



2013 Caernarfon Award Nomination New Zealand

A HISTORY OF A QUARRY IN A CITY



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FOREWORD

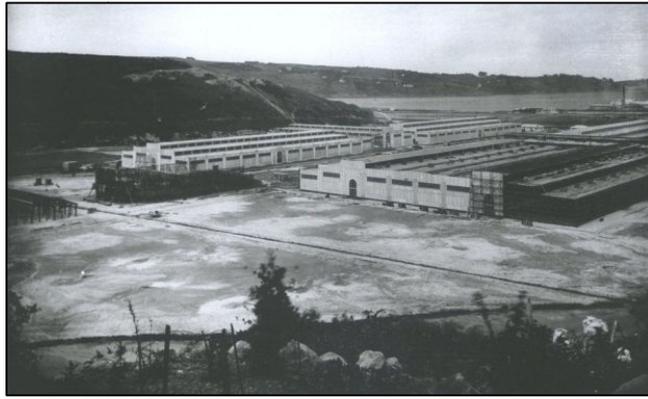
In today's world it would be virtually impossible to apply for consent and for it to be granted for a quarry to extract and process rock in the middle of a city. This is just what happened at Logan Point Quarry, operated by Blackhead Quarries Ltd in Dunedin. Although the quarry was existing consent was applied for and granted for 50 years to allow the quarry to continue operations from well within the city limits, this is unheard of in the modern day environment. The scenario of urban growth surrounding and more commonly leading to quarries been closed down is the norm, making Logan Point Quarry very special, not only is the quarry in the city, it is located in the middle of the city within 1.5 kilometres of the central business district. Generally where quarries are located very close to the market their success of supplying aggregate to the market leads to their own demise. Environmental operating conditions virtually become unworkable or cost prohibitive, the operators of Logan Point Quarry recognised their place in the community and the important part they play in the development of Dunedin. As environmental pressures changed they kept ahead of the game introducing the latest technology and recording information long before it become compulsory to do so.

THE BEGINNING

The Logan Point quarry was established in 1880. It took advantage of a headland of phonolite basalt rock jutting out into the Otago Harbour forming a back drop for Lake Logan.



Rock from the quarry was initially used to form a causeway for the railway line north from Dunedin to Port Chalmers. This gave the quarry rail access to the city area.



Lake Logan, to the west of the quarry was filled in in the early 1900's for the South Seas exhibition. Reclaiming the harbour has carried on since with much of the flat land in Dunedin reclaimed from the harbour.



As the harbour was reclaimed the quarry products were used to develop the town ever closer to the quarry.



After the second Dunedin South Seas exhibition in 1926 the buildings were cleared and the land was developed as sports fields for the city. This development has included several upgrades and we currently have an international hockey turf, tennis courts, running track and athletics facility, rugby and soccer fields, cricket wickets and the university oval international cricket ground all within a stones throw of the quarry.

The latest addition to the sports and recreation facilities surrounding the quarry is the Forsyth Barr covered stadium. With the stadium and the university; Dunedin's largest enterprise, moved even closer to the quarry and in particular the crushing plant. Foot traffic around the stadium including the attached university buildings is up to one million people a year.

The Dunedin City basin, the market for the Logan Point quarry, has a mature infrastructure with no space for new development. The market for the Logan Point quarry is therefore restricted to maintaining the current infrastructure. This is approximately 4 tonne per person per annum.

QUARRY PLANT DEVELOPEMENT

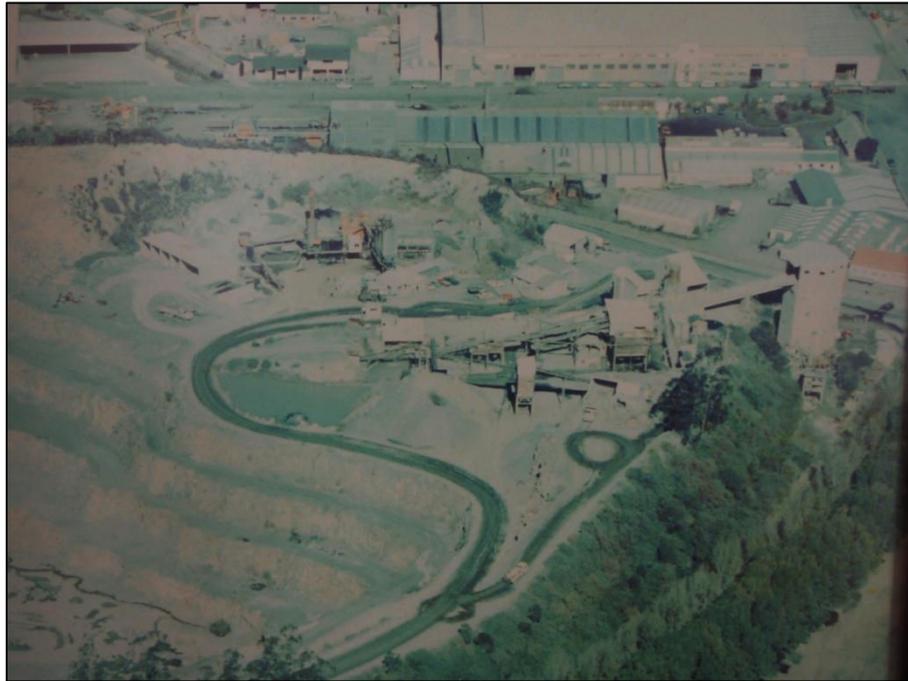
The first plant was on the site in the late 1880,s with material loaded from the plant into rail wagons for delivery to the market.



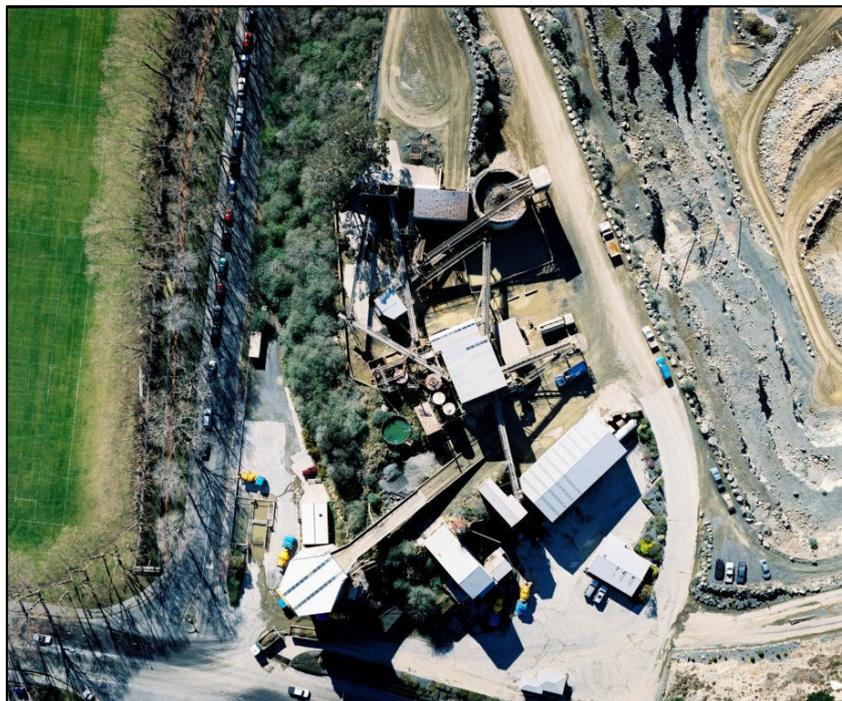
In 1925 the crushing plant looks more advanced.



In 1956 the plant was upgraded, the basis of which would last for 56 years.



Over the years this plant has evolved as crushing technology developed. Originally there was a primary jaw crusher followed by a 4 ¼ foot Symonds cone and a horizontal shaft impactor. Later three 36 x6 jaw crushers were added to get chip shape. Once the Barmac vertical shaft impact crusher was developed the Logan Point quarry installed a Barmac. When I started at the quarry in 1986 there were nine crushers in the plant.



In 1996 we had a major upgrade replacing all the crushers with just three, a jaw, cone and Barmac. A water treatment plant was added at this stage. This plant remained until the start of 2013, when another chapter started for the quarry, processing of rock by mobile plant.



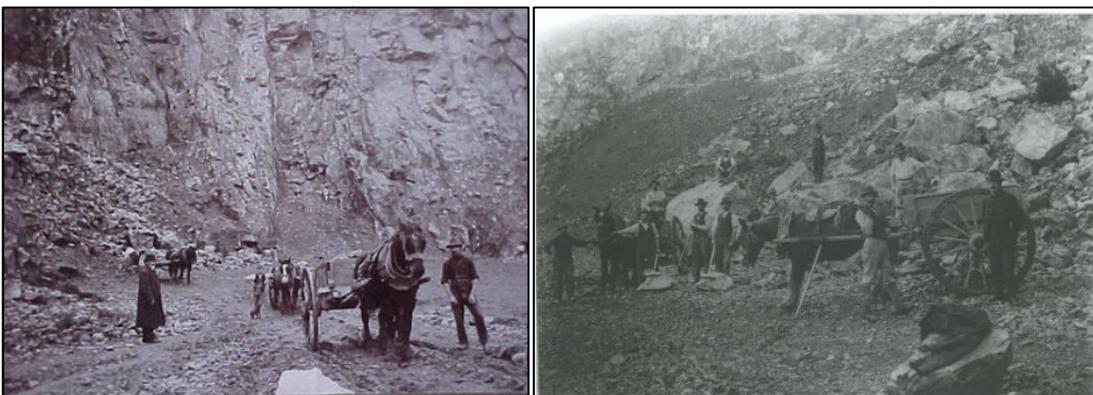
At Logan Point we have always had modern and efficient mobile plant. We were early users of hydraulic excavators and have embraced new plant as it has developed giving benefits in safety, environmental impact and efficiency.



At the start of 2013 two mobile crushers were commissioned at the Logan Point site to replace the stationary plant. High grade asphalt dust, sealing chips and concrete aggregate production was shifted to the Blackhead quarry. This change was mainly due to the changing nature of the rock resource but also enabled us to apply world best practice in crushing technology and methods reducing our impact on neighbours.

QUARRY DEVELOPEMENT

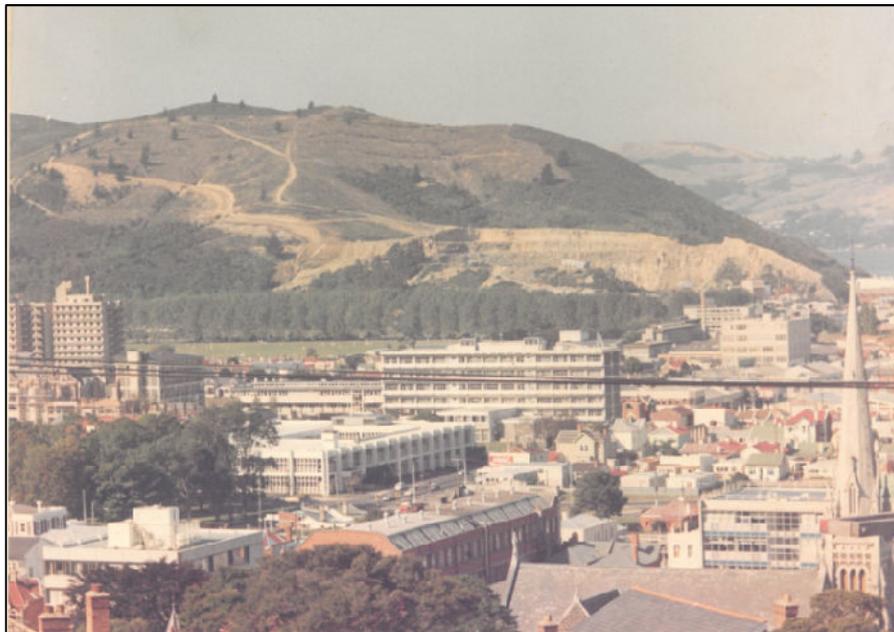
The quarry was started by going directly into an outcrop of rock. This would have been the easiest rock to access in the area and it would have seemed to go on forever.



Methods at the time were very basic.



In the early 1960's the quarry was changed to a series of benches. This improved efficiency and was also considerably safer. Up to 5 rope shovels were used at the time to blend rock and maintain production.



In the early 1970's the rock on the back wall of the quarry deteriorated and there was only rotten rock to quarry. The decision was then made to go down in the quarry floor and at the same time develop the hill behind to secure rock for the future of the town.



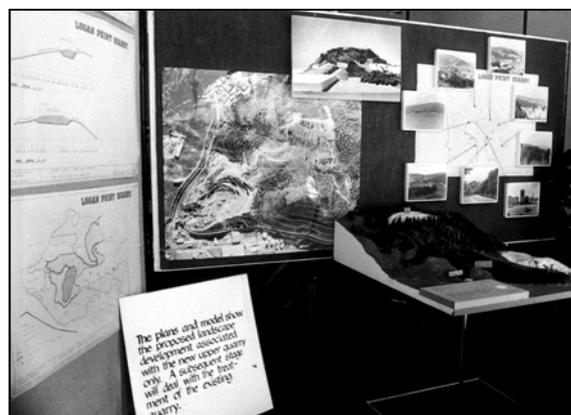
The bottom quarry has subsequently been determined to be a dome structure and rock in the top quarry is the result of a series of flows. The top quarry has been progressively developed over the years.

EVER CHANGING ENVIRONMENTAL EXPECTATIONS

The first cut of the quarry in 1880 was taken out the side of the hill where the rock outcropped. Equipment and methods were primitive; safety and the environment were words that hadn't been invented.



With the growing town more rock products were required. Operations became more sophisticated, more rock was shifted and external impacts were greater. In the 1970's, pre Resource Management Act (1992), when the top quarry was being developed, public consultation took the form of a display in one of the banks downtown with pictures and a model of the hill in the future to show the public of Dunedin what was proposed.



CONTROLLING THAT DUST

In the early days controls on dust were limited as with all industries in the city. Dust controls at the quarry were well established by the 1980's. A water truck was used on all the haul roads and water sprays were strategically placed around the plant. They were only used when "required".

As the town moved closer dust control methods became more complex and effective. Water sprays were still used and work extremely well in certain applications. A sonic fog system was installed in the late 1980's for the more open areas of the plant. This uses water and compressed air to produce a fog that attaches to the very fine dust particles binding them together and dropping them out.

A foam system was installed in recent years for the very dusty conditions in the plant. This has proved very effective.

Sprinklers are used on the main roads around our boundaries. The main haul road to the stockpiles has the sprinklers hooked into a weather station. This turns the sprinklers on when dust is potentially a problem, even when there is no one at the site. A water truck is still deployed on the haul roads as required.



The top quarry road has pine trees planted on either side. These maintain moisture in the ground reducing traffic dust. The fine nettles catch the dust reducing the external impact.



Dust monitoring has been carried out at Logan Point for the last 30 years. Dust pots were used in the early days of monitoring and have been used ever since. A high volume PM10 dust monitor was installed in the surrounding area in the mid1990's.

In 2010 a nephelometer was installed to give real time data on dust emissions. This data was used in association with text alarms to quarry staff to determine the amount of dust suppression required for the day's changing conditions.



The new mobile crushing plant has move the main source of dust further from the boundary and with fewer transfer points and crushers it also reduces the opportunity to produce dust.



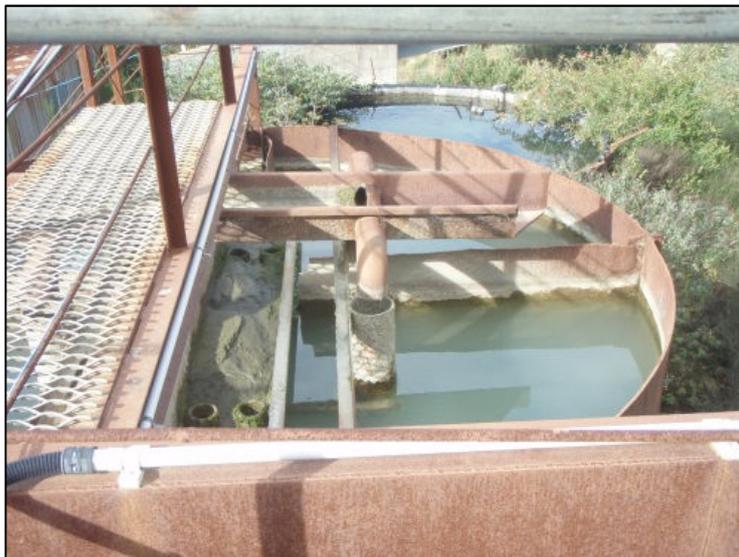
KEEPING THE DISCHARGED WATER CLEAN

There are three main issues with water at the Logan Point quarry.

1. Pumped water. With the quarry floor reaching down to 60 meters below sea level we need to pump water. This water is mainly rain from the surrounding catchment however there is some ground water. No salt water seeps through from the nearby harbour.
2. Water runoff. This comes down the roads and is discharged off site during heavy rain events. This is difficult to control however is a minor problem as the receiving water body is generally discoloured during these heavy rain events.



3. Wash water. Up until the start of 2013 water was used in the process of producing concrete aggregate and sealing chips. Traditionally concrete trucks from the on-site concrete plant washed out their bowls at the end of the day in the large settling pond. The cement acted as a flocculent and kept the water reasonably clean for discharge. In the 1996 plant upgrade the settling ponds were taken out as they were over a large source of quality rock. A water washing plant was built at this stage. This gave us control over water quality and also enabled us to control when and what quality of water we discharged. Flocculants were used in the water control plant.



With the change to mobile crushing the Logan Point quarry no longer requires wash water. Water is still pumped from the hole however this can be done on our terms with the large volume of storage available. The concrete trucks still wash out in the quarry pit keeping this water clear.



We have recently purchased a water testing tool that gives us a turbidity reading within 10 minutes. This allows us to test any water being discharged before any pumping starts and if there is any change during pumping so we maintain a clear water discharge.



GOOD VIBRATIONS

Being a hard rock quarry Logan Point has always used drill and blast methods to extract rock. With blasting there are potential negative effects on neighbours with vibration and air blast.



Monitoring of vibration and air blast has been carried out at Logan Point for the last 50 years. The first vibration recorder was built for the quarry by the University of Otago using mirrors reflecting light onto photographic paper. The quarry now has two seismographs that measure vibration at the boundary for all blasting. We have self-imposed vibration limits of 5mm per second at our boundary. This is well below the national standard and well below the threshold to do damage to property.

Explosive technology has also helped us control our impact on the surrounding community. The largest improvement is in detonator technology. At Logan Point we currently use electronic detonators. These are relatively expensive however it allows us to control the timing of each hole accurately giving us the ability to control vibration while maximising blasting efficiency.

RESOURCE CONSENT APPLICATION -2004

After purchasing some more land and undertaking a land swap resource consent was applied for to extend the top quarry back into the hill. This would extend the life of the quarry by about 50 years.

As the area can be seen from most of Dunedin City the consent was publicly notified. We had five submissions three wanting to be heard. Of these three, two were concerned about pine trees and one about the slope stability above their house. Consent was subsequently granted for 50 years.

As this is a prominent site in Dunedin City the fact only three people bothered to participate in the resource consent process and their concerns were relatively minor, two were not related to quarrying, would suggest a quarry can survive in an urban environment.

This is however dependent on the quarry operator having respect for the community. Not just being reactive to environmental issues but being proactive, thinking ahead and using the best tools available.

Early monitoring of effects to ensure you are dealing with facts rather than perception is one of the strongest tools available when dealing with the public.



View over looking Top Quarry to Dunedin City

Previous to the resource consent process, Palmer & Son, one of Blackhead's parent companies had restored a disused quarry in the north of Dunedin. The reclamation won us several awards at the time including the Otago environmental award and a Green Ribbon award from the Minister for the Environment. The reclamation was done voluntarily by the company and this gave us a lot of credibility with councils. They generally have trouble trusting the quarry industry.



Rehabilitation of North East Valley Quarry

THE FUTURE IS BRIGHT

The future has started for the Logan Point quarry.

- There is consent in place for the next 50 years.
- The stationary crushing plant is in the process of being decommissioned.
- New mobile crushing and screening equipment is working at the quarry face taking noise and dust well away from the public.
- The bottom hole is starting to be back filled
- A landscape plan is in place and being implemented for the top quarry.
- Community relationships are strong

The future of a quarry in a city looks good but it is an evolving process.



“Best practice is always getting better”.