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Martins Creek Quarry Business and Extraction Report

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Report Date: Draft 1 – 11 March 2016

Report Date: Rev 2 – 21 March 2016

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Executive Summary

1. Introduction and Scope

1.1 Introduction and Scope

The Martins Creek Quarry is located in the local government area of Dungog Shire Council and has been operating continuously since 1915. The quarry was originally owned and operated by the NSW Government Railways and various subsequent NSW transport departments, commissions, corporations and authorities (NSW Railways) until November 2012. The quarry was extended from the original workings (Lot 1 DP 1006375) into Lots 42 (DP815628), Lots 5 and 6(DP242210) by the previous owner/operator in the early 1990's to ensure continuation of operations. Martins Creek Quarry has been operated by Buttai Gravel Pty Ltd (referred to in this report as Daracon) since December 2012. Daracon are extracting Andesite to produce high quality aggregates, roadbase, ballast, gabion and other specified materials used in road, railway, concrete and civil construction.

The site currently operates with existing consent and under an Environmental Protection Licence EPL 1378 which regulate conditions including:

- Air/water quality monitoring
- Noise limits
- Blasting operations
- Hours of operation
- Plant maintenance
- Complaint management
- Reporting requirements

Daracon have been provided a Development Application number (No. SSD 6612) from the Department of Planning to expand the quarry and to increase production to a maximum of 1.5 million tonnes per annum for another 30 years.

This Extraction Operations Plan examines the existing and proposed operations of the quarry including a summary of the geological assessment undertaken by VGT Pty Ltd, quarry production processes, quarry plant and equipment (fixed and mobile), a SWOT Analysis, analysis of the existing construction materials market, quarry operating hours, product distribution methods and the proposed staged extraction plans.

1.2 Approach

Martins Creek Quarry is an existing hard rock quarry. The areas of former extraction having been upon Lot 5 (DP 242210), Lot 6 (DP 242210), Lot 42 (DP 815628) and Lot 1 (DP 1006375). However, current extraction of rock is limited to Lot 5 and Lot 6. These lots have well established and formed benches, haul roads, overburden storage and water management processes. Material extracted from Lot's 5 and 6 is principally processed and stockpiled upon Lot 1 (DP1006375) with additional stockpiling and product blending upon Lot 1 (DP 204377). Lesser quantities are processed and stockpiled within lot's 5 and 6 depending upon market demand for a given product. The quarry is a

drill and blast operation with subsequent face load and haul to the crushing plant and equipment. Secondary breakage of oversize rock is undertaken with an excavator mounted hydraulic hammer.

The existing principles adopted for quarry planning and extraction activities utilised upon Lot's 5 and 6 are well suited to the site rock material characteristics, the nature of the processing plant and equipment optimised capabilities, site safety and environmental criteria.

The nature of the resource, as referenced in the following and the geological reports, identifies that the resource is contained within a seam that dips from east to west in a predictable manner with limited areas of deleterious or material unsuitable for processing into saleable product.

The resource has been exposed by the establishment of a series of benches progressively developing downwards, east to west, following the dip of the resource. These benches being progressively expanded both north and south as the greater bulk of the resource became exposed with increasing depth into the resource. This process of extraction and quarrying continues to the present.

The progressive development of the quarry into the future has been reviewed with consideration of the following;

- location and quality of the existing and proposed resource as assessed
- location and impacts upon key environmental factors (community, water and air quality)
- suitability of the plan to manage and optimise site safety
- suitability of the plan to manage and optimise environmental outcomes
- provides for economic extraction of the resource whilst providing mechanisms to ensure that the safety and environmental outcomes are not compromised
- flexibility and contingency for unplanned events (excessive rainfall, geological variation, changes to bench or slope stability etc)
- flexibility and contingency to adapt to future market and specification requirements

The proposed extraction plan and quarry development encapsulates these criteria and will continue to deliver optimised outcomes in a safe and environmentally responsible manner.

1.3 Documents Reviewed and Investigations Completed

The documents reviewed and considered in this report include:

- Secretary's Environmental Assessment Requirements SSD 6612
- Martins Creek Quarry Preliminary Environmental Assessment (Monteath and Powys)
- Rail Logistics Report (Plateway)
- Water Quality Impact Assessment (JME)
- Rehabilitation (Conacher)
- Martins Creek Andesite Quarry Geology Assessment (VGT Pty Ltd)

- Martins Creek Quarry Blasting and Vibration Report (Peter Belairs Consulting Pty Ltd)
- Acoustic Assessment Report (RCA Acoustics)
- Traffic Impact Assessment (SECA Solutions)
- Martins Creek Quarry Aboriginal Cultural Heritage Assessment (Niche Environment and Heritage)
- Martins Creek Quarry – Heavy Vehicle Route and Market Assessment (Daracon)
- Various legislation including;
    - Protection of the Environment Operations Act 1997
    - Water Management Act 2000
    - Water Act 1912
    - Work Health and Safety Act 2011 and Work Health and Safety (Mines) Act 2013
    - Work Health and Safety Regulation 2011 and Work Health and Safety (Mines) Regulation 2014

1.4 Inherent Limitations and Third Party Reliance

The quarry extraction and business plan has been developed by reviewing the existing operations, the existing and proposed markets for quarry products, consideration of impacts upon various key planning drivers (such as site safety, environmental management, nature of existing plant and equipment utilised) and with particular reference to the various detailed environmental and operational reports prepared by others for the preparation of this Development Application.

The reports conducted have been reviewed in detail for content and recommendations and utilised in determining the optimum business and extraction processes to address the report determinations and recommendations of these various environmental, geological, planning and performance requirements. Therefore, these various reports by others are inherently integral to the development of the business and extraction report.

Whilst the report endeavours to identify, and indeed has provided some contingency for, a number of variables there are still potential unknown factors, that are beyond the control or reasonable scope of assessment, of the parties that have developed the various reports and recommendations relating to this proposed development. Consequently, there may be events or developments, which are currently unforeseen, that may require some modification or changes to this business and extraction plan in the future. However, the approach adopted for this plan, provides a template that enables changes to staging, bench development, extraction directions of development, rates of extraction and blasting techniques etc without compromising the principal planning and development objectives for the project overall.

2. Quarry Business Description

2.1 Martins Creek Quarry – Overview

The Martins Creek Quarry is located in the Dungog Shire Council (refer to location map Figure 1) and has been operating continuously since circa 1915. Daracon are currently extracting, sorting and crushing Andesite to produce high quality aggregates, roadbase, ballast, gabion and other specified materials used in road, railway, concrete and civil construction.

Operations include stripping, drilling and blasting, load and haul, secondary processing, crushing and screening, product blending, product washing, pugmill operations and sales and distribution (refer to figure 2 for the existing site layout).

The quarry utilises the existing road network through the main access at Station Street Martins Creek and as required via an alternative access located on Douglas Street Martins Creek to distribute quarry products by truck (predominantly 'truck and dog') and an existing rail siding that connects to the North Coast Rail line to distribute quarry products to customers by rail (predominantly rail ballast). The haulage route taken and volume required is determined as a result of customer location and the volume of material demanded by the customer on any given day. A summary of the Market Analysis and haulage routes is located in Section 5 of this report , whist a detailed assessment is located in the "Martins Creek Quarry – Heavy Vehicle Route and Market Assessment" report (refer to Annexure of the EIS).

2.2 Martins Creek Quarry Products

The quarry products produced on site include (but not limited to):

1. Rail ballast
2. Concrete, sealing, precoated sealing, asphalt and drainage aggregates
3. Bound and unbound roadbases
4. Gabion material and mattress rock
5. Railway Capping
6. Manufactured sand and washed manufactured sand
7. Engineering Fill
8. Armour and revetment rock
9. Other specified materials used in road, railway, concrete and civil construction.

2.3 Review of Geology

2.3.1 Regional Geology

The site is underlain by Carboniferous volcanic and sedimentary sequences, approximately 350 million years old. The volcanic sequence of interest is known as the Martins Creek 'Andesitic Ignimbrite', as identified in the Newcastle 1:100,000 geology sheet. Refer to Figure 12 of this document and the Martins Creek Andesite Quarry Geology Assessment; VGT Pty Ltd (refer to Annexure of the EIS).

2.3.2 Local Geology

The quarry faces and floor are dominated by the volcanic rock Andesite which has large white rhombohedra crystals (plagioclase). Analysis of the fresh Andesite have been undertaken and the results show that the rock is volcanic rock which is hard and durable which is made up of predominantly Plagioclase Feldspar, both large and small fragments indicating a two stage cooling process.

There are some exposures of underlying red sandstone and claystone in parts of the quarry floor and these are known as metasediments. This underlying sequence is thought to be Cll the Wallaringar Formation.

The depth of weathering is determined upon the rip ability of the material. A dozer can generally rip to 0.5 metres below the surface and then the material is too hard and competent and must be blasted. The yellow surfaces seen in the quarry are very thin iron stains found on the joints and do not compromise the strength of the material. (Refer Martins Creek Andesite Quarry Geology Assessment; VGT Pty Ltd).

2.3.4 Rock Characteristics

As part of the quality control of producing aggregates and associated quarry products currently produced testing is routinely undertaken for engineering properties including but not limited to rock strength, sizing and shape. Qualtest Pty Limited has prepared a report which describes the engineering properties of the rock types encountered at Martins Creek (report contained in Appendix A).

The report concludes that the material encountered at Martins Creek is a hard igneous rock suitable for concrete aggregate, asphalt and sealing aggregate, ballast, gabion, rock fill, rock armour, road pavements, drainage and bulk fill operations.

2.3.5 Overburden Characteristics

The overburden or waste generated throughout the life of this quarry will consist of soil, sub-soil and weathered Andesite. The amounts generated are considered to be low due to the thin soil profile approximately 15 centimetres thick, whilst the weathered Andesite can be used to create drainage aggregates, roadbase, gabion and fill products.

Soil and sub soil will be produced as part of the stripping and the weathered Andesite will be very similar to the fresh but it will generally have higher clay content. Generally material not suitable for processing at any given time will be stockpiled in an area so as to not restrict extraction activities. This material can either be used for processing at a later date or if no suitable application can be determined used for rehabilitation purposes. It is not anticipated from exploration activities undertaken or from past experience that a significant volume of material not suitable for processing will be available for rehabilitation purposes.

2.3.6 Bench Design

Typical bench design within the quarry is an approximate face height of nominal 12m (typically ranging between 8 -14m) and access to benches typically minimum 10m. Qualtest Pty Ltd undertook a Quarry Face Stability Assessment (located in Appendix B of this report) and concluded the existing quarry is assessed as having a low risk of slope instability. It has been determined that the future bench design will be undertaken based on these same typical design parameters with works to be undertaken as per the report's recommendations. Ongoing periodic assessments on bench design and slope stability will be undertaken throughout the quarry's operation.

2.4 Estimates of Remaining 'Reserves'

A resource assessment "Martins Creek Andesite Quarry Geology Assessment" was undertaken by VGT Pty Limited, 15th September 2015 (refer to Annexure of the EIS). The geological and resource assessment of this deposit was undertaken using the following data:

- Site survey, provided by Daracon
- Site extraction boundaries, provided by Daracon
- Drill site locations, provided by Daracon
- Hand held GPS co-ordinates for final drill hole locations for E and PBH series
- Total drilling provided samples for E series

- Precision drilling (blast hole rig) provided samples for PBH series
- Daracon supplied 8086 series logs
- Samples were collected by Daracon
- Drill samples provided samples for E and PBH series were logged by VGT
- Volumes calculated using SURPAC 3D modelling software
- Density of Andesite is 2.7 g/cm^3, provided by Daracon
- The base of the Andesite resource has been determined and interpolated from the drilling
- The soil depth is estimated at 0.15 metres, provided by Daracon
- The overburden thickness is estimated at 0.5 metres, provided by Daracon
- Remaining undisturbed land is approximately 330,000 metres squared.
- Proposed hard rock quarry faces are face angle of 80-90^o as identified in the quarry now, and
- A single batter face has been modelled to determine insitu volume

The report determines a calculated volume of Andesite is 14.1 million cubic metres or 38.07 million tonnes.

2.5 Review of Quarry Operations

2.5.1 Production Process

The onsite processes at Martins Creek Quarry are generally as follows:

1. Stripping of overburden
2. Drilling and Blasting
3. Secondary breakage of unsuitable rock for direct loading
4. Load and Haul
5. Crushing and Screening
6. Stockpiling
7. Pugmill operation
8. Pre-coating of Aggregate
9. Manufactured Sand Washing
10. Sampling and Testing
11. Sales loading
12. Weighbridge operations
13. Train Loading
14. Bucket blending, including the importation of materials for blending to meet product specifications
15. Mobile crushing and screening
16. Maintenance and Repairs

17. Wheelwash
18. Environmental management

Further detailed discussion of the above is detailed in sections 2.5.1.1 through 2.5.1.18. Also refer to Figure 4 for a typical Production, Sales and Distribution Flowchart.

2.5.1.1 Stripping of Overburden

Initially the site will be cleared using suitable earthmoving plant (e.g. dozer, excavator, truck) to clear trees and push up top soil stockpiles. As required stockpiled topsoil will be carted to a stockpile location using appropriate earthmoving machinery and used at a later date for rehabilitation works. It is not anticipated that a significant volume of topsoil will recovered during this process. Areas to be stripped of vegetation will be done progressively as the benches are further developed. Stripping will be limited to those areas required to expose reserves of rock for extraction, safety of operations, access for rehabilitation, site environmental management including surface water management, bunding, bushfire control, boundary maintenance and other activities in accordance with quarry operations.

Constraints on access to areas to be stripped due to topography means the tracked dozer is generally favoured for initial clearing and the rip and push of topsoil to stockpile due to safety, economic and efficiency constraints.

2.5.1.2 Drilling and Blasting

Peter Bellairs Consulting Pty Ltd has prepared a blast report for the site, The "Martins Creek Quarry Blasting and Vibration Report" (refer to Annexure of the EIS) describes the extensive blast history of the site and found that the blast vibrations were within prescribed limits and there was no recorded overpressure exceedance.

Drill and Blast activities are undertaken using a hydraulic drill rig to drill the blast pattern. The Peter Bellairs report identified a typical blast pattern used at Martins Creek Quarry as 89 millimetre diameter holes with a 500mm sub-drill on a 2.8 m (Burden) and 3.2 metre (Spacing) grid layout, with a typical powder factor of approximately 0.6 to 0.65. Further the report identifies that as the quarry develops the blast design will require modification depending on relative impacts to sensitive receivers, as is the case currently at Martins Creek Quarry. Drilling and blasting is conducted using experienced drill and blast contractors using late model, hydraulically driven drilling rigs. They utilise contemporary bulk explosives pumped directly from delivery vehicles. There will be nominally 5 blasts per month.

2.5.1.3 Secondary Breakage

Secondary breakage involves the reduction in size of oversize rock to a suitable size for processing or sale as revetment/oversize rock. It is done by the use of hydraulic rock hammer equipped hydraulic excavators. Secondary breakage will typically occur on the lower benches of the East and West pits and located in a manner that minimise noise impacts to receivers.

2.5.1.4 Load and Haul to Process Area

The blasted material will be dug using suitable loading machinery (typically loader or excavator) to sort and load haul trucks at the quarry face.

The haul trucks will cart this material to the primary jaw crushing station ROM pad and/or directly in the dump hopper that feeds the primary jaw crushing station. Rock is also transferred from the ROM pad by wheeled front end loader into the dump hopper.

The trucks will use both the existing haul roads and as the quarry develops the newly constructed haul roads. The haul roads in the West Pit are well established. Haul roads are to be constructed in locations that offer reduced gradients and suitable barriers/buffers to noise sources and sensitive receivers.

2.5.1.5 Crushing and Screening

The production of quarry products is predominately done through the use of the fixed crushing plant with supplementary materials produced using mobile crushing plant. The crushing plant consist of a Primary crushing station, Secondary Crushing Station, Tertiary Crushing Station, conveyors, screens and other associated infrastructure. Refer to figure 13 and Figure 14 for the existing processing plant process flow chart. Section 4.1 of this document contains a detailed discussion of the existing crushing and screening plant.

2.5.1.6 Stockpiling

Quarry products are typically stockpiled in readiness for dispatch in product specific stockpiles in the sales and processing area. However, project, floor space, quality accreditation or operational requirements may require products to be stockpiled and loaded in, or from, any operational area of the quarry during the course of the quarry life and development. Stockpiling activities are undertaken by mobile plant including excavator, loader and trucks.

2.5.1.7 Pugmill Operations

The pugmill includes silos for various blending and binding agent storage. The pugmill primarily blends (uniformly mixes with given ratios of product / blending agent) run of crush product with flyash, hydrated lime, slag / lime blends, slag/lime/cement blends etc depending upon the final product specifications. The pugmill provides the additional capability of moisture modification of the blended product. Pugmill capacity is up to 300 tph. To meet product customer demands the use of additional pugmills in any operational area of the quarry may be required.

2.5.1.8 Precoating of Aggregate

The precoat plant consists of oil emulsion storage tanks, aggregate feed bin, and radial stockpiling conveyor with an integral emulsion mixing and spray unit. Material is placed into the aggregate feed bin using wheeled loader. The precoating plant applies a proprietary bitumen based oil emulsion onto various sized aggregates for use in sprayed sealing work on roads.

2.5.1.9 Manufactured Sand Washing Plant

The sand washing plant consists of a feed hopper, moisture pre-conditioning unit, twin screw sand washing unit, stockpiling conveyor and a water siltation dam. This provides a product compliant with high quality concrete coarse sand specification requirements. The sand washing plant is essentially mobile and will require relocating to suitable locations throughout the development of the quarry.

2.5.1.10 Sampling and Testing

Due to customer, project and client requirements quality control testing and certification of materials is required. This testing is undertaken internally through the use of the laboratory currently located in the ‘store’ at Martins Creek Quarry and externally using NATA accredited laboratories.

2.5.1.11 Sales Loading

The loading of products onto lorries for distribution by road is primarily undertaken by wheel loaders and excavators from product stockpiles. These product stockpiles can be in any operational area of the quarry. For the loading of trains refer to section 2.5.1.13 of this report.

2.5.1.12 Weighbridge

The weighbridge installed is a “Toledo” 20 metre model:

- It is a reinforced concrete deck bridge supported by longitudinal steel beams

- The bridge is equipped with 6 x load cells
- Maximum loading capacity is 60 tonnes x 20Kg increments
- The bridge is equipped with concrete approach and exit platforms
- The bridge is certified as suitable for product sales in NSW
- It is not a public weighbridge
- Ticketing, docketing and restraint / covering of loads is managed by a permanent weighbridge operator utilising appropriate visual displays and industry software
- Software manages maximum loading characteristics and limitations of the respective vehicles. Legal load data is input when vehicles are tared which ensures vehicles cannot be overloaded
- The weighbridge operator has access to detailed information relating to lorry operations, travelling times, applicable codes of conduct for drivers etc to ensure all transport to and from the quarry is in accordance with company policies and procedures

2.5.1.13 Train Loading

The quarry is equipped with a rail siding that is connected to the NSW rail network via a connection adjacent and south of Martins Creek Station. Details of the siding are below. The siding will accommodate all contemporary rolling stock types and hook and pull operators.

- The siding is parallel to, and east of, Station Street
- Rail access to the quarry siding is via a road level crossing adjacent to the property boundary at Cory Street, Martins Creek. This level crossing is within the jurisdiction of the ARTC and is part of that network
- Loading of rail wagons is achieved via discharge from an overhead loading bin. The discharge of material into the wagons controlled from a sealed operator's cabin located adjacent the loading bin. The conveyor loads the bin by passing product over a vibrating "scalping" screen to remove fine material. It may be necessary to provide feed to the load out reclaim tunnel feeder with a wheeled front end loader depending upon the product to be loaded and the location of the respective stockpile
- Loading of trains can also be achieved by utilising wheeled front end loaders. Haul trucks transport product for loading to stockpiles adjacent the rail siding and the product is then loaded into the wagons by the loader. A typical loader for this application would be a Caterpillar 988 or equivalent.

Currently supply of material via rail is predominantly rail ballast for rail infrastructure purposes. Further discussion on the rail siding use and potential for product distribution is located in Section 5 of this report and the Rail Logistics Report completed by Plateway (refer to Annexure of the EIS).

2.5.1.14 Bucket Blending

Depending on customer/specification requirement bucket blending of products will be required. This is achieved by bucket blending typically with a wheeled loader two or more quarry products together. This may be done using either site won material carted to stockpile using quarry trucks or by the delivery of material to Martins Creek Quarry for blending.

2.5.1.15 Mobile Crushing & Screening

Mobile crushing and screening plants will be utilised on a campaign basis to produce products such as additional aggregates, roadbase, gabion/mattress rock and revetment rock. Mobile crushing will typically occur on the lower benches of the East and West Pits. Mobile crushing is to be located and screened in a manner that minimises noise impacts to receivers.

2.5.1.16 Maintenance and Repairs

An efficient, well managed and effective maintenance and repairs programme for the quarry plant and equipment is critical for the reliable and economic operation of Martins Creek Quarry. Such a programme requires 24 hour, 7 day per week site access.

Maintenance and repairs encompasses various aspects of the equipment operations from routine minor maintenance through to major periodic refurbishment and repairs.

The aspects of maintenance and repairs can be divided into a number of broad elements and / or activities. These elements apply to each category of plant and equipment. The categories of equipment being itemised as follows:

- Fixed Crushing and Screening Equipment
- Mobile plant and equipment
- Ancillary quarry product processing plant and equipment
- Electrical supply and reticulation plant and equipment
- Road haulage vehicles
- Fuelling and lubricant level adjustments of mobile and miscellaneous equipment and the operation of miscellaneous equipment for maintenance purposes

Each of these categories of equipment will require some, or all, of the following maintenance or repair activities during their respective economic operational lives. These activities range in frequency from daily through to several thousands of operational hours depending upon equipment use and Original Equipment Manufacturer (OEM) requirements and recommendations.

- Equipment fit for purpose inspections to ensure required levels and aspects of safe operations, environmental performance and functional performance are achieved.

- Cleaning of equipment and removal of contaminants from equipment components (eg. Electrical panels and switchgear) to maintain safe and efficient operations, enable accessibility for inspections and to limit unplanned failures.

- Routine preventative maintenance and servicing of plant and equipment involving, but not limited to, lubrication, changing filters, changing tyres, checking rims, checking equipment is fit for purpose, regulatory compliance and inspection checks, changing and replacement of wear liners and consumables and crushing chamber liners, replacing ground engaging components, checking operation and condition of safety systems and equipment, checking operation and condition of environmental and fire control systems and equipment, checking operation and condition of plant control functions and equipment, replacing screening media, repairs and replacement of conveying components and belting.

- Major periodic maintenance and repairs are conducted at predetermined frequencies, typically some thousands of hours of operation, that are based upon OEM or equivalent advice or recommendations. Such work often involves the replacement or refurbishment of

significant equipment parts or components. Such works can be extensive and may require many man hours of work to complete. This work being necessary to ensure the respective equipment operates efficiently as designed and consequently meet all safety, regulatory and commercial operational requirements.

- Breakdown repairs occur as a consequence of the failure of one or other of the above maintenance and repair functions to be done appropriately or in a timely manner. A common reason being the limited predictability of the market requirements for products. This may occur as some non critical (ie. Does not impact upon safety, environment or cause major commercial impacts) maintenance may be delayed to ensure customer and industry requirements are met so that their respective construction programmes are completed. Such unpredictability can occur when projects are accelerated by developers or Government, natural disasters, a number of projects overlap in their delivery scheduling etc.

- Operation of ancillary functions to manage site operational requirements such as safety compliance, environmental compliance and commercially viable operation and utilisation of equipment. Such an activity is the operation of water pumps to manage stormwater on the site. Stormwater management has volume and time constraints that require prompt and timely water quality rectification, management and discharge. Excessive quantities of water may limit access to areas of the quarry of indeed cause cessation of quarrying activities until the water is effectively managed. This may require many hours of pumping and filtration operations.

In order for the quarry to operate at all times in a safe, environmentally sound and commercially sound manner, it is imperative that the quarry is able to perform these maintenance, repair and ancillary functions and activities as they become necessary and as they are required. This requires that these works are able to be undertaken without time constraints. Consequently, the quarry requires the capacity to undertake this work 24 hours per day, 7 days per week.

The inability to operate in this manner will result in reduced plant and equipment availability and reduced plant and equipment utilisation. This will significantly impact upon the commercial operation of the quarry and limit the quarry capacity to compete effectively with competitors in the market. Ultimately, this results in increased costs to projects and infrastructure. Further, it generates the potential for environmental or safety compromising events to occur outside normal working hours without the capacity to control and manage them appropriately or in a timely manner.

These repairs and maintenance works will be undertaken by Martins Creek Quarry and Daracon staff, OEM contractors and specialist subcontractors.

2.5.1.17 Wheelwash

The 13m vehicular wheelwash bath and associated infrastructure is currently located on the road pavement prior to the weighbridge. The wheel wash bath consists of the following:

- 13m wheelwash bath
- Dewatering pump
- Chemical dosing pump
- Bunded chemical storage
- 2 of 25 000 litre water tanks connected to 100 000 litre potable water tank
- Associated pipe work
- Electrical and Lighting

The wheelwash is modular and will be moved as required to suit any changes to the access route to the quarry.

2.5.1.18 Environmental Management

Martins Creek Quarry operates within the constraint of an Environmental Management Plan that ensures that all activities are undertaken in accordance with all relevant legislation and accordance with the existing Environmental Protection Licence (EPL 1378). Well established management processes are used for:

- Dust control using fixed water dust suppression, with or without suppression agents and site watercarts
- Waste
- Spills
- Blasting
- Surface water management
- Environmental reporting

2.6 Mobile Plant and Miscellaneous Equipment

The below table summarises the mobile plant and equipment currently used and plant and equipment proposed to be used in Martins Creek Quarry. It is anticipated that the plant and equipment to be used may vary from the list provided as plant requires replacement, technology improves or operational requirements change. Further this list though extensive is not absolute as plant not included may be required for specific unforeseeable tasks. It is expected that the selection of plant to be used will be done in a manner that allows compliance with the relevant consent conditions and environmental licensing conditions as will apply.

Mobile Plant	
Plant Type	**Typical Operational Function**
Loader Caterpillar 988 or equivalent	Sales, pugmill loader ,stockpiling, product blending
Loader Caterpillar 980 or equivalent	Sales, pugmill loader , stockpiling, product blending
Loader Komatsu WA 600 or equivalent	Face loader, sales loader, pugmill loader
Loader Komatsu WA 600 or equivalent	Face loader, sales loader, pugmill loader
Backhoe	General housekeeping, maintenance duties
Bobcat	General housekeeping, maintenance duties
Forklift or equivalent	Unloading deliveries and moving items around site
Dozer D10 or equivalent	Stripping
Excavator Caterpillar 65 tonne or equivalent	Secondary processing , stripping, bench development
Excavator 35 tonne or equivalent	Secondary processing
Excavator range 4 tonne – 35 tonne)	Environmental Rehabilitation, Drainage works, general miscellaneous works
Dumptruck Komatsu 605 or equivalent	Load and haul , secondary processing , stockpiling/stripping

Dumptruck Caterpillar 775 or equivalent	Load and haul , secondary processing , stockpiling, stripping
Dumptruck 605/775 or equivalent	Load and haul , secondary processing , stockpiling, stripping
Dumptruck Articulated 740 or equivalent	Secondary processing , stockpiling, stripping
Power Rock drill or equivalent	Drilling for blasting activities
Watercart (s)	Dust suppression, miscellaneous jobs
Mobile Crushing Jaw Crusher	Crushing of materials to specific customer requirements eg roadbase, gabion etc, additional aggregate production
Mobile Crushing Cone Crusher	Crushing of materials to specific customer requirements eg roadbase, gabion etc/ additional aggregate production
Mobile Crushing Vertical Shaft Impactor or equivalent	Crushing of materials to specific customer requirements eg roadbase , additional aggregate production
Mobile Screening	Screening of materials to specific customer requirements eg roadbase, gabion et, / additional aggregate production
Service Vehicles	Site maintenance tasks
Pumps fixed	Environmental management, pugmill operations, dust suppression
Pumps mobile	Environmental management, pugmill operations, dust suppression
Generators	Maintenance task, back up temporary power source
Wash Plant	Sand and aggregate washing
Wheelwash	Vehicle wheel washing

Additional mobile equipment will be required throughout the life of the quarry such as mobile cranes, exploration drill rigs, maintenance vehicles, graders etc. The use of such equipment will be done so in a manner that the relevant consent conditions and environmental licensing conditions as apply are complied with.

3. Situational Analysis

3.1 Summary

A SWOT analysis has been undertaken to identify the internal and external factors that may impact on Martins Creek Quarry. The Strengths, Weaknesses, Opportunities and Threats are detailed below.

3.2 SWOT Analysis

Strengths	• Existing and well established operation including developed extraction area and processing plant. Commencement of operation Martins Creek Quarry circa 1915. • Existing operational safety and environmental management systems

	• Well established position in the market place as a supplier of high quality aggregates, especially for high strength concrete, asphalt, road sealing, roadbase, ballast, rock revetment etc • Diversified and well established product base • Diversified and well established customer base with existing supply contracts in place • Proven ability to distribute product by the existing road network • The quarry is located in close proximity to the Greater Newcastle/Hunter Region and the Hunter Expressway/M1 • Ability to supply products by rail and in particular rail ballast to rail infrastructure providers • Existing highly skilled workforce • Supplier of high quality RMS approved roadbase products with extensive field applications • Long standing relationships with suppliers of quarry plant and machinery • Geological assessment identifying 38million tonne of high quality andesite • Optimised supply of all products produced minimising by-product • Relatively small amounts of deleterious material not suitable for production
Weaknesses	• High volume of road transport travelling through the township of Martins Creek and Paterson • Proximity of residential properties to the quarry • Reliance on water for dust suppression, pugmill operations and processing operations • Increase financial cost associated with the expansion and development of extraction areas • High capital cost of replacing fixed plant items
Opportunities	• Secure a long term source of high quality construction material within the region • Establishment of markets outside of that traditionally available via road transport using the existing rail siding. In particular to the greater Sydney region and North Coast/Pacific Highway • Impacts of changes in government economic policy including local infrastructure projects • Ability to increase production by increasing operating hours • Financial benefit to customers and projects of having competitive pricing with the construction materials business • Seek option for alternate entrance to the quarry avoiding the township of Martins Creek • Potential to broaden/extend supply into the concrete and asphalt markets or to engage in partnership with major suppliers • Forecasted growth in the Hunter Region and the government's commitment to upgrading infrastructure to service this growth
Threats	• Current ongoing legal action being undertaken by Dungog Shire Council v Buttai Gravel Pty Ltd (Martins Creek Quarry) • Increase in demand for recycled materials • Complaints relating to the use of road transport in particular from residents in Paterson • Residential housing encroaching on quarry activities • Quarry materials impacted by fluctuating economic cycles

	• Impacts of changes in government policy:
	  ○ Environmental requirements in relation to flora and fauna
	  ○ Economic direction including infrastructure projects
	• Competitors pricing policy
	• Regulatory action taken by breaching licence or consent conditions

4. Plant and Equipment

4.1 Martins Creek Quarry Fixed Crushing and Screening Plant Review

Section 4.1.1 to 4.1.3 provides an overview of the existing crushing and screening plant and its functions. Refer to figure 13 and figure 14 for Martins Creek Quarry Crushing Plant Flow Diagrams.

4.1.1 Primary Crushing Station

The primary crushing station consists of a multi-level metal clad building with operators control room, dump hopper that accepts ROM rock feed from quarry haul trucks. Beneath the dump hopper is a vibrating feeder which transfers controlled rock feed to the Jaw Crusher which reduces ROM rock to approximately minus 300mm. Material exiting the jaw crusher is transferred via conveyor to a surge bin. The discharge point of the surge bin is fitted with a vibrating feeder to provide controlled feed to the secondary crushing station.

4.1.2 Secondary Crushing Station

The secondary crushing station is a metal clad multi-level building. It contains a 3 deck Vibrating screen and a Secondary Crusher. The screen sorts material that is ex jaw and ex gyratory in a closed loop. This generates products that are stockpiled directly and / or transferred via conveyor for further tertiary processing.

4.1.3 Tertiary Crushing Station

The tertiary crushing station is equipped with Vibrating Screens, a VSI crusher accepting feed material via a surge bin, various product transfer and stockpiling conveyors and a re-entry bin. The surge bin receives a mix of aggregate ex the secondary plant. The surge bin feeds this material via the discharge point belt feeder into the VSI crusher. Material ex the VSI is then screened via the two vibrating screens. Products are stockpiled directly via conveyors. Oversize material, too coarse for product, is returned to the tertiary crusher surge bin for re-crushing. The tertiary plant also provides for this returned oversize material to be diverted to stockpile. This then provides for this material to be re-crushed either at a later time or concurrently using alternative mechanisms. This alternative mechanism may be by use of ancillary mobile crushing and screening equipment or by having the material processed again in the fixed tertiary plant by utilising a re-entry mechanism that is incorporated in the existing plant.

The re-entry mechanism consists of a re-entry feed surge bin and stockpile. The bin is equipped with a belt feeder which transports and deposits material to be reprocessed back into the tertiary crushing circuit for processing.

The tertiary crushing station can consequently be operated and produce quarry products independently of either the secondary or primary crushing stations. This enables these other circuits to produce alternative quarry product materials independently of the tertiary plant. Further, it provides for independent operations of sections of the plant whilst some maintenance activities are conducted on the other unutilised portion of plant. This improves utilisation and productive capacity during some maintenance activities where applicable. This re-entry bin can be fed directly by wheeled loader, excavator or equivalent. Alternatively, it can be fed indirectly from a stockpile equipped with a reclaim feeder or by utilising an excavator, wheeled loader or equivalent to feed the

reclaim equipment. This enables larger volumes of material to be reprocessed / processed without need for equipment to load and carry to the reclaim point.

4.2 Summary of Findings

The review of the existing crushing and screening plant and equipment has determined that this plant and equipment is appropriate for the existing operations. It is considered that such equipment, or equivalent, will continue to be suitable for the purposes of the proposed development as described in this document. However, the nature of the processing equipment is such that major failures of equipment can occur, and consequently, repairs may necessitate replacement of major components or indeed entire machines if they cannot be repaired economically. It is anticipated that such replacements would be with plant and equipment of an equivalent nature and capacity.

The equipment and plant configuration installed has adequate productive capacity to meet the needs of the development based upon the various criteria specified within this development application. Such criteria relating to approved times for processing operations, ancillary processing activities, stockpiling and loading, repairs and maintenance. Variations to the proposed application times of planned activities may necessitate potential changes to the nature of the equipment to achieve the desired productive outcomes. As with the existing operations, there will be continued use of ancillary equipment in conjunction with the use of the existing plant and equipment to achieve some particular product specification requirements. Such factors and activities have been included in the assessment and review of this development application.

However, it is considered reasonable to assume that there may be changes to product and technical specifications, in the future by various government authorities and others, as has historically been evident. This may result in the need for, what is currently, unforseen changes to the nature of the equipment. Further, technological improvements with crushing and screening equipment and associated plant, (for example improved materials, improved energy efficiency, improved safety, improved environmental performance etc), may result in the requirement to replace or change plant and equipment.

5. Market Analysis

5.1 Demand for Quarry Materials and Impact on Operating Hours

5.1.1 Proposed Quarry Operating Hours

There are a number of factors that determine the necessary operating hours of a quarry. These factors are predominantly beyond the control of Martins Creek Quarry. Operating hours being those required to meet the demands of both production and for product sales and distribution. The production hours are driven by the market demands for particular products at any given time and the opening hours for sales and distribution are driven by particular customer and client requirements relating to their own respective needs to in turn meet the requirements of their customers and clients. The greater the diversity of the customer and client requirements, the greater the need for the quarry to be able to respond flexibly to the market, customer and client demands.

5.1.2 Product Market Criteria

Martins Creek Quarry is an existing supplier of high quality aggregates and associated quarry products to the civil construction, railway, roads, airports and related concrete products industries. The source rock is a high quality Andesite displaying superior material characteristics to many alternatives in the market. The products produced and supplied using the rock achieves the highest quality and performance standards that are specified within these industries. The quarry is recognised in these industries within the region as a benchmarking standard for these products.

Consequently, Martins Creek Quarry has been, and remains, a preferred supplier over many years to these industries.

5.1.3 Factors Influencing Operating Hour Requirements

The extensive and diverse customer base and product base of the quarry underscores the importance of Martins Creek Quarry to the Newcastle and Hunter region and to the State of NSW.

To service this diverse customer base with the required diversity of products they require to engage in infrastructure construction and creation, infrastructure maintenance and building projects the Martins Creek Quarry must be able to provide a responsive, flexible, effective, timely and reliable service to these customers in an efficient and commercially sound manner.

To achieve this, there are a number of critical factors that control the logistical outcomes and the achievement of the expectations of customers so that they in turn may comply with the demands of their customers and the respective construction and infrastructure clients.

Such critical factors are:

Nature of the product and intended use

- Product specification requirements including material characteristics, manufacturing methods, storage and delivery criteria
- Product moisture and preconditioning requirements
- Product workability and “shelf life”
- Material cost

Delivery method

- Delivery cost
- Delivery scheduling
- Customer work and construction schedules
- Customer project restrictions and delivery constraints
- Delivery site access and availability
- Lead time from the quarry dispatch point to customer delivery point
- Aggregate storage capacities at customer sites
- Safety and environmental inductions at customer and project sites for deliveries
- Weather conditions both at the intended customer / project delivery point and at the quarry

A common essential element that is a primary driver for the quarry to manage and address each of these factors in an efficient and commercially sound manner is the operating hours of the quarry.

5.1.4 Nature of the Product and Intended Use

Depending upon the type of quarry product required, there are different processes that may be required to ensure the product is suitable for the intended use. As an example, bound roadbases to RMS specifications have the requirement for the product to be mixed with a binder and moisture modified via a pugmill. This requires the delivery of binder into the pugmill silo (delivery via road tanker), the production of the material through the pugmill (maximum rate of 300 t/hr), the sampling and testing of the material for compliance to moisture specified by the customer (conducted by a geotechnician that travels to the quarry) and then loading into the transport for

dispatch (road lorry has had to travel to the quarry to get loaded). The material must be delivered to the customer's site and be placed and finished within specified timeframes as detailed within the product specifications. To achieve this in a technically and commercially sound manner, this material must be made early in the morning so that the delivery vehicles can transport it to the customer worksite in time for the customer to complete the work they have arranged for the day. The customer's respective workday typically starts very early, often 6:00am to 7:00am to ensure they can get their work finished for the day. This is essential as work not completed must be redone due to specification requirements for such products, or material not used on site within the allocated timeframe must be discarded. In weather conditions prone to storms, or if rainfall is forecast later in the day, these works must be completed as early as possible, before any rainfall. A further time pressure to have this placement work completed early, driving the requirement to mix the product early at the quarry.

Additionally, it is critical for efficient and commercially sound processing operations that product wastage and product reworking be minimised to optimise production costs. This is achieved by only producing products with "shelf life" directly to customer order. Problems at a project site (eg. Weather, breakdowns etc) may result in orders being cancelled at short notice. Therefore, orders by customers are confirmed prior to batching on the day of delivery. This inherently requires early morning hours processing.

Consequently, it is sought to begin mixing and binding operations from 4:30am. Further, mixing and binding until 10:00pm on weekdays and 6:00pm on Saturdays is required to accommodate customers with larger quantity orders of non-bound materials the following day. These materials do not require the addition of cementing or binding agents, they can be mixed and preconditioned the evening prior to reduce the quantities requiring mixing in the early hours of the next day. This enables enough processing time to be achieved with a 4:30am start. The delivery of blending or binding agents to the quarry using road tankers is required during the pugmill operating hours.

For aggregates, the production cost of the material is essentially driven by the tonnes processed within any given timeframe. Quarries have particularly high proportions of their operating costs fixed. These costs being independent of the tonnes processed. Therefore, to reduce the production costs of the processed material and meet peaks in customer aggregate demand it is endeavoured to maximise the tonnes processed per shift. Therefore, it is sought to operate the crushing and screening plant from 6:00am to 10:00pm. The quarrying activity, face loading, dump truck haulage and associated activities will only be conducted between 6:00am and 6:00pm to improve environmental outcomes. Run Of Mine (ROM) rock, adequate for the crushing plant to be supplied until 10:00pm, can be transported during these hours and stockpiled at the primary crushing station ROM pad in readiness for further processing. This material is then to be fed directly into the processing plant using a wheeled front end loader, only, during the period of 6:00pm to 10:00pm. This significantly reduces any operational noise whilst improving the unit production costs of the processed material. This in turn reduces the cost of products for infrastructure and customers and the commercial competitiveness of the operation. Alternatively during this period material can be reprocessed using the re-entry conveyor of the tertiary plant.

5.2 Market Area and Size

The Martins Creek Quarry – Heavy Vehicle Route and Market Assessment (refer to Annexure of EIS) identifies the volume of quarry materials supplied as a percentage of total sales to each local government area for the period November 2013 – October 2014.

Refer to below summary:

Market By Local Government Area	% of Total Volume
Newcastle City Council	40.2%
Maitland City Council	12.7%

Port Stephens Council	18.2%
Lake Macquarie Council	15.8%
Dungog Shire Council	0.7%
Cessnock City Council	3.5%
Singleton Council	1.7%
Muswellbrook Shire Council	0.6%
Central Coast	1.5%
Upper Hunter Shire	0.1%
Glouceter	0.1%
Sydney	0.2%
Other	
Ex-bin (no address)	2.3%
Ballast Trains	2.5%

5.3 Industry and Customer Analysis

Major customers include Local, State and Federal Government agencies such as Roads and Maritime Services, Sydney Trains, Australian Rail Track Corporation, Airports and Ports Authorities, Department of Commerce, Water Resources, Soil Conservation, Newcastle Council, Lake Macquarie Council, Maitland Council, Port Stephens Council, Cessnock Council, Singleton Council, Muswellbrook Council, Dungog Council and Upper Hunter Council. All of whom request products to the highest contemporary benchmark standards available. Further, Martins Creek supplies many concrete, asphaltic concrete and road sealing customers. These customers reflect all facets of the industry including the major industry suppliers of construction materials, for example Boral, Hanson, Holcim, Metromix, EDI Downer and Fulton Hogan. Martins Creek is a supplier to major infrastructure providers such as Leighton Group, Lend Lease, Seymour Whyte, John Holland, Theiss, Robsons, and Daracon Group.

5.4 General Competitor Analysis

Martins Creek Quarry currently supplies quarry products to several regions (refer 5.2). It is desired to improve the servicing of all market sectors and, in particular, those of the Central Coast and Sydney Metropolitan regions.

Martins Creek is located in what is generally described as the Lower Hunter. As detailed within the Market Analysis (Section 5), Martins Creek provides a very diverse range of quarry products. This diverse range of high quality quarry products is more extensive than that which is typically evident within the hard rock quarrying industry. Whilst this increases the number of competitors for

particular products produced, there are very few other hard rock quarries that compete with the quarry across such a diverse range of products. Most other producers target materials into a particular market sector. Focusing upon concrete aggregates alone or concrete and asphalt aggregates as an example. It is particularly unusual to service all aggregate types, including precoated sealing, concrete, asphalt, drainage and filtration aggregates. Additionally, a specialist supplier of ballast and associated rail industry construction and maintenance quarry products with direct delivery by rail access. River and watercourse revetment materials, all forms of roadbase including bound and unbound, for road and rail industries construction, and further, washed and graded manufactured sands for the concrete industry and for filtration sands. This is a critical and particular point of difference between Martins Creek Quarry and other hard rock quarry producers. This issue evidences the critical significance of what this quarry provides to the region and the State.

The other hard rock and concrete product producers in the Lower Hunter / Newcastle region are Seaham Quarry (Boral), Brandy Hill Quarry (Hanson Heidelberg), Karuah Quarry (Hunter Group - Independent) and Allandale Quarry (Quarry Products – Independent). Seaham and Brandy Hill quarries belong to vertically integrated major companies predominantly supplying their own company requirements. Karuah and Allandale are smaller quarries and service the general Lower Hunter and Newcastle markets. Additionally, there is a conglomerate quarry being Teralba Quarry (Metromix/Hanson Heidelberg/Holcim Lafarge). Whilst not providing direct competition, there is indirect competition from some minor roadbase and engineering fill material quarry sources and sand quarry sources that provide unbound roadbases and sand market competition.

It is of particular note when assessing the importance of Martins Creek within the market that it includes among its significant customers, Boral, Hanson, Holcim, Metromix, Redicrete, EDI Downer etc. All of whom have their own individual sources of either hard rock quarry products, conglomerate quarry products or sand quarry products.

5.5 Transport of Products

5.5.1 Delivery Method

The delivery method chosen for a product is a function of customer demands, project requirements and the delivered cost of the product to site. The delivered cost being the transportation costs plus the material production costs. This is ultimately the cost with which the customer, the consumer or the infrastructure project is burdened.

5.5.2 Rail Transport

An assessment of the appropriateness of rail transport from Martins Creek was undertaken by Plateway Pty Ltd (refer to Annexure of EIS). This research concluded that commercially viable rail transport of quarry products ex Martins Creek is currently limited to the distribution of railway ballast to rail infrastructure owners and maintainers such as ARTC and Sydney Trains. The various reasons are detailed within the report. However, the primary factor is cost competitiveness and limited flexibility when compared with road transport.

To improve the cost competiveness, and maximise utilisation of rail transportation, the report concludes that train loading operations be extended to enable trains to be loaded on a 24 hours, 7 days per week basis. Therefore, it is sought to have provision to load trains 24 hours per day / 7 days per week. This would enable more products to be transported economically by rail. In turn it may reduce the volume of road transport travelling from the quarry further improving outcomes for the road infrastructure and maintenance, traffic management and communities along transport routes.

There is strong commitment to developing rail transport for the distribution of quarry products. However, to achieve this desirable outcome, the economics of the loading and distribution would need to be improved and optimised. The specialised rail rolling stock, specialised rail unloading facility and the construction and maintenance, of an upgraded rail siding at the quarry, are

particularly high fixed cost capital items. To achieve cost competitiveness with road transport the rail utilisation must be optimised. Optimisation includes increasing the availability of access to the siding for loading purposes as detailed above. Further the increased use of rail for product distribution can only occur if various key objectives are achieved. These include:

- The development of suitable secure markets that can be supported by rail distribution from Martins Creek Quarry. Eg. The greater Sydney region.
- Development of the integrity of the supply chain (including production, repeatable quality management, product availability, integrity of long term supply).
- Identification and establishment of a suitable train unloading and product distribution facility. The location of which such that the economic distribution of product can be achieved.
- Access to the rail network and suitable rolling stock.
- The extraction of the andesite resource in the location where the upgrade to the rail siding may occur.

The objective is to develop the utilisation of rail transportation from the distribution of rail ballast only to also include the distribution of various aggregates. It is anticipated that it will require development over a period of approximately a decade to enable a secure market to be established within major markets that could be supplied economically in the future. Daracon includes within our application provision for the establishment of improved rail loading facilities at the applicable stage of the development for the distribution of aggregate products by rail transport. To this end the provisions of the recommendations of the Plateway Pty Ltd document are included in this application.

Critical in this development will be the maximised utilisation of the capital intensive infrastructure which requires the maximised availability of the quarry siding and loading facilities. The available hours for access detailed above will be a significant influence upon the cost competitiveness of this transport and the timing of its' growth in use.

5.5.3 Road Transport

As verified by the Plateway report, research and experience, road transport will remain the more economical, customer preferred and flexible method of quarry product distribution (excluding railway ballast for maintenance of rail track) from Martins Creek Quarry, to the existing and anticipated markets for products produced, for the short and medium term. It is anticipated that it will remain an important mechanism into the long term for shorter transportation distances given the logistics and limitations of rail transport.

Principle haulage routes, transportation vehicles, markets and customer locations have been detailed and identified. They are discussed and extensively addressed within the Martins Creek Quarry – Heavy Vehicle Route and Market Assessment report contained within this EIS.

The respective markets, customers and clients of the various quarry products produced at the quarry, have particular need of timely and reliable delivery of these products. Typically, this requires deliveries to commence as early as practicably possible in the mornings before the start of their respective work schedules (viz. Customer and client schedules). These delivery schedules being

driven by the criteria as described above and the customer's and client's project, manufacturing and production criteria and in turn their client and customer criteria.

Typical examples of this are the concrete, asphalt, road construction and civil construction industries. Concrete and asphalt plants, in particular, typically have limited on site storage capacities. They begin production early for their daily requirements (typically 6:00 am) and require replenishment of their quarry products as they are consumed from their limited on site stockpiles. Reliable and early replenishment is essential for continuity of supply to the projects and clients being supplied. Conversely, sites with greater storage capacities (eg. Civil infrastructure site), or where customers are doing night work (eg. Asphalt, concrete and rail), they may require deliveries later in the afternoon and early evening to replenish stocks in preparation for these evening works. Civil sites, in preparation of placing large volumes of material the following day will also benefit from later deliveries. These issues are addressed in detail within the Martins Creek – Heavy Vehicle Route and Market Assessment report.

A significant driver of delivery costs for quarry product is the utilisation of the transportation fleet. Given the high proportion of fixed costs associated with the operation of road lorries, the fewer loads transported in a given period, the greater the transportation costs of each tonne of product delivered. This cost is ultimately incurred by the project and customers and passed onto the cost of infrastructure works being undertaken. Further, Daracon must remain competitive with alternative suppliers that service the same market sectors and transportation costs are an integral component of the relative competitiveness of the quarry. Therefore, mechanisms that improve transport utilisation will offer beneficial outcomes for the quarry and the consumers of the quarry products distributed.

These capabilities are essential for the quarry to provide customers, clients and projects with a product delivery schedule that is flexible and meets their particular requirements, enables management of their own inventory of stock to be in line with their client and project needs and enables cost competitiveness in product delivery.

To achieve the cost competitive and flexible supply outcomes demanded by the market, customers and clients, Daracon requires that it undertakes the management of site stockpiles and product blending for client specifications, load road transport and dispatch loaded lorries to customers between the hours of 5:30am to 7:00pm Monday to Saturday.

Some road lorries will be parked at the quarry on an as required basis. The lorries will move about the site during and outside of operational hours for refuelling, maintenance etc.

5.6 Market Segmentation

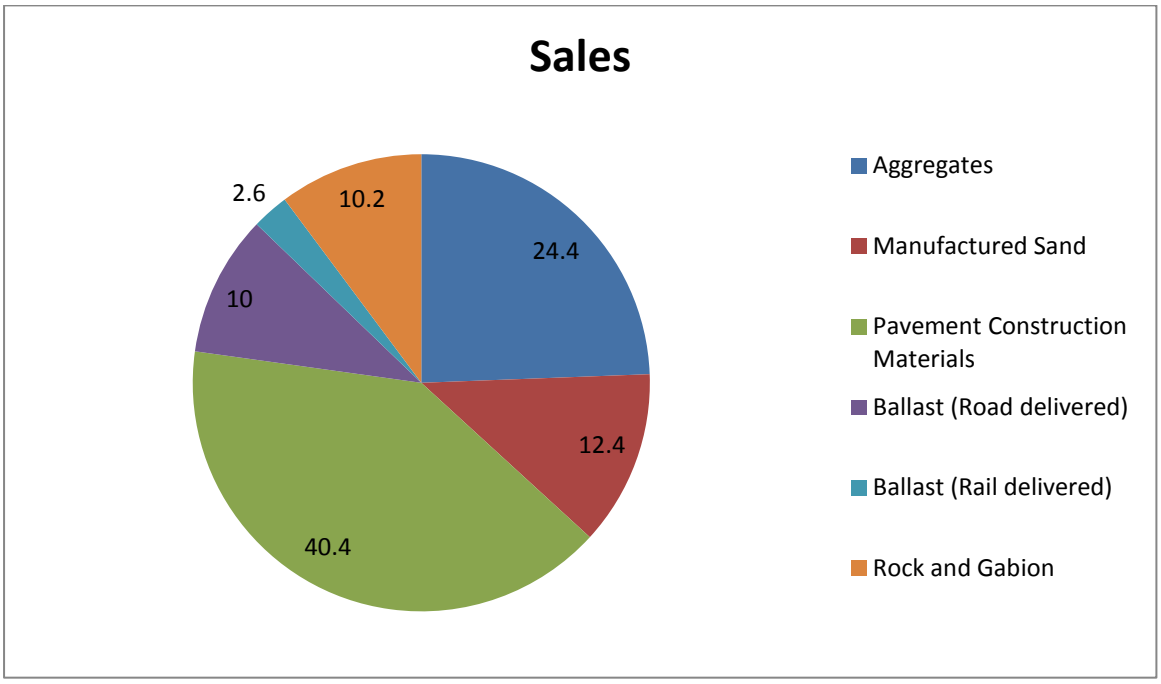
The market segmentation for Martins Creek Quarry has been divided into, and reported by, six broad quarry product categories or "market segments" as defined in the following general category descriptions.

- Aggregates; this category of quarry products includes concrete aggregates, asphalt aggregates, spray sealing aggregates, drainage aggregates, pipe bedding aggregates, stemming aggregates.
- Manufactured Sand; this category of quarry products includes manufactured concrete sand, washed manufactured sand for concrete, manufactured sand for pipe bedding, washed manufactured sand for pipe bedding, manufactured sand for asphalt, washed manufactured sand for asphalt, fill sand, filtration sand, paving sand, stabilised bedding sand.
- Pavement Construction Materials; this category of quarry products includes unbound sub-bases and bases, bound sub-bases and bases, railway capping, structural and engineering fill.
- Ballast (delivered by road); this category of quarry products includes ballast for use as railway track ballast to the various rail authority specifications being Australian Rail Track

Corporation (ARTC), Transport for NSW and light rail suppliers. The majority of railway track ballast is delivered by road transport. The reasons for this are discussed in the sections dealing with rail transport elsewhere in this report. It also includes ballast used as a coarse drainage product in mining, environmental works, septic systems.

- Ballast (delivered by rail); this category of quarry products includes ballast for use as railway track ballast only. It complies with the rail authority specifications as described above. This material is transported from the quarry in purpose designed rail wagons which in turn deliver material onto the existing railway tracks directly for maintenance and rectification purposes or at locations that are inaccessible by road.
- Rock and Gabion Materials; this category of quarry products includes sized and graded coarse rock products. These products being gabion and mattress rock for civil retaining and water course stabilisation and revetment works, sized rock for watercourse revetment, stabilisation and landscaping works, rock fill applications in watercourses, areas of poor drainage, locations where the water table is high and provides poor foundation characteristics, ground improvement and piling works, wick drains.

The above indicative market segmentation by product category is detailed in the following graph displaying the proportion of category sales as a percentage of total sales. (Source – Martins Creek Quarry Nov ’13 – Oct ’14 Heavy Vehicle Route and Market Assessment).



6 Marketing Strategy

6.1 Sales Forecasts and Marketing Mix

Martins Creek Quarry services a broad customer base with an extensive and diversified quarry product range. The very nature of the product diversity and range is one of the key drivers of the particularly successful performance of Martins Creek Quarry in a market that is demanding of both high quality quarry products and cost competitiveness.

Martins Creek Quarry endeavours to produce the highest quality stone, aggregate, sand and roadbase products to maximise the marketability of all materials produced at the quarry. Many typical quarry producers have extensive stockpiles of what are considered production by-products. These materials are typically of low value and do not meet high contemporary standards and result from a production process designed to maximise recovery of "particular products" (typically aggregates) in the production process which is driven by the significantly higher aggregate price versus roadbase or restrictive licence conditions limiting the sales tonnes and thereby encouraging the higher value products only to be sold. This does not provide maximised use and recovery of the limited resource and is counter to the objectives of sustainability.

Daracon has done extensive and expensive development work within the industry to ensure that the recovery and use of the entire resource, including what would otherwise be by-product is maximised rather than simply focusing upon the higher value aggregate market ensuring long term sustainability due to increased utilisation of this high quality and strategically well placed resource for the community. Daracon aim to market and distribute one hundred percent of product produced.

Consequently, effective and extensive marketing of products is of particular importance. Daracon seeks to provide their customers with a range of products that will meet the requirements of an entire project. This simplifies the project logistics significantly, ensuring that products are delivered to site in an "as required" and managed process. This limits significant overlapping of deliveries from other sources reducing project site transport and delivery issues. It also enables significantly improved transport and logistics management which can be particularly advantageous for major developments endeavouring to reduce their impacts upon the community. Further, such broad diversification enables better production, sales and transport management at the quarry.

The above mechanisms provide for an optimised marketing and sales mix to the various customers and projects being supplied. Forecasting of indicative sales volumes based upon extensive market feedback and information available to Daracon enables cost effective production processes, which minimise peaks and troughs in the market, with the consequent improved competitiveness of costs of production and costs of transport. This provides for improved outcomes for infrastructure costs and expenditure and the ability to ensure all the resource is utilised by enabling by-product to be processed at economical costs of production which in turn provides for improved sustainability and resource utilisation for the state.

The quarry is continuously endeavouring to balance the delivery scheduling of products sold. Variations to the operating hours of the quarry as described elsewhere are an important key development criteria to assist in this redistribution of delivery "expectation" that is current in the existing market and to enable more distant markets to be accessible to the quarry which will in turn reduce the dependence upon localised markets. This will improve outcomes for the community whilst ensuring marketability of all quarry products which is essential to the development meeting the objective of improved utilisation and sustainability of a state significant resource.

6.2 Critical Success Factors

There are a number of factors that are critical to the success in terms of practical, operational and commercial viability of this development application for the expansion of Martins Creek Quarry. These factors ultimately control the costs of providing quarry products from Martins Creek Quarry to developments, projects and infrastructure construction which directly impact costs to the community and the state. The factors identified being;

- Entitlement to undertake quarrying and extraction activities from 6:00am until 6:00pm on a Monday to Saturday inclusive each week excluding Public Holidays to provide for

commercially sound and cost effective production costs to service the industry and provide for optimised infrastructure costs to the community and state

- Entitlement to undertake rock and aggregate crushing and screening processing and reprocessing activities from 6:00am until 10:00pm Monday to Saturday inclusive each week excluding Public Holidays to provide for commercially sound and cost effective production costs to service the industry and provide for optimised infrastructure costs to the community and state

- Capacity and capability to service the industry customers, projects and markets during their early morning peak demand periods

- Continued access to, and use of, the existing quarry road haulage distribution routes and networks

- No road transport limitations that impact upon the quarry capacity to distribute materials to customers, projects and markets at times and at volumes to meet typical client and industry requirements

- Entitlement to undertake pugmill blending and moisture conditioning activities from 4:30am until 10:00pm Monday to Friday inclusive and 4:30am until 6:00pm Saturday each week excluding Public Holidays so that the quarry may effectively service the industry construction programme demands within the constraints of industry specifications

- Entitlement to undertake rail train loading and rail transport of products from the quarry on a 24 hours per day, 7 days per week basis to improve the economic viability of rail transportation costs and subsequently enable the expansion of product distribution by rail transport as opposed to road transport

- Entitlement to undertake all site required maintenance activities on a 24 hours per day, 7 days per week basis to ensure the optimum plant and equipment availability which improves production costs and delivers the community and state improvements in infrastructure expenditure

7 Quarry Extraction Models and Costs

7.1 Quarry Management Plan – Caveats

Whilst the best endeavours have been made to ensure the Quarry extraction plans are as definitive as possible there are caveats to the accuracy of timing and extraction of material quantities.

Unlike other forms of development a quarry is a “living” activity in that it changes on a daily basis, it is not fixed in a set plan such as the case of an urban subdivision.

The forces that affect the extraction plans are both internal and external.

Internal Forces:

- Latent ground conditions for extraction. E.g. seams of unsuitable material, other geological imposts

- Stockpiling capacity for bi-products of material production not taken up by other markets at the same time

- Operational equipment that is used in material production- appropriateness for a product, environmental impacts of additional plant, maintenance of plant and currency of plant
- Changes in government policy and guidelines on environment, production and operations
- Emergency production as required

External Forces:

- Market demand for volumes
- Market demand for type of products, specified and non- specified
- Market demand for industry application- differing materials to be used in differing aspects.eg crusher dust for trenching, aggregates for concrete batching, rock armouring for environmental works
- Number of markets and contracts at any one time- multiple markets requiring non complimentary materials
- Government fiscal policy. E.g. government policy for infrastructure construction

These forces reshape the internal and external operations of the quarry on a daily basis and therefore the strict adherence to plans are not a reality of quarrying.

Quarry development life cycle has an impact on the intensity of activity on a quarry. In some cases the activity is related to preparing the site for further extraction such as the construction of new haul roads or the clearing of new expansion areas with vegetation and stripping. These activities normally occur in addition to the primary quarrying and manufacturing of quarry products but are undertaken in short intense timeframes normally associated with the beginning of further extraction practices.

In reviewing the plans and associated activities at various points of time (2 years, 5, 10, 15, 20 and 25) all efforts have been made to encapsulate the conceivable activities that would relate to the quarry at that point in its development life- cycle. It is stressed that the impacts of internal and external forces will modify the plans as a matter that is beyond capacity of certainty.

The quarry extension is proposed to extract a maximum of 1.5 million tonnes per annum, but this will vary based upon the following factors:

1. Economic (demand for product),
2. Environmental (wet weather),
3. Geological local variations in quality and quantity of product,
4. Specifications of products.

7.2 Quarry Extraction Plan and Options

The staged extraction plans as detailed below have been done for the following key reasons and within the limitations as described:

- There will be a multi-location extraction design adopted to ensure that final product quality and production targets can be met throughout all stages of the quarry

- Expansion of the quarry into Lot 21 DP773220 (East Pit) to commence as early as possible to ensure that product quality and production targets can be met and that the andesite resource contained within this area is recovered as early as reasonably possible to allow the potential extension of the rail siding
- Extraction plans have been developed so that appropriate water management measures are in place as required by legislation and as detailed in the Water Quality Impact Assessment report
- Expansion of the quarry and associated stripping activities are undertaken in a staged and progressive basis
- Rehabilitation can only occur when final landform has been achieved
- The existing crushing and screening plant in its current location is suitable for all stages of the quarry lifecycle until decommissioning in the final stage for removal of available resource in this location
- Proposed locations of infrastructure are intended as indicative only with final engineering design and approval to determine final location
- The staged plans have been developed based on extracted volume of 1.5 million tonnes per annum. Any variation to this volume will affect the adherence to each stage as indicated

Quarry Design Parameters

Qualtest Pty Ltd has undertaken a geotechnical assessment of the current bench design practices (refer to Appendix B of this report) within Martins Creek Quarry.

The quarry design parameters for all stages throughout the life of the quarry, now and into the future have the following typical features:

1. Soil and burden thickness less than 1 metre;
2. Soil and burden batter 1V : 3H or 18 degrees;
3. Face height 12 metres nominal;
4. Face angle 80 to 90 degrees, depending upon face formation;
5. Haul roads minimum 3 times width of largest haul truck;
6. Haul roads sloped back to the face at 1V : 100H;
7. Haul roads and faces have safety berms that are half the wheel height of the largest vehicle on site; and
8. Haul roads will be mostly graded to 1V : 10H but in some circumstances and over short distances could be as steep as 1V : 6H

Activities Stage One

<u>Duration and Location</u>

It is intended that this period will occur for approximately the initial 2 years (the duration of this period is dependent on being granted approval to commence operations in Lot 21 DP773220(further referred to as East Pit) and extraction will occur in the area as shown on Figure 5 but this could vary depending upon the items presented in Section 7.1. The quarrying operations during this stage will be contained within the already disturbed areas as shown on Figure 5.

Operations During Stage One

Quarry operations will be undertaken generally as described in Section 2 of this report. No stripping of trees and soils will occur during this period for quarrying purposes and it is not expected that there will be any rehabilitation during this period.

The new haul road, weighbridge and associated infrastructure will be constructed for highway haul trucks to access Dungog Road. Figure 5 and subsequent extraction plans provide indicative locations of where this infrastructure may be located. Tree clearing will be required for the construction of the new access road and associated infrastructure. Acoustic engineering controls will be installed as required (refer to RCA Acoustics Assessment).

Activities Stage Two

Duration and Location

It is intended that this period will occur for approximately up to year 5 and extraction will occur in the areas as shown on Figure 6 but this could vary depending upon the items presented in Section 7.1 of this report. This stage will commence extraction operations outside the already disturbed areas as presented on Figure 6. Extraction will take place in the existing stockpile area which will be required to create additional product stockpile room. The existing water storage tank will be relocated to within the sales and processing area. Extraction in the East Pit will commence with a focus on extracting from where the proposed potential rail siding extension is to occur.

Operations during Stage Two

Quarry operations will be undertaken generally as described Section 2 of this report. The West and East Pit will operate concurrently for the purposes of maintaining rock quality and production targets.

A sediment dam will be constructed prior to the interception of the two watercourses in the East Pit. This sediment dam will have a designated licence water discharge point. Refer to the Water Quality Impact Assessment report for further discussion of water management practices and control measures. The interception of the watercourses in this manner is optimal to prevent contamination of the downstream watercourse, whilst allowing economic extraction of resource and the extraction for the proposed rail siding. Whilst alternatives to the interception of the watercourses were identified the underlying geology and topography relative to the location of the water courses made the alternatives unviable.

The Acoustics Assessment report completed by RCA Acoustics identifies that engineering noise control elements are to be constructed to either reduce noise at source or to interrupt the noise path.

The report identifies that the majority of the engineering noise control elements will be installed within year 0 to 5.

At such time as these engineering noise control elements are installed it may be necessary to relocate the office, crib, amenity, store and materials testing facilities to another location. It is likely that this location will be within the processing and stockpile areas.

Activities Stage Three

Duration and Location

It is intended that this period will occur for approximately year 5 to 10 and extraction will occur in the areas as shown on Figure 7 but this could vary depending upon the items presented in Section 7.1. This stage will commence extraction operations outside the already disturbed areas as

presented on Figure 7. Further expansion of the quarry in the East Pit will occur with a focus on resource extraction where the proposed rail siding extension is to occur. Clearing and quarry expansion will also occur in the south of the West Pit.

Operations for Stage Three

Quarry operations will be undertaken generally as described in Section 2 of this report.

Rehabilitation of areas may be undertaken in areas where final landform has been achieved as the Rehabilitation report.

It is intended that the rail siding extension and haul road bridge over the rail siding is completed, as indicated on Figure 7, however the extension of the rail siding is dependent on extraction of the andesite, market demand for rail supplied products, the acquisition of a suitable rail unloading and distribution facility and other factors identified in Section 7.1 of this report and the Plateway report.

The location of the rail siding and rail bridge is intended as indicative only with final design to confirm set-out.

Activities Stage Four

Duration and Location

It is intended that this period will occur for approximately year 10 to 15 and extraction will occur in the areas as shown on Figure 8 but this could vary depending upon the items presented in Section 7.1. This stage will commence extraction operations outside the already disturbed areas as presented on Figure 8 with the West Pit being expanded northwards.

Operations for Stage Four

Quarry operations will be undertaken generally as described in Section 2 of this report.

Rehabilitation of areas as per the Rehabilitation report may be undertaken in areas where final landform has been achieved.

Activities Stage Five

Duration and Location

It is intended that this period will occur for approximately year 15 to 20 and extraction will occur in the areas as shown on Figure 9, but this could vary depending upon the items presented in 7.1. This stage will extend extraction in the East Pit south into the existing processing area as presented on Figure 9.

Operations for Stage Five

Quarry operations will be undertaken generally as described Section 2 of this report.

Rehabilitation of areas as per the Rehabilitation report may be undertaken in areas where final landform has been achieved.

Activities Stage Six

Duration and Location

It is intended that this period will occur for approximately year 20 to 25 and extraction will occur in the areas as shown on Figure 10, but this could vary depending upon the items presented in *7.1*. This stage will extend extraction in the East Pit south into the existing processing area as presented on Figure 10.

Operations for Stage Six

Quarry operations will be undertaken generally as described in Section 2 of this report.

Rehabilitation of areas as per the Rehabilitation report may be undertaken in areas where final landform has been achieved.

During this period as extraction encroaches on the existing processing operations within the East Pit, the crushing plant and infrastructure will be decommissioned as required so that extraction can occur in this area.

Activities Stage Seven

Duration and Location

It is intended that this period will occur approximately up to year 30 and extraction will occur as presented on Figure 11, but this could vary depending upon the items presented in Section 7.1.

Operations for Stage Seven

Quarry operations will be undertaken generally as described in Section 2 of this report.

Based on extracted 1.5 million tonnes per annum the available resource as identified by VGT is exhausted during this period.

During this stage it is intended that rehabilitation and final landform may be achieved as per the Conacher report.

8 Appendices

8.1 Appendix A Material Engineering Properties (Qualtest Pty Ltd)

8.2 Appendix B Quarry Face Stability Assessment (Qualtest Pty Ltd)

8.3 Appendix Daracon Capability Statement

9 Figures

Figure 1 Location Map

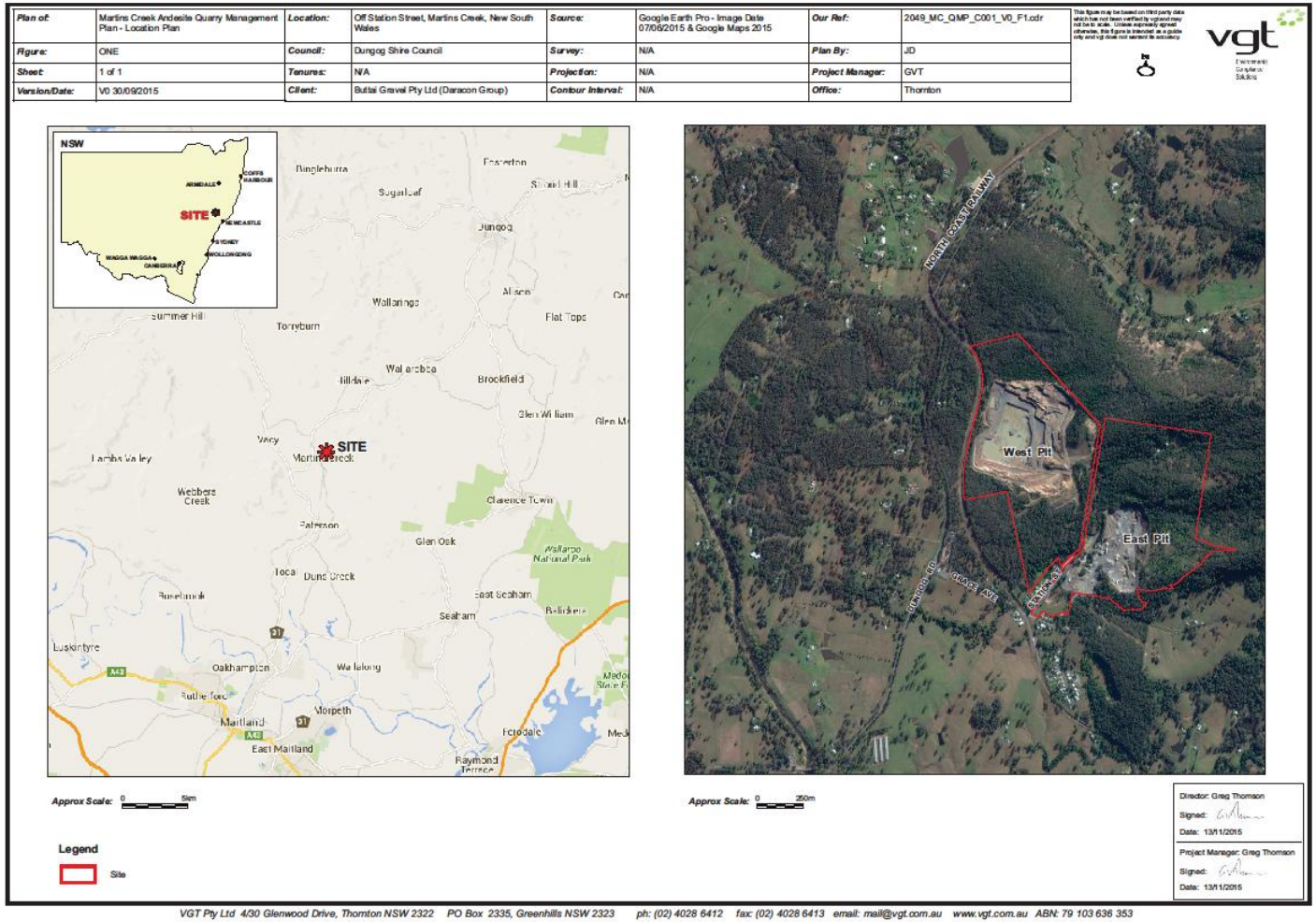


Figure 2 Existing Site Layout

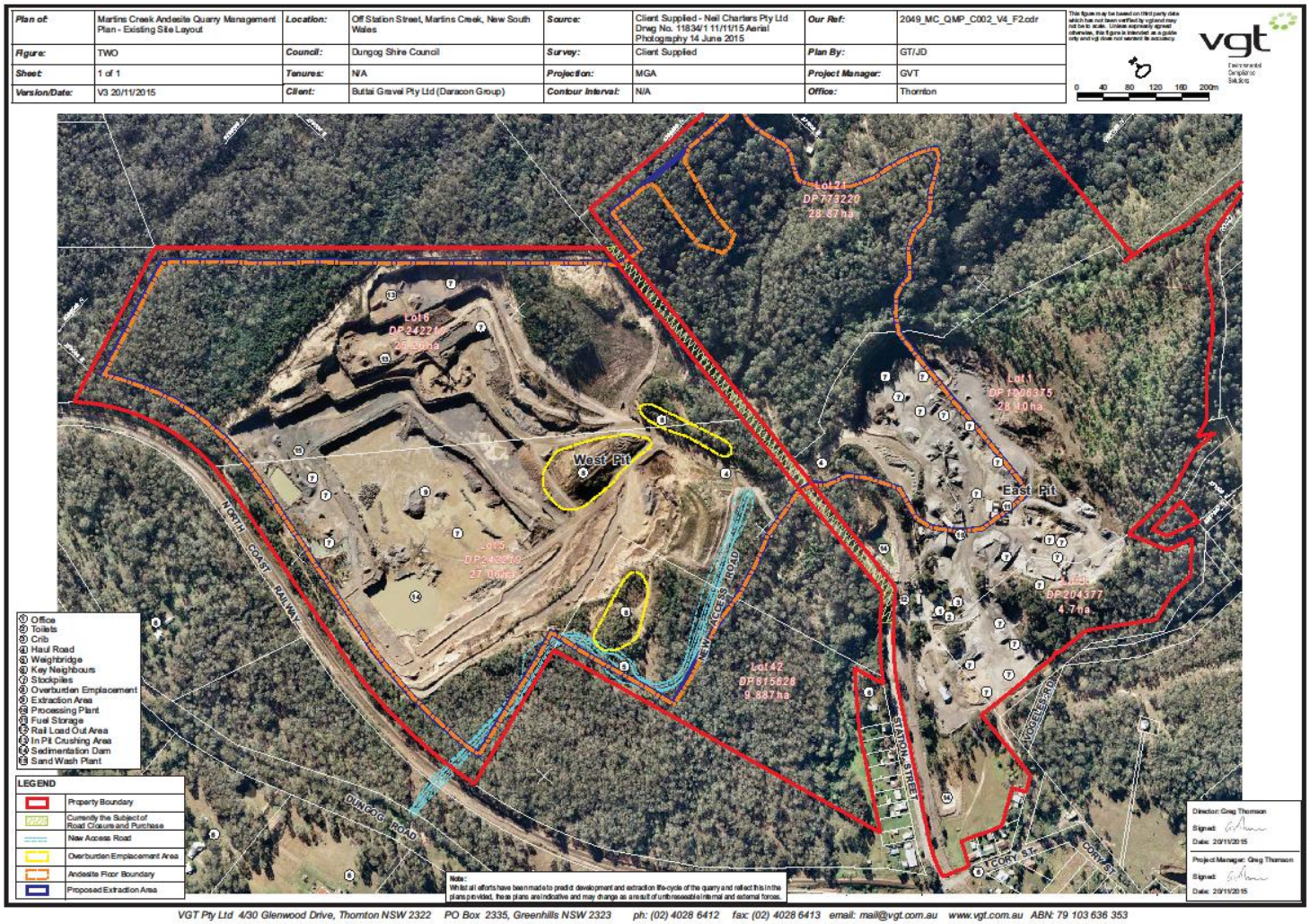


Figure 3 Typical Bench Development

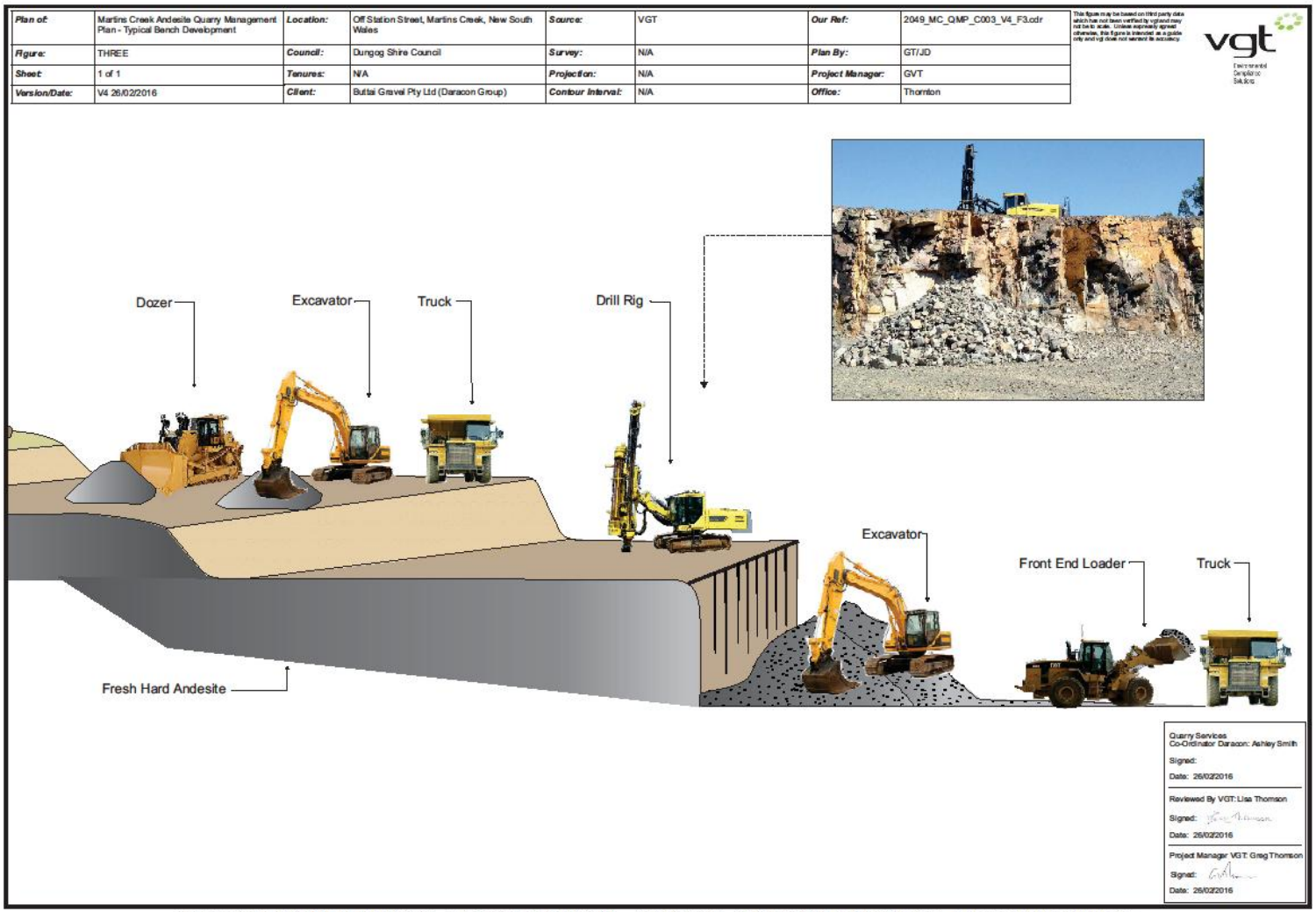


Figure 4 Typical Production, Sales and Distribution Flowchart

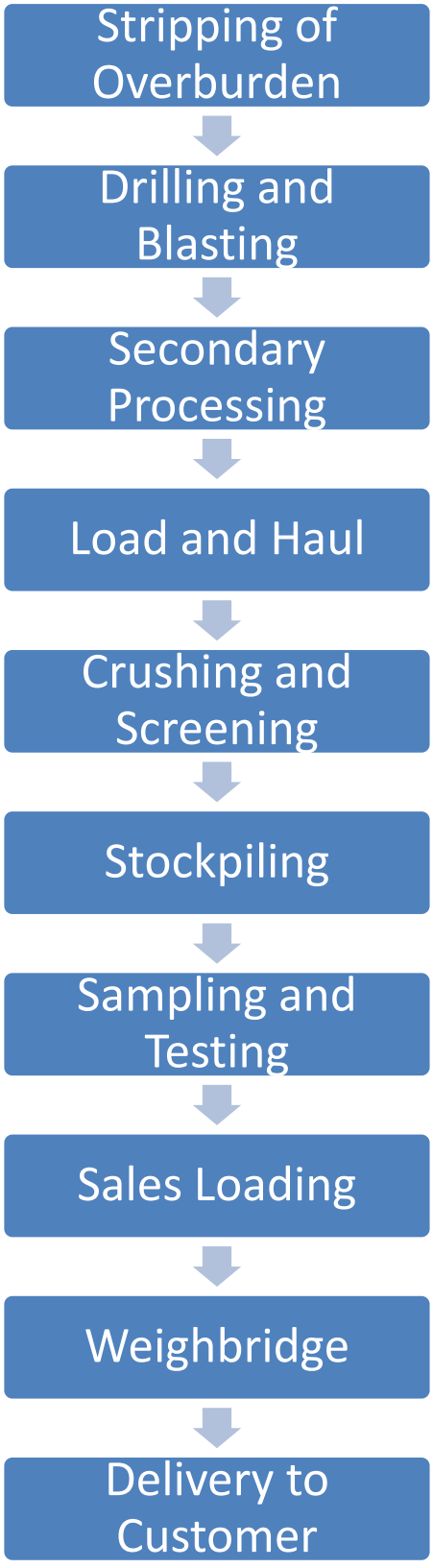


Figure 5 Extraction Plans 0-2 Year

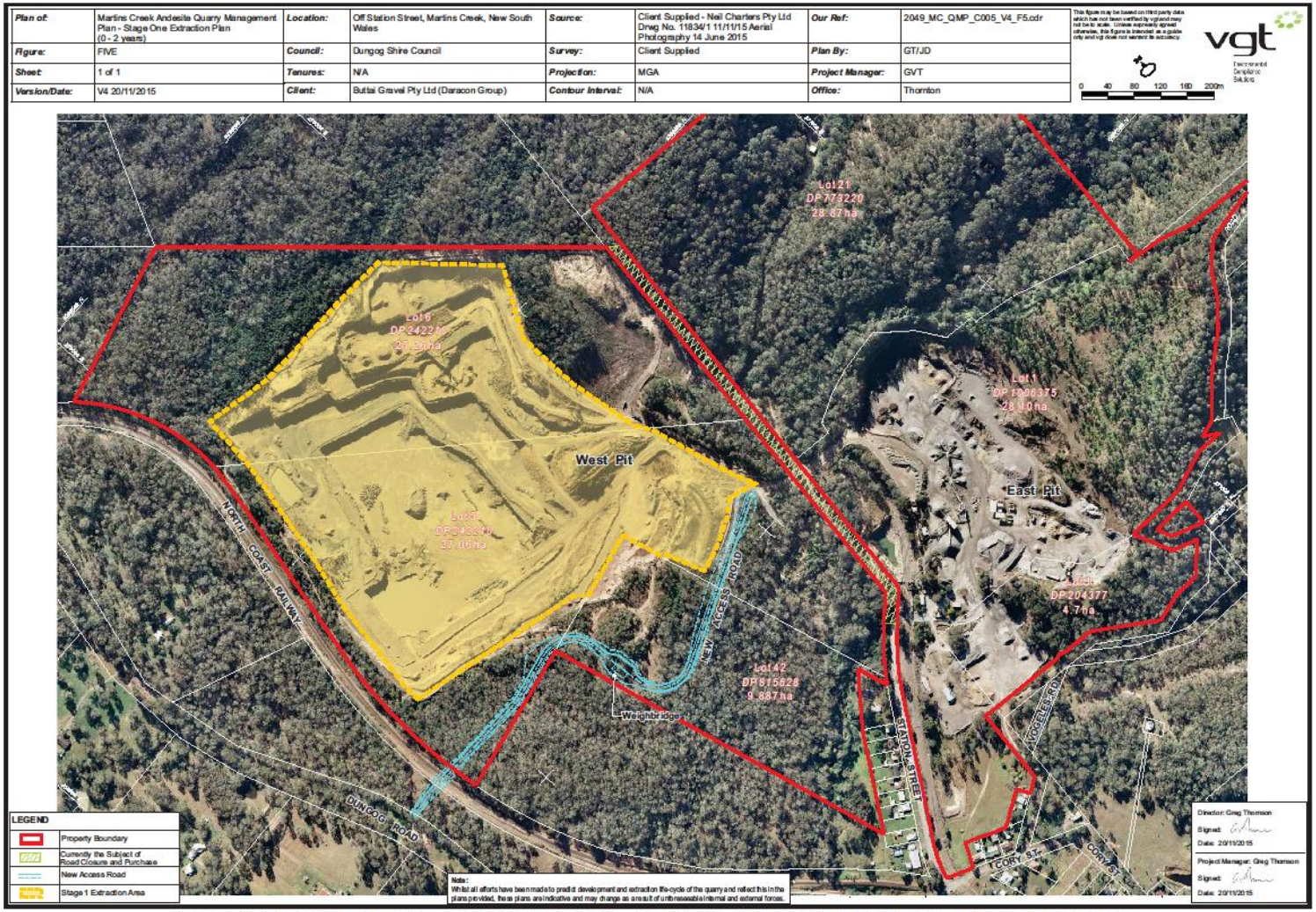


Figure 6 Extraction Plans 0-5 Year

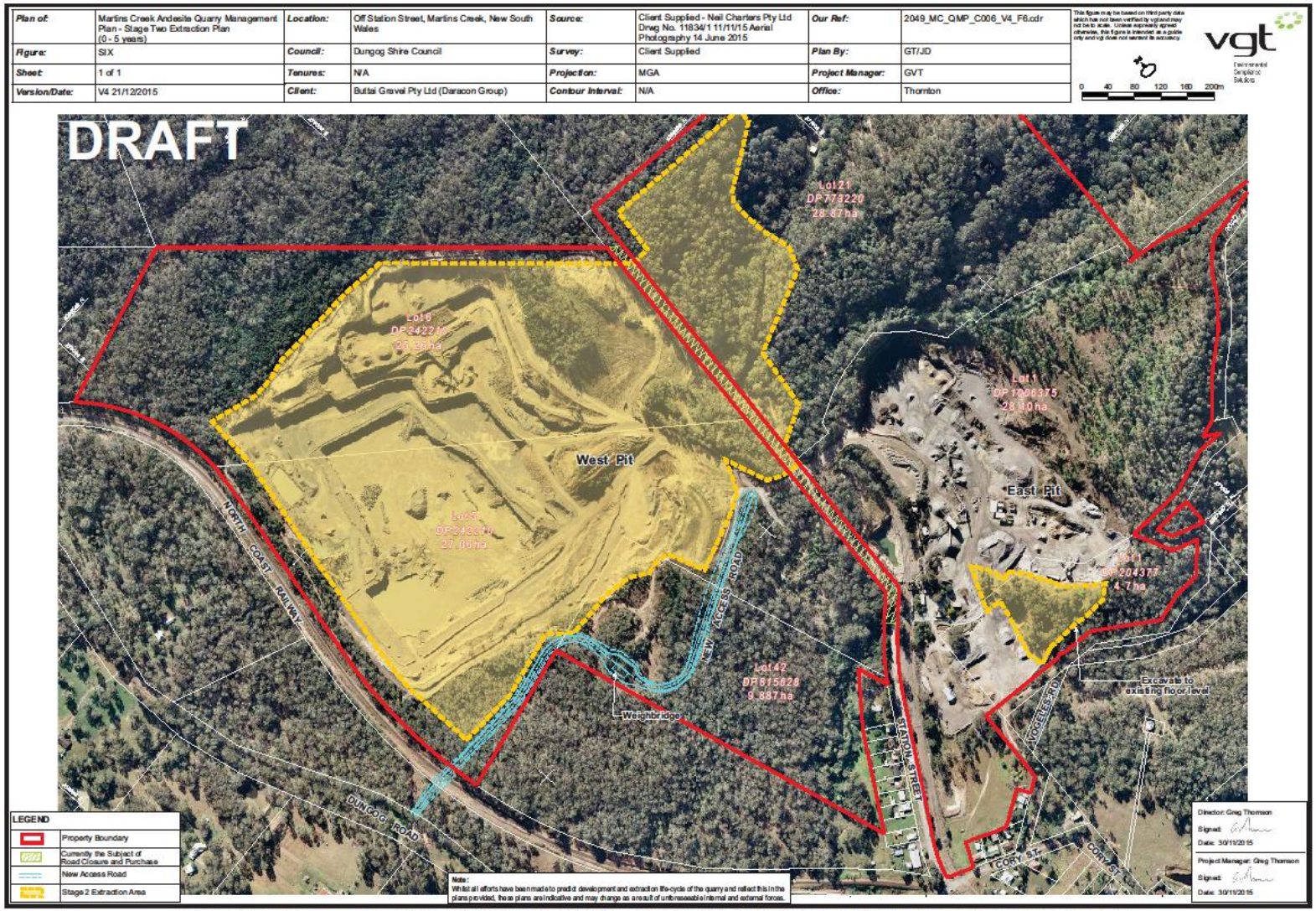


Figure 7 Extraction Plans 5-10 Year

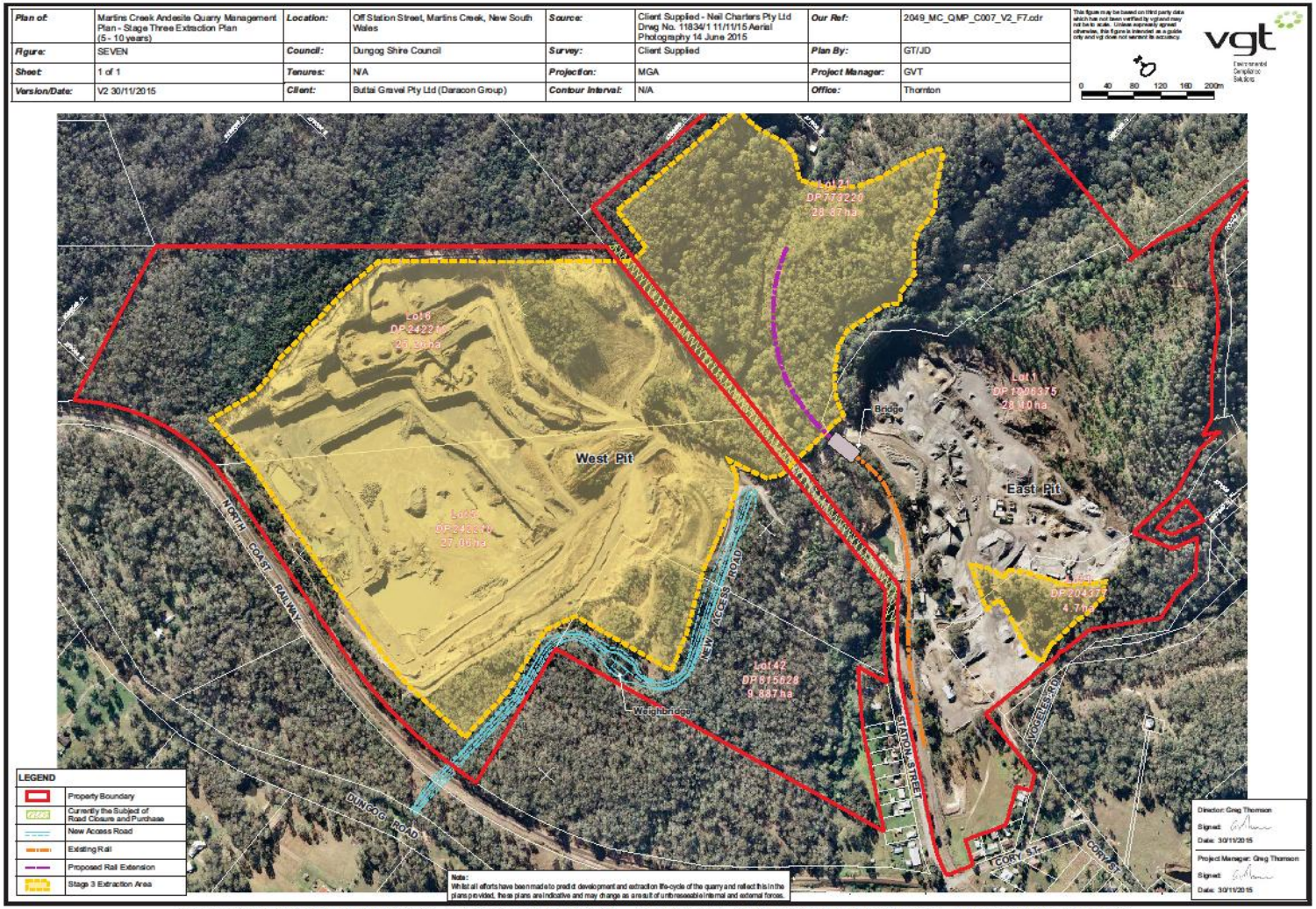


Figure 8 Extraction Plans 10 -15 Year

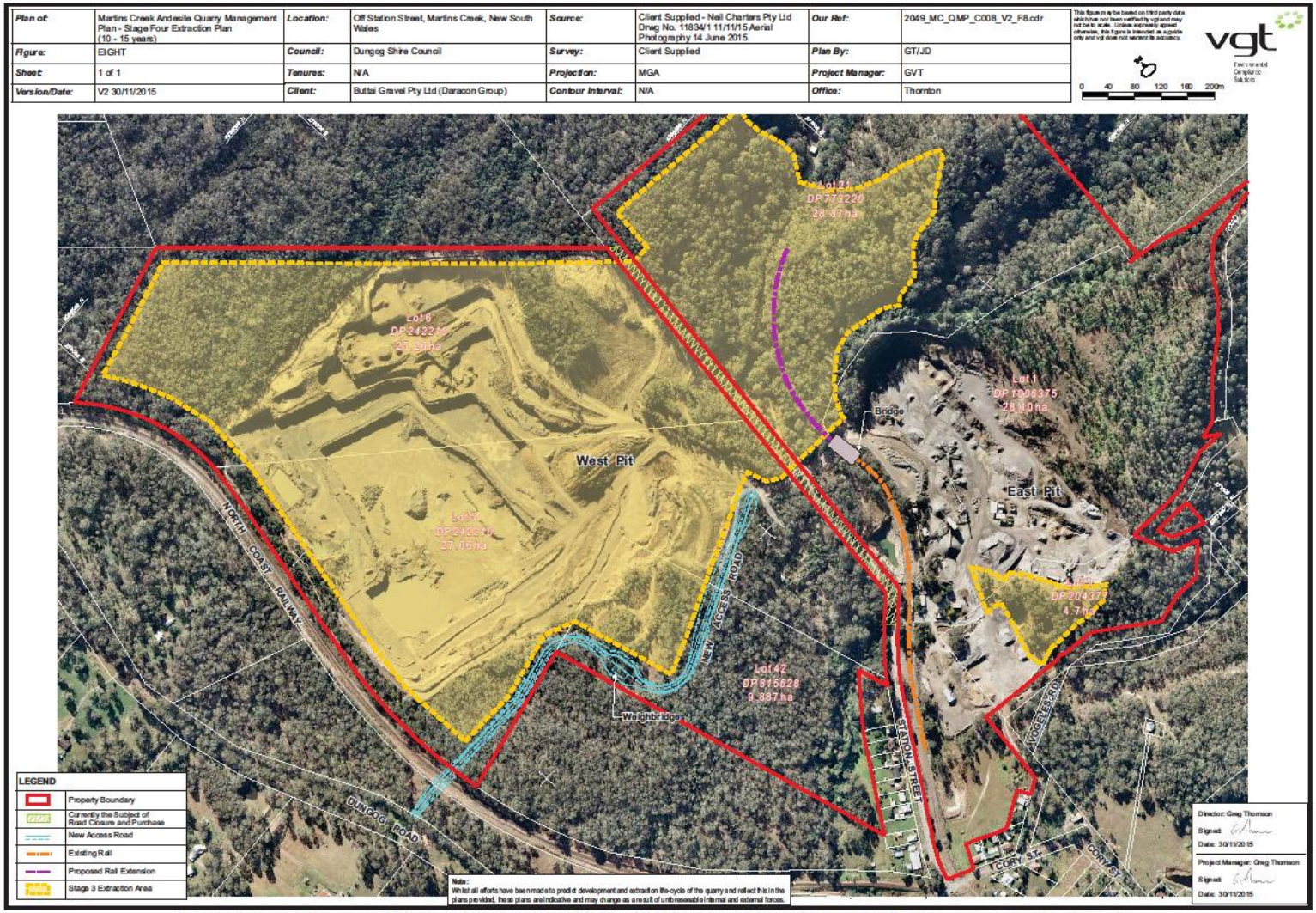


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Figure 9 Extraction Plan 15-20 Year

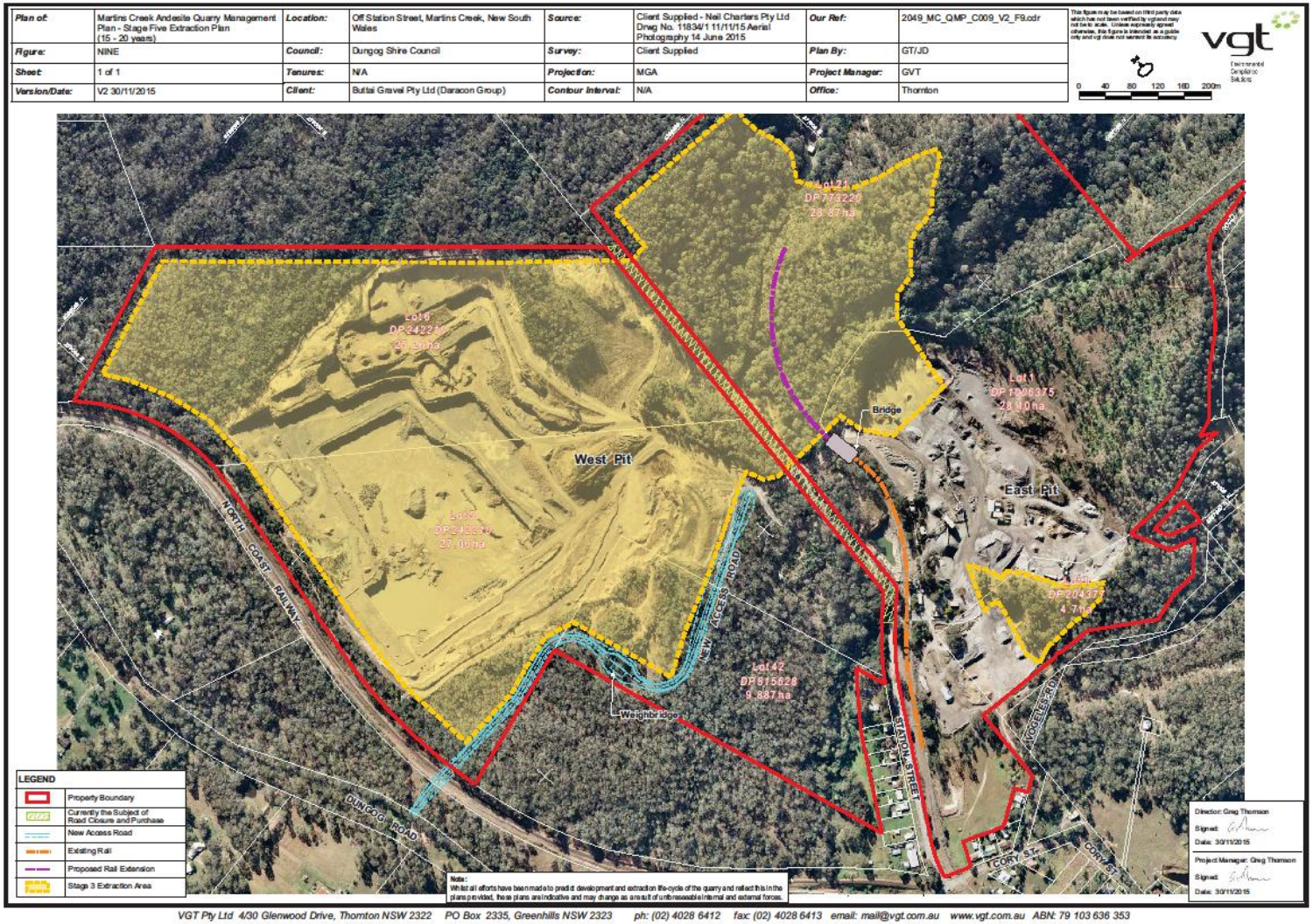

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Figure 10 Extraction Plan 20 -25 Year

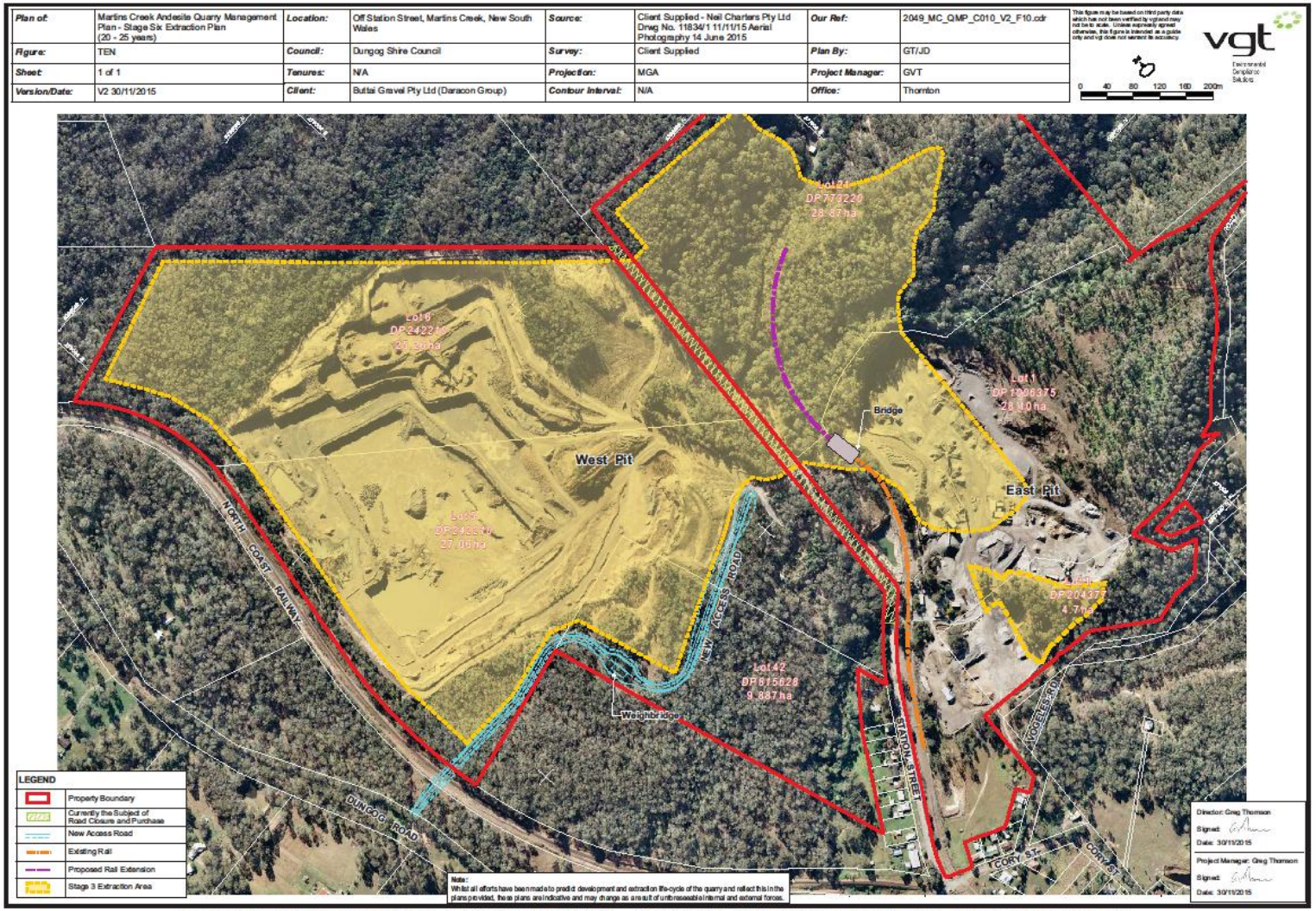


Figure 11 Extraction Plan 25 -30 Year

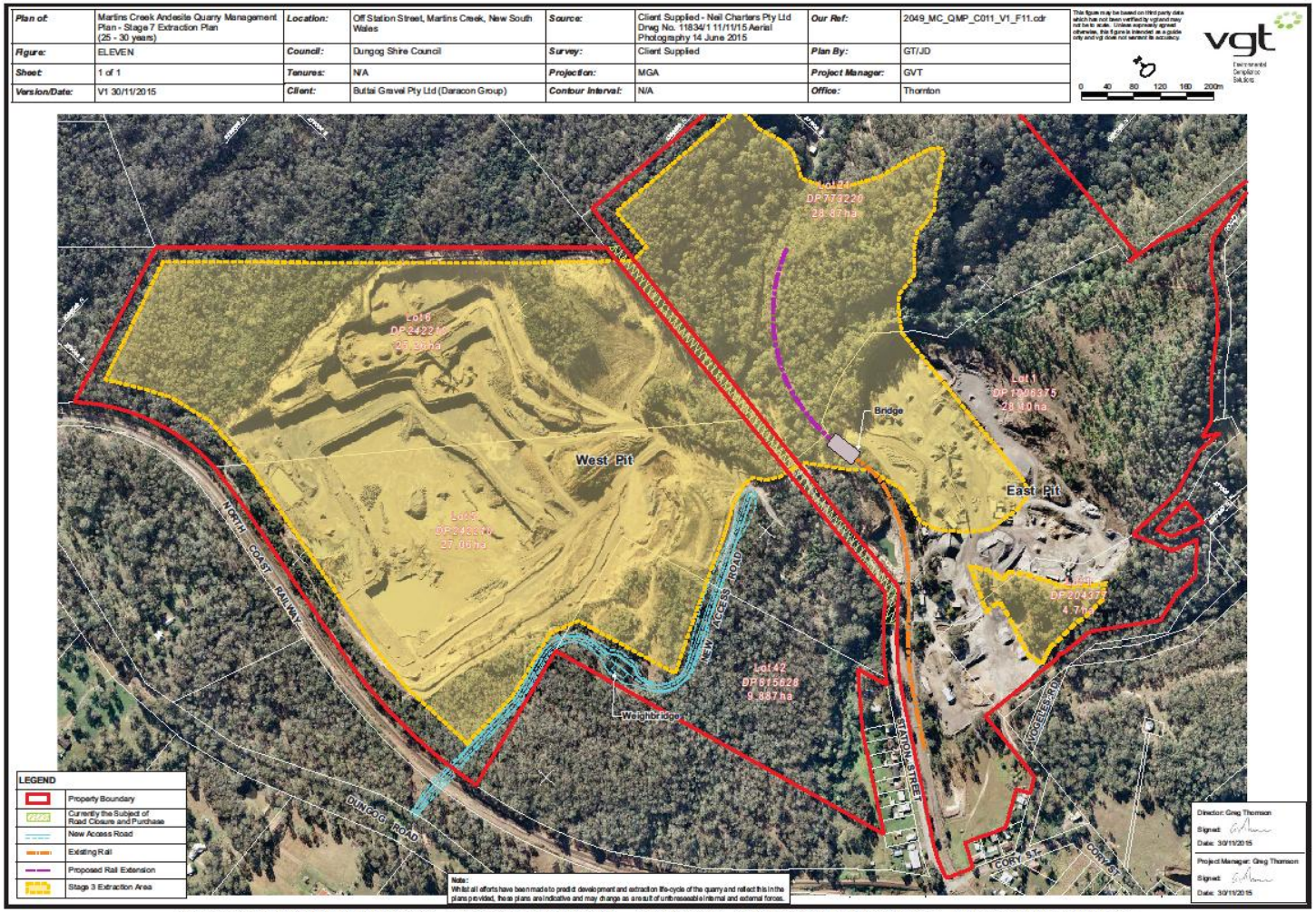


Figure 12 Geology and Air Photograph

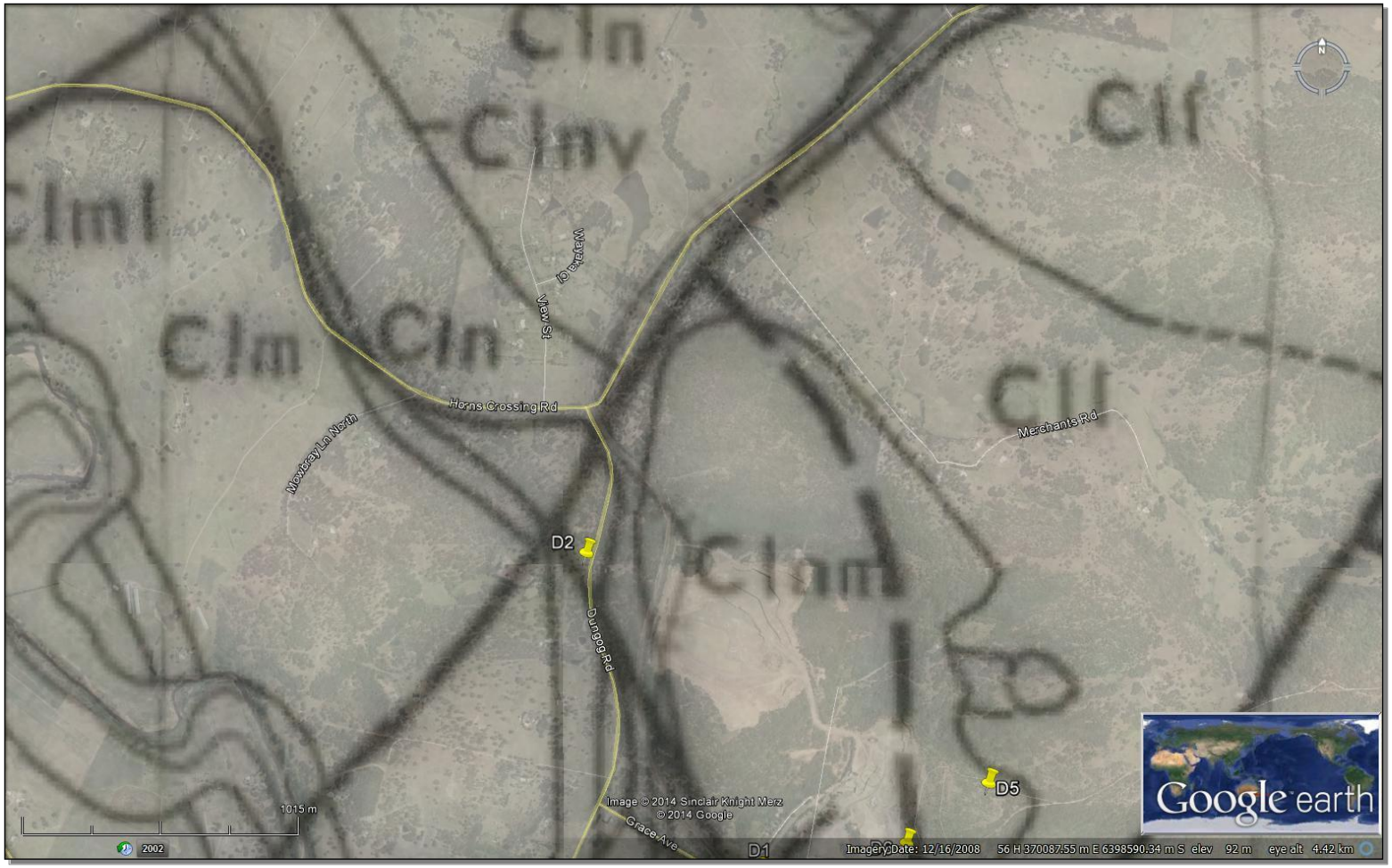
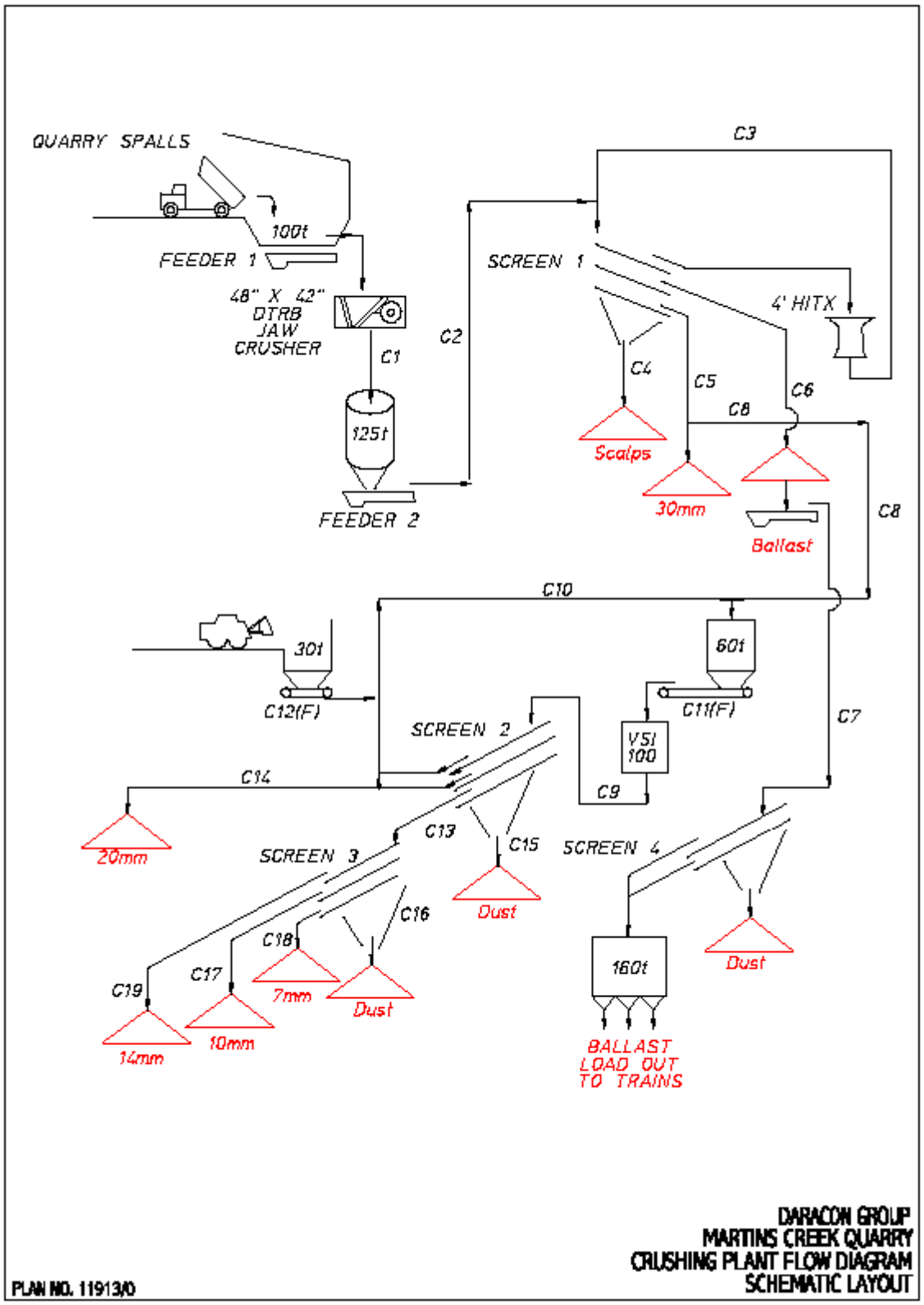


Figure 13 Martins Creek Quarry Crushing Plant Flow Diagram (Schematic)



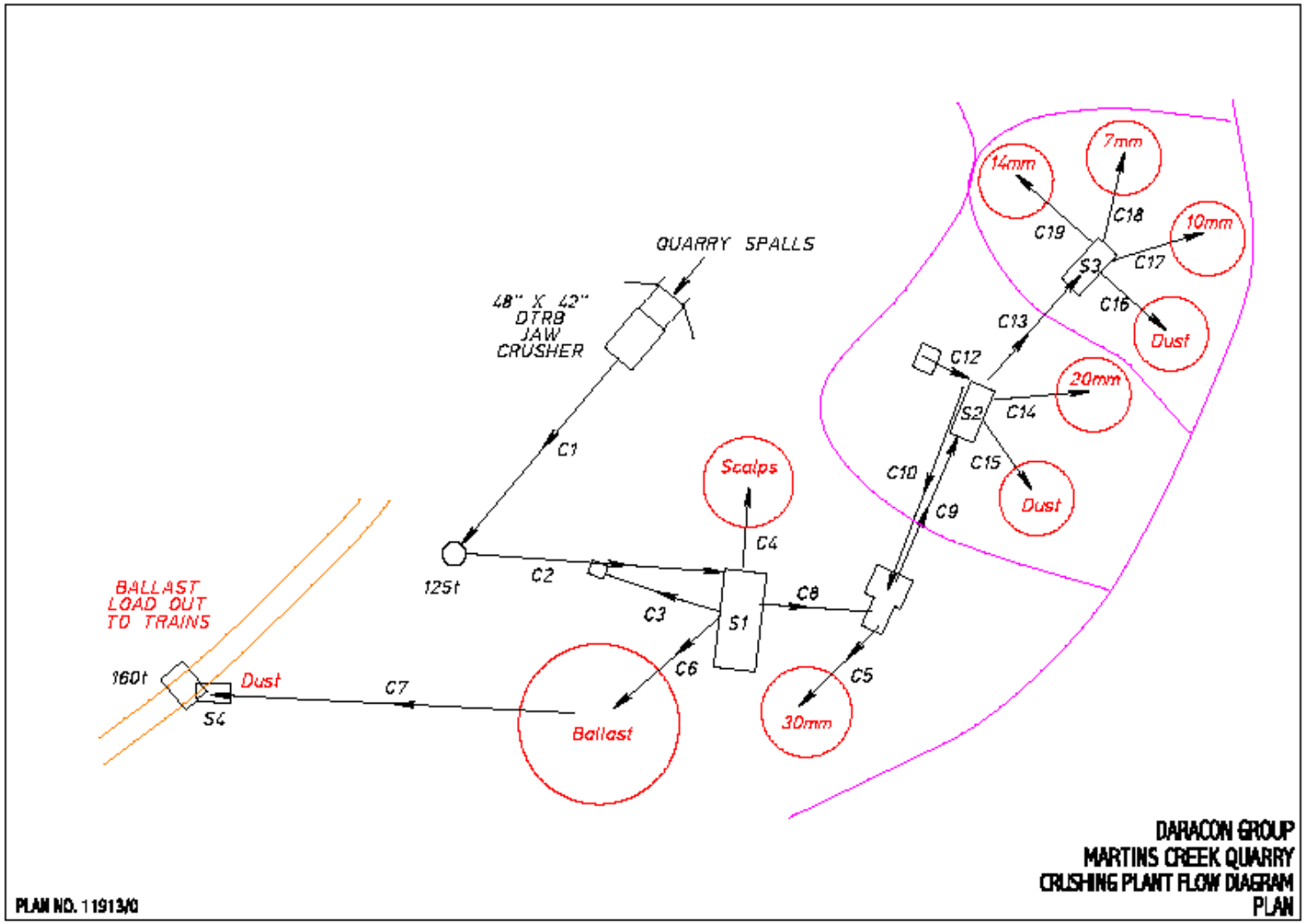


Figure 14 Martins Creek Quarry Crushing Plant Flow Diagram (Plan)