau of Meteorology monitoring station with a suitable meteorological data set is not available.

Noise modelling was conducted for two main operational scenarios to identify potential noise impacts from operations at the northern and the southern ends of the quarry:

- quarrying operations undertaken in the north of the pit together with the operation of plant in the processing area; and
- quarrying operations undertaken in the south of the pit together with the operation of plant in the processing area, for the day time period only.

These two operational scenarios were then combined with the loading and dispatch of product trucks. As the loading and dispatch of product trucks could occur during the evening and the night-time (i.e. before 7 am) periods when quarrying, crushing and processing were not being undertaken, the noise impact of this activity was modelled as a separate stand-alone activity. The quarrying, processing, truck loading and dispatch scenarios were

modelled under three meteorological conditions, while the loading and dispatch of product trucks were modelled under six meteorological conditions. These included a winter evening/night temperature inversion scenario.

Temperature inversions are an important atmospheric factor that influences noise impacts. This results from variations in temperature occurring in layers in the atmosphere that can increase noise impacts. The INP includes a methodology for estimating the effect of inversions, however the noise modelling for the ongoing operations has considered temperature inversion conditions using a TAPM V4 meteorological data set, as a local representative weather station was not available. As a result, the calculated noise levels more accurately reflect expected noise impacts, in comparison to the default INP temperature inversion assumptions which would otherwise apply.

The key noise controls included in the modelling are discussed in **Section 6.3.5**.

6.3.4 Noise Impact Assessment

Operational Noise Impacts

A detailed noise assessment was undertaken which included the direct noise impacts associated with the ongoing operations and the cumulative noise impacts. The worst case 10th percentile noise levels for each of the residences surrounding the Project were calculated for day, evening and night-time operations for each of the modelled scenarios. Noise levels were predicted for private residences surrounding the Project.

The quarry has been operating without noise complaints for many years however has been generating noise levels under certain meteorological conditions in excess of the target PSNL of 35 dB(A). Inclusion of new crushing and screening plant is estimated to reduce the existing noise at the nearby residential receivers by 3 dB to 6 dB, when compared to the current operations.

Modelling indicates that during the day, evening and night time period noise levels will not exceed the target PSNL of 35 dB(A) under calm conditions or under conditions associated with significant wind conditions as defined by the INP (EPA, 2000) at all surrounding residences except for the following:

- under non-significant 3 m/s westerly winds noise levels of up to 41 dB(A) may be experienced at Location 1 (Hackfath) during quarry operations and 42 dB(A) during quarry operations and product dispatch. This is a 1 dB reduction in noise levels from existing operations under the same non-significant wind conditions. Mr Hackfath has stated that he does not find existing noise levels intrusive; and
- under temperature inversion conditions with a 2 m/s southerly drainage flow product dispatch on the private quarry haul road during evening and night time periods could result in noise levels of 38 dB(A) at Location 5 (Langley Heights). It is noted there is a commercial agreement between Oberon Quarries and the owner of Location 5.

Cumulative Noise Impacts

There is no other significant existing or approved noise generating developments within the vicinity of the quarry. Therefore, there are no significant cumulative industrial noise impacts that could contribute to noise generated by the quarry.

Road Traffic Noise Impacts

Assessment of the road traffic noise impact of the Project has been conducted at setback distances of 60 metres, 110 metres and 250 metres from the centre line of Oberon Quarry Road, Shooters Hill Road, Edith Road and Titania Road. These distances are considered representative of the residential receivers likely to be influenced by the movement of product trucks travelling to and from the quarry along these roads. Predictions were based on a maximum of eight truck movements per hour, an average speed on Shooters Hill Road, Edith Road and Titania Road of 100 km/h with no noise barriers included in the traffic noise prediction model. The results of traffic noise modelling are presented below in **Table 6.4**.

Table 6.4 – Predicted Day and Night Road Traffic Noise Levels (dB(A)) Shooters Hill Road, Edith Road and Titania Road

Receiver	Setback Distance (metres)	Period	Assessment Criteria, LAeq,1 hour	Traffic Noise Levels, LAeq,1 hour
Oberon Quarry Road, Shooters Hill Road, Edith Road, Titania Road	60	Day	55	47
		Night	50	
	110	Day	55	43
		Night	50	
	250	Day	55	36
		Night	50	

The results indicate the predicted road traffic noise levels associated with product trucks travelling to and from Oberon Quarries' operations do not exceed the day or night-time period road traffic noise criteria.

There will be no change to the maximum number of truck movements per hour as part of the Project.

6.3.5 Noise Management and Mitigation Measures

Key noise management and mitigation measures to limit potential operational noise impacts currently being implemented at Oberon Quarries' operations and that will be applied to future operations include:

- consideration of seasonal influences on noise impacts, to avoid or otherwise minimise noise impacts to sensitive receivers;
- undertaking prescribed works within the approved hours of operation. Works undertaken outside these hours include:
 - emergency work to avoid the loss of life, property and/or prevent environmental harm; and
 - any other work as agreed through negotiation between Oberon Quarries and potentially affected noise receivers or as otherwise agreed by the EPA.
- where practical aural reversing alarms on mobile plant will be muffled;
- regular inspections of all site plant and equipment to ensure ongoing compliance with manufacturers' specifications;

- provision of noise awareness training to site workers;
- positioning (i.e. location and orientation) mobile plant and equipment where feasible to minimise any potential noise impact on the surrounding residential receivers;
- implementing noise attenuation controls, where feasible, on any mobile and stationary equipment that is potentially generating noise levels above that predicted and/or are generating noise complaints;
- installation of a new crushing plant that has a SWL 6 dB less than the existing equipment and the screening plant that has a SWL 3 dB less than the existing equipment;
- limiting truck speeds on the internal haul roads to 40 km/h;
- not permitting the use of compression brakes on internal haul roads and Oberon Quarry Road;
- drilling associated with blasting will only take place between the hours of 7.00 am and 6.00 pm, Monday to Saturday; and
- during the periods 6.00 am to 7.00 am and 6.00 pm to 10.00 pm, a maximum of 4 laden delivery trucks should leave the site per hour (total 8 truck movements per hour).

These are considered the only feasible measures available to mitigate noise impacts.

Oberon Quarries will set up and operate a community contact line. The local community is encouraged to use this point of contact to report any instances of excessive noise. All enquiries are to be recorded and the subsequent investigation, action and response logged. The action taken is also communicated to the person who made the enquiry.

6.4 Blasting (Overpressure and Vibration)

6.4.1 Existing Blasting Environment

Explosives are used to fracture the high quality basalt to enable the extraction of the resource by earthmoving equipment. To achieve this, holes are drilled in a pre-determined pattern giving attention to their angle, depth and spacing. These holes are then filled with an explosive and the charge is initiated with the aid of primers and detonators. The detonation of each hole is delayed in a pre-designed sequence to ensure that each hole is fired individually in close succession. This delayed firing technique improves the efficiency of the blast and also reduces its environmental impacts.

The design of a blast depends on its location, geological structures in that area, volume of resource in the target area, end product requirements and any limiting factors in relation to potentially sensitive locations (including residences and infrastructure). Blast design is therefore completed on a blast by blast basis, ensuring that all these factors are considered to achieve blast levels within acceptable limits.

Oberon Quarries undertakes blast monitoring to assess potential for blast impacts on people, property and livestock and verify that the limits for airblast overpressure levels and ground vibration peak particle velocity are not exceeded at any point within 1 metre of any affected residential boundary or other noise sensitive area.

In accordance with Environment Protection Licence conditions which are designed to minimise impacts on people, property and livestock, the airblast overpressure level from blasting operations must not exceed¹:

- 115 dB (Lin Peak) for more than 5 per cent of the total number of blasts during each reporting period; and
- 120 dB (Lin Peak) at any time.

Similarly, at any point within one metre of any affected residential boundary or other noise sensitive area in the vicinity of the plant, the ground vibration peak particle velocity from blasting operations must not exceed:

- 5 mm/s for more than 5 per cent of the total number of blasts carried out on the premises during each reporting period; and
- 10 mm/s at any time;

Blasting typically occurs approximately once per month and occasionally twice per month with each blast typically yielding 15,000 tonnes to 25,000 tonnes of rock depending on number, spacing and depth of blast holes. It is envisaged that at maximum production level of 400,000 tonnes per year, approximately 20 blasts per year will be required.

The immediate surrounds of the active quarry area and the adjoining paddocks are used for grazing and have been since blasting for quarry operations commenced in 1995. When blasting is not occurring, livestock regularly graze around the perimeter of the quarry to keep grass levels down for fire and weed management purposes. Prior to commencing preparations for blasting, the landholder is notified removes any livestock from the fenced quarry area to remove the potential to accidentally impact on blasting equipment or detonate explosives that have been placed in drill holes ready for blasting. Prior to blasting occurring, adjoining landholders and Oberon Council are contacted and informed as to what time blasting will occur.

Observations by the landholder and quarry personnel over 20 years of blasting demonstrate that livestock are not adversely affected with stock showing no signs of being startled. The quarry has received no complaints in regard to impacts of blasting on livestock. As a result potential impacts of blasting on livestock are low risk and have not been considered further in preparation of this document.

6.4.2 Blasting Assessment

Blasts at Oberon Quarries' operations are monitored (i.e. overpressure and vibration) in accordance with DA 92/164. The blast monitoring results for the 2010 and 2011 calendar years shows that none of the blasts monitored were above 115 dB or 10 mm/s.

The blast monitoring results for the 2012 calendar year show that there had been two exceedances of 120 dB overpressure and no exceedances of the 5 mm/s vibration limit of the blasts that were monitored. The overpressure exceedances were due to irregularities along the blasting face, which when combined with the drillhole angle reduced the distance to face for some holes. This resulted in some of the blast energy that was designed to fracture the hard rock not being absorbed through fracturing the rock which resulted in overpressure levels being recorded above 120 dB.

¹ For assessment of annoyance due to blasting, the EPA adopts guidelines produced by the Australian and New Zealand Environment and Conservation Council (ANZECC, 1990)

These exceedances occurred when blasting was being undertaken on the upper level at the very northern end of the extraction area approximately 360 metres from NM2 (Alevras cottage) (refer to **Figure 2.1**) where the blasts were monitored. In the future, blasting at the northern end of the extraction area will be at least 400 metres from Alevras cottage and will be undertaken on the lower bench which is approximately 10 metres below ground level.

Oberon Quarries is committed to ensuring that sufficient distance is maintained between the blast hole and the quarry face so that this situation does not occur in the future and has subsequently developed a draft Blast Management Plan for quarry operations. A copy of the draft Blast Management Plan is provided in **Appendix 4**.

Alveras cottage (NM2) is the closest residence to the quarry. Within the currently approved extraction area, the distance of the quarry operations where blasting will take place from Alveras cottage ranges from approximately 400 metres to 1400 metres. There are several other non-quarry related residences in proximity to the quarry with the closest of these being in excess of 850 metres from the quarry blasting area.

Blasting site laws developed for the quarry by Richard Heggie and Associates (Oberon Quarries Pty Limited Submission in Reply 1993), indicate that airblast overpressure is the limiting factor in terms of the size of the Maximum Instantaneous Charge (MIC) that can be detonated. This is consistent with blast monitoring results recorded at the quarry. Based on the site laws, air blast overpressure and ground vibration for a range of MIC and distances from the nearest residence have been derived and are provided in **Table 6.5**.

Table 6.5 – Permissible Maximum Instantaneous Charge

Distance to Nearest Residence (m)	Maximum Instantaneous Charge (kg)	Modelled Airblast Overpressure (dB Linear)	Modelled Ground Vibration (mm/s)
400	40	114	1.7
600	40	110	0.8
800	40	107	0.5
400	60	116	2.0
600	60	112	1.1
800	60	108	0.7
400	80	117	2.7
600	80	113	1.3
800	80	110	0.9
400	100	117.5	3.0
600	100	114	1.7
800	100	111	1.0
400	120	118	3.7
600	120	114.5	1.9
800	120	112	1.2
1000	120	108	0.8

To minimise the potential for off-site impacts, the MIC for any blast at the quarry can be varied depending on distance to nearest residence. The closest residence is 400 metres to the north of the quarry blasting area.

As shown in **Table 6.5**, site laws developed for blasting at the site indicate that blast overpressure is the limiting factor in terms of charge size. Site laws indicate that blast overpressure limits are able to be complied with at 400 metres with a MIC of approximately 45 kilograms or less. As set out in **Table 6.5**, MIC can be increased to 60 kilograms where the distance to the closest residence is in excess of approximately 450 metres, 80 kilograms where the distance is 500 metres or more and 120 kilograms where the distance to the nearest residence is 550 metres or greater.

Oberon Quarries uses 89 millimetre diameter drill holes which are then filled with explosive to within 2 metres to 2.5 metres of the surface. The upper 2 metres to 2.5 metres of the drill hole is then filled with stemming material to minimise fly rock and prevent excessive blasting impacts. The explosive used weighs approximately 7.47 kilograms per metre length of drill hole. To limit the MIC, the depth of drill hole is varied to take into account the MIC that can be triggered and a Nonel delay system is used to enable charged drill holes to be independently detonated where required.

Where residences are 400 metres from blasting, a 45 kilogram MIC can be achieved by drilling an 8 metre deep hole 89 millimetres in diameter and then filling it with 6 metres of explosive and 2 metres of stemming material.

Where residences are 550 metres from blasting, a MIC of up to 120 kilograms can be used. This could involve two 10.5 metre holes with 8 metres of explosive and 2.5 metres of stemming being detonated simultaneously or a single 18.5 metres hole, comprising 16 metres of explosive and 2.5 metres of stemming material being detonated. Maximum bench height at the quarry is less than 15 metres indicating that all blasting can be undertaken with a MIC of 120 kilograms or less if required.

Blast monitoring has been a requirement of the blasting contract for many years. There have been some problems with the implementation of component of the contract in the past and as a result of the November and December 2012 blast exceedances, Oberon Quarries has purchased its own blast monitoring equipment and has been undertaking blast monitoring in parallel with the blasting contractor to ensure that all blasts are accurately monitored.

In addition, the Quarry Manager has undertaken blasting training so that all blasts configurations and delays used can be thoroughly checked before the blasts are detonated. In conjunction with this Oberon Quarries has reduced the maximum number of holes to be detonated in a blast from 300 to 150.

Oberon Quarries has committed to ensuring that sufficient distance is maintained between the blast hole and the quarry face, that appropriate delays are used and that all blasts are monitored and recorded to avoid any further exceedances in the future.

Oberon Quarries has and will continue to manage its blasting impacts through ongoing monitoring and review of the blast design, so that the overpressure and vibration criteria are not exceeded at private residences unless agreed with the resident. Blasting site laws and blast monitoring demonstrate that blasting at the quarry site can be undertaken in accordance with blast overpressure and ground vibration criteria.

With the ongoing adoption of appropriate controls and checks no adverse impacts from blasting on people, property and livestock are predicted to occur as a result of the proposed ongoing operations.

6.4.3 Blast Management Procedures

Oberon Quarries will continue to implement the existing blast management measures:

- all relevant quarry personnel will be trained on the environmental obligations in relation to blasting controls;
- the surrounding landowners and Council will be notified prior to undertaking a blast;
- the date, location of blast holes and quantity of explosive used each day will be documented;
- blasts will be designed to comply with overpressure and vibration criteria;
- monitoring will be undertaken at the nearest private residence and/or other sensitive locations (as required) to verify compliance with the relevant criteria (refer to **Figure 6.1**);
- the maximum number of holes to be detonated in a blast will be 150;
- sufficient distance will be maintained between the blast hole and the quarry face;
- appropriate delays will be used;
- all blasts will be monitored and recorded;
- blast monitoring data will be used on an ongoing basis to further refine the blast design and management;
- review of blast design will be ongoing and blast management procedures will be periodically reviewed to evaluate performance and identify corrective action, if required; and
- blasting will be undertaken between 9.00 am and 5.00 pm, Monday to Saturday inclusive, except under apparent temperature inversion conditions when blasting shall only occur between 11.00 am and 1.00 pm Monday to Saturday. No blasting is undertaken on Sundays or public holidays, without approval of the Secretary.

6.5 Air Quality

A comprehensive air quality assessment was completed for the ongoing operations. The assessment details the existing air quality environment for the local area, identifies potential air quality impacts associated with the ongoing operations and assesses predicted emissions from the ongoing operations against the relevant criteria.

The main emissions sources associated with ongoing operations are from the exposed surface areas.

As such the key air quality considerations include depositional dust, Total Suspended Particulates (TSP) and PM₁₀. A summary of the key findings of the assessment is provided below, with the full assessment report included in **Appendix 5**.

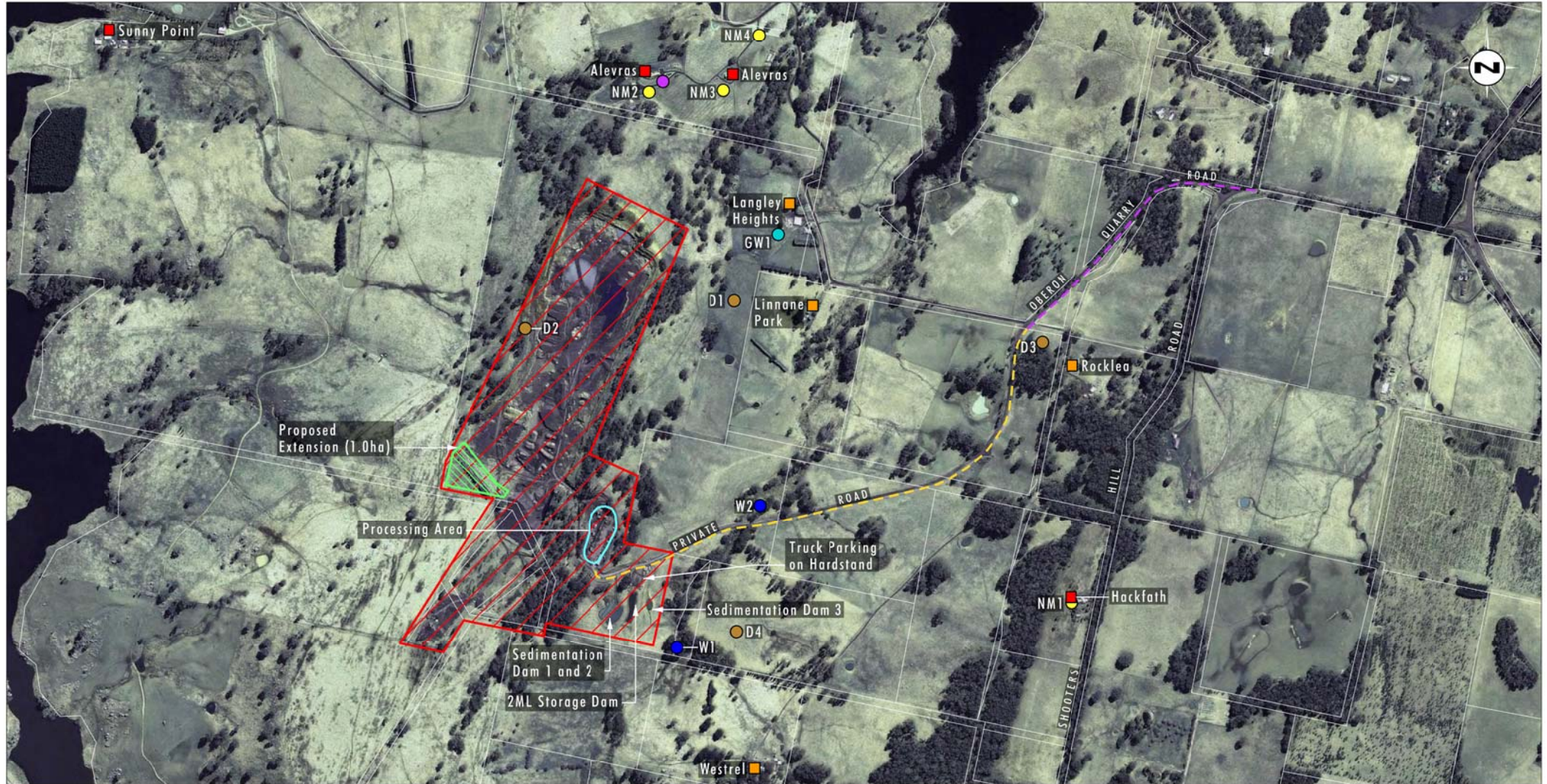


Image Source: Google Earth (2012)
Data Source: Oberon Quarries Pty Limited (2014)

Legend

- | | | |
|-----------------------------------|--|----------------------------|
| Project Area | Noise Monitoring Location | Proposed Extension (1.0ha) |
| Right of Carriageway (12m Wide) | Blast Monitoring Location | |
| Depositional Dust Gauge Location | Private Residence | |
| Surface Water Monitoring Location | Residence Owned by Oberon Quarries/Associated with Oberon Quarry | |
| Groundwater Monitoring Location | Processing Plant | |

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FIGURE 6.1
Environmental Monitoring Locations

6.5.1 Climate and Meteorology

A TAPM meteorological data set has been used to derive the various meteorological conditions used to predict the air quality impacts from the ongoing operation of the quarry, as a local Bureau of Meteorology monitoring station with a suitable meteorological data set is not available.

The TAPM meteorological data indicates that during the day-time east-north-east to east-south-east winds dominate during the summer, while east to south-east winds dominate during the autumn. During the summer and autumn evening period east to east-south-east winds dominate, while winds from the south-west to west dominate during the evening periods during winter and spring.

To use the wind data to assess dispersion it is necessary to also have available data on atmospheric stability. A stability class was calculated for each hour of the meteorological data using sigma-theta (a measure of the fluctuation of the horizontal wind direction) according to the method recommended by the US EPA (US EPA, 1986).

6.5.2 Existing Air Quality

Oberon Quarries operates a network of four depositional dust monitoring gauges as shown on **Figure 6.1**. **Table 6.6** shows the annual average dust deposition levels ranged between 1.05 g/m²/month and 3.05 g/m²/month at these four locations for the period between 2003 and 2012. These results show that the recorded levels have been consistently below the relevant EPA air quality criteria of 4 g/m²/month annual average.

Background TSP and PM₁₀ air quality monitoring data is not available for the Oberon area. The nearest air quality monitoring station to the quarry is the EPA's Bathurst air quality monitoring station. The Bathurst station has therefore been used to represent the background air quality levels for air impact assessment purposes.

Table 6.6 – Depositional Dust Monitoring Results

Year	Dust Monitoring Location			
	D1 Average (g/m ² /m)	D2 Average (g/m ² /m)	D3 Average (g/m ² /m)	D4 Average (g/m ² /m)
2003	1.41	1.69	1.35	2.24
2004	1.37	1.05	1.67	2.07
2005	2.35	1.71	1.88	2.31
2006	2.82	1.97	1.67	2.72
2007	2.39	1.91	1.98	2.21
2008	2.57	1.13	1.45	2.32
2009	2.62	2.08	2.27	2.66
2010	2.90	1.65	1.71	2.71
2011	3.05	2.08	1.79	2.54
2012	2.79	2.23	1.46	1.99
2013	2.39	1.79	1.28	1.76

NB: EPA annual average dust depositional criteria 4 g/m²/month

6.5.3 Air Quality Criteria

This assessment utilises the relevant (i.e. PM₁₀, TSP and depositional dust) air quality criteria specified by EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DECC, 2005) (refer to **Table 6.7**).

When assessing the potential air quality impacts associated with a proposed operation, it is necessary to compare the existing air quality environment, the proposed operation and the relevant air quality criteria. Air quality criteria are used to assess the potential for ambient air quality to give rise to adverse health or nuisance effects.

Table 6.7 – Relevant Air Quality Criteria

Pollutant	Criterion	Averaging Period	Source
PM ₁₀	50 µg/m ³ +	24 Hour	EPA
	30 µg/m ³	Annual Average	EPA
TSP	90 µg/m ³	Annual Average	EPA
Depositional dust	2 g/m ² /month (Maximum increase in deposited dust)	Annual Average	EPA
	4 g/m ² /month (Maximum allowable deposited dust)	Annual Average	

NB: + 5 exceedances allowed per year

The assessment of PM₁₀, TSP and depositional dust emissions from a Project against air quality criteria considers the existing levels of each substance and the contribution of the Project, i.e. the cumulative impact.

6.5.4 Assessment Methodology

The air quality assessment has been undertaken in accordance with the Approved Methods and Guidance for Modelling of Air Pollutants in NSW (DECC, 2005) (refer to **Appendix 5**). The guidelines specify how assessments based on the use of air dispersion models should be undertaken. They include guidelines for the preparation of meteorological data to be used in dispersion models, the way in which emissions should be estimated and the relevant air quality criteria for assessing the significance of predicted air quality impacts associated with a project.

The specific approach to the air quality assessment included dispersion modelling based on the existing meteorological conditions and emissions factors to estimate emissions from Project-related processes, further details are provided in **Appendix 5**. Off-site air quality impacts have been predicted using AUSPLUME. AUSPLUME is widely used throughout Australia and is regarded as a 'state-of-the-art' model. The AUSPLUME model is accepted by the EPA for air quality impacts assessment.

The model has utilised:

- a TAPM generated meteorological data set;
- existing air quality data collected from Oberon Quarries-operated dust deposition air quality monitoring gauges;

- the EPA's Bathurst air quality monitoring station; and
- estimated emissions rates and characteristics associated with the operation of the quarry.

6.5.5 Air Quality Impact Assessment

Dust emissions will occur during the crushing and screening of the quarried rock, operation of the Hydrasander, the loading of trucks, vehicle movements, exposed surfaces and stockpiles.

Table 6.8 summarises the highest predicted ground level concentrations for PM₁₀, TSP and depositional dust at all sensitive receiver locations due to the ongoing operation of the quarry under all modelled meteorological scenarios. Estimates of background levels are provided and combined with predicted project-related emissions to provide an indication of the cumulative air quality impacts as a result of the operation of the quarry (refer to **Table 6.8**).

Table 6.8 – Highest Predicted Ground-level Pollutant Concentrations for PM₁₀, TSP and Depositional Dust

Pollutant and Averaging Time	Assessment Criteria	Existing Levels	Project Contribution	Cumulative Level (Project Contribution + Existing)
Max 24 Hour Average PM ₁₀ ⁺	50	9.00	23.90	32.90
Annual Average PM ₁₀	30	14.00	1.68	15.68
Annual Average TSP	90	35.00	4.28	39.28
Deposited Dust	4	-	0.88	-

+ 5 exceedances allowed per year.

- No data available

Predictions are for private residences only

As outlined in **Table 6.8**, there are no predicted exceedances of the relevant air quality assessment criteria.

In addition, given the nature of the infrastructure on site and the blasting regime and management measures, emissions from diesel and NO_x from blasting are likely to be negligible.

6.5.6 Air Quality Management and Mitigation Measures

As outlined in **Section 6.3.5**, the air quality assessment has indicated that the ongoing operations will not have a significant impact on air quality. Furthermore, the air quality assessment has indicated that the predicted emissions from the ongoing operations are substantially below relevant criteria. Oberon Quarries has committed to implementing the following dust management and mitigation practices:

- regular watering of unsealed haul roads within the extraction and processing areas and working areas;
- mist sprays on conveyors discharging to product stockpiles;
- limiting vehicles speeds on unsealed surfaces to 40 km/h;

- progressive stabilisation/rehabilitation of exposed areas no longer needed for operational purposes;
- rehabilitating the final landform surface as soon as practicable;
- minimisation of the total disturbed/working areas at any one time;
- implementing temporary stabilisation measures (e.g. cover crops or mulch) on disturbed areas soon as practicable, if rehabilitation is not to be undertaken within the coming three months;
- where practical/possible conduct drilling and blasting during suitable meteorological conditions (i.e. not during high winds);
- drill holes capped with stemming to restrict the upward emission of dust;
- undertaking preventative maintenance on all dust suppression plant and equipment;
- truck wheel wash facility;
- covering of all laden trucks leaving the site; and
- monitoring of depositional dust levels and analysis of the data for trends.

These are considered the only feasible measures available to mitigate air quality impacts.

Oberon Quarries will continue to implement the existing air quality monitoring program which comprises four dust deposition gauges and monitor the dust levels at these locations at monthly sample intervals.

6.6 Visual Amenity

An assessment has been undertaken to assess the impact of the continued quarry operations on the visual amenity of the view shed surrounding the operation. The assessment consisted of a review of existing information about the site, including the 1992 EIS for the site and topographical mapping, to identify potential viewing locations from which the quarry extension area would potentially be visible from. Following which a field visit to these locations was undertaken to determine the likelihood of any visual amenity impacts from the extension and continued operations.

Since the 1993 development consent was granted, three new residences have been constructed (i.e. Tony Alevras (2) and John Hackfath). The two residences belonging to Mr Alevras, are located approximately 1.3 kilometres due north of the processing plant and are shielded from the quarry activities by intervening topography, including Racecourse Hill, which extends approximately 40 metres higher than the processing plant and in excess of 50 metres higher than the new residences. Neither the processing plant nor the extraction area is visible from these residences. The topsoil bund located around the perimeter of the quarry extraction area is however visible from these residences (refer to **Plate 1**).

The third residence, belonging to John Hackfath, is located adjacent to Shooters Hill Road, approximately 1.3 kilometres to the east of the processing plant. The ground elevation at this residence is approximately 75 metres higher than the processing plant. Sections of the processing plant haul road and topsoil bund located around the perimeter of the quarry extraction area are visible from this residence (refer to **Plate 2**). Any views of the quarry from private residences are either obstructed or long distance views.

Views of Oberon Quarries existing processing area and the topsoil bund located around the perimeter of the quarry extraction area (eastern side) are possible to varying degrees from Shooters Hill Road (refer to **Plate 3**), Oberon Quarry Road and the Hackfath residence. Views from these roads will commonly be associated with local road commuters and they will generally be short term. The view from the Hackfath residence is far afield and partially screened by the existing vegetation. The ongoing operations within the quarry pit and the processing area are not visible from outside of the quarry other than the existing limited views of the processing area from the Hackfath residence.

The assessment concluded that the natural topography, existing bunds, existing vegetation and distance of the quarry from surrounding residences and vantage points, heavily restrict the visibility of the quarry and its operations. The Project will therefore not impact on the visual amenity of the surrounding view shed (i.e. visual amenity impacts will not change from that approved by the 1993 development consent).

6.7 Surface Water

6.7.1 Existing Water Management System

Surface water management infrastructure at the quarry has been established and fully operational since 1995.

The quarry is located within the perimeter of Racecourse Hill. Racecourse Hill is a plateau and the quarry extraction area and associated topsoil stockpiles and bunds occupy the majority of the top of the plateau at the northern end where the quarry is located. As a result, there is negligible catchment area on top of the northern part of Racecourse Hill that is outside or upslope of the perimeter of the quarry water management system. The existing water management system includes grass bunds around the perimeter of the excavation to prevent runoff from the surrounding plateau entering the quarry water management system. Any runoff from the area outside of the quarry management system drains around or away from the quarry.

The water management system also includes a series of clean water diversion drains, catch drains and sedimentation dams as shown on **Figure 6.2**.

Catch drains have been constructed within the perimeter of the quarry management system to convey potentially sediment laden runoff to the sediment dams. Catch drains have also been established and vegetated along the sides of the haul road when it was first being established in 1994. These catch drains include rock weirs at regular intervals that are now well vegetated and maintained in a stable condition.

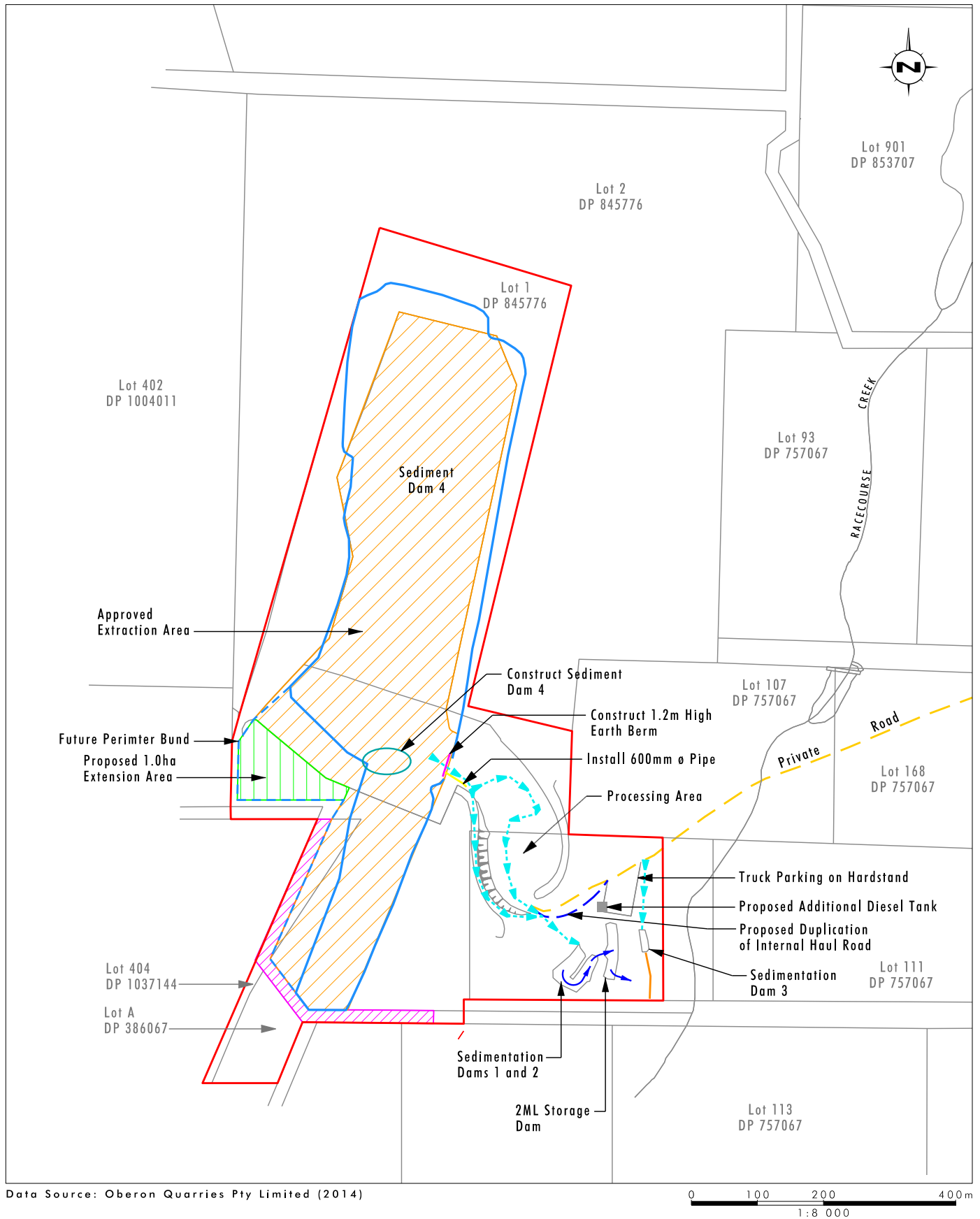
The location of the diversion drains, catch drains and sedimentation dams that comprise the quarry water management system are shown on **Figure 6.2**. As can be seen from **Figure 6.2**, all runoff from within the perimeter of the quarry water management system is conveyed to the sediment dams which have been constructed in series. Sediment Dams 1 and 2 are located down slope of the processing plant area. Both Sediment Dams 1 and 2 can be drawndown by a siphon system and constant flow devices to provide approximately 1 metre or approximately 1600 m³ of surcharge capacity.

Flow from Sediment Dam 1 to Sediment Dam 2 is regulated by a constant flow device which restricts the flow rate to approximately 10 L/s. Discharges from Sediment Dam 2 are regulated by a similar constant flow device with discharges piped to a 2 ML Storage Dam that is immediately down slope of Sediment Dam 2. The 2 ML Storage Dam has a very small



PLATE 3

Screened view of the quarry from Shooters Hill Road looking west towards the quarry



Legend

- | | | |
|---|--|--|
| Project Area | Perimeter Bund | Pipe |
| Crown Road Reserve | Future Perimeter Bund | Sediment Dam |
| Approved Extraction Area | Catch Drain | |
| Proposed Extension (1.0ha) | Level Spreaders | |
| Right of Carriageway (12m wide) | → Direction of Flow | |
| Proposed Duplication of Internal Haul Road | Earth Berm | |

FIGURE 6.2

Existing and Proposed
Water Management System

external catchment and predominantly only receives inflow from Sediment Dam 2. The 2 ML Storage is maintained in a drawn down state with water from the dam being used for dust suppression. The system has been designed to contain runoff from in excess of a 1 in 100 year 24 hour rainfall event (154 millimetres of rainfall) and as a result uncontrolled discharges from the 2 ML Storage Dam are likely to be infrequent and small. No discharges from the 2 ML Storage Dam have been observed over the 20 year period that the quarry has been operating. If discharges from the 2 ML Storage Dam occurred, water would flow to the level spreader that is located immediately downslope of the sediment dams and the 2 ML Storage Dam. Water flows as sheet flow from the level spreader to Racecourse Creek over approximately 120 metres of vegetated (grass) buffer which further filters the water before it enters Racecourse Creek.

A third Sedimentation Dam is located immediately downslope of the truck parking area and collects and treats runoff from this area. Sedimentation Dam 3 overflows to the 100 metre long level spreader upslope of Racecourse Creek.

Runoff from the quarry floor is controlled through a series of excavations, low berm and pipes to provide storage within the quarry during periods of heavy rainfall. The quarry floor and associated flow controls effectively provide the detention and settling capacity that will be provided by Sediment Dam 4 once it is constructed on the final quarry floor. A low berm is maintained at the entrance to the extraction area to provide additional surcharge capacity during extreme rainfall events. Flow controls within the quarry floor enable contained runoff to drain at a controlled rate from the quarry floor through the processing plant area to Sedimentation Dams 1 and 2. As discussed, Sedimentation Dams 1 and 2 are in series with Sediment Dam 1 overflowing to Sediment Dam 2. Overflows from Sedimentation Dam 2 drain via a 100 millimetre diameter pipe to the 2 ML Storage Dam. Water in the 2 ML Storage Dam is used for dust suppression in the processing plant area and for unsealed haul roads.

As discussed, Sediment Dams 1 and 2 have been designed to have 1600 m³ of surcharge capacity. The available surcharge capacity is sufficient to contain 120 millimetres of runoff from the processing plant area which is in excess of the predicted runoff from a 1 in 100 year 24 hour storm event of 154 millimetres of rainfall. Rainfall from smaller events is unlikely to result in discharges from the 2 ML Storage Dam.

The processing area has also been designed to act as a detention basin during significant storm events with the ability to detain up to approximately 0.9 metres depth of water.

Pipes between Sediment Dam 2 and the 2 ML Storage Dam restrict the flow rate to between the storages to approximately 10 L/s. This provides in excess of 60 hours of detention and settling time for entrained sediment flowing from the processing plant area. When the water management system was first established in 1995, provision was made for flocculation of sediment within the 2 ML Storage Dam. Quarry operations since that time have demonstrated that flocculation is not required and the provision for a flocculation system has since been removed with the series of dams, pipes and detentions systems providing adequate time for settling to occur without flocculation.

Dam sizes and surcharge capacity of each dam are provided in **Table 6.9**. Dams are cleaned out as required to maintain capacity.

Table 6.9 – Sediment and Storage Dam Characteristics

Dam	Length	Width	Depth	Storage Volume (KL)	Surcharge Volume (KL)	Top Water Level (mAHD)	Construction Type
SD1	62	20	2.5	890	800	1,109.5	Homogenous earth wall with cut-off trench
SD2	65	20	2.5	950	800	1,109.0	Homogenous earth wall with cut-off trench
SD3	30	7	2.0	210	0	1,097.5	Homogenous earth wall
Quarry floor/ SD4	80	25	2.0	4,100	32,000+	Quarry Floor	Excavation and earth bunds that are progressively modified to facilitate quarrying. Once quarrying within the second lower layer of basalt opens a sufficient section of the quarry floor, a 1.2 metre high earth bund will be established across the entrance to the quarry to provide additional detention capacity within the quarry.
2 ML Storage	84	17	2.0	2,000	0 to 2000	1,106.5	Homogenous earth wall
Total	-	-	-	8,150	33,600+	-	-

NB: SD = Sedimentation Dam

As presented in **Table 6.9**, the quarry water management system provides a capacity of approximately 8150 KL of storage for sediment laden runoff with stored water being utilised and used for dust suppression. This is the equivalent of approximately 40 millimetres of runoff from the entire 21 hectare quarry and processing plant area. In addition, the dams system has been designed to provide in excess of 33,600 KL of surcharge capacity making a total capacity equivalent to approximately 220 millimetres of runoff. The existing water management system was designed in 1993 to accommodate runoff from a Probable Maximum Precipitation rainfall event of 380 millimetres in 1 hour. The entire extraction area of the quarry, including the proposed 1.0 hectare extension has a total catchment area of approximately 21 hectares.

As discussed, Sedimentation Dams 1 and 2 in series with the 2 ML Storage Dam have been designed and constructed to provide sufficient retention time to allow sediment entrained within runoff from the quarry to settle out before the water is discharged to a 100 metres long grassed level spreader that is located parallel to Racecourse Creek and approximately 120 metres upslope required to dissipate concentrated flows. The level spreader also serves as the overflow spillway for Sediment Dam 3. Discharges from the level spreader occur as sheet flow over the 120 metre grassed section between the level spreader and Racecourse Creek. This provides further sediment settling and water quality treatment before any discharges enter the Racecourse Creek system.

The Sedimentation Dams, 2 ML Storage Dam and associated water management system was completed in 1995 and since that time has functioned with a very high level of control with limited potential significant discharges. No overflows or discharges from the system to Racecourse Creek have been observed over the last 20 years. Water quality monitoring over

this period demonstrates that the quarry is not adversely impacting on water quality in Racecourse Creek (see **Section 6.7.3**).

In addition to the diversion drains and sedimentation ponds, Oberon Quarries implements localised sediment and erosion controls, as required, in accordance with *Managing Urban Stormwater – Soils and Construction* (Landcom, 2001) to reduce the impacts on the water quality in the quarry's dirty water management system.

The location of the quarry in relation to Racecourse Creek, together with the erosion and sedimentation control measures implemented by Oberon Quarries provides a high level of protection to the existing water quality in Racecourse Creek and Lake Oberon.

6.7.2 Proposed Surface Water Management

Oberon Quarries will continue to utilise the existing surface water management system for ongoing operations. No changes are proposed to Sediment Dams 1, 2 and 3 or the 2 ML Storage Dam.

Drainage for the duplication of the 180 metres of haul road adjacent to the processing plant area will be constructed so that it continues to convey runoff from the processing plant area to Sediment Dam 1.

The water management system for the extraction area can be readily augmented to accommodate any additional runoff from the proposed 1.0 hectare extension of the quarry operations without any significant increases in discharge volumes, frequency of discharges or the ability of the existing system to contain sediment on-site.

The existing water management system collects runoff from approximately 20 hectares of this area. The perimeter of the water management system will be extended to include the additional 1.0 hectare extension area. This will ensure that clean runoff from areas outside of the quarry does not drain to the quarry water management system.

Runoff into the quarry extraction area is initially ponded on the quarry floor in a series of dams that have been excavated into the quarry floor. The dams and excavations on the existing quarry floor are located on the upper extraction bench and are currently providing the storage and surcharge capacity that will ultimately be provided by Sedimentation Dam 4.

Sediment Dam 4 will be constructed when a sufficient area of the lower basalt layer has been extracted. Sedimentation Dam 4 will have a storage capacity of 4100 KL as was originally proposed. A 1.2 metre high earth berm with a 2 metre wide spillway will be constructed across the entrance to the quarry to further facilitate detention of sediment laden runoff in the quarry. A 600 millimetre diameter pipe will be constructed through the berm and extend from the extraction area to the top of the processing plant area. The pipe will be constructed on a grade of approximately 2 per cent and will have a flow capacity of approximately 0.8 m³/s.

As the lower level of quarry floor is expanded, the capacity to detain runoff within the quarry during significant runoff events will also increase. The 1.2 metre high berm at the entrance to the quarry will provide approximately 10 ML of additional surcharge capacity per hectare of extracted quarry floor that is at the lower level.

Runoff from the 21 hectare extraction area during a 1 in 100 year 24 hour rainfall event of 154 millimetres is estimated to be approximately 22.6 ML assuming 70 per cent runoff coefficient. On this basis approximately 2.26 hectares of quarry floor at the lower level would be required to fully contain runoff from the 1 in 100 year 24 hour event. Discharge from the quarry floor via the 600 millimetre diameter pipe will be approximately 2.88 ML/hour with the pipe flowing at full capacity.

As discussed, surcharge capacity on the quarry floor will increase as quarrying on the lower section progresses. Detention capacity on the upper bench will decrease as extraction progresses and will be replaced by detention capacity on the quarry floor with sufficient space to contain runoff from a 1 in 100 year 24 hour event being available throughout the life of the quarry.

Estimated runoff from a 1 hour Probable Maximum Precipitation event of 380 millimetres for the 21 hectare extraction area is approximately 80 ML assuming 100 per cent runoff during the extreme event. This would require approximately 8 hectares of excavated quarry floor to fully contain the runoff or a combination of quarry floor storage and dams/detention areas on the upper bench.

The water management system for the Hydrasander will be located on the quarry pit floor within the perimeter of the quarry water management system and will be fully contained having no external impact on water resources.

6.7.3 Surface Water Monitoring

In accordance with Condition 26 of DA 92/164, and EPL Condition P1.3, surface water quality is monitored at two sites on Racecourse Creek (refer to **Figure 6.1**):

- W1 – upstream of the quarry; and
- W2 – downstream of the quarry.

Surface water samples are analysed for pH, conductivity, turbidity, non-filterable residue (NFR), total kjeldahl nitrogen (TKN), total phosphorus (TP) and total petroleum hydrocarbons (TPH). A summary of monitoring results since monitoring began in 1996 is presented in **Table 6.10**.

EPL condition M2.1 requires the monitoring of Oil & Grease, Total Suspended Solids (TSS) and pH. It has been assumed that TPH is a suitable measurement for Oil & Grease.

Water quality in Racecourse Creek has remained within the normal range of values since monitoring began in 1996. Water quality at W2, downstream from the quarry influence, shows no deterioration compared with water quality at W1, upstream of the quarry influence. These results indicate that the quarry operations are not having a measurable impact on the quality of water in Racecourse Creek.

Based on the nature of the Project and the ability of the current water management system to be augmented to include changes as part of the Project, it is unlikely that water quality will be impacted as a result of the Project.

Oberon Quarries will continue to undertake surface water monitoring for the life of the Project.

Table 6.10 – Summary of Water Quality Monitoring in Racecourse Creek

Year		1996 – 2009		2010		2011		2012		2013	
Site		W1	W2	W1	W2	W1	W2	W1	W2	W1	W2
pH	Min	5.2	6.2	6.5	6.5	6.7	6.8	6.6	6.6	6.1	6.2
	Max	8.4	8.3	7.7	7.6	8.2	8.2	8.2	8.2	7.3	7.3
Conductivity (µS/cm)	Min	54	60	75	70	70	70	73	71	13	80
	Max	280	280	230	240	100	100	120	120	125	130
Turbidity (NTU)	Min	2	1.1	3.9	4	3.4	3.2	3.4	3.2	5	5.1
	Max	45	50	15 (310) ¹	24 (170) ¹	60 (450) ²	60 (450) ²	30 (110) ³	26 (120) ³	110	55
NFR (mg/L)	Min	<2	<2	<2	<2	<2	<2	<2	<2	3	4
	Max	44	25	14 (470) ¹	25 (230) ¹	25 (230) ²	28 (270) ²	34 (93) ³	31 (96) ³	420	40
TKN (mg/L)	Min	<0.4	<0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1
	Max	2.7	2.1	0.8 (4.5) ¹	1.5	1.5	1.7	1.3	1.3	2.8	<0.1
Total P (mg/L)	Min	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Max	0.26	0.42	0.71	0.59	0.56	0.48	0.22	0.27	0.53	0.3
Total Petroleum Hydrocarbons (mg/L)	Min	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Max	<0.1	1	<0.5 (2.8) ⁴	<0.5 (1.5) ⁴	<0.5 (4.8) ⁴	<0.5	<0.5	<0.5	<0.5	<0.5

Note: Turbidity and NFR results for January and March 2010¹, March and May 2011² as well as September and November 2013³ were well outside the normal range of results. It was confirmed with the monitoring contractor that the increase in Turbidity and NFR were due to storms, the creek being stirred by livestock, or other non-quarry related occurrences.

⁴Recorded TPH was confirmed with monitoring contractor to not be caused by quarrying operations

6.7.4 Water Yield, Demand and Licensing

Average annual rainfall at Oberon is approximately 870 mm/year. As set out in Section 5.7.1 of the 1992 EIS (Resource Planning, 1992) average annual yield from the 416 hectares Racecourse Creek catchment immediately downstream of the site, is estimated to be approximately 645 ML/year corresponding to a long term average runoff coefficient of 18 per cent.

Annual runoff from an undisturbed area equivalent in size to the 21 hectares quarry water management system (i.e. the existing 20 hectares plus the proposed 1.0 hectare extension) would be approximately 36 ML assuming runoff is equal to 18 per cent of annual rainfall.

Runoff from the 21 hectares disturbed quarry water management system catchment, if it was maintained as free draining, would be higher than from the natural catchment and is estimated to be approximately 75 per cent of annual rainfall or approximately 150 ML/year. This is approximately 114 ML/year more than for an undisturbed catchment of the same size.

The Hydrasander will use a closed system and recycled water used in the washing process.

Annual water demand for crushing, processing and dust suppression for current operations is up to approximately 30 KL/day during summer periods which equates to a maximum water usage of less than 9 ML/year. It is estimated that at a maximum production rate of 400,000 tpa, maximum water usage will be up to 60 KL/day with maximum annual usage of up to 18 ML/year.

As set out in **Table 6.9**, sedimentation and storage dams on-site are designed to have a combined capacity of approximately 8.15 ML indicating that there will be adequate water supply available for dust suppression and processing.

There will be no significant change to yields as a result of the proposed 1.0 hectare change to the quarry area. Over the next 20 to 30 years the total runoff from the quarry area will continue to increase as the quarry footprint expands to the full extent of the quarry area. As discussed above, average annual runoff from the quarry area at full development is approximately 150 ML/year or approximately eight times predicted annual demand at maximum production level of 400,000 tonnes per year.

The quarry is located within the Fish River Water Source and is within the catchment of Lake Oberon. Oberon Quarries currently holds a Part 2 surface water licence under the *Water Act 1912* (80SL051088, WAL 34279) for the extraction of water from Racecourse Creek. Water, if required, is pumped from Racecourse Creek at a flow rate of approximately 2 L/s.

No further water licensing is required for the ongoing operations. Due to volume of runoff from the quarry area being in excess of quarry usage and the low pumping rate when water is required, ongoing quarry operations are not likely to significantly impact on flows in Racecourse Creek.

6.8 Groundwater

Several small springs are located towards the base of Racecourse Hill in the Tertiary gravel layer that is located between the basalt and the underlying less pervious granitic material (refer to **Figure 2.5**). Springs to the north and west of the site are located at approximately 40 metres below the top of Racecourse Hill at 1100 metres AHD and are thought to be fed by water infiltrating to the alluvial gravel sediments that occur between the basalt and granite.

At the northern end of the approved extraction area, Oberon Quarries has constructed a temporary dam on the floor of the upper quarry bench of the quarry to help contain runoff from the quarry excavation area. The resulting void has filled with runoff that is now increasing the supply of water to a network of fractures in the lower layer of basalt. This water will contribute to water draining to quarry water management system via the fractured rock and over a much longer period to the springs that are located around the perimeter of the quarry.

Drilling of the upper bench as part of blasting operations has not encountered groundwater within the drill holes that extend down approximately 11 metres from the surface. As quarry progresses into the lower bench, it is expected that groundwater associated with the jointing in the basalt will be intercepted and drain to the quarry water management system. It is estimated that groundwater inflow will be less than 2 ML/year.

6.8.1 Groundwater Monitoring

In accordance with Condition 26 of DA 92/164, Oberon Quarries undertakes groundwater monitoring to determine any potential impacts as a result of quarry operations. Groundwater is monitored for pH and conductivity at a spring-fed dam (GW1) at 'Langley Heights', downslope of the quarry on Racecourse Hill (refer to **Figure 6.1**). A summary of groundwater monitoring results since monitoring began in 1996 is provided in **Table 6.11**.

Table 6.11 – Summary of Oberon Quarry Groundwater Monitoring

Year	pH Range	Conductivity Range (mS/cm)
1996	6.8 – 7.5	130 – 270
1997	6.8 – 7.2	180 – 290
1998	6.8 – 9.1	72 – 280
1999	6.6 – 8.9	210 – 450
2000	6.9 – 8.0	110 - 270
2001	6.7 – 8.1	140 - 260
2003	6.4 – 7.2	140 - 300
2004	6.8 – 8.9	150 - 200
2005	6.7 – 7.2	130 - 205
2006	6.9 – 7.5	140 - 300
2007	6.1 – 7.1	105 – 250
2008	6.8 – 7.3	225 – 270
2009	6.3 – 7.4	100 – 270
2010	6.4 – 7.3	88 – 270
2011	6.8 – 8.2	80 – 270
2012	6.6 – 8.2	90 – 310
2013	6.1 - 9	95 – 345

Monitoring results show that the range of values for pH and conductivity has been consistent over the period 1996 to 2013 indicating that operation of the quarry is not adversely impacting on groundwater quality at the monitoring point.

6.8.2 Overview of Groundwater Impacts

Oberon Quarries is located on the eastern edge of the Murray Darling Basin. The groundwater springs around the perimeter of Racecourse Hill are located above the surrounding landform with water draining from these springs being sourced from more elevated sections of Racecourse Hill. As such the potential groundwater impacts of quarrying within Racecourse Hill are confined to Racecourse Hill and any immediate downstream groundwater dependent ecosystems or groundwater supply works.

Ongoing operations at the quarry, including extraction in the 1.0 hectare extension area, will result in the basalt hard rock aquifer being excavated and removed with groundwater in the jointing of the basalt draining to the quarry water management system while extraction is occurring.

The seepage rate of water from basalt jointing is expected to be less than 2 ML per year with infiltration of surface water dams within the quarry floor contributing a significant proportion of this seepage water. Seepage is estimated to account for less than 1.3 per cent of predicted annual runoff from quarry extraction area of approximately 150 ML/year.

As quarrying progresses all the basalt will be removed from above the underlying alluvial gravel sediments with the alluvial sediments being left undisturbed. Overburden and interburden material will be placed on the quarry floor as part of rehabilitation and the area will then be vegetated.

6.8.3 Assessment against Aquifer Interference Policy

Predicted groundwater impacts associated with the quarry, have been assessed in relation to the NSW Aquifer Interference Policy (2012) which states that any mining activity must consider 'Minimal Harm Criteria' with respect to groundwater sources. Key criteria to demonstrate minimal harm for fractured rock water sources include:

- less than 10 per cent variation in the water table, allowing for typical climatic 'post-water sharing plan' variations, 40 metres from any:
 - (a) high priority groundwater dependent ecosystem; or
 - (b) high priority culturally significant site;listed in the schedule of the relevant water sharing plan;
- a maximum 2 metre decline at any water supply work.

There are no known groundwater dependent ecosystems, high priority or culturally significant sites or water supply works in close proximity to the quarry, and the groundwater system which supplies the springs around Racecourse Hill is not influenced by Oberon Quarries operations.

The quarry is located approximately 400 metres from Racecourse Creek, the nearest water body. The above criteria are therefore not triggered by the ongoing operations, thereby meeting the 'no more than minimal harm' criteria outlined in the NSW Aquifer Interference Policy (2012) for the granting an aquifer interference approval and surface water and groundwater licences.

NOW has provided confirmation that no approval under water legislation is required:

'It appears that the incidental water intercepted during the activity is mainly derived from the joints in the underlying basalt at shallow depths which is recharged by the accumulation of rainfall run off on the quarry floor. The quarrying activity is therefore not intercepting the saturated main aquifers in the underlying gravel and would take place above the groundwater table in the main localised unconsolidated sediments. This is not considered to be an aquifer interference activity and no approval under water legislation is required'
(email dated 9 April 2013 from Greg Paine to Alice Smith (assessing officer for the DP&I)).

6.9 Traffic and Transport

Distribution of product will be via the approved haul roads and the public road network. It is noted that sections of roads and a number of intersections were upgraded by Oberon Quarries in accordance with the 1993 development consent. It is also noted that Titania Road was upgraded, at Council's request, to a higher standard than the consent required. The cost of this upgrade was \$1.3 million rather than the estimated \$790,000. As the ongoing operations do not change the maximum production limits from the quarry (i.e. 400,000 tpa and 2000 tonnes per day), no increase in traffic impacts on traffic flow, intersection capacity, traffic noise or road safety are predicted to occur as a result of the ongoing operation of the quarry.

Transport is via a sealed haul road to Shooters Hill Road, Edith/Jenolan Caves Road, Titania Road and other sealed roads that form part of the State road system to the market areas.

In accordance with consent requirements, currently Oberon Quarries pays and will continue to pay Oberon Council a tonnage based and indexed road maintenance contribution for wear and tear on roads (i.e. road pavement damage).

There are no proposed changes to the maximum number of truck movements per hour or per day leaving the quarry as a result of the Project; therefore no increased peak traffic flow or intersection capacity impacts are anticipated due to the Project. No change to the approved traffic route and no increase to the maximum daily limit of 2000 tonnes per day or maximum annual production limit of 400,000 tonnes per annum are proposed.

6.9.1 Proposed Changes to Product Transport

Oberon Quarries is seeking to increase annual production for a maximum of 400,000 tpa in any year with a 10 year average of 200,000 tpa over any 10 year period to a maximum of 400,000 tpa in any year. There are no proposed changes to peak hourly truck movements or the maximum number of truck movements per day as a result of the Project. As a result it is not anticipated that there will be any significant increases in peak traffic flow or intersection capacity impacts compared to the existing approved operations at the quarry. No change to the approved traffic route and no increase to the maximum annual production limits are proposed.

The quarry can transport product between the hours of 6 am and 10 pm Monday to Friday and 6 am to 5 pm on Saturdays. No product transport occurs on Sundays and Public Holidays which means that product can be transported from the quarry approximately 300 days per year or approximately 3900 hours per year. The majority of trucks used to transport product from the quarry are either dog and trailer or semi-trailer which can carry 32 tonne and 27 tonne payload respectively with an average load of approximately 29 tonnes. On this basis, transport of 400,000 tonnes per year would result in an average of 46 laden truck movements per day or an average of approximately four laden truck movements per hour.

6.9.2 Current Quarry Truck Movements

Truck movements from the quarry were recorded over the period 2 December 2014 to 9 December 2014 with daily laden truck movements leaving the quarry presented in **Table 6.12**. As shown in **Table 6.12**, Oberon Council was transporting product from the quarry between 2 December 2014 and 5 December 2014 which significantly increased truck movements over this period. All of the trucks transporting product for Oberon Council travelled via Shooters Hill Road and Edith Road directly to Oberon. Quarry trucks travelled via Edith Road, Titania Road and Duckmaloi Road to Oberon.

**Table 6.12 – Laden Truck Movements per Day from Oberon Quarries
(2 December 2014 to 9 December 2014)**

Date	Quarry Laden Trucks	Council Laden Trucks	Total Laden Trucks
2/12/14	25	38	63
3/12/14	32	51	83
4/12/14	33	43	76
5/12/14	33	17	50
6/12/14	8	0	8
7/12/14	0	0	0
8/12/14	33	0	33
9/12/14	36	0	36
Total	200	149	349

As set out in **Table 6.12**, a total of 349 laden trucks left the quarry over the seven day period between 2 December 2014 and 9 December 2014 which equates to an average of 63 laden truck movements per day over the six day operational week or approximately 1.3 times the average daily laden truck movement required for a maximum annual production level of 400,000 tpa.

6.9.3 Existing Traffic Volumes on Haul Routes used by the Quarry

In addition to recording truck movements from the quarry, automatic traffic counters were installed on Edith Road immediately to the east of the intersection with Shooters Hill Road, Titania Road immediately to the south of Duckmaloi Road and on Duckmaloi Road immediately to the east of Titania Road intersection (see **Figure 2.6**). Automatic traffic counters were deployed for the period 2 December 2014 to 9 December 2014 inclusive. Recorded traffic numbers for the period are listed in **Table 6.13**.

Table 6.13 – Automatic Traffic Counts on Edith Road, Titania Road and Duckmaloi Road

Traffic Counter Location	Vehicles per Day (Tuesday 2 December to Monday 9 December 2014)							Daily Average
	Tues 2	Wed 3	Thu 4	Fri 5	Sat 6	Sun 7	Mon 8	
Edith Road	483*	455	361	429	308	321	441	400
Titania Road	247	255	182	299	127	172	288	224
Duckmaloi Road	825	796	813	845	514	668	792	750

* Adjusted for traffic counter error

Vehicle numbers were higher at all traffic count locations during the week (Monday to Friday) and lowest at all locations on Saturday (see **Table 6.13**).

Table 6.14 summarises the average numbers of vehicles per day (vpd) during the seven day survey period.

Table 6.14 – Average Vehicle Movements per Day

Road	Average Vehicles per Day (Weekdays Monday to Friday)	Average Vehicles per Day for the Week
Edith Road	434	400
Titania Road	254	224
Duckmaloi Road	814	750

Attended manual traffic counts were also undertaken between the hours of 7 am and 5 pm on 2 December 2014 and 3 December 2014 at the following intersections:

- Shooters Hill Road and Edith Road; and
- Titania Road and Duckmaloi Road.

Results for the attended traffic surveys are provided in **Appendix 6** and summarised in **Table 6.15**.

Table 6.15 – Attended Traffic Survey Results (2 and 3 December 2014)

Location	Average Vehicles per Day (7 am to 5 pm on 2 and 3 December 2014)						Percentage Heavy Vehicles (December 2014)
	Cars	Heavy Vehicles				Total Vehicle s	
		Quarry Traffic	Council Traffic	Non-Quarry Traffic	Total		
Shooters Hill Road	64	28.5	44.5	17.5	90.5	155	59%
Edith Road	310	28.5	44.5	47.5	120.5	430	28%
Titania Road	163	28.5	0	24.5	53	216	25%
Duckmaloi Road	576	28.5	0	124.5	153	729	21%

The percentage of heavy vehicles on all roads between 7 am and 5 pm on 2 and 3 December 2014 was high and ranged from 21 per cent on Duckmaloi Road to 59 per cent on Shooters Hill Road. As can be seen from **Table 6.15**:

- approximately 31.5 per cent of trucks using Shooters Hill Road were Oberon Quarries trucks, approximately 49.2 per cent were Council trucks doing short hauls from Oberon Quarries and 19.3 per cent were other trucks that were not related to the quarry;
- approximately 23.6 per cent of trucks using Edith Road were Oberon Quarries trucks, approximately 36.9 per cent were Council trucks doing short hauls from Oberon Quarries and 39.5 per cent were other trucks that were not related to the quarry;

- approximately 53.7 per cent of trucks using Titania Road were Oberon Quarries trucks and 46.3 per cent were other trucks; and
- approximately 18.6 per cent of trucks using Duckmaloi Road were Oberon Quarries trucks and 81.4 per cent were other trucks.

As can be seen by comparing the traffic counts for 2 and 3 December 2014 from the automatic traffic counters in **Tables 6.13** and results from the attended surveys for the same period in **Table 6.15**, approximately 90 per cent of the total daily traffic recorded by the automatic counters occurred between 7 am and 5 pm.

6.9.4 Peak Hourly Traffic

Peak hourly traffic volumes for Shooters Hill Road, Edith Road, Titania Road and Duckmaloi Road were derived from the manual traffic counts listed in **Appendix 6** and are summarised in **Table 6.16**.

Table 6.16 – Average Vehicles per Day

Road	Peak Hourly Two Traffic	Average Vehicles per Day on Weekdays	Peak Hourly Traffic as % of Vehicles per Day on Weekdays
Shooters Hill Road	25	154	16%
Edith Road	68	434	16%
Titania Road	38	254	15%
Duckmaloi Road	93	814	11%

As can be seen from **Table 6.16**, peak hourly traffic volumes range from approximately 11 per cent to 16 per cent of the number of vehicles per day. This is consistent with the 10 per cent to 15 per cent range that is typically used to estimate peak hourly traffic volumes from average daily traffic volumes.

6.9.5 Projected Traffic Volumes

It has been conservatively assumed that over the next 30 years car traffic will grow at 3% per year and heavy vehicle traffic will grow at 1% per year. A lower annual growth rate has been assumed for heavy vehicles as the quarry is the predominant source of heavy traffic and was transporting product from the quarry during the December 2014 survey period at an average of 63 laden trucks per day for the period which is approximately 1.3 times the daily average required at maximum production of 400,000 tonnes per day of 46 laden trucks per day. On this basis it is considered that as maximum production is not proposed to exceed 400,000 tpa over the next 30 years, heavy vehicle movements are not likely to significantly increase beyond the levels that occurred during the December 2014 survey period.

Table 6.17 – Project Daily Traffic Volumes as at December 2044

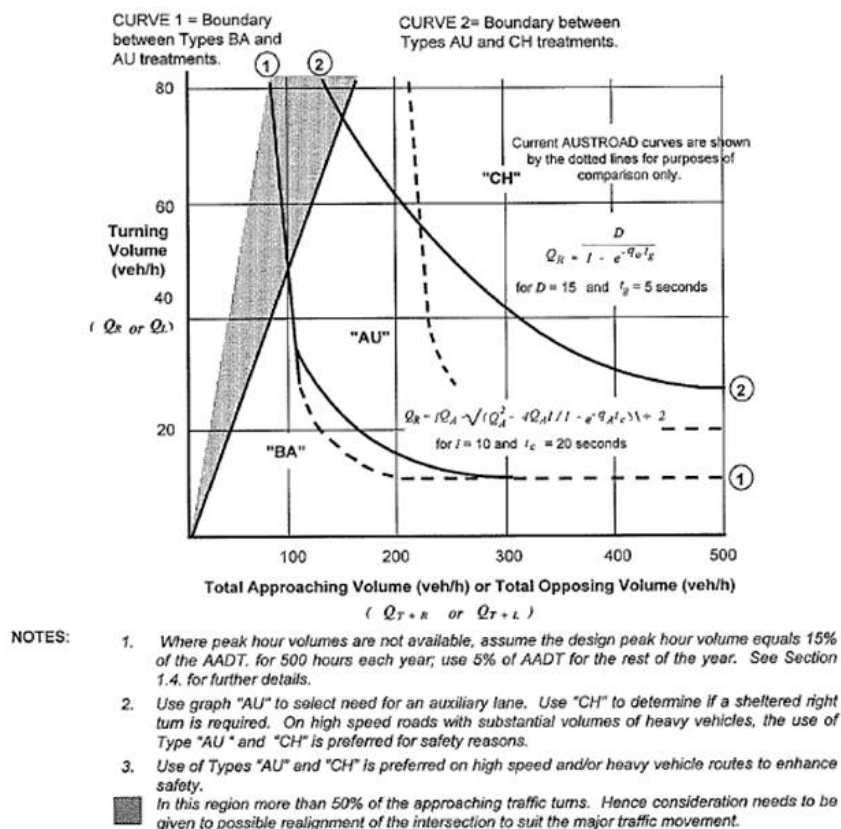
Location	Projected Average Daily Traffic (2044)			Percentage Heavy Vehicles (December 2044)
	Cars (3% Annual Growth)	Heavy Vehicles (1% Annual Growth)	Total	
Shooters Hill Road	155	123	278	44%
Edith Road	752	162	914	18%
Titania Road	396	71	467	15%
Duckmaloi Road	1398	206	1604	13%

As set out in **Table 6.17**, based on the above growth assumptions (3% per annum growth in cars and 1% growth in heavy vehicles), it is estimated that traffic volumes on the local road network are likely to approximately double over the next 30 years.

6.9.6 Intersection Capacity

The intersections at Oberon Quarry Road/Shooters Hill Road, Shooters Hill Road/Edith Road, Edith Road/Titania Road and Titania Road/Duckmaloi Road have been designed and constructed to a rural type BA standard.

Graph 1 which is an excerpt from the Road Design Guide (Figure 4.5.12 – Warrants for Rural Turn Lanes) indicates hourly through traffic and turning volumes that can be accommodated by a Rural Type BA, AU and CH intersections. As shown on **Graph 1**, the volume of hourly traffic that a type BA intersection can accommodate is dependent on the relationship between through traffic and turning traffic.

**Figure 4.5.12 - Warrants for Rural Turn Lanes**

Graph 1 – Warrants for Rural Turn Lanes

Current peak hour traffic volumes and directions of traffic movement at the Shooters Hill Road/Edith Road intersection and Titania Road/Duckmaloi Road intersections have been derived from the attended traffic surveys to assess whether these intersections require upgrading to handle current traffic volumes (see **Table 6.15**) or predicted traffic volumes over the projected 30 year life of the quarry (see **Table 6.17**). Peak hourly traffic volumes for Shooters Hill Road/Edith Road intersection and for Titania Road/Duckmaloi Road intersection are shown graphically on **Figures 6.3a** and **6.3b** respectively.

As can be seen from **Figure 6.3a** for the Shooter Hill Road/Edith Road intersection, peak hour total approaching volume (Q_{T+R} or Q_{T+L}) is 31 vehicles/hour for southbound traffic and 37 vehicles/hour for northbound with turning volumes of 5 vehicles/hour and 16 vehicles/hour respectively. As shown on **Graph 1**, these traffic volumes are well within the 'BA' zone indicating that a Rural Type BA intersection can accommodate these traffic levels. If traffic volumes are doubled by 2044 as discussed in **Section 6.8.5**, a rural type BA intersection would still be adequate.

As can be seen from **Figure 6.3b** for the Titania Road/Duckmaloi Road intersection, peak hour total approaching volume (Q_{T+R} or Q_{T+L}) is 32 vehicles/hour for westbound traffic and 37 vehicles/hour for northbound with turning volumes of 6 vehicles/hour and 14 vehicles/hour respectively. As shown on **Graph 1**, these traffic volumes are well within the 'BA' zone indicating that a Rural Type BA intersection can accommodate these traffic levels. If traffic volumes are doubled by 2044 as discussed in **Section 6.8.5**, a rural type BA intersection would still be adequate.

As can be seen from **Table 6.16**, peak hour traffic volumes on Edith Road and Duckmaloi Road are significantly higher than on Shooters Hill Road and Titania Road and as a result the Rural type BA intersections at Shooters Hill Road and Oberon Quarry Road and Edith Road and Titania Road would be adequate for current and predicted traffic volumes in 2044.

6.9.7 Capacity of Road Network

As the ongoing operations do not change the maximum production limits from the quarry (i.e. 400,000 tpa and 2000 tonnes per day), no increase in traffic impacts on traffic flow, intersection capacity, traffic noise or road safety are predicted to occur as a result of the ongoing operation of the quarry. Traffic surveys undertaken for the Project as discussed in **Sections 6.92 to 6.94** included product transport from the quarry at a daily rate approximately 1.3 times the average daily laden truck movements required for a maximum production level of 400,000 tpa. Analysis of traffic survey information indicates that under these conditions the existing traffic network has adequate capacity for the required truck movements under current and predicted traffic volumes at the end of the life of the quarry.

Oberon Quarries will continue to pay an indexed road maintenance contribution to Oberon Council that will contribute to the upkeep of the local road network used by quarry traffic.

6.10 Ecology

6.10.1 Background

The original flora survey of the whole of the Project Area was undertaken as part of the 1992 EIS. The survey found the area to be largely cleared of native vegetation and the grasslands improved with introduced grasses for grazing of sheep. Remnants of native vegetation were found on the slopes of Racecourse Hill and Racecourse Creek (Resource Planning, 1992).

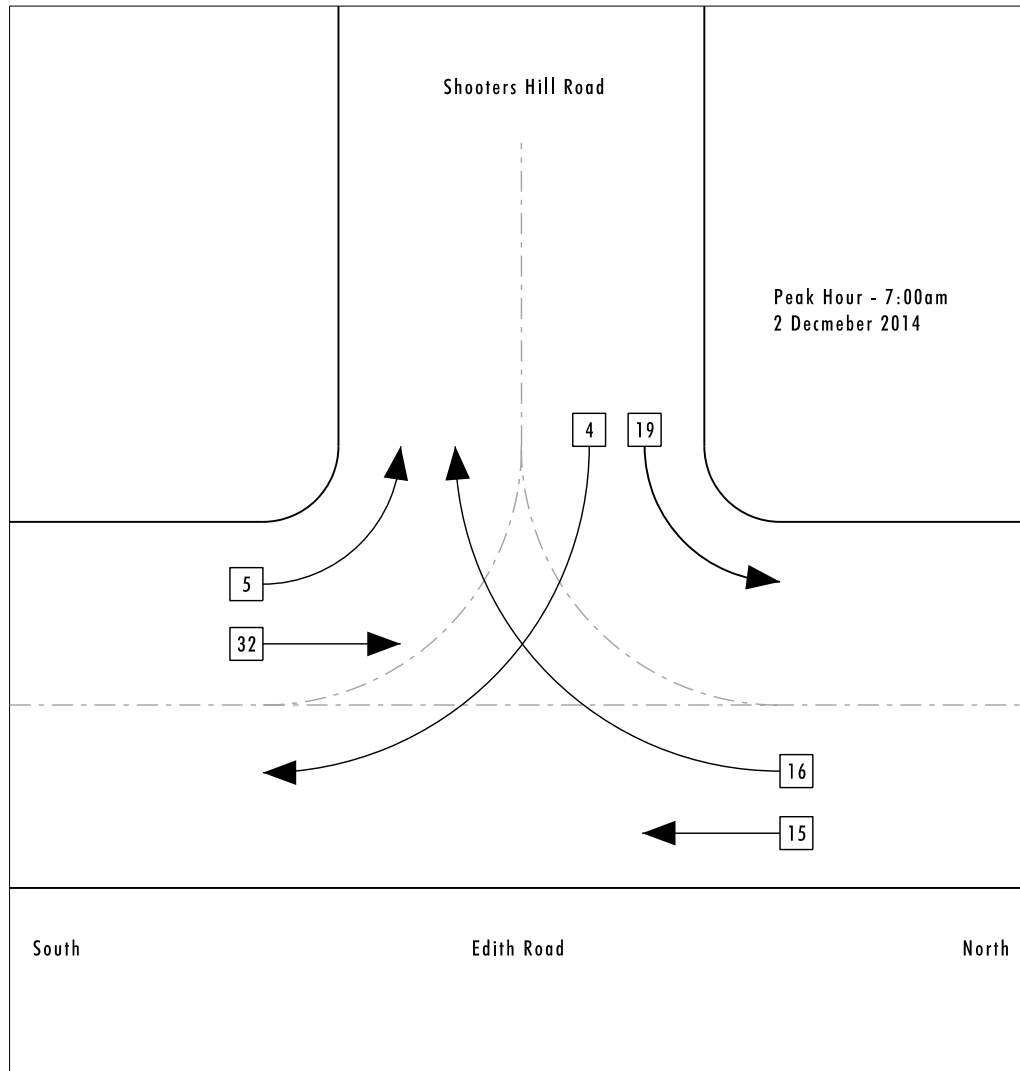


FIGURE 6.3a
Peak Hour Traffic
Shooters Hill Road and Edith Road Intersection

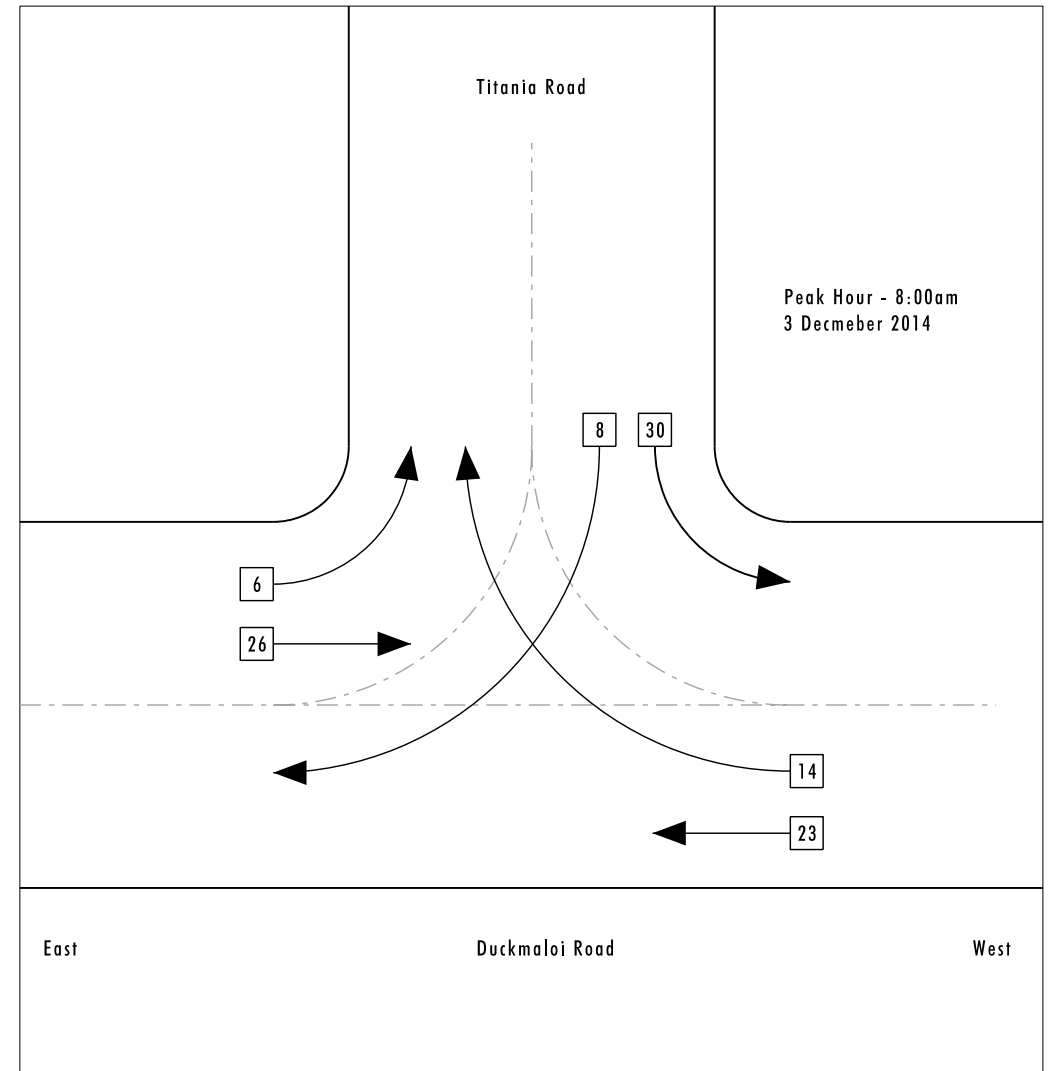


FIGURE 6.3b
Peak Hour Traffic
Titania Road and Duckmaloi Road Intersection

Approval has been previously granted for disturbance of the approved existing extraction area. No suitable habitat for threatened flora or fauna species, Endangered Populations (EP) or Threatened Ecological Communities (TECs) has been identified in this area. The proposed extension to quarry operations will involve disturbance of an additional 1.0 hectare of land that is contiguous with the existing site. This area will provide access to approximately 0.5 Mt of high quality basalt that would be otherwise sterilised once the site was rehabilitated. In addition approximately 0.5 hectares of cleared land will be disturbed to provide for the proposed duplication of the haul road on the steep section adjacent to the processing plant and weighbridge.

6.10.2 Survey Methodology

On 24 of September 2013 two suitably qualified Umwelt ecologists conducted an ecological assessment of two proposed disturbance areas and the surrounding area within the Oberon Quarry proposed operations area. A 1.0 hectare triangular paddock on the south-western boundary of the existing extraction area and a 0.5 hectare area adjacent to the existing haul road were surveyed in detail and the surrounding ecological context assessed.

The survey involved random meandering transects undertaken on foot, rapid vegetation assessments as well as additional opportunistic observations. Detailed quadrat sampling was not undertaken as the ground cover was dominated by introduced species. The specific detail of each survey component is described below.

Rapid Vegetation Assessments

Rapid vegetation assessments were completed within the proposed disturbance areas. They were used in combination with meandering transects and opportunistic records primarily to assist in providing an understanding of the vegetation within the proposed disturbance areas. Rapid vegetation assessment points recorded dominant, common and some uncommon (but notable) plant taxa, but cover abundance scores were not.

Two rapid vegetation assessment points were conducted during the field survey, one in each of the proposed disturbance areas.

Random Meandering and Opportunistic Records

Meandering transects were walked through the proposed disturbance areas, particularly searching for threatened and otherwise significant species, EPs and TECs. Records along transects supplemented floristic sampling carried out during rapid vegetation assessments.

Fauna species and fauna habitats present were recorded during meandering transects walked within the proposed disturbance areas.

6.10.3 Results

The 1.0 hectare triangular paddock was found to have been cleared of native vegetation and comprised improved grassland for sheep grazing. Dominant species were cocksfoot (*Dactylis glomerata*), phalaris (*Phalaris aquatica*), prairie grass (*Bromus catharticus*), white clover (*Trifolium repens*), sorrel (*Acetosella vulgaris*), capeweed (*Arctotheca calendula*) and spear thistle (*Cirsium vulgare*). Vegetation within this area was consistent with that found in the adjoining sections of the approved extraction area that have not been cleared yet.

The north-east fence line of the triangular paddock consisted of a planted windbreak of the introduced species, Mexican cypress (*Cupressus lusitanica*). The surrounding land was also consistently disturbed with active quarry land occurring to the north, north-east and east. Paddocks to the south and west also supported improved pastures for stock grazing.

Scattered eucalypt trees were visible in the wider area; species included ribbon gum (*Eucalyptus viminalis*) and mountain gum (*Eucalyptus dalrympleana* subsp. *dalrympleana*).

The vegetation along proposed haul road widening area comprised introduced pasture grasses and weeds, as well as a planted treeline of Eucalypt trees. Tree species included mountain gum (*Eucalyptus dalrympleana* subsp. *dalrympleana*) and ribbon gum (*Eucalyptus viminalis*). The modified groundlayer was dominated by cocksfoot (*Dactylis glomerata*), common bracken (*Pteridium esculentum*), phalaris (*Phalaris aquatica*), *Austrostipa* sp., sweet briar (*Rosa rubiginosa*), blackberry (*Rubus fruticosus*), spear thistle (*Cirsium vulgare*) and white clover (*Trifolium repens*).

No suitable habitat for threatened flora species, EPs or TECs was identified within the proposed disturbance areas. Given the lack of suitable habitat for threatened flora species, EPs or TECs in both proposed disturbance areas, and the small size of both areas, the removal of proposed disturbance areas is unlikely to significantly impact on any threatened flora species, EPs or TECs.

With the exception of the Mexican cypress windbreak, the triangular paddock did not contain any tree or shrub cover and provided little fauna habitat. During the assessment of the triangular paddock, five fauna species were recorded and comprised the sulphur-crested cockatoo (*Cacatua galerita*), yellow-rumped thornbill (*Acanthiza chrysorrhoa*), stubble quail (*Coturnix pectoralis*), fairy martin (*Petrochelidon ariel*) and common wombat (*Vombatus ursinus* – identified from the presence of an active burrow).

The proposed haul road widening area provided a small stand of planted eucalypt trees with an exotic grassy understorey. Fauna habitat was limited to the planted eucalypt trees and grassy understorey. While 12 bird species were recorded in or adjacent to the proposed haul road widening area, most were recorded in the vicinity of the proposed haul road widening area or were moving between native eucalypt woodland to the south-west and native eucalypt woodland to the north-east. The removal of the proposed haul road widening area is unlikely to affect the level of connectivity for fauna species due to the small size of the area and the proximity of nearby woodland areas. The 12 bird species recorded in or adjacent to the haul road widening area included the striated pardalote (*Pardalotus striatus*), Australian raven (*Corvus coronoides*), Galah (*Cacatua roseicapilla*), superb fairy-wren (*Malurus cyaneus*), yellow-faced honeyeater (*Lichenostomus chrysops*), laughing kookaburra (*Dacelo novaeguineae*) and crimson rosella (*Platycercus elegans*).

No threatened fauna species or endangered fauna populations were identified in either proposed disturbance area. Given the lack of fauna habitat features present in both proposed disturbance areas, and the small area of both areas, the removal of proposed disturbance areas is unlikely to significantly impact on any threatened fauna species or endangered flora populations.

The proposed extension of the Oberon quarry into the 1.0 hectare triangular paddock and the proposed widening of the entrance haul road are unlikely have a significant impact on any key ecological values. The proposed extension to the extraction area and disturbance for haul road duplication will have a similar low impact on the native vegetation to that reported in the 1992 EIS.

6.10.4 Flora and Fauna Management and Mitigation Measures

To ensure the ecological impacts of the quarry are minimised, Oberon Quarries has committed to implementing the following management and mitigation measures:

- installing survey pegs to mark the extent of extraction;

- create a stable final landform within the quarry pit consisting of self-sustaining vegetation communities characteristic of the pre quarry environment;
- progressively conduct rehabilitation and revegetation of the post-quarry area over the life of the operations and as quarrying operations of the second bench allow (refer to **Section 6.18**);
- minimising the extent of vegetation clearance to that associated with the next blast area; and
- identifying the weed management controls for the Project area, i.e. types of weeds known to be present, required control methods and frequencies, as well as monitoring frequencies.

6.11 Aboriginal Archaeology and Cultural Heritage

For the purposes of the assessment of Aboriginal cultural heritage, the areas subject to existing approval are considered to have been sufficiently assessed. Thus the focus of the current assessment is the proposed extension to the extraction area however reference is also made to the broader project area where relevant.

6.11.1 Legislative Context

The *NSW National Parks and Wildlife Act 1974* (NPW Act) and the EP&A Act are the primary statutory controls protecting Aboriginal cultural heritage within New South Wales. These are discussed below.

6.11.1.1 Environmental Planning and Assessment Act 1979

The EP&A Act regulates development activity in New South Wales. Under Section 89J of the EP&A Act, it is not necessary to obtain an Aboriginal Heritage Impact Permit (AHIP) under the NPW Act (as discussed below) in relation to State significant development activities approved under Part 4 of the EP&A Act. State significant development projects approved under Part 4 of the EP&A Act are subject to conditions of approval issued by the DP&E and (where relevant) Aboriginal cultural heritage is addressed by appropriate conditions.

6.11.1.2 National Parks and Wildlife Act 1974

The OEH is primarily responsible for regulating the management of Aboriginal cultural heritage in New South Wales under the NPW Act (as amended October 2010). The NPW Act is accompanied by the National Parks and Wildlife Regulation 2009 (the Regulation) and other codes of practice and guidelines including the OEH Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW, 2010b).

The objectives of the NPW Act include:

The conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including, but not limited to: (i) places, objects and features of significance to Aboriginal people.

The NPW Act defines an Aboriginal object as

any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales

Under Section 84 of the NPW Act, an Aboriginal Place must be declared by the Minister as a place that, in the opinion of the Minister, is or was of special significance with respect to Aboriginal culture.

In accordance with Section 86(1) of the NPW Act, it is an offence to harm or desecrate a known Aboriginal object, whilst it is also an offence to harm an Aboriginal object under Section 86(2). Similarly, Section 86(4) states that a person must not harm or desecrate an Aboriginal place. Harm to an object or place is defined any act or omission that:

- a) destroys, defaces or damages an object or place, or
 - b) in relation to an object – moves the object from the land on which it had been situated, or
 - c) is specified by the regulations, or
 - d) causes or permits the object or place to be harmed in a manner referred to in paragraph (a), (b) or (c),
- but does not include any act or omission that:
- e) desecrates the object or place, or
 - f) is trivial or negligible, or
 - g) is excluded from this definition by the regulations.

Section 87(1) of the NPW Act specifies that it is a defence to prosecution under Section 86(1) and Section 86(2) if the harm or desecration of an Aboriginal object was authorised by an Aboriginal heritage impact permit and the activities were carried out in accordance with that permit. Furthermore, Section 87(2, 4) establishes that it is a defence to prosecution under Section 86(2) (the strict liability offence) if due diligence was exercised to reasonably determine that the activity or omission would not result in harm to an Aboriginal object or if the activity or omission constituting the offence is a low impact act or omission (in accordance with Section 80B of the Regulation). The Regulation identifies that compliance with the NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects (NSWMC, 2010 – hereafter referred to as the due diligence code) is taken to constitute due diligence in determining whether a proposed activity will harm an Aboriginal object.

6.11.2 Aboriginal Party Consultation

Consultation with Aboriginal people is critical to identifying and assessing the significance of Aboriginal objects and/or places and determining and carrying out appropriate strategies to mitigate impacts upon Aboriginal heritage. The Project area is within the boundaries of a registered Native Title Claim by the Gundungurra Tribal Council (NSD 6060/1998). The project area is also within the area of interest of the Gundungurra Aboriginal Heritage Association Inc. A letter outlining the Project and seeking input on Aboriginal cultural values associated with the Project Area was sent to both of these organisations on 4 September 2013 (refer to **Appendix 7**).

On 19 September 2013, Sharyn Halls (Gundungurra Aboriginal Heritage Association Inc) was contacted by telephone to discuss the Project. Sharyn stated that she understood that the proposed additional impacts outside the area previously approved for extraction were limited to an area of approximately one hectare. No specific cultural information was provided for the project area; however, Sharyn noted that the general Oberon area was significant because Aboriginal families had lived in the area and Oberon forms part of a songline through the region.

Attempts were made to contact the Gundungurra Tribal Council by telephone on 19 September and 4 October 2013 however it was not possible to reach a representative and no response was received.

6.11.3 Consideration against the Due Diligence Code

The due diligence code establishes a series of steps necessary to comply with due diligence requirements. These are addressed below.

Step 1 – Check for records of Aboriginal objects and places

A search of the Aboriginal Heritage Information Management System database conducted on 8 January 2014 identified a total of four previously recorded sites within an area of 6.1 kilometres by 4.3 kilometres (MGA E760776 – 766868 N6259593 – 6263942) surrounding the Project area (refer to **Appendix 8**). These sites consisted of one isolated artefact and three artefact scatters, of which one is located within the Project area, as shown in **Figure 6.4**.

One site (AHIMS #44-6-0060) was located on the top of Racecourse Hill within the approved extraction area. The site consisted of three artefacts (quartz core and two quartz flaked pieces) located on the edge of a trench excavated by the landholder during land management activities. Resource Planning (1992) considered that the site was unlikely to be associated with further subsurface artefacts and assessed it as being of insufficient significance to warrant conservation. Resource Planning (1992) therefore recommended that a consent to destroy permit be obtained for the site. The area containing site AHIMS #44-6-0060 has since been subject to extraction in accordance with project approval conditions. Oberon Quarries has undertaken consultation with OEH regarding management of this site and will submit an Aboriginal Site Impact Recording (ASIR) form to correct the status of the site which still appears as valid on the AHIMS database.

The project area (including the proposed extension to the extraction area) was subject to an archaeological assessment conducted as part of the EIS for the approved operation (Resource Planning, 1992), which resulted in the identification of three of the AHIMS registered sites discussed above. No sites were located within the proposed extension to the extraction area and Resource Planning (1992) suggested that the hilltop landform was unlikely to be associated with further subsurface artefacts. Consequently, Resource Planning did not identify any requirements for further archaeological investigations or salvage within the proposed extension to the extraction area.

Step 2 – Is the activity a ‘low impact activity’

The project is not a low impact activity as prescribed in the NPW Regulation.

Step 3 – Are there any landscape features on undisturbed land that are likely to indicate the presence of Aboriginal objects?

The project area is centred on Racecourse Hill, an elongated flat top hill oriented approximately north-south. It is bordered to the east by Racecourse Creek and to the west by Fish River. As discussed, the majority of the project area has been subject to approved extraction activities that have altered the landscape in a way that remains clear and observable, as shown in **Figure 6.4**. The primary disturbance activity has been the extraction of hard rock, with other activities including the construction and maintenance of sedimentation dams, surface facilities and access roads.

The proposed extension to the extraction area is located on the hilltop adjacent to the existing extraction area (refer to **Figure 6.4**). It has been subject to vegetation clearance and primarily consists of improved grasslands. It is currently used for grazing of sheep. The combination of vegetation clearance and active use for grazing purposes dictate that this area has been subject to disturbance that remains clear and observable.



Image Source: Google Earth (2012)
Data Source: Oberon Quarries Pty Limited (2014), AHIMS (2014)

0 0.5 1.0 1.5 km
1:30 000

Legend

- ▨ Project Area
- ▭ Langley Heights Property
- Isolated Find
- Artefact Scatter

FIGURE 6.4

Archaeological Sites in the vicinity
of Oberon Quarry

6.11.3.1 Summary

In summary, the proposed extension to the extraction area has been subject to previous archaeological assessment but does not contain any recorded Aboriginal archaeological sites. Furthermore, it is in a landform that was assessed by Resource Planning (1992) as being unlikely to contain additional subsurface deposits. Lastly, the proposed extension to the extraction area has been disturbed by vegetation clearance and grazing activities in a way that remains clear and demonstrable. Therefore, in accordance with the requirements of the due diligence code, it is not necessary to undertake further archaeological investigations. The recommendations below are provided to ensure ongoing compliance with the NPW Act.

6.11.4 Recommendations

The following recommendations are made with reference to the requirements of the NPW Act, the NPW Regulation, the Due Diligence Code (NSWMC, 2010) and the information provided in this document:

- Oberon Quarries should ensure that all parties involved in the Project are aware that it is an offence under Section 86 of the NPW Act to harm or desecrate an Aboriginal object unless that harm or desecration is the subject of an AHIP;
- the Project may proceed without any further cultural heritage investigations provided that the impacts and extent of the Project are consistent with those discussed in this EIS;
- Oberon Quarries should submit an ASIR form to correct the status of site AHIMS #44-6-0060, which appears as valid on the AHIMS database but was located within the approved extraction area;
- in the event that an Aboriginal object (or objects) is uncovered during the proposed works, ground disturbance works should cease within 20 metres of the object(s) and OEH and the relevant Aboriginal parties should be contacted so that appropriate management strategies can be identified;
- In the unlikely event that a potential burial site or potential human skeletal material is exposed within the project area, the following procedure should be followed in accordance with the *Policy Directive –Exhumation of Human Remains* (NSW Department of Health 2008), *Skeletal Remains – Guidelines for the Management of Human Skeletal Remains under the Heritage Act 1977* (NSW Heritage Office, 1998) and the *Aboriginal Cultural Heritage Standards and Guidelines Kit* (NPWS, 1997):
 - as soon as remains are exposed, work in the vicinity of the remains is to halt immediately to allow assessment and management;
 - the relevant manager of the project will be informed and will contact local police, OEH and the Heritage Branch;
 - if the remains are suspected to be human, a physical or forensic anthropologist should inspect the remains *in situ*, and make a determination of whether the remains are human and if so, the likely ancestry (Aboriginal or non-Aboriginal) and antiquity (pre-contact, historic or forensic);
 - if the remains are identified as forensic the area is deemed as crime scene;
 - if the remains are identified as Aboriginal, the site is to be secured and OEH and the relevant Aboriginal parties are to be notified in writing; or
 - if the remains are non-Aboriginal (historical) remains, the site is to be secured and the Heritage Branch is to be contacted.

This process functions only to appropriately identify the remains and secure the site. From this time, the management of the remains is to be determined through liaison with the appropriate stakeholders and in accordance with the *Public Health Act 1991*.

6.12 Historical Heritage

The Project Area, including the 1.0 hectare extension, was assessed as part of the 1992 EIS and confirmed that it does not contain any items of historical heritage. No historic heritage items have been identified on the site over the last 20 years.

6.13 Greenhouse Gas and Energy

A detailed greenhouse gas and energy assessment has been undertaken for the ongoing operations. This has included a quantitative assessment of the potential Scope 1, 2 and 3 emissions of the Project; a qualitative assessment of the potential impact these emissions may have on the environment; and an assessment of reasonable and feasible measures to minimise greenhouse gas emissions and ensure energy efficiency. Calculations and assumptions are provided in **Appendix 9**.

6.13.1 Greenhouse Assessment Framework

The Greenhouse Gas and Energy Assessment (GHGEA) framework is based on the methodologies and emission factors contained in the *National Greenhouse Accounts (NGA) Factors 2013* (DCCEE, 2013). The assessment framework also incorporates the principles of *The Greenhouse Gas Protocol* (WRI/WBCSD, 2004) (the Protocol).

The Protocol provides an internationally accepted approach to greenhouse gas accounting. The Protocol provides guidance on setting reporting boundaries, defining emission sources and dealing with issues such as data quality and materiality. The GHG Protocol also defines three distinct reporting scopes, to eliminate the possibility of double counting. The reporting scopes are briefly outlined below.

Scope 1 emissions are direct emissions which occur from sources owned or controlled by the reporting entity, over which they have a high level of control (such as fuel use).

Scope 2 emissions are those generated from purchased electricity consumed by the reporting entity, which can be easily measured and can be influenced through energy efficiency measures. Scope 2 emissions physically occur at the facility where electricity is generated (i.e. the power station).

Scope 3 emissions are indirect emissions that are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another reporting entity (e.g. outsourced services).

6.13.2 Methodology

Scope 1, 2 and 3 emissions were calculated based on the methodologies and emission factors contained in the NGA Factors (DCCEE, 2013). Diesel use activity data associated with product transport was estimated using diesel use efficiency factors developed by the Australian Greenhouse Office 2006.

6.13.2.1 Data Sources and Exclusions

The calculations in this report are based on activity data projections developed by Umwelt. On-site energy use data was estimated based on energy use indicators developed from 2012 data provided by Oberon Quarries. Transport energy use was estimated based on fuel consumption and distance assumptions for specific markets.

Table 6.18 includes activity data which was excluded from the assessment boundary.

Table 6.18 – Data Exclusions

Emissions Source	Scope	Description	Reason for Exclusion
Combustion of fuel for energy	Scope 1	Small quantities of fuels such as petrol	Emissions likely to lack relevance to project stakeholders
Construction materials	Scope 3	Steel and concrete used to install new crushing/screening equipment	Emissions likely to lack relevance to project stakeholders
Business travel	Scope 3	Employees travelling for business purposes	Emissions likely to lack relevance to project stakeholders
Employee travel	Scope 3	Employees travelling between their place of residence and the quarry site	Emissions likely to lack relevance to project stakeholders

Petrol use, construction materials, employee travel and business travel were excluded from the greenhouse gas assessment as these are not forecast to be a major source of energy or greenhouse gas emissions.

6.13.2.2 Predicted Energy Consumption

The Project's energy consumption is based on the following assumptions:

- on-site electricity use will average 1.483 kWh per crushed tonne (observed electricity use in 2012);
- on-site diesel use will average 0.00075 kL per crushed tonne (observed diesel use in 2012);
- product distribution at 400,000 tpa has been pro-rated using the product distribution destinations for the 2012 calendar year;
- 20 per cent of all deliveries to Western Sydney will backload materials for organisations not associated with the Project; and
- transport diesel use will average 0.546 L/km (AGO, 2006).

Future electricity use may deviate from the activity data assumptions due to the following:

- equipment is likely to be replaced by more efficient equipment during the life of the ongoing operations;
- the electricity use assumption includes a fixed proportion of electricity (i.e. administrative activities), that is unrelated to production. Electricity use is likely to be overstated when the electricity use assumption is applied to higher production levels; and

- the electricity use assumption does not include additional crusher and associated conveyor equipment planned for the ongoing operations. However the additional crusher is predicted to crush approximately 80 per cent of the hard rock, thereby functionally replacing the existing crusher.

The activity data assumptions may overestimate future diesel use due to the following:

- ramp gradients will decrease as extraction operations are undertaken within the second bench;
- equipment is likely to be replaced by more efficient equipment during the life of the Project; and
- product yield will improve over time and the quarry will handle less waste material (crushed fines and scalps).

The Project's primary energy sources are grid electricity and diesel. The operation of the quarry is forecast to require approximately 55,000 GJ of energy per annum at a production rate of 400,000 tpa.

6.13.3 Predicted Greenhouse Gas Emissions

Total annual emissions associated with the Project, at maximum production, are forecast at approximately 5000 tonnes CO₂-e per annum. **Table 6.19** provides a breakdown of the Project's greenhouse gas emission sources, and compares current emissions to the emissions of the proposed Project.

Table 6.19 – Greenhouse Gas Emissions

Emissions Source	Scope	2012 Operations (192,127 tonnes) ²	400,000 tpa ³
		t CO ₂ -e	t CO ₂ -e
Stationary diesel use	1	644.79	1,073.00
Transport diesel use	1	1,319.29	2,746.71
Electricity use	2	418.87	686.26
Energy extraction/transmission	3	232.97	438.17
Outsourced transport	3	10.51	25.99
TOTAL		2,626.43	4,970.13

Annual Scope 1 emissions generated by the quarry operations are forecast at approximately 3900 tonnes CO₂-e per annum. Scope 1 emissions are generated from the combustion of diesel.

Annual Scope 2 emissions associated with the quarry operations are forecast at approximately 700 tonnes CO₂-e per annum. Scope 2 emissions are indirect emissions associated with electricity consumption.

Annual Scope 3 emissions associated with the quarry operations are forecast at approximately 470 tonnes CO₂-e per annum. Scope 3 emissions are indirect emissions

² 2012 calculations are provided in **Appendix 9**

³ 400,000 tpa calculations are provided in **Appendix 9**

associated with the production of diesel, transmission of electricity and third party transport of materials.

The Project is forecast to increase existing greenhouse gas emissions by approximately 2400 tonnes CO_{2-e} per annum.

6.13.4 Impact of Emissions on the Environment

The Project's greenhouse gas emissions will have a disperse impact as they are highly mobile and are generated up and down the supply chain. Greenhouse gas emissions primarily alter the atmospheric concentration of carbon dioxide and methane. The secondary impacts of greenhouse gas emissions include; global warming, ocean acidification and carbon fertilisation of flora. The tertiary impacts of greenhouse gas emissions (i.e. climate change) may have many ramifications for the natural and built environment.

The Project's direct emissions are forecast to be approximately 3900 tonnes CO_{2-e} per annum.

To put the Project's emissions into perspective, global greenhouse gas emissions are forecast to be 46,000,000,000 tonnes CO_{2-e} by 2020 (Sheehan et al 2008). During operation, the quarry will contribute approximately 0.000008 per cent to the global emissions per annum (based on its projected Scope 1 emissions). The Scope 2 and 3 emissions associated with the quarry should not be considered in a global context, as global projections only represent Scope 1 emissions (i.e. the sum of all individual emission sources).

6.13.5 Impact on Climate Change

The Intergovernmental Panel on Climate Change (IPCC) define climate change as a change in the state of the climate that can be identified by changes in the mean and/or variability of its properties, and persists for an extended period, typically decades or longer (IPCC, 2007).

Climate change is caused by changes in the energy balance of the climate system. The energy balance of the climate system is driven by atmospheric concentrations of greenhouse gases and aerosols, land cover and solar radiation (IPCC, 2007). There is strong evidence to suggest that observations of global warming are directly correlated to increased concentrations of atmospheric greenhouse gases (IPCC, 2007).

It would be misleading to assess the climate change impacts of the ongoing operations by simply applying a radiative forcing coefficient to the greenhouse gases generated by the Project. Carbon emitted to the atmosphere is exchanged between carbon reservoirs such as oceans and ecosystems over a wide range of timescales (IPCC, 2007). It is erroneous to assume that the greenhouse gases generated by the ongoing operations will materially shift the atmospheric concentration of greenhouse gases in a linear way.

The extent to which global emissions and atmospheric concentrations of greenhouse gases have a demonstrable impact on climate change will be largely driven by the global response to reducing total global emissions that includes all major emission sources and sinks.

6.13.6 Assessment of Mitigation Measures

Figure 6.5 demonstrates that approximately 61 per cent of the Project's scope 1 and 2 emissions relate to product transport.

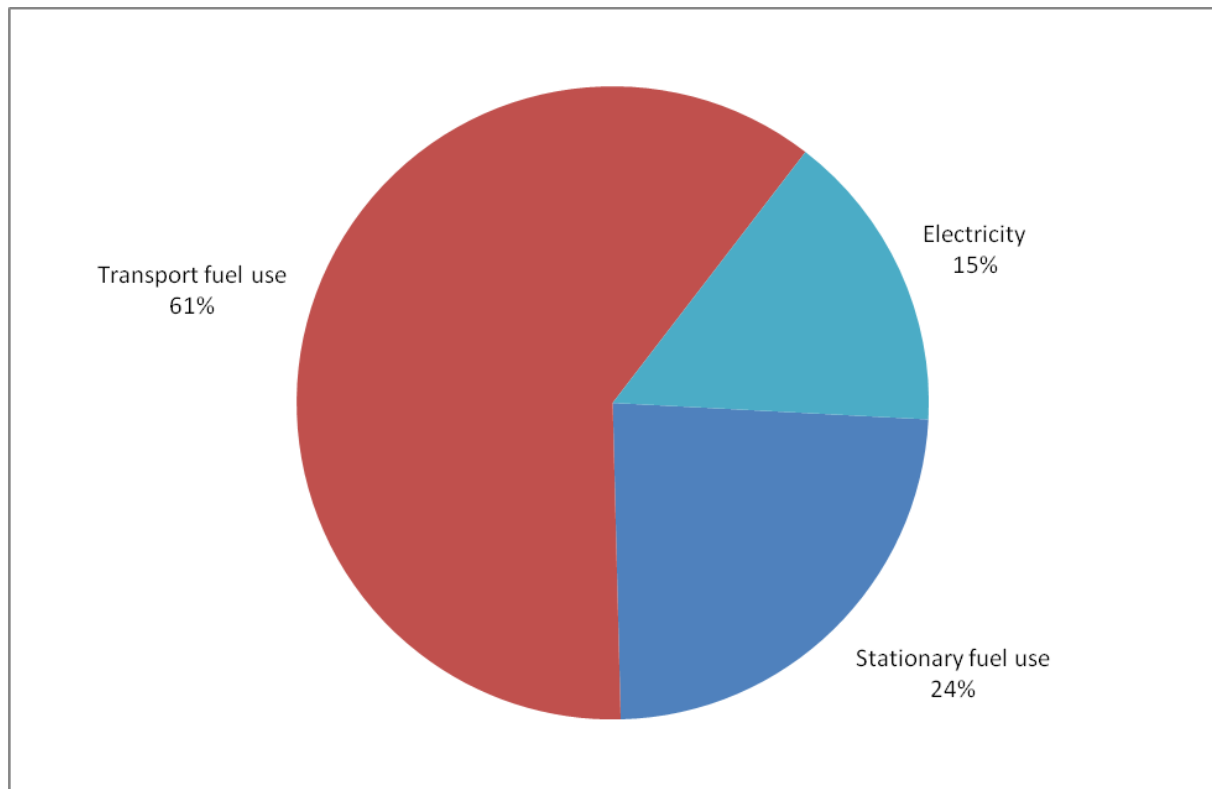


Figure 6.5 – Proportion of Greenhouse Gas Emissions by Source

Improving the diesel use efficiency associated with the transport of products is likely to provide the greatest reduction in greenhouse gas emissions. Other effective mitigation measures could include:

- improving diesel use efficiency of on-site plant and equipment;
- switching from diesel to alternative fuel sources; and
- improving the electricity efficiency of processing equipment.

The following sections assess the ongoing operations planned greenhouse gas mitigation measures against common mitigation practice.

6.13.6.1 Improving transport diesel use efficiency

Table 6.20 includes the mitigation measures assessed for minimising greenhouse gas emissions from transporting products.

Table 6.20 – Options Assessed for Transport Truck Fuel Use

Energy Use During Extraction		
Potential Mitigation Measure	Planned for Project	Reason for Inclusion/Exclusion
1. Limiting the length of transport routes	Yes	The transport route is selected based on considering the shortest route and traffic congestion/delays.
2. Fuel efficient haul trucks	Yes	The existing transport fleet over the life of the ongoing operations will be replaced by more efficient trucks. Fuel use efficiency will be an important factor in selecting new haul trucks.
3. Maximising payload	Yes	Oberon Quarries ensures that each truck carries the maximum legal payload.
4. Increasing payload	No	It is not possible to increase the legal payload of the road transport trucks. Each truck is weighed prior to departing the quarry to ensure it is carrying its maximum legal payload.
5. Reducing idling times	Yes	Oberon Quarries will continuously try to improve idle times. Idle times are typically minimal given there is a front end loader specifically for truck loading.
6. Alternative fuels	No	The use of biodiesel can reduce fuel use efficiency and power output. In some situations, the use of biodiesel can create technical issues. Oberon Quarries is currently reviewing the feasibility of using biodiesel however, it is not proposed at this time due to the above concerns.

6.13.6.2 Improving on-site diesel use efficiency

On-site diesel consumption is forecast to generate approximately 24 per cent of the Project's combined Scope 1 and 2 emissions. **Table 6.21** includes the mitigation measures assessed for minimising greenhouse gas emissions from on-site diesel use.

Table 6.21 – Options Assessed for On-site Diesel Use

Energy Use During Extraction		
Potential Mitigation Measure	Planned for Project	Reason for Inclusion/Exclusion
7. Scheduling activities so that equipment and vehicle operation is optimised	Yes	Quarry operations are scheduled to optimise the productivity and efficiency of equipment.
8. Alternative fuels	No	The use of biodiesel can reduce fuel use efficiency and power output. In some situations, the use of biodiesel can create technical issues. Oberon Quarries is currently reviewing the feasibility of using biodiesel however, it is not proposed at this time due to the above concerns.
9. Fuel efficient equipment	Yes	The existing quarry fleet over the life of the ongoing operations will be replaced by more efficient trucks, excavators and front end loaders. Fuel use efficiency will be an important factor in selecting quarry fleet.

Table 6.21 – Options Assessed for On-site Diesel Use (cont)

Energy Use During Extraction		
Potential Mitigation Measure	Planned for Project	Reason for Inclusion/Exclusion
10.Blasting strategies to improve extraction efficiency	Yes	Blasting will be undertaken using best practice.
11.Maximising resource recovery efficiency	Yes	Resource recovery will be optimised within the constraints of the Project.
12.Working machines to their upper design performance	Yes	Machines will be worked to their upper design performance. Optimising machine performance is a key performance indicator for operators. This will be an important factor in selecting new machines.
13.Electric drills	No	Not technically practical as they lack the flexibility of diesel drills.

Table 6.22 includes the mitigation measures assessed for minimising greenhouse gas emissions from haul trucks.

Table 6.22 – Options Assessed for Haul Trucks

Energy Use During Extraction		
Potential Mitigation Measure	Planned for Project	Reason for Inclusion/Exclusion
14.Limiting the length of material haulage routes	Yes	The quarry planning process paid particular attention to reducing haul route distances.
15.Replacing trucks with conveyors	No	The implementation of conveyors has been ruled out due to the capital cost of installation in comparison to a haul trucks. The conveyor system is also not considered practicable as it would have to be regularly relocated to align with the quarry operations. The use of a conveyor would also not eliminate the haul truck requirement. Haul trucks are used to transport extraction materials and crusher fines from the processing area to the quarry pit, for use in the final landform.
16.Optimising ramp gradients	Yes	Over the life of the quarry the excavation depth will be increased, thereby reducing the haul road gradient between the processing area and the quarry pit.
17.Fuel efficient haul trucks	Yes	The existing haul trucks over the life of the ongoing operations will be replaced by more efficient trucks. Fuel use efficiency will be an important factor in selecting new haul trucks.
18.Maximising payload	Yes	Trucks will be matched with excavators to maximise payload.
19.Increasing haul truck payload	No	Given the size of the operation and the capacity of the existing processing plant it is not considered to be viable.
20.Improving rolling resistance of haul roads	Yes	Haul road locations are constantly changing and it would be very expensive to pave every haul route. The haul roads are regularly maintained to improve the rolling resistance of haul roads.

Table 6.22 – Options Assessed for Haul Trucks (cont)

Energy Use During Extraction		
Potential Mitigation Measure	Planned for Project	Reason for Inclusion/Exclusion
21.Reducing idling times	Yes	Oberon Quarries will continuously try to improve idle times. Idle times are typically minimal given there is a front end loader and/or excavator specifically for haul truck loading.
22.Alternative fuels	No	The use of biodiesel can reduce fuel use efficiency and power output. In some situations, the use of biodiesel can create technical issues. Oberon Quarries is currently reviewing the feasibility of using biodiesel however, it is not proposed at this time due to the above concerns.

6.13.6.3 Improving electricity efficiency of processing equipment

Electricity consumption by the processing plant is forecast to generate approximately 15 per cent of the Project's combined Scope 1 and 2 emissions. **Table 6.23** includes the mitigation measures assessed for minimising greenhouse gas emissions from consuming electricity.

Table 6.23 – Options Assessed for Electricity Use

Energy Use During Processing		
Potential Mitigation Measure	Planned for Project	Reason for Inclusion/Exclusion
23.Reducing reject percentage	Yes	The installation of the new crushers is expected to reduce the percentage of 5 millimetres minus material that is created from 30 per cent to 25 per cent. This results in a 5 per cent efficiency gain in production and reduces the need for double handling. It is anticipated that the existing markets for the 5 millimetres minus material will be expanded over time and new markets will be developed such as production of manufactured sand as is proposed. This has the potential to create up to a 25 per cent gain in energy efficient per tonne of product.
24.Automatically shutting down the processing plant when not in use	No	Not applicable. The quarry should ensure the processing plant does not have to shut down as is expected to be constantly in use.
25.High efficiency motors	Yes	Will occur as part of on-going upgrades to the processing plant. Likely to be financially reasonable.
26.Variable Speed Drives	Yes	Will occur were appropriate as part of on-going upgrades to the processing plant. Likely to be financially reasonable.
27.Optimising motor size to load	Yes	Will occur as part of on-going upgrades to the processing plant.
28.Optimising basalt throughput	Yes	The processing plant has been designed to match the maximum through put of the quarry.
29.On-site renewable energy (solar)	No	The implementation of solar panels on site to provide power to the processing plant is not viable given the hours of operation. Oberon Quarries would need to be connected to the power grid.

6.13.7 Conclusion

The operation of the quarry is expected to generate approximately 4600 tonnes CO₂-e Scope 1 and 2 emissions per annum, at maximum production. The greenhouse gas emissions associated with the ongoing operations are not expected to trigger the reporting requirements under the *National Greenhouse Gas Energy Reporting Act 2007*.

The ongoing operations may increase existing greenhouse gas emissions by approximately 2400 tonnes CO₂-e per annum. The greenhouse gas emissions associated with the ongoing operations are unlikely to generate a demonstrable impact on the environment.

The GHGEA found that the ongoing operations are unlikely to impact national greenhouse gas policy objectives due to the relatively small annual contribution the Project will make to national emissions.

Over the life of the quarry Oberon Quarries will continue to monitor diesel and electricity usage and assess the associated efficiencies. Through this process Oberon Quarries will identify opportunities and subsequently implement reasonable and feasible measures which will result in improved energy efficiencies.

6.14 Waste Management

As an existing operation Oberon Quarries currently has an established waste management system on site which is based on waste management principles that will continue to be applied in the management of waste materials throughout the life of the Project. Waste management principles include:

- waste avoidance and reduction at the source;
- waste re-use;
- waste recycling; and
- waste removal and disposal (all waste that cannot be re-used or recycled).

The underpinning strategies for management of waste are focused on minimisation through cleaner production and the aforementioned principles as well as the appropriate segregation, storage and disposal of waste generated.

Waste currently generated at the site, and methods of management, consist of the following:

- office waste – negligible amounts consistent with that regenerated by 2 to 3 equivalent people. Waste is removed from site and disposed of in a licensed landfill facility (estimated to be less than 10 tonnes/year);
- small amounts of oil waste – collected and taken off site to a recycling facility (estimated to be less than 1000 L/year);
- approximately 0.5 tonnes/year of batteries disposed of to a recycling facility;
- approximately 10 tonne/year of scrap metal is sold to a recycling facility; and

- approximately 20 tonnes of chrome iron per year used as part of the crushing process is returned to manufacturers for recycling.

Oberon Quarries also has a Council approved pump out sewage system which is regularly pumped out by a licensed contractor who disposes of the sewage according to Council requirements.

The Project will not generate significantly more waste than current generation rates. Waste management practices will continue to be implemented for the life of the quarry operations.

6.15 Hazard

Under *State Environmental Planning Policy 33 – Hazardous Industry and Offensive Development* (SEPP 33) (Department of Planning (DoP) 1992) a 'hazardous industry' is one which when all location, technical, operational and organisational safeguards are employed, continues to pose a significant risk to surrounding land users. Under SEPP 33, an 'offensive industry' is categorised as one which, even when controls are used, has emissions which result in a significant level of offence, such as air quality impacts or noise emissions, which have been assessed as part of this EIS; refer to **Sections 6.3** and **6.5** respectively. A project or site cannot be considered either 'hazardous' or 'offensive' until it is identified as such through assessment in accordance with SEPP 33. A Preliminary Hazard Analysis (PHA) is required if a proposed project or site is classified as 'potentially hazardous'.

Under SEPP 33, a preliminary risk screening for the Project is required to determine the need for a PHA. The preliminary screening involves identification and assessment of the storage of specific dangerous goods classes that have the potential for significant off-site effects.

Dangerous goods storage on site consists of the storage of diesel in an above-ground storage tank with approximately 28,000 litre capacity with a bunded area with a capacity of approximately 120 per cent. Current storage is consistent with the requirements of *AS1940-2004 The storage and handling of flammable and combustible liquids* (AS1940) and has Council approval.

The Project seeks to include a second diesel fuel storage tank with a capacity of approximately 28,000 litres. The second tank will be located within the existing truck parking area (refer to **Figure 1.2**) and will comply with the requirements of the EPA's *Storage and Handling Liquids: Environmental Protection Participant's Manual* (EPA, 2007). The installation of a second tank minimises the operational risk associated with running out of fuel as each delivery can only be ordered when the existing 28,000 litre diesel tank is almost empty to ensure there is sufficient space in the tank for the delivered diesel. The proposed new storage will also be consistent with Council requirements and AS 1940.

Preliminary screening concludes that under SEPP 33 the Project is not considered either 'hazardous' or 'offensive'.

With respect to hazards caused by transport, to greatly improve the safety and functionality of access to the processing plant area approximately 180 metres of new road will be constructed establishing a separate ingress and egress routes to this area of the quarry. The remaining transport routes to and from the site and within the site itself remain unchanged.

6.16 Bushfire

A bush fire prone area is an area of land that can support a bush fire or is likely to be subject to bush fire attack. Bush fire prone areas are identified on a bush fire prone land maps and identify bush fire hazards and associated buffer zones within a local government area. The bush fire prone map for the Oberon LGA has been certified by the Commissioner of the NSW Rural Fire Service (RFS); **Figure 6.6** presents the portion of this map which is relevant to the quarry. Areas which are coloured red, yellow or orange are considered to be bushfire prone (RFS, 2014).

New development on areas identified as bush fire prone are subject to the development and planning controls of *'Planning for Bush Fire Protection 2006'* and must be designed to improve the survivability of the development and the occupants that are exposed to a bush fire hazard. The Project (including the 1.0 hectare extended disturbance area) relates to an area previously assessed and approved for development and therefore is not considered to be a new development and therefore not subject to the development and planning controls of *'Planning for Bush Fire Protection 2006'*.

In accordance with consent conditions, Oberon Quarries has an approved Bushfire Control Plan for the site which was developed in consultation with Council.

6.17 Socio-Economic

The Oberon LGA as at 2011 had a population of approximately 5040 people, of which approximately 3185 live in the town of Oberon (Australian Bureau of Statistics, 2011).

Oberon Quarries' operations are an important part of the local Oberon economy providing employment through the provision of 15 jobs at the quarry and 10 jobs for truck drivers as well as associated indirect jobs and regular engagement of local service contractors. At the proposed production level of 400,000 tpa, it is envisaged that the quarry will provide full-time employment for 20 people at the quarry and 15 truck drivers. Oberon Quarries also supports the local economy through the supply of high quality hard rock products for road, building and other construction activities in the region.

The Project will not result in any significant adverse changes to the potential socio-economic impacts of the quarry. Oberon Quarries' continued operation will provide ongoing employment opportunities at the quarry for those currently employed and new employment opportunities as production increases to 400,000 tpa. It will also provide ongoing opportunities for contractors and other providers servicing the quarry.

Oberon Quarries has also identified that some of the traditional suppliers of high quality hard rock to the Sydney market have recently exhausted their reserves and ceased operations. Limiting the supply of high quality hard rock quarry products by Oberon Quarries would further impose increased price pressures on the supply of quarry products to the Sydney, Bathurst, Blue Mountains and local hard rock markets. Removal of the 10 year annual average production limitation will assist with minimising price pressures on the supply of quarry products to the Sydney and the Central Tablelands hard rock markets and result in significant industry benefits through continuity of supply and increased competition. In addition, ongoing operation will ensure a continued supply of high quality construction materials to local markets, and markets in Bathurst, Blue Mountains and Sydney.

Consultation with surrounding landholders indicates that quarry operations are not adversely impacting on land use or amenity of the surrounding area. There are no anticipated impacts on any neighbouring land uses, including agricultural activities, as a result of the Project.

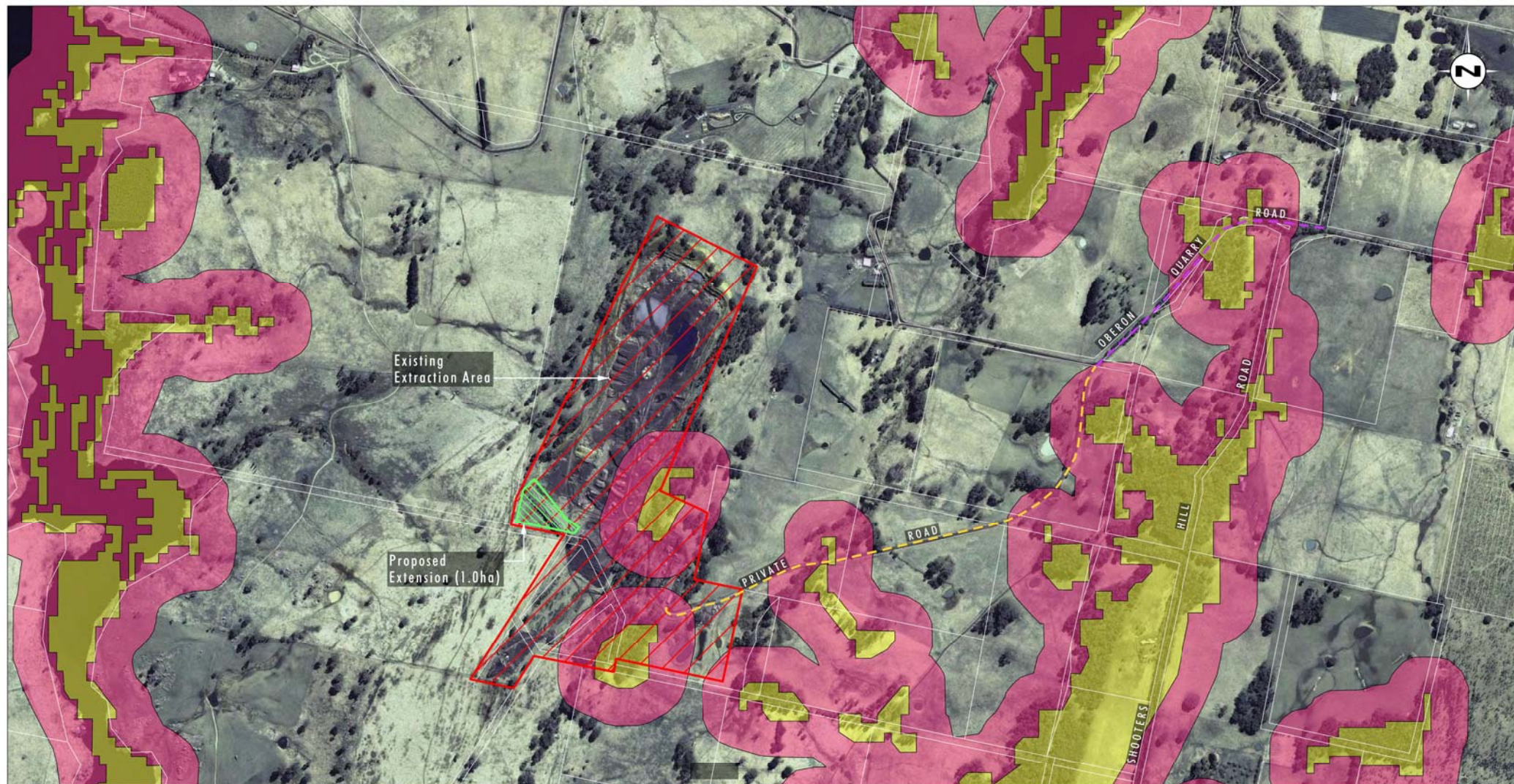


Image Source: Google Earth (2012)
Data Source: Oberon Quarries Pty Limited (2014)

Legend

- ▨ Project Area
- ▨ Proposed Extension to Extraction Area
- Bushfire Zone 1
- Bushfire Zone 3
- Right of Carriageway (12m Wide)

File Name (A4): R31/1296_147.dgn
20150106 15.07

FIGURE 6.6

Bushfire Prone Areas in
Relation to Oberon Quarry

6.18 Rehabilitation, Decommissioning and Closure

As set out in Section 7.7 of the EIS (Resource Planning, 1992) rehabilitation will be undertaken as hard rock resource within sections of the quarry is fully extracted and the final extent of extraction is reached. As discussed, quarrying involves the removal of two layers of basalt which are separated by a varying thickness layer of interburden material. The quality and structure of the basalt varies within the layers making it important to be able to access material from various sections of the quarry to ensure that a full range of high quality quarry products can be continuously produced. To date quarrying has been principally undertaken in the upper basalt layer. Due to the layout of the quarry with all quarry extraction undertaken within the rim of Racecourse Hill, all the runoff from the disturbed quarrying area drains to the floor of the quarry where it is detained to reduce peak discharges before flowing to the sediment dams and the rest of the water management system. As a result, the lower sections of the extraction area within the lower basalt layer are likely to be flooded during periods of heavy rainfall. During these times it will be necessary to have access to resource in the upper layer to enable extraction to continue while the flooded areas are either drained or dry out. The potential for flooding of the quarry to restrict operations will reduce as more area is opened up within the lower layer. It is envisaged that it will be at least 10 years before sufficient sections of the lower basalt layer are extracted to enable rehabilitation to be undertaken without interfering with or being disturbed by quarrying activities.

Once sufficient basalt resource is extracted and clear space provided between extraction and rehabilitation activities, rehabilitation will commence and be undertaken progressively to achieve the final benched landform which is conceptually shown on **Figure 6.7**. This final landform is consistent with that approved as part of the 1993 consent and is consistent with the landowner's future land use expectations of being able to continuing grazing the land once quarrying has ceased.

Rehabilitation within the extraction area will involve the following:

- benched areas as shown on **Figure 6.7** will be approximately 10 metres wide and will have a minimum of 0.5 metres of overburden placed on them before being planted with native tree species;
- placement of a minimum of 0.5 metres of overburden and interburden material from stockpiles around the rim of the quarry on the quarry floor and then shaping the floor to have slopes of less than 5 per cent;
- shaping the quarry floor to drain freely towards a dam on the quarry floor (Sediment Dam 4). The dam will drain via the entrance to the extraction area to the existing quarry water management system;
- shaping of Sediment Dam 4 on the quarry floor to be an integral part of the final landform and linking it with a central grassed waterway to convey runoff from the extraction area to Sedimentation Dams 1 and 2. Sedimentation Dam 4 will be maintained as a farm dam to provide runoff attenuation and contain sediment that may be generated from the rehabilitated quarry area. Sediment Dams 1, 2 and 3 will be maintained at the end of the life of the quarry as farm dams;
- placement of a minimum 100 millimetres of topsoil over the overburden and interburden material;
- planting of the quarry floor with improved pasture species so that it can be returned to viable grazing land in accordance with the requirements of the landowner;

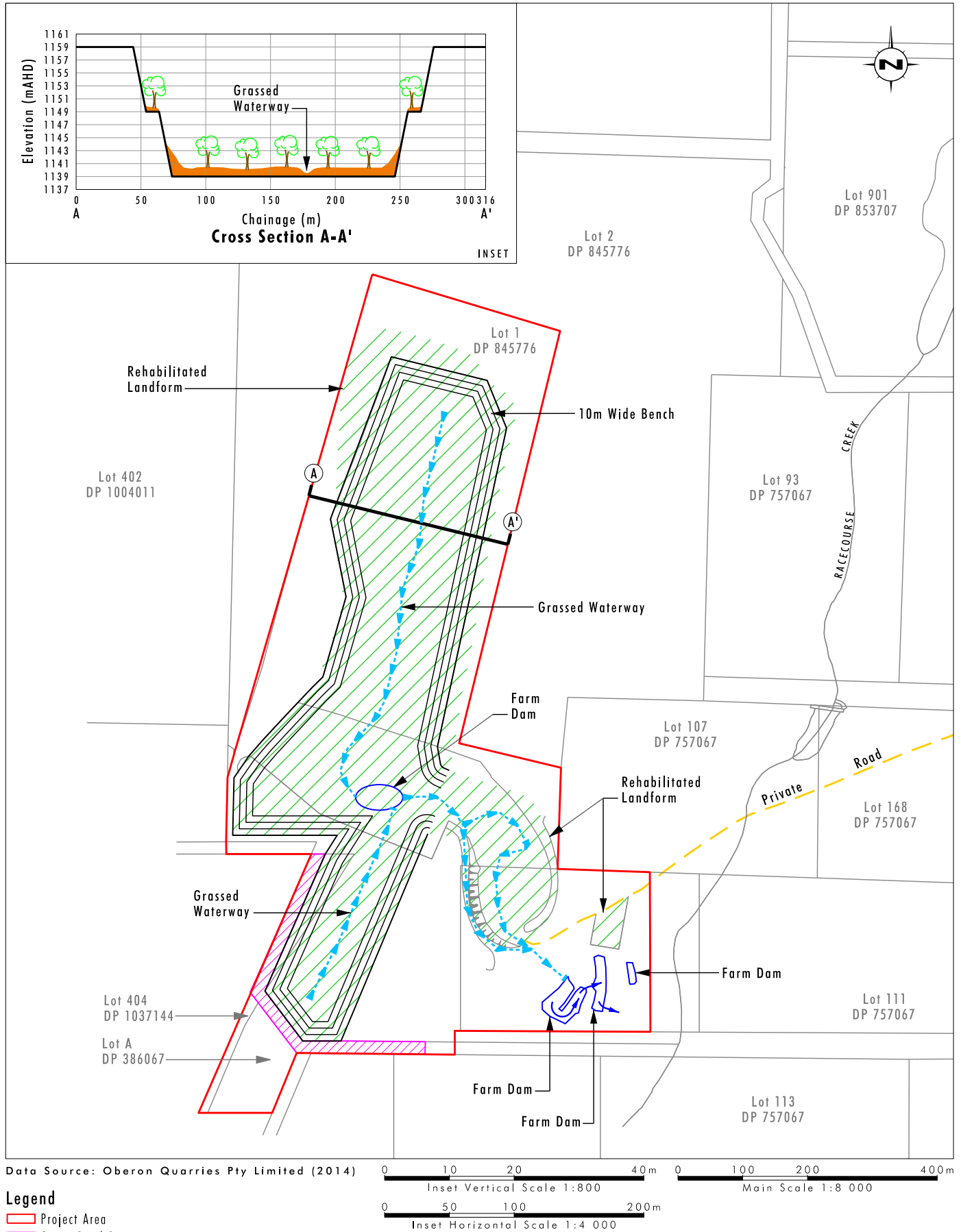


FIGURE 6.7
Conceptual Final Landform

- as rehabilitation progresses, a series of native woodlots will be planted on the quarry floor to provide shelter for stock and habitat for native fauna;
- progressive removal of stockpiled material from around the rim of the quarry, shaping and reseeded of stockpile areas with improved pasture species; and
- maintenance of rehabilitated areas until a stable vegetative cover is achieved.

Pasture species to be planted and sowing rates are provided in **Table 6.24** and are consistent with that approved as part of the 1993 development consent.

Table 6.24 – Improved Pasture Species and Application Rates

Improved Pasture Species	Application Rate per Hectare
<i>Saroso phalaris</i>	4.5 kg
Porto coxfoot	9.0 kg
Ryegrass	9.0 kg
White clover	2.25 kg
Subterranean Clover	9.0 kg
Cereal ryecorn	16.0 kg

Once all the approved hard rock resource at the site has been quarried, the crushing screening and processing equipment and all associated infrastructure including the workshop, parking, fuel storage facilities and product bins will be removed.

As there is in excess of 10 Mt of hard rock resource remaining within the currently approved extraction area, decommissioning of the processing plant is not expected to occur for at least 30 years.

At the time of decommissioning, the floor of the processing area will be deep ripped. Material from the acoustic bund along the eastern side of the processing area will be removed and spread over the floor of the processing area to a minimum depth of 0.5 metres. Similarly the truck parking area will be deep ripped and have overburden spread over it.

As the processing area and the truck parking areas are reshaped, a minimum of 100 millimetres of topsoil will be spread over the surface and the area will then be seeded with improved pasture species to provide a stable vegetative cover. As with the quarry floor, native woodlots will be planted within the reshaped and rehabilitated processing area to provide natural habitat and shelter for stock.

As shown on **Figure 6.7**, grassed waterways with rock weirs and pool and riffle sequences will be constructed through the processing area to convey runoff from the extraction area to Sedimentation Dams 1, 2 and 3 and the 2 ML Storage Dam.

It is envisaged that Sedimentation Dams 1, 2 and 3 and the 2 ML Storage Dam will be maintained for ongoing sediment and flow control and as farm water dams into the future. As discussed, the quarry is expected to have a remaining life of in excess of 30 years with the currently approved extraction area containing in excess of 10 Mt of high quality hard rock reserves.

Rehabilitation will be reviewed and updated as necessary at least 2 years prior to any planned or notified closure of the quarry.

Progressive rehabilitation, both completed and planned works, will be reported on an annual basis to DP&E. Planning details for final landform and decommissioning will be submitted to planning and other relevant authorities closer to the end of the life of the quarry operations.

6.19 Overview of Environmental Impacts

The Project is designed to enable the remaining 10 Mt of high quality basalt resource to be extracted and to maximise the return on the energy, finances and resources that have been expended in establishing the existing quarry and associated infrastructure. Demand for high quality quarry products such as are produced by Oberon Quarries has grown over the last 20 years and will continue to grow into the future. Continued operation of the quarry as proposed, poses a far smaller environmental and social impact than establishment of a new quarry on a greenfields site and represents a much greater return from and utilisation of our natural resources.

The major changes to quarry operations that are sought principally relate to improving the efficiency and reducing the environmental impact per tonne of product produced from the quarry in comparison to that of the current operations. These include:

- increase maximum product tonnage from an average of 200,000 tpa over any 10 year period to an annual maximum of 400,000 tpa. This will provide greater efficiencies due to economies of scale and better utilisation of the equipment on-site;
- replacement of some of the crushing and screening plant and inclusion of an additional cone crusher to increase productivity of the processing equipment, reduce noise emissions and reduce the percentage of <5 millimetre material that is produced as a result of the crushing process;
- use of Finlay 150e Hydrasander or equivalent to reduce the amount of 75 micron minus material that is contained in the <5 millimetre material to enable manufactured sand to be produced. This will enable approximately 500,000 tonnes of <5 millimetre material that is stockpiled on the quarry floor at present and an additional 2.5 Mt of <5 millimetre material that will be produced over the remaining life of the quarry to be processed to produce manufactured sand;
- extension of the extraction area to include approximately 500,000 tonnes of resource from a 1.0 hectare area that would otherwise be sterilised;
- construction of an approximately 180 metres of new road over an existing area that is cleared of trees to establish separate ingress and egress routes to the processing plant area greatly improving the safety and functionality of access to this part of the quarry; and
- installation of a second approximately 28,000 litre diesel tank to ensure that there is diesel on-site at all times for refuelling trucks and mobile equipment.

These changes will not result in any significant adverse impacts of quarry operations on the surrounding area or fundamentally change quarry operations from those approved under DA 92/164 and subsequent modifications. Oberon Quarries will continue to undertake quarry operations in accordance with the conditions of DA92/164 and EPL 4442 or as modified.

As detailed in **Sections 6.1 to 6.18**, the potential environmental impacts of the ongoing operations have been identified and an environmental assessment completed. **Table 6.25** provides a broad overview of the key outcomes of the environment and social impact assessment for the ongoing operations. The ongoing operations are likely to result in low environmental impacts which are consistent with DA 92/164.

Table 6.25 – Overview of Environmental and Social Impacts

Environmental/Social Issue	Overview of Key Outcomes
Noise	The quarry has been operating without noise complaints for many years. The inclusion of new crushing and screening equipment is estimated to reduce the existing noise at the nearby residential receivers by up to 3 dB(A), when compared to the current operations. Modelling of the noise impacts from the ongoing operations indicates that the noise level at surrounding residences will not exceed the EPA criteria/goals during calm and significant wind conditions. Product haulage on the private haul road may result in a 3 dB(A) exceedance at Location 5 (Langley Heights) during evening and night time periods when temperature inversion conditions with a 2 m/s southerly drainage wind occur. Langley Heights has a commercial agreement with Oberon Quarries.
Blasting	Over the last 19 years of operation no adverse blasting impacts on property, people or stock have been reported by any surrounding resident. In 2012, blast overpressure limits were exceeded on two occasions. Oberon Quarries has implemented measures to ensure that such exceedances do not occur in the future. Oberon Quarries has developed a Blast Management Plan for the quarry and will continue to refine blasting operations over the life of the quarry. No adverse blasting impacts are predicted to occur as a result of the ongoing operations. Oberon Quarries will continue to undertake noise and blast monitoring as per the requirements of DA 92/164 and EPL 4442 and implement mitigation and management measures as required.
Air Quality	As there is no significant increase in footprint, maximum production levels or the overall nature of the already approved development, the impacts with the ongoing operation are expected to remain consistent with those of the already approved development. The depositional dust impacts from the quarry are predicted to be below the EPA's PM₁₀, TSP and depositional dust goals. Oberon Quarries will continue to implement air quality mitigation and management measures, to minimise any potential dust impacts.
Visual Amenity	The ongoing operation of the quarry will not impact on the visual amenity of the surrounding view shed (i.e. visual amenity impacts will not change from that approved by the 1993 development consent (DA 92/164)).
Water Resources	The ongoing operations will not result in any changes in the surface water or regional groundwater impacts or the management of water resources from those approved under development consent (DA 92/164). Oberon Quarries has an existing surface water licence (80SL051088) under Part 2 of the <i>Water Act 1912</i> to extract water from Racecourse Creek when needed. No additional water licensing is required for the project. Oberon Quarries will continue to undertake operations to satisfy the requirements of EPL4442 and DA 92/164, or as modified.
Traffic and Transport	Oberon Quarries has upgraded the required roads and intersections along the transport route in accordance with the requirements of DA 92/164. Traffic surveys and analysis undertaken for the project indicate that the existing road infrastructure has adequate capacity for existing traffic using the road system and that ongoing operations will not result in any significant changes to the existing peak traffic volumes, haul routes, traffic flow or intersection capacity. The wear and tear on roads (i.e. road pavement damage) will be addressed through per tonne based road maintenance contributions to Council by Oberon Quarries. The traffic impacts are therefore predicted to remain consistent with that already approved.

Table 6.25 – Overview of Environmental and Social Impacts (cont)

Environmental/Social Issue	Overview of Key Outcomes
Ecology	Ecology surveys show that the Project area contains no suitable habitat for threatened flora or fauna species, EPs or TECs and that the proposed continued operations will not impact on any significant ecological values.
Aboriginal Heritage	The Project will not result in any impact to known Aboriginal archaeological sites. The Aboriginal archaeological impacts of the ongoing operations are consistent with that approved by the 1993 development consent (DA 92/164).
Rehabilitation, Closure and Decommissioning	Proposed rehabilitation, closure and decommissioning procedures and outcomes for the quarry are consistent with that proposed in the 1992 EIS with the final land use being to return the quarried area to grazing in accordance with the land owner's requirements. Rehabilitation of the quarry benches will commence once sufficient areas of the lower basalt layer have been extracted to enable rehabilitation to proceed without impacting on the ability to efficiently extract the high quality basalt resource. It is envisaged that rehabilitation will commence in approximately 10 years. During the intervening period, extraction will continue with the same environmental controls as have been utilised over the past 20 years of operation. The proposed minor changes to extraction area and operations have no significant bearing on rehabilitation of the final landform and are unlikely to adversely impact on the surrounding area with activities contained within the existing quarry water management system.
Greenhouse and Energy	A greenhouse gas and energy assessment undertaken identified the annual direct and indirect emissions of greenhouse gas from the ongoing operations equate to approximately 0.000008 per cent of annual global greenhouse gas emissions. Although insignificant in a global context, GHG emissions may contribute to climate change. However, it should also be noted that Oberon Quarries will be meeting market demand and that should the ongoing operations not proceed, this demand will be met from other sources. Some of these sources may be less energy efficient and may result in increased GHG emissions per tonne of quarried rock.
Socio-economic	The ongoing operation of the quarry provides continued employment for those currently employed and new employment opportunities as production increases to 400,000 tpa. It will also provide ongoing opportunities for contractors and other providers servicing the quarry. The Project will provide for the continued employment of approximately 25 people and approximately an additional 10 people at 400,000 tpa plus associated indirect jobs.

As outlined in this EIS, the ongoing operations will not result in any substantial change to the environmental impacts of Oberon Quarries' operations when compared to those of the currently approved operation.

7.0 Summary of Mitigation and Management Measures

Clause 7(1)(e) of Schedule 2 EP&A Regulation Requirements requires that the EIS include a compilation of the mitigation measures (refer to **Section 4.2.1.2**).

If development consent is granted under Part 4 of the EP&A Act for the Project, Oberon Quarries will commit to the following controls.

Hours of Operation

Oberon Quarries' approved hours of operation are as per Condition 16 of DA 92/164, and are dependent on the activity being undertaken; approved hours are detailed in **Table 7.1**. Hours of operation will not change as a result of the Project.

Table 7.1 – Approved Hours of Operation

Activity	Approved Hours of Operation
Quarrying and Processing Areas	7.00 am to 6.00 pm, Mondays to Fridays 7.00 am to 5.00 pm, Saturdays No quarrying or processing shall be undertaken on Sundays or public holidays.
Loading Haul Trucks	6.00 am to 10.00 pm, Mondays to Fridays 6.00 am to 5.00 pm, Saturdays No loading of haul trucks shall be undertaken on Sundays or public holidays.
Product Delivery	6.00 am to 10.00 pm, Mondays to Fridays 6.00 am to 5.00 pm, Saturdays No product delivery trucks are to enter the quarry prior to 6.00 am on any day. During the periods 6.00 am to 7.00 am and 6.00 pm to 10.00 pm a maximum of 4 laden delivery trucks shall leave the site per hour (total 8 truck movements per hour).
Construction of Haul Road and Quarry Infrastructure	7.00 am to 6.00 pm Mondays to Fridays 7.00 am to 4.00 pm Saturdays No construction shall be undertaken on Sundays or public holidays.
Maintenance	7.00 am to 6.00 pm Mondays to Fridays 7.00 am to 4.00 pm Saturdays

Erosion and Sediment Control

Current site infrastructure and management practices successfully manage sediment and erosion control for the operation. Surface water management infrastructure at the quarry has been established and fully operational since 1995. The existing water management system at the site includes diversion drains, catch drains and sedimentation dams. Diversion drains and embankments have been constructed around the disturbance area and are vegetated. Catch drains have been constructed with rock weirs and convey sediment-laden runoff from the extraction area to a series of sedimentation dams.

In addition to the diversion drains and sedimentation ponds, Oberon Quarries will continue to implement localised sediment and erosion controls, as required, in accordance with *Managing Urban Stormwater – Soils and Construction* (Landcom, 2001) to reduce the impacts on the water quality in the quarry's dirty water management system.

Noise

Key noise management and mitigation measures to limit potential operational noise impacts currently being implemented at Oberon Quarries' operations and that will be applied to future operations include:

- consideration of seasonal influences on noise impacts, to avoid or otherwise minimise noise impacts to sensitive receivers;
- undertaking prescribed works within the approved hours of operation. Works undertaken outside these hours include:
 - emergency work to avoid the loss of life, property and/or prevent environmental harm; and
 - any other work as agreed through negotiation between Oberon Quarries and potentially affected noise receivers or as otherwise agreed by the EPA.
- where practical aural reversing alarms on mobile plant will be muffled;
- regular inspections of all site plant and equipment to ensure ongoing compliance with manufacturers' noise specifications;
- provision of noise awareness training to site workers;
- positioning (i.e. location and orientation) mobile plant and equipment to minimise any potential noise impact on the surrounding residential receivers;
- implementing noise attenuation controls, where feasible, on mobile and stationary equipment that is potentially generating noise levels above that predicted and/or are generating noise complaints;
- installation of a new crushing plant that has a SWL 6 dB less than the existing equipment and the screening plant that has a SWL 3 dB less than the existing equipment;
- limiting truck speeds on the internal haul roads to 40 km/h;
- not permitting the use of compression brakes on internal haul roads and Oberon Quarry Road;
- drilling associated with blasting will only take place between the hours of 7.00 am and 6.00 pm, 5 days per week;
- restricting truck movements during the periods 6.00 am to 7.00 am and 6.00 pm to 10.00 pm to a maximum of 4 laden truck movements per hour (total 8 truck movements per hour);
- undertaking noise compliance monitoring and reporting (i.e. attended noise monitoring to assess compliance and assist with minimising impacts) once the new crusher and screen are installed. A noise report will be prepared by an independent and suitably qualified person, to assess compliance with the noise levels generated by the quarrying, processing and transportation of quarry products; and
- minimising noise impacts at residential locations, unless there is an alternative agreement with the private resident.

Oberon Quarries will operate a community contact line. The local community is encouraged to use this point of contact to report any instances of excessive noise. All enquiries are to be recorded and the subsequent investigation, action and response logged. The action taken is also communicated to the person who made the enquiry.

These are considered the only feasible measures available to mitigate noise impacts.

Blasting

Oberon Quarries will continue to implement the existing blast management measures:

- all relevant quarry personnel will be trained on the environmental obligations in relation to blasting controls;
- the surrounding landowners and Council will be notified prior to undertaking a blast;
- the date, location of blast holes and quantity of explosive used each day will be documented;
- blasts will be designed to comply with overpressure and vibration criteria;
- monitoring will be undertaken at the nearest private residence and/or other sensitive locations (as required) to verify compliance with the relevant criteria (refer to **Figure 6.1**);
- the maximum number of holes to be detonated in a blast is 150;
- sufficient distance will be maintained between the blast hole and the quarry face;
- appropriate delays will be used;
- blast monitoring data will be used on an ongoing basis to further refine the blast design and management;
- blast design and blast management procedures will be periodically reviewed to evaluate performance and identify corrective action, if required; and
- blasting will be undertaken between 9.00 am and 5.00 pm, Monday to Saturday inclusive, except under apparent temperature inversions conditions when blasting shall only occur between 11.00 am and 1.00 pm Monday to Saturday. No blasting is undertaken on Sundays or public holidays, without approval of the Secretary.

Air Quality

Oberon Quarries has committed to implementing the following dust management and mitigation practices:

- regular watering of unsealed haul roads within the extraction and processing areas and working areas;
- mist sprays on conveyors discharging to product stockpiles;
- limiting vehicles speeds on unsealed surfaces to 40 km/h;
- progressive stabilisation/rehabilitation of exposed areas no longer needed for operational purposes;

- rehabilitating the final landform surface as soon as practicable;
- minimisation of the total disturbed/working areas at any one time;
- implementing temporary stabilisation measures (e.g. cover crops or mulch) on disturbed areas soon as practicable, if rehabilitation is not to be undertaken within the coming three months;
- where practical/possible conduct drilling and blasting during suitable meteorological conditions (i.e. not during high winds);
- drill holes will be capped with stemming to restrict the upward emission of dust;
- undertaking preventative maintenance on all dust suppression plant and equipment;
- truck wheel wash facility will be maintained to be fully functional;
- covering of all laden trucks leaving the site; and
- monitoring of depositional dust levels and analysis of the data for trends (refer to **Figure 6.1** for locations).

Oberon Quarries will continue to implement the existing air quality monitoring program which comprises four dust deposition gauges and monitor the dust levels at these locations at monthly sample intervals.

These are considered the only feasible measures available to mitigate air quality impacts.

Surface Water

The existing water management system including diversion drains, catch drains and sedimentation dams will continue to be managed as per current operations. The system can and will be readily augmented to allow for the additional 1.0 hectare extension area.

Oberon Quarries holds a surface water licence (80SI05018, WAL 34279) that allows extraction of water from Racecourse Creek. No other water licensing will be required for the continued operation of the quarry.

In addition Oberon Quarries will continue to implement localised sediment and erosion controls, as required, in accordance with *Managing Urban Stormwater – Soils and Construction* (Landcom, 2001) to reduce the impacts on the water quality in the quarry's dirty water management system.

Surface water monitoring will continue in accordance with Condition 26 of DA 92/164, and EPL Condition P1.3, surface water quality is monitored at two sites on Racecourse Creek (refer to **Figure 6.1**):

- W1 – upstream of the quarry; and
- W2 – downstream of the quarry.

The samples are analysed for pH, conductivity, turbidity, non-filterable residue (NFR), total nitrogen (TKN), total phosphorus (TP), and total petroleum hydrocarbons (TPH).

EPL condition M2.1 requires the monitoring of Oil & Grease, Total Suspended Solids (TSS) and pH. TPH has been used at the quarry for many years as a suitable measurement for Oil & Grease.

Groundwater

Groundwater will continue to be monitored in accordance with Condition 26 of DA 92/164. Oberon Quarries undertakes groundwater monitoring to determine any potential impacts as a result of quarry operations. Groundwater is monitored for pH and conductivity at a spring-fed dam (GW1) at 'Langley Heights', downslope of the quarry on Racecourse Hill (refer to **Figure 6.1**).

Traffic and Transport

In accordance with existing consent requirements, Oberon Quarries pays and will continue to pay Oberon Council a tonnage based and indexed road maintenance contribution for wear and tear on roads (i.e. road pavement damage).

Flora and Fauna

To ensure the ecological impacts of the quarry are minimised, Oberon Quarries has committed to implementing the following management and mitigation measures:

- installing survey pegs to mark the extent of extraction;
- create a stable final landform within the quarry pit consisting of self-sustaining vegetation communities characteristic of the pre quarry environment;
- progressively conduct rehabilitation and revegetation of the post quarry area over the life of the operations and as quarrying operations of the second bench allow (refer to **Section 6.18**);
- minimising the extent of vegetation clearance to that associated with the next blast area; and
- identifying the weed management controls for the Project Area, i.e. types of weeds known to be present, required control methods and frequencies, as well as monitoring frequencies.

Aboriginal Archaeology

To ensure the archaeological impacts of the quarry are minimised, Oberon Quarries has committed to implementing the following management and mitigation measures:

- Oberon Quarries should ensure that all parties involved in the Project are aware that it is an offence under Section 86 of the NPW Act to harm or desecrate an Aboriginal object unless that harm or desecration is the subject of an AHIP;
- Oberon Quarries will submit an ASIR form to correct the status of site AHIMS #44-6-0060, which appears as valid on the AHIMS database but was located within the approved extraction area;
- in the event that an Aboriginal object (or objects) is uncovered during the proposed works, ground disturbance works will cease within 20 metres of the object(s) and OEH and the relevant Aboriginal parties will be contacted so that appropriate management strategies can be identified;

- In the unlikely event that a potential burial site or potential human skeletal material is exposed within the Project Area, the following procedure should be followed in accordance with the *Policy Directive – Exhumation of Human Remains* (NSW Department of Health, 2008), *Skeletal Remains – Guidelines for the Management of Human Skeletal Remains under the Heritage Act 1977* (NSW Heritage Office, 1998) and the *Aboriginal Cultural Heritage Standards and Guidelines Kit* (NPWS, 1997):
 - as soon as remains are exposed, work in the vicinity of the remains is to halt immediately to allow assessment and management;
 - the relevant manager of the project will be informed and will contact local police, OEH and the Heritage Branch;
 - if the remains are suspected to be human, a physical or forensic anthropologist should inspect the remains *in situ*, and make a determination of whether the remains are human and if so, the likely ancestry (Aboriginal or non-Aboriginal) and antiquity (pre-contact, historic or forensic);
 - if the remains are identified as forensic the area is deemed as crime scene;
 - if the remains are identified as Aboriginal, the site is to be secured and OEH and the relevant Aboriginal parties are to be notified in writing; or
 - if the remains are non-Aboriginal (historical) remains, the site is to be secured and the Heritage Branch is to be contacted.

This process functions only to appropriately identify the remains and secure the site. From this time, the management of the remains is to be determined through liaison with the appropriate stakeholders and in accordance with the *Public Health Act 1991*.

Greenhouse Gas and Energy

There are a number of mitigation and management measures proposed to be implemented for the ongoing operations. These are outlined in **Table 7.2** below.

Table 7.2 – Greenhouse Gas and Energy Mitigation and Management Measures

Mitigation/Management Measure	Application
<i>Improving transport diesel use efficiency</i>	
Limiting the length of transport routes	The transport route is selected based on considering the shortest route and traffic congestion/delays.
Fuel efficient haul trucks	The existing transport fleet over the life of the ongoing operations will be replaced by more efficient trucks. Fuel use efficiency will be an important factor in selecting new haul trucks.
Maximising payload	Oberon Quarries ensure the each truck carries the maximum legal payload.
Reducing idling times	Oberon Quarries will continuously try to improve idle times. Idle times are typically minimal given there is a front end loader specifically for truck loading.
<i>Improving on-site diesel use efficiency</i>	
Scheduling activities so that equipment and vehicle operation is optimised	Quarry operations are scheduled to optimise the productivity and efficiency of equipment.

Table 7.2 – Greenhouse Gas and Energy Mitigation and Management Measures (cont)

Mitigation/Management Measure	Application
Fuel efficient equipment	The existing quarry fleet over the life of the ongoing operations will be replaced by more efficient trucks, excavators and front end loaders. Fuel use efficiency will be an important factor in selecting quarry fleet.
Blasting strategies to improve extraction efficiency	Blasting will be undertaken using best practice.
Maximising resource recovery efficiency	Resource recovery will be optimised within the constraints of the Project.
Working machines to their upper design performance	Machines will be worked to their upper design performance. Optimising machine performance is a key performance indicator for operators. This will be an important factor in selecting new machines.
<i>Haul Truck Options</i>	
Limiting the length of material haulage routes	The quarry planning process paid particular attention to reducing haul route distances.
Optimising ramp gradients	Over the life of the quarry the excavation depth will be increased, thereby reducing the haul road gradient between the processing area and the quarry pit.
Fuel efficient haul trucks	The existing haul truck over the life of the ongoing operations will be replaced by a more efficient truck. Fuel use efficiency will be an important factor in selecting new haul trucks.
Maximising payload	Trucks will be matched with excavators to maximise payload.
Improving rolling resistance of haul roads	Haul road locations are constantly changing and it would be very expensive to pave every haul route. The haul roads are regularly maintained to improve the rolling resistance of haul roads.
Reducing idling times	Oberon Quarries will continuously try to improve idle times. Idle times are typically minimal given there is a front end loader and/or excavator specifically for haul truck loading.
<i>Improving electricity efficiency of processing equipment</i>	
Reducing reject percentage	The installation of the new crushers is expected to reduce the percentage of 5 millimetres minus material that is created from 30 per cent to 25 per cent. This results in a 5 per cent efficiency gain in production and reduces the need for double handling. It is anticipated that the existing markets for the 5 millimetres minus material will be expanded over time and new markets will be developed such as production of manufactured sand as is proposed. This has the potential to create up to a 25 per cent gain in energy efficient per tonne of product.
High efficiency motors	Will occur as part of on-going upgrades to the processing plant. Likely to be financially reasonable
Variable Speed Drives	Will occur where appropriate as part of on-going upgrades to the processing plant. Likely to be financially reasonable.
Optimising motor size to load	Will occur as part of on-going upgrades to the processing plant.
Optimising basalt throughput	The processing plant has been designed to match the maximum throughput of the quarry.

Waste

The current site waste management practices will continue to be implemented for the life of the Project.

Bushfire

The Council approved Bushfire Management Plan for the site will continue to be implemented for the life of the Project.

8.0 Conclusion

This section provides a conclusion discussing the justification for the Project, taking into consideration the environmental impacts of the Project and the suitability of the site, to assist the consent authority to determine whether or not the Project is in the public interest. Other matters considered in the development of the Project design are discussed in **Sections 3.1** and **3.2**.

8.1 Suitability of the Site

The site is an established quarrying operation producing crushed aggregate from high quality hard rock since 1995. Over this time Oberon Quarries has provided ongoing economic benefits to the local area.

Oberon Quarries has already invested significant capital, energy and resources in establishing the existing quarrying operations (e.g. road upgrades, buildings, quarry infrastructure and water management infrastructure). The ongoing operation of the quarry will maximise the return from environmental and financial investment in these assets when compared to a greenfield project.

A detailed analysis of the potential off-site impacts is provided in **Section 6.0** and an overview of impacts is provided in **Table 6.24**. Mitigation and management measures will continue to be incorporated into the Project to minimise impacts, including land use impacts.

The use of the existing operation, and the addition of the proposed changes, provides by far the highest economic returns from the land relative to any other identified permissible uses of the land.

8.2 Ecologically Sustainable Development

The EP&A Act aims to encourage ESD within NSW. As outlined in **Section 1.0**, the Project requires approval from the Minister under Part 4 of the EP&A Act. As such, the Minister needs to be satisfied that the Project is consistent with the principles of ESD. This section provides an assessment of the Project in relation to the principles of ESD.

To justify the Project with regard to the ESD principles, the benefits of the Project in an environmental and socio-economic context should outweigh any negative impacts. The ESD principles, as outlined in Section 6 of the *Protection of the Environment Administration Act 1991* encompass the following:

- the precautionary principle;
- inter-generational equity;
- conservation of biological diversity; and
- valuation and pricing of resources.

8.2.1 The Precautionary Principle

The EP&A Regulation defines the precautionary principle as:

Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In the application of the precautionary principle, public and private decisions should be guided by:

- (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
- (ii) an assessment of the risk-weighted consequences of various options.

In order to achieve a level of scientific certainty in relation to potential impacts associated with the Project, this EIS has undertaken an extensive evaluation of all the key components of the Project. Detailed assessment of all key issues and necessary management procedures has been conducted and is comprehensively documented in this EIS.

The assessment process has involved a detailed study of the existing environment and the use of engineering and scientific modelling to assess and determine potential impacts as a result of the Project (refer to **Section 6.0**). To this end, there has been careful evaluation to avoid, where possible, irreversible damage to the environment.

The decision making process for the design, impact assessment and development of management processes has been transparent in the following respects:

- government authorities, landholders potentially affected by the proposed development, the local community and other stakeholders were consulted during EIS preparation (refer to **Section 5.0**). This enabled comment and discussion regarding potential environmental impacts and proposed environmental management procedures;
- the community has been consulted through individual meetings with surrounding landholders within the vicinity of the quarry. During the meetings the ongoing operations and the potential impact on the community and environment were outlined and feedback was sought on the proposed ongoing operations for incorporation in the EIS as appropriate; and
- the EIS has been undertaken on the basis of the best available scientific information for the study area. Where uncertainty in the data used in the assessment has been identified, a conservative worst-case analysis has been undertaken and contingency measures have been identified to manage that uncertainty.

8.2.2 Intergenerational Equity

The EP&A Regulation defines intergenerational equity as:

Intergenerational equity namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

Social equity involves concepts of justice and fairness so that the basic needs of all sectors of society are met and there is a fairer distribution of costs and benefits to improve the wellbeing and welfare of the community, population or society (DUAP, 1997).

Intergenerational equity refers to equality between generations. It requires that the needs and requirements of today's generations do not compromise the needs and requirements of future generations in terms of health, biodiversity and productivity.

The objective of the Project is to allow for a more efficient recovery of the resource in a manner that achieves the best practical safety, environmental, social and economic outcomes while aiming to minimise any associated environmental impacts. The environmental management measures discussed in **Sections 6.0** and **7.0** have been developed to minimise the impact on the environment to the greatest extent reasonably possible.

The management of environmental issues as outlined in the EIS will maintain the health, diversity and productivity of the environment for future generations. The Project will also contribute to maintaining services in the community through the direct and flow on effects of employee and operational expenditure.

8.2.3 Conservation of Biological Diversity

The conservation of biological diversity refers to the maintenance of species richness, ecosystem diversity and health and the links and processes between them. All environmental components, ecosystems and habitat values potentially affected by the Project are described in the EIS. Potential impacts and measures to ameliorate any negative impact are outlined in **Sections 6.0** and **7.0**.

Oberon Quarries has sought to avoid and minimise potential adverse impacts on the ecological values throughout the project planning process. This has included limiting the extent of the Project to within the existing approved Project Area and utilising an area within the existing approved disturbance area on which there is no native vegetation communities.

8.2.4 Valuation and Pricing of Resources

The principle of improved valuation and pricing refers to the need to determine proper values of services provided by the natural environment. The objective is to apply economic terms and values to the elements of the natural environment. This is a difficult task largely due to the intangible comparisons that need to be drawn in order to apply the values.

Oberon Quarries has intrinsically valued the environmental resources by designing the Project to avoid and minimise potential environmental impacts as much as possible. For example, the extent of the quarry has been limited to a 1.0 hectare extension area within the existing approved disturbance footprint. In addition, it is noted that the ongoing annual energy requirements of the existing quarry is significantly less than that which would be required for the establishment of a new quarry.

Where residual impacts remain, mitigation measures (refer to **Sections 6.0** and **7.0**) are proposed to further reduce potential impacts on the environment.

8.3 Justification for the Project

Oberon Quarries' operations provide economic benefits at Federal, State and local levels whilst being committed to maintaining a good working relationship with the community and solid environmental credentials and performance.

The Project will not result in any substantial changes to the quarry operations or the environmental impacts associated with the current operations which were approved under

DA 92/164. The proposed changes to quarry operations have been designed to result in improved overall environmental, social and economic performance of quarry operation and are consistent with that approved under DA 92/164.

The ongoing operation of the quarry will allow for the continued supply of high quality hard rock materials to the surrounding region and markets in Bathurst, Blue Mountains and Sydney from this regionally significant resource. This high quality hard rock quarry product is suitable for use in nearly all quarry product applications and has been used at the Opera House and Third Runway in Sydney.

The continued operation of the quarry and the beneficial reuse of the <5 millimetre material will provide a greater net return (i.e. better utilisation) on the capital, energy and resources which have already been invested as part of establishing the quarry (e.g. road upgrades, buildings, quarry infrastructure and water management infrastructure) when compared to establishment of a new quarry on a greenfield site.

Oberon Quarries is an important contributor to local employment through the provision of direct and indirect employment. The ongoing operation of the quarry will maintain the existing employment of 25 full-time employment positions. This is envisaged to increase to 35 full-time employment positions at a production level of 400,000 tpa.

If the Project is not approved, the opportunity to extract and supply in excess of 10 Mt of high quality basalt resource from this site to markets in Central Tablelands, Bathurst, Blue Mountains and Sydney areas will be lost as will the ability to use a fully established and environmentally sustainable quarry operation that will provide ongoing direct employment for 25 to approximately 35 people as the quarry reaches maximum production levels.

The ongoing operations will have limited, if any, substantial additional environmental impacts from that approved in 1993.

Oberon Quarries has demonstrated its commitment to continuous improvement in effective environmental management of its existing operations. This management approach will continue, and be refined, under the ongoing operations.

9.0 References

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10.0 Acronyms and Abbreviations

AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management Systems
AHIP	Aboriginal Heritage Impact Permit
ASIR	Aboriginal Site Impact Recording
DA	Development Application
dB	decibel
dB(A)	dB(A) Decibels A-weighting
DGB	Dense Grade Base
DGRs	Director-General's Requirements
DoL	Department of Lands
DoE	Department of Environment
DP&E	Department of Planning and
DP&I	Department of Planning and Infrastructure (now Department of Planning and Environment)
DSC	Dams Safety Committee
EIS	Environmental Impact Statement
ENM	Environmental Noise Model
EP	Endangered populations
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1997
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPL	Environmental Protection Licence
ESD	Ecologically Sustainable Development
GHGEA	Greenhouse Gas and Energy Assessment
GJ	Giga Joule
GAHAI	Gundungurra Aboriginal Heritage Association Inc.
GTCAC	Gundungurra Tribal Council Aboriginal Corporation

INP	Industrial Noise Policy
IPCC	Intergovernmental Panel on Climate Change
kL	kilolitre(s)
km/h	kilometres per hour
LEP	Local Environmental Plan
LGA	Local Government Area
L/s	litres per second
MIC	Maximum Instantaneous Charge
m/s	metres per second
mg/L	milligrams per litre
mm/s	millimetres per second
mm/y	millimetres per year
ML	megalitres
ML/year	megalitres per year
MNES	Matters of National Environmental Significance
mS/cm	microSiemens per centimetre
Mt	million tonnes
NFR	Non Filterable Residue
NNTT	National Native Title Tribunal
NOW	NSW Office of Water
NPW Act	NSW National Parks and Wildlife Act 1974
NTU	Nephelometric Turbidity Units
OEH	Office of Environment and Heritage
Oberon Quarries	Oberon Quarries Pty Limited
PHA	Preliminary Hazard Analysis
PM ₁₀	10 micron particulate material
PMP	Probable Maximum Precipitation
POEO Act	Protection of the Environment Operations Act 1997

PSNL	Project Specific Noise Level
RBL	Rating Background Level
RFS	Rural Fire Service
RMS	Roads and Maritime Services
SEPP	State Environmental Planning Policy
SWL	Sound Power Level
t	tonnes
TECs	Threatened Ecological Communities
TKN	Total Kjeldahl Nitrogen
TP	Total Phosphorus
tpa	tonnes per annum
TPH	Total Petroleum Hydrocarbons
TSC Act	Threatened Species Conservation Act 1995
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
Umwelt	Umwelt (Australia) Pty Limited
vpd	vehicles per day