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ENVIRONMENTAL MANAGEMENT PLAN

DUGGANS QUARRY, CATOS HILL - CRADOC

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FORWARD

Duggans Pty Ltd operates a hard rock quarry at Cradoc in the Huon Valley. The operation has ancillary activities including a crushing and screening operation, a concrete batching plant and a pre-cast concrete forming plant. The operation originally encompassed four separate mining leases and two permits (former) license to operate scheduled premises.

Duggans Pty Ltd (Operator and Lessee) has consolidated the four mining leases into one lease, number 1918P/M comprising 93 hectares. The Operator also seeks to rationalize the two permits into one. The Operator does not seek an increase in the maximum production levels identified in the permits and will confine quarry operations to the quarry footprint identified in previous plans.

The Director of the Environment Protection Authority has agreed to the change, provided that there is no increase in the potential for environmental harm and that a satisfactory Environmental Management Plan is submitted covering the activities on the new consolidated mining lease.

This Environmental Management Plan has been prepared by the Operator in accordance with the guidelines detailed in the Environment Protection Authority document “Guidelines for the preparation of an Environmental Management Plan for H Duggan and Sons Pty Ltd – A level 2 extractive industry and level 2 material handling works at Off Channel Highway, Cradoc, TAS, 7019” dated 18 December 2008.

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EXECUTIVE SUMMARY

Duggans Quarry has operated continuously from the Cradoc site for over 30 years. In that time the business has developed into an important contributor to the local community. The quarry supplies high quality construction materials vital for the continued development of the region.

Duggans Pty Ltd is the operator and seeks only to rationalize the mining leases and permits that enable it to operate. The operator does not seek to increase its maximum annual production rates. The existing maximum permitted production rates are comprised of 200,000 tonnes total of which 100,000 tonnes is quarry run gravel and 100,000 tonnes is processed. A further 10,000 processed tonnes is allowed on the second environment permit. The maximum annual production rate is therefore, 125,000 cubic metres (200,000 tonnes) production of which 68,750 cubic metres (110,000 tonnes) is processed.

The only change in the operation will be the gradual advancement of the mining plan and the rehabilitation of strategic areas to provide more comprehensive screening. The extraction will progress over an area of rough pasture with minimal disturbance to the margins of woodlands on either side. The quarry will continue to be developed in a slot that will provide access to the maximum resource while ensuring that the faces become less discernable over time from vantage points at Cradoc and Franklin.

This Environmental Management Plan (EMP) satisfies a requirement for the issue of a single environmental permit as stated by the Environment Protection Authority (EPA). This EMP sets out the principles to enable the quarry to continue to develop without causing adverse impacts on the receiving environment or the local community.

By adopting this EMP, Duggans Pty Ltd demonstrate their commitment to continuously improving the environmental, social and economic sustainability of their business.

1. INTRODUCTION

The activity is described as "Duggans Quarry – Precast – Earthworks" and has the address of the Operator as detailed in Table 1 below:

TABLE 1: OPERATOR DETAILS

Name	Duggans Pty Ltd
ABN	54 009 565 799
Residential Address	8420 Channel Highway Cradoc TAS 7109
Postal Address	8420 Channel Highway Cradoc TAS 7109
Phone	(03) 6266 3204
Fax	(03) 6266 3593
Contact	Stephen Duggan
Mobile	0409 663 204

The quarry is situated on private land comprising 4 titles detailed in Table 2 below:

TABLE 2: PROPERTY DETAILS

Registered Number	Area	Landowner
47130 / 1	11.81 ha	Duggans Pty Ltd
114690 / 1	46.41 ha	Duggans Holdings Pty Ltd
233263 / 1	51.05 ha	LE & SP Duggan
218657 / 1		LE & SP Duggan

Until recently the quarry operation was registered on 4 mining leases detailed in Table 3 below:

TABLE 3: MINING LEASE DETAILS

Mining Lease	Area	Holder	Operator
997P/M	8 ha	AR Duggan	Duggans Proprietary Limited
1487P/M	47 ha	Duggans Proprietary Limited	Duggans Proprietary Limited
1001P/M	20 ha	LE & SP Duggan	Duggans Proprietary Limited
1395P/M	20 ha	LE & SP Duggan	Duggans Proprietary Limited

The recent consolidation places the operation on one lease, described in Table 4:

TABLE 4: NEW MINING LEASE DETAILS

Mining Lease	Area	Holder	Operator
1918P/M	93 ha	Duggans Pty Limited	Duggans Pty Limited

The operation comprises of an extraction pit, crushing and screening facilities, separate sand screening operation, a concrete batching plant and a pre-cast concrete forming plant.

The main extraction pit, subsequently referred to as 'Quarry B' is operated under License number 3307 first issued in 1991 and amended in 1995. The permit places restrictions on the operation as detailed in Table 5 below:

TABLE 5: PERMIT 3307 RESTRICTIONS

Production Limit (maximum)	125,000 cubic metres (200,000 tonnes) per annum total of which 68,750 cubic metres (110,000 tonnes) per annum is processed.

Noise emission (maximum)	
7:00 am to 7:00 pm	45 dB (A)
All other times	40 dB (A)

Hours of operation	
First day of the working week (excluding public holidays)	6.00am to 6.00pm
Other days	7.00am to 6.00pm
Good Friday, Anzac day and Christmas Day	No operations permitted (excludes mobile equipment taken off site to work elsewhere)

The sand screening activity operates under License number 3308 first issued in 1987. This license was issued after a preceding permit 3197 expired, the new permit conditions were amended to include the pre-cast concrete works.

The operation of Quarry B is primarily an extractive industry and is required to have a current mining lease through which resource recovery and connected operations are controlled by Mineral Resources Tasmania through the *Mineral Resources Development Act 1995.* The operation is now under one mining lease.

The Huon Valley Council regulates the operation through the *Land Use Planning and Approvals Act 1993* using the Port Cygnet Planning Scheme. The Port Cygnet Special Areas maps have buffers around the quarry and the screening operation. As the operation is considered a level two activity, the Environment Protection Authority is required to regulate those aspects of the operation that may have an environmental impact through the *Environmental Management and Pollution Control Act 1994*. The operation has two permits (former) Licences to Operate Scheduled Premises which control the quarry and crushing operations and the sand screening plant.

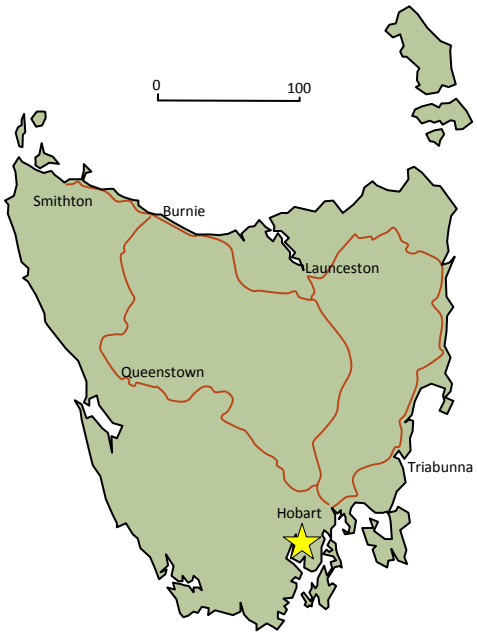
In addition to the above legislation that controls the issue of permits and licences and their associated conditions, the operation must comply with aspects of the following legislation, policies, regulations and industry codes of practice:

- Aboriginal Relics Act 1975 (Tas)
- Draft Environmental Protection Policy (Noise) 2003
- Environment Protection Policy (Air Quality) 2004
- Quarry Code of Practice 1999
- State Coastal Policy 1996
- State Policy on the Protection of Agricultural Land 2009
- State Policy on Water Quality Management 1997
- Threatened Species Protection Act 1999 (Tas)
- Water Management Act 1999 (Tas)
- Weed Management Act 1999 (Tas)
- Workplace Health and Safety Act 1995 (Tas)
- Workplace Health and Safety Amendment (Mine Safety) Act 2010

2. Activity Description

The Duggans Pty Ltd quarry at Cradoc primarily extracts weathered and fresh dolerite from a pit referred to as quarry B. The recovered product is processed on site to make a variety of construction materials including road base and aggregate to be sold into the local market. Some of the product is diverted into an on-site concrete batch plant that blends concrete mix for sale into the local market. A portion of the concrete is further downstream processed into 'pre-cast' concrete products for sale throughout the State.

The quarry is situated approximately 7 kilometres southeast of Huonville on the eastern side of the Huon River. Access is gained to the quarry from a private road junction with the Channel Highway.



The Duggans Quarry operation is an example of a local business that has integrated 'value adding' industries into its operation to achieve the maximum value from the raw material.

It is expected that the activity will continue to develop with the current expansion of the enclosed pre-casting building and future integration of the maintenance workshops on the site. The quarry mining plan will progress in a slot arrangement leaving the eastern and western slopes of the ridge to screen the operation, while excavation proceeds in a northerly direction.

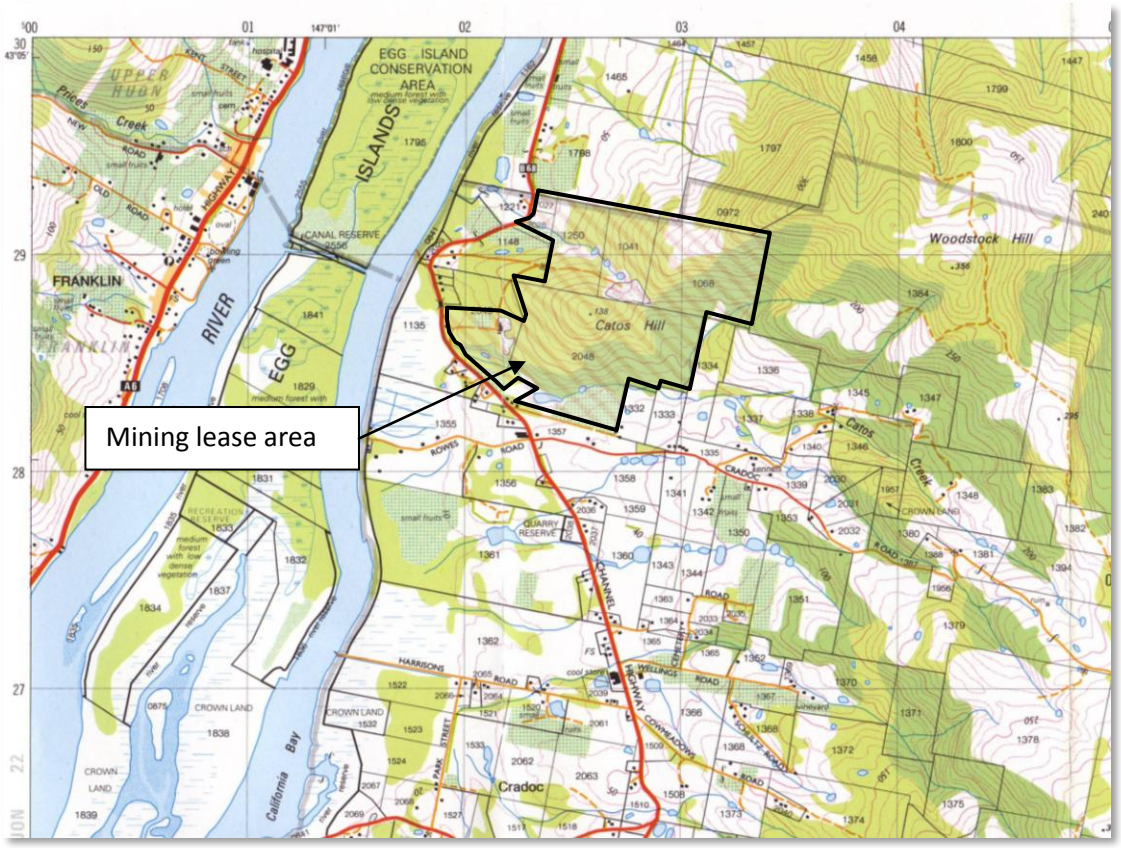


FIGURE 1: LOCALITY PLAN WITH MINING LEASE AREA

2.1 ACTIVITY OUTLINE

2.1.1 GENERAL

The Duggans Quarry commenced operations in 1979 and has progressivley expanded and diversified throughout 30 years of continuous operation. The quarry operation consists of extraction, processing and value-adding activities all located on the one site. A separate site currently houses the maintenance depot although the Operator plans to relocate this facility to the main operations site in the future.

The overall operation can be separated into four separate but interrelated operations:

1. Extraction:

Quarry B is the location for the extraction activities. Quarrying activities have progressed north and south cutting into the ridge in both directions. More massive dolerite is recovered from the northern faces; hence more recent activity is concentrated here. The southern quarry faces are utilized to provide weathered dolerite gravels for road construction.

The primary method of recovery in the northern section is through drill and blast techniques. Excavators are used to rip out fractured rock and stockpile for loaders to tram the material to the primary crusher.

2. Crushing:

Shot rock is fed to the primary crusher and screen and subsequently passes onto the secondary crusher and deck screens (see schematic Figure 2). Ancillary to the crushing operation is a sand screening facility that blends site won and imported sand products for feed into the concrete batch plant.

3. Concrete batch plant:

Products from the rock crushing facility and the sand screening facility are blended with imported cement products in a fixed batching plant. The batch plant can produce different grades of concrete with the addition of additives and various ratios of the component products. Water is added to the final mix before the concrete is loaded into agitator trucks.

4. Pre-cast concrete component facility:

Pre-cast concrete components are produced by depositing concrete into various forms and by incorporating steel reinforcing a wide variety of structural and non-structural concrete components are fabricated. These components are then delivered by various truck and trailer combinations to fulfil orders around the State.

The main items of machinery for all four operations are listed in Table 5 below:

TABLE 6: MAIN EQUIPMENT USED IN EACH SECTION

Quarry and crushing	Batch plant	Pre-cast concrete plant
CAT 30 tonne wheel loader	60 tonne cement silo	20 tonne gantry crane
CAT 20 tonne wheel loader	15 tonne batch hopper	10 tonne gantry crane
CAT 20 tonne hyd. excavator	15 tonne wheel loader	Steel casting tables
Kue Ken 36 x 24 Jaw Crusher	Trucks	35 tonne mobile crane
Jaques 35” Cone Crusher		12 tonne wheel loader
Jaques 6” x 3’6” prim. screen		Truck and trailers
Jaques 16” x 6” 3 deck screen		
Jaques 10” x 5” 3 deck screen		
Hazemag 1013 Impact crusher		

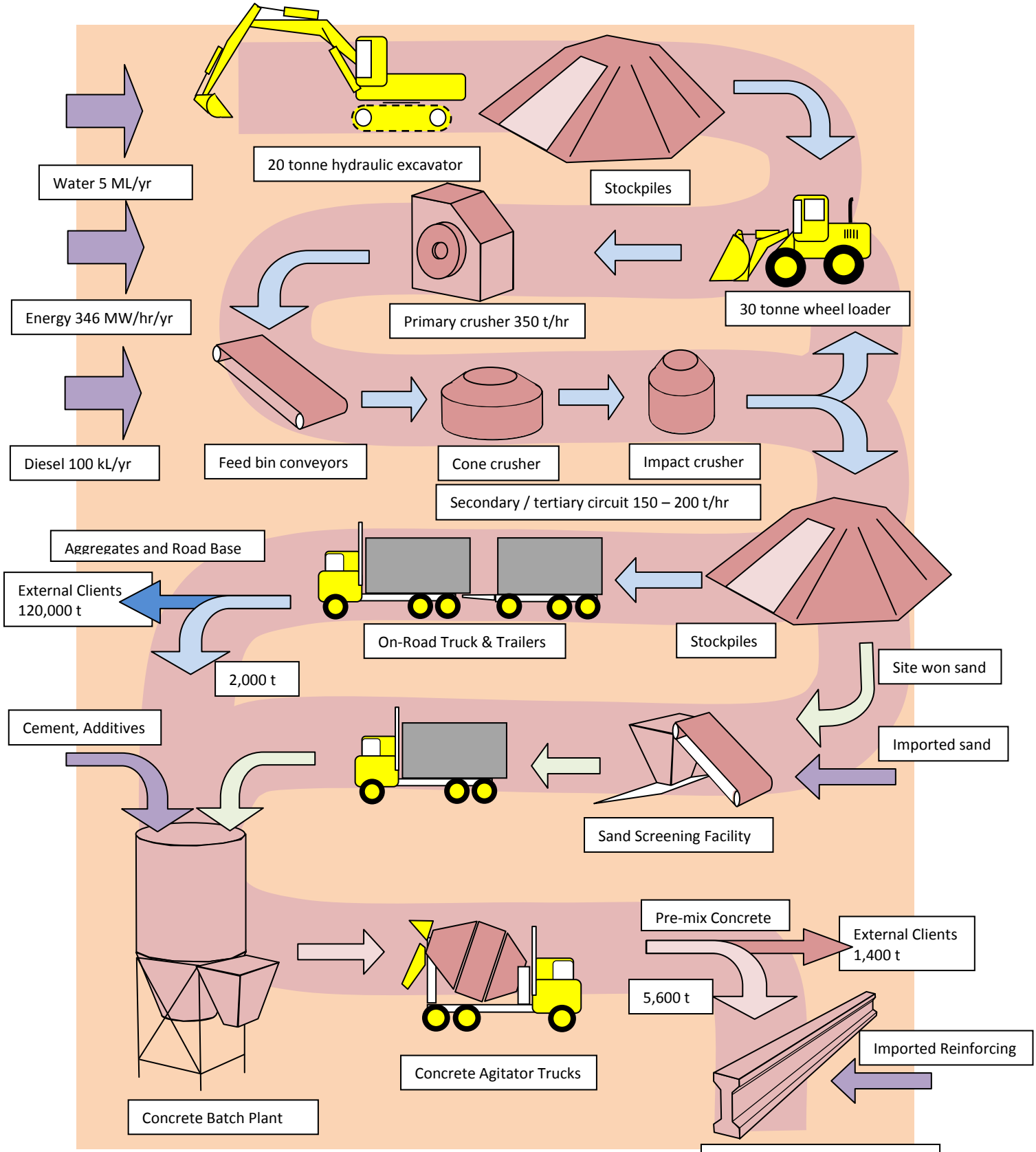


FIGURE 2: QUARRY OPERATION SCHEMATIC

2.1.2 EXTRACTIVE INDUSTRY

Extractive operations are confined to the southern and northern faces of Quarry B (see Site Plan Figure 3). The southern face provides more weathered product, while the northern face offers fresh dolerite rock. Overburden thickness varies from less than one metre up to three metres where faulting and major jointing has allowed ingress of surface water. Overburden materials are utilised as clean fill for haul roads and ramps, where possible. Unsuitable materials are windrowed on the east or west abutments awaiting recovery for future rehabilitation works. Small quantities of topsoil are windrowed outside the overburden stockpiles.

Product in the southern quarry is recovered through ripping and pushing up into a stockpile which is then trammed to the crusher facility by a wheel loader. The weathered dolerite product is used for blending to make road base and driveway gravels. The product from the northern quarry is recovered by drill and blast techniques using a specialised blasting contractor to design, load and fire the shots. The shot rock is then ripped out using an excavator working on a series of benches. The benches are nominally three to five metres wide and the faces are nominally ten metres high.

TABLE 7: BLAST TIMING AND FREQUENCY

Blast timing	Week days only	11:00 am and 2:00 pm
Blast frequency	4 to 5 blasts per year	

Differing products recovered from the various areas of the quarry are defined by their source location. The southern and northern extraction areas are divided into three mining zones, east, mid and west. This combined with the bench level identifies nine source rock descriptors for the southern pit and thirteen descriptors for the northern pit.

At the end of life for Quarry B the land will be returned to natural woodland. The existing land is steep and inaccessible by vehicles. The final land shape will modified to a more natural form by cutting the benches and faces in half, thus reducing the maximum face height to less than 5.0 metres. The small benches will be covered with overburden materials and topsoil and planted with local provenance shrubs and trees. The nature of the rock ensures the final faces will be stable and the vegetation will grow to conceal the disturbance.

Plate 1 shows the northern faces with the fresher ‘blue’ dolerite and minimal topsoil / overburden. The far left of the frame shows an excavator ripping out shot rock and cascading the product down to the pit floor where it is trammed to the primary crusher using a wheel loader.

PLATE 1: LOOKING NORTH AT NORTHERN FACE OF QUARRY B

The operation is supplied with water for washing, dust suppression and for addition to concrete by pumping from surface water impoundments. These are identified on the General Layout Plan Figure 4. The main catchment is from Cato Creek and the impoundment has a permanent pumping station located on the bank with a rising main directed to storage tanks that supply gravity feed to various off-take points.

Water is used in the process at the crushing plant for dust suppression, at the concrete batching plant for addition to the concrete mix and at the pre-casting yard for cleaning out forms and agitators on trucks. The offices and mess facilities use water for kitchens and toilets. These facilities are supplied by a roof runoff collected in dedicated storage tanks.

TABLE 8: FACILITIES WATER USEAGE

Facility	**Crusher / Screener**	**Batch Plant**	**Pre-cast Plant**	**Site Amenities**
Water usage	1800 kL	3200 kL		unknown
Total Water Demand	5000 kL per annum			

2.1.3 Energy Supply

The site uses energy in the form of diesel fuel to activate mobile machinery and electric power to energise fixed plant and equipment. Diesel is supplied to a purpose built fuel storage facility located on the site and vehicles are driven to the facility to refuel. Equipment located in more remote areas of the site are refuelled using a utility mounted refuelling tank. The diesel fuel requirements of the site are detailed in 'Section 4.11. Greenhouse Gas Emissions'.

Total Diesel Fuel Demand	100 kL per annum

Electrical energy is supplied via the State Grid using Aurora Energy via a three phase overhead connection. Electric power is utilised to energise the crushing and screening plant, concrete batch plant, pre-cast concrete facility, workshop and office and cribrooms.

Total Electrical Energy Demand	350 MWh per annum

2.2. Site Plan

Figure 3 is an aerial image of the site with the main features of the current operation highlighted. The underlying image is dated 2005 and does not reflect the current footprint of the extraction area. The current area of disturbance is displayed as an overlay to the satellite imagery. Haul roads, access roads and existing tree screens are also depicted. Duggan's Pty Ltd currently have a new building under construction in the precast plant, this building is also not represented.

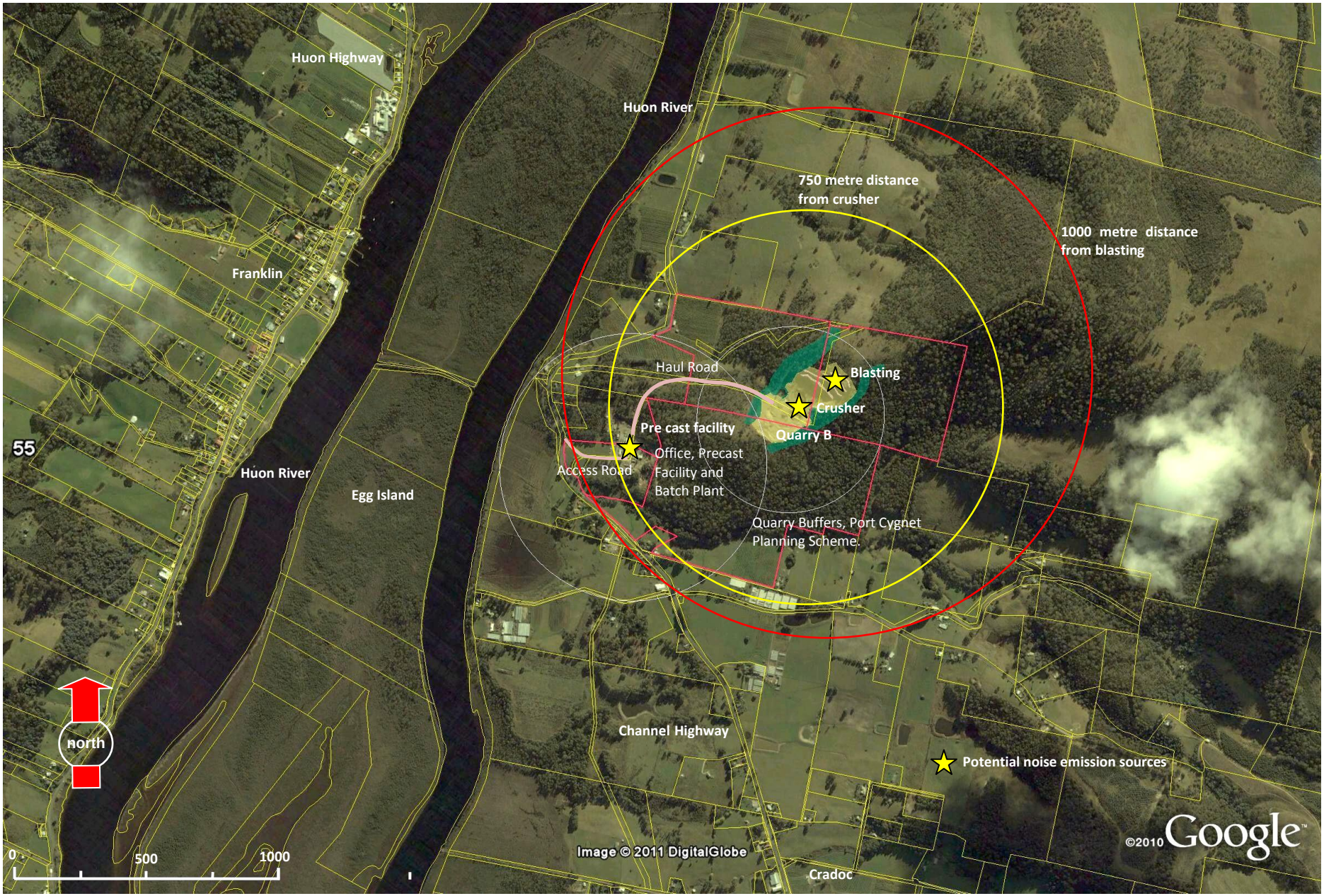
The Port Cygnet Planning Scheme shows two environmental buffers in the special areas overlay. These two buffers are represented as overlapping circles on the plan. More complete representation of the land use and zoning is included in Figure 5.

2.2.1. Off-site infrastructure

The quarry operations are supported by an off-site maintenance facility. The workshops are located on the Channel Highway, around 400 metres south from the quarry access junction. It is currently necessary for vehicles that need servicing or repairs to access the workshop by travelling along the Channel Highway.

Duggans Pty Ltd plan to relocate this facility to the main quarry site. Once this occurs there will be a reduction in the volume of quarry traffic on the Channel Highway and improved servicing efficiency, especially for off-road machinery.

The current level of supply for energy and water are adequate for the current level of operation.



Duggan's Quarry

FIGURE 3: GENERAL LAYOUT PLAN - showing distances from quarry activities

Image Date: 22 March 2005

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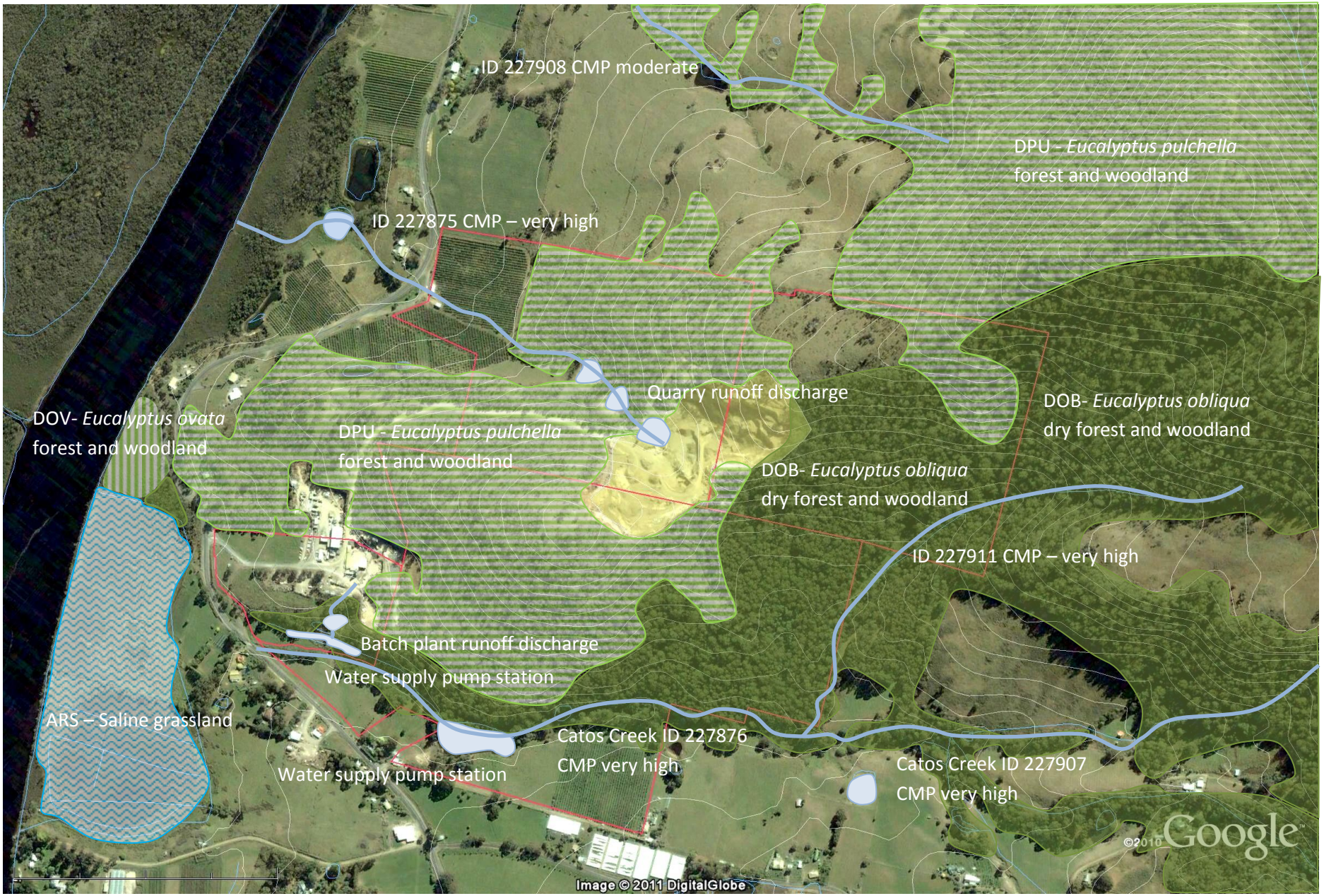

Duggan's Quarry

FIGURE 4: GENERAL LAYOUT PLAN - SHOWING VEGETATION TYPES AND WATERCOURSES

Image Date: 22 March 2005

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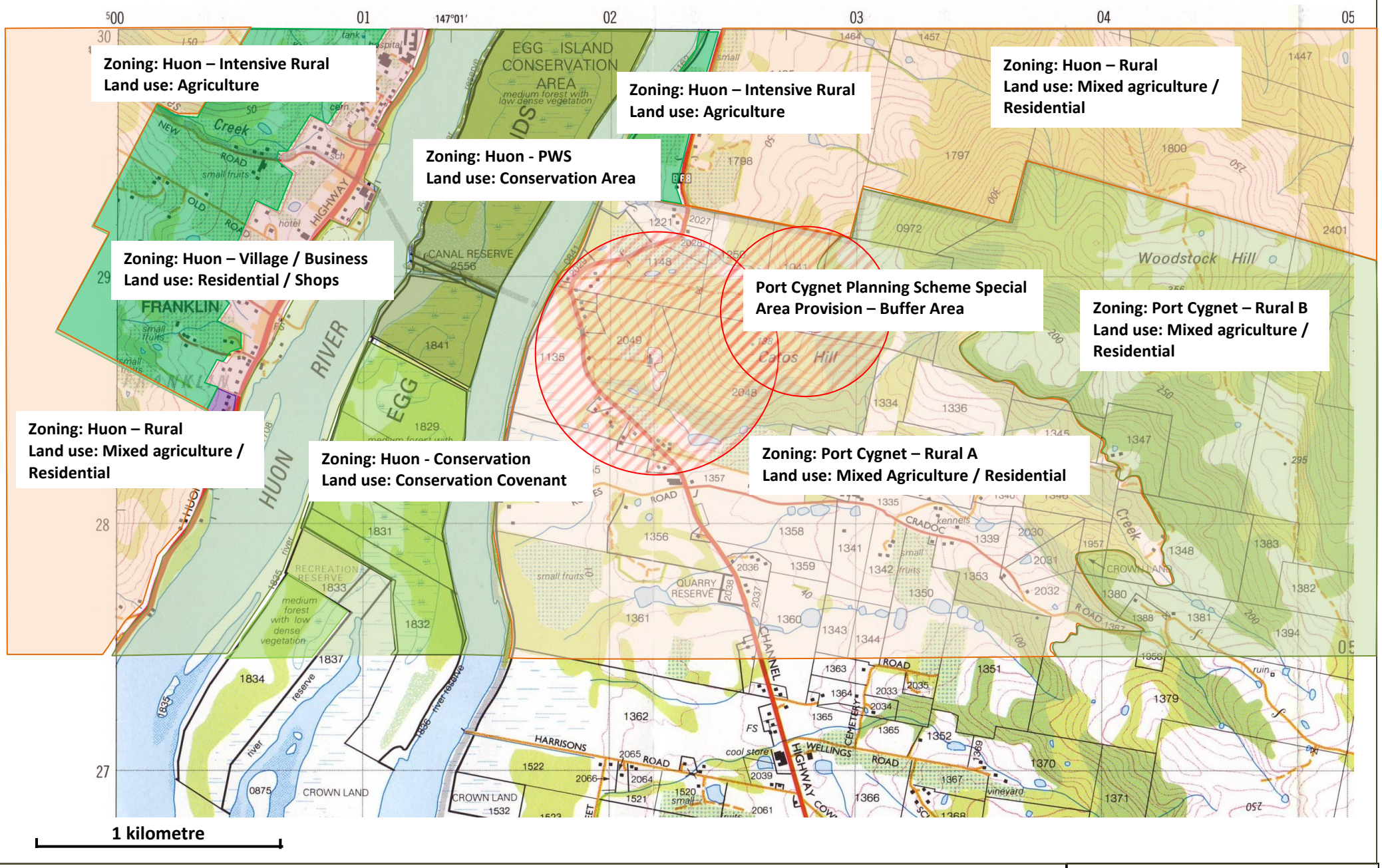

Duggan's Quarry

FIGURE 5: LAND USE PLANNING AND ZONING PLAN

Planning scheme zones simplified, (base map extracted from 1:25000 series topographic)

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Duggans Quarry

FIGURE 6: MINING PLAN - CURRENT ARRANGEMENT AT MARCH 2011

Image Date: 22 March 2005

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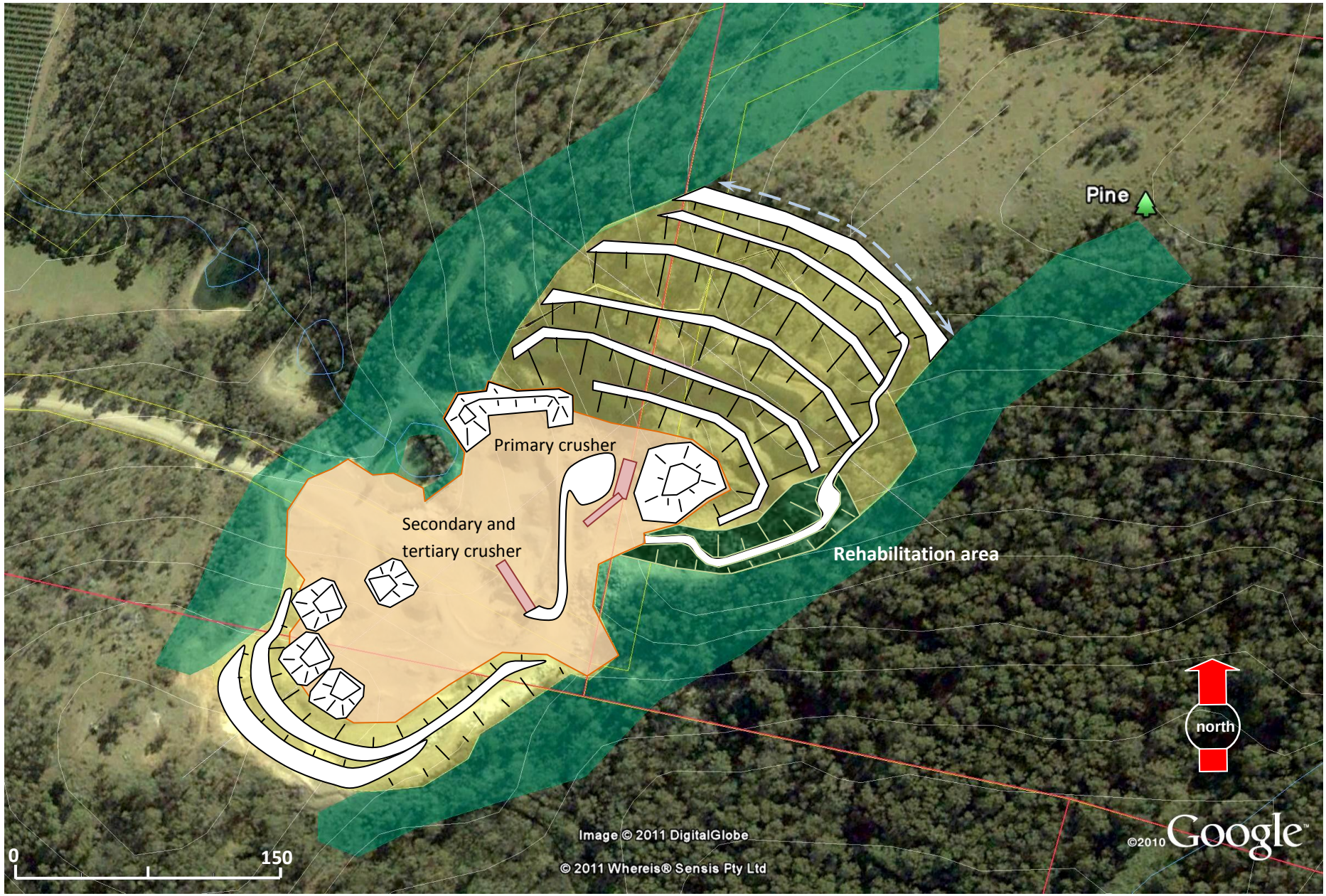

Duggans Quarry

FIGURE 7: MINING PLAN - EXPECTED ARRANGEMENT AT 2015

Image Date: 22 March 2005

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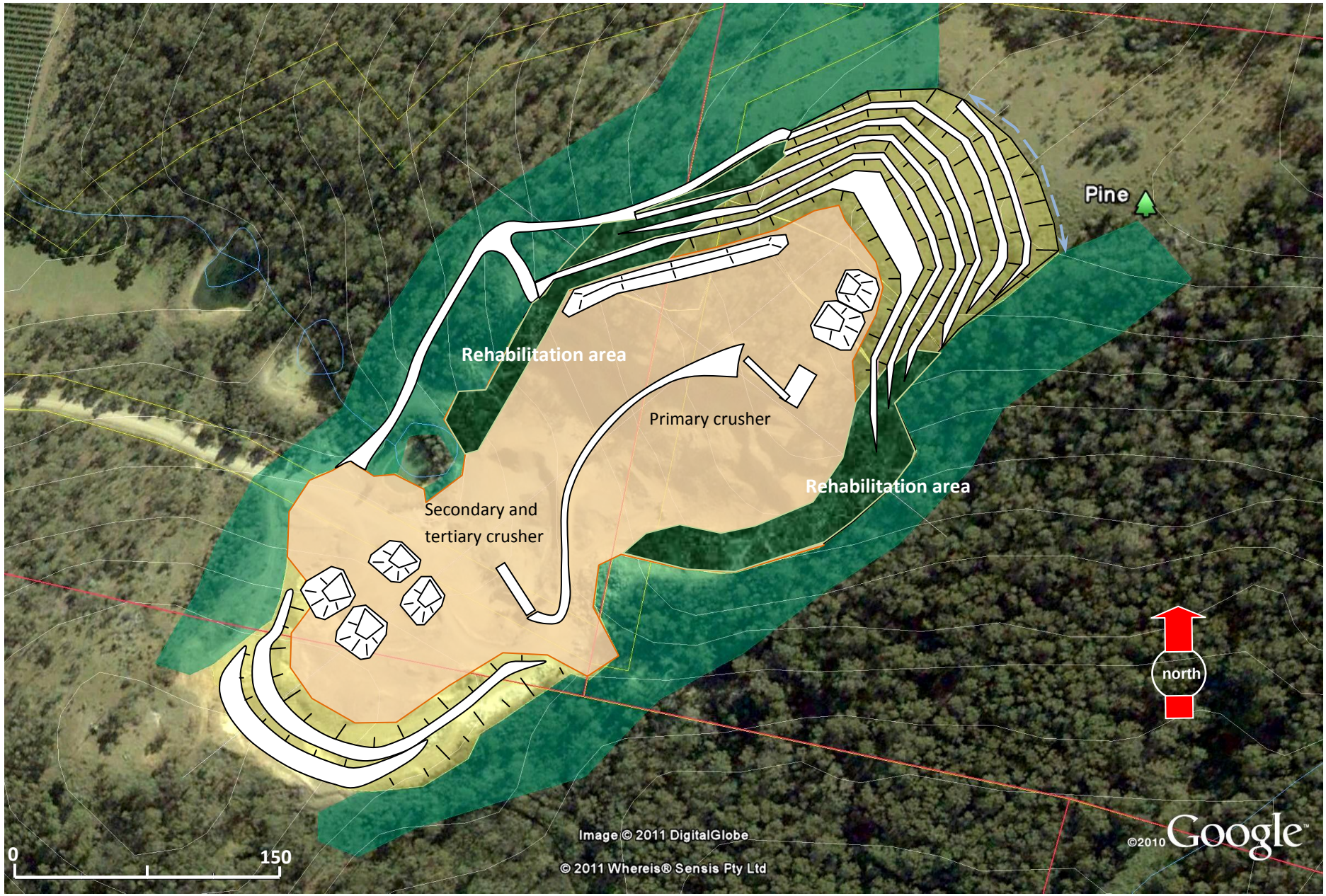

Duggans Quarry

FIGURE 8: MINING PLAN - EXPECTED ARRANGEMENT AT 2025

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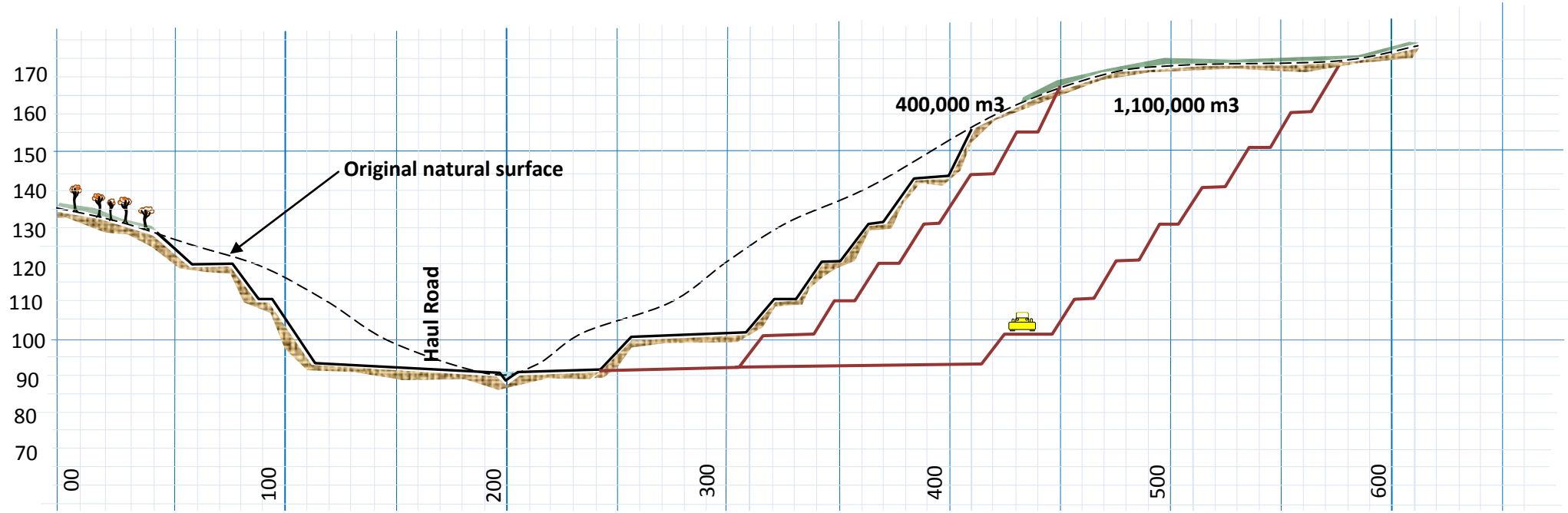
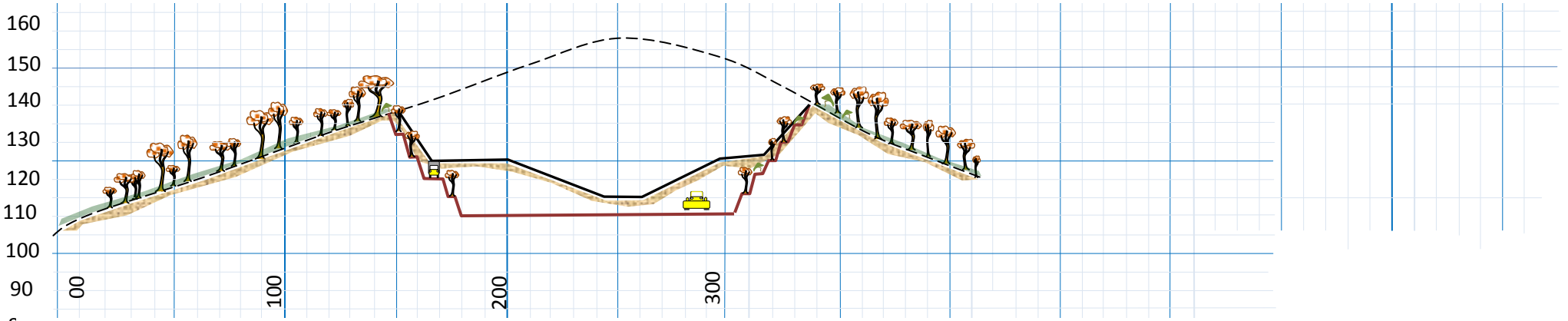


Cross Section A-A (2:1 exaggerated scale)



Cross Section B-B (2:1 exaggerated scale)

Duggans Quarry

FIGURE 11: MINING PLAN - LONG SECTION AND CROSS SECTION

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FIGURE 12: MINING PLAN - EXPECTED ARRANGEMENT AT DECOMMISSIONING

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3. THE EXISTING ENVIRONMENT

3.1. PLANNING ASPECTS

The Duggans Quarry is located on private land owned by parties with an interest in the business. The landowners and title details appear in Table 2. The current mining lease details appear in Table 4.

The land is within the Huon Valley Council municipal region and is managed under the Port Cygnet Planning Scheme. The boundary between the Port Cygnet Planning Scheme and the Huon Valley Planning Scheme is in close proximity to the northern boundary of the land. The land occupied by the quarry development is zoned partly Rural A and partly Rural B under the Port Cygnet Planning Scheme, with the boundary cutting through the Quarry B extraction area.

The Planning Scheme zones relate to existing uses and particular attributes of the land that make the land suitable for a defined use. Each zone has an 'intent' that seeks to articulate the preferred use. Rural A zone seeks to protect the rural environment to aid the continuance of farming and related activities. Rural B zone seeks to protect the scenic quality, flora and fauna habitats, the stability of soils and potential forestry resources. Extractive industries are defined as a 'discretionary use' in both zones. The quarry has been in operation for around thirty years and as such has 'existing use rights' for its operation.

The Port Cygnet Planning Scheme has Special Area Provisions that indentify land that by way of special attributes or uses may need to be considered in planning decisions. The Duggan's Quarry site has two environmental buffers that overlay the zoning map to alert the public and planners to the potential for the quarry operation to affect the suitability of certain uses on surrounding land. Figure 5 shows the 'Buffer Areas' along with the zoning of the various planning schemes and typical existing uses.

The Huon valley Council were asked to provide details of planned developments that might be affected by the quarry operation on 23 March 2011. No details of vulnerable developments were provided.

3.2. ENVIRONMENTAL ASPECTS

Duggan's Quarry is located on the eastern flank of the Huon River valley as it runs south towards the D'Entrecasteaux Channel. The local topography is dominated by steep to rolling hills mostly forested with a narrow river flat either side of the Huon River. The quarry site is situated on low to mid-slope of Catos Hill and Quarry B occupies the north-western flank of a saddle formed in the ridgeline between Catos Hill and Woodstock Hill.

The offices, batch plant and pre-cast facility are located at approximately Reduced Level 40 metres, while quarry B starts at 90 metres and will rise to 160 metres. The processing areas have a westerly aspect while the quarry has a north westerly aspect.

The land occupied by the various extraction and process areas of the quarry has a land capability classification of 6, described as "land marginally suited to grazing due to severe limitations". The limitations are likely to refer to the steepness of the ground and access difficulties. Cleared areas of the land, especially the area where future extraction activities will take place are used currently as rough grazing country. The

predominant soil type is that derived on weathered dolerite substrate and has moderate erodibility. A fault cuts through the eastern edge of the quarry exposing sedimentary substrate on this flank. Much of the ground with sedimentary rock under lying, has vegetation retained to provide a tree screen or is the subject of a revegetation effort.

Catos Creek and a tributary run along the southern and eastern boundary to the site. Quarry development is on the opposite side of the ridge and hence will not affect these watercourses. A water course located on northern boundary carries the discharge from the main sediment retention basin on the floor of quarry B. The retention basin and two more similar basins in series providing ample opportunity for suspended solids to drop out prior to the water leaving the quarry site, see Section 4.6 for more details.

There are no conservation reserves within 500 metres of the quarry. The nearest is the Egg Islands Conservation Area located in the centre of the Huon River. There are small fragmented pockets of *Eucalyptus ovata* forest and woodland in the vicinity of the site. This community is listed as endangered under the *Nature Conservation Act 2002* but none of these stands are threatened by any existing or planned activity by the company.

3.3. SOCIO-ECONOMIC ASPECTS

Duggan's Pty Ltd commenced operations principally as a transport business and under another name. The business was started by the father of the current owner/directors in 1927. Since then the business has provided diverse range of services to the Huon Valley region including: school bus service, general freight and transport, farming, fruit production and road construction.

The current business is the only local facility that can provide a full range of aggregate and gravel products to the community. As fuel costs increase in coming years, strategically located construction material suppliers will become critical for the economic development of regional communities.

The pre-cast concrete facility exports products out of the region to clients throughout the State including the Australian Antarctic Division for their requirements in the Antarctic.

The business has been a consistent employer in the Huon Valley region for over eighty years. Today Duggan's Proprietary Limited employs a total of seventy two staff and four directors. The Duggan's Quarry site employs the following in the individual sections:

TABLE 9: NUMBERS EMPLOYED WITHIN VARIOUS QUARRY SECTIONS

Activity	**Number employed**
Quarry operation	5 full time in the pit and 3 full time support
Pre-cast operation	17 full time in the facility and 5 full time support
Earthworks and workshop	14 full time and 3 full time support

3.4. ALTERNATIVE SITES

The quarry at Cradoc is ideally situated on a substantial resource body with good direct access to the state road network without passing close to residences. There are no hospitals, schools or nursing homes in the vicinity and any residences that are in other ownership and close to the quarry are screened from the operation.

Duggans Proprietary Limited has invested substantially in the Cradoc site by establishing buildings, equipment and pollution control infrastructure. Alternative sites for this operation are not being considered.

4. Potential Effects and their Management

The Duggan's Quarry has operated consistently for over thirty years from the Cradoc site. Over that period operations have expanded and new activities have been introduced. The company has continued to improve existing pollution control systems and introduce new systems to manage the environmental effects of the operation.

4.1. Noise Emissions

Hard rock quarry operations create noise from various sources. Under certain circumstances the noise emissions from these sources can be a nuisance to neighbours. Noise is generated by earthmoving equipment through engine noise, reversing beepers and implements impacting rock surfaces; by the percussion head of blast hole drilling equipment; by blasting through ground vibration and air blast overpressure; by the crushing and screening equipment and through loading rock materials into hoppers and trucks.

4.1.1. Legislative and Policy Requirements

To be compliant the quarry is required to operate within the limits specified in the following legislation and policies:

- *Environment Management and Pollution Control Act 1994 (TAS)*
- *Environment Protection and Pollution Control (Miscellaneous Noise) Regulations 2004*
- *Environment Protection Policy (Noise) 2004*
- *DEPHA Quarry Code of Practice 1999*

The Quarry Code of Practice imposes noise, air-blast overpressure and ground vibration limits for quarries as detailed in Table 9 below:

TABLE 10: NOISE AND BLASTING LIMITS IMPOSED

Emission	**Acceptable Standard**	
Noise	A maximum noise limit of 10 dB (A) above ambient noise levels during daytime operations.	
Blasting	95% of blasts	100% of blasts
Air Blast Overpressure	115 dB (Lin Peak)	120 dB (Lin peak)
Ground Vibration	5 mm/s (Peak particle velocity)	10 mm/s (Peak particle velocity)

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

4.1.2. Mitigating Factors and Actions

The location of the potential source of particular noise emissions are shown in Figure 3. These same sources are described in Table 11 along with factors and actions that mitigate the effects.

TABLE 11: NOISE SOURCES AND MITIGATION MEASURES

Noise source	Potential effect	Mitigating factor or action
Earthmoving equipment	Engine noise, reversing beepers and implements impacting hard rock.	Activities only occur during working hours. Engines are silenced by proprietary equipment. Ripping activities occur within the pit which is screened from neighbours by topography. Speed limit imposed on site.
Blast hole drilling	Percussion head creates a chronic rattling noise.	Activities occur only prior to blasting. Activities occur within the pit which is screened. Modern equipment operates more quietly.
Blasting	Acute air-blast over pressure and ground vibration.	Professional contractor required to monitor blasts and report any occurrence where limits are exceeded. Blasts are infrequent and occur within strict time constraints. Contractor is required to take into account adverse weather conditions in blast planning.
Crushers and screening operations	Chronic rumble during working hours	Activities only occur during working hours. Crusher located within pit which is screened from neighbours. Material drop heights into hoppers kept to a minimum.

Commitment	Details	Responsible
1	Mitigation measures will be employed to ensure that noise from the quarry operation does not exceed the limits specified in the Quarry Code of Practice	Quarry Manager

Currently activities within the pit are screened from view from all points in close proximity. The only vantage points that are elevated enough to see within the pit are too far away to be affected by noise in all but the most extreme weather events. As progress with the mining plan develops, the pit operation

including crushing and blasting activities will move further into the hill to the north. The natural ground retained on the eastern and western sides will provide more effective noise attenuation screening.

To further attenuate noise generated by the primary crusher this function has been relocated closer to the active face on the pit floor. This work is undertaken by a fixed or mobile crushing facility.

4.2. DUST EMISSIONS

The inherent nature of quarries is to break new ground to expose the resource under. The exposed surface and many of the activities that take place can give rise to dust emissions that can adversely affect air quality on the site and potentially over neighbouring land. Duggan's Quarry is a hard rock quarry where blasting is used to extract the rock. Without effective management the following activities can cause a dust nuisance; blast hole drilling, blasting, earthmoving equipment operation, crusher / screener / conveyor operation, loading hoppers and vehicle movements over gravel roads.

4.2.1. LEGISLATIVE AND POLICY REQUIREMENTS

Air emission standards are included in:

- *Environment Management and Pollution Control Act 1994 (TAS):*
- *Workplace Health and safety Regulations 1998:*
- *Quarry Code of Practice 1999:*
- *National Environment Protection Measure (Air) varied 2003:*
- *Environment Protection Policy (Air Quality) 2004:*

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 3 as red 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)

4.2.2. MITIGATING FACTORS AND ACTIONS

Dust emissions are affected by winds. The closest weather data is available from the Geeveston weather station (94137) where the predominant wind direction and the strongest winds are recorded as coming from the northwest (over 20% of the time in the morning and over 30% of the time in the afternoon). Where dust is generated on the site it would most likely be carried in a south-easterly direction by the prevailing wind. The property boundary and mining lease boundary is a minimum of 300 metres distant to the east and 500 metres distant in a south easterly direction. The nearest residence in other ownership in a south easterly direction is 700 metres away.

The land between the quarry and the residence is fully forested and the residence is screened from the quarry both by intervening topography and tall forest. In the unlikely event that the dust control measures failed and dust were emitted it would be unlikely that dust would be carried this far over forested land.

The potential sources of dust and the mitigating factors and actions are described in Table 12.

TABLE 12: DUST SOURCES AND MITIGATING FACTORS

Dust source	Potential effect	Mitigating factor or action
Blast hole drilling	Dust from percussion head picked up by wind	Modern drilling equipment have dust collection systems that can deposit drill dust in bags.
Blasting	Dust on surface ejected into air by blast	Dust from drilling collected and removed from the site.
Earthmoving	Materials disturbed by equipment give rise to dust.	Drop heights from buckets to hopers or trucks kept low. Surfaces wetted when high winds occur.
Crusher / screener / conveyor	Crushers and drop points give rise to dust	Materials wetted in crushers and at drop points on dry windy days.
Loading, transport	Loading trays and vehicle wheels give rise to dust	Drops heights to trays kept low. Loads wetted or covered on dry windy days. Speed limit imposed on vehicles on site.

Commitment	Details	Responsible
2	Mitigation measures will be employed to ensure that dust from the quarry operation does not exceed the limits specified in the Quarry Code of Practice	Quarry Manager

The above mitigating actions are described as best practice quarry management and the operator, Duggans Proprietary Limited is committed to implementing best environmental practice at all times. The Quarry Code of Practice also specifies these actions for dust mitigation and compliance with the code is a condition of the retention of the mining lease.

4.3. LAND USE AND DEVELOPMENT

The Huon Valley is a region that is known for its physical beauty in natural and rural landscapes. Any activity that can detract from that experience is a threat to the full development of the region's tourism potential. The township of Franklin is located on the opposite side of the Huon River. Franklin is home to no less than eight accommodation houses. There is a risk that activities at the quarry could adversely affect the enjoyment of patrons of these establishments through any of the factors described in Section 4 of this EMP.

There is also a risk that the quarry could intrude visually on the natural landscape and skyline vistas from the direction of Franklin. Visual effects of the quarry are addressed in the next section.

With proper implementation of this environmental management plan, Duggan's Quarry will not have an adverse impact on neighbouring residential, industrial or tourist activities. By ensuring that closer neighbours are not affected, it can be guaranteed that more remote neighbours on the opposite side of the Huon River will not suffer an adverse impact.

Both sides of the Huon River are on Tasmania's Huon Trail. The Huon Trail is one of the iconic tourist routes around Tasmania that encompasses the Huon Valley, Hartz Mountains and Bruny Island. Attractions on the Huon Trail include Home Hill Winery, Tahune Forest Airwalk, Bruny Island Charters Wildlife Cruises and Peppermint Bay Restaurant.

The construction, expansion and maintenance of all these attractions and the road network that connects them rely on a consistent supply of high quality and competitively priced construction materials. Duggan's Quarry is one supplier that has serviced the Huon Valley for over thirty years offering high quality construction materials without the high cost associated with importing product from other regions.

4.4. VISUAL EFFECTS

Duggan's Quarry is set in a landscape that comprises a mosaic of different land uses all with differing visual appearances. Grazing land is interspersed with orchards and remnant forest clumps. The skyline of Catos Hill, Woodstock Hill and the connecting ridge line has a covering of unbroken forest that provides a natural backdrop to the Huon Valley. The quarry site is not visible from vantage points close because of intervening topography but the site is visible from Cradoc and from Franklin.

From the Cradoc direction the north western corner of the quarry face is visible. The darkish colour of the face is not easily discernible against the dark colour of the surrounding forest, see Plate 2.

PLATE 2: QUARRY VIEWED FROM CRADOC

To minimise the visual impact from this direction, it is necessary to maintain the integrity of the western flank of the quarry face. This feature connects the natural contour of Catos Hill with the rest of the ridgeline. If the quarry face and bench structure were to 'daylight' out of the ridge to the west, the geometric shape of the face and bench would spoil the skyline from this point of view.

The mining plan as proposed, will protect the western flank and the more southern section will be rehabilitated and revegetated to ensure that from this direction the quarry becomes less visible as development proceeds. See Figures 6, 7 and 8 for the location of the flanks of the ridgeline that will be retained.

The quarry is also visible from Franklin on the opposite side of the Huon River estuary. Franklin is an historic township that has a number of popular tourist attractions. One of the important attractions is the beauty of the township and its location on the edge of the Huon River. Catos Hill and the connected ridgeline provide a natural back drop to vistas from Franklin across the river. The quarry can be seen from this direction see Plate 3 below.

PLATE 3: QUARRY VIEWED FROM FRANKLIN

The quarry is more visible from this vantage point because the faces expose the lighter coloured sandstone rock on the eastern side of the quarry. This resource has marginal economic value and this flank of the quarry will be retained to provide a visual screen from the Cradoc direction. The eastern flank of the quarry is included in the rehabilitation and revegetation area in the mining plan, see Figures 7, 8, 9 and 10.

By retaining both the western and eastern flank of the quarry and developing the extraction area in a slot, it will be possible to continue extraction without disturbing the skyline when viewed from Cradoc or from Franklin. The planned rehabilitation and revegetation on the inside of these flanks will cause the quarry become less obvious as development progresses, see rehabilitation plan Figure 10 and Section 6.

Commitment	Details	Responsible
3	The mining plan will retain the land on the western and eastern flanks of the ridgeline to screen the quarry operation.	Operator

4.5. WATER EMISSIONS

The mining plan for the quarry specifies that the eastern and western flanks are retained to provide visual screening for the extraction and processing activities. As a consequence of this layout all the stormwater runoff from the quarry B area is directed to a single discharge point, identified in Figure 4 as the source of watercourse 227875.

The stormwater runoff and process water from the batch plant area report to a drain that leads to an impoundment on the southern side of the site. This dam is an alternative water supply dam and the level is kept low by pumping. A sediment trap is located on the drain to intercept the worst of the silt entrained in the water. The remaining is captured in the main impoundment.

4.5.1. LEGISLATIVE AND POLICY 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*

4.5.2. DISCHARGE OF WASTEWATER TO THE ENVIRONMENT

The main discharge point or runoff from quarry B is watercourse 227875. There are three impoundments in series at the source of this water course. These impoundments provide ample detention capacity to ensure that any silt suspended in the runoff water has time to settle out. Calculations for the required retention capacity to accommodate a 1in 20 year flood follow:

The sediment retention basin is designed to retain all the runoff from a one in twenty year reoccurrence storm event over a 24 hour period.

From the rainfall intensity – frequency – duration data (BOM, 2009) average intensity over twenty four hours for a one in twenty year reoccurrence storm is 4.0 mm/hr which gives a total volume of 96 mm over the development area. At the end of the design period quarry B is expected to have a footprint of 8 hectares in total.

The sediment retention basin must detain all the runoff from a twenty four hour event in addition to the process water produced over that period. The entire development area will report to the basin except the runoff retained in the fractured surface of the development area.

Runoff volume = 0.096 x 80000 = 7680 cubic metres

Volume retained in floor = 0.75 x .05 x 60000 = 2250 cubic metres

The design capacity is runoff volume plus process volume less the retained volume.

Sediment Retention Basin volume = 7680 + 6 – 2250 = 5436 cubic metres.

The first of the series 3 impoundments has a surface area of 1595 square metres if pond is assumed to have a regular shape and the maximum depth is 4 metres the capacity is:

First Dam Volume = 0.4 x Surface Area x Depth = 0.4 x 1595 x 4 = 2552 m3.

Second Dam Volume = 0.4 x 1100 x 4 = 1760 m3.

Third Dam Volume = 0.4 x 1810 x 4 = 2896 m3

The total retention volume of the dams that carry the runoff from the quarry B site is over 7200 cubic metres which is over 30% more than that required to contain a 1 in 20 year event. The first dam is maintained at a low level by pumping for supplementary water supply for the quarry and the third dam is utilised as an irrigation dam for the neighbouring orchard business.

The batch plant, hard stand and stockpiles are located on a 1.3 hectare site. Using the formula above the retention volume required is:

Volume = 0.096 x 13000 = 1248 m3

Process water = 10.6 m3

The batch plant area is serviced by a sediment retention basin and then a water impoundment that treats the process and runoff water before it enters the natural drainage system.

Volume = 0.4 x 785 x 3 = 942 m3

Volume = 0.4 x 805 x 3 = 966 m3

The capacity required to contain a 1 in 20 year event is 1260 cubic metres and the capacity provided is 1908 cubic metres.

4.6. BIODIVERSITY AND NATURE CONSERVATION VALUES

A site specific search of the Natural Values Atlas operated by The Department of Primary Industries Parks Water and the Environment revealed the following information.

4.6.1. THREATENED FLORA SPECIES

There are records of the following species within 5 kilometres of the quarry site:

TABLE 13: RECORDS OF THREATENED FLORA SPECIES

Species	Common name	TSPA	EPBCA	Date of record
Deyeuxia minor	small bentgrass	rare	-	1985?
Juncus amabilis	gentle rush	rare	-	2001

The observation of small bentgrass was recorded of Mitchells Road north of Franklin and the gentle rush was recorded off Garths Road at Cradoc. The gentle rush inhabits moist areas often in drains on road sides (DPIPWE (A), 2003). The small bentgrass inhabits open eucalypt forests and the margin of wet sclerophyll forest (DPIPWE (B), 2003).

The mining plan predicts the quarry will disturb an area of 2 hectares for the period up to 2025. The area to be cleared is predominantly rough pasture with a margin of the DPU *Eucalyptus puchella* forest and woodland on the western side and a margin of the *Eucalyptus obliqua* dry forest and woodland on the eastern side. Total clearing in the 2 separated woodland areas aggregate to 0.7 hectares.

PLATE 4: LOOKING SOUTH OVER ROUGH PASTURE AREA TO BE CLEARED

PLATE 5: NORTH TO WOODLAND MARGIN ON WEST SIDE

PLATE 6: NORTH TO WOODLAND MARGIN ON EAST SIDE

The native woodland communities are not listed as threatened and there are no records of threatened flora or fauna species located close by, see the following sections. At its maximum extent the new disturbance will advance 120 metres from the existing disturbed area adjacent to the northern face. The clearing will occur mainly in the pasture but also the margins of the woodlands communities will be disturbed for a similar length.

4.6.2. THREATENED FAUNA SPECIES

There are records of the following species within 5 kilometres of the quarry site:

TABLE 14: RECORDS OF THREATENED FAUNA SPECIES

Species	Common name	TSPA	EPBCA	Number recorded
Accipiter novaehollandiae	grey goshawk	endangered		3 records to 1991
Aquila audax subsp. fleayi	wedge-tailed eagle	endangered	endangered	1 record 2002 (nest)
Haliaeetus leucogaster	white-bellied sea eagle	vulnerable	-	1 record 1979?

Lathamus discolor	swift parrot	endangered	endangered	10 records to 2009
Lissotes menalcas	mt. mangana stag beetle	vulnerable	-	1 record 1995?
Perameles gunnii	eastern barred bandicoot	-	vulnerable	52 records to 1994
Sarcophilus harrisii	Tasmanian devil	endangered	endangered	2 records 2010
Tyto. novaehollandiae subsp. castanops	masked owl (Tasmanian)	endangered	vulnerable	6 records to 2007

The wedge-tailed eagle nest is located in a heavily forested area over three kilometres away towards the north. The quarry activity is existing and apart from a slight advancement of the face over the period of the mining plan, the operation will not substantially change. All the disturbance will occur on the ridgeline, which is a situation not preferred by wedge-tailed eagles for establishing nest sites (Forest Practices Authority (A), 2009).

The stag beetle was recorded close to Prices Creek behind Franklin on the opposite side of the Huon River. This species is known to prefer fallen logs in mature, regrowth and regenerating wet forests and to a lesser extent rainforests (Forest Practices Authority (B), 2010). Both forest communities on the margin of the land to be cleared are dry woodland communities and are therefore unlikely to support populations of stag beetle.

Records of observations of grey goshawk are located;

- close to Turners Road Cradoc,
- close to Cradoc Hill Road, Cradoc, and
- close to a tributary of Victoria Creek at Woodstock.

The grey goshawk is known to prefer mature blackwood swamp forest, wet forest and mixed forest communities for foraging. For nesting they prefer closed canopy wet forests and riparian forests (Forest Practices Authority (C), 2002). Neither woodland community would be considered tall or wet enough to be ideal grey goshawk habitat.

Records of observations of masked owl (Tasmanian) are located;

- off Pelverata Road at Woodstock,
- close to Clarks Rivulet at Franklin,
- close to Goodwins Road at Upper Woodstock, and
- off Church Street in Franklin.

Masked owls inhabit a diverse range of forests and woodlands including agricultural land and forest mosaics. Nesting occurs in large tree hollows in living or dead trees (Department of Sustainability, Environment, Water. Population and Communities, 2010). There are no records of observations of masked owl close to the quarry site.

Records of observations of swift parrot are located;

- off Morrisons Road at South Bridge,
- off Swamp Road at Franklin,
- off Maxfields Road at Franklin,
- off Braeside Road at South Franklin, and
- close to Victoria Creek at Woodstock,

The distribution of swift parrot includes much of the coastal eucalypt forest although the breeding range is confided to the south-east of Tasmania and coincides with the range of blue gum (*Eucalyptus globulus*). A small breeding population has been recorded in the north. It is unlikely that the small areas of woodland that will be disturbed as a result of the mining plan would contain nesting habitat. In certain years flowering eucalypts within the woodlands would provide foraging potential and for this reason clearing should be confined to only that essential to progress extraction.

Commitment	Details	Responsible
4	Clearing will be confined to only that essential to progress the mining plan	Operator

4.6.3. THREATENED VEGETATION COMMUNITIES

Table 15 lists the threatened vegetation communities that are located in close proximity:

TABLE 15: THREATENED VEGETATION COMMUNITIES IN VICINITY

Code	Title	Status
DOV	*Eucalyptus ovata* forest and woodland	endangered
AWU	wetland (undifferentiated)	vulnerable

The black gum (*Eucalyptus ovata*) woodlands are confined to small remnant stands in the agricultural land mosaic, especially located close to the river see Figure 4. The wetlands areas are also located alongside the Huon River. Neither community will be affected by the continued operation of the quarry.

4.6.4. GEO-CONSERVATION SITES

The quarry is located near to the Egg Islands Tidal Delta which is listed as a geo-conservation site with sensitivity classification of 6.

The quarry operation has not and will not affect the Egg Island Tidal Delta.

4.6.5. RESERVE ESTATE

Egg Islands is also the site of the Egg Island Conservation Area over part of the island and a conservation covenant of the balance.

The quarry operation has not and will not affect the Egg Island Conservation Area.

4.7. DANGEROUS GOODS

The quarry uses dangerous goods and environmentally hazardous materials in its operation. The Duggans Quarry site is classified as a DSL (Dangerous Goods Location) under the *Dangerous Goods (Safe Handling) Act 2005*.The materials can be categorised into groups; explosives, hydrocarbons, gases, cement, acids and herbicides.

4.7.1. LEGISLATIVE AND POLICY 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 Handling) Act 2005*
- *Dangerous Goods (Safe Transport) Act 1998*
- *DEPHA Quarry Code of Practice 1999*
- Security-Sensitive Dangerous Substances Act 2005 (TAS*)*

4.7.2. MITIGATING FACTORS AND ACTIONS

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.

Commitment	Details	Responsible
5	Explosives will be handled in accordance with AS 2187.1 – 1998.	Explosives Contractor / Quarry Manager

Hydrocarbons:

The quarry has an established refuelling facility at the site. This facility is fully bunded to prevent accidental hydrocarbon leaks to the environment should a spill occur. The operation currently supports an alternative site for equipment and vehicle maintenance and servicing. All other hydrocarbons are stored at this location in robust containers, undercover and within secure, site facilities with appropriate signage. The Quarry Manager maintains a Material Safety Data Sheet Register on site in an accessible location. The property access gates are locked when the quarry and the maintenance facilities are unattended. The Quarry Manager has keys and lives locally. Tasmania Fire Service also has keys to the access gates.

Commitment	Details	Responsible
6	Hydrocarbons are stored undercover or in a fully bunded facility with a total capacity of at least 110 percent of the tank volume.	Operator

Gases:

Gases for various purposes are stored at the maintenance facility. No bulk gas storage facility is located at the site but workshop facilities 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 are stored in a secure location in cradles that will prevent the cylinders from falling over if accidentally knocked. Cylinders are 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 caustic in nature and prolonged exposure can cause burns. Cement is stored on site in a purpose built silo and is pumped into the silo from a tanker truck. The risk associated with the storage and handling of cement is mitigated by controlling dust generated when transferring cement into storage.

Commitment	Details	Responsible
7	Cement is stored in a purpose built facility and transported using proprietary tanker trucks.	Quarry Manager

Acids:

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

Herbicides:

The quarry operator is responsible for controlling weeds on the mining lease. Weed management is implemented by a sub-contractor who is responsible for the safe handling of any hazardous chemicals used. The weed management contractor brings only the required quantity of chemicals to the site and removes the unused portion at the end of the program. Hazardous or environmentally harmful chemicals are not stored on site for extended periods.

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

The Quarry Manager uses his experience in managing 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.

Commitment	Details	Responsible
8	Hazardous chemicals for use in weed control will not be stored on site.	Quarry Manager

4.8. Fire risk

Employees working on the site are subject to a risk of a bush fire approaching from the forest located to the east and south. The quarry haul road runs through a forested area on the western side of the quarry. It unlikely that a fire would approach from this direction but there is potential for the only escape path to be threatened in a bushfire event.

Maintaining heavy earthmoving machinery often involves hot work including welding and grinding, which can present an ignition source giving rise to a fire threat to the surrounding forest.

4.8.1. Legislative and Policy Requirements

Fire threats are controlled under the following:

- Fire Service Act 1979
- Fire Service (Miscellaneous) Regulations 2007
- General Fire Regulations 2000

4.8.2. Mitigating factors and actions

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. All activities will take place within the quarry and processing areas footprint which is effectively an area around 10 hectares of land, clear of combustible materials.

The offices and concrete batch plant are served with a fire hydrant in the dividing island between the buildings. Another hydrant and a dry chemical extinguisher are located close to the refuelling facility. The fuel bowsers are located in a large cleared area although a tree is close to the fuel storage tank.

Water for fire suppression is available at quarry B from a storage / header tank located on the eastern side of the site near to the secondary crusher facility. Alternatively the first sediment retention pond can be used as a location to draw water.

Hot works only occur at the quarry B 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.

All buildings associated with the quarry operation including manufacturing plant, and offices are maintained to be compliant the General Fire Regulations 2000.

4.9. HAZARD ANALYSIS AND RISK ASSESSMENT

The Operator has undertaken a structured analysis to identify the hazards and assess the environmental risk.

4.9.1. LEGISLATIVE AND POLICY 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.

The Operator can be liable for common law claims against nuisance caused by the quarry operation. The Quarry's Operator is obliged to manage the risk of environmental harm as specified in the *Environmental Management and Pollution Control Act 1994*.

4.9.2. MITIGATING FACTORS AND ACTIONS

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 1.

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.

4.10. HEALTH AND SAFETY ISSUES

The quarry operation presents health and safety issues associated with;

- frequent operation of the heavy machinery,
- transport and use of explosives for blasting,
- emissions 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 is responsible for ensuring that all the people working on the site have a safe and healthy workplace and that activities on the site cause no harm to members of the public.

4.10.1. LEGISLATIVE AND POLICY REQUIREMENTS

Legislation controlling health and safety issues include:

- *Workplace Health and Safety Act 1995*
- *Workplace Health and Safety Regulations 1998*

4.10.2. MITIGATING FACTORS AND ACTIONS

The Operator has over 30 years experience in managing quarries controlling heavy machinery and transport operations. The Quarry Manager oversees 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 4.2.

Noise emissions will be controlled by the factors and strategies identified in Section 4.1.

4.11. GREENHOUSE GASES

In the process of developing the quarry a very small portion (10 hectares) of the site has been converted from open rough grazing and forest to production areas. The balance of the site (79 hectares) has been retained as a largely forested landscape. The existence of the quarry sterilises the surrounding land from development and hence from clearing. This forested area has a greenhouse gas benefit in that the trees have sequestered in them a significant quantity of carbon.

4.11.1. LEGISLATIVE AND POLICY REQUIREMENTS

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

4.11.2. ESTIMATE OF GREENHOUSE GAS EMISSIONS

Total green house 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 emissions from off road equipment will be the major contributor to the quarry'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 GHG emissions.

The site has a fixed crushing and screening plant, water return pumping system a concrete batch plant and a pre-cast concrete component fabricating facility, and an office. These facilities are powered by electricity sourced from the grid. The consumption of this power will have indirect or scope 2 GHG emissions.

Calculations of the scope 1 and 2 green house gas emissions are included in Appendix 2.

4.11.3. Implementing greenhouse best practice

The greenhouse gas emissions can be controlled by the implementation of industry best practice quarry management techniques. Any initiative that controls waste and reduces fuel consumption has a positive benefit for controlling either direct or indirect greenhouse gas emissions. Strategies pertinent to quarry operations include:

- Locating regularly visited equipment in close proximity to each other to cut tramming distances and travel times for trucks, wheel loaders and excavators.
- Reduce standing time for loading by ensuring that turnaround times are efficient so that equipment is not left idling for long periods.
- Ensure that the equipment is not operating at full revs when maximum engine power is not required. Trials show that operating at lower engine revs can prolong equipment service life, and contribute to a considerable reduction in fuel consumption without a significant reduction is production.

4.12. Groundwater

Ground water bore 3054 is the closest to the site and was sunk to a depth of 36 metres. This bore can produce 3.2 litres / second at a depth of 18.3 metres. The ground surface at this point is approximately R.L. 40 metres, therefore the ground water level at this point is approximately R.L. 22 metres or 68 metres below the level of the floor of Quarry B.

It is highly unlikely that the extraction activities will encounter groundwater at any point and the infrastructure installed to control and direct stormwater runoff will ensure that no disruption to groundwater flows and recharge rates will occur.

4.13. Solid and controlled waste

This quarry generates waste products and imports materials that can be classified as waste materials as a necessary part of the operation. Receiving and generating waste is not the 'core business' for this operation and hence is 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

4.13.1 LEGISLATIVE AND POLICY REQUIREMENTS

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

- *Environment Management and Pollution Control Act 1994 (TAS)*
- *Environment Management and Pollution Control (Waste Management) Regulations 2000*
- *DEPHA Quarry Code of Practice 1999*

The Quarry Code of Practice 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.

4.13.2. AVOIDANCE AND MITIGATION MEASURES

Imported products for this operation include cement and sand for concrete production and blending. Where possible these aggregates are sourced onsite and waste and losses minimised to contain costs. The Quarry Manager is 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 are applied to the importation of sand to ensure that no weed or disease contaminated material arrives on site.

The controls 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 effects on the surrounding environment and create a nuisance for neighbours. The proponent has adopted the strategies detailed in Section 4.2. 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 applies 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 4.11. for further 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 waste 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.

Runoff water will entrain sediment from the exposed gravel surfaces. Contamination is confined to inert particulate matter and possibly hydrocarbons. All runoff from the processing, extraction and traffic areas is treated before being discharged into the receiving environment see Section 4.5.

Packaging including plastic, cardboard and steel generated as a by-product of purchasing equipment is stored onsite temporarily and then removed to a recycling centre. Putresciple 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 is in place to ensure that the bin is regularly replaced and the contents taken a defined landfill site.

4.14. SOCIO-ECONOMIC ISSUES

Quarries develop a region's natural resources by converting minerals into construction materials for the local and broader markets. The quarry is required to pay royalties to the crown for the raw materials extracted but the enterprise should offer other benefits directly to the region. In return for their natural resources the quarry should facilitate the economic development of the region and directly benefit its people.

4.14.1. LEGISLATIVE AND POLICY REQUIREMENTS

The Resource Management and Planning System of Tasmania have objectives that are enshrined in legislation in Schedule 1 of the *Land Use Planning and Approval Act 1993.*

Part 1 of the objectives of RMPS states:

> ***1.*** *The objectives of the resource management and planning system of Tasmania are –*
>
> > ***(a)*** *to promote the sustainable development of natural and physical resources and the maintenance of ecological processes and genetic diversity; and*
> >
> > ***(b)*** *to provide for the fair, orderly and sustainable use and development of air, land and water; and*
> >
> > ***(c)*** *to encourage public involvement in resource management and planning; and*
> >
> > ***(d)*** *to facilitate economic development in accordance with the objectives set out in paragraphs (a), (b) and (c); and*
> >
> > ***(e)*** *to promote the sharing of responsibility for resource management and planning between the different spheres of Government, the community and industry in the State.*

4.14.2. ASSESSMENT OF EFFECTS

At the last census the Huon Valley region had a total population of 14,000 people and a total labour force of 5,910. The region had 7.3 percent unemployment compared to the national average at the time of 5.2 percent. A third of the workforce was employed as 'labourers' or 'technicians and trade workers' and 10 percent worked in either the aquaculture or fruit tree growing industries (Australian Bureau of Statistics, 2007).

Duggan's Quarry offers an alternative source of employment for a workforce already skilled in the necessary fields. Opportunities are also offered in the underrepresented 'machinery operators and driver'

sector of the workforce. By employing 47 people fulltime the quarry accounts for over 0.8 percent of the region's total labour market.

The quarry is a major contributor to the region's economy by employing local people who live and spend their wages locally. The cash injection into the local economy by the Company's wages contribution is detailed in table 16. below:

TABLE 16: WAGES TO LOCAL ECONOMY

Year	Wages contribution
2009	$1,962,226
2010	$1.755,033

The quarry also contributes by offering a source of high quality, cost competitive construction materials to private and commercial developers.

4.15. HERITAGE

4.15.1. ABORIGINAL HERITAGE

It is necessary to determine whether it is likely that ground breaking work will disturb items or sites with Aboriginal heritage significance. Information regarding the location and significance of recorded Aboriginal sites is not available to the general public. To assess the risk a request was made to Aboriginal Heritage Tasmania (AHT) for them to undertake a search of the Tasmanian Aboriginal Site Index.

The search found that the area that will be disturbed has a low probability of Aboriginal heritage being present. Correspondence from AHT reinforced the need to cease works immediately if Aboriginal heritage is suspected of being present.

Commitment	Details	Responsible
10	Works will cease and AHT will be contacted if Aboriginal heritage is suspected of being present in an area that will be disturbed.	Quarry Manager

4.15.2 HISTORIC HERITAGE

A search of the Huon Valley Planning Scheme and the Tasmanian Heritage Register failed to find any sites in close proximity to the quarry development that might be adversely affected by the operation of the quarry.

4.16. INFRASTRUCTURE AND OFF-SITE ANCILLARY FACILITIES

The operation of the quarry should not place an unacceptable burden on off-site and ancillary infrastructure. Facilities that may be affected include the following:

4.16.1. CHANNEL HIGHWAY

Duggans Quarry has operated in the present location for over thirty years. Recent upgrading works on the Channel Highway in proximity to the quarry have lifted the road to a very high standard. Road safety has been enhanced in the vicinity of the quarry entrance road by creating an 80 km/hr speed environment.

4.16.2. WATER SUPPLY

There is a plan for the quarry to be connected to Southern Water reticulated mains supply. The quarry currently is supplied by its own storage infrastructure for process areas and by roof water collection for the offices. It is planned to connect the batch plant and offices to 'town water' so that water quality variability in concrete can be better controlled. The demand will not be significant and will not stress the supply capacity.

4.16.3. ELECTRICAL POWER

The demand on electrical power will remain consistent and is unlikely to over-load Aurora's capacity to supply power to the district.

4.16.4. MECHANICAL SERVICING FACILITIES

It is proposed to relocate these facilities from their current location in Cradoc to the quarry site. These will then become site facilities and a traffic burden will be relieved from the Channel highway.

4.17. ENVIRONMENTAL MANAGEMENT SYSTEMS

4.17.1 EXISTING ENVIRONMENTAL MANAGEMENT SYSTEMS

Duggans Pty Ltd is the owner of the property and holder of the mining lease covering 94 hectares. As such the Company has responsibility for the environmental management of the land. The Quarry Manager and the Principals of the Company use their experience and considerable resources to actively manage and enhance the overall environmental management effort on the land.

The Company 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 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 the Quarry Manager who ensures that the objectives and targets of the three disciplines are met.

All employees and contractors are made aware of the Company's requirements for environmental care and that they apply to all sites whether they are owned or leased.

4.17.1. NEW ENVIRONMENTAL MANAGEMENT SYSTEM

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 through the adoption of this Environmental Management Plan. The specific provisions include:

- Air quality observations and introducing mitigation strategies when the need arises.
- Noise and vibration monitoring during blasting as the need arises and reporting of the results.
- Rehabilitation 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.

4.18. CUMULATIVE AND INTERACTIVE EFFECTS

There are no industries situated locally that when combined with the quarry are likely to produce an adverse impact on the receiving environment or the communities amenity.

A request of the Huon Valley Council failed to reveal any new industries that, when combined with the quarry, are likely to produce an adverse impact on the receiving environment or the public's amenity.

5. MONITORING AND REVIEW

5.1. AIR QUALITY MONITORING

Performance criteria

The acceptable standard for dust emissions are specified by the Quarry Code of Practice. The code states that "*Dust should not normally be visible crossing the boundary of the premises.*" (Department of Primary Industries, Water and Environment, 1999). The boundary in this case is the mining lease boundary.

Performance assessment

The Quarry Manager will continually monitor dust emissions and will ensure that mitigation actions are deployed before dust conditions approach this limit. Mitigation actions deployed include the use of water sprays on drop points at the secondary crushing complex and a water cart used to wet the surface of roads and hardstand areas.

Review

The Quarry Manager will keep a record of those days where dust conditions required action and the prevailing weather conditions at the time. This information will be used to establish a dust protocol to guide future operations in predicting conditions when action will be required to control dust emissions.

5.2. NOISE MONITORING

A professional blasting contractor is used to plan and undertake blasting at quarry B. The Blasting Contractor is responsible for ensuring that any blast will comply with the acceptable standard

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 Contractor will assess the potential for any blast to exceed the standard. If a risk exists the Blast Contractor will either vary the blast plan or undertake blast monitoring.

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. WEED MONITORING

The Quarry Manager currently employs an annual weed control program for the entire site. An external contractor surveys the site for weed infestations and uses the appropriate technique to eliminate the plants.

Performance criteria

An examination of the site revealed 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 Quarry Manager has responsibility to prevent the spread of the weeds to neighbouring properties. It is also necessary to prevent weed seed from contaminating construction products and vehicles visiting the site.

Performance assessment

The annual weed control program consists of inspecting for existing weed infestations. Infestations identified will be treated at the time of year that offers the most effective control for that species.

As part of the weed control program, 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 effectiveness of the weed control program will be monitored throughout the year. A supplementary program will be implemented if the controls appear to have failed.

5.4. 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. PROGRESSIVE REHABILITATION

As a consequence of the 'slot design' mode for quarry B the actual footprint of the quarry will remain small at 8 hectares. Because the quarry is located along the top of a ridge it is possible to excavate deeply without a serious threat of inundation. The small footprint and the need to keep areas open for stockpiling conspire to restrict opportunities to progressively rehabilitate 'worked out' areas.

Commencing shortly it will be possible to rehabilitate the face and benches on the eastern side as shown in the mining plan Figure 7. This rehabilitation will reduce the visual impact when observed from the Franklin side of the Huon River. The works here will also stabilize the slopes on this flank of the quarry. It is envisaged that this work will be self-sustaining by 2015.

As work progresses rehabilitation works will commence on the western flank of the quarry. The extraction face will tend to recede behind the eastern flank and rehabilitation works will tend to reduce the visual impact from the Cradoc view point.

6.1.1. EARTHWORKS

Rehabilitation areas will be treated by pulling the edge of the benches down over the face, which will serve to reduce the height of the faces and width of the benches. Overburden and subsoil will placed against the toe of each of the faces and topsoil roughly spread over the surface. Cut off drains will ensure that no runoff is directed onto the rehabilitation areas.

6.1.2. 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 the plants to acclimatize over winter.

6.1.3. 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 and paint methods for woody weeds and selective foliar spray for others. Care must be taken to not impact the revegetation plants.

6.2. 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 steep woodland. Figure 10 shows the expected 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.

6.2.1. 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. Materials won will either be rock for production or overburden for rehabilitation works.

6.2.2. 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 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 the existing 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.

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 servicing the crushing plants removed.
- Water tanks and rising mains will be taken off-site for disposal or re-use.
- The access road will remain operation for 3 years to enable periodic rehabilitation works and revegetation inspections.

7. COMMITMENTS

Commitment	Details	Responsible
1	Mitigation measures will be employed to ensure that noise from the quarry operation does not exceed the limits specified in the Quarry Code of Practice	Quarry Manager
2	Mitigation measures will be employed to ensure that dust from the quarry operation does not exceed the limits specified in the Quarry Code of Practice	Quarry Manager
3	The mining plan will retain the land on the western and eastern flanks of the ridgeline to screen the quarry operation.	Operator
4	Clearing will be confined to only that essential to progress the mining plan	Operator
5	Explosives will be handled in accordance with AS 2187.1 – 1998.	Explosives Contractor / Quarry Manager
6	Hydrocarbons are stored undercover or in a fully bunded facility with a total capacity of at least 110 percent of the tank volume.	Operator
7	Cement is stored in a purpose built facility and transported using proprietary tanker trucks.	Quarry Manager
8	Hazardous chemicals for use in weed control will not be stored on site.	Quarry Manager
10	Works will cease and AHT will be contacted if Aboriginal heritage is suspected of being present in an area that will be disturbed.	Quarry Manager

8. CONCLUSION

Duggans Quarry operated by Duggan's Pty Ltd is a prime example of how a business can be developed to get maximum benefit from a natural resource. By diversifying, this business has become a major contributor to the local and regional economy.

This Environmental Management Plan sets out the principles that will allow the quarry to continue to operate harmoniously in a diverse and progressive community. By adopting the prescriptions of this Environmental Management Plan the company is making a commitment to continue to operate an environmentally, socially and economically sustainable quarry into the future.

9. REFERENCES

Australian Bureau of Statistics. (2007, October 25). *Australian Bureau of Statistics*. Retrieved January 7, 2010, from 2006 Census QuickStats : Southern Midlands (M) (Local Government Area): http://www.censusdata.abs.gov.au/ABSNavigation/prenav/LocationSearch?locationLastSearchTerm=southern+midland&locationSearchTerm=southern+midland&newarea=LGA65010&submitbutton=View+QuickStats+%3E&mapdisplay=on&collection=Census&period=2006&areacode=LGA6501

BOM. (2009). *Rainfall Intensity Frequency Duration Data*. Retrieved April 6, 2009, from Australian Government Bureau of Meteorology: http://www.bom.gov.au/hydro/has/cdirswebx/index.shtml

Department of Climate Change. (2009). *National Greenhouse Accounts (NGA) Factors.* Canberra: Department of Climate Change.

Department of Primary Industries Water and Environment. (2005). *Environment Protection Policy (Air Quality) 2004.* Hobart: Department of Primary Industries Water and Environment.

Department of Primary Industries, Water and Environment. (1999). *Quarry Code of Practice.* Hobart: Department of Primary Industries, Water and Environment.

Department of Sustainability, Environment, Water. Population and Communities. (2010, July 13). *Approved Conservation Advice for Tyto novaehollandiae castanops*. Retrieved May 8, 2011, from Species Profile and Threats Database: www.environment.gov.au%2Fbiodiversity%2Fthreatened%2Fspecies%2Fpubs%2F67051-conservation-advice.pdf

DPIPWE (A). (2003). *Threatened Flora of Tasmania - Note sheet - Juncus amabilis.* Hobart: Department of Primary Industries Parks Water and Environment.

DPIPWE (B). (2003). *Threatened Flora of Tasmania - Note Sheet - Deyeuxia minor.* Hobart: Department of Primary Industries Parks Water and Environment.

Forest Practices Authority (A). (2009). *Fauna Technical Note No. 1 - Eagle Nest Searching, Activity Checking and Nest Management.* Hobart: Forest Practices Authority.

Forest Practices Authority (B). (2010). *Fauna Technical Note No. 5 - Protocol for conducting Lissotes menalcas surveys.* Hobart: Forest Practices Authority.

Forest Practices Authority (C). (2002, October 10). *Grey Goshawk - Accipiter novaehollandiae*. Retrieved May 8, 2011, from Forest Practices Authority - Fauna Value Database: http%3A%2F%2Fwww.fpa.tas.gov.au%2Ffileadmin%2Fuser_upload%2FPDFs%2FZoology_Ecology%2Ftfm_grey_goshawk.pdf

10. APPENDICES

10.1. APPENDIX 1: HAZARD ANALYSIS AND RISK ASSESSMENT

10.2. APPENDIX 2: GREEN HOUSE GAS EMISSION CALCULATIONS