CONSTITUTION HILL QUARRY

DEVELOPMENT PROPOSAL AND ENVIRONMENTAL MANAGEMENT PLAN

Prepared by: INTEGRATED LAND MANAGEMENT AND PLANNING

Prepared for: Hazell Bros. Group

22 September 2010

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FOREWORD

This Development Proposal and Environmental Management Plan (DPEMP) is provided by Hazell Bros. Group Pty Ltd (Proponent) as source of information to those responsible for assessing a proposal to develop a hard rock quarry at Dysart including the Director Environment Protection Authority, the Southern Midlands Council, Mineral Resources Tasmania and interested stakeholders. The document will provide:

- a description of the proposal,
- an evaluation of the potential social, economic and environmental impacts of the proposal, and
- a description of the management measures introduced to minimize impacts and ensure that the activity complies with regulatory requirements.

This document has been prepared in accordance with the General Guidelines for the preparation of a Development Proposal and Environmental Management Plan for Level 2 activities and ‘called in’ Activities and the Development Proposal and Environmental Management Plan Project Specific Guidelines for Hazell Bros. Group Pty Ltd Constitution Hill Quarry Dysart, Southern Midlands.
CONTENTS

1. Introduction ......................................................................................................................... 11
   1.1. Applicant ......................................................................................................................... 11
   1.2. Name and Location of Project ....................................................................................... 11
   1.3. Proponent ....................................................................................................................... 11
   1.4. Proponent’s experience ................................................................................................. 12
   1.5. Background .................................................................................................................. 13
       1.5.1. Proposal Rationale ............................................................................................... 13
       1.5.2. Current status ......................................................................................................... 14
   1.6. Relevant Legislation ...................................................................................................... 14
   1.7. Public Consultation ...................................................................................................... 16

2. Proposal Description ........................................................................................................ 16
   2.1. General ........................................................................................................................ 18
       2.1.1. Stage 1 – Initial quarry development ................................................................. 20
       2.1.2. Stage 2 – Quarry expansion ............................................................................... 22
       2.1.3. Stage 3 – Lower the pit floor ............................................................................... 23
       2.1.4. Stage 4 - Future expansion ................................................................................. 23
       2.1.5. Pit closure and decommissioning ........................................................................ 23
   2.2. Extraction and processing ............................................................................................ 29
   2.3. Process inputs ............................................................................................................... 29
       2.3.1. Power consumption .............................................................................................. 29
       2.3.2. Water requirements ............................................................................................... 29
       2.3.3. Import products for blending ............................................................................... 31
       2.3.4. Fuels and lubricants ............................................................................................. 31
   2.4. Waste generation ......................................................................................................... 32
       2.4.1. Rubbish .................................................................................................................. 32
       2.4.2. Overburden and waste rock ................................................................................. 32
       2.4.3. Dust emissions ........................................................................................................ 32
       2.4.4. Carbon dioxide emissions ................................................................................. 33
       2.4.5. Quarry site runoff water ...................................................................................... 33
   2.5. Waste collection and treatment facilities ..................................................................... 34
   2.6. Noise emissions .......................................................................................................... 34
Constitution Hill Quarry - Development Proposal and Environmental Management Plan

2.7. Production rates................................................................. 35
2.8. Vehicles movements during construction .................................. 36
2.9. Off-site infrastructure .......................................................... 36
2.10. Technical and management alternatives .................................... 37
3. The existing environment .......................................................... 38
  3.1. Planning aspects................................................................. 38
  3.2. Environmental aspects ......................................................... 41
  3.3. Socio-economic aspects ....................................................... 45
  3.4. Alternative sites ................................................................. 45
4. Potential effects and their management ......................................... 46
  4.1. Air Emissions .................................................................. 46
    4.1.1. Existing conditions ......................................................... 46
    4.1.2. Performance requirements ............................................... 46
    4.1.3. Avoidance and mitigation measures .................................. 48
    4.1.4. Assessment of effects ..................................................... 49
  4.2. Liquid waste .................................................................. 49
    4.2.1. Existing conditions ......................................................... 49
    4.2.2. Performance requirements ............................................... 51
    4.2.3. Avoidance and mitigation measures .................................. 51
    4.2.4. Assessment of effects ..................................................... 53
  4.3. Groundwater .................................................................. 54
    4.3.1. Existing conditions ......................................................... 54
    4.3.2. Performance requirements ............................................... 54
    4.3.3. Avoidance and mitigation measures .................................. 54
    4.3.4. Assessment of effects ..................................................... 54
  4.4. Noise emissions ................................................................ 55
    4.4.1. Existing conditions ......................................................... 55
    4.4.2. Performance requirements ............................................... 55
    4.4.3. Avoidance and mitigation measures .................................. 56
    4.4.4. Assessment of effects ..................................................... 57
  4.5. Solid and controlled waste management .................................. 59
    4.5.1. Existing conditions ......................................................... 59
4.5.2. Performance requirements ........................................................................... 59
4.5.3. Avoidance and mitigation measures ............................................................. 59
4.5.4. Assessment of effects .................................................................................. 60
4.6. Dangerous goods and environmentally hazardous materials ................................ 61
  4.6.1. Existing conditions ..................................................................................... 61
  4.6.2. Performance requirements ........................................................................ 61
  4.6.3. Avoidance and mitigation measures ............................................................ 61
  4.6.4. Assessment of effects ................................................................................ 62
4.7. Biodiversity and natural values ..................................................................... 63
  4.7.1. Existing conditions .................................................................................... 63
  4.7.2. Performance requirements ........................................................................ 63
  4.7.3. Avoidance and mitigation measures ............................................................ 64
  4.7.4. Assessment of effects ................................................................................ 64
4.8. Marine and coastal ....................................................................................... 65
4.9. Greenhouse gases and ozone depleting substances ........................................ 65
  4.9.1. Existing conditions .................................................................................... 65
  4.9.2. Performance requirements ........................................................................ 65
  4.9.3. Avoidance and mitigation measures ............................................................ 65
  4.9.4. Assessment of effects ................................................................................ 68
4.10. Heritage ........................................................................................................ 68
  4.10.1. Existing conditions ................................................................................... 68
  4.10.2. Performance requirements ....................................................................... 69
  4.10.3. Avoidance and mitigation measures ........................................................... 69
  4.10.4. Assessment of effects ............................................................................... 70
4.11. Land use and development ......................................................................... 70
  4.11.1. Existing conditions .................................................................................. 70
  4.11.2. Performance requirements ....................................................................... 70
  4.11.3. Avoidance and mitigation measures .......................................................... 71
  4.11.4. Assessment of effects ............................................................................... 71
4.12. Visual effects .................................................................................................. 71
  4.12.1. Existing conditions ................................................................................... 71
  4.12.2. Performance requirements ....................................................................... 71
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.12.3.</td>
<td>Avoidance and mitigation measures</td>
<td>71</td>
</tr>
<tr>
<td>4.12.4.</td>
<td>Assessment of effects</td>
<td>72</td>
</tr>
<tr>
<td>4.13.</td>
<td>Socio-economic issues</td>
<td>80</td>
</tr>
<tr>
<td>4.13.1.</td>
<td>Existing conditions</td>
<td>80</td>
</tr>
<tr>
<td>4.13.2.</td>
<td>Performance requirements</td>
<td>81</td>
</tr>
<tr>
<td>4.13.3.</td>
<td>Avoidance and mitigation measures</td>
<td>81</td>
</tr>
<tr>
<td>4.13.4.</td>
<td>Assessment of effects</td>
<td>81</td>
</tr>
<tr>
<td>4.14.1.</td>
<td>Existing conditions</td>
<td>82</td>
</tr>
<tr>
<td>4.14.2.</td>
<td>Performance requirements</td>
<td>82</td>
</tr>
<tr>
<td>4.14.3.</td>
<td>Avoidance and mitigation measures</td>
<td>82</td>
</tr>
<tr>
<td>4.14.4.</td>
<td>Assessment of effects</td>
<td>83</td>
</tr>
<tr>
<td>4.15.</td>
<td>Hazard analysis and risk assessment</td>
<td>83</td>
</tr>
<tr>
<td>4.15.1.</td>
<td>Existing conditions</td>
<td>83</td>
</tr>
<tr>
<td>4.15.2.</td>
<td>Performance requirements</td>
<td>83</td>
</tr>
<tr>
<td>4.15.3.</td>
<td>Avoidance and mitigation measures</td>
<td>83</td>
</tr>
<tr>
<td>4.15.4.</td>
<td>Assessment of effects</td>
<td>83</td>
</tr>
<tr>
<td>4.16.</td>
<td>Fire risk</td>
<td>84</td>
</tr>
<tr>
<td>4.16.1.</td>
<td>Existing conditions</td>
<td>84</td>
</tr>
<tr>
<td>4.16.2.</td>
<td>Performance requirements</td>
<td>84</td>
</tr>
<tr>
<td>4.16.3.</td>
<td>Avoidance and mitigation measures</td>
<td>84</td>
</tr>
<tr>
<td>4.16.4.</td>
<td>Assessment of effects</td>
<td>85</td>
</tr>
<tr>
<td>4.17.</td>
<td>Infrastructure and offsite ancillary facilities</td>
<td>85</td>
</tr>
<tr>
<td>4.17.1.</td>
<td>Existing conditions</td>
<td>85</td>
</tr>
<tr>
<td>4.17.2.</td>
<td>Performance requirements</td>
<td>85</td>
</tr>
<tr>
<td>4.17.3.</td>
<td>Avoidance and mitigation measures</td>
<td>85</td>
</tr>
<tr>
<td>4.17.4.</td>
<td>Assessment of effects</td>
<td>86</td>
</tr>
<tr>
<td>4.18.</td>
<td>Environmental management systems</td>
<td>86</td>
</tr>
<tr>
<td>4.18.1.</td>
<td>Existing conditions</td>
<td>86</td>
</tr>
<tr>
<td>4.18.2.</td>
<td>Performance requirements</td>
<td>87</td>
</tr>
<tr>
<td>4.18.3.</td>
<td>Existing environmental management systems</td>
<td>87</td>
</tr>
<tr>
<td>4.18.4.</td>
<td>New environmental management systems</td>
<td>87</td>
</tr>
</tbody>
</table>
Constitution Hill Quarry - Development Proposal and Environmental Management Plan

4.19. Cumulative and interactive effects .................................................................................. 88
  4.19.1. Existing conditions .................................................................................................. 88
  4.19.2. Performance requirements ...................................................................................... 88
  4.19.3. Avoidance and mitigation measures ....................................................................... 88
  4.19.4. Assessment of effects ............................................................................................ 88

4.20. Traffic impacts .............................................................................................................. 88
  4.20.1. Existing conditions .................................................................................................. 88
  4.20.1. Performance requirements ...................................................................................... 89
  4.20.2. Avoidance and mitigation measures ....................................................................... 89
  4.20.3. Assessment of effects ............................................................................................ 89

5. Monitoring and review ...................................................................................................... 91
  5.1. Air quality monitoring .................................................................................................. 91
  5.2. Noise monitoring ........................................................................................................ 91
  5.3. Vegetation monitoring ................................................................................................ 92
  5.4. Weed monitoring ........................................................................................................ 93
  5.5. Water quality monitoring ........................................................................................... 93

6. Decommissioning and rehabilitation ................................................................................. 94
  6.1. Construction phase ..................................................................................................... 94
    6.1.1. Sediment retention embankments ........................................................................ 94
    6.1.2. Cut off drains ........................................................................................................ 94
    6.1.3. Road cuttings and embankments .......................................................................... 94
    6.1.4. Temporary hardstands ........................................................................................ 95
  6.2. Operational phase progressive rehabilitation ............................................................... 95
    6.2.1. Earthworks ............................................................................................................ 95
    6.2.2. Revegetation ........................................................................................................ 95
    6.2.3. Maintenance ......................................................................................................... 96
  6.3. Pit Closure and Rehabilitation ...................................................................................... 96
    6.3.1. Final extraction activities ....................................................................................... 96
    6.3.2. Rehabilitation works ............................................................................................ 96
    6.3.3. Revegetation ........................................................................................................ 97

7. Commitments .................................................................................................................. 98

8. Conclusion ........................................................................................................................ 99
9. References ........................................................................................................................................ 101
10. Appendices ..................................................................................................................................... 103

FIGURES
Figure 1: Extract from 1:25000 topographic series showing mining lease and operations area .......... 15
Figure 2: Schematic showing the common process stages to produce an aggregate range .............. 17
Figure 3: General Arrangement main quarry infrastructure ............................................................... 21
Figure 4: General pit layout plan — ..................................................................................................... 24
Figure 5: Mining plan stage 1 ................................................................................................................ 25
Figure 6: Mining plan stage 2 ................................................................................................................ 26
Figure 7: mining plan Stage 3 ................................................................................................................. 27
Figure 8: Closure plan ........................................................................................................................... 28
Figure 9: Zoning map ............................................................................................................................ 38
Figure 10 Location plan ......................................................................................................................... 39
Figure 11: aerial image showing nearest sensitive receptors (Google earth) ........................................ 40
Figure 12 Project area with watercourses and WIST identifiers (Google Earth) .................................... 50
Figure 13 typical section through swale drain ....................................................................................... 51
Figure 14: Aerial image showing residences and relationship to access road and quarry site .......... 58
Figure 15 GE image showing the location of various vantage points .................................................. 73
Figure 16: Cross section aa from Ely Street to stage 2 and 3 construction with crusher building ... 79
Figure 17: arrangement of intersections servicing quarry access ......................................................... 90

PLATES
Plate 1: Wheel loader and Off-road dump truck operating in a dolerite quarry ................................. 19
Plate 2: On-road truck and trailer combination ready for loading ....................................................... 19
Plate 3: Mobile crusher / screener ...................................................................................................... 20
Plate 4: Fixed enclosed crushing plant operating at leslie vale .......................................................... 22
Plate 5: Virtual view from Midland highway (Bagdad) .......................................................................... 74
Plate 6: Actual view from Midland Highway (Bagdad) ........................................................................ 74
Plate 7: Virtual view from East Bagdad Road............................................................... 75
Plate 8: Actual view from east bagdad Road ............................................................... 75
Plate 9: Virtual view from Quion Mountain.................................................................. 76
Plate 10: Actual view from quion mountain ............................................................... 76
Plate 11: Virtual view from Clifton Vale Road............................................................. 77
Plate 12: Actual view from clifton vale road .............................................................. 77
Plate 13: Virtual view from ely street ....................................................................... 78
Plate 14: Actual view from ely street ....................................................................... 78

**TABLES**

Table 1: Mobile equipment to be utilised in operations .............................................. 18
Table 2: Acceptable limits for operating noise ............................................................... 19
Table 3: Water supply budget .................................................................................. 30
Table 4: Production volumes and quarry footprint areas .......................................... 35
Table 5: Environmental data for development site .................................................... 41
Table 6: Threatened flora species recorded in the vicinity ......................................... 43
Table 7: Threatened fauna species recorded in the vicinity ........................................ 44
Table 8 CFEV identifier and corresponding CMP score for local watercourses ........ 50
Table 9 existing water bores in proximity of development site .................................. 54
Table 10: Acceptable limits for airblast overpressure and ground vibration from blasting 57
Table 11: Typical mobile equipment and indicative rates of fuel consumption .......... 66
EXECUTIVE SUMMARY

Project description
Hazell Bros. Group Pty Ltd propose developing a quarry on private land at Dysart in the Southern Midlands municipal area. The quarry will exploit a dolerite resource and produce a range of aggregates and blended construction materials. The product will be won and processed using drill and blast, crushing and screening techniques.
The quarry operation will be developed in stages starting with a mobile crushing machine and a small footprint in the first few years and building to a six hectare footprint, a fixed crushing plant and an annual production of 300,000 cubic metres.
The quarry is required to enable the Proponent to tender competitively for infrastructure projects in the Southern Midlands region and if the application is successful help to channel government and private investment into the local community.

Site description
The pit for the quarry will be located on land that is within a mosaic of grazing land, Eucalypt plantations and managed forests. The site for the pit has too much exposed rock for any agricultural or silviculture purpose. The land is zoned rural forest and is remote (1.7 kilometres) from the nearest residence.

Potential environmental impacts
The pit site is located within a mining lease 880 hectares in area and many potential environment impacts are mitigated by the separation distance between the operation and any sensitive use. The Proponent will adopt the prescriptions of a Dust Management Plan and undertake vibration and noise monitoring during blasting. Water used in the process and collected from runoff will be directed through sediment control infrastructure before being recycled back into the process.
The Proponent has engaged specialists to undertake a flora and fauna study, an Aboriginal heritage survey, a noise and blasting modelling report, and a traffic impact assessment. The results of these studies and reports conclude that with some controls the quarry can operate with minimal impact on the environment or the local community.

Monitoring
The proponent will undertake a program of monitoring to ensure that emissions from the quarry will remain within accepted limits and will have a vegetation management plan prepared to care for the natural vegetation communities surrounding the site.

Decommissioning
At the end of its useful life and progressively throughout operation the Proponent will rehabilitate worked out areas back to either natural woodland or plantation forestry.
1. INTRODUCTION

1.1. APPLICANT

<table>
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<th>Integrated Land Management and Planning</th>
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<tr>
<td>FAX</td>
<td>(03) 6243 4520</td>
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<td>Contact</td>
<td>Barry Williams</td>
</tr>
<tr>
<td>Mobile</td>
<td>0437 394 492</td>
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1.2. NAME AND LOCATION OF PROJECT

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<td>Location</td>
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1.3. PROPONENT

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<tr>
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<th>Hazell Bros. Group Pty Ltd</th>
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<tr>
<td>ABN</td>
<td>27 088 345 804</td>
</tr>
<tr>
<td>Residential</td>
<td></td>
</tr>
<tr>
<td>Address</td>
<td>8B Lampton Avenue</td>
</tr>
<tr>
<td>Postal Address</td>
<td></td>
</tr>
<tr>
<td>Phone</td>
<td>(03) 6277 7888</td>
</tr>
<tr>
<td>Fax</td>
<td>(03) 6273 4160</td>
</tr>
<tr>
<td>Contact</td>
<td>Robert Hazell</td>
</tr>
<tr>
<td>Mobile</td>
<td>0418 138 339</td>
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1.4. PROPONENT’S EXPERIENCE

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<thead>
<tr>
<th>Mining Leases held by the proponent</th>
<th>45M/1982, 50M/1985, 1382P/M, 1502P/M, 1512P/M, 1651P/M, 1671P/M.</th>
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<td>Subsidiary Company’s Name</td>
<td>H.B.M.I. Pty Ltd (Operator)</td>
</tr>
<tr>
<td>ABN</td>
<td>84 009 509 148</td>
</tr>
<tr>
<td>Residential Address</td>
<td>8B Lampton Avenue Derwent Park</td>
</tr>
<tr>
<td>Postal Address</td>
<td>PO Box 430 Moonah TAS 7009</td>
</tr>
<tr>
<td>Quarrying Experience</td>
<td>HBMI Pty Ltd has 30 years experience producing high quality construction products from quarries in Tasmania. The company has the largest quarry holdings in the state.</td>
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<td>Financial Capacity</td>
<td>Hazell Bros. Group has an annual turnover in excess of $100M. and is one of BRW’s top 500 companies nationally (Hazell Bros. Group, 2008).</td>
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1.5. BACKGROUND

1.5.1. PROPOSAL RATIONALE

Hazell Bros. Group proposes establishing a new quarry development approximately 3 kilometres north of Dysart on private land. The quarry will target a dolerite resource that caps the hills locally and is common throughout the region. It is the proponent’s intention to extract and process the resource to produce a range of products including aggregates, gravels and road base.

This development will require improvements to an existing access road that currently intersects Harbach’s Road 200 metres before that road’s intersection with the Midland Highway. A new section of road approximately 1800 metres in length running from an existing forestry operations landing up to the quarry site will be required.

The quarry site is located on a natural plateau at elevation 660 metres above sea level. Water supply infrastructure and an extension to the existing electricity supply will be required to service the quarry site.

Resource extraction will be achieved with drill and blast techniques and in the first phase of the project a mobile crusher / screener will be utilised to process the shot rock. It is anticipated that as the quarry develops a permanent crushing and screening facility will be constructed on the quarry site.

The proponent foresees an increase in construction and maintenance of transport infrastructure in this region in forthcoming years and plans to develop this resource in order to service this demand. Areas around the major centres of Hobart and Launceston are serviced with existing quarries but the Midland area has few local quarries capable of servicing major contracts. The proponent’s other major quarry in the south is located south of Hobart. By establishing this facility the proponent will be able to service contracts north of Hobart without running trucks through the city centre.

The initial establishment costs are likely to be less than $1M, but as the quarry develops it is expected that the demand and rates of extraction will increase. The proponent will ultimately develop a permanent enclosed crushing complex. The likely cost to establish this facility will be in the order of $20M.
1.5.2. CURRENT STATUS
The mining lease area for this proposal was marked out on the 15th May 2009 and an application for a mining lease was submitted on the 22nd May 2009. Mineral Resources Tasmania will make a recommendation to the Minister regarding issuing the lease once the supporting information included in this document is available for review. The mining lease area is partly shared with an Exploration Licence number SEL 26/2005 for category 6 – Geothermal Substance held by KUTh Exploration Proprietary Limited. No conflict will arise from these two endeavours occupying the same ground.

The Proponent has proposed an operations area within the mining lease area that excludes land that is sanitised by proximity to sensitive uses and natural values. The lease area and operations area are shown as overlays on an extract from the 1:25000 topographic map in Figure 1.

The Applicant acting on behalf of the Proponent presented a Notice of Intent relating to the proposal to the Environment Protection Authority (EPA) on the 19th June 2009. The EPA notified the proponent that the proposal will be evaluated under a 2B class of assessment on the 2nd July 2009. A site meeting was conducted on the 7th July 2009 and a follow up meeting with a representative from the Southern Midlands Council was conducted on the 29th July 2009. Project Specific Guidelines for the proposal were forwarded to the Applicant and Proponent on the 31st July 2009.

1.6. RELEVANT LEGISLATION
The following legislation, policies and guides have been considered in the production of this report;

- Land Use Planning and Approvals Act 1993 (Tas);
- Environmental Management and Pollution Control Act 1994 (Tas);
- Resource Management and Planning Appeal Tribunal Act 1993 (Tas);
- Water Management Act 1999 (Tas);
- Workplace Health and Safety Act 1995 (Tas);
- Weed Management Act 1999 (Tas);
- Mineral Resources Development Act 1995 (Tas);
- Threatened Species Protection Act 1995 (Tas);
- Aboriginal Relics Act 1975 (Tas);
- Forest Practices Act 1985 (Tas);
- Environmental Protection and Biodiversity Conservation Act 1999 (Cth);
- Southern Midlands Planning Scheme 2000;
- State Policy on Water Quality Management 1997;
- Environment Protection Policy (Air Quality) 2004;
- Draft Environmental Protection Policy (Noise) 2003; and
Constitution Hill Quarry - Development Proposal and Environmental Management Plan

Mining Lease: 1892P/M
Category: 3 construction materials
Area: 883 hectares

Operations area
Area: 82 hectares

FIGURE 1: EXTRACT FROM 1:25000 TOPOGRAPHIC SERIES SHOWING MINING LEASE AND OPERATIONS AREA
1.7. PUBLIC CONSULTATION

The Proponent and/or Applicant have initiated stakeholder consultation with;

- the landowner (Mr Robert Howlett) in numerous discussions relating to access, compensation, plantation displacement, forest practices plans and community sensitivities;
- the plantation managers (Gunns Ltd) in negotiations regarding plantation displacement, forest practices plans and compensation;
- the legislative regulators (Mineral Resources Tasmania) in submitting an application for a Mining Lease number 1892P/M and authority to undertake geotechnical drilling on the site;
- the legislative regulators (Environment Protection Authority) in submitting a Notice of Intent to prepare a case for assessment under the EMPCA 1994 and in holding two site meetings with representatives from the EPA in attendance; and
- the municipal authority (Southern Midlands Council) in calling a private meeting with council representatives on the 23rd June 2009 and a site meeting on 29th July 2009.

Community consultation will initially take the form of a public meeting held locally after the DPEMP has been completed but before the Development Application is advertised. Interested members of the public will be invited to attend and share their comments with the proponent and key sub-consultants. The objective of this meeting will be to disseminate accurate information about the proposal and its potential impact on the locality. A representative of the Southern Midlands Council will attend the meeting representing the community and will be available to answer questions that may arise on planning issues.

2. PROPOSAL DESCRIPTION

In this proposal, the Proponent seeks to exploit a dolerite resource located on private land at Dysart. The resource is Jurassic aged dolerite that originated by volcanic magma intruding between the layers of Triassic aged sedimentary rock creating a dolerite sill. Weathering has removed the upper sedimentary layers and in places cut through the sill to expose the sedimentary layers beneath. The resultant structure is a mosaic of Triassic aged sedimentary hills capped with Jurassic dolerite.

Once the weathered surface materials have been removed the dolerite is massive and when fractured with explosives, crushed and screened it produces a sharp aggregate with good friction and wear-resisting properties. The proponent will produce a range of products including weathered dolerite gravels for gravel roads, sub-base materials and bulk fill, R40 road base and clean aggregates for concrete and road surfacing.

Figure 2 is a schematic showing the general process route for materials starting at extraction and finishing with the products prepared for market. The actual make up of the product list will vary depending on markets being served at the time.
Resource extraction
50 holes 3.5 m grid 12 deep (volume-8400 m³)

Shot-rock stockpiles (capacity)
Max. size – 600 mm nom.

Preliminary screen

Primary crusher
(Jaw crusher) setting 125mm
270 tph

Secondary crusher
(Cone crusher) setting 35mm
300 tph

Surge pile

Screens and washing

Rip Rap 200 mm
Erosion control

Oversized retained on bench

Periodic treatment with excavator mounted rock breaker

Undersize bypasses primary 150 tph

Imported sand for blending

Coarse clean 40mm
Medium clean 20mm
Medium clean 14mm
Fine clean 7mm

Blended R40 road base
Blended concrete mix
Crusher dust

FIGURE 2: SCHEMATIC SHOWING THE COMMON PROCESS STAGES TO PRODUCE AN AGGREGATE RANGE
TABLE 1: MOBILE EQUIPMENT TO BE UTILISED IN OPERATIONS

<table>
<thead>
<tr>
<th>Machine type</th>
<th>Number</th>
<th>Frequency</th>
<th>Operators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel loader (50 tonne)</td>
<td>1</td>
<td>Permanent</td>
<td>HBMI</td>
</tr>
<tr>
<td>Wheel loader (20 tonne)</td>
<td>1</td>
<td>Permanent</td>
<td>HBMI</td>
</tr>
<tr>
<td>Excavator (30 tonne)</td>
<td>1</td>
<td>Permanent</td>
<td>HBMI</td>
</tr>
<tr>
<td>Excavator (20 tonne)</td>
<td>1</td>
<td>Permanent</td>
<td>HBMI</td>
</tr>
<tr>
<td>Off-road dump trucks (50 tonne)</td>
<td>2</td>
<td>Permanent</td>
<td>HBMI</td>
</tr>
<tr>
<td>Grader</td>
<td>1</td>
<td>As required</td>
<td>HBG</td>
</tr>
<tr>
<td>Mobile crusher / screener</td>
<td>1</td>
<td>Stage 1 only</td>
<td>HBG</td>
</tr>
<tr>
<td>Mobile drilling machine</td>
<td>1</td>
<td>Prior to blasting</td>
<td>Blasting Contractor</td>
</tr>
<tr>
<td>On road truck and trailer combinations</td>
<td>5</td>
<td>Transport contracts</td>
<td>Sub-Contractors</td>
</tr>
</tbody>
</table>

2.1. GENERAL

The quarry will be developed in stages. In all stages excavators and wheel loaders will handle the product at various points in the process line. Shot rock will be transported within the site with off-road dump trucks and the processed product will be removed from the site with on-road truck and trailers or semi tippers. Table 1 above is a list of the mobile equipment that is likely to be used to undertake the operation.

The quarry operating hours will vary depending on the activity. Blasting will be restricted to a regular time during weekdays to minimise the impact on neighbours. The remote location of the quarry site means that other operations can occur outside normal operating hours without causing a nuisance to neighbouring properties.

The Proponent will demonstrate that extraction and processing activities can occur without causing noise levels at neighbouring properties to exceed the threshold levels deemed acceptable in the Quarry Code of Practice (Department of Primary Industries, Water and Environment, 1999) included here in Table 2.
TABLE 2: ACCEPTABLE LIMITS FOR OPERATING NOISE

<table>
<thead>
<tr>
<th></th>
<th>Noise level - above ambient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal hours</td>
<td>10 dB (A)</td>
</tr>
<tr>
<td>Extended hours</td>
<td>5 dB (A)</td>
</tr>
</tbody>
</table>

PLATE 1: WHEEL LOADER AND OFF-ROAD DUMP TRUCK OPERATING IN A DOLERITE QUARRY

PLATE 2: ON-ROAD TRUCK AND TRAILER COMBINATION READY FOR LOADING
2.1.1. **Stage 1 – Initial Quarry Development**

In stage one, production rates will be small and stockpiles of shot rock will be created before a mobile crusher is transported to the site to process the product. Little overburden will be encountered at this stage of extraction. The types of material excavated for road construction and for establishing the stage one quarry will be variable. Highly weathered and overburden materials will be used for access road improvements onsite. The excavation will continue until a floor level of RL 638 is achieved see Figure 5. A floor 100 metres wide will be created with a total area of 3.4 hectares. The floor will have a slight fall towards the south to facilitate drainage. Benches 10 metres wide will be cut at R.L. 350 in the faces on the east, north and west sides giving a maximum face height of 12 metres. The total face height will start at 0 at the southwest corner and increase to between 12 and 22 metres on the west, north and east faces.

A sump will be excavated in the floor of the pit at the southwest corner and runoff water collected from the extraction; stockpiling and process areas will be directed here. The sump will act as sediment retention basin and will be sized to be effective in retarding the flow of runoff until suspended solids have had time to settle out. The overflow from the retention basin will be directed into a swale drain that will report to an existing irrigation dam located down-slope and to the west. Stage 1 construction features are shown on the general pit layout plan Figure 4 as purple and in detail on the mining plan stage 1 Figure 5.

Existing sediment control infrastructure along the access road will be improved by increasing capacity and therefore retention times. The road itself will be improved by widening in places and grade improvements. The existing access road will be realigned in one section to achieve a better grade and in another to form a cutting to provide noise attenuation. See ‘Figure 3 general arrangement plan’ for the locations of major infrastructure works and improvements around the pit. Infrastructure improvements are described in detail in subsequent sections.
Constitution Hill Quarry

FIGURE 3: GENERAL ARRANGEMENT MAIN QUARRY INFRASTRUCTURE
(Image date 22 Jan 2006)
2.1.2. **Stage 2 – Quarry Expansion**

Once the main body of the resource is exposed it will be possible to produce a full range of gravel products. In stage 2 of the operation the footprint of the quarry will increase to approximately 6 hectares. This area is required to layout the stockpiles of shot-rock; aggregates of various nominal sizes and blends of gravels as well as accommodate the extraction area and sediment control infrastructure.

The pit will be extended to the north generally aligned with, but offset from the property boundary to the west. It is expected that demand will increase during this period and the quarry operators will establish a fixed crushing plant on the site. This plant will be located to the east of the access road entrance to take advantage of the sound attenuating effect of Spences Hill. The fixed crushing plant will be sized in proportion to the maximum production potential of this site.

It will be necessary during stage two to bring electric power from the current Site Manager’s workshops up to the water recovery impoundment and then on to the crushing / screening building. Power will be supplied via over/beat wires on poles. A mechanical workshop will be required to enable mechanical service personnel to maintain the fixed and mobile plant. A weighbridge and site amenities building will also be established onsite during this stage of development.

Proposed stage 2 development is shown on the general pit layout plan Figure 4 as a yellow area outside the stage 1 purple area. Details of the stage 2 development are shown on the mining plan stage 2 Figure 6.

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**PLATE 4: FIXED ENCLOSED CRUSHING PLANT OPERATING AT LESLIE VALE**
2.1.3. **STAGE 3 – LOWER THE PIT FLOOR**

The third stage of development will require no increase in the area of disturbance. The floor of the existing quarry will be lowered by 11 metres over an area of 4.6 hectares. The minimum face height will now be 11 metres at the south west corner and the maximum will be approximately 32 metres in places on the west and east faces. Permanent infrastructure will remain on the access road level but the retention basin will be lowered to enable the pit floor to drain to one point.

Natural drainage from the sediment retention basin will be maintained with a slot cut through from the retention basin to the existing swale formation. The slot will be narrow and at this stage in the quarry’s development a tree screen to the west will have matured enough to completely conceal the structure.

The proposed stage 3 development does not appear on the general pit layout plan because the footprint is entirely within the boundaries of the previous stages. Details of the proposed stage 3 pit are included in mining plan stage 3 Figure 7.

2.1.4. **STAGE 4- FUTURE EXPANSION**

Further development for the quarry will depend on market conditions at the time. The faces to the east and north present opportunities to extend the life of the quarry. More overburden will be encountered in these directions, some of which can be utilised in rehabilitation works the balance will be stockpiled and marketed as clean fill.

2.1.5. **PIT CLOSURE AND DECOMMISSIONING**

The proposed extraction area is situated on the crest of an escarpment. The excavation can therefore continue to be free draining at considerable depth. When the economic reserves have been extracted the land will be returned to its current use as plantation forestry.

The pit floor and benches will have been fractured by over-drilling and blasting for extraction activities, these surfaces will remain the basis for rehabilitation. Earthworks will be employed to reduce the height of the faces to a maximum of 6 metres and overburden and stripping will be spread over the surface to provide a growing medium for plantation trees. Access through the site will be maintained by leaving in place a series of ramps and the new section of access road.

Progressive rehabilitation will commence during the stage 3 development as depicted in Figure 7. Final rehabilitation will not commence until all economic reserves have been extracted and the quarry is due for decommissioning. Figure 8 shows how rehabilitation might be planned if works were to stop at the completion of stage 3.
The following staged mining plans use this border

- Footprint possible future expansion
- Footprint stage 2 and 3 extraction
- Footprint stage 1 extraction
- Future crusher building site
- Dust from the crusher is a possible chronic source of atmospheric emissions
- Shallow cutting to R.L. 638m
- Sediment retention basin
- Swale drain for retention basin overflow
- Recovery water impoundment
- Overflow from this dam is a possible discharge point for liquid and sediment emissions
- Mining lease boundary
- Spences Hill
- New section of access road construction
- Ex. log landing
- Ex. helipad

Constitution Hill Quarry

FIGURE 4: GENERAL PIT LAYOUT PLAN – Showing main quarry infrastructure and surrounding land features

(Image date 22 Jan 2006)
Process and extraction area Level 640

Stage 1
Construct cut off drain, run-out north on contour for diffuse discharge. Install culvert on south, discharge into vegetation.

Strip vegetation and topsoil from footprint in front of current extraction area, and stockpile separately.

Cut access road cutting to RL 638. Use weathered dolerite for access road improvements.

Excavate sediment retention basin to 3 m deep. Form swale drain in natural ground, apply rip-rap on steep sections. Establish processing pad for mobile crusher and stockpiles.

Progress 10 to 12 m high face northward, in two 50 m wide sections.

Install rising main loop from existing irrigation dam. Install diesel driven pump to activate main.
Stage 2

Strip topsoil and overburden from production areas immediately before extraction, stockpile separately.

Advance eastern and northern face in 50 m wide sections while maintaining drainage towards sediment retention pond.

Provide electrical power connection to pump station and processing area and establish fixed crushing and screening plant.

Locate workshop and toilet facilities beside offices.
Stage 3

Excavate trench to lower sediment retention basin discharge to new floor level.

Excavate new sediment retention basin to 3 m below new floor level.

Fire and excavate ramp from processing level down to new floor level.

Advance new face in 50 m wide sections towards the north and west. Leave 8 m wide bench at 638 level to maintain maximum face height of 12 m.

Locate workshop and toilet facilities beside offices.
Quarry closure

Remove machinery and offices and break out concrete foundations.

Collapse sides of sediment retention basin and spread silt over new surface. Encourage reeds to colonise the surrounds.

Cut benches in half to form new 4 metre wide benches with 5 to 6 metre faces. Fracture rock floor to 1 metre depth on floor and benches.

Cut ramp from natural surface down to 338 m bench and connect road to existing track through plantation.

Place overburden at the toe of the faces, cover with topsoil and stripping and establish plantation trees.

FIGURE 8: CLOSURE PLAN SHOWING FACE TREATMENTS AND PLANTATION ON FLOOR – AFTER YEAR 20

Lay back faces of swale drain trench and plant with woodland species

Establish plantation

Road on old bench

Swale drain

Miss-close between cadastral information and imagery

Established plantation

Cross Section A-A

Cut new ramp in face, form bench to align with natural ground. Construct new road to intersect with old road formation.
2.2. EXTRACTION AND PROCESSING

The resource will be extracted using drill and blast techniques. An area of roughly level bedrock will be exposed and a tracked drill rig will drill a series of holes in a grid pattern across the bench. The diameter, depth and spacing of the holes will be informed by the blasting contractor’s design. The holes are loaded with explosive charges and a shot fired to fracture the rock. The shot rock will be loaded onto off-road dump trucks with an excavator. Oversized rock not fractured in the firing will be stockpiled separately and periodically broken up with a rock breaker mounted on an excavator.

In the initial stages where a mobile crusher is used a wheel loader will cart shot rock from a stockpile and feed it into the primary crusher. Where a fixed crushing plant is established a ramp and hopper will be constructed that will allow the dump trucks to load the primary crusher. In a series of operations the product will advance through the crusher’s stages screening off 40mm, 20mm, 14mm, and 7mm nominal aggregates and dust. These products are deposited under the discharge end of various conveyors and periodically relocated to stockpiles for storage (see Figure 2 for schematic).

Products that have engineered specifications such as R40 or concrete mix can be blended through the crusher screen by adding fines produced from other products on site or imported to the site for that purpose.

2.3. PROCESS INPUTS

2.3.1. POWER CONSUMPTION

In the first stage of the quarry development the crushing facility will be a mobile unit powered by a diesel engine. In stage 2 a permanent crushing and screening facility will be established on the site. 3 phase power will need to be connected to the site. The entire plant is likely to have a peak load requirement of 400 kW.

2.3.2. WATER REQUIREMENTS

The quarry operation will immediately require a permanent water supply. Initial construction activities will require water for dust suppression and to achieve compaction in road construction. Washing will be an integral part of the production process. The plant is expected to have a daily water requirement of 40 kL. Most of the water utilised on site will be recycled through the sediment retention basin, swale drain and return water impoundment.

The water budget below (Table 3) presents a worst case scenario assuming that no water will be recovered through recycling. An additional reserve supply is included in the data but not for the calculation. The location of the recovery, backup and reserve supply dams are presented in Figure 3. The reserve supply dam is located to the south of the facility and will only be exploited if drought conditions prevail.
An average of 585 mm of rainfall occurs annually over the catchment for the supply dams. Assuming half of this is lost through infiltration and evapo-transpiration the total annual supply is 26 mega litres.

Assuming the plant uses 40 kilolitres per day and operates 312 days per year the total annual water used is 12.5 mega litres.

The annual evaporation rate is estimated to be 985 mm. If this loss occurs over the area of the two supply impoundments the total annual loss will be 4 mega litres.

The annual water budget is $26 - (12.5 + 4) = 9.5$ mega litres surplus.

The quarry arrangement depicted in Figure 3 shows that process water will be supplied by a pump station located on an existing farm dam described as the recovery water dam. The water is delivered
to the processing site through a rising main. Depending on the requirements of the plant, water may be delivered to a tank or the water supply main could be a pressurised loop. Once the water is used in the plant it is collected in a sediment retention basin located at the southwest corner of the extraction area. After a suitable retention time to allow suspended particles to settle out, the water is discharged to a swale drain. This drain carries the water back to the water recovery dam.

This method of water supply has advantages in that:

- Existing impoundment infrastructure is utilised, which saves construction costs and new permit requirements.
- The sediment retention facilities are sized according to the settling times and not for water supply capacity. The main sediment retention basin is therefore smaller taking up less space on the pit floor and costing less to build.
- The recycled water supply has been fully treated through the sediment retention facility and will have less particles entrained and therefore be less damaging to the process pumps and equipment.
- The sediment retention facility can be taken off line and cleaned or maintained without interrupting the water supply to the plant.

2.3.3. IMPORT PRODUCTS FOR BLENDING

Products with specific engineering qualities will be required for blending with the raw rock to produce products such as R40 road base and concrete aggregates. These offsite products will need to be imported and stockpiled to ensure that the supply is sufficient to fulfil orders. It is likely that these offsite imports will consist of sand, lime and some clays. Imported products on average account for 5 percent by volume of the blended products so it is therefore likely that around 15,000 m3 per year will be required at full production.

2.3.4. FUELS AND LUBRICANTS

All the mobile equipment and some fixed equipment utilised on site will be diesel powered. It will be necessary to install a fuel depot on the site for refuelling purposes. Mobile equipment will be driven to the facility for refuelling. Fixed equipment will be refuelled using ‘utility-mounted’ mobile refuelling equipment. Where possible fixed equipment will be electric powered rather than diesel powered.

The fuel depot will consist of a single ‘Transtank’ self bunded installation. The ‘Transtank’ refuelling facility will have capacity for 18000 litres of fuel or around two weeks supply at normal operating capacity. The unit will be installed as per the manufacturer’s recommendations.
2.4. WASTE GENERATION

The quarry will generate waste products throughout the extraction, stockpiling, processing and transport stages of the operation.

2.4.1. RUBBISH

Rubbish generated on the site will consist of the following discrete types:

- Food scraps and packaging from employees working on the site will be contained in bins with heavy lids to prevent scavenging by native and feral animals.
- Mechanical spares and soiled waste from repairs will be removed from site at the completion of the repair work. Products will be recycled where an appropriate waste stream is available locally. Used grease cartridges and hydraulic oil containers will be taken off site at the end of the day.

2.4.2. OVERBURDEN AND WASTE ROCK

There is little or no overburden in stage 1 of the operation. In subsequent stages the overburden depth varies up to 8 metres in places. It will be necessary to stockpile the overburden for some years until worked out areas become available for rehabilitation. Stripping will be stockpiled behind the tops of the faces ready to be pulled down over faces and benches. Overburden will be stockpiled separately and used in final rehabilitation works for contouring and landscaping.

Waste rock encountered during excavation works will be stockpiled and markets developed to on-sell the material as landscaping rock or clean fill. Oversized product will be temporarily stored on the benches and periodically treated with an excavator mounted rock breaker.

2.4.3. DUST EMISSIONS

Under certain weather conditions all activities on the site can be expected to cause the emission of dust. Weathered dolerite is often associated with fine clays and the Triassic aged overburden material can produce sandy clay loam soils. Handling these materials with earthmoving equipment especially loading into trucks and hoppers under dry conditions can produce dust. Blasting can cause dust, created by the drilling equipment to be ejected off the surface and into the air. Blasting can cause an acute problem that although highly visible will be short lived.

The crushing equipment, especially the mobile equipment can cause a chronic dust problem. Quantities will be small but because the equipment is operating for extended periods the accumulated volume can become a problem.

Another chronic source of dust can be vehicles using the access road and the short section of Harbach’s Road between the access road and the Midland Highway. Dust emitted from here has a greater potential to be a nuisance because the source is quite close to neighbouring properties. Both light vehicles and trucks can cause dust from the gravel road surface directly and can cause mud from the gravel roads to be trafficked onto the sealed road. When this deposited mud dries it can create dust from the sealed road surface.
Dust management strategies and procedures will ensure that particulate emissions will not cause a nuisance to neighbours. Particulate emissions at neighbouring properties will be within the standards set by the National Environment Protection Measures (Ambient Air Quality) and hence the Tasmanian Environment Protection Policy (Air Quality) 2004.

A more detailed discussion on dust emissions appears in Section 4.1. of the document.

2.4.4. **Carbon Dioxide Emissions**

Carbon dioxide emissions will be produced directly by mobile plant and trucks and indirectly by electricity consumption in the fixed plant.

The volume of green house gas emitted from heavy vehicles is closely related to diesel fuel consumption. A major emitter for the Constitution Hill project will be trucks carting processed product from the site. Another source of carbon dioxide emission will be the heavy equipment used on the site to move product from the extraction area to the process line and then to stockpile. It is likely that the following equipment or equivalent machines will be utilised in materials processing functions:

- Wheel loader (50 tonne)
- Wheel loader (20 tonne)
- 2x excavators (30 tonne and 20 tonne)
- 2x off road dump trucks (50 tonne)

During the early phases of development mobile crushers will be used to process shot rock in a campaign style operation. Once full production is reached a fixed crushing plant will be established on the site. The fixed crushing plant along with pump stations and other fixed plant will consume electricity leading to indirect carbon dioxide emissions from the electricity generator.

See section 4.11. for details on greenhouse gas emissions calculated for this projects.

2.4.5. **Quarry Site Runoff Water**

The Constitution Hill Quarry will cause rain water and overland flow to be directed over areas of exposed ground. By travelling over exposed earth and rock the water will entrain solids that will become suspended and must be settled out before the water can be discharged into the natural water system.

The quarry floor and benches will be carefully graded to provide a very low slope so that runoff water is directed at a low velocity to an organised drainage system. The drainage system will terminate in a sediment retention basin that will retard the progress of the water until the solids have settled out.

The discharge from the sediment retention facility will be directed to an existing irrigation reservoir through a swale drain approximately 500 metres in length. Steep sections of the drain will be reinforced with rip rap to protect against erosion. A water recovery pump station will be established.
to take water from the reservoir back to the crushing facility via a rising main. The discharge from this reservoir will progress through a heavily vegetated drainage path 800 metres in length that will filter any particles that may have escaped the two retention facilities and swale. Only after travelling the length of the drainage path will the discharge enter a defined water course.

Liquid emissions are discussed in Section 4.2. of this document.

2.5. WASTE COLLECTION AND TREATMENT FACILITIES

The proponent will install waste collection and treatment facilities or employ mitigation strategies to ensure that waste products generated onsite are not transported off site.

Procedures and facilities for containing industrial and domestic waste on the site will ensure that no emission of a pollutant will occur from an industrial waste and no domestic rubbish will become a nuisance to neighbours by acting as an attractant to vermin or by being blown off site by wind.

Structures and strategies to contain and treat runoff water from the site will cause all water discharged from the site will meet the standards required for secondary contact under the Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

2.6. NOISE EMISSIONS

Sources of noise emissions from the quarry can be broken down into acute and chronic sources. The most acute noise generating activity is blasting that is likely to occur two or three times per month. Blasting generally occurs between 10:00 in the morning and 3:00 in the afternoon. Modelling undertaken by Vipac Engineers and Scientists Ltd has predicted what the noise and vibration levels will be at the most exposed sensitive uses.

Chronic noise will emanate from the crushing facility. This facility will operate continuously during the quarry’s normal hours of operation. The noise modelling has also predicted the resultant noise levels from this source under worst case scenario conditions.

An intermittent noise source is that of the trucks hauling product from the facility. The access road is a total of 5 kilometres in length from the pit to the Harbachs Road intersection. The road is generally a decline losing 350 metres in elevation over its length. Engine brakes are likely to be the most obtrusive sound generated from this source.

Other intermittent noise sources are wheel loaders, excavators and excavator mounted rock breakers all operating at different times during quarry operating hours. Wheel loaders will be used to load hoppers to the crushing facility with shot rock and to periodically relocate product from the discharge stockpiles to the product stockpiles. Excavators, and dozers will be used to handle the shot rock and an excavator mounted rock breakers will be used to break up oversized rock. All these activities will take place within the perimeter of the quarry.

Noise emissions are discussed in detail in Section 4.4. of this document.
2.7. Production Rates

In the early stages of the development extraction will service needs of the construction works only and production for off-site contracts will be minimal. Once the site is established production is likely to increase to around 210,000 cubic metres per year. It is expected that this level of production will be maintained until stage 3 of the development is established then production will increase to between 285,000 and 300,000 cubic metres per year. This level of production can then be sustained until stage 3 is complete at around year 13. The future expansion area can sustain around 300,000 cubic metres of production until year 21. If the demand is still strong the pit can sustain expansion towards the east following what will then be a mature plantation boundary north of Spences Hill.

Table 1 below shows the expected footprint area of the pit, the extracted volume and volume of processed product in the design stages. A bulking factor of around 1.9 is assumed but this will vary with the product produced.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Total quarry footprint (ha)</th>
<th>Extracted volume (1000 m$^3$)</th>
<th>Volume processed (1000 m$^3$)</th>
<th>Period (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>3.4</td>
<td>440</td>
<td>840</td>
<td>0-5</td>
</tr>
<tr>
<td>Stage 2</td>
<td>6.3</td>
<td>350</td>
<td>670</td>
<td>5-8</td>
</tr>
<tr>
<td>Stage 3</td>
<td>6.3</td>
<td>600</td>
<td>1140</td>
<td>8-13</td>
</tr>
<tr>
<td>Future expansion</td>
<td>10.0</td>
<td>1300</td>
<td>2470</td>
<td>13-21</td>
</tr>
</tbody>
</table>
2.8. Vehicles movements during construction

Development of the quarry will occur progressively over the first five years of operation. Work is expected to commence in the fourth quarter of 2010 and progress through the first quarter of 2011. Commissioning will occur at the beginning of the second quarter 2011. Activities during the initial construction phase will include:

- Cutting a new 1.8 kilometre section of access road around the lower slope of Spences Hill. Equipment required will include medium sized excavators (30 tonne) with rock breakers, off-road dump trucks, drilling equipment and explosives.
- Improvements to the existing access road using excavators and graders. Some road widening and realignment will be required using materials won in the new road construction works. Improvements to sediment control infrastructure will also be required in places.
- The quarry area will be stripped of vegetation and topsoil using dozers and excavators and a first face established using drilling equipment and blasting. Shot rock stockpiles will be processed in the first five years of operation by mobile crushing and screening equipment.

All the heavy equipment for the initial construction phase will be transported onto the site using floats (articulated low loaders). The equipment will come from either the Hazell Bros. Group offices at Derwent Park or from other sites. The work force will use temporary site sheds and relocatable toilets. Daily vehicle movements will be confined to utilities and trucks for workers, fuel and materials.

The quarry operation will be developed over the first five years and at the end of this period a fixed crushing plant will be required to process the expected production volumes. Constructing the fixed crushing plant will require transporting oversized pieces of equipment to the site and a temporary increase in the numbers of workers employed on the site.

2.9. Off-site infrastructure

The development will require an extension to the existing 3-phase electrical power supply servicing the property manager’s residence and equipment service sheds. The power supply will be carried above ground on poles from the property manager’s residence first to the new return water pump station and later to the crusher site (see Figure 3).

The Traffic Impact Assessment makes recommendations regarding the removal of vegetation on the inside of the curve on the western side of the Midland Highway opposite Harbachs Road intersection and lowering the embankment on the inside of the curve on Harbachs road directly south of the access road intersection.
2.10. **TECHNICAL AND MANAGEMENT ALTERNATIVES**

Quarried dolerite provides a range of products that are used in construction activities. Crushed rock is used as an aggregate in concrete, as road sub base and in flush seals, as facing stone building construction and armour stone in rip rap. As an aggregate in road sealing dolerite provides typically better pavement skid resistance than basalt which is the most common alternative.

Industry best practice for quarrying hard rock requires the use of drill and blast techniques. Blasting effectively fractures hard rock reducing the effort needed to break down particle sizes. An alternative economical method of extraction does not exist for the quantities of material required for quarrying.

Technologies that enable recycled materials to be used rather than quarried materials for aggregates are available and are used in road reconstruction works. Profiling machines allow old pavement to be stripped and recycled into new pavement materials. Steel extracting trommels can be teamed with crushers to produce aggregate from waste concrete from demolition works. New quarried construction materials are still required to supply high quality road construction materials for highway construction.
3. THE EXISTING ENVIRONMENT

The Constitution Hill Quarry development is planned for a site located within a mosaic of marginal grazing land and new plantations. The quarry site is located on the edge of an escarpment at an elevation of 640 metres above sea level. The property is privately owned and has been previously grazed, however the higher slopes of the property are less productive as grazing land and have been developed into new plantations. Some areas of the high ground are unsuitable for establishing plantation because of outcropping rock. The pit will be located on one such site.

3.1. PLANNING ASPECTS

The proposal is wholly located on private land under the one ownership. The mining lease that covers the development land covers the following land titles:

477738/1, 105106/1, 23673/1, 29391/3, 245356/1, 111494/1, 111495/2.

The mining lease occupies land that is zoned either Rural Forest or Rural Agriculture under the Southern Midlands Council Planning Scheme 1998. A full discussion on this development’s relationship to the provisions in the Southern Midlands Council’s Planning Scheme is included later in this document in Appendix 9.

FIGURE 9: ZONING MAP SHOWING MAJOR LAND USE ZONING SURROUNDING THE DEVELOPMENT SITE
The land on the boundaries of the subject land has either rural agriculture or rural forest zoning except for a small section adjacent to the Devil’s Den Nature Conservation Area. This land is zoned environmental management. Figure 10 is an extract from the 1:25000 topographic series with current land use on properties surrounding the development site shown.

Property listed on the Tasmanian Heritage Register

FIGURE 10 LOCATION PLAN SHOWING EXISTING LAND USE ACTIVITIES ON NEIGHBOURING LAND (EXTRACT TASMAP BAIN)

The small parcels of land on the eastern side of the Midland Highways in the vicinity of Prichards Lane and Harbachs Road are zoned rural.
The aerial image in Figure 11 shows the areas prepared or recently set to plantation as lighter areas while the forested areas unsuitable for harvesting or plantation as dark. Highlighted on Figure 11 are the closest dwellings to the proposed development. The quarry footprint is mainly located on an existing outcrop that has not been developed to plantation but also has very sparse vegetation cover. The access road leading from the existing road around the low slope of Spences Hill traverses native regrowth forest for a distance of 1.8 kilometres.
The development site is likely to have been forested prior to the introduction of the Eucalypt plantations. The current Goggle Earth BE image is dated 22 January 2006 and shows the plantation with immature trees. The aerial photography on TheLIST shows the land sparsely forested. It is unlikely that any activities have taken place on the site that could have lead to contamination. Aerial spraying during the establishment of the plantation may have introduced harmful concentrations of pesticides through processes of accumulation or from accidental spills. These activities ceased after the plantations became self sustaining and in the intervening period harmful chemical residues would have decayed.

3.2. Environmental Aspects

The information in Table 2 is a summary of the publicly available information on the site. More detailed descriptions of flora and fauna aspects are included in the flora and fauna assessment included in Section 4.7 and Appendix 7.

<table>
<thead>
<tr>
<th>TABLE 5: ENVIRONMENTAL DATA FOR DEVELOPMENT SITE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SITE DESCRIPTION</strong></td>
</tr>
<tr>
<td>Climate data (BOM, 2009)</td>
</tr>
<tr>
<td>Mean max. Temperature (°C)</td>
</tr>
<tr>
<td>Mean min. Temperature (°C)</td>
</tr>
<tr>
<td>Mean annual rainfall (mm)</td>
</tr>
<tr>
<td>Wind data</td>
</tr>
<tr>
<td>The dominant wind direction and strongest winds in</td>
</tr>
<tr>
<td>summer come from the west (&gt; 30%). Lesser winds</td>
</tr>
<tr>
<td>and the dominant wind direction in winter is from</td>
</tr>
<tr>
<td>the north.</td>
</tr>
<tr>
<td>Land capability</td>
</tr>
<tr>
<td>Class 5 and 6</td>
</tr>
<tr>
<td>Aspect</td>
</tr>
<tr>
<td>The mining lease is over land starting at elevation</td>
</tr>
<tr>
<td>270 metres at Harbachs Road and rising to 670</td>
</tr>
<tr>
<td>metres at the quarry site. The land can be</td>
</tr>
<tr>
<td>described as rolling hills with grades generally</td>
</tr>
<tr>
<td>between 10 and 40 percent. Spences Hill and</td>
</tr>
<tr>
<td>Barren Rock are sparsely forested outcrops of the</td>
</tr>
<tr>
<td>dolerite sill with rocky talus on the surrounding</td>
</tr>
<tr>
<td>slopes.</td>
</tr>
<tr>
<td>Geology</td>
</tr>
<tr>
<td>The area surrounding Quoin Mountain and Spences</td>
</tr>
<tr>
<td>Hill is dominated by the remnants of a Jurassic</td>
</tr>
<tr>
<td>period dolerite sill intruded into Triassic</td>
</tr>
</tbody>
</table>
Sediments. Both Quoin Mountain, Spences Hill and many other topographic features in the area are capped by the dolerite either outcropping or thinly covered with weathered dolerite undefined brown soils. The Triassic sediments consist of cross bedded quartzose sandstone, quartz rich lithic sandstone, siltstone and mudstone; intervals with dark grey carbonaceous mudstone, thin lenticular coal seams and fossil plants occur in places. The sediments are normally associated with the valleys where weathering has eroded through the overlying dolerite, however close to the quarry site is an area where the sediments are overlying the dolerite. The midslopes of the hills where dolerite is outcropping have a rough dolerite talus covering the surface concealing either dolerite or the sediment derived soils. The talus is normally associated with slopes between 10 and 28 degrees and particle sizes vary from cobble to large boulders.

**Vegetation**

The crushing plant will be located on the southern end of the quarry adjacent to the access road entrance. The development will disturb a small area of forest mapped as *Eucalyptus delegatensis* dry forest and woodland by TASVEG 2.0. Other communities that might be encountered with road widening are *E. viminalis* grassy forest and woodland and *E. obliqua* dry forest and woodland. These communities are not listed as priority forest communities under the *Forest Practices Act 1985* and *Forest Practices Regulations 2007* and are not listed as threatened under the *Nature Conservation Act 2002*.

**Podzolic Soils on Dolerite**

Imperfectly drained texture contrast soils developed on Jurassic dolerite bedrock and colluvium on rolling to steep (10-56%) land (Information and Land Services Division, 2009)

**Brown Soils on Dolerite**

Undefined brown soil developed on Jurassic dolerite bedrock and colluvium on rolling to steep (10-56%) land.

**Podzol and Podzolic Soils on Sandstone**

Undefined soil developed on Triassic sandstone bedrock and colluvium on undulating to rolling (3-32%) land.
A desk top survey revealed records of the following threatened flora species within 5000 metres of the mining lease boundary. The mining lease area is large and only a small fraction of this area will be disturbed. Many of the plants listed below would have been recorded along the verge of the Midlands Highway.

**TABLE 6: THREATENED FLORA SPECIES RECORDED IN THE VICINITY**

<table>
<thead>
<tr>
<th>Species name</th>
<th>Common name</th>
<th>TSPA</th>
<th>EPBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austrodanthonia induta</td>
<td>tall wallaby grass</td>
<td>r</td>
<td>-</td>
</tr>
<tr>
<td>Austrodanthonia popinensis</td>
<td>blue wallaby grass</td>
<td>e</td>
<td>en</td>
</tr>
<tr>
<td>Brachyscome rigidula</td>
<td>hairy cutleaf daisy</td>
<td>v</td>
<td>-</td>
</tr>
<tr>
<td>Caladenia caudata</td>
<td>tailed spider orchid</td>
<td>v</td>
<td>vu</td>
</tr>
<tr>
<td>Carex tasmanica</td>
<td>curley sedge</td>
<td>-</td>
<td>vu</td>
</tr>
<tr>
<td>Colobanthus curtisiae</td>
<td>grassland cupflower</td>
<td>r</td>
<td>vu</td>
</tr>
<tr>
<td>Epacris acuminata</td>
<td>claspleaf heath</td>
<td>r</td>
<td>vu</td>
</tr>
<tr>
<td>Hovea tasmanica</td>
<td>rockfield purplepea</td>
<td>r</td>
<td>-</td>
</tr>
<tr>
<td>Lepidium hyssopifolium</td>
<td>soft peppercress</td>
<td>e</td>
<td>en</td>
</tr>
<tr>
<td>Lepidium pseudotasmanicum</td>
<td>shade peppercress</td>
<td>r</td>
<td>-</td>
</tr>
<tr>
<td>Pentachondra ericifolia</td>
<td>fine frillyheath</td>
<td>r</td>
<td>-</td>
</tr>
<tr>
<td>Ranunculus sessiliflous var. sessiliflous</td>
<td>rockplate buttercup</td>
<td>r</td>
<td>-</td>
</tr>
<tr>
<td>Scleranthus fasciculatus</td>
<td>spreading knawel</td>
<td>v</td>
<td>-</td>
</tr>
<tr>
<td>Velleia paradoxa</td>
<td>spur velleia</td>
<td>v</td>
<td>-</td>
</tr>
<tr>
<td>Vittadinia gracilis</td>
<td>woolly new-holland daisy</td>
<td>r</td>
<td>-</td>
</tr>
<tr>
<td>Vittadinia muelieri</td>
<td>narrow leaf new holland daisy</td>
<td>r</td>
<td>-</td>
</tr>
</tbody>
</table>

Integrated Land Management and Planning
A desk top survey revealed the following threatened fauna species within 500 metres of the mining lease boundary. Many of the species listed below would have been recorded within the Quoin Mountain and Devil’s Den Conservation Area and the development will not affect these areas.

**TABLE 7: THREATENED FAUNA SPECIES RECORDED IN THE VICINITY**

<table>
<thead>
<tr>
<th>Species name</th>
<th>Common name</th>
<th>TSPA</th>
<th>EPBC</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Aquila audax subsp. fleayi</em></td>
<td>wedge-tailed eagle</td>
<td>e</td>
<td>en</td>
</tr>
<tr>
<td><em>Accipiter novaehollandiae</em></td>
<td>grey goshawk</td>
<td>e</td>
<td>-</td>
</tr>
<tr>
<td><em>Tyto novaehollandiae subsp. castonops</em></td>
<td>masked owl</td>
<td>e</td>
<td>-</td>
</tr>
<tr>
<td><em>Haliaeetus leucogaster</em></td>
<td>white-bellied sea eagle</td>
<td>v</td>
<td>-</td>
</tr>
<tr>
<td><em>Perameles gunnii</em></td>
<td>barred banicoot</td>
<td>-</td>
<td>vu</td>
</tr>
<tr>
<td><em>Sarcophilus harrisii</em></td>
<td>tasmanian devil</td>
<td>e</td>
<td>vu</td>
</tr>
</tbody>
</table>

The specialists commissioned to undertake the flora and fauna survey and prepare the report that appears in this document were aware of these records and were vigilant for signs of the presence of all of the above species.

The parcel of land on the western boundary closest to the pit development is in other ownership and has a conservation covenant on the title. This land will be within 500 metres of the development but it is unlikely that this land will sustain an adverse environmental effect for the following reasons:

- The pit excavation is set back 10 metres from the property boundary and is excavated below natural ground level. The resultant face will create a substantial barrier that will reduce the impact of noise and dust and prevent runoff water, sediment and disease from entering the land.
- The prevailing winds come from behind the conservation reserve across to the pit. This will further reduce the impact of noise and dust and weed seeds being carried from the pit to the conservation reserve.
- Vegetation management plans introduced to support the quarry development will be focused on the land surrounding the pit and the rehabilitated areas that are adjacent to the conservation reserve.
- The conservation covenant ensures that this land will continue to prevent encroachment of residential development towards the quarry from this direction.
3.3. Socio-economic aspects

The Constitution Hill Quarry is located in a largely agricultural district and this sector is the largest employer of the local population. The local community will be familiar with primary industry activities that bring about a certain amount of landscape change. They will also be prospective employees of the quarry with ten percent of the labour force recorded as ‘being machinery operators and drivers’ (Australian Bureau of Statistics, 2007).

Another demographic within the community will be commuters and hobby farmers. This component of the local community will be more sensitive to the development. Although commuters are unlikely to be affected by a temporary nuisance during working hours, retirees or stay at home hobby farmers will be very sensitive to noise and other environmental emissions.

Harbachs Road has a number of hobby farms and small horse properties along its length. At the end of Harbachs Road is a tourism venture Woodfield Lodge. Guests staying here can be expected to be sensitive to noise especially out of hours and on Saturdays. They can also be expected to appreciate the native woodlands and forest surrounding the cabins and the possibility of seeing wildlife at close quarters.

3.4. Alternative sites

Two other sites that could potentially accommodate the quarry development were investigated. One of these had significant natural values and both could only be accessed along roads with established residences close by. This site was found to have the following advantages;

- traffic from the quarry could gain access to an arterial route (Midland Highway) without passing in front of residences,
- much of the property is already substantially disturbed by clearing for grazing or plantations,
- The actual pit site will be concealed from off-site vantage points, and
- is remote (1.7 km) from the nearest sensitive receptor.
4. POTENTIAL EFFECTS AND THEIR MANAGEMENT

4.1. AIR EMISSIONS

4.1.1. EXISTING CONDITIONS

This quarry proposal is set in a landscape that includes a mosaic of production agriculture, plantation forestry, regrowth forest and forest reserves. The plantation forests have been recently planted and large areas of bare earth are exposed see Figure 11 and commentary in Section 1. During certain periods of the year, areas of the agricultural land will be tilled exposing bare ground. In periods of high wind and after recent dry conditions it is likely that topsoil will be carried into the air as dust.

Data from the Bureau of Meteorology show that the site is likely to have a westerly or northerly prevailing wind condition with the strongest winds also coming from these directions. See Appendix 1 for the seasonal wind roses from the two nearest weather stations. The most susceptible addresses are therefore to the east and south of the proposed development site. There is no record of air quality monitoring at the susceptible addresses. The nearest constantly monitored air quality station is located at New Town in Hobart.

Dust can be made up of particles of various sizes although fine particles ie (PM$_{10}$ PM$_{2.5}$) are more easily entrained by wind or disturbances and can remain in the air column for longer periods. PM$_{10}$ and refers to the physical size of the particulate matter that constitutes the dust, PM$_{10}$ refers to particles 10µm (0.01mm) and less, PM$_{2.5}$ refers to particles 2.5µm (0.0025mm) and less.

Fine particles also tend to have more serious health effects. Dust with particle size of PM$_{10}$ or less tend to be inhaled and deposited in the upper portion of the lungs affecting the mucus membrane and PM$_{2.5}$ particles are respirable, penetrating deep into the lungs and into the alveoli.

The health effects of exposure to dust are also influenced by the chemical makeup of the dust particles. Dolerite contains a proportion of quartz in its makeup. Activities on products containing quartz can give rise to silica dust. Information sourced from Material Safety Data Sheets for quarry materials produced from Hobart dolerite shows that they contain less than one percent crystalline silica (CSR Limited, 1997). A 2005 Australian Government Senate Committee found that there were no reports in international literature of individuals developing silicosis from non-occupational levels of silica dust.

(Environmental Defenders Office Ltd (NSW), 2006)

4.1.2. PERFORMANCE REQUIREMENTS

Air emission standards are included in:

- *Environment Management and Pollution Control Act 1994 (TAS):*

Key legislation in respect of air quality.

- *Workplace Health and safety Regulations 1998:*

Deals with air emissions in so far as they may present risk to the health of workers in the workplace.
- **Quarry Code of Practice 1999**: Describes the possible impact on workers and neighbours and suggests possible solutions to resolve issues involving air emissions including dust.

- **National Environment Protection Measure (Air) varied 2003**: Specifies maximum exposure levels for different air emissions including particles.

- **Environment Protection Policy (Air Quality) 2004**: Provides a framework for the management and regulation of both point and diffuse sources of emissions to air.

The quarry code of practice stipulates an acceptable standard for dust emissions from a mining operation is that “dust should not normally be visible crossing the boundary of the premises.” (Department of Primary Industries, Water and Environment, 1999). The boundary of the premises is the Mining Lease boundary shown in Figure 1 as a black line.

The *Environment Protection Policy (Air Quality) 2004* states that the environmental values to be protected “are:

- the life, health and well-being of humans at present and in the future;
- the life, health and well-being of other forms of life, including the present and future health, wellbeing and integrity of ecosystems and ecological processes;
- visual amenity; and
- the useful life and aesthetic appearance of buildings, structures, property and materials.”

   (Department of Primary Industries Water and Environment, 2005)

In reference to dust the *Environment Protection Policy (Air Quality) 2004* has adopted as its standard the National Environment Protection (Ambient Air Quality) Measure. For particulate matter suspended in air the standards are from Schedule 2 Table 1 for PM$_{10}$ and Table 2 for PM$_{2.5}$ particles.

In the absence of background measurements of ambient levels of PM10 and PM2.5 by the regulatory authorities in the Dysart region, it would be impractical and un-warranted to undertake air quality measurements for these parameters. PM10 and PM2.5 monitoring requires the use of highly sophisticated and expensive high volume air monitoring equipment, access to a reliable mains power and a safe and secure site, set up according to Australian Standard AS 2922:1987.

Air quality monitoring and goals for this development both during the construction phase and in operation will be as detailed in the Dust Management Plan included as Appendix 2. The prescriptions of the plan will be adopted in the general operating procedures for the site.
4.1.3. AVOIDANCE AND MITIGATION MEASURES

4.1.3.1. Nature of the materials:
From personal observations of geotechnical drilling it appears that the dolerite in this location is massive with little jointing. The percussion drilling operation produced intact chips with little dust. It is likely therefore that blasting will produce less dust than a more heavily jointed rock with weathered clays in the joints and more dust remaining from drilling.

4.1.3.2. Attenuation distance
Dust entrained in the air column by ejection from an activity such as blasting or crushing or picked up from a surface by wind will remain suspended for a period before settling out. A major factor in ensuring that neighbouring properties are protected from exposure to dust from this development is the separation distance. The closest residence to the quarry is located on Prichards Lane and is 1.7 kilometres away. There are topographic features and forested areas intervening between the quarry and this residence. The commonly accepted separation distance between crushing and a sensitive use is 700 metres. This attenuation distance is for noise but is included in the Quarry Code of Practice as a guideline for quarrying activities, remembering that the code specifies that no visible dust should cross the mining lease boundary.

4.1.3.3. Wind conditions:
Another major factor affecting the entrainment and distribution of dust are the prevailing wind conditions. The nearest currently operating weather station is at Melton Mowbray (North Stockman No. 094201) around 11 kilometres to the north of the quarry site. Analysis of the historic wind data from this site gathered over twelve years until present reveal that the dominant wind direction and strongest winds are westerlies in all seasons in the morning and afternoon (see wind rose data in Appendix 1. These winds will cause the dust emanating from activities at the quarry to be transported over the landowner’s property to the east. This land is either undeveloped or has been planted out to plantation forestry. The nearest sensitive use to the east is six kilometres distant on Springhill Bottom Road. The nearest sensitive use to the south east is on East Bagdad Road and is 3.6 kilometres distant. It is possible that these predominant winds will cause dust originating from traffic on the quarry access road to be directed towards properties on Harbachs Road. At times of full production heavy traffic on the access road may cause a dust nuisance at the properties. The Proponent will improve the access road from the intersection of Harbachs Road for the first 700 metres of the road’s length before the quarry reaches its full production phase. The improvements will include widening, some minor realignment, and sealing. Dust generated from traffic on the road on the remaining unsealed section will be transported over farmland and forest and not over sensitive uses.

Less common winds (+/- 20 percent) are northerly winds during the winter which are light in the morning but build in the afternoon. These winds may cause dust originating on the site to be transported over properties to the south.

4.1.3.4. Active controls:
The Quarry Code of Practice requires that quarrying activities do not cause visible dust to be carried across the mining lease boundary. The closest boundary is alongside the quarry to the northwest. The wind data shows that south easterly winds are an extremely uncommon event and the land to the northwest is heavily forested for over one and a half kilometres, it is very unlikely that dust will cause a nuisance in this direction.

It is possible that dust may become visible as a plume when viewed from the Midlands Highway especially if northerly winds carry the plume down into the Bagdad Rivulet valley. The Proponent will use active control techniques detailed in the Dust Management Plan (Appendix 2) to mitigate
the risk of dust creating a nuisance at neighbouring properties or becoming visible as a plume from the Midland Highway.

1. Roads and hardstand areas will be maintained to a high standard to prevent a loose surface forming that will give rise to a dust problem.
2. Drop distances from conveyors to stockpiles and from loaders into trucks and hoppers will be kept to a minimum.
3. A vehicle speed limit will be imposed on the site including the access roads.
4. On windy days where dust is likely to become a problem water sprays will be employed on drop points and road surfaces to settle the dust.
5. Stockpiles will be hosed with water to wash the fine particles off the surface.

4.1.3.5. Monitoring:
The quarry manager will be responsible for ensuring that extra dust suppression activities including the use of a water cart and sprinklers are deployed when quarry and weather conditions demand, see roles and responsibilities in the Dust Management Plan included as Appendix 2.

4.1.4. ASSESSMENT OF EFFECTS
A combination of attenuation distances, knowledge of prevailing wind conditions and active monitoring and intervention as detailed in the Dust Management Plan will result in a very low probability that dust from activities at the quarry will become a nuisance to neighbours.
The risk of quarry traffic causing a dust problem for local residents is mitigated by the Proponent’s commitment to seal the first 700 metres of the access road.

4.2. LIQUID WASTE
4.2.1. EXISTING CONDITIONS
The site of the Constitution Hill quarry proposal was traditionally forested land partly converted to rough seasonal grazing pastures. More recently large areas have been converted to plantation forestry. The more arable land on the western slopes is part of the Dysart Creek catchment. The southern steeper more forested land is in the catchment for the Bagdad Rivulet.
The Water Recourses Division of the State Government Department of Primary Industries, Parks, Water and Environment (DPIPWE) maintain a database that keeps records for each reach of Tasmanian watercourses and awards it a Conservation Management Priority (CMP). The CMP score is based on an audit of each reach of Tasmanian watercourses undertaken for the Conservation of Freshwater Ecosystem Vales (CFEV) project where the representativeness, naturalness and any distinctive values are assessed.
The watercourses in the Dysart Creek catchment generally have a CMP of Moderate possibly because historic agricultural activities have altered the condition of the watercourses from their natural state. The Bagdad Rivulet catchment watercourses have a CMP of Very High possibly because the streamside vegetation has remained largely intact natural forest.
TABLE 8 CF EV IDENTIFIER AND CORRESPONDING CMP SCORE FOR LOCAL WATERCOURSES

<table>
<thead>
<tr>
<th>River</th>
<th>Tributary Number</th>
<th>Conservation Management Priority (CMP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dysart Creek</td>
<td>Dysart Creek</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>236657</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>236658</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>236669</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>236722</td>
<td>Moderate</td>
</tr>
<tr>
<td>Bagdad Rivulet</td>
<td>Bagdad Rivulet</td>
<td>Very high</td>
</tr>
<tr>
<td></td>
<td>236714</td>
<td>Very high</td>
</tr>
<tr>
<td></td>
<td>236715</td>
<td>Very high</td>
</tr>
<tr>
<td></td>
<td>236716</td>
<td>Very high</td>
</tr>
<tr>
<td></td>
<td>236717</td>
<td>Very high</td>
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<tr>
<td></td>
<td>236718</td>
<td>Very high</td>
</tr>
<tr>
<td></td>
<td>236725</td>
<td>Very high</td>
</tr>
<tr>
<td></td>
<td>236731</td>
<td>Very high</td>
</tr>
</tbody>
</table>
4.2.2. **PERFORMANCE REQUIREMENTS**

Liquid discharge emission and water quality standards are included in:

- *State Policy on Water Quality Management 1997*
- *Water Management Act 1999 (TAS)*
- *Quarry Code of Practice 1999*

4.2.3. **AVOIDANCE AND MITIGATION MEASURES**

The major threat from liquid waste produced by the proposal is the potential to adversely affect water quality in natural watercourses. Liquid waste in natural watercourses can cause damage to freshwater ecosystems which can degrade the usefulness of the watercourse for ecosystem services, agricultural uses and can affect human health.

This proposal has potential to generate three different types of liquid waste:

- Contaminated process water,
- Contaminated runoff water, and
- Effluent from human sanitary facilities.

4.2.3.1 It will be necessary to use water during the rock processing operation for washing crushed stone to produce clean aggregates and settling dust in windy conditions. It is possible that at full production 40 kilolitres of water will be used per day. The Proponent intends to source this water from an existing impoundment and recycle the water back to the impoundment. An alternative source of supply will be sought from another impoundment on the property if this supply is inadequate. No reticulated water supply will be sought from the domestic service provided to the Dysart and Bagdad population.

After use, the process water is likely to have quantities of rock particles in suspension and on occasion hydrocarbons after a mechanical failure or spillage. Process water will be directed to the sediment retention basin where it will be detained long enough to allow the particles to settle out. This facility will use booms to capture any hydrocarbons present on the water's surface. From the sediment retention basin the water will discharge into a swale drain that will carry it to the recovery water impoundment.

![Figure 13 Typical Section Through Swale Drain](image)

Steeper sections of the swale will be armoured with stone rip rap to control water velocity and...
prevent erosion. Reeds will be encouraged in the swale to further filter the water and stabilise the drain liner.

4.2.3.2 Stormwater collected on the extraction and process areas has the potential to entrain particles and hydrocarbons. This water will be treated similarly to the process water. The benches and floor of the disturbed area will drain towards the sediment retention basin. A series of drains will ensure that water will not stand in ponds but rather be carried away from trafficked areas. The layout of the drains is shown on mining plans Figures 5, 6 and 7. Once in the retention ponds the solids will settle out and the water will pass through the swale drain to the return water impoundment.

The sediment retention basin and swale drain will be constructed to accommodate the volume collected on the disturbed area in a one in twenty year rain event as well as the maximum process water flow at peak production. The floor of the extraction and process areas are assumed to have a retention capacity as a result of over-drilling and fracturing during blasting. The fracturing is assumed to be 0.75 deep and comprise of 5 percent voids. Calculations for sizing the stormwater management infrastructure are located in Appendix 3. The calculations show that a sediment retention basin with a capacity of 2780 cubic metres will detain the maximum design flow. This capacity will be achieved by excavating a sump in the floor of the pit at the southwest corner with an area of 1000 metres and 3 metres deep. Site drainage will enter the sump from the northeast corner and the discharge will be diagonally opposite. Turbid water will then have the least chance of contaminating discharge water.

Stormwater falling outside the footprint of the quarry operation will be diverted away from the site by a system of cut-off drains constructed around the perimeter of the complex. The locations of these drains are shown on the mining plan Figures 5, 6, 7 and 8.

The access road comes close to the tributaries of Bagdad Rivulet in places. It will be necessary to construct sediment retention basins on the side of the road to ensure that runoff from the road does not contaminate these water courses.

The reach 236718 is protected already by a sediment control installation constructed for a previous logging operation. The installation consists of a long flat drain excavated parallel and down slope from the road. The drain is constructed on the contour and will intercept any runoff from the road and detain it for a considerable period while the water finds its way to the discharge point. This facility will be cleared of accumulated sediment and maintained in good working condition.

The reach 236714 has had a substantial dam constructed immediately downstream of the road crossing, which will act as a sediment retention facility. The reach 236715 will have a new sediment retention basin constructed downstream of the road crossing that will capture the road runoff and hold it separately to any existing stream flow. Only a short section of road reports to this facility (approximately 200 metres) so the volume of runoff will be small. The discharge from this facility will be diffuse and directed into vegetation to further protect the waterway from the effects of turbid water.

The reach 236717 runs alongside the access road for some distance and crosses down-slope from the steepest section. Permanent sediment control infrastructure will be established on the southern side of the road. The included basin will be adequate to detain the flow from a one in twenty year reoccurrence storm event to protect the watercourse from sedimentation from the road runoff. The sediment retention basin will have a capacity of 234 cubic metres and a diffuse outfall into established vegetation.
4.2.3.3 The site office and personnel facilities will be serviced with a pump out effluent tank. The tank will have no overflow and will be periodically pumped clean under contact. Water usage will be kept to a minimum with water saving plumbing fittings and with employee education. Stormwater collected on the buildings will be discharged onto ground and managed through the site drainage infrastructure.

4.2.4. **ASSESSMENT OF EFFECTS**

Process water used in the operation will make only a small contribution to the load of contaminated water that must be treated on the site. The used process water will be contaminated with the same mineral particles that will be entrained in runoff water from the site. These particles are inert and although small are heavy and hence will tend to fall out of suspension readily. The sediment retention facilities that deal with the runoff water will cater for these contaminants as well. The water management infrastructure will also capture accidental leaks or spills of hydrocarbons.

The stormwater runoff from the site carries the greatest risk of contaminating the receiving waters and the water management infrastructure has been designed to cater for a one in twenty year storm event. The efficiency of the sediment retention infrastructure will suffer in an event that exceeds this level but will not fail and so will continue to provide protection to the receiving environment.

All liquid effluent produced by the employees working at the site will be trucked off-site and cannot threaten the receiving environment.
4.3. **GROUNDWATER**

### 4.3.1. **EXISTING CONDITIONS**

There is no record of ground water bores located near to the development site. The nearest are recorded here in Table 9.

**TABLE 9 EXISTING WATER BORES IN PROXIMITY OF DEVELOPMENT SITE**

<table>
<thead>
<tr>
<th>Number</th>
<th>Location</th>
<th>Depth</th>
<th>Depth to standing water</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>17468</td>
<td>Bagdad</td>
<td>55 metres</td>
<td>44 metres</td>
<td>0.38 litres/s</td>
</tr>
<tr>
<td>2708</td>
<td>Kempton</td>
<td>20 metres</td>
<td>15 metres</td>
<td>0.38 litres/s</td>
</tr>
<tr>
<td>3520</td>
<td>Colebrook</td>
<td>72 metres</td>
<td>40 metres</td>
<td>0.63 litres/s</td>
</tr>
</tbody>
</table>

The Proponent has undertaken geotechnical drilling to investigate the subsurface conditions for feasibility works. One hole within the ultimate footprint of the quarry encountered standing water in small quantities at a depth of 15 metres. This location is on the edge of the ultimate quarry development area and will not be excavated to the full depth of the quarry. The balance of the geotechnical drilling encountered no water within the footprint of the quarry or supporting infrastructure. A record of the geotechnical drilling is presented in Appendix 4.

### 4.3.2. **PERFORMANCE REQUIREMENTS**

- *State Policy on Water Quality Management 1997*
- *Water Management Act 1999 (TAS)*
- *DEPHA Quarry Code of Practice 1999*

### 4.3.3. **AVOIDANCE AND MITIGATION MEASURES**

The geotechnical drilling shows that to the depth of the record it is highly unlikely that the construction and extraction activities will encounter groundwater. The drilling explored the sub-grade to a depth of 21 metres below surface which encompasses the first and second benches of the design. The only standing water encountered during the drilling issued from the sedimentary rock overlying the dolerite when that overburden reached a depth of 15 metres. The cost of removing overburden will make extraction activities inefficient before this depth of overburden is encountered.

The quarry benches and floor are designed to be free draining with defined drainage paths. The only area of standing water will be the 1000 square metre footprint of the sediment retention basin. The floor of the basin will be solid rock and any fractures will quickly seal with sediment that settles out from runoff waters.

### 4.3.4. **ASSESSMENT OF EFFECTS**

As a consequence of the geotechnical drilling confidence is high that the development will not affect groundwater by addition or subtraction or by changing groundwater flow paths.
4.4. **Noise Emissions**

### 4.4.1. **Existing Conditions**

The Proponent engaged Vipac Engineers & Scientists Ltd (Vipac) to undertake a noise assessment and a blasting noise and vibration assessment on the proposed quarry operation. Vipac were provided with a series of digital terrain models that incorporated three different stages of quarry development into the existing terrain conditions provided as digital information by ‘theLIST’.

Three receptor locations were chosen as they represented typical exposure to noise from the proposed quarry. Ambient noise levels were recorded at these locations every fifteen minutes for a week. Noise can become a nuisance when it is audible over background noise levels and these records were then used in calculations for noise over ambient. The residences closest to the development are presented in Figure 14 and the Houses A, B, C, and D are identified. An additional predicted noise level is presented for the Landowner’s house. The Proponent has first option to buy this property, should the owner wish to sell and hence the house will not fall into ownership that might be sensitive to quarry operations.

Sound power levels from Vipac’s databases of equipment similar to that employed to carry out tasks at the quarry were entered into acoustic modelling software ‘Soundplan’ to predict the quarry noise at different locations. The output of the modelling constitutes a noise contour map of the land surrounding the quarry depicting the noise levels under different operating conditions. The complete report is included in this document as Appendix 5.

The blasting noise and vibration assessment report used the same terrain information along with a geological description of the surrounds to develop a terrain model. Information about the blast plans used commonly at the Leslie Vale site were used as an input into the blast and vibration modelling. The complete report is included in this document as Appendix 6.

### 4.4.2. **Performance Requirements**

- **Environment Management and Pollution Control Act 1994 (TAS)**

  Section 53. (3) States in summary, causing an environmental nuisance by the emission of noise that interferes with a person’s enjoyment of the environment is guilty of an offence.

- **Environment Protection and Pollution Control (Miscellaneous Noise) Regulations 2004**

  The regulations set default noise limits for various machinery unless otherwise approved by the Director

- **DEPHA Quarry Code of Practice 1999**

  A limit of 15dBA above background noise levels is stated as the performance criteria in the Quarry Code of Practice.

- **Environment Protection Policy (Noise) 2004**
4.4.3. **AVOIDANCE AND MITIGATION MEASURES**

The separation distance between the Constitution Hill Quarry site and sensitive receptors was a major contributor to the decision to propose the quarry at this location. The Proponent is aware that an operating quarry can become a nuisance to its neighbours if the two are not properly separated. The separation distance of 1.7 km is a significant mitigating factor in relation to noise impacts.

Noise considerations informed the design of the pit. The location of the crushing facility and the main processing area behind the topographic feature of Spences Hill interrupts the propagation of noise towards sensitive receptors towards the south and east. The greatest risk of a noise impact will be during the early low volume works on the surface while the full scale production activities will occur within the slot style excavation below ground level and hence more effectively screened.

The noise assessment concluded that under worst case scenario conditions, there was a risk that truck noise and rock breaker noise on the access road would exceed acceptable limits at one of the representative receptor sites (house B) during the period before 7 am. The period before 7 am is considered to be night time and hence the acceptance limits are more stringent (see Table 10.).

(Vipac Engineers & Scientists Ltd (A), 2010)

To mitigate the risk of trucks on the access road disturbing local residents the proponent will slightly change the alignment and lower the access road in the vicinity of an existing impoundment. The location of the works is indicated on Figure 14 as a yellow line.

The effect of lowering the road will be to locate solid sound attenuating structure very close to the road, screening the trucks from view and shielding house B from direct noise impact. With these structural changes to the access route, noise levels at the closest neighbouring residence (house B) and all other sensitive receptors will not exceed acceptable standards.

(Vipac Engineers & Scientists (C), 2010)

The noise consultants determined that the environmental impacts from blasting would be acceptable providing recommended actions were implemented:

- a blasting management plan should be developed, approved and applied
- blasts are monitored,
- the blast monitoring should continue to inform the blast plan, and
- if environmental thresholds are approached, described impact reduction actions are introduced.

(Vipac Engineers & Scientists Ltd (B), 2010)
4.4.4. **ASSESSMENT OF EFFECTS**

With the application of the recommended actions stated in the noise consultant’s reports and the structural changes to the access road modelling has confirmed that the quarry operation will not cause noise, air blast or vibration to exceed acceptable limits.

The acceptable limits for blasting are derived from the ANZECC *Technical Basis For Guidelines to Minimise Annoyance Due To Blasting Overpressure and Ground Vibration* and are shown in Table 10.

**TABLE 10: ACCEPTABLE LIMITS FOR AIRBLAST OVERPRESSURE AND GROUND VIBRATION FROM BLASTING**

<table>
<thead>
<tr>
<th>Blasting</th>
<th>95% of blasts</th>
<th>100% of blasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Blast Overpressure</td>
<td>115 dB (Lin Peak)</td>
<td>120 dB (Lin peak)</td>
</tr>
<tr>
<td>Ground Vibration</td>
<td>5 mm/s (Peak particle velocity)</td>
<td>10 mm/s (Peak particle velocity)</td>
</tr>
</tbody>
</table>
FIGURE 14: AERIAL IMAGE SHOWING RESIDENCES AND RELATIONSHIP TO ACCESS ROAD AND QUARRY SITE

Realign and lower road. (3.0m max)

Blasting required in road construction
4.5. SOLID AND CONTROLLED WASTE MANAGEMENT

4.5.1. EXISTING CONDITIONS

The development site is an operating farm and has waste products associated with agricultural production and other related activities stored in different locations around the property. There are likely to be hydrocarbons stored as recovered fuel and maintenance oils, redundant herbicide and pesticide chemicals used for agricultural production and silviculture, abandoned machinery and equipment and small volumes of domestic waste located on the property.

4.5.2. PERFORMANCE REQUIREMENTS

Standards for the storage and disposal of general and controlled waste are included in:

- **Environment Management and Pollution Control Act 1994 (TAS)**
  
  Schedule 2 section 3 states if solid waste in excess of 100 tonnes is to be stored on site awaiting disposal to another location or controlled waste destined for another State or Territory then a separate permit is required.

- **Environment Management and Pollution Control (Waste Management) Regulations 2000**
  
  Section 6 (1) Separate approval is required to receive, store, reuse, recycle, incinerate, treat, dispose of or use for energy recovery a controlled waste.

- **DEPHA Quarry Code of Practice 1999**
  
  Section 6.10. states that only materials that are classified ‘clean fill’ can be imported onto site, and that quarries should not accumulate rubbish, disused plant or other waste materials.

4.5.3. AVOIDANCE AND MITIGATION MEASURES

This quarry will generate waste products and import materials that can be classified as waste materials as a necessary part of the operation. Receiving and generating waste will not be ‘core business’ for this operation and hence will be an activity that must be controlled to improve efficiency. Waste will be controlled using the principles set out below, ranked in order of merit:

1. Avoidance
2. Reuse
3. Recycling
4. Treatment
5. Disposal

Imported products may include carbonate materials for cement production and sand for cement production and blending. Where possible these additives will be sourced onsite or quantities will be minimised and waste and losses minimised to contain costs. The Quarry Manager will be responsible for ensuring that quality standards are applied to the importation of the materials to guarantee that they conform to the definition of clean fill. Strict controls will be applied to the importation of sand to ensure that no weed or disease contaminated material arrives on site.

The controls will include visual assessment of the extraction sites, ongoing monitoring of loads delivered, isolation of materials from different sources until the materials are approved and agreement from the supplier that substandard products will be removed from site promptly.
Dust can be recognised as a waste product that can have harmful affects on the surrounding environment and create a nuisance for neighbours. The proponent will adopt the strategies detailed in Section 4.1. to ensure that dust emissions are controlled. Engine exhaust is a waste product that can also create a nuisance as well as adding to the greenhouse gas accumulating in the atmosphere. The proponent will apply best practice quarrying techniques, routine engine maintenance and driving practices leaning towards fuel economy rather than maximum production to reduce fuel consumption and hence emissions, see Section 4.9. for details.

Quarries use heavy earthmoving machinery as an integral part of the operation to move product from one process area to the next. All machinery generates waste in the form of used parts and fluids from routine servicing. Many of the used parts and fluids already have defined management streams controlled by the manufacturers. For example failed mechanical parts are returned for reconditioning, used tyres are returned for recapping where practical or a surcharge is paid on the replacement tyre to cover the cost of recycling.

This proposal is planned to be developed through phases. The first production phase will utilise mobile crushing and screening equipment to process the shot rock and latter phases will require fixed plant. There will be an amount of redundancy of infrastructure when moving from one phase to another. The quarry layout and mining plan is designed to minimise the quantity of waste created when plant and equipment is made redundant. The access road will remain unchanged throughout the operation as will the processing and stockpiling area, see Figures 5, 6 and 7. Equipment including grizzlies for sorting oversized materials, offices and ablution blocks will be relocatable to avoid abandoning foundations and services when these facilities are removed.

Runoff water will entrain sediment from the exposed gravel surfaces. Contamination will be confined to inert particulate matter and possibly hydrocarbons. All runoff from the processing, extraction and traffic areas will be treated and under most circumstances reused, see Section 4.2.

Packaging including plastic cardboard and steel generated as a by-product of purchasing equipment will be stored onsite temporarily and then removed to a recycling centre. Putrescible waste in the form of discarded food and food containers will be stored onsite in a skip bin with a heavy lid. A contract with a waste disposal company will be developed to ensure that the bin is regularly replaced and the contents taken a defined landfill site.

### 4.5.4. **Assessment of Effects**

All quarries have the capacity to generate solid, liquid and gaseous waste. The proponent in this development will plan to minimise the waste generated from the outset. A combination of experience, best practice quarrying techniques and strict controls will ensure that waste is minimised and all waste generated will have a defined management path.
4.6. DANGEROUS GOODS AND ENVIRONMENTALLY HAZARDOUS MATERIALS

4.6.1. EXISTING CONDITIONS

The property that will host the proposed quarry is currently worked as a mixed use agricultural operation with grazing, cropping, plantation forestry and native timber reserves. These activities use dangerous and environmentally hazardous materials as part of their operations. Herbicides will be routinely used in weed management and hydrocarbons will be required for machinery operation and servicing.

4.6.2. PERFORMANCE REQUIREMENTS

Standards on the storage, handling and transport of dangerous goods are included in:

- Environment Management and Pollution Control Act 1994 (TAS)
- Dangerous Goods (Safe Transport) Act 1998
- DEPHA Quarry Code of Practice 1999
- Security-Sensitive Dangerous Substances Act 2005 (TAS)

For the purposes of this report environmentally hazardous materials are considered to be those that if released into the environment have the potential to cause environmental harm.

4.6.3. AVOIDANCE AND MITIGATION MEASURES

The quarry development will introduce new dangerous goods and environmentally hazardous materials to the site. The materials can be categorised into groups:

Explosives:

All explosives used on this site will be transported, temporarily stored and used by a fully qualified blasting sub-contractor. The sub-contractor will be responsible for complying with all relevant legislation and standards including; AS 2187.1-1998 Explosives-Storage, transport and use, Part 1: Storage, AS 2187.2-2006, Explosives-Storage and Use Part 2: Use of explosives and the Australian Explosives Code (AEC).

Before undertaking blasting the sub-contractor will undertake hazard identification and a risk assessment process that will inform a blast plan. The process and the plan will be documented and available for scrutiny by the regulators.

Hydrocarbons:

It will be necessary to establish refuelling facility at the site. This facility will be located within the quarry footprint and will consist of a single ‘Transtank’ T20 facility installed according to the manufacturers recommendations. These facilities are proprietary built and self bunded with over-fill protection valves to prevent accidental spills.
All other hydrocarbons will be stored in robust containers, undercover and within secure, site facilities with appropriate signage. The Quarry Manager will maintain a Material Safety Data Sheet register on site in an accessible location. The existing property access gate will be retained and locked when the quarry is unattended. The Quarry Manager, Landowner and Plantation Manager will be provided with keys.

Gases:

It is likely that gases for various purposes will be stored on site. No bulk gas storage facility will be located at the site but work shop facilities are likely to contain small gas pressure cylinders containing acetylene and liquid petroleum gas.

Storing flammable gases presents an occupational health and safety and a fire risk. The cylinders will be stored in a secure location in cradles that will prevent the cylinders from falling over if accidentally knocked. Cylinders must be routinely checked or replaced as per the supplier’s requirements.

Cement:

Cement is hazardous to human health because dust generated in handling contains crystalline silica which is a class 1 carcinogen. Cement also is a caustic in nature and prolonged exposure can cause burns. The risk associated with the storage and handling of cement is mitigated by controlling dust generated when transferring cement into storage.

Acids:

Quarries store and handle acids in the form of sulphuric acid for activating lead acid batteries and hydrochloric acid used to clean out concrete mixers. The risk from storage and handling of these products are mitigated by the use of protective equipment and securely storing the materials in the manufacturer’s containers with labels attached.

Herbicides:

The quarry operator will share responsibility for controlling weeds on the mining lease. The weed management plan as part of the vegetation management and rehabilitation plan will be implemented by a sub-contractor who will be responsible for the safe handling of any hazardous chemicals used. The weed management contractor will bring only the required quantity of chemicals to the site and will remove the unused portion at the end of the program. Hazardous or environmentally harmful chemicals will not be stored on site for extended periods.

4.6.4. **Assessment of Effects**

The most hazardous materials that will be used at this quarry are explosives that will be managed by a professional sub-consultant. Blasting will be conducted by professional blasting contractors. The blasting contractors will have their own risk management procedures in place.

The proponent will use their experience in managing the other hazardous materials to ensure that there is little chance of these materials affecting the community or environment. Under adverse conditions such as storms and fires the safe guards including runoff water detention and fire separation will still protect the surrounding environment from adverse impacts.
4.7. BIODIVERSITY AND NATURAL VALUES

4.7.1. EXISTING CONDITIONS

North Barker and Associates were engaged to fully assess the biodiversity and natural values of the site for the proposed quarry, evaluate the possible impact of the development on those values and recommend strategies to mitigate the risk of adverse impacts. The full report prepared by North Barker and Associates appears as Appendix 7. Following is a summary of the findings:

The development will disturb native vegetation in the quarry footprint, the new section of access road, an area of road realignment and for some sediment control infrastructure along the road alignment. None of the communities affected are listed as threatened although the DPU *Eucalyptus rodwayi* (black gum) forest and woodland and the DVG *Eucalyptus viminalis* (white gum) grassy forest and woodland are poorly reserved on a regional basis.

The northern 150 metres of the new access road section and the southern section of the quarry will displace a local expression of *Eucalyptus rubida* (candle bark).

A single specimen of small herb *Glycine latrobeana* (clover glycine) was recorded within the footprint of the proposed first stage of the quarry development.

Four wedge-tailed eagles’ nests have been recently recorded within the vicinity of the quarry and supporting road infrastructure. The flora and fauna assessment included an investigation into the status of these nests. The wedge-tailed eagle nests reported in the natural values atlas are represented in Figure 11 by the nest numbers; 1405, 520, 1370 and 1371. Nest number 362 is an old record and is considered inaccurate.

Two nests 1370 and 1371 were located by helicopter survey and found to be in poor repair and both in dead trees. Eagles tend not to build or rebuild nests in dead trees, so it is unlikely that these nests will be rebuilt. There are few other suitable trees in the vicinity so it is unlikely that the nesting will again occur close to the abandoned nests.

The nests 1405 and 520 were recorded closest to the quarry development and would be more vulnerable to disturbance from blasting. The helicopter survey failed to locate these nests as did a follow up ground survey. Given the accurate location of the nest observation records it is highly unlikely that the nests were not observed either from the ground or air. It is assumed that these nests are gone.

The helicopter survey searched the area surrounding the proposed quarry site and found no other nests and very little suitable habitat for nest construction. The full report is included in this document as appendix 7.

4.7.2. PERFORMANCE REQUIREMENTS

Requirements for identifying natural values and protecting biodiversity are included in:

- *Crown Lands Act 1976* (Tas)
- *Forest Practices Act 1985* (TAS)
- *Threatened Species Protection Act 1995* (TAS)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth)
- *DEPHA Quarry Code of Practice 1999*
4.7.3. AVOIDANCE AND MITIGATION MEASURES

The report prepared by North Barker and Associates makes the following recommendations to mitigate the impact of the development on biodiversity and natural values:

- The alignment of the access road close to the quarry site needs to consider the local stand of candle bark.
- A permit to destroy the single specimen of the clover glycine must be obtained under the *Threatened Species Protection Act 1995*.
- Weeds already present on the site or unintentionally introduced must be controlled to prevent spread into the Glenfern Private Forest Reserve.
- A referral should be prepared under the *Environment Protection and Biodiversity Conservation Act 1999* (Comm.) referring to the wedge-tailed eagle and clover glycine.
- A vegetation management and rehabilitation plan should be prepared with prescriptions to manage the remnant candle bark forest, to control the introduction and spread of weeds and to consider the clover glycine in appropriate species for rehabilitation works.

(Northbarker Ecosystem Services, 2010)

The Proponent will take the following actions to mitigate the impact of the development on flora and fauna values:

- The final alignment of the access road where it intersects with the quarry footprint will be set-out while taking into consideration an existing stand of candle bark.
- An application will be made under the Threatened Species Protection Act 1995 for a permit to destroy a single specimen of a listed plant (clover glycine).
- The site will be monitored for weeds and disease and any outbreaks will be quickly controlled and prescriptions consistent with the *Washdown Guidelines ed. 1* (French, 2004) will be employed to reduce the risk of infection.
- Advice from a wedge-tailed eagle specialist has been received that *Environmental Protection and Biodiversity Conservation Act 1999* (Com) referral to the Department of Environment, Water, Heritage and the Arts on the basis of impact to wedge-tailed eagles is not required. The Proponent believes that the loss of a single specimen of a listed plant does not constitute a nationally significant impact and therefore will not refer the project to DEWHA on the basis of the clover glycine.
- A vegetation management and rehabilitation plan will be prepared to manage the candle bark forest, control weeds and disease and make recommendations for appropriate revegetation species.

4.7.4. ASSESSMENT OF EFFECTS

The assessment finds that the proposed Constitution Hill Quarry need only have low to moderate impact to flora and fauna biodiversity and conservation values subject to adequate monitoring and management.
4.8. Marine and Coastal
The development site is located at elevation 640 metres above sea level and at its closest approach 38 kilometres distant from the coast. This section does not apply.

4.9. Greenhouse Gases and Ozone Depleting Substances

4.9.1. Existing Conditions
The site of this development has been converted from open rough grazing and woodlands to tree plantations. The carbon sequestration lost by clearing woodlands will be compensated by the take up of carbon in the actively growing trees. A very small part of that benefit will be lost by a small amount of clearing of woodland and plantation required to establish the quarry and access road. This loss would not be distinguished from the natural variability of plantation growth and changes in soil carbon associated with the change in vegetation cover.

4.9.2. Performance Requirements
The proponent is required to determine whether the emissions associated with this proposal will trigger the National Greenhouse and Energy Reporting Act 2007 (Comm).

The application of best practice environmental management principles including the minimisation of the emission of greenhouse gases is consistent with the principles of the Environmental Management and Pollution Control Act 1994 (Tas)

4.9.3. Avoidance and Mitigation Measures
Total greenhouse gas (GHG) emissions for this development are made up of the arithmetic addition of the direct and indirect emissions for each of the relevant greenhouse gases.

The emissions from the transport of construction materials delivered to various projects will be accounted in that project’s emissions accounting or the accounting for the transport side of the business. These emissions cannot be calculated accurately because it is not known to where the materials will be delivered. The location of the quarry will provide a benefit to the transport side of the business as transport distances to projects north of Hobart will be reduced.

The emissions from off road equipment will be the major contributor to the development’s total emissions. These emissions are calculated as petroleum based products for stationary energy purposes (Department of Climate Change, 2009). These are direct emissions and are referred to as scope 1 emissions.

Heavy machinery operating on site (from Section 2.4.4) and their respective typical fuel consumption figures are tabulated in Table 11 below:
Constitution Hill Quarry - Development Proposal and Environmental Management Plan

**TABLE 11: TYPICAL MOBILE EQUIPMENT AND INDICATIVE RATES OF FUEL CONSUMPTION**

<table>
<thead>
<tr>
<th>Machine type</th>
<th>Fuel type</th>
<th>Fuel consumption (litres/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel loader (50 tonne)</td>
<td>Diesel</td>
<td>40</td>
</tr>
<tr>
<td>Wheel loader (20 tonne)</td>
<td>Diesel</td>
<td>18</td>
</tr>
<tr>
<td>Excavator (30 tonne)</td>
<td>Diesel</td>
<td>25</td>
</tr>
<tr>
<td>Excavator (20 tonne)</td>
<td>Diesel</td>
<td>15</td>
</tr>
<tr>
<td>Off-road dump truck (50 tonne)</td>
<td>Diesel</td>
<td>35</td>
</tr>
</tbody>
</table>

The quarry has a full operating potential of 300,000 cubic metres of processed product. If on average the aggregate mixes have a specific gravity of 1.65, this equates to an annual production rate of approximately 500,000 tonnes.

An example of a quarry large wheel loader is the Cat 988 which has a bucket capacity of 11 tonnes. Supported by two off-highway dump trucks with a load capacity of 45 tonnes each operating on a short haul. The loader would take 5 minutes to load one truck so the trucks would have a 10 minute turn around. The trucks could therefore cart 48 loads in an eight hour working day so the daily production capacity for the quarry would be (48 x 2 x 45) = 4320 tonnes.

At full production the operating permit production limit would be reached after 116 days. If it assumed that a full production year is 50 weeks or 300 days the equipment will be operating 39 percent of the time.

The total non-transport related equipment consumes a total of 133 litres of diesel per hour. If these machines are assumed to be operating eight hours of the day, 1064 litres of diesel will be consumed each day or after 116 equivalent operating days 123,424 litres will be consumed.

Green House Gas emissions produced by this volume of fuel burned is calculated below:

From (Department of Climate Change, 2009)

$$E_{i,j} = \frac{Q_i \times E_{Ci} \times EF_{i,exec}}{1000}$$

where:

- $E_{i,j}$ is the emissions of gas type (j), carbon dioxide, methane or nitrous oxide, from fuel type (i) (CO$_2$-e tonnes).
- $Q_i$ is the quantity of fuel type (i) (kilolitres or gigajoules) combusted for energy purposes.
- $E_{Ci}$ is the energy content factor for the fuel type (i) (gigajoules per kilolitres) from Table 3 in (Department of Climate Change, 2009)
- $EF_{i,exec}$ is the emission factor for each gas type (j) from Table 3 in (Department of Climate Change, 2009)
Emissions of carbon dioxide:
\[ = \frac{(123 \times 38.6 \times 69.2)}{1000} \]
\[ = 328 \text{ t CO}_2\text{-e} \]

Emissions of methane:
\[ = \frac{(123 \times 38.6 \times 0.1)}{1000} \]
\[ = 0.47 \text{ t CO}_2\text{-e} \]

Emissions of nitrous oxide:
\[ = \frac{(123 \times 38.6 \times 0.2)}{1000} \]
\[ = 0.95 \text{ t CO}_2\text{-e} \]

Total scope 1 GHG emissions = 328 + 0.47 + 0.95 = 329 t CO\text{-e}

When operating at full production potential the site will have a fixed crushing and screening plant, water return pumping system and an office. These facilities will be powered by electricity sourced from the grid.

The consumption of this power will have indirect or scope 2 GHG emissions that is calculated below.

From 2.3.1. the peak daily power demand will be 400 kW/hrs.
The throughput of the primary jaw crusher is likely to be around 270 tonnes per hour or 2160 tonnes in an eight hour day. The annual production limit will be reached after 231 days operation.

The total power consumption will be 400 x 231 = 92,400 kW/hrs

From (Department of Climate Change, 2009):

\[ Y = \frac{Q \times EF}{1000} \]

where:
Y is the scope 2 emissions measured in CO\text{-e} tonnes
Q is the quantity of electricity purchased (kilowatt hours)
EF is the scope 2 emission factor for the State from Table 5 (Department of Climate Change, 2009)

Emissions of greenhouse gases (scope 2) in tonnes of CO\text{-e} are estimated as follows:
\[ = \frac{(92,400 \times 0.23)}{1000} \]
\[ = 21 \]

Total scope 2 GHG emissions = 21 tonnes CO\text{-e}
Other emissions that can be attributed to the development are land clearing and the transport of additives, equipment and fuels to the site. These sources are considered not significant and will not cause the total emissions to exceed the threshold for reporting under the National Greenhouse and Energy Reporting Act 2007 (Comm). As can be seen from the calculations above by far the greatest contribution to greenhouse gases from this quarry will be the burning of diesel fuel to energise earthmoving equipment. A recently introduced training course has highlighted opportunities to reduce fuel consumption while undertaking quarrying activities. The course reveals that by efficient placement of equipment and a reduction in engine rpm, a very small increase in load times can realise substantial reduction in fuel consumption and hence greenhouse gas emissions (Quarry, October 2009)

### 4.9.4. Assessment of Effects

The total annual estimated greenhouse gas emissions for the development when operating at maximum production levels is calculated here at 350 tonnes of CO$_2$-e. The trigger for the commonwealth reporting requirements for a controlling corporation as part of a group is 25 k/tonnes CO$_2$-e.

The proponent will employ efficient machine management techniques and scheduled maintenance to ensure that the operation will produce the minimum quantity of greenhouse gas emissions possible.

### 4.10. Heritage

#### 4.10.1. Existing Conditions

4.10.1.1. Historic heritage

A search conducted by the Heritage Council of the Tasmanian Heritage Register found twenty-one properties either listed, nominated for listing or with surveys pending located within the immediate area. Most properties were situated within the township of Bagdad or closer to Kempton. Four properties are listed in the township of Dysart, they include:

- St. Ann’s Anglican Church and Cemetery, 5 Church Lane,
- the former Baptist Church, 10 Dysart Drive,
- a culvert and quarry at 126 Dysart Drive, and
- a residence at 12 Dysart Drive.

These properties are represented on Figure 10 with a white star.

4.10.1.2. Aboriginal cultural heritage

Previous cultural heritage surveys have recorded findings of an abundance of sites and artefacts located in the Jordan River catchment. Assessment of these findings reveal a pattern of distribution of sites:

- They tend to be located close to a water course
- Larger sites are related to level elevated landscape features such basal slopes of hills or level spines of spurs which may have provided attractive camp sites.
Artefact and site densities are high also on major ridgeline that may have been used as travelling routes.

Artefact and site densities are lower away from watercourses and on moderate to steeply sloping terrain.

Research undertaken for the preparation of the Aboriginal Heritage Assessment found that two TASI sites are located within 5 kilometres of the proposal. Both sites are located on the western side of the Midland Highway south of Dysart and around 3 kilometres from the development site.

### 4.10.2. PERFORMANCE REQUIREMENTS

**Historic Cultural Heritage Act 1995** (Tas)

A works application is required for any works or development which may impact on the significance of a place entered in the Tasmanian Heritage Register.

**Aboriginal Relics Act 1975** (Tas).

It is necessary to evaluate the risk that in constructing the proposed quarry, the proponent will cause items or sites of cultural heritage significance to be disturbed or destroyed. To do so would be a breach of the ARA.

** Torres Strait Islander Heritage Protection Act 1987** (Comm).

This act ‘overrides the state legislation if the commonwealth minister is of the opinion that the state legislation is insufficient to protect the threatened items or sites.

**Environment Protection and Biodiversity Conservation Act 1999** (Comm)

This act was amended in 2003 to provide protection for cultural heritage sites.

The survey and report must conform to the *Aboriginal Heritage Investigation Report Guidelines* and meet the standards and requirements of the current *Practice Notes for Consulting Archaeologists*.

### 4.10.3. AVOIDANCE AND MITIGATION MEASURES

#### 4.10.3.1. Historic heritage:

The survey of the Tasmanian Heritage Register revealed that the only properties listed, close to the proposed quarry were on the western side of the Midland Highway. These properties are remote from the quarry and from the access road. It is highly unlikely that the quarry operation or traffic can have any direct impact on these properties. The only possibility of an indirect impact would be if the quarry were to substantially change the visual back drop to these buildings. The quarry has been designed to minimise visual impact especially from the Midland Highway. These design features will protect the view field behind the heritage listed properties from any substantial change.

#### 4.10.3.2. Aboriginal cultural heritage:

The Proponent engaged CHMA to undertake a complete and detailed Aboriginal cultural heritage survey of the quarry site and surrounds as well as those areas on the side of the access road that might be affected by road works or sediment control activities. The area of regrowth forest that will be disturbed by the extension to the access road was also investigated.
The product of the Aboriginal cultural heritage survey and report is a Cultural Heritage Management Plan. The plan prepared for the Constitution Hill site makes the following recommendations:

- No sites of aboriginal heritage significance were found in the study area so there are no specific constraints on the development proceeding within the study area.
- There were no specific areas of potential archaeological sensitivity identified within the study area that would warrant further archaeological investigation.
- If an item or site of cultural significance is discovered during the course of the works the ‘Unanticipated Discovery Plan’ included in the report should be initiated.
- The Aboriginal Heritage Report should be submitted to Aboriginal Heritage Tasmania for review and comment.

4.10.4. ASSESSMENT OF EFFECTS

4.10.4.1. Historic heritage

Features incorporated into the design will ensure that the quarry development and supporting infrastructure will not affect the view field from the direction of Dysart and the Midland Highway. The quarry can have no other impact on the currently listed properties in the vicinity.

4.10.4.2. Aboriginal cultural heritage

Independent professional archaeologists have found no sign of any sites or items of aboriginal cultural significance within the areas of disturbance associated with the quarry development. It is highly unlikely that the quarry will impact on any sites or artefacts. A complete copy of the Archaeologist’s report is included as appendix 8.

4.11. LAND USE AND DEVELOPMENT

4.11.1. EXISTING CONDITIONS

The development is wholly located within the Southern Midlands Council’s municipal area and the Council administers the development controls through the Southern Midlands Planning Scheme 1998. The development is located on land that is zoned Rural Forest. The lower section of the access road traverses land zoned Rural Agriculture. The intent of the Rural Forest zone includes giving priority to multiple uses including extractive industry (Southern Midlands Council, 2007). A quarry is considered by the planning scheme to be a low or medium impact industry and as such is discretionary in the Rural Forest zone.

4.11.2. PERFORMANCE REQUIREMENTS

Requirements for controlling land use and development are included in:

Southern Midlands Planning Scheme 1998
4.11.3. **AVOIDANCE AND MITIGATION MEASURES**

A full response to the provisions of the Southern Midlands Council Planning Scheme is included in Appendix 9.

4.11.4. **ASSESSMENT OF EFFECTS**

The response to the planning scheme shows that if proper environmental controls are implemented the Constitution Hill Quarry will not only comply with the requirements of the planning scheme but help to realise some of the strategic goals for the community.

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4.12. **VISUAL EFFECTS**

4.12.1. **EXISTING CONDITIONS**

The Constitution Hill Quarry proposal is set in a landscape of varied agricultural land uses and forestry activities. When viewed from a distance the appearance of the landscape is a mosaic of dark forested steeper gullies and hill crests and light coloured pastures and crops. The colour of the cultivated land would change with the seasons.

The location of the quarry is over the crest of a ridgeline running north west from Spences Hill. Spences Hill is forested and below the ridgeline on the maximal upper slope new plantations have been established. The forest on Spences Hill is separated from a forested area on neighbouring land to the northwest by a ridgeline with very sparse mature trees.

The features described are elevated from the surrounding terrain and hence form the skyline from many vantage points to the west and south. From these points Spences Hill is an obvious visual marker as is Constitution Hill to the west.

4.12.2. **PERFORMANCE REQUIREMENTS**

To be acceptable for the local community and to the travelling public a development should not detract from the existing landscape character or become a focal point that catches the eye. Features introduced with the development should either blend with the existing landscape or be concealed from all obvious viewpoints.

4.12.3. **AVOIDANCE AND MITIGATION MEASURES**

The situation for the quarry was selected because it is elevated above the surrounding land and so the actual excavation will be concealed from vantage points outside the property boundaries. The quarry site is also remote from any vantage points and so any glimpses of infrastructure will be difficult to discern. The brown colour of the soil and the dark blue/grey colour of the rock also make any initial scarring less visible in the period before they are completely concealed by revegetation works.

The decision to develop the resource by excavating in a slot resulted from the close proximity of a property boundary on the western side. The only off site vantage points occur to the west and an added advantage of the slot arrangement is that the original ridge and hence skyline are retained.
The land on the upper slope approaching the ridgeline is planted out with an immature plantation which overtime will continue to grow and fill the gap between the forests on Spences Hill and the neighbouring land. The plantation trees will further conceal the quarry operation from view points to the west and south.

### 4.12.4. Assessment of Effects

To assess the visual impact of the development from certain vantage points the footprint of the quarry has been traced on the terrain surface in Google Earth (GE). With the terrain on, the views from various locations were tested to determine whether the footprint of the quarry could be seen. These views were recorded as images and the viewpoint locations transferred to GPS coordinates.

The boundaries of the mining lease, the access road alignment were included in the model to help with orientation. The future crusher building was created by forming a rectangle with a height. The crusher building will rest on the 638 m level. The natural ground level at this point is around 650 m, the building is assumed to be 18 metres high so the rectangle has a vertical height above ground of 6 metres.

The vantage points were then visited and photographs taken of the view towards the future quarry site. By visiting the site it could be determined whether a clear sight line to the site exists and the photographs were then used to evaluate how realistic the GE images are. In some cases the future quarry site was found to be more prominent from an alternative site other than those set in GE. In these cases a new point was recorded and a photograph taken and then the virtual view from these sites compared. Figure 15 below shows the vantage points where the quarry is likely to be most visible. In the following pages a series of plates show a comparison of the GE virtual image and an actual photograph, project features are labelled on the GE image.

The imagery and terrain model generated by GE and used in this visual assessment does not consider trees, road cuttings and other localised features that can obstruct views from certain locations.
FIGURE 15 GE IMAGE SHOWING THE LOCATION OF VARIOUS VANTAGE POINTS
PLATE 5: VIRTUAL VIEW FROM MIDLAND HIGHWAY (BAGDAD)

PLATE 6: ACTUAL VIEW FROM MIDLAND HIGHWAY (BAGDAD)
Constitution Hill Quarry - Development Proposal and Environmental Management Plan

PLATE 7: VIRTUAL VIEW FROM EAST BAGDAD ROAD

PLATE 8: ACTUAL VIEW FROM EAST BAGDAD ROAD
PLATE 9: VIRTUAL VIEW FROM QUION MOUNTAIN

PLATE 10: ACTUAL VIEW FROM QUION MOUNTAIN
PLATE 11: VIRTUAL VIEW FROM CLIFTON VALE ROAD

PLATE 12: ACTUAL VIEW FROM CLIFTON VALE ROAD
PLATE 13: VIRTUAL VIEW FROM ELY STREET

PLATE 14: ACTUAL VIEW FROM ELY STREET
Constitution Hill Quarry - Development Proposal and Environmental Management Plan

Final

FIGURE 16: CROSS SECTION AA FROM ELY STREET TO STAGE 2 AND 3 CONSTRUCTION WITH CRUSHER BUILDING

Integrated Land Management and Planning
If the footprint of the quarry were visible from the vantage points shown it would appear in the virtual images. All the public vantage points are below the ridgeline in elevation and hence the footprint cannot be seen. The vantage point on Quoin Mountain is higher than the quarry site and the footprint can be clearly seen although at some distance away. This vantage point is on the landowner’s property and therefore has restricted access.

The access road is visible from most vantage points but in reality the road is either located on existing roads or is traversing forested land and hence will be concealed by trees on the western side. The immature plantation trees will gradually grow and further conceal the development from all vantage points.

The crusher building is visible from the Clifton Vale Road and Ely Street vantage points in the virtual image but in reality the existing mature remnant trees and new plantation trees will conceal this feature when it is built. The view from the Midland Highway from this direction will be similar but from a lower level so the development will be better concealed. The View from Ely Street is considered the worst case for off-site visual impact and a sight line cross section has been developed from this point.

Figure 16 is a cross section on a sight line from Ely Street at view point 5 to the proposed quarry site. The ground levels are developed from 10 metre contours from TheLIST and other features are derived from GE imagery. The vertical scale is exaggerated by a factor of 2 to make the topography more pronounced. The sight line shows that even without the existing and future forest and plantation the crusher building and the quarry face behind will be 2.7 kilometres away and almost completely concealed by the remaining ridgeline topography.

4.13. SOCIO-ECONOMIC ISSUES

4.13.1. EXISTING CONDITIONS

The Constitution Hill quarry development is located within the Southern Midlands local government area. This is a municipality encompassing the population centres of Bagdad, Kempton and Oatlands. The municipality has a population of slightly over 5,500 at the last census (Australian Bureau of Statistics, 2007). The total labour force of the region is 2,500 of which nearly 15 percent are employed in ‘sheep, beef cattle and grain farming’ three times the proportion employed in any other sector. Ten percent of the labour force are recorded as being ‘machinery operators and drivers’ and nearly 16 percent ‘technicians and trade workers’.

The Southern Midlands Council operates a small quarry to service its construction and maintenance activities. The quarry has reached the end of its useful life and will soon be closed and rehabilitated. If an alternative source of construction materials cannot be found the Council will have to establish a new quarry at considerable cost.
4.13.2. **PERFORMANCE REQUIREMENTS**

The overall impact on the region of a new development should be positive in providing new employment opportunities, capacity for new service industries and injecting private and government capital into the local economy.

4.13.3. **AVOIDANCE AND MITIGATION MEASURES**

The Proponent is a major company owned locally and employing up to 500 Tasmanians. The majority of the company’s expenditure is circulated in the state sourcing labour and materials. Where practical the company will access materials and services from local providers both during the construction and operating phases of the project.

The new quarry will provide the Southern Midlands Council with an alternative source of materials and negate the need to establish a new quarry to supply their needs.

The quarry and supporting infrastructure is wholly located on private land. The only change to public infrastructure will be improvements to sight distances and surfacing on Harbachs Road. The general public does not have access to the site and recreational opportunities will not be adversely affected.

4.13.4. **ASSESSMENT OF EFFECTS**

The Proponent predicts that over the next 10 years the State and Commonwealth Governments will be investing in road and water infrastructure. The State’s major arterial road transport route, the Midland Highway, runs through the Southern Midlands Council’s municipality.

Projects constructing or upgrading linear infrastructure such as roads, railways and pipelines require large quantities of quarry products including gravels, aggregates and concrete. If these materials can be sourced locally there will be benefits to the local community in:

- direct employment of local people that will spend their salaries locally,
- direct injection of government investment by supporting new businesses to supply products and services, and
- secondary investment through business accessing local products and services.

The wider community will benefit from sourcing products locally by a reduced transport component included construction materials resulting in:

- lower construction costs;
- less transport/kilometres on the state highway network leading to less maintenance costs less congestion and increased road safety; and
- less consumption of transport fuels and less green house gas emissions from transport.

The Proponent’s company has a strong record on staff development and training, up-skilling where necessary rather than importing personnel to meet commercial needs. The Southern Midlands region has a workforce with strengths in machinery operation and trades that would benefit from an opportunity to work with a strong company on an important project.
4.14. HEALTH AND SAFETY ISSUES

4.14.1. EXISTING CONDITIONS

Land uses on the property include plantation forestry, grazing stock and native forest management. There are already areas with steep rocky country, tree felling operations at different times, weed management activities using hazardous chemicals and heavy machinery on the internal road network.

Access to the property is controlled with gates and a full time property manager. The Proponent will maintain the security of access by retaining the gate on the main access road.

The introduction of the quarry activity will introduce new health and safety issues associated with the:

- frequent operation of the heavy machinery,
- transport and use of explosives for blasting,
- emission of dust from blasting, crushing and processing of rock containing quartz, and the
- emission of noise from blasting, crushing and machinery operation.

The quarry operator will be responsible for ensuring that all the people working on the site have a safe and health workplace and the activities on the site cause no harm to a member of the public.

4.14.2. PERFORMANCE REQUIREMENTS

Legislation controlling health and safety issues include:

- Workplace Health and Safety Regulations 1998

4.14.3. AVOIDANCE AND MITIGATION MEASURES

The Proponent is an experienced quarry operator and has over sixty years experience controlling heavy machinery and transport operations. Hazell Bros Group employ a safety health and environment manager and a comprehensive array of safety management procedures referring to quarry operations and the operation of heavy machinery.

Blasting at the site will be performed by a professional blasting contractor. A site specific hazard analysis and risk assessment will be carried out and documented. A blasting plan will be designed for the site and modified while extraction activities progress. Storage and handling of the explosives will be in accordance with the Security-sensitive Dangerous Substances Act 2005 (TAS) and the Security-sensitive Dangerous Substances Regulations 2005.

Dust emissions from the site will be controlled by the four mitigating factors or actions discussed in section 4.1.

Noise emissions will be controlled by the factors and strategies identified in section 4.6.
4.14.4. **Assessment of Effects**

The Proponent will do all that is reasonably practical to ensure that the quarry construction and operation poses no risk to the health and safety of employees or the local community.

The greatest risk from air quality problems caused by the quarry will be to employees working on the site. The strategies detailed in the dust management plan will keep this risk to acceptable levels.

Water quality in receiving waters should not be affected by the quarry operation. A combination of the sediment retention facility, the swale drain and the return water recovery impoundment and pump station will ensure that runoff water from the quarry will be retained and recycled. Overflow from the impoundment is remote from the nearest watercourse and discharge is unlikely to reach this watercourse in other than the most extreme conditions. In these conditions runoff from the quarry will be a minor contributor to the overall flow.

Risks associated with the use of machinery and explosives will be controlled through the Proponent’s and their contractor’s safety management systems.

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4.15. **Hazard Analysis and Risk Assessment**

4.15.1. **Existing Conditions**

This proposal will introduce new activities to the land and region. There are environmental risks associated with the introduction of new activities to a region or community. The proponent must undertake a structured analysis to identify the hazards and assess the environmental risk.

4.15.2. **Performance Requirements**

The quarry operator has a responsibility to ensure that any activities under their control do not cause injury to any person, nuisance to any neighbours or pose a threat to the environment or the community.

Apart from common law claims against nuisance the Quarry’s Operator is obliged to manage the risk of environmental harm through the EMPCA legislation.

4.15.3. **Avoidance and Mitigation Measures**

To ensure that environmental hazards are identified, accurately evaluated and the risks assessed a formal hazard analysis and risk assessment has been completed and is included in this document as Appendix 11.

4.15.4. **Assessment of Effects**

The hazard analysis and risk assessment found that the activities associated with the initial phase and the operational phases of the quarry operation are similar. The hazard analysis found that there are risks to the receiving environment particularly from sediment, dust and effluent.
emanating from earthmoving operations. There are also risks of the operation causing a nuisance to neighbours of the operation through noise, traffic and blasting.

The risk assessment found that the risk of most hazards can be reduced to a level of ‘Low’ by the application of specified controls, all of which are detailed elsewhere in this document. The application of controls can reduce risk rating of three hazards to a level of ‘Moderate’. These hazards are:

- The spread of weeds and diseases into the natural vegetation surrounding.
- The impact of air blast overpressure and ground vibration on neighbours.
- The impact of noise from the crusher affecting neighbours.

With this level of residual risk it is necessary for the Quarry Manager to evaluate the specified controls each time the task that gives rise to the hazard is introduced and only when satisfied that the risk is minimised authorise the activity.

4.16. **FIRE RISK**

4.16.1. **EXISTING CONDITIONS**

Employees working on the site are subject to a risk of a bush fire approaching from the forest conservation reserve located on the west boundary. This direction is also the predominant and strongest wind direction during the summer season. The quarry site has plantations to the north, east and native forest to the south.

Maintaining heavy earthmoving machinery often involves hot work including welding and grinding which can pose a risk to the surrounding forest.

4.16.2. **PERFORMANCE REQUIREMENTS**

Minimise the risk to employees from bush fires in the surrounding forest and plantations and the risk to the forest and plantations from fire escaping from the site.

4.16.3. **AVOIDANCE AND MITIGATION MEASURES**

Consultation with Mr Gerald Crawford of Tasmania Fire Service resulted in the following prescriptions to be introduced as a fire management plan:

Vegetation from the quarry footprint will be stripped and windrowed outside the works area. Inside the vegetation windrow will be two windrows, the outside will be topsoil and the closest to the operation will be subsoil and overburden. The quarry footprint will be between 3 and 6 hectares of land clear of combustible materials.

The fuel storage area will located at least 50 metres clear of vegetation.

A supply of water will be available for fire fighting purposes that is accessible when the quarry is in operation. This can be hoses from a reticulated supply within the quarry compound, a relocatable tank either on skids or on a trailer or a water cart with a pump operated spray or hose.

Hot works will only occur at the main quarry extraction and processing area and with equipment suitable for fire suppression purposes at hand. Fire suppression equipment will be at least a 9 kg dry chemical fire extinguisher.
### 4.16.4. Assessment of Effects

The quarry extraction and processing areas presents a defendable space with a limited supply of water that can be used in fire fighting operations. Restrictions on hot work will ensure that surrounding forest and plantations will not be threatened by fire escaping from the quarry operation.

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### 4.17. Infrastructure and Offsite Ancillary Facilities

#### 4.17.1. Existing Conditions

- **4.17.1.1. Midland Highway**
  
The Midland Highway is the major arterial route between the major population centres in the south and north of the state. The Midland Highway in the vicinity of the quarry access carries on average 5632 vehicle per day (Prodanovic, 2009).

- **4.17.1.2. Harbachs Road**
  
  Harbachs Road services around fifty, mainly rural residential properties and carries an average of 100 vehicles per day. The quarry traffic will add substantially to Harbachs Road vehicle loading; however there are no entrances onto Harbachs Road between the quarry entrance and the intersection with the Midland Highway.

- **4.17.1.3. Midland Highway Intersections**
  
The quarry development will create turning movements at the intersections of Swan Street, Harbachs Road and Clifton Vale Road. The safety of these facilities has been assessed in the traffic impact assessment (Prodanovic, 2009).

- **4.17.1.4. Other Infrastructure**
  
  Other infrastructure requirements include electric power and water. Water will be recirculated from the quarry utilising the existing water storage infrastructure established for the agricultural operations. 3 phase electrical power will supplied by an extension to the existing supply to the Property Manager’s workshops and machinery sheds off Prichard’s Lane.

#### 4.17.2. Performance Requirements

The development should not place an unacceptable burden on existing offsite and ancillary infrastructure.

#### 4.17.3. Avoidance and Mitigation Measures

- **4.17.3.1. Midlands highway**
  
  On average the quarry will generate around 200 truck movements per day and on occasion a peak load of 520 truck movements per day. These trucks will be delivering construction materials to various road and other projects in the vicinity. The quarry is strategically located to service projects north of Hobart and if this application is successful, will reduce the number of ‘truck kilometres’ travelled on the highway system for projects locally.
4.17.3.2. Harbachs Road

The Proponent has made a commitment to assist with the maintenance of Harbachs Road for the 200 or so metres that will be utilised by the quarry. The proponent will also improve sight distance on Harbachs Road by grading the embankment on the inside of the bend immediately south of the quarry entrance.

4.17.3.3. Other Intersections

The geometric design of these intersections enable vehicles to follow wide turning paths which will reduce the damage caused to the pavement surface by axles twisting in tight turns.

4.17.3.4. Other infrastructure

The development will recycle water used in production by detaining the process water to allow solids to settle and then storing the water in a nearby impoundment. If in the future the capacity of the water recovery impoundment is insufficient extra water will be pumped across from another water storage identified in Figure 11.

An application will be made to Aurora Energy on their Form A when more is known regarding the electrical power demand of the stage 2 development phase.

4.17.4. Assessment of Effects

There will be an increase in heavy traffic at the three intersections affected by the proposal. The Traffic Impact Assessment prepared for this proposal found the intersections had been designed to accommodate semi-trailer movements. Truck and trailers will be able to negotiate the intersections with minimal damage to the road surface.

The Proponent will contribute to the care and maintenance of the short section of Harbachs Road directly affected and will improve sight distance on a bend south of the proposed quarry entrance. The quarry will reduce truck kilometres on the highway system for major projects north of Mangalore.

The development will collect water from the surface of the developed area and reuse it in its process. The water supply will be supplemented by drawing from existing impoundments and will not deplete water reserves in local streams.

It is highly unlikely that the power consumption of the processing equipment will be greater than can be supplied by Aurora energy’s existing infrastructure.

4.18. Environmental Management Systems

4.18.1. Existing Conditions

This quarry development is proposed to take place on land that has traditionally been managed for agricultural and timber production. Recently another level of management has been introduced by forestry activities. Until very recently the site for the quarry was under the management control of a Forest Practices Plan number TRI 0427. The plantations adjoining the quarry site continue to be routinely inspected for health and disease symptoms.
The agricultural production area of the land is managed by an on-site manager that undertakes regular maintenance of fences and drainage structures, weed management and patrols for unauthorised entry. The hands-on management of the plantation and agricultural aspects of the land will continue.

4.18.2. PERFORMANCE REQUIREMENTS

Introduction of the new activity will bring with it a new manager to share the responsibility for environmental management of the land. The introduction of a new manager should lead to more comprehensive management of that portion of the land that encompasses the mining lease.

4.18.3. EXISTING ENVIRONMENTAL MANAGEMENT SYSTEMS

The Proponent will be the lessee of a mining lease covering 880 hectares of the property and as such will share responsibility for the environmental management of that area with the landowner and the plantation managers. The new managers will use their experience and considerable resources to enhance the overall environmental management effort on the land.

The Proponent has included an Integrated Management System (IMS) into its daily business. The IMS combines quality, environmental and occupational health and safety systems into the Group Management System. The Environmental Management System complies with the international standard ISO 14001.

The Environmental Management System is articulated in a series of policies and is communicated to new employees and all employees and visitors during inductions to different workplaces. The IMS is overseen by a Safety Health and Environment Manager that ensures that the objectives and targets of the three disciplines are met. All employees and contractors are made aware that the Proponent’s requirements for environmental care apply to all sites whether they are owned or leased.

4.18.4. NEW ENVIRONMENTAL MANAGEMENT SYSTEMS

Various sections within this document specify particular management prescriptions for different environmental aspects. These prescriptions will be incorporated into the daily business at the quarry site by including these into the IMS thorough the Constitution Hill site’s List of Environmental Aspects and Impacts. The specific provisions include:

- Air quality monitoring and introducing mitigation strategies when the need arises.
- Noise and vibration monitoring during blasting and reporting of the results.
- Vegetation condition and weed monitoring and interventions to mitigate effects.

The combination of these new initiatives and the Proponent’s existing commitment to environmental management will result in an overall benefit for the environmental management of the land.
4.19. **Cumulative and Interactive Effects**

### 4.19.1. Existing Conditions

The Dysart Bagdad area is predominantly a rural region with the majority of the population either commuting out of the area to work or engaged in agricultural activities. There are no major industrial developments planned in the vicinity that might clash with the quarry development to cause an adverse effect.

During periods of dry weather and strong wind the combination of dust entrained in the air column from agricultural land could combine with dust from the quarry to create an adverse environmental effect.

Exposed soil on agricultural land surrounding the development is likely to contribute to water quality problems during extreme rainfall events. Uncontained runoff from the quarry development could aggravate background water quality problems.

### 4.19.2. Performance Requirements

The planning and management of the development should not interact with other bio-physical, socio-economic or cultural effects to worsen the situation.

### 4.19.3. Avoidance and Mitigation Measures

The proposal will provide the region with a source of high quality construction material with reduced transport requirements making any future developments more economically and environmentally sustainable.

By enforcing the Dust Management Plan the Proponent will ensure that adverse air quality conditions in periods of extreme weather will not be aggravated by the quarry operation.

Sediment control infrastructures on the access road and for the quarry will ensure that the access road and quarry development do not contribute to water quality issues during both construction and operational phases.

### 4.19.4. Assessment of Effects

The development will have an overall socio-economic benefit to the local community without degrading environmental conditions.

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4.20. **Traffic Impacts**

### 4.20.1. Existing Conditions

The existing traffic environment takes into account four junctions in all including:

- Harbachs Road junction with the quarry access road approximately 200 metres from the beginning of Harbachs Road,
- the junction of Harbachs Road with the Midland Highway,
- the most southern junction of Swan Street in Bagdad with the Midland Highway, and
- Clifton Vale Road junction with the Midland Highway.
All these elements are involved because the Midland Highway is divided between north bound and south bound traffic lanes. North bound traffic entering the quarry must turn left at the Clifton Vale Road junction and cross the north bound lane to approach Harbachs road in the south bound lane. Likewise north bound traffic exiting the quarry must travel in the southbound lane to the Swan Street junction and cross into the north bound lane. See Figure 17 for the layout of intersections servicing traffic accessing the quarry.

The traffic volumes on the Midland Highway were recorded in May 2008 and an average weekday traffic flow of 5,632 vehicles per day was reported.

### 4.20.1. PERFORMANCE REQUIREMENTS

To satisfy the requirements of the Department of Infrastructure Energy and Resources - Land Transport Safety Section the proposal must be assessed using the Traffic Impact Assessment Guidelines.

The assessment is made in reference to the ‘Austroads’ documents:


### 4.20.2. AVOIDANCE AND MITIGATION MEASURES

The Traffic Impact Assessment prepared for this proposal and included in the document as Appendix 12 found that sight distance south along Harbachs Road from the quarry access road junction was inadequate. The sight distance will be improved to meet the standard by grading the embankment on the internal corner on the eastern side of Harbachs Road. Consideration was given to the need for an acceleration lane on the highway starting at the Harbachs Road junction but calculations found that it was not required.

### 4.20.3. ASSESSMENT OF EFFECTS

The assessment calculated that the quarry will generate on average 200 movements per day with occasional peaks of up to 520 movements. The normal traffic volume on Harbachs Road is estimated at less than 100 movements and hence would be expected to increase to 300 movements per day.

The assessment found that the additional traffic onto the road network will not create any safety or operational issues at the affected highway junctions or along the highway.

(Prodanovic, 2009)
FIGURE 17: ARRANGEMENT OF INTERSECTIONS SERVICING QUARRY ACCESS

- Traffic destined for quarry from the north
- Traffic destined for quarry from the south
- Traffic entering quarry
- Traffic exiting quarry
- Clifton Vale Road junction with Midland Highway
- Harbachs Road junction with Midland Highway
- Quarry access junction with Harbachs Road
- Swan Street junction with Midland Highway
- Quarry traffic northbound
- Quarry traffic southbound
5. Monitoring and Review

5.1. Air Quality Monitoring

Performance criteria

The dust monitoring program will use the criteria for dust deposition rates from the Department of Environment and Conservation NSW. These criteria offer a maximum dust deposition rate that can be measured with Dust Deposition Gauges and is measured in grams per square metre per month.

No background monitoring will be undertaken because air quality is likely to be highly variable based on the prevailing weather conditions and what agricultural activities are occurring.

Performance assessment

The results of the air quality monitoring program will be evaluated monthly as records are kept. The three sites and the control will be compared against the maximum deposition criteria and against each other.

Any occasion where the limits have been exceeded will be treated as a ‘non-conformance’ and an investigation will ensue. Prevailing weather conditions when the limits where exceeded will be compared to the dust control measures recorded in the Construction Engineer’s or Quarry Manager’s notes. The Dust Management Procedure will be modified to strengthen controls when those activities and conditions align in the future. The records of the monitoring, investigation and actions will be available for scrutiny by the regulator.

The routine dust monitoring program will be invoked at the direction of the EPA and will continue for three years. If the prescribed air quality limits have not been exceeded in that three year period the operator will apply to the EPA to curtail the monitoring program.

Review

A report will be prepared triennially to be submitted to the regulator that describes the results of the monitoring, occasions where the maximum deposition levels have been exceeded and the resultant actions to prevent re-occurrences.

5.2. Noise Monitoring

The blast impact assessment report prepared by Vipac Engineers and Scientist Ltd recommends that a management plan for controlling blast impacts be developed. This plan will be informed by ongoing monitoring of each blast during construction and operation.

Performance criteria

The quarry Code of Practice describes the acceptable standard for blasting control as follows:
“Blasting must be carried out such that, when measured at the cartilage of the nearest residence (or sensitive use) in other occupation or ownership, air blast and ground vibration must comply with the following:

a) for 95% of blasts, air blast overpressure must not exceed 115 dB (Lin Peak);
b) air blast overpressure must not exceed 120 dB (Lin Peak) at all; and

c) ground vibration must not exceed 5 mm/s peak particle velocity.”

(Department of Primary Industries, Water and Environment, 1999)

Performance assessment

The blast monitoring will take place at appropriate locations and the results will enable vibration and air-blast propagation equations to inform the blast design.

The blast monitoring will also demonstrate compliance with the accepted limits.

If the acceptable limits are exceeded actions to reduce air blast impacts will be introduced into the blast plan to reduce the impact to within the acceptable limits.

Review

The blast management plan will be submitted for approval by the regulator.

If blast impact mitigation actions are to be introduced, the regulator must review the monitoring report and approve the actions.

5.3. Vegetation monitoring

The flora and fauna assessment and report prepared by Northbarker and Associates recommends that a vegetation management and rehabilitation plan be prepared. A monitoring program will be incorporated into this plan to evaluate the response of the vegetation as described in the flora and fauna assessment to the introduction of the quarrying activity.

Performance criteria

The vegetation monitoring program will analyse the condition of the natural vegetation communities in close proximity to the major quarry infrastructure. There should be no detrimental effects on the condition of those communities over time.

Performance assessment

Vegetation monitoring will consist of a series of ‘photo monitoring sites’ in unspoilt areas of the different communities occurring around the site. The procedure for establishing a photo monitoring site will follow that described in (Barker, 2001). Periodically photographs will be taken and kept as record of the vegetation condition at that time.
Review

Photographs will be compared to previous photographs of the same site and any changes in the condition of the vegetation noted. Where change is occurring, possible causes will be evaluated and remedial actions introduced to reverse the change.

The reports of the vegetation assessment, comparisons and any remedial actions will be available for scrutiny by the regulator.

5.4. WEED MONITORING

The vegetation management and rehabilitation plan as recommended by NorthBarker and Associates will have a weed management component. An integral part of this component will be weed monitoring.

Performance criteria

The flora and fauna survey identified three weeds listed as ‘declared weeds’ by the Weed Management Act 1999. The management of the weed infestations is a requirement under the act and the Proponent has shared responsibility with the landowner to prevent the spread of the weeds to neighbouring properties.

Performance assessment

The extent of the existing weed infestations will be mapped as an initial step in the weed management plan. Localised dense infestations will have photo monitoring sites established as described earlier for vegetation assessment. A photo record will enable the effectiveness of weed control strategies to be assessed over time.

As part of the weed management plan, neighbouring properties on the boundary of the operations areas of the quarry will be monitored for any change in the prevalence of weed infestations. Any change apparent from these investigations will initiate remedial actions in active weed management.

Review

The weed management plan will be submitted and approved by the regulator. The records from photo monitoring sites, weed infestation mapping and visual assessment on neighbouring properties will be available for scrutiny by the regulator.

5.5. WATER QUALITY MONITORING

The infrastructure designed to control any impact on water quality in receiving waters makes it highly unlikely that the development will cause an adverse effect. Water quality monitoring will be undertaken where it can be demonstrated that the quarry development has contributed to a water quality problem.
6. DECOMMISSIONING AND REHABILITATION

6.1. CONSTRUCTION PHASE

In order to install the safe guards necessary to ensure that the project has minimal impact on the environment and community it will be necessary to disturb areas in the construction phase. As soon as these facilities are constructed the exposed surfaces will be rehabilitated. The rehabilitation and re-vegetation works will be monitored and maintained through the construction and operational phases until such time as a self sustaining ground cover is established.

Along the existing access road new sediment retention facilities will be installed where none exist. Where sediment retention facilities have been previously installed they will be maintained or improved to ensure efficient operation for the life of the project. Details of the location and type of sediment control infrastructure are discussed in Section 4.2.

All areas disturbed in the construction phase and not required for extraction, processing or equipment and vehicles will be immediately rehabilitated. These areas include; retention basin embankments; cut-off drains; road cuttings and embankments and temporary site compounds and vehicle hardstands.

6.1.1. SEDIMENT RETENTION EMBANKMENTS

Work to construct or expand sediment retention basins will require stripping of natural vegetation and excavating down through the surface soil layers. These materials will be windrowed separately and once the basin has been formed from low permeability structural subsoils the areas that will not be inundated will be covered with the stockpiled materials placed in the correct order. In wooded locations rough stripping will be placed over the placed soil to protect it until vegetation has a chance to ‘take’.

Inundated areas will be periodically stripped to remove accumulated silt so revegetation of the inside of the basin will not be successful. Vegetation will be encouraged on the spillway or discharge points to dissipate energy in the flow of water and stabilise the ground surface. The discharge points will be designed to encourage diffuse discharge over natural ground into vegetation and away from natural watercourses.

6.1.2. CUT OFF DRAINS

The cut off drains upslope of the quarry proper will be excavated early in the site works so that these facilities can be well progressed with re-vegetation before they are needed. The drains will be wide and shallow and formed in the subsoil. Topsoil will be spread over the surface of the drain and the growth of reeds, ferns and grasses will be encouraged. These drains will not be required to carry large flows because the catchment is small.

6.1.3. ROAD CUTTINGS AND EMBANKMENTS

Most of access road follows an existing alignment and works will be confined to widening the formation by cutting new faces in the existing cuttings. In these cases the vegetation and soil above
the existing face will be pushed back to behind the new cutting and then pulled forward over the new slope. On fill embankments the existing vegetation and topsoil will be pushed down outside the extent of the new embankment and then pulled up over the slope in the correct order.

Where ever possible rough woody stripping will be spread over the new ground to protect the vulnerable soils under and promote early natural germination of seeds. In situations where stripping is not available a sterile annual grass seed will be broadcast as a cover crop to secure soil and provide a thatch to capture and encourage colonising plants.

6.1.4. Temporary Hardstands
The surface will be ripped and subsoil and topsoil spread over the surface. The surface will be deliberately rough to provide a variety of habitats for colonising plants and to discourage further use by vehicles. Any wood vegetation stripped to prepare the hardstand will be pulled over the surface to encourage recruitment of colonising species.

6.2. Operational Phase Progressive Rehabilitation
As a consequence of the ‘slot design’ mode for the proposal the actual footprint of the quarry will remain small at six hectares. Because the quarry is located on top of a ridge it is possible to excavate deeply without a serious threat of inundation. The small footprint and the proposed ‘stage three’ development in the floor of the ‘stage two’ quarry conspire to restrict opportunities to progressively rehabilitate ‘worked out’ areas.

At the beginning of stage three it will be possible to commence rehabilitation on the 650 metre bench closest to the western boundary of the site. This rehabilitation will assist in increasing the density of trees along the ridgeline visually connecting the woodland areas to the west and on Spences Hill. This revegetation works will also reinforce the habitat links between these woodland fragments, enhancing opportunities for population expansion for a variety of species. Figure 7 shows the quarry footprint at this stage with the early stages of progressive rehabilitation along the west and northwest corner. The techniques used to effect the rehabilitation are in line with current best practice as described in the Quarry Code of Practice and are described below.

6.2.1. Earthworks
The outside edge of the 650 metre bench will be fired to produce two faces approximately 6 metres high. The explosives holes will be over drilled to fracture the surface of the bench. Overburden and subsoil will placed against the toe of each of the faces and topsoil roughly spread over the surface.

6.2.2. Revegetation
Where available woody stripping material including uprooted shrubs, tree limbs and bark will be spread over the growing medium to stabilise the soil and provide cover for colonising plants. A selection of local provenance trees and shrubs will be planted into the growing medium in autumn to allow from the plants to acclimatise over winter.
6.2.3. MAINTENANCE
The planting will be monitored during the year and at least one extra planting will take place annually to replace losses. Weed infestations that threaten to smother the immature plants will be treated by cut an paint methods for woody weeds and selective foliar spray for others. Care must be taken to not impact on the revegetation plants.

6.3. PIT CLOSURE AND REHABILITATION
At the end of the service life of the quarry the site will be rehabilitated and returned to the current use of plantation and woodland. Figure 8 shows the arrangement of the proposed rehabilitation works at final pit closure. The final closure plan may vary according to the actual conditions at the time of closure.

6.3.1. FINAL EXTRACTION ACTIVITIES
Leading up to pit closure the final extraction works will concentrate on the outer edge of the benches effectively cutting each face in half to produce 3.0 metre wide benches and 5 to 6 metres high faces. A new ramp will be constructed at the northern end of the 638 metres bench as part of the extraction activities to provide for an access track connection. Materials won will either be rock for production or overburden for rehabilitation works.

6.3.2. REHABILITATION WORKS
As extraction activities progress around the sides of the pit rehabilitation materials will be recovered from stockpiles outside the perimeter and spread over the benches. Excess rehabilitation material will be used in the floor of the pit to construct a growing medium. The bench on the eastern side at the 638 metre level will be left wider to accommodate a continuation of the access road. The processing area will be roughly covered with subsoil and overburden. The topsoil will be spread over the new surface and any stripping spread over this surface.

The floor of the pit will remain graded towards two drainage lines, culverts will be removed and a growing medium consisting of overburden, subsoil and topsoil will be spread over the surface. The sides of the sediment retention basin will be collapsed to form a more natural shape and the spoil placed in the bottom to lower the slope of the sides.

The faces of the cutting for the discharge from the pond will be laid back with a bench and the surfaces spread with soil and stripping. The sediment retention basin and the swale drain will remain as permanent drainage paths for the rehabilitated pit excavation.

Once all extraction and processing activities are finished the equipment will be removed from the site:

- The power supply will be terminated at the site manager’s machinery shed and the poles and wires removed.
- Pump stations and rising mains will be taken off-site for disposal or re-use.
- Sewer, water and power connections will be removed from the relocatable offices and workshops and the buildings will be taken off-site.
• The crusher complex will be disassembled and removed from the site for re-use or disposal.
• Concrete footings for all site infrastructure including buildings, machinery, hoppers and culverts will be broken out and removed from the site.

6.3.3. Revegetation
The final landform after extraction and rehabilitation activities are complete will consist of; the faces and benches; the old processing area; the pit floor and the drainage works. The revegetation treatment will change according to the location:

• Pit faces, benches and processing areas will be planted out with local provenance species consisting of ground cover, shrubs to form a mid storey and trees similar to the mix in the neighbouring woodlands.
• The drainage works will be planted out with local provenance reeds species. The cutting slopes will be planted out with similar species to the benches.
• The pit floor will be planted out with plantation Eucalypts in line with the other plantations on the property.
7. COMMITMENTS

Commitments are incorporated as a separate document included as Appendix 13.
8. CONCLUSION

This document describes a proposal by a local Tasmanian company, Hazell Bros Group Pty Ltd to develop a new quarry at Dysart. The proposed quarry is on private land and remote from neighbours but still close to future works. By locating the quarry in the Southern Midlands region its development can help the local community share in some real benefits flowing from future infrastructure projects planned for the region.

The site is within an agricultural property part grazing, part plantation forestry and part working forest. Establishing a commercial quarry on this land meets the strategic planning vision for the region and the land use zoning intent. As with any development in close proximity to native forests the quarry will have to be constructed and managed in a way that minimises the risk of an adverse impact on the environment or the community. The Proponent has commissioned a series of surveys, assessments and reports to help to understand the risks and suggest strategies for mitigation.

A critical risk associated with quarrying is that of adverse air quality due to dust emissions. A dust management plan has been developed specific to this site that outlines how controlling dust emissions will become a daily part of doing business at the quarry.

The location of the quarry is remote from natural watercourses. The water for the processing works will be sourced from existing storages and recycled, so reticulated water will be not required from the local domestic supply. The natural watercourses in the receiving environment will be protected from water contaminated by retention facilities at all potential discharge points.

Recommended strategies to mitigate the effect of noise from the plant will be adopted and as the quarry develops the risk of nuisance noise diminishes. Blasting noise and vibration will be monitored to ensure compliance with acceptable standards.

The quarry will cause an area of working forest to be cleared to accommodate the access road. The alignment will be adjusted to avoid excessive disturbance to a candle bark community and rehabilitation works will occur on worked out areas. The Proponent will commission a vegetation management and rehabilitation plan to guide future activities and mitigate the risk to neighbouring forests and woodlands. The vegetation management and rehabilitation plan will also have a weed management component to control the risk of weeds affecting neighbouring lands.

The Constitution Hill Quarry proposal meets the guidelines of the Resource Management and Planning System in Tasmania by:

- developing natural resource while maintaining ecological processes through the development of a vegetation management and rehabilitation plan;
- not interrupting the fair and orderly use of air, land and water through the introduction of prescriptions to protect air and water quality and keeping land disturbance to a minimum;
- encouraging public involvement through the provision of this document to inform the community about the proposal;
- facilitating economic development by providing competitively priced construction materials to future projects; and
- sharing the responsibility of resource management by working cooperatively with Local and State Governments.

The Constitution Hill Quarry is ideally located to bring benefits to the local community, provide construction materials to future projects, keep activities that are likely to cause a nuisance away from local residents and cause minimal adverse environmental impacts. Those impacts that cannot be avoided will be mitigated to acceptable levels by the adoption of the strategies outlined in this document.
9. REFERENCES


Mackey, M. D. (2010, February 24). Manager Development and Environmental Services. (Barry Williams, Interviewer)


10. APPENDICES
10.1. **APPENDIX 1: WIND ROSE DATA FOR CLOSEST WEATHER STATIONS**
10.2. APPENDIX 2: DUST MANAGEMENT PLAN
10.3. **APPENDIX 3: STORMWATER RUNOFF CALCULATIONS**
10.4. **APPENDIX 4: GEOTECHNICAL DRILLING REPORT**
10.5. **APPENDIX 5: NOISE ASSESSMENT REPORT**
10.6. **APPENDIX 6: BLAST IMPACT ASSESSMENT REPORT**
10.7. **APPENDIX 7: FLORA AND FAUNA ASSESSMENT REPORT**
10.8. **APPENDIX 8: CULTURAL HERITAGE SURVEY REPORT**
10.9. **APPENDIX 9: RESPONSE TO SOUTHERN MIDLANDS COUNCIL PLANNING SCHEME**
10.10. **APPENDIX 10: ACCESS ROAD NOISE DETAILED ASSESSMENT**
10.11. **APPENDIX 11: HAZARD ANALYSIS AND RISK ASSESSMENT**
10.12. APPENDIX 12: TRAFFIC IMPACT ASSESSMENT
10.13. **APPENDIX 13: COMMITMENTS**