SYDNEY CONSTRUCTION MATERIALS

NEWNES JUNCTION SAND AND KAOLIN EXTRACTION PROJECT

QUARRY PLAN

MineConsult
mine management consultants

May, 2004
Job No. 1864

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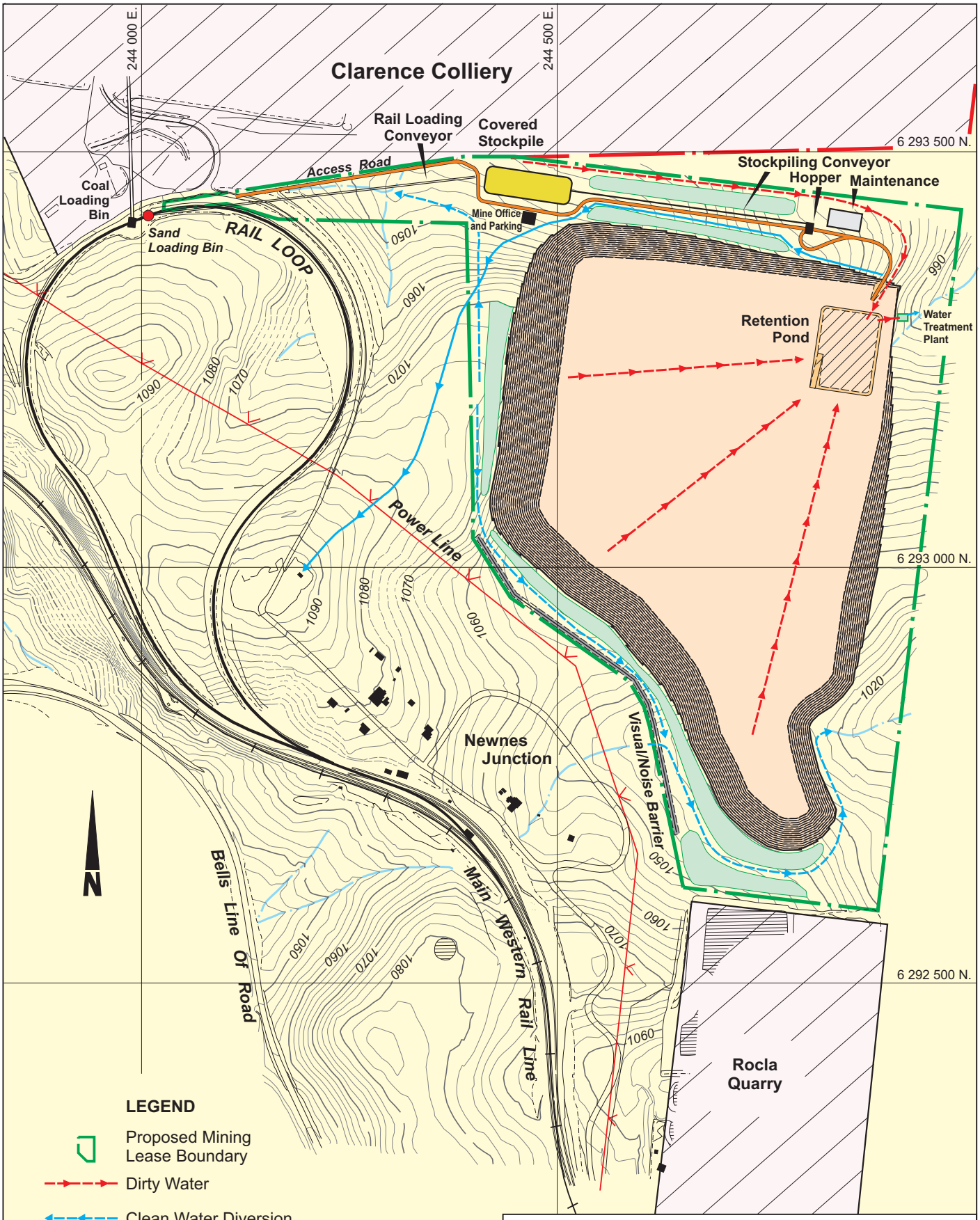
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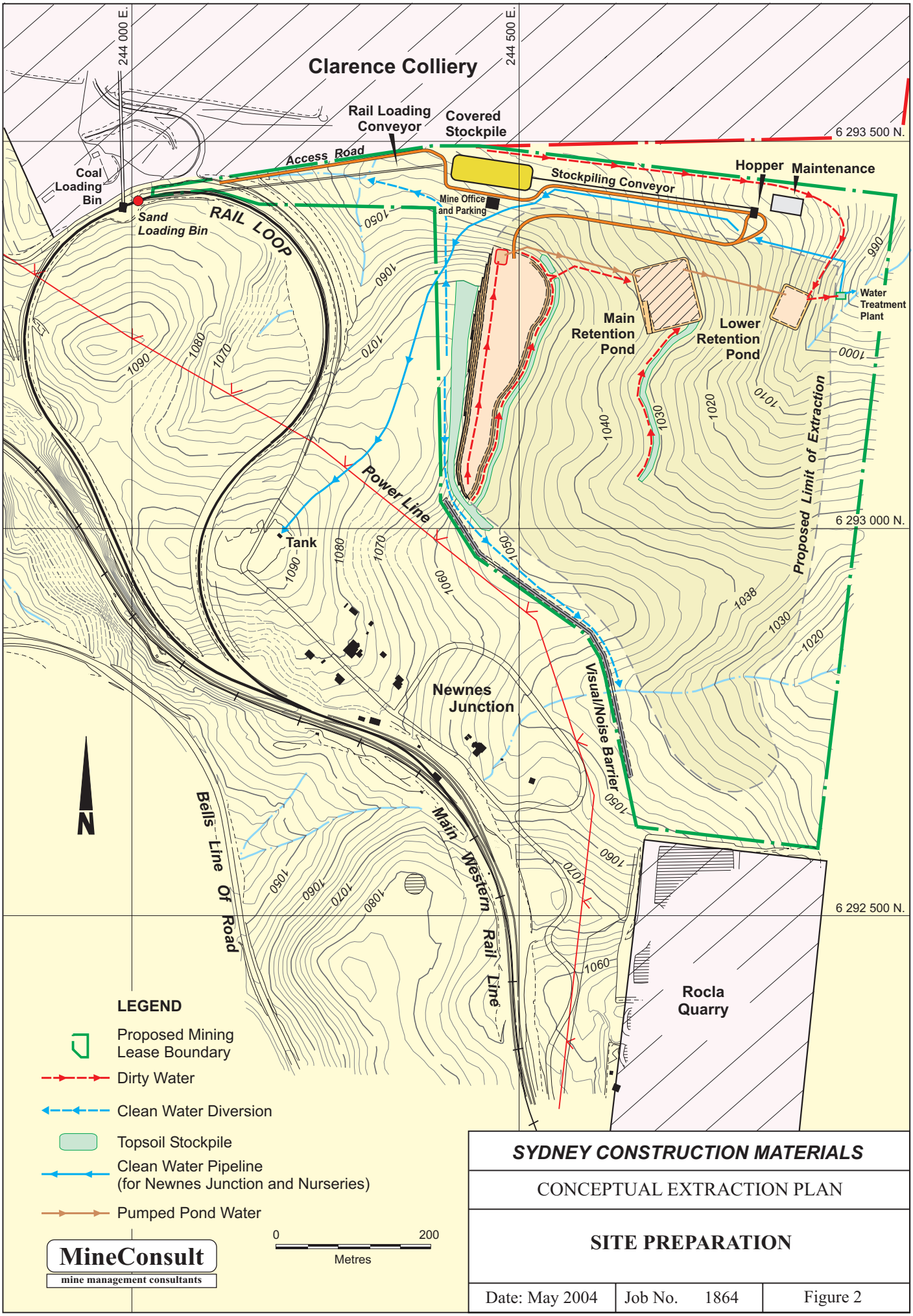
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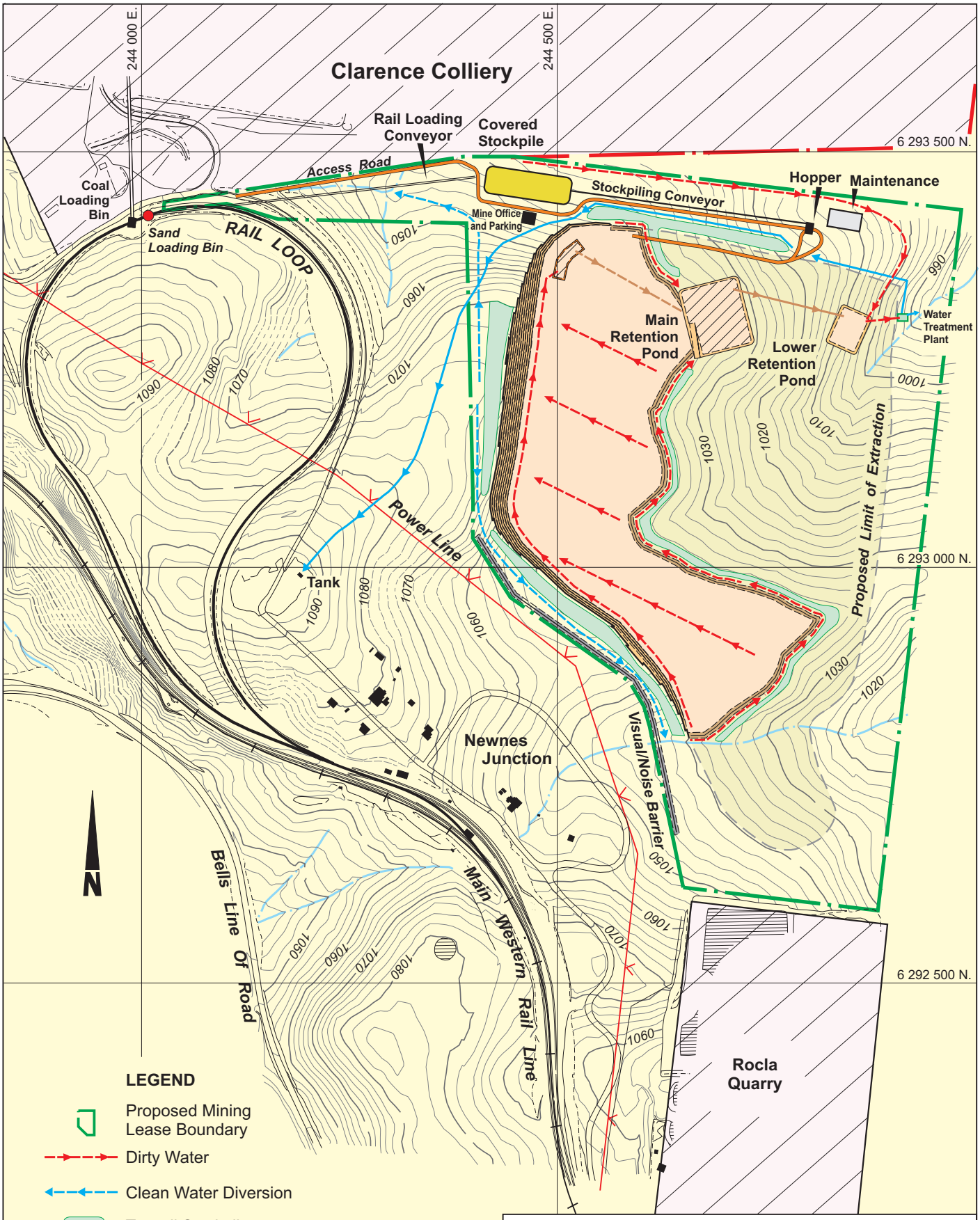
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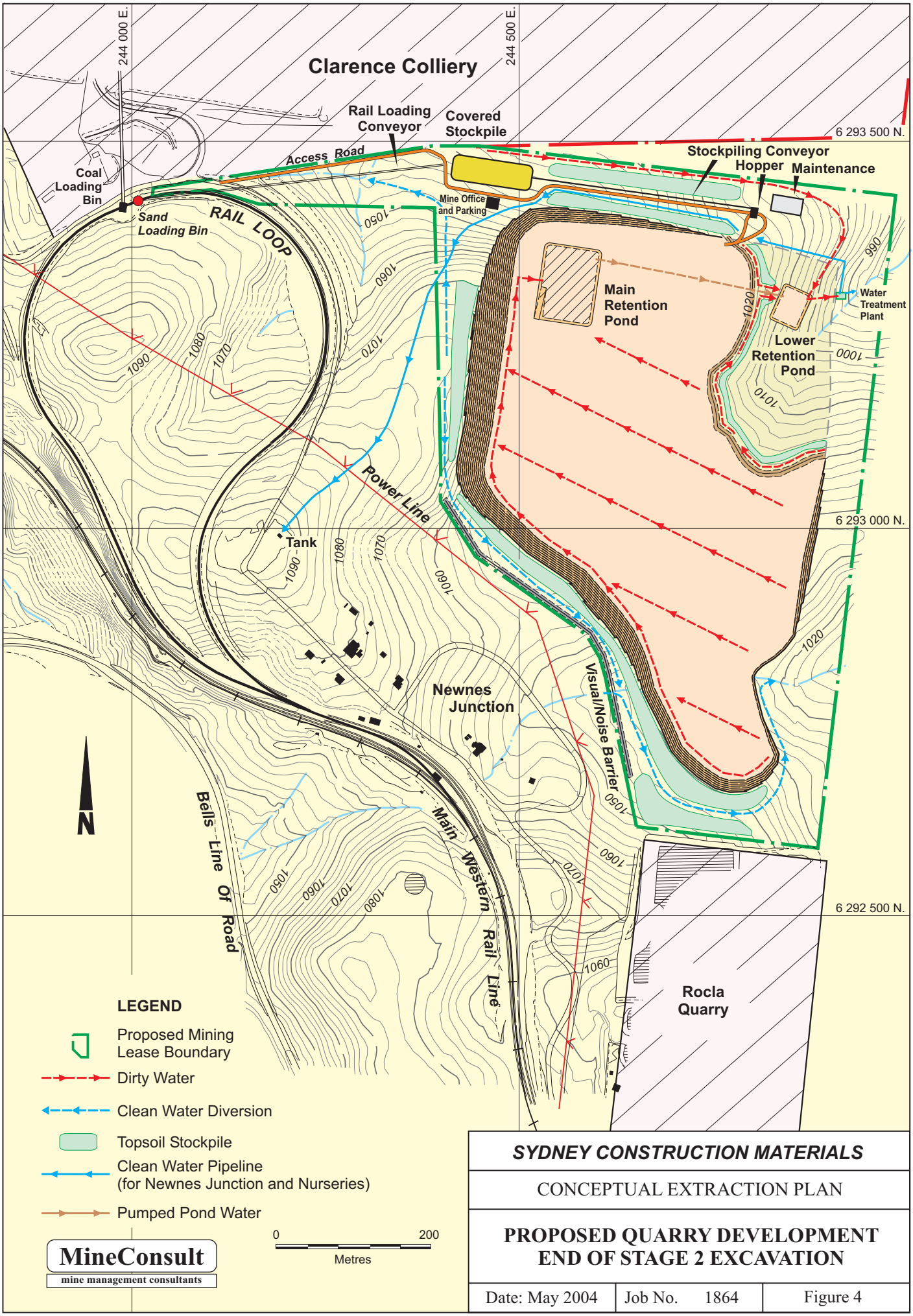
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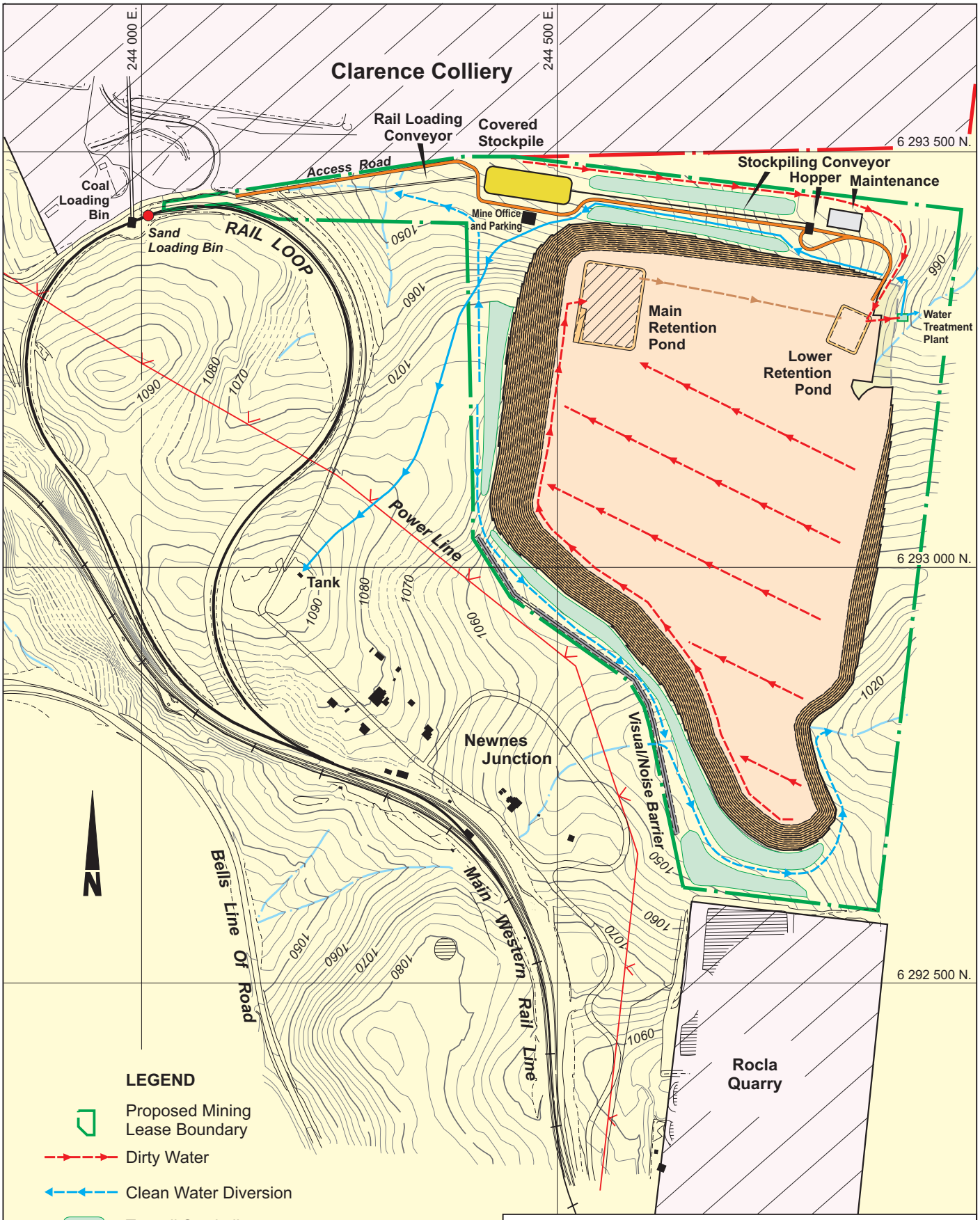
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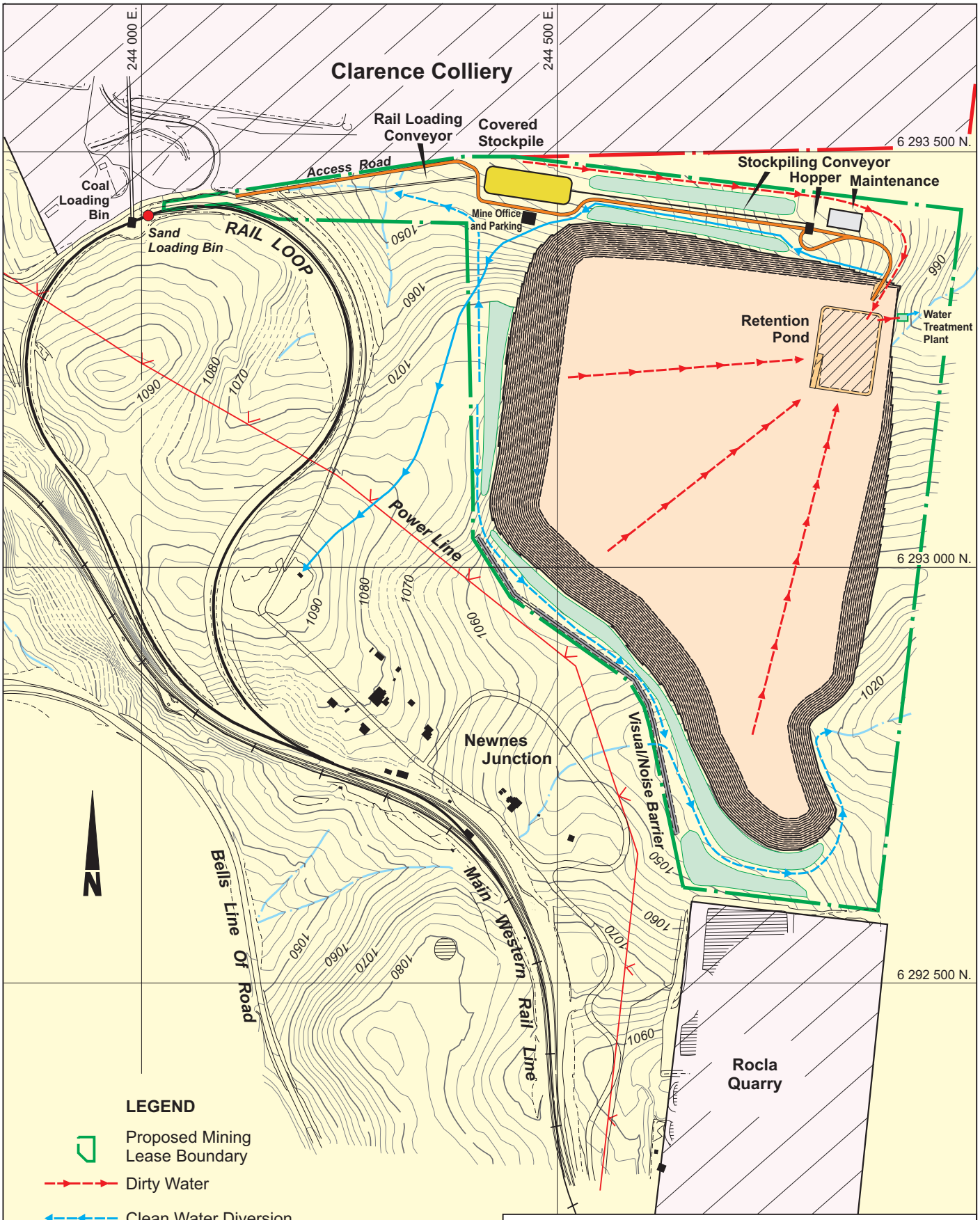
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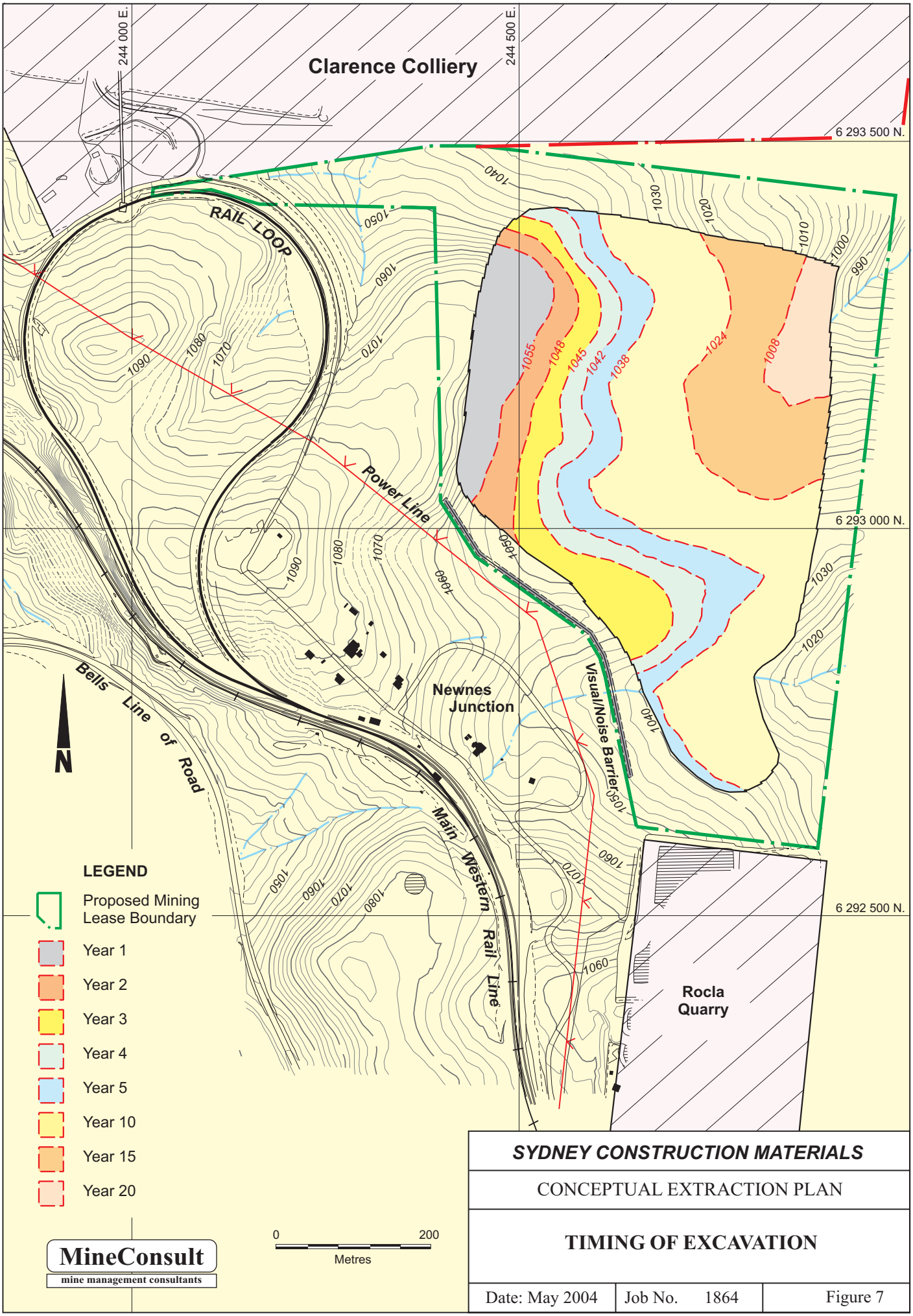
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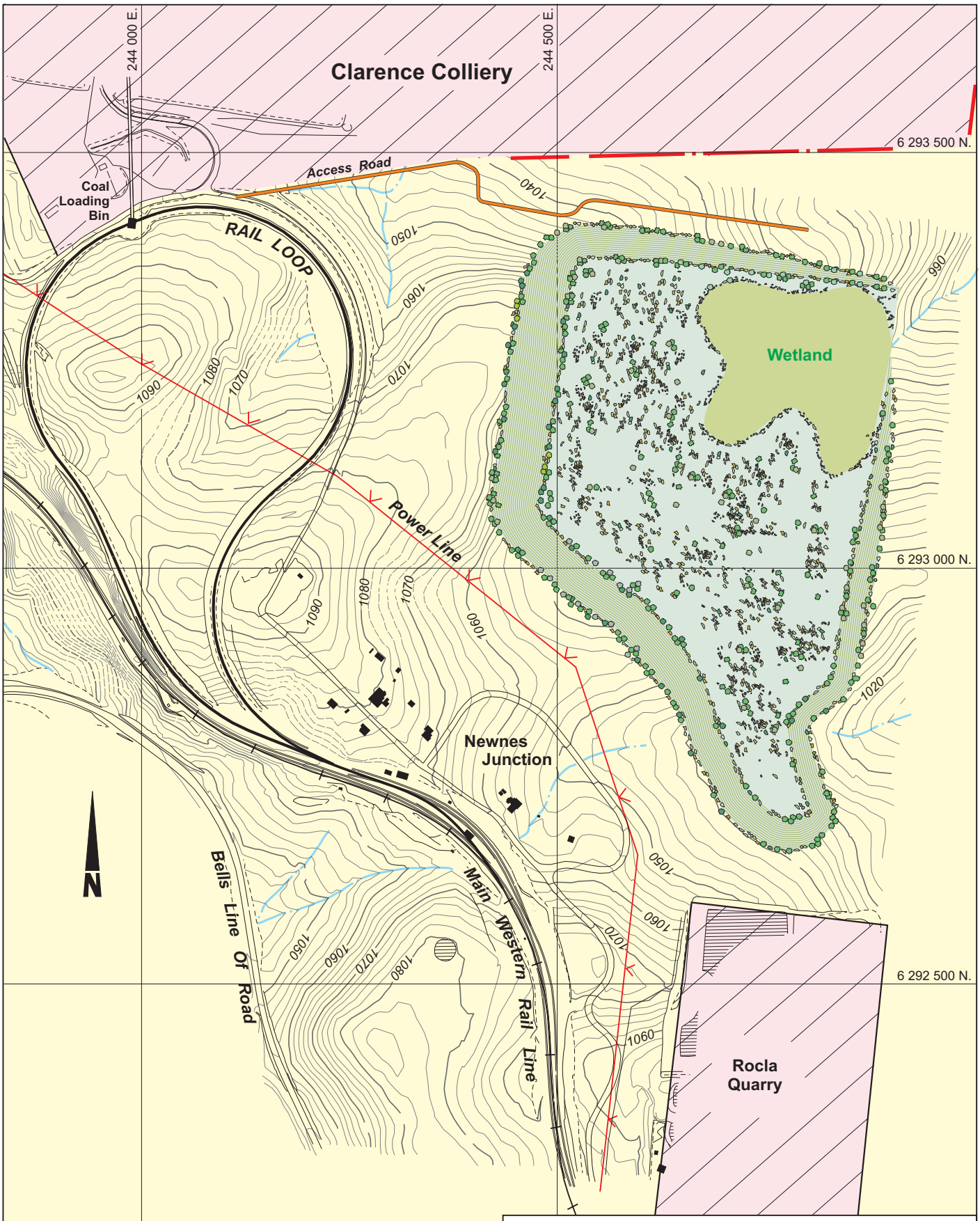

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SYDNEY CONSTRUCTION MATERIALS

CONCEPTUAL EXTRACTION PLAN

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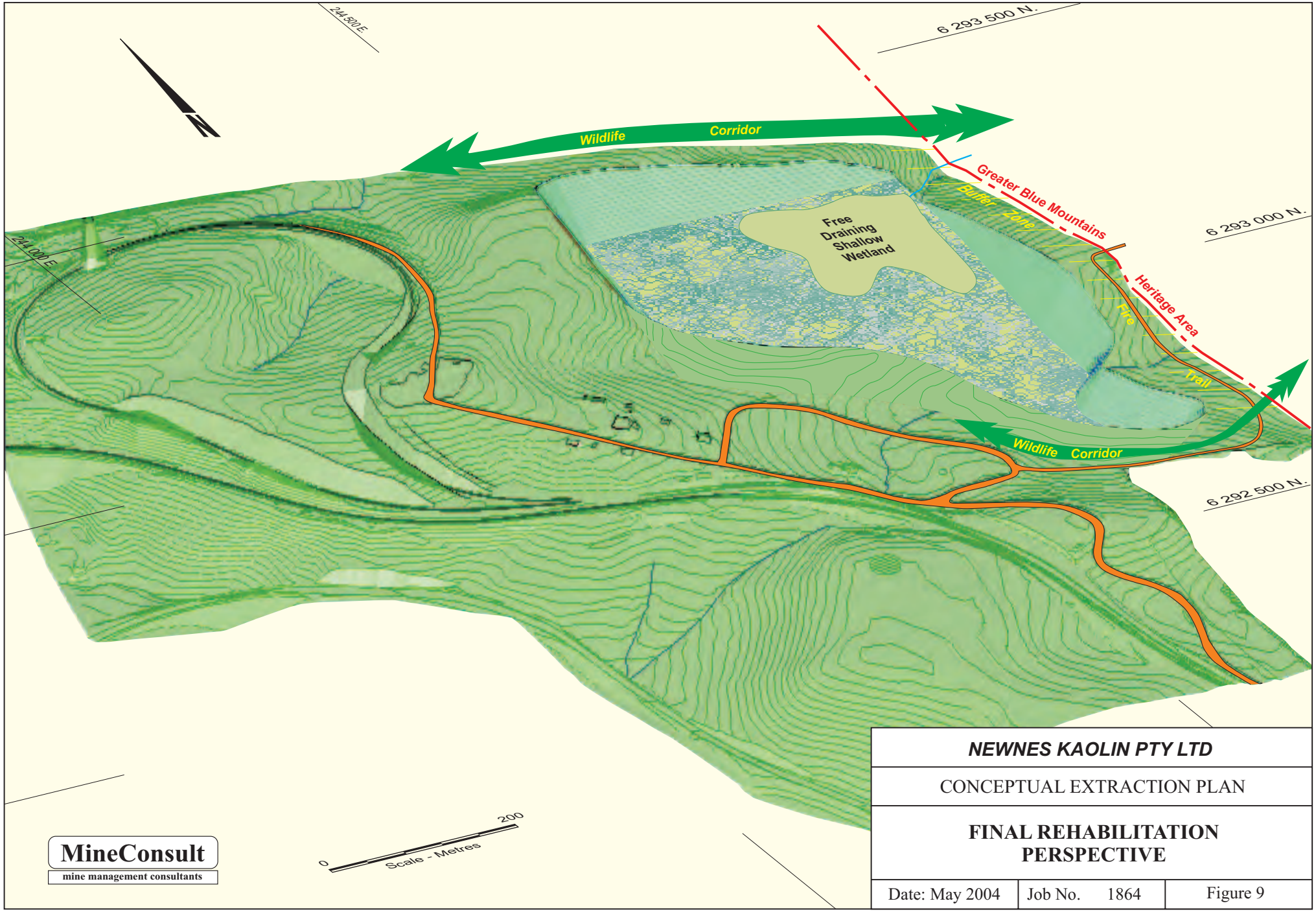
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Greater Blue Mountains
Buffer Zone
Free Draining Shallow Wetland
6 293 000 N.
244 000 E.
Heritage Area
Fire Trail
Wildlife Corridor
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MineConsult
mine management consultants
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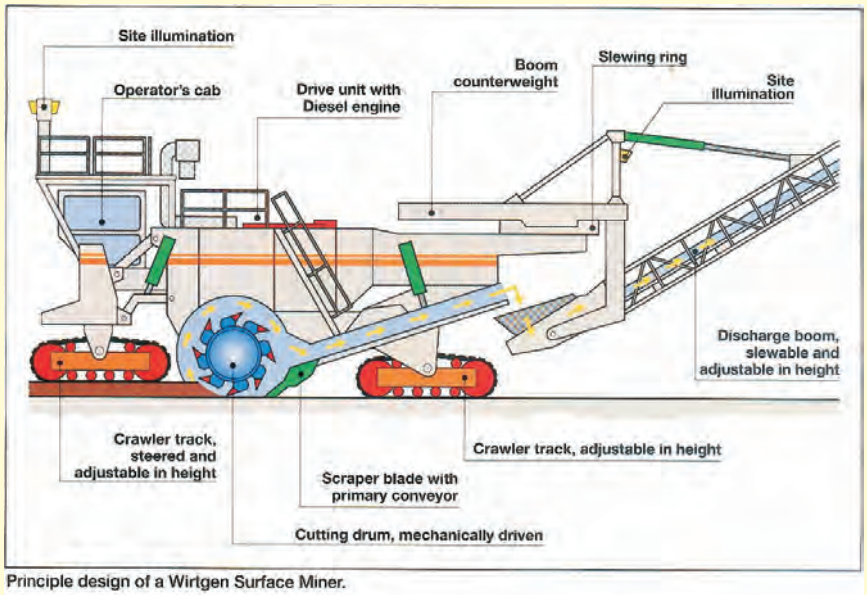
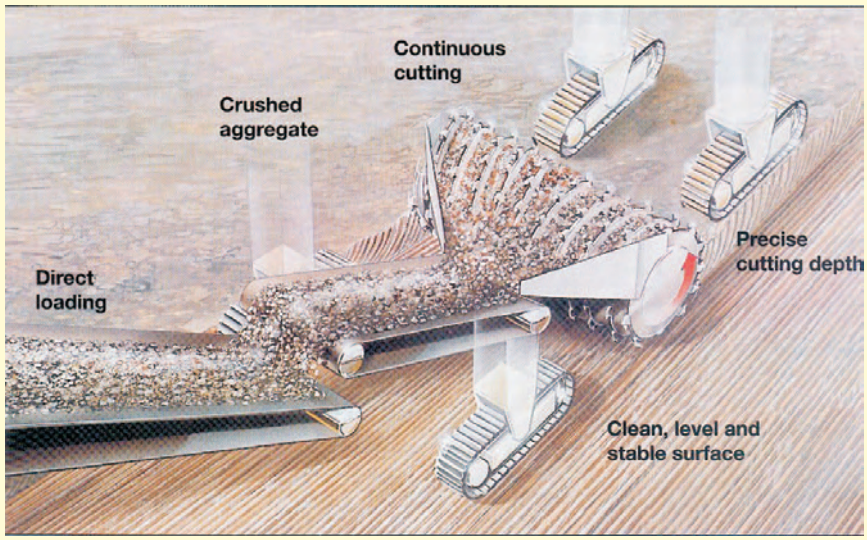


Principle design of a Wirtgen Surface Miner.



NEWNES KAOLIN PTY LTD

CONCEPTUAL EXTRACTION PLAN

SURFACE MINER

CONVEYOR DISCHARGE WILL NOT APPLY

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1. INTRODUCTION

1.1 Study Background and Scope

Sydney Construction Materials (SCM) proposes to develop an open pit operation to quarry friable sandstone from a mining lease application within EL4192, near Newnes Junction, NSW. The development is limited to extracting the sandstone resource at a location bounded on three sides by existing sand extraction and coal mining operations and associated infrastructure. There is no proposal for any onsite processing of extracted material as all is to be railed to Sydney for off-site processing. The off-site processing will produce kaolin and sand products.

A quarry plan was prepared by MineConsult Pty Ltd (MineConsult) in 2001 that involved developing the quarry in stacked benches progressing from north to south. The extraction method involved:

- rip and doze by large dozer to fragment and heap the rock
- loading by front-end loader into rear dump haul trucks,
- haulage and dumping onto grizzly and crusher, and
- crushing and placement of material on a stockpile prior to being conveyed and loaded onto trains for transport.

The quarry plan was incorporated into the proposed development's Environmental Impact Statement (EIS) which was submitted to NSW Department of Infrastructure, Planning and Natural Resources (DIPNR) in May, 2003.

Feedback to the EIS from the statutory authorities suggested that the proposed quarry development required additional planning to further mitigate impacts on the surrounding environment.

In response, SCM commissioned MineConsult to improve the quarry plan and review environmental issues across all aspects but with a particular focus on the areas of:

- noise mitigation
- surface water management, and
- flora and fauna impact mitigation.

MineConsult only considered those aspects directly relevant to the quarrying operation and incorporated measures to mitigate the environmental impact based on feedback from the other consulting specialists, including Atkins Acoustics Pty Ltd and Hughes Trueman Pty Ltd.

The purpose of this report is to support SCM's modified Development Application to the DIPNR.

1.2 Approach

MineConsult initiated research into alternative extraction methods and noise reduction technology to enable noise criteria to be met. Further modifications were made to the quarry

design to incorporate feed back from consulting specialists in the areas of flora and fauna management and water management.

All other relevant environmental aspects were reviewed in the course of modifying the quarry plan to ensure impacts from the quarrying operation were mitigated for the surrounding environment and nearby residents.

The work has been completed to a level of detail considered appropriate for review of the quarry plan. Further work is recommended following development approval to confirm the requirements of the quarry operation.

Technical information on the operation of the surface miner was provided by Wirtgen Australia Pty Ltd who also provided information to SCM. MineConsult understands that SCM has completed their own assessment of the economic viability of the proposed mining method.

Extraction planning and scheduling was reviewed by Don Reed and Associates (DRA) in consultation with SCM.

2. QUARRY PLAN

2.1 Introduction

A full description of the site, its surrounds and the geological resource is provided in the 2003 EIS. The following description primarily focuses on areas in which the quarry plan has been modified from that presented in the 2003 EIS. The reader is referred back to the 2003 EIS for a more detailed description of aspects outside of that covered below.

2.2 Comparison of Current Quarry Plan with 2003 EIS Quarry Plan

The following table summarises the primary differences between the quarry plan proposed in the 2003 EIS and that presented in this report.

Table 2.1
Comparison of Current and 2003 EIS Quarry Plan

Item	2003 EIS Quarry Plan	2004 Quarry Plan
Area of quarry	25.4 ha	25
Rock reserves	23.7 Mt	20.6 Mt
Quarry life	21 years	20 years
Pit base	970 mRL	990 mRL
Quarrying sequence	North to south direction in stacked benches	Top to bottom with open, wide benches
Rock fragmentation method	Rip and doze	Surface Miner
Loading	Front-end loader	Self loading scrapers
Pit haulage	Rear dump trucks	Self loading scrapers
Crushing	Jaw Crusher	None required
Surface water management	1 in 50 year design capacity	1 in 100 year design capacity
Marginal swamp vegetation	Some disturbance	Minimal disturbance
Noise mitigation	Rock mound / mound wall	Acoustic barrier

All other aspects of the proposed development are largely unchanged, including:

- construction period
- hours of operation
- materials handling and stockpiling, and
- method of off-site product transport.

2.3 Quarry Design

The open cut quarry design and infrastructure layout is shown in **Figure 1**. The design is based on maintaining substantial buffers to the Newnes Junction residents and National Park, reducing disturbance to the marginal Newnes Plateau swamp vegetation in the southwest and having sufficient area for the required infrastructure. The pit depth is variable as it is located on the side of a hill and ranges from 80m on its western wall to only a few metres in the east. The maximum pit dimensions are 750 m in length north-south by 460 m in width. The final

wall slope has a 2m wide berm every 3 m in vertical height providing regular terraces for planting of vegetation as part of the progressive rehabilitation and eventual screening of walls.

The changes to the quarry design from that presented in the 2003 EIS are as follows:

- southeast crest modified to reduce disturbance to swamp vegetation
- construction of internal drainage within the pit to ensure zero discharge from the disturbed area runoff catchment in conditions of up to a 1 in 100 year storm event;
- pit base raised to prevent a large lake formation as proposed in the final rehabilitation plan of the 2003 EIS,
- pit base drainage modified to ensure final rehabilitation has a free-draining surface as recommended by DIPNR, and
- modifications to the quarry design has reduced the rock reserves from 23.7 Mt to 20.6 Mt..

The road design and location is largely unchanged to that presented in the 2003 EIS.

2.4 Quarry Product Quantities

The products obtained from the friable sandstone following processing include kaolin and high quality sands, as shown in **Table 2.2**.

Table 2.2
Quarry Production

	% of Product	Total Production (Mt)	Average Annual Production (Mt)	Max. Annual Production (Mt)
Kaolin	8.5%	1.8	0.1	0.1
Construction Sand	82.4%	17.0	0.8	1.2
Specialty Sand	9.1%	1.9	0.1	0.1
Total Production	100.00%	20.6	1.0	1.4

The quarry life is scheduled at 20 years with production targets slightly less in the earlier years to account for lower productivity in order to comply with the noise restrictions. Production commences at 300 kt in the first year, and gradually increases to 1.4 Mt by Year 12.

2.5 Site Development

The site development will take place in three stages: site preparation and construction stage; quarry development / operations stage; and final rehabilitation stage. The main activities of each are described below.

2.5.1 Site Preparation and Construction Stage

The site preparation stage involves:

- construction of acoustic barrier
- construction of infrastructure, and

- preparation of flat area for efficient surface miner operation.

The construction period is unchanged from the 2003 EIS except that an acoustic barrier will be constructed on commencement to mitigate the noise impact on nearby residences for this and subsequent development. Also, no construction of a crusher is required as crushing rock will no longer be necessary with the new mining method.

The site preparation for surface miner use involves establishing an area of sufficient width and length to allow the surface miner to operate efficiently. Wirtgen recommend for standard applications in soft material that the minimum cutting length be nominally 300 m. The surface miner working bench will be established by ripping and dozing with a small dozer and removal of material by scrapers. The excavated friable sandstone will be required for test work in commissioning the process plant; incorporated in site infrastructure activities or stockpiled and railed from site for processing. Topsoil stripped will be placed adjacent to the acoustic barrier to allow a visual screen of native trees to be established and further shield the barrier and quarry operation from the residents.

The layout of the quarry following site preparation is shown in **Figure 2**.

2.5.2 Quarry Development and Operations

Plans have been prepared to show quarry development over the project life as shown in **Figures 3** to **6.** As shown, the quarrying method involves extracting the material in horizontal layers from the upper most quarry bench to its base over the full width and length of each successive bench. This method meets the requirements of the surface miner, which prefers to operate over large, relatively flat areas for maximum efficiency. As the excavation expands, final slope batters and berms are formed and progressively rehabilitated. Also, residences will be increasingly shielded from the development by the final pit walls.

The working benches will have a slight grade to direct surface run-off away from the pit crest to the northwest area of the excavation. Quarrying below 1002 mRL will involve maintaining a minimum 2 m high wall on the western side to prevent outflow of water into the National Park and significantly increase the void's water storage capacity (refer Section 2.12). The pit base is approximately 990 mRL.

An important characteristic of the quarry development will be the early and progressive rehabilitation of the open cut berms. As the bench height is only 3 m, the wall will form a series of small terraces relative to typical quarry operations. Vegetation growth will hence shield the walls with the intention of screening the open cut void and reducing the visual impact ("terrace landscaping"). As described in the 2003 EIS, rehabilitation will involve:

- surface preparation of the area by light ripping;
- placement of topsoil on an area 2 m wide around the edge of the pit; and
- planting of native shrubs and trees on the topsoiled bench.

The site topography will allow for continued access to all benches.

The timing of the extraction stages is shown in **Figure 7**.

2.5.3 Final Rehabilitation

The final quarry void contains a large number of small benches forming a terraced, vegetated landscape. The base of the pit will be graded to be free-draining with all disturbed areas to be topsoiled and re-vegetated. A small wetland will result in the area occupied by the final retention pond (refer **Figures 8** and **9**).

The quarry design enables all water flows at completion of quarrying to be contained within the quarry void. When the final rehabilitation is complete, and vegetation well established and the landform stable, it will be possible to place a channel from the near quarry floor to the small creek channel in the north (refer **Figure 8**) and re-establish flows directly to the water course. Previously, no direct flows other than those discharged by the water treatment plant would have taken place.

Also on completion of quarrying, as described in the 2003 EIS, all buildings, infrastructure and stockpiles will be removed from the pit and processing areas leaving them to be shaped and re-vegetated.

2.6 Quarrying Method

Prior to cutting of friable sandstone by the surface miner, the area immediately downslope of the working bench will require clearing of vegetation and topsoil stripping. The topsoil management procedures are unchanged from the 2003 EIS. In brief, topsoil will be stripped by dozer and heaped for transport by scraper to stockpiles. Stockpiles will be located adjacent to the pit crest or placed directly on berms available for rehabilitation.

The friable sandstone will be excavated in small lifts of 0.3 m to allow greater quality control over the different grades of sandstone. After cutting, the fragmented rock drops onto the bench behind the cutting drum and, as the surface miner advances, metal plates heap the rock into long windrows (refer **Figure 10**). A water tank on the rear of the surface miner will provide dust suppression.

Self-loading scrapers are then used to pick up the windrowed material and haul it out of the pit and dump it onto a grizzly. As the surface miner breaks up the rock, no crushing is required.

An important aspect of this quarrying method compared to most other quarry methods is that the dig, load and haul activities are largely independent operations. Typically, as with the mining method in the 2003 EIS, loaders and trucks must work together to remove material from the quarry while dozers rip and doze rock in advance. With the surface miner method, the surface miner can independently dig, fragment and heap the material while the scrapers are not working. Similarly, the scrapers can operate on the windrowed heaps with the surface miner parked up. Hence, this provides a lot of flexibility for reducing peak noise emissions by reducing the quantity of equipment operating at any one time.

Quarrying from the more exposed upper benches, may require at times for the surface miner to operate independently from the scrapers to meet the noise criteria. Similarly, a scraper may need to operate at times with the surface miner parked up. As the working bench lowers and greater shielding by the quarry walls is achieved, equipment can commence to work simultaneously more regularly.

2.7 On Site Materials Handling

The following details on on-site materials handling is extracted from the 2003 EIS and is based on work completed by Roger Smith and Associates. It is briefly presented below for completeness of the description of site activities.

Excavated sandstone will be delivered by scrapers and discharged through a grizzly screen to a surge bin below the dump point. The grizzly will be a hydraulically operated, tipping, SimbaGrid type that allows oversize to be tipped off to the side as and when necessary. The small amount of oversize expected would be periodically run over by the dozer and crushed to below 200 mm then picked up by a scraper and again discharged onto the grizzly.

A light duty apron feeder will be located under the surge bin to ensure a steady controlled feed to the rest of the stockpiling conveyor taking rock to the main stockpile. The capacity of the main crushed sandstone stockpile will be 12,000 t.

Product will be reclaimed by gravity feed through a reclaim tunnel, then conveyed to the rail loading facility adjacent to the existing Clarence Coal loading facility.

This sizing, handling, stockpiling and reclaim process is common to that used by other mines and quarries.

2.8 Major Excavation Equipment

Mobile plant used to win, load and haul friable sandstone from the proposed quarry will typically consist of:

- 1 x Wirtgen 2200SM surface miner (or equivalent);
- between 1 and 3 x 50 t scrapers (or equivalent).

The major equipment will be supported by, on an as-required basis, a D6 or D7 sized Cat dozer, small watercart, long reach backhoe excavator and small dump truck. The dozer will primarily be used to prepare areas for excavation by clearing vegetation and stripping topsoil. The watercart will be used for dust suppression on disturbed quarry areas, such as haulage roads and benches, and on excavated sandstone windrows.

The surface miner is not commonly used in mining in Australia though it is used in soft rock quarries and mines throughout the world. Surface miner variants are however used in Australia for road construction due to its high level of control and accuracy in forming a flat surface. For example, it has recently been used in the expansion of the F3 Freeway north of Sydney, and reported as cutting through sandstone considerably harder than that located at the Newnes Junction site.

The surface miner is a track mounted machine and has a central cutting drum and cutting picks of similar appearance to underground continuous miners (refer **Figure 10**). When cutting, the central drum is lowered and the machine crawls forward at a low speed (<3 km/hr) cutting to a depth of approximately 300 mm into the friable sandstone. The surface miner proposed for

this development will not have the conveyor attachment, but rather cut sandstone will be placed directly on the ground with guide plates heaping it into windrows as it passes out the back of the machine. The cutting action of the surface miner crushes the sandstone and negates the need for any primary crushing on site.

2.9 Fixed Plant and Infrastructure

The fixed plant and infrastructure is unchanged from that presented in the 2003 EIS except that no crusher will be required.

2.10 Project Schedule and Hours of Operation

2.10.1 Construction Schedule

The project schedule is unchanged from that presented in the 2003 EIS. It is anticipated that the proposed extractive operation could be in commercial production within 26 weeks of development consent being granted. Exact scheduling of the development will however, depend upon the time of receipt of development approval and necessary licences and permits, in particular for the processing site in the Greater Sydney region (subject of a separate 2003 EIS).

2.10.2 Operations Schedule

Hours of operation are unchanged from the 2003 EIS. Normal hours of operation for development and operational activities will be as follows:

- ***pit development*** will occur in daylight hours only, nominally 7.00 am to 6:00 pm Monday to Saturday;

- ***train loading dispatch*** will occur during daylight hours wherever possible, 6 days per week, the operation will need to be available 24 hours a day, 7 days a week to provide flexibility for transportation requirements. ; and

- ***plant maintenance*** - will be undertaken during normal pit operational hours. In the event that this is not possible, maintenance will occur after hours with limited overtime. Breakdown maintenance may be required up to 24 hours per day during stoppages, as per normal industry practice.

2.11 Workforce

2.11.1 Construction

The construction workforce is unchanged from that presented in the 2003 EIS.

2.11.2 Operation

The number of people employed at the operation on a day to day basis is anticipated to fluctuate between 7 and 10, depending on production. The single shift workforce will typically require up to 8 people, including:

- 1 x pit manager;
- 1 x bulldozer / support equipment operator;
- 1 x surface miner operator;
- 2 x scraper drivers
- 2 x support staff / train loader / general support; and
- 1 x maintenance / general hand.

2.12 Water Management

The water management plan is discussed in greater detail in the "Revised Water Management Plan" (Hughes Trueman, 2004). The following discussion primarily focuses on the quarrying aspects. Key features of the water management plan are illustrated in **Figures 2** to **6**. The proposed system will be capable of retaining all runoff from storms in excess of the 100 year average recurrence interval (ARI), 72 hour storm. There will be no uncontrolled discharge from the site during operational and rehabilitation phases of the project and any discharge will only be by means of controlled flow from the water treatment plant. Hydrological modelling by Hughes Trueman has confirmed the plan will allow the site to store sufficient water to meet all on-site water needs throughout the life of the project, primarily for dust suppression and watering of newly established rehabilitation plantings.

Surface-runoff will be retained within the quarry excavation as benches will be formed with a nominal 1 in 100 gradient towards the northeast corner of the void. At commencement of the project, the main water retention pond will be required to be located down slope from the excavation and surface runoff will flow directly into the pond. Water will be transferred to the main retention pond by pumping.

As the quarry expands, the main retention pond will be relocated to the northeast corner of the void.

The cutting method of the surface miner allows for accurate control of bench gradient and will prove more efficient in forming and maintaining benches than traditional quarrying methods. The surface miner will also be used to form a "safety" windrow at the crest of the excavation to further prevent uncontrolled run-off from the workings.

A critical phase in the water management plan will be as the quarry approaches final depths. A change in the bench gradient is required to relocate the low point from the northwest to the northeast corner in order establish a free-draining surface as part of the final rehabilitation plan. At 1002 mRL, the bench gradient continues to slope up to the northeast with the main retention pond in the northwest at a depth of 5 m. As the working bench is lowered below this elevation, the extraction method will be modified to maintain a 2 m high wall between the crest and base. With each successive lift down to 998 mRL, the bench gradient will reduce until the pit base is flat and large retention pond will be developed in the northeast corner.

Below 998mRL, the gradient will gradually be modified until the bench adequately slopes towards the new retention pond in the northeast corner of the pit.

During the life of the project, run-off from stockpile, material handling and infrastructure areas will be channelled to a second retention pond adjacent to the water treatment plant. This pond will serve as a balancing storage for the transfer of water from the main retention pond for dust suppression purposes or treatment prior to discharge.

All water discharge from site will be treated.