

Appendix D

Other relevant reports

Regional Demand Forecasts for Aggregates in Wellington



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1. Background

KPQ is strategically located in Ngauranga Gorge, on State Highway 1 within Wellington City. The quarry is a hard rock quarry extracting greywacke. The KPQ site also hosts:

- An asphalt plant owned and operated by Downer, and
- A concrete plant owned and operated by Allied Concrete in which Holcim has a 50% holding.

There are long term supply agreements in place with these businesses which provide both long term stability and sales, with the advantage of having exposure to both roading and construction based sales. This provides balance if there are short term fluctuations in either market. There is reasonable ability to adjust production between either market.

There are limited sources of aggregate material in the region. The greywacke rock resource reserves along the Wellington Fault have for many decades been the prime source of the hard rock quarried for use in the wider Wellington and Hutt Valley areas. Ngauranga Gorge has been quarried for over 100 years.

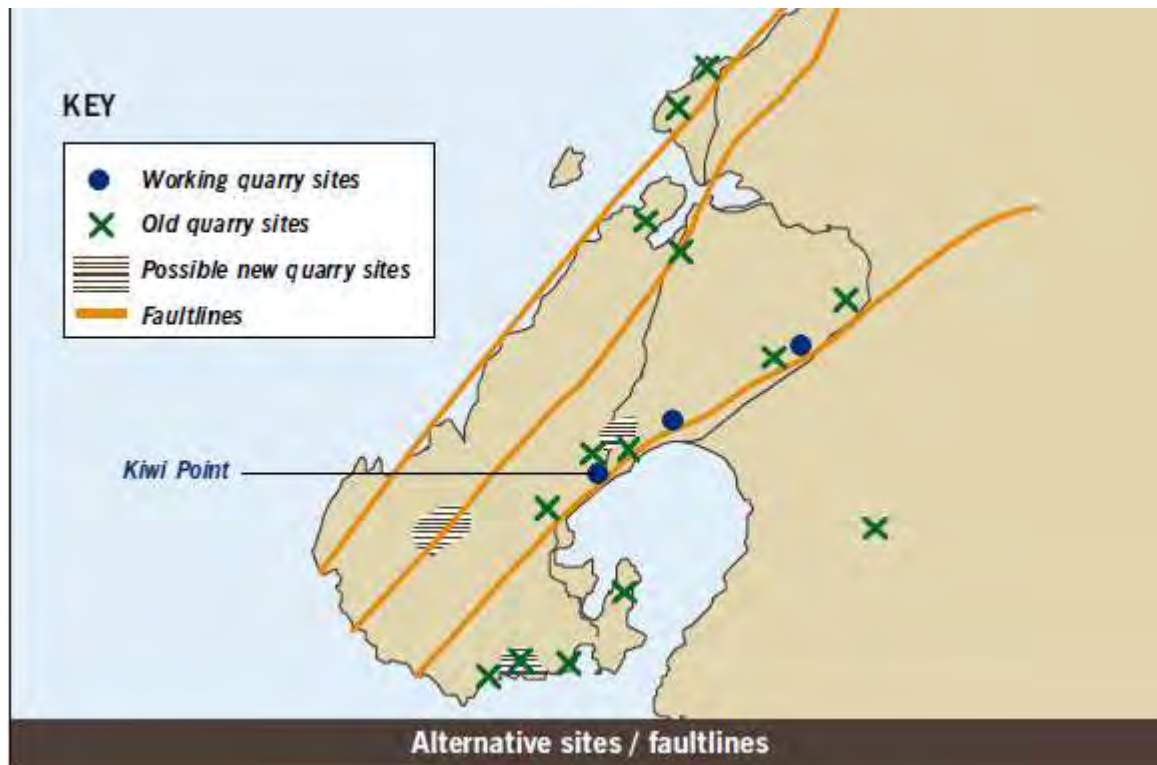


1920 Quarry activity in Ngauranga Gorge:Track & Stream (Alexander Turnbull Library)

2. Regional Rock Resources and Alternatives

Location of rock resources

The three main existing Wellington quarries (Kiwi Point, Belmont and Horokiwi) are all located adjacent to the Wellington Fault. This has lifted greywacke available for extraction. There are many older and abandoned sites.



Generic barriers to quarrying

The Commerce Commission notes the following barriers to entry in the quarry and aggregate industry:¹

- Appropriate Resource. In Wellington, the greywacke resources are located on major fault lines.
- Land. Land needs to be available next to the appropriate resource.
- Equipment/capital. The hard rock quarries in Wellington take a reasonable investment in equipment.
- Resource consent.

New quarry sites would run into considerable difficulty to be established due to these factors. Consenting activities would also need to be considered in relation to the District Plan provisions with potential sites in the Wellington region more likely to be zoned 'rural' or 'open space B' which would likely require a plan change. Transport and trucking of materials would provide a significant impact on infrastructure.

¹ Commerce Commission decision: [file:///C:/Users/Philip/Downloads/Fletcher-Building-Holdings-NZ-Ltd-Higgins-Group-Holdings-Ltd-and-Horokiwi-Quarries-Ltd-clearance-application-16-February-2016%20\(1\).pdf](file:///C:/Users/Philip/Downloads/Fletcher-Building-Holdings-NZ-Ltd-Higgins-Group-Holdings-Ltd-and-Horokiwi-Quarries-Ltd-clearance-application-16-February-2016%20(1).pdf)

Alternative sites for Aggregate extraction

The Wellington region was initially estimated to have around 84 million tonnes of extractable resource². About 32-36 million tonnes are estimated still to be available. The other main potential rock resources in the Wellington region are the Makara area (centered around Quartz Hill), Owhiro Bay Quarry, and the Northern Ngauanga Gorge. There would be considerable difficulties accessing these resources.

- Makara/Quartz Hill. This area is located on a ridgeline running above the Makara Road on a South West orientation. The easterly flanks of this ridge may represent a large area of accessible hard rock resource. However, there would be significant issues accessing this resource:
 - Meridian's wind farm is located along the ridgetop and is a valuable wind resource with a large investment in turbines. The cost of acquiring and accessing this land would be considerable.
 - The ridge including Quartz Hill and White Rock Hill to the southwest was included in the ridgeline and hilltop overlay for protection under the District Plan.
 - Transport and access would present major difficulty as the roads from Karori to Makara and through the Owhariu valley to Johnsonville are currently small and narrow. Widening and straightening them would be challenging, particularly in Makara valley. Karori Road is also heavily used and congested at peak times and the presence of heavy trucking would cause significant impacts. The Owhariu route is much longer with similar challenges.
 - Amenity & landscape values. The Makara Road is a popular scenic route for drivers and cyclists. While most visual impacts could be hidden depending on the location of the quarry operations, trucking and noise would be detrimental to the amenity values. The local community are also sensitive to noise and disruption (as evidenced in their opposition to the Wind Farm construction).
 - Accessing this or other resource in the Makara beach area or from the western side and attempting to transport through the Coastal Area (e.g. by barge) would present significant logistical and environmental challenges. There is some DOC land, a Coastal walkway and limitations on activities in the coastal area (let alone the logistical challenges of operating on an exposed coast and barging back to some other port facility through Cook Strait).

However, in the next 20 years this resource may need further assessment as to its potential. This would be prudent to carry out in during the lifespan of the existing Wellington quarries to test out the resource availability, and whether there were any logistical solutions that could enable extraction.

- Northern Ngauranga Gorge. On the North Side of SH1 across from Kiwi Point Quarry is a potential resource. It likely has similar rock characteristics to the existing KPQ operation. The issues accessing this resource would include:
 - Land access as there is subdivision on the top of the hill for lifestyle blocks.
 - Operational constraints as there is little space separating SH1 and the steep upper slopes. On the eastern side the North Island Main Trunk Line (railway) would constrain access.
 - Landscape and amenity values as the area has been included in the ridgetops and hilltops overlay in the District Plan, and there would be visual impacts from the northern Khandallah area.
 - The northern side of Ngauranga is regenerating forest, assisted by being damper and less disturbed than the southern faces. Disturbance could

– ² Applied Geology Associates, 1978. Planning for Mineral Resources in the Wellington Region.

fragment a developing ecological corridor up the gorge that links to Tyers Stream Reserve to the south.

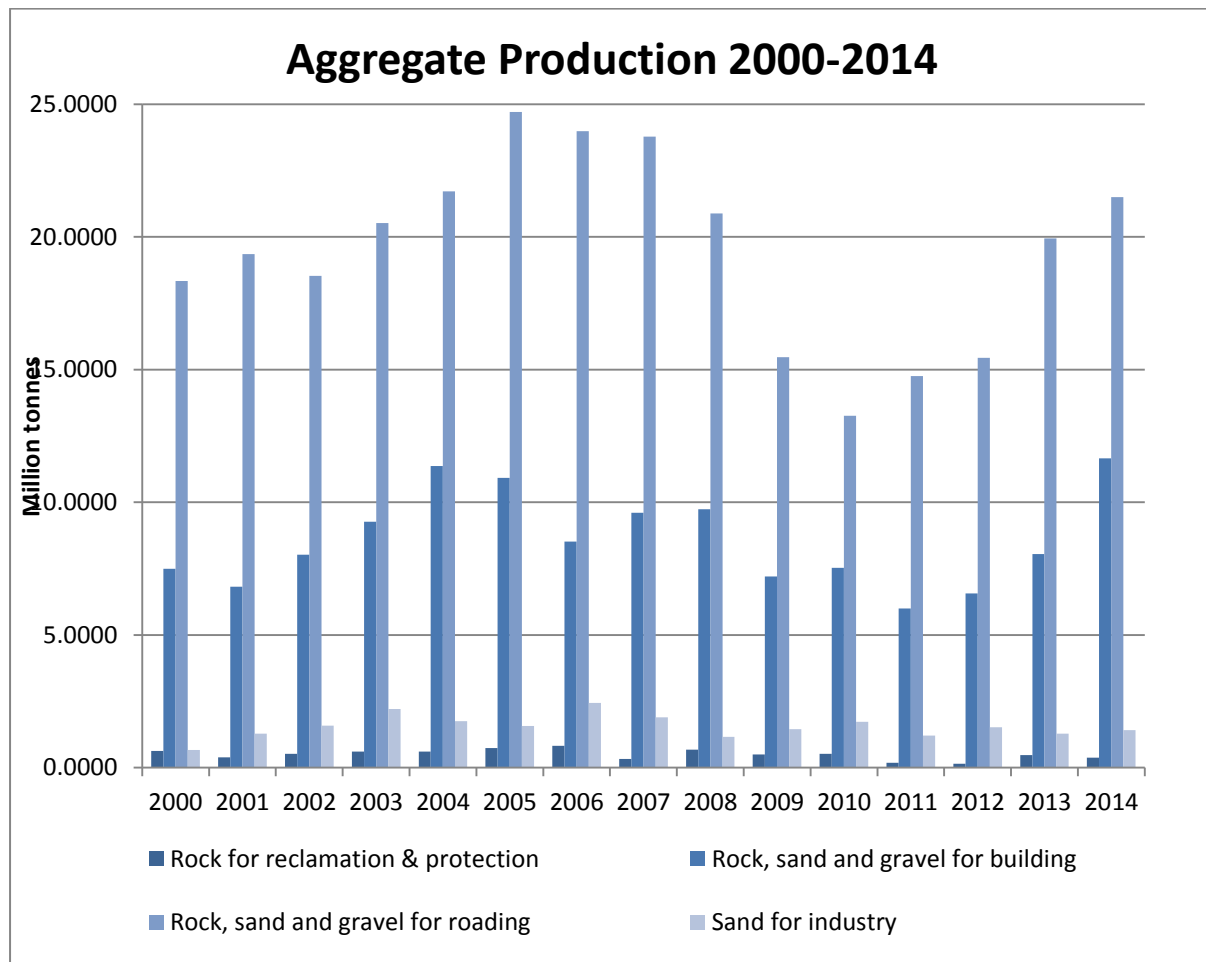
- Owhiro Bay. The former quarry at this site was closed in 1999. It was decommissioned mainly in response to concerns about environmental effects. The obstacles to this site include:
 - Commercial barriers as the terms of the Wellington's City Council purchase means the Council cannot reopen the quarry as of right.
 - Previous works and rehabilitation which means that accessing resource would require significant land modification.
 - Considerable public opposition to activity in the coastal area. This is an important recreation resource for the public accessing the wild south coast including walkers and mountain bikers. The quarry also lies within an area of special value to local iwi with cultural sites for protection. Given a main reason for public pressure closure was environmental effects in the coastal area reopening this quarry or nearby would be highly contentious.
 - Transport up the Happy Valley would add to the landfill trucking impacts.
 - Access from Happy Valley (landfill) side was considered during the quarry closure process and was not considered feasible as access to high quality rock was constrained by intervening overburden and poor rock.

In the wider region there are limited other possibilities. Plimmerton quarry was closed due to the environmental effects of trucking through the village and was a limited resource. The Regional Council holds consents for extraction of aggregate from the Hutt River but that is specifically aimed at river management activities and is not a reliable material for supply.

3. Current Wellington Market

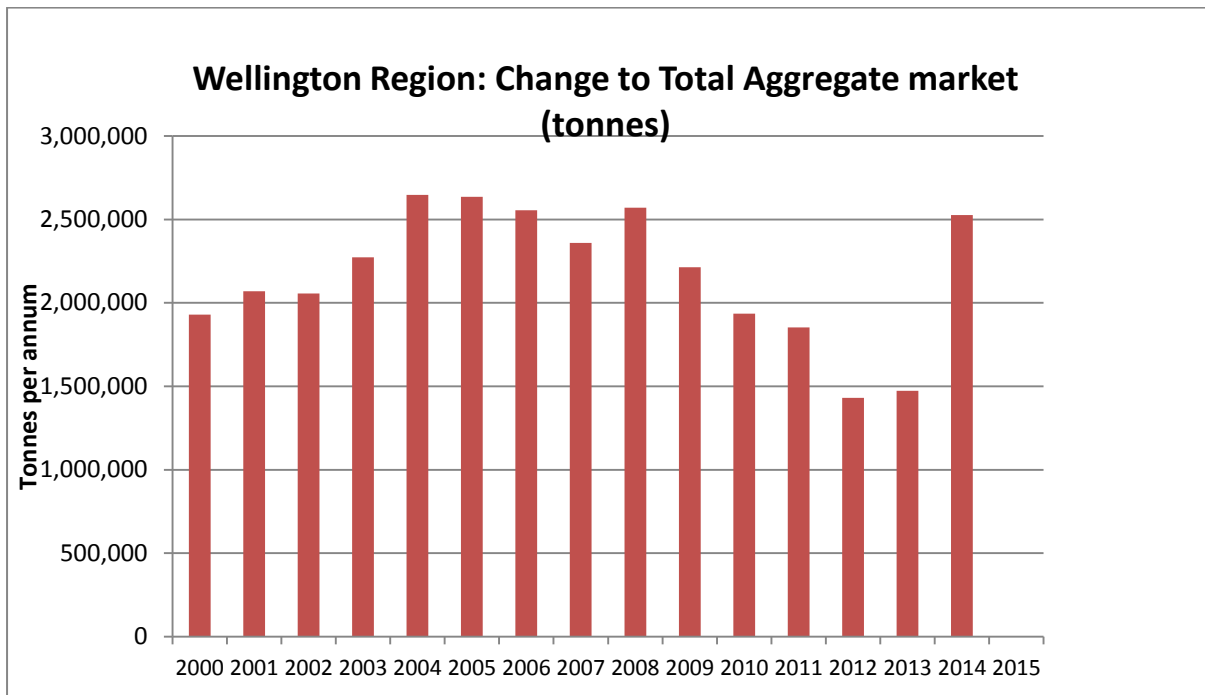
National Production

Nationally, aggregate production has been somewhat cyclical. Following the global financial crisis in 2008 there was a major downturn. From 2013 there has been a significant reinstatement of production levels³:

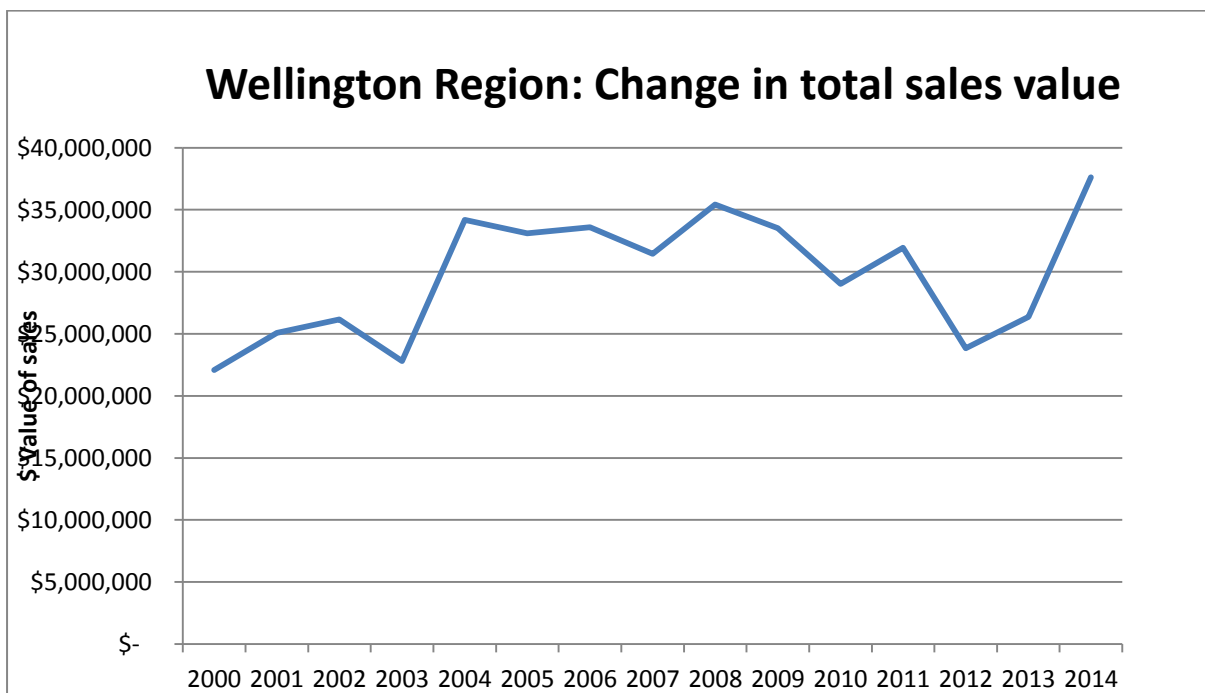


³ Source: <http://www.nzpam.govt.nz/cms/investors/doc-library/minerals-industry-snapshot-files/aggregate-production-1993-2014.xls>

The Wellington market has been less extreme but has also rebuilt in terms of tonnage and value⁴ with a 70% increase from 2013 to 2014.



Sales value has also increased:



⁴ Regional production figures from <http://www.nzpam.govt.nz/cms/investors/doc-library/minerals-industry-snapshot-files/> (downloadable spreadsheets by year).

4. Market Outlook

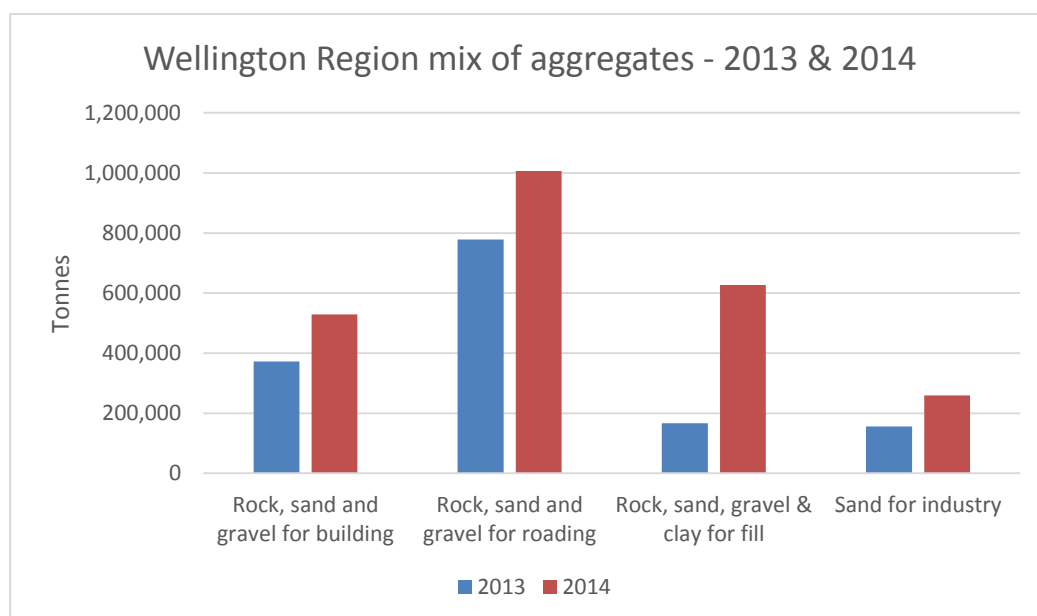
Underlying demand for aggregate

There is an underlying demand for aggregate for a wide range of uses in building, roading and infrastructure. The 'rule of thumb' is that the per capita consumption rate is about 8 tonnes per person per year⁵. Of course that consumption is averaged out. Some examples of drivers of aggregate use are:

- A new house uses approximately 250 tonnes of aggregate including foundations, retaining works, drains, cladding, linings, driveways and landscaping etc.
- 1 km of motorway uses 4,000 tonne of aggregate from basecourse to sealing chip.

In addition, commercial construction, drainage and other uses all require aggregate inputs.

In the Wellington Region, the estimate of usage is about 6.3 tonnes per year for a total of about 2.5 million tonnes. The mix of aggregates is as follows:



Population forecasts and development

The population of Wellington City is expected to rise by about 0.64% per annum between 2013 and 2043, from 203,933 to around 246,692⁶. Slightly lesser increases are forecast for other regional areas.

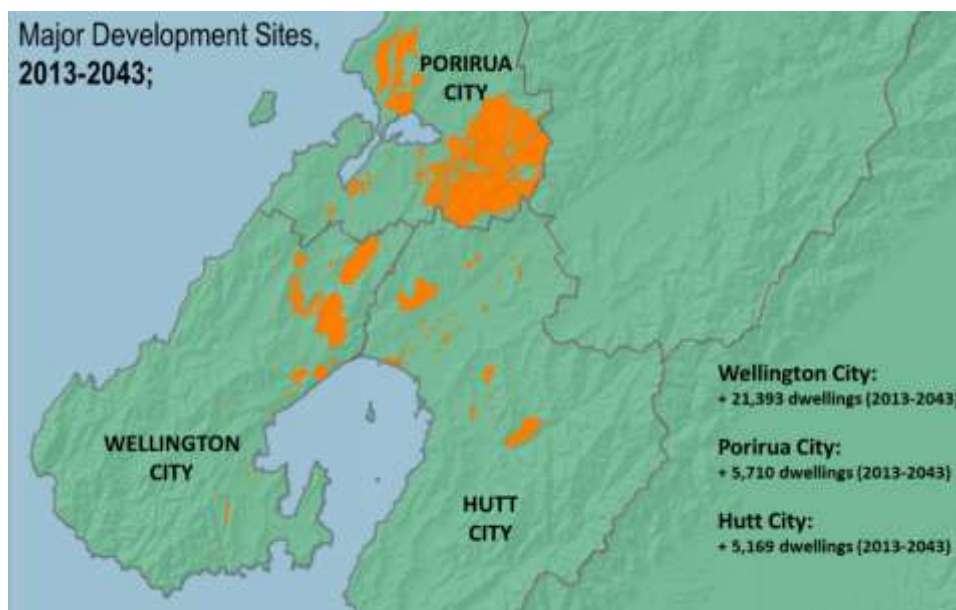
While there are around 800 building consents for new dwellings per annum in Wellington, the Housing Accord aims to increase this from 1000 to 1500 per annum through to 2019. Hutt City and Wellington City Council policies are to increase intensification, particularly around transport hubs and for more multi-storey buildings.

The following is an outline of major development sites for forecast building:⁷

⁵ Source" Aggregate & Quarry Association 2002

⁶ This is the Wellington City Council forecasts: see <http://forecast.idnz.co.nz/wellington>

⁷ <http://blog.id.com.au/2016/population/new-zealand/forecasting-in-new-zealand-building-regional-knowledge-in-the-wellington-region/>



So for example, 21,000 new dwellings would indicate about a resource demand of 5 million tonnes.

Specific projects and infrastructure

Nationally there is a current strong focus on infrastructure development including Roads of National Significance (RoNS) and on improving regional links⁸. There are considerable opportunities for growth in the Wellington market. From the National Construction Pipeline⁹ the following is specific to Wellington for the period up to 2019:

- All building and construction is expected to grow by 38% (better than the national average of 32%);
- Residential building expected to grow by 21%; and
- Non-residential building and construction forecast to grow by 49%.

The peak of construction is in 2017 with \$3 billion of works forecast.

The planned non-residential works in Wellington include:

- Roothing. In total over the next 10 years NZTA projects \$5.4 billion in roading within the Wellington region.
 - RoNS including McKays to Peka Peka (M2PP), Transmission Gully, Waitangirua and Whitby links.
 - Link road development including SH1 development through Wellington (Aotea Quay to Ngauranga, Airport to Mt Vic Tunnel, etc.); and Petone to Grenada links.
- Wellington Airport including \$635 million on the Master Plan for terminal upgrade, hotel development, car park extension and apron development. This does not include the \$300 million runway extension for which resource consent is being planned.
- Retirement villages (Boulcott and Petone) and health infrastructure (e.g. Wakefield Hospital expansion).
- Education Sector developments.
- Other civil works and construction (including water and wastewater projects)

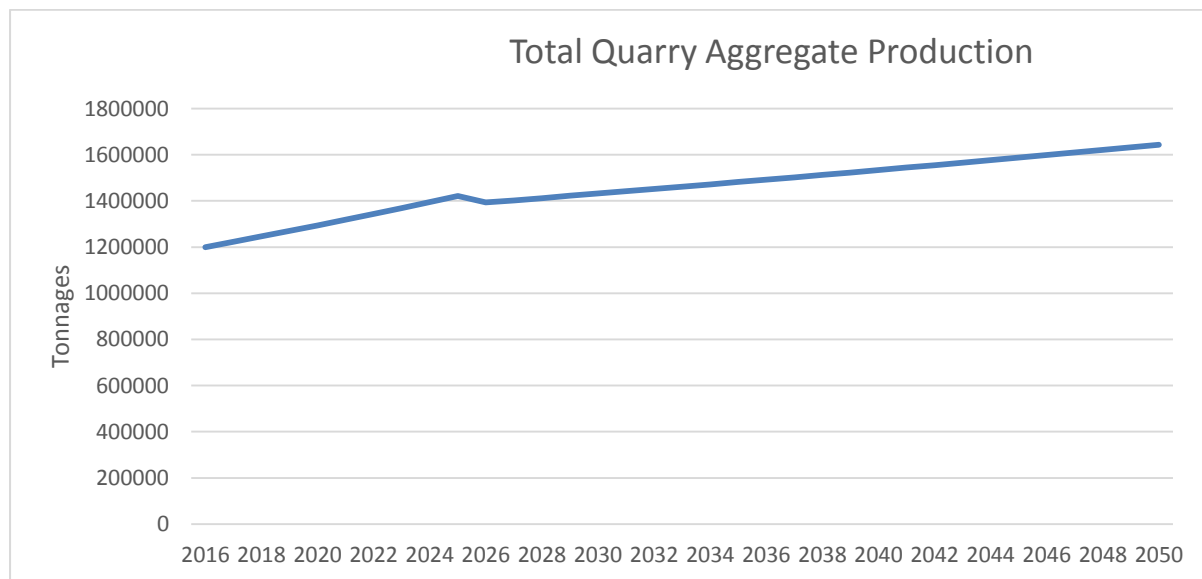
⁸ <http://www.insideresources.co.nz/news-story/19694/govt-confirms-transport-spend-over-next-ten-years>

⁹ "National Construction Pipeline", October 2014 prepared by BRANZ, Pacifecon, and MBIE.

The \$300 million Wellington Airport Runway extensions (if approved and funded) would require a significant amount of rock material. They estimate 150,000 cubic metres of primary armour or akmons and 137,000 cubic metres of secondary armour will be needed, plus concrete to form the rock and dyke wall, with a further 1.5 million cubic metres of fill material like fine gravel or dredged material for the land mass. South Island sources may be looked at, as well as possibly timing in construction with a second tunnel from Mt Vic supplying some rock¹⁰.

Forecast of Wellington Production and Demand

Combining the current known demand and projects (not including the runway extension), and the underlying population and new dwelling forecasts substantiates the following aggregate production¹¹:



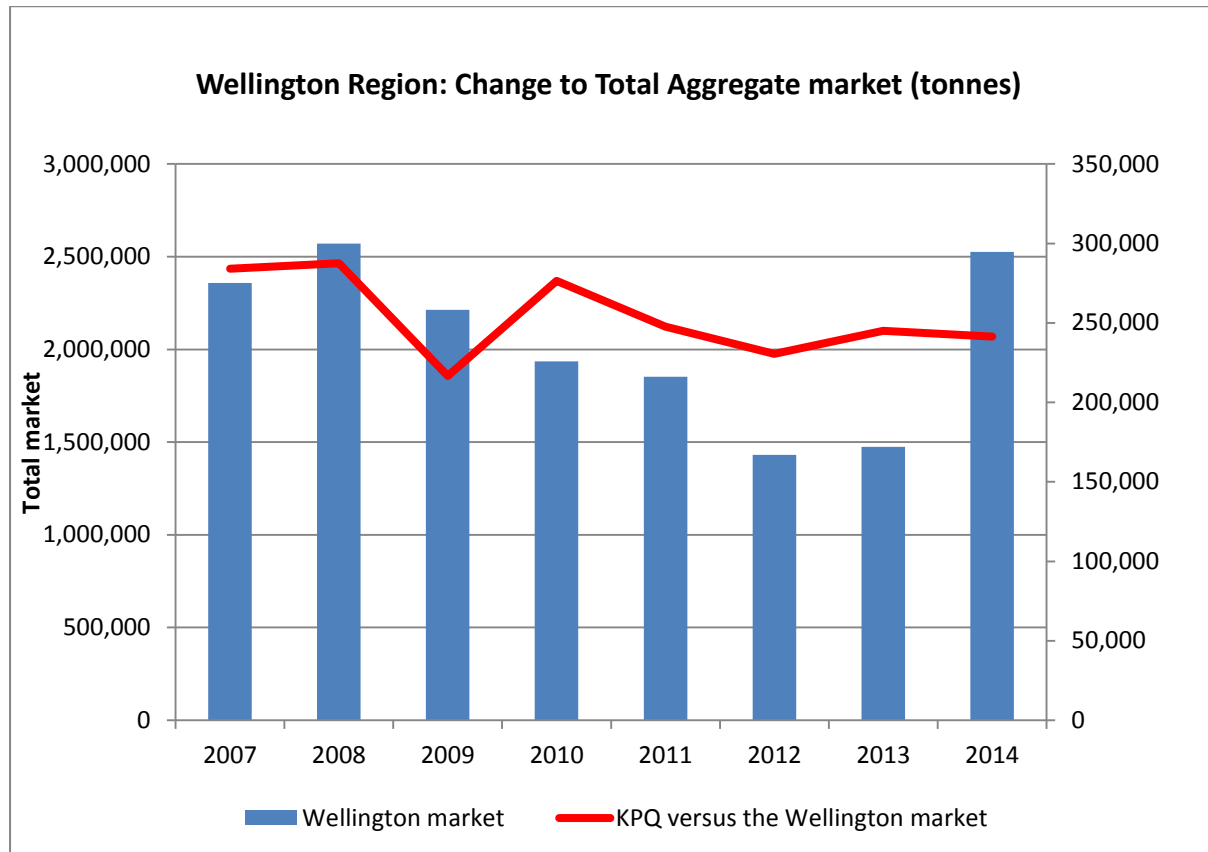
¹⁰ <http://www.insideresources.co.nz/news-story/19720/wellington-airport-extension-may-source-south-island-rock>

¹¹ This is based off the 3 major quarries in the area around their core product sets and does not include overburden etc.

5. Relative market supply

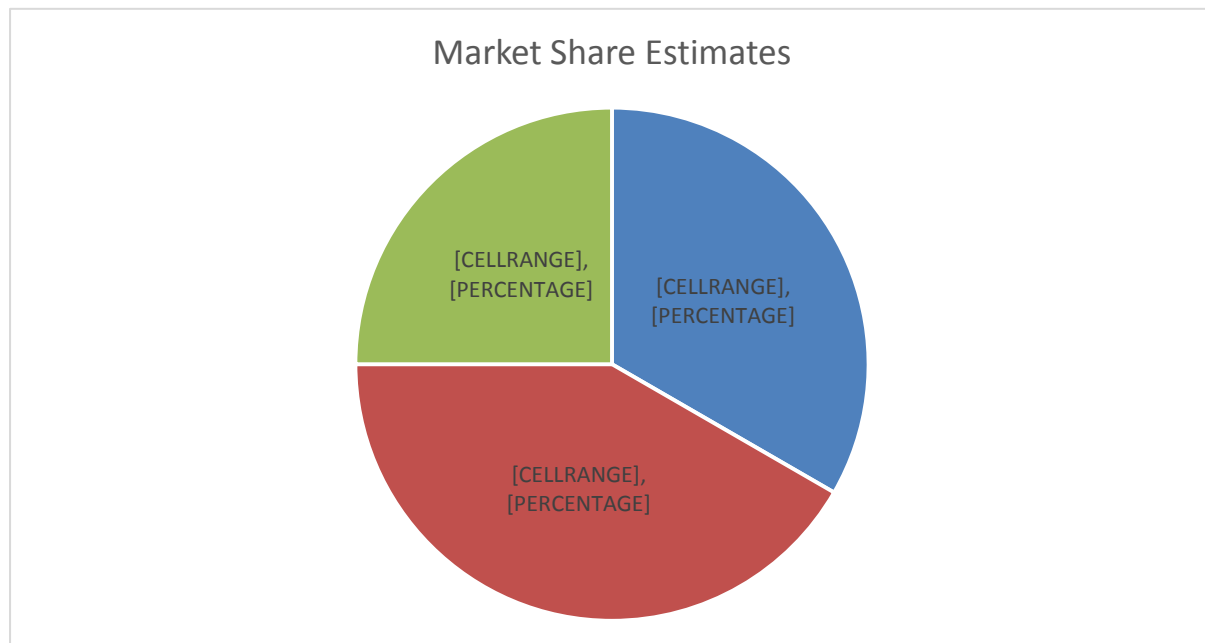
Performance relative to market:

KPQ volumes are fairly consistent against the total market:



The market share estimates for the three regional quarries are as follows:¹²

¹² Based on reported tonnages from Inside Resources. Note that KPQ is listed as 350,000 tonnes in this, there well may be padding of all participant numbers.



Product Mix

All quarries produce a range of material. While Belmont and Kiwi Point Quarry have traditionally had more ability to produce higher grade roading product, there is reasonable ability for any of the quarries individually or together to support the construction or roading markets from all quarries.

Barriers to entry and supply

With road or alternative haulage costs a significant factor in supplying quarry products there are barriers to non-local entry into the market. Local haulage costs are also a significant factor of the cost. The three Wellington based quarries have both the resource and the location for the immediate Wellington market.

Lifespan with KPQ Plan Change

Both Belmont and Horokiwi appear to have sufficient resources in the medium term.

- Horokiwi has a forecast of about 20 years of resource remaining¹³.
- Belmont had a plan change approved in 2014 that gave it access to additional resources of about 10 million cubic metres. This additional resource also improved their access to higher-quality resources. This is thought to extend the current life of the quarry to around 40 years¹⁴.

If KPQ also gets the required Plan Change, then the supply outlook is as follows:

With KPQ Plan Change	2015	2020	2025	2030	2035	2040	2045	2050	
KPQ									
Belmont									
Horokiwi									

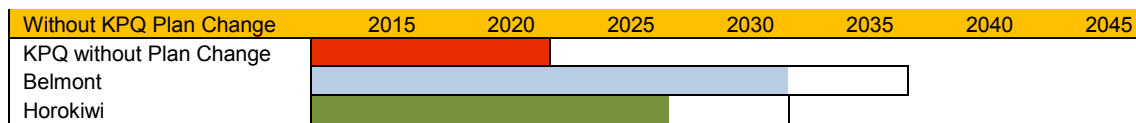
Note that means there is an opportunity around 2030 for reduced competition, higher demand from KPQ and potential increase in pricing.

¹³ <http://www.insideresources.co.nz/news-story/19374/horokiwi-pushes-ahead-quarry-development>

¹⁴ <http://www.insideresources.co.nz/news-story/14999/winstone-prepares-belmont-expansion>

Lifespan without KPQ Plan Change

Without the Plan Change, then there is a more severe supply outlook.



KPQ resources would be exhausted by 2020 and while a limited amount of material could be taken from the Southern area (already consented) that would not be of high quality or be particularly viable. The loss of access to high quality resource would speed up the utilisation of resources from the other two quarries. Belmont is likely to be significantly impacted – it is expected that it would be able to gear up for higher demand – and continue to supply a full range of high quality products. There would be opportunity for increased prices due to lessening competition in this period, as well as additional transport costs for southern and western areas of the Wellington region.

Demand/supply risks

Given the constancy of historical demand for aggregates it is hard to envisage significant downside risks to demand. More likely are potential increasing demands. This may be from higher levels of construction/intensification and infrastructure development or from re-building from one-off events. GNS has estimated the risk of a large (>magnitude 7.5) earthquake on the Wellington Fault as 10% in the next 100 years¹⁵. The experience from Christchurch is that following their earthquakes there was considerable demand for quarry materials to support re-building. However, a lesser earthquake, such as Wellington experience in 2013, can also trigger considerable demand e.g. to strengthen or replace earthquake prone buildings.

¹⁵ www.gns.cri.co.nz

Kiwipoint Quarry
Indicative Value Impact Report
Prepared for Wellington City Council

June 2016

CBRE

Advisory and Transaction Services

Report prepared by:

Gerrard Wilson 021 537 245

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Glossary of terms

Term	Definition
GFA	Gross floor area
ha	Hectare
m	Metre
NLA	Net lettable area
psm	Per square metre
sqm	Square meters
WCC	Wellington City Council

1. Introduction

1.1. Background

Wellington City Council (Council) is in the process of reviewing future zoning and remediation options for the Kiwipoint Quarry, Ngauranga.

Strategically, the quarry is an important asset for Wellington City, providing a source of roading aggregate, construction and landscaping products, plus accommodating the Taylor Preston meat processing facility. The overall site is currently subject to a split zoning being part Business 2 with the balance zoned Open Space B.

Council is in the process of preparing a Plan Change to expand quarry operations into an area referred to in this report as Area 2 which is currently partly zoned for Open Space B use. The Plan Change will re-zone the land currently zoned Open Space B to Business 2 (i.e. the same as the rest of the Quarry).

Once quarry operations have ceased on each area of the site, it is anticipated by Council that the land will be rehabilitated to a relatively high standard to provide generally level land suitable for a wide range of business and commercial uses.

Council has instructed CBRE to provide indicative valuation advice in relation to the Kiwipoint Quarry land, on the basis that it is remediated as described by Council.

1.2. Scope and Purpose

Council has engaged CBRE to report on the basis of the following scope and to understand:

1. The indicative value of the land as at the date of this report, on the basis that it is remediated to the standard identified by Council;
2. The potential and indicative future value of the land when it becomes available for use under “Hi”, “Base” and “Lo” growth assumption scenarios (*subject to the qualifications and limitations outlined in section 1.3 below*);
3. The types of business and commercial land uses that will likely generate demand for the land in its remediated state; and
4. A high level overview of the market for business and industrial zoned land in the Wellington Region.

1.3. Assumptions, Qualifications and Limitations

This report is subject to the following assumptions, qualifications and limitations:

- This exercise has been carried out on a ‘high level’ and desktop only basis to understand indicative and potential value impact only. We have not carried out detailed investigations into the subject site and this report does not meet the minimum reporting requirements of the *Property Institute of New Zealand Valuation and Property Standards* for a full valuation report. Accordingly, this report should not be construed or relied upon as a full valuation report.
- We have been instructed to provide a view of the potential future value of the subject land. We note that we cannot determine or provide the market value of an asset at a future date. However, we have provided three potential growth scenarios to provide an estimate of future value under a specified set of assumptions.

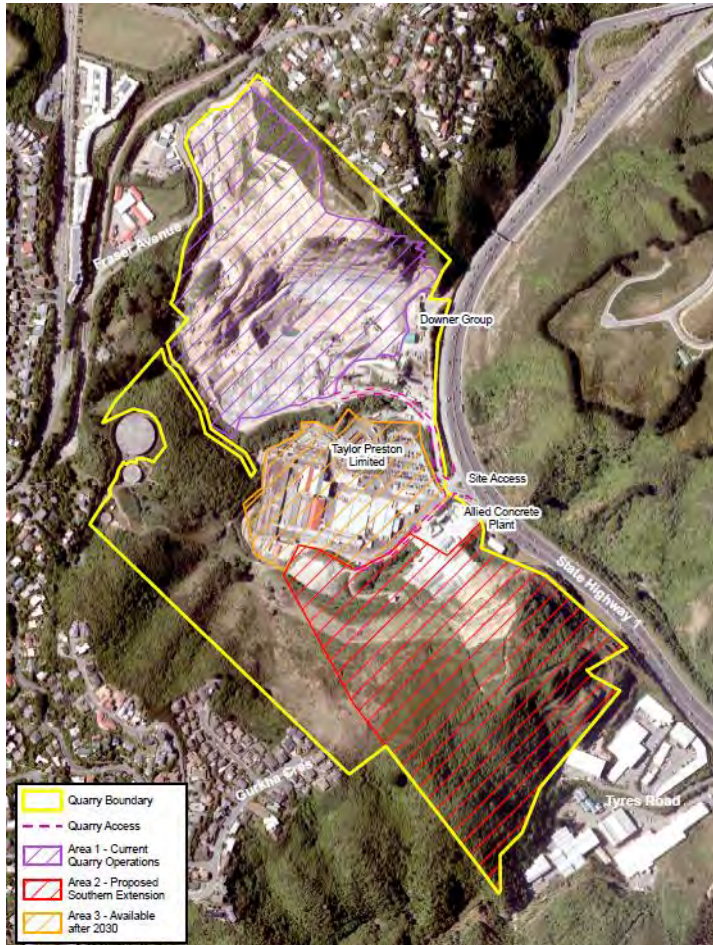
These growth scenarios are premised on our research of historic market conditions for Industrial land in Wellington.

- This indicative advice is provided on the basis of the prevailing market conditions as at June 2016. We note that market conditions are subject to change and future market movements have the potential to materially impact our findings.
- We have not sighted lease documentation and have relied solely on the tenancy information provided to us.
- We have proceeded on the basis that the land will be remediated and made available for development as described by Council; i.e. the land will:
 - Be provided in a “raw” state (i.e. no infrastructure such as roading in place) with generally level and suitably engineered building platforms, of a size suitable for commercial development;
 - Have typical utilities services available at the boundary;
 - Be remediated to a contamination standard suitable for commercial development in accordance with any legislative or regulatory standards applicable at the time;
 - Have north-bound only access and egress from State Highway 1 (as provided at present).
- We have not been provided with costs to remediate the site, neither have we tested the economic feasibility of carrying out the site remediation to the standard identified by Council.
- Our indicative valuation advice is provided on an “as if complete” remediated basis. We have not been instructed and neither have we assessed the indicative value of the land on an “as is” basis (i.e. as the land sits, as zoned, in its present physical state).

2. Site Details

2.1. Overview

The Kiwipoint Quarry site is situated on the south western side of SH1 in the Ngauranga Gorge, Wellington City. Council has delineated the site into three areas as illustrated in the following aerial photograph:



Current State

The northern portion of the site referenced as Area 1 comprises the current quarry operations and is extensively cut with a steep face toward the northern end. The balance of this area is currently terraced with some unsealed roading formed to facilitate quarry access.

Area 2 comprises the southern portion of the site which is largely in sloping to steep terrain in bush and scrub, with the northern section of the site comprising some level terraces accommodating the concrete plant.

Area 3 is the central portion of the site which is relatively level throughout and current accommodates the Taylor Preston processing facility.

Proposed Future State

Council proposes that on termination or completion of each of the existing uses operating on the site, any contamination will be remediated and the land engineered to provide generally level developable areas, suitable for commercial or industrial use. The anticipated developable areas for each component as follows:

Table 1: Developable site areas

Component	Area
Area 1 – Current Quarry Operations	~ 10 ha
Area 2 – Proposed Southern Extension	~12 ha
Area 3 – Taylor Preston Site	~ 4.8 ha
Total	~ 26.8 ha

2.2. Occupancy Details

Noting that we have not sighted actual leases, we have been advised that the site is currently occupied by the following tenancies, with the respective areas becoming available at the dates shown:

Table 2: Occupancy details

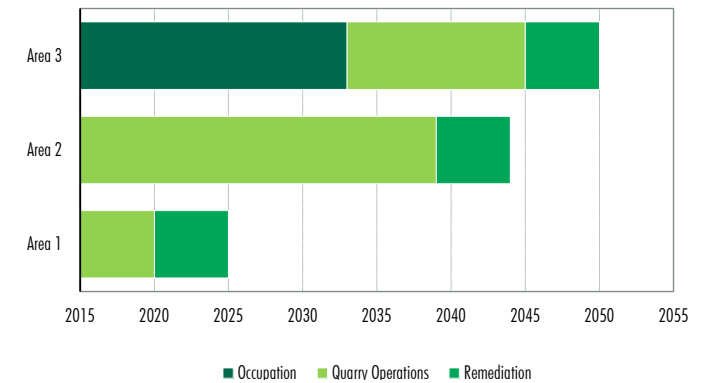
Tenant	Component Occupied	Current Term Expires	Renewal Options	Assumed Available
Downer Group	Area 1	2028	2 x 7yrs	2021
Allied Concrete	Area 2	2026	2 x 7yrs	2040
Taylor Preston	Area 3	2033	1 x 25yrs	2050

In relation to the above, Council has advised that:

- For Downer Group, while the lease extends to 2028, Council has advised that the Quarry operations in Area 1 will cease in 2021.
- For Allied Concrete, Council could choose not to renew the lease in 2026.
- Council can choose not to renew the Taylor Preston lease in 2033 or could specify relocation under a new lease to either Area 1 or 2.
- Remediation for each area will take approximately 5 years once that area becomes available.

The following chart summarises the assumed occupancy of the existing use for each component, remediation period and date of availability of each of the three defined areas, as instructed by Council:

Chart 1: Summary timeline



2.3. Resource Management Considerations

The site is currently split zoned with the majority of the land adjacent to SH 1 being zoned Business 2, with the balance zoned Open Space B under the Wellington City Council Operative District Plan. Council is preparing a Plan Change that will re-zone the Open Space B land to Business 2 (i.e. the same as the rest of the Quarry).

The Business 2 zone is relatively flexible and accommodates a wide range of Permitted Uses including:

- Specifically quarrying in relation to the subject site;
- Trade supply retail;
- Wholesalers;
- Service uses;
- Ancillary and yard based retail uses; and
- Those activities that comply with the standards in section 34.6.1 of the District Plan.

Controlled Activities are generally those requiring the use, storage or handling of hazardous substances.

Discretionary Activities (Restricted) include those related to, inter alia, transport matters such as parking, movement of vehicular traffic to and from the site, impact on the roading network and the provision and location of facilities for multiple modes of transport. There are also specific provisions in relation to other matters such as noise, lighting and other matters.

The Business 2 zoning provides for a wide range of commercial and industrial uses on the KIWIPPOINT Quarry land, including uses that could be accommodated alongside some of the existing tenants. Examples include archival or data storage, cold storage and logistics or distribution hubs.

3. Value Considerations

3.1. Market Overview

There are relatively few areas within Wellington City, or indeed the Greater Wellington Region, that are available for new industrial development. The market for industrial land within Wellington City is characterised by smaller 'pockets' or enclaves spread across a number of suburbs, however these areas are generally fully built up.

Within Wellington City, there are greenfields industrial development opportunities however these are generally limited to Grenada North. Brownfields industrial sites are less frequently available, or may be available for specific land uses (e.g. logistics on Kiwirail land in Thorndon) however these invariably require the amalgamation of multiple sites, demolition of obsolete improvements and potentially remediation of associated contamination and other similar complications; this has a negative impact on development feasibility for these sites and adds risk to development as remediation costs are difficult to accurately estimate.

Further afield in the Wellington region, smaller industrial sites are available within Porirua, Broken Hill and off Raiha Street plus within more established areas such as Plimmerton, in Lower Hutt in the established industrial suburbs of Gracefield and Seaview and in Upper Hutt in locations such as Alexandra Road.

However, given the geography and layout of the Wellington region there are a number of limitations for new industrial development:

- Throughout the Wellington Region there are very few sites of any significant scale (i.e. greater than 1-2 hectares) suitable for modern industrial development requirements¹;
- Traffic congestion and proximity to arterial routes has made some of the more traditional industrial locations less appealing (Gracefield and Seaview for example);
- There is a paucity of suitable sites with close proximity to the main commercial areas;
- Competing land uses have driven higher land values in some locations rendering industrial land uses uneconomic (Rongotai for example where retail land uses tend to 'outbid' traditional industrial land uses).

It is also worth noting that the composition of the industrial market in greater Wellington has changed materially over the last two decades. In particular, large scale manufacturing uses have declined materially with the closure of multiple factories and in their place, albeit of lesser scale, logistics uses have become more prevalent.

In some cases however (Petone for example), adaptive re-use to other "higher and better" uses has absorbed the premises vacated by manufacturers. This has to some extent cushioned the industrial market by removing land and limiting oversupply. However, reduced land supply will only serve to support future land value growth as demand invariably increases.

Industrial Vacancy Snapshot

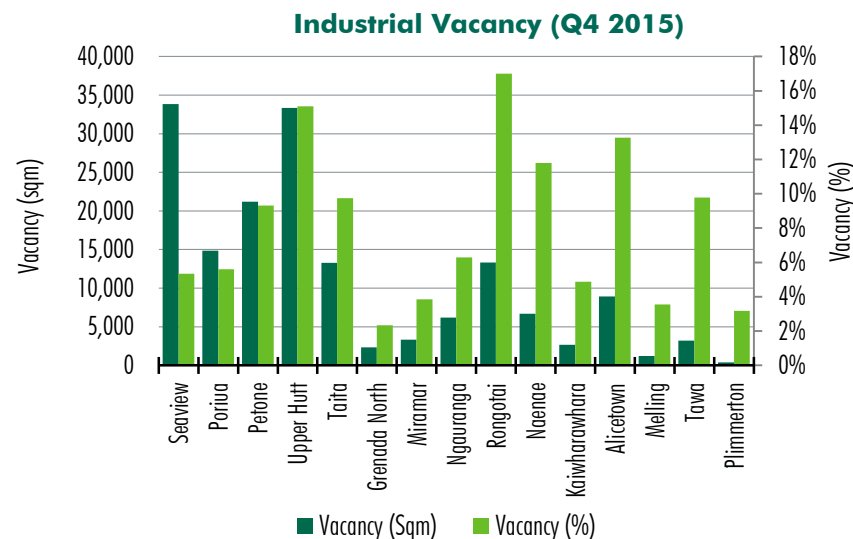
A brief overview of current market conditions is useful at this juncture.

¹ We are aware of industrial occupiers that have been unable to secure suitably sized large industrial sites in the Wellington region (particularly if greater than 1 ha is required), or have had to compromise on location to secure a site – the Car Distribution Group in Mark Ave at the northern end of Grenada Village is a one example.

Prime vacancy fell from 7.2% to 3.8% over 2015. Major contributors were the occupation of 11 Barnes Street, Revera’s purpose built data centres, and the Woodward Group occupying a site at Centennial Highway. The impact of these two relatively small requirements on the overall vacancy level highlights the ‘shallow’ nature of the Wellington industrial market.

Secondary stock also experienced a positive demand environment in 2015 and numerous locations in the Wellington region recorded overall positive absorption in excess of 5,000 sqm.

Chart 2: Wellington Industrial Vacancy Summary



Source: CBRE Research, Q1 2016

As a consequence of the declining vacancy situation, industrial rents increased across the market in 2015, Prime by 6.7% and Secondary by 30.3% (net effective).

With high levels of demand, market rental rates are expected to continue to increase in 2016. Over time and as vacancy continues to decrease, this should also place upward pressure on industrial land values as new development activity is triggered, particularly if further industrial land is converted to other uses and no new supply is available.

New developments are increasingly expected as higher occupier demand outgrows the existing supply (much of which is reflected in obsolete stock). Additionally, the Petone Tawa link road is expected to demolish 37 light industrial buildings, and flood protection in Lower Hutt may demolish another 21 industrial properties leading to an expected shortfall of stock for occupiers.

Notwithstanding and offsetting the above, Lincolnshire Farms is zoned Urban Development Area and the Structure Plan (contained in the District Plan) identifies 40-50 hectares of land for future employment uses (this is equivalent to a Business 1 zoning). This area will be opened up for development as part of the Petone to Grenada link road, which has a construction dated of 2019/20.

On balance, the limited anticipated supply environment and increasing demand should help underpin land values and future land value growth. In our opinion, it also highlights the importance of ensuring that sufficient industrial land supply is preserved and is sufficient to cater for future demand.

3.2. Industrial Land Values

On balance, the supply and demand dynamic for land supply has been relatively balanced which is reflected in land values. Land values have been static, at approximately \$243 psm average overall (for a typical size industrial lot of greater than 3,000 sqm and less than 1 hectare), as the supply of undeveloped industrial land available matches demand.

The following table summarises indicative land value rates for those sites in the Greater Wellington Region having an area of between 3,000sqm and 1 hectare:

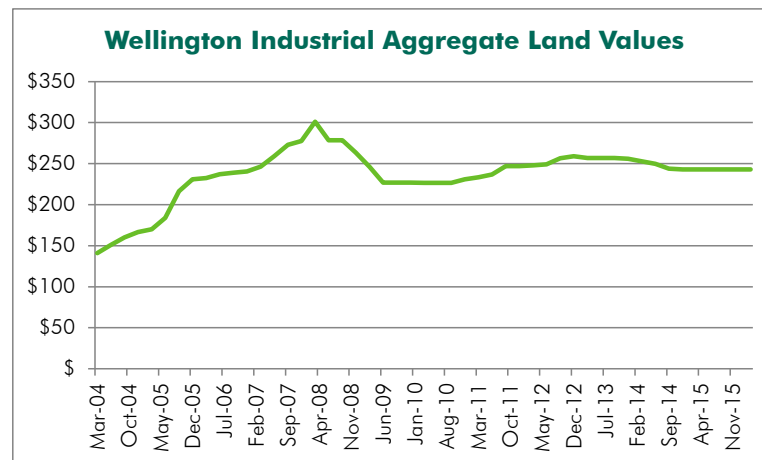
Table 3: Indicative Industrial Land Values

Suburb	Land Value Rate
Seaview / Gracefield	\$170 to \$200 psm
Ngauranga / Grenada North	\$225 to \$275 psm
Elsdon / Plimmerton	\$175 to \$225 psm

We note that we typically observe a non-linear and negative correlation between site size and land value rates; i.e. as site size increases, we observe that the land value rate (analysed on a dollar per unit of area measure) decreases.

Whilst relatively static in recent years, the long run trend for industrial land values in Wellington has been positive. The following chart illustrates land value growth since 2004:

Chart 3: Aggregate Land Value Summary



The above reflects compounding annual land value growth of 4.6% per annum or 72% overall. However, strong market activity up to the 2008 GFC exacerbated the level of growth observed over this period; post GFC, the past five years growth has been materially lower at a CAGR of 0.8% p.a. or 4.1% overall. In our view, the more recent levels of growth observed are likely to be a more accurate indication of long run future land value growth.

In terms of forecast growth scenarios and based on our research, we have adopted the following growth assumptions for the three growth scenarios adopted within this report:

Table 4: Scenario Growth Assumptions

Scenario	Assumption
Low Case Growth ("Lo")	1.0% p.a.
Base Case Growth ("Base")	2.0% p.a.
High Growth Case ("Hi")	2.5% p.a.

3.3. Value Rationale for Kiwipoint Quarry Site

Summary Overview

In the context of the Kiwipoint Quarry site, we are mindful of the following factors in determining the indicative land value of the "as if" remediated land areas:

- There are very few sites of this scale suitable for industrial development in the Wellington region;
- The site is well located in the context of Wellington City, being close to the CBD and northern Wellington suburbs;
- Access directly from State Highway 1, albeit from a northbound direction only;

- The site could accommodate a wide range of compatible industrial and commercial land uses. Examples of the types of use that we believe would suit this site, once remediated, are:
 - Secure and archive storage facilities;
 - Manufacturing and processing;
 - Cold storage and distribution;
 - Vehicle storage and servicing (both wholesale distribution and depot's for heavy vehicles).

Most if not all of these uses could function in the proximity of the Taylor Preston facility.

- In our view, unless additional access is made available to the site, there is unlikely to be demand for any form of retail use (which would also serve to fragment the existing retail base in Wellington City in any event).

Given the above factors and the relative paucity of suitable industrial land throughout the Wellington region, we believe that on the basis of the land being available on the basis of the physical state proposed by Council, the site would be subject to relatively strong levels of demand. In particular, the large size of the site and its proximity to Wellington CBD and northern suburbs is positive and would go some way to offsetting the northbound only access constraints from State Highway 1.

Adopted Indicative Values

Having summarised the relevant considerations in the sections above, we have adopted the following indicative values (on an "as if" basis as if the remediated, raw sites were available "today") for each of the three areas that comprise the Kiwipoint Quarry:

Table 5: Indicative Kiwipoint Land Values as at June 2016

Component	Area	Land Value Rate	Indicative Value
Area 1	~ 10 ha	\$155psm	\$15.5m
Area 2	~12 ha	\$150psm	\$18.0m
Area 3	~ 4.8 ha	\$180psm	\$8.6m
Total	~26.8 ha		\$42.1m

In relation to the above, we have proceeded on the basis that:

- Each of the areas will be made available as single, un-subdivided and generally level lots at the land areas stated;
- The sites will be available as Business 2 zoned, contamination free and remediated to a standard suitable for industrial development;
- Utility services are available at the boundary;
- Access will remain from SH 1 as at present.

4. Summary Conclusions

4.1. Methodology

In the sections above we have outlined our assumptions in relation to the market for industrial land and more specifically in relation to the Kiwipoint Quarry site.

Council has instructed us to opine on the indicative value of each of the three areas as they are anticipated to become available, both for existing uses and potential future uses.

For Areas 1 and 2 we have not provided a value for the land “as is” (i.e. as quarry land or zoned Open Space B). However, there will be significant uplift in value from the “as is” land value to the “as if complete” land value for Areas 1 and 2. This will largely be attributable to the change in the physical state of the land, rather than the uses accommodated on the land.

For Area 3, the Taylor Preston land, the “before” and “after” basis of land value doesn’t change – this site is already a generally level Business 2 zoned site land and assuming that it is contamination free (for which we have made no allowance) the basis of value for this site does not change.

In order to derive the indicative land value for each area of the site at a future date, we have grown the current indicative land values for each area at the “Hi”, “Base” and “Lo” growth rates stated for each scenario as outlined in Section 3.2.

4.2. Conclusions

Based on the set of assumptions outlined within this report, our summarised analysis is shown in the following table (also referenced within Appendix I):

Table 6: Implied Value of Areas in Year Available

Land Component	Indicative Current Value	Year Available	Implied value under growth scenario		
			Lo	Base	Hi
Area 1	\$15.5m	2026	\$17.1m	\$18.9m	\$19.8m
Area 2	\$18.0m	2045	\$24.0m	\$32.0m	\$36.8m
Area 3	\$8.6m	2050	\$12.1m	\$16.9m	\$20.0m

In relation to the above we note the following:

- Future land values cannot be predicted. Whilst we have endeavoured to substantiate our assumptions based on historic market information, future conditions are subject to change and may materially impact our findings.
- The effect of compounding growth can be readily seen for Area’s 2 and 3 which are predicted by Council to become available materially later than Area 1.
- The above values do not consider any of the costs that will be incurred to prepare and remediate the land. Furthermore, we have not investigated the feasibility of remediating the land.

5. Contact Details

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Level 12

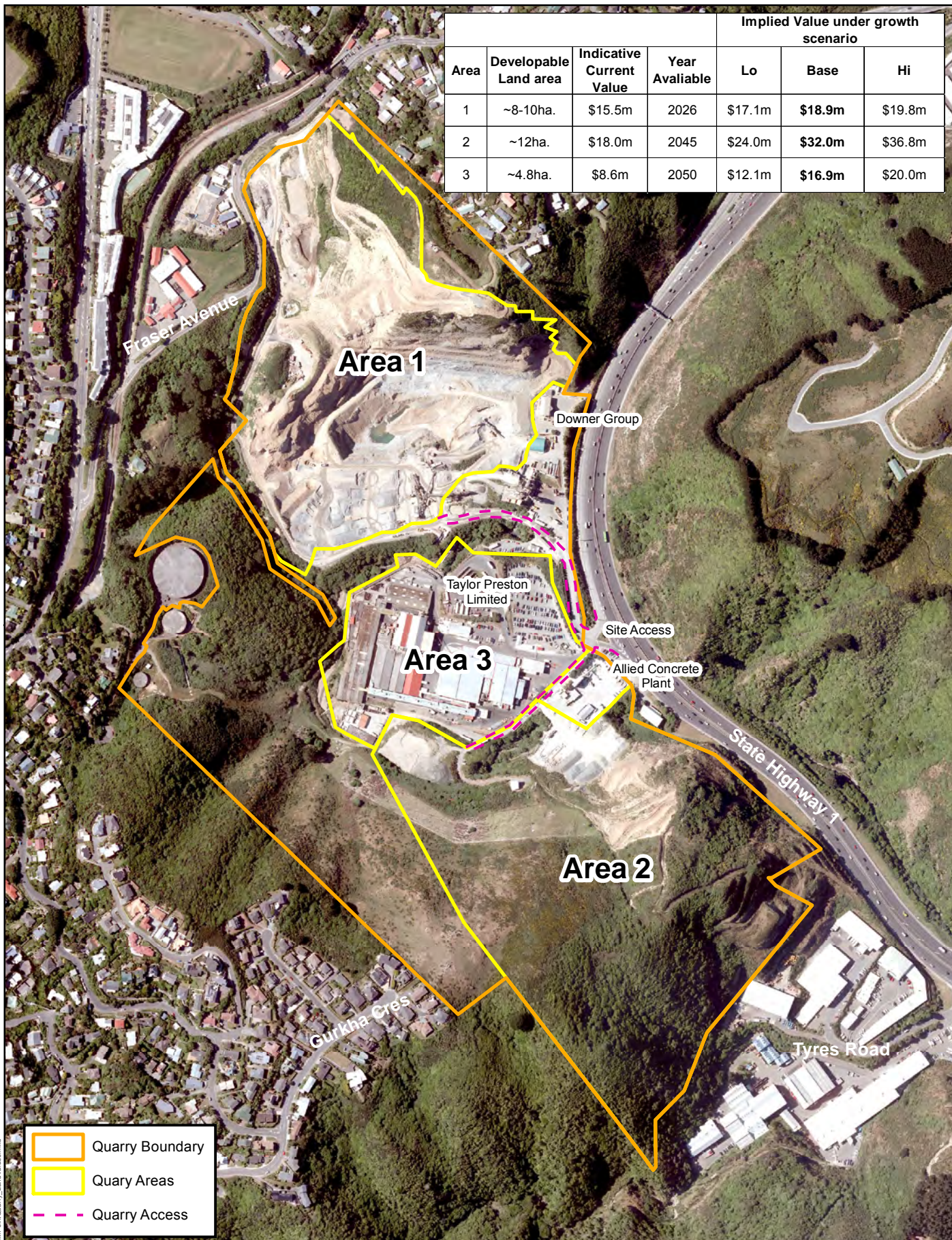
ASB Tower, 2 Hunter Street

PO Box 5053

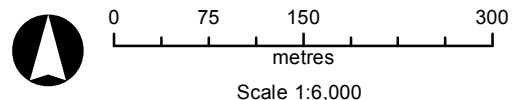
Wellington 6145

A 1. Indicative Value Summary and Aerial Map

Area	Developable Land area	Indicative Current Value	Year Available	Implied Value under growth scenario		
				Lo	Base	Hi
1	~8-10ha.	\$15.5m	2026	\$17.1m	\$18.9m	\$19.8m
2	~12ha.	\$18.0m	2045	\$24.0m	\$32.0m	\$36.8m
3	~4.8ha.	\$8.6m	2050	\$12.1m	\$16.9m	\$20.0m



Kiwi Point Quarry Quarry Areas



Property boundaries, 20m Contours, road names, rail line, address & title points sourced from Land Information NZ. Crown Copyright reserved. Property boundaries accuracy: +/-1m in urban areas, +/-30m in rural areas. Census data sourced from Statistics NZ. Postcodes sourced from NZ Post. Assets, contours, water and drainage information shown is approximate and must not be used for detailed engineering design. Other data has been compiled from a variety of sources and its accuracy may vary, but is generally +/- 1m.

MAP PRODUCED BY:
Wellington City Council
101 Wakefield Street
WELLINGTON, NZ

ORIGINAL MAP SIZE: A4
AUTHOR: patter3j
DATE: 2/06/2016

**Absolutely Positively
Wellington City Council**
Me Heke Rūpoko



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11 July 2016

Logen Logeswaran
Senior Infrastructure Project manager
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5C3287.00

Dear Logen

Kiwi Point Quarry - Review of Geotechnical Information

1 Introduction and Background

Kiwi Point Quarry has been owned by Wellington City Council (WCC) and was operating as a Council Business Unit until 2006, when it was contracted out for operation. Holcim (NZ) Ltd (Holcim) is the current operator of the quarry.

The current quarry operation is proceeding at the area referred to as the Northern Face (Areas A, B, and C) and the availability of good quality resource is expected to last for another 3 to 4 years, at present rate of consumption. In the view of this, Holcim are suggesting to expand their quarry operations to the so-called Southern Face and specifically Area H, which is an approved quarrying area under the current District Plan.

Due to safe design of quarry slopes requirements and in order to make the development of the quarry economically viable, Holcim are proposing to expand the quarry operation to the west of Area H, which is designated as Open Space B, under the current District Plan. As a result of this, a change of the current District Plan is required.

Apart from the above, the current Northern Face slopes of the active quarry have presented instabilities over the years and require laying back at a more stable angle. This laying back will result in encroaching into the northern buffer area which is also designated as Open Space B under the current District Plan.

Holcim have carried out geotechnical investigation and prepared a number of geotechnical reports to support the proposed changes of the District Plan. For the preparation of the reports Holcim engaged Geoscience (ENGEO) and Ormiston Associates Ltd.



Wellington City Council engaged Opus International Consultants to review the available geotechnical reports with the aim to ensure that all the appropriate geological and geotechnical information and assessment is in place to support the proposed change of the District Plan.

This letter presents the comments and observations of the review of the geological geotechnical information relevant to the existing and proposed development of Kiwi Point Quarry (KPO).

2 List of reports reviewed

The following documents were initially provided by Wellington City Council on 13 June 2016:

1. Wellington City Council (2015), Proposed Kiwi Point Quarry Extension 2015, Memorandum by Logen Logeswaran, January 2015
2. Incite (2016), Kiwi Point quarry Expansion Issues and Options Report, April 2016.
3. Ormiston Associates Ltd. (2016), Report on the proposed development for the Business Centre Area, South Ridge, Kiwi Point Quarry, February 2016.
4. Ormiston Associates Ltd. (2016), Report on the proposed development for Open Space B Area, South Ridge, Kiwi Point Quarry, February 2016.

Following the review of the above documents and the attendance of a workshop in Wellington City Council on 23 June 2016, additional geological – geotechnical information was requested from WCC, which was received on 28 June 2016. The additional information includes the following:

5. Ormiston Associates Ltd. (2016), Southern Ridge Queries Response for Wellington City Council, Memorandum by Sandy Ormiston et al., 27 June 2016.
6. Geoscience Consulting (NZ) Limited (2015), Slope Stability Review, Kiwi Point Quarry, Ngauranga Gorge, Wellington, 24 February 2015.
7. Ormiston Associates Ltd. (2014), Site Plan – Southern Ridge – Borehole Locations, Dwg. No. 3655–SR-1, 4 August 2014.
8. Ormiston Associates Ltd. (2014), Geological Section SR1 – **SR1’ Revised 16-10-14**, Dwg. No. 3655–SR-1, 16 October 2014.
9. Ormiston Associates Ltd. (2014), Geological Section SR2 – **SR2’ Revised 16-10-14**, Dwg. No. 3655–SR-2, 16 October 2014.
10. Ormiston Associates Ltd. (2014), Borehole Logs, BH 406 to BH 412, June – July 2014.

3 Review comments

3.1 General

Our review is at a high level and no independent calculations or site visits were carried out at this stage. Our review comments are focused on the following objectives:

- To ensure that the appropriate geotechnical information and assessment are in place to support the proposed change of the District Plan.
- To ensure that the slope stability and other geotechnical risks imposed to the surrounding environment by the quarry operations are low.
- To ensure that the long term stability of the final slopes to be returned to WCC is satisfactory, without the need to implement extensive stabilisation and risk mitigation measures, or additional change of the District Plan for laying back.

As the information collected and assessed for the stability assessment and operational safety of the existing quarry slopes by Geoscience (Geoscience, 2015) was used for planning of the new proposed development in Area H and Open Space B, this report was also taken into account in our review.

3.2 Slope description and context

It is noted that the existing quarry slopes (Northern Face) are estimated to be of a height of the order of 80 - 90 m (based on the analysis outputs provided in the appendices of the Geoscience report) and appear to be at an overall angle of 60 degrees, consisting of intermediate slopes (batters) at 80 degrees 22 m high and benches of a width less than 4 m. The proposed laying back is at an overall slope angle of about 40 degrees, with intermediate slopes (batters) at 55 degrees, which will result at slope heights of about 100 m.

Dwellings of the residential area of Johnsonville are located above (upslope) of the Northern Face slopes, at a distance of 50 m to 80 m approximately from the crest of the existing slopes. This distance will be reduced by the proposed laying back of the slope to about 40 m from the crest of the existing slope.

The height of the quarry slopes of the proposed new development (Southern Face, i.e. Area H and Open Space B) vary at the different stages of the proposed quarry development, with the final slope height to be of the order of 170 m (Section SR2-SR2', Drawing no 3655-SR-2, Ormiston 2014). The overall slope angle proposed for these slopes are 40 degrees approximately, consisting of intermediate slopes (batters) at 45 degrees in brown rock and 55 degrees in blue rock, 15 m high, and benches 5 m wide.

Existing infrastructure adjacent to the new development is State Highway 1 at the northeast and the Commercial Centre at the southeast. The residential area of Kandallah, which is located upslope at the southwest of the proposed development, appears to be at a distance of ~100 m from the final proposed slopes and is not considered to be affected.

3.3 Review comments

The key points of our review are presented below:

Proposed Slope Angles

In Section 5.1.1 of the Geoscience report it is mentioned that 55 degrees is the commonly accepted long term maximum batter slope angle of Greywacke in the Wellington Region and 45 degrees are referred to as a conservative recommendation. These slope angles appear to have been adopted in the design of the new development at the Southern Face.



We note that the long term adequacy of slope angles proposed for each slope depends on local rock mass quality, orientation of rock defects, slope height, the wider context of slope, and acceptable risks. As a result, the adequacy of the slope angle, especially for so high slopes, should be thoroughly examined.

Slope Stability Analysis

Slope stability analysis was mainly carried out for the existing quarry slopes (Northern Face) by Geoscience (Geoscience, 2015). We understand that the slope angles recommended for the new quarry development at the Southern Face (Area H and Open Space B) are based on this analysis. The comments referred for the analysis of the Northern Face should be appropriately taken into account in the design of the new slopes.

We note that the global stability of the Northern Face quarry slopes (existing and new proposed configurations) are only examined against circular failure through rock mass, which is not considered to be the most critical for greywacke rock. The possible presence of persistent rock defects such as shear zones and crush zones, or combined failures through such defects and poor quality rock mass have not been examined. ***These types of failures are considered to be the most critical for the long term stability of the slopes in Greywacke rock, especially under seismic loading.***

Further, the Factor of Safety (FoS) against circular failure through moderately weathered rock for the Northern Face slopes for Scenario 3 (55 degrees batters) for the 1:500 years earthquake is <1. The implications of such a type possible failure and the risk imposed to the areas above and below the slopes need to be further discussed for the long term use of the land. The slope stability analysis and the possible mechanisms of failure identified will confirm the adequacy of the distance to the residential area above the existing slope, as well as the width of the no built zone from the base of North Face slopes (currently proposed 5 m no build zone for a 100 m high slope, see Table 5 in Geoscience Report, 2015).

In the slope stability models, the presence of soil overburden and highly weathered rock should be also taken into account. A slope angle of 45 or 55 degrees in such material may not be adequate. Ormiston memorandum provided following our request for additional information, suggests a 30 degree angle in such material. The adequacy of this angle should be examined by analysis and the areas of application of this slope angle should be specifically shown on the drawings.

Further, the excavation methodology and slope stability of temporary slopes during staged excavation of the quarry affecting existing infrastructure (e.g. SH1) should be examined in more detail.

Geological mapping and assessment - investigation of rock defects

Persistent defects in Greywacke rock are critical for slope stability and eventually govern the stable slope angle in this material. As mentioned in the previous comment these defects are not taken into account in the slope stability analysis.

It is not clear if such persistent critical defects (e.g. shears) were found on the existing Northern Face slopes during geological mapping. We note that such defects are not easily

identified on the slope face during mapping, especially if they are adversely oriented. They can be spotted though by mapping a slope face perpendicular to the existing face or with downhole geophysical survey in boreholes, which has not been carried out in the boreholes for the new development. Such downhole survey is relatively quick and cheap and can provide valuable information on rock quality and defects.

In Section 4.2 of the Geoscience report the presence of “greasy back” structures are observed at the northeast and the northwest of the North Face (domains N1 and N2). These structures are described as stress-relief induced, parallel to the original ground surface (are they parallel to the excavated slope face?) **and “more persistent” than** the ones in the rock mass beneath. The location, orientation and persistence of these defects with respect to the existing slopes of the North Face, as well as their possible effect on the stability of the slopes and the surrounding environment above and below the quarry slopes in the short and long term should be further explained and examined.

Could the above defects systematically appear in the entire area (Area H and Open Space B)? This may be demonstrated by a more detailed assessment of available defect mapping information from the entire area.

Further, planar failure was observed on the West Wall of the existing Northern Face slopes (Geoscience, 2015). This failure should be further explained and assessed (mechanism - size – conditions) and the findings should be taken into account in the stability analysis. Is the failure along one of the inferred as key discontinuity sets and what would that mean for similar failures occurring in the future or in new developments?

An inactive fault is mentioned to be suspected between the West and the North Wall. It is mentioned that it is unlikely that the rock mass consisting the proposed slopes are affected by this feature. What are the dip and orientation of this feature, can they be measured on site? We believe that this feature and the effect on rock mass and slope stability should be investigated further, especially for the new developments proposed in Area H and Open Space B.

We believe that further assessment of general published information relative to the site and of the existing mapping information could provide a better understanding of possible systematic appearance of predominant critical defects for the entire site.

Geological interpretation of Southern face (Area H and Open Space B)

The inferred depth of resource (blue rock) presented in the geological sections SR1-**SR1'** and Sr2-**SR2'** **appears to be reasonable**, based on the borehole logs. Some fluctuation of the depth of the resource along the entire area of proposed quarrying could be expected, as indicated by BH 407.

However, we note that the geological interpretation of the collected information is at a relatively high level. The sections should provide more detail of geology and tectonics expected in the area of the pit, i.e. presence of faults, interlayers of argillite or the rock quality of the overburden. These elements could influence slope design and estimated quantities of overburden and resource.



The possible presence of a fault zone is inferred in the area (shown in the 1:50,000 Geological Map of the Wellington region, observed during mapping as part of the Geoscience report and also possibly inferred from the quality of rock mass in BH409). The presence of a fault zone could influence both the stable slope batters (for temporary excavations as well) and the quantity of available resource, as a result the presence, extent and orientation of such a zone should be investigated further.

Rock fall analysis for Northern Face

The recommended slope batter angles in Table 1 (Geoscience, 2015), based on kinematic analysis results and structurally controlled failures in the rock, are between 35 and 50 degrees, depending on the slope aspect. The suggested slope angles of 45 and 55 degrees, obviously allow some failures to occur, which will be contained in the benches temporarily and eventually generate rock fall.

Rock fall stability analysis was carried out in the Geoscience report, however the material used on the bench surface and at the bottom of the slopes do not appear to allow bouncing of rocks away from the slope. This implies that the distance from the toe of the slope affected by rock fall has not been examined. This should be further explained. Further, seismic loading should be accounted for in the rock fall analysis to assess the long term rock fall risk.

Following the above comments the adequacy of the rock fall protection measures proposed in the Geoscience report (Table 5) should be confirmed against all possible rock fall for the final long term configuration of the slope.

4 Recommendations

The proposed District Plan changes are more likely to be accepted if they are supported by a robust geotechnical assessment and proposal. An adequate geotechnical assessment will provide confidence that the proposed new District Plan boundaries are appropriate to accommodate the long term stable slope angles and further change will not be required in the future. A possible change in slope angles to fit within the approved boundaries could compromise the quantity of useful resource extracted.

A better understanding of the rock structure and presence of defects in the entire area is required to provide confidence on the proposed slope angles for both the Northern Face and new development at the Southern Face. The assessment should be carried out with a focus on the Northern Face, where there is abundance of rock exposure, and the results adequately extrapolated to the proposed areas for new development, Area H and Open Space B. The following supplementary assessment is recommended to be carried out to support the district plan change, points 1 to 9 below:

1. There is indication that persistent rock defects are present in the area of Northern Face (**“greasy back** structures, inactive fault etc.). A more thorough assessment of these and other defects, which could possibly be critical for the stability of the slopes in the entire area, should be carried out.
2. The defect assessment could initially include a desktop interpretation of ground models obtained using best practice modern surveying and inspection techniques,



such as Unmanned Aerial Vehicles (UAV), that have good application on slope stability problems, especially at steep and inaccessible sites. Older aerial photographs could be also studied. Alternatively, laser scan could be used. The techniques mentioned (especially UAV) are cheap and quick and can provide invaluable information regarding location and orientation of persistent defects.

3. Supplementary geological mapping is recommended to be carried out on site, following the desk top study to supplement the information. The mapping could be focused on the Northern Face, possible existing excavations perpendicular to the North Face slope and rock exposures near and around Area H and Open Space B. The mapping should aim at confirming the critical defects identified in the desk top study, and to assist adequate extrapolation of defects at the entire area. Past failures (e.g. the planar failure on the west slope and others) should be adequately assessed to provide insight on the possible critical defects.
4. Mapping or digital terrain models interpretation should also identify areas of poor quality rock (HW or highly fractured) on the slope faces as well as the extent and depth of soil overburden or highly weathered rock at the top of the slope on the Northern Face.
5. The results of the above supplementary assessment, especially in terms of defects, should be taken into account in the stability analysis of the Northern Face. Defect controlled large scale mechanisms should be examined (formed by defects only or combined defect – poor quality rock mass) for the long term condition and the slope angles revised accordingly, if required.
6. Potential instabilities and risk should be assessed in relation to the long term use of land, i.e. for the final slopes to be returned to the Council, taking into account the existing and intended infrastructure above and below the slopes.
7. Rock fall risk should be examined for the final proposed slope, allowing bouncing of the rocks on the benches and ground at the bottom of the slope, to determine the adequate width of no-build zone and possible additional protection measures, if required.
8. The geological long section of the new proposed development (Area H and Open Space B) should be supplemented with more detailed information (all boreholes carried out, information on rock quality, brecciated material, any critical defects identified by the supplementary assessment). The slope angles recommendations should be revised according to the results of the additional assessment (if required).
9. The upper part of the slopes possibly formed in soil overburden or highly weathered material may need to be designed at a shallower angle. This will be demonstrated by stability analysis. The flatter angle proposed should be shown on the drawings supporting the District Plan change proposal.

For the design of the proposed new development (Area H and Open Space B) we propose the following:

1. Detailed assessment of defects and rock mass quality. The defect assessment could be carried out with detailed geological mapping, when more accesses are formed. Downhole geophysical survey in any new boreholes to be carried out is recommended. The investigation should be focused in identifying the persistent defects that could be critical for the overall stability of the slopes (temporary and permanent).
2. The extent and depth of the possible fault zone should be investigated further, as it could affect slope stability as well as the quantities of resource / overburden.



3. The proposed stages of excavation should be shown in drawings. Proposed slope angles should be confirmed by appropriate stability analysis for all possible modes of failure (rock mass, defect controlled small and large scale and combined defect- poor quality rock mass), following the recommendations of Worksafe best practice guidelines (Worksafe, 2015) for the design of new excavations in quarries.
4. The potential failures for each stage of excavation should be assessed in terms of the risks imposed to the operation of the quarry but also to any adjacent infrastructure temporarily or permanently affected (e.g. the Motorway).
5. The long term stability and possible landscaping or rehabilitation requirements of the final slope to be returned to the Council should be taken into account in the design of the new development.

We remain at your disposition for any clarification and additional information may be required.

Sincerely yours,

Prepared by



Eleni Gkeli
Team Leader - Engineering Geology

Reviewed by



Pathmanathan Brabhakaran
National Director - Geotechnical Engineering and Risk.



3655

MEMORANDUM

To Darcy Maddern, Andy Campbell
From Sandy Ormiston, Louise Vick, Ormiston Associates Limited.
Date 28th July, 2016
Subject Kiwi Point Quarry Queries Response For Wellington City Council.

1. Introduction

We have been provided with a review prepared by Opus International Consultants Ltd and titled '*Kiwi Point Quarry – Review of Geotechnical Information*' dated 11th July 2016 of supporting information provided to Wellington City Council by Holcim for development of the Kiwi Point Quarry southern ridge area.

2. Review of Comments

These comments refer to section 3.3 of the Opus letter.

2.1 Northern Pit

The reviewer incorrectly assumes that rule of thumb slope angles have been recommended by Geoscience. It is clearly stated in section 5.2 of the Geoscience report that a kinematic analysis of discontinuities has been completed and the findings of the analysis are detailed in that report.

It is also completely incorrect to state that the northern face has only been examined against circular failure. We refer the reviewers to the Geoscience report section 5.2 for the detailed assessment which comprised,

- Kinematic analysis.
- Planar failure.
- Wedge failure.
- Toppling failure.

We have referred the implications from a 1:500 year earthquake back to Geoscience for comment and will provide their response when available.

We append an updated rock fall assessment prepared for Kiwi Point Quarry in July 2015 which provides recommendations for rock fall containment at the toe of the northern face.

The highly weathered material at the crest of the northern batter includes remnant rock. However the principle issues in this area include'

- The limited area at the crest available to allow flattening of the batter to improve overall stability.
- The existing very steep northern batter slope.
- The existing rock mass kinematic conditions.

Holcim have inherited the current northern batter slope configuration and are working towards achieving multiple goals to improve the batter slope stability. Wellington City Council were originally advised that the end result from quarrying the northern area would provide a platform suitable for development. To achieve a useable platform there are limitations on the final batter slope angle and this results in slope angles that may be steeper than are desirable. The alternative is to buttress the toe and build fill up the existing batter to improve long term stability but this may result in little if any suitable building platforms for future uses.

In view of the conflicting finished pit and batter slope requirements a compromise including some reduction in slope angle from the existing and forming toe rock traps was developed and is proposed.

Geological Mapping and Investigation of Defects

We refer to sections 5.2 and 6.0 of the 2015 Geoscience report for the kinematic analyses requested.

Planar failure referred to by Opus within the western wall is detailed in Section 6 of the geoscience report and recommendations for slope design based on the discontinuities and kinematic analysis are provided.

2.2 Southern Ridge (Area H and Open space B)

2.2.1 Geological Interpretation

The reviewers recommend adding more detailed geology onto the Southern ridge geological cross section including faults, argillite layers, rock quality of the overburden.

Comment

Cross sections provided in the Ormiston Reports for the Business Area and Open Space B show a simplified geological structure showing the weathered zones and quarry batter slope options.

Cross section SR2 – SR2' dated 20 November 2015 showing batter slope stages subdivides the greywacke weathering profile into Brown, Competent Brown, Blue-Brown and Blue and based on the quarry operator rock classification for quarrying purposes.

A fault zone was identified and within Boreholes BH408 and BH409 and inferred to be dipping steeply into the proposed batter slope. Attached Drawing 3655-SR25 shows the boreholes and the inferred fault zone to assist the reviewers. The cross section remains simplified and is based on the borehole intersections.

Boreholes identified argillite beds but we have not plotted these as bedding intersections are not orientated and therefore cannot be plotted with accuracy and are likely to be highly misleading.

The resource is very similar to the northern pit resource which also comprises interbedded sandstone and argillite (mudstone) although it is likely there will be some variation in the percentage of argillite compared with the northern resource.

We agree that the presence of a fault zone would impact on the batter slope design. In view of the difficulty accessing rock exposure and measuring defects for kinematic analysis and the potential impact from the inferred fault we have proposed a staged development beginning with the Geoscience lower recommended slope batter angle (45°) which also allows the batter to be

increased to 55° also within the batter slope range recommended by Geoscience. The proposal allows highwall batter slope design modifications within the fault zone if required and as it is exposed. At this stage there is insufficient detailed information for specific design. Subsurface information is extremely difficult to collect due to machine access issues in the extremely steep elevated terrain and the level of vegetation clearance that would be required.

3. Responses to Recommendations

The review includes a list of recommendations which are addressed below.

Northern Area.

1. Items 1, 2, 3, 4, 5. The review recommends an assessment of rock defects in the Northern Face for assessment of batter slope stability.

Comment

A detailed rock mass defect assessment and kinematic analysis was completed and reported by Geoscience as detailed in Sections 5.2. and 6.0 of their report dated 24/02/2015.

2. Items 6 & 7.

A report prepared by Ormiston Associates Limited was completed addressing rock fall risks and mitigation measures. The report is titled '*Rocfall Analysis For The Northern Face of Kiwi Point Quarry, Wellington*' ref 3655 and dated July 2015. The report is not listed in the list of documents referenced by Opus and with the supporting documentation reviewed. A copy of the assessment is appended.

Southern Area

3. Item 8 & 9.

Borehole intersection details can be obtained from the borehole logs and the intersection rock quality and weathering relative to the quarry operator requirements are broadly identified on the cross sections provided by colour coding. We have clarified the naming of boundaries at the western end of the cross section and extended the section. The cross section identifies a property boundary approximately 30metres west from the proposed highwall crest. The boundary identified as 'property boundary' is not the boundary with residential properties on Gurkha Crescent but a Lot boundary within the Wellington City

Council property. Drawing No 3655-SR17rev1, cross section SR2 - SR2' has been extended to show the separation distance from Gurkha Crescent. The separation distance between the proposed Stage 5 highwall batter crest and properties on Gurkha Crescent is approximately 100metres.

We note that in Section 3.2 review that the Southern Ridge batter slope design is incorrectly stated by Opus as having benches 5metres wide. Design bench width is 8metres as stated in Para 4.3 (Ormiston reports for Open Space B and Business Centre Ref 3655 Dated February 2016) as being 8 metres wide and also identified on Cross Section 3655-SR25 dated 20 November 2015.

The upper slope top bench area has not yet been accessed for drilling. We anticipate a similar weathering profile intersected in boreholes completed on the Southern Ridge comprising surficial extremely weak, very weak to weak, Completely to Highly Weathered rock (Greywacke) (NZ Geotechnical Society Field Description of soil and Rock' 2005). The preliminary design batter is approximately 7metres in height and battered at 45° with an 8metre wide bench.

A maximum of 2metre depth of completely weathered Greywacke was intersected in Borehole BH406 whilst other boreholes intersected Highly to Moderately weathered greywacke.

4. Southern Area (Area H and Open Space B)

1. A defect analysis of the very limited southern area exposure was completed by Geoscience as reported in section 7 of their report which recommends batter slopes of 45° to 55°. We have allowed for initial development at 45° batters to allow assessment of the southern ridge rock exposure by quarrying for final design. We note that existing batter slopes descending to the motorway are standing at slopes of more than 45° without any protection measures for the motorway.

Access to the ridge for drilling boreholes is extremely difficult and any further drilling will require track construction or helipad construction. Track formation does not provide sufficient exposure of material from which

reliable defect mapping can be undertaken. Additional infill drilling can be undertaken when consent to develop the southern ridge is granted. The proposed staged development comprising progressive exposure of rock will also allow thorough analysis at initial 45° batter slopes and the batter angle retained at 45° or increased to a maximum of 55° as recommended by Geoscience.

2. The inferred fault zone has been added to cross section 3655-SR25. 2 boreholes intersected the fault which appears to be steeply dipping into the slope (to the west).
3. Staged modelling of the proposed pit have been recently completed and attached. These include a geological model and Open Space B and Business Centre options for 45° and 55° batter slopes and potential backfill platforms for later construction. A Rockfall analysis will be required for design of protection measures.
4. Potential failure modes and risks based on the northern pit have been applied for two batter slope scenarios (45° and 55°) and include the western face access road and the inferred fault zone.
Safety measures to protect existing commercial buildings to the south and the motorway comprise;
 - Excavation will be undertaken from the pit side such that all material is excavated into the pit minimising the risk to outside areas..
 - Rock trap fences would be erected along the boundaries above the commercial area and motorway to trap any rocks dislodged by quarrying.
 - Batter slope failures within the working area would be contained within the workings as these would fail into the pit.
5. A range of final rehabilitation plans are attached. We have attempted to provide through access from Tyres Road through to the Atlas concrete plant. This is difficult to achieve due to existing site constraints and the height difference to the finished backfill platform.

3655

**KIWI POINT QUARRY
NAURANGA GORGE
REPORT ON THE
POTENTIAL DEVELOPMENT OF THE QUARRY**

**For: Holcim New Zealand Limited
Kiwī Point Quarry
PO Box 13341
JOHNSONVILLE 6440**

**By: Ormiston Associates Ltd.
P.O. Box 47-822
Ponsonby 1144**

Date: July 2015

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1. Introduction

This report is a compilation of the work completed on the investigation, analysis and assessment of the drilling and surface mapping programme carried out during 2014. The drilling and some of the surface mapping was carried out by Ormiston Associates Ltd with Geoscience Consulting (NZ) Ltd. carrying out the detailed structural mapping. Their analysis of this latter work is incorporated into this report.



Plate 1
General view of Kiwi Point Quarry looking to the Northwest with the main northern batter at the right and western batter at the left.

From the results of the above work, an assessment of the potential quarry excavation has been completed and a design drawn up. This has been incorporated into a model by Precision Aerial Surveys Ltd and the potential volumes of rock so developed measured by them.

2. Site Description

Kiwi Point Quarry is located on the southern side of State Highway 1 within the Ngauranga Gorge and approximately 5 kilometres north from Wellington City (Figure 1).

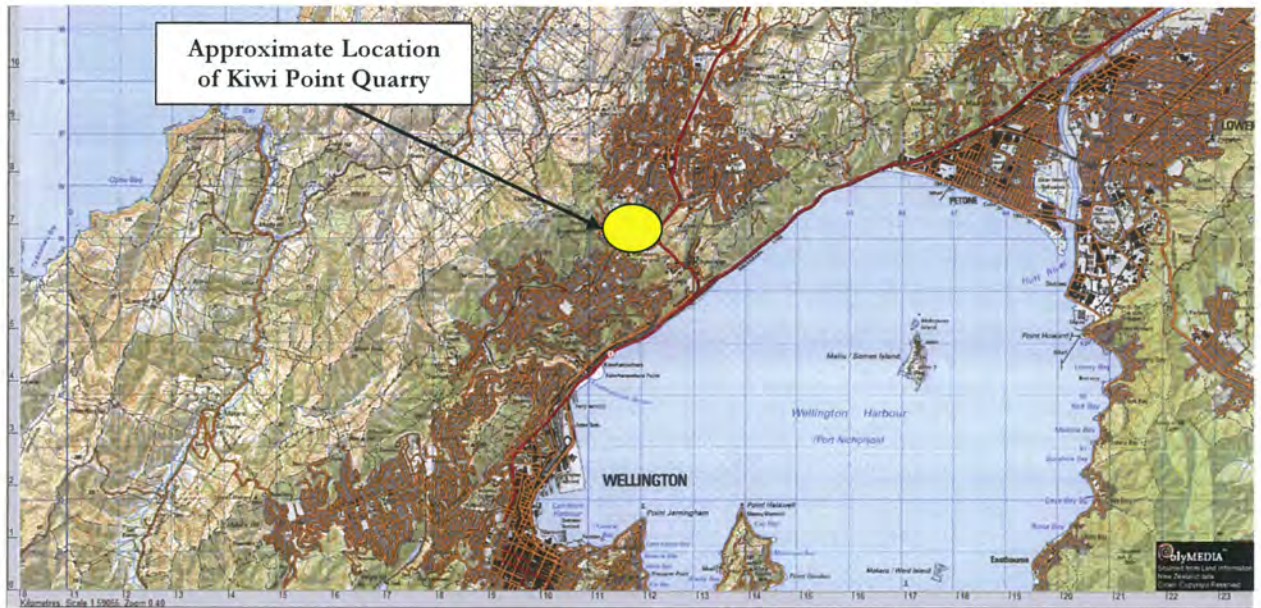


Figure 1.
Location Map, Kiwi Point Quarry.

The current quarry has been excavated from south to north into a ridge resulting in the formation of a batter slope rising steeply to the north. The quarry floor is currently being excavated to win aggregate production.

3. Geology

Reference to Geological Map 22 (Begg J.G, Mazengarb C, Geology of the Wellington Area, 1:50,000, IGNS 1996) indicates the quarry site is underlain by Torlesse Complex within the Wellington Belt of Triassic age (215 to 205 million years old) and comprising interbedded Sandstone and Argillite (mudstone). The lithology is commonly referred to as 'Greywacke'.

Observation of the Northern Quarry batter slope and Southern Area batter slope (Plate 2) indicates bedding defined by black argillite beds within the sandstone dominant lithology.



Plate 2
Northern Batter exposing slightly weathered to fresh sandstone dominant greywacke with bedding dipping to the left as defined by black argillite beds.

3.1 Weathering Profile

Slightly weathered to fresh greywacke is overlain by a variable depth of moderately to completely weathered greywacke that is discoloured brown (Plate 3). Weathering develops from the surface down and therefore forms an 'onion skin' generally following the surface topography. Weathering can also be observed close to prominent joints/faults which allow water to penetrate deeply into the rock mass. **Highly weathered greywacke** is discoloured and more than 50% of the rock mass is changed to soil. **Moderately weathered greywacke** is described as discoloured and discontinuity surfaces have discolouration which penetrates slightly into the rock mass. The moderately weathered rock mass is significantly weaker than the fresh rock.

For the purposes of this exercise we have assumed moderately weathered greywacke is overburden although there may be a market for this material from time to time (Plate 3).

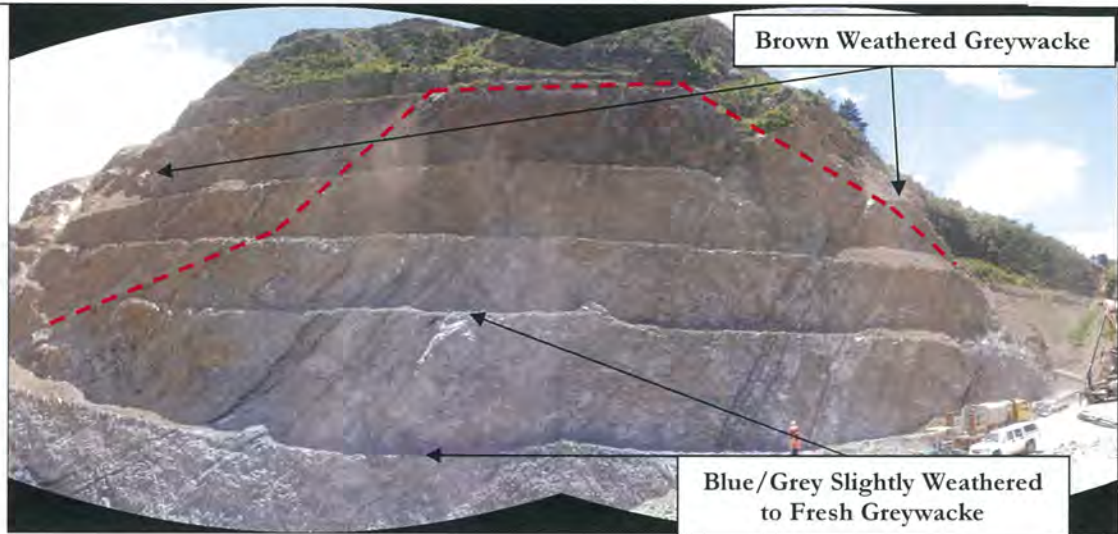


Plate 3

View of Northern Batter showing brown weather veneer forming an onion skin appearance overlying the slightly weathered to fresh (blue/grey) greywacke. Dashed red line denotes the approximate location of the contact between weathered and slightly weathered.

The approximate contact exposed within the northern and western batters between brown weathered materials (overburden) overlying slightly weathered to fresh greywacke is identified on the appended quarry plan Drawing No. 3655-1, Sheet 1, Revision 1 and on Plate 3 above.

The approximate location of the contact between overburden and greywacke as observed in the quarry batters and from available borehole logs is identified on Cross Sections A-A' (Drawing No. 3655-2, Rev. 1), and E – E' (Drawing No. 3655-6). Subsurface conditions have been extrapolated between the boreholes and opinions and recommendations are based on this assumption. However, even though such inference is made no guarantee can be made as to the validity of such inferences or assumptions due to the inherent variability of natural soil, rock and fill deposits both laterally and with depth. Consequently, variations between the boreholes may exist and may vary away from our cross sections.

4. Ultimate Pit Crest Constraints

Although the pit has been excavated to RL 65 metres the pit has along the northern and north western faces been backfilled to approximately RL 90 metres. Geoscience (Reference 1) has calculated the impact of placing this fill on the stability of the faces rising to the north and west and has demonstrated that under static conditions this fill slightly increases the factor of safety for the faces but that the difference becomes more significant under earthquake loading.

4.1 Northern Batter

The ultimate pit northern batter slope crest is currently restricted to the existing batter crest within residual to completely weathered soils at an elevation of approximately RL 210m (See Drawing 3655-1, Sheet 1, Revision 1). We also understand that without a variation to the land use consent, the quarry batter crest cannot be pushed back closer to the northern boundary of the property. There is also a minimum 20 metre buffer requirement between any future ultimate pit crest and residential property boundaries to the north. Geoscience (Reference 1) has recommended a maximum slope batter angle of 40° for this face. Current batters are at 76° or more with an overall slope, including benches, of more than 60°. It is evident therefore that unless the face is cut back at the top to flatten both the batters and the overall slope there will be continual failure of benches and batters on the face. As the benches are generally less than 5 metres wide and, for the most part, significantly less than this due to previous slope failures, the ability to mitigate such failures is limited. Furthermore, previous slope failures on the slope have, in some places, eliminated the benches entirely (see Plates 4 & 5).

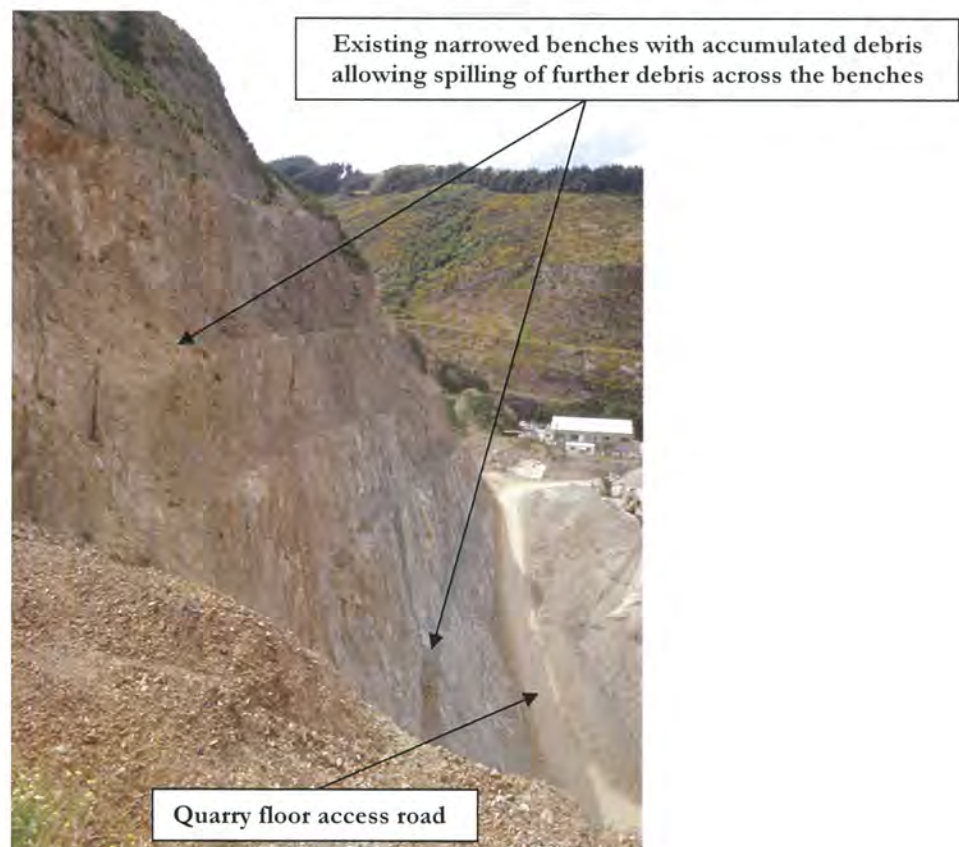


Plate 4

View to the east of northern batters and benches. Note that benches are inaccessible for maintenance and debris accumulated on remnant benches allowing any further Rockfall material to spill down the face.

Geoscience has also carried out an assessment of the potential for large scale deep seated landslides (Reference 1, pages 12 to 14). This assessment has identified that while the probability of mass failure of the face is low for up to a 1 in 500 year earthquake, the stability of the moderately weathered upper layers of rock is not. Loose rock could possibly fall in an earthquake of a 1 in 50 year magnitude in sufficient quantities to overwhelm the benches and fall to the base of the face (Factor of Safety 1.07 or greater). For a 1 in 500 year earthquake such failures are probable (FoS 0.83 to 0.93).



Plate 5

Bench failure on lower western end of northern batter removing all access to the bench for maintenance. Failure inferred to be stress release on Joint Set 1.

4.2 Western Batter

The potential western extent of the existing western pit batter crest is limited by the access road and a Wellington City Council sewer running within the road formation. It is understood that relocation of this amenity is being investigated to enable the quarry footprint to be extended to the limits imposed by the topography alone. It is understood that while it might be possible to relocate the sewer, it is not possible to relocate the road.

In the northwest corner of the face (see Plate 6) joint Set 2 dips out of the western batter slope at approximately 45° and at an angle that is less than the existing 66° batter slope forming kinematically unstable large blocks perched on the batter slope that have been undermined by excavation as illustrated in the following Plates 6 & 7.

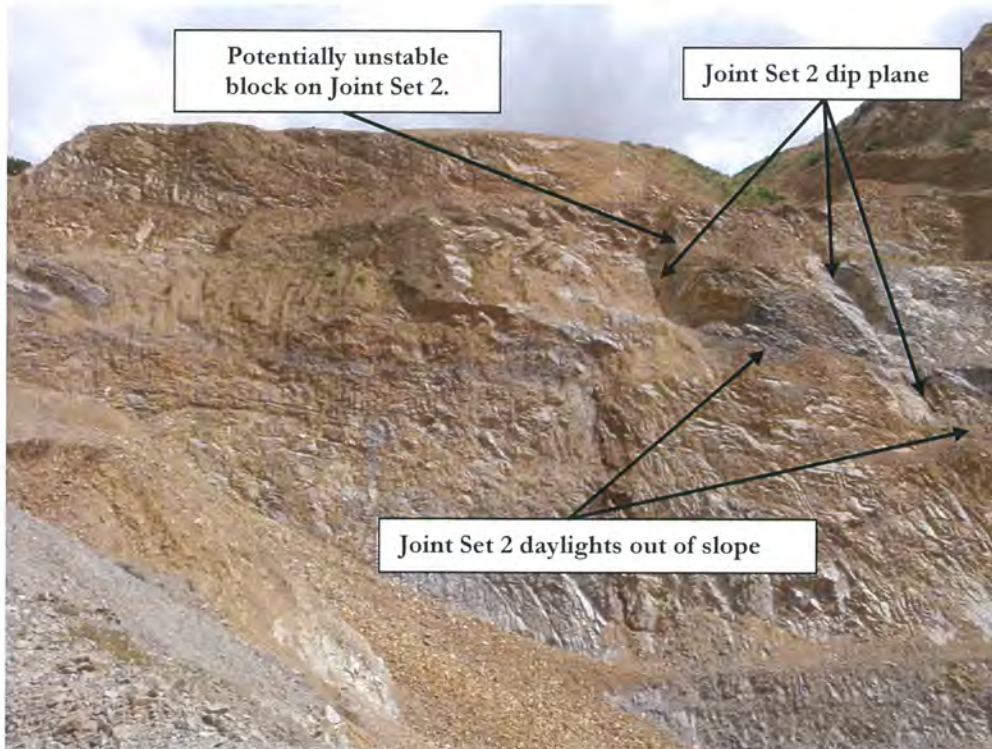


Plate 6

View to the west of the western batter showing Joint Set 2 dipping out of the face and remnant undermined kinematically unstable blocks perched on the batter slope.

Geoscience has assessed the potential for failure on this southeast facing batter (Ref 1 Table 1 page 11). They have identified that planar failure is likely at batter slopes greater than 35° and wedge failure at batters greater than 40° . These are apparent in Plates 6 & 7. A fault running up the intersection between the northern and western faces (see Drawing No. 3655-1, Sheet 1, Rev 1) complicates the structure of the situation (see Plate 5).



Plate 7

Joint Set 2 and potentially unstable blocks perched on the batter slope.

As the face swings to a north-south orientation the joint orientation steepens so that the recommended batter angles steepen slightly to 40° (Reference 1, Table 6, page 17).

4.3 Southern Batter

The structure along this face all dips into the face so that the risk of both wedge and planar failures is unlikely to exist. The southern batter will be cut to a level which will intersect with the south facing side of the previously excavated valley floor. This is at about RL 80 metres. Backfilling will be above the crest of the excavation. This face has a recommended batter of 45° based on the risk of topping failure (reference 1, page 17). As this risk can, during the working life of the quarry, be managed the design batters have been set at 65° with 5 metres benches at 15 metres intervals.

4.4 Eastern Batter

The eastern batter is all below RL 90 metres and will be backfilled following excavation. Geoscience has recommended (Ref 1 page 11) batter angles of 40° due to the risk of planar sliding. As this risk can, in the short term, be managed during the working of the face a design batter of 55° with 5 metre benches at 15 metre intervals is proposed.

5. Pit Remediation and Expansion

5.1 Northern Face

The northern face is over steep and does not have adequate benches on it. Analysis has determined that there is a risk of failure of the moderately weathered rock forming the upper approximately 70 metres of the face with 1 in 50 year earthquake and a high risk of failure with a 1 in 500 year event. To improve this stability it will be necessary to cut back the crest, lower the batter angles and widen the benches. Currently the excavation to the north is limited by planning constraints; physical constraints are provided by the property boundary and the presence of the telecommunications tower (see Drawing No. 3655 -1, Sheet 1, Rev. 1).

By cutting the face crest back to the edge of the telecommunications tower site as shown on Drawing No. 3655-1, Sheet 1, Rev. 1 a more stable configuration on the face can be achieved with an initial 40° batter increasing to 50° after the bench at RL 180 metres as shown on Cross Section A-A' (Drawing No. 3655-2, Sheet 2, Rev. 1). This batter configuration will daylight on the existing face at RL 105 metres. Below this level it will be necessary to support the existing face by building up the current fill to this level or slightly above.

While this face configuration is still steeper than that recommended by Geoscience, it will at least meet the recommendations for avoidance of planar failure. As this type of failure has the potential for the largest scale of face collapse it is anticipated that by achieving these batter slopes, the amount of potential rock fall will be substantially reduced.

5.2 Western Face

The main part of the western face can be excavated to reduce the batter angle to those recommended by Geoscience, however, at the intersection of the Northern and Western faces this is not possible for the full height of the face. Above RL 135 metres it is possible to flatten the batters to about 35° but below this level the constraints of the existing excavation and the access road require the batters be steepened to 45° (see Drawing No.'s 3655-1, 3655-3, 3655-5 and 3655-6). The proposed backfill will provide support up to RL 105 metres but for the batters between RLs 105 and 135 metres it may be necessary to consider other forms of remediation such as rock bolting. This will only be apparent once the final faces are exposed.

The fill proposed to extend to RL 90 metres will allow the batters to be steepened below this level to 45° as potential for failure above this angle can be managed during the operation of the quarry.

5.3 Southern Face

The Southern face will be subject to toppling failure only. As the crest of this face is below RL 90 metres, this type of failure can be managed during the operation of the quarry. Backfilling will support the face in the long term eliminating any risk of failure.

As the pit will be filled to the crest of the face no rock catch berms will be required on this face.

5.4 Eastern Face

The Eastern Face has not been specifically considered by Geoscience. They do, however, consider the jointing on the north face for west facing batters (Ref 1 Table 1, page 11). They note that the only form of failure likely is from wedge failure. There are no known joint intersections likely to form such features on this face. As fill will be placed against the total height of this face it is considered that batters can be cut to 55° without undue short term risk. Any failures that occur during the excavation can be managed by the operation.

As the pit will be filled to the crest of the face, no rock catch berms will be required on this face.

6. Rock Trap Design Sizing

There is an ongoing risk for failures occurring on the batter slope ranging from individual boulders to partial bench failures. The full northern face height is approximately 100 metres and there is potential for debris to travel the full face height. We would expect material to be slowed by loose debris on benches but there is a risk for debris to travel the full face height. This risk is increased with failures initiated by earthquake events.

Analysis of the potential for rockfall has been carried out using the computer programme Rockfall from Rocscience Ltd. A detailed description of the analyses carried out and the assessments from them are presented in Appendix 1.

This analysis has confirmed that the potential for inundation from rockfall decreases as the height from which the fall originates decreases (Appendix 1, cross sections 2a to 7a). Also that the distance that the rocks will travel from the base of the face is related to the

nature of the benches and the size of the rockfall. The rocks will travel further when the benches are clean compared with when they have talus on them (see sections 2a, b, c and 8a, b, c). The design of the fill surface will also impact on the distance rocks will travel from the base of the face. By raising the fill level to RL 9

8m and leaving a 5 metre deep trench at the toe of the batter most of the rocks falling from the face will be captured and by constructing a 2.0 metre high barrier wall on the crest of the trench the risk of inundation can be reduced to a level where it can be considered to be minimal.

7. Pit Expansion and Deepening

To maximise the production from the pit a design for the deepening to the floor has been completed. This design incorporates the recommendations for batter slope design provided by Geoscience and is presented in a digital format prepared by Precision Aerial Surveys Ltd (PAS). The design is attached as Drawing Number 3655-7 at the rear of this report.

Additional to the resource available from below the floor it material that will be derived from the flattening of the batters on all the existing faces.

The calculation of the resources available from the quarry completed by PAS is based on topographical data provided by Beca in February 2014. Any estimate of the current resources will need to take into account sales since that date.

The estimated quantities are presented in Table 1 below.

Table 1
Estimated quantities of material (PAS).

Item	Volume (m³)	Dominant rock Type	Assumed Density (t/m³)	Tonnes
Pit	581,500	Blue & Blue Brown	2.6	1,512,000
Walls	425,300	Brown	2.4	1,021,000
Total	1,006,823	Mixed	-	2,533,000
Fill	798,800		1.6	1,278,000

8. Conclusions and Recommendations

8.1 Northern Batter

1. The northern batter is over-steepened, unstable and poses a high risk to the current pit floor access road, personnel and machinery.
2. We recommend application to WCC to vary the land use consent to allow advancing the batter crest further north by 30metres. Although it would be preferable to extend the quarry zone to within 20 metres of the quarry boundary the presence of the telecommunications tower might prevent this.
3. A more stable face than at present has been designed and it is recommended that fill be placed at the toe of the face to RL 105 metres. Any fill benches formed should be at least 20 metres wide.
4. As part of this construction we recommend buffer zones be formed at the toe of the face with raised berms to limit the spread of any rock falling from the face. This is discussed further in paragraph 17 below.

8.2 Intersection of Northern and Western Faces

5. On the northern face above RL 135 metres it will be possible to form batters that comply with the recommended stable angles. Below this level the constraints of the previous excavation limit the ability to flatten the batter angles sufficiently
6. It is recommended that following excavation of this face the need for specific remedial measures such as rock bolting be reviewed for the interval between the fill to be placed to RL 105 metres and the flatter batters above RL 135 metres.
7. To avoid the risk of rockfall impacting on any structures to be placed on the filled quarry floor, rock catch berms have been recommended.

8.3 Western Batter

8. It has been possible to design a face with batters which meet the recommended slopes of 40°.
9. To avoid the risk of rockfall impacting on any structures to be placed on the filled quarry floor, rock catch berms have been recommended.

8.4 Southern Batter

- 10 It has been possible to design a face to meet the recommended batter angle of 65°
- 11 As fill will be placed to the crest of the face there are no long term concerns regarding the stability of the face.

8.5 Eastern Face

- 12 As fill will be placed against the eastern face once excavated it is considered that the design face can be excavated slightly steeper than the recommended batter angle of 50°. A batter angle of 55° has been used in the design.
- 13 It is considered that any potential rockfall from this face during excavation can be managed during the operation of the quarry. Backfill will provide support to stabilise this face in the longer term.

8.6 Overburden

- 14 Recontouring of the current batter slopes will produce significant volumes of material that will need to be disposed of either by sale or backfilling the existing quarry floor. It is estimated that some 800,000 bench m³ (1,300,000 tonnes) of this material will be generated from the proposed redesign of the quarry. If recompacted on site, this will fill a volume of some one million cubic metres.

8.7 Resources

- 15 Recontouring of the quarry batter slopes will produce some 430,000 bench m³ (1,000,000 tonnes) of rock. This will be predominantly brown in nature but with limited quantities of blue-brown rock.
- 16 By deepening the pit a further resource, primarily blue but with a significant proportion of blue-brown rock, will be produced. The quantities estimated are some 600,000 bench m³ (1,500,000 tonnes).

8.8 Rockfall Analysis and Fill Design

- 17 Analysis of the stability of the quarry faces by Geoscience has identified the likelihood of failures occurring on the faces particularly under conditions of earthquake acceleration. Such rockfalls will impact on the potential use of the land to be developed from backfilling the quarry.
- 18 To assess the risk of inundation onto the platform to be constructed on the quarry floor, a computer programme “Rocfall” has been used to assess the relative impact of various situations.
- 19 Results from this analysis have shown that the risk of inundation increases with the height on the face, from increased size of the fall and the nature of the benches on the face.
- 20 A design for the toe fill has been achieved to reduce this risk to negligible proportions. This design consist of a toe bund to RL 105 minimum, a bund along the outside edge of the main bund, raising the fill on the lower platform to RL 98 metres and leaving a 5 metres deep trench along the base of the toe bund. A rockcatch fence at least 2 metres high along the crest of this trench will augment the effect to prevent the spread of rock falling from the face.

9. Reference

- 1 Geoscience Consulting (NZ) Ltd, 24 February 2015, Slope Stability Review, Kiwi Point Quarry, Ngauranga Gorge, Wellington.

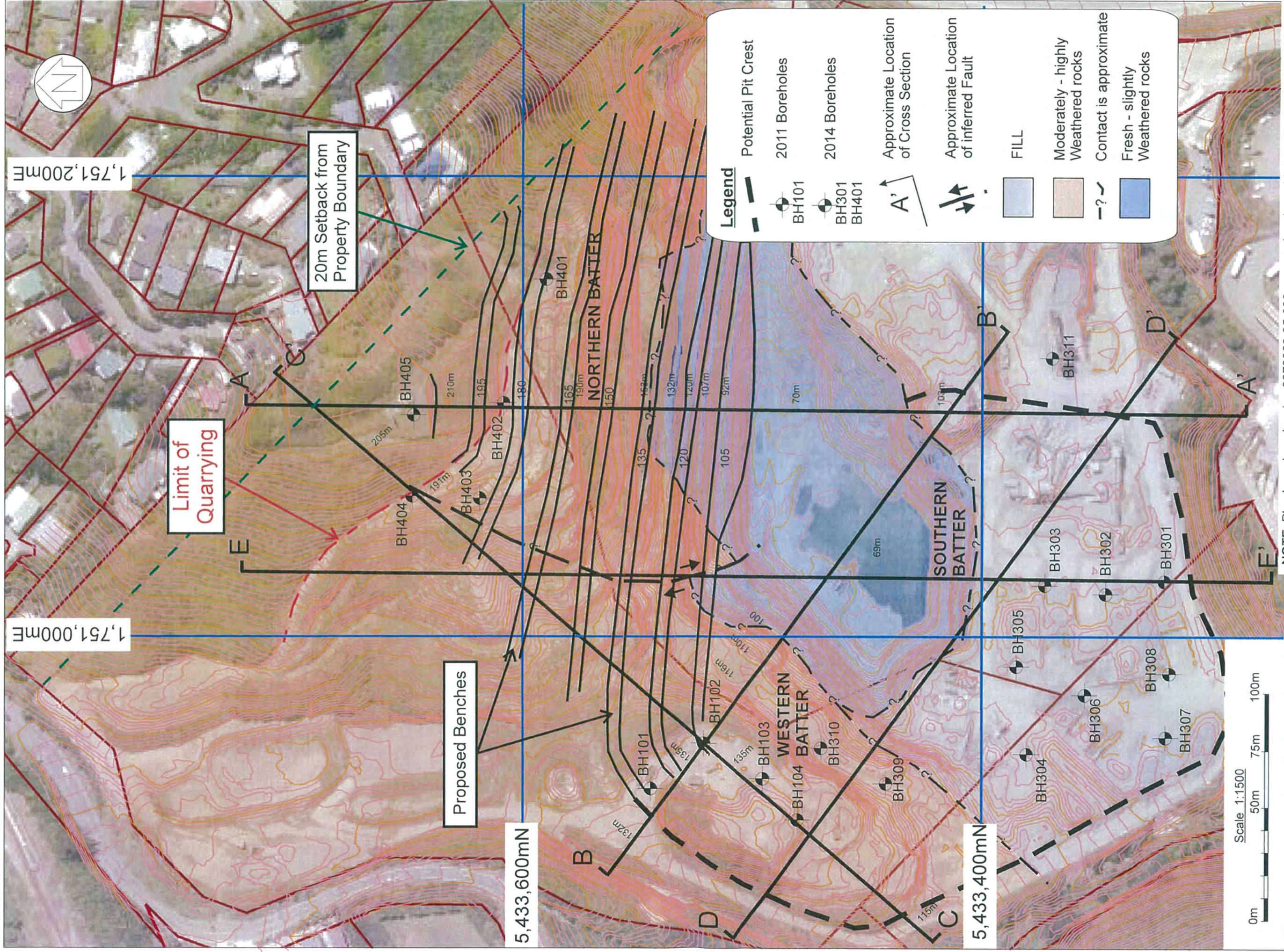
Prepared by

Sandy Ormiston MSc MAusIMM

And

Simon Carryer MSc FAusIMM

July 2015



Legend

- Potential Pit Crest
- 2011 Boreholes
BH101
- 2014 Boreholes
BH301
BH401
- Approximate Location of Cross Section
A'-A'
- Approximate Location of inferred Fault
- FILL
- Moderately - highly Weathered rocks
- Contact is approximate
- Fresh - slightly Weathered rocks

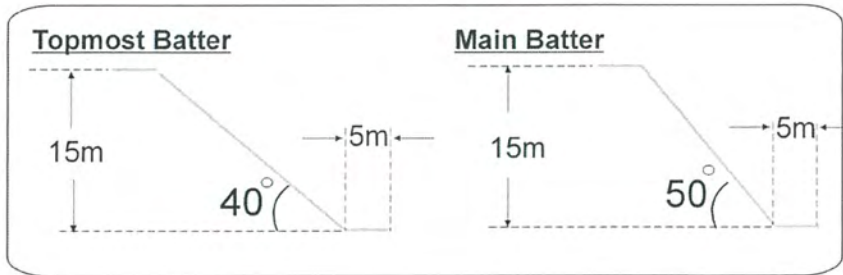
NOTE: Plan based on drawing 3272389-95-006 prepared and provided by Beca, dated 03/02/2014. Refer to Drawing No. 3655-7 for the Ultimate Quarry Development Plan, dated 14/07/2015.

CLIENT: Holcim NZ Ltd
 LOCATION: Kiwi Point Quarry
 TITLE: Site Plan - General Geology & Proposed Northern Batter

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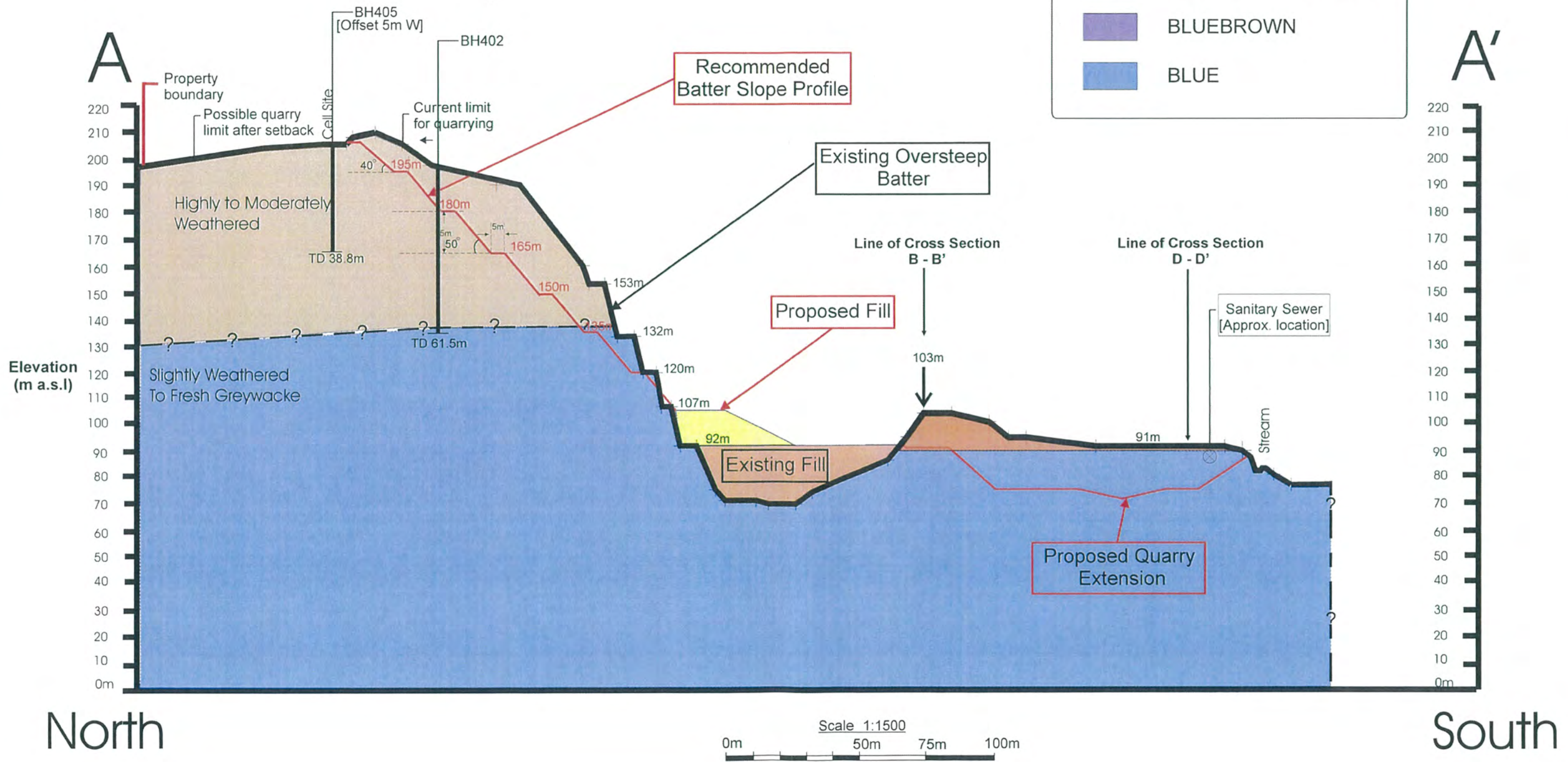
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 3655-1
 SHEET 1 OF 7



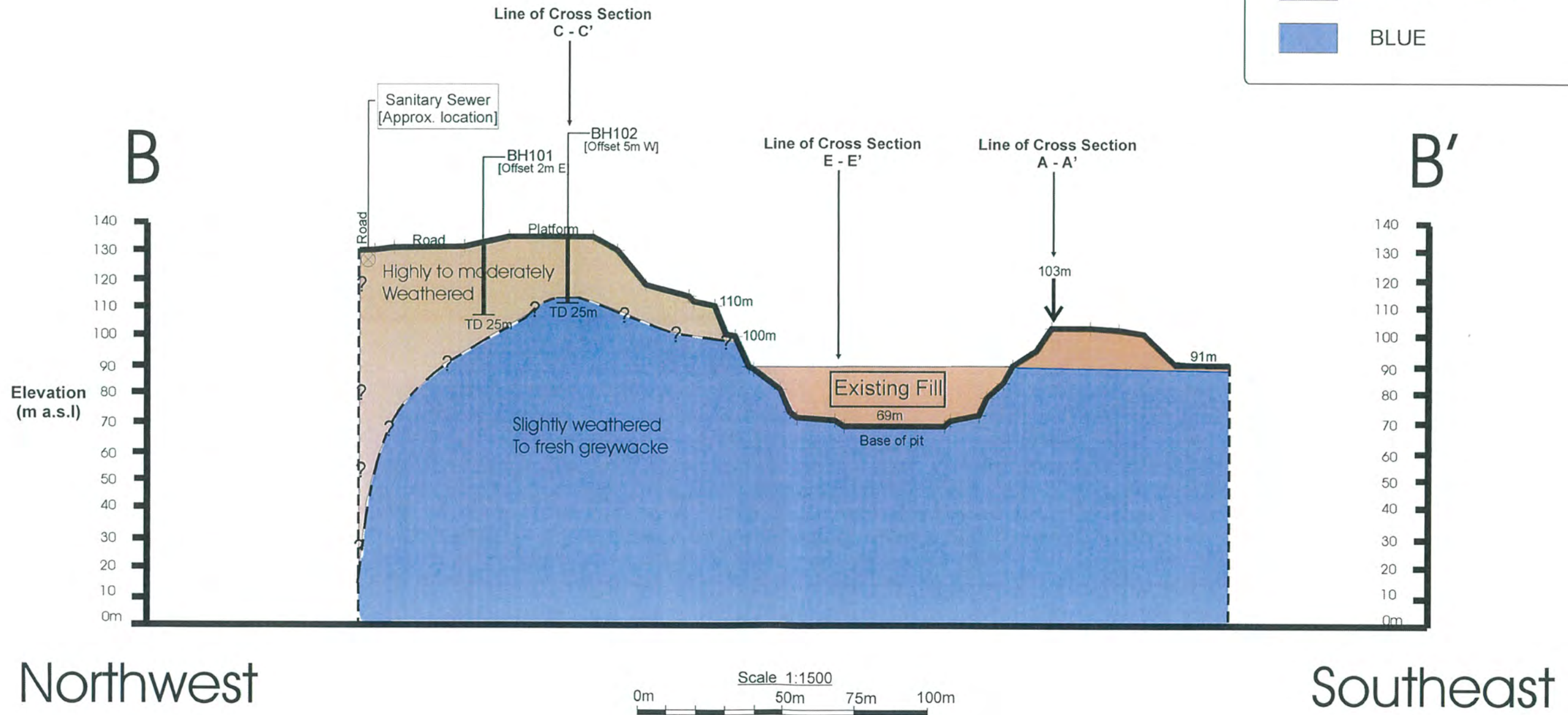
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- BLUE



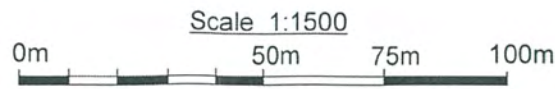
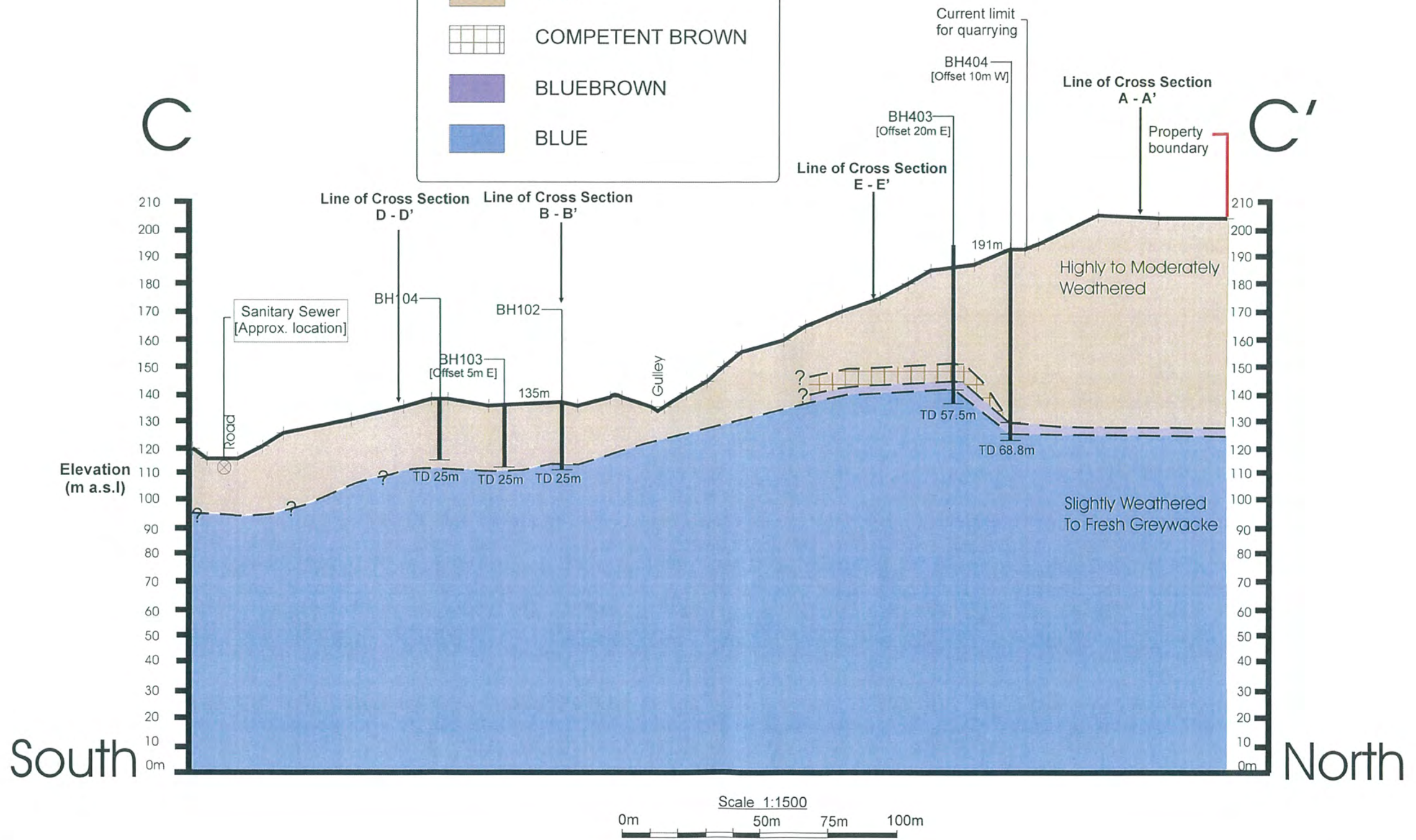
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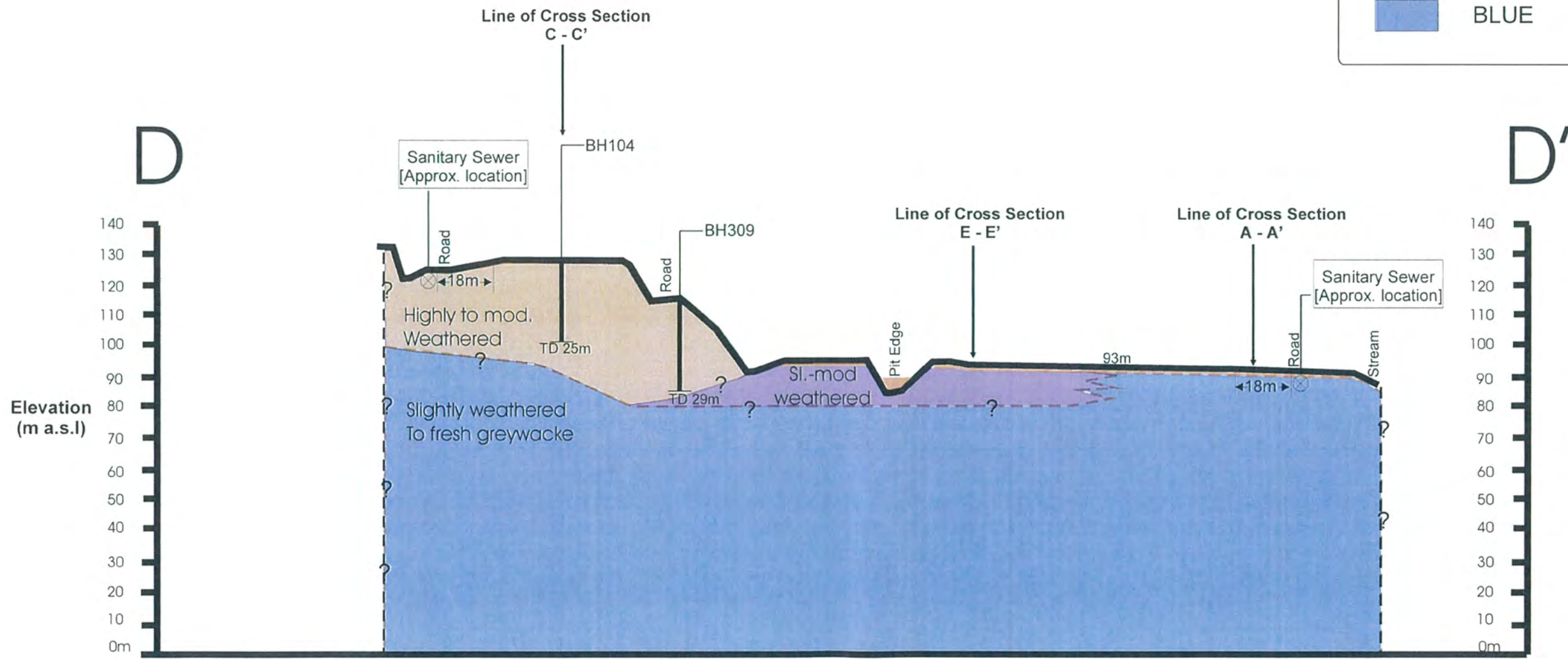
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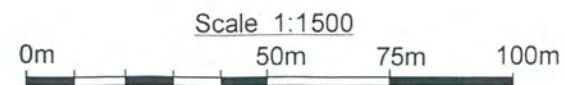
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- COMPETENT BROWN
- BLUEBROWN
- BLUE



Northwest

Southeast



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 Ph (09) 302 2193 Email: mail@ormiston.co.nz

CLIENT: Holcim NZ Ltd.
 LOCATION: Kiwi Point Quarry
 TITLE: Section D - D'

SCALE: 1:1500 @ A3
 DRAWN: TCF
 DATE: 14 July 2015
 CHECKED: AWO

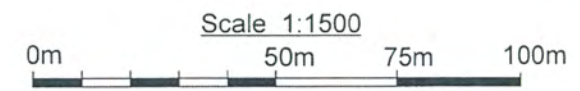
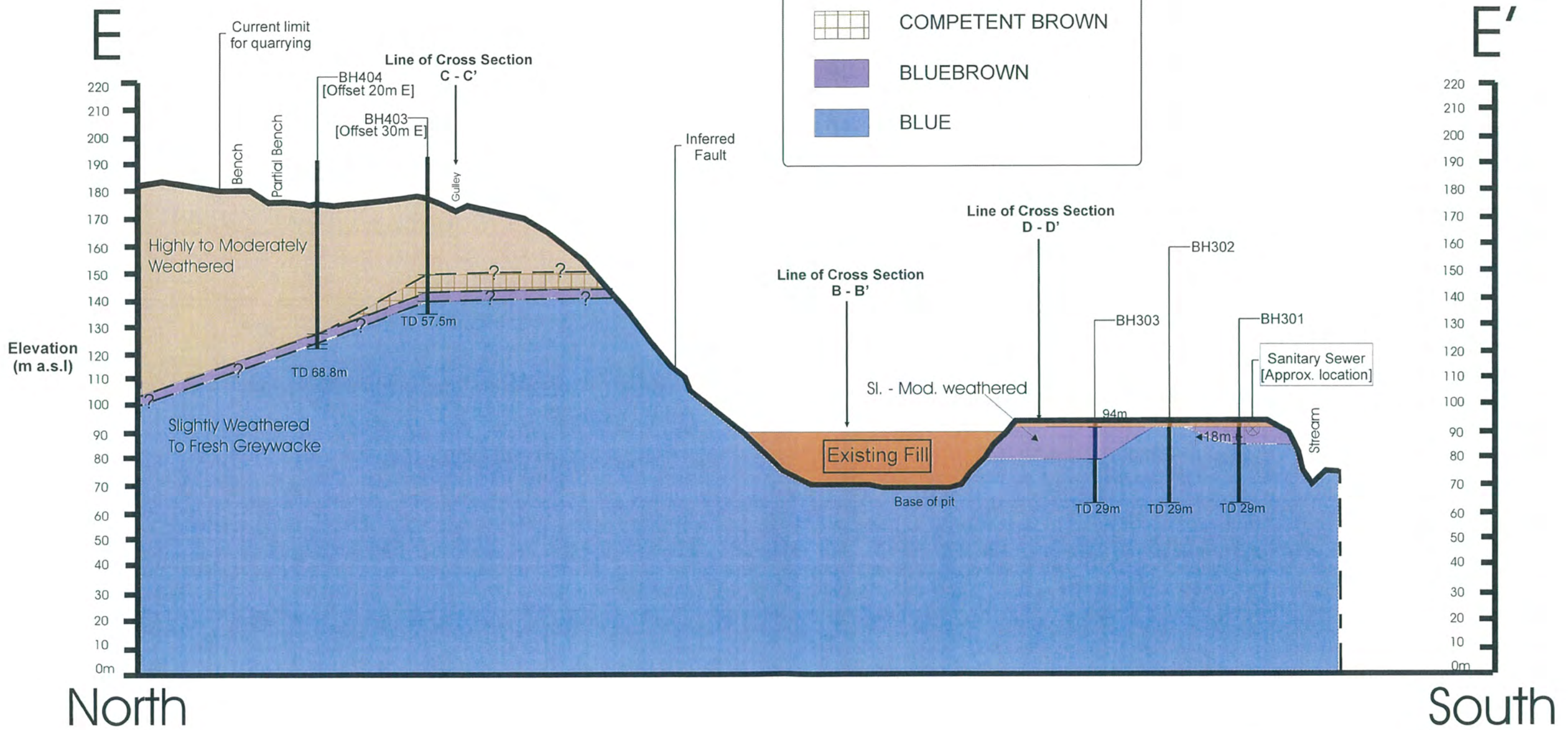
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SHEET 5 OF 7

KEY

- FILL
- BROWN
- COMPETENT BROWN
- BLUEBROWN
- BLUE

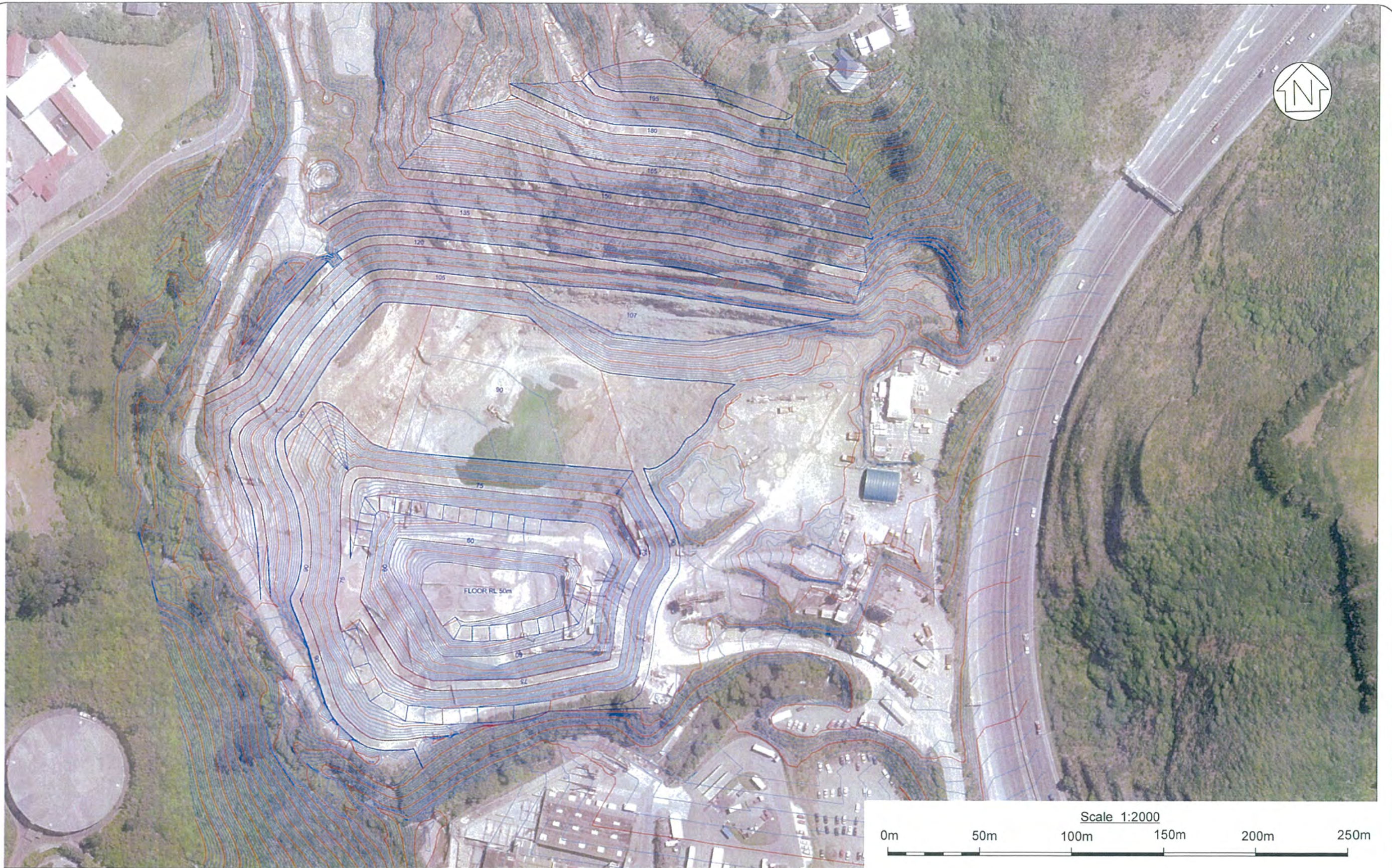


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CLIENT: Holcim NZ Ltd.
LOCATION: Kiwi Point Quarry
TITLE: Section E - E'

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3655-6
SHEET 6 OF 7



NOTE: Plan based on drawing prepared and provided by Precision Aerial Surveys Ltd. D&G Ref: 6010-01, Dated May 2015.

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CLIENT: Holcim NZ Ltd.
 LOCATION: Kiwi Point Quarry
 TITLE: Ultimate Quarry Development Plan

SCALE: 1:2000 @ A3
 DRAWN: TCF
 DATE: 14 July 2015
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DRAWING NO
 3655-7
 SHEET 7 OF 7

APPENDIX 1

RocFall Analysis

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APPENDIX 1 ROCKFALL ANALYSIS

1. Introduction

The computer programme “RocFall” from RocScience Inc has been used to test a number of scenarios to assess the risk of inundation onto the proposed building platform at the base of the north face of the Kiwi Point Quarry. The face configuration used is that proposed from the parameters provided by Geoscience Consulting (NZ) Ltd (Reference 1) providing for 15 metre high batters at 50° with 5 metre wide benches. This configuration provides an overall face slope of approximately 45°. A 20 metre wide toe bund is incorporated in the face design and a 2 metre high berm is constructed on the outer edge of this to limit debris from the face rolling over onto the building platform below. Following derivation of the results from the initial analyses described above, modifications to the design of the toe have been considered and the most effective result decided to minimise the distance of rocks bouncing from the face toe has been modelled. This will reduce the risk of impact on buildings constructed on the platform below the face to minimal.

2. Input Parameters

Initially the model was tested using static conditions and subsequently it was again tested under dynamic conditions for a 1 in 50 year earthquake and a 1 in 500 year earthquake. The results of a fall originating from each of the benches were compared to derive the worst case situation. The rock characteristics used have been derived from tables provided by RocScience Inc. and are for “weathered rock” from the top of the face and “bedrock” for the rest of the benches/faces. Three sizes of rock have been used in the model – small (2.56 kg), medium (780 kg) and large (3,120 kg). The results were analysed for single rocks, small falls (10 rocks total or 12 tonnes), large falls (50 rocks total or 70 tonnes) and huge falls (100 rocks total or 130 tonnes). A range of rock shapes were used in the testing.

Two different slope situations have been tested, being with clean bedrock benches and with talus on the benches. In all scenarios the faces were assumed to be clean of any talus.

The parameters used are set out in full on the RocFall Analysis Information Sheets at the end of this appendix.

For analysis under the dynamic situations of a 1 in 50 year earthquake (SLS) and a 1 in 500 year earthquake (ULS) the magnitude of the peak horizontal velocity of the rocks had to be derived empirically. The rationale for the derivation of peak horizontal velocities for the Kiwi Point site is described in **Section 3** of this report below.

3. Rationale for Selection of Peak Initial Horizontal Velocity

The Serviceability Limit State (SLS) is indicated as a 1 in 50 year earthquake where 0.13g acceleration is expected, and which will result in any structures directly affected being able to remain operational.

The Ultimate Limit State (ULS) is indicated as a 1 in 50 year earthquake where 0.35g acceleration is expected, and whereby any person within or adjacent to a structure are not endangered. These criteria are in conformation to NZ Standard 1170.5:2004 including Supplement 1.

These expected acceleration values have been provided by Geoscience Consulting (NZ) Ltd (Reference 1) and these accelerations used as a basis for the modelling of rockfall from the face.

GeoNet Strong Motion data records all large ground movements from stations located in key areas around the country. Analysis of selected data sites shows that the largest peak ground accelerations (PGA) measured were during the 2010/2011 Christchurch earthquake sequence with the most relevant results plotted below. Locations summarised in **Table 1** are considered the most similar to the Kiwi Point Quarry site, where measurements have been recorded and on rock slopes considered to likely provide similar effects to the Kiwi Point Quarry site.

Table 1: Summary of large strong motion earthquakes in Christchurch.

Event/Date	M _w ⁽ⁱ⁾	Epicentre Distance (km) ⁽ⁱⁱ⁾	Peak Velocity (m/s)	PGA ⁽ⁱⁱⁱ⁾
Panorama Rd 13/06/2011	6.0	1km	1.17m/s	0.82g
Godley Drive 13/06/2011	6.0	7km	1.69m/s	1.86g
Heathcote Valley 21/02/2011	6.2	2km	0.97m/s	1.47g

Notes:

- (i) M_w = Measured Earthquake magnitude
- (ii) Epicentre Distance from station.
- (iii) PGA – Peak Ground Acceleration

Motion data summarised in **Table 1** above indicates a maximum PGA of between 0.82g and 1.86g experienced during magnitude 6.0 to 6.2 earthquakes. These accelerations are between 2.37 and 5.31 times larger than what is anticipated to be experienced at Kiwi Point Quarry for a 1 in 500 year earthquake.

The associated horizontal velocities recorded for the motions presented in **Table 1**, were between 0.97 m/s and 1.69 m/s and as such, we can assume that the maximum horizontal velocity expected for a 1 in 50 and 1 in 500 year earthquake at the Kiwi Point Quarry to be smaller than this, due to lower expected Peak Ground Accelerations.

To choose the initial horizontal velocities for use in the RocFall model of the Kiwi Point Quarry north face, we have chosen four (4) accelerogram stations from sites with similar geological characteristics to the Kiwi Point Quarry slope and have plotted Peak Ground Acceleration against Peak Horizontal Velocity for all data recorded from these sites. Accelerograms chosen are Makara Bunker (Wellington), Wainuiomata Hill (Wellington), Godley Drive (Christchurch) and Panorama Road (Christchurch). By extrapolation of these graphs, presented at the end of this Appendix, figures summarised in **Table 2** have been derived for Average Peak Horizontal Velocity as the input parameter into RocFall for modelling dynamic situations resulting from earthquake acceleration of the rock face.

Table 2 – Assessed Peak Horizontal Velocities for Chosen Sites.

Location	Peak Horizontal Velocity (m/s)	
	SLS (0.13g)	ULS (0.35g)
Makara Bunker	0.171 m/s	1.127 m/s
Wainuiomata Hill	0.081 m/s	0.277 m/s
Godley Drive	0.106 m/s	0.306 m/s
Panorama Road	0.127 m/s	0.419 m/s
	Average: 0.105 m/s	Average: 0.334 m/s

4. Results

The results of the individual analyses are presented in the Analytical Sections following the analysis graphs for the Derivation of Peak Horizontal Velocity at the end of this Appendix.

4.1 Static Conditions, “Clean Hard Bedrock” Benches

A variety of scenarios were tested for static conditions with “clean hard bedrock” as described below.

4.1.1 From Top of Face

Six analyses are presented in the sections attached to the end of this Appendix. These (Sections 1a to 1c) confirm that as the size of the individual rock increases the distance travelled from the toe will increase. Also that for all rock sizes the initial protection design, as analysed, is inadequate.

For small, large and huge rockfalls, of mixed sized rocks (Sections 2a to 2c), the number of rocks breaching the protection barrier increases with the size of the rockfall.

4.1.2 From First Bench

This scenario (Sections 3a to 3c) shows that small rockfalls are held within the containment, however for large and huge rockfalls, the initial protection design is breached and runout distances have not been reduced compared with rockfalls from the top of the slope (Sections 2a to 2c).

4.1.3 From Second Bench

This scenario (Sections 4a to 4c) shows that the initial protection design is breached by all rockfalls, however, the runout distance and amount of rocks decreases for the large and huge falls.

4.1.4 From Third Bench

This scenario (Sections 5a to 5c) shows that the design protection will contain the majority of rocks from all size rockfalls but the distance travelled is very little different from the bench above.

4.1.5 From Fourth Bench

This scenario (Sections 6a and 6c) shows that for a small and huge rockfalls (12 tonnes and 130 tonnes), all rocks will be contained, but for the large rockfall (70 tonnes) the occasional rock, although having limited runout distance, will still breach the design containment.

4.1.6 From Fifth Bench

This scenario (Section 7a) shows that large rockfalls from the lowest bench will be contained by the design containment.

4.2 Static Conditions, Dirty Benches

To test the effect of talus collecting on the benches, the worst case scenario determined from the above analyses to be from the top of the face has been modelled for each of the three sizes of rockfall (Sections 8a to 8c). These analyses show that although the talus has a significant effect in reducing the number of rocks breaching the design containment, the large and huge rockfalls (70 tonne and 130 tonne) still breach the containment albeit with less runout than for clean benches (Sections 2a to 2c).

4.3 Dynamic Conditions

To test the effect of an initial horizontal velocity on the falling rocks as would be imparted by an earthquake, the rockfalls from the top of the face were analysed for both clean and dirty benches. The scenarios analysed are for peak initial horizontal velocities that would be imparted from a 1 in 50 year earthquake (SLS) and a 1 in 500 year earthquake (ULS).

4.3.1 Rockfall from 1 in 50 year Earthquake, Clean Benches

The analyses presented (Sections 9a to 9c) have been compared with the analyses for static conditions (Section 2a to 2c). These show that under earthquake conditions (SLS), large and huge rockfalls are not significantly different than for static conditions. It is interesting to note that the runout and amount of rocks for a small (12 tonne) in a 1 in 50 year scenario decreases compared to static conditions.

4.3.2 Rockfall from a 1 in 50 year earthquake, Dirty Benches

The analyses presented (Section 10a to 10c) show that there is a decrease in runout and amount of rocks breaching the containment in all size rockfalls, compared to a clean bench SLS scenario (9a to 9c). There seems to be no significant change in runout or amount of rocks breaching the containment for all rockfalls compared to the dirty bench, static condition (Section 8a to 8c).

4.3.3 Rockfall from a 1 in 500 year Earthquake, Clean Benches

This analyses shows that small falls would appear to have fewer rocks breaching the design containment than for the static condition (Section 11a). Large rockfalls (70 tonne) show significantly greater numbers of rocks breaching the containment and having much greater outrun than compared to both static and SLS conditions (Sections 11b). In a huge rockfall (130 tonne) the number of rocks and runout distance are reasonably similar to both static and SLS conditions.

4.3.4 Rockfall from a 1 in 500 year earthquake, Dirty Benches

The analyses presented (Sections 12a to 12c) show that compared with the static conditions and dirty bench (Section 8a to 8c), there is no significant difference in runout or rocks breaching the containment for all rockfalls. Compared to a Clean Bedrock scenario (ULS) (Section 11a to 11c) there is a significant decrease in rockfall runout distance and the number of rocks breaching the containment.

5. Redesign of Containment Structure

As the results of the analyses show that the initial design of the fill at the toe of the face will not contain any but the smallest of rockfalls, a variety of different designs were tested using the worst case scenario of a fall from the top of the face in a 1 in 500 year earthquake (ULS), with clean hard bedrock benches and talus covered, dirty benches. The result of these analyses has provided a satisfactory design as presented in Section 13a and 14a. To test the risk of inundation from an even greater rockfall situation resulting from 200 tonne and 300 tonne falls have been analysed and presented as Sections 13b, 13c, 14b and 14c.

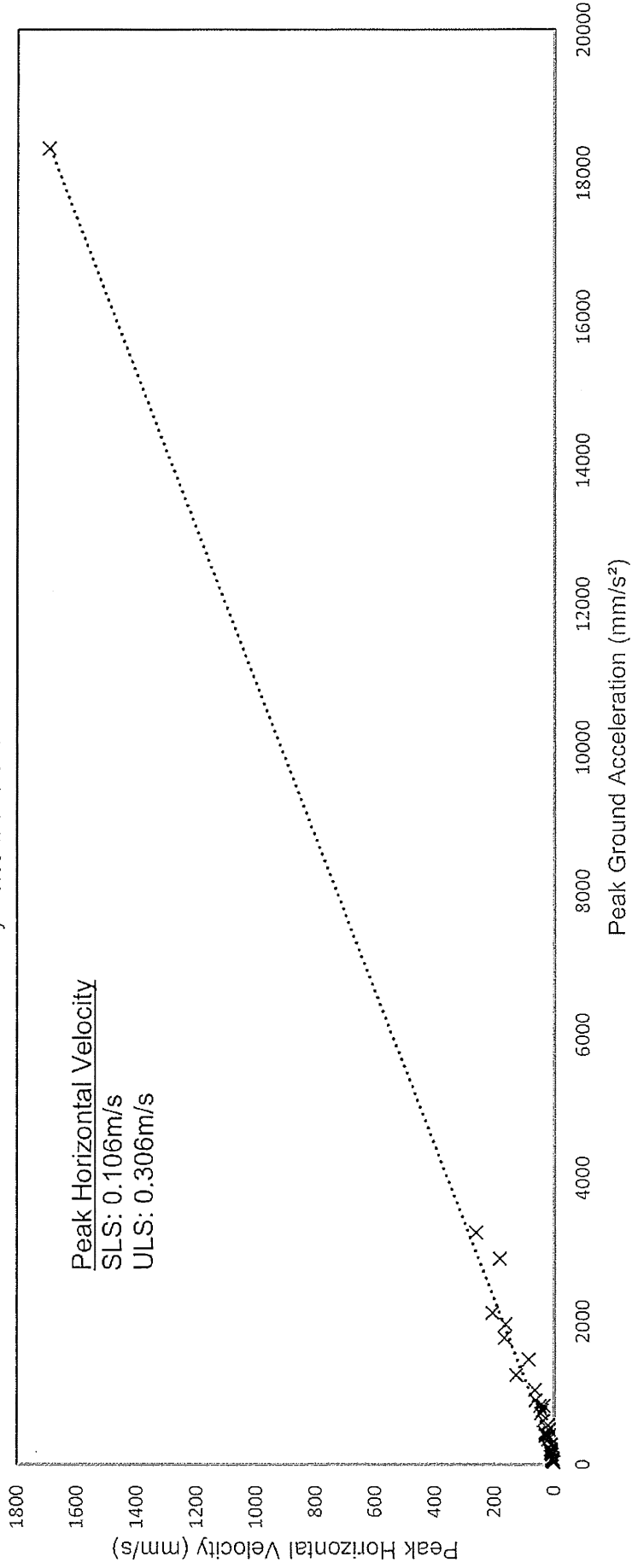
These results show that the ultimate design for a containment structure as presented in these sections (Sections 13a to 13c and 14a to 14c) can provide for the containment of the majority of all falls that are considered by us to be potentially likely from this face.

6. Summary and Conclusions

1. Analysis of potentially likely rockfalls from the north face of the Kiwi Point Quarry as redesigned using the recommendations provided by Geoscience Consulting (NZ) Ltd have been carried out using the programme “RocFall” provided by RocScience Inc.
2. Analysis has been undertaken on a slope under ‘worst case’ scenario, clean hard bedrock conditions.
3. The analyses have tested the risk of inundation of the building platform proposed at the base of this face under both static and dynamic conditions.
4. The dynamic conditions tested are for a 1 in 50 year (SLS) earthquake and a 1 in 500 year (ULS) earthquake. The horizontal velocities anticipated to result from these events have been derived using measured data from four sites considered to be similar to that of the Kiwi Point Quarry. The figures used are the average of these four results being 0.105 m/sec (SLS) and 0.334 m/sec (ULS).
5. Testing under both static and dynamic conditions has shown that the risk for inundation of the building platform will increase with the size of the rockfall and also from the height on the face from where it originates. The risk does not seem to increase drastically with the size of the earthquake, however a large rockfall (70 tonnes) in a ULS earthquake caused a significant increase in runout and amount of rocks breaching the containment.
6. To reduce the risk of inundation of the building platform the toe containment structures at the toe of the northern face have been redesigned from that originally proposed. The redesigned containment structure is shown from the analyses carried out to reduce the risk of inundation of the building platform to very low levels.

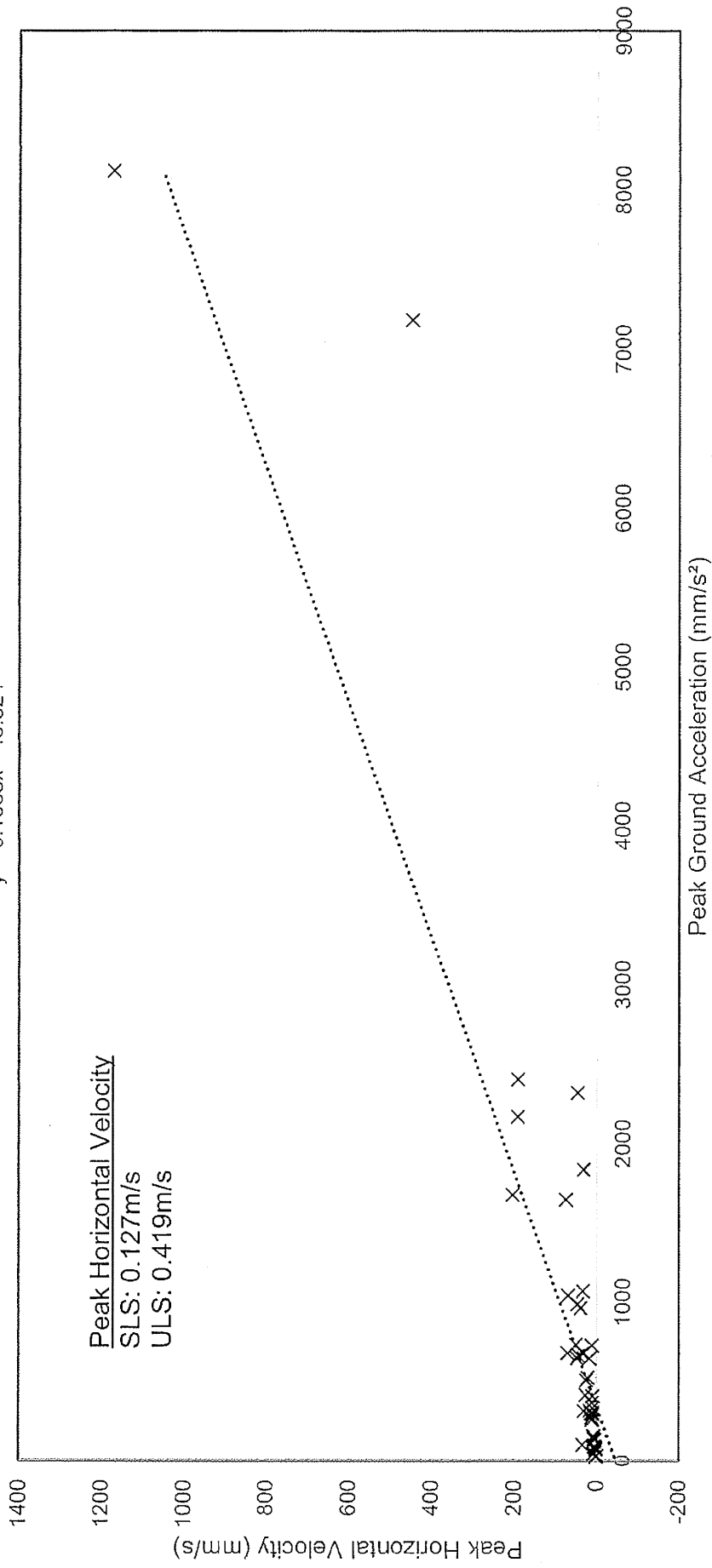
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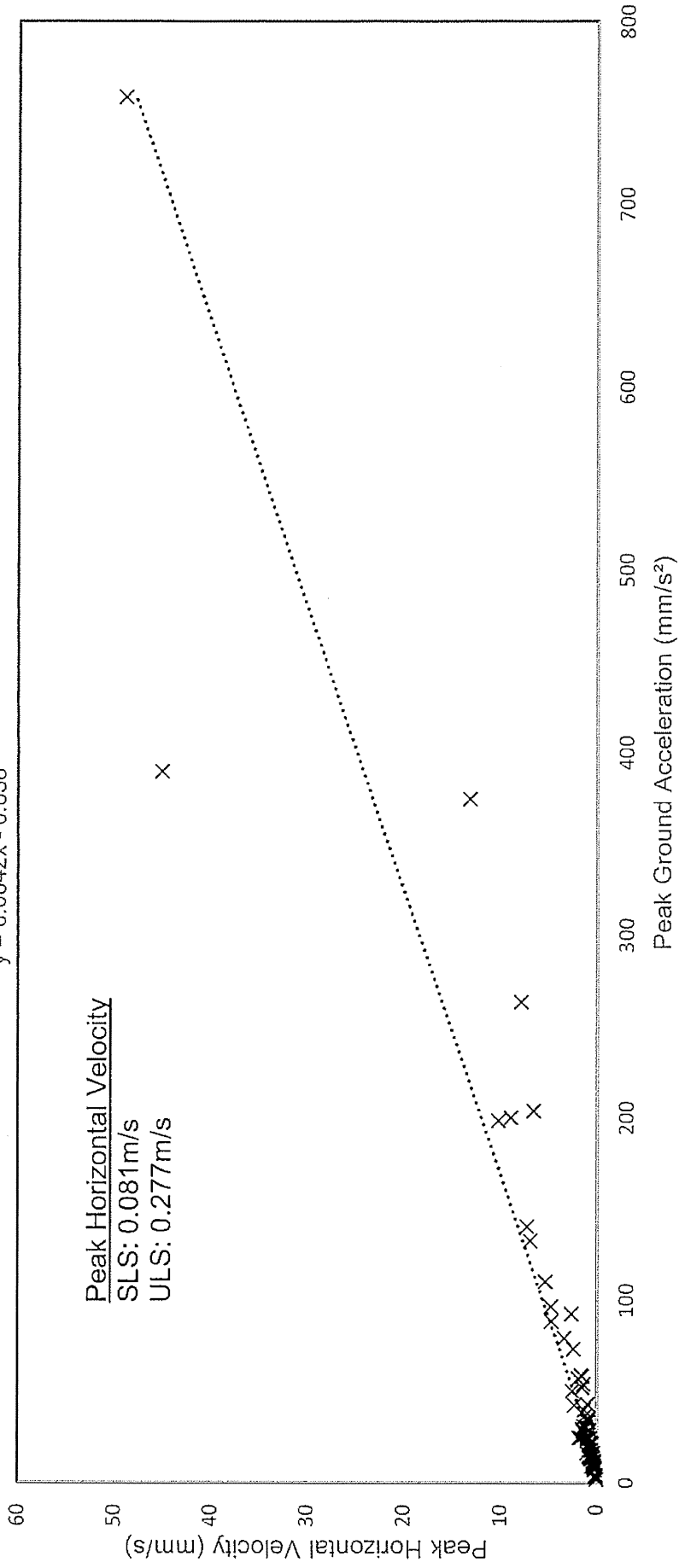
Panorama Road

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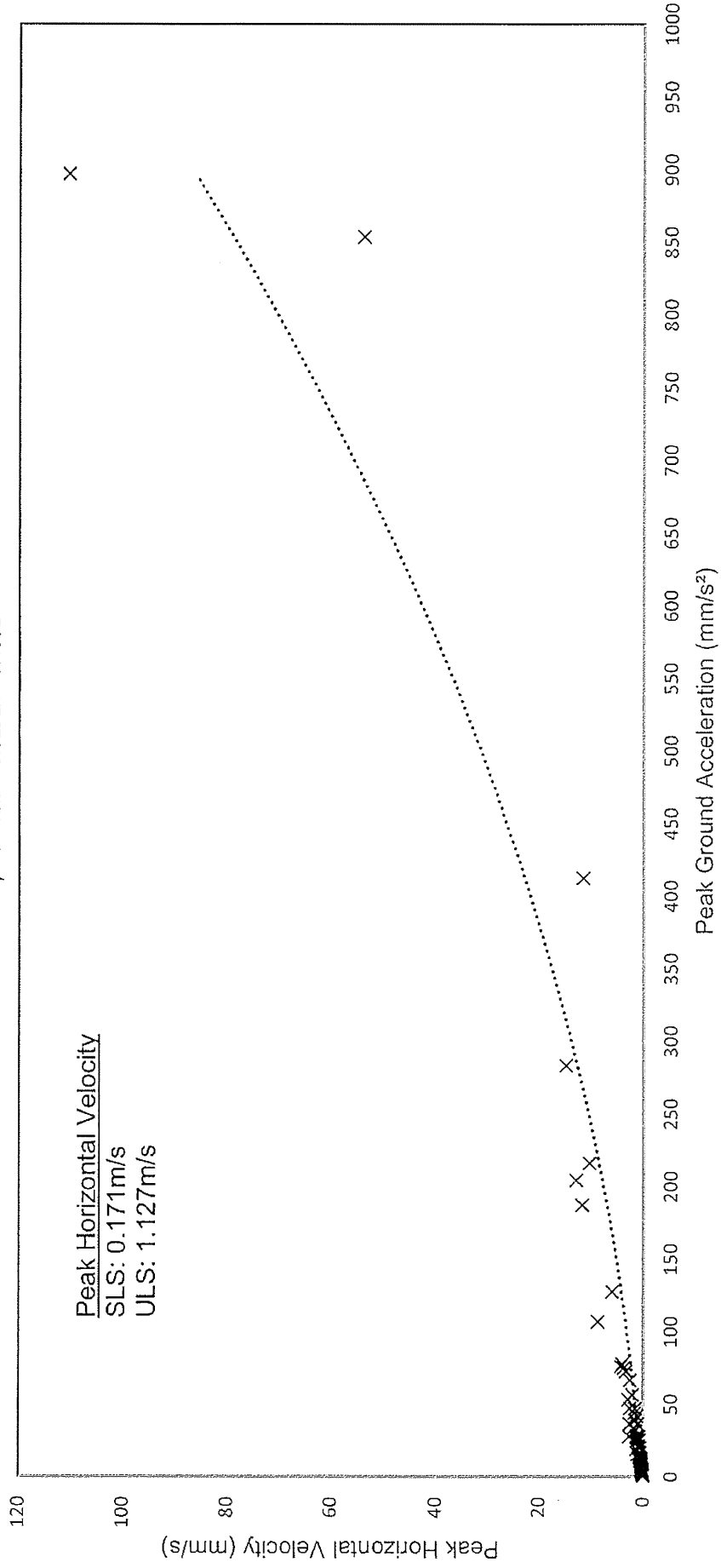
Wainuiomata Hill

$$y = 0.0642x - 0.838$$



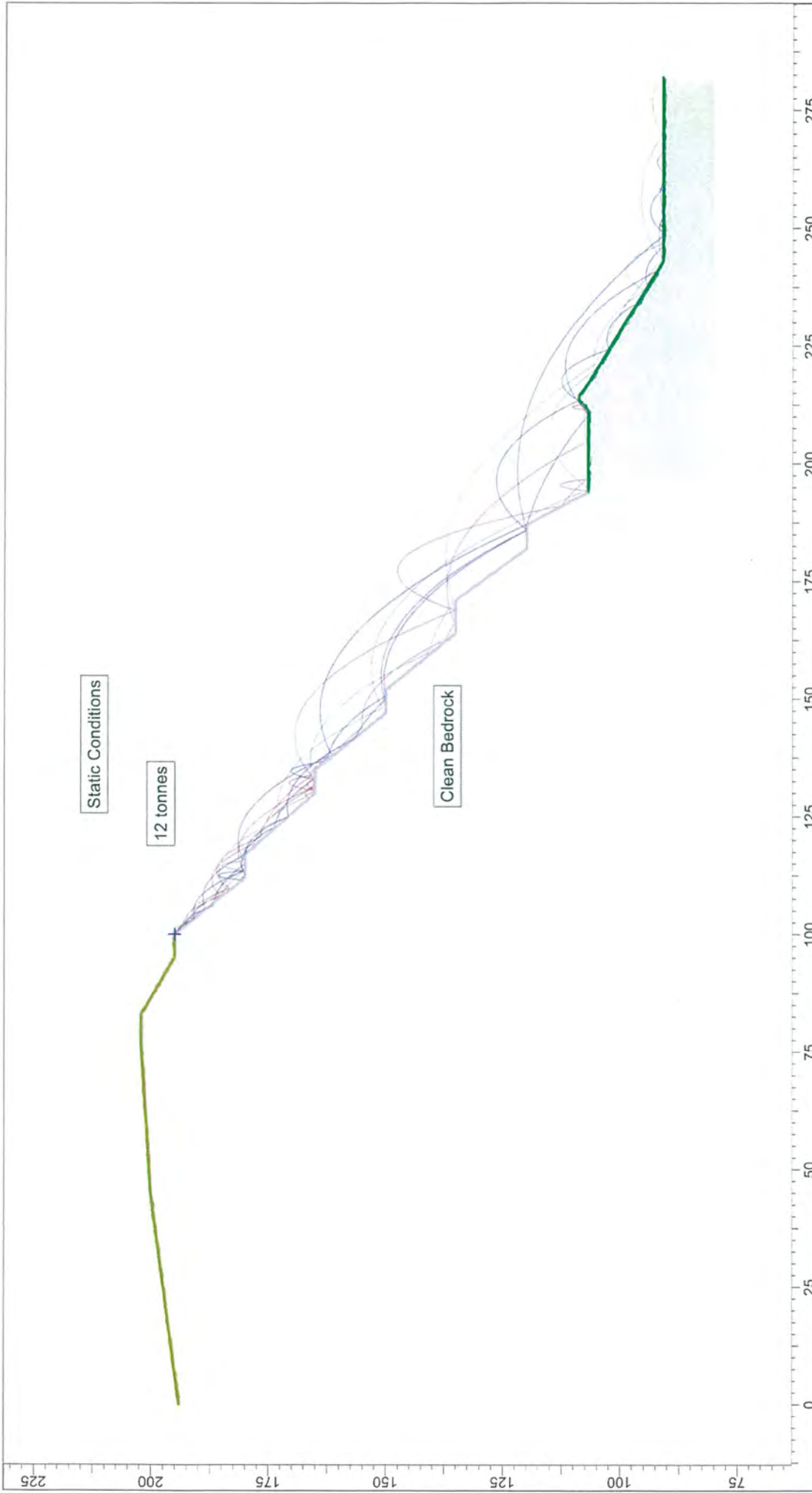
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$$y = 9E-05x^2 + 0.0191x + 0.4092$$



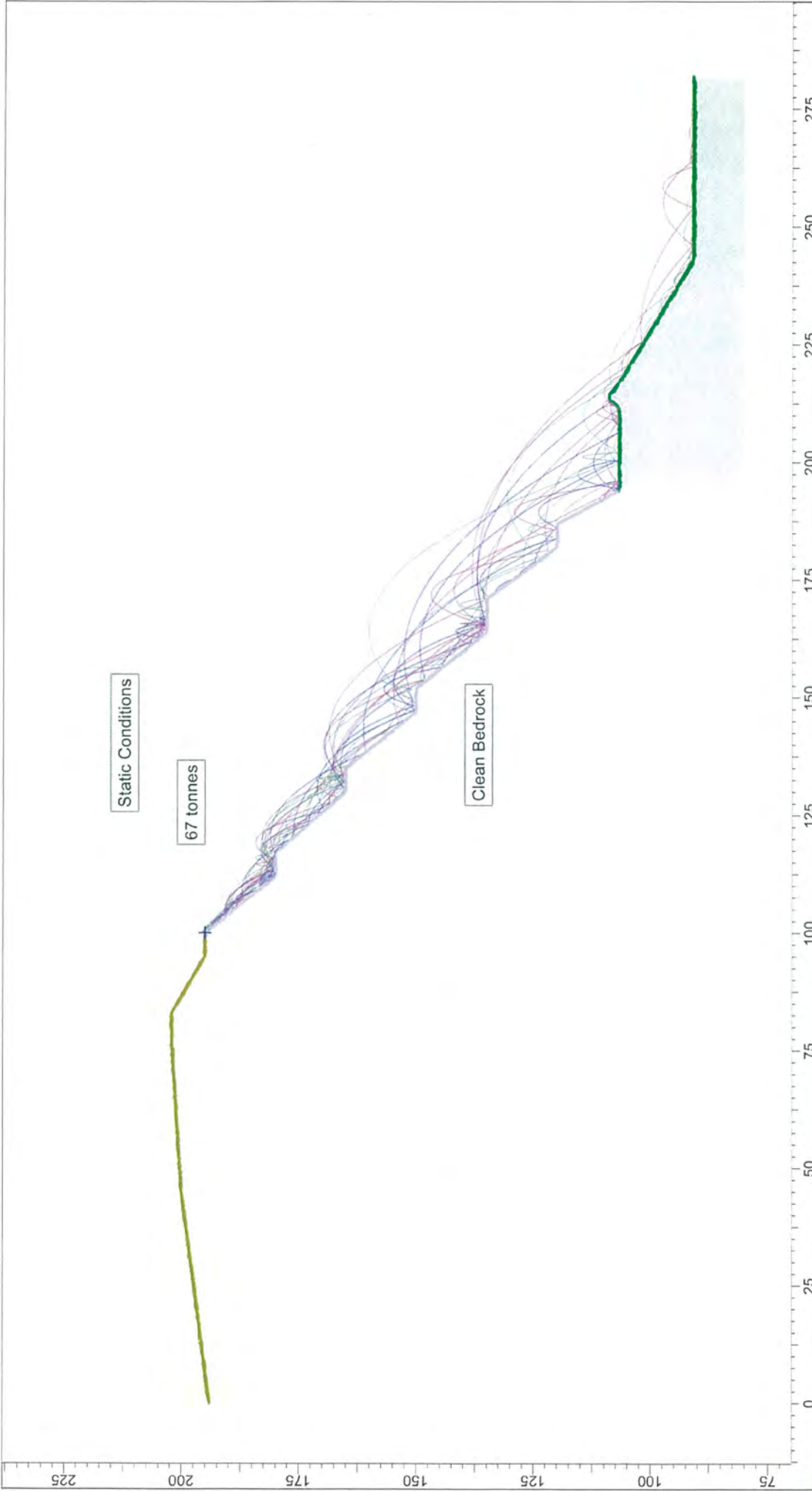
ANALYTICAL SECTIONS FOR
KIWI POINT QUARRY, NORTH FACE.

Static Conditions



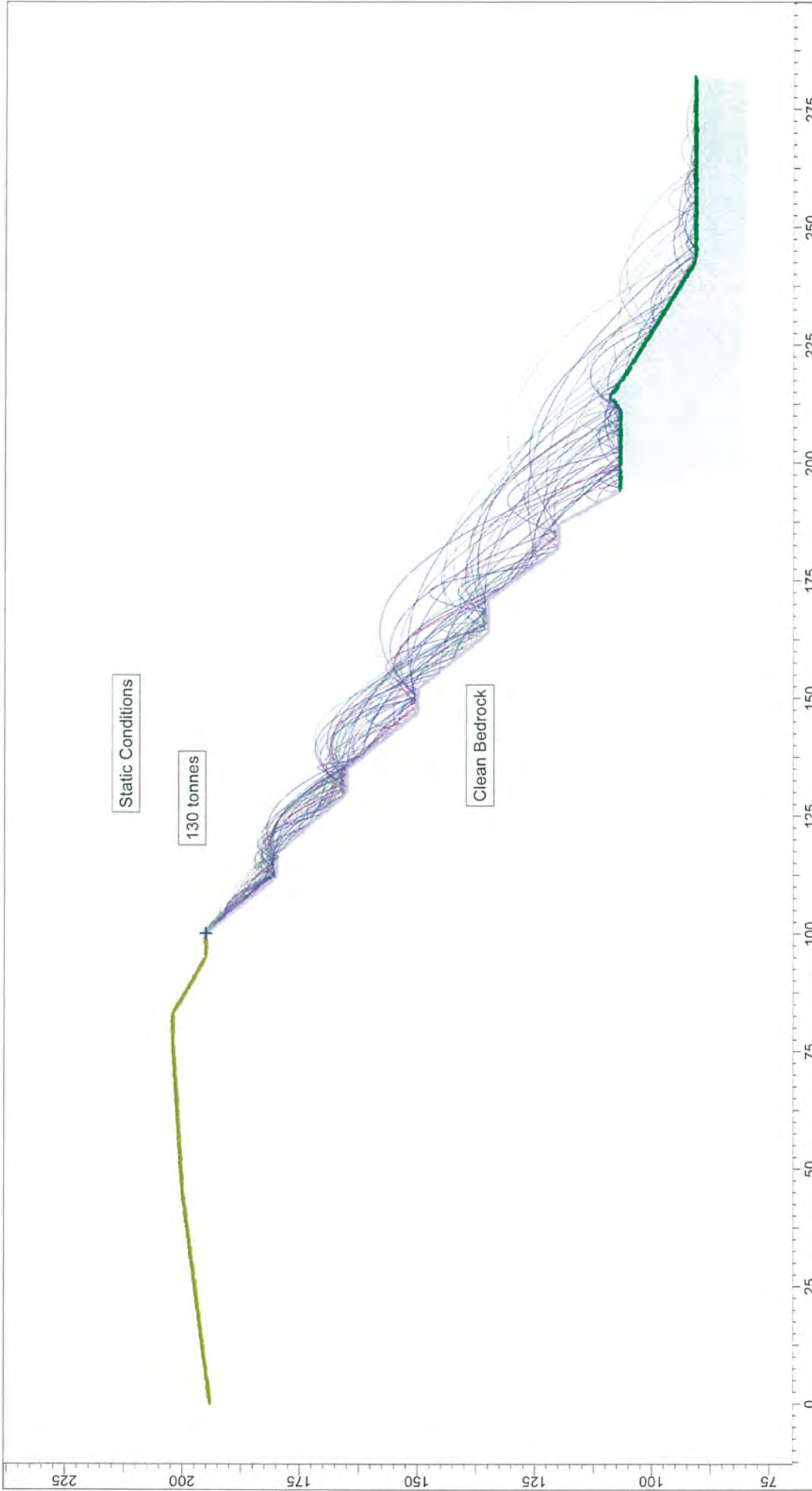
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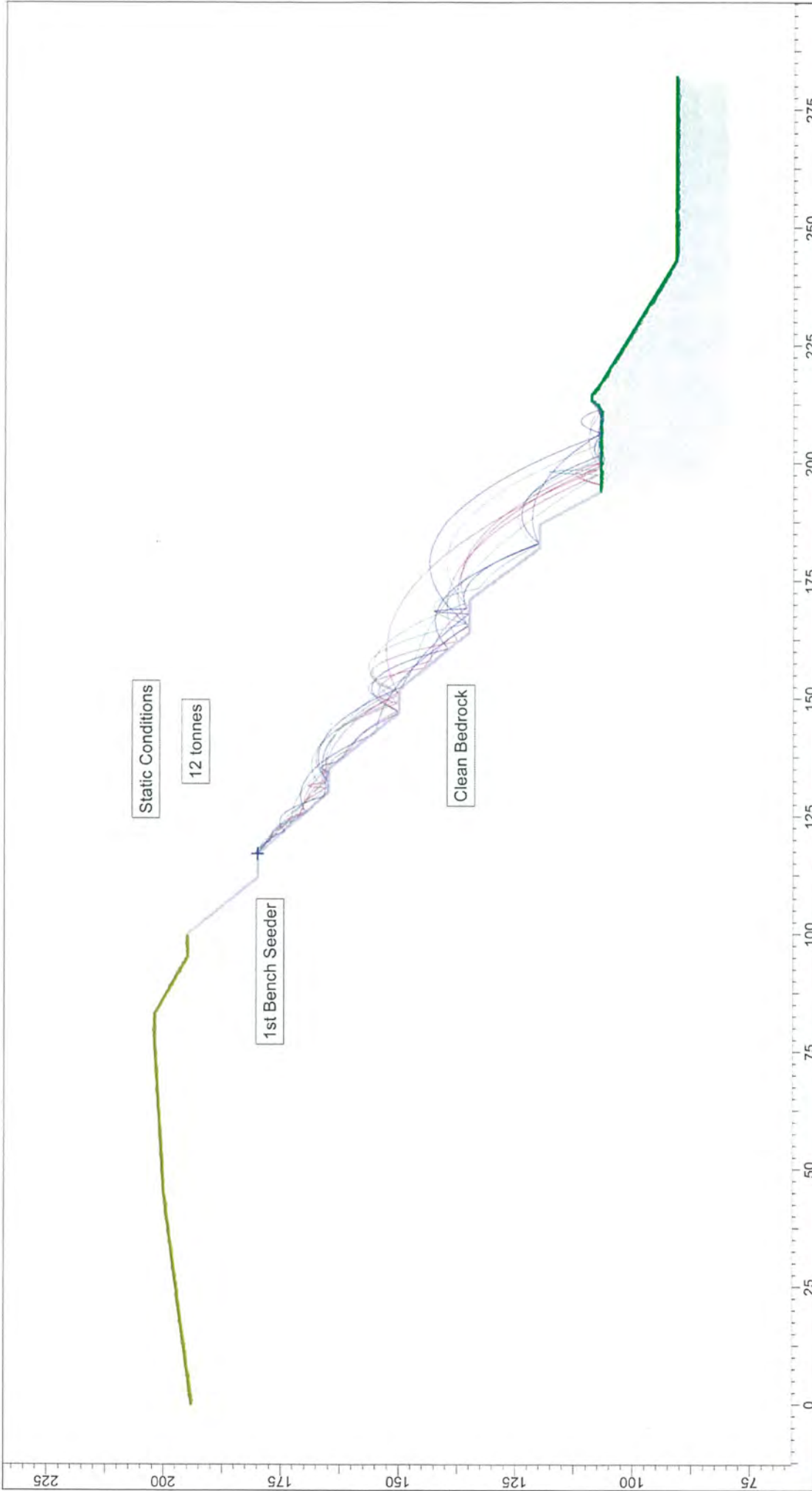
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24/6/2015	
Company File Name	





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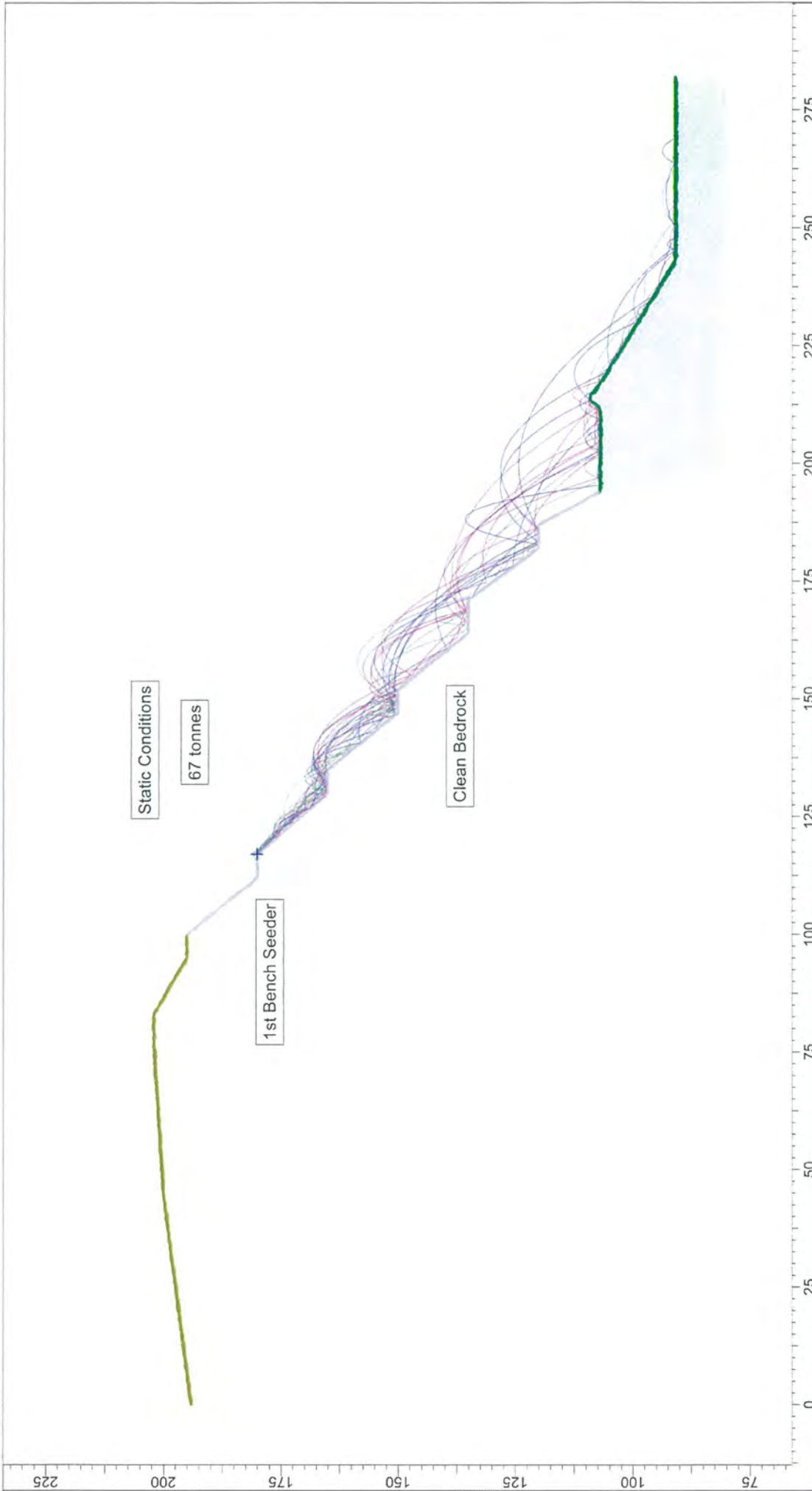




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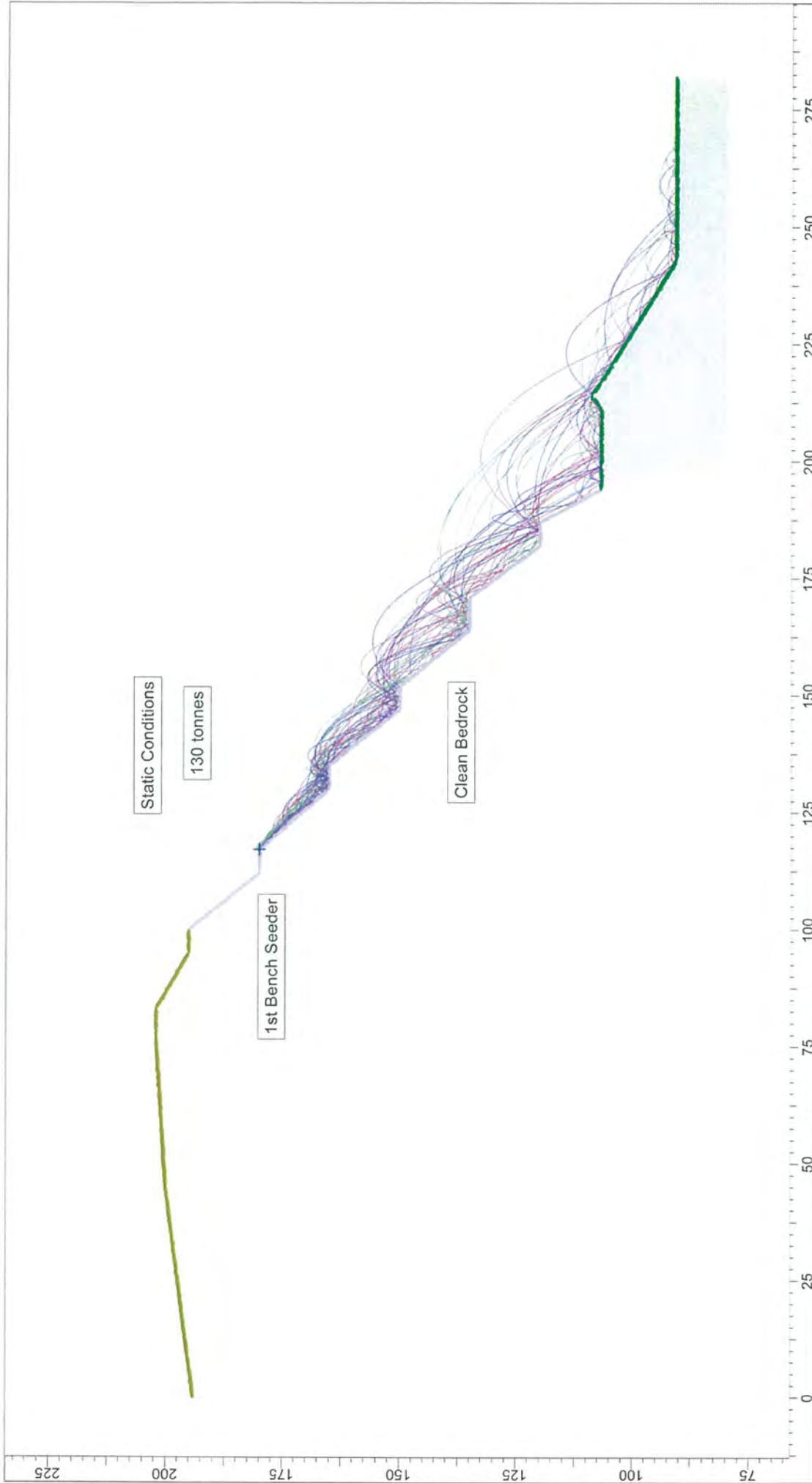



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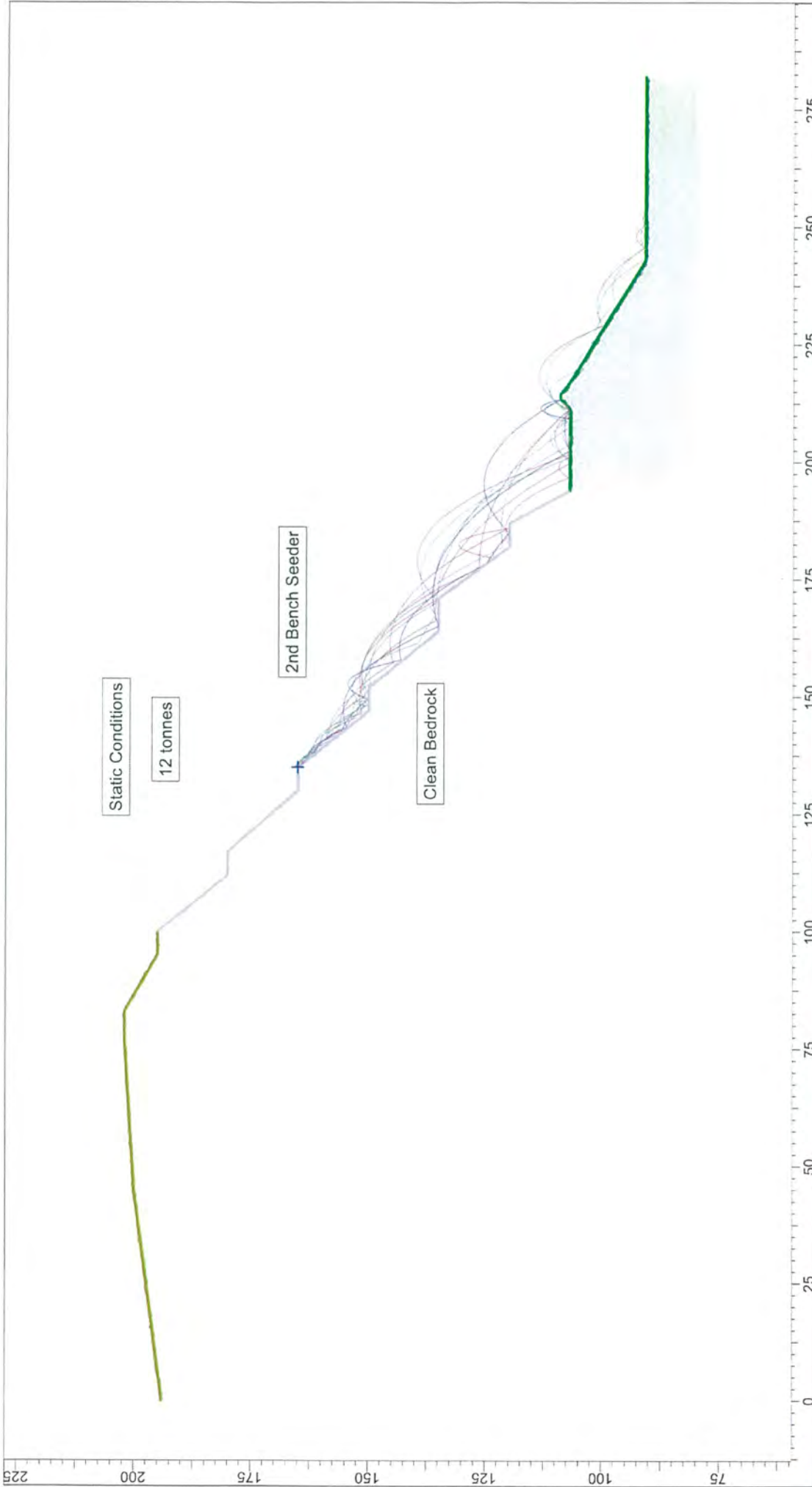


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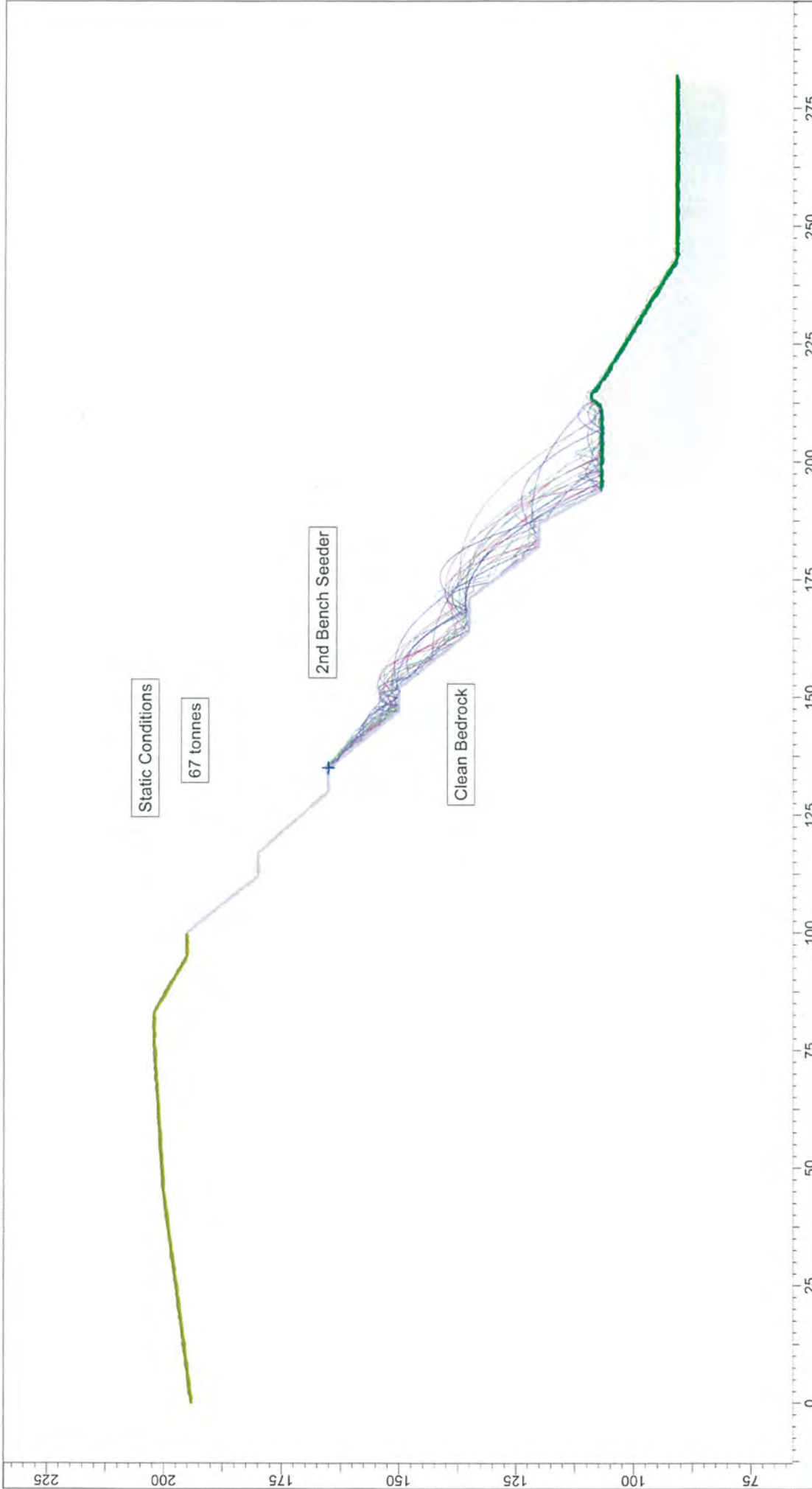


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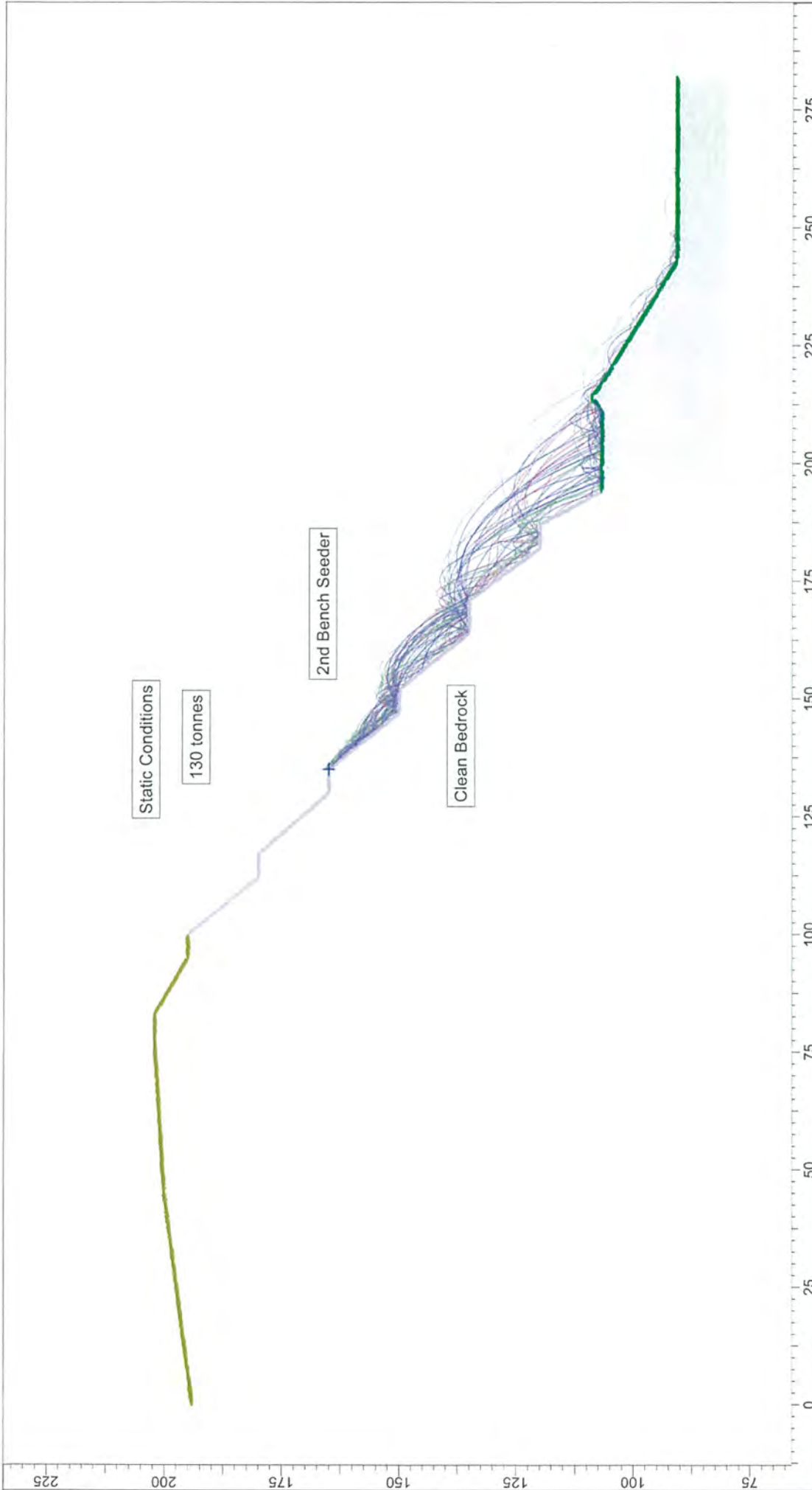
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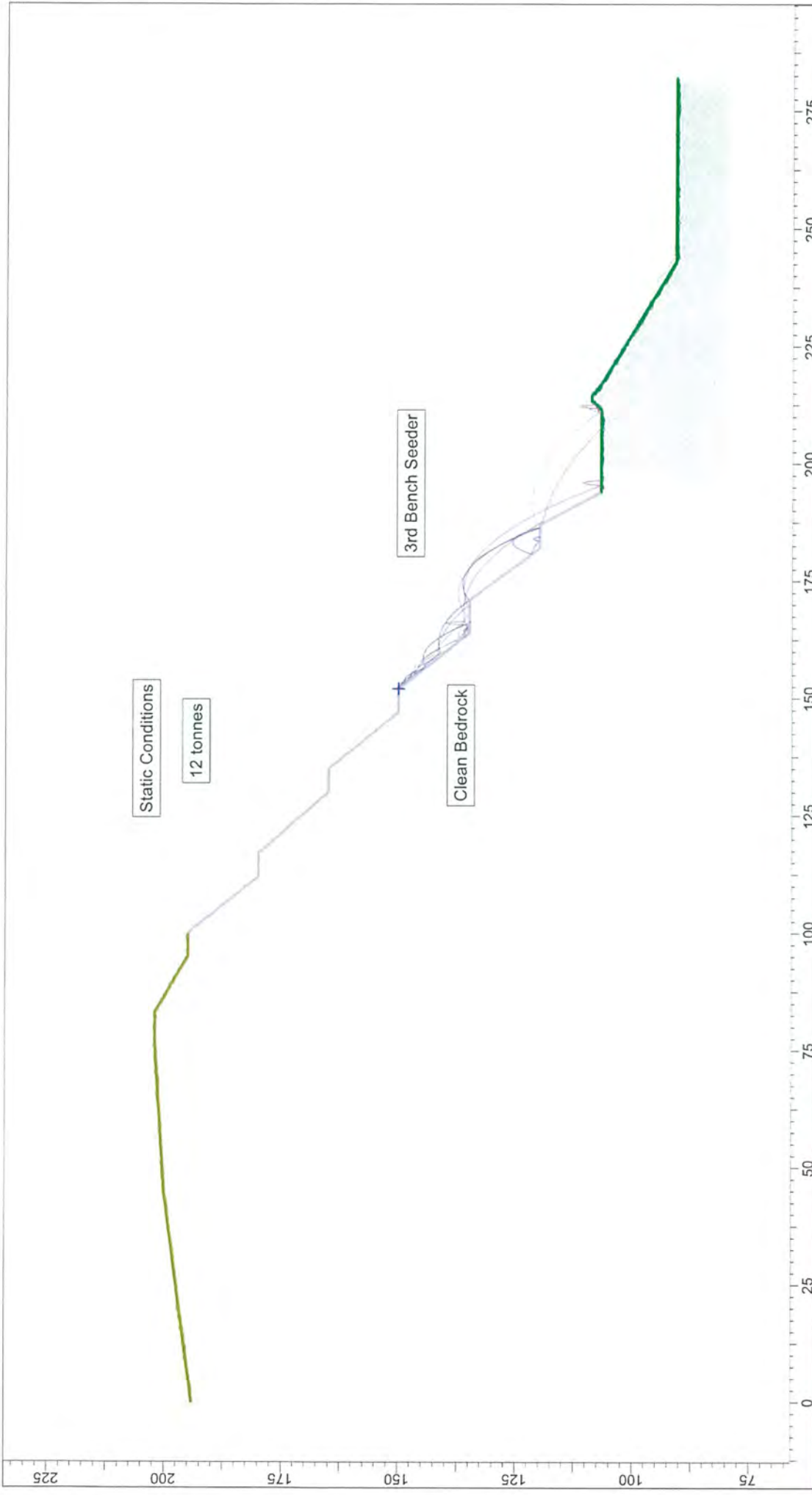
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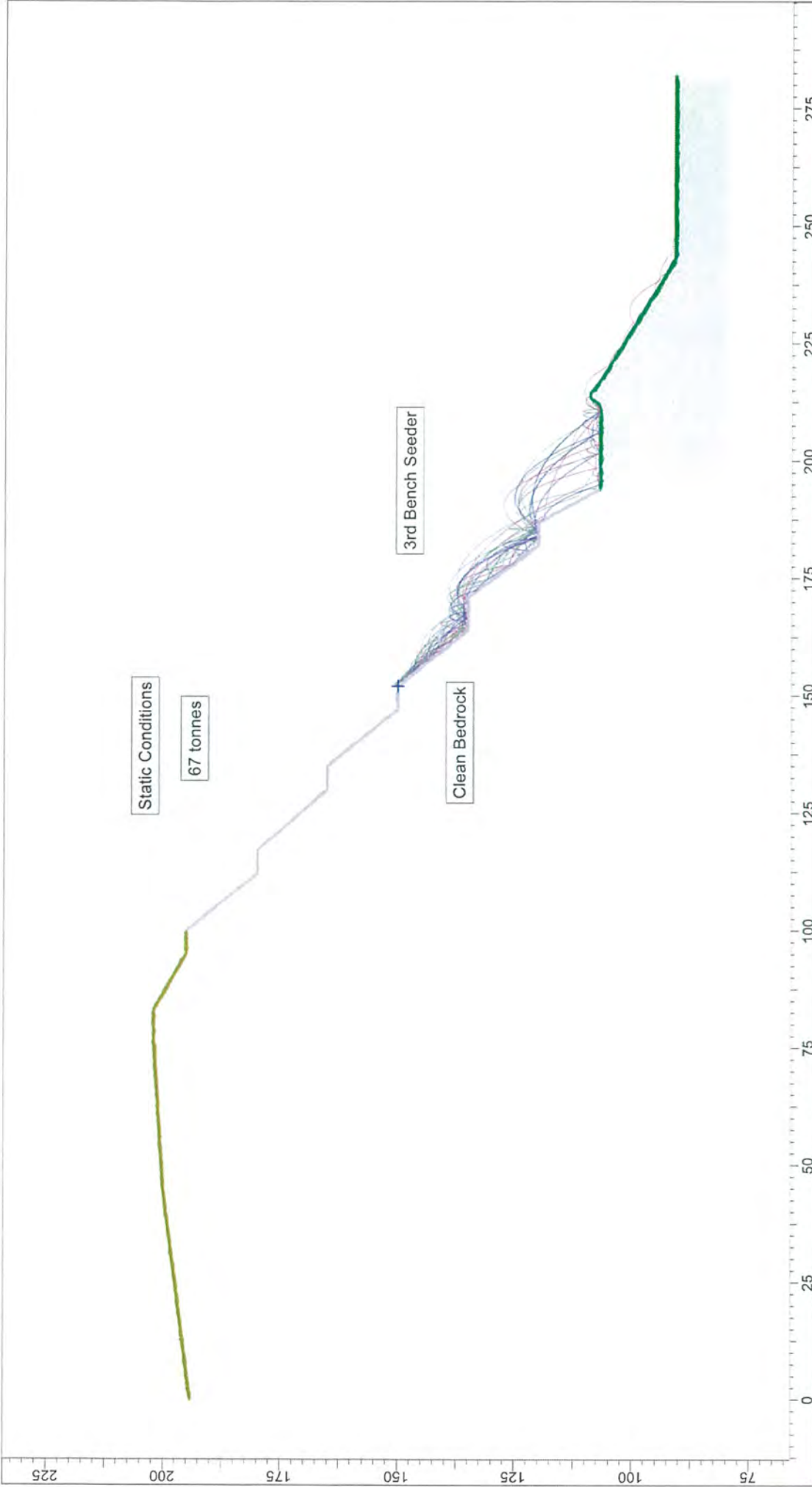
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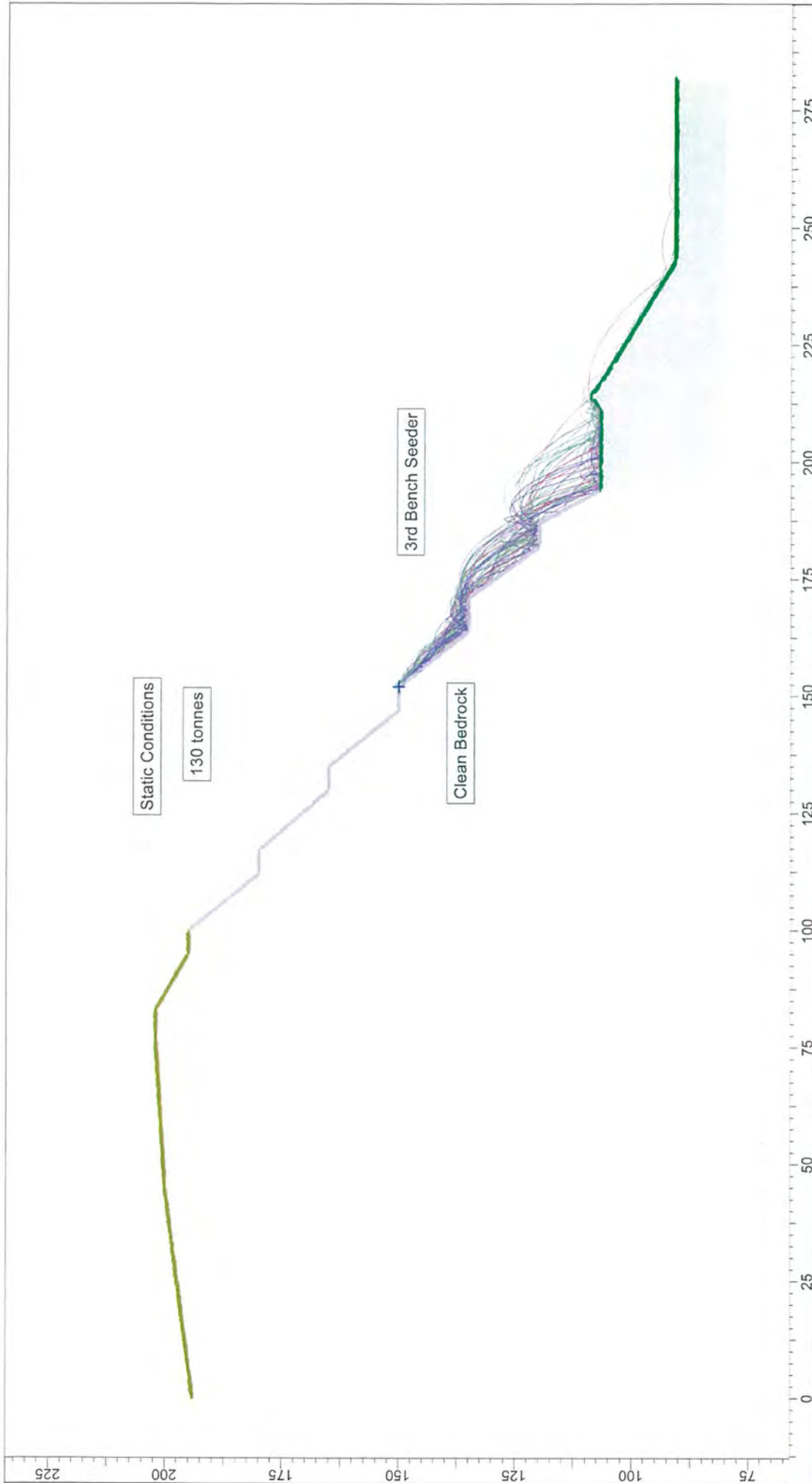
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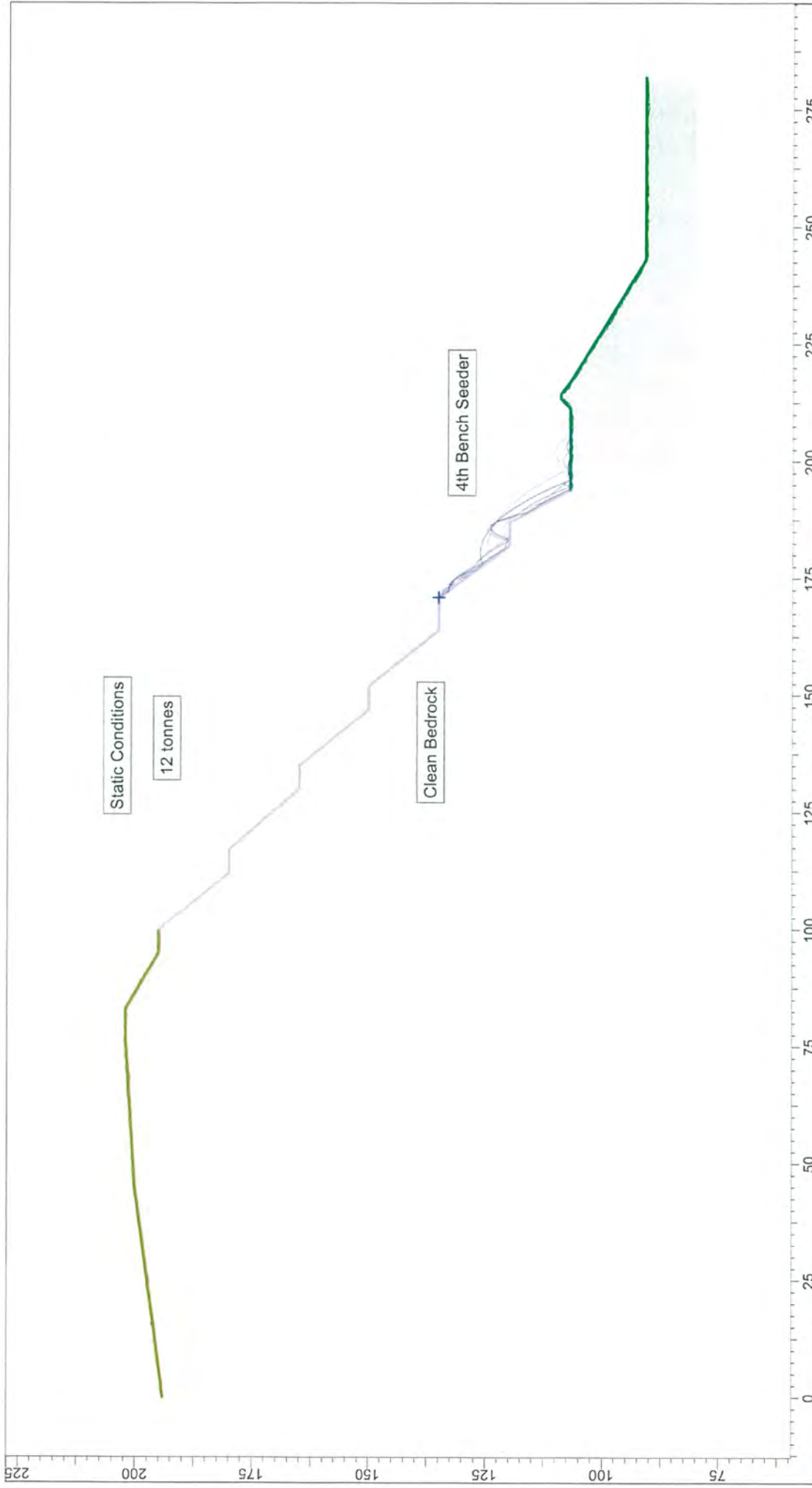
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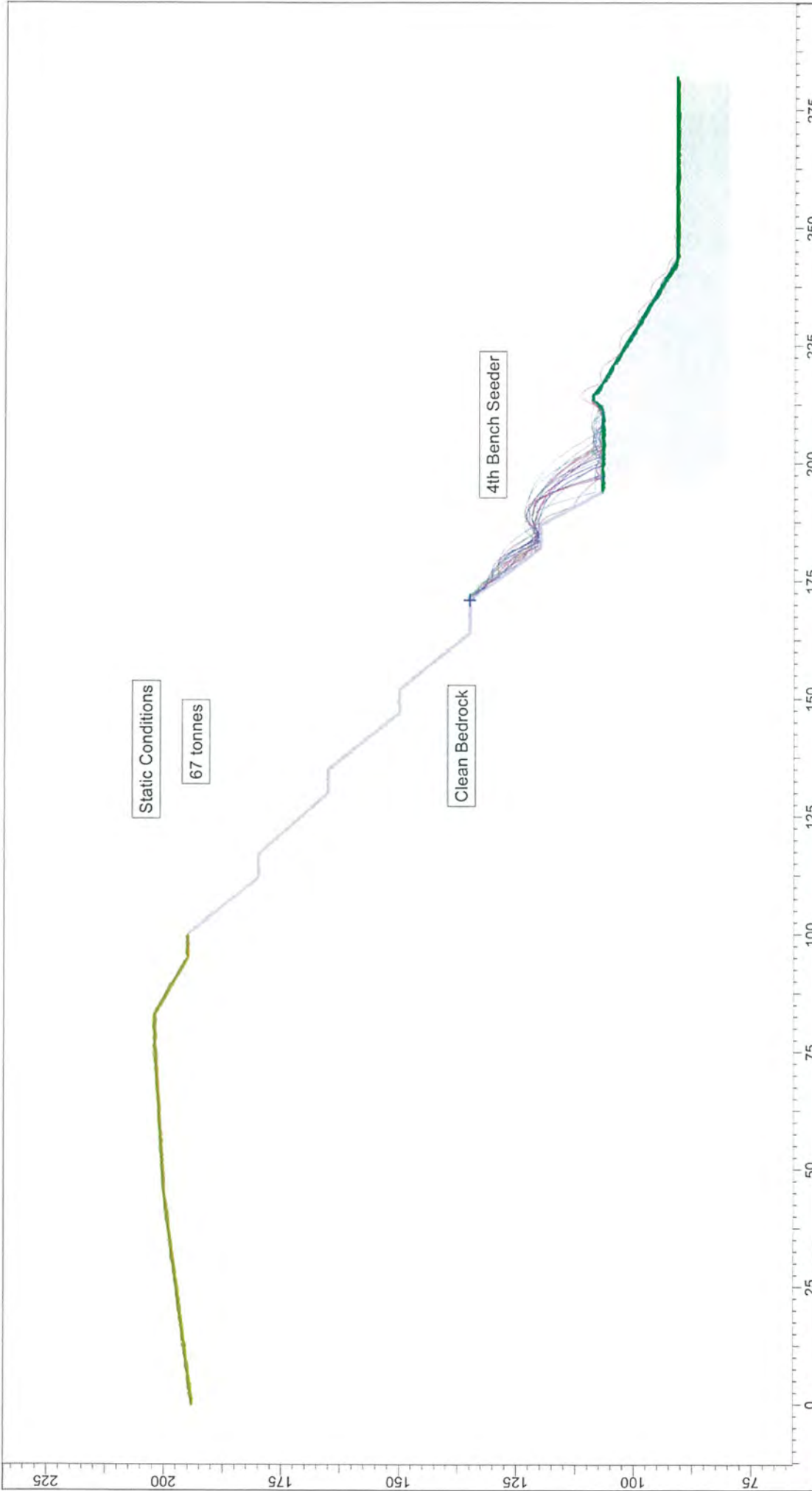
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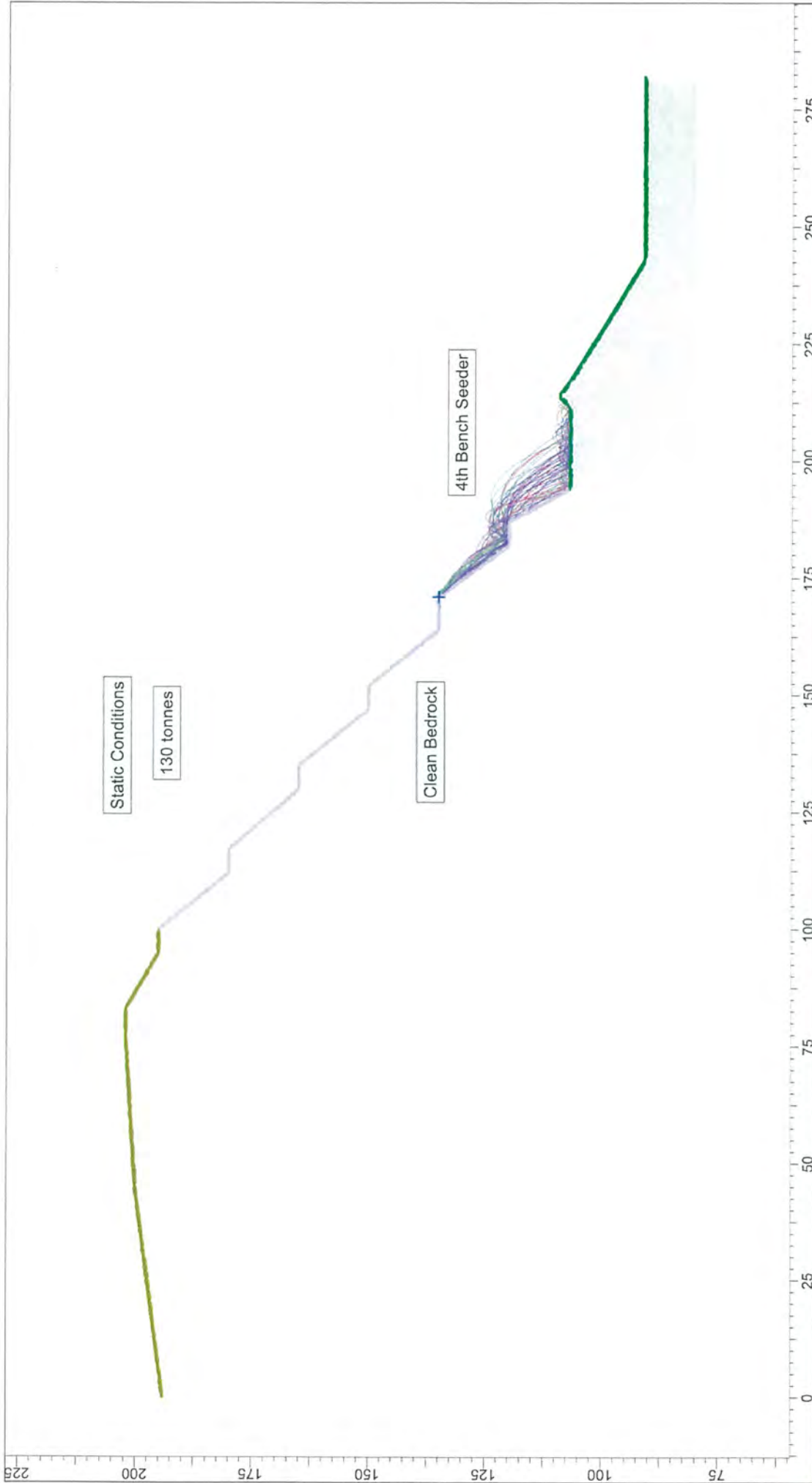


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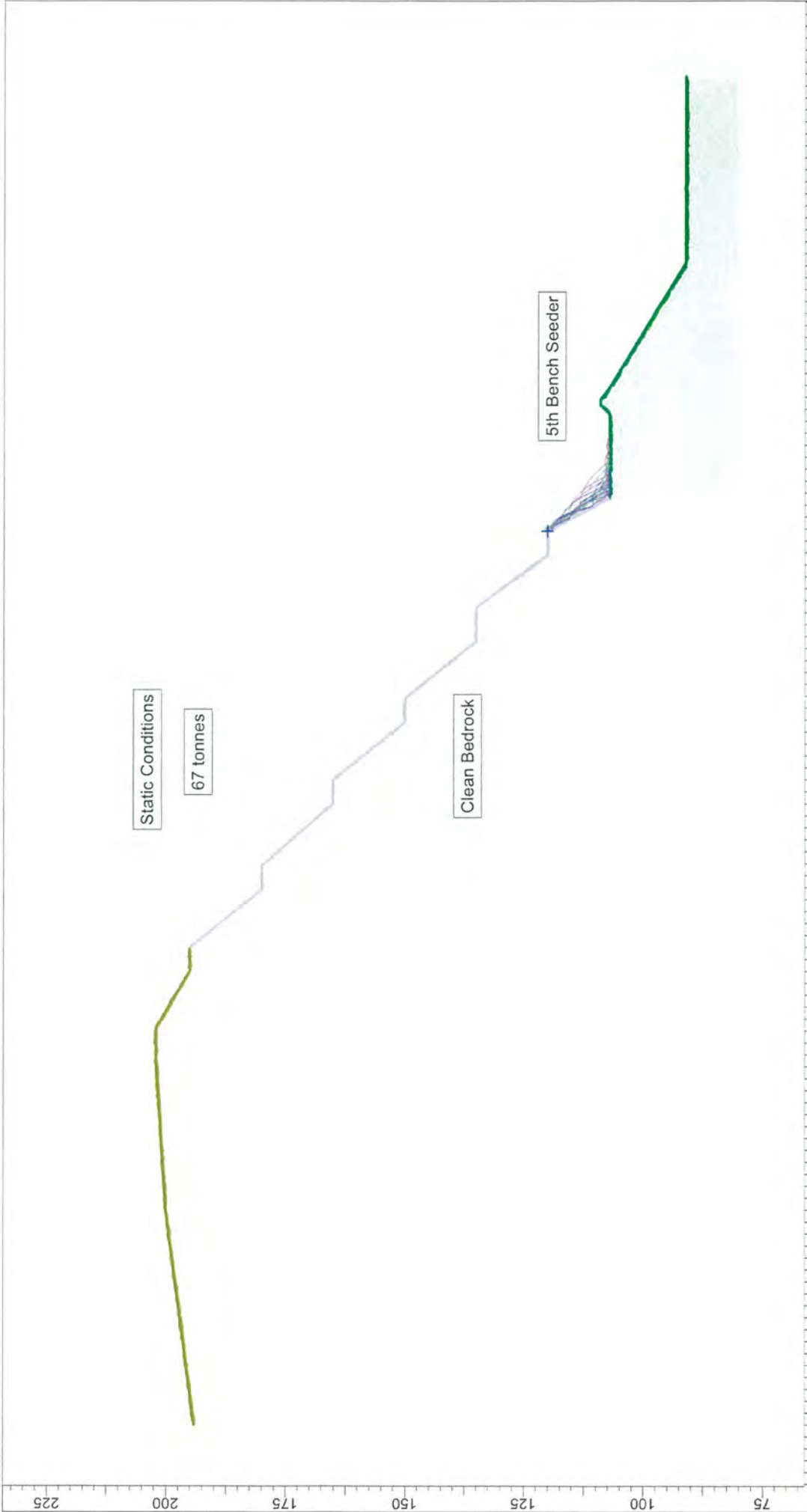


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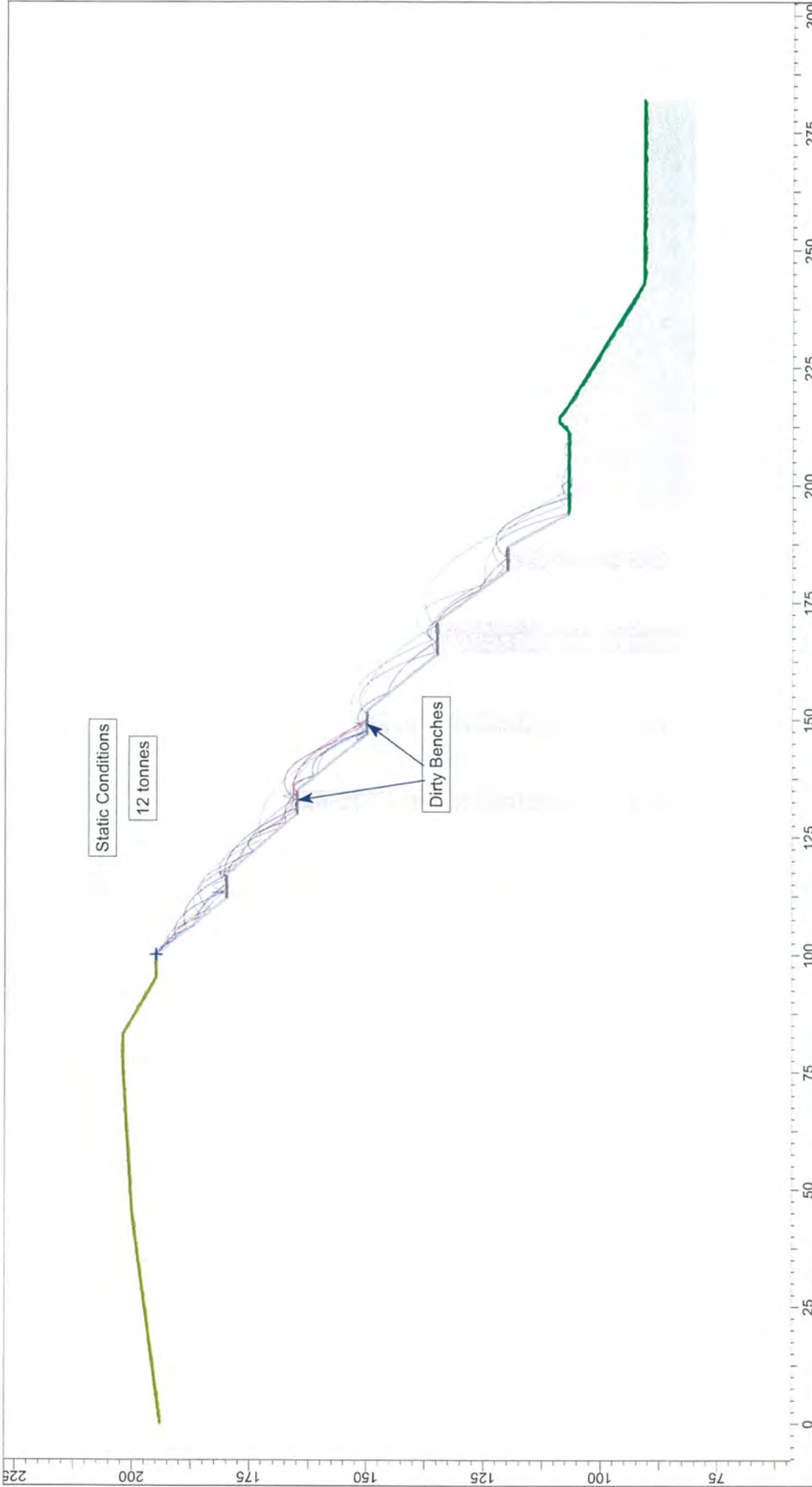


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<i>Date</i>	Ormiston Associates Ltd
<i>Company</i>	6c Clean Bedrock, 130t, static, fourth bench.fal5
<i>File Name</i>	



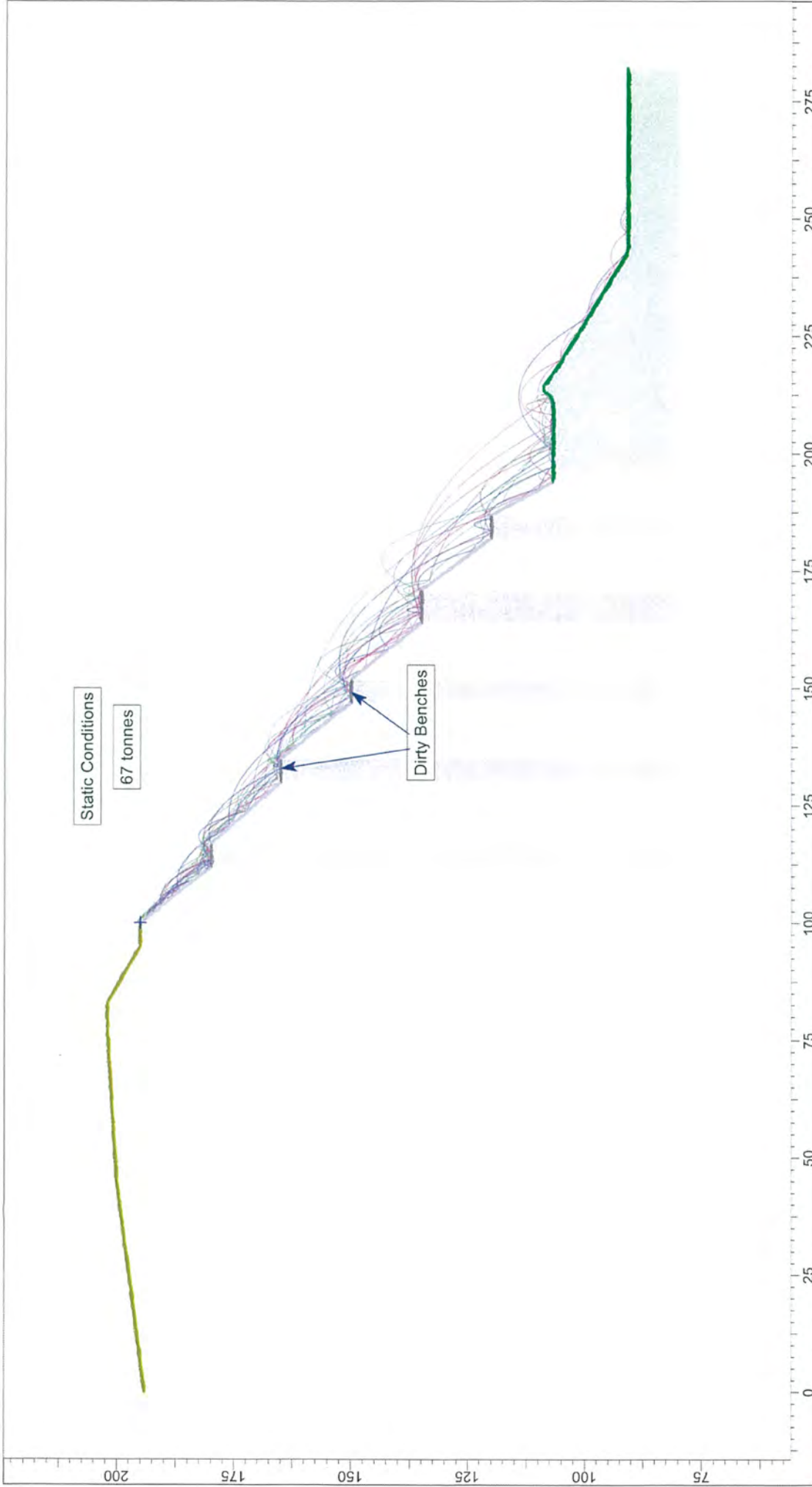


rockscience	Project		Kiwi Point Quarry, Wellington	
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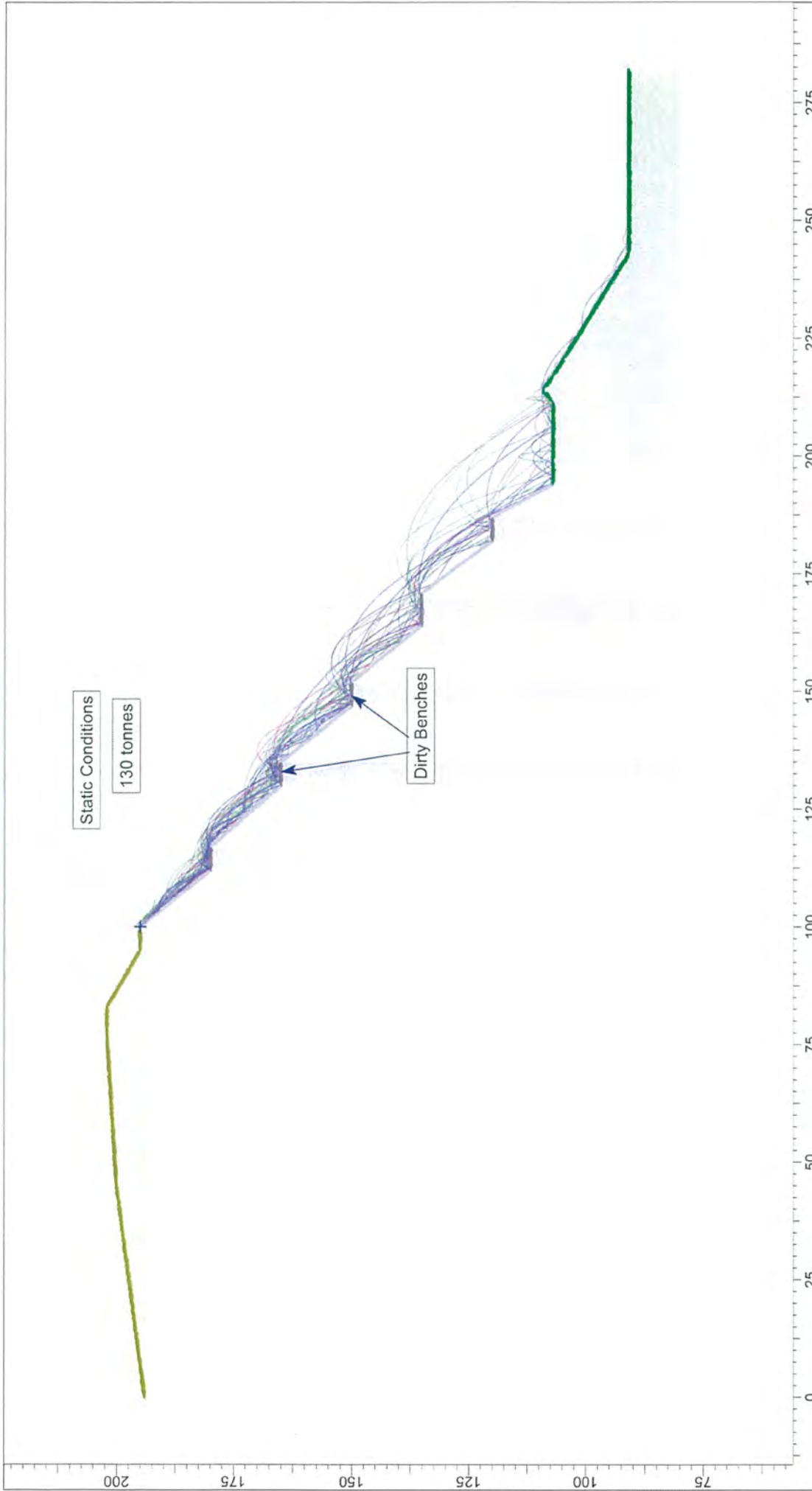


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Drawn By	File Name
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Date	





Rockscience		Project		Kiwi Point Quarry, Wellington	
Analysis Description		Rock Fall Analysis			
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Kiwi Point Quarry, Wellington	
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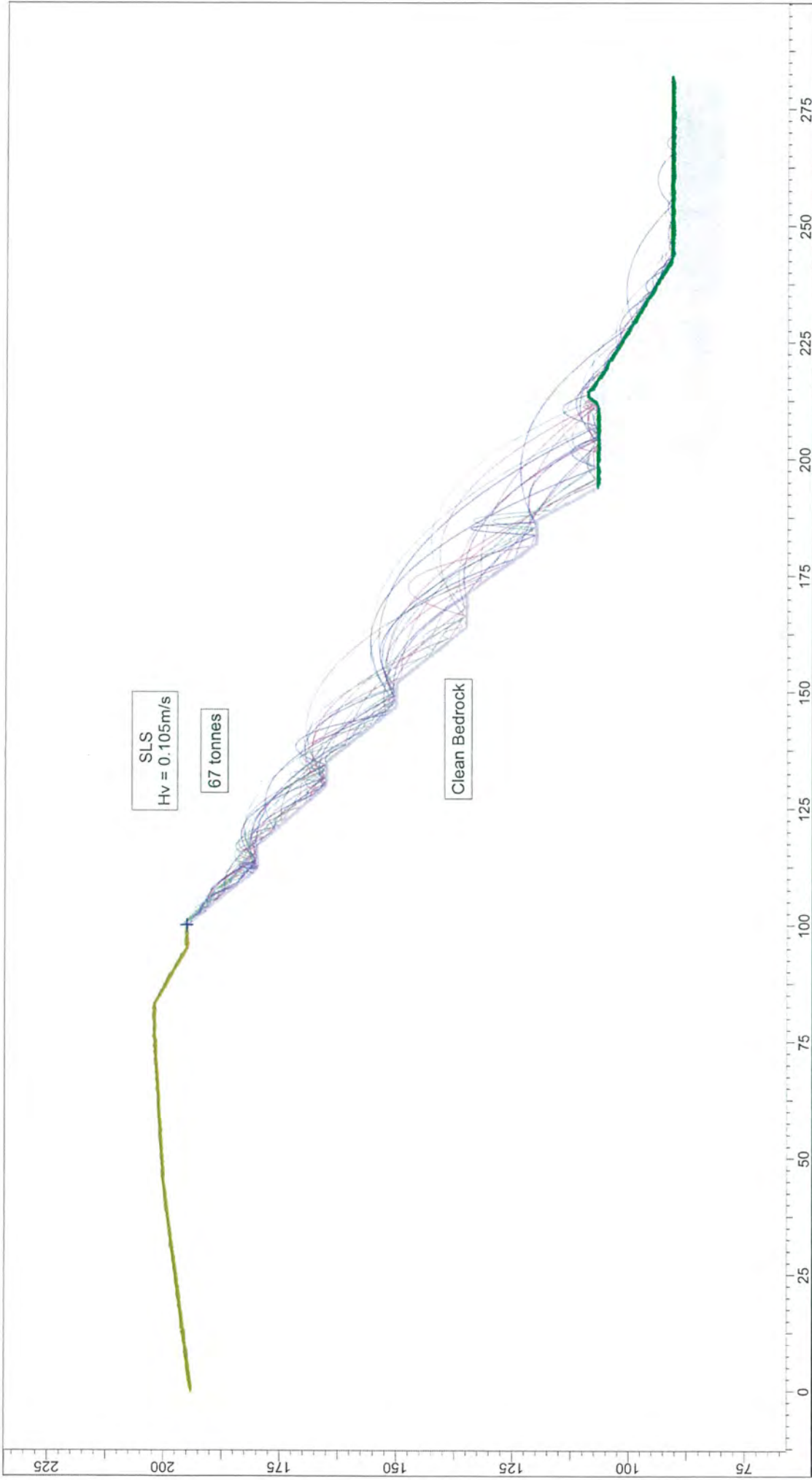
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Dynamic Conditions (SLS)



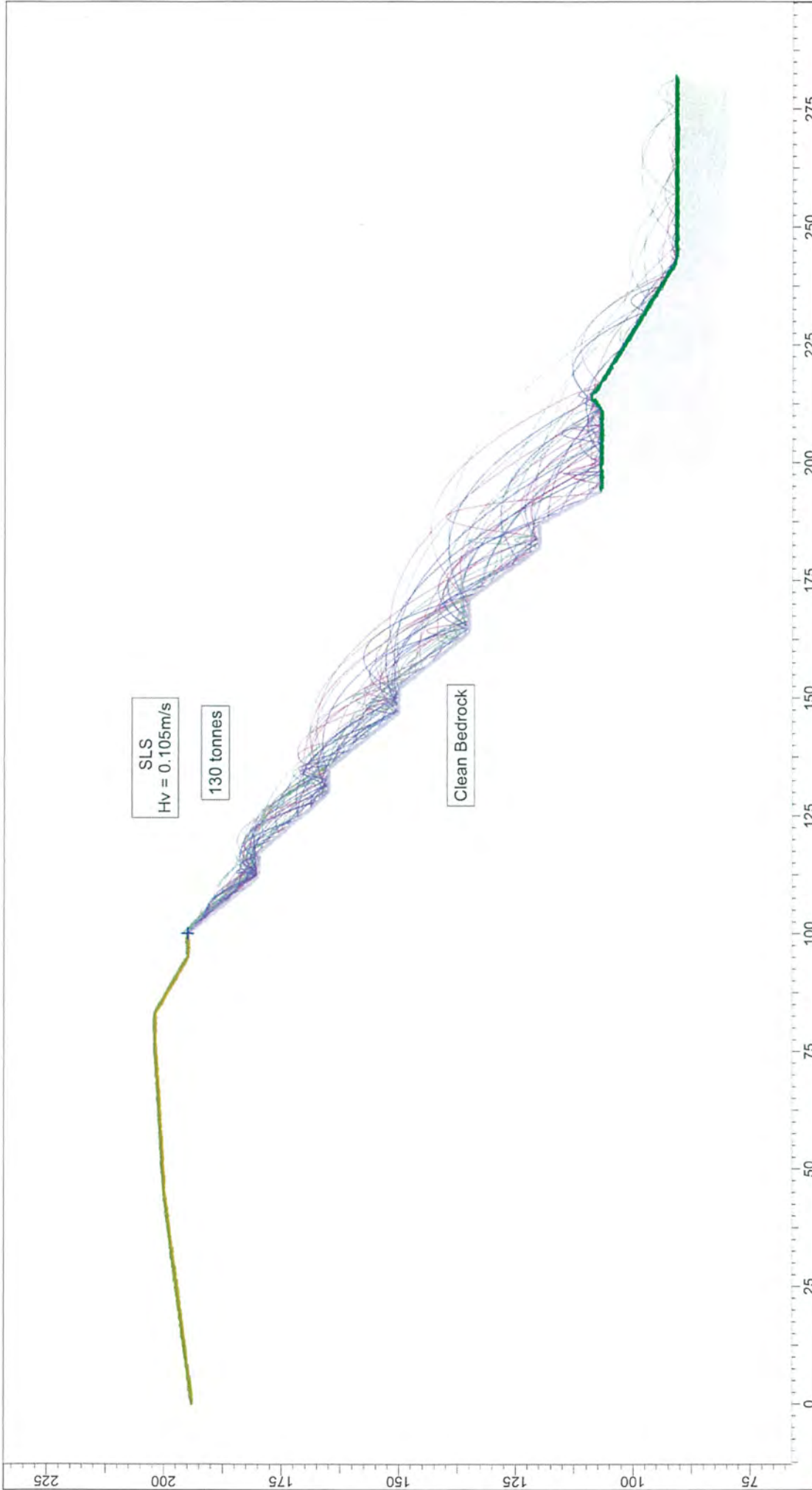
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Drawn By	S Carryer & A Fell		Company
Date	24/6/2015		Ormiston Associates Ltd
			File Name
			9a Clean Bedrock, 12t, SLS.fal5




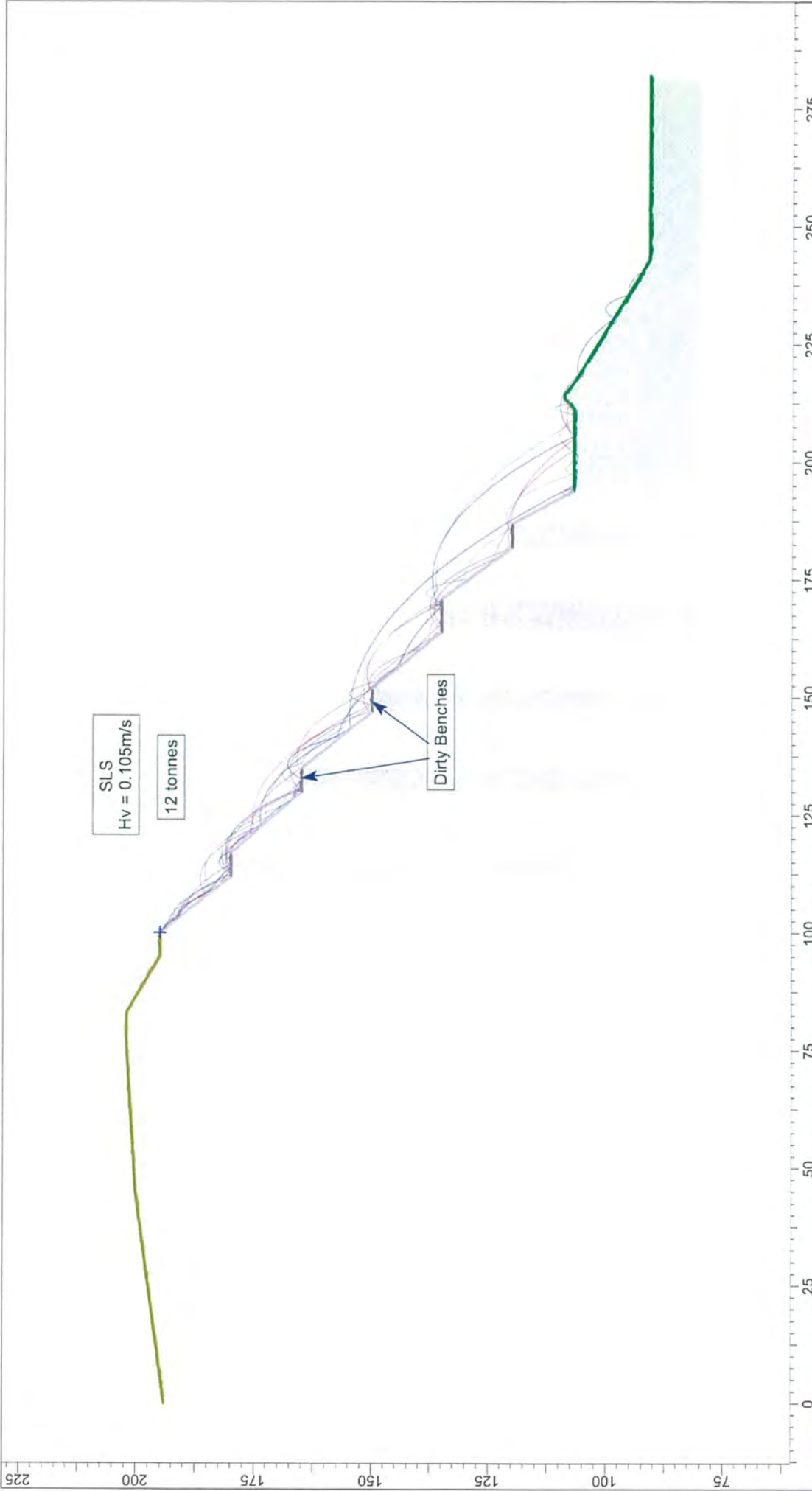


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Rock Fall Analysis	
<i>Analysis Description</i>	<i>Company</i>
S Carryer & A Fell	Ormiston Associates Ltd
<i>Date</i>	<i>File Name</i>
24/6/2015	9b Clean Bedrock, 67t, SLS.fal5

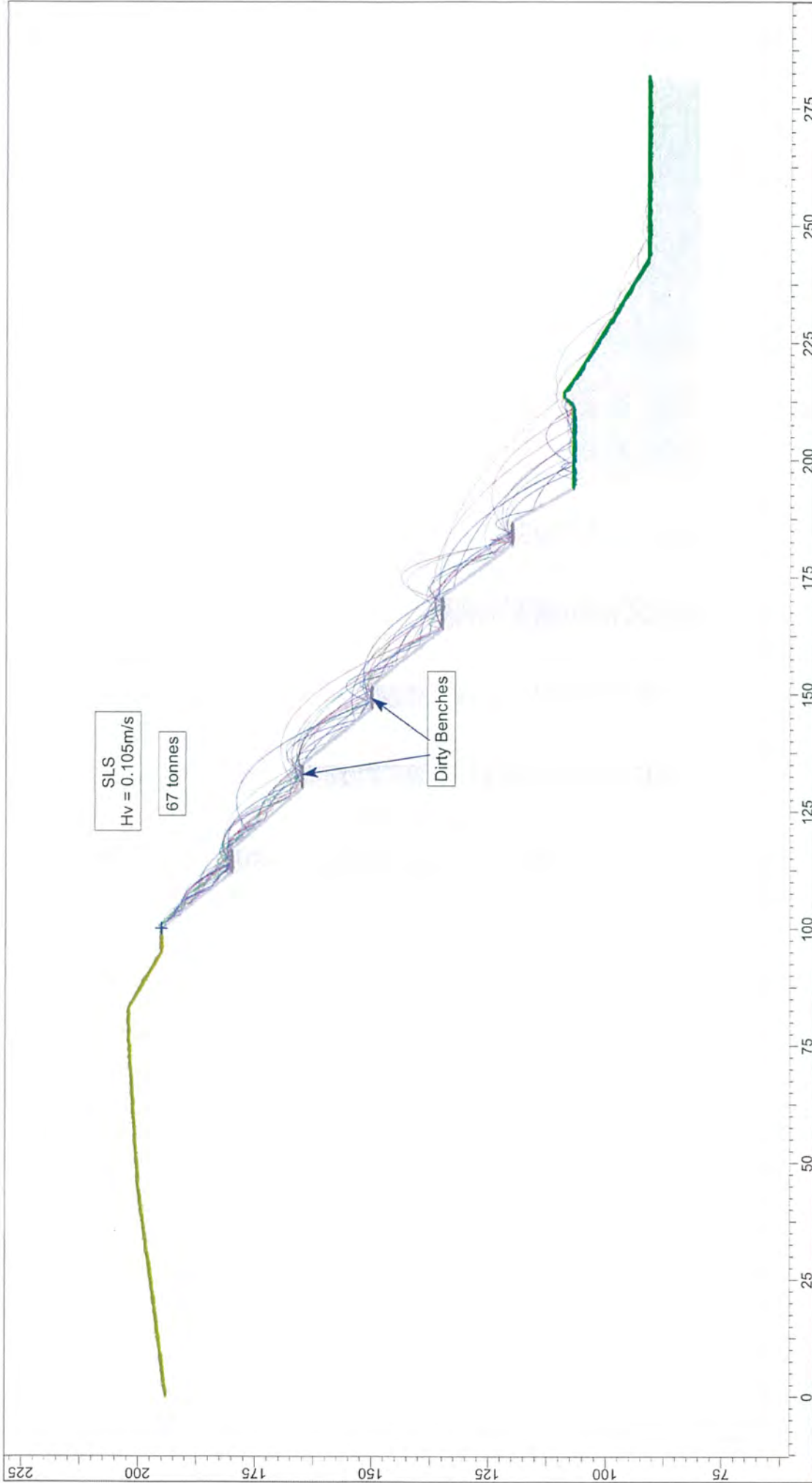




	Project	
	Kiwi Point Quarry, Wellington	
Analysis Description		Rock Fall Analysis
Drawn By	S Carryer & A Fell	
Date	24/6/2015	
Company		Ormiston Associates Ltd
File Name		9c Clean Bedrock, 130t, SLS.fal5



Rockscience		Project	
ROCFALL 5.013		Kiwi Point Quarry, Wellington	
Analysis Description		Rock Fall Analysis	
Drawn By		Company	
S Carryer & A Fell		Ormiston Associates Ltd	
Date		File Name	
24/6/15		10a Dirty Bench, 12t, SLS.fal5	



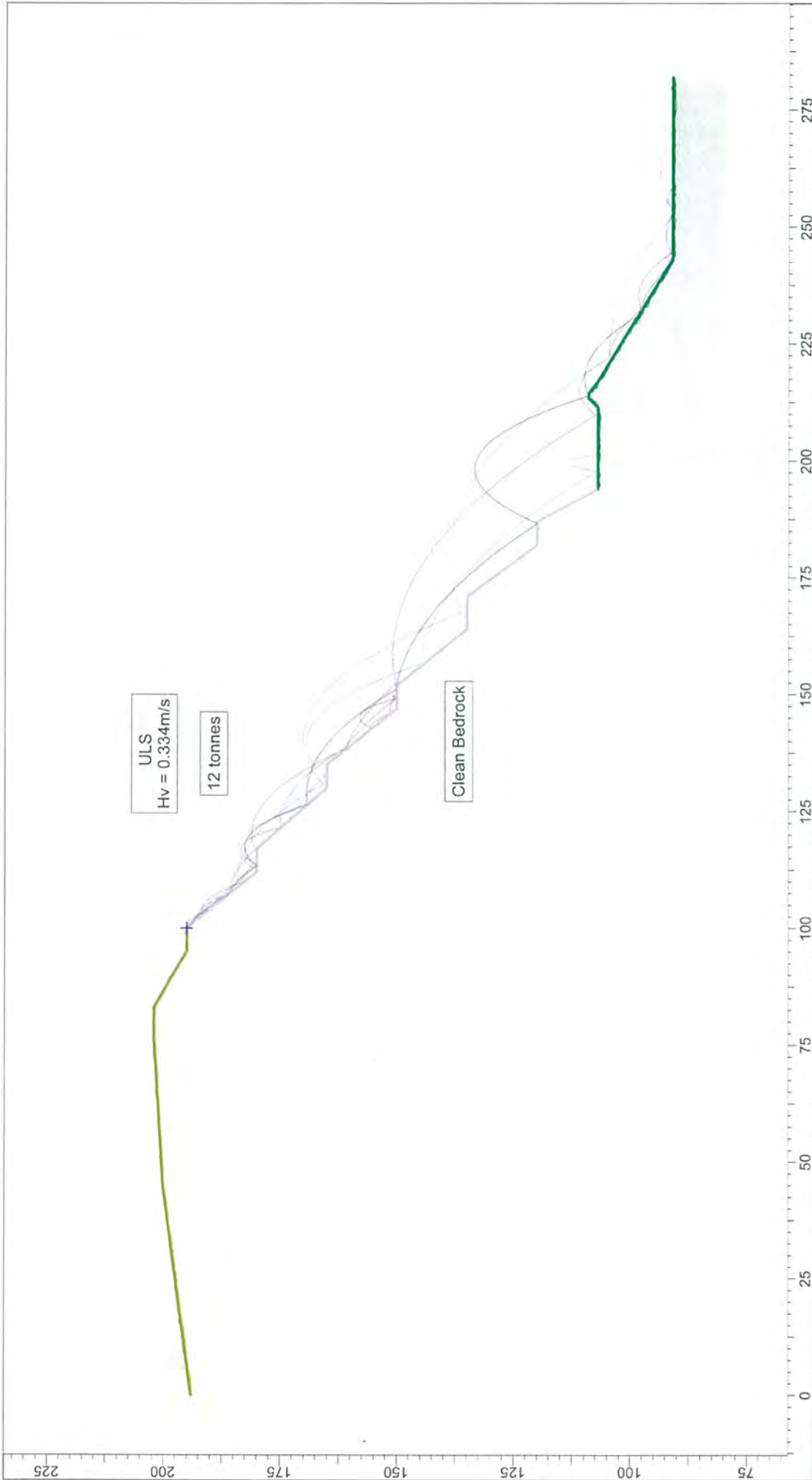
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S Carryer & A Fell		Ormiston Associates Ltd	
24/6/15		10b Dirty Bench, 67t, SLS.fail5	




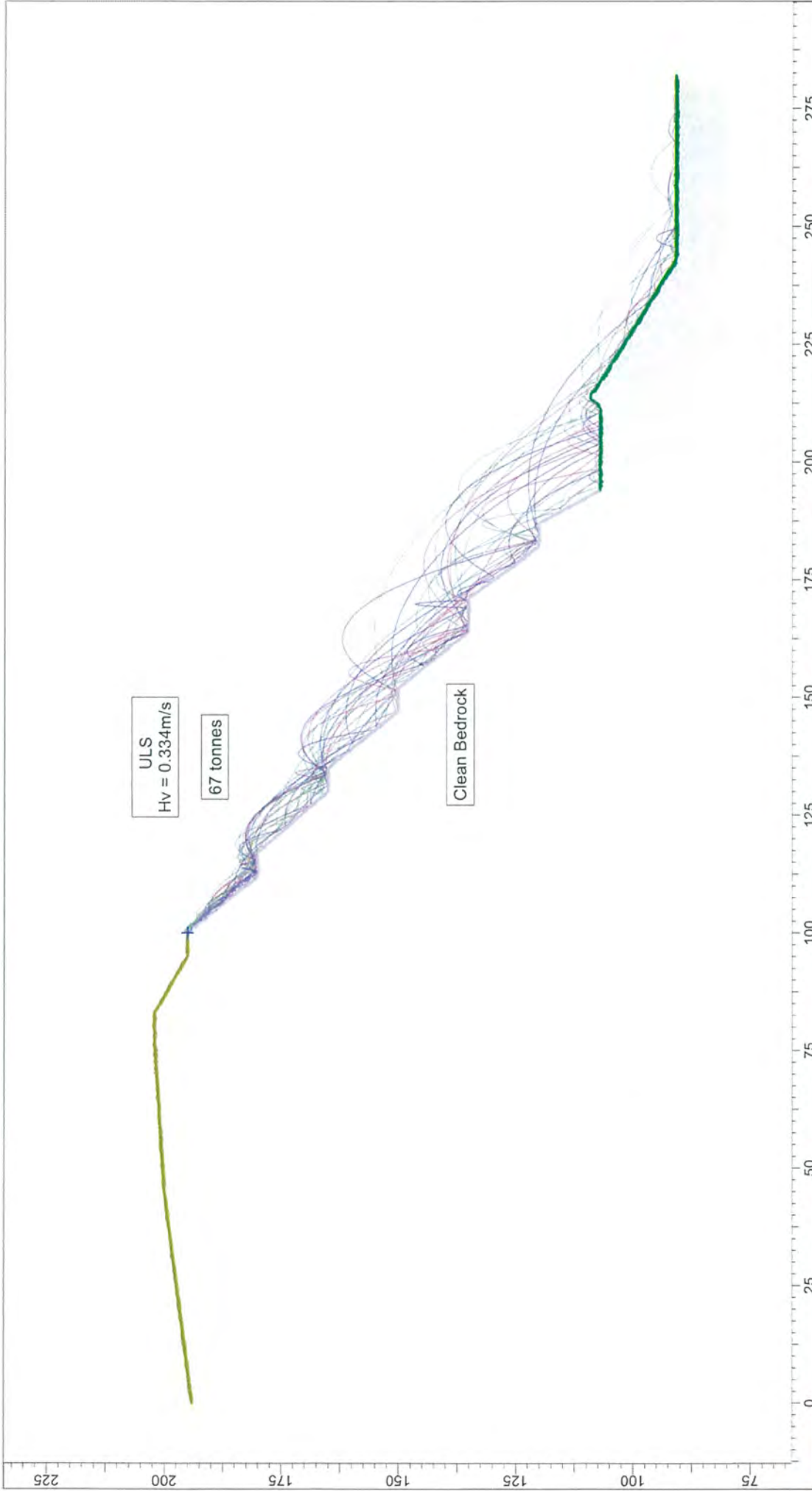


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	Analysis Description	Rock Fall Analysis		
	Drawn By	S Carryer & A Fell	Company	Ormiston Associates Ltd
	Date	24/6/15	File Name	10c Dirty Bench, 130t, SLS.fal5

Dynamic Conditions (ULS)

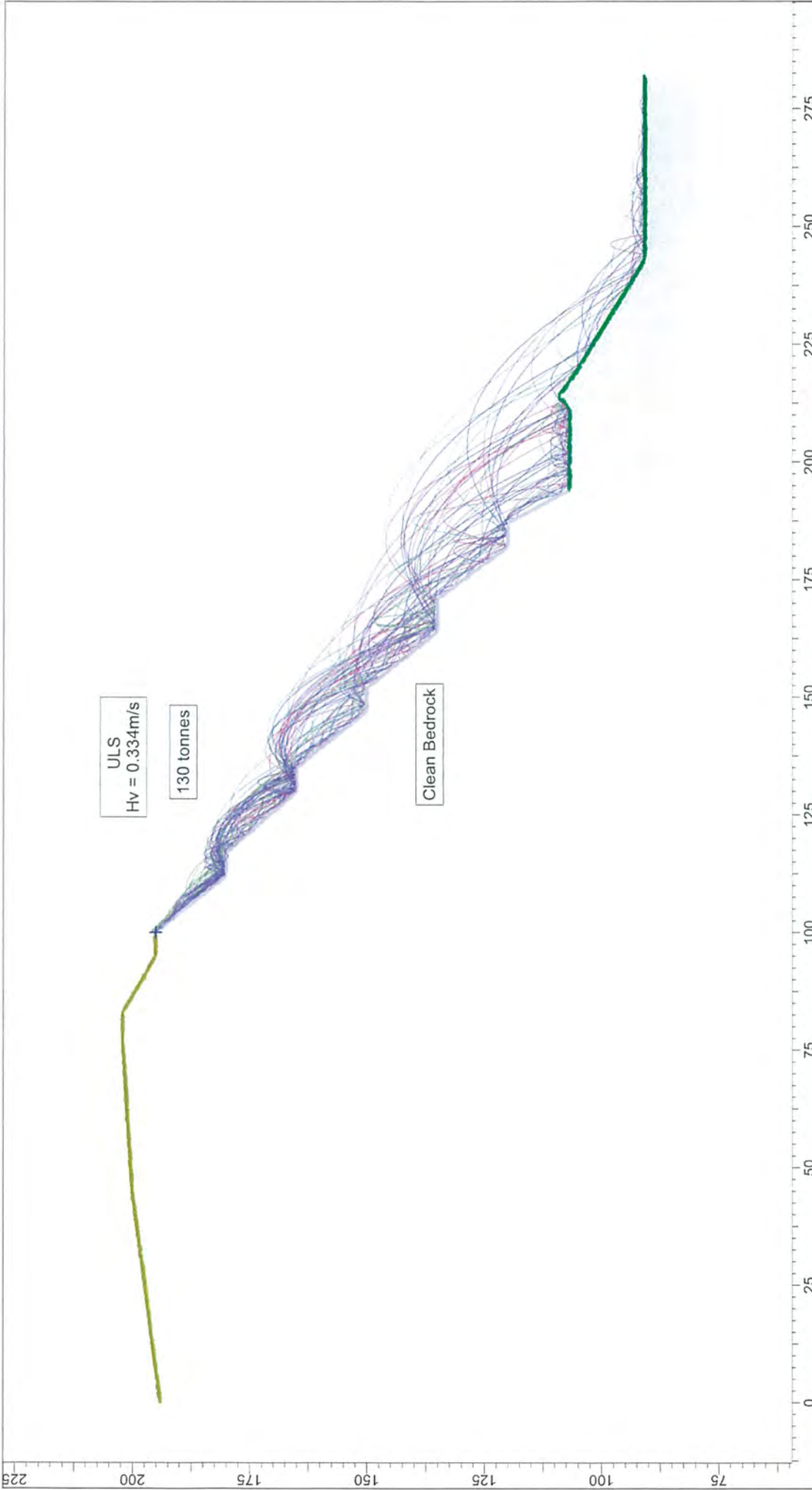


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Date	24/6/2015	File Name	11a Clean Bedrock, 12t, ULS.fal5



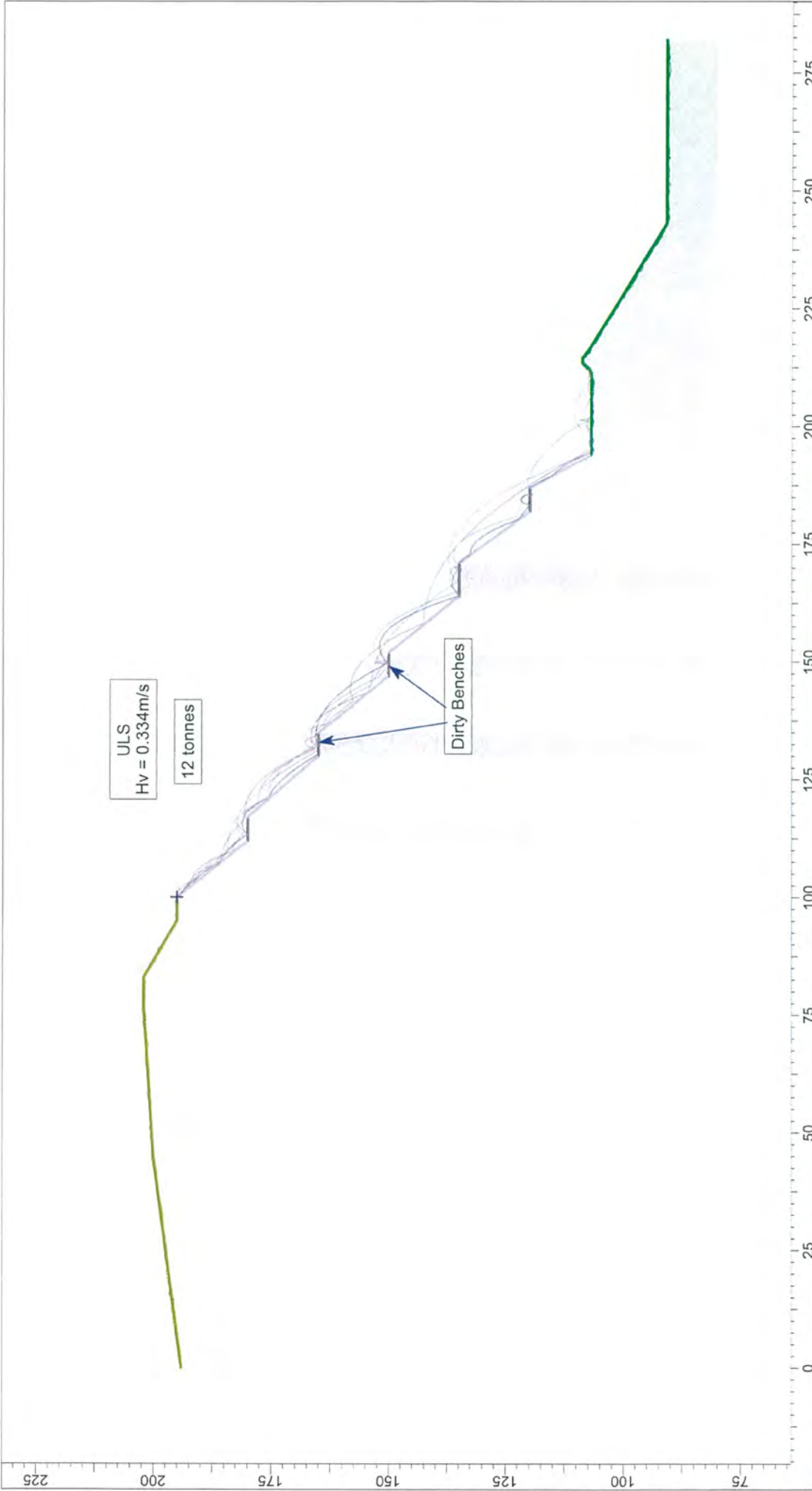
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Drawn By	S Carryer & A Fell		Company
Date	24/6/2015		Ormiston Associates Ltd
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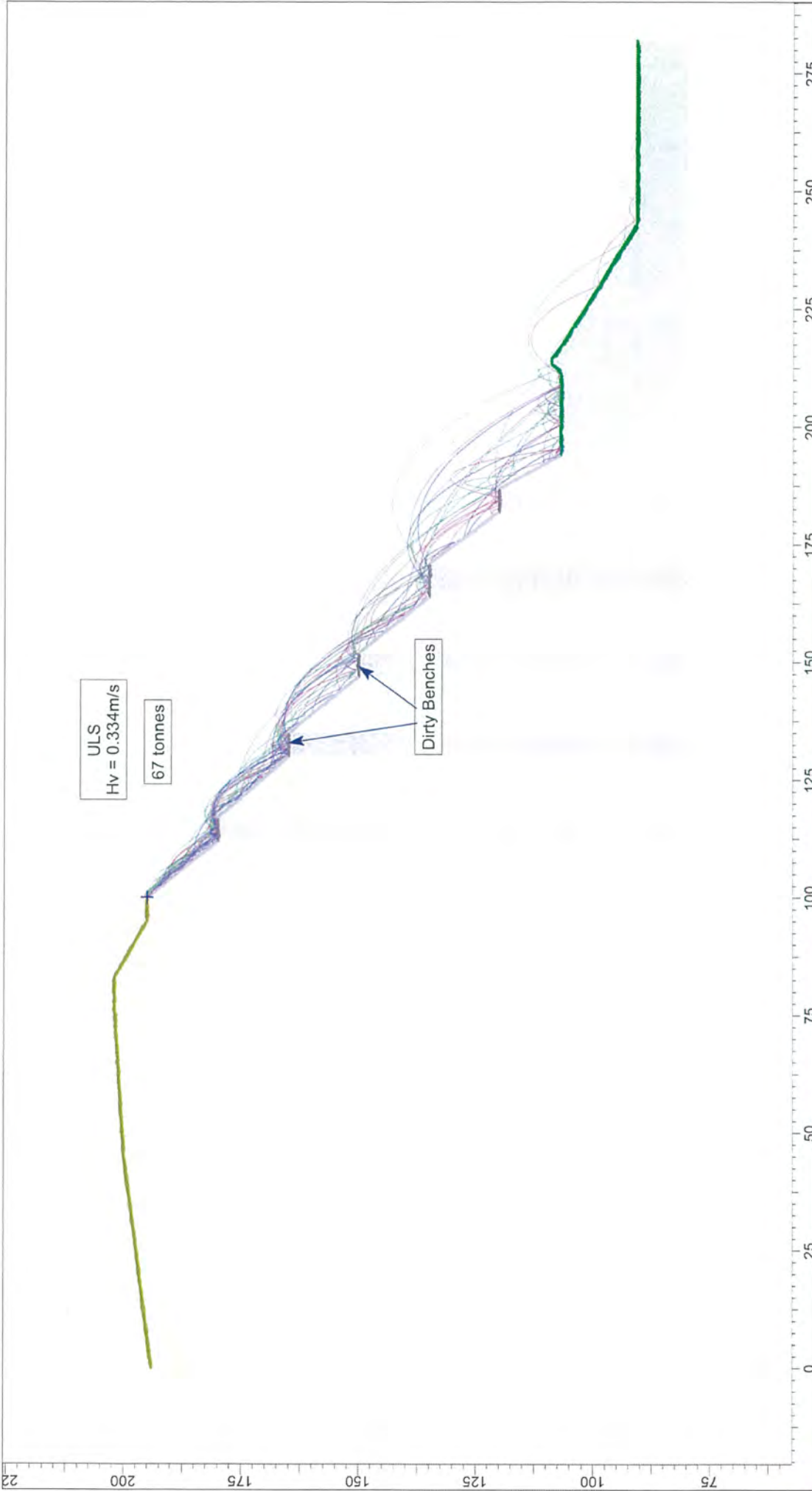


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Date	24/6/2015		Ormiston Associates Ltd
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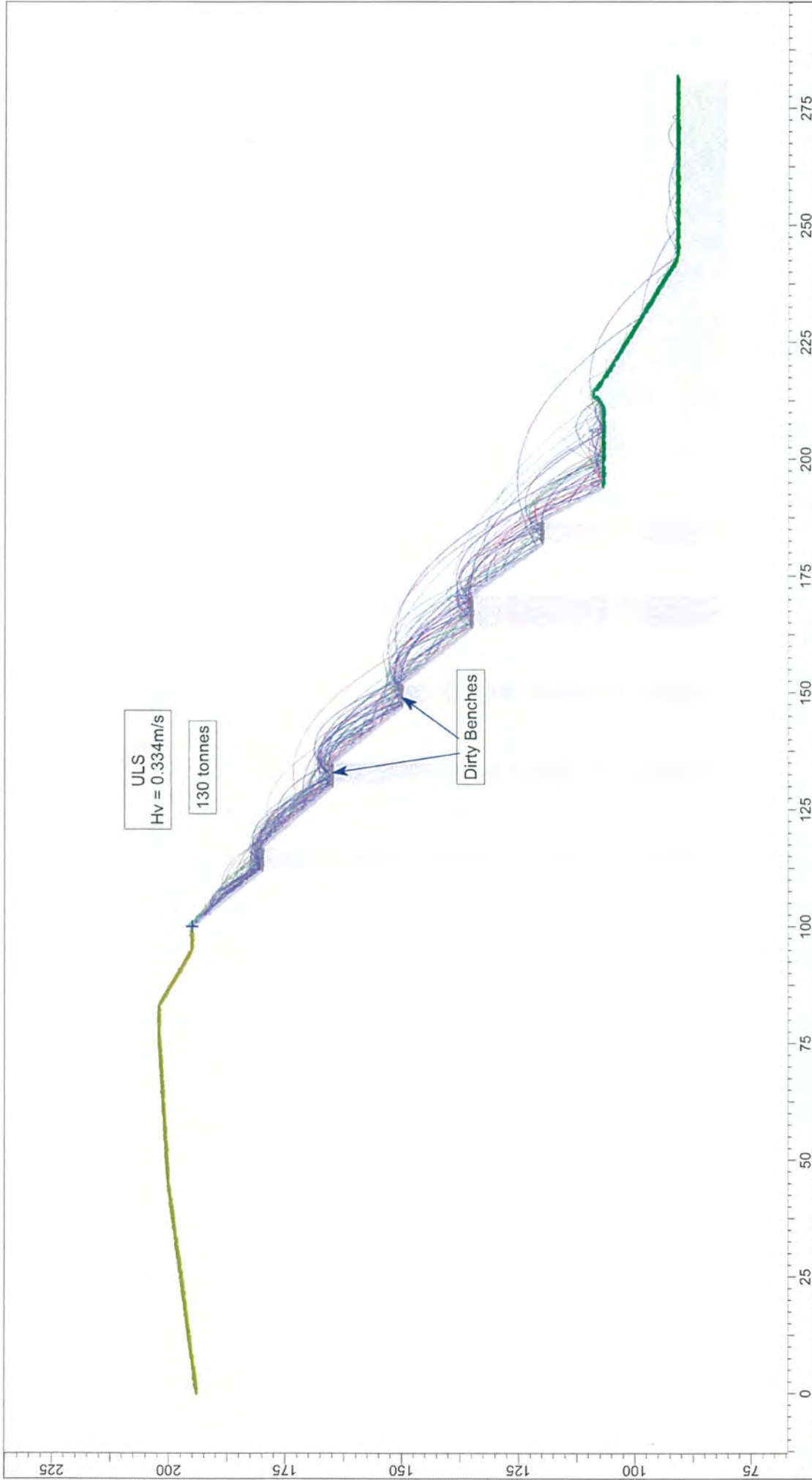


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Drawn By		File Name	
S Carryer & A Fell		Ormiston Associates Ltd	
Date		12a Dirty Bench, 12t, ULS.fal5	
24/6/15			

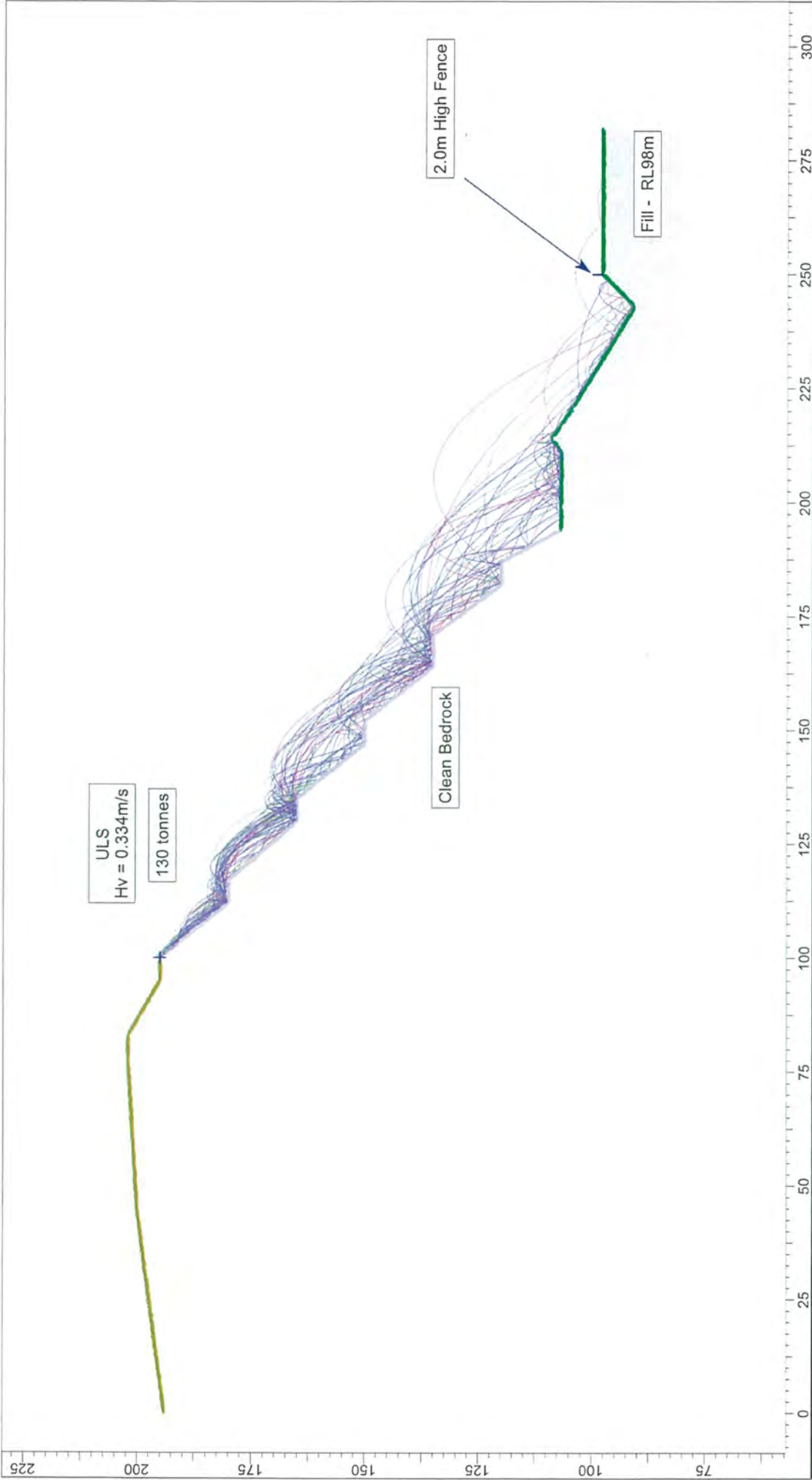


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Analysis Description		Rock Fall Analysis	
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Date	24/6/15	File Name	12b Dirty Bench, 67t, ULS.fal5



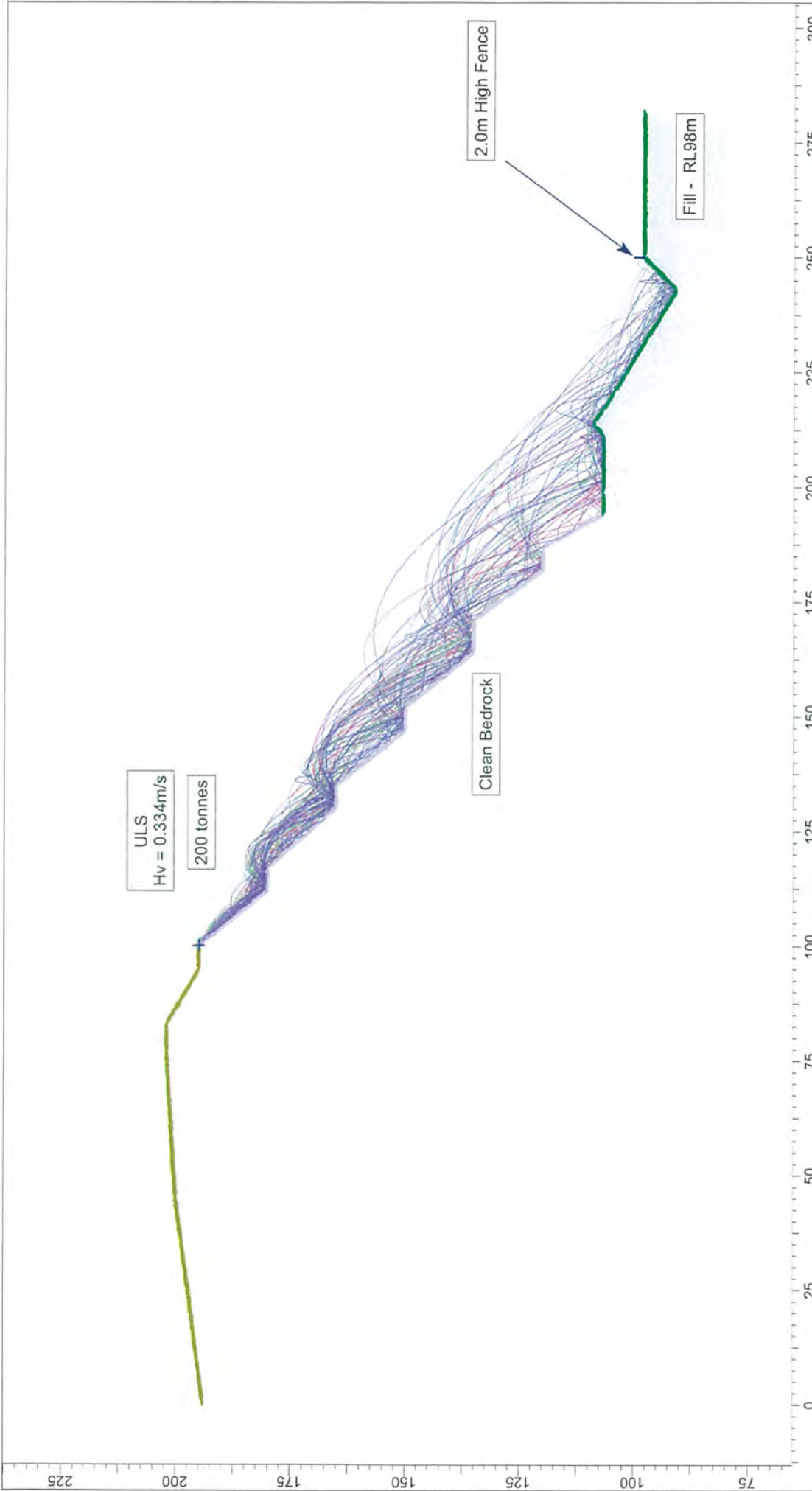


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Analysis Description		Rock Fall Analysis
Drawn By		Company
S Carryer & A Fell		Ormiston Associates Ltd
Date		File Name
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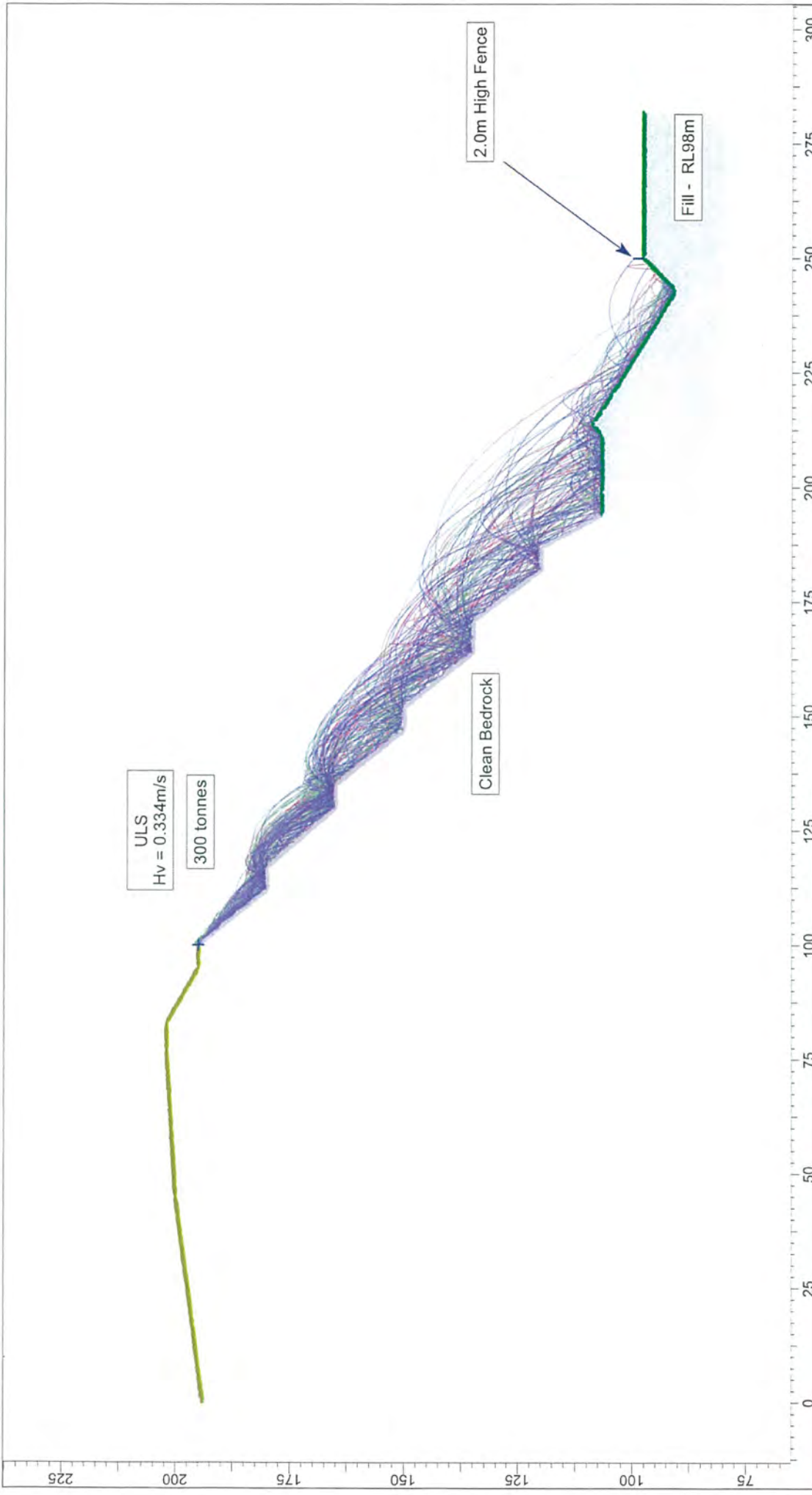


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Analysis Description		Rock Fall Analysis	
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Date	24/06/2015	File Name	13a Clean bedrock, (ULS), 130t, v-notch + fence.fal5



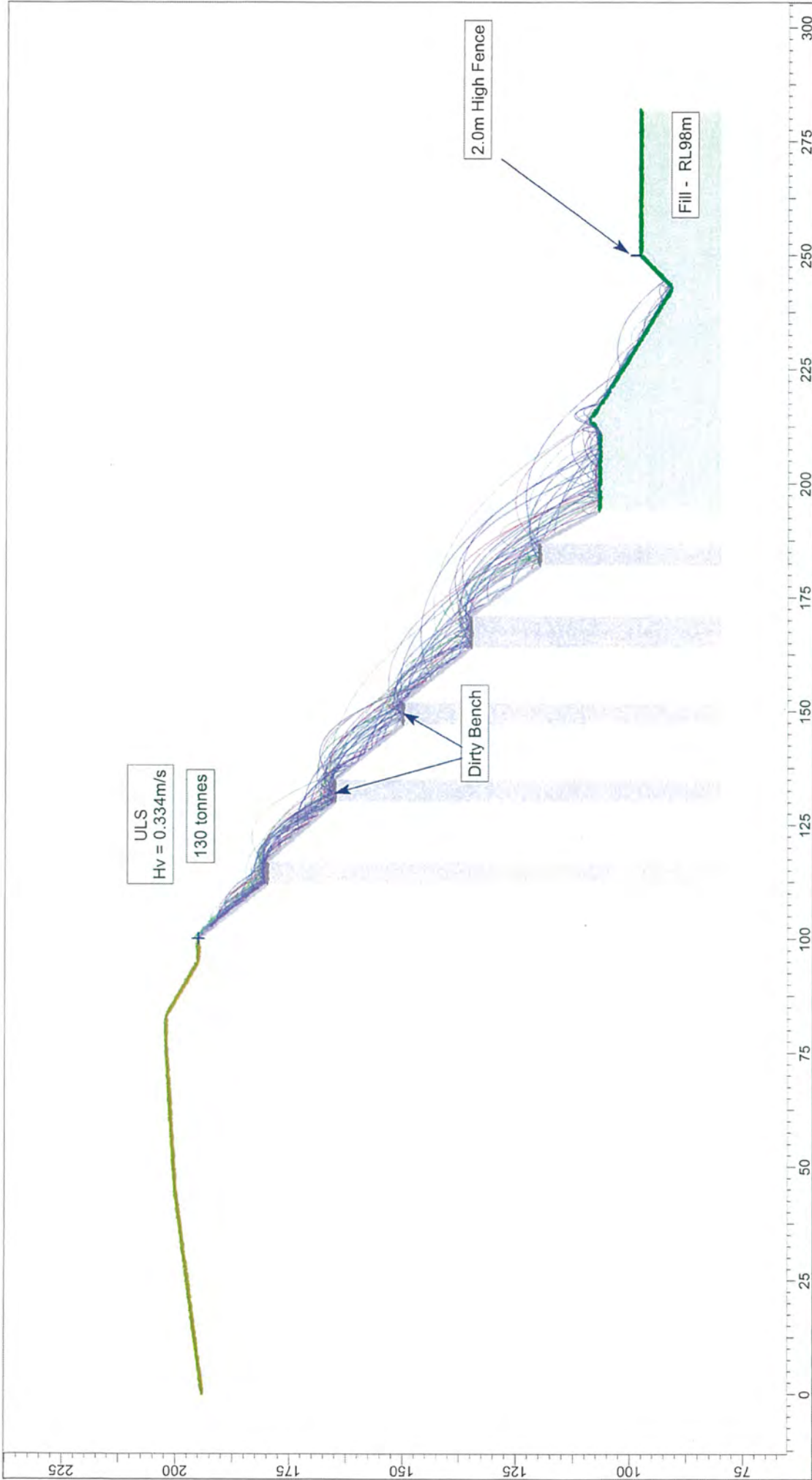


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Date	24/06/2015	File Name	13b Clean bedrock, (ULS), 200t, v-notch + fence.fal5

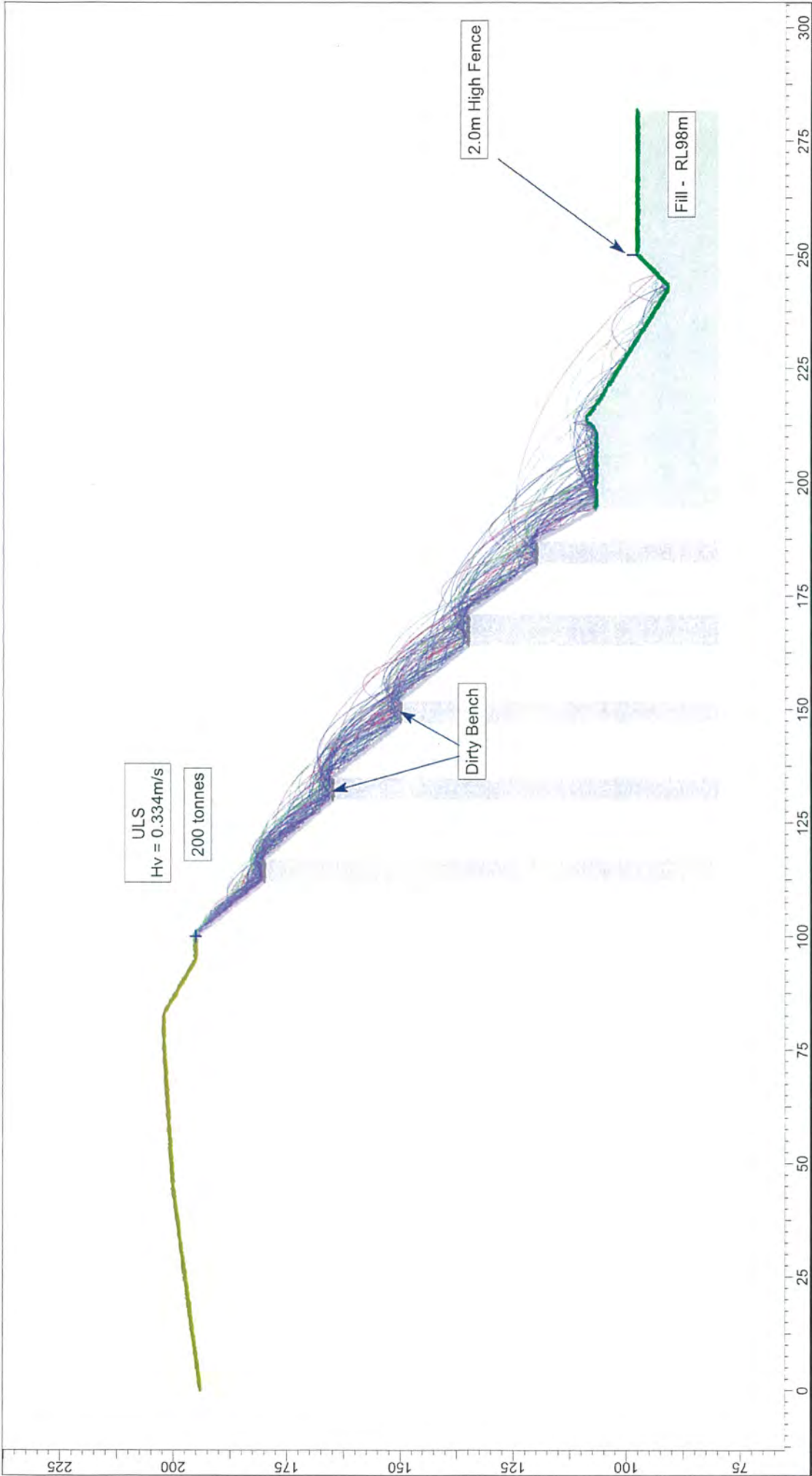


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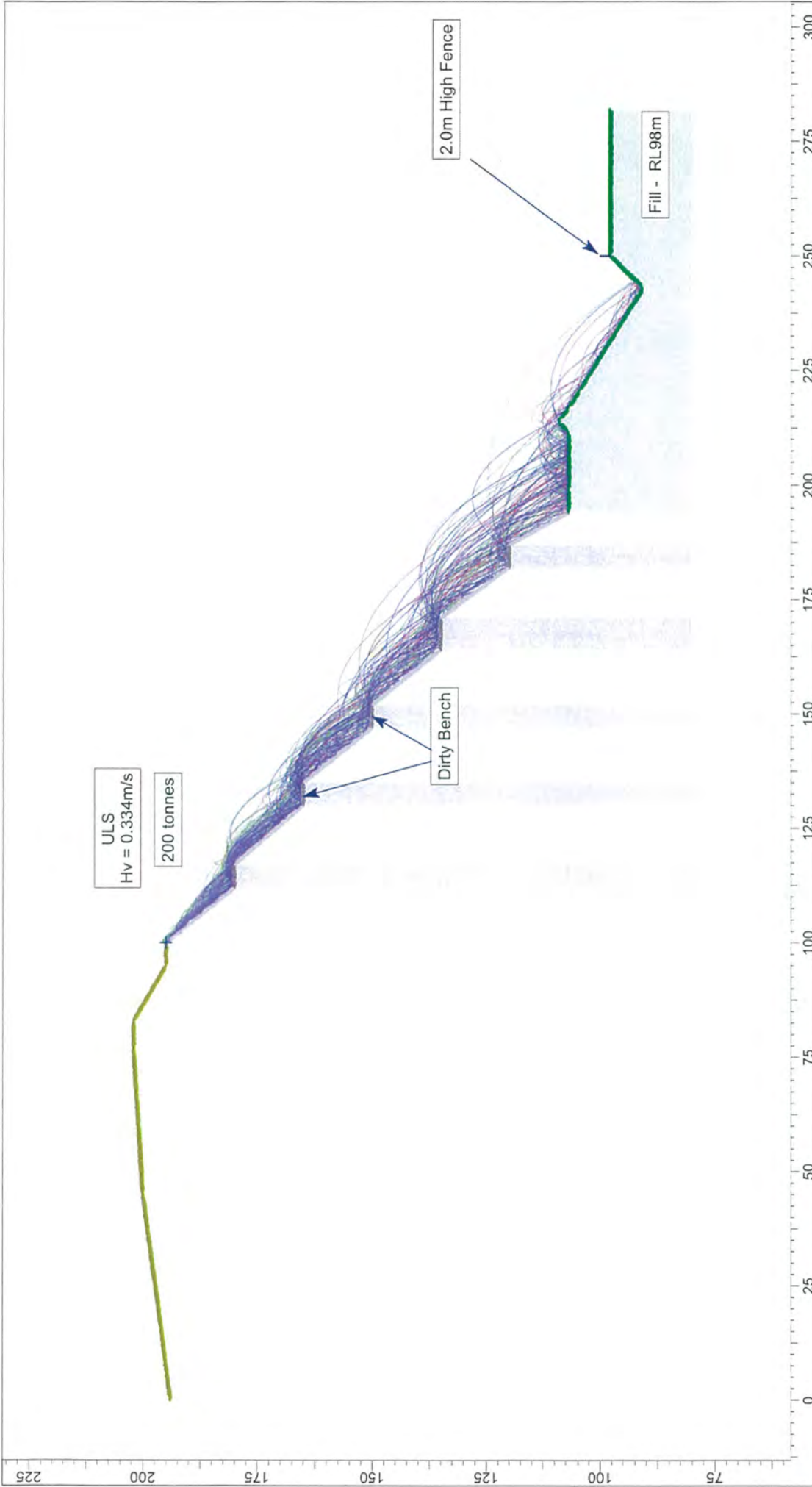


Kiwi Point Quarry, Wellington	
<i>Project</i>	Rock Fall Analysis
<i>Analysis Description</i>	Rock Fall Analysis
<i>Drawn By</i>	S Carryer & A Fell
<i>Date</i>	24/06/2015
<i>Company</i>	Ormiston Associates Ltd.
<i>File Name</i>	14a Dirty Bench, (ULS), 130t, v-notch + fence.fal5



Project		Kiwi Point Quarry, Wellington	
Analysis Description		Rock Fall Analysis	
Drawn By		S Carryer & A Fell	
Date		24/06/2015	
Company		Ormiston Associates Ltd.	
File Name		14b Dirty Bench, (ULS), 200t, v-notch + fence.fal5	





Kiwi Point Quarry, Wellington	
Project	Rock Fall Analysis
Analysis Description	Company
S Carryer & A Fell	Ormiston Associates Ltd.
Drawn By	File Name
24/06/2015	14c Dirty Bench, (ULS), 300t, v-notch + fence.fal5
Date	



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Slope Stability Review

Kiwi Point Quarry

Ngauranga Gorge

Wellington

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1 Introduction

Geoscience Consulting (NZ) Limited was initially engaged by Holcim (NZ) Limited in 2012 to undertake a slope stability review of the quarry development at that time, and comment on the proposed expansion of the quarry. Since the initial report (September 2012), Geoscience have been subsequently engaged to carry out regular (at least quarterly) site inspections to assess ongoing quarry development and/or incidents.

The purpose of this current engagement is to provide geotechnical and geological reporting for the further development of the quarry, specifically in the areas of the North Wall, West Wall and Area H.

This report provides information on the following:

- The suitability of the proposed western batter slope to be cut in alternative directions;
- Recommendations for the extraction methodology in Area H (Southern Area); and
- Recommendations for the North Wall as follows:
 - Extraction methodology to maximize the resource yield (based on the information given in the Ormiston Associates report “*Kiwi Point Resource Review 2014*” (undated).
 - Recommendation for the remediation of the North Wall to allow buildings to be constructed at the final proposed level at the base of the slope when the quarry site is returned to Wellington City Council (WCC).

2 Scope of Work

The following scope of work was undertaken:

- Review of Ormiston Associates borehole logs of the recently drilled boreholes and recent reports;
- Geological mapping of the West Wall and Area H on 25 August 2014;
- Kinematic analysis of the results of the mapping to assess bench scale and multiple bench scale stability of the proposed western batter slopes;
- Kinematic analysis of the results of the mapping to propose safe cut batters and benches for Area H;
- Use of the available data (previous discontinuity mapping, Ormiston report, borehole logs) to produce a preferred methodology to maximise the resource at North Wall;
- Global stability assessment of the North Wall to assess appropriate remedial solutions;
- Analysis of the rock fall risk of the North Wall to give an initial indication of the potential set back distance that may be required for the construction of buildings at the base of the slope; and
- Production of this report based on our findings and data analysis.

3 Geology Overview

The geology of the Wellington area has been mapped by the Institute of Geological and Nuclear Sciences. The geology within the quarry is mapped as Triassic age Torlesse Complex grey Sandstone (“Greywacke”) and Siltstone/Mudstone (Argillite) sequences which have been repeatedly folded and faulted by a series of tectonic events.

The geological map indicates that the northern part of the quarry is overlain by Quaternary age alluvium, silt, peat and loess.

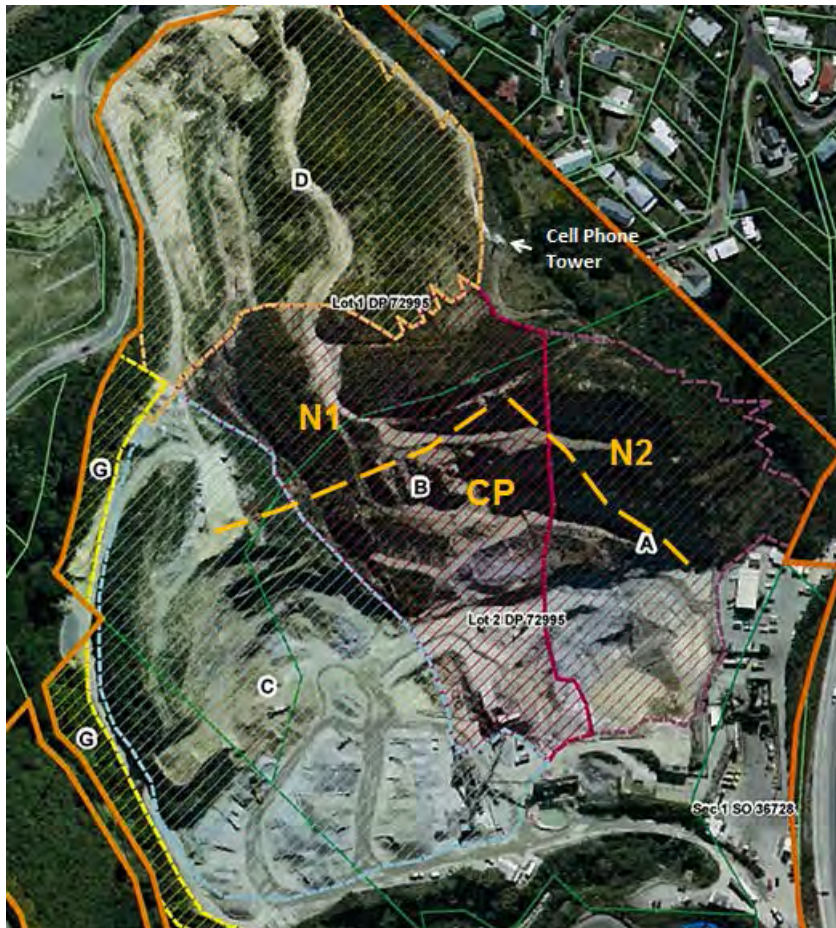
Previous reports at the Quarry indicate that the weathering profiles of the Greywacke within the quarry vary from fresh to moderately weathered. Highly weathered Greywacke is also exposed at high levels within the quarry.

Bedding is visible within the Quarry walls and, as is typical of Greywacke/Argillite in the Wellington Region, the rock in the quarry is variably jointed, with the density and continuity of the joints varying considerably.

4 Quarry Geotechnical Domains Overview

As a result of the defect mapping undertaken in 2013, the following geotechnical domains have been identified (see Figure 1 - reproduced from Figure 3 of our 2013 report).

Figure 1: Geotechnical Domains



Note: Domain CP (Central Pit) includes the north, west, south and east walls of the pit.

4.1 Domain CP

The geotechnical character of Domain CP (Central Pit) within the quarry is denoted by three defects within the rock, being the bedding planes and two joint sets.

Bedding planes (and sheared bedding) are typically at a slope angle of 70° from the horizontal and dip towards a bearing of 305° . The bedding planes are assumed to be continuous through multiple benches.

Joint Set 1 (JS1) typically dips at an angle of 75° from the horizontal towards a bearing of 220° . The assumed continuity of this joint set is less than 8 m in the lower benches (refer to section 5.2.2).

Joint Set 2 (JS2) typically dips at an angle of 45° from the horizontal towards a bearing of 090° . The assumed continuity of this joint set is less than 8 m in the lower benches.

The north, south, east and west walls all form part of this domain.

4.2 Domains N1 and N2 - Inferred Controls on Slope Stability

Domains N1 and N2 are denoted as the areas where the “greasy back” structures are observed within the east and west of the North Wall. These structures are considered to be due to stress relief within the rock mass due to down-cutting of the gullies on either side of the ridge into which the north wall is cut. They have been formed along the existing defects JS1 and JS2 which are parallel to the original ground surface. As a result the structures are more persistent than those in the unaffected rock mass beneath. It should be noted that the structures at N2 are poorly defined at this stage as access to the face in this area was considered to be too dangerous.

The eastern and western ends of the North Wall form part of this domain.

5 North Wall

This section discusses the North Wall stability, resource and remediation. The discussion includes existing stability, recommendations to improve the stability, potential maximum resource extraction and recommendations for future remediation.

The current quarry limit at the crest of the North Wall is defined by the existing land use consent. Further extraction at the crest is also restricted by the presence of a cell phone tower and associated easement as well as a 20 m buffer requirement from the residential properties to the north (see Figure 1). We understand that at the end of the quarry life, the land will be returned to WCC and the construction of commercial properties is currently proposed. In our analysis, we have allowed for the quarry to be filled to RL 92 m which is the approximate current height of the existing pit access track.

Our analysis of the North Wall includes cross sections illustrating the following scenarios:

- **Scenario 1:** The existing North Wall with batter slopes at approximately 80°;
- **Scenario 2:** The maximum resource extraction possible within the current quarry limits whilst improving current levels of stability with upper batter slopes at 55° as indicated by Ormiston and Associates drawing number 3655-2 dated 12 March 2014; and
- **Scenario 3:** Maximum resource extraction if the cell phone tower can be relocated and the wall can be extended to within 20 m from the quarry boundary (required setback).

It is noted that Scenario 2 is the most likely scenario to be chosen, as the cell tower is unlikely to be moved.

5.1 North Wall Resource

Current slope batters on the North Wall are cut at approximately 80 degrees at heights of up to 22 m with benches less than 4 m wide (typically between 2 m and 4 m wide). The overall batter slope is approximately 60 degrees.

Scenarios 2 and 3 are discussed in the following sections.

5.1.1 Resource Optimisation with Restrictions – Scenario 2

Scenario 2 maintains the current quarry limits but reduces the slope angle at the top of the existing slope to 55°. This is the commonly accepted long term maximum batter slope angle of Greywacke in the Wellington Region. This results in reduced resource extraction, but if the current restrictions remain in place, is recommended in order to maintain long term slope stability. In this scenario, the lower 3 batters have already been over excavated to more than 55°. As no access is currently available from the benches, the excavations to form this slope would need to be undertaken from the crest of the slope down.

5.1.2 Resource Optimisation without Restrictions

It would be preferable to obtain consent to extend the current limit for quarrying at the crest of the North Wall towards the property boundary. This would require the permanent relocation of the cell phone tower. We understand that a 20 m setback would be required from the boundary to safeguard the houses close to the boundary.

If this change of consent is possible, Scenario 3 would not only maximize resource yield potential, allowing a significant volume of “blue” rock to be extracted, but would also result in increased slope stability, as all of the cut batters can be cut at 55°. This is therefore the preferred final slope option.

5.2 North Wall Stability

5.2.1 Kinematic Analysis of Discontinuities

In the September 2012 Geoscience report, mapping of the North Wall was undertaken and analysis of the mapped discontinuities was detailed. This analysis is reproduced in this section for convenience.

The discontinuities in the North Wall are denoted by three defects within the rock, being the bedding planes and two joint sets.

Bedding planes (and sheared bedding) are typically at a slope angle of 70° from the horizontal and dip towards a bearing of 305°. The bedding planes are assumed to be continuous through multiple benches.

Joint Set 1 (JS1) typically dips at an angle of 75° from the horizontal towards a bearing of 220°. The assumed continuity of this joint set is less than 8m in the lower benches.

Joint Set 2 (JS2) typically dips at an angle of 45° from the horizontal towards a bearing of 090°. The assumed continuity of this joint set is less than 8m in the lower benches.

There are two main controls on slope instability on the north wall as it currently stands;

1. Planar sliding on JS1 for batter slopes above 50° (i.e. the existing condition); and
2. Wedge failures where JS1 intersects JS2.

The analysis indicates that bench scale failures may occur at slope angles over 45°, and this is observed on the North Wall. The current bench widths of approximately 2m to 4m generally contain the small scale failures that do occur, however in some cases, the debris overflows one bench and is caught by a lower bench.

As the extension of the quarry progresses, it may be required to re-align the North Wall. To assess the implications of any change in slope aspect on slope failure due to discontinuities within the rock mass, further Dips analysis has been undertaken to assess the effects of a change in slope aspect on stability. Table 1 gives an indication of the possible North Wall slope aspects, the controls on stability, and the recommended optimum slope batter angle to minimise the risk of slope failure. Note that failures may occur if slopes are cut steeper than recommended. If slopes are required to be steeper than those recommended, a risk assessment should be carried out to assess whether the consequence of failures would be acceptable (see Section 9 for further information). Benches should be maintained at a design width of no less than 5m.

Table 1: North Wall Batter Slope Design Recommendations

Possible Slope Aspects	Control on Stability			Recommended Slope Batter Angle	Comments
	Planar	Wedge	Toppling		
South facing	✓	✓	✓	40°	Planar sliding occurs on slopes steeper than 50° Wedge failure occurs on slopes steeper than 45° Toppling failure occurs on slopes steeper than 40° Bench scale failures may occur at the design slope angle of 55°
South east facing	✓	✓	✓	35°	Planar sliding occurs on slopes steeper than 35° Wedge failure occurs on slopes steeper than 40° Toppling failure occurs on slopes steeper than 35°
East facing	✓	X	✓	40°	Planar sliding occurs on slopes steeper than 40° Toppling failure occurs on slopes steeper than 50°
South west facing	✓	X	X	40°	Planar sliding occurs on slopes steeper than 40°
West facing	X	✓	X	50°	Wedge failure occurs on slopes steeper than 50°

Dips analysis for the North Wall is included in Appendix D.

5.2.2 North Wall Rockfall Risk

The main controls on North Wall stability are the discontinuities within the rock mass.

Analysis of the rock fall risk caused by the discontinuities has been completed using Rocscience Rocfall software. The model used has assumed that the proposed future filled ground surface will be at a level of RL 92 m. Note that the software is limited to single rock fall events and does not allow for multiple failures occurring instantaneously (i.e. cliff collapse events). A design rock size of 300 mm square has been used based on observed fallen rocks at the base of the quarry wall. The results for each of the three scenarios in both static and seismic conditions indicate the following:

- **Scenario 1:** When loose rock falls from the face at any height, the benches capture the falling rock before it reaches the ground (i.e. only the rock falling from beneath the bottom bench reaches the proposed ground level). However, as observed in the past, debris from wedge failures may be large enough to overtop the bench immediately below the failure and land on the bench below that.
- **Scenario 2:** Rock fall from the upper 55° batter slopes with 5 m benches is captured by the benches. The steeper batters and narrower benches towards the base of the slope are likely to be overwhelmed with rock fall debris and overtop in time. The effects of such failures will be dependent on the routine maintenance scheduled to clear fallen debris from each bench.
- **Scenario 3:** Rock fall from the slope is likely to be captured by the 5 m wide benches.

Suitable mitigation measures to minimise the risk of rock fall affecting future site users is discussed in Section 6.3. Rocfall outputs are presented in Appendix A.

5.2.3 North Wall Global Stability – Large Scale Deep Seated Landslides

The global stability of the North Wall has been modelled using Rocscience Slide software. This analysis was primarily undertaken to assess the risk of global instability for the proposed commercial end use of the quarry, however the existing North Wall was also analysed for completeness of our review. Strength parameters used in this analysis were obtained using Rocscience Roclab, which evaluates equivalent Mohr-Coulomb shear strength parameters, based on the Generalized Hoek-Brown shear-normal function, with assumed conservative bedrock strengths and characteristics. A review of relevant technical journal papers has been undertaken regarding the selection of strength parameters used in the model. There are inherent difficulties in selecting these parameters in Greywacke of the Wellington region, as the rock strength is generally controlled by the discontinuities within the rock mass, rather than the rock mass itself. The strength parameters obtained using Roclab have therefore been adjusted to accommodate the information reviewed in the papers to give more reliable parameters.

The selected parameters are given in Table 2.

Table 2: Slope Stability Parameters – North Wall

Rock Weathering	Cohesion (kPa)	Friction Angle (°)
Highly to Moderately	90	30
Slightly Weathered	470	56

The analysis was carried out under static and seismic conditions (earthquake magnitude 7.5) and the results are presented in Table 3.

Table 3: Global Slope Stability of the North Wall – Failure through Moderately Weathered Greywacke

Scenario	Factor of Safety		
	Static	1 in 50 year Earthquake (0.13g)	1 in 500 year Earthquake (0.35g)
1	1.26	1.07	0.82
2	1.35	1.11	0.82
3	1.51	1.25	0.93

In the slope stability analysis, the degree of stability of a slope is expressed as the 'factor of safety' (FOS) which is the ratio of the forces resisting failure to the driving forces causing instability.

Theoretical failure of a slope is possible when the FOS is less than 1.0, while increasing values above 1.0 indicate improving stability. A minimum FOS of 1.5 and 1.2 are commonly adopted for slopes under long term static / seismic conditions respectively.

The failure with the lowest factor of safety in each scenario is limited to the upper highly to moderately weathered Greywacke layer. Groundwater levels were added to the slope stability models for the existing condition (Scenario 1), being the highest feasible groundwater level and lower groundwater level. The high groundwater level used is shown in Appendix B. The levels were selected based on the understanding that, during and after high rainfall events, groundwater has not been observed seeping out of the slope. In both high and low groundwater cases, the effect of groundwater in the system does not affect the failure with the lowest factor of safety.

The results indicate that:

- **Static:** In all scenarios, the slope is globally stable, with a minimum FOS of 1.26.
- **SLS:** In a 1 in 50 year earthquake, in all cases the FOS is greater than 1, and therefore the global stability of the slope is expected to be maintained during an earthquake of this magnitude (0.13g). Note that this model does not allow for small scale rock failures from the rock face, which are expected in this size of event.
- **ULS:** In a 1 in 500 year earthquake, all scenarios have a FOS < 1 and therefore the likelihood of failure is high. If failure of the slope in a 1 in 500 year earthquake is not acceptable, further seismic analysis can be undertaken to assess the likely amount of displacement to be expected in such an event.

Further analysis has been undertaken to find out the factors of safety against failure of the whole face (i.e., Global Failure). A slip circle was modelled, which extends through the slightly weathered Greywacke within the lower slopes. The results are given in Table 4.

Table 4: Global Slope Stability of the North Wall – Failure through Slightly Weathered Greywacke

Scenario	Factor of Safety					
	High Groundwater			No Groundwater		
	Static	1 in 50 year Earthquake (0.13g)	1 in 500 year Earthquake (0.35g)	Static	1 in 50 year Earthquake (0.13g)	1 in 500 year Earthquake (0.35g)
1	2.02	1.57	N/A	2.67	2.16	1.42
2	2.72	1.99	N/A	2.88	2.36	1.93
3	2.86	2.35	N/A	3.82	3.10	2.66

A 1 in 500 year earthquake event with high groundwater level has not been modelled due to the low probability of these events occurring simultaneously.

The results indicate that a global failure through the slightly weathered Greywacke is unlikely. All Slide outputs are presented in Appendix B.

5.3 North Wall Slope Remediation

Table 5 details the risk reduction measures suitable for mitigation of the site from slope instability at the end of the Quarry operations.

Table 5: North Wall Risk mitigation measures

Scenario	Mitigation
1	<p>If the slope remains at the current slope angle of around 80°, a minimum 15 m no-build zone from the base of the North Wall should be allowed for.</p> <p>An approximately 10 m wide catch ditch and outer bund (subject to geotechnical design) will be required at the base of the slope to catch loose material, which will need to be cleared regularly.</p> <p>Pedestrian access to the no build zone should be restricted.</p> <p>Alternatively, if regular maintenance is not considered to be possible, other remedial measures should be considered (see Section 9)</p> <p>Alternatively, the top part of the slope comprising completely to moderately weathered rock may be regraded to a shallower angle of no more than 55°.</p>
2	<p>Clearing of the upper 5 m wide benches will be required on a regular basis to prevent the build-up of rock fall debris.</p> <p>A no build zone of 10 m from the base of the North Wall should be allowed for.</p> <p>An approximately 5 m wide catch ditch and outer bund (subject to geotechnical design) will be required at the base of the slope to catch loose material, which will need to be cleared regularly.</p> <p>Pedestrian access to the no build zone should be restricted.</p> <p>Alternatively, if regular maintenance is not considered to be possible, other remedial measures should be considered (see Section 9)</p>
3	<p>Clearing of the benches will be required on a regular basis to prevent the build-up of rock fall debris.</p> <p>A no build zone of 5 m from the base of the North Wall should be allowed. Alternatively, the buildings should be designed with no windows on the wall closest to the slope, and the walls and roof designed to withstand impact loads from falling rock debris and static loads from debris accumulation.</p> <p>An approximately 2 m wide catch ditch and outer bund (subject to geotechnical design) will be required at the base of the slope to catch loose material, which will need to be cleared regularly.</p> <p>Pedestrian access to the no build zone should be restricted.</p> <p>Alternatively, if regular maintenance is not considered to be possible, other remedial measures should be considered (see Section 9)</p>

6 West Wall

It is proposed to extend the West Wall further to the north. The current proposal is to form 15 m high cut batters with a south facing aspect (see proposed sketch plan presented as Figure 2). Defect mapping was undertaken on the West Wall in 2012. During our recent quarry visit on 25 August 2014, additional kinematic data was collected. All the data collected for the West Wall has been analysed using Rocscience Dips. The results of the analysis are discussed in the following section. The Dips outputs are presented in Appendix D.

A slip has occurred recently at the location of the West Wall, which is believed to be activated on a planar discontinuity as a result of steep cut batters and loading of overburden at the slope crest.

Figure 2: Sketch Plan of Proposed West Wall Batters



6.1 West Wall Stability

6.1.1 Kinematic Analysis of Discontinuities

The main control on slope instability on the West Wall currently is planar sliding on Joint Set 2, which will occur if batter slopes are cut at an angle of 45° or more with an east facing slope aspect. There is also some risk of toppling failure on bedding planes if the cut slopes are steeper than 30° .

With the proposed south facing slope aspect, wedge failures are likely to occur at cut batters steeper than 45° . As with an east facing slope, there is a risk of toppling failure on bedding planes if the cut slopes are steeper than 30° .

A suspected inactive fault is located at the intersection between the West Wall and the North Wall. However, the proposed south facing cut batters are located some metres to the west of this feature

and so it is unlikely that significant deformation features will be present in the rock mass around the proposed south facing batters.

As for the North Wall, the proposed orientations for the West Wall may vary. Analysis has been undertaken of the effect of different slope aspects on slope stability on the West Wall and the results and recommendations are presented in Table 6. In all cases, benches not less than 5 m wide should be constructed to catch any small-scale failures and will need to be regularly maintained to remain effective. Note that failures may occur if slopes are cut steeper than recommended. If slopes are required to be steeper than those recommended, a risk assessment should be carried out, to assess whether the consequence of failures would be acceptable (see Section 9 for further information).

Table 6: West Wall Batter Slope Design Recommendations

Possible Slope Aspects	Control on Stability			Recommended Slope Batter Angle	Comments
	Planar	Wedge	Toppling		
South facing	X	✓	✓	50°	Wedge failure occurs on slopes steeper than 50° Low risk of toppling failure on slopes steeper than 30°
South east facing	✓	✓	X	45°	Planar failure occurs on slopes steeper than 45° Wedge failure occurs on slopes steeper than 50°
South west facing	✓	X	✓	50°	Planar failure occurs on slopes steeper than 55° Toppling failure occurs on slopes steeper than 50°
East facing	✓	✓	X	40°	Planar failure occurs on slopes steeper than 40° Wedge failure occurs on slopes steeper than 45°
North east facing	✓	✓	✓	40°	Planar failure occurs on slopes steeper than 40° Wedge failure occurs on slopes steeper than 40° Toppling failure occurs on slopes steeper than 45°
North facing	X	X	✓	45°	Toppling failure occurs on slopes steeper than 45°

6.1.2 West Wall Global Stability – Large Scale Deep Seated Landslides

The global stability of the West Wall has been modelled using Rocscience Slide software. This analysis was primarily undertaken to assess the risk of global instability for the proposed cut slope design of 40 degree slope angle with 5 m benches every 15 m vertical distance. The existing West Wall has also been analysed for completeness of our review. See Table 2 for the strength parameters used in this analysis.

The analysis was carried out under static and seismic conditions (earthquake magnitude 7.5) and the results are presented in Table 7.

Table 7: Global Slope Stability of the West Wall – Failure through Moderately Weathered Rock

Case	Factor of Safety					
	High Groundwater			No Groundwater		
	Static	1 in 50 year Earthquake (0.13g)	1 in 500 year Earthquake (0.35g)	Static	1 in 50 year Earthquake (0.13g)	1 in 500 year Earthquake (0.35g)
Existing	1.96	1.53	NA	2.13	1.67	1.20
Proposed	2.85	2.32	NA	2.88	2.34	1.74

The failure with the lowest factor of safety in both existing and proposed cases is limited to the upper highly to moderately weathered Greywacke layer. Groundwater levels were added to the slope stability models; the effect of groundwater in the system does lower the factor of safety slightly in both cases but the effect is larger in the existing case.

The results indicate that:

- **Static:** In all scenarios, the slope is globally stable, with a minimum FOS of 1.96.
- **SLS:** In a 1 in 50 year earthquake, in all cases the FOS is greater than 1, and therefore the global stability of the slope is expected to be maintained during an earthquake of this magnitude (0.13g). Note that this model does not allow for small scale rock failures from the rock face, which are expected in this size of event.
- **ULS:** In a 1 in 500 year earthquake, both cases have a FOS greater than 1 and therefore the global stability of the slope is expected to be maintained during an earthquake of this magnitude (0.35g). Note that this model does not allow for small scale rock failures from the rock face, which are expected in this size of event.

Further analysis has been undertaken to find out the factors of safety against failure of the whole face (i.e., Global Failure). A slip circle was modelled which extends through the slightly weathered Greywacke within the lower slopes. The results are given in Table 8.

Table 8: Global Slope Stability of the West Wall – Failure through Slightly Weathered Greywacke

Case	Factor of Safety					
	High Groundwater			No Groundwater		
	Static	1 in 50 year Earthquake (0.13g)	1 in 500 year Earthquake (0.35g)	Static	1 in 50 year Earthquake (0.13g)	1 in 500 year Earthquake (0.35g)
Existing	3.61	3.01	NA	4.55	3.77	2.90
Proposed	4.04	3.08	NA	4.64	4.17	2.88

A 1 in 500 year earthquake event with high groundwater level has not been modelled due to the low probability of these events occurring simultaneously.

The results indicate that a global failure through the slightly weathered Greywacke is unlikely. All Slide outputs are presented in Appendix C.

7 Area H

It is proposed to begin rock extraction from Area H to the south of the quarry (also known as the southern area). During our quarry visit on 25 August 2014, the accessible defects in this area were mapped. The Greywacke rock in this area is noticeably more fractured than in the main quarry, and the defects appear to be more randomly orientated with a wide range of dip angles.

Seven boreholes were drilled in June 2014 by McMillan Drilling Group and supervised by Ormiston associates. Defects recorded in the boreholes in this area are summarised as follows:

1. Moderately to widely spaced (0.2 m to 2 m) sub-vertical joints dipping at an angle of $>80^\circ$;
2. Closely to moderately widely spaced (60 mm to 600 mm) sub-vertical joints dipping at an angle of $>75^\circ$;
3. Moderately to widely spaced joints dipping at an angle of $55-70^\circ$;
4. Closely to moderately widely spaced joints dipping at an angle of $40-50^\circ$;
5. Closely to moderately widely spaced joints dipping at an angle of $20-45^\circ$; and
6. Closely to moderately widely spaced sub-horizontal joints dipping at an angle of $<20^\circ$.

7.1 Controls on Stability

The mapped defects have been analysed with Rocscience Dips software. The Dips outputs are presented in Appendix D. The results indicate that the main controls on slope instability in Area H are likely to be:

- Possibility of planar failure on Joint Set E at batter angles greater than 45° ;
- Possibility of wedge failure at the intersection between Joint Sets C and E which may occur at cut batter angles greater than 45° ; and
- Toppling failure is possible in batter slopes steeper than 30° .

There are at least six defects logged in the boreholes drilled in Area H. Due to the rotary drilling method used, the orientations of the defects have not been determined. Defects appear to be dipping between a range of <20 to >80 which is generally consistent with the observational data collected.

7.2 Recommendations for Cut Batter Angles

Due to the wide range of dip angles and random defect orientations in this area, a conservative cut batter angle of 45° is recommended with a minimum of 5 m wide benches. The vertical interval between benches should be no more than 15m, unless specifically designed. Cut batters formed at this angle are likely to minimise the occurrence of small scale planar and wedge failures, however, these may still occur periodically. Toppling failure is expected to occur at a cut batter of 45° , however these are expected to be bench scale failures. The 5 m wide benches would be required to catch the majority of these small scale failures, and will require periodic debris clearance as part of ongoing maintenance requirements.

As excavations progress in Area H at a cut batter angle of 45° , further defect mapping and an assessment of cut slope stability should be undertaken to assess whether the cut batters could be

increased to 55°. At this stage, the future scope of any required ground investigation can be determined.

8 Quarry Risk Assessment – Cut Slopes

Tables 1 and 6 and Section 7.2 give recommended cut batter angles for long term slope stability for unprotected slopes. These recommended batter angles are based on analysis using computer software and observations of the performance of existing cut slopes on site. The slope angles take into consideration both cut slope stability during quarry operations and after the quarry site has changed to commercial use.

Whilst it is clear that some of the cut slopes may be maintained and small scale failures (particularly toppling failures) be managed during regular quarry operations (i.e. ongoing bench clearance), consideration must also be given at this stage to long term maintenance requirements after quarry operations have ceased. This is likely to be more difficult to guarantee.

The Holcim Risk Assessment Matrix in Figure 3 has been used when considering the recommended slope batter angles in this report. The safety of current and future site users must be considered when planning for quarry expansion. It is considered that if the cut batter angles are steepened to angles greater than those given in this report, then the combination of Likelihood Category C – Possible and Consequence Category 5 – Disaster, results in an unacceptable “high” risk. If cut batter angles are required to be steeper than those recommended in this report, then before the quarry is handed back to WCC, slope remediation options must be considered (see Section 9).

Figure 3: Holcim Risk Assessment Matrix

ASSESSMENT MATRIX FOR USE WITH HAZARD AND INCIDENT MANAGEMENT					
Category	Consequence <i>Hazards: How bad could it get? Incidents: How bad did it get? How bad could it have been?</i>				
People Safety	Fatality or multiple fatalities	Permanent Disability	Lost Time Injury	MTI	FAI
Quality	>\$1 Million Recall / Stop production	\$100,000 - 1M Recall / Stop production	\$10,000-\$100,000 Requires action	\$1000-\$10000 Requires action	< \$1,000
Environment	Long term effect Prosecution expected	Significant Effect Prosecution Likely	Uncontrolled discharge with minor effects on the environment, moderate non-compliance.	Uncontrolled release, discharge or spill locally contained & short-term non-compliance.	Complaint, minor discharge or spill
Assets Damage	> \$1 Million	\$100,000 - 1M	\$10,000-\$100,000	\$1000-\$10000	< \$1,000
Business Continuity	Critical interruption > 5 days	Serious interruption 2-5 days	Moderate interruption 1-2 days	Minor interruption Up to 1 day	Low interruption Up to 2 hours
Reputation	National/ international long-term. Known statutory violation, criminal offence, and possible imprisonment.	Widespread long-term local. Medium-term national. Statutory violation. Legal prosecution.	Medium-term local. Short-term national. Statutory violation. Abatement notice and fined.	Medium-term local. Reportable violation of consent. Informal warning by authority.	Short-term local. Not regulated necessarily. Regulated by an authority.
	5 Disaster	4 Severe	3 Serious	2 Significant	1 Low
A Certain	High	High	High	Medium	Medium
B Likely	High	High	Medium	Medium	Low
C Possible	High	Medium	Medium	Low	Low
D Unlikely	Medium	Medium	Low	Low	Low
E Rare	Medium	Low	Low	Low	Low

The commonly accepted long term maximum batter slope angle of Greywacke in the Wellington Region is 55% (without adverse defect orientation) and it is recommended that permanent slopes are not cut steeper than this within the Quarry.

9 Remedial Options

If the recommended cut slope angles in Tables 1 and 6 and Section 7.2 are required to be steepened, then short term slope maintenance during quarry operations as well as long term slope remediation to safeguard the safety of future site users will be required.

9.1 Maintenance During Quarry Operations

Benches will need to be designed to allow regular access for machinery or quarry workers to safely remove any debris accumulating from failures above. This is required to maintain the ability of the benches to catch falling debris.

9.2 Long Term Remedial Options

If regular maintenance of the slopes and any future catch ditch and bund cannot be undertaken, then slope remedial options for long term stability should be considered. Low maintenance remedial options could include:

- No build zone;
- Anchored mesh; or
- Anchored shotcrete.

10 Overburden

Overlying the moderately weathered rock in all areas there is expected to be a veneer of highly weathered rock, loess and colluvium comprising silty soil. It is recommended that this material is cut at a slope angle of no more than 1V:2H for permanent excavations. Further investigation of this material is required if higher angle slopes are required.

11 Summary

Geoscience Consulting (NZ) Limited has been engaged by Holcim (NZ) Limited to provide geotechnical and geological reporting for the further development of the quarry, specifically in the areas of the North Wall, West Wall and Area H.

The following scope of work was undertaken:

- Review of Ormiston Associates borehole logs of the recently drilled boreholes and recent reports;
- Geological mapping of the West Wall and Area H on 25 August 2014;
- Kinematic analysis of the results of the mapping undertaken in 2012 to assess bench scale and multiple bench scale stability of the North Wall batter slopes
- Kinematic analysis of the results of the mapping to assess bench scale and multiple bench scale stability of the proposed West Wall batter slopes;

- Global stability assessment of the West Wall to inform cut batter design;
- Kinematic analysis of the results of the mapping to propose safe cut batters and benches for Area H;
- Use of the available data (previous discontinuity mapping, Ormiston report, borehole logs) to produce a preferred methodology to maximise the resource at North Wall;
- Global stability assessment of the North Wall to assess appropriate remedial solutions; and
- Analysis of the rock fall risk of the North Wall to give an initial indication of the potential set back distance that may be required for the construction of buildings at the base of the slope.

Three scenarios for the design of the North Wall have been assessed with regard to global slope stability and future rock fall risk as the quarry is developed into a commercial area when quarry operations have ceased. Mitigation measures to reduce the consequence of instability have been provided.

Kinematic analysis of discontinuities on the North Wall and West Wall has been undertaken to assess the consequence of a variation in slope aspect on slope stability. Optimum batter slope angles have been recommended to minimise these failures.

Kinematic analysis of discontinuities in Area H has been undertaken to assess the optimum cut batter angle in this area.

12 References

Geoscience, 2012, *Kiwi Point Quarry Pit Slope Stability Review*, Holcim (NZ) Limited

Begg, J.G. & Mazengarb, C., 1996, *Geology of the Wellington Area, scale 1:50000. Institute of Geological and Nuclear Sciences Geological Map 22. 1 sheet + 128 p.* Lower Hutt, New Zealand: Institute of Geological and Nuclear Sciences Limited.

Hoek, E., Carranza-Torres, C and Corkum, B (2002). *Hoek-Brown Failure Criterion – 2002 Edition*. Proc. NARMS-TAC Conference, Toronto, 2002, 1, 267-273.

Ormiston Associates, undated, *Kiwi Point Resource Review 2014*.

Pender, M. J., 1980, *Friction and Cohesion Parameters for Highly and Completely Weathered Wellington Greywacke*, Aust-NZ 3rd Conference on Geomechanics.

Read, S.A.L, Richards, L., Perrin, N, 2000, *Assessment of New Zealand Greywacke Rock Masses with the Hoek-Brown Failure Criterion*, GeoEng 2000, Melbourne.

13 Limitations

- i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Holcim New Zealand Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.
- ii. The recommendations in this report are based on the ground conditions indicated from published sources, site inspections and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the Client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it must be appreciated that actual conditions could vary from the assumed model.
- iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.
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We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned if you require any further information.

Report prepared by



Karen Jones

Senior Engineering Geologist

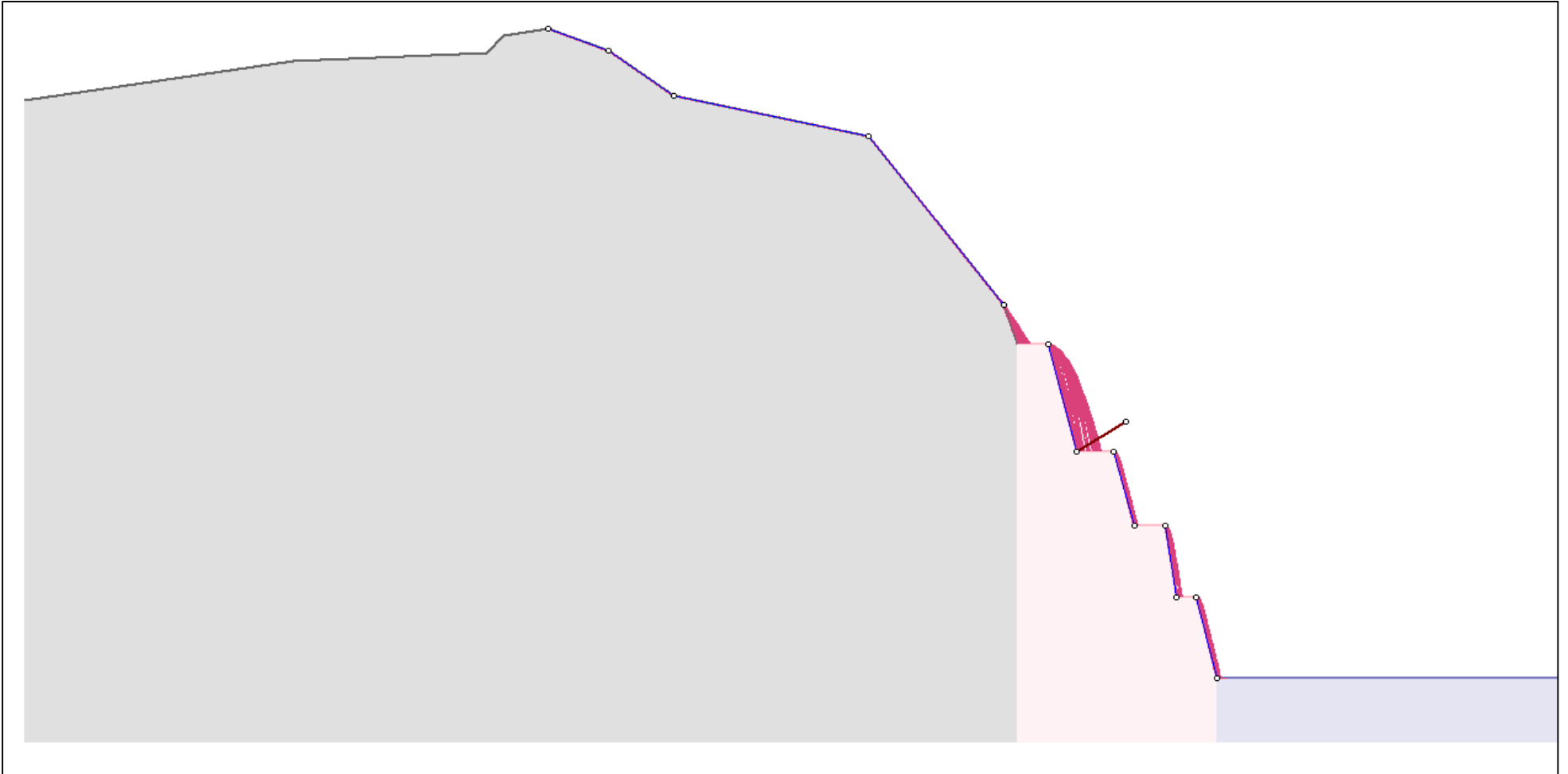
Reviewed by



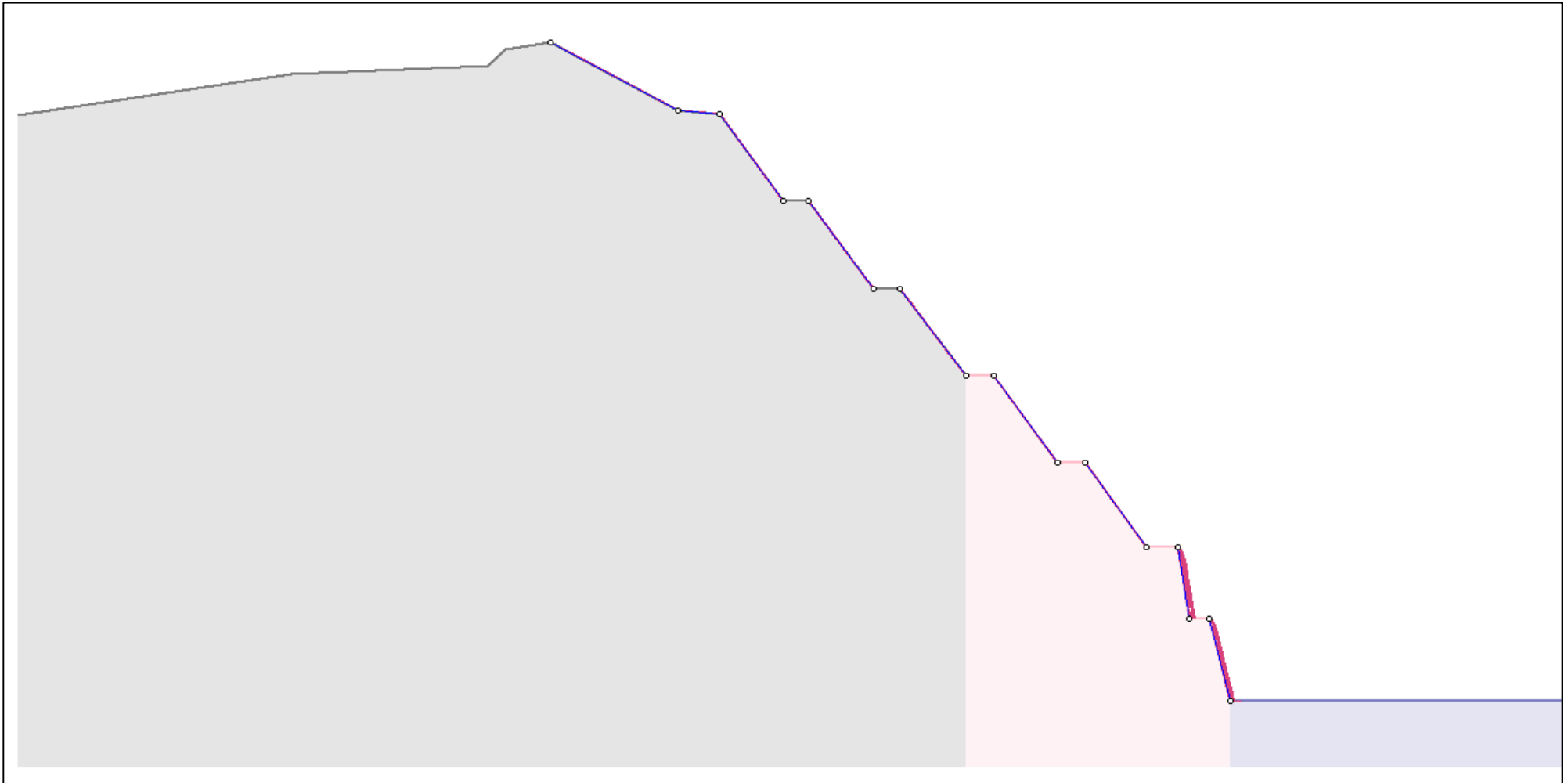
Guy Cassidy, MIPENZ, PEngGeol

Associate Engineering Geologist

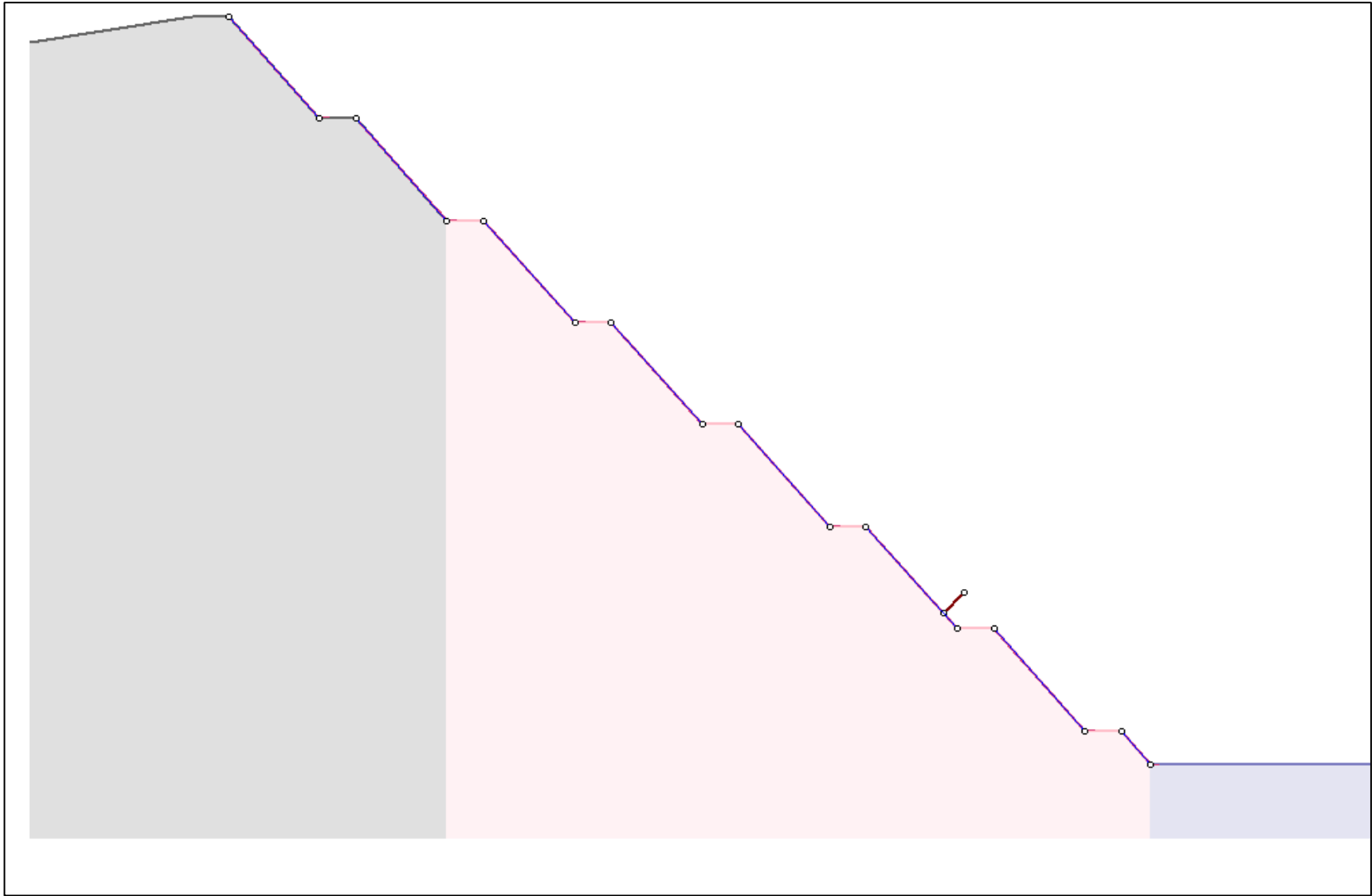
Appendix A
Rocfall Modelling



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Rocfall Model - Scenario 1 (Seismic)		
Appendix A	1	Project Number	10315



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 2 (Seismic)		
Appendix A	2	Project Number	10315

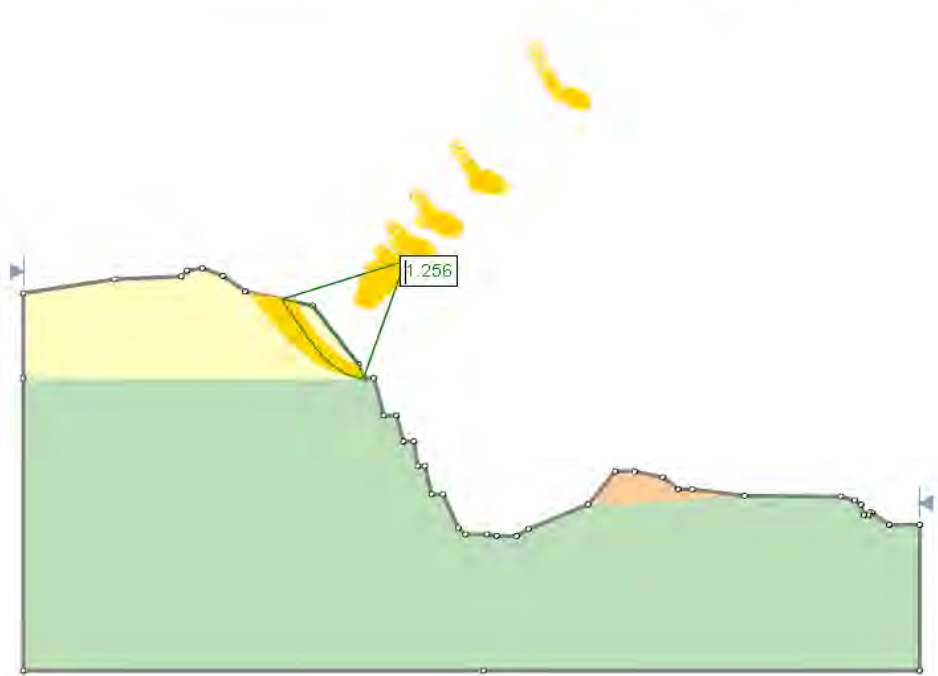


Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 3 (Seismic)		
Appendix A	3	Project Number	10315




Appendix B

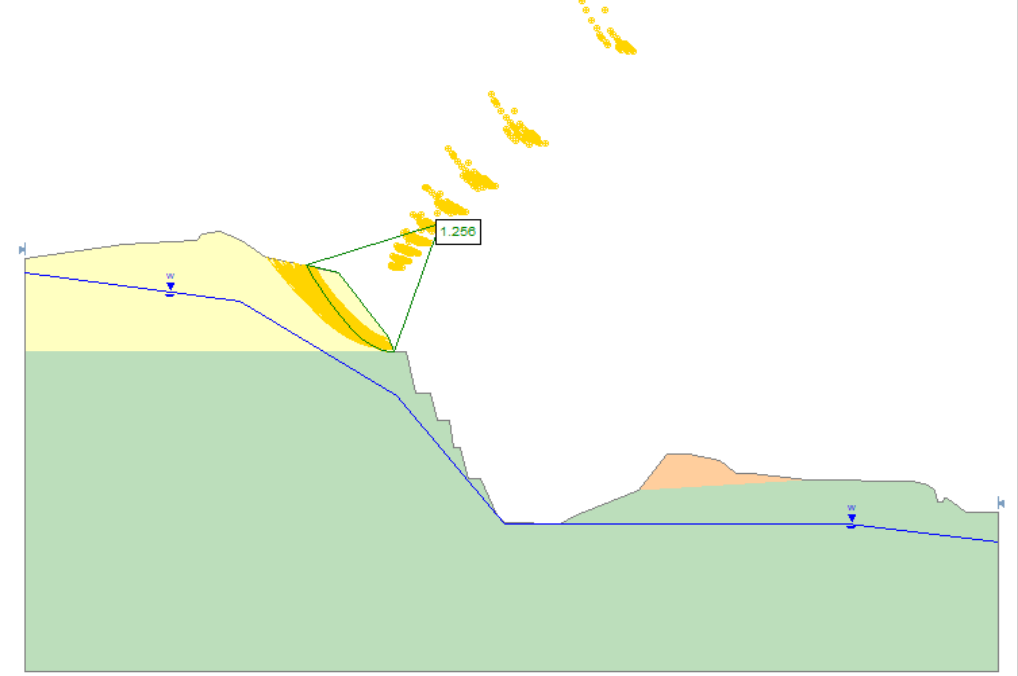
North Wall Slide Slope Stability Outputs

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Highly to moderately weathered		24	Mohr-Coulomb	91	30	None	0
Slightly Weathered to fresh		26	Mohr-Coulomb	469	56	None	0
Fill		18	Mohr-Coulomb	1	32	None	0



Static - no Groundwater

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type
Highly to moderately weathered		24	Mohr-Coulomb	91	30	Water Surface	Constant
Slightly Weathered to fresh		26	Mohr-Coulomb	469	56	Water Surface	Constant
Fill		18	Mohr-Coulomb	1	32	Water Surface	Constant



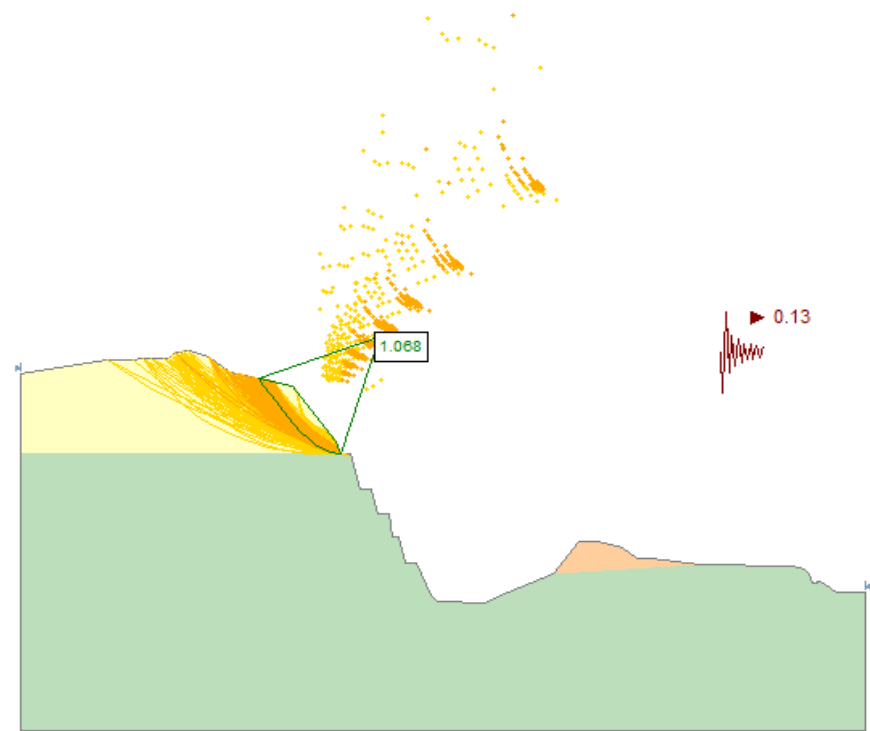
Static - high Groundwater

Failure surfaces with a factor of safety of less than 1.5 shown
 Failure through moderately weathered Greywacke



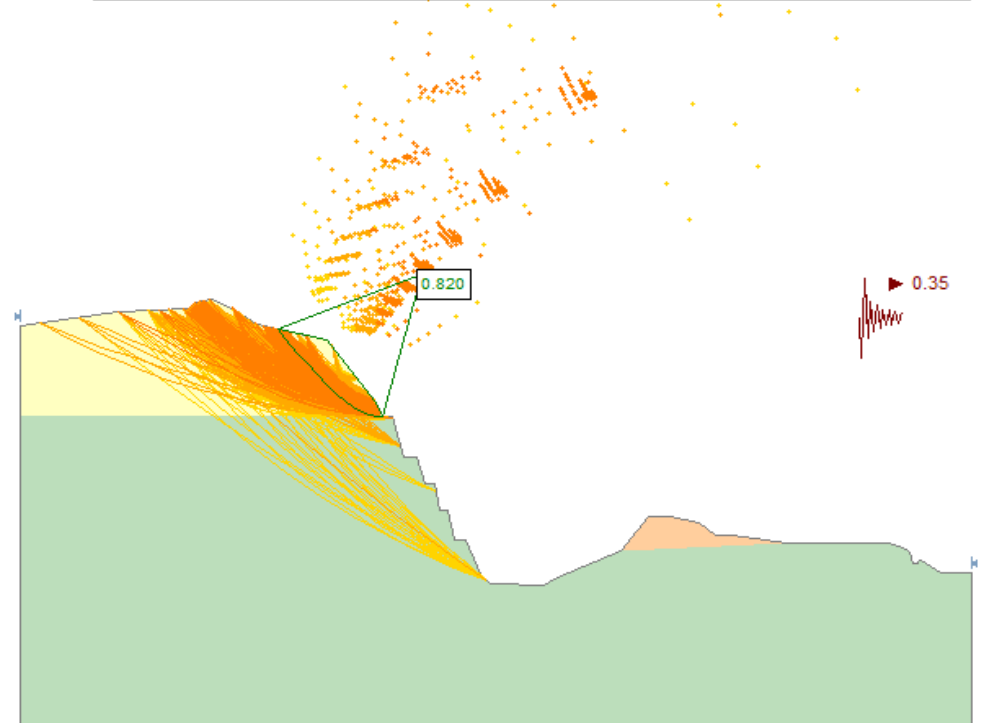
Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 1 (Static)		
Appendix B	1	Project Number	10315

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Highly to moderately weathered	Yellow	24	Mohr-Coulomb	91	30	None	0
Slightly Weathered to fresh	Green	26	Mohr-Coulomb	469	56	None	0
Fill	Orange	18	Mohr-Coulomb	1	32	None	0



1 in 50 year event

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Highly to moderately weathered	Yellow	24	Mohr-Coulomb	91	30	None	0
Slightly Weathered to fresh	Green	26	Mohr-Coulomb	469	56	None	0
Fill	Orange	18	Mohr-Coulomb	1	32	None	0





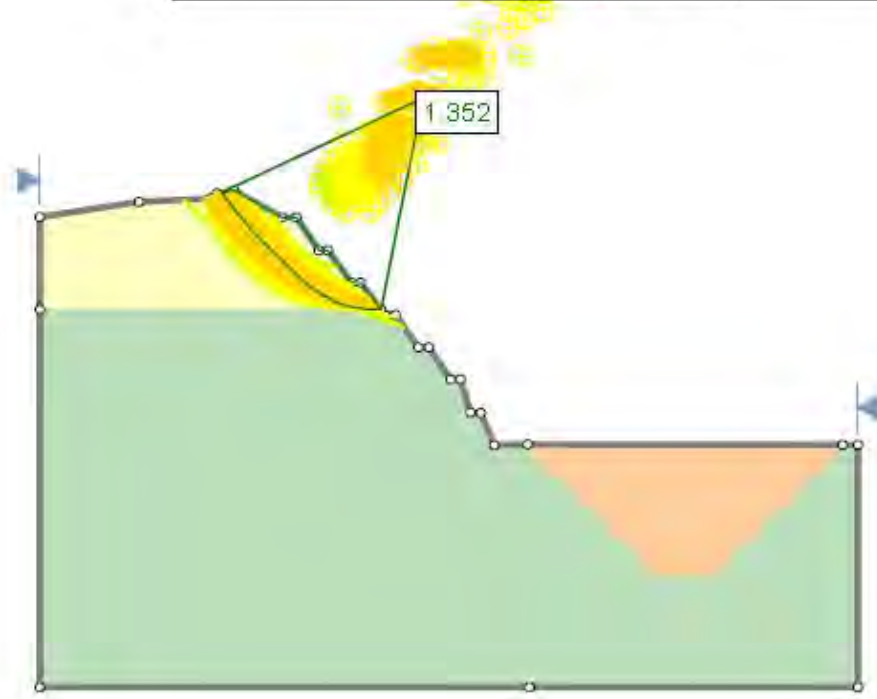
1 in 500 year event

Failure surfaces with a factor of safety of less than 1.5 shown
 Failure through moderately weathered Greywacke



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 1 (Seismic)		
Appendix B	2	Project Number	10315

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Highly to moderately weathered		24	Mohr-Coulomb	91	30	None	0
Slightly Weathered to fresh		26	Mohr-Coulomb	469	56	None	0
Fill		18	Mohr-Coulomb	1	32	None	0



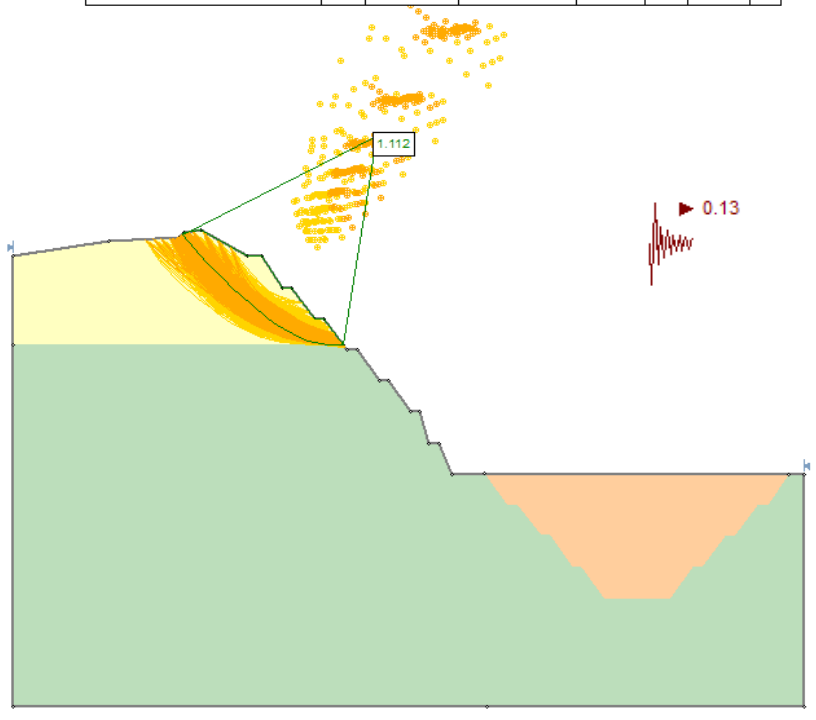
Static - no groundwater

Failure surfaces with a factor of safety of less than 1.5 shown
 Failure through moderately weathered Greywacke



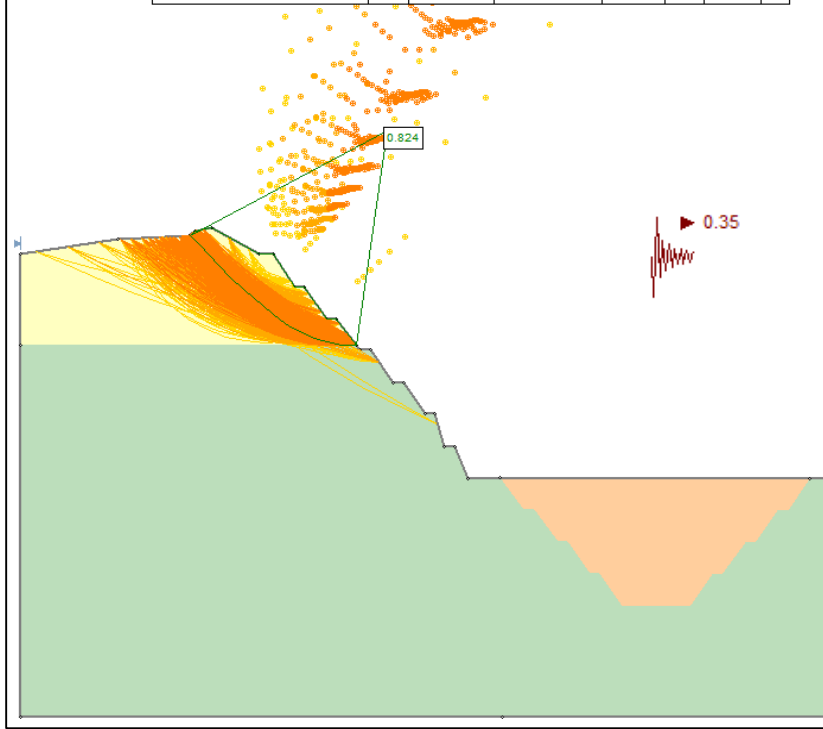
Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 2 (Static)		
Appendix B	3	Project Number	10315

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Highly to moderately weathered	Yellow	24	Mohr-Coulomb	91	30	None	0
Slightly Weathered to fresh	Green	26	Mohr-Coulomb	469	56	None	0
Fill	Orange	18	Mohr-Coulomb	1	32	None	0



1 in 50 year event

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Highly to moderately weathered	Yellow	24	Mohr-Coulomb	91	30	None	0
Slightly Weathered to fresh	Green	26	Mohr-Coulomb	469	56	None	0
Fill	Orange	18	Mohr-Coulomb	1	32	None	0



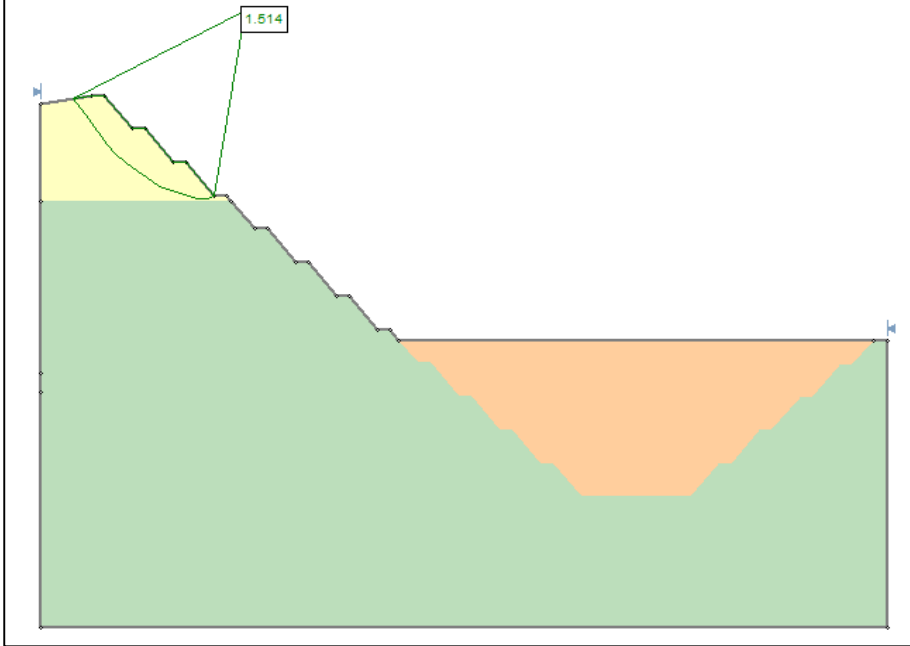
1 in 500 year event

Failure surfaces with a factor of safety of less than 1.5 shown
 Failure through moderately weathered Greywacke



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 2 (Seismic)		
Appendix B	4	Project Number	10315

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Highly to moderately weathered	Yellow	24	Mohr-Coulomb	91	30	None	0
Slightly Weathered to fresh	Green	26	Mohr-Coulomb	469	56	None	0
Fill	Orange	18	Mohr-Coulomb	1	32	None	0



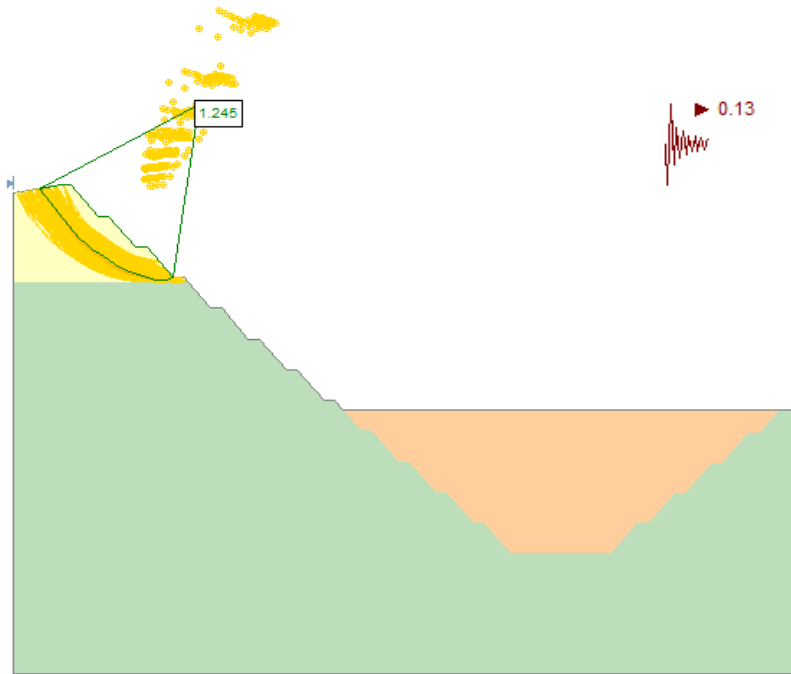
Static - no groundwater

No failure surfaces with a factor of safety of less than 1.5
 Failure through moderately weathered Greywacke



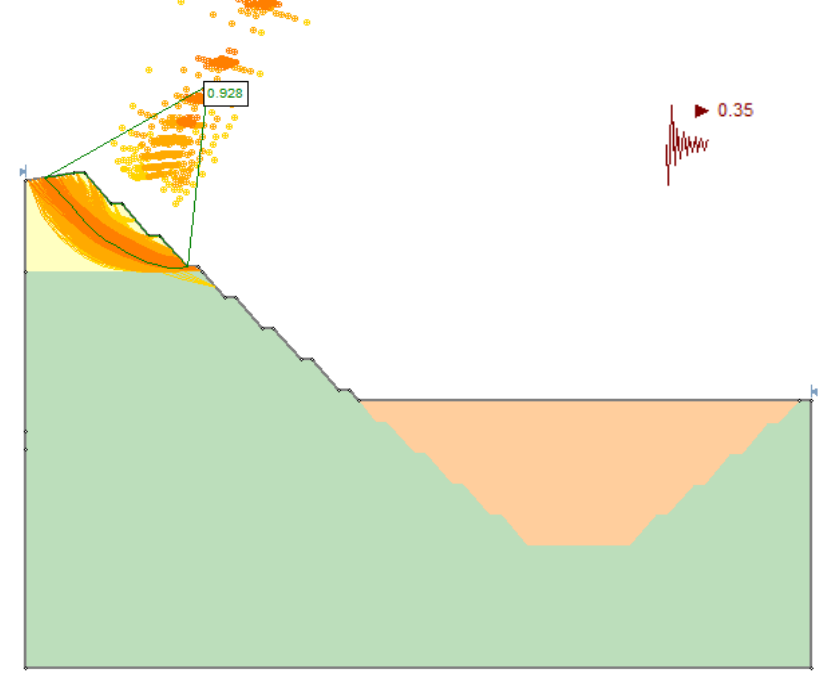
Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 3 (Static)		
Appendix B	5	Project Number	10315

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Highly to moderately weathered	Yellow	24	Mohr-Coulomb	91	30	None	0
Slightly Weathered to fresh	Green	26	Mohr-Coulomb	469	56	None	0
Fill	Orange	18	Mohr-Coulomb	1	32	None	0



1 in 50 year event

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Highly to moderately weathered	Yellow	24	Mohr-Coulomb	91	30	None	0
Slightly Weathered to fresh	Green	26	Mohr-Coulomb	469	56	None	0
Fill	Orange	18	Mohr-Coulomb	1	32	None	0

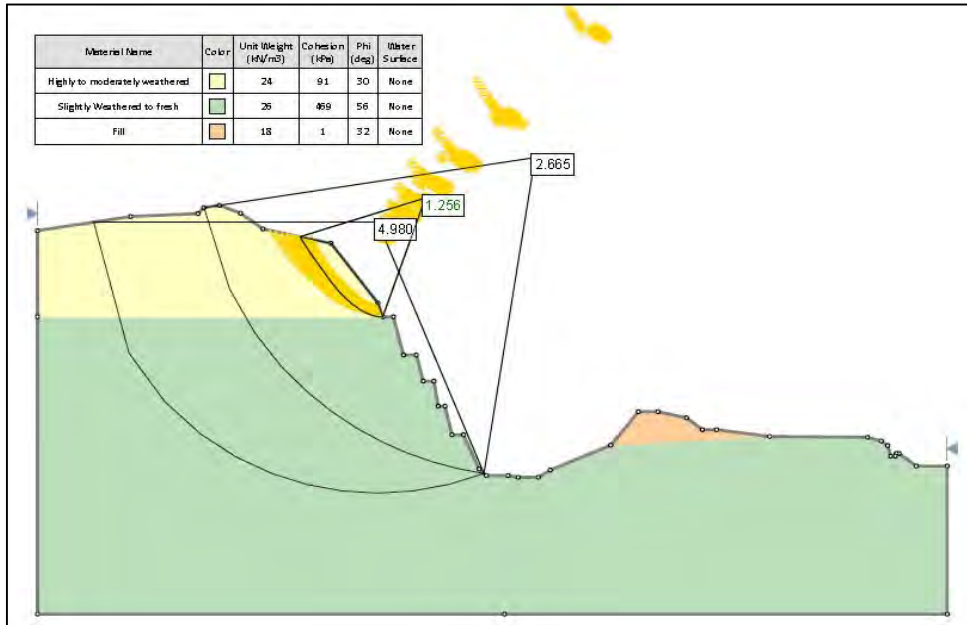


1 in 500 year event

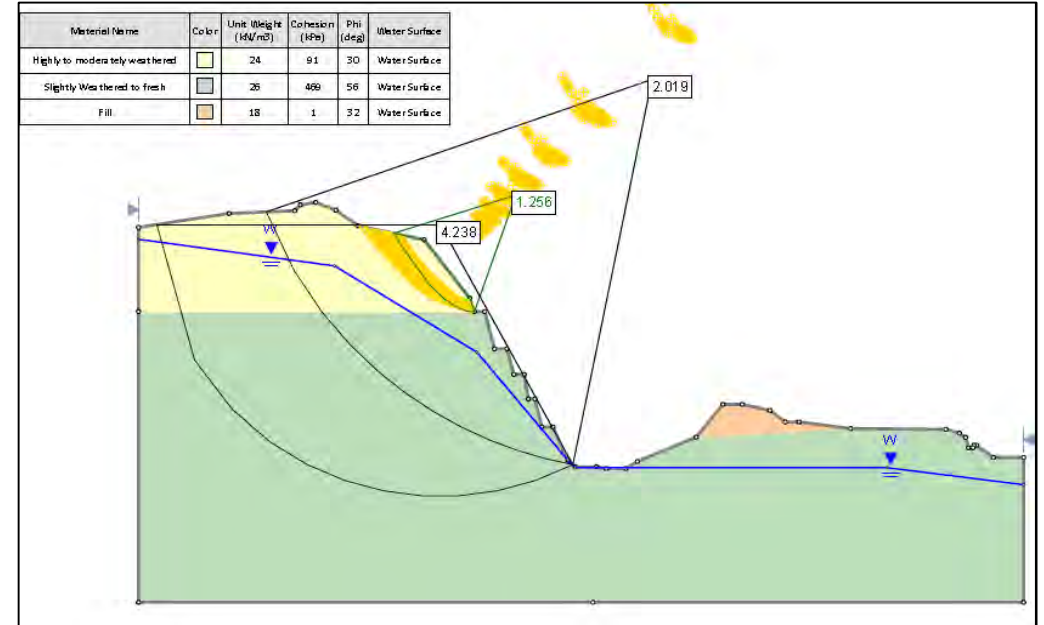
Failure surfaces with a factor of safety of less than 1.5 shown
 Failure through moderately weathered Greywacke



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 3 (Seismic)		
Appendix B	6	Project Number	10315



Static - no groundwater

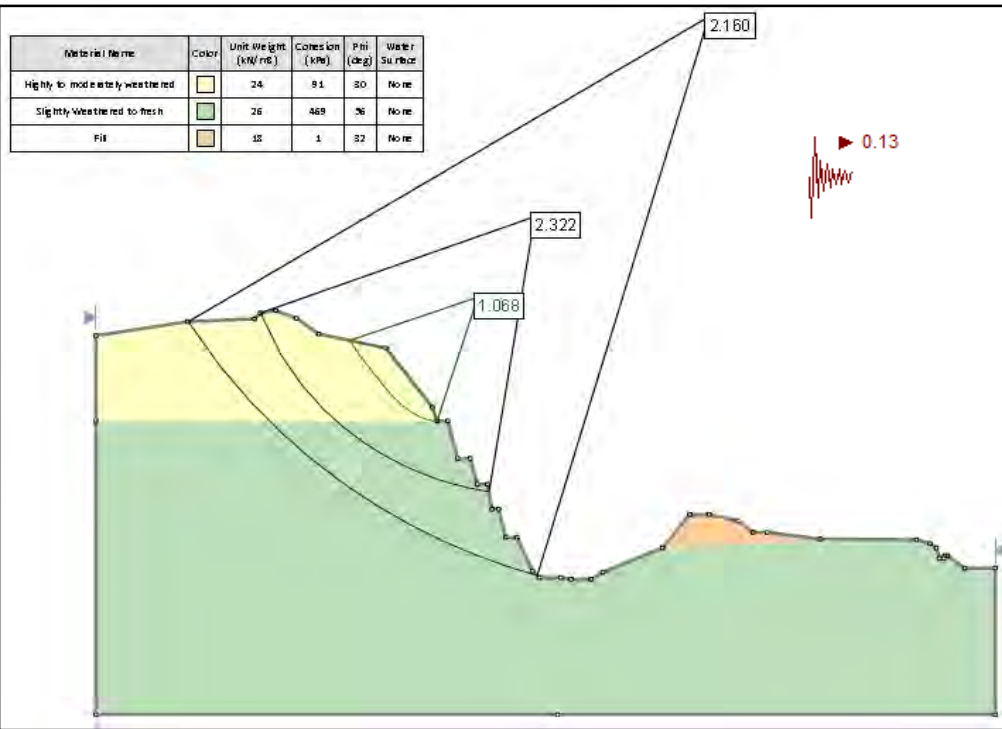


Static - high groundwater

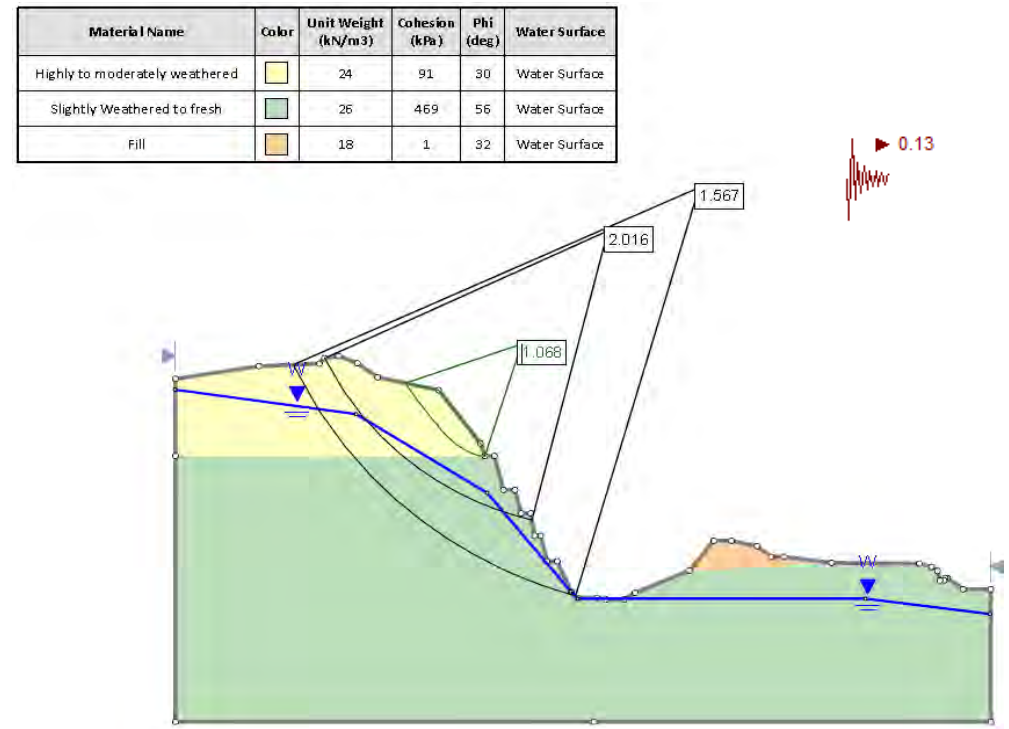
Failure surfaces with a factor of safety of less than 1.5 shown
Failures through slightly weathered Greywacke



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 1 (Static)		
Appendix B	7	Project Number	10315



1 in 50 year event no groundwater

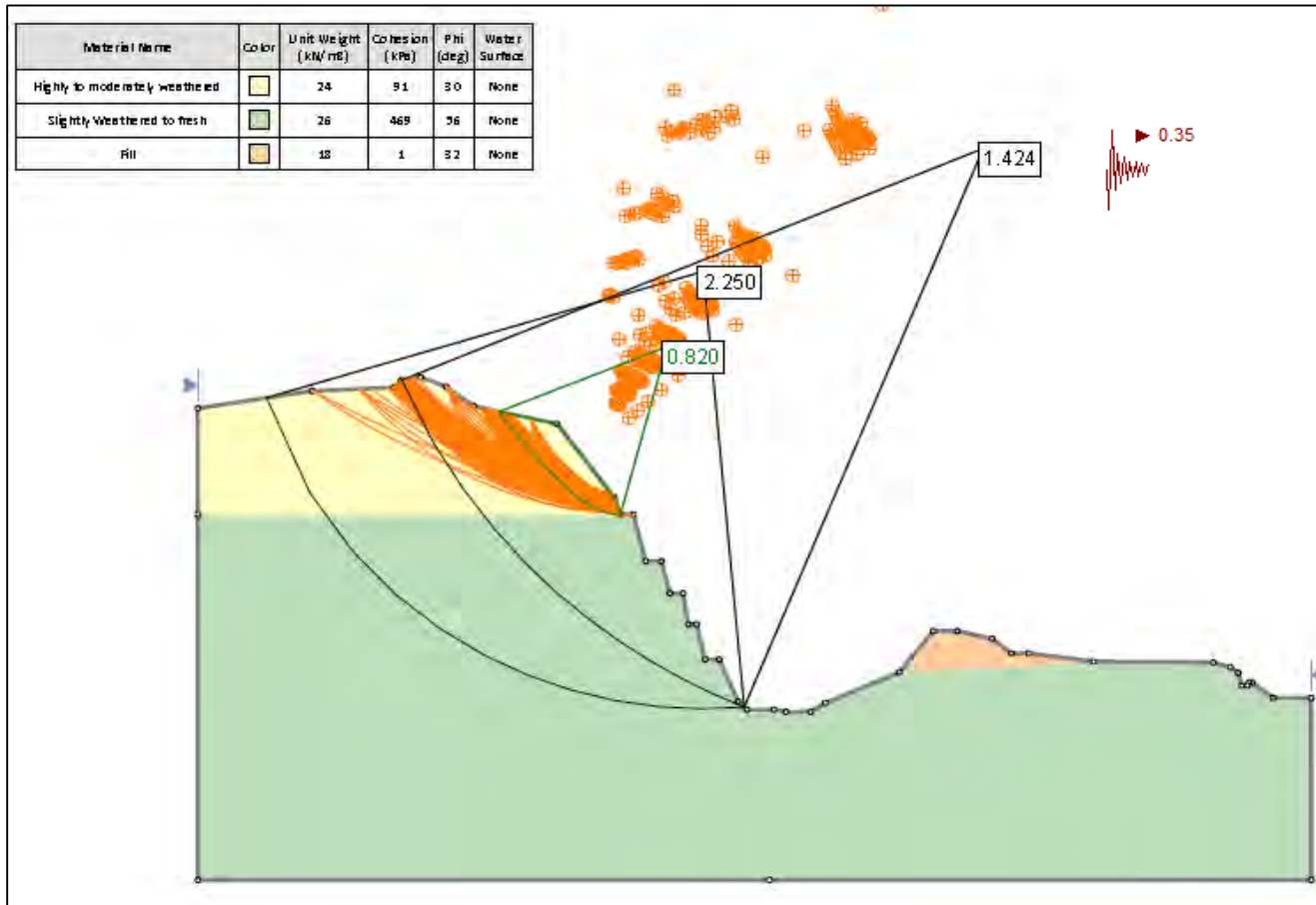


1 in 50 year event high groundwater

Failure surfaces with a factor of safety of less than 1.5 shown
Failures through slightly weathered Greywacke



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 1 (Seismic SLS)		
Appendix B	8	Project Number	10315



1 in 500 year event

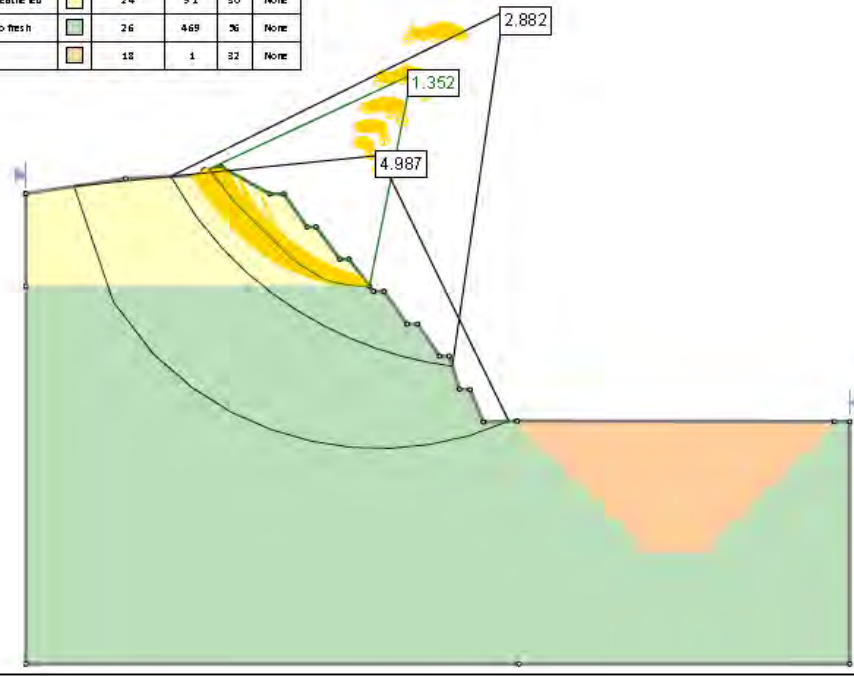
Failure surfaces with a factor of safety of less than 1.5 shown

Failures through slightly weathered Greywacke



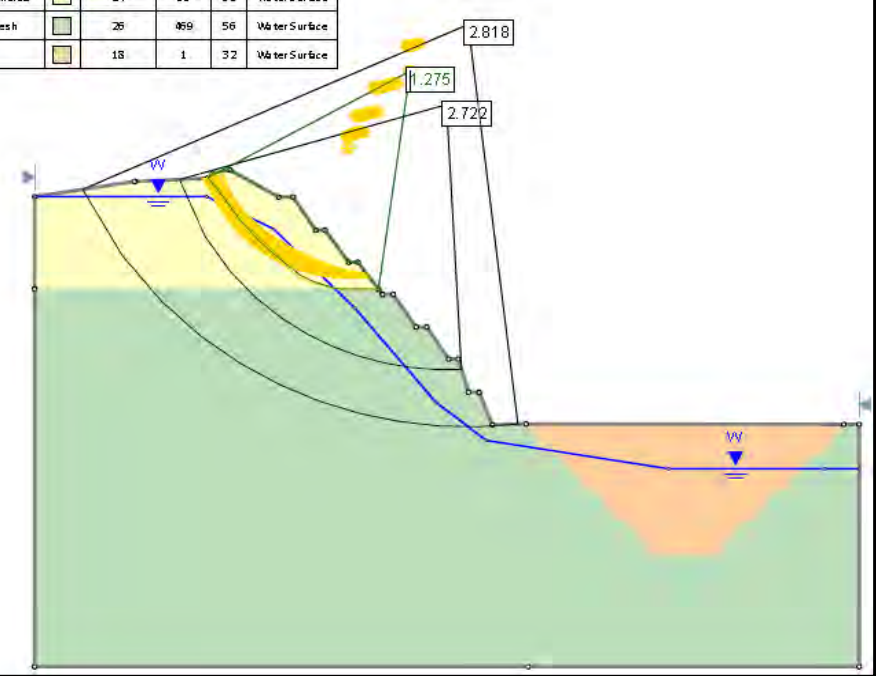
Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 1 (Seismic ULS)		
Appendix B	9	Project Number	10315

Material Name	Color	Unit Weight (kN/m ³)	Cohesion (kPa)	Phi (deg)	Water Surface
Highly to moderately weathered	Yellow	24	91	30	None
Slightly weathered to fresh	Green	26	469	36	None
Fill	Orange	18	1	32	None



Static - no groundwater

Material Name	Color	Unit Weight (kN/m ³)	Cohesion (kPa)	Phi (deg)	Water Surface
Highly to moderately weathered	Yellow	24	91	30	Water Surface
Slightly weathered to fresh	Green	26	469	36	Water Surface
Fill	Orange	18	1	32	Water Surface



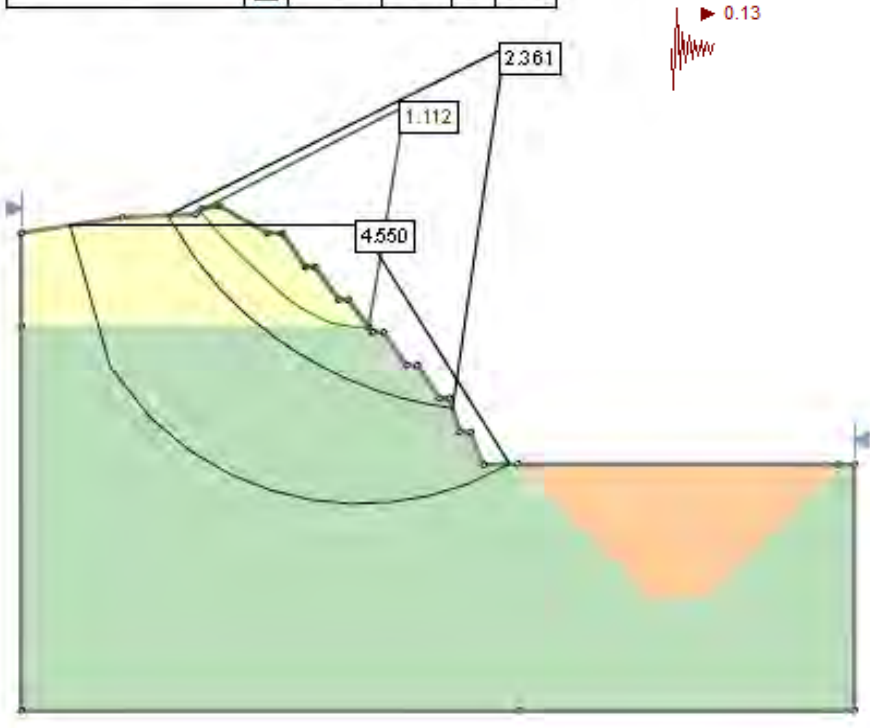
Static - high groundwater

Failure surfaces with a factor of safety of less than 1.5 shown
Failures through slightly weathered Greywacke



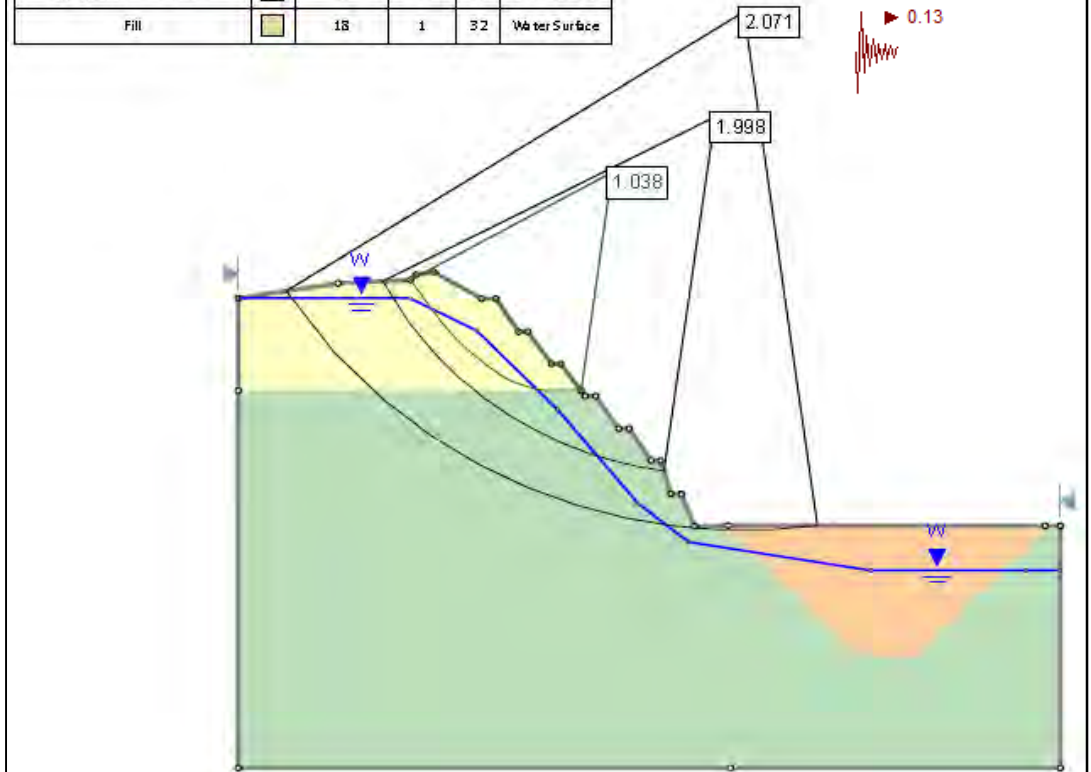
Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 2 (Static)		
Appendix B	10	Project Number	10315

Material Name	Color	Unit Weight (kN/m ³)	Cohesion (kPa)	Phi (deg)	Water Surface
Highly to moderately weathered	Yellow	24	91	30	Water Surface
Slightly weathered to fresh	Green	26	469	56	Water Surface
Fill	Orange	18	1	32	Water Surface



1 in 50 year event - low groundwater

Material Name	Color	Unit Weight (kN/m ³)	Cohesion (kPa)	Phi (deg)	Water Surface
Highly to moderately weathered	Yellow	24	91	30	Water Surface
Slightly weathered to fresh	Green	26	469	56	Water Surface
Fill	Orange	18	1	32	Water Surface

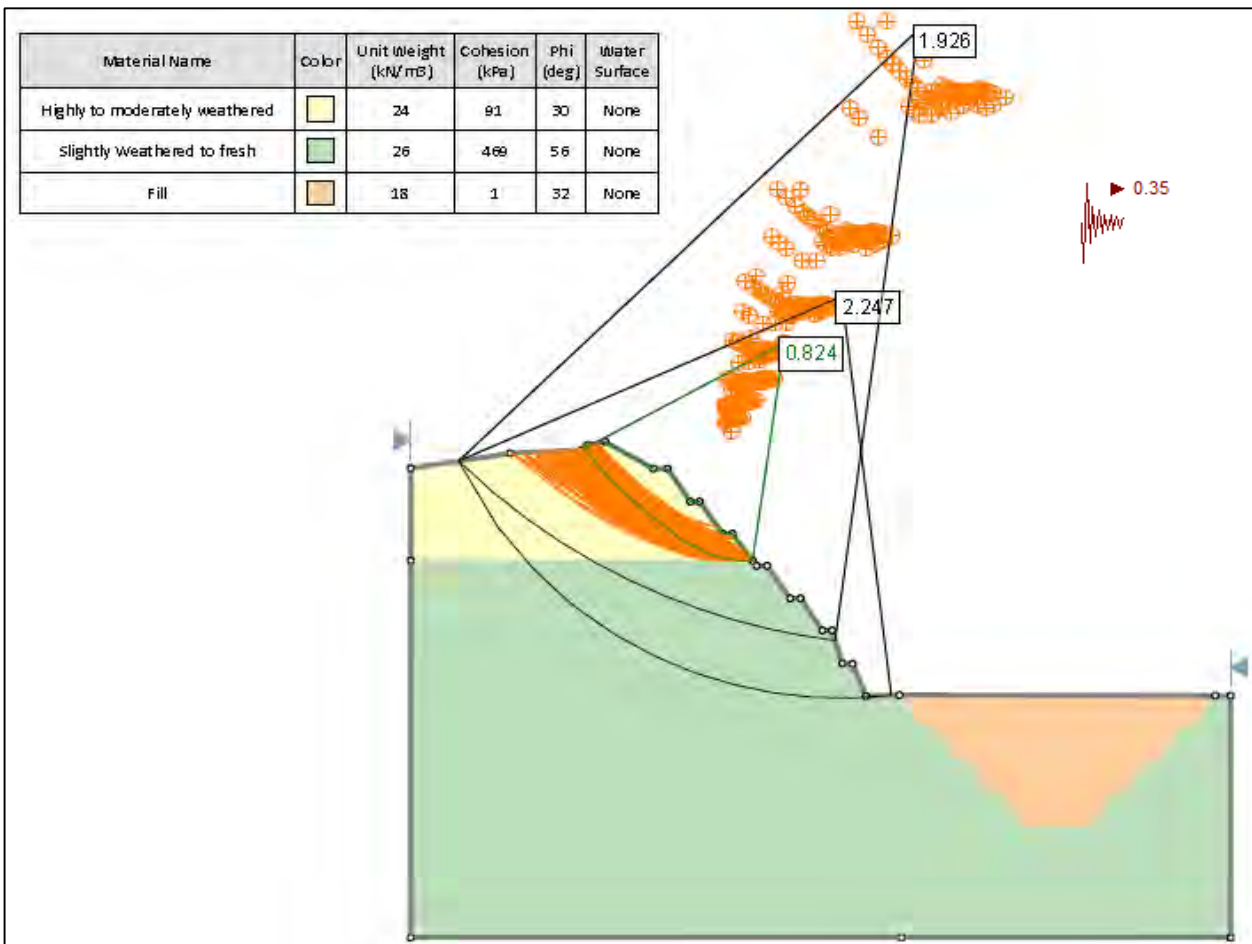


1 in 50 year event - high groundwater

Failure surfaces with a factor of safety of less than 1.5 shown
Failures through slightly weathered Greywacke



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 2 (Seismic SLS)		
Appendix B	11	Project Number	10315

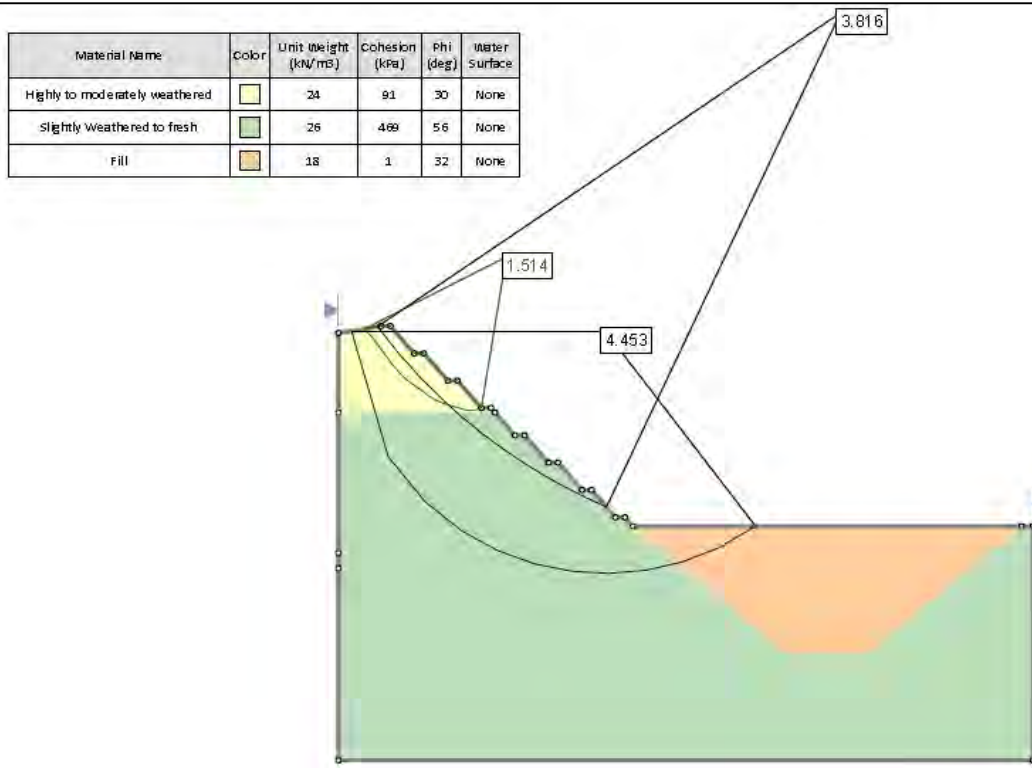


1 in 500 year event

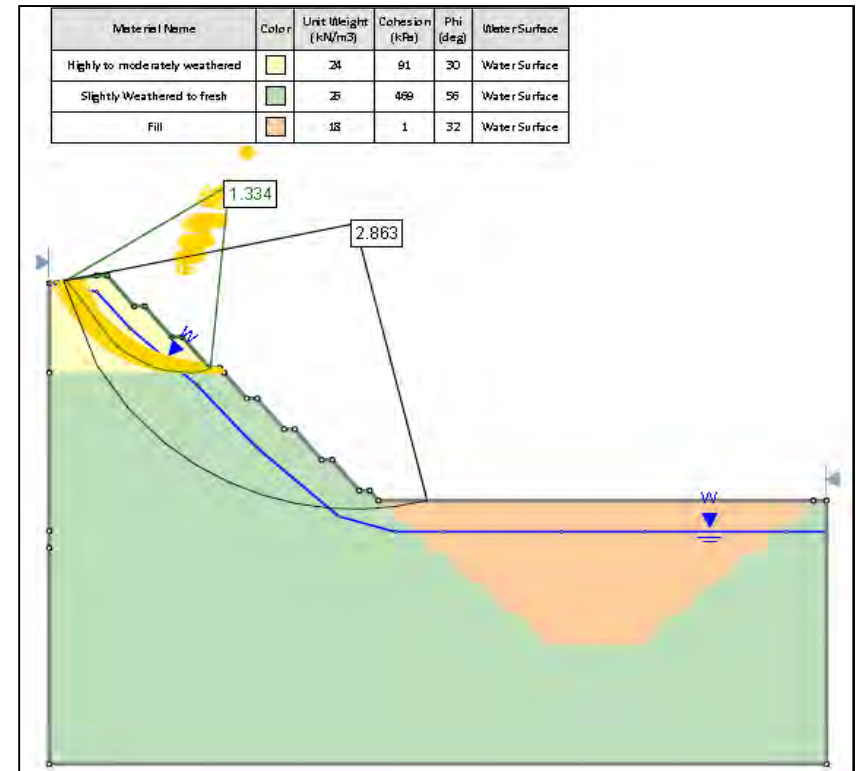
Failure surfaces with a factor of safety of less than 1.5 shown
 Failures through slightly weathered Greywacke



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 2 (Seismic ULS)		
Appendix B	12	Project Number	10315



Static - no groundwater

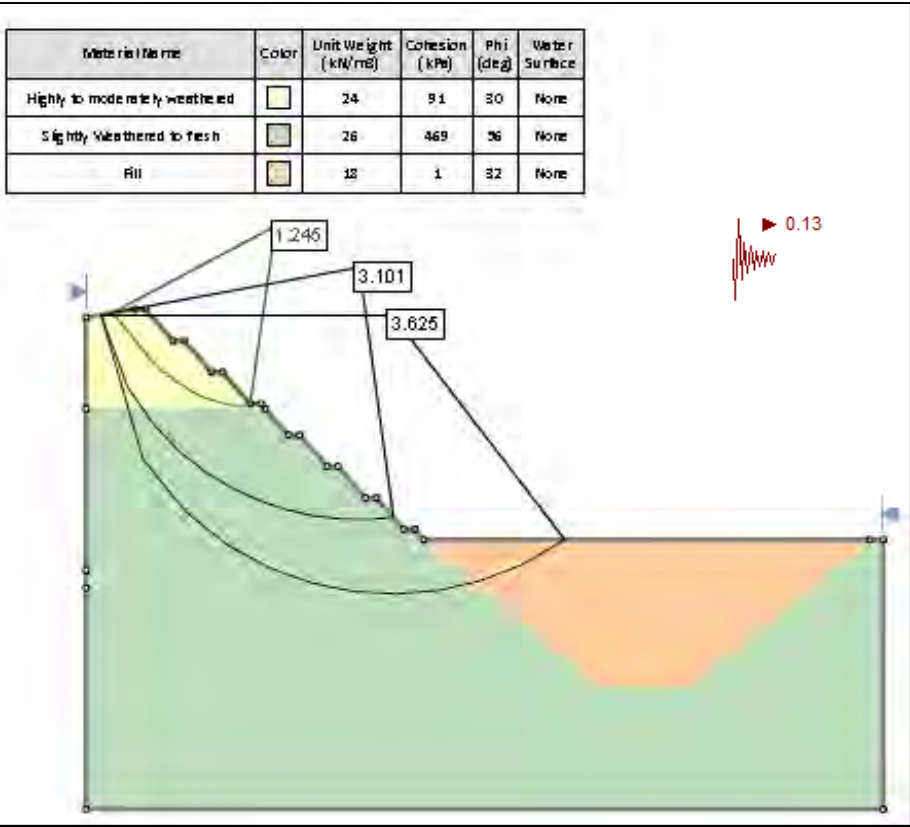


Static - high groundwater

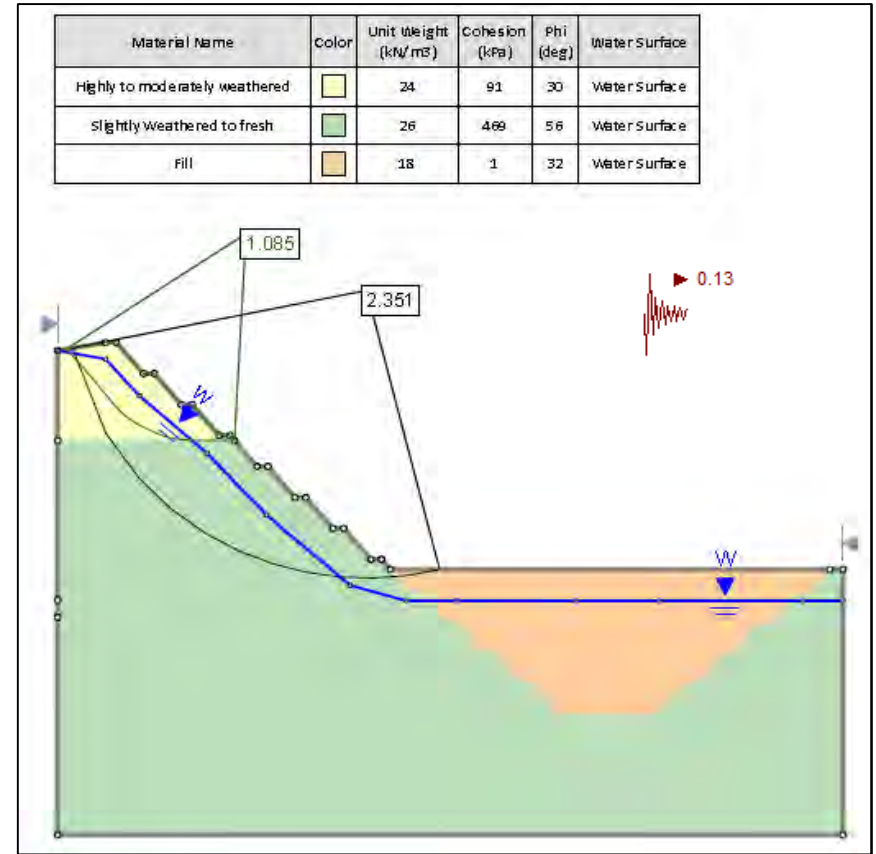
Failure surfaces with a factor of safety of less than 1.5 shown
Failures through slightly weathered Greywacke



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 3 (Static)		
Appendix B	13	Project Number	10315



1 in 50 year event - low groundwater

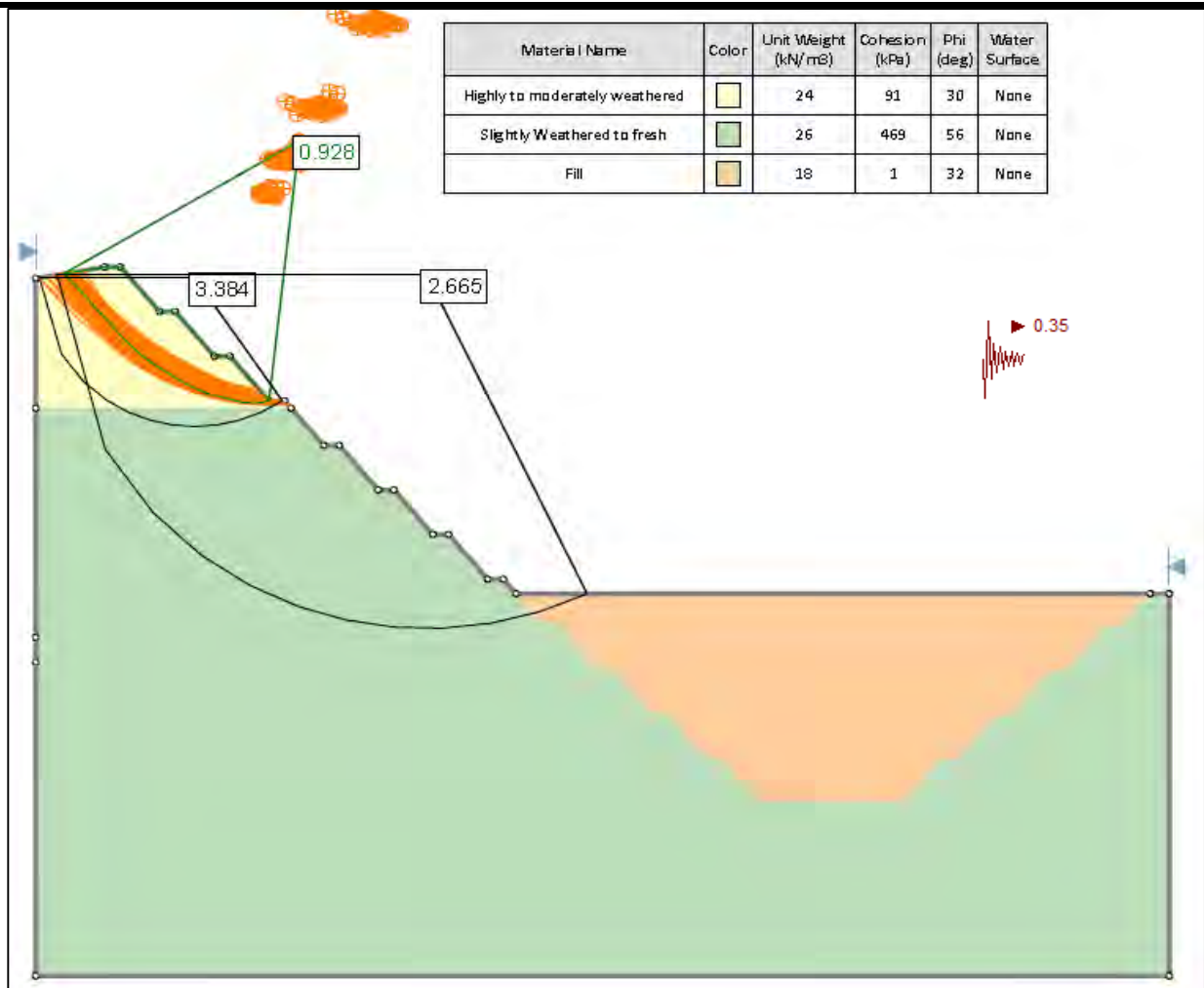


1 in 50 year event - high groundwater

Failure surfaces with a factor of safety of less than 1.5 shown
 Failures through slightly weathered Greywacke



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 3 (Seismic SLS)		
Appendix B	14	Project Number	10315



1 in 500 year event

Failure surfaces with a factor of safety of less than 1.5 shown
 Failures through slightly weathered Greywacke

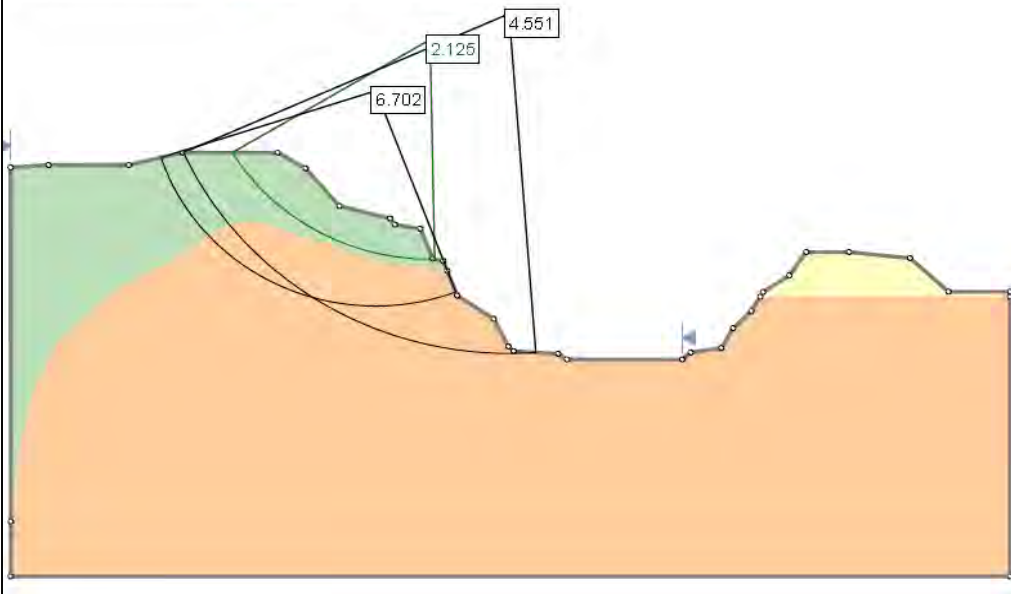


Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	North Wall Stability Model - Scenario 3 (Seismic ULS)		
Appendix B	15	Project Number	10315

Appendix C

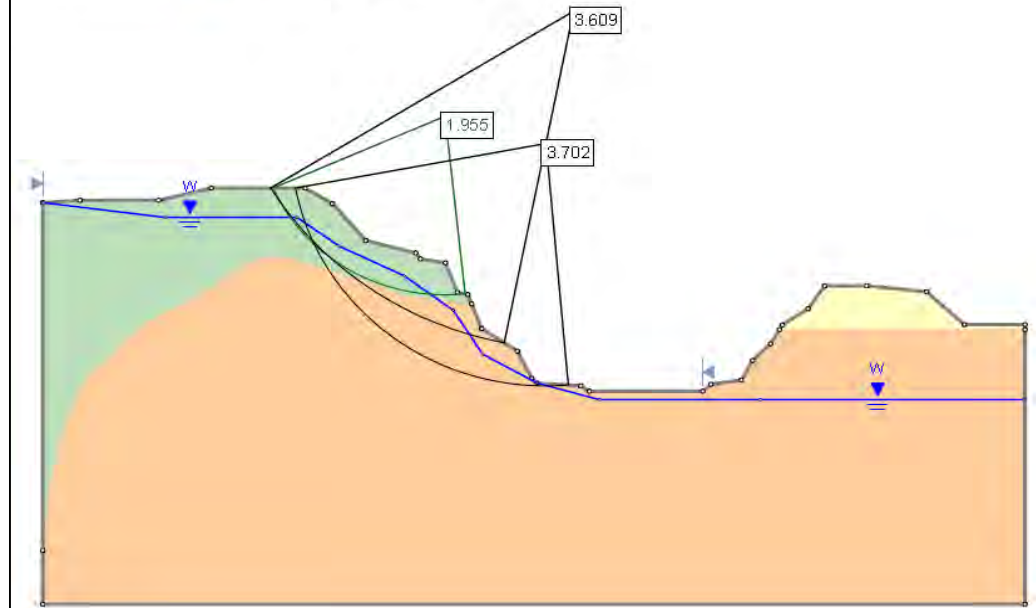
West Wall Slide Slope Stability Outputs

Material Name	Color	Unit Weight (kN/m ³)	Cohesion (kPa)	Phi (deg)	Water Surface
Fill	Yellow	18	1	32	None
Highly to moderately Weathered	Green	24	91	30	None
Slightly weathered to fresh	Orange	26	469	56	None



Static - no Groundwater

Material Name	Color	Unit Weight (kN/m ³)	Cohesion (kPa)	Phi (deg)	Water Surface
Fill	Yellow	18	1	32	Water Surface
Highly to moderately Weathered	Green	24	91	30	Water Surface
Slightly weathered to fresh	Orange	26	469	56	Water Surface



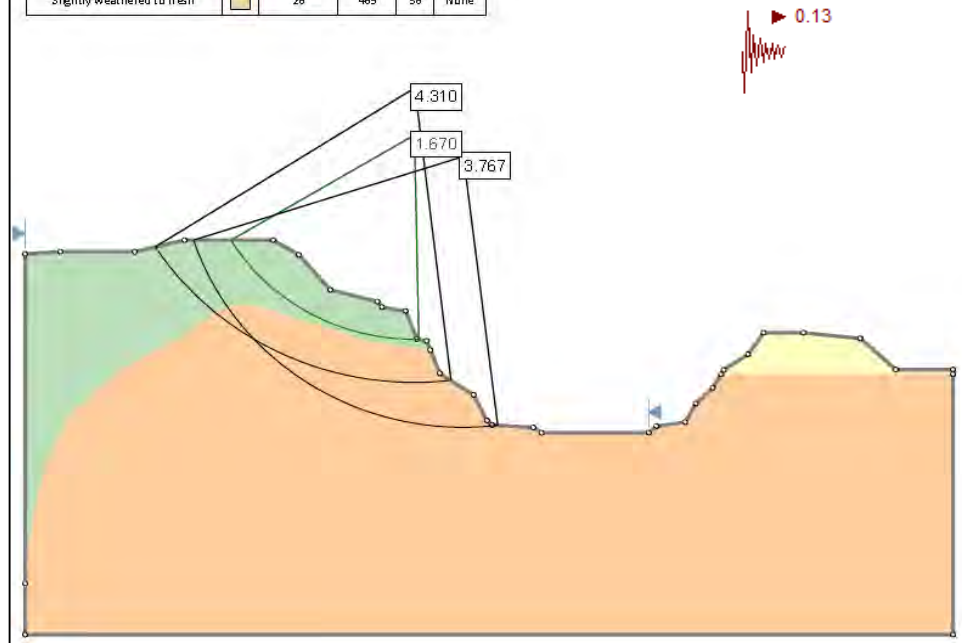
Static - high Groundwater

No failure surfaces with a factor of safety of less than 1.5
 Failure through moderately weathered Greywacke



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	West Wall Stability Model - Existing (Static)		
Appendix C	1	Project Number	10315

Material Name	Color	Unit Weight (kN/m ³)	Cohesion (kPa)	Phi (deg)	Water Surface
Fill	Yellow	18	1	32	None
Highly to moderately Weathered	Green	24	91	30	None
Slightly weathered to fresh	Orange	26	469	56	None

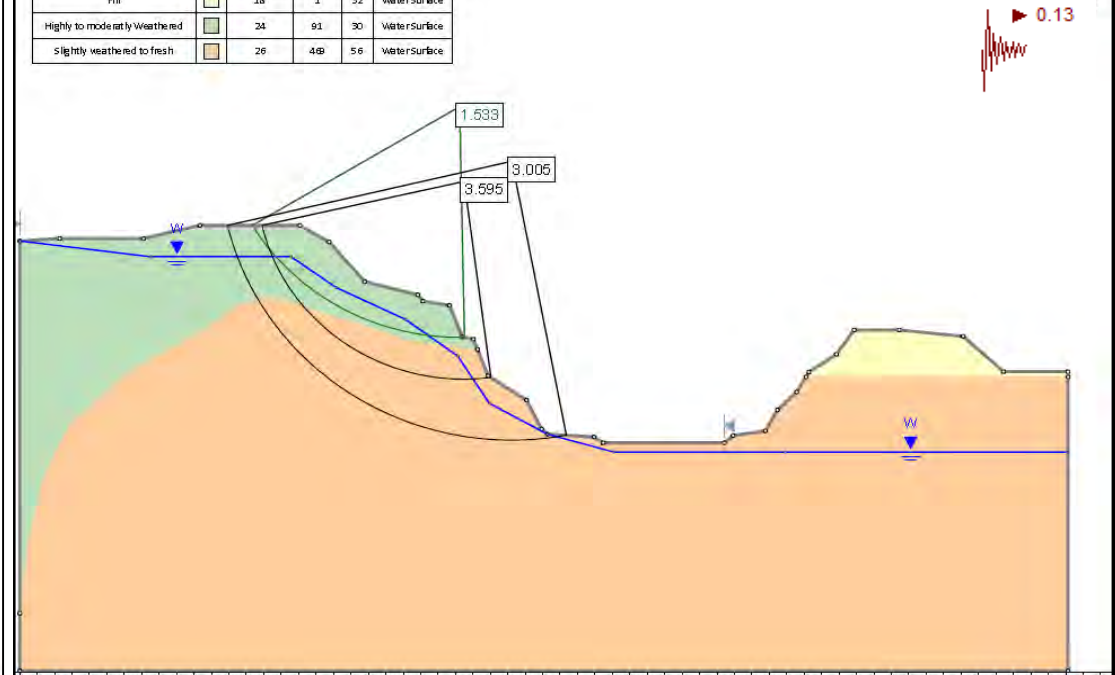


1 in 50 year event

No failure surfaces with a factor of safety of less than 1.5
 Failure through moderately weathered Greywacke

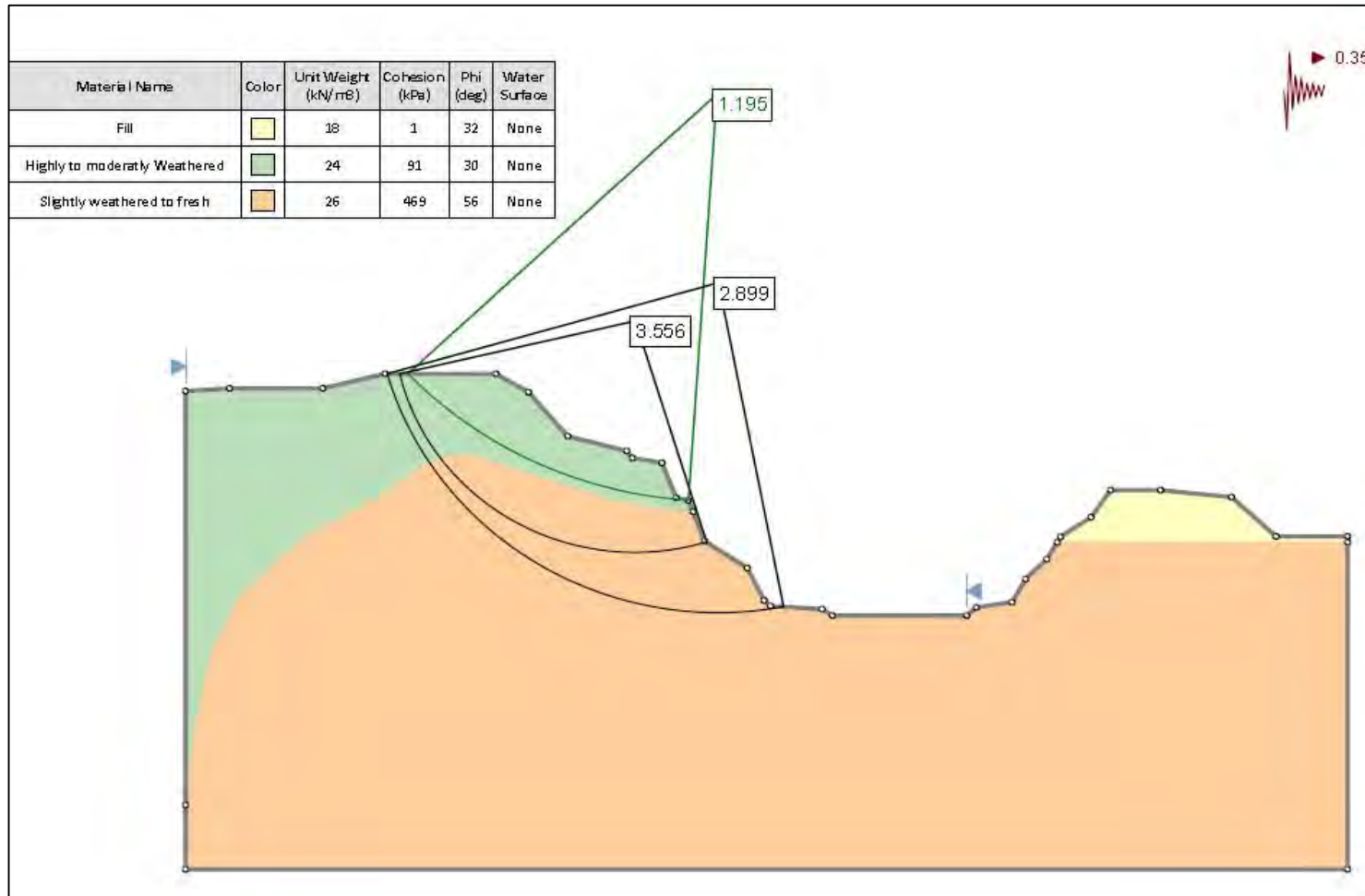


Material Name	Color	Unit Weight (kN/m ³)	Cohesion (kPa)	Phi (deg)	Water Surface
Fill	Yellow	18	1	32	Water Surface
Highly to moderately Weathered	Green	24	91	30	Water Surface
Slightly weathered to fresh	Orange	26	469	56	Water Surface



1 in 50 year event - high groundwater

Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	West Wall Stability Model - Existing (Seismic SLS)		
Appendix C	2	Project Number	10315

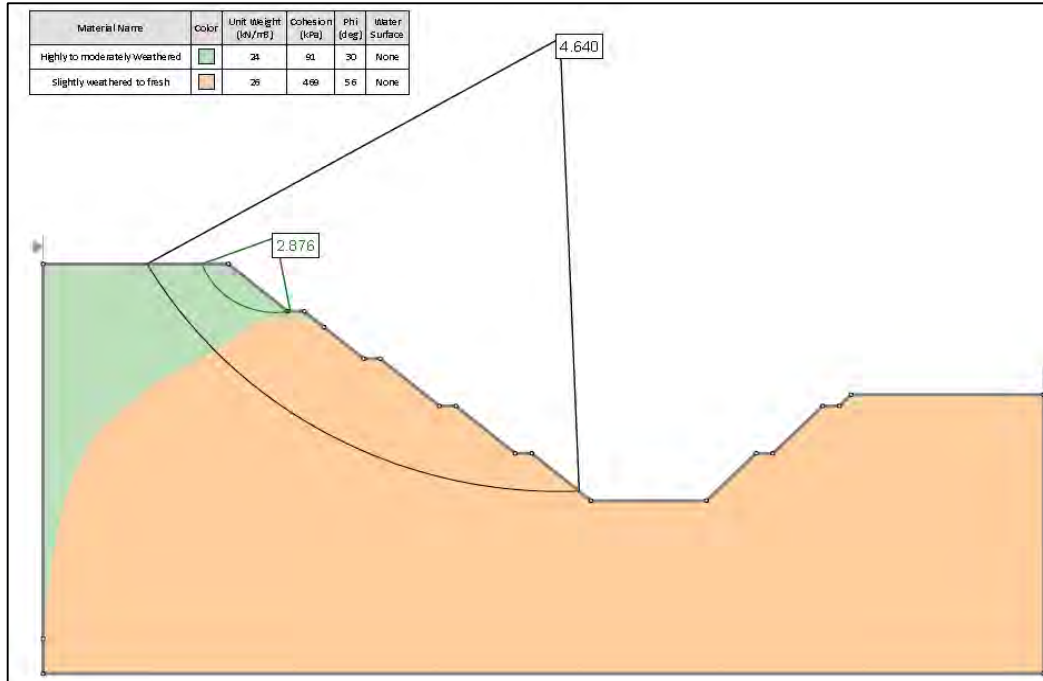


1 in 500 year event

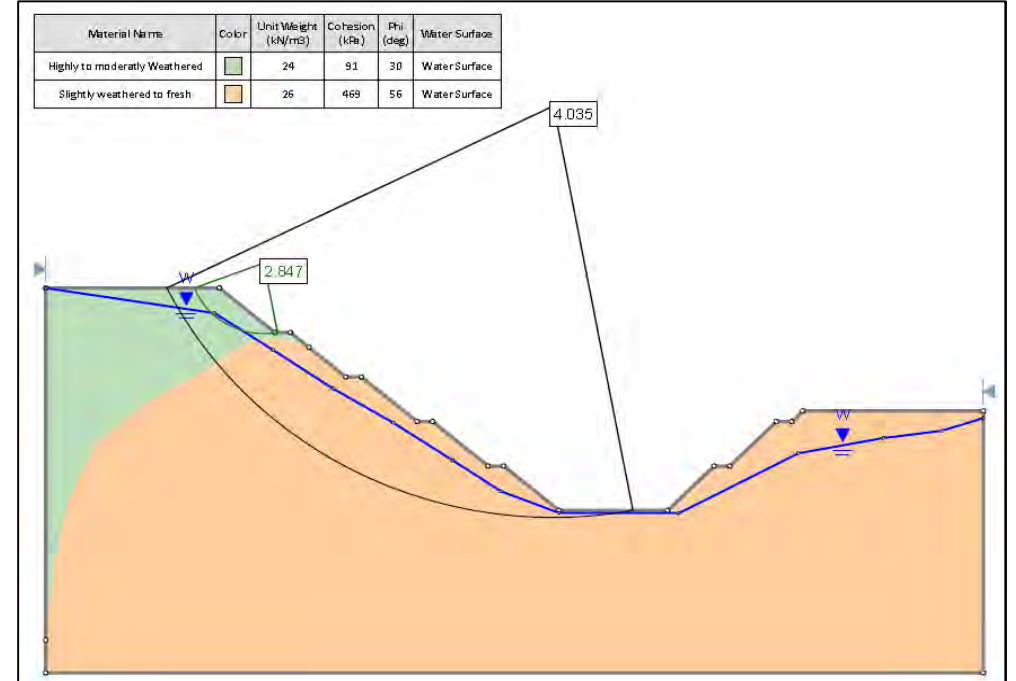
Failure through moderately weathered Greywacke



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	West Wall Stability Model - Existing (Seismic ULS)		
Appendix C	3	Project Number	10315



Static no groundwater

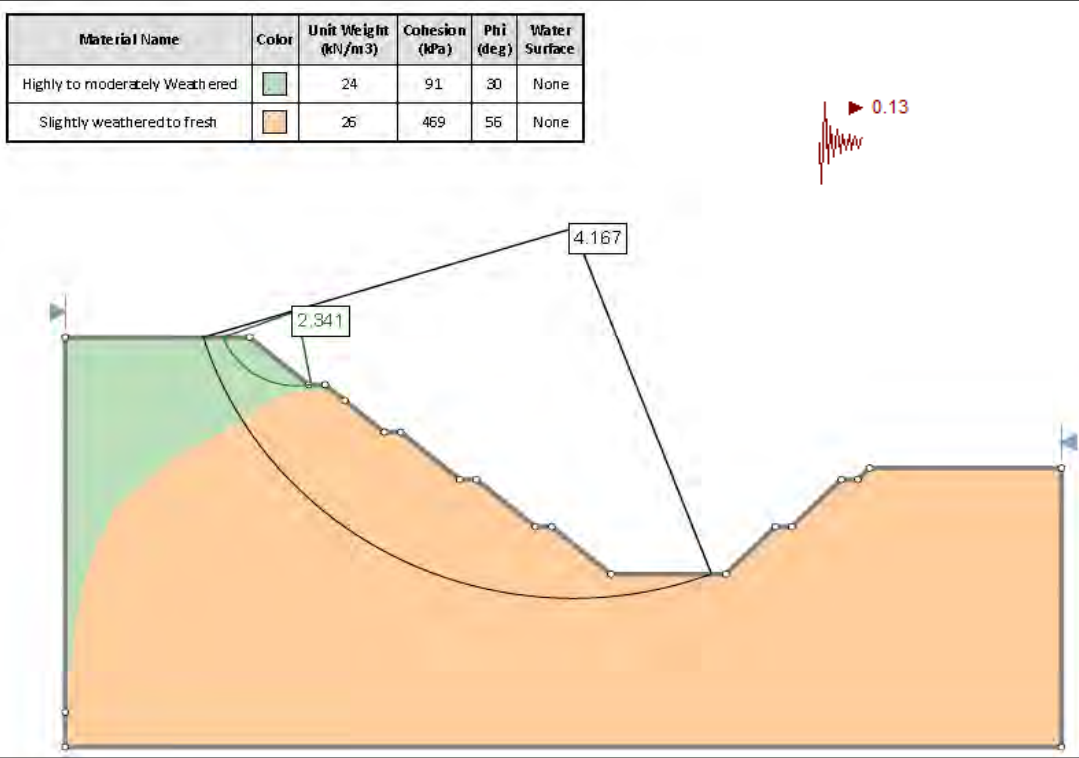


Static - high Groundwater

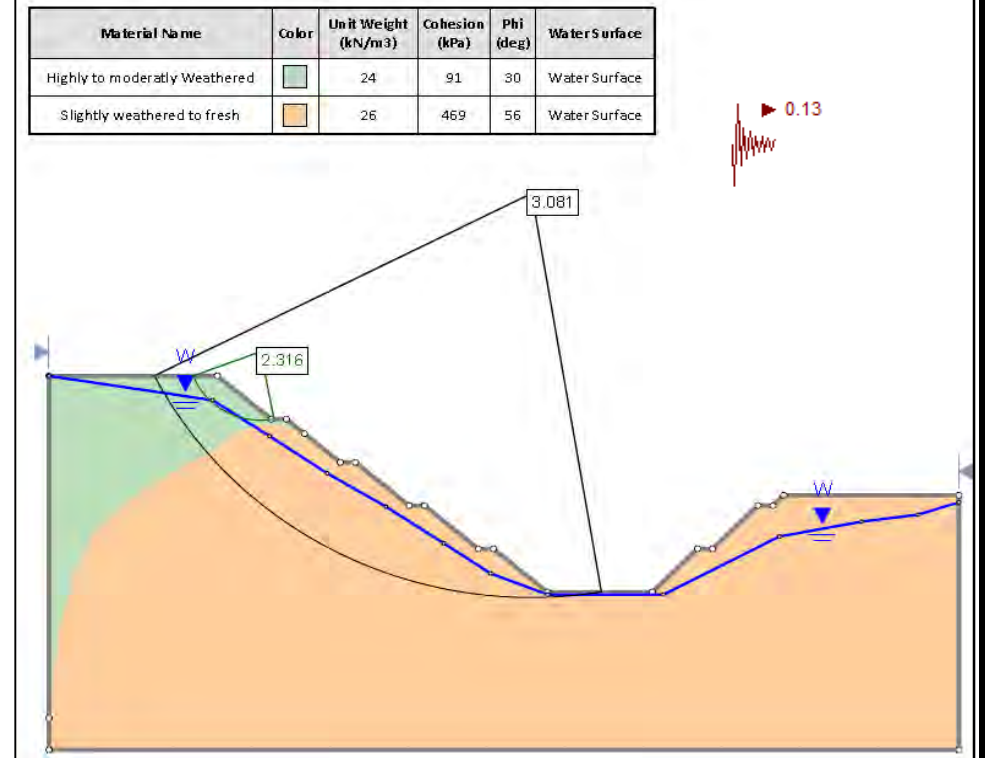
No failure surfaces with a factor of safety of less than 1.5
 Failure through moderately weathered Greywacke



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	West Wall Stability Model - Proposed (Static)		
Appendix C	4	Project Number	10315



1 in 50 year event



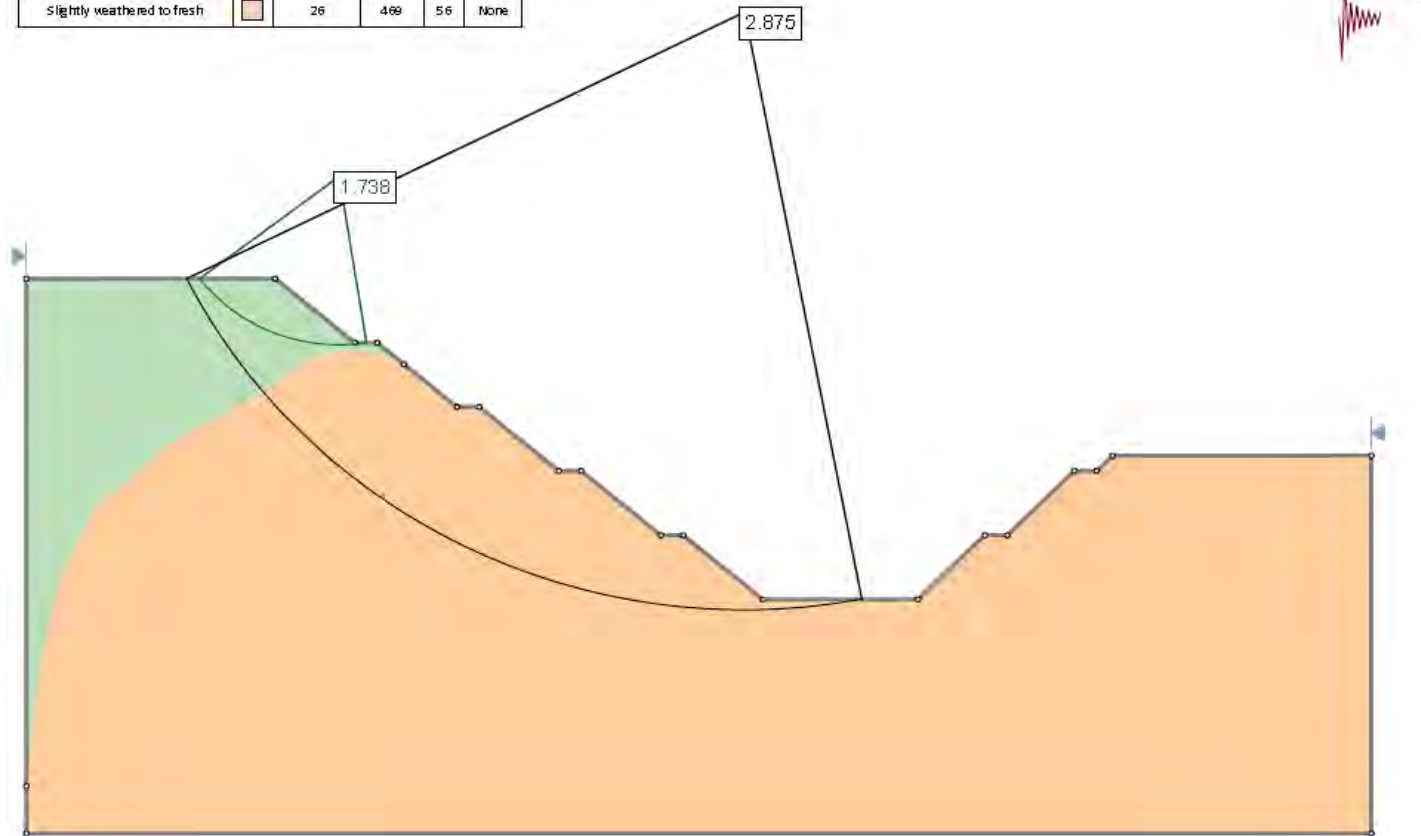
1 in 50 year event - high groundwater

No failure surfaces with a factor of safety of less than 1.5
 Failure through moderately weathered Greywacke



Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	West Wall Stability Model - Proposed (Seismic SLS)		
Appendix C	5	Project Number	10315

Material Name	Color	Unit Weight (kN/m ³)	Cohesion (kPa)	Phi (deg)	Water Surface
Highly to moderately weathered	Green	24	91	30	None
Slightly weathered to fresh	Orange	26	469	56	None



1 in 500 year event

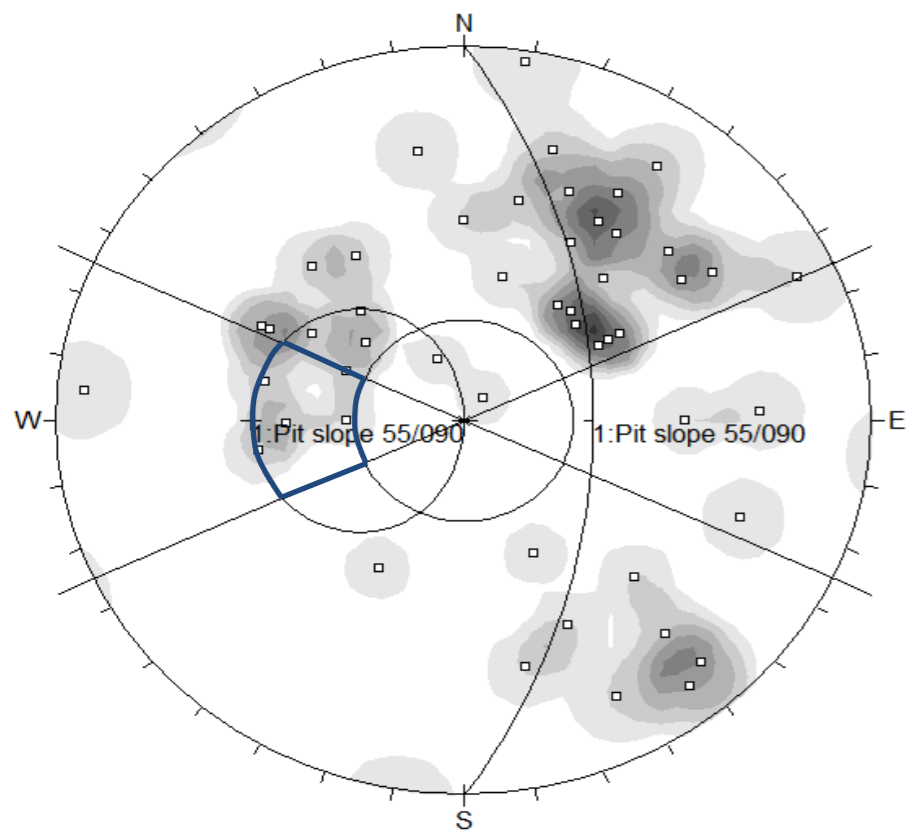
No failure surfaces with a factor of safety of less than 1.5
 Failure through moderately weathered Greywacke



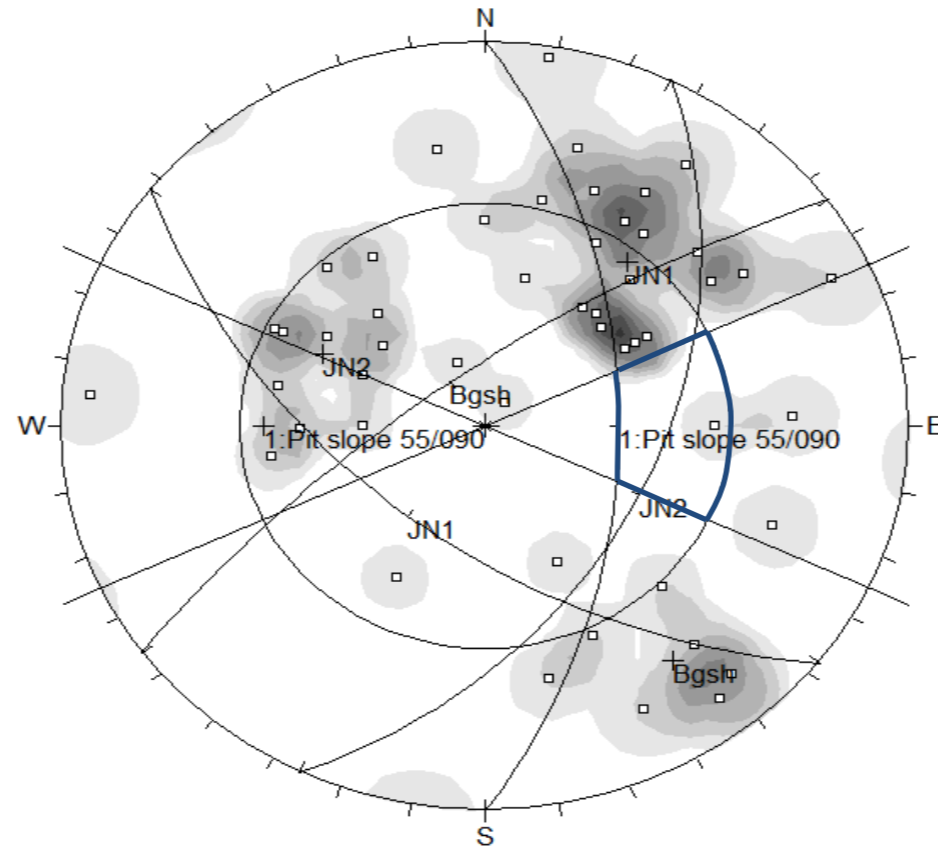
Client	Holcim (NZ) Limited		
Project	KiwiPoint Quarry		
Description	West Wall Stability Model - Proposed (Seismic ULS)		
Appendix C	6	Project Number	10315

Appendix D
Dips Analysis

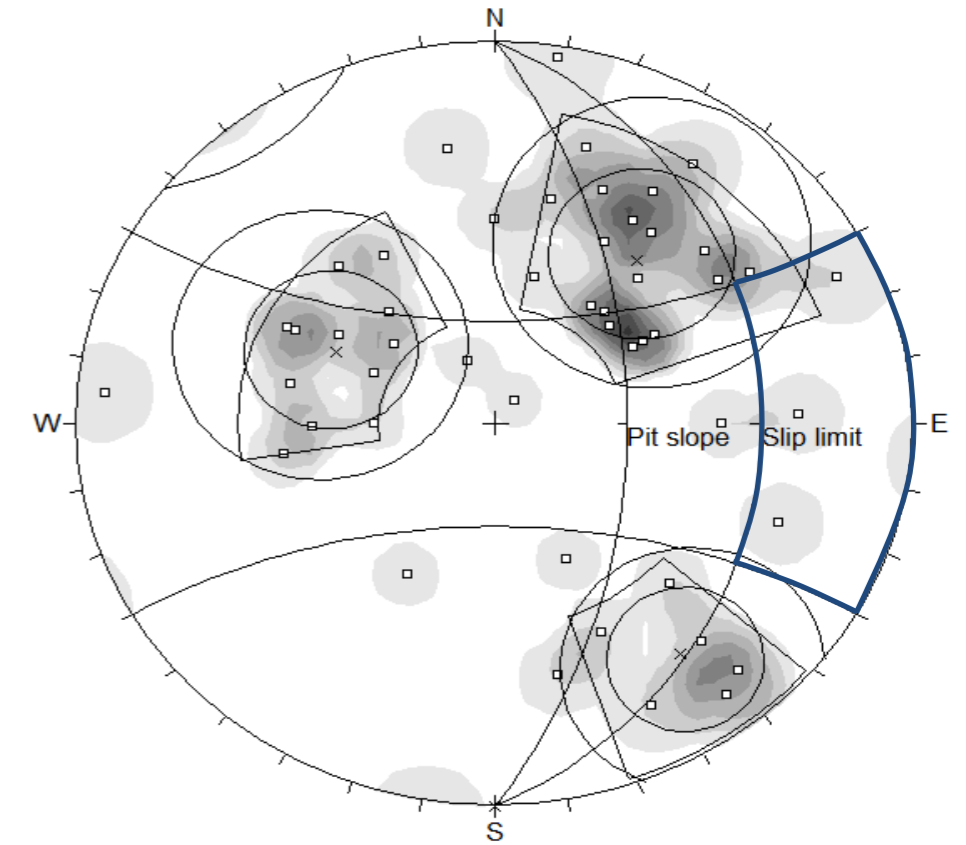
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 55° EAST FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL



Control on Stability: High potential for planar failure for cut slopes with 55° batter angle and East orientation



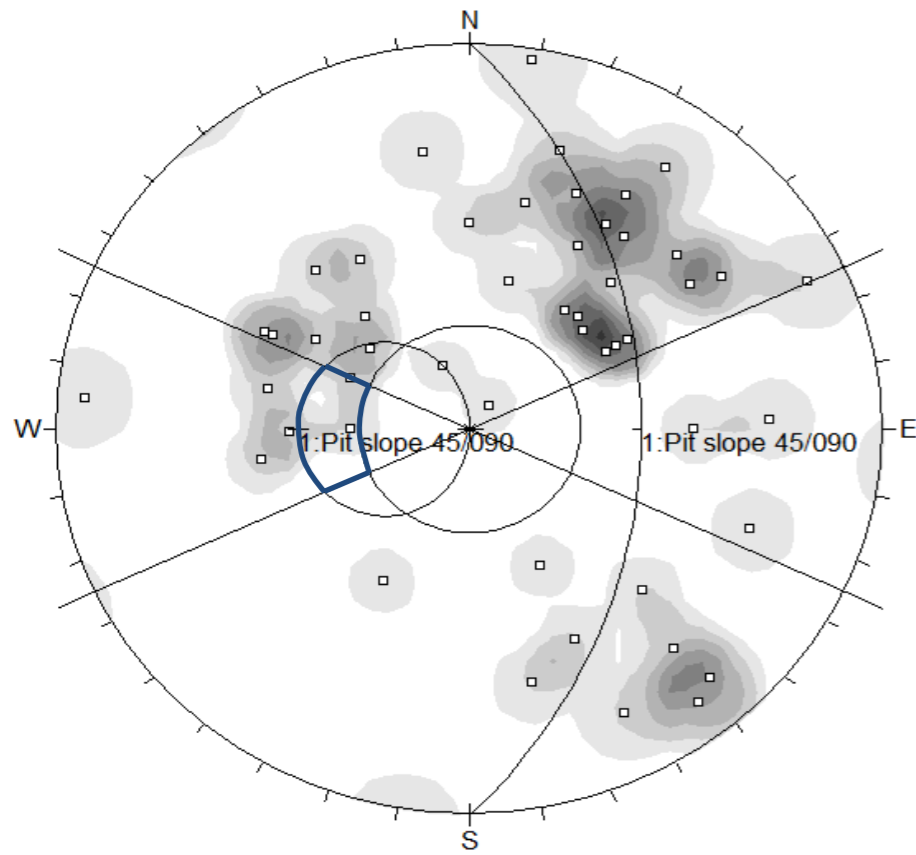
Control on Stability: Low potential for wedge failure for cut slopes with 55° batter angle and East orientation



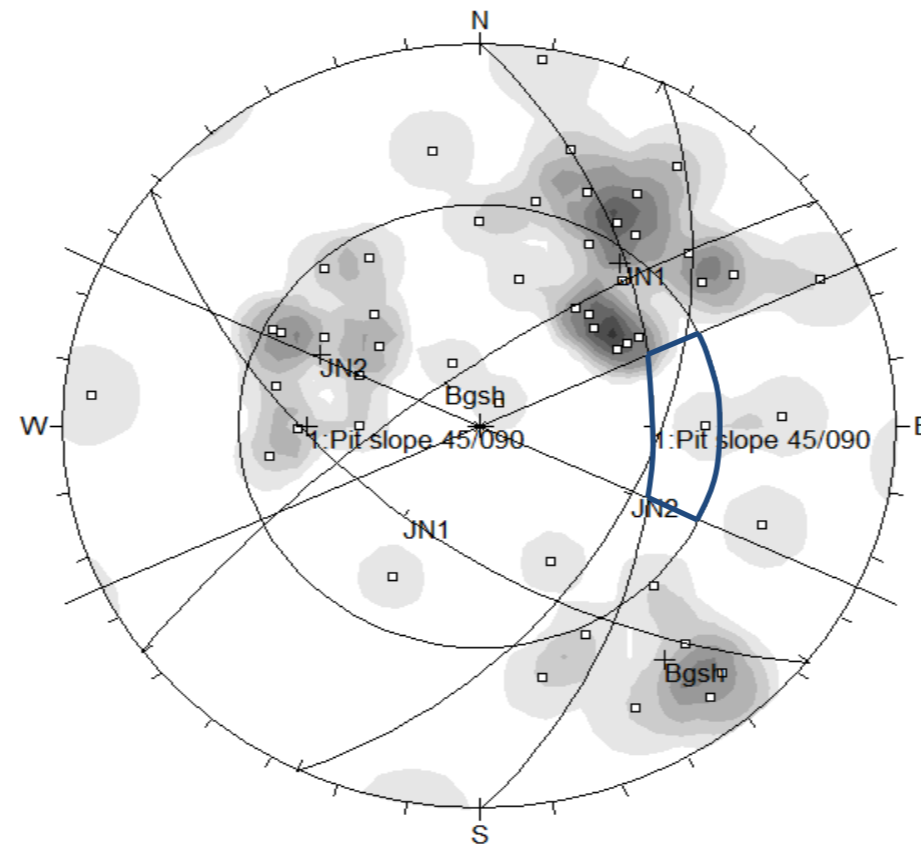
Control on Stability: Moderate potential for toppling failure for cut slopes with 55° batter angle and East orientation

Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

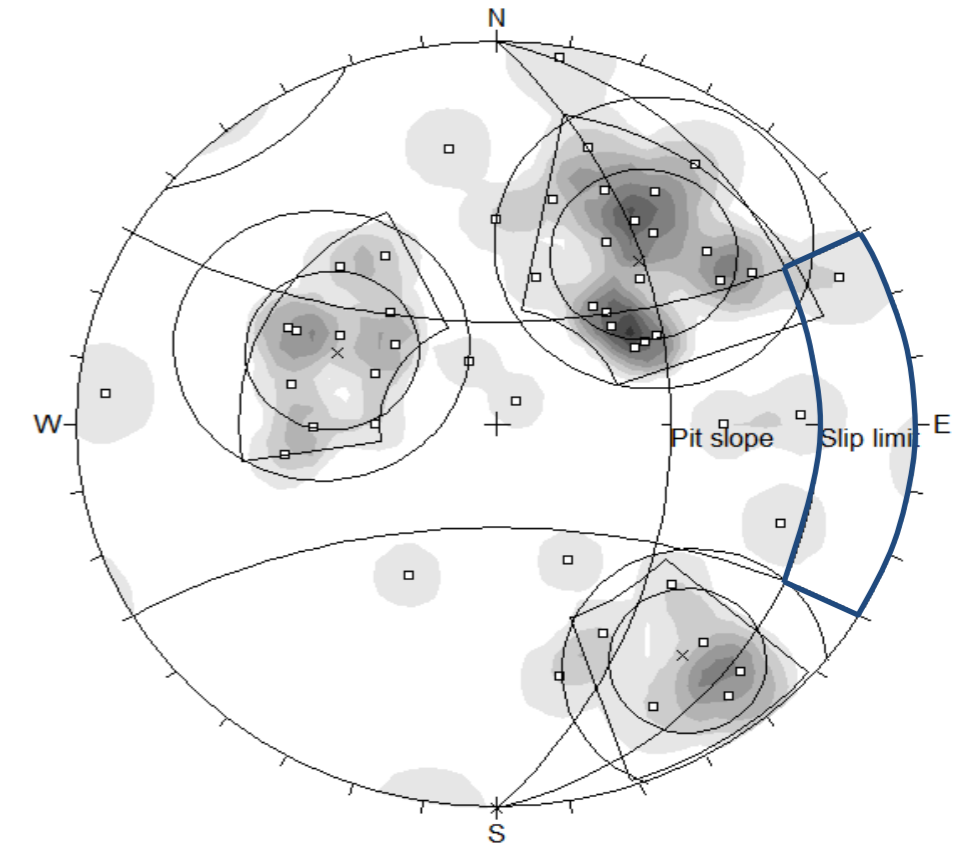
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 45° EAST FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL



Control on Stability: Moderate potential for planar failure for cut slopes with 45° batter angle and East orientation



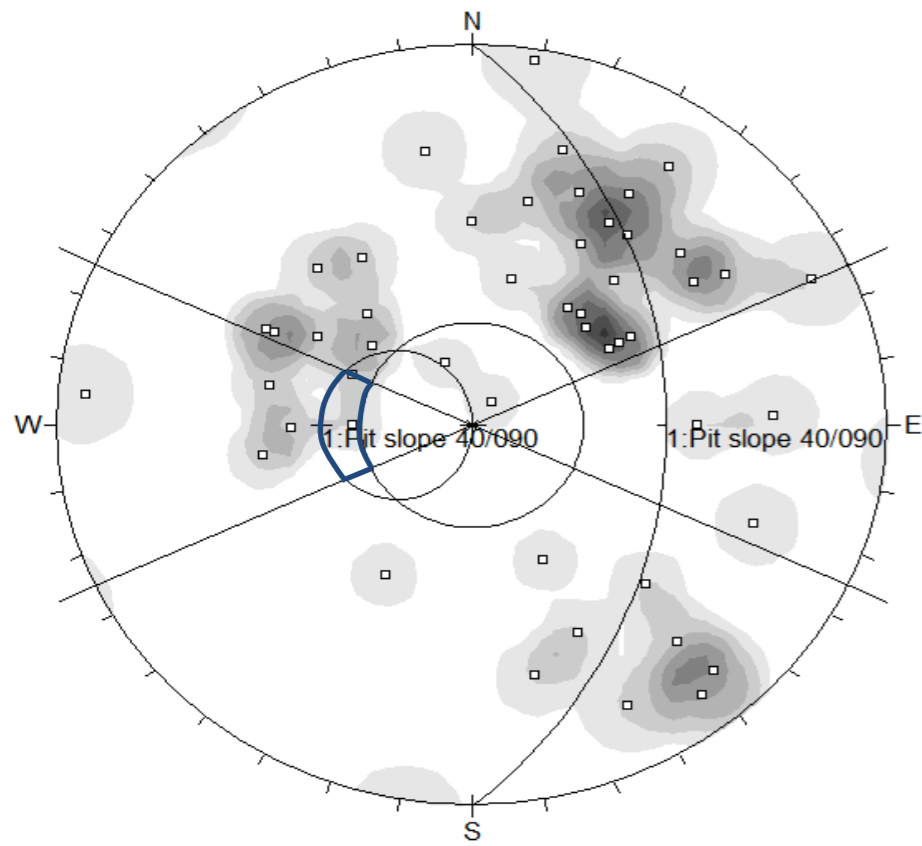
Control on Stability: Low potential for wedge failure for cut slopes with 45° batter angle and East orientation



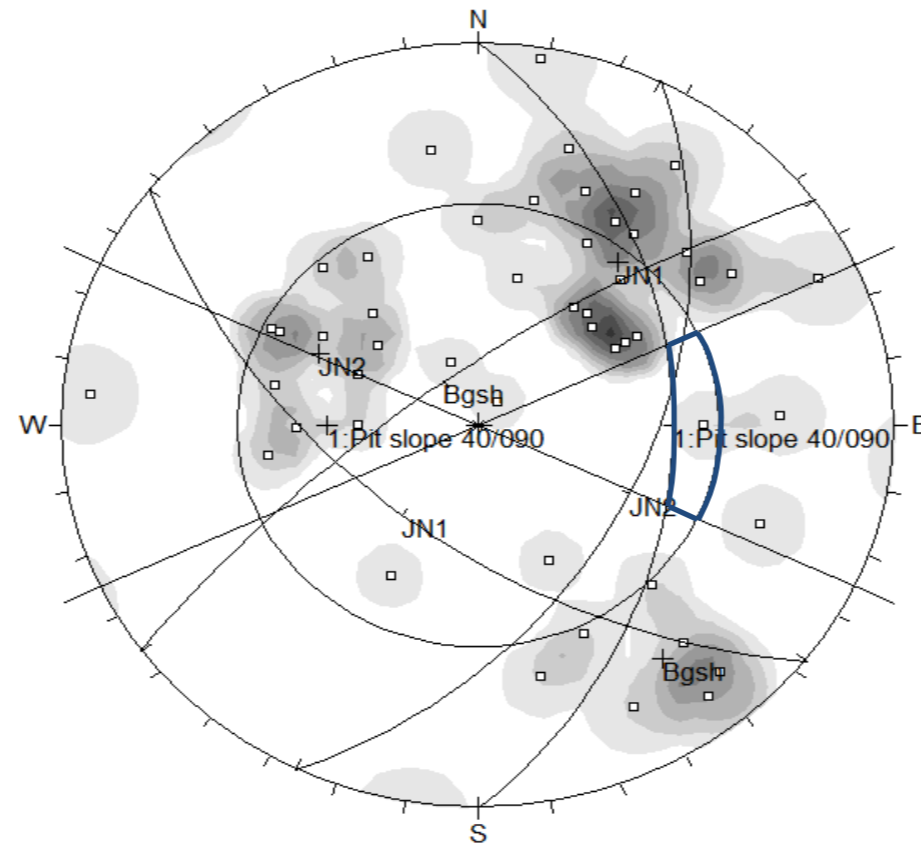
Control on Stability: Low potential for toppling failure for cut slopes with 45° batter angle and East orientation

Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

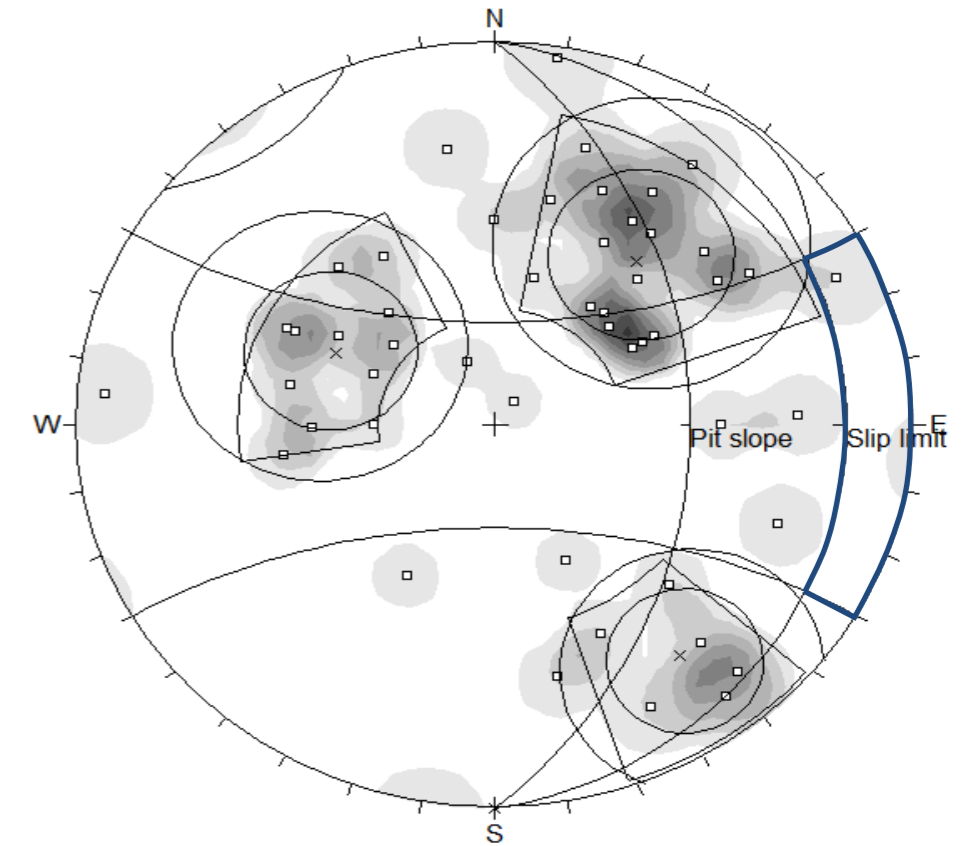
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 40° EAST FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL



Control on Stability: Moderate potential for planar failure for cut slopes with 40° batter angle and East orientation



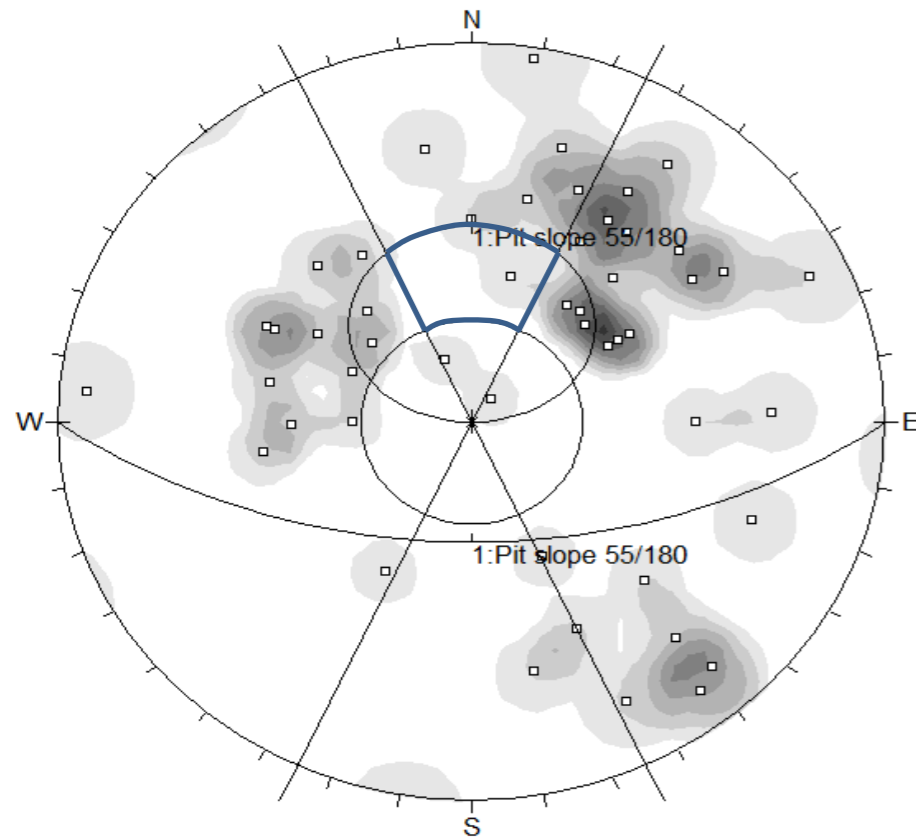
Control on Stability: Low potential for wedge failure for cut slopes with 40° batter angle and East orientation



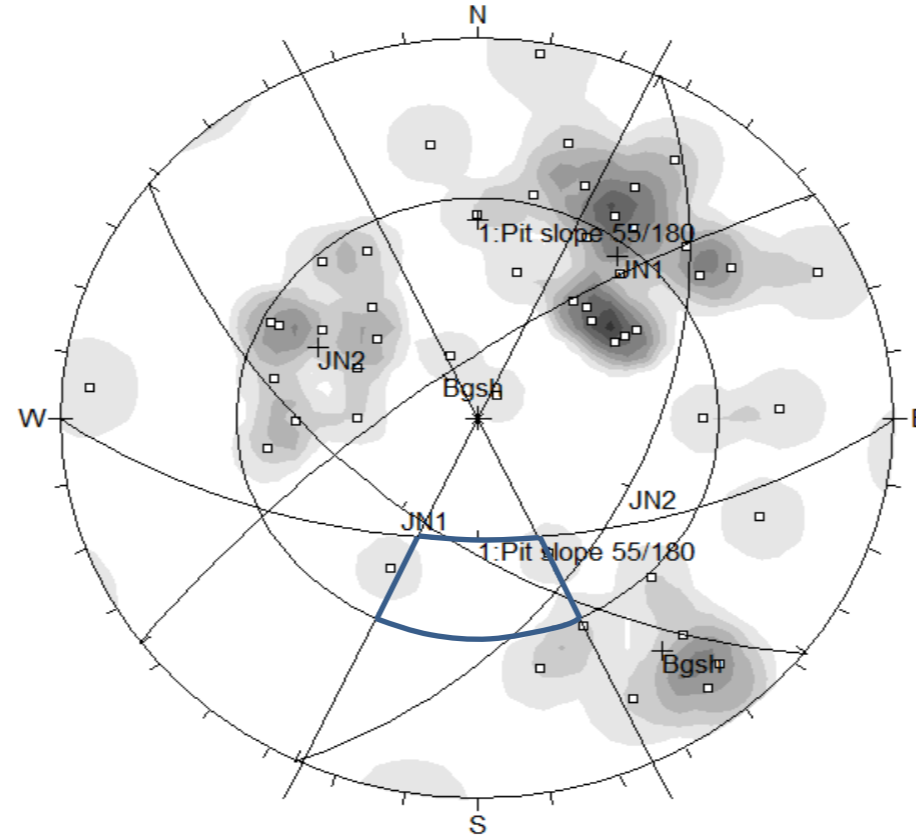
Control on Stability: Low potential for toppling failure for cut slopes with 40° batter angle and East orientation

Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

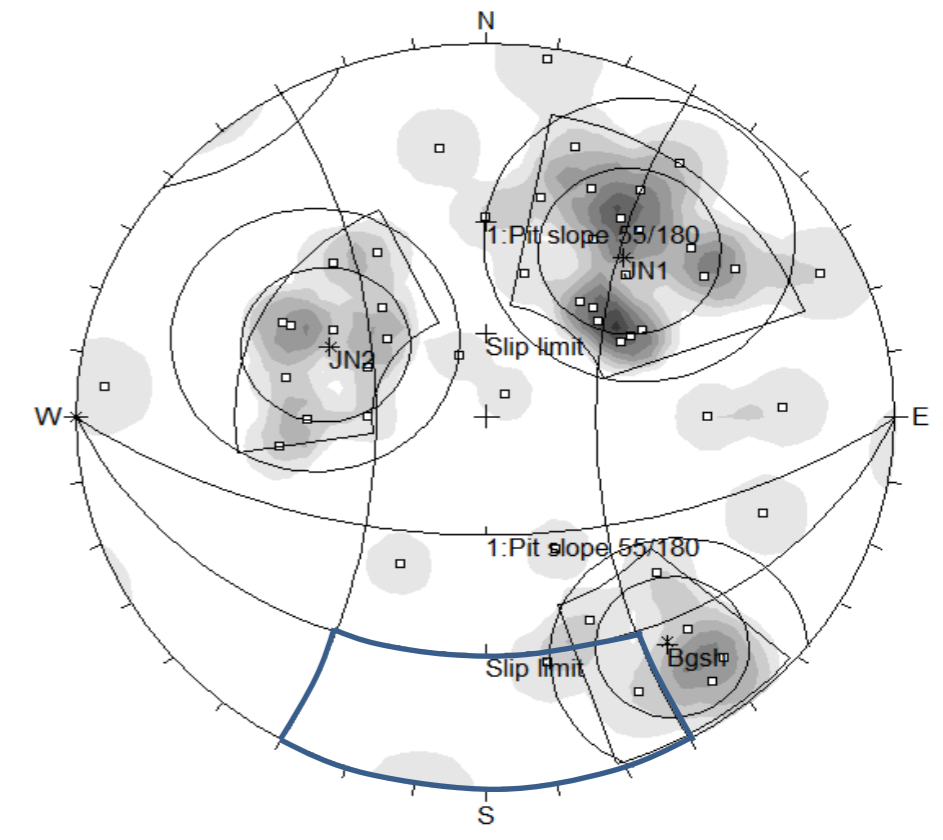
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 55° SOUTH FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL



Control on Stability: Moderate potential for planar failure for cut slopes with 55° batter angle and South orientation



Control on Stability: High potential for wedge failure for on joint sets JN1 and JN2 for cut slopes with 55° batter angle and South orientation

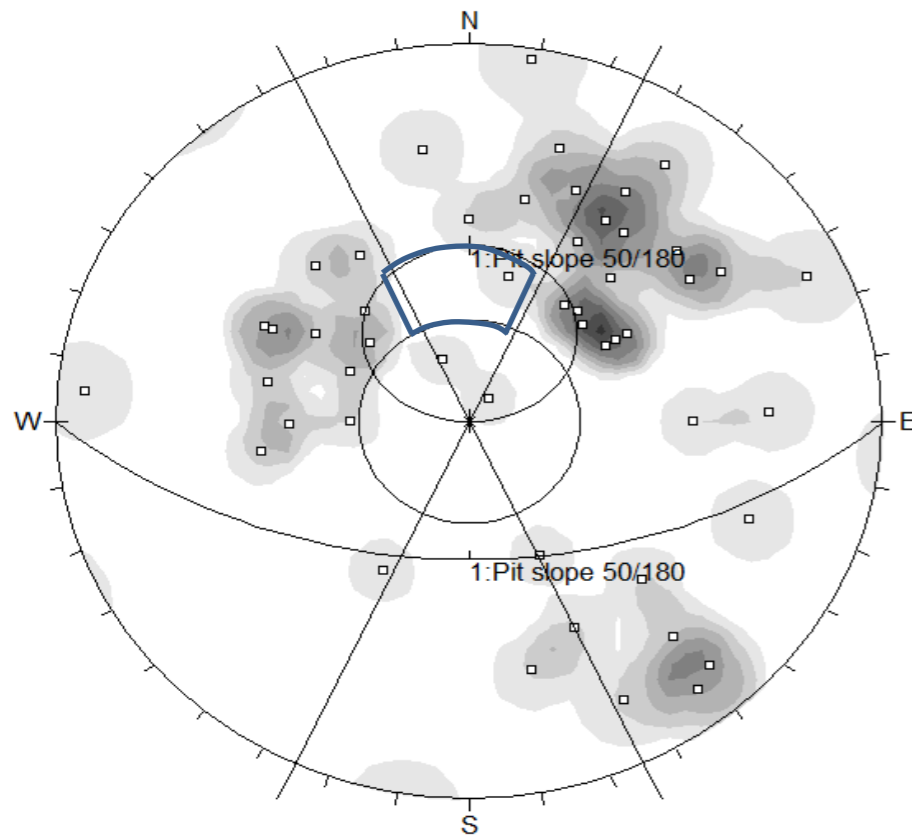


Control on Stability: Moderate potential for toppling failure for cut slopes with 55° batter angle and South orientation

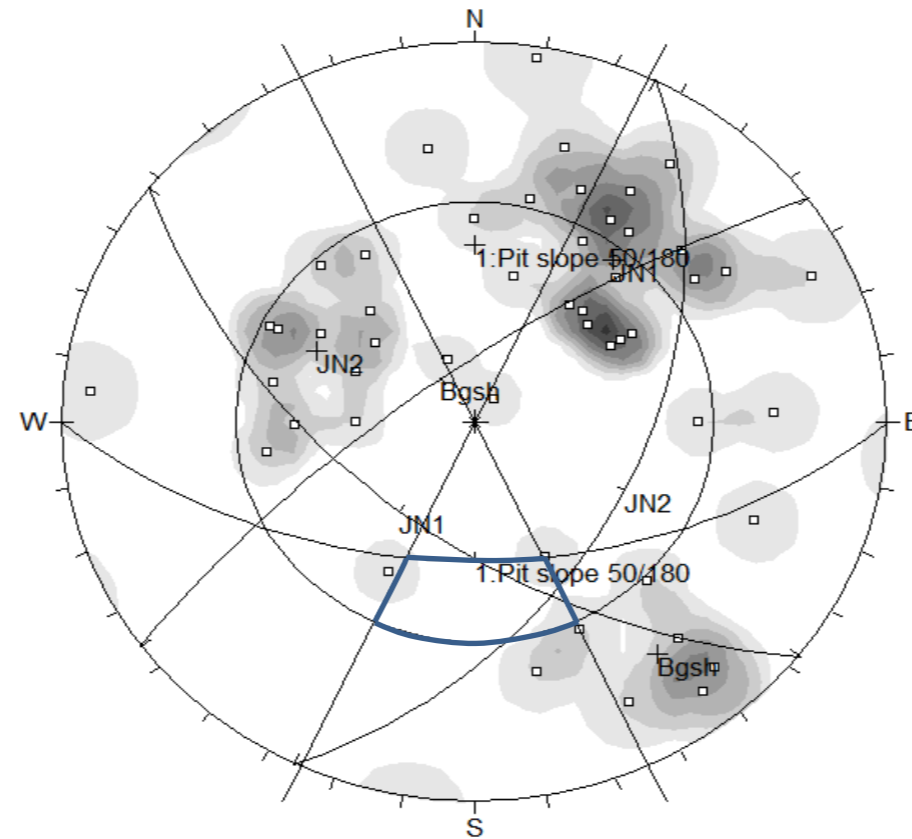


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

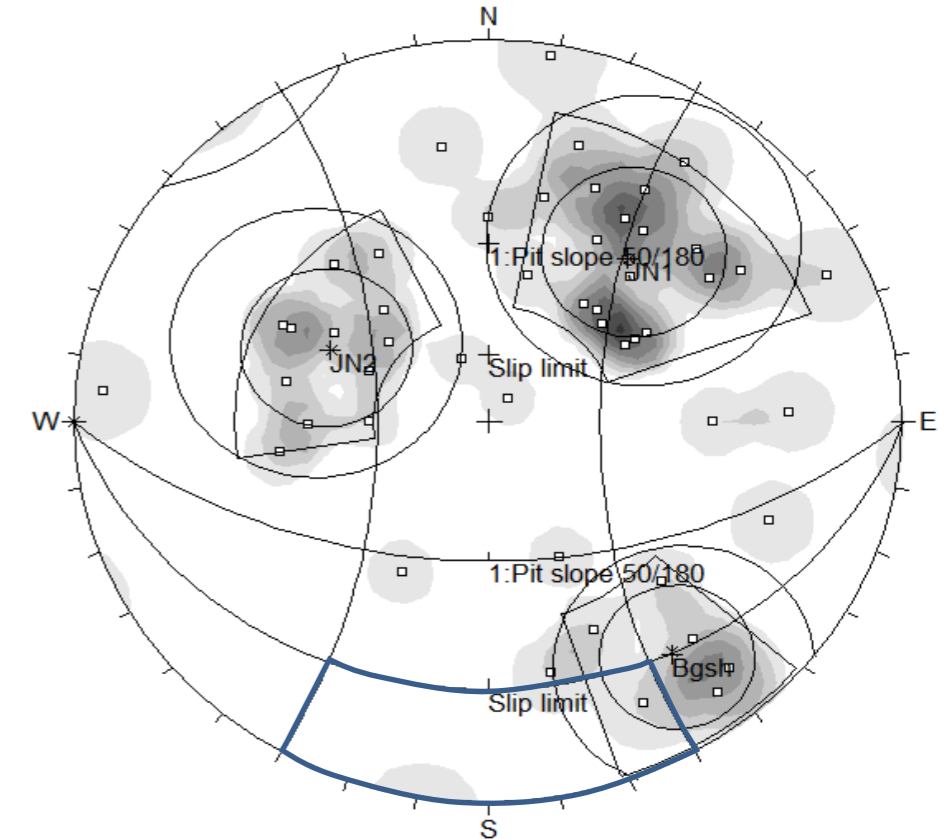
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 50° SOUTH FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL



Control on Stability: Moderate potential for planar failure for cut slopes with 50° batter angle and South orientation



Control on Stability: High potential for wedge failure for on joint sets JN1 and JN2 for cut slopes with 50° batter angle and South orientation

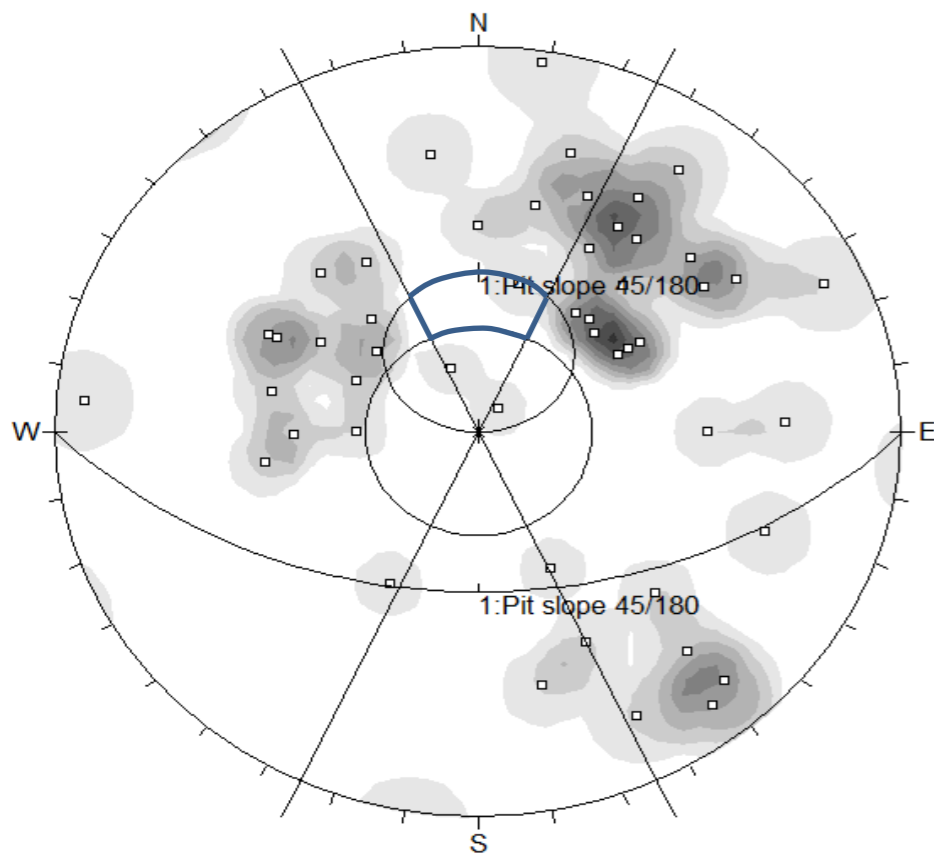


Control on Stability: Moderate potential for toppling failure for cut slopes with 50° batter angle and South orientation

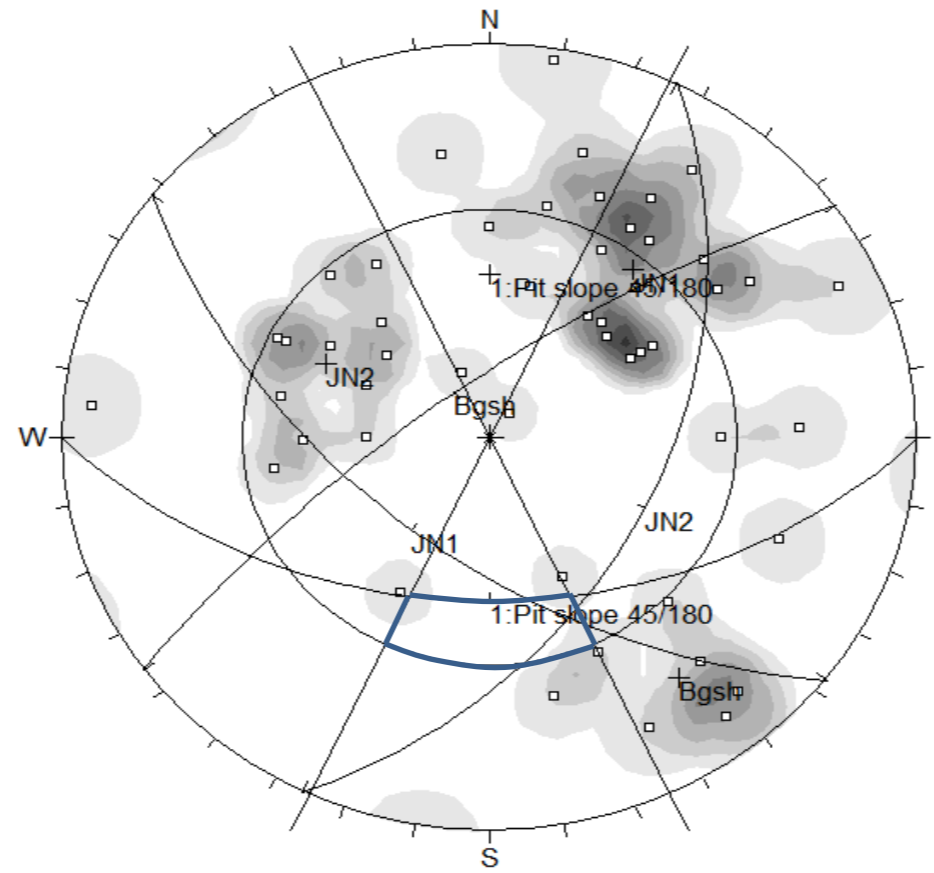


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

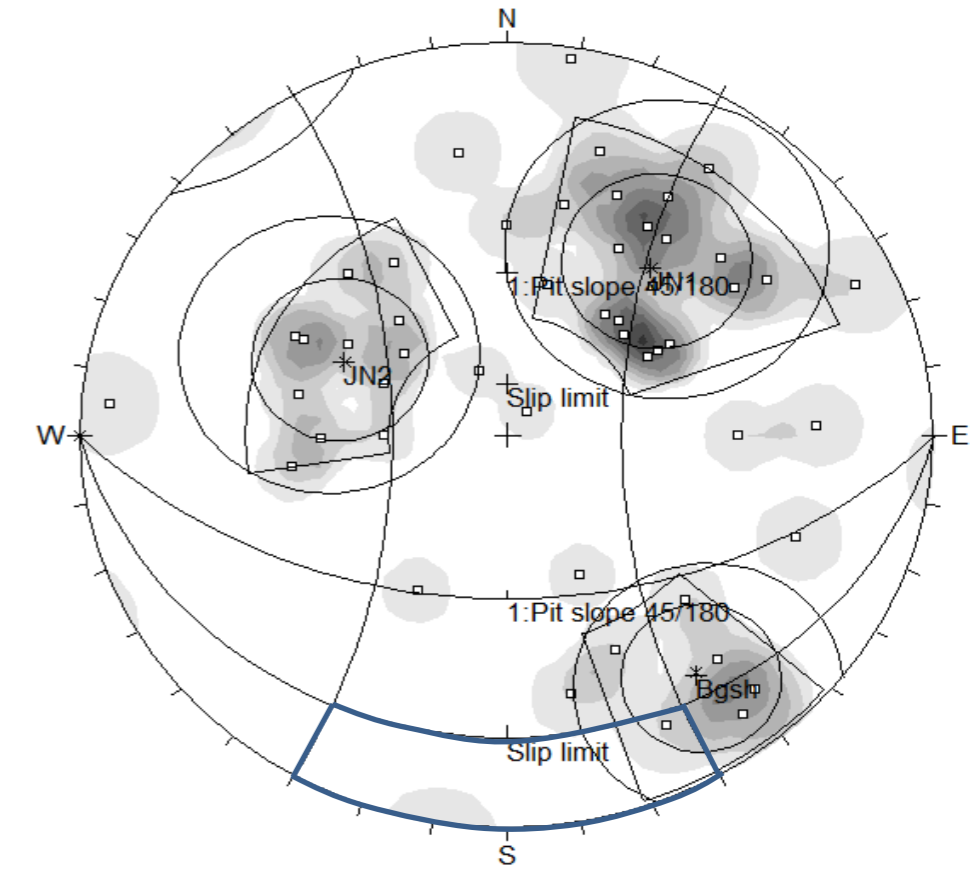
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 45° SOUTH FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL



Control on Stability: Low potential for planar failure for cut slopes with 45° batter angle and South orientation



Control on Stability: High potential for wedge failure for on joint sets JN1 and JN2 for cut slopes with 45° batter angle and South orientation

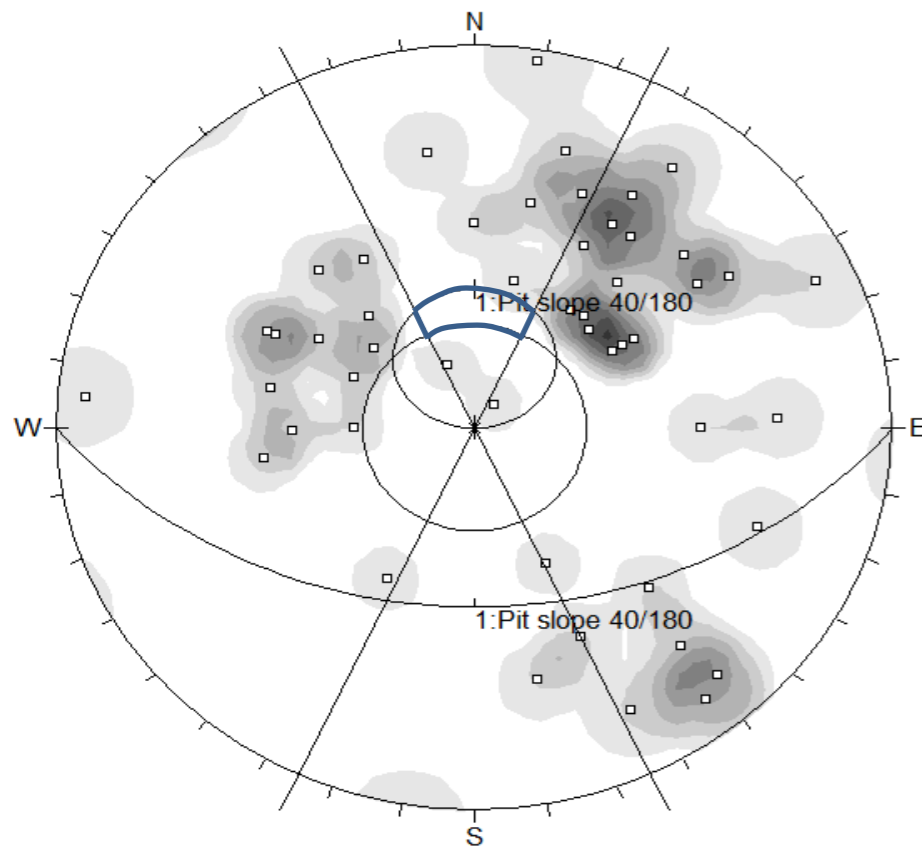


Control on Stability: Low potential for toppling failure for cut slopes with 45° batter angle and South orientation

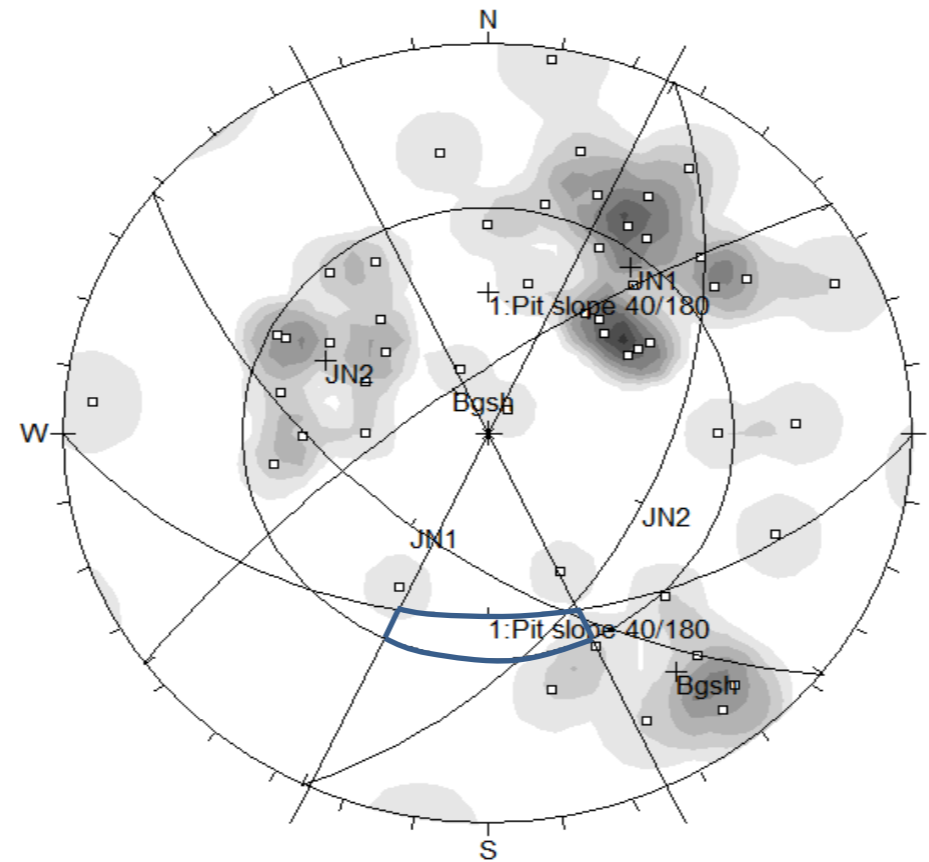


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

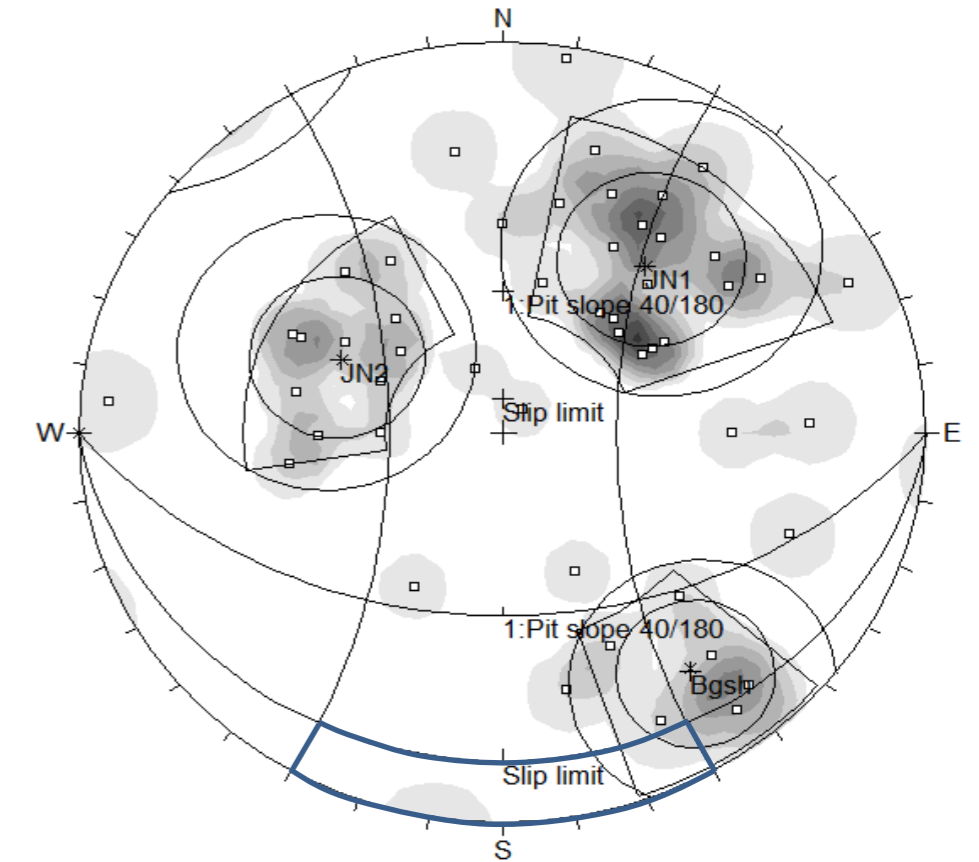
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 40° SOUTH FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL



Control on Stability: Low potential for planar failure for cut slopes with 40° batter angle and South orientation



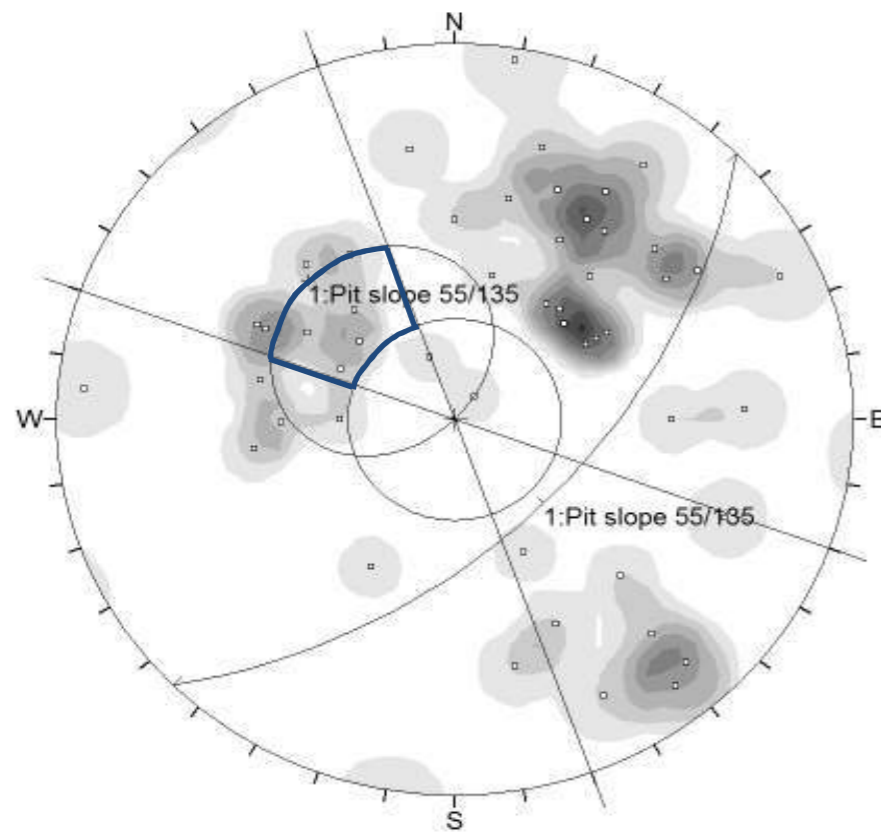
Control on Stability: Moderate potential for wedge failure on joint sets JN1 and JN2 for cut slopes with 40° batter angle and South orientation



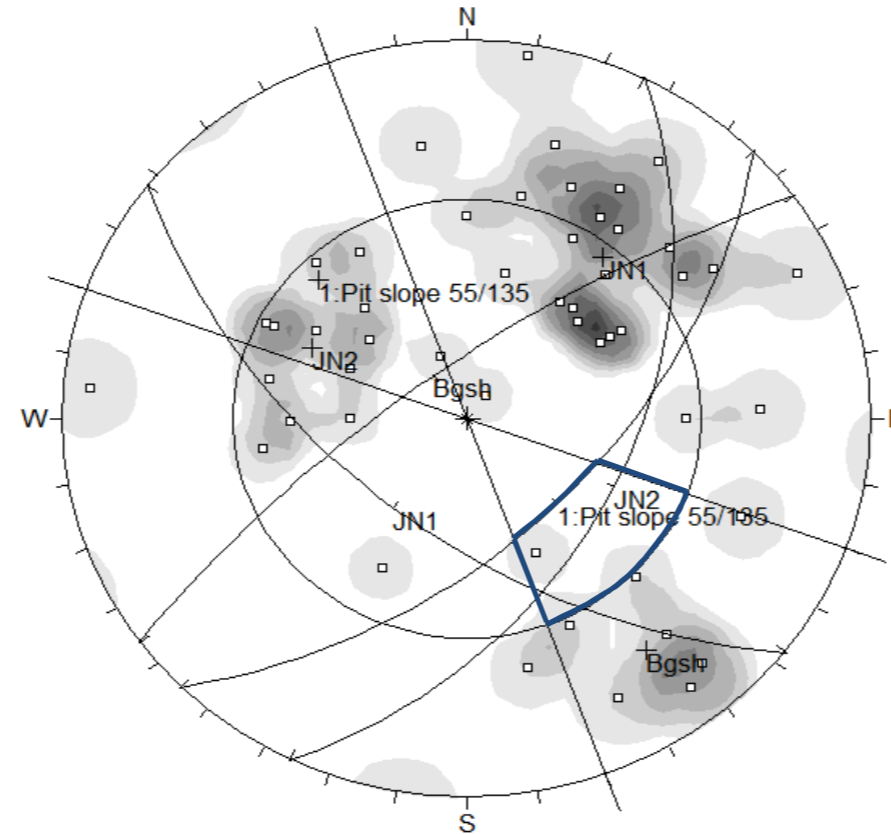
Control on Stability: Low potential for toppling failure for cut slopes with 40° batter angle and South orientation

	Date	20/02/15	Client	Holcim (NZ) Limited
	Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
	Approved by	KJ	Description	Failure Analysis
	Scale	N/A	Project Number	10315

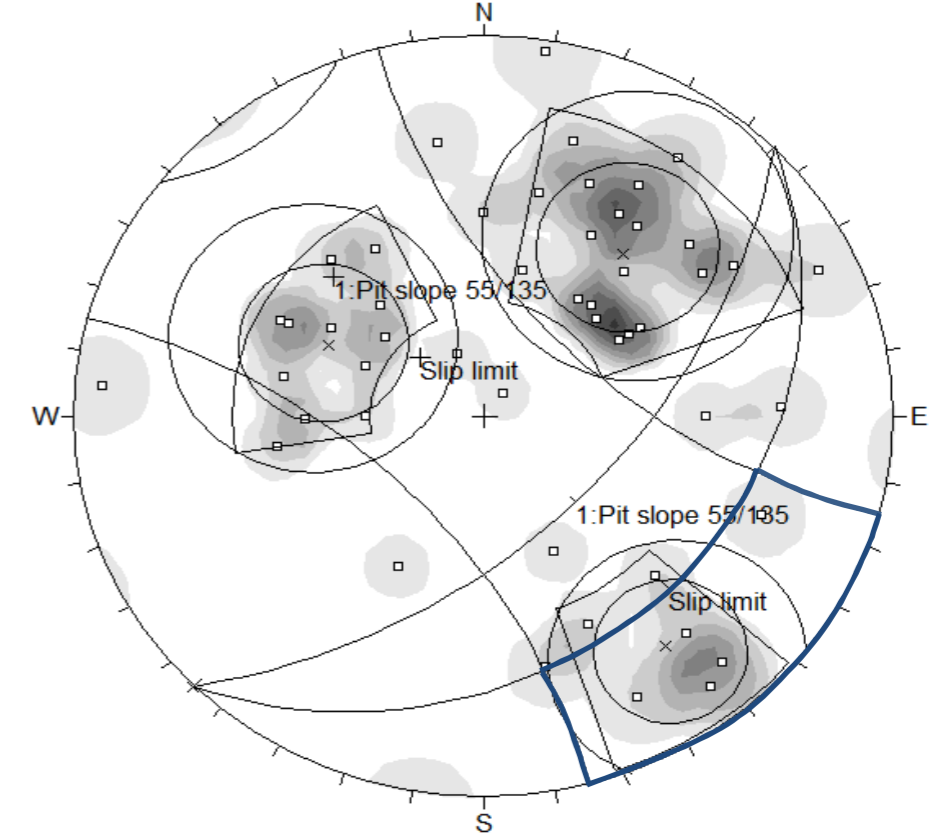
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 55° SOUTH-EAST FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL




Control on Stability: High potential for planar failure for cut slopes with 55° batter angle and South-East orientation



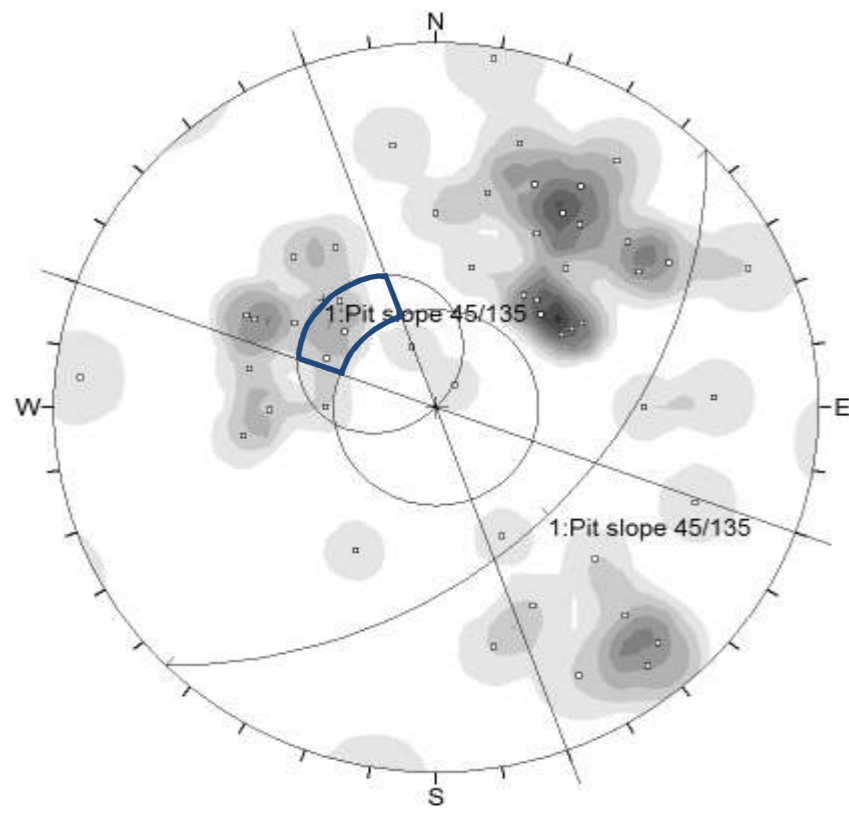
Control on Stability: Moderate potential for wedge failure on joint sets JN1 and JN2 for cut slopes with 55° batter angle and South-East orientation



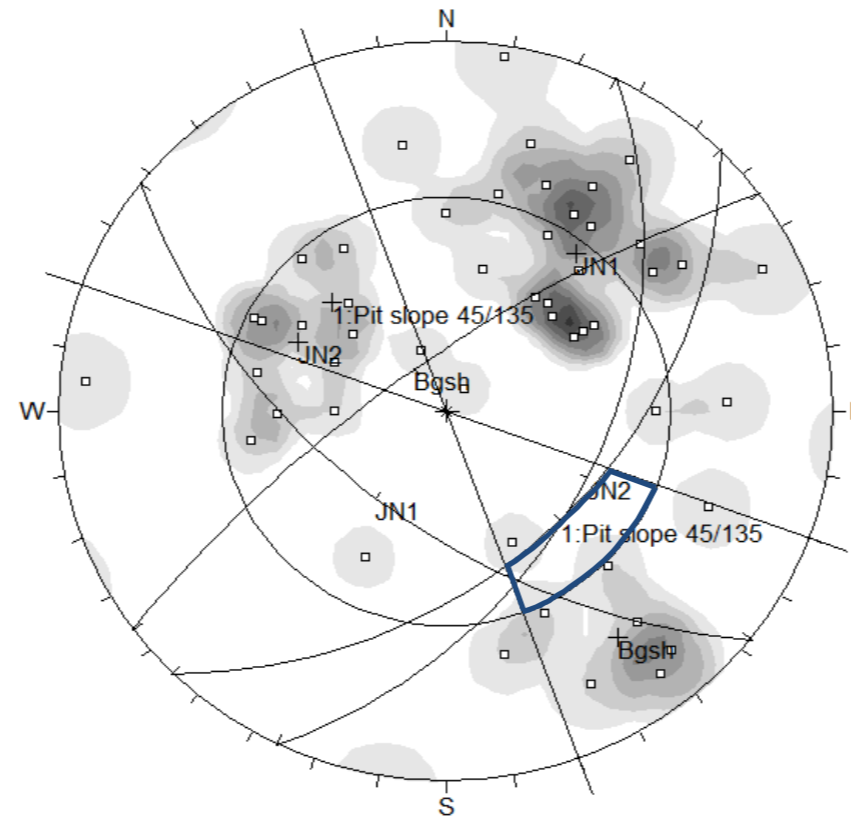
Control on Stability: Moderate potential for toppling failure for cut slopes with 55° batter angle and South-East orientation

	Date	20/02/15	Client	Holcim (NZ) Limited
	Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
	Approved by	KJ	Description	Failure Analysis
	Scale	N/A	Project Number	10315

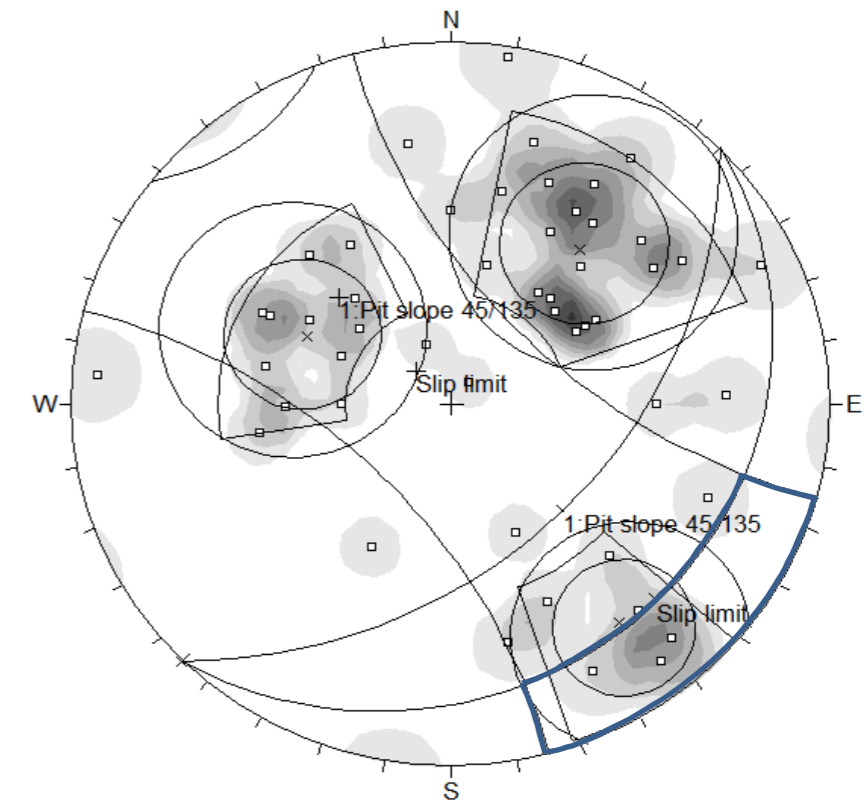
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 45° SOUTH-EAST FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL



Control on Stability: High potential for planar failure for cut slopes with 45° batter angle and South-East orientation



Control on Stability: Moderate potential for wedge failure on joint sets JN1 and JN2 for cut slopes with 45° batter angle

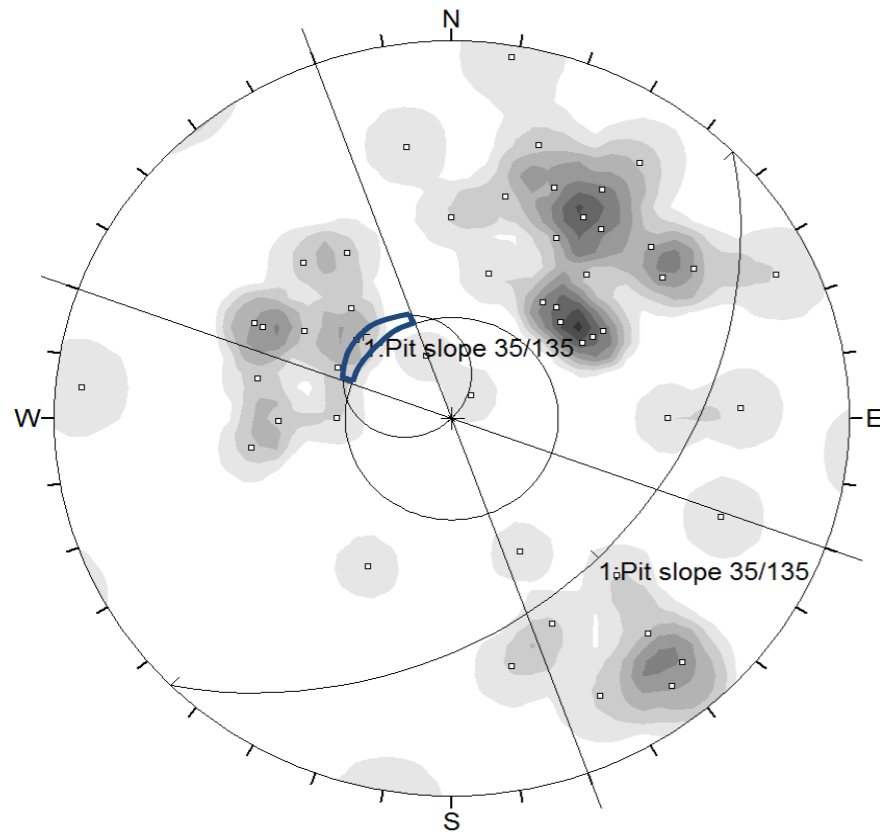


Control on Stability: Moderate potential for toppling failure for cut slopes with 45° batter angle and South-East orientation

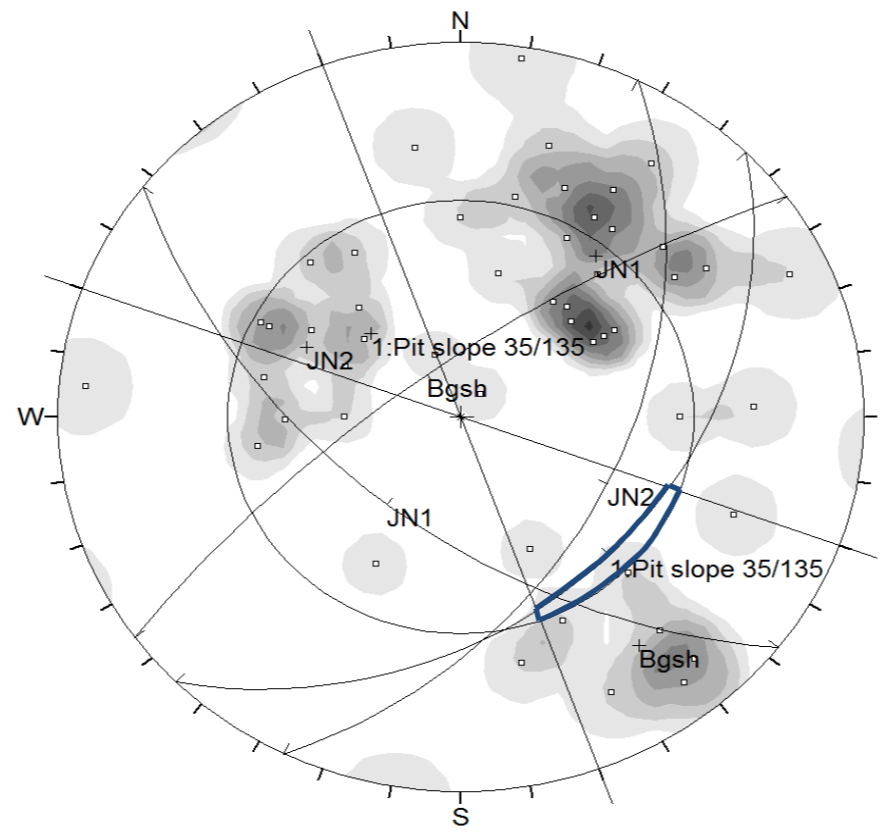


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

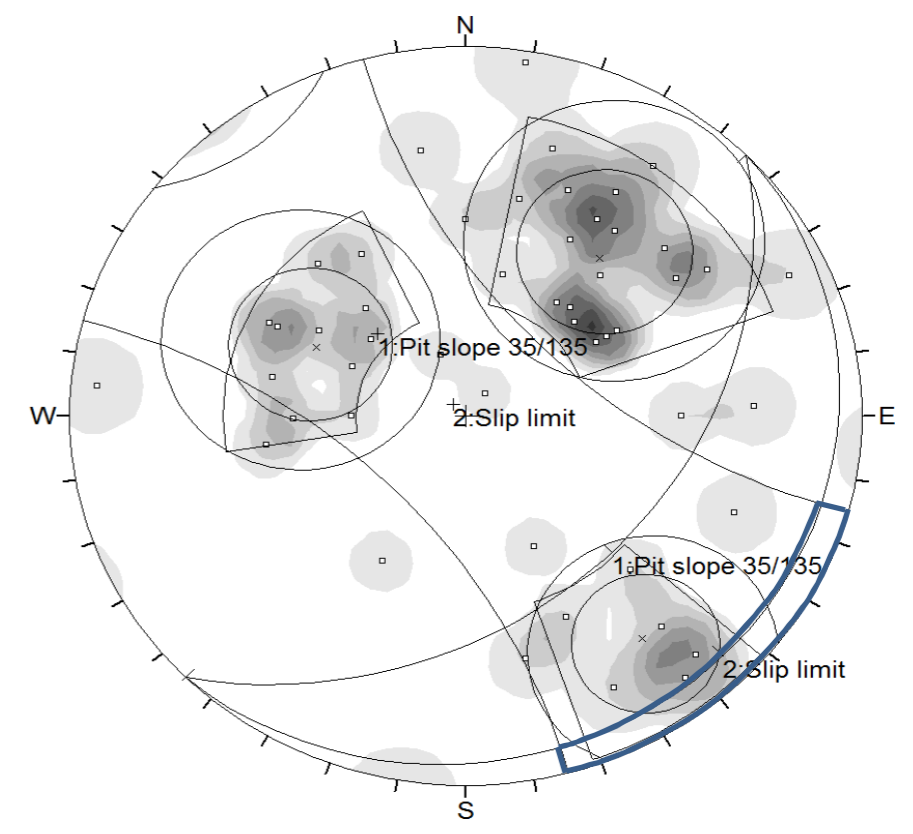
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 35° SOUTH-EAST FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL



Control on Stability: Low potential for planar failure for cut slopes with 35° batter angle and South-East orientation



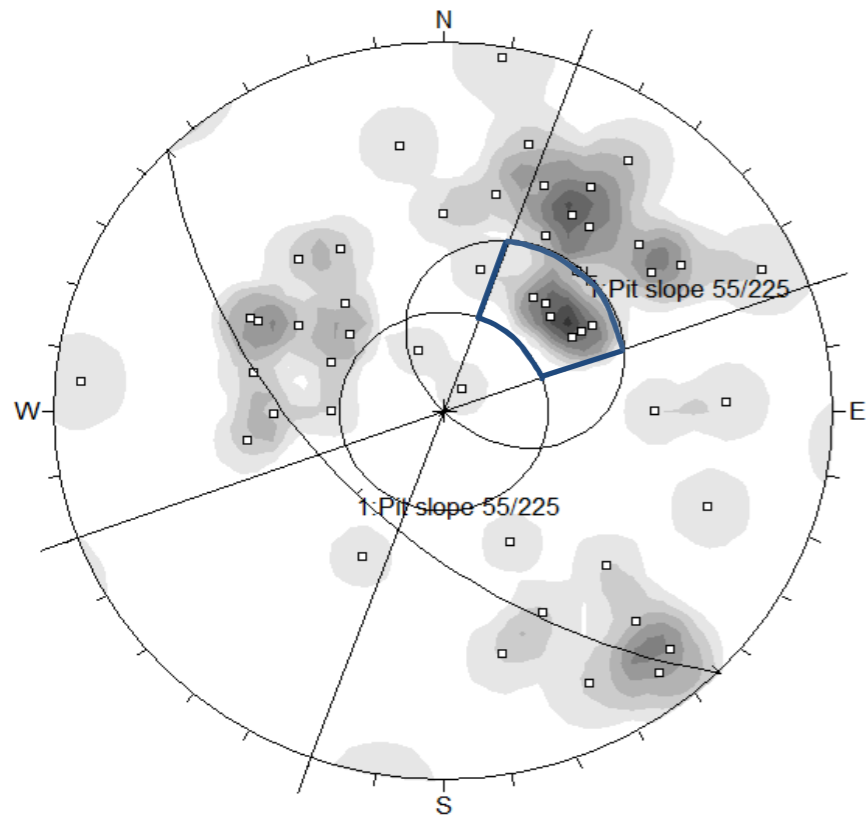
Control on Stability: Low potential for wedge failure for cut slopes with 35° batter angle and South-East orientation



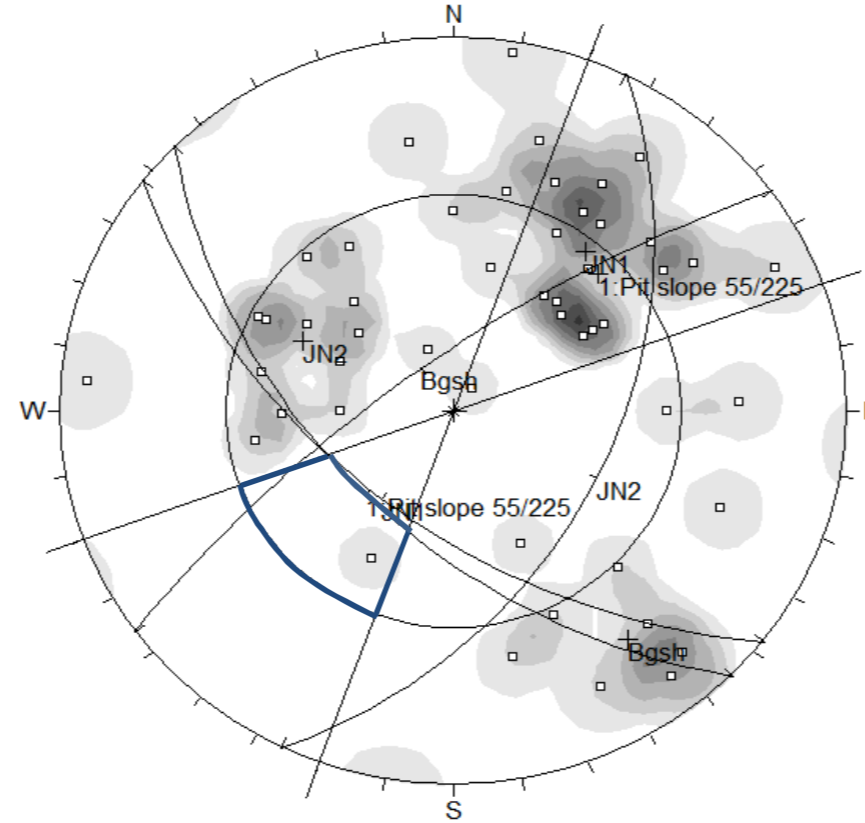
Control on Stability: Low potential for toppling failure for cut slopes with 35° batter angle and South-East orientation

	Date	20/02/15	Client	Holcim (NZ) Limited
	Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
	Approved by	KJ	Description	Failure Analysis
	Scale	N/A	Project Number	10315

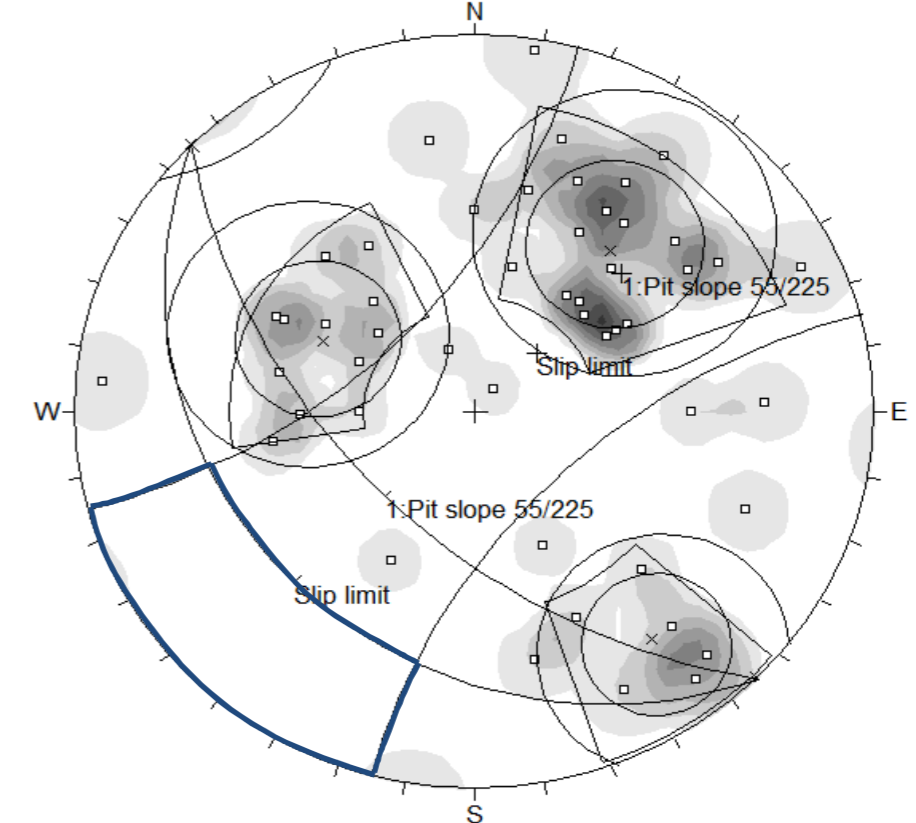
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 55° SOUTH-WEST FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL



Control on Stability: High potential for planar failure for cut slopes with 55° batter angle and South-West orientation



Control on Stability: Low potential for wedge failure for cut slopes with 55° batter angle and South-West orientation

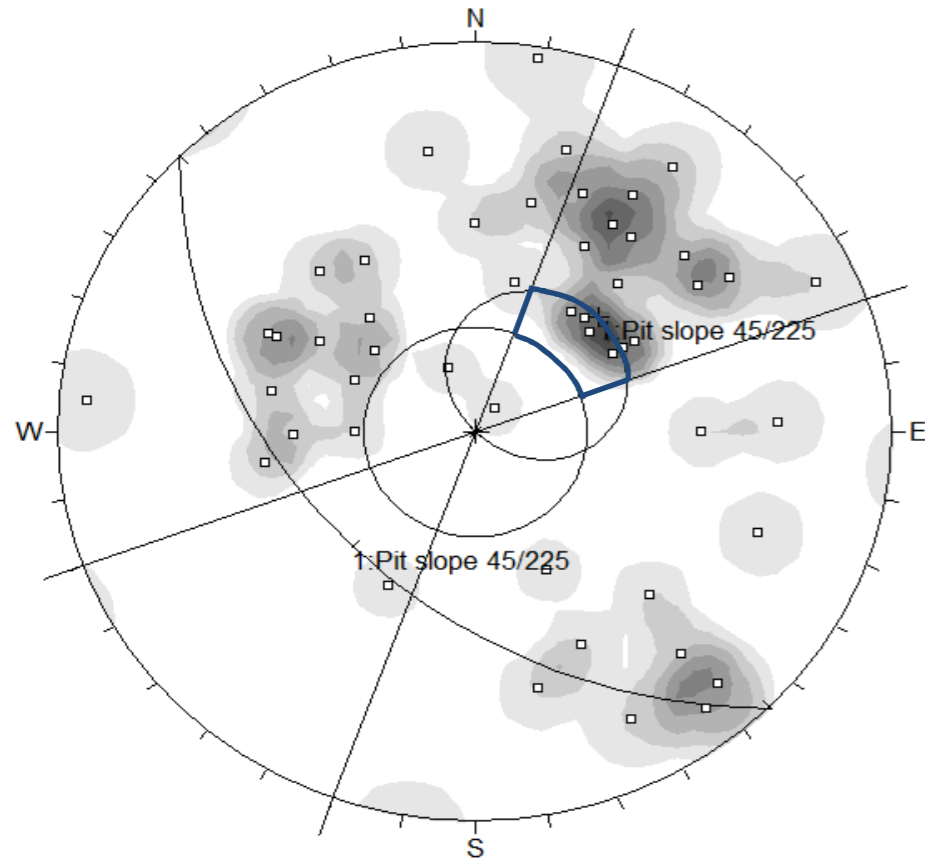


Control on Stability: Low potential for toppling failure for cut slopes with 55° batter angle and South-West orientation

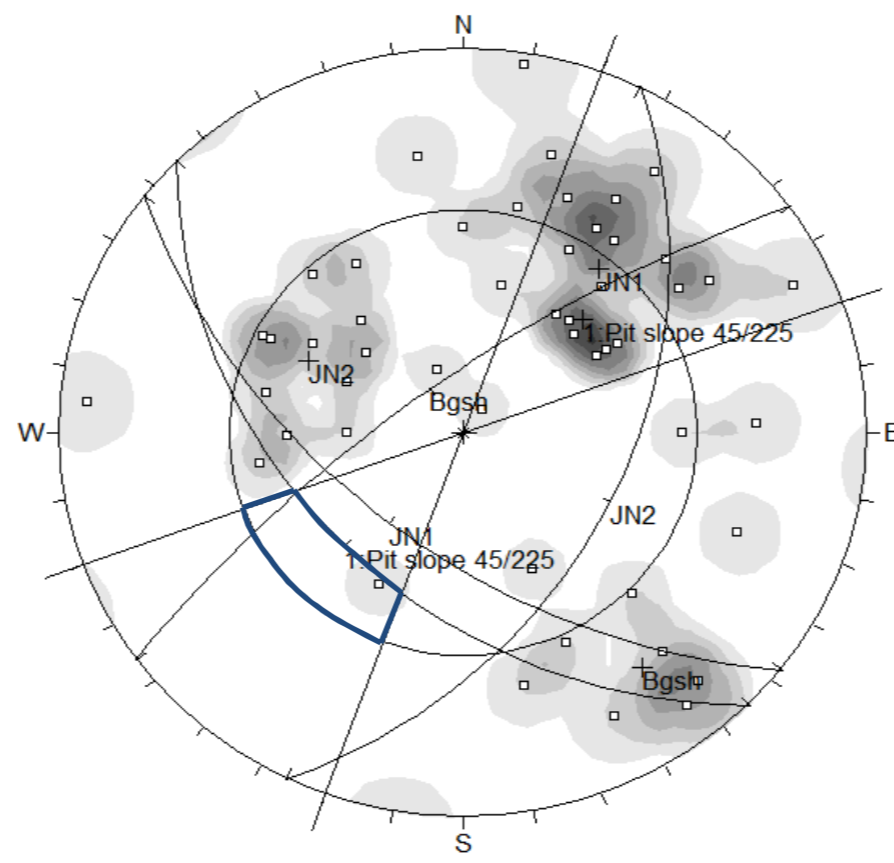


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

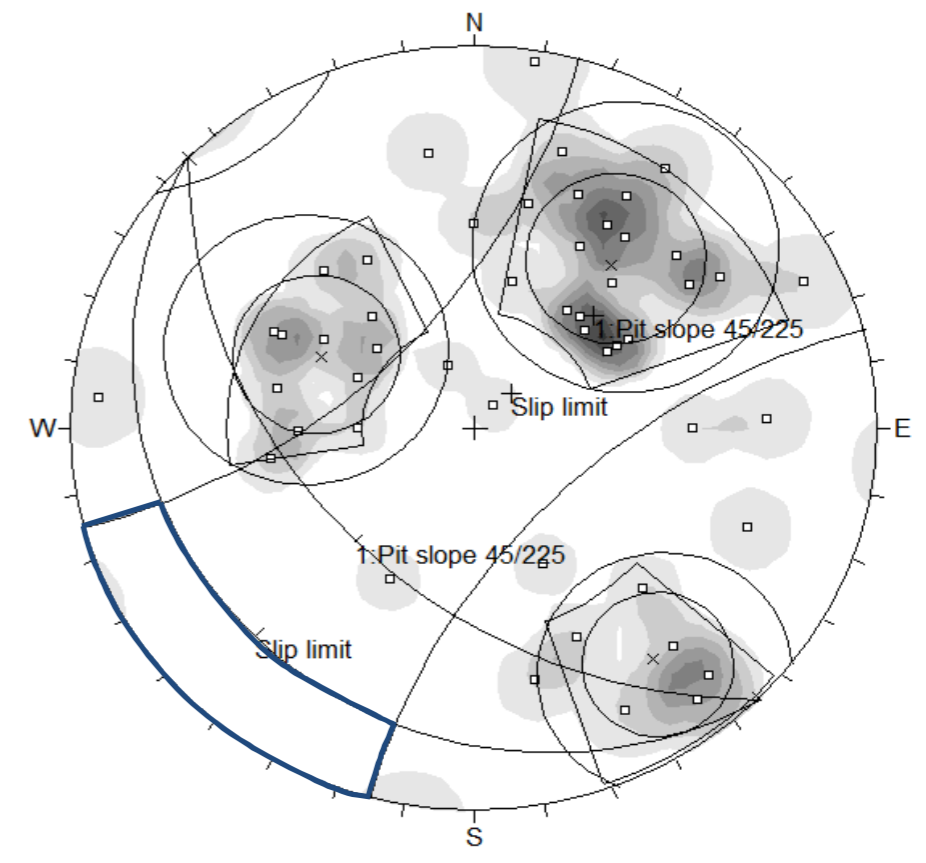
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 45° SOUTH-WEST FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL



Control on Stability: High potential for planar failure for cut slopes with 45° batter angle and South-West orientation



Control on Stability: Low potential for wedge failure for cut slopes with 45° batter angle and South-West orientation

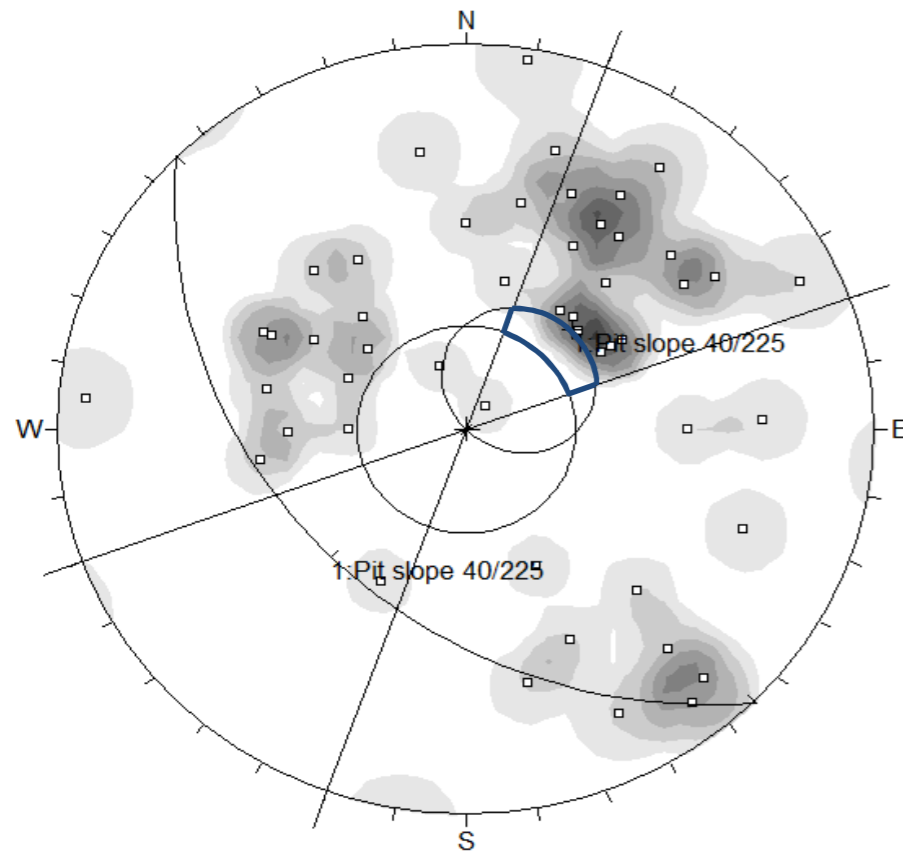


Control on Stability: Low potential for toppling failure for cut slopes with 45° batter angle and South-West orientation

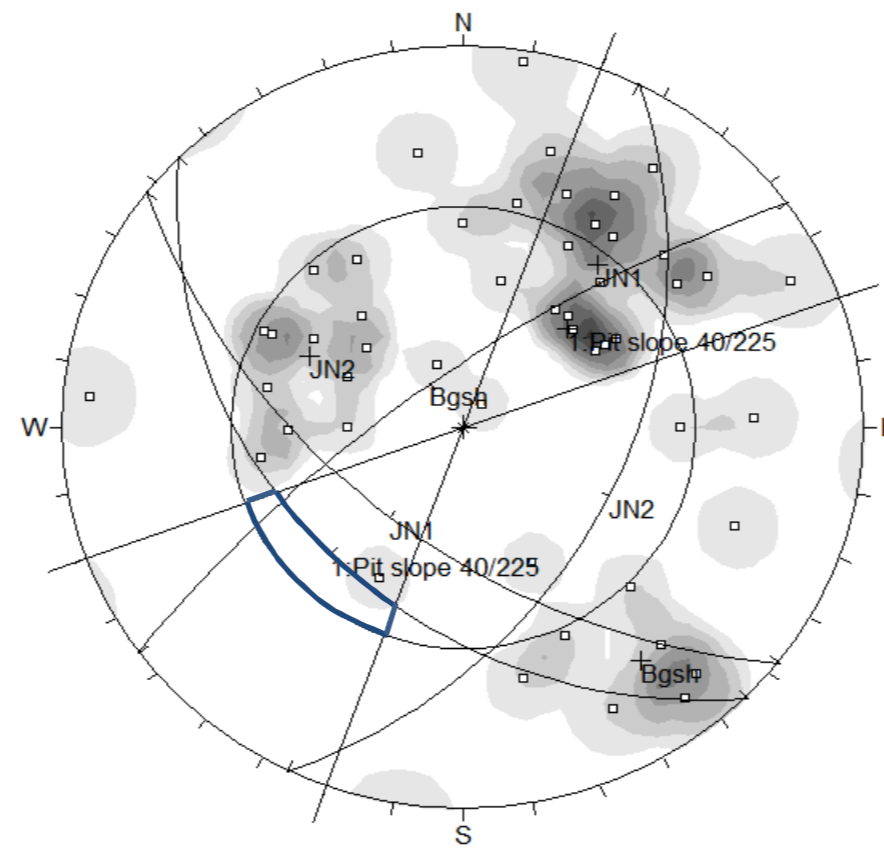


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

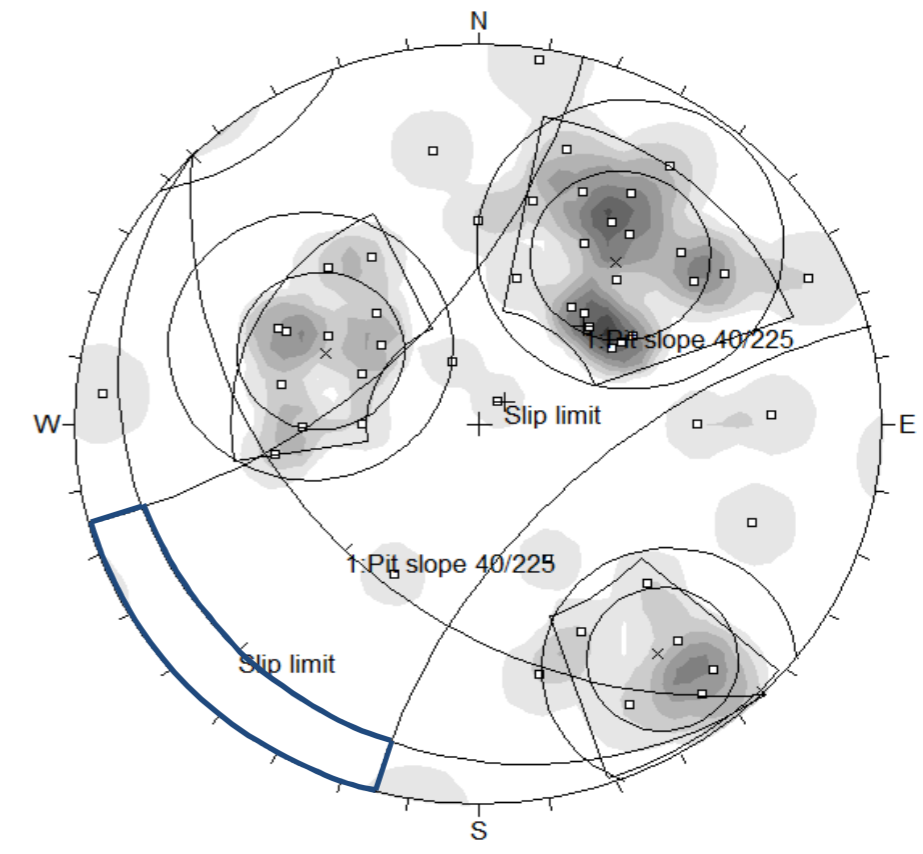
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 40° SOUTH-WEST FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL



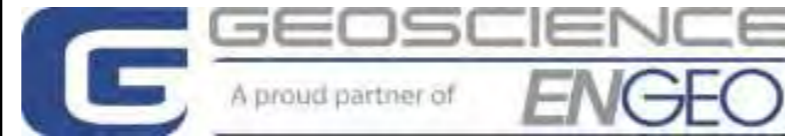
Control on Stability: Moderate potential for planar failure for cut slopes with 40° batter angle and South-West orientation



Control on Stability: Low potential for wedge failure for cut slopes with 40° batter angle and South-West orientation

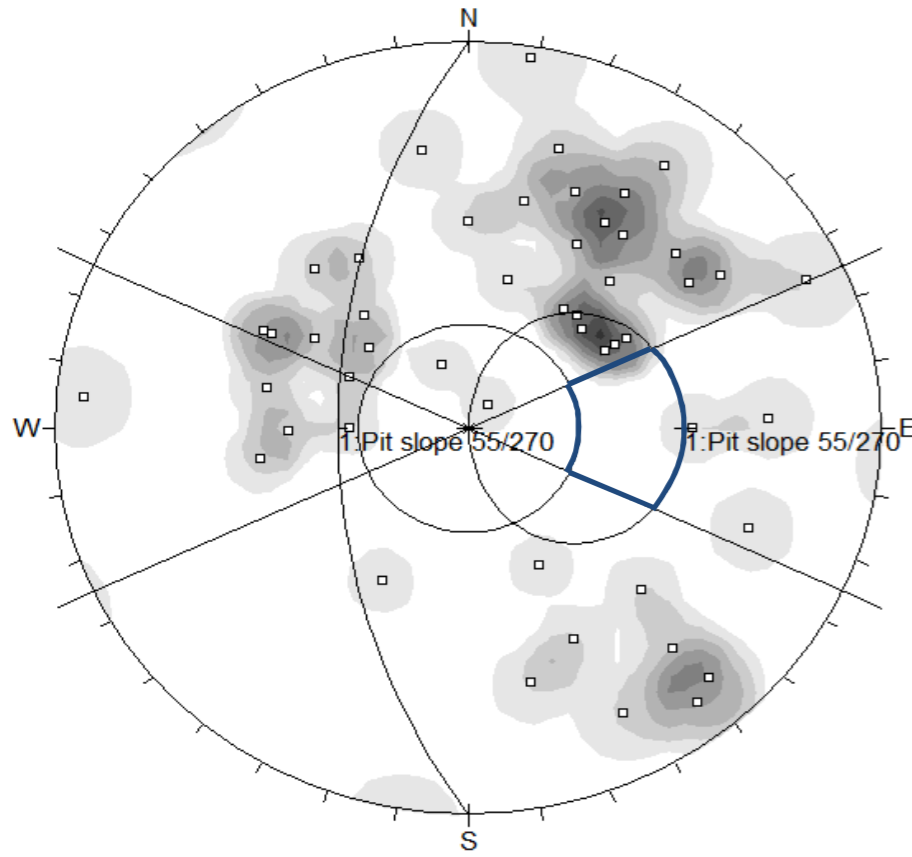


Control on Stability: Low potential for toppling failure for cut slopes with 40° batter angle and South-West orientation

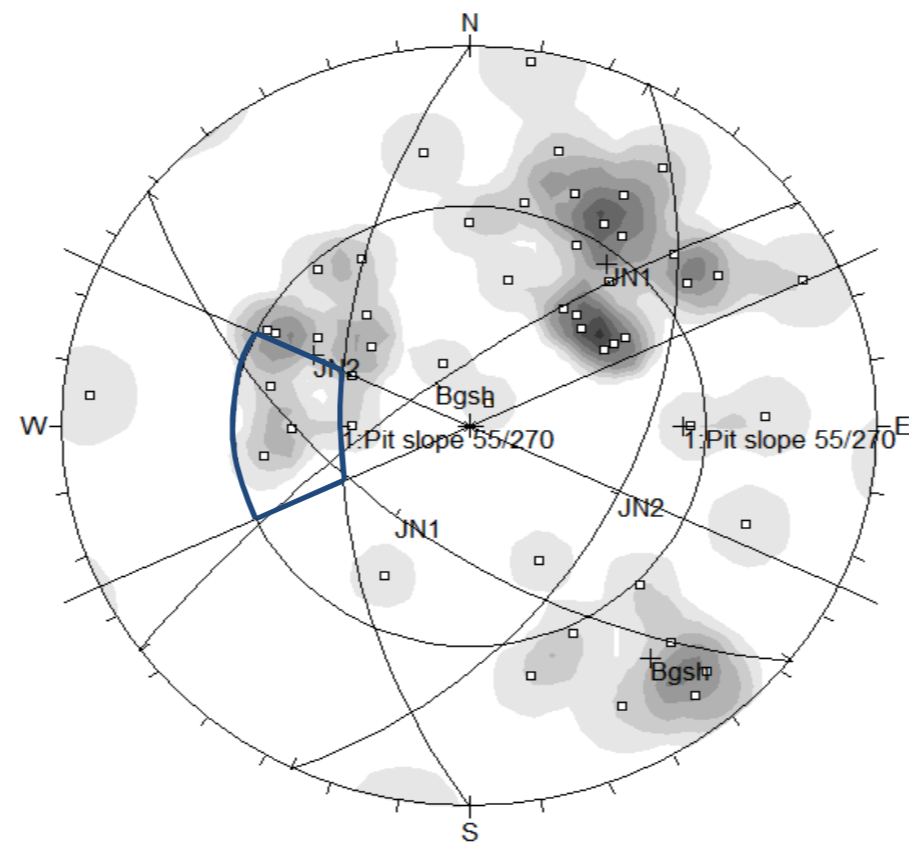


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

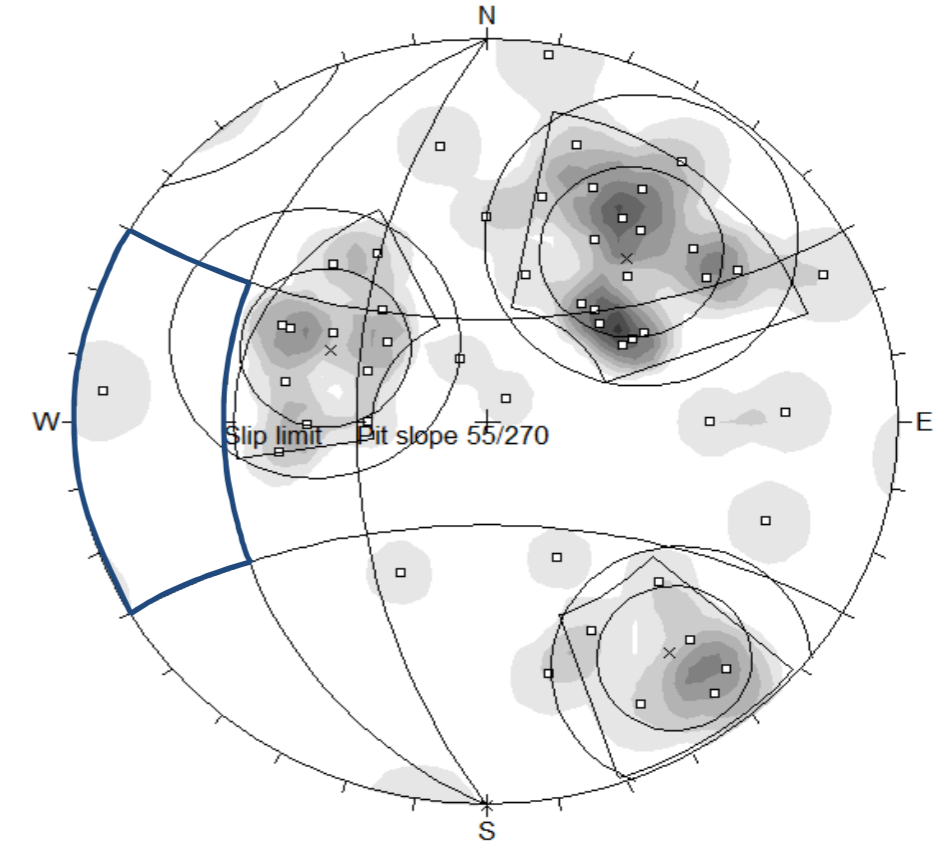
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 55° WEST FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL




Control on Stability: Low potential for planar failure for cut slopes with 55° batter angle and West orientation



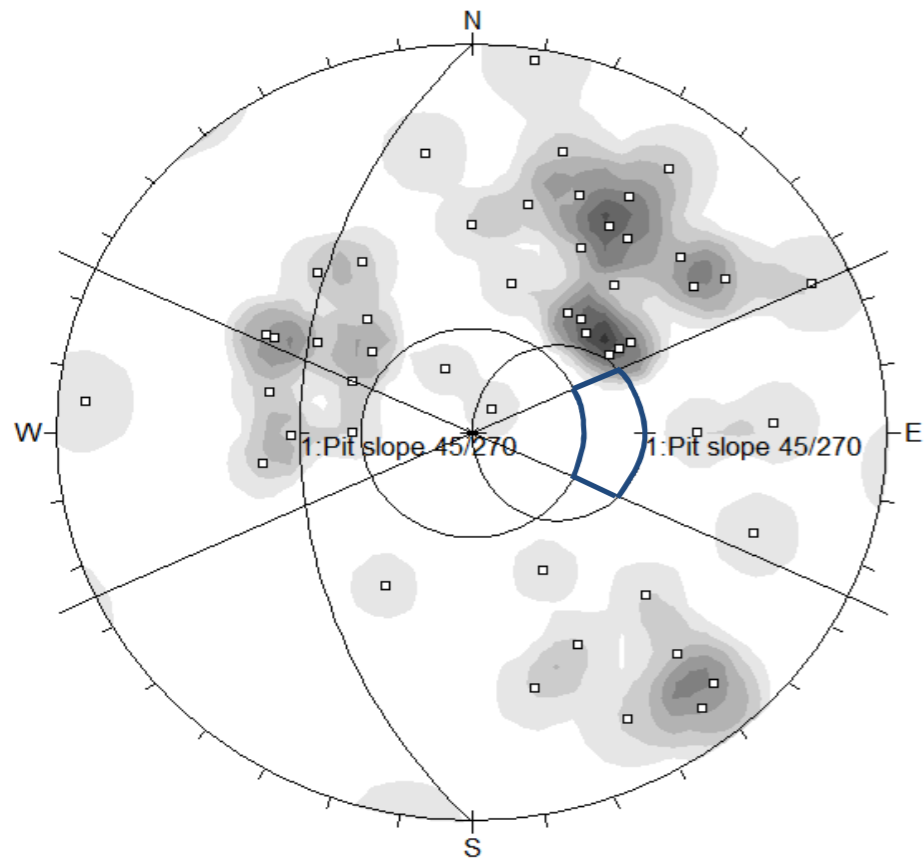
Control on Stability: High potential for wedge failure on joint sets JN1 and Bgsh for cut slopes with 55° batter angle and West orientation



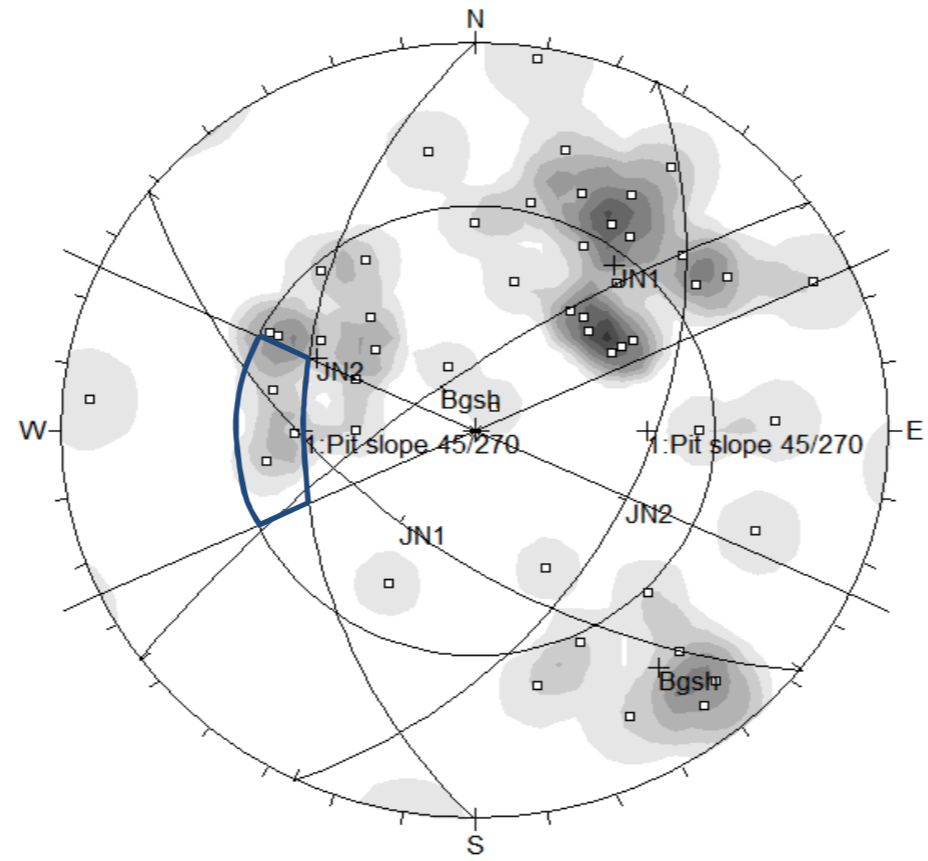
Control on Stability: Low potential for toppling failure for cut slopes with 55° batter angle and West orientation

	Date	20/02/15	Client	Holcim (NZ) Limited
	Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
	Approved by	KJ	Description	Failure Analysis
	Scale	N/A	Project Number	10315

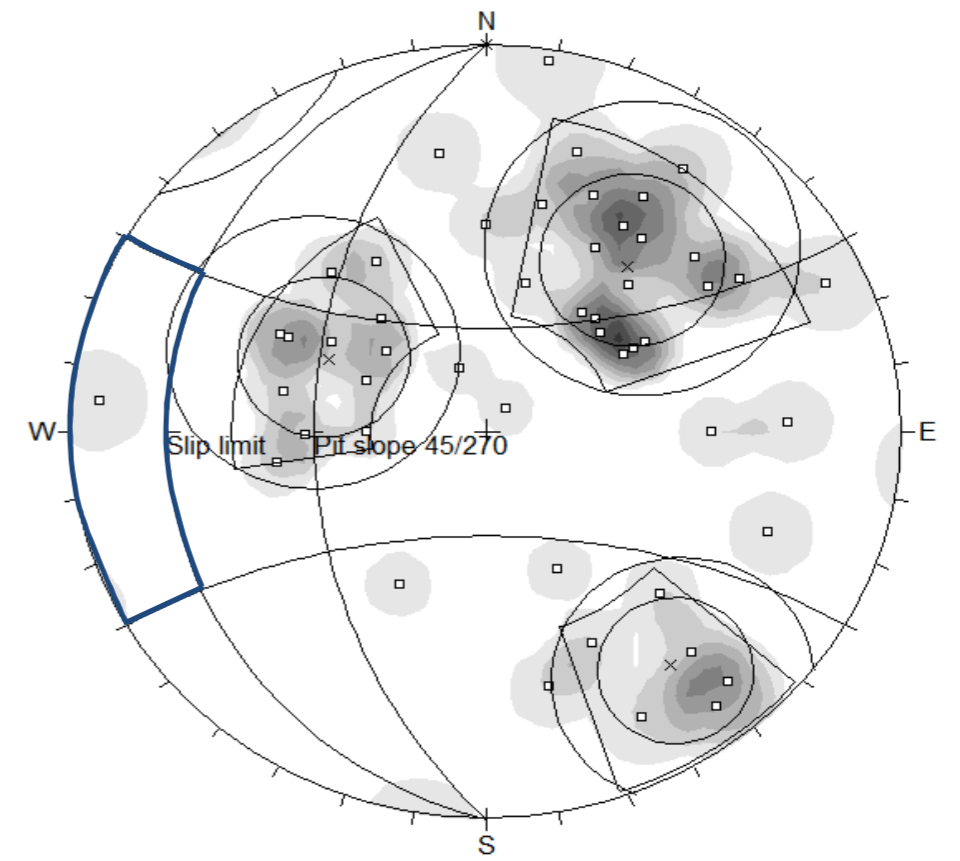
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 45° WEST FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL



Control on Stability: Low potential for planar failure for cut slopes with 45° batter angle and West orientation



Control on Stability: Low potential for wedge failure for cut slopes with 45° batter angle and West orientation

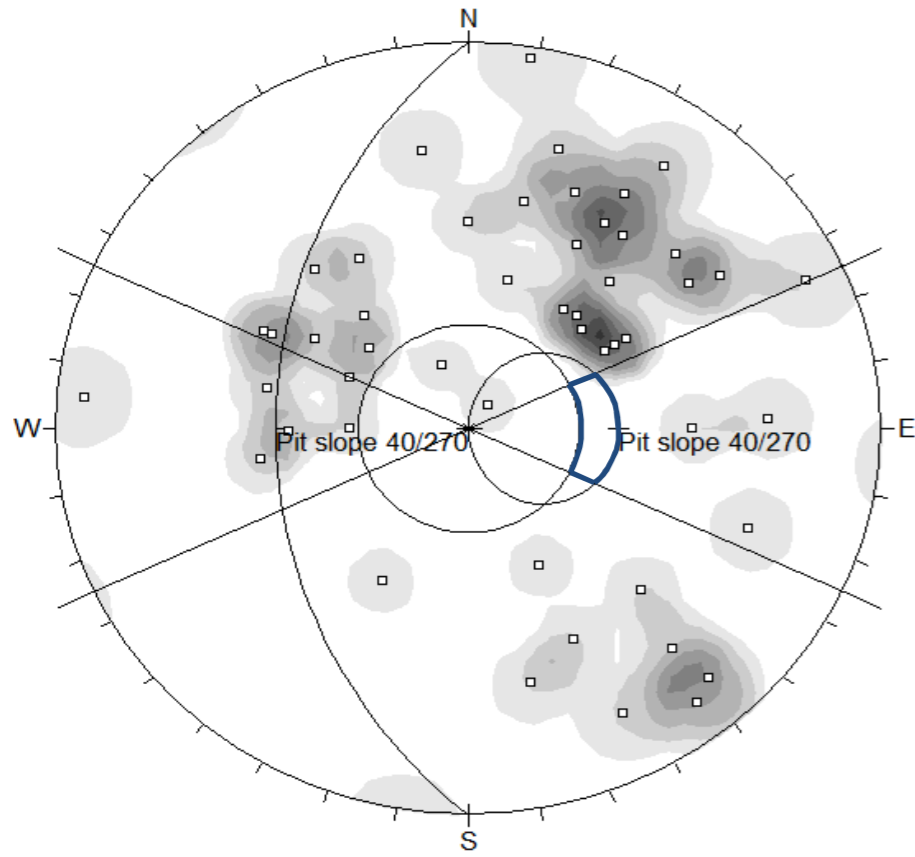


Control on Stability: Low potential for toppling failure for cut slopes with 45° batter angle and West orientation

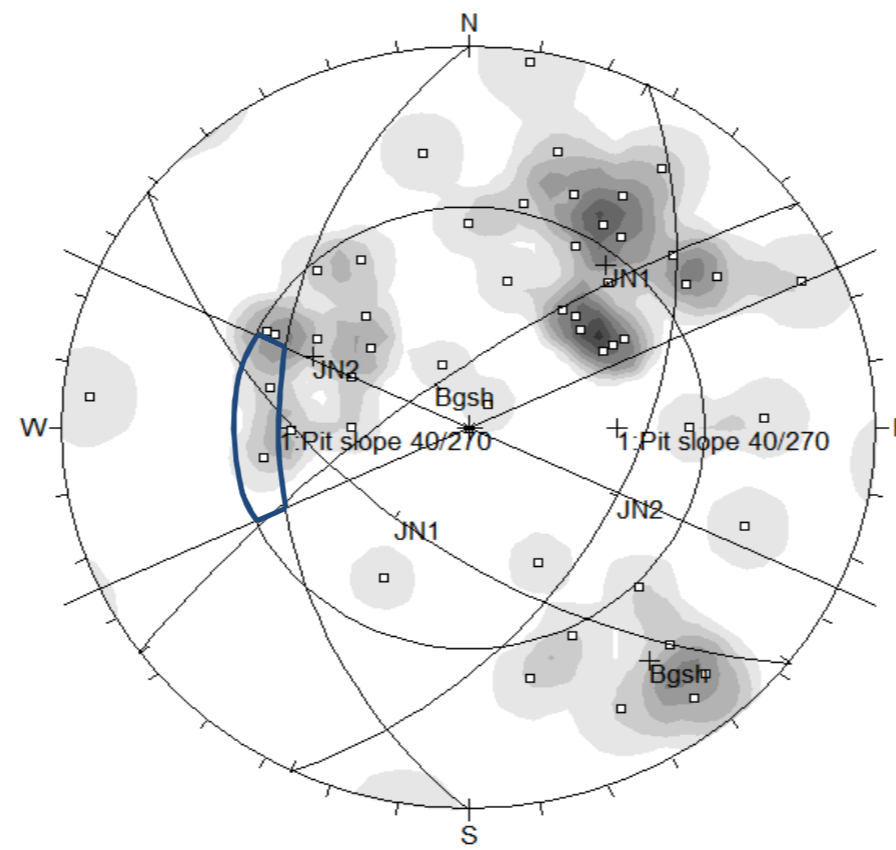


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

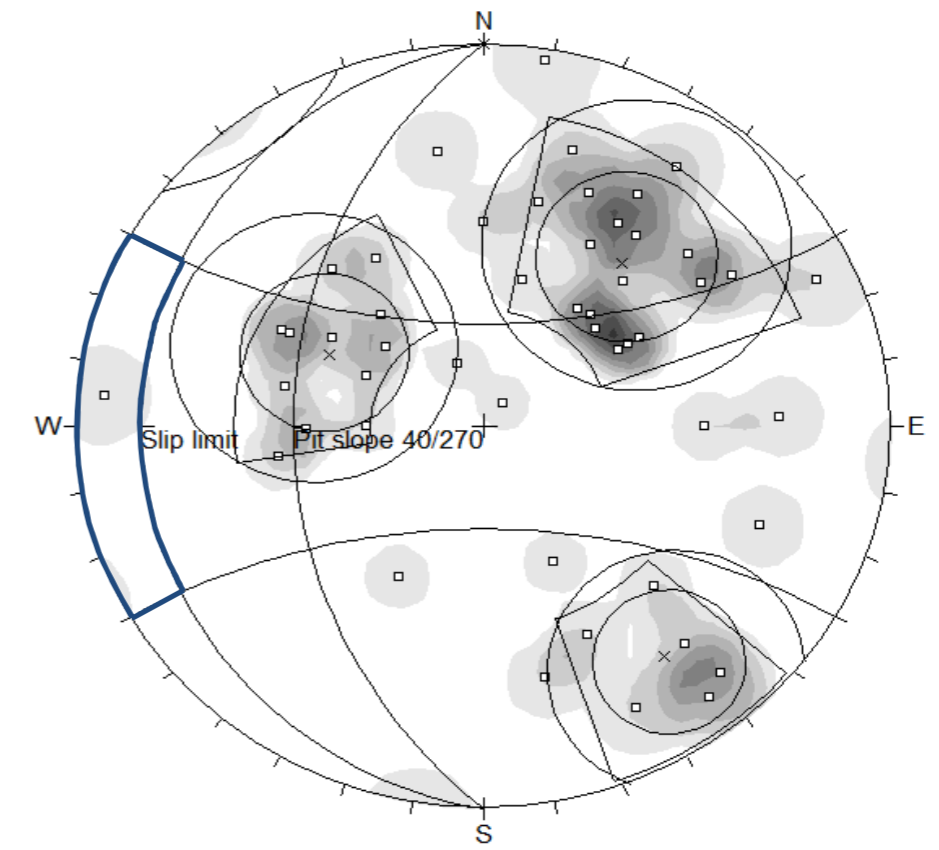
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 40° WEST FACING BATTER BASED ON OBSERVATIONS FROM THE NORTH WALL



Control on Stability: Low potential for planar failure for cut slopes with 40° batter angle and West orientation



Control on Stability: Low potential for wedge failure for cut slopes with 40° batter angle and West orientation

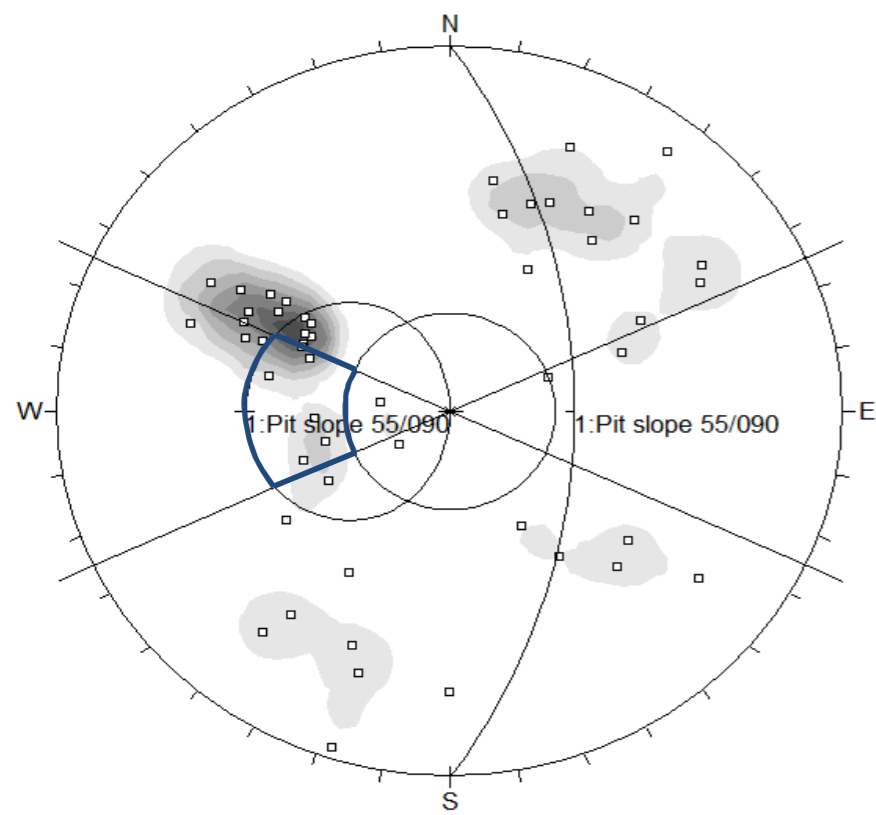


Control on Stability: Low potential for toppling failure for cut slopes with 40° batter angle and West orientation

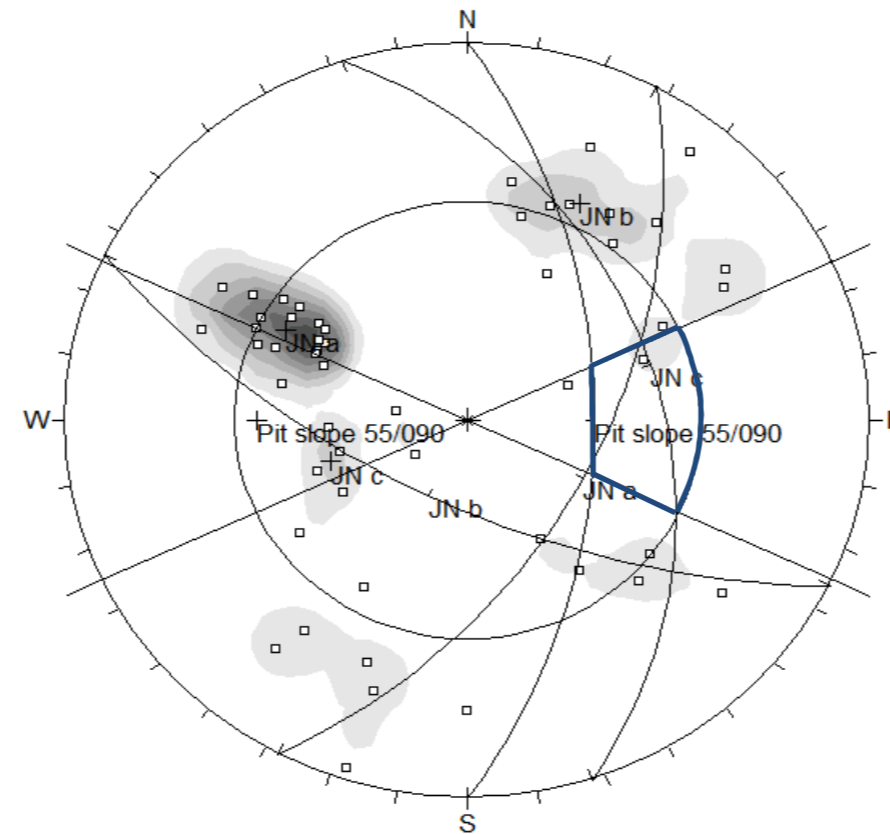


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

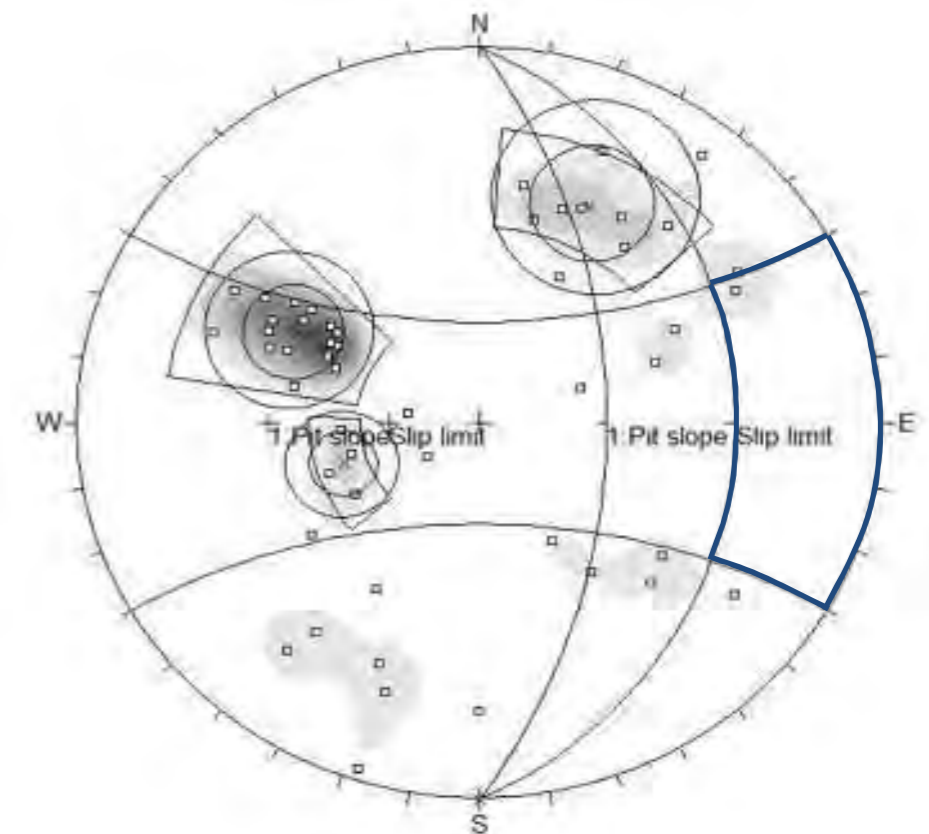
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 55° EAST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: High potential for planar failure for cut slopes with 55° batter angle and East orientation



Control on Stability: Moderate potential for wedge failure on joint sets JNa and JNc for cut slopes with 55° batter angle and East orientation

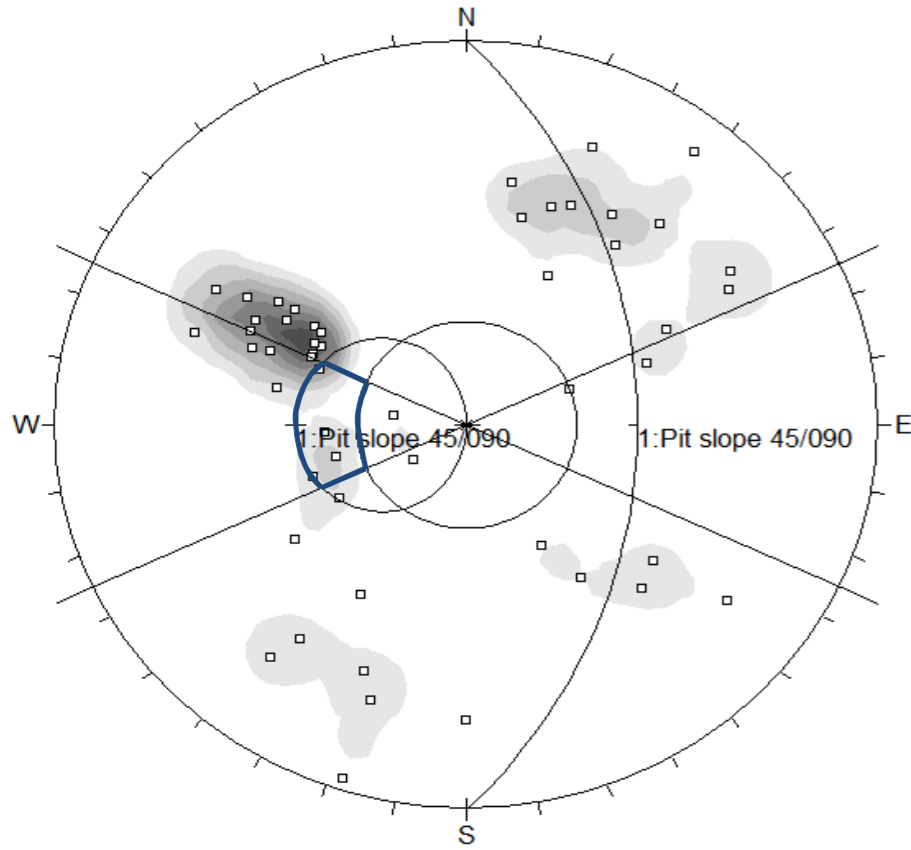


Control on Stability: Low potential for toppling failure for cut slopes with 55° batter angle and East orientation

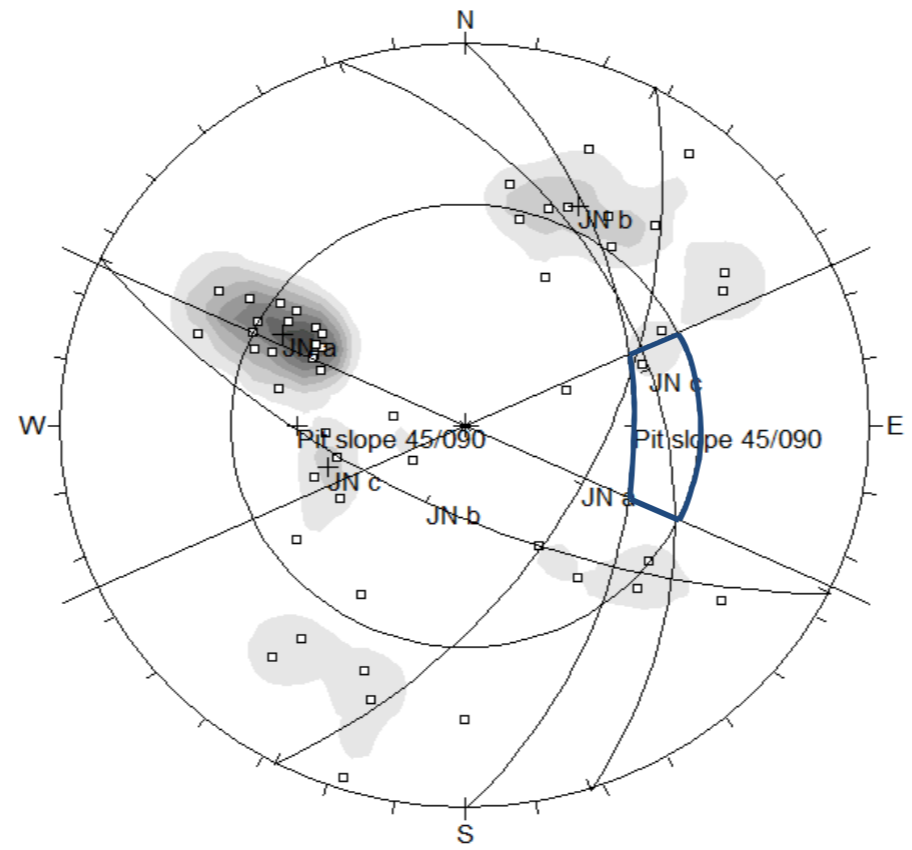


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

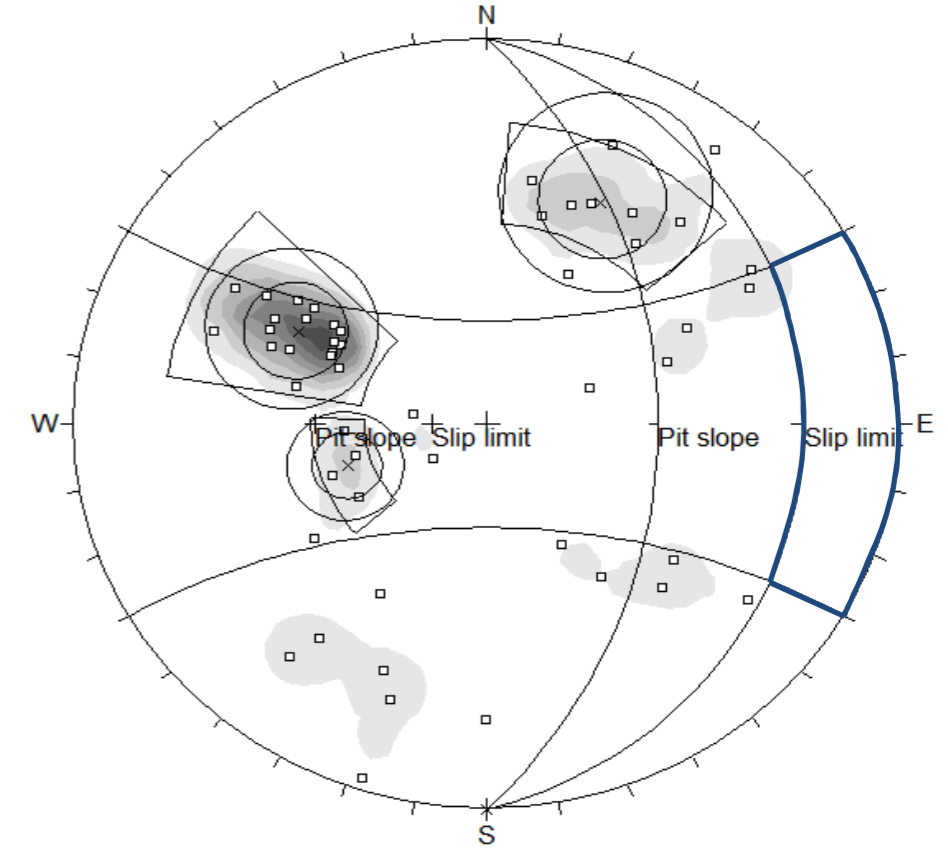
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 45° EAST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: Moderate potential for planar failure for cut slopes with 45° batter angle and East orientation



Control on Stability: Moderate potential for wedge failure on joint sets JNa and JNc for cut slopes with 45° batter angle and East orientation

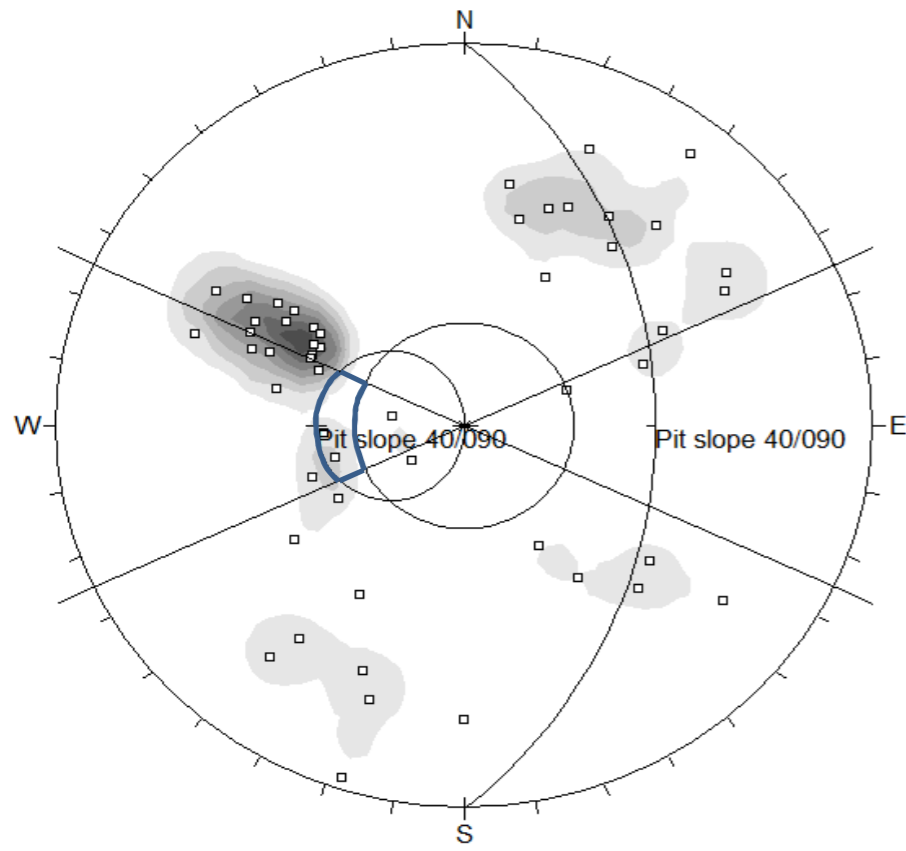


Control on Stability: Low potential for toppling failure for cut slopes with 45° batter angle and East orientation

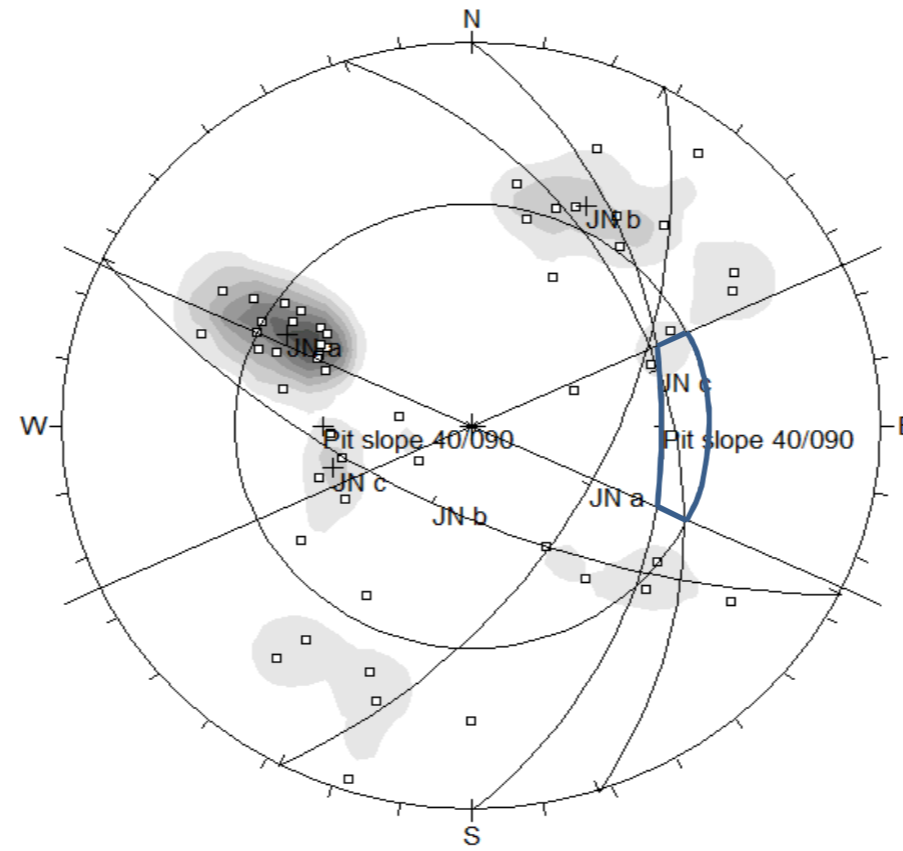


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

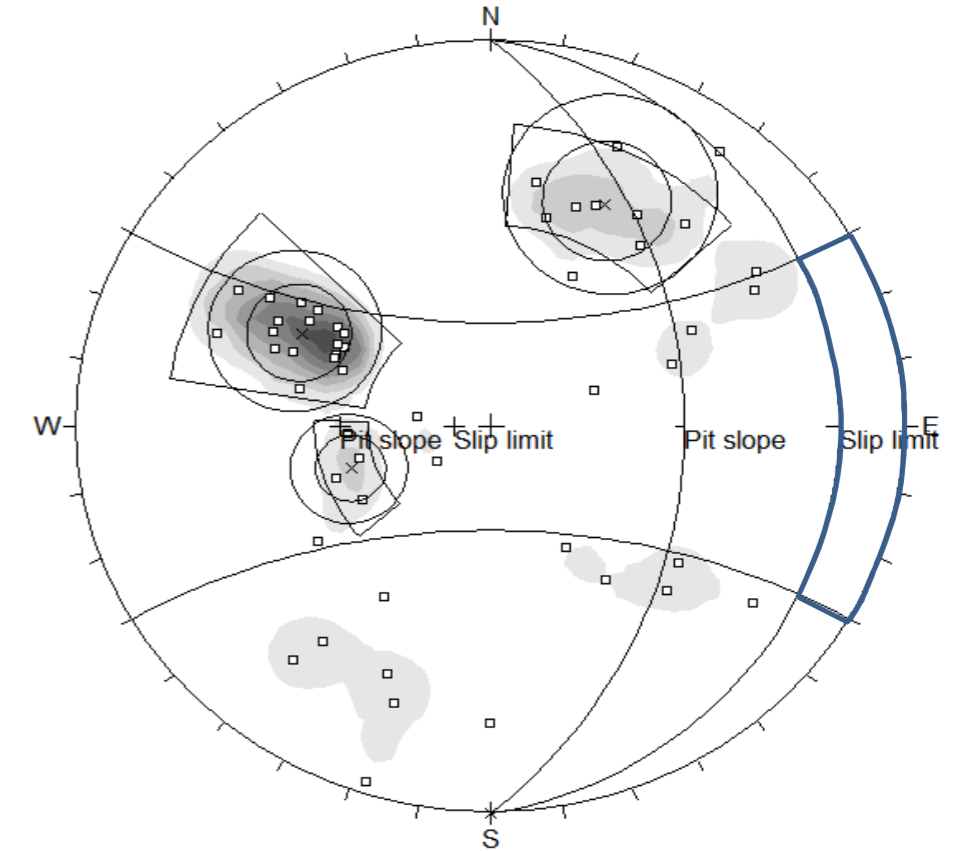
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 40° EAST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: Low potential for planar failure for cut slopes with 40° batter angle and East orientation



Control on Stability: Low potential for wedge for cut slopes with 40° batter angle and East orientation

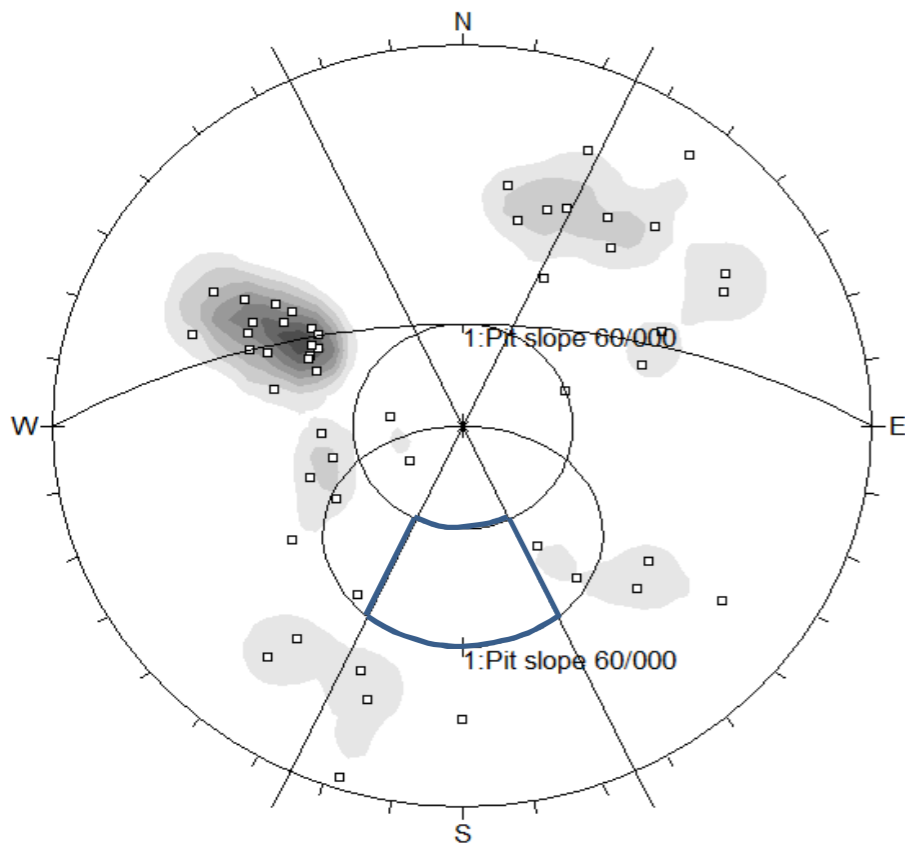


Control on Stability: Low potential for toppling failure for cut slopes with 40° batter angle and East orientation

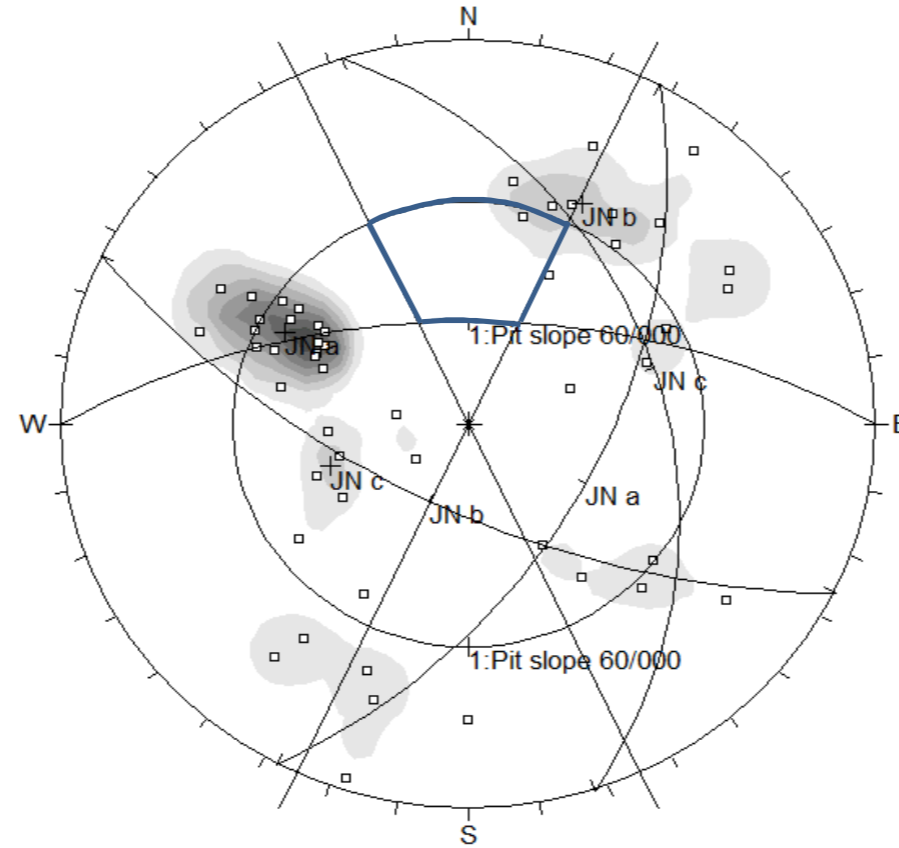


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

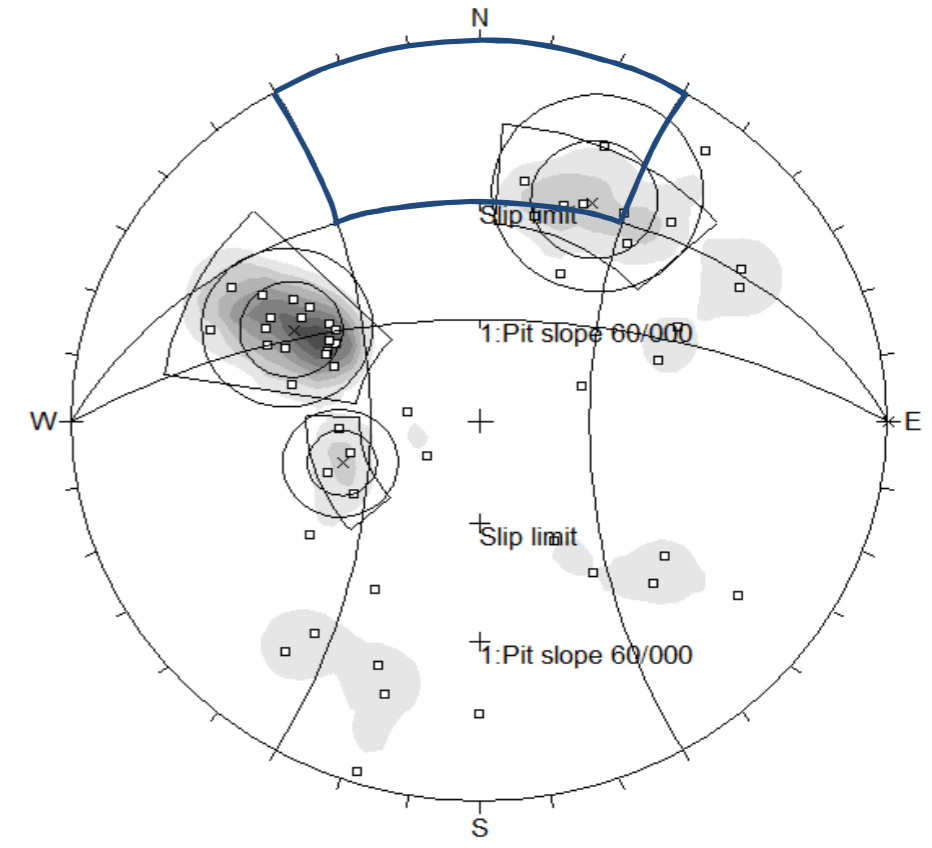
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 60° NORTH FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: Low potential for planar failure for cut slopes with 60° batter angle and North orientation



Control on Stability: Low potential for wedge failure for cut slopes with 60° batter angle and North orientation

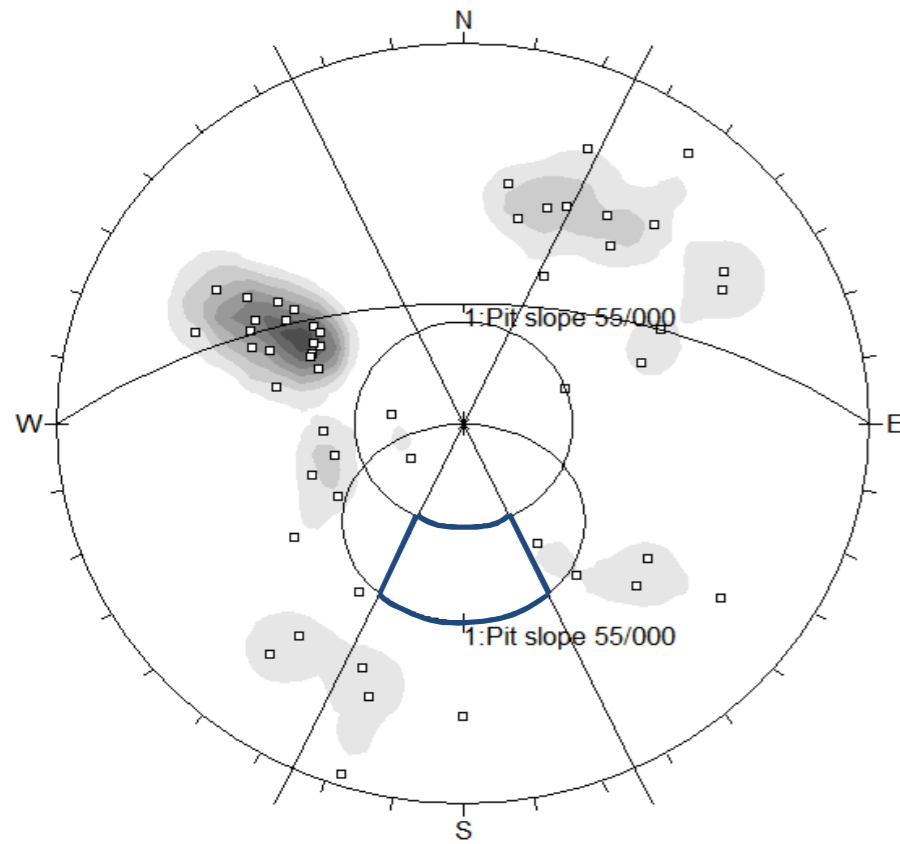


Control on Stability: Moderate potential for toppling failure for cut slopes with 60° batter angle and North orientation

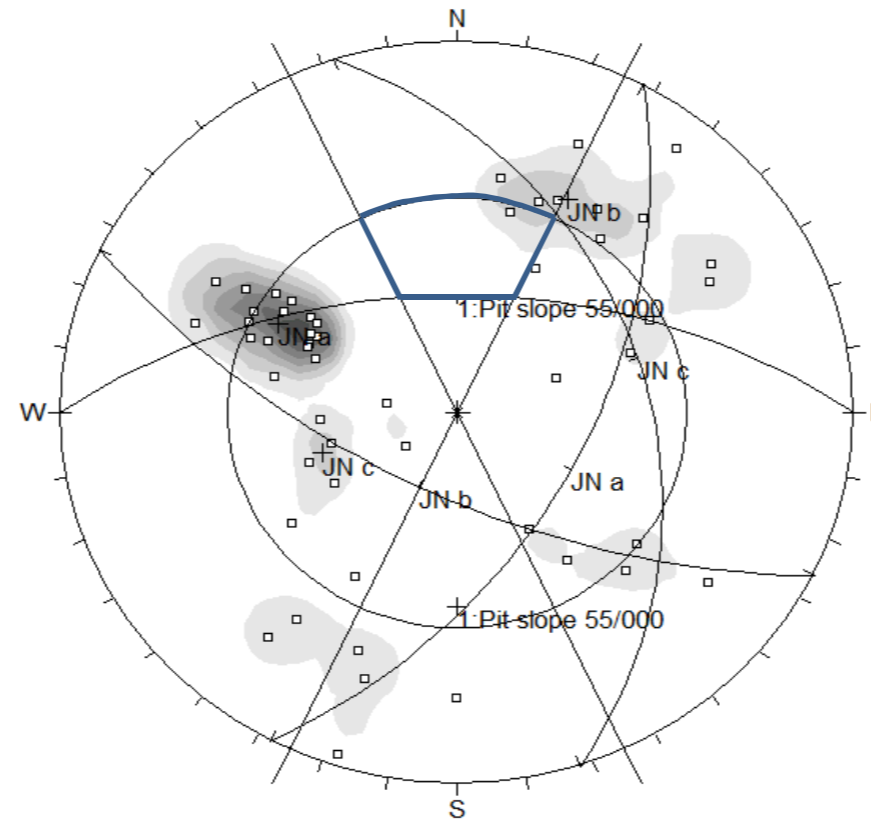


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

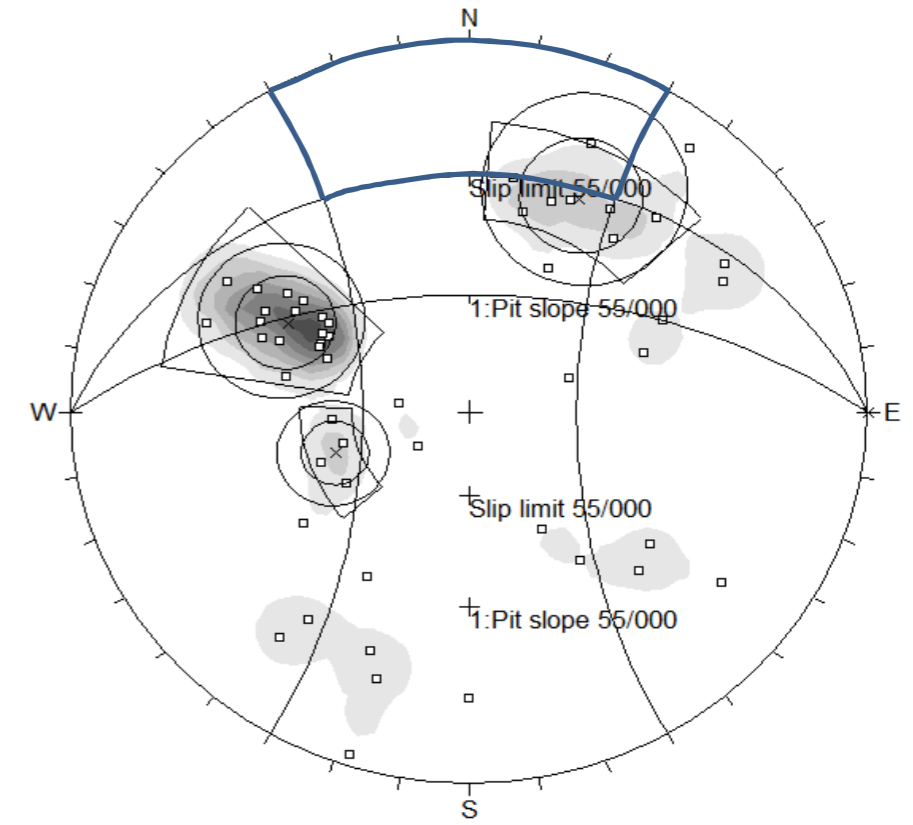
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 55° NORTH FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: Low potential for planar failure for cut slopes with 55° batter angle and North orientation



Control on Stability: Low potential for wedge failure for cut slopes with 55° batter angle and North orientation

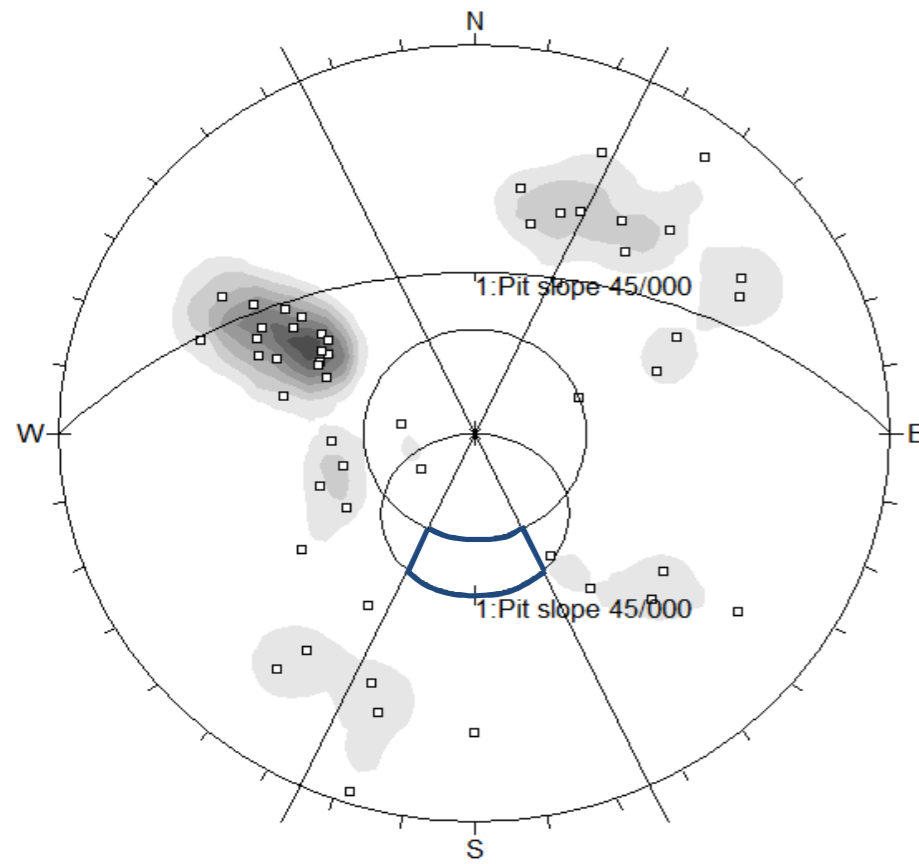


Control on Stability: Moderate potential for toppling failure for cut slopes with 55° batter angle and North orientation

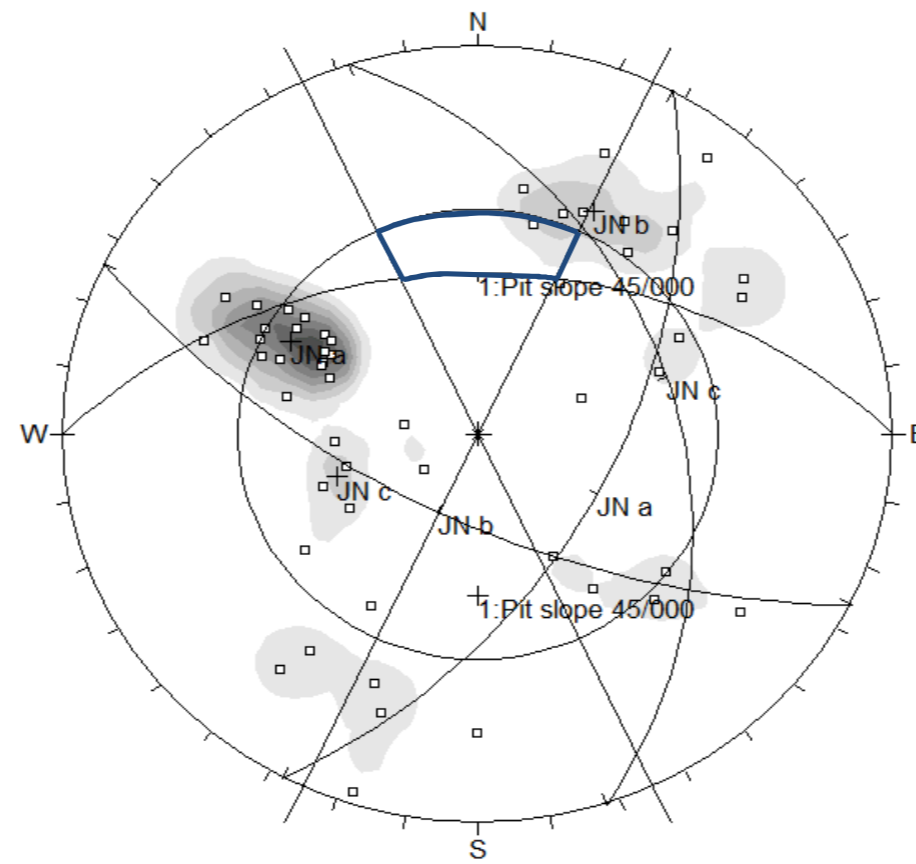


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

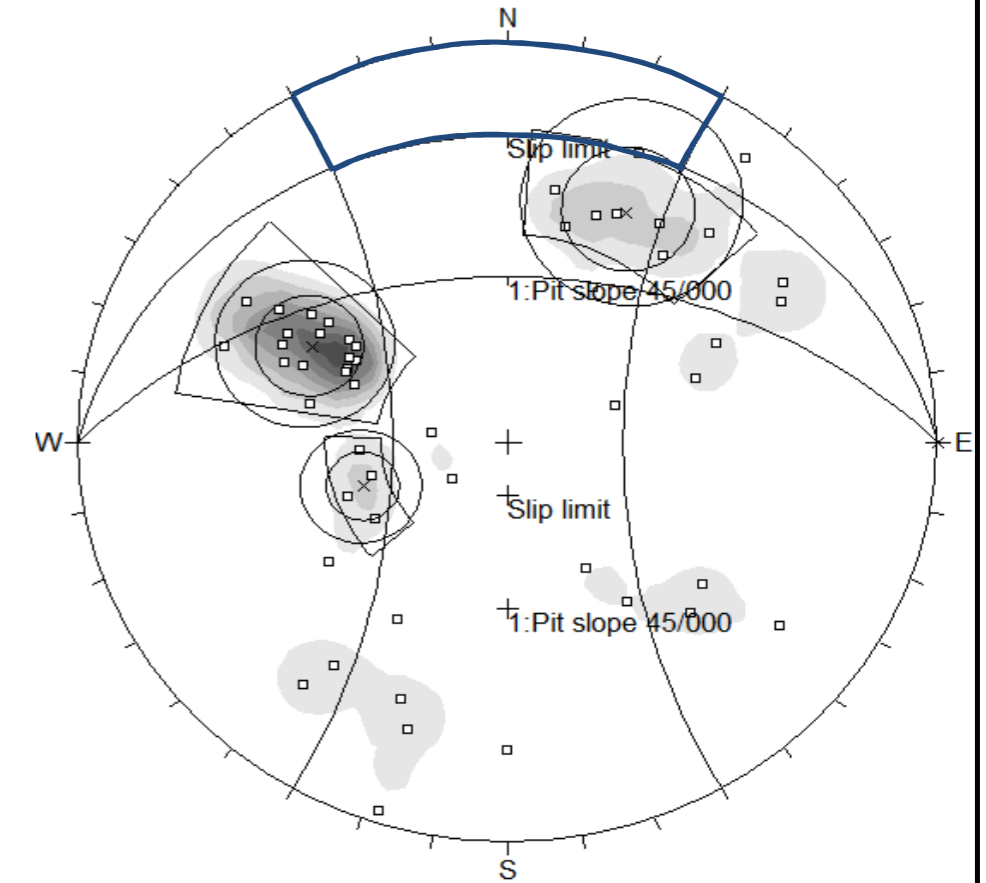
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 45° NORTH FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: Low potential for planar failure for cut slopes with 45° batter angle and North orientation



Control on Stability: Low potential for wedge failure for cut slopes with 45° batter angle and North orientation

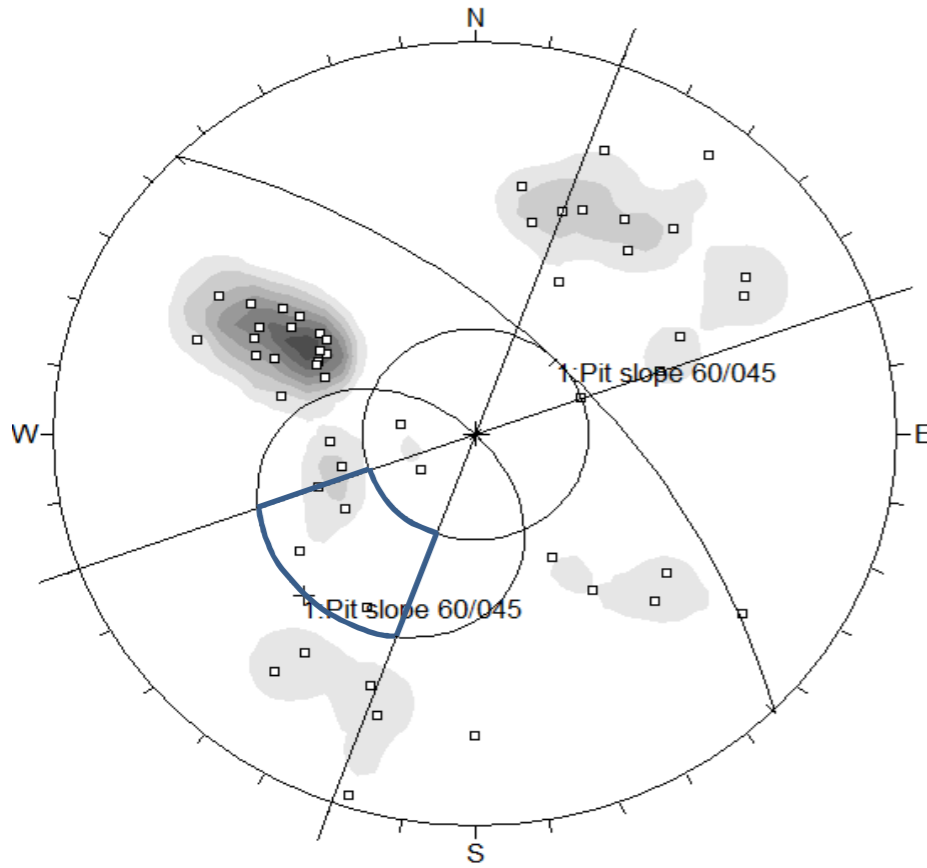


Control on Stability: Low potential for toppling failure for cut slopes with 45° batter angle and North orientation

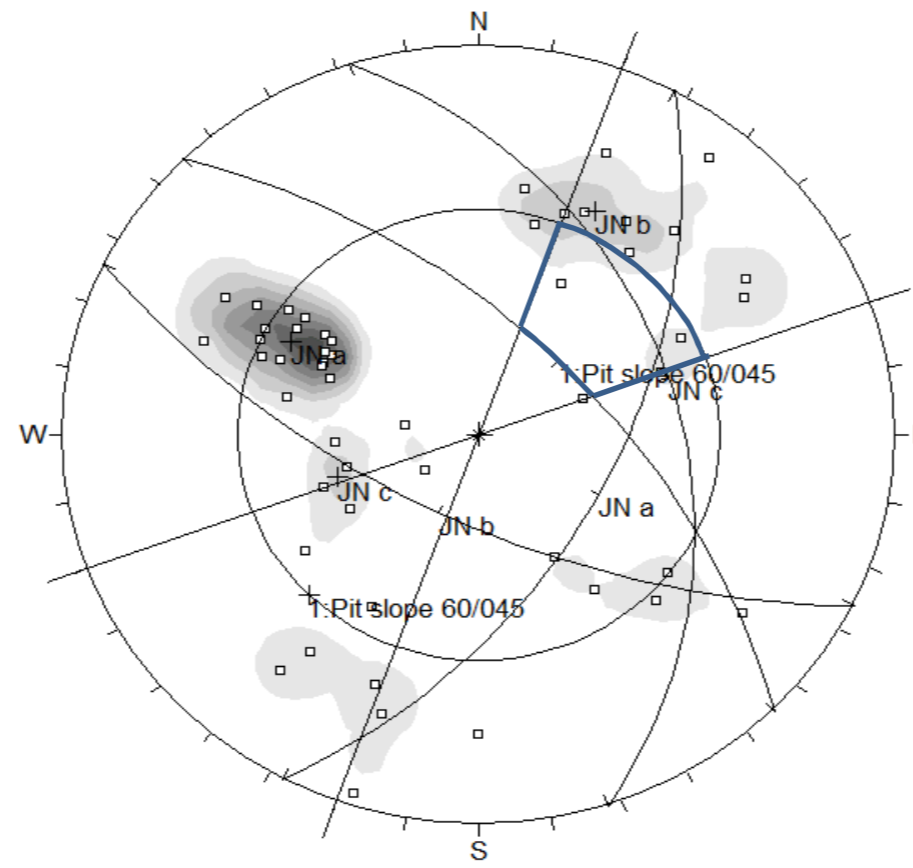


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

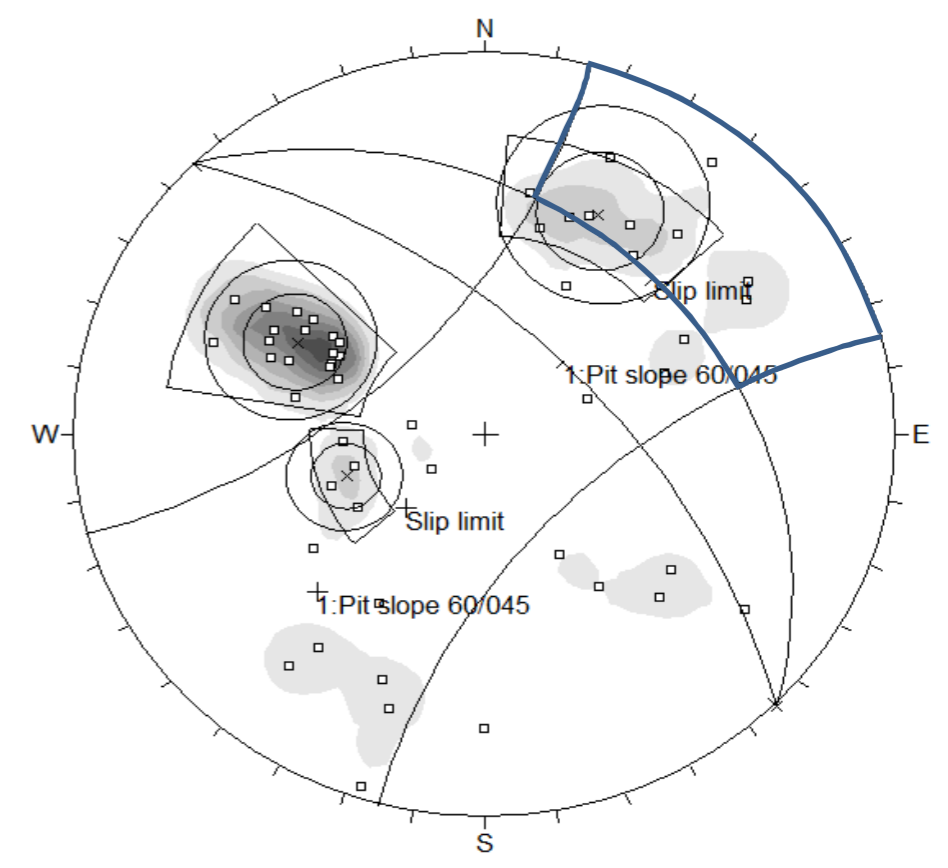
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 60° NORTH-EAST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: Moderate potential for planar failure for cut slopes with 60° batter angle and North-East orientation



Control on Stability: High potential for wedge failure on joint sets on JNa and JNc for cut slopes with 60° batter angle and North-East orientation

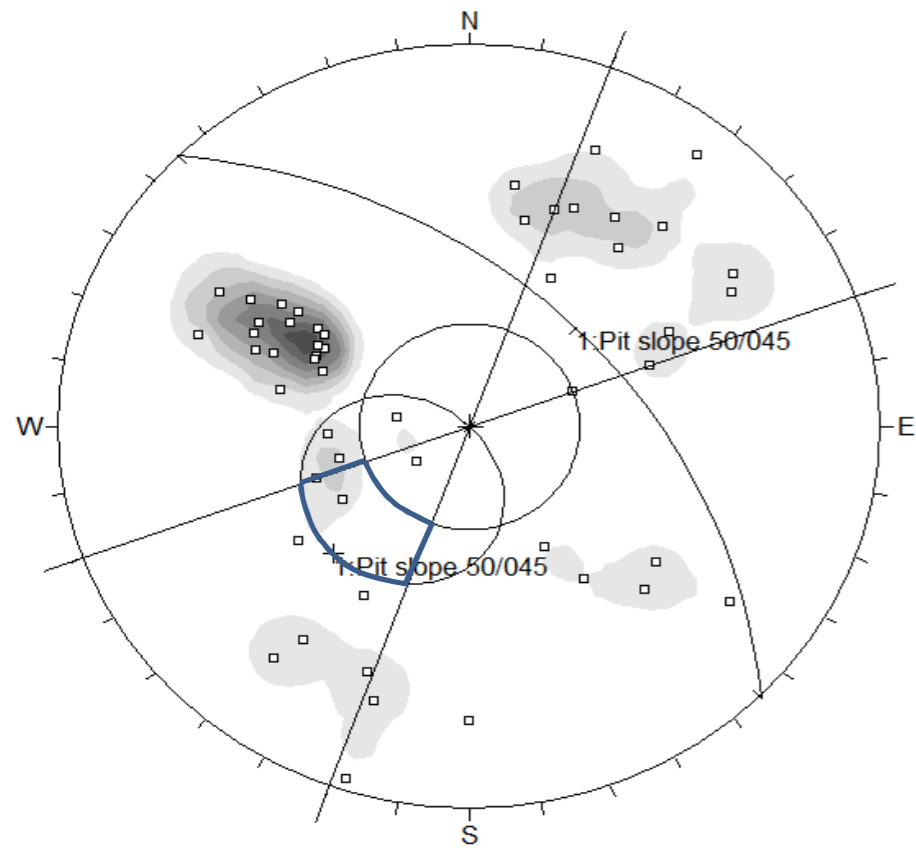


Control on Stability: High potential for toppling failure for cut slopes with 60° batter angle and North-East orientation

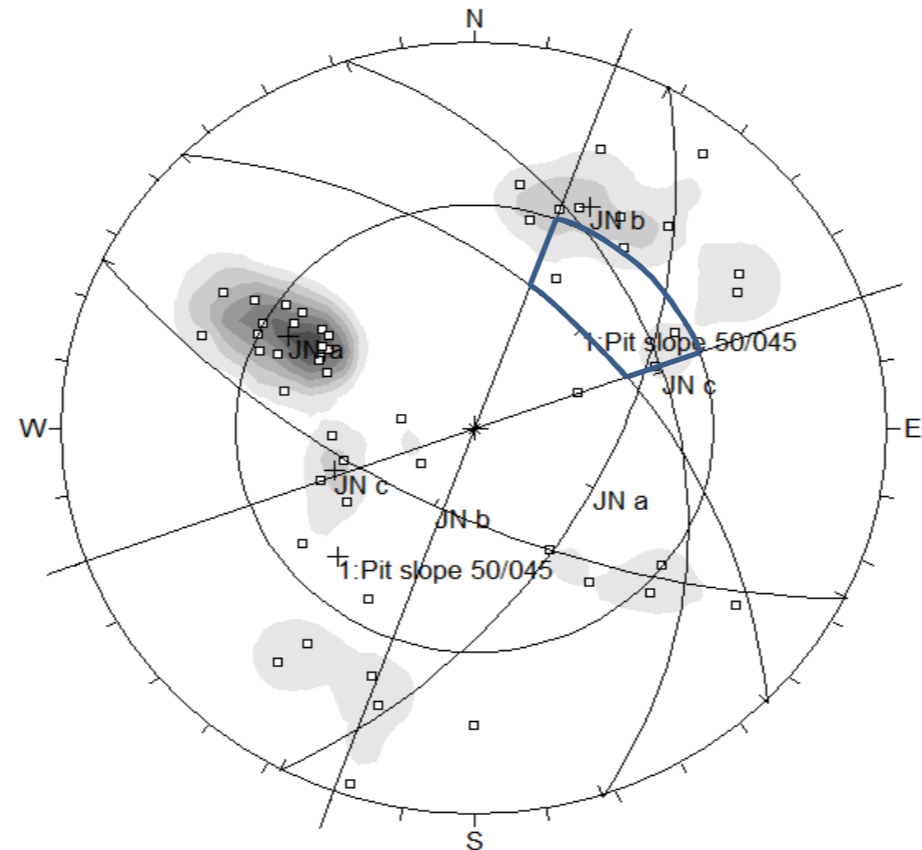


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

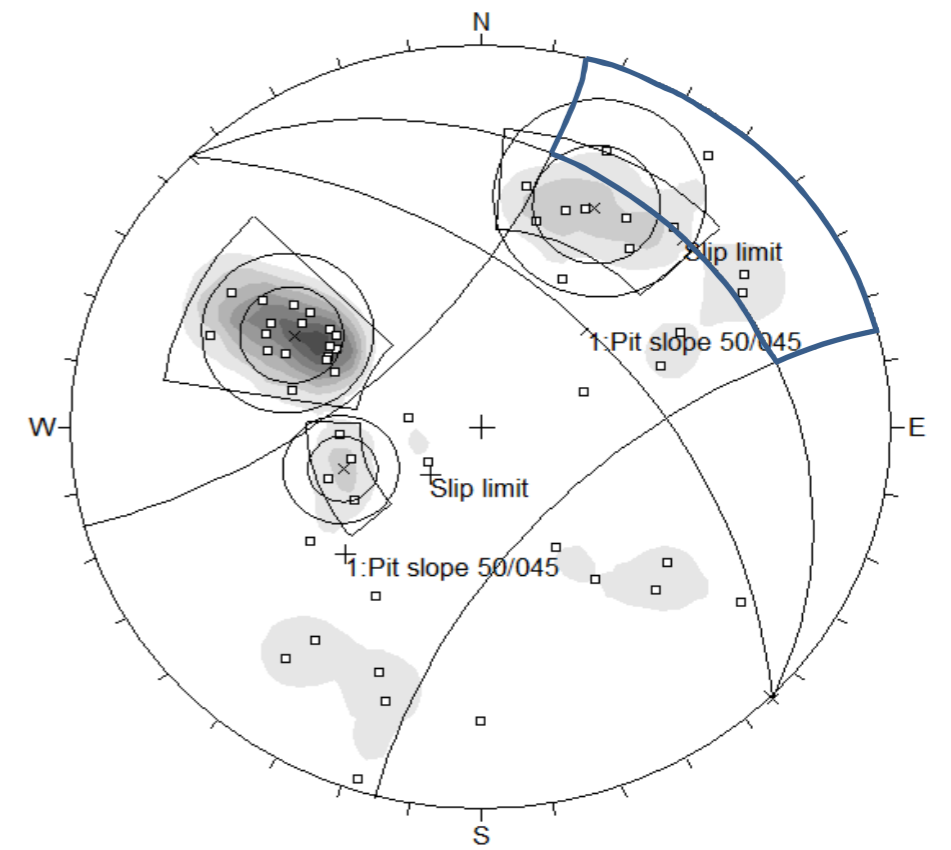
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 50° NORTH-EAST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: Moderate potential for planar failure for cut slopes with 50° batter angle and North-East orientation



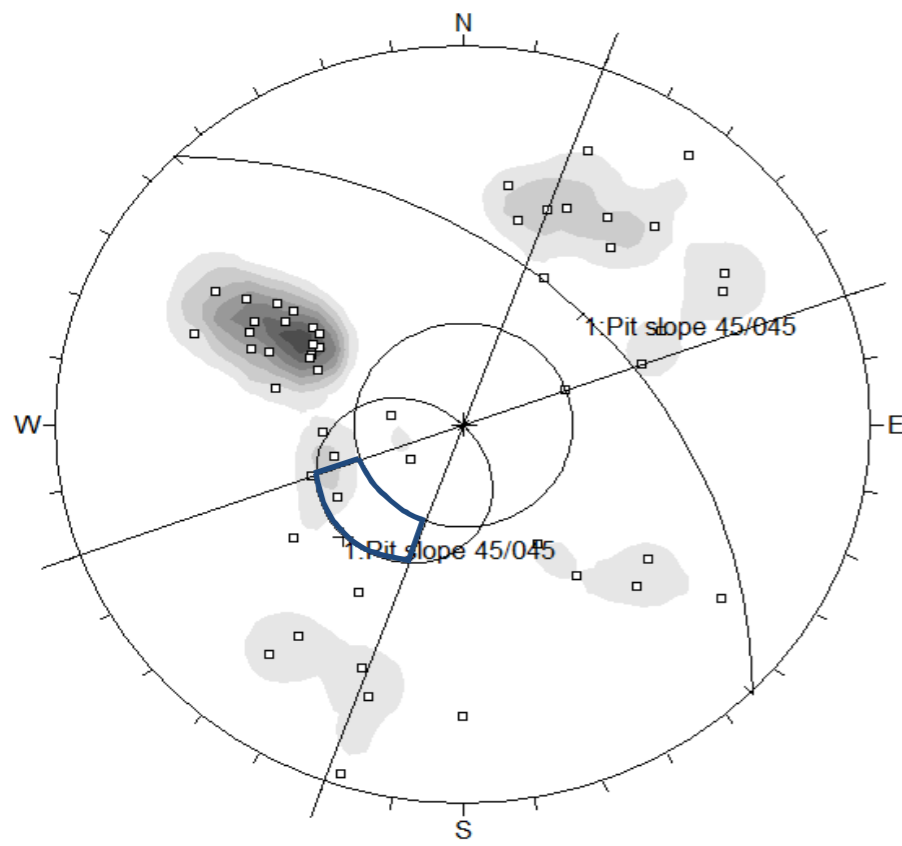
Control on Stability: High potential for wedge failure on joint sets JNa and JNc for cut slopes with 50° batter angle and North-East orientation



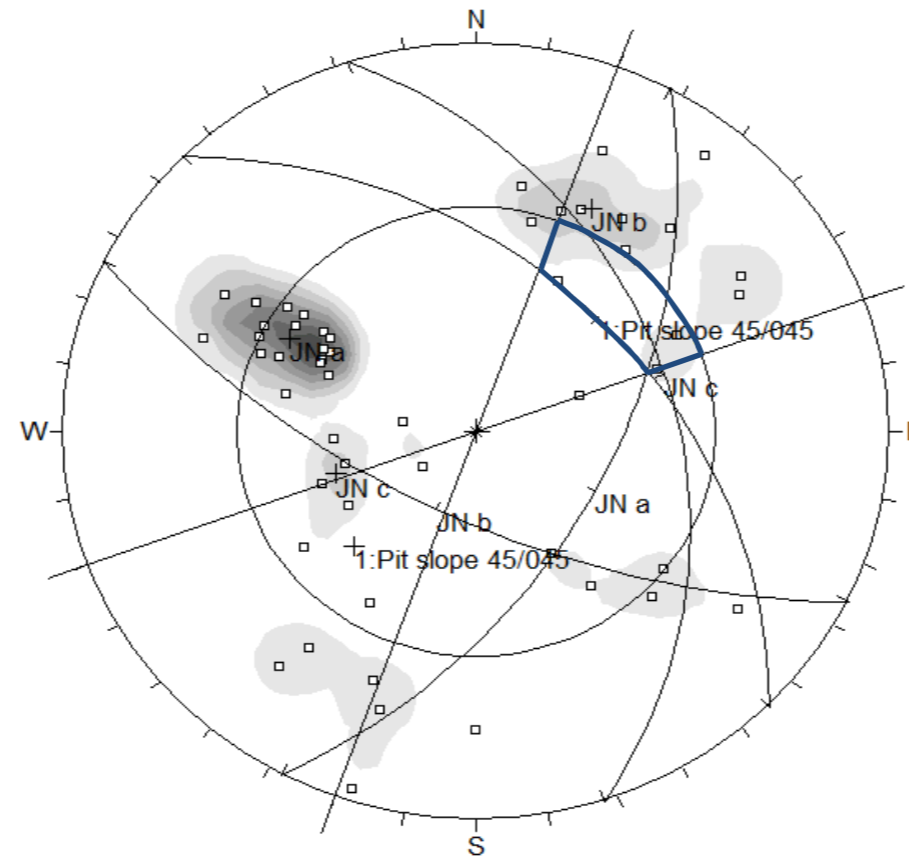
Control on Stability: Moderate potential for toppling failure for cut slopes with 50° batter angle and North-East orientation

	Date	20/02/15	Client	Holcim (NZ) Limited
	Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
	Approved by	KJ	Description	Failure Analysis
	Scale	N/A	Project Number	10315

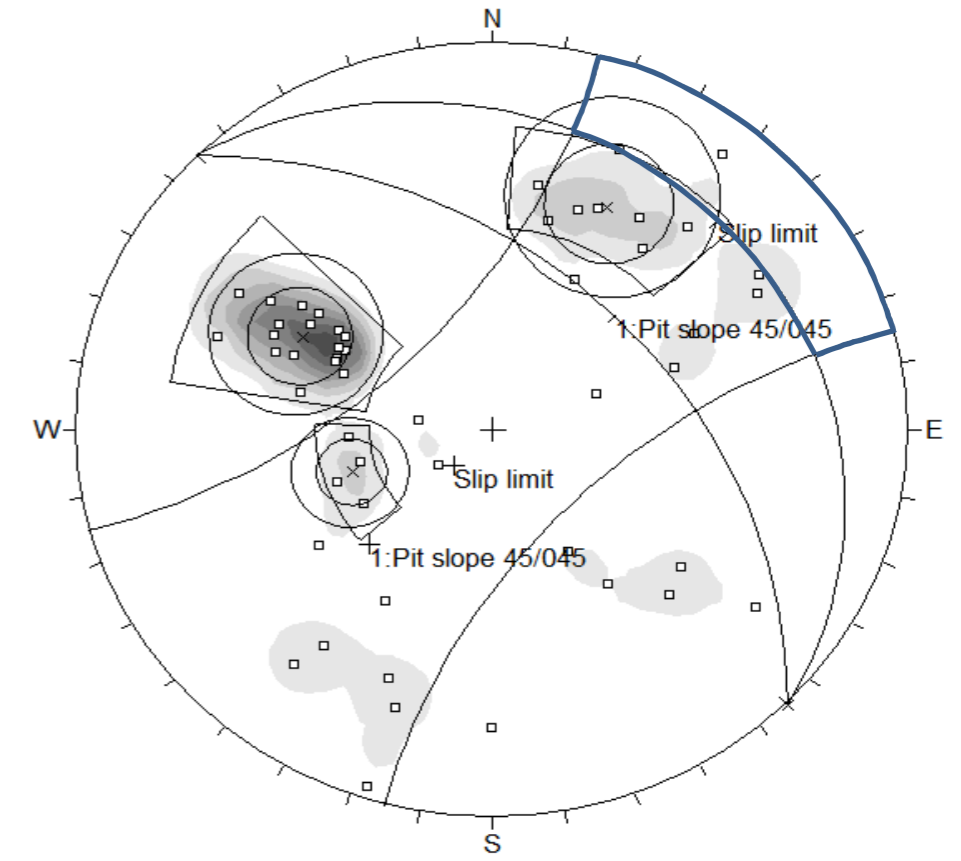
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 45° NORTH-EAST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL




Control on Stability: Low potential for planar failure for cut slopes with 45° batter angle and North-East orientation



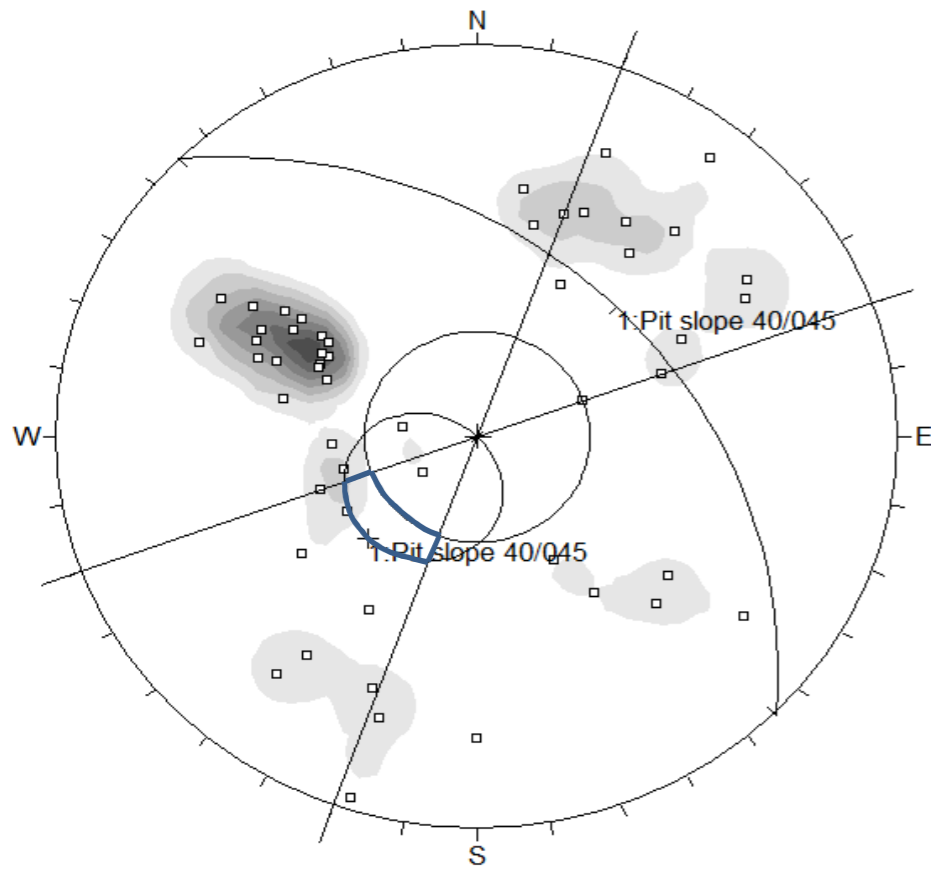
Control on Stability: High potential for wedge failure on joint sets JNa and JNc for cut slopes with 45° batter angle and North-East orientation



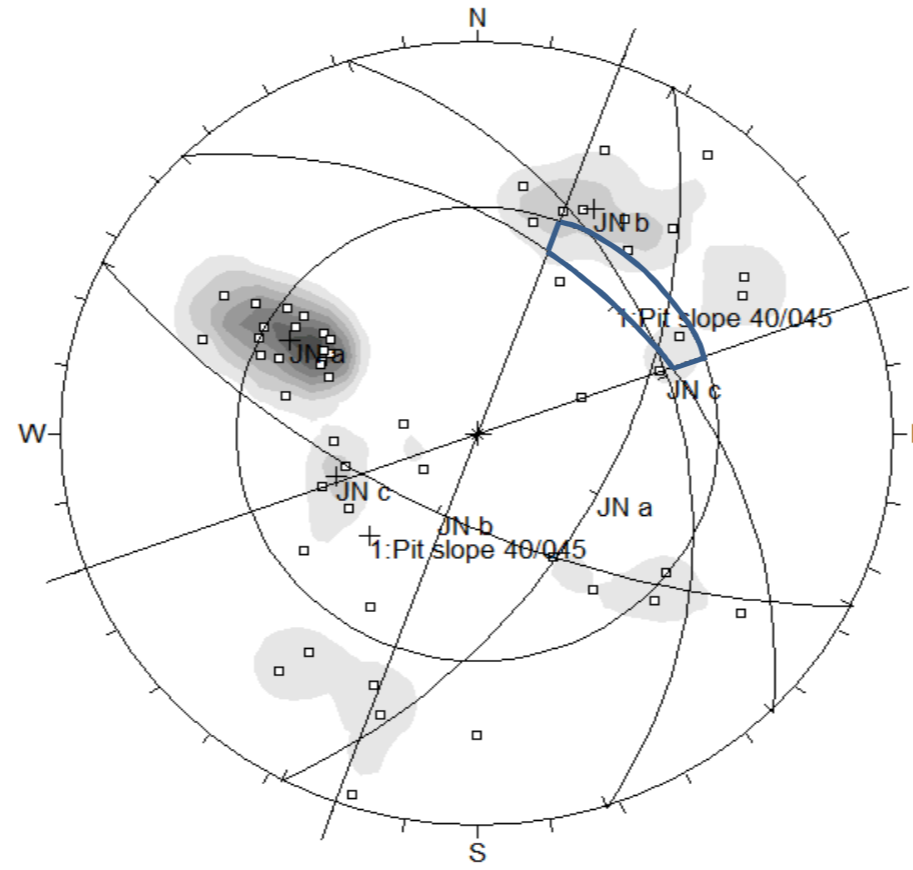
Control on Stability: Low potential for toppling failure for cut slopes with 45° batter angle and North-East orientation

	Date	20/02/15	Client	Holcim (NZ) Limited
	Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
	Approved by	KJ	Description	Failure Analysis
	Scale	N/A	Project Number	10315

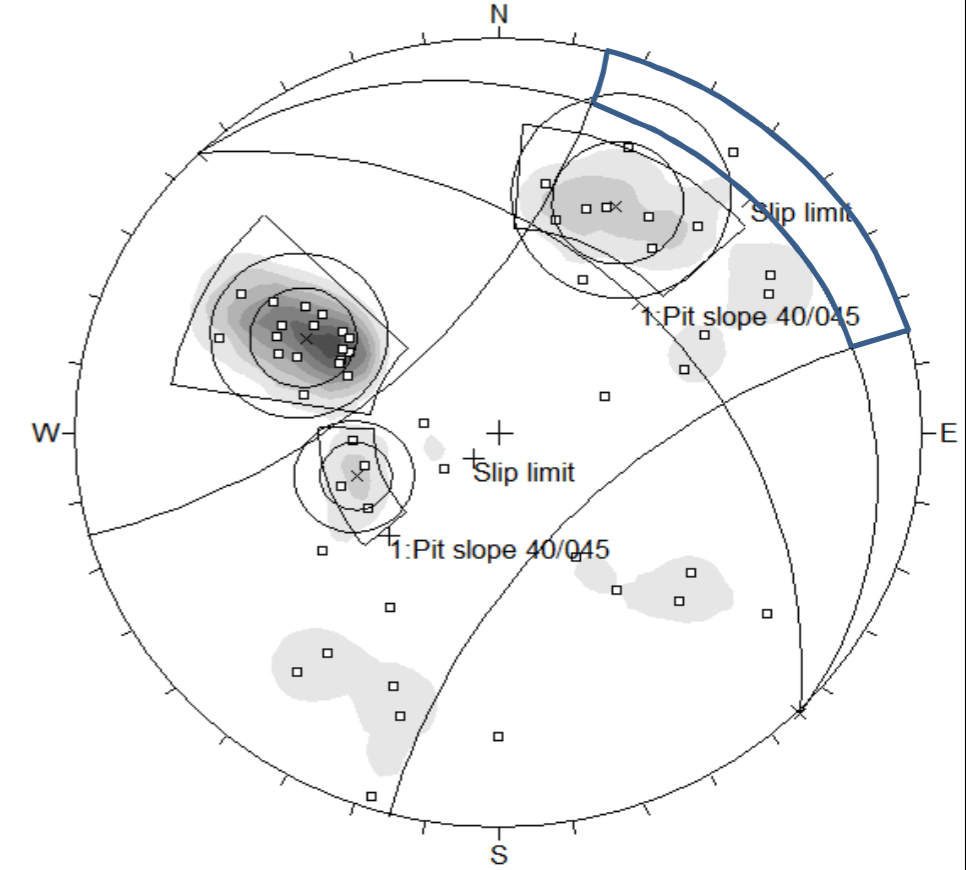
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 40° NORTH-EAST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: Low potential for planar failure for cut slopes with 40° batter angle and North-East orientation



Control on Stability: Moderate potential for wedge failure on joint sets JNa and JNc for cut slopes with 40° batter angle and North-East orientation

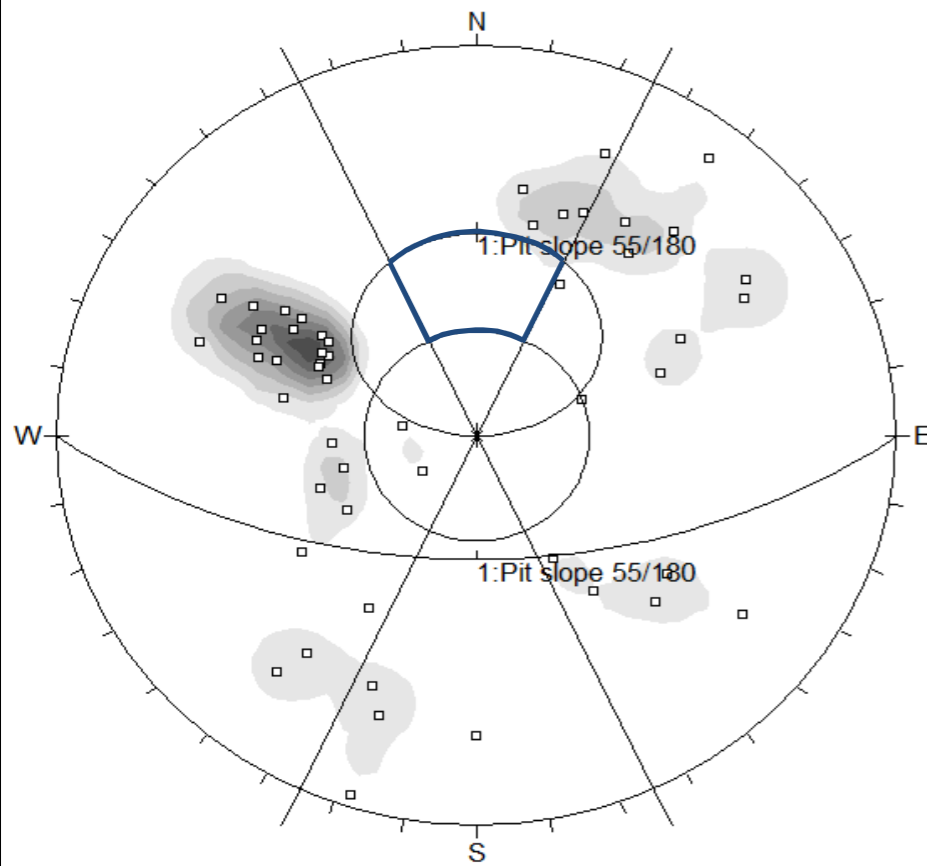


Control on Stability: Low potential for toppling failure for cut slopes with 40° batter angle and North-East orientation

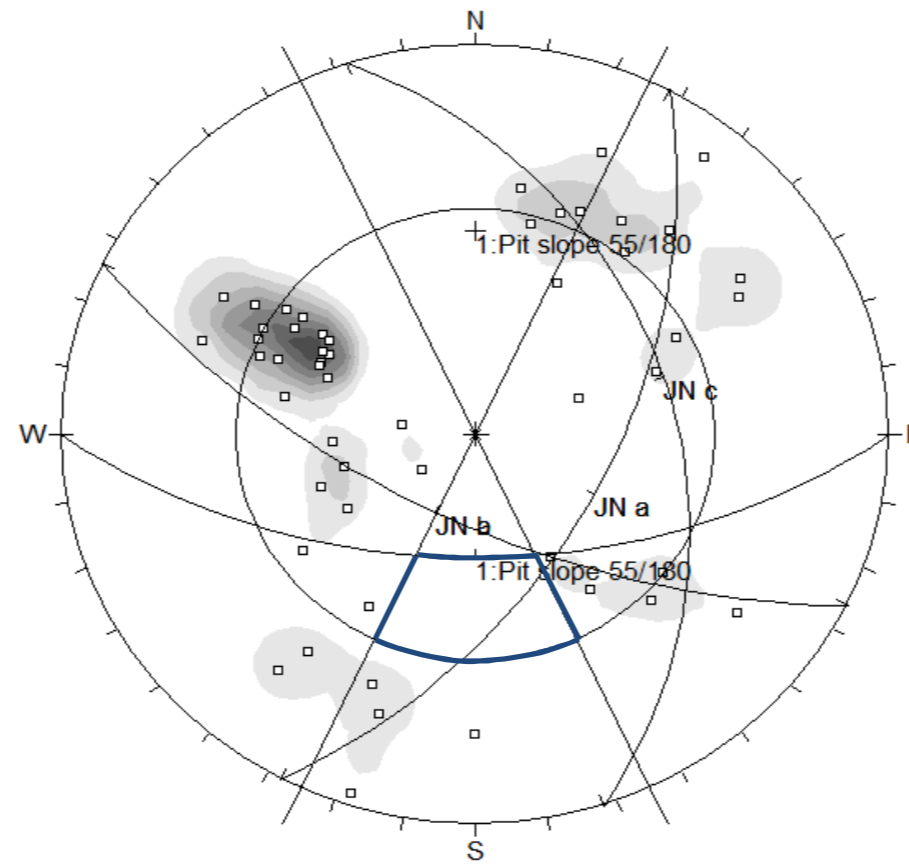


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

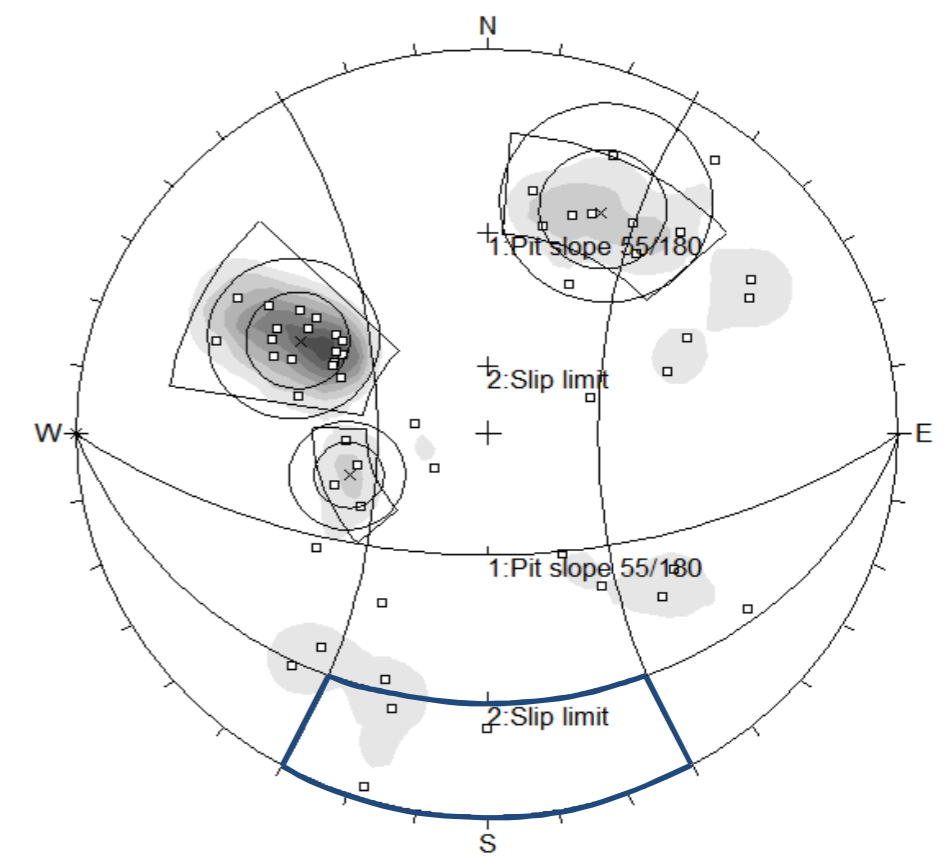
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 55° SOUTH FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: Low potential for planar failure for cut slopes with 55° batter angle and South orientation



Control on Stability: Moderate potential for wedge failure on joint sets JN a and JN b for cut slopes with 55° batter angle and South orientation

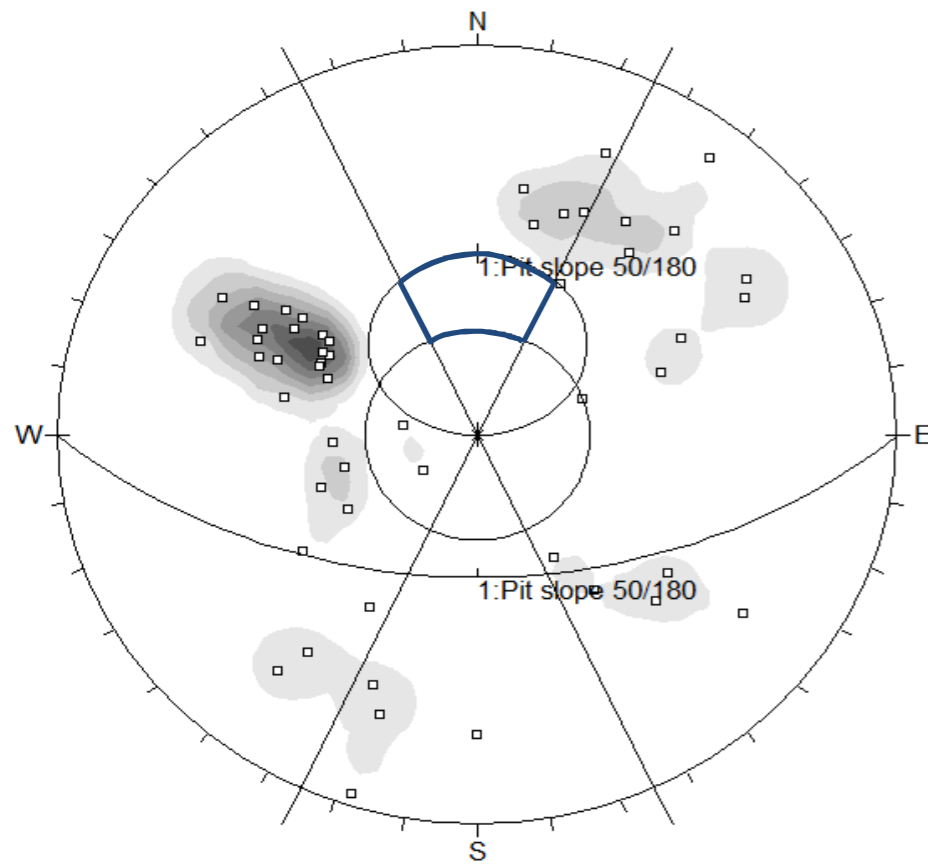


Control on Stability: Low potential for toppling failure for cut slopes with 55° batter angle and South orientation

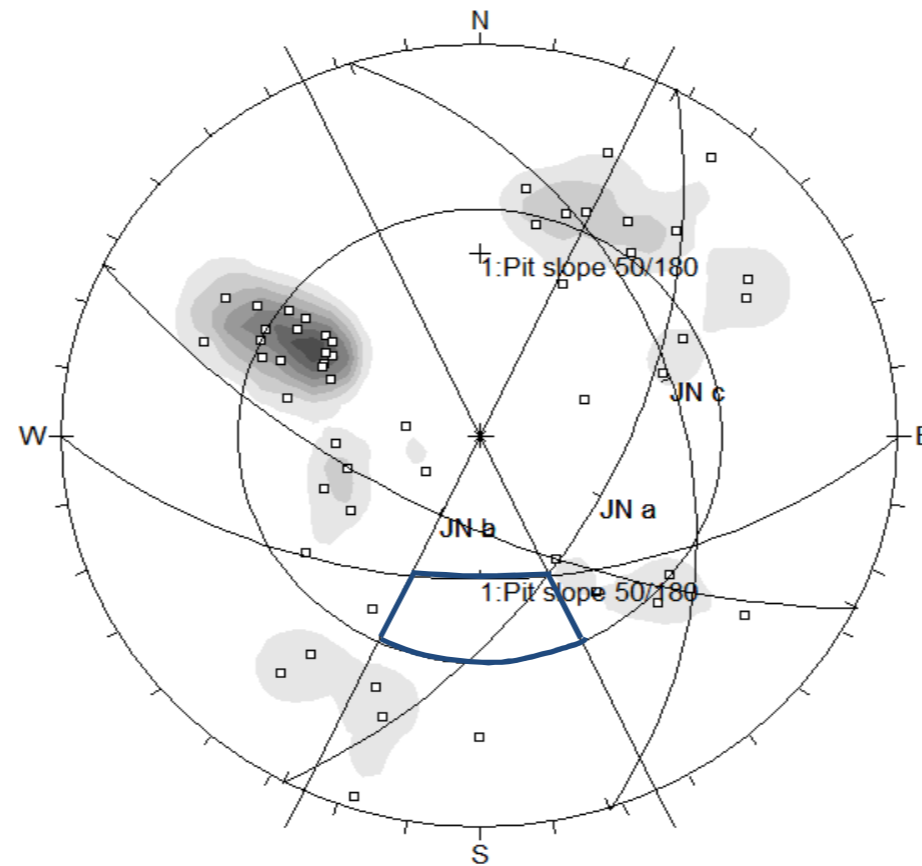


Date	20/02/15	Client	Holcim (NZ) Limited
Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

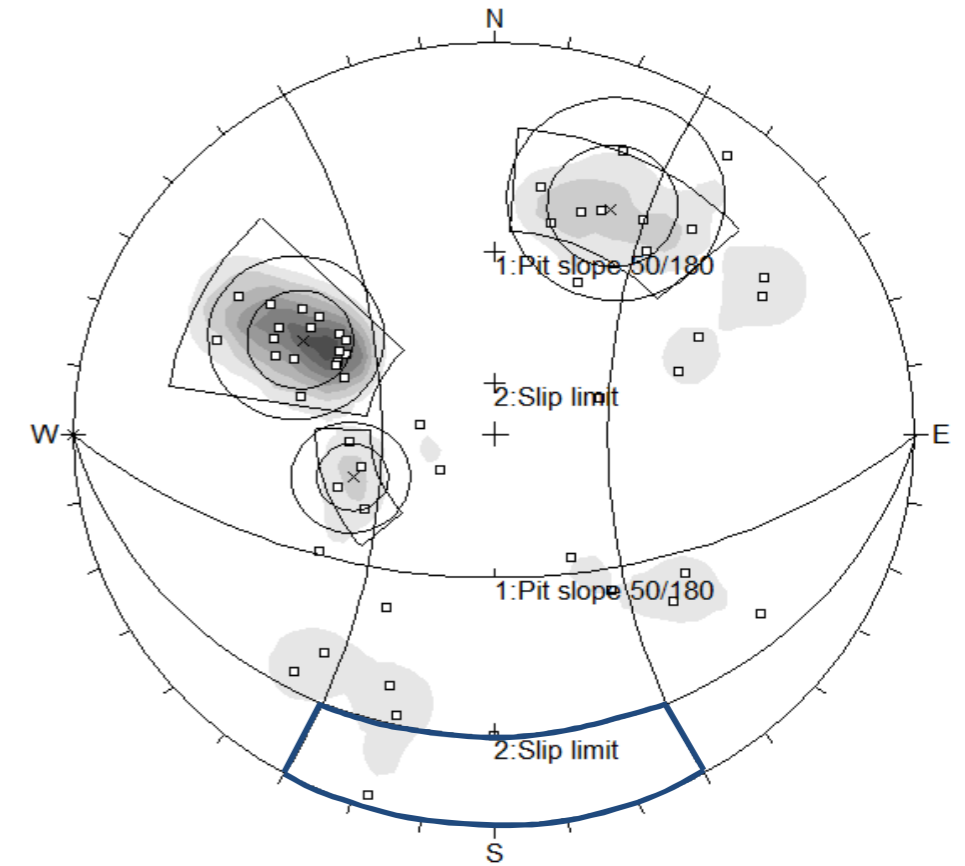
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 50° SOUTH FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL




Control on Stability: Low potential for planar failure for cut slopes with 50° batter angle and South orientation



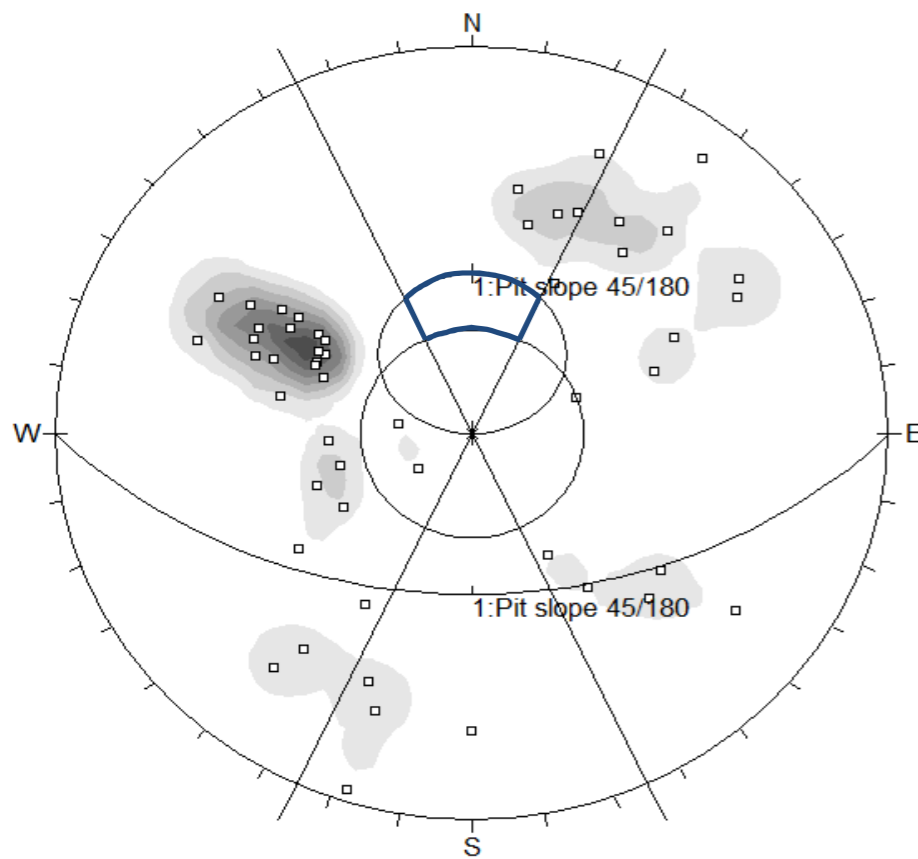
Control on Stability: Low potential for wedge failure for cut slopes with 50° batter angle and South orientation



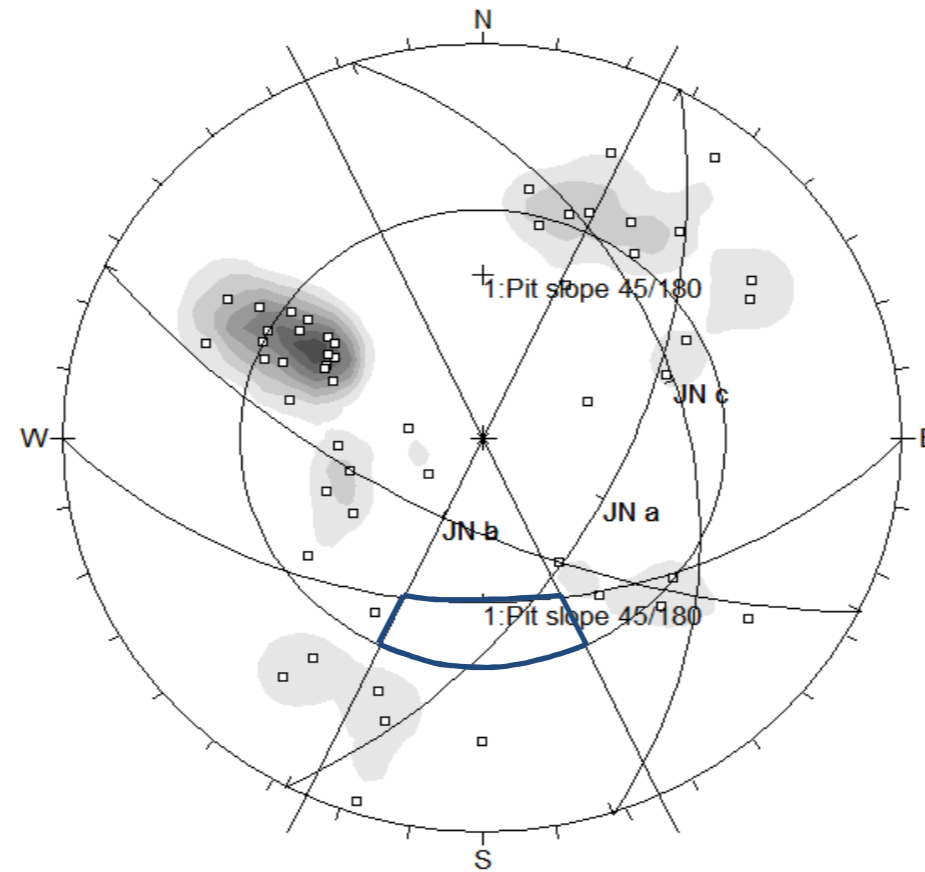
Control on Stability: Low potential for toppling failure for cut slopes with 50° batter angle and South orientation

	Date	20/02/15	Client	Holcim (NZ) Limited
	Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
	Approved by	KJ	Description	Failure Analysis
	Scale	N/A	Project Number	10315

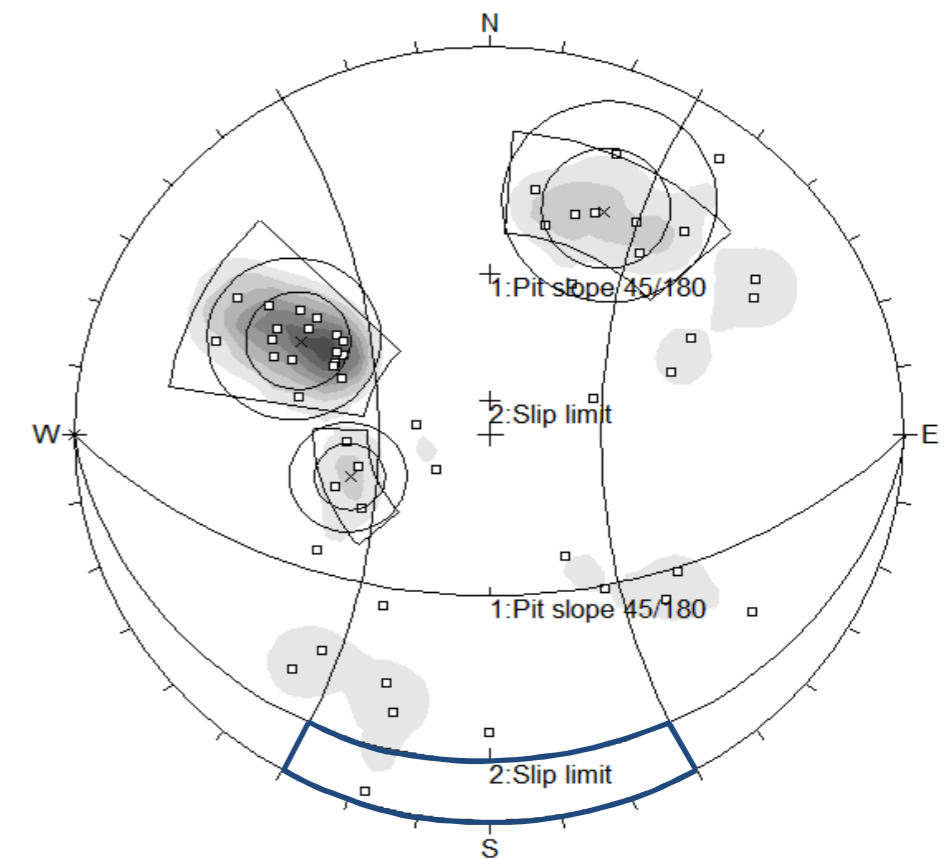
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 45° SOUTH FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL




Control on Stability: Low potential for planar failure for cut slopes with 45° batter angle and South orientation



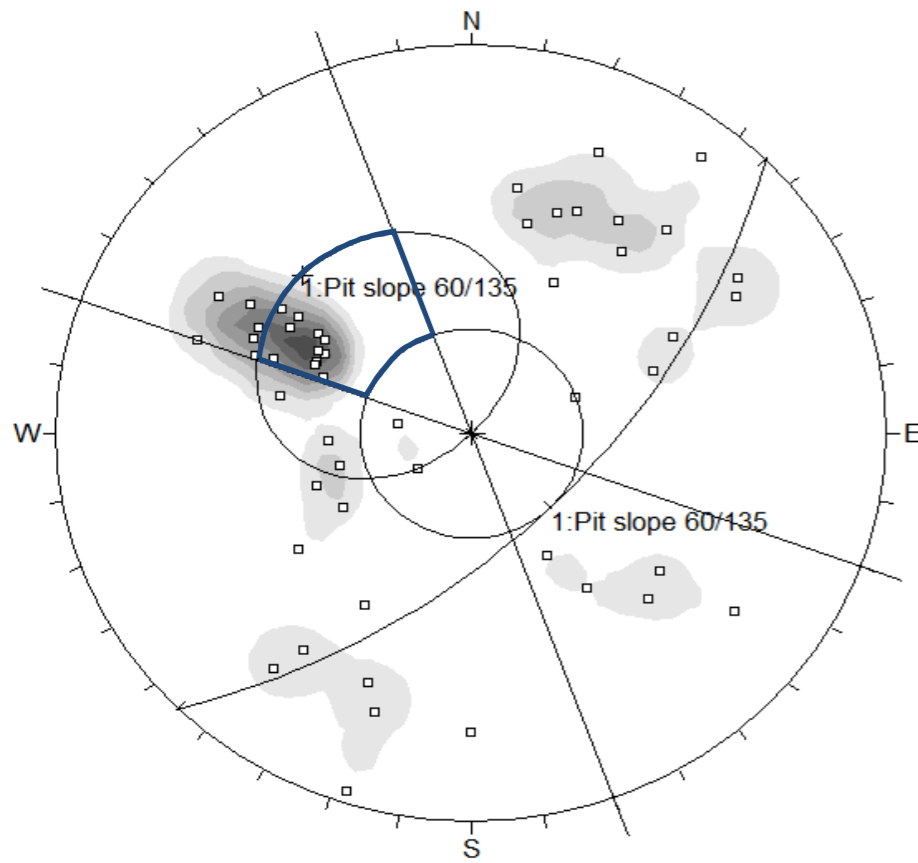
Control on Stability: Low potential for wedge failure for cut slopes with 45° batter angle and South orientation



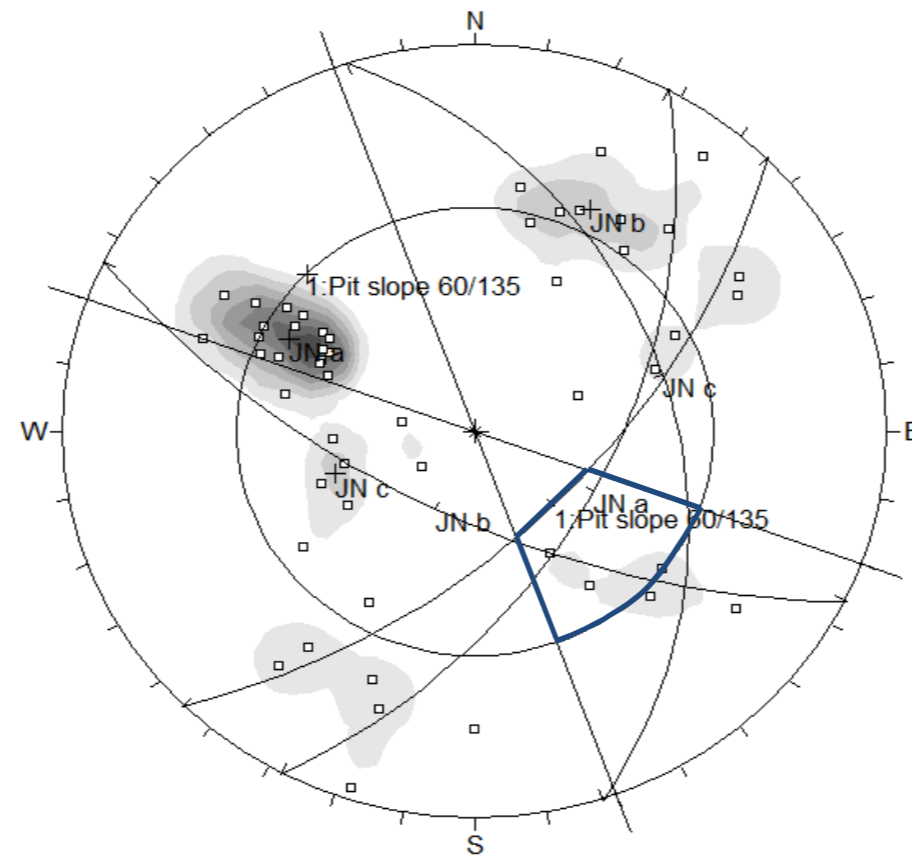
Control on Stability: Low potential for toppling failure for cut slopes with 45° batter angle and South orientation

	Date	20/02/15	Client	Holcim (NZ) Limited
	Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
	Approved by	KJ	Description	Failure Analysis
	Scale	N/A	Project Number	10315

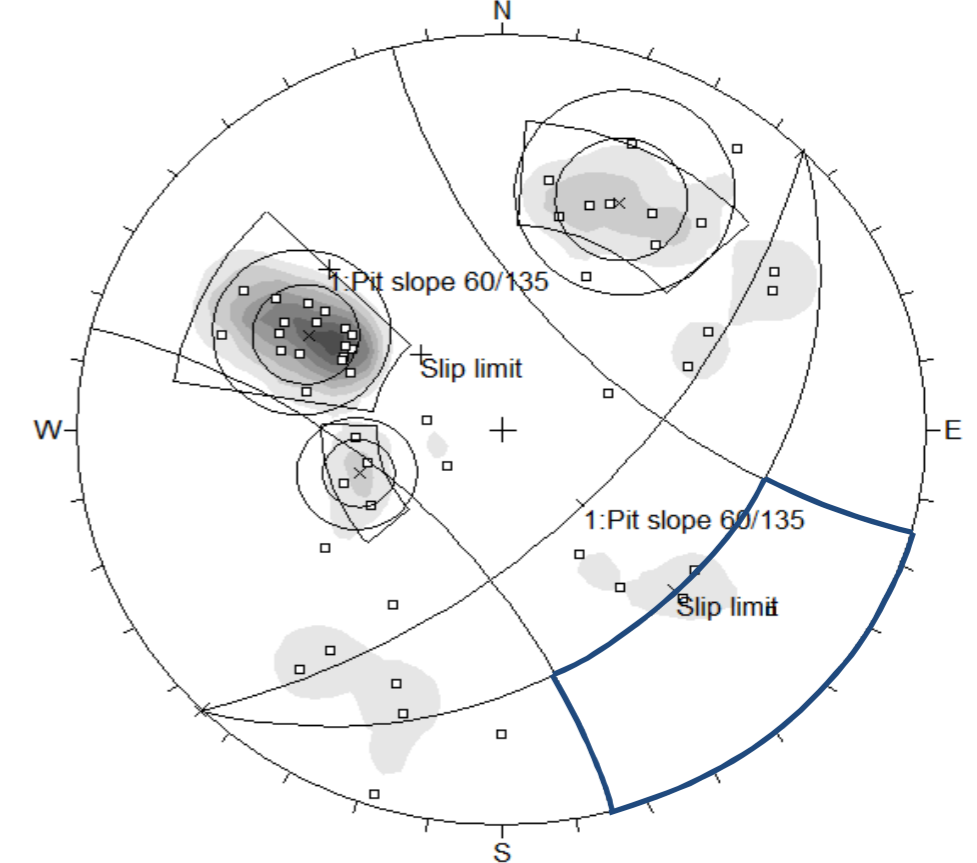
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 60° SOUTH-EAST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL




Control on Stability: High potential for planar failure for cut slopes with 60° batter angle and South-East orientation



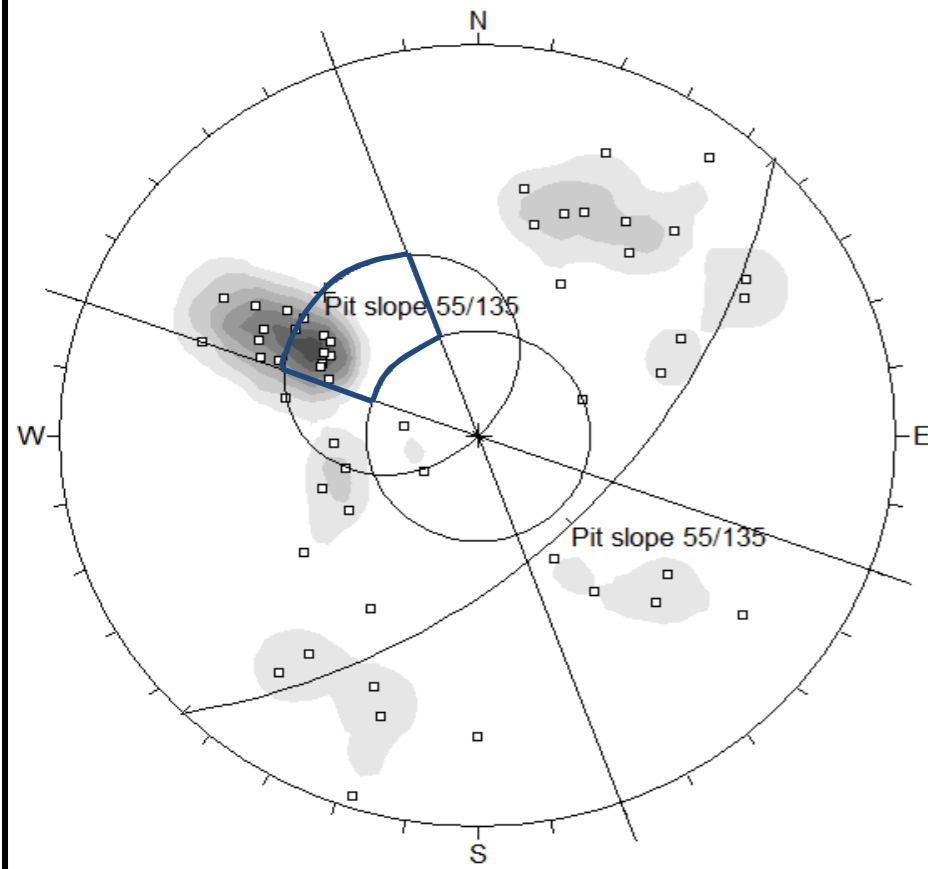
Control on Stability: High potential for wedge failure on joint sets JNa and JNb for cut slopes with 60° batter angle and South-East orientation



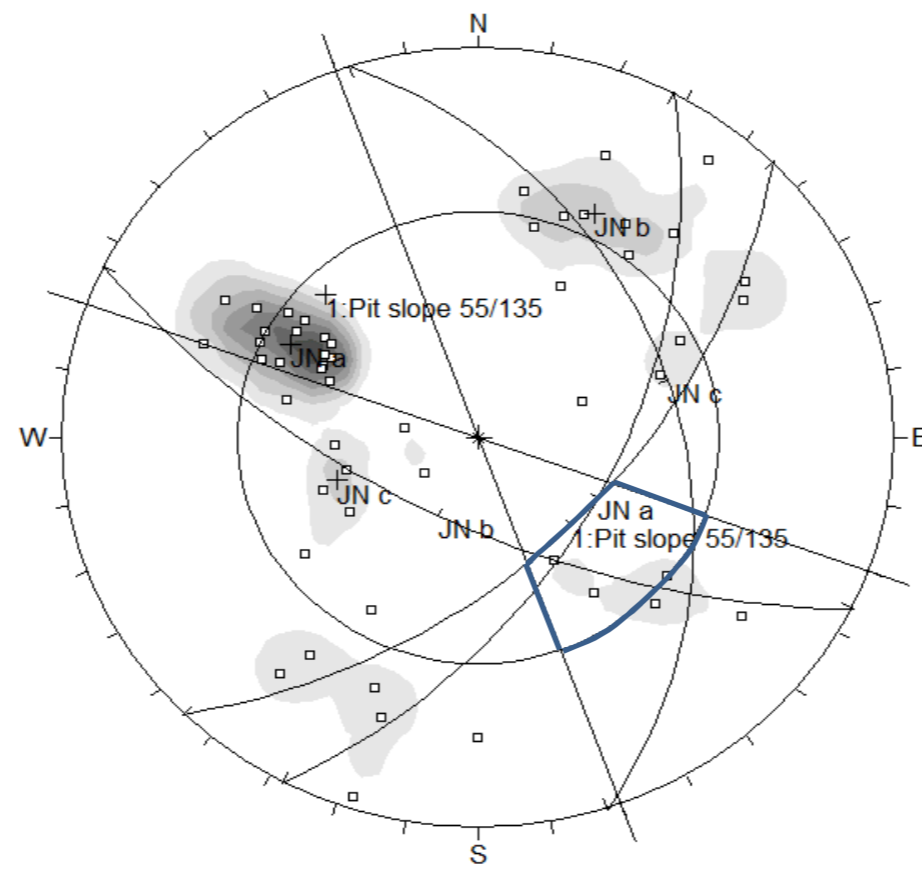
Control on Stability: Low potential for toppling failure for cut slopes with 60° batter angle and South-East orientation

	Date	20/02/15	Client	Holcim (NZ) Limited
	Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
	Approved by	KJ	Description	Failure Analysis
	Scale	N/A	Project Number	10315

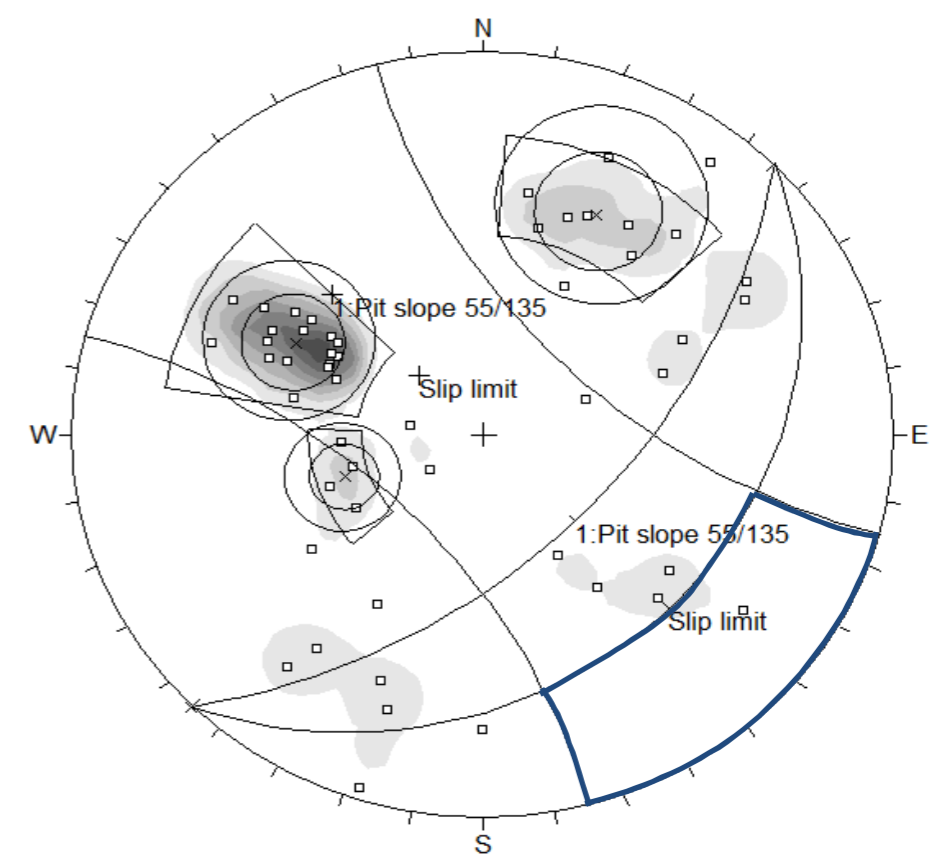
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 55° SOUTH-EAST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL




Control on Stability: High potential for planar failure for cut slopes with 55° batter angle and South-East orientation



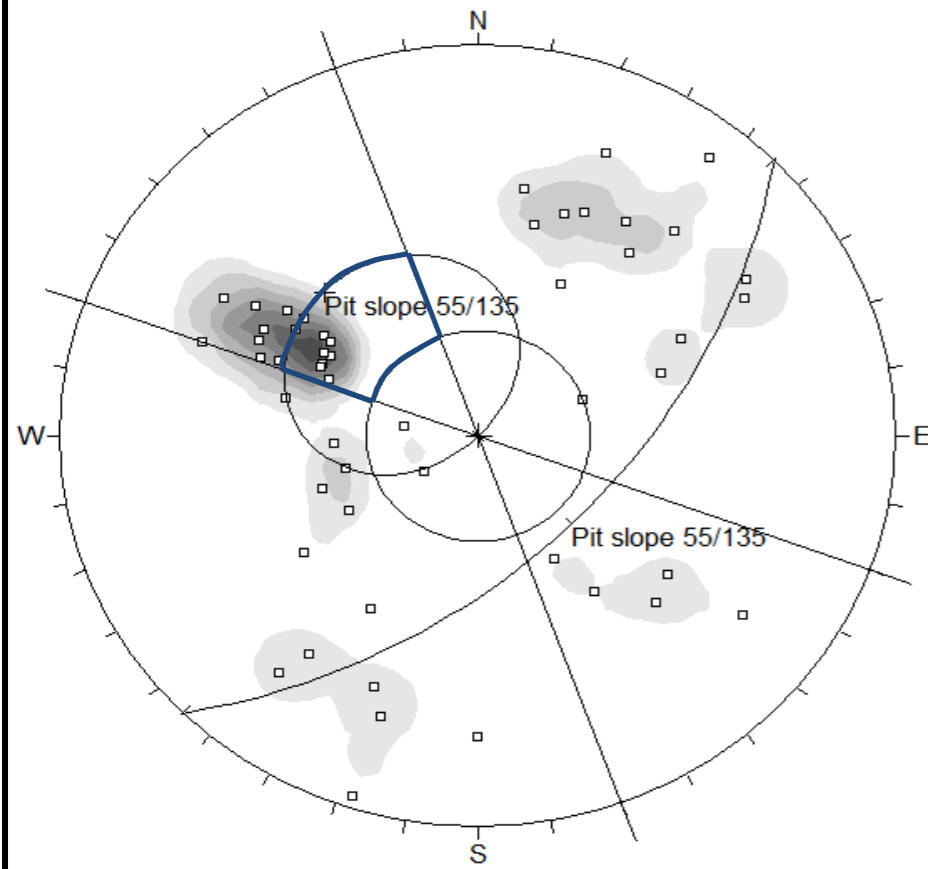
Control on Stability: High potential for wedge failure on joint sets JNa and JNb for cut slopes with 55° batter angle and South-East orientation



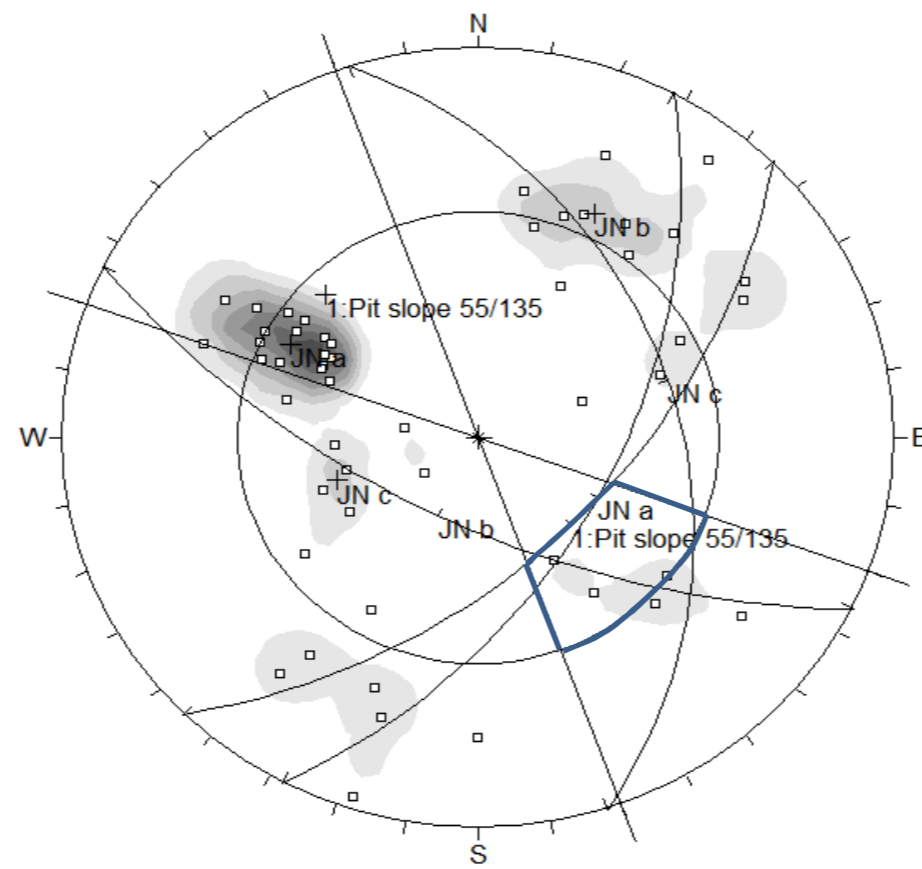
Control on Stability: Low potential for toppling failure for cut slopes with 55° batter angle and South-East orientation

	Date	20/02/15	Client	Holcim (NZ) Limited
	Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
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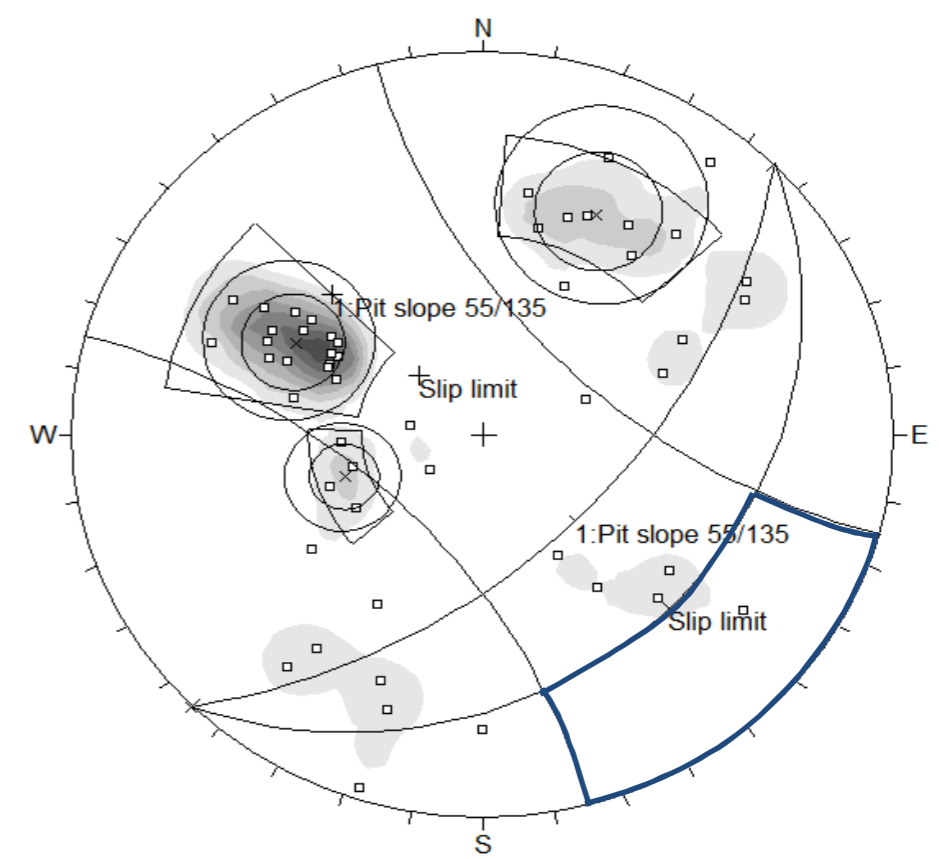
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 55° SOUTH-EAST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL




Control on Stability: High potential for planar failure for cut slopes with 55° batter angle and South-East orientation



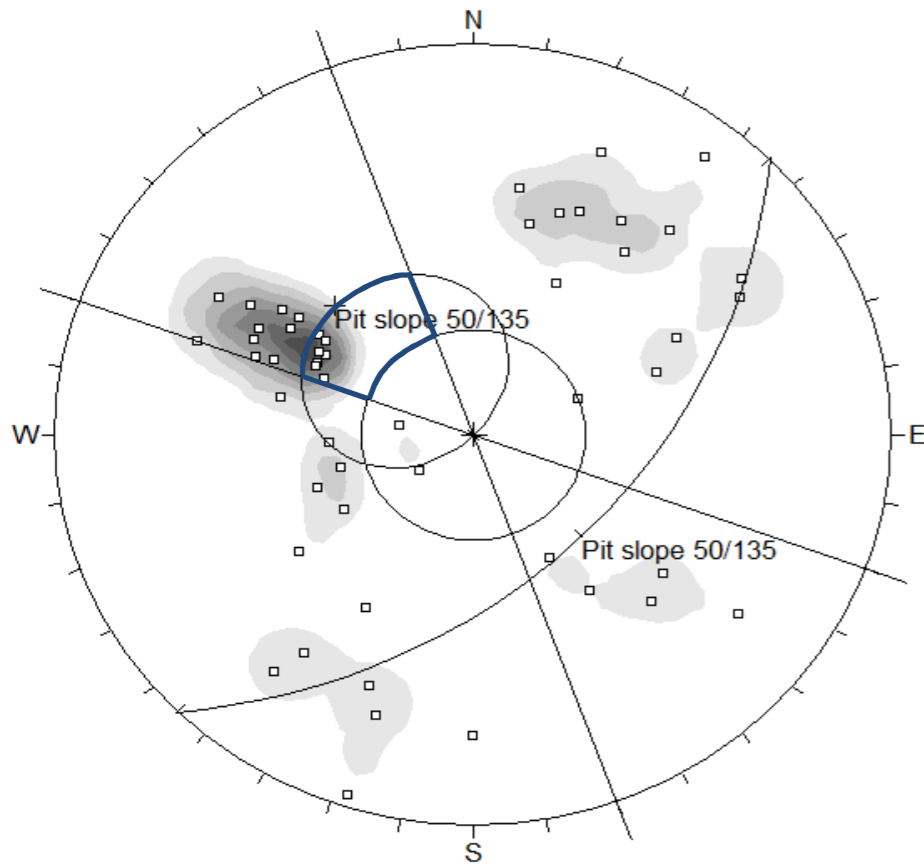
Control on Stability: High potential for wedge failure on joint sets JNa and JNb for cut slopes with 55° batter angle and South-East orientation



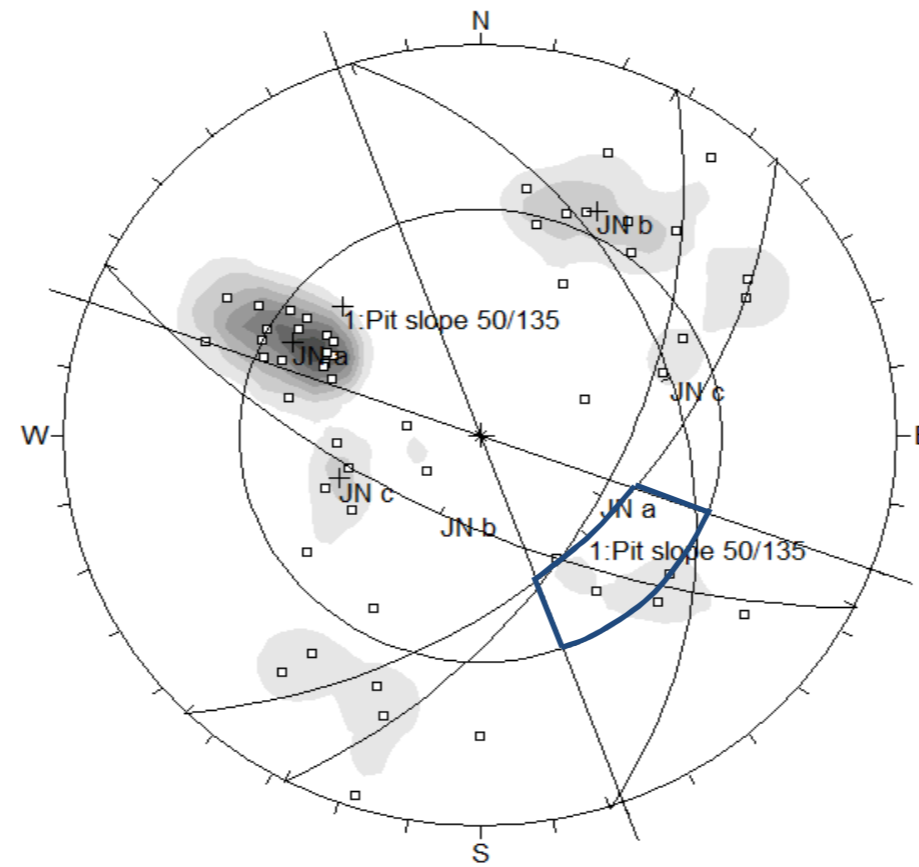
Control on Stability: Low potential for toppling failure for cut slopes with 55° batter angle and South-East orientation

	Date	20/02/15	Client	Holcim (NZ) Limited
	Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
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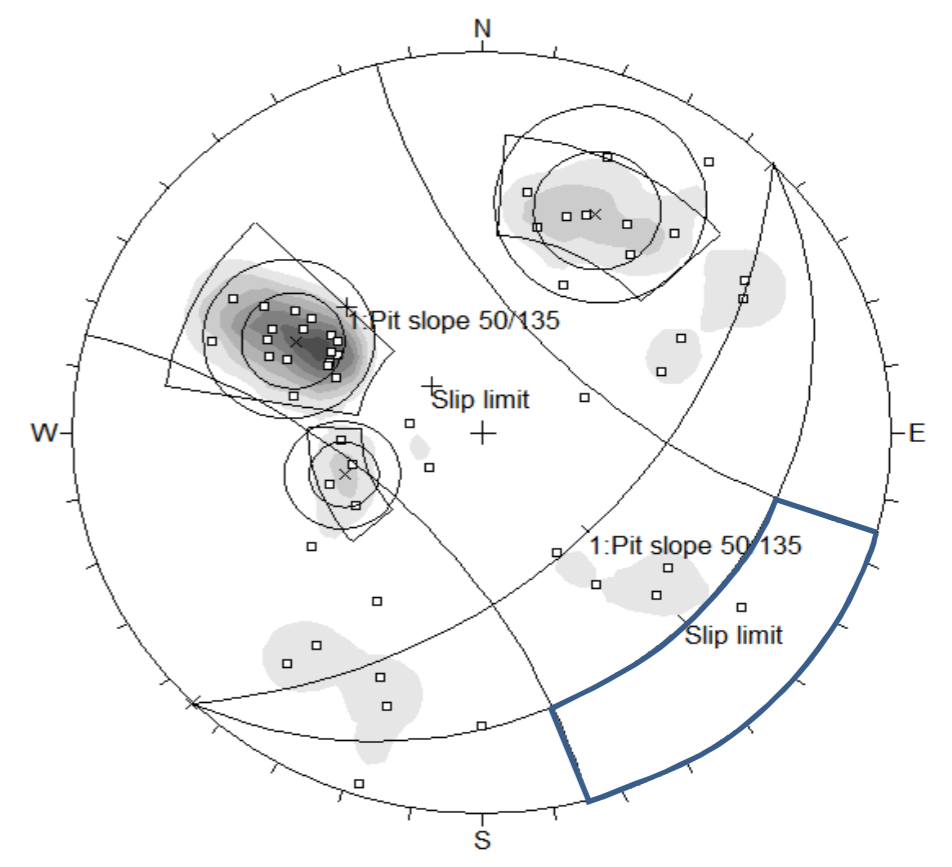
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 50° SOUTH-EAST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: High potential for planar failure for cut slopes with 50° batter angle and South-East orientation



Control on Stability: Moderate potential for wedge failure on joint sets JNa and JNb for cut slopes with 50° batter angle and South-East orientation

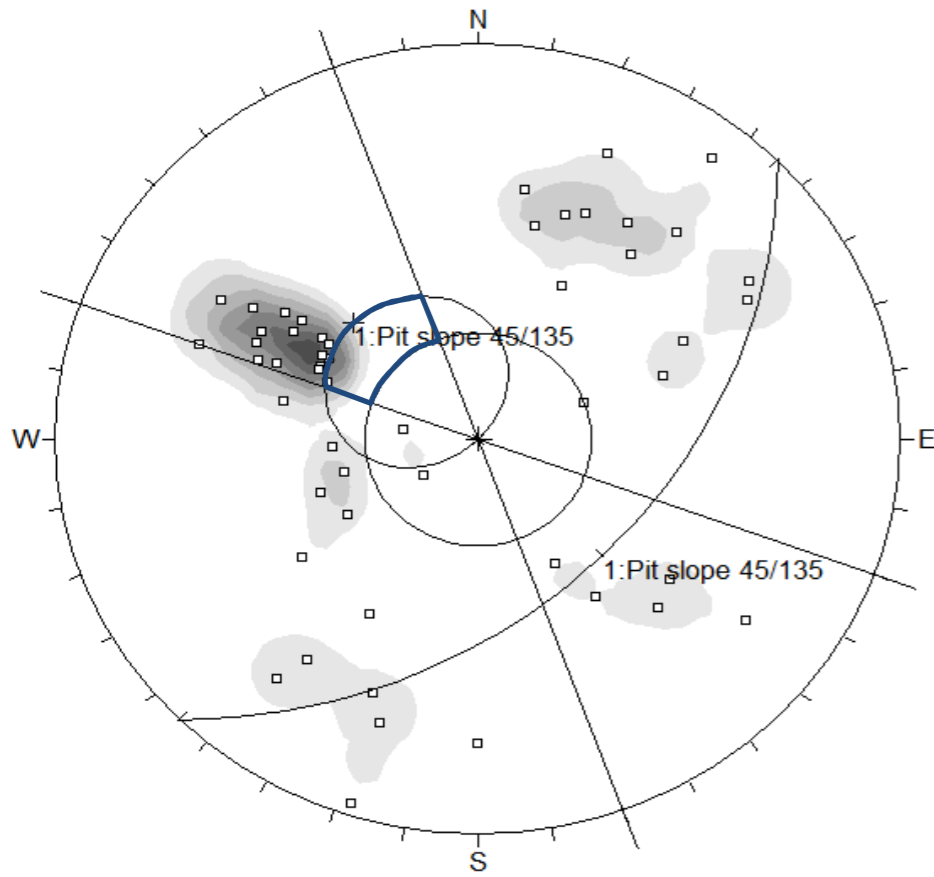


Control on Stability: Low potential for toppling failure for cut slopes with 50° batter angle and South-East orientation

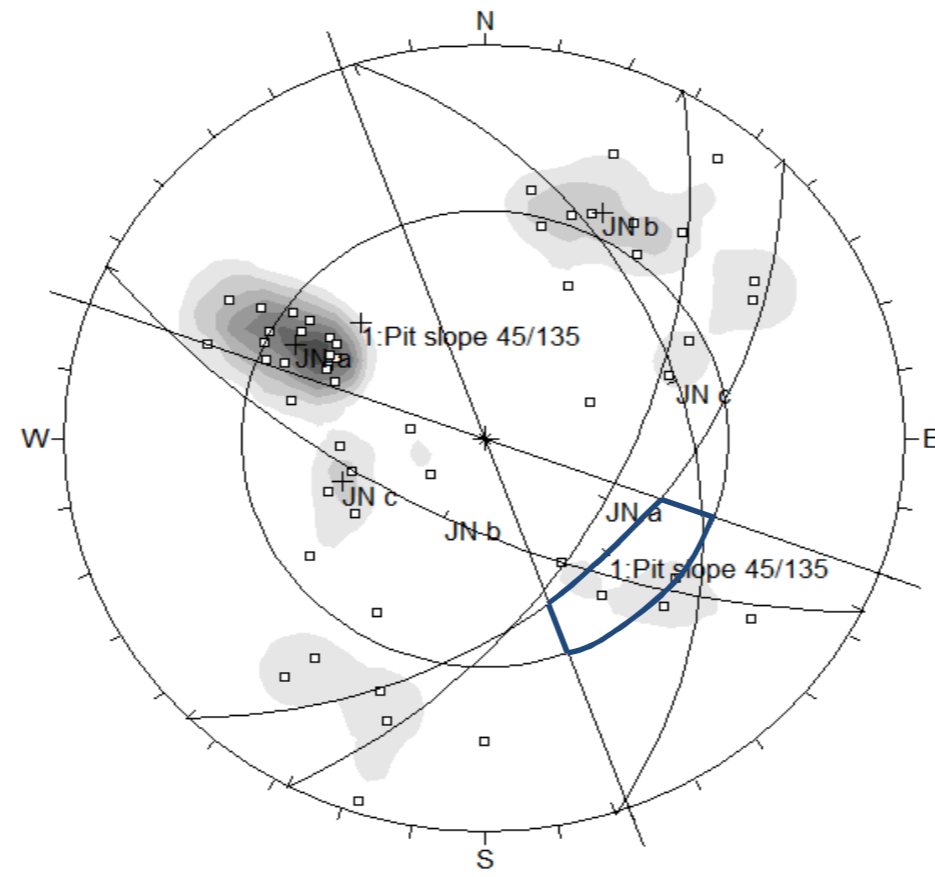


Date	20/02/15	Client	Holcim (NZ) Limited
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Approved by	KJ	Description	Failure Analysis
Scale	N/A	Project Number	10315

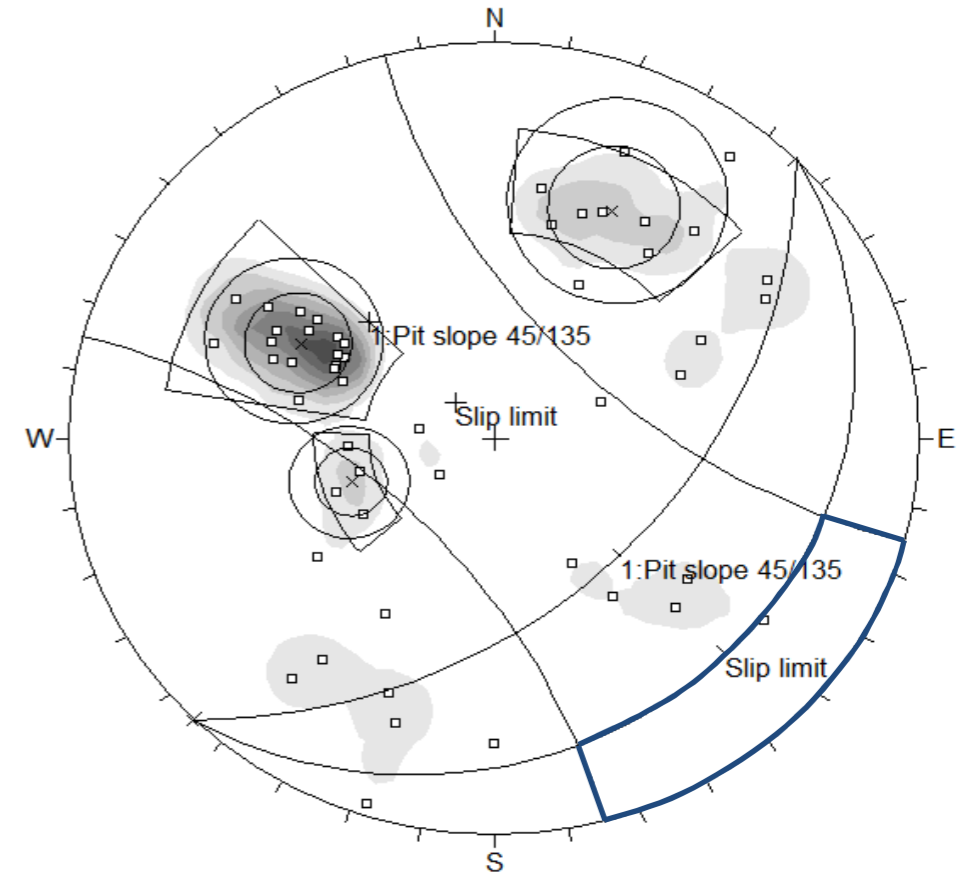
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 45° SOUTH-EAST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: Moderate potential for planar failure for cut slopes with 45° batter angle and South-East orientation



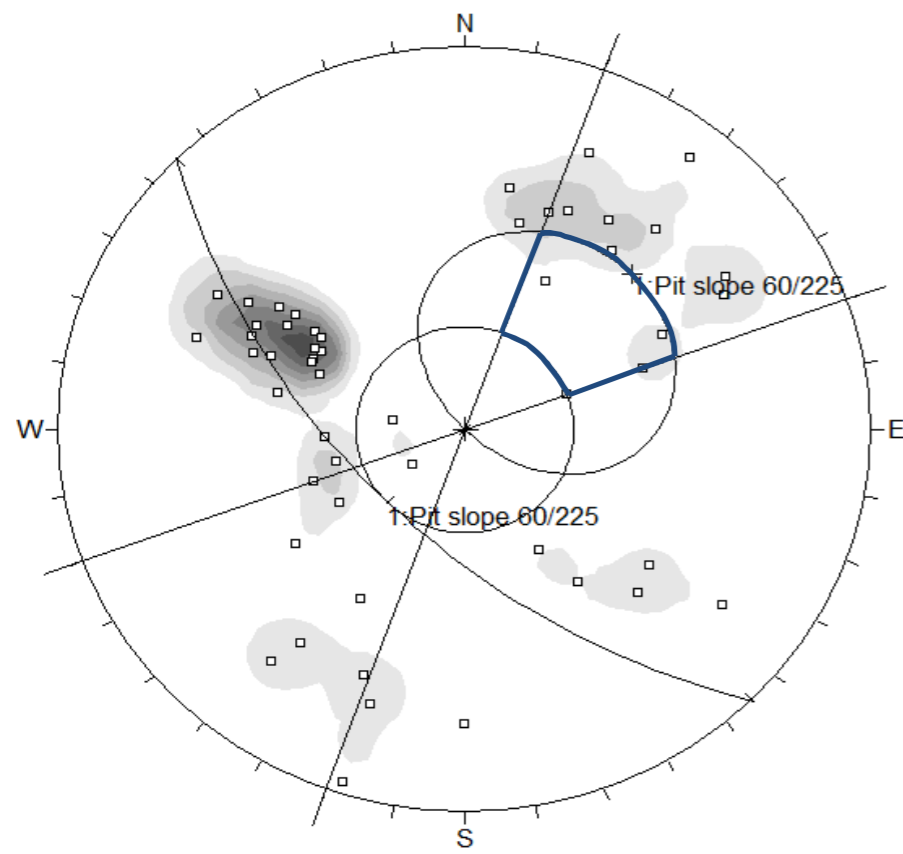
Control on Stability: Low potential for wedge failure on joint sets JN a and JN b for cut slopes with 45° batter angle and South-East orientation



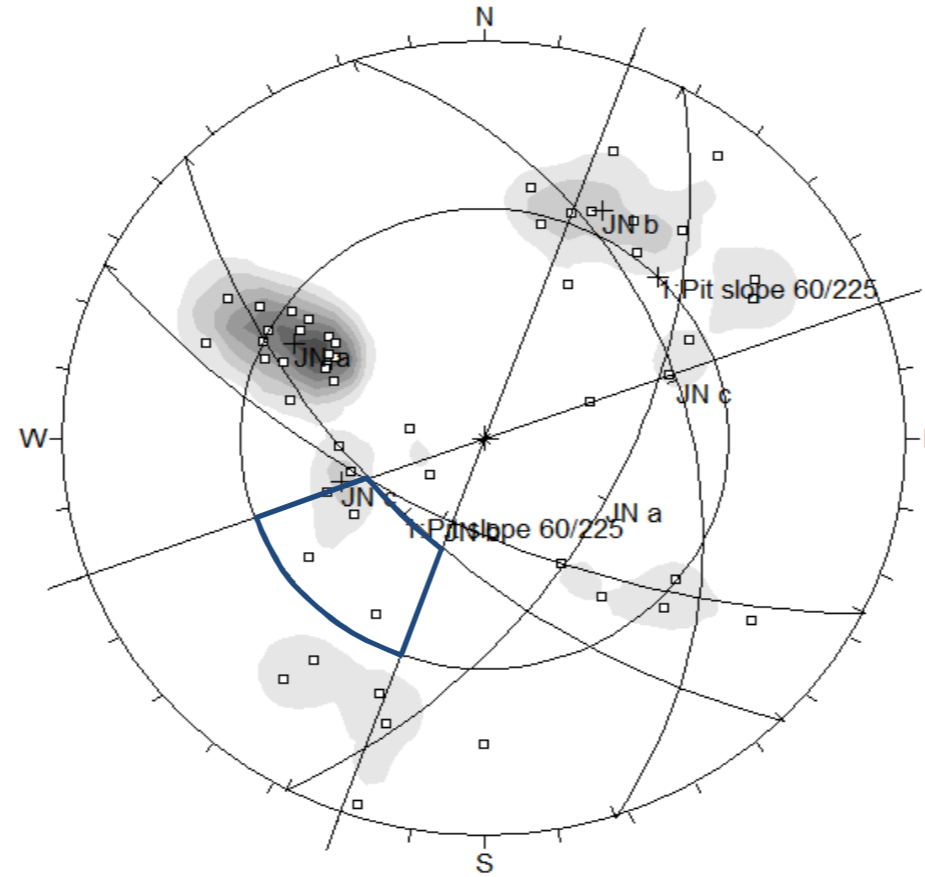
Control on Stability: Low potential for toppling failure for cut slopes with 45° batter angle and South-East orientation

	Date	20/02/15	Client	Holcim (NZ) Limited
	Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
	Approved by	KJ	Description	Failure Analysis
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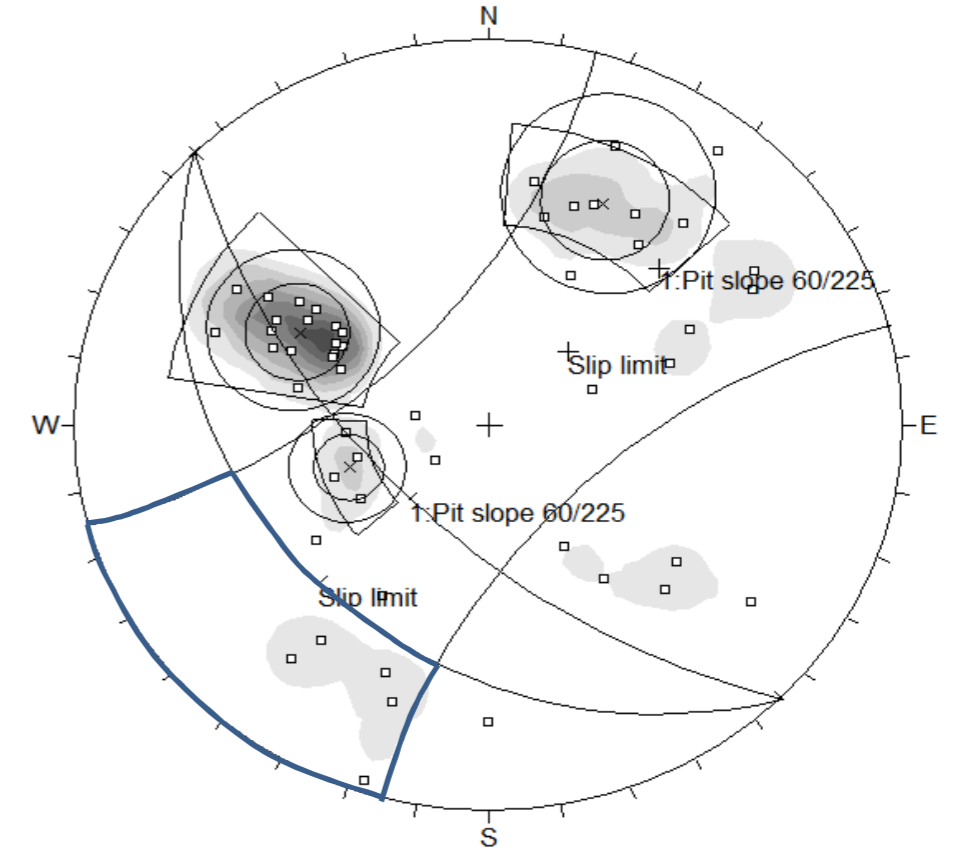
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 60° SOUTH-WEST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: Moderate potential for planar failure for cut slopes with 60° batter angle and South-West orientation



Control on Stability: Low potential for wedge failure for cut slopes with 60° batter angle and South-West orientation

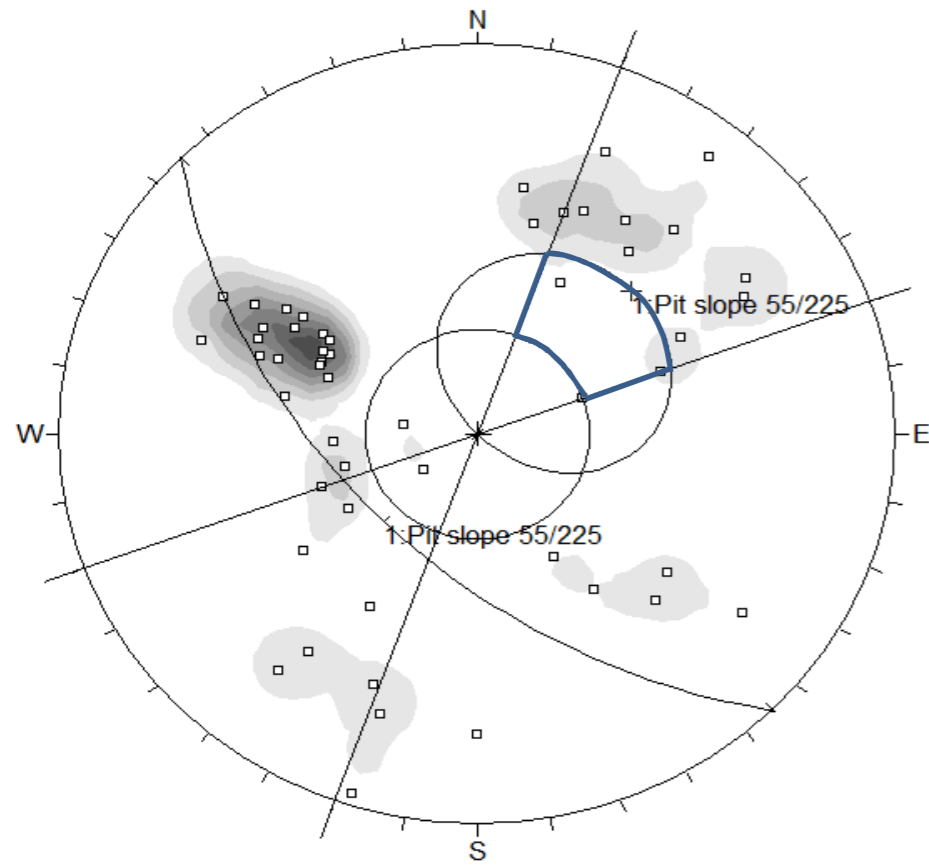


Control on Stability: Moderate potential for toppling failure for cut slopes with 60° batter angle and South-West orientation

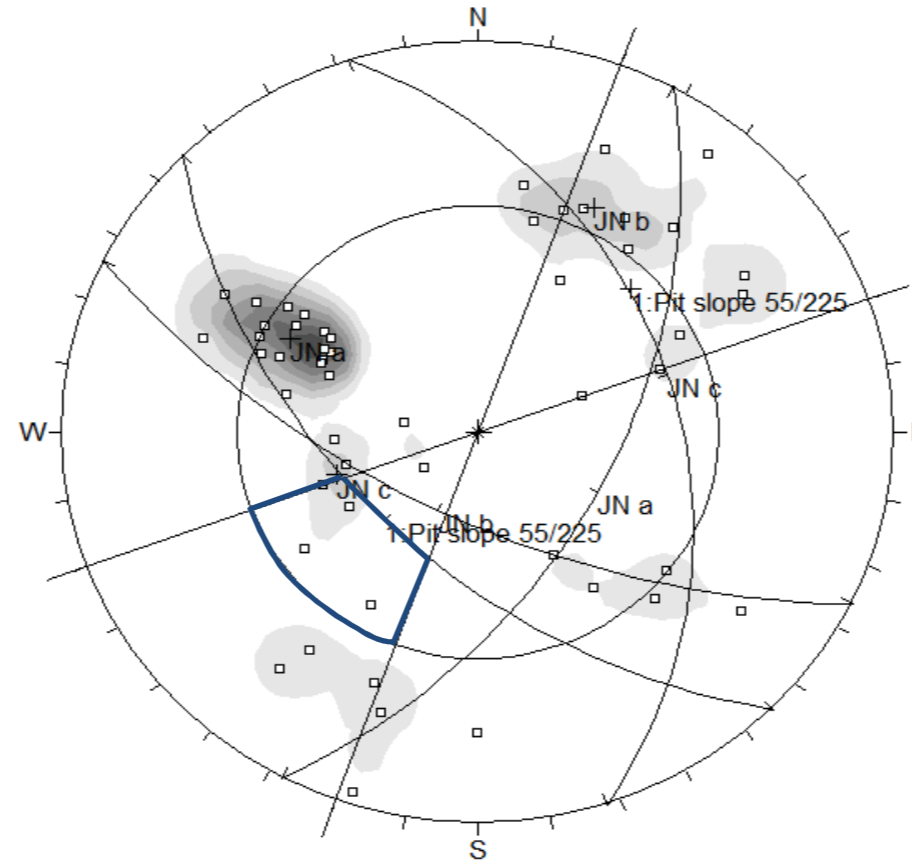


Date	20/02/15	Client	Holcim (NZ) Limited
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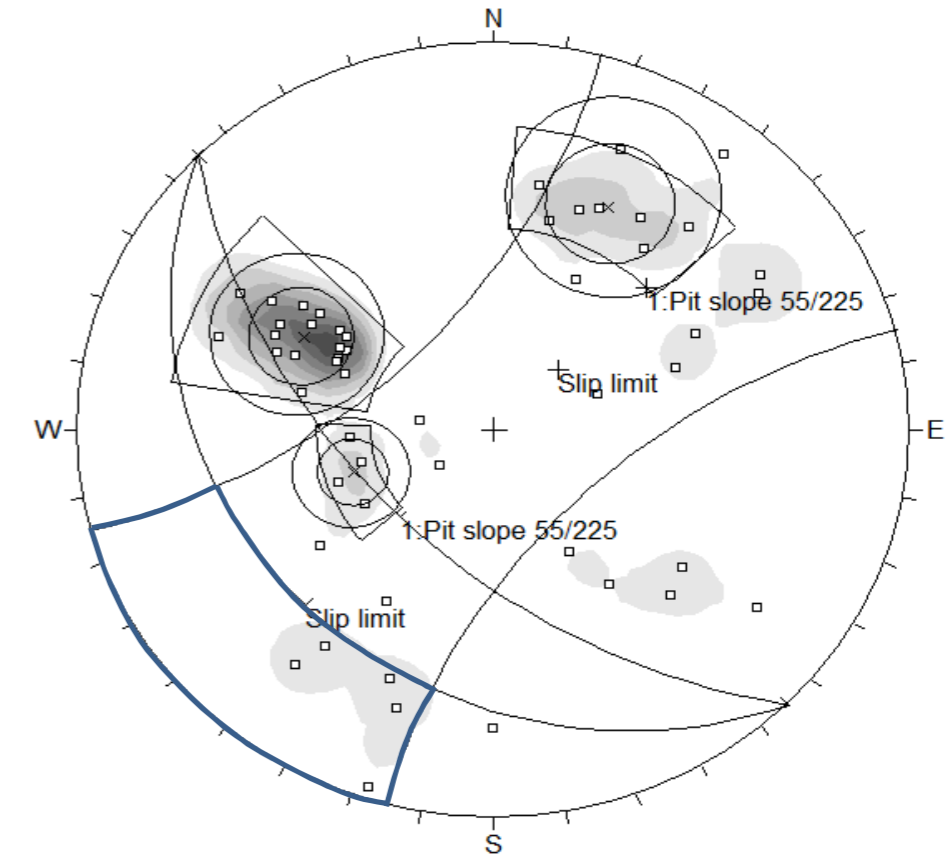
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 55° SOUTH-WEST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: Moderate potential for planar failure for cut slopes with 55° batter angle and South-West orientation



Control on Stability: Low potential for wedge failure for cut slopes with 55° batter angle and South-West orientation

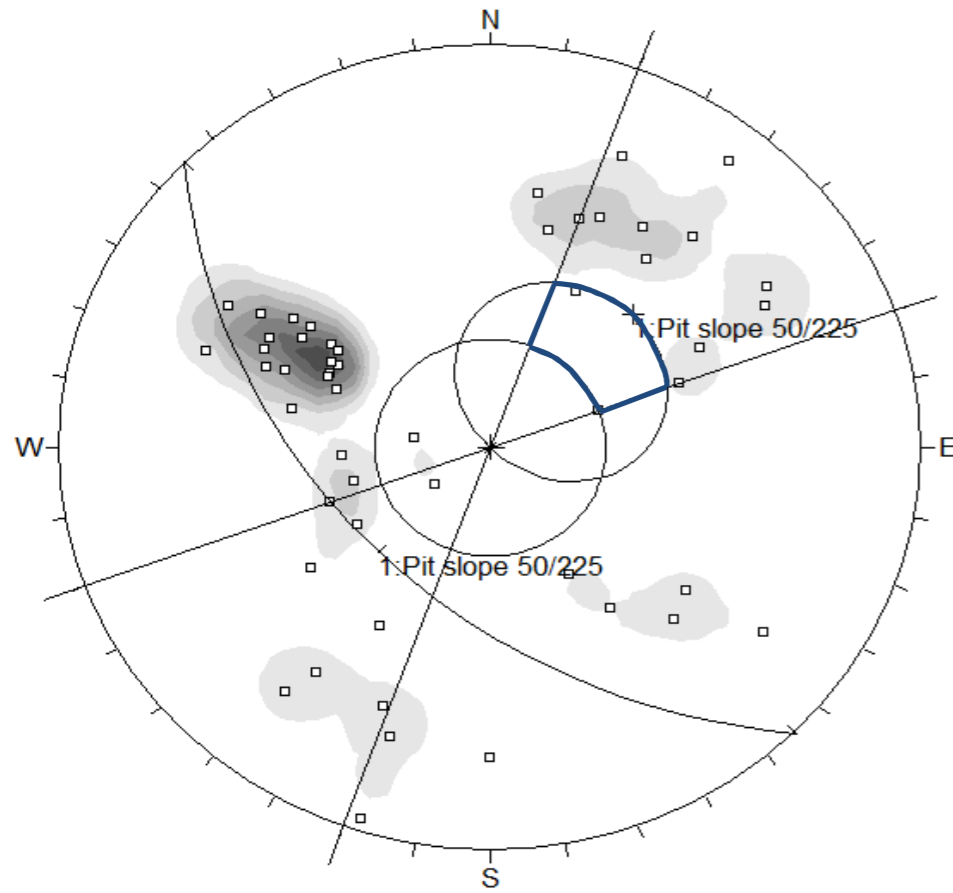


Control on Stability: Moderate potential for toppling failure for cut slopes with 55° batter angle and South-West orientation

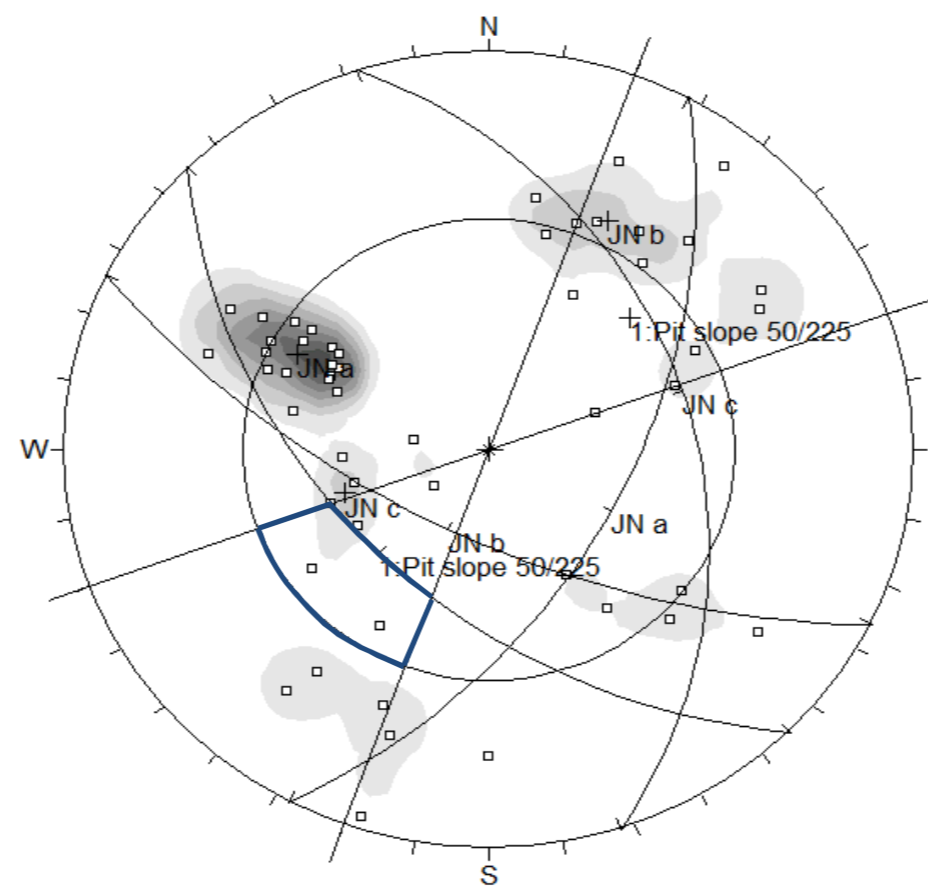


Date	20/02/15	Client	Holcim (NZ) Limited
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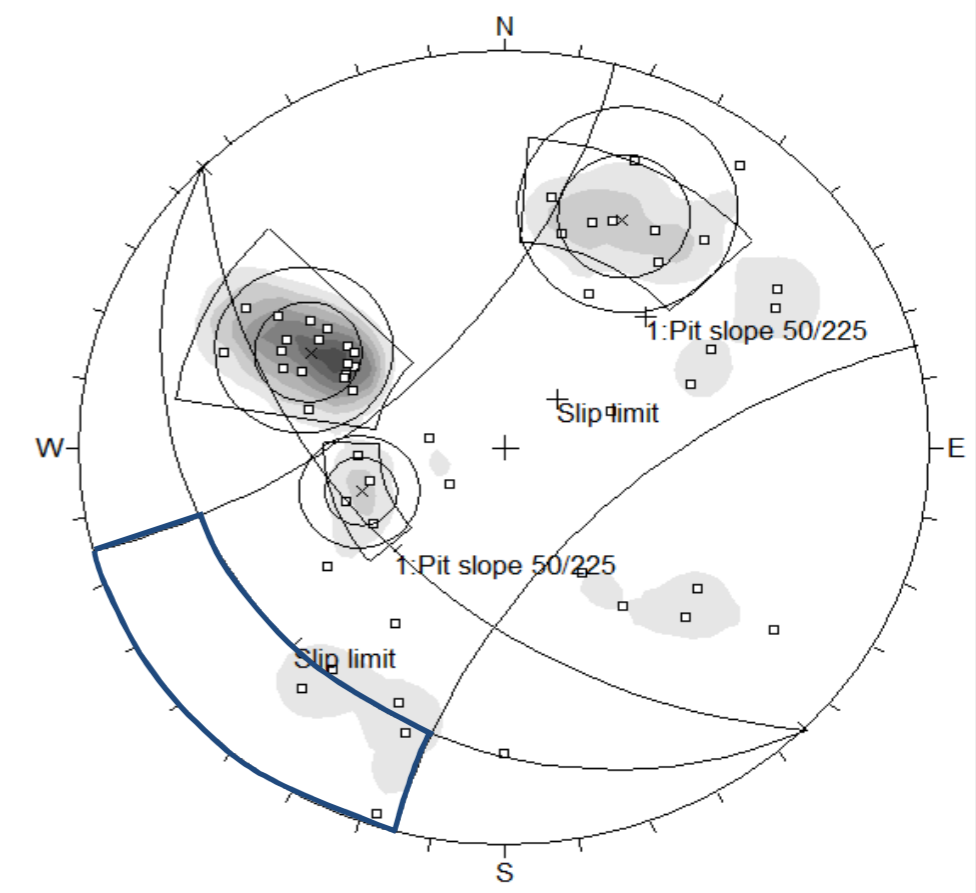
PLANAR, WEDGE AND TOPPLING FAILURE ANALYSIS FOR 50° SOUTH-WEST FACING BATTER BASED ON OBSERVATIONS FROM THE WEST WALL



Control on Stability: Low potential for planar failure for cut slopes with 50° batter angle and South-West orientation



Control on Stability: Low potential for wedge for cut slopes with 50° batter angle and South-West orientation



Control on Stability: Low potential for toppling failure for cut slopes with 50° batter angle and South-West orientation

	Date	20/02/15	Client	Holcim (NZ) Limited
	Drawn by	GL	Project	Kiwi Point Quarry Stability Analyses
	Approved by	KJ	Description	Failure Analysis
	Scale	N/A	Project Number	10315

29 April 2015

Mr Darcy Maddern
Holcim New Zealand Limited
PO Box 13341
Johnsonville
Wellington 6440
Via email.

Dear Darcy

RE: Addendum Slope Stability Report for the North Wall and Area H, KiwiPoint Quarry, Wellington

Our Reference: 10319.000.001-03

1 Introduction

In February 2015, ENGEO Limited (ENGEO) (formally Geoscience Consulting NZ Limited) issued a Slope Stability Review report for the proposed KiwiPoint quarry development to Holcim New Zealand Limited. In a meeting attended by ENGEO at the KiwiPoint office on 26 March 2015, it was requested that further slope stability modelling be undertaken to support the consenting process for the development.

2 Slope Stability Modelling

The February 2015 report assessed slope stability for the North Wall using three proposed scenarios:

- **Scenario 1:** The existing North Wall with batter slopes at approximately 80°;
- **Scenario 2:** The maximum resource extraction possible within the current quarry limits whilst improving current levels of stability with upper batter slopes at 55° as indicated by Ormiston and Associates drawing number 3655-2 dated 12 March 2014; and
- **Scenario 3:** Maximum resource extraction possible if the cell phone tower can be relocated and the wall can be extended to within 20 m from the quarry boundary (required setback).

The results of the initial slope stability assessments are detailed in our February 2015 report and that report should be read in conjunction with this addendum report. For the current assessment, the following additional slope stability modelling has been undertaken:

- An assessment of the three development scenarios for the north wall using the existing slope stability parameters, with the addition of the approximate location of the existing houses at the top of the slope. The modelling has been undertaken to assess the effect of global slope

failure on the houses using static conditions, SLS and ULS earthquake events and varying groundwater levels;

- An assessment of the slope stability of the proposed development in Area H (using the proposed 45° cut angle) including the approximate locations of existing houses at the top of the slope. As above, the modelling has been undertaken to assess the effect of global slope failure on the houses using static conditions, SLS and ULS earthquake events and varying groundwater levels;
- An assessment of slope stability using the three scenarios for the North Wall as well as Area H, using the actual earthquake data from the largest earthquake affecting Christchurch CBD during the Christchurch Earthquake Sequence in 2010-2011. This modelling has been undertaken to allow comparison between the effects of a known recently experienced New Zealand earthquake and the effects of a similar code defined (SLS and ULS) earthquake in the Wellington Region. The peak ground acceleration experienced in the Christchurch CBD of up to 0.46g equates approximately to a 1 in 800 year earthquake in the Wellington Region, in comparison to a code defined ULS earthquake (1 in 500 year event) of 0.35g.

In the slope stability analysis, the degree of stability of a slope is expressed as the 'factor of safety' (FOS) which is the ratio of the forces resisting failure to the driving forces causing instability. Theoretical failure of a slope is possible when the FOS is less than 1.0, while increasing values above 1.0 indicate improving stability. Depending on the levels of certainty around the various input parameters in the ground model, a minimum FOS of 1.5 and 1.2 are commonly adopted for slopes under long term static / seismic conditions respectively.

In each case, failure surfaces and the associated FOS likely to affect the houses at the crest of the slopes have been modelled and reported. The modelling results are discussed in detail in the following sections.

In this assessment, a "traffic light" system has been utilised in the results tables, as follows:

- A red light signifies that slope failure is likely to occur (FOS <1);
- An amber light signifies that slope failure is possible (FOS >1 but FOS <1.5 in static conditions and <1.2 in seismic conditions); and
- A green light signifies that slope failure is unlikely to occur (FOS >1.5 in static conditions and >1.2 in seismic conditions).

3 Slope Stability Modelling Results

3.1 North Wall – Equivalent Christchurch Earthquake

Earthquake data from the Christchurch CBD on 22 February 2011 has been used in this assessment. The peak ground acceleration recorded in the CBD during this earthquake was 0.46g. Table 1 indicates the results of such an earthquake event on the North Wall.

Table 1. Results of modelling Christchurch CBD event

Scenario	Factor of Safety	
	Failure through Highly to Moderately Weathered Rock	Failure through Slightly Weathered Rock
1	0.72	1.43
2	0.72	1.64
3	0.81	2.11

Note: A dry slope was modelled in this case as the probability of a 1 in 800 year earthquake occurring at the same time as high groundwater levels is low.

The results indicate that in an earthquake similar to that experienced in the Christchurch CBD on 22 February 2011, failure of the upper part of the slope comprising highly to moderately weathered rock is likely (i.e. FOS is below 1). Global slope failure through the slightly weathered Greywacke is unlikely.

3.2 North Wall – Failures Affecting Houses at Crest

The existing slope stability models for each scenario have been used with the addition of the approximate location of the existing houses at the crest of the slope. The FOS of failure surfaces likely to affect houses at the crest are shown in Table 2.

Table 2 Results of modelling slope failures affecting the existing houses at the crest of the slope

Scenario	Factor of Safety						
	High Groundwater			No Groundwater			
	Static	1 in 50 year Earthquake (0.13g)	1 in 500 year Earthquake (0.35g)	Static	1 in 50 year Earthquake (0.13g)	1 in 500 year Earthquake (0.35g)	Christchurch CBD (0.46g)
1	5.27	3.61	N/A	6.32	4.98	3.62	3.68
2	5.18	3.12	N/A	5.81	5.13	3.26	3.25
3	3.43	2.60	N/A	4.63	3.21	2.40	2.11

N/A = A 1 in 500 year earthquake event with high groundwater level has not been modelled due to the low probability of these two events occurring simultaneously.

The results indicate that in all scenarios the houses at the crest of the slope are unlikely to be affected by the earthquake events modelled (i.e. FOS more than 1).

Note that the FOS generally reduces between Scenario 1, 2 and 3 as the crest of the slope is modelled to be closer to the houses. For example, the crest of the existing steep slope (Scenario 1) is further away from the houses than in Scenario 3 where the slope has been battered back to a shallower angle.

3.3 Area H

Table 3 provides the results of the slope stability modelling at Area H. The approximate location of the existing houses has been added to the model.

Table 3. Area H Slope Modelling Results.

Groundwater	Scenario	Factor of Safety			
		Failure through Highly to Moderately Weathered Rock (lowest FOS)	Failure through Highly to Moderately Weathered Rock affecting houses	Failure through Slightly Weathered Rock (lowest FOS)	Failure through Slightly Weathered Rock affecting houses
High	Static	1.20	1.75	2.03	2.22
	1 in 50 year Earthquake (0.13g)	0.98	1.26	1.67	1.73
	1 in 500 year Earthquake (0.35g)	N/A	N/A	N/A	N/A
No	Static	1.32	2.09	2.45	2.78
	1 in 50 year Earthquake (0.13g)	1.09	1.49	1.77	2.76
	1 in 500 year Earthquake (0.35g)	0.81	0.99	1.46	1.90
	Christchurch CBD (0.46g)	0.70	0.85	1.40	1.85

N/A = A 1 in 500 year earthquake event with high groundwater level has not been modelled due to the low probability of these two events occurring simultaneously.

The results indicate that:

- **In the Static case:** Both results for failure in static conditions in highly to moderately weathered rock are above a FOS of 1 but below the ideal result of 1.5 (being 1.20 and 1.32). However, if these failures were to occur, the houses at the crest of the slope are unlikely to be affected (FOS 1.75 and 2.09). Failures through slightly weathered rock are unlikely to occur in static conditions.
- **In a 1 in 50 year (SLS) earthquake:** In all cases the FOS is very close to or greater than 1, and therefore the global stability of the slope is expected to be largely maintained during an earthquake of this magnitude (0.13g). Note that this model does not allow for small scale rock failures from the rock face, which are expected in this size of event.
- **In a 1 in 500 year (ULS) earthquake:** In a 1 in 500 year earthquake, the two models representing failure in highly to moderately weathered rock have returned a FOS < 1 and therefore failure is possible, although the FOS for slope failure affecting the houses above is close to 1. If failure of the slope in a 1 in 500 year earthquake is not acceptable, further seismic analysis can be undertaken to assess the likely amount of displacement to be expected in such an event. Failure in slightly weathered rock is unlikely.
- **In an earthquake similar to the February 2011 event:** the two models representing failure in highly to moderately weathered rock have a FOS considerably less than 1 and therefore slope failure is likely to affect the houses at the crest of the slope. Failure in slightly weathered rock is unlikely.

Outputs from the slope modelling software are appended to this report.

4 Limitations

- i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Holcim New Zealand Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.
- ii. The recommendations in this report are based on the ground conditions indicated from published sources, site inspections and subsurface investigations based on accepted normal methods of site investigations. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it must be appreciated that actual conditions could vary from the assumed model.
- iii. This Limitation should be read in conjunction with the IPENZ/ACENZ Standard Terms of Engagement.
- iv. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on 04 472 0820 if you require any further information.

Report prepared by



Karen Jones

Senior Engineering Geologist

Enc. Slope Stability Models

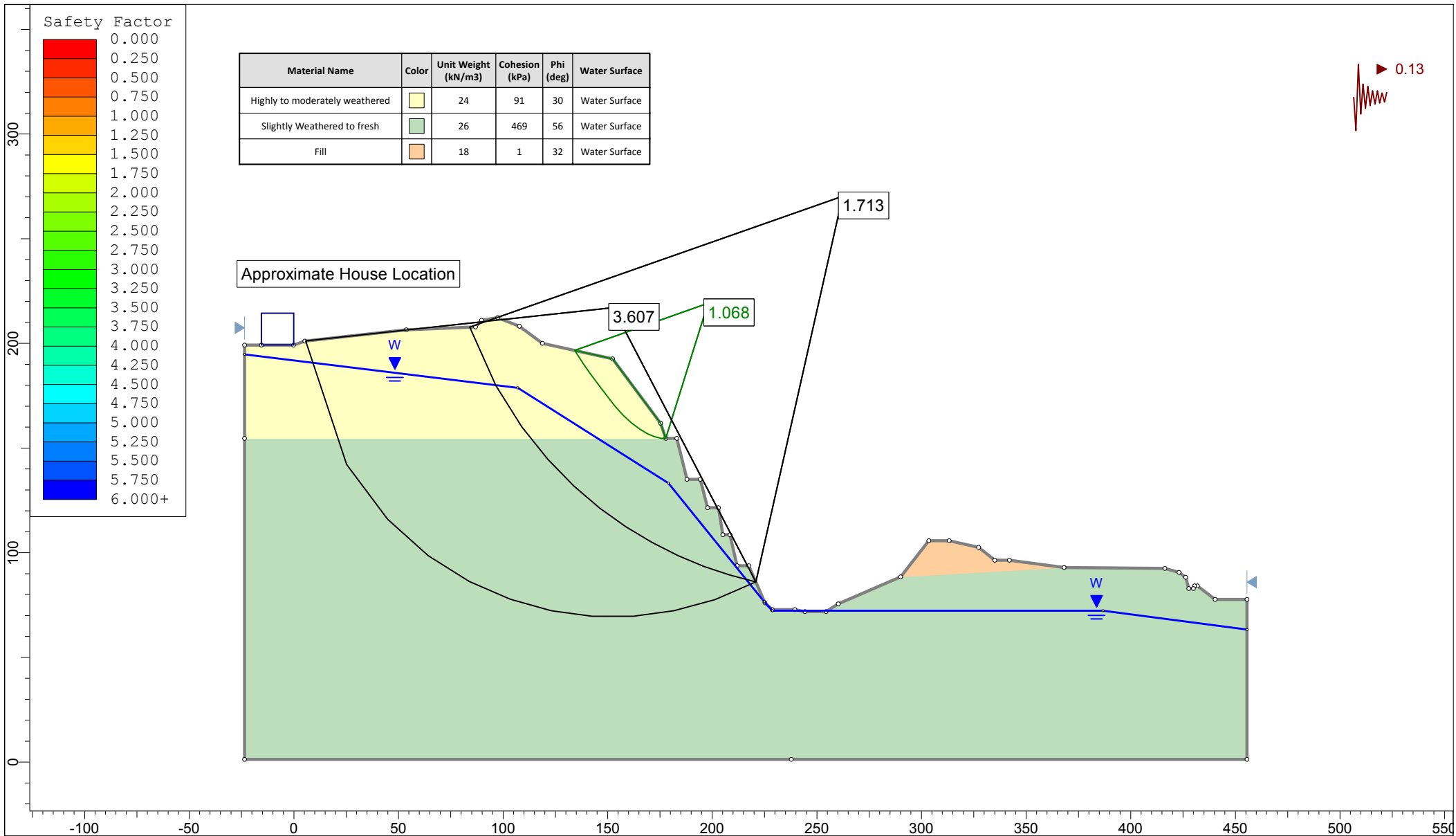
Reviewed by





Guy Cassidy, MIPENZ, PEngGeol

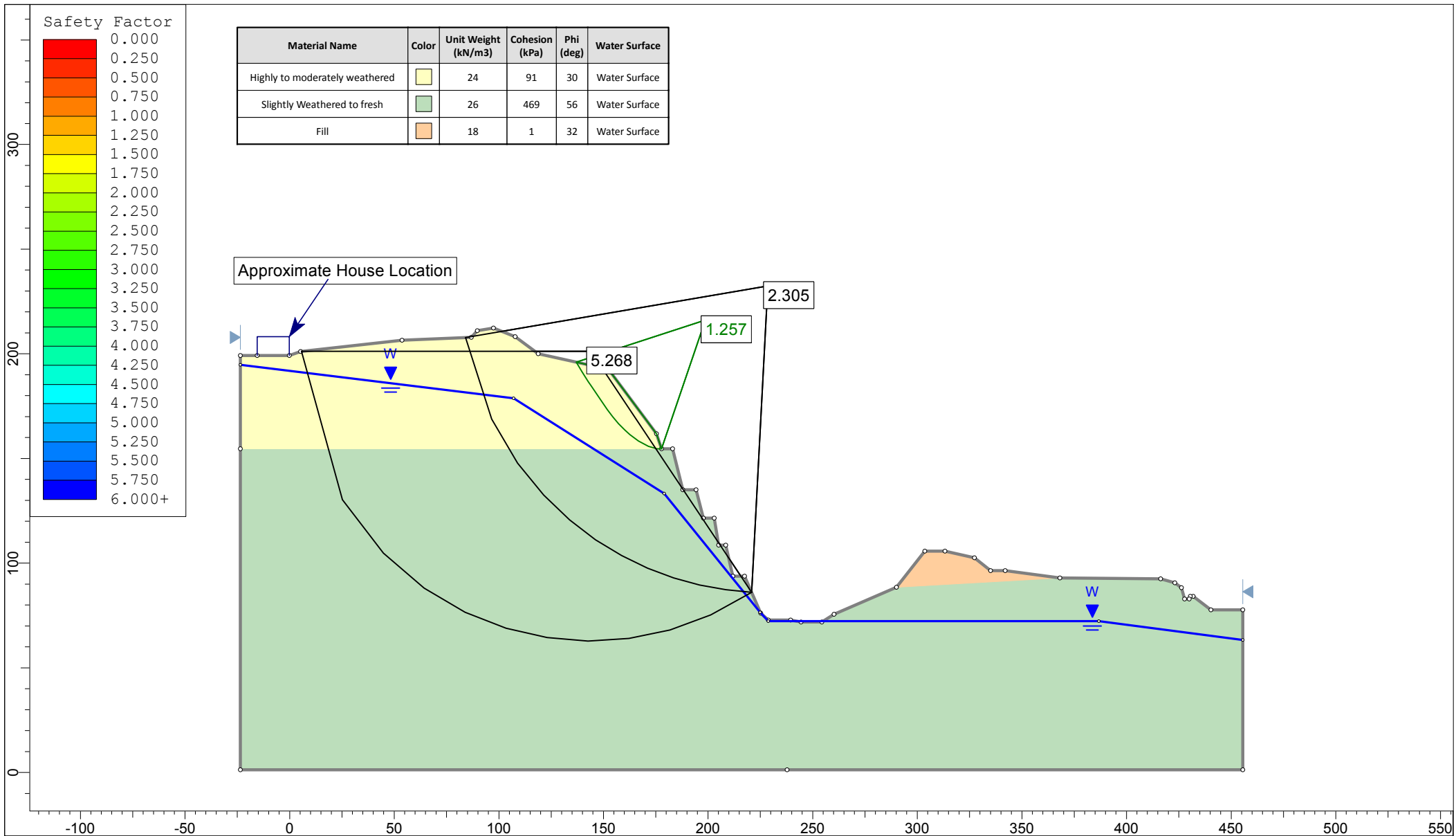
Principal Engineering Geologist

North Wall – Scenario 1

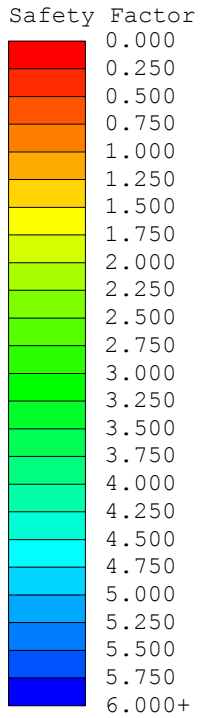


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)	Water Surface
Highly to moderately weathered	Yellow	24	91	30	Water Surface
Slightly Weathered to fresh	Green	26	469	56	Water Surface
Fill	Orange	18	1	32	Water Surface

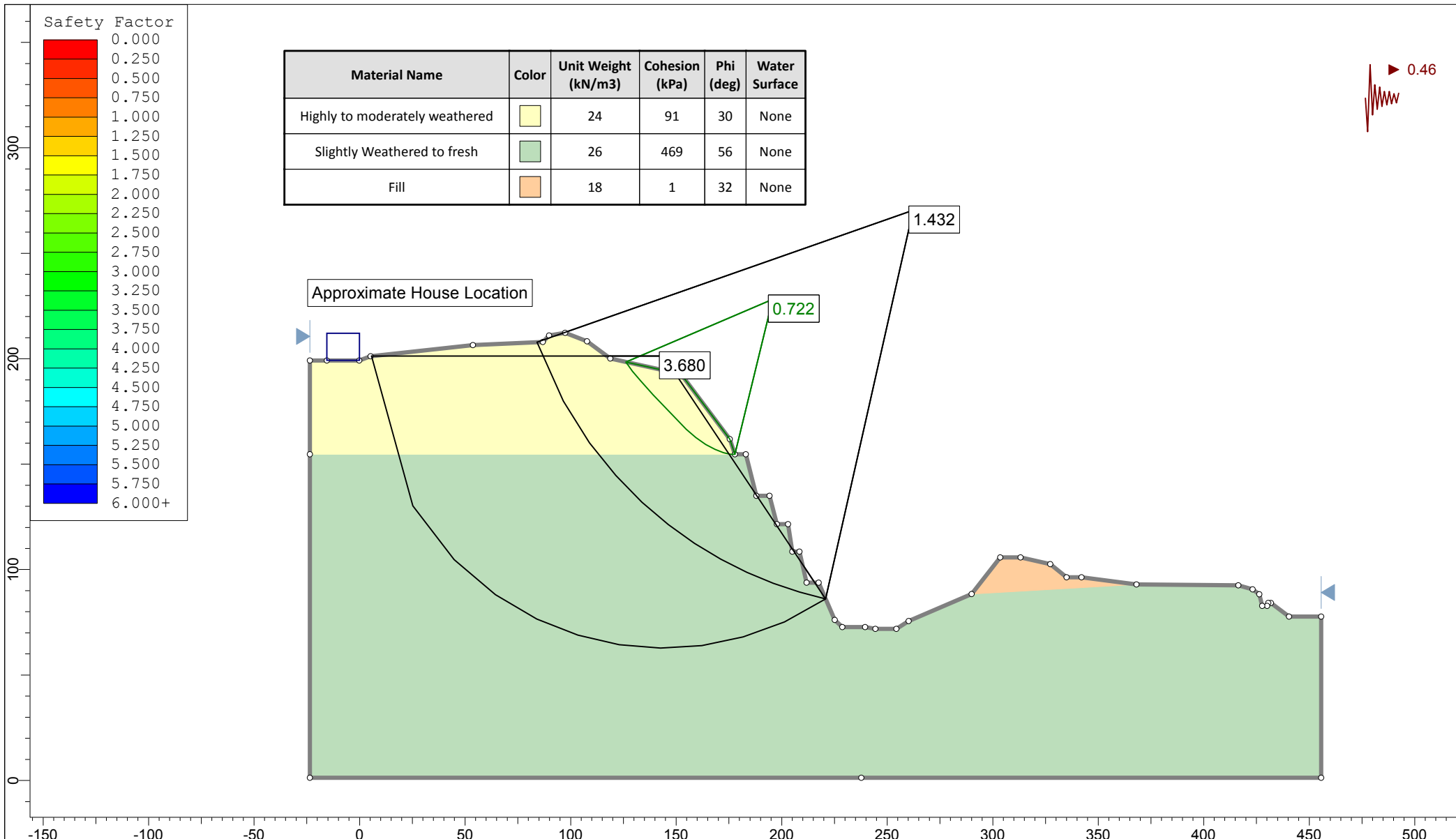
 A proud partner of 	Client Holcim New Zealand Limited		Project KiwiPoint Quarry	
	Drawn By SC	Approved By GC	Analysis North Wall, Scenario 1, SLS, high groundwater	
	Date 24/04/2015	Revision		
	Scale 1:2500	Page Size A4	Reference 10315.000.000	





Material Name	Color	Unit Weight (kN/m ³)	Cohesion (kPa)	Phi (deg)	Water Surface
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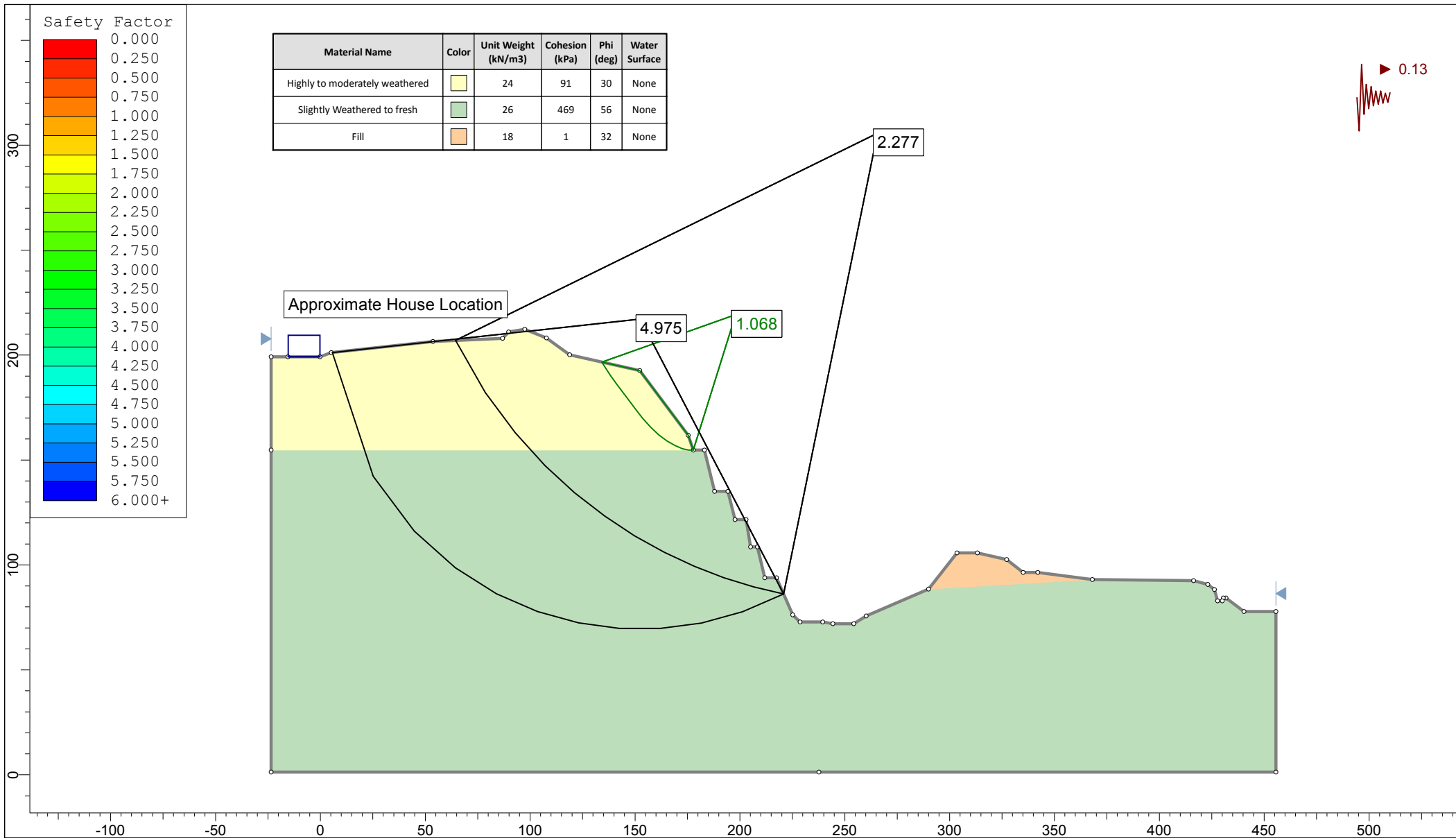


	Client Holcim New Zealand Limited		Project KiwiPoint Quarry
	Drawn By SC	Approved By GC	Analysis North Wall Scenario 1, static, high groundwater
	Date 24/04/2015	Revision	
	Scale 1:2500	Page Size A4	Reference 10315.000.000

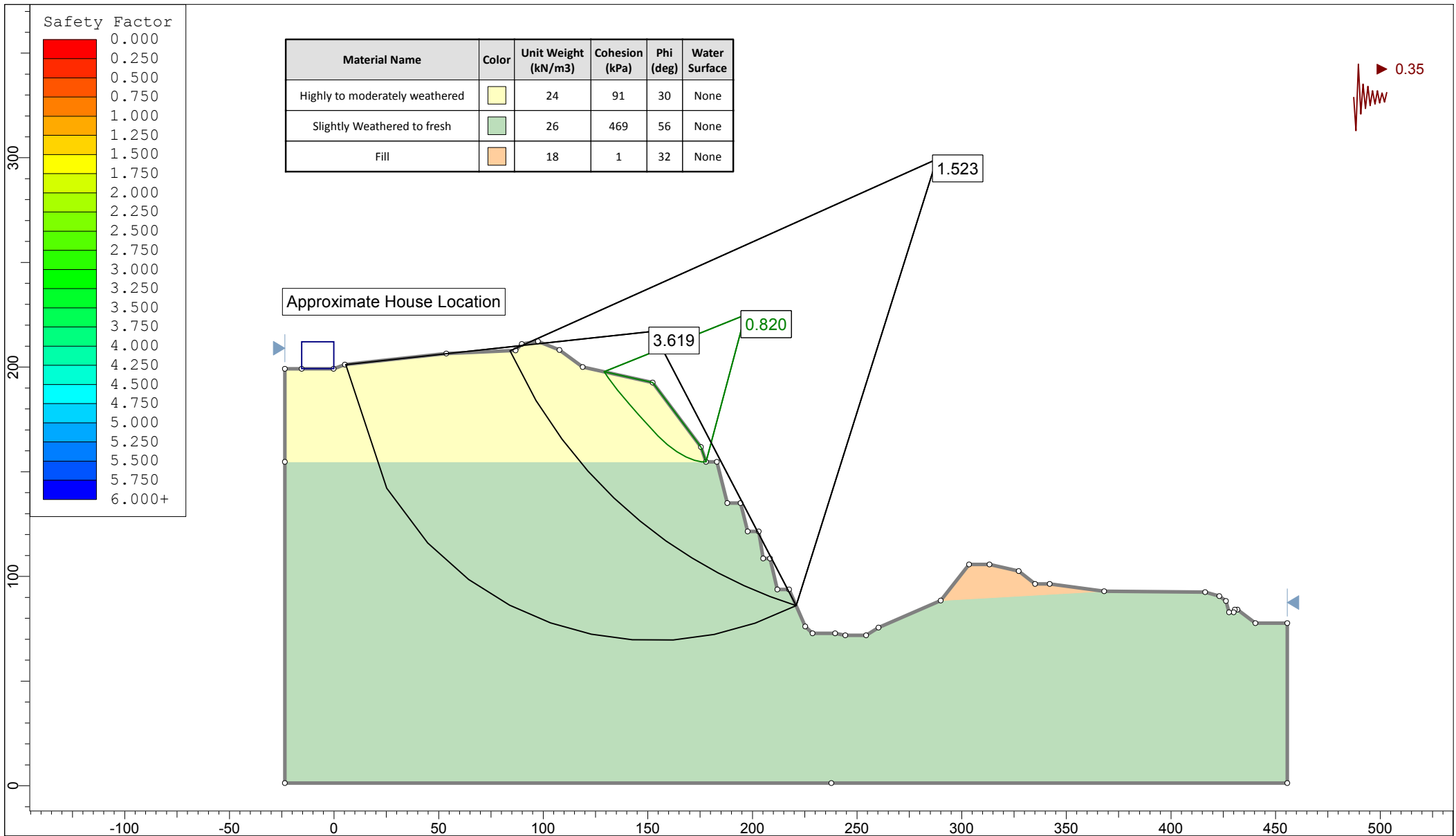


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)	Water Surface
Highly to moderately weathered	Yellow	24	91	30	None
Slightly Weathered to fresh	Green	26	469	56	None
Fill	Orange	18	1	32	None



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	Drawn By SC	Approved By GC	Analysis North Wall Scenario 1, Chch, no groundwater
	Date 24/04/2015	Revision	
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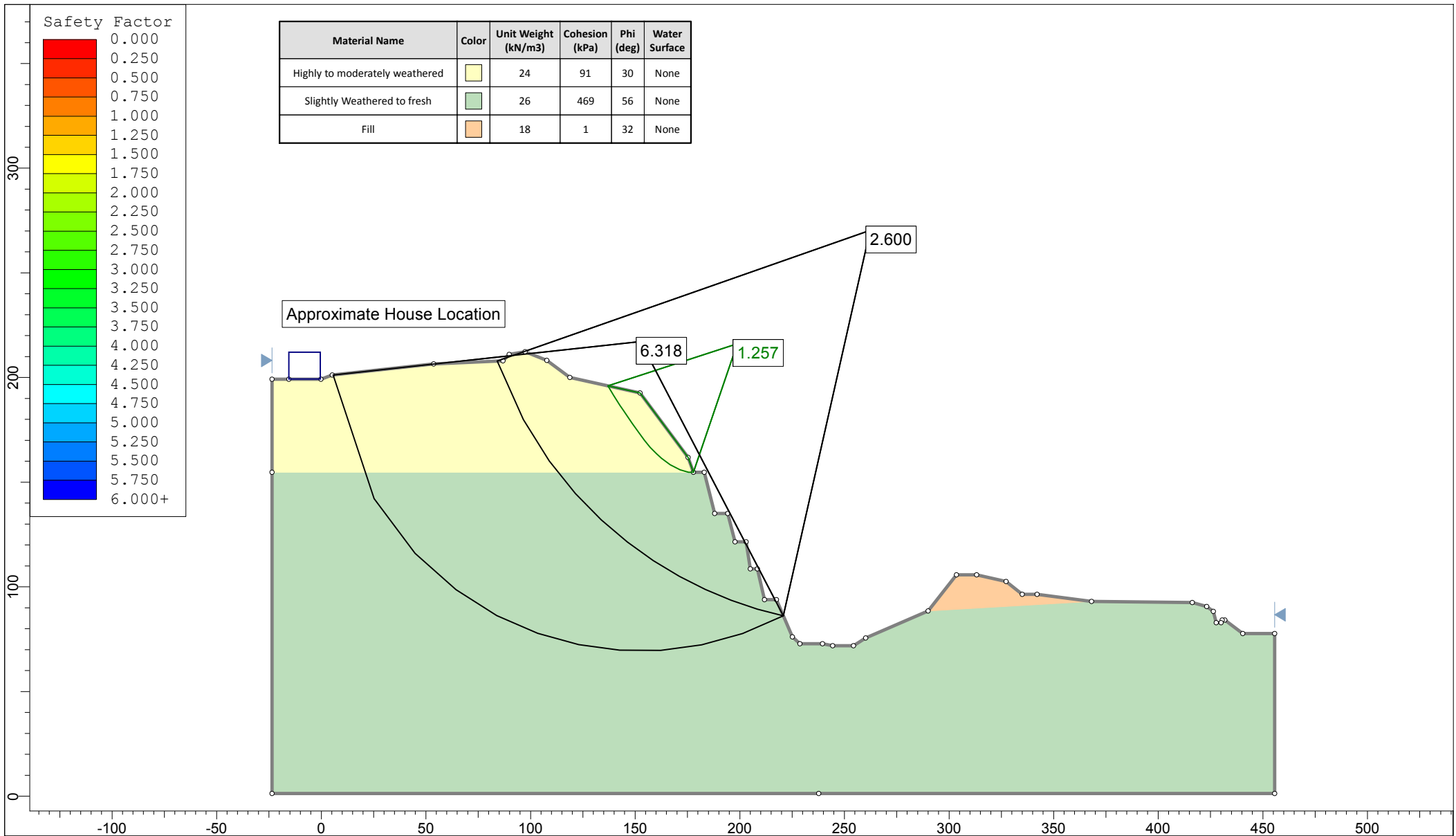


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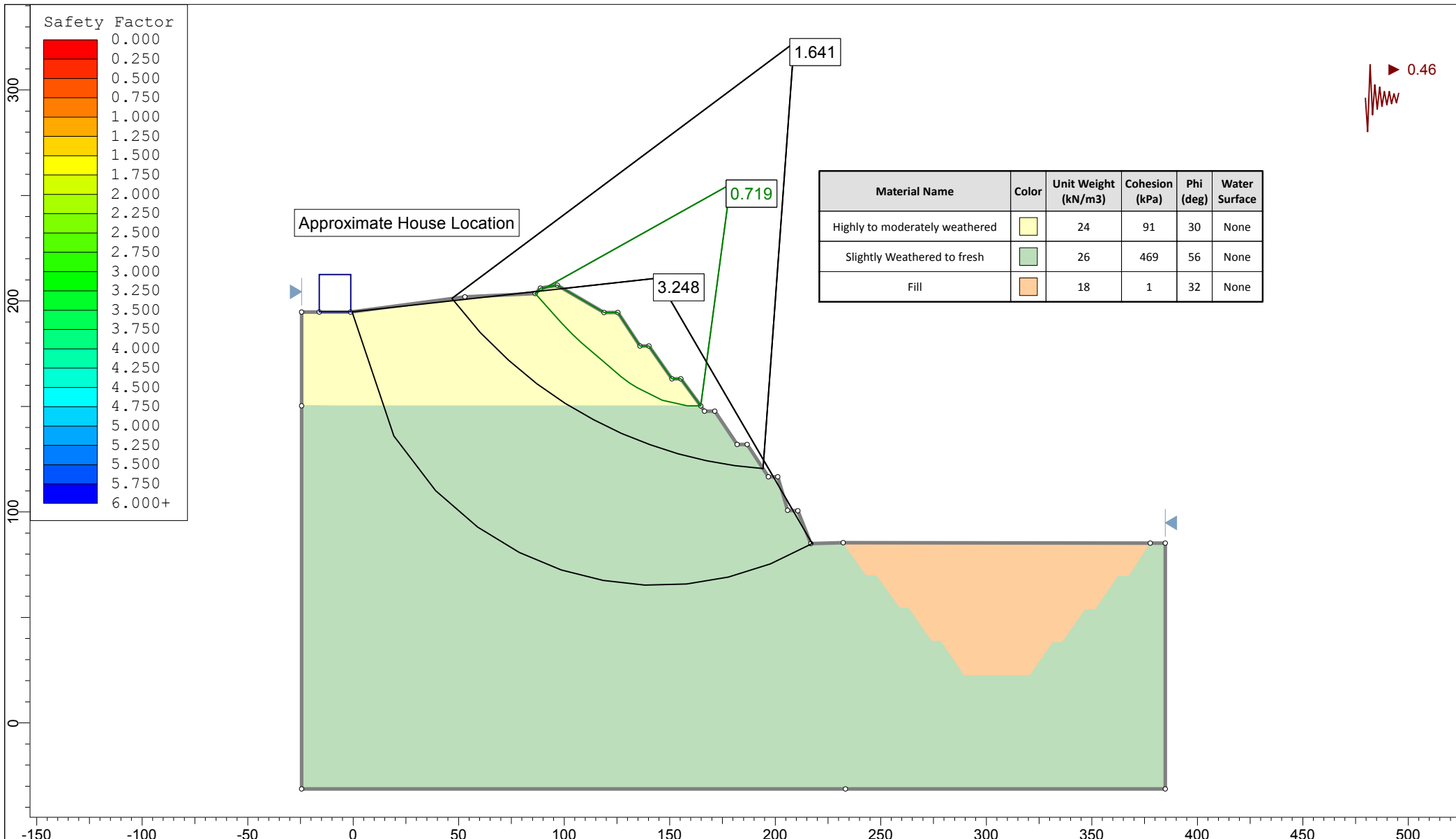
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Slightly Weathered to fresh	Green	26	469	56	None
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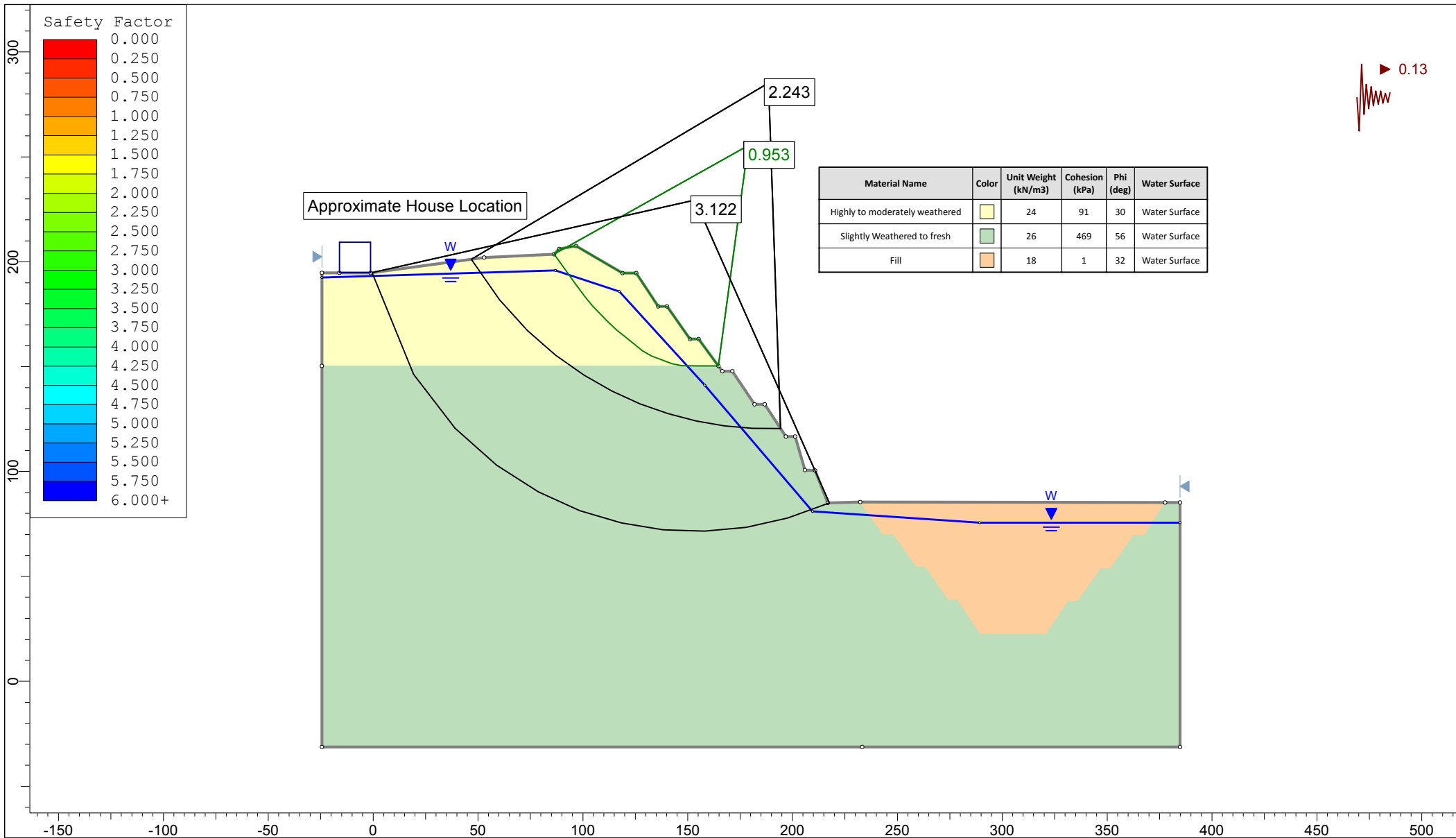


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	<i>Date</i> 24/04/2015	<i>Revision</i>	
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North Wall – Scenario 2

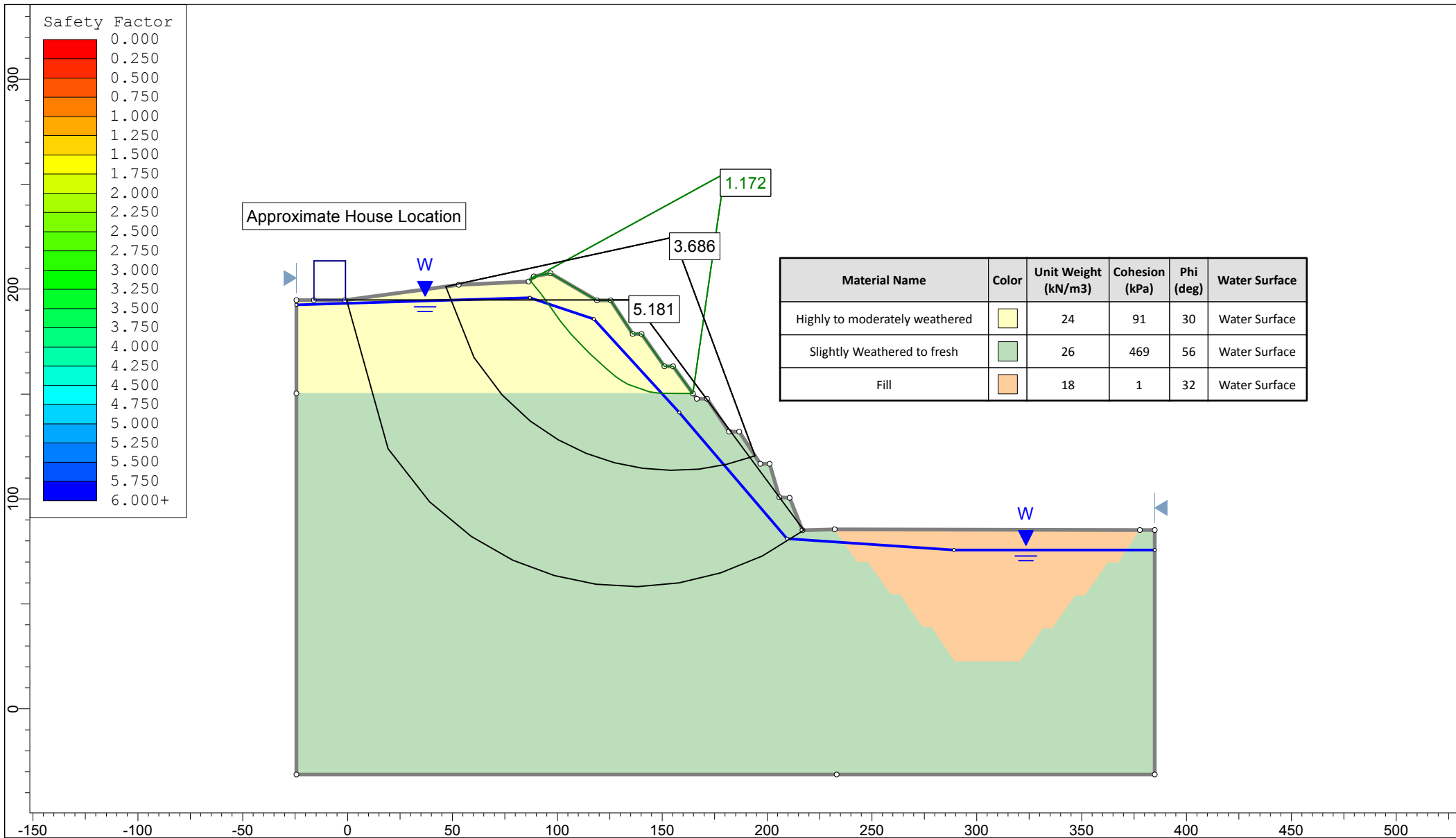




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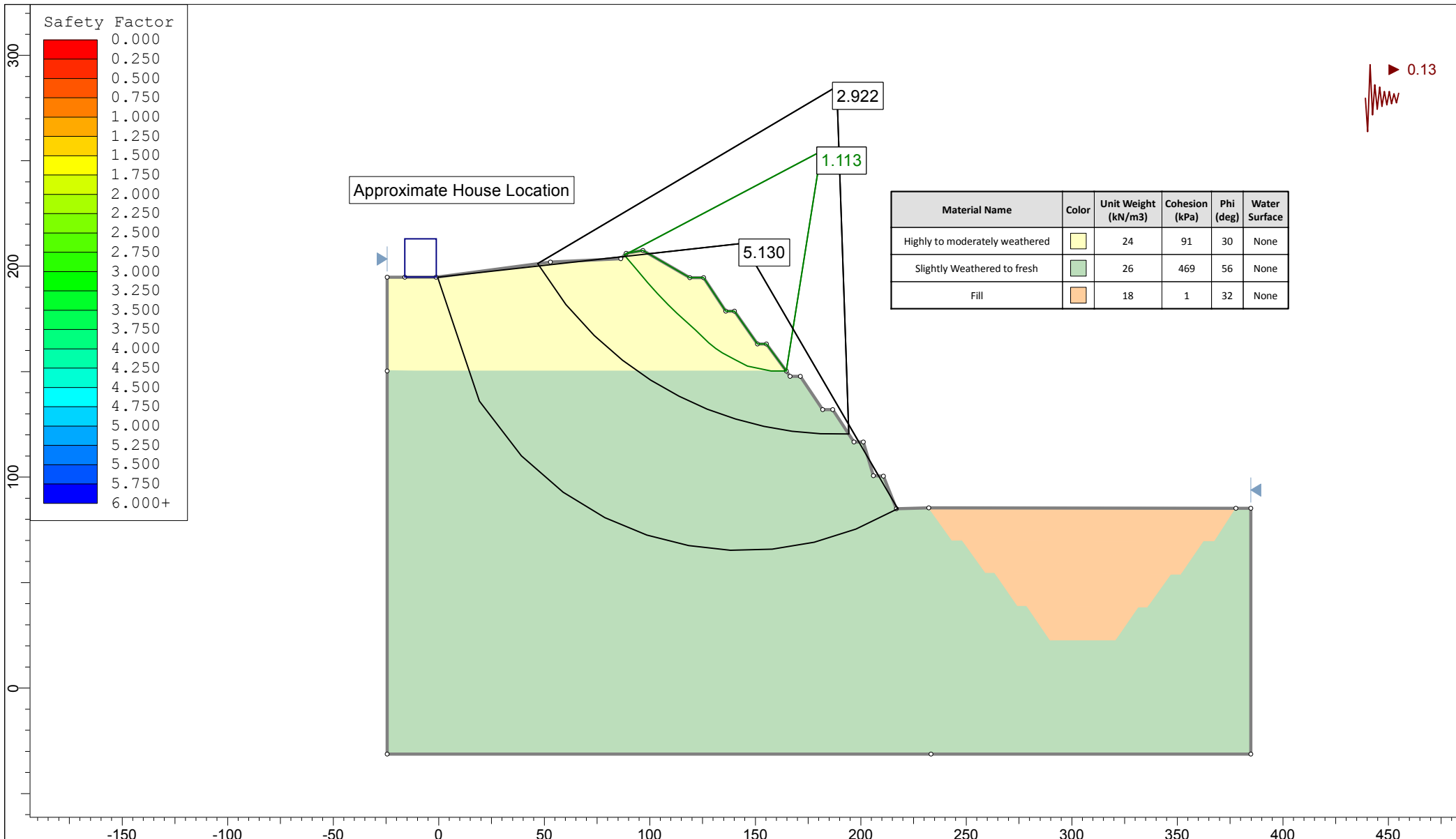




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Slightly Weathered to fresh	Green	26	469	56	Water Surface
Fill	Orange	18	1	32	Water Surface

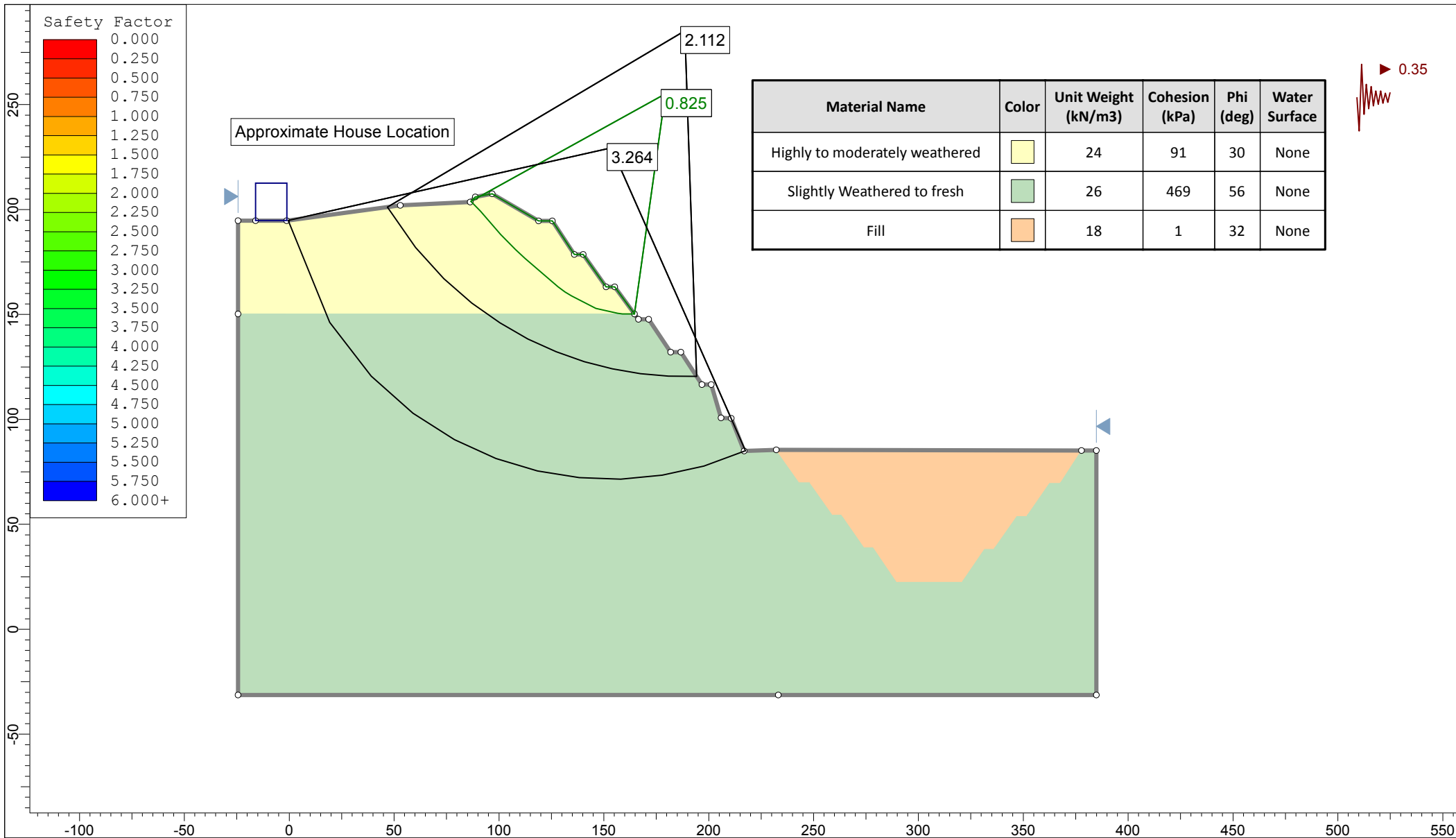
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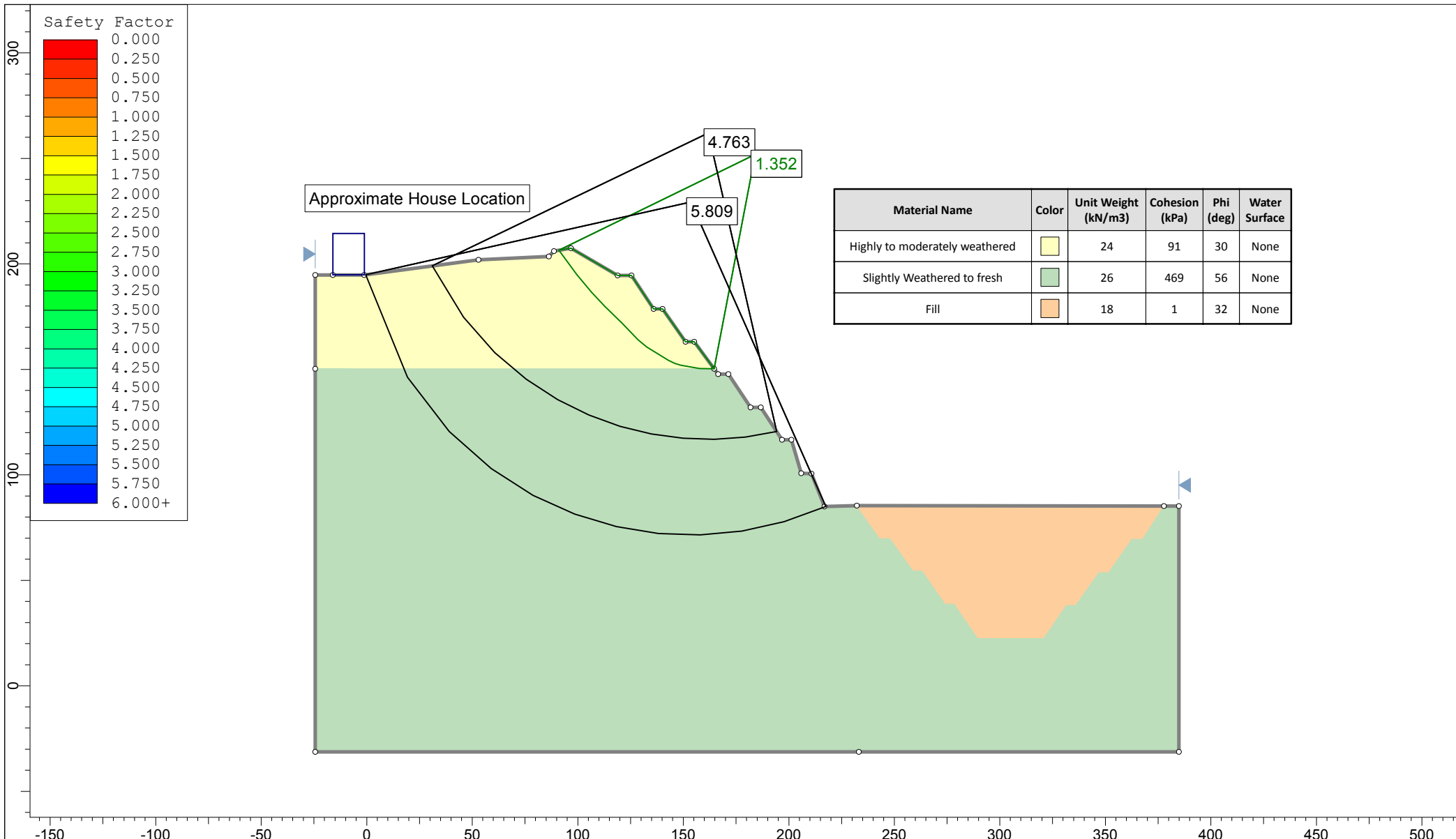
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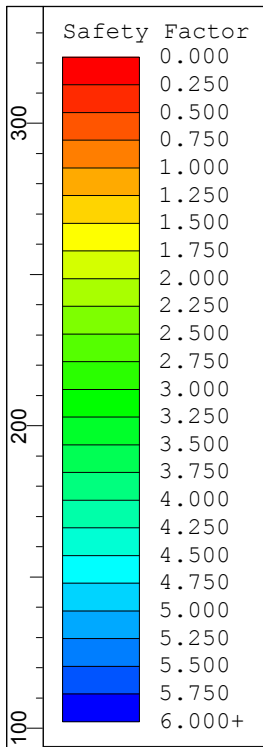
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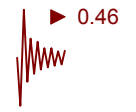
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Slightly Weathered to fresh	Green	26	469	56	None
Fill	Orange	18	1	32	None

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	<i>Drawn By</i> SC	<i>Approved By</i> GC	<i>Analysis</i> North Wall Scenario 2, static, no groundwater		
	<i>Date</i> 24/04/2015	<i>Revision</i>			
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North Wall – Scenario 3



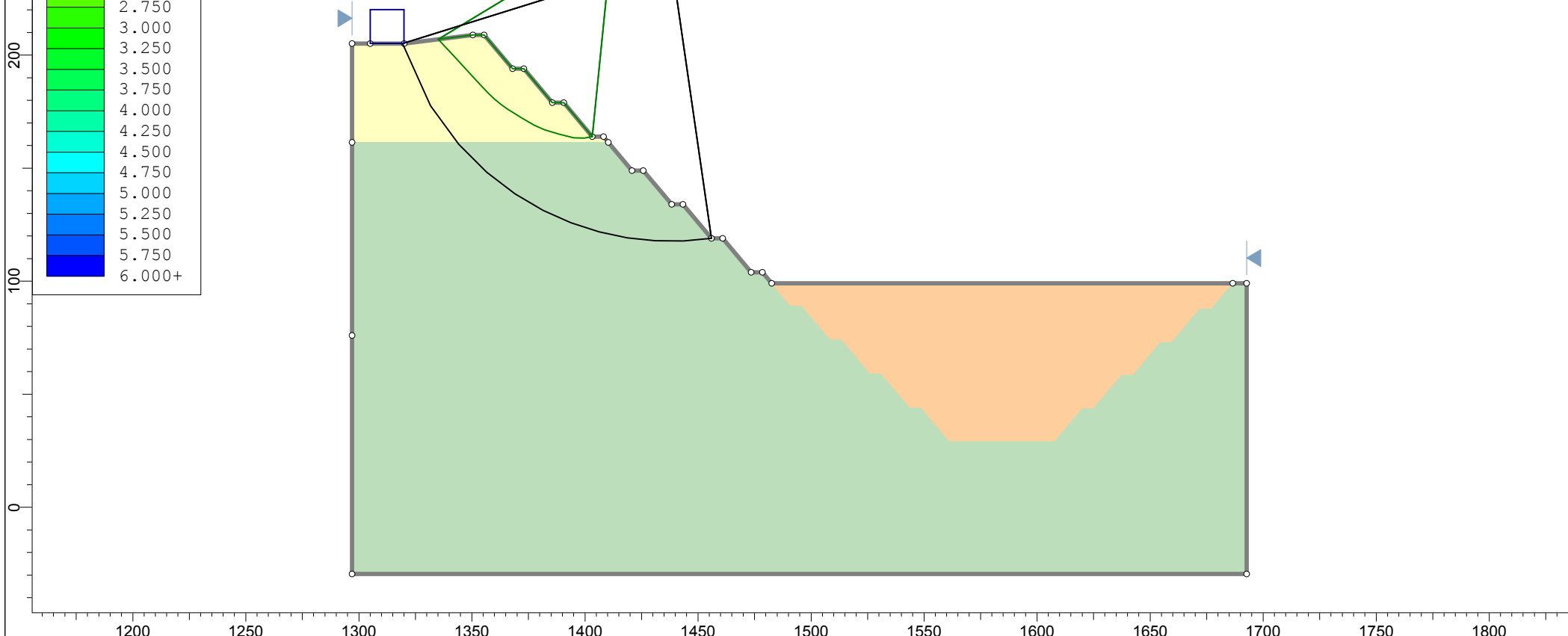
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Slightly Weathered to fresh	Green	26	469	56	None
Fill	Orange	18	1	32	None



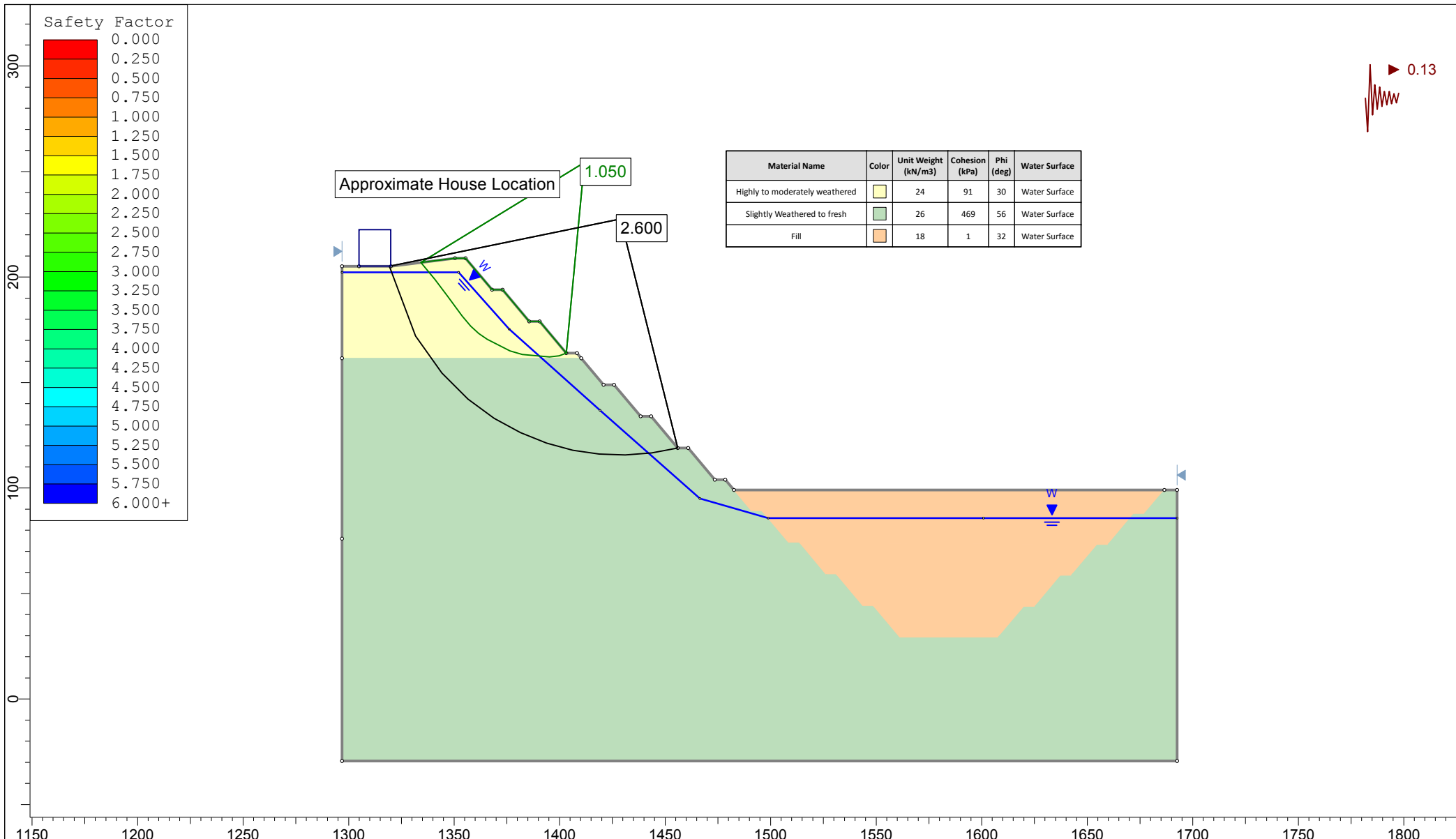
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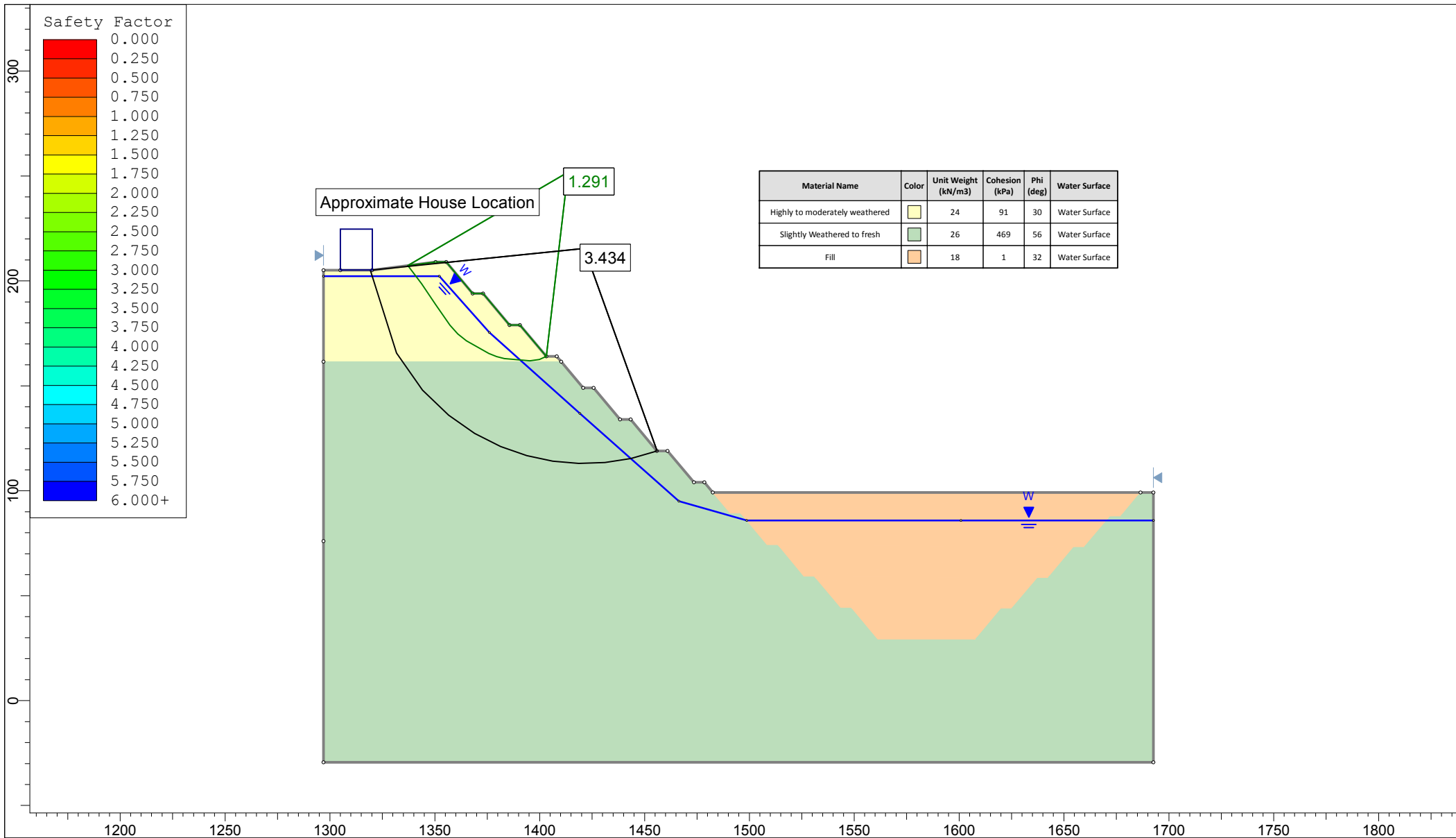




 GEOSCIENCE <small>A proud partner of</small> ENGEO	<i>Client</i> Holcim New Zealand Limited		<i>Project</i> KiwiPoint Quarry
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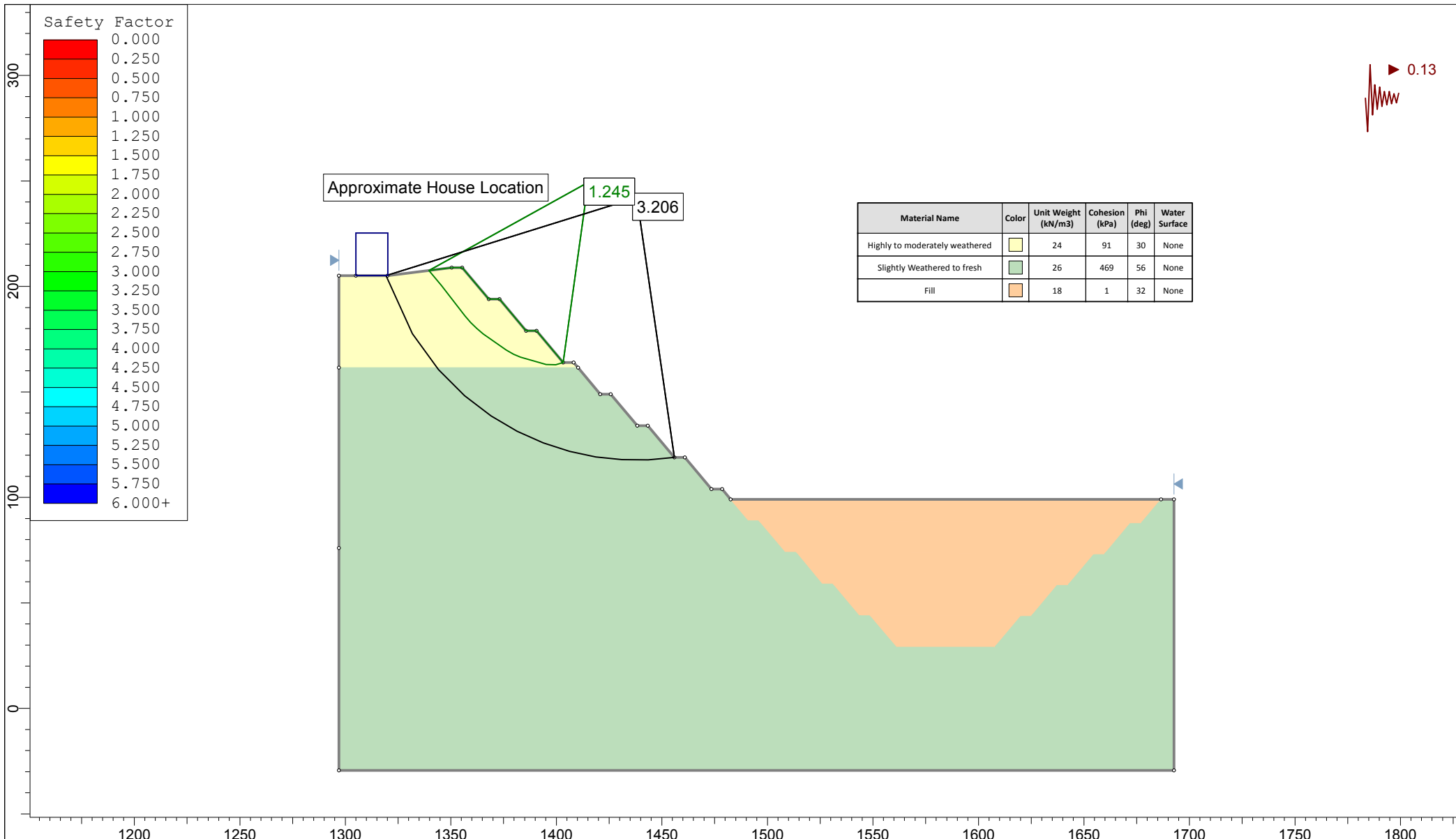




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Slightly weathered to fresh	Green	26	469	56	Water Surface
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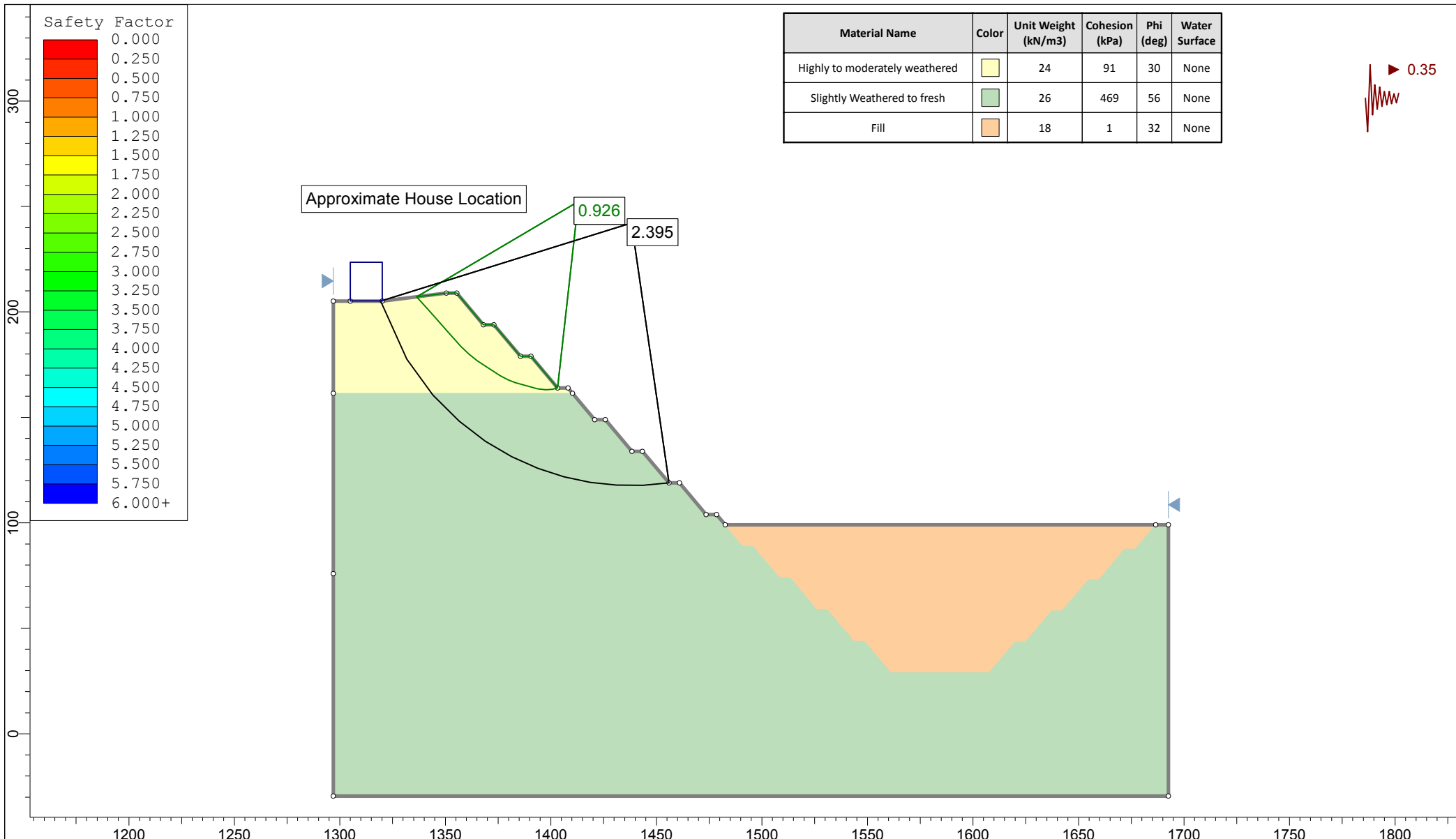
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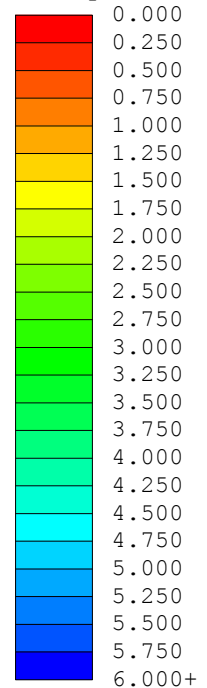
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Safety Factor



Material Name	Color	Unit Weight (kN/m ³)	Cohesion (kPa)	Phi (deg)	Water Surface
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Slightly Weathered to fresh	Green	26	469	56	None
Fill	Orange	18	1	32	None

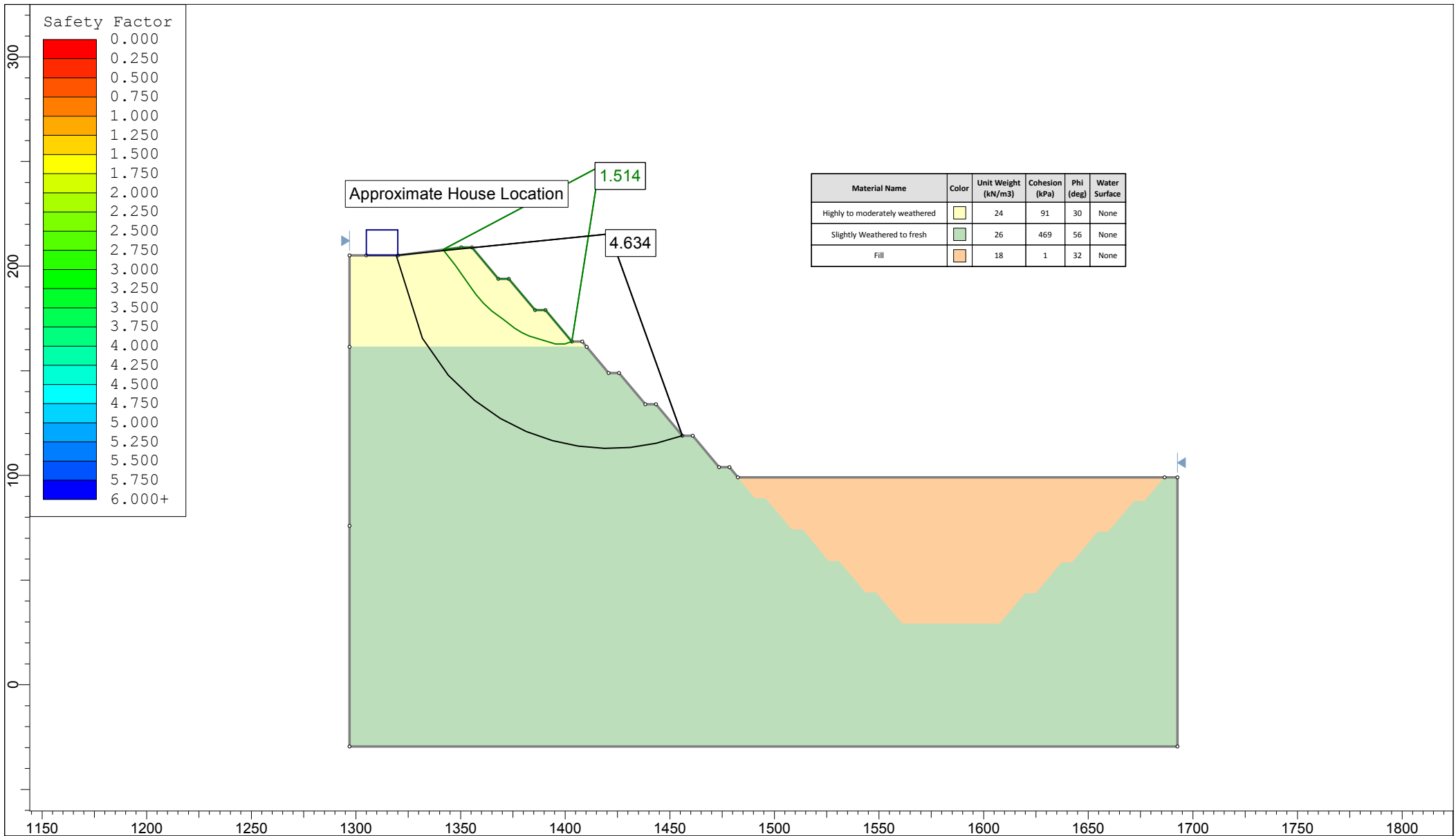
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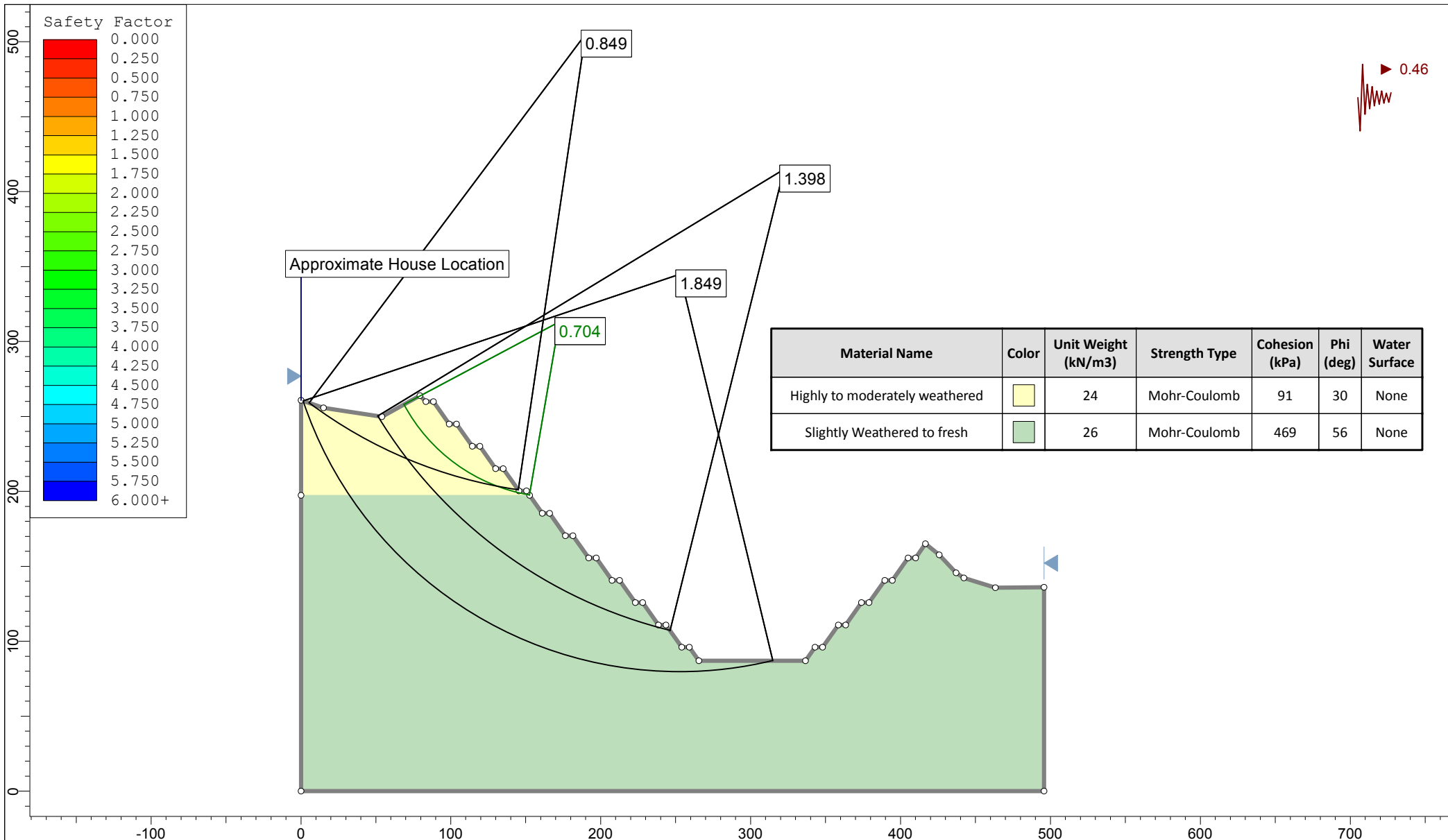
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	Client Holcim New Zealand Limited		Project KiwiPoint Quarry
	Drawn By SC	Approved By GC	Analysis North Wall Scenario 3, ULS, no groundwater
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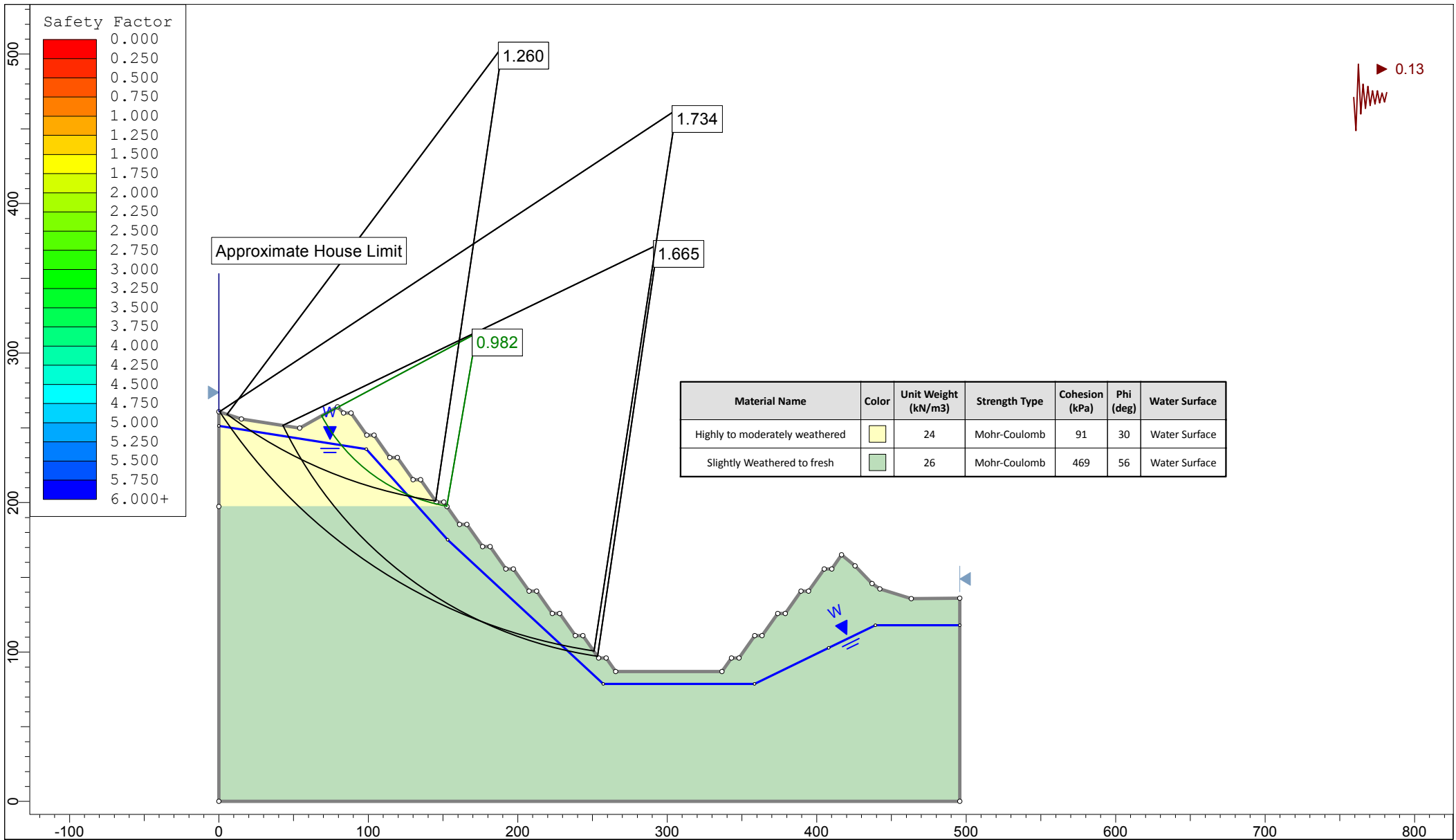



 A proud partner of 	<i>Client</i> Holcim New Zealand Limited		<i>Project</i> KiwiPoint Quarry
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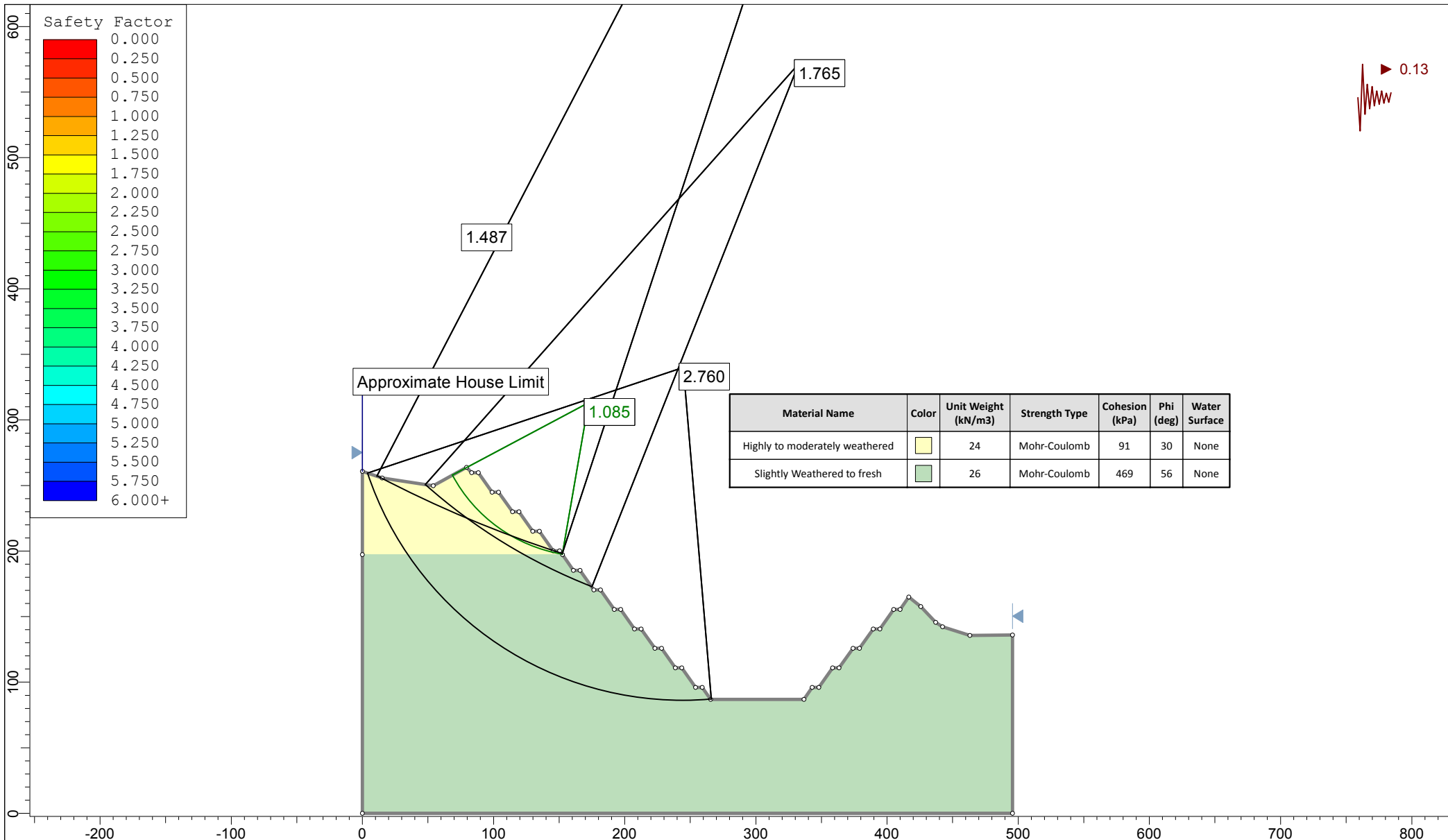
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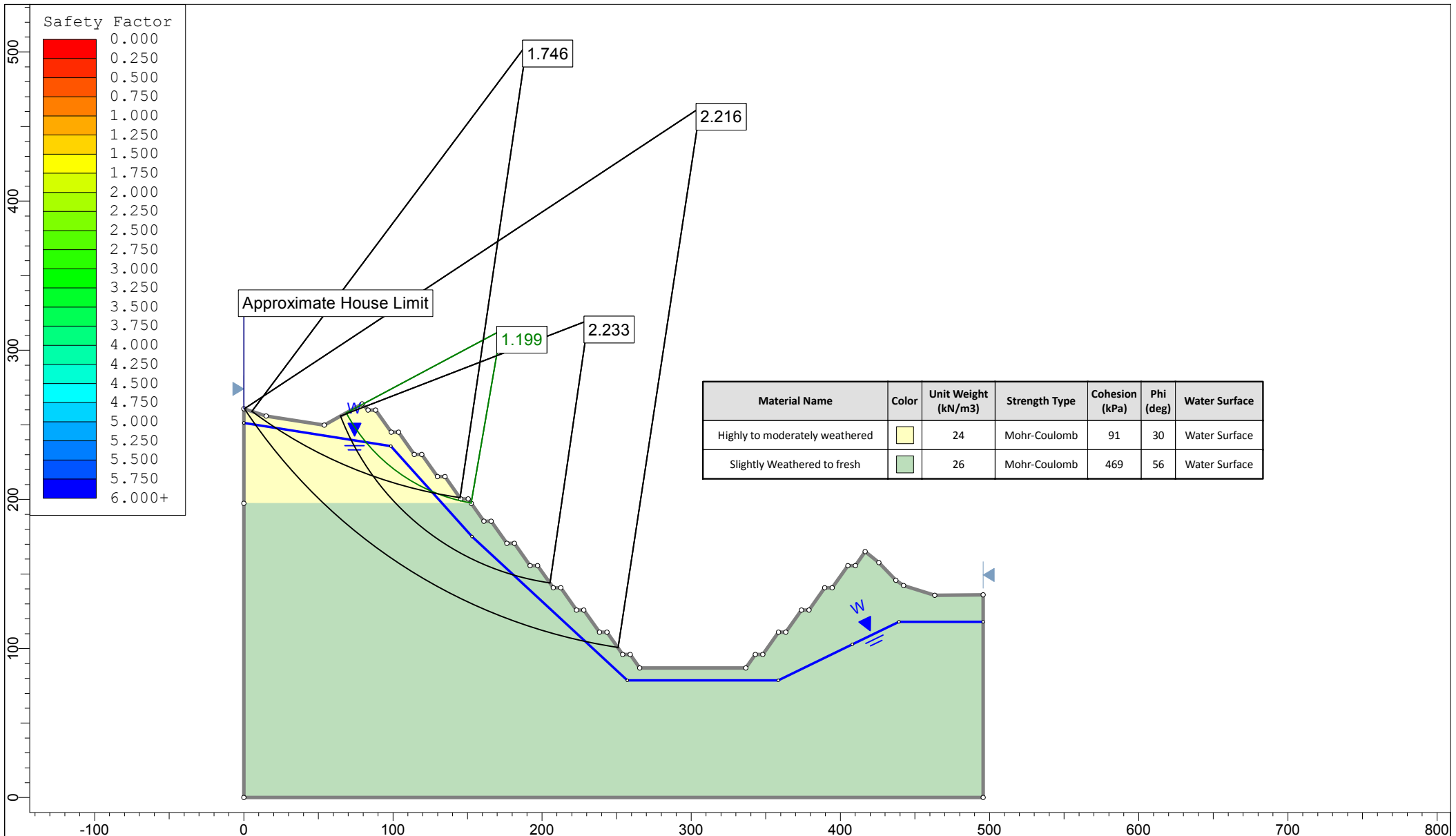
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	<i>Date</i> 28/04/2015	<i>Revision</i>		
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	<i>Client</i> Holcim New Zealand Limited		<i>Project</i> KiwiPoint Quarry	
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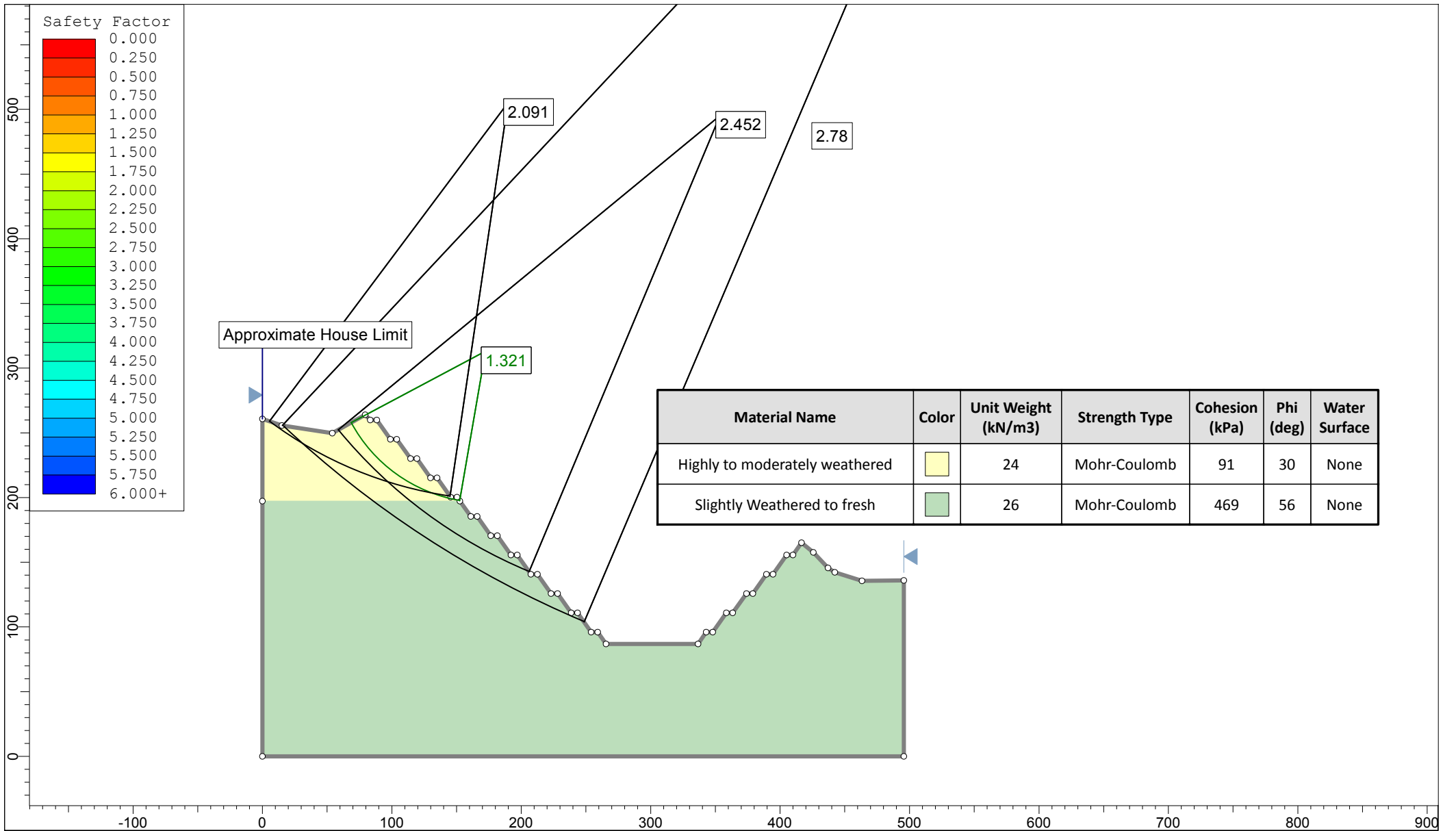


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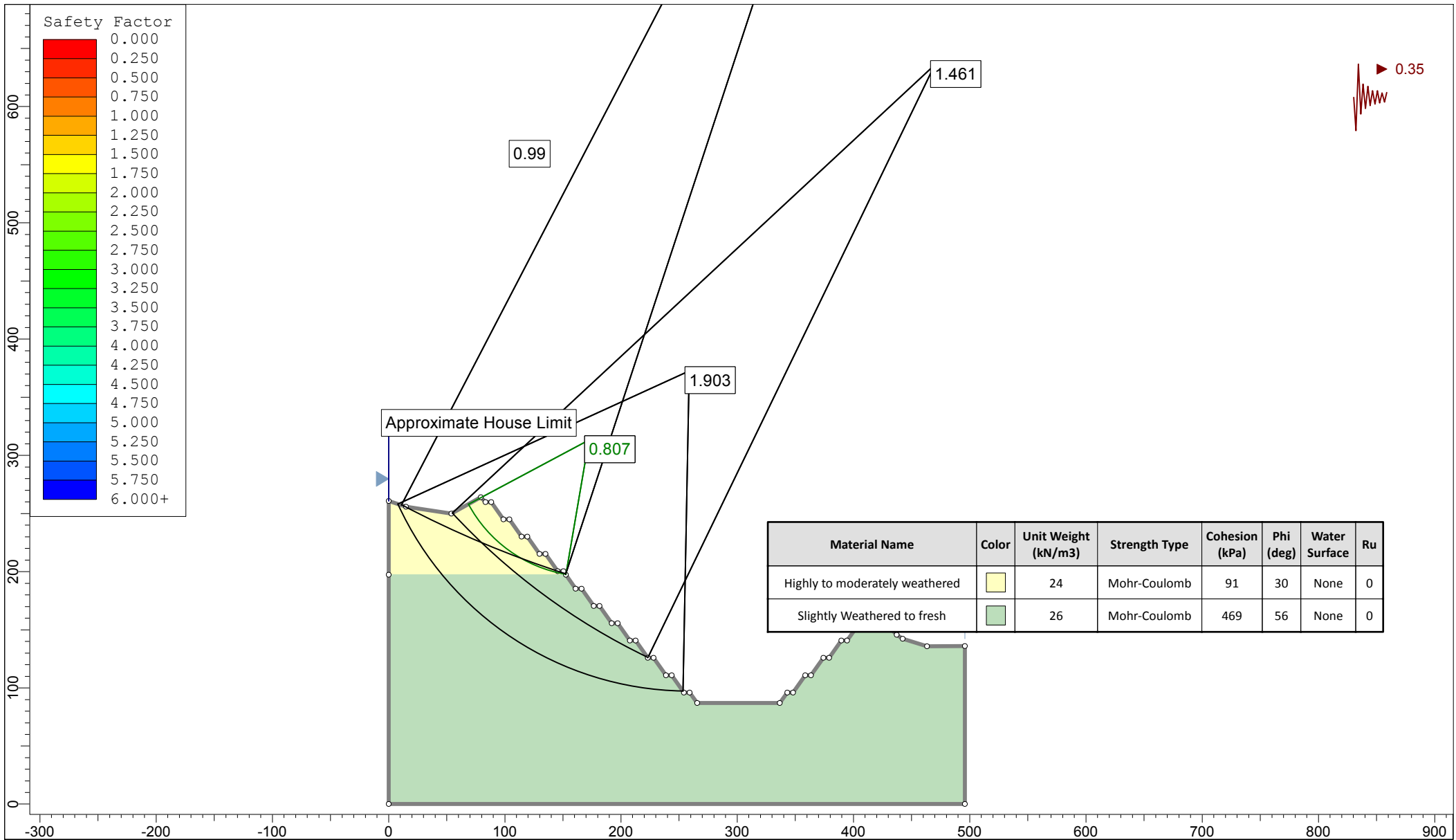
Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface
Highly to moderately weathered	Yellow	24	Mohr-Coulomb	91	30	Water Surface
Slightly Weathered to fresh	Green	26	Mohr-Coulomb	469	56	Water Surface

	Client Holcim New Zealand Limited		Project KiwiPoint Quarry	
	Drawn By SC	Approved By GC	Analysis Area H, static, high groundwater	
	Date 28/04/2015	Revision		
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Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface
Highly to moderately weathered	Yellow	24	Mohr-Coulomb	91	30	None
Slightly Weathered to fresh	Green	26	Mohr-Coulomb	469	56	None

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	Drawn By SC	Approved By GC	Analysis Area H, static, no groundwater		
	Date 28/04/2015	Revision			
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Highly to moderately weathered	Yellow	24	Mohr-Coulomb	91	30	None	0
Slightly Weathered to fresh	Green	26	Mohr-Coulomb	469	56	None	0

	<i>Client</i> Holcim New Zealand Limited		<i>Project</i> KiwiPoint Quarry		
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KIWI POINT QUARRY

Quarry Management Plan
June 2014

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APPENDIX 2 QUARRY MANAGEMENT PLAN JUNE 2009

APPENDIX 3 HEALTH AND SAFETY IN EMPLOYMENT (MINING OPERATIONS AND QUARRYING OPERATIONS) REGULATIONS 2013

HEALTH AND SAFETY IN EMPLOYMENT AMENDMENT ACT 2013

APPENDIX 4 RESOURCE CONSENTS

APPENDIX 5 NORTH FACE STAGING PLANS

APPENDIX 6 SOUTH FACE CONCEPT STAGING PLANS

APPENDIX 7 BUDGET DETAIL 08/09 TO 18/19

APPENDIX 8 STORMWATER MANAGEMENT PLAN

EXECUTIVE SUMMARY

The Wellington City Council's (WCC or Council) Kiwi Point Quarry (KPQ or Quarry) is a strategic Council asset and operates as a permitted activity under the Suburban Centre provisions of the Wellington City District Plan with its core business being supplying a key infrastructural resource to the City and Region. The quarry is located in the Ngauranga Gorge, adjacent to State Highway 1. The site is within an industrial area, which is located at the bottom of a basin surrounded by high ridges.

In December 2004, the Council approved a District Plan Change (Plan Change 25) for the expansion of the quarry into a previously quarried area to the south of the original quarry operation. A further plan change in December 2008 (Plan Change 64) has consolidated the provisions for the quarry area as a whole and brings the whole of the quarry operation under a single regime in the District Plan.

The Plan Changes ensure the Council and the City has continued access to a quality quarry rock resource. Included in the Plan Changes are strict conditions to ensure adverse effects will be avoided, remedied or mitigated and sets out the requirements for a Quarry Management Plan (QMP) (this document) and how the site is to be progressively rehabilitated as quarrying operations proceed.

The quarry currently produces around 350,000 tonnes, with production expected to increase to 500,000 tonnes per year over the term of this plan, of crushed greywacke comprising a full range of products from low grade to high quality sealing and asphalt aggregates for the Wellington roading and infrastructure market.

Since 2006 the quarry has been operated by an independent contractor under a long term Quarry Development Services Contract. Holcim (New Zealand) Ltd is the current contractor.

The quarry resource available at current extraction rates is estimated to provide for a further 50 years plus.

This document has been prepared in accordance with the requirements of the Wellington City District Plan.

This version of the plan is to be effective as from 01 July 2014 and supersedes all earlier versions.

1. INTRODUCTION

1.1 KIWI POINT QUARRY

The Kiwi Point Quarry (KPQ) operates as a permitted activity under the Suburban Centre provisions in the Wellington City District Plan and is one of the City and region's key resources for development. Rock material from quarries is essential to providing and maintaining housing, building and infrastructure.

In December 2004 the Council approved a District Plan Change (Plan Change 25) to extend the quarry into a formerly-worked area in Ngauranga Gorge to the south of the present quarry. The development of this area is expected to provide a supply of rock material and aggregates for a further 50 years.

As part of the Plan Change 25 process, considerable investigations into all aspects of the future development of KPQ were undertaken so that the Council and community could be assured that the quarry activity could be extended into the new area proposed without significant adverse effects. The quarry extension area is to be used for the extraction of the rock resource, the temporary storage of material prior to transport to the crushing, screening and sale areas, and in the longer term for a temporary clean filling activity to restore the more deeply excavated areas back to a development level. A Quarry Management Plan (QMP) was identified as necessary as part of this process.

In December 2008, the Council undertook another plan change, Plan Change 64, to consolidate the provisions of the District Plan so that the whole of the quarry operated under one set of rules. Further modification of the quarry boundaries and rezoning of land allowed for the facilitation of the ongoing quarry operation. The 2009 QMP update reflected the amended provisions of the District Plan Change 64 process.

This version of the QMP is to be effective as from 01 July 2014, and supersedes all earlier QMP versions from that date.

1.2 SITE LOCATION

KPQ is located in the Ngauranga Gorge to the west of State Highway One, prior to the Newlands off-ramp at or about map reference NZMS 260: R27; 611.952. Figure 1 shows the general location of KPQ.

1.3 LEGAL DESCRIPTION

The legal descriptions of the land are Lot 1, and Lot 2 DP 72995, Lot 2 DP 91179, Lot 4, Lot 5 and Lot 6 DP72996, Lot 1 DP34015 and Sec1 SO36728 Ngauranga Gorge. Wellington City Council owns the quarry land as well as surrounding land occupied by Taylor Preston Limited, Allied Concrete and Downer NZ Ltd. Please refer to Figure 1.

1.4 QUARRY AREA ACTIVITIES

Not all areas of the site will be subject to quarry activities. The areas subject to quarrying and therefore this QMP are discussed in section 5 and depicted in Appendices 4 and 5.

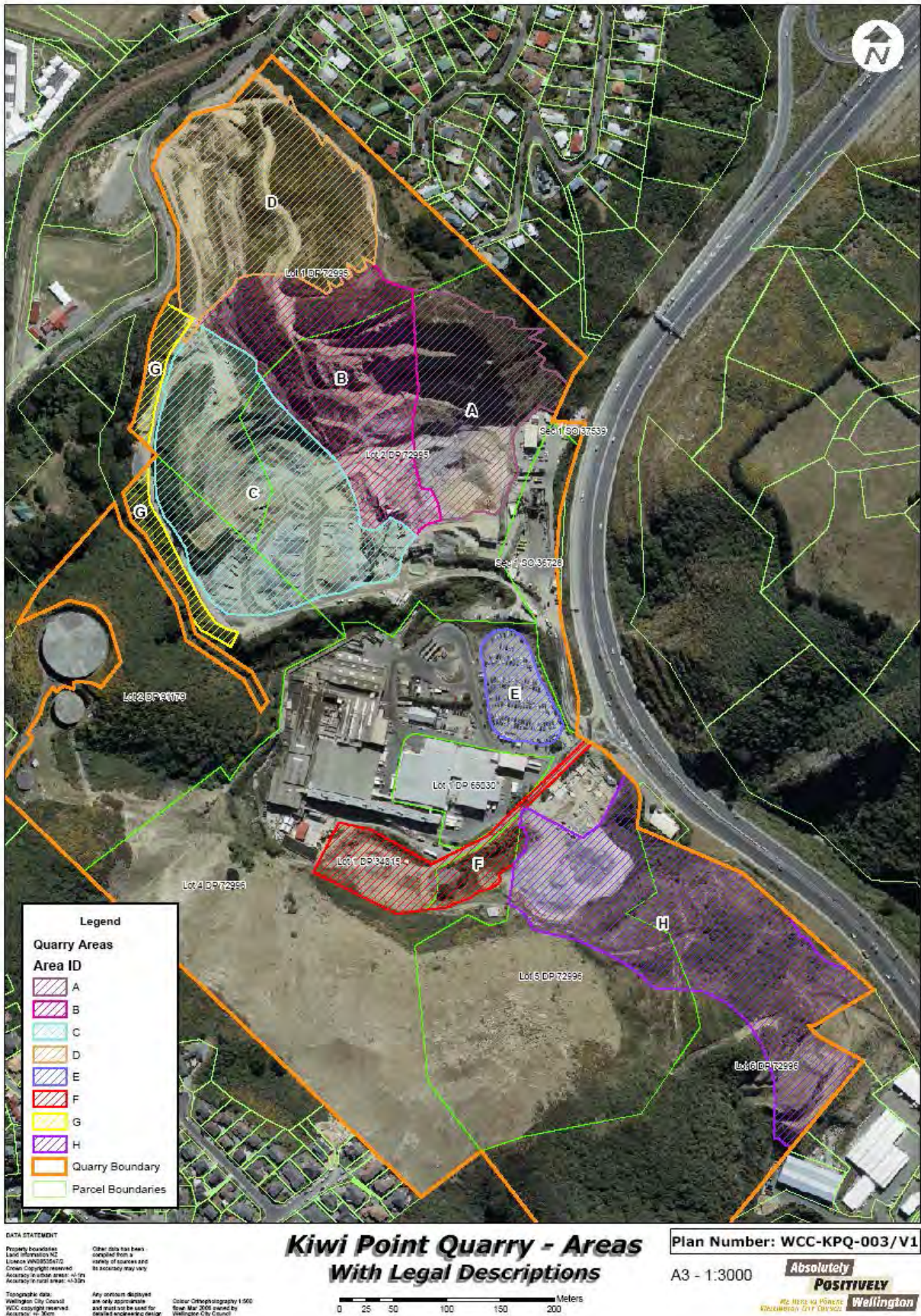


Figure 1

1.5 LAND USE ZONING

KPQ is predominantly zoned as Suburban Centre with some areas zoned Open Space B. The surrounding land is zoned Open Space B. Rule 7.1.3 of the Wellington District Plan allows for quarrying and cleanfilling as permitted activity within specified parts of the KPQ area, subject to conditions. The full wording of the relevant rules is included in Appendix 1.

Policy 6.2.3.3A of the District Plan provides for the development and site rehabilitation of the quarry. A method to achieve this policy is a requirement for a QMP to be developed and for the operation of the quarry to be in accordance with that Plan. The Method states:

A QMP shall be prepared and regularly updated, which sets out:

- *intended staging of the excavation and cleanfilling activities*
- *the means of management of surface and groundwater*
- *management of on-site traffic*
- *provision for any onsite processing and temporary storage of quarry material*
- *any specific provisions relating to onsite management of noise, dust, vibration, visual impact, water quality*
- *a procedure for addressing any complaints*
- *objectives and principles for the rehabilitation of the site, including:*
 - *a timetable for the rehabilitation of prominent quarry faces*
 - *measures to create soil conditions which will support plant growth*
 - *measures to create a variety of site conditions to support a range of species*
 - *means of controlling runoff to avoid erosion*
 - *means of control of plant and animal pests*
 - *measures to avoid fire risks*
 - *means to assist native vegetation to regenerate on grazing land*
 - *rehabilitation which is compatible with Open Space strategy for adjacent areas of land*
- *management of buffer areas*
- *practices and methods that will be adopted to ensure that all permitted activity conditions applying to the activities will be met.*

The QMP will complement the other rules applying to the quarry activity and will provide additional management details. It will be reviewed at least every five years and any necessary adjustments will be made.

As progressive rehabilitation of the area is an important aspect of quarry management, the QMP includes rehabilitation provisions. As quarrying and cleanfilling activities are completed on the site, an implementation plan shall be prepared annually in accordance with the QMP.

The requirement that regular monitoring is undertaken and regular progress reports are completed and submitted to the Council is a key element. This requirement is included because successful rehabilitation of any disturbed area requires constant monitoring as site conditions vary considerably and evolve over time. Regular observation and recording of results is an essential part of managing the process.

A vegetated buffer area is included within the Suburban Centres Area as part of the development of the southern part of the quarry. At the northern end, the necessary buffer area is within the Open Space B Area.

It is important also that rehabilitation of the quarry area should recognise and in the longer term be able to be integrated as appropriate with the Open Space strategy developed by the Council for adjacent areas of land. Current Council policy is for the creation of further Green Belt areas on the steep hill sides of the Ngauranga Gorge and, for instance, it may be possible to allow continuation or linking of proposed walkways.

Overall, the environmental result will be the availability of quarry materials for the City and wider region in the short and medium term, and long-term achievement of well-vegetated quarry faces with the appearance of a natural landform which will be integrated with Council development of open space areas in this vicinity.

This QMP has been prepared in accordance with these requirements of the Wellington City District Plan.

1.6 PURPOSE OF THE QUARRY MANAGEMENT PLAN

The purpose of this QMP is to provide an overall framework that outlines how the Council will operate, manage and develop all the land area at Kiwi Point, which is owned by the Council for the purpose of quarrying and cleanfilling in order to:

- Ensure compliance with the specific planning provisions contained within the Wellington City District Plan; and
- Guide management of the KPQ and rehabilitate quarried areas in accordance with the District Plan requirements.

1.7 SCOPE OF THE PLAN

The scope of this plan includes:

All the land within Ngauranga Gorge related to quarrying, cleanfilling and associated rehabilitation as indicated on the Plan in Figure 1:

- The carrying out of the quarry operations in a prescribed manner
- The items and detail necessary to achieve the District Plan objectives. Cross-links to other management documents are provided when these deal with an issue in more detail.

The QMP is intended to be a practical working document to:

- ✓ *Ensure that the KPQ site is operated in a safe manner, and that environmental effects are properly controlled.*

1.8 CONSULTATION TO DATE

The Council undertook consultation on the KPQ during 2003 and 2004 as part of Plan Change 25.

The consultation involved the general public, neighbours and stakeholders such as community groups through media releases, public notices, and the Council's web site. Substantial information was made available through these mechanisms, and also through a brochure and an information pack sent out to stakeholders, potentially affected residents and any others who requested it.

Consultation was also undertaken with the general public, neighbours and stakeholders as part of Plan Change 64. Consultation related to the proposed amendment of the provisions of Chapters 6 and 7 of the Suburban Centres chapter of the District Plan, the modification of the quarry boundaries, and the rezoning of land.

Ongoing consultation will be conducted as and when it becomes necessary. Current lines of communication are directly with the Quarry Operations Manager or through regular emails to residents. A community liaison group is currently not considered necessary due to the absence of issues associated with the quarry activities in relation to the surrounding residents.

1.9 CHANGES TO QUARRY MANAGEMENT PLAN – JUNE 2009

The QMP is intended to be a practical working document to:

- ✓ *Ensure that the KPQ site is operated in a safe manner, and that environmental effects are properly controlled. KPQ is currently operated in accordance with the QMP adopted in June 2009.*

The June 2014 QMP (this document) will become effective from 01 July 2014. This covers all the land area at Kiwi Point which is owned by the Council for the purpose of quarrying and cleanfilling and will replace the June 2009 QMP.

The key change provided for in this revised plan are.

1. The changes in operational process documents and Quarry Operator;

1.10 RELATIONSHIP WITH OTHER COUNCIL DOCUMENTS

Document	Purpose
Wellington City District Plan	<ul style="list-style-type: none"> ▪ Imposes conditions under which the quarry must operate
Stormwater Management Plan - July 2005 <i>The present Stormwater Management Plan is being reviewed</i>	<ul style="list-style-type: none"> ▪ Demonstrates how quarry stormwater is managed on site
Wellington City Council Kiwi Point Quarry Design – February 2006	<ul style="list-style-type: none"> ▪ Design of northern face
Kiwi Point Quarry Development Service contract between the Council and the Quarry Operator	<ul style="list-style-type: none"> ▪ Contract terms and conditions (Confidential and commercially sensitive)
Quarry Quality & Procedures Manual (This manual is owned by the quarry operator and it is a requirement of the Council)	<ul style="list-style-type: none"> ▪ Quarry operator's Business Management System (ISO 14001 and 9001 accredited) Provides operational procedures for the quarry operations including environmental management

1.11 FACILITIES NOT INCLUDED IN PLAN

The following facilities are hosted within the land area at Kiwi Point on Council leased land and are not subject to this QMP:

- Downers NZ Ltd – Asphalt Plant
- Taylor Preston's – Meat Processing Plant
- Allied Concrete – Concrete Plant

1.12 PLAN REVIEW

This QMP will be reviewed every five years as required by the District Plan and Quarry License provisions. The review will include (without limitation):

- (1) Updates to satisfy the District Plan requirements;
- (2) Resource extraction rates in relation to Site Development projections;
- (3) Site Development issues that may have arisen;
- (4) Changes in Best Industry Practice or relevant Standards and Codes of Practice;
- (5) Quarry Health & Safety;
- (6) Quarry Operations Complaints;
- (7) Any other relevant matters in relation to the KPQ site and the carrying out of quarrying and cleanfilling operations;

(8) Updates to matters covered in the QMP which are no longer required or changed.

The results of each review will be reported back to the Council.

2. LEGISLATIVE INFLUENCES

2.1 LEGISLATIVE INFLUENCES

The following external documents, studies and legislative changes have been identified as having an influence on the development of the QMP.

- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013 Health and Safety in employment amendment Act 2013
- Health and Safety in Employment amendment Act 2013
- Electricity (Safety) Regulations 2010
- Hazardous Substances & New Organisms (HSNO) Act 1996 and related regulations (and subsequent reviews)
- Resource Management Act 1991

2.2 NON STATUTORY DOCUMENTS

- Holcim (New Zealand) Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim Business Management System
- A Guide to the Management of Cleanfills
- Australian Standard – Explosives – Storage, transport and use – Part 1: Storage and Part 2 Use of Explosives
- Industry Code of Practice Surface Mining and Quarrying Industries (and subsequent reviews) www.minex.co.nz.

3. QUARRY ASSET

3.1 QUARRY ASSET DESCRIPTION

The KPQ was established in the 1930s and has always been owned by the Council. Originally, the Council simply utilised the quarry for its own roading needs. However, since 1995 quarry products have been available to the public. Due to change in Health and Safety regulations, public trailer sales have ceased from May 2014.

The site is within an industrial area, which is located at the bottom of a basin surrounded by high ridges. Residential areas are situated at the top of these ridges.

The current rock resource available for extraction on the current northern face is estimated to be 8mT with the volume of rock available on the southern face is estimated to be 10mT. Both volumes are based on pit quarry operations.

Quarrying of all areas within the KPQ site will release both valuable commercial site opportunities and space for cleanfill activities.

The KPQ site contains the following infrastructure assets owned by the Council:

- 0.5 km of roads (sealed)
- 3 km of roads (unsealed)
- 1 office administration building
- 1 staff facility
- 1 workshop building
- 1 x transformer room
- Road bridge
- Boundary fences
- Stormwater sumps

In addition to these infrastructure assets, the quarry operator owns and operates a range of fixed and mobile equipment on site.

3.2 DEVELOPMENT

To maximise efficiency of quarrying and cleanfilling operations, site work to be completed will include filling in the current culvert flume and stream area at least to a point where a suitably graded road for truck access to the nominated quarry stockpile areas can be achieved and will also include:

- The culverting of the Ngauranga Stream within the quarry and abattoir boundaries.
- Infilling the upper gully area from Fraser Avenue, down and through the quarry operation area. This infilling will effectively provide further industrial land. The stream has been partly piped from Fraser Avenue to the existing quarry road and partly in-filled. This upper filled area (area D) is expected to release approximately 19,500 sq. metres.

4. QUARRY OPERATIONS

4.1 GENERAL

Current annual production from the quarry is about 350,000 tonnes of material. Of this, around 150,000 is high grade stone used in infrastructural projects such as roading and building.

4.1.1 HOURS OF OPERATION

- KPQ operational hours are not restricted but have to comply with noise emitted and received standards.
- Quarry product sale hours are Monday to Saturday 0600 to 1800 hrs (but is subject to change to meet sales demands); and
- Quarry extraction and processing hours are set to meet operational demands and can be over 24/7 days per week subject to noise and dust restrictions.

4.2 QUARRY OPERATIONS – EXTRACTION AND PROCESSING

4.2.1 OVERBURDEN STRIPPING

The quarry operator or his/her delegated representative shall ensure that soil stripping within the quarry is a controlled activity and carried out in line with the quarry Development Plans and that best practice guidelines are referenced.

4.2.2 ROCK EXCAVATIONS AND TIP AREAS

The quarry operator or his/her delegated representative shall ensure that excavations and tip areas are designed, constructed, operated and maintained so as to ensure that -

- (1) instability; or
- (2) movement,

which is likely to give rise to a risk to the health and safety of any person, is avoided.

Reference

- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System

4.2.3 EXTRACTION

Extraction of rock from the quarry is carried out by firstly drilling and blasting (where required) and then removal by excavators. Extracted rock is then delivered to the crushing plant(s) by loaders or dumpers depending on requirements of the crushing plant(s).

It is the duty of the quarry operator or his/her delegated representative to develop and ensure compliance with suitable and sufficient rules covering excavation to ensure the safe construction and operation of excavations. Such rules shall in particular specify the following matters -

- (1) the manner in which such activities are to be carried out;
- (2) the nature and extent of supervision of such activities; and
- (3) the precautions to be taken during such activities to properly avoid, mitigate or minimise risks to the health and safety of any person and the safety and stability of the excavation.

Reference

- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz

4.2.4 APPRAISAL OF EXCAVATION

The quarry operator or his/her delegated representative shall ensure that a suitable and sufficient appraisal of all proposed or existing excavations at the quarry is undertaken by a competent person in order to determine whether any such excavation is a significant hazard.

- (1) The quarry operator or his/her delegated representative shall ensure that -
 - (a) any significant findings made during an appraisal, any conclusions reached and the reasons for those conclusions are recorded by the competent person undertaking the appraisal;
 - (b) the competent person signs and dates any such record; and
 - (c) the record made in accordance with sub-paragraph (a) is made available to each employer of persons at work at the quarry and to all persons at work at the quarry.
- (2) Where the conclusion reached by the competent person following an appraisal is that the excavation presents no significant hazard then further such appraisals shall be carried out by a competent person -
 - (a) at appropriate intervals;
 - (b) whenever there is any reason to suspect that there has been or will be a significant change to -
 - (i) the matters to which the appraisal relates, or
 - (ii) any neighbouring land which may be affected by movement by or instability of the excavation to which the appraisal relates; and
 - (c) whenever there is any reason to doubt the validity of the conclusion of the current appraisal.
- (3) Where the conclusion reached by the competent person following an appraisal is that the excavation represents a significant hazard, the quarry operator or his/her delegated

representative shall close the excavations down as soon as is reasonably practicable pending an assessment of the site and or a geotechnical assessment.

The quarry operator or his/her delegated representative shall ensure that -

- (a) any significant findings made during an assessment or geotechnical assessment are recorded; and
- (b) any remedial works identified during the assessment are undertaken by the date specified.

Reference

- Quarry operator's Log Book
- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System
- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz

4.2.5 DUTIES IN RELATION TO A SIGNIFICANT HAZARD – EXCAVATIONS

Where the conclusion recorded following an assessment of a proposed or existing excavation is that the excavation represents a significant hazard by way of instability or movement, the quarry operator or his/her delegated representative shall ensure, that a geotechnical assessment of the excavation is carried out as soon as is reasonably practicable.

Reference:

- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System
- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz

4.3 ROCK PROCESSING (CRUSHING, SCREENING AND WASHING)

4.3.1 GENERAL

This section describes the current mode and scope of the quarrying operations carried out at the Quarry. Quarry operations will vary over time in accordance with operational requirements and changes in quarrying technology and methods.

4.3.2 PROCESS

The process begins with the loosening of rock by blasting and excavation on the quarry face. This material is then transferred to the crushing plant by front-end loader or dump truck.

4.3.3 PRIMARY CRUSHING

Aggregate transferred to the primary feed bin passes over a primary scalping screen where oversize material is processed through a Jaw Crusher. Undersized aggregate from the scalping screen bypasses the primary crusher and is transferred to produce by-products. The use of this screen reduces the overall load on the primary crusher. Aggregate is then passed to the main feed belt where it is transferred into the secondary feed bin.

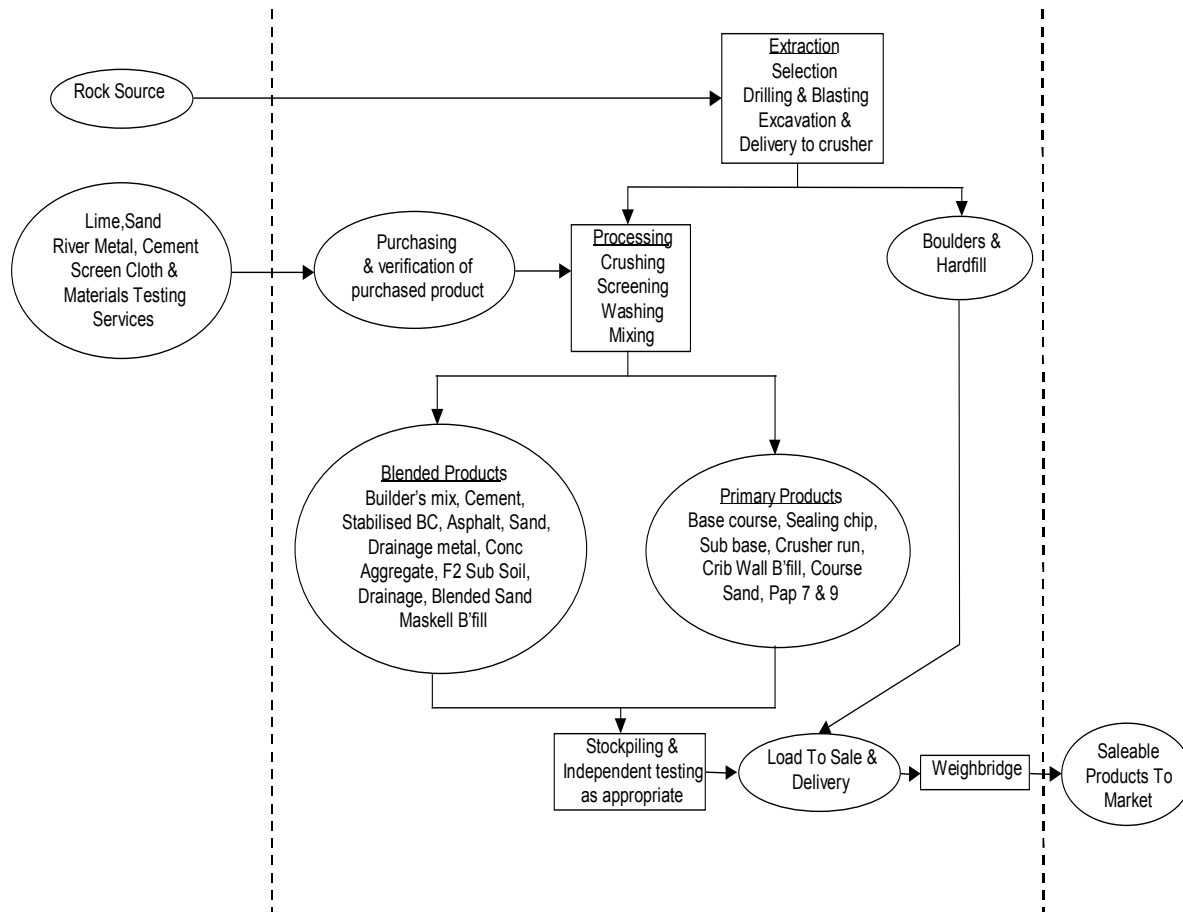
4.3.4 SECONDARY CRUSHING

Aggregate from the secondary feed bin passes over a scalping screen, with the undersized bypassing the crusher, again reducing the load on the secondary crusher. The remaining aggregate passes through a cone crusher. Product is then conveyed to a Barmac for shaping before screening and or return to the Barmac for further reduction.

4.3.5 AGGREGATE WASHING

Aggregate is fed to the wash screen where it is washed and graded to the required product size. All products having been processed are then transported to specified storage areas for stockpiling.

4.3.6 PROCESS FLOW



Reference:

- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System
- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz

4.4 CLEANFILLING

4.4.1 CLEANFILLING SITES

The quarry operator or his/her delegated representative shall ensure that a suitable and sufficient appraisal of all proposed or existing cleanfilling sites at the quarry is undertaken by a competent person in order to determine whether any such cleanfilling site is a significant hazard.

- (1) The quarry operator or his/her delegated representative shall ensure that -
 - (a) any significant findings made during an appraisal, any conclusions and the reasons for those conclusions are recorded by the competent person undertaking the appraisal;
 - (b) the competent person signs and dates any such record; and
 - (c) the record made in accordance with sub-paragraph (a) is made available to each employer of persons at work at the Quarry and to all persons at work at the Quarry.
- (2) Where the conclusion reached by the competent person following an appraisal is that the cleanfill site presents no significant hazard, then further such appraisals shall be carried out by a competent person;
 - (a) at appropriate intervals

4.4.2 POTENTIAL EFFECTS OF CLEANFILLING ACTIVITIES

The main effect of any cleanfill which is not immediately used or restored is to:

- occupy space within or outside the working area,
- be visible,
- be a source of dust,
- be a source of sediment and other contamination in run-off,
- affect the surface water regime, e.g. by changing surface water flow in a flood plain.

The implications of carrying out cleanfilling activities can be minimised by Good Practice.

Greater Wellington Regional Council approved a resource consent application to discharge dust in association with cleanfill activities on 6 July 2005. A copy of the discharge permit is included in Appendix 4.

Reference:

- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System
- A guide to the Management of Cleanfills
- Quarry operator's log book

4.5 QUARRY OPERATIONS – SAFETY

4.5.1 INSPECTIONS

The quarry operator or his/her delegated representative shall prepare and keep an up to date written log of complaints, inspection, maintenance and, where appropriate, testing of -

- (1) all complaints (environmental, operational and other),
- (2) all buildings (whether temporary or permanent) at the quarry,
- (3) any plant at the quarry; and
- (4) the carrying out of quarry operations.

Reference:

- Quarry operator's log book
- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013
- Health and Safety in Employment amendment Act 2013
- Holcim NZ Ltd Incident Management System (INX)
- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System and QMP Section 9, Management of Complaints
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews)

4.5.2 BENCHES AND HAUL ROADS

The quarry operator or his/her delegated representative shall ensure that -

- (1) Benches and haul roads are investigated, designed, constructed and monitored by a competent person so as to allow vehicles and plant to be used and moved upon them safely -
 - (a) a written report by a competent person that includes the statement that the intended height is safe and water discharge and collection is managed.
 - (b) each working bench should have separate loading arrangements and of sufficient length and breadth to provide safe working conditions for the vehicles and equipment used on it as determined by a competent person.
 - (c) working benches shall be designed in such a way that no water is discharged over a lower face bench.
- (2) The overburden or top of the quarry shall be cleared far enough back from the edge of the quarry to provide safe working environment
- (3) All vehicle access roads within the quarry shall be so constructed and maintained that the width and surface of the carriageways are safe for the purpose for which they are to be

used. Where access roads to benches are used to transport the quarried product by vehicle down a gradient, then the maximum gradient shall be 1 in 10 and in no case shall it exceed a gradient of 1 in 5.

- (4) Where necessary, effective precautions shall be taken, by the installation of barriers or otherwise, to prevent vehicles or plant accidentally leaving any bench or haul road.

Reference:

- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System
- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.n

4.5.3 QUARRY OPERATIONAL AND FINISHED FACES

The quarry operator or his/her delegated representative shall ensure, so far as is reasonably practicable, that -

- (1) a face should not be worked in a manner that will create an overhang of the face
- (2) where unconsolidated ground is quarried, the face and sides should be battered to prevent collapse
- (3) a face should not be undercut by excavation of a slot at the toe of the face
- (4) where a person is required to work at the toe of a quarry face or on the face itself, the face must be safely scaled of loose rock that could fall on the person
- (5) faces should be left in a safe condition at the end of each day's work
- (6) finished slope of quarry faces shall not exceed 55 degrees from the horizontal
- (7) maximum height of finished batters shall not exceed 15 meters (excludes working batters)

Reference:

- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz
- District Plan Rules 7.1.3.3.4 and 7.1.3.3.5

4.5.4 BARRIERS AND/OR FENCES

The quarry operator or his/her delegated representative shall ensure that, where appropriate, a barrier suitable for the purpose of discouraging trespass is placed around the boundary of the quarry and is properly maintained. Please also refer to sections 4.5.10 and 5.2.2 of this QMP.

Reference:

- District Plan Rules 7.1.3.3.7 and 7.1.3.3.8

4.5.5 SIGNS

The quarry operator or his/her delegated representative shall ensure that signs are positioned throughout the Quarry site providing safety and general site information.

4.5.6 ESCAPE AND RESCUE FACILITIES AT THE QUARRY

The quarry operator or his/her delegated representative shall ensure that -

- (1) adequate means of escape and rescue are provided and maintained so as to permit persons in the quarry to leave the quarry promptly and safely in the event of danger;
- (2) adequate means of communication and warning are provided to enable assistance, escape and rescue operations to be launched at once when required;
- (3) written instructions concerning the use of emergency equipment and the action to be taken in the event of an emergency at or near the quarry are prepared;
- (4) persons at work at the quarry are trained in appropriate action to be taken in the event of an emergency; and
- (5) rescue equipment is provided at readily accessible, appropriately sited and clearly sign-posted places and kept ready for use.

Reference

- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System
- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz

4.5.7 SAFETY DRILLS

The quarry operator or his/her delegated representative shall ensure that safety drills are held at regular intervals for persons at work at the quarry, and that the results of the safety drills are recorded.

Such safety drills shall be for the following purposes -

- (1) to train the persons who work at the quarry in the appropriate actions to be taken in an emergency including, where appropriate, the correct use, handling or operation of emergency equipment; and
- (2) to train and check the skills of such persons to whom specific duties involving the use, handling or operation of such equipment have been assigned in the event of an emergency.

Reference:

- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System
- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz

4.5.8 FIRE AND EXPLOSION HAZARDS

The quarry operator or his/her delegated representative shall ensure that -

- (1) No person at work at the quarry uses a naked flame or carries out any work which could give rise to a risk of an unintended explosion or fire unless sufficient measures to prevent such an explosion or fire are taken.
- (2) No person shall smoke in any part of the quarry where there is a risk of fire or explosion.

4.5.9 CONTROL OF HARMFUL AND EXPLOSIVE ATMOSPHERES

- (1) It is the duty of the quarry operator or his/her delegated representative shall ensure that -
 - (a) steps are taken in order to determine whether potentially explosive substances are present in the atmosphere and, where such substances are present,
 - (b) at any place in the quarry where there is a risk of the occurrence or accumulation of an explosive atmosphere, all necessary measures are taken with a view to -
 - (i) preventing such occurrence and accumulation, or, where this is not practicable,
 - (ii) preventing the ignition of such an atmosphere; and
 - (c) at any place in the quarry where there is a risk of the occurrence or accumulation of a substance harmful to health in the atmosphere, appropriate measures are taken in order to -
 - (i) prevent such occurrence and accumulation, or, where this is not practicable,
 - (ii) extract or disperse that harmful substance,in such a way that persons are not placed at risk.

- (2) Whenever persons at work are present at any place in the quarry where they may be exposed to a substance harmful to health in the atmosphere -
 - (a) appropriate and sufficient breathing and resuscitation equipment shall be made available; and
 - (b) a sufficient number of persons trained in the use of such equipment shall be present.
- (3) The quarry operator or his/her delegated representative shall ensure that equipment referred to a paragraph (2) (a) is suitably stored and maintained.

4.5.10 DANGER AREAS

The quarry operator or his/her delegated representative shall ensure that -

- (1) any danger areas in the quarry are clearly marked;
- (2) equipment or barriers designed to prevent inadvertent entry by any unauthorised person are installed at any danger area in the quarry in which, because of the nature of the work being carried out there or for any other reason there is -
 - (a) risk of a person falling a distance likely to cause personal injury,
 - (b) risk of a person being struck by a falling object likely to cause personal injury, or
 - (c) a significant risk to the health and safety of persons; and
 - (d) where any person at work is authorised to enter a danger area, appropriate measures are taken to protect his/her Health and Safety.

Reference:

- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System
- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz

4.6 QUARRY OPERATIONS – EXPLOSIVES, DRILLING AND BLASTING

This section shall apply to the storage, transport and use of explosives at the quarry.

Reference:

- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System
- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013
- Health and Safety in Employment amendment Act 2013
- Australian Standard – Explosives – Storage, transport and use – Part 1: Storage and Part 2 Use of explosives
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz

4.6.1 QUARRY OPERATOR OR HIS/HER DELEGATED REPRESENTATIVE - DUTIES

- (1) The quarry operator or his/her delegated representative shall ensure that -
 - (a) so far as is reasonably practicable, that all explosives are stored, transported and used safely and securely; Refer 4.6.4
 - (b) the appointment of one or more qualified (Approved Handlers) to organise and supervise all work at the quarry involving the use of explosives ("the Shot-Firer "); and
 - (c) that at no time is there more than one person acting as the Shot-Firer at the Quarry.
- (2) It shall be the duty of the quarry operator or his/her delegated representative to ensure that -
 - (a) suitable and sufficient rules are made which lay down in writing procedures for –
 - (i) shot-firing operations at the quarry, Refer 4.6.2
 - (ii) appointing shot-firer, and trainee shot-firer,
 - (iii) authorising other persons who will be involved with the storage, transport or use of explosives,
 - (iv) dealing with misfires, Refer 4.6.3 and
 - (v) ensuring, so far as is reasonably practicable, that such rules are complied with;

- (b) an adequate written design (whether produced by him/her or not) is prepared for each shot-firing operation at the quarry to ensure, so far as is reasonably practicable, that when such firing occurs it will not give rise to danger (Ref: Blast log form QF 3.1; and
 - (c) a copy of the specification referred to in sub-paragraph (b) is given to any person upon whom it imposes duties.
- (3) The quarry operator or his/her delegated representative shall ensure that operations involving the storage, transport or use of explosives are carried out by -
- (a) a duly authorised and qualified (Approved Handlers); or
 - (b) a trainee under the close supervision of a qualified (Approved Handlers).
- (4) The Quarry Operator or his/her delegated representative shall ensure that -
- (a) such facilities and equipment as are necessary to enable shot-firing operations to be carried out safely are provided;
 - (b) any vehicle which is provided for use in relation to shot-firing operations is so marked as to be readily identifiable from a distance;
 - (c) detonators are stored in separate containers from other explosives; and
 - (d) explosives are kept at all times either in a locked explosives store or under the constant supervision of a suitable person.
- (5) The quarry operator or his/her delegated representative shall ensure -
- so far as is reasonably practicable, that each shot-firing operation is carried out safely and in accordance with the rules required to be made in pursuance of paragraph (2)(a) and any specification required to be prepared in pursuance of paragraph (2)(b).

Reference:

- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System
- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013
- Health and Safety in employment amendment Act 2013
- Australian Standard – Explosives – Storage, transport and use – Part 1: Storage and Part 2 Use of explosives
- Hazardous Substances & New Organisms Act (HSNO) 1996 and related regulations
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz
- Blast Permit

4.6.2 SHOT FIRES – DUTIES

Before a shot is fired, the shot-firer shall -

- (1) check the shot-firing system or circuit to ensure that it has been connected correctly
- (2) where appropriate, ensure that the electrical integrity of the shotfiring system or circuit is such as to make a misfire unlikely; and
- (3) ensure that the shot is fired from a safe place.

Reference:

- Holcim NZ Ltd Fatality Prevention elements (FPE's) and subsequent reviews
- Holcim NZ Ltd Business Management System
- Blast Permit
- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013
- Health and Safety in employment amendment Act 2013
- Australian Standard – Explosives – Storage, transport and use – Part 1: Storage and Part 2 Use of explosives• Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz

4.6.3 MISFIRES

In the event of a misfire the quarry operator shall consult the individual appointed as the Shot-Firer and ensure, so far as is reasonably practicable, that -

- (1) apart from him/herself, no person other than the shot-firer or any other person authorised by him/her enters the misfire area -
 - (a) where the shot was fired by means of safety fuse, wait until a period of 30 minutes has elapsed since the misfire, or
 - (b) where the shot was fired by other means, wait until a period of 5 minutes has elapsed since the misfire and any shot-firing apparatus has been disconnected from the shot;
- (2) appropriate steps are taken to determine the cause of and to deal with the misfire; and
- (3) a suitable record is kept of the misfire in Blast Permit and Holcim NZ Ltd Incident Management System (INX).

Reference:

- Blast Permit
- Holcim NZ Ltd Incident Management System (INX)

- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz
- Australian Standard – Explosives – Storage, transport and use – Part 1: Storage and Part 2 Use of explosives

4.6.4 TRANSPORT OF EXPLOSIVES

- (1) No person (other than a person engaged in the transport of explosives to or from the quarry, a shot-firer, trainee shot-firer, a person authorised to handle explosives at a quarry, or a person appointed to be in charge of the explosives store) shall handle explosives at the quarry.
- (2) No person shall bring any substance or article (other than explosives) likely to cause an unintended explosion or fire within 10 metres of any explosives or (except for the purpose of lighting igniter cord or safety fuse) take any naked flame within 10 metres of any explosives.
- (3) No person shall forcibly remove any detonator lead, safety fuse or other system for initiating shots from a shot-hole after the shot-hole has been charged and primed.
- (4) No person shall charge or fire a shot -
 - (a) unless there is sufficient visibility to ensure that work preparatory to shot-firing, the shot-firing operation and any site inspection after the shot is fired can be carried out safely;
 - (b) in a shot-hole which has previously been fired, unless he is dealing with a misfire in accordance with action taken in pursuance of regulation 28(b); or
 - (c) in any tunnel or other excavation (not being merely a shot-hole) in the face or side of the quarry for the purpose of extracting minerals or products of minerals.
- (5) No person shall fire a shot -
 - (a) unless he/she is a shot-firer or trainee shot-firer; and
 - (b) other than by means of a suitable exploder or suitable safety fuse.
- (6) No person shall cap a safety fuse with a detonator unless he is using equipment designed for the purpose and he is in a suitably sheltered place designated by the operator for the purpose.

Reference:

- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz

- Australian Standard – Explosives – Storage, transport and use – Part 1: Storage and Part 2 Use of explosives
- Hazardous Substance & New Organisms Act (HSNO) 1996 and related regulations (and subsequent reviews)

4.6.5 BLAST TIMING

Blasting of quarry workings/faces for extraction of rock for production shall be carried out in accordance with the District Plan rules between 10.00am and 2.00pm, Monday to Friday only using approved industry practices.

- (1) In all cases applicable property owners shall be notified as required by the District Plan by mail one week in advance or through an agreed system between the Quarry Operator and the property owners.
- (2) The owners of the following properties shall be notified:
 - 9 and 14 Plumer Street, Johnsonville
 - 73 and 75 Tarawera Road, Johnsonville
 - 84 and 86 Tarawera Road, Johnsonville
 - 113, 130, 170 and 175 Fraser Avenue, Johnsonville
 - 87 Burma Road, Johnsonville
 - 146 Burma Road, Johnsonville

Where required they will also be advised by phone 5 minutes before firing of the blast. And

- (3) Immediately preceding all blasts and following the all clear being given by the “shot-firer ” the shot fire shall activate an all clear siren. The siren sound shall distinguish it from normal Police, Ambulance or Fire Service sirens.
- (4) Adjoining business operations of Downer, Allied Concrete and Taylor Preston shall also be notified by mail one week in advance or through an agreed system between the quarry operator and the businesses.

Immediately preceding all blasts and following the all clear being given by the " shot-firer " the shot-firer shall activate an all clear siren.

Reference:

- Blast Permit
- District Plan Rules 7.1.3.3.2 and 7.1.3.3.3
- Holcim NZ Ltd Business Management System
- Australian Standard – Explosives – Storage, transport and use – Part 1: Storage and Part 2 Use of explosives
- Hazardous Substance & New Organisms Act (HSNO) 1996 and related regulations (and subsequent reviews)

4.6.6 BLAST DESIGN

In general, the blast design is determined by the geology of the material at the quarry to be broken and the fragmentation required. The degree of fragmentation required is related to the type and size of both the loading equipment and primary crusher(s).

A written design shall be prepared for each blasting operation to ensure, so far as is reasonably practicable, that when blasting occurs it will not give rise to danger to persons or property.

Reference

- Blasting Permit
- Holcim NZ Ltd Business Management System
- Australian Standard – Explosives – Storage, transport and use – Part 1: Storage and Part 2 Use of explosives
- Hazardous Substance & New Organisms Act (HSNO) 1996 and related regulations (and subsequent reviews)

4.6.7 BLAST IMPACT ON ENVIRONMENT

To reduce the effects of blasting (noise, flyrock, vibration) on the environment blast impacts shall be controlled by good design and operations.

To reduce the effects of blasting operations the following planning conditions relating to blasting in most cases will reduce the effects. These conditions include:

- no blasting outside the permitted blasting hours (see 4.6.5 above)

Reference:

- Blasting Permit
- Holcim NZ Ltd Business Management System
- Australian Standard – Explosives – Storage, transport and use – Part 1: Storage and Part 2 Use of explosives

5. QUARRY DEVELOPMENT PLANS

5.1 SITE & QUARRY DEVELOPMENT PLANS

5.1.1 STAGING PLANS

Detailed staging plans have been produced to:

- Ensure staging is progressed in a manner that will be consistent with the requirements of the District Plan, including the final finished contour levels;
- Provide detailed engineering guidance for the quarry activities; and
- Be used in determining the visual impact assessment of the quarry.

The quarry operations are designed to minimise the working face visible to the public at any time, and reduce the extent of visible modification to the prominent ridge. It aims to minimise the area that will be disturbed and create a final landform of comparatively natural appearance, finished to facilitate rehabilitation, while also maximising quarried rock volumes.

5.1.2 NORTHERN QUARRY AREA

The northern quarry area staging plans have been updated to reflect the finished design of this face of the quarry which is expected to close first. To that end cleanfilling is proposed to fill the extracted area such that suitable contours can be obtained for rehabilitation of the area. The north face staging plans are included in Appendix 5.

Reference

- Wellington City Council Kiwi Point Quarry Design – February 2006
- Kiwi Point Quarry Annual Work Plan

5.1.3 SOUTHERN QUARRY AREA

The concept staging plan through to finished design for the southern face indicates removal of the lower part of the spur that separates the abattoir from the industrial area on Tyers Road. This would eventually see the lower end of the spur entirely removed from 158m asl down to the bottom of the gorge where a platform resulting from the quarrying would be formed approximately 10 – 15 metres above the level of SH1. Then the quarrying would continue down to a platform level of 30m asl, before backfilling with cleanfill. The final finished ground level would form a platform sloping north south from 64 – 44m asl, which would vary between 0 and 10 metres above the level of SH1.

Quarrying would start on the south side of the spur and work progressively north. The following six representative stages are illustrated in Figures 2(a) 2(b) and 2(c) (Appendix 6) to show how the landform will progressively change during the quarry's life span. The figures show the large-scale landform modification and staging and show regular benching required for overall slope stability and working access during the quarry's operation. However, as the quarry face is completed the final finishing will be designed in detail and progressively implemented, as part of site rehabilitation, to stagger the benching, vary gradients and vary ground conditions to achieve a more natural appearance and to aid plant establishment.

- Stage 1:** Set-up stage: construction of an access road to a working platform at 94m asl with screening bunds around the outer edge, screen planting adjacent to the WRC pumping station.
- Stage 2:** Quarrying of the south face from 154m asl to an enlarged working platform at 94m asl (i.e. level of the preliminary working platform).
- Stage 3:** Quarrying of the south face from 94m asl down to the quarry pit platform by progressively excavating and lowering the level of the working platform.
- Stage 4:** Quarrying to remove the remainder of the spur landform within the site from 158m asl to the quarry pit platform, working from south to north and final contouring of the finished face.
- Stage 5:** Quarrying of the quarry pit to 30m asl into the quarry pit platform.
- Stage 6:** Backfilling of the quarry pit to the level of the finished platform sloping north south from 64 - 44m asl.

The staging plans are included in Appendix 6. Figure 2a covers Stages 1 – 2. Figure 2b covers Stages 3 – 4. Figure 2c covers Stages 5 – 6.

Note

Presently this concept staging plan through to finished design is being reviewed to carry out the quarrying operations efficiently and economically. Upon finalising the staging plan the QMP will be updated to reflect the revised plan.

5.2 BUFFER AREAS & ASSOCIATED FEATURES - NORTHERN AND SOUTHERN QUARRY AREAS

5.2.1 BUFFER AREAS – NORTHERN QUARRY AREA

A buffer area is to be maintained along the north-eastern boundary of the site near Plumer Street and Tarawera Road.

A 25 metre wide buffer area will be maintained on the uphill boundary of the site around the steep sides and top of the southern area to be excavated. This buffer area will be allowed to revegetate naturally except where additional planting is required.

5.2.2 FENCING – NORTHERN QUARRY AREA

The top boundary of the northern buffer area shall be fenced and will continue to be while the quarry is in operation, and pending any future use consideration.

A steel pole wire mesh fence must be maintained adjacent to any properties in the residential area along the quarry boundary to a height of 1.2 metres.

A security fence will be installed and maintained along the outer edge of the buffer area prior to commencement of operations in any area to exclude members of the public.

5.2.3 SCREENING – SOUTHERN QUARRY AREA

Screening of the southern face shall be provided by maintaining a bund on the site adjacent to State Highway 1 while carrying out operations.

Bunds on the outer edge of the access road and the main working platform (south to Tyers Road) will provide a visual screen, noise and dust buffer, and safety barrier during quarrying of the southern spur. The bunds will be a minimum of 2m height and will be created by excavating the road and working platform to a level 2m or more below the outer edge, which will be left in situ to form a 'rim'. As the working platform is lowered, the bund will be adjusted to maintain the minimum height above the working area.

The earth bunds formed on the outer edge of the access road and main working platform will reduce the visible extent of the working area and screen truck movement from viewpoints below – namely SH1 and industry in the gorge. The bunds will be formed by leaving the outer edge of the road and working platform in place as a 'rim' and will be gradually lowered as the level of quarrying descends. Forming them in this way not only reduces the risk of rock fall from road and platform construction but also minimises the amount of ground disturbance on the slope below the working area.

5.2.4 SCREEN PLANTING – SOUTHERN QUARRY AREA

Screen planting will be in place south of the pumping station during Stage 1 of development of the southern face. By the time the quarrying operations reaches end of stage 4, the plants would have grown tall enough to block views of the quarrying operations from southbound SH1 traffic. At this time the working platform is also expected to be at the level of SH1. The planting will consist of fast-growing eco-sourced trees, common to the area. This planting will complement the two existing karaka stands beside the pumping station that are to be retained.

The screen planting proposal will be included in the revised southern quarry area staging plan design.

5.2.5 BUILDINGS AND PLANT – NORTHERN & SOUTHERN QUARRY AREA

The existing northern site operational area at the quarry, including the processing plant, office, and temporary stockpiling and customer service area will be maintained. Consequently, no permanent buildings or fixed machinery will be located at the southern part of the quarry.

5.2.6 ACCESS ROAD SOUTHERN QUARRY AREA

An access road will be constructed around the lower part of the southern spur to enable machinery to reach the south face (which will be quarried first) and transport the rock material back to the existing quarry facilities for washing and stockpiling. This road will eventually be removed as the quarrying excavates below its level.

The revised southern quarry area staging plan will address the access road.

5.2.7 TEMPORARY HYDROSEEDING

As the access road is likely to be in place for at least 10 years, and the batters will be noticeable to southbound SH1 travellers, the batters will be hydroseeded to reduce the degree of contrast with the adjacent hillside. Machine access tracks to the working face of the southern part of the Quarry will be progressively constructed, removed and reconstructed as the landform is excavated.

The revised southern quarry area staging plan will address temporary screening of batters to the southbound SH1 travellers.

5.2.8 STOCKPILES

Stock piling of quarry material will be provided for in the southern part of the quarry as part of daily operations. Quarry material will be stockpiled only for short periods.

5.2.9 LOCATION OF CRUSHING PLANT AND STOCKPILES - CURRENT AREA

The crushing plant is intended to be maintained at its existing location.

Future options for processing will be determined as required. However any processing plant used in the southern part of the quarry shall be relocatable.

The existing stockpiles in the northern part of the quarry will continue to be used for quarry sales. Temporary stockpiles (pre-processing) may be used within the southern part of the quarry in accordance with the provisions of the District Plan.

6. QUARRY MANAGEMENT MEASURES

6.1 DISTRICT PLAN PROVISIONS

The following table cross-references how requirements of the District Plan outlined in Section 1.5 of this plan are in practice achieved through operational practice.

REQUIREMENT	DP REF's	MANAGEMENT PLAN & OTHER DOCUMENT LINKS
<i>Provide for the development and site rehabilitation of the Kiwi Point Quarry to the extent specified in the Plan in a way that avoids, mitigates, or remedies adverse effects</i>	6.2.3.3A	Staging Plans as included in this document The District Plan (including rehabilitation provisions) as a method, as provided for in this document Other effects as dealt with in this document
Practices and methods that will be adopted to ensure that all permitted activity conditions applying to the activities will be met	6.2.3.3A Method	Holcim NZ Ltd Business Management System Resource Consents (Regional Council) Compliance
Staging of the excavation and cleanfilling activities	6.2.3.3A Method	Staging Plans as included in this document
Management of surface and groundwater	6.2.3.3A Method	This document Resource Consents (Regional Council) Compliance Storm-water Management Plan (<i>The 2005 version of the Storm-water Management Plan is being reviewed</i>)
Management of on-site traffic	6.2.3.3A Method	Fatality Prevention Element (FPE) #3 – Vehicle & Traffic Safety Site Specific Guideline
Management of any on-site processing and temporary storage of Quarry materials	6.2.3.3A Method	This document Resource Consent (Regional Council) Compliance Hlocim NZ Ltd Business Management System
Specific provisions relating to on-site management of noise, dust, vibration, visual impact and water quality	6.2.3.3A Method	Resource Consent (Regional Council) Compliance Holcim NZ Ltd Business Management System
Rehabilitation objectives and principles for the rehabilitation of the site	6.2.3.3A Method 7.1.3.7	This document Annual Implementation Plan
Complaints procedure	6.2.3.3A Method	Holcim NZ Ltd Business Management System
Blasting times and notification	7.1.3.3.2	This document
Review the Quarry Management Plan every 5 years	6.2.3.3A Method	As per this document

6.2 GREATER WELLINGTON REGIONAL COUNCIL CONSENTS

The following activities are subject to Greater Wellington Regional Council (WRC) consents that will be maintained during the life of quarry operations:

- Permit to take Surface Water (WGN130058 [31916]): For aggregate washing and dust suppression. Expires 08 November 2022.
- Permit to Discharge to Stream (WGN110099 [30687]): To intermittently discharge a mix of treated and settled storm water run-off and wash water into Ngauranga Stream. Expires October 2020.
- Permit to Discharge to Air (WGN 050352 [24540]): To discharge contaminants to air from the operation of cleanfill. Expires 6 July 2020.
- Land Use Consent (WGN 050352 [24518]) and Water Permit (WGN050352 [24519]): To pipe and divert watercourses within Kiwi Point Quarry. Lapse 22 August 2010 unless implemented. Expires 22 Aug 2040.
- Land Use Consent (WGN 060255 [25159]); To undertake soil disturbance and vegetation clearance on erosion-prone land. Expires 26 November 2016
- Land Use Consent (WGN 060255 [25260]): To pipe a 20-metre section of a tributary of the Ngauranga Stream and carry out associated disturbance of the stream bed. Expires 26 November 2041.

All resource consents are attached in Appendix 4.

6.3 STORMWATER MANAGEMENT

A storm-water management plan has been established for the KPQ and submitted to WRC in June 2005 by WCC. This plan provides for appropriate storm-water controls such as sediment ponds and maintenance schedules. These measures ensure that any sediment laden run-off is adequately treated prior to leaving the site. In addition to these measures, two watercourses flowing through the site will be piped, further reducing the likelihood of downstream sedimentation.

The 2005 version of the Stormwater Management Plan is being reviewed

Reference

- Appendix 9 – Storm-water Management Plan

6.4 FUEL & SPILL CONTAINMENT MANAGEMENT

The operation of the quarry shall be undertaken in a way that ensures that -

- refuelling of equipment shall only be done within the established fuelling station structure;
- a spill contingency plan to deal with any spills of fuel, oil, lubricants or hydraulic fluids shall be maintained;
- an emergency spill containment kit shall be maintained on site;

- any spill of fuel, oil, lubricants or hydraulic fluids or other deleterious substances shall be immediately contained, reported and remediated.

6.5 DUST MANAGEMENT

Dust from the operation of the quarry and Cleanfilling operations shall be managed in line with the requirements of Resource Consent WGN 050352 [24540] attached in Appendix 4.

Reference:

- District Plan Rule 7.1.3.2
- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz
- GWRC Permit to Discharge to Air (WGN 050352 [24540]): To discharge contaminants to air from the operation of the cleanfill.

6.6 NOISE MANAGEMENT

6.6.1 NOISE

In order to ensure that noise emissions from the quarry site remains acceptable, it is of fundamental importance that the equipment on site is well maintained.

Reference

- District Plan Rule 7.1.1.1

6.6.2 EQUIPMENT NOISE

All equipment used on site will be regularly maintained and of high standard to assist reduce noise.

6.6.3 VEHICLE REVERSING ALARMS

One specific item of equipment that can cause complaints is the use of vehicle reversing alarms. These are provided for safety reasons for the workforce, and need to generate a certain level of noise to achieve this. However, all items of plant operating at the Quarry will be fitted with reversing alarms such as directional and adjustable systems, which can help to minimise the noise impact.

6.6.4 BLASTING NOISE

As previously stated in this QMP, times where blasting is permitted to be undertaken is restricted to certain times of the day to help minimise the impact of noise.

Reference:

- Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013

- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz
- Australian Standard – Explosives – Storage, transport and use – Part 1: Storage and Part 2 Use of explosives

6.7 MANAGEMENT OF OTHER EFFECTS

6.7.1 MANAGEMENT OF TRAFFIC

There are two entry points to the quarry. However, the entry/exit on Fraser Avenue has been closed (temporarily) to reduce heavy truck traffic within the community.

The main entry to the quarry is from State Highway 1 and shall during the period of this QMP be maintained to a standard required for industrial use. As per the District Plan this is the only access point for quarry vehicles. This access is also the main access route for Taylor Preston's meat works, Allied Concrete and the Downer Asphalt complex.

During the period covered by this plan it is intended to upgrade the Fraser Avenue entrance. This will allow more use to be made of the site for development once quarrying is completed.

Access routes for the cartage of quarry materials from both the northern and southern quarry operations will be maintained to a standard that complies with the requirements for the operation of heavy earth moving equipment.

Other than the access point, there are no restrictions on traffic movement to or from the quarry.

Reference:

- District Plan Rules 7.1.3.6
- Holcim (NZ) Ltd Fatality Prevention Element (FPE) #3 – Vehicle & Traffic

7. KIWI POINT QUARRY REHABILITATION

7.1 INTRODUCTION AND REHABILITATION APPROACH

The rehabilitation of the quarry will extend to all areas within the boundaries of the site, which are located within both the Suburban Centres and Open Space Activity Areas under the District Plan, including the grazing areas, Ngauranga Gorge (Waitohi) stream, and buffer areas above the north and south quarry faces. (Refer to Appendix 9).

This section of the QMP establishes an objective, a set of principles and a process for the rehabilitation of KPQ. Each of the principles will be integrated within planning, design and management as each stage of the quarry operation is completed. Detailed plans and budgets will be prepared annually to ensure the integrated and ongoing coordination of rehabilitation and quarry operations.

The quarry requires substantial site modification over time. Therefore specific rehabilitation activities are to be planned and carried out on an annual basis as part of an implementation plan. Each implementation plan will be tailored to the progress of quarry face closures, incorporating knowledge gained from ongoing monitoring. Each implementation plan will guide contract documentation for the physical works involved in the rehabilitation of the site. This will ensure maximum flexibility to respond to new situations as the excavations continue.

The implementation plans will be adequately funded on an ongoing basis as part of the quarry operation, as there is little or no value in commencing rehabilitation unless there are resources available to implement and complete successive stages and monitor results. The rehabilitation of KPQ is to be monitored, and re-evaluated annually for the remaining life of the quarry, anticipated to be approximately 50 years, and followed by several years of maintenance.

The long period of quarry operations allows for a substantial element of trialling and testing in finding solutions to best meet the rehabilitation specifics of the site. Because the precise nature of the final landform can only be determined for each section of the quarry once the variations in rock type become evident, the preparation of a detailed quarry rehabilitation implementation plan is not practicable in advance. However, the Quarry Staging Plans in Appendices 5 and 6 will provide a starting point for rehabilitation.

The overall objective of the proposed rehabilitation is to establish native vegetation cover that contributes to the Council's vision of Ngauranga Gorge as part of the City's inner green belt network. Rehabilitation will focus on bringing all areas where quarry operations have ceased to a state where native vegetation will re-establish. It is intended that all land encompassed within the KPQ Boundary in Figure 1 will be progressively rehabilitated, other than areas which are to be used in future for permitted or consented activities.

These latter areas comprise areas of cleanfill north of the access road that will be hydroseeded and left to settle. No additional planting or rehabilitation of the cleanfill will be required. Elsewhere active revegetation through planting will be required for approximately 10% of the existing quarry site. It is intended that the 10% will be distributed across the site to act as "islands" of planted small hardwood shrubs to establish seed sources.

7.2 SITE DESCRIPTION

The site is located in the central part of Ngauranga Gorge, adjacent to SH1, a major transport corridor, and surrounded by industrial land use and open space areas. The site is overlooked by elevated residential suburbs. The landscape is highly modified, resulting from clearance of the original native forest cover followed by a long and ongoing history of major landform modification. The District Plan provides for the quarry to operate within this unique environment until the completion of the southern area, which will mark the end of quarry operations. The main areas of the quarry requiring rehabilitation work are listed below:

Main Rehabilitation Areas

- North Face
- South Face
- Grazing Area
- Buffers
- Stream

7.3 REHABILITATION OBJECTIVE AND PRINCIPLES

The overall objective of the KPQ rehabilitation *“is to establish native vegetation cover that contributes to the Council’s vision for Ngauranga Gorge to become part of the identified inner green belts”*.

While rehabilitation of the quarry does not imply restoration of the site to its original pre-quarry state, it is important that the specific landscape qualities of Ngauranga Gorge are reflected in the rehabilitation of the site. Quarrying dramatically alters landforms and disrupts ecological processes and habitats. The primary aim of rehabilitation is to provide the conditions that enable natural processes to resume functioning albeit in a modified form.

Prior planning, landscape and ecological assessments, and consultation, have identified the following five general rehabilitation principles:

- (1) To promote Wellington’s indigenous biodiversity and rehabilitate natural processes within the site.
- (2) To conduct rehabilitation concurrently with quarry operations, coordinating progressive completion with rehabilitation.
- (3) To finish the quarry faces to resemble the steep bluff landforms that would have occurred naturally in the Ngauranga Gorge.
- (4) To conduct rehabilitation in a manner that encourages rapid vegetation of the slopes, reducing the duration of adverse visual impacts.
- (5) To revegetate the quarry in a way that supports the vision of the City’s Inner Green Belts.

Most effective rehabilitation occurs when the work is integrated as part of the overall operation and is implemented progressively, as each section of the Quarry is completed. At the same time the creation of scree slopes, bench ripping, return of over-burden to soften excavated terraces and faces and importation of soils provides opportunities for re-vegetation. Coordination of these activities ensures a high success rate for re-vegetation and encourage rapid vegetation.

Rehabilitation attempts to maximise favourable environmental conditions for plant growth and hasten natural revegetation processes by controlling those factors that are able to be controlled, monitoring results, and where necessary, progressively adapting activities to improve results.

Initial planting must be considered using known effective methods and techniques, and locally proven, rapid growing and robust plant species with a high likelihood of survival in a range of site conditions. In time, when site conditions have been moderated by the initial nursery cover, other species can be introduced.

Key factors that are likely to influence the success of this rehabilitation project are:

- Width, height and stability of terraces, size of screens
- The proximity and condition of remaining areas of adjacent native vegetation
- Quality of topsoil, cleanfill or redistributed stockpile
- Control of plant and animal pests
- Contamination of water sources
- Prevention of fire
- Monitoring of progress

Rehabilitation measures for each area will vary according to the specific micro climate, exposure aspect and substrate of the different sites. Specific detail for the varying conditions and appropriate measures will be included in the annual implementation plans.

7.4 NGAURANGA GORGE VALUES

To determine how best to rehabilitate the site, the contextual values of the site must be described and understood so that the rehabilitation techniques can re-integrate the quarry into the Ngauranga gorge landscape, and so that natural systems can be re-established to allow revegetation that approximates to the original patterns.

The Ngauranga Gorge has been identified as an area of strategic significance to the city and is recognised as a ‘working’ city gateway containing industrial and commercial uses and a major transport corridor that is made memorable by the views of Wellington Harbour. The Council’s open space strategy, *Capital Spaces*, refers to the Ngauranga Gorge as one of four proposed inner green belts. The return of closed canopy forest to the Ngauranga Gorge hillsides will enhance and realise the Council’s vision for a green belt in the Ngauranga Gorge. It will also be a positive factor in creating plant and animal habitat, soil protection and enhancing indigenous biodiversity. The rehabilitation of the Quarry seeks to support this vision.

The values of Ngauranga Gorge, identified in *Capital Spaces*, and their contribution to the Gorge landscape are summarised as:

Ecological values: Coastal forest is under-represented in Wellington. There is potential for native forest to be gradually restored on the steep hillsides of the gorge increasing this uncommon forest type and providing an almost continuous green corridor between the Wellington fault escarpment (Hutt Road Scarp), Ngauranga Gorge bush, Tyers Bush and the lowland reserves in Khandallah and Johnsonville, and the regenerating native forest of Mt Kaukau and the outer green belt.

Landscape Values: The gorge is an important threshold in and out of Wellington Harbour, experienced by thousands of people every day, and the regenerating native vegetation is noted in the strategy as providing the basis for a “*striking gateway to the harbour in the future*”.

Recreational values: Recreational values in the Ngauranga Gorge are currently limited by the steep open space terrain; SH1, which is a major cross-gorge barrier for pedestrian and cycle

movement; and the dominance of industry on the valley floor. However, the Council has long term plans to develop more recreation routes along the western hills of the harbour, and opportunities to develop more recreational access through the gorge are likely to be explored further.

Heritage values: The entire gorge landscape is of historic interest, dating back to Maori settlement at the mouth of the gorge and then the history of the transport corridor and associated land uses, which have involved major modifications to the gorge landscape and the supply of quarry materials to the city and region for over 100 years.

7.5 IMPLEMENTATION TECHNIQUES

The quarry has a number of factors which will make its rehabilitation challenging. The techniques in this section are to be applied generically across the site to the greatest practicable extent. The annual implementation plan should progressively develop specific rehabilitation proposals for each of the areas to cater for the unique combination of soil, slope, exposure and aspect within the site to which revegetation activities must respond. The implementation plan shall be prepared annually. The responsibilities of each technique are outlined below:

7.5.1 PLANNING

Ideally rehabilitation planning should commence at an early enough stage to ensure that remaining values of the site that are not directly affected by quarrying are protected and that maximum opportunities are provided for future rehabilitation in the quarried areas. The annual implementation plan should demonstrate an appropriate level of planning in order to achieve the rehabilitation principles.

An annual implementation plan will be developed. Each part of the site will have unique limitations and opportunities, so planning should not be too rigid. Regular monitoring enables rehabilitation actions and management to be reviewed and revised in response to results. Implementation will evolve over time, and will be reviewed and refined each year. Achieving a final landform that reflects the earlier features and topography of the area will require further detail and developed design to be carried out through annual implementation plans closer to the time of each individual quarry face closure.

7.5.2 VEGETATION PROTECTION

Prior to commencement of operations the extent of earthworks adjacent to vegetated buffers and stream margins should be clearly marked on site along with areas of vegetation and topsoil that are to be stripped and areas of vegetation that are to be retained.

The vegetation that is to remain must be clearly marked to prevent accidental removal. These remnants of vegetation have a vital role in future rehabilitation, acting as a seed source, providing shelter and providing habitat for birds that will encourage natural seed dispersal.

The removal of pine trees and other pest species must be immediately initiated throughout the site. The buffer areas above the northern face have been identified for pine removal. This should be initiated and continued through the development of future implementation plans.

7.5.3 STOCKPILING

The quarry currently has on-site soil material stockpiled for re-spreading as areas are made available for rehabilitation within the annual implementation plans as appropriate.

In addition to topsoil and overburden stripped from quarried areas and the composted vegetation, other quarry by-products, such as grit and sludge, can potentially be used in the preparation of substrate. The addition of a 'blended' combination of these different materials to the uppermost layer of fill can improve both physical properties and fertility and thereby make these areas more suitable for plant establishment and growth.

7.5.4 ROCK FACE SHAPING

Rehabilitation will involve physical re-shaping of the quarry site to achieve the landform principle (Principle 3) and to support revegetation, before any planting is carried out. In accordance with the landform principle, the final shaping of the quarry faces is a critical phase of the rehabilitation of the quarry, in order to address the high visual prominence of the quarry and its location in an important gateway to the city and existing residential suburbs.

A series of benches and haul roads will remain at completion of quarry extraction activities. These platforms are one of the most distinctive features that indicate an area has been quarried. These benches run against the 'grain' of the landscape and removing some of them or breaking them up is the key to reducing their visibility.

Some benches can be fully or partly demolished as part of the planned face finishing, but some benching is likely to need to remain to ensure slope stability. With care, key components of the surrounding landscape can be mirrored in the modified quarry face including large rock bluffs, screes and gullies.

The rehabilitation works also need to ensure continued safe access across the site for staff undertaking ongoing rehabilitation works such as planting and pest management. Retaining some benching on a temporary or permanent basis can ensure this.

The implementation plans shall provide that the absolute maximum slope of a quarry face (batter) shall not exceed 55 degrees from the horizontal (ie between benched areas) and the maximum height of a batter shall be no more than 15 metres in height. However, variety and visual interest shall be provided for by varying the batter angle and heights and creating features as described above.

Reference:

- District Plan Rules 7.1.3.3.4 and 7.1.3.3.5

7.5.5 DRAINAGE

Care is needed in managing water and associated erosion. Benches direct and concentrate water flow and so drainage needs to be considered to prevent scouring and erosion. Cut-off drains are particularly important on the benches to prevent erosion and scouring of the replaced soils.

Routes for storm-water drains need to be determined in consultation with the rehabilitation adviser to ensure that routes are aligned to avoid tall trees and advanced native vegetation, and that appropriate remedial work is undertaken to prevent future erosion. This should be developed within the annual implementation plan.

7.5.6 SOIL PREPARATION

A fundamental process of rehabilitating the site will be the preparation of the substrate and the quality of topsoil for all planting areas, including areas left to regenerate naturally. Topsoil shall conform to the following specification:

Topsoil shall exhibit the presence of biological activity as evidenced by adequate aggregation and organic matter content. The material shall be acceptable for growing all of the appropriate species, given adequate management, and shall not contain any substances injurious to plant growth.

The mix of rubble, blended fill and topsoil needs to be determined for areas of both the north and south faces to reflect their unique climatic properties and planting requirements. Once laid, the exposed soils should be hydroseeded (or any other approved method) immediately to prevent erosion and dust problems, and also to limit germination of some pest plants.

The treatment of rock benches is important before re-spreading of onsite topsoil is possible. The surface of the bench usually needs to be ripped to create a zone of fractured rock which will allow the topsoil to be 'keyed in' and prevent the formation of extensive slip planes between the two materials. The fractured zone also serves to retain moisture and provides secure rooting.

7.5.7 REVEGETATION

The objective is to achieve a vegetation cover that relates to the existing vegetation remnants in the area. This provides continuity of habitat and linkages for wildlife movement.

There are three common methods appropriate for establishing vegetation cover on the earth-worked areas. Using a combination of methods at KPQ will mean that the most appropriate method can be used for the prevailing site conditions. There may be a need for fertilizing to enhance vegetation. The methods are:

- Hydroseeding (where appropriate)
- Natural regeneration by providing suitable conditions for vegetation establishment
- Planting with locally eco-sourced native species.

Planting will be co coordinated within the annual implementation plan to ensure appropriate plants species and numbers are available for the following planting season.

7.5.8 HYDROSEEDING

Hydroseeding or hydromulching of exposed soils will reduce run-off and erosion, bind soils preventing dust problems, and will inhibit some invasive pest plants. Hydroseeding will assist in stabilising loose soils primarily on benches and where appropriate some lower batter slopes; however its application to rock face and steep batter slopes is not yet proven as a reliable rehabilitation technique. Trials and development of new hydroseeding techniques should be initiated and monitored to find one or more solutions that meet the specifics of the site.

Hydroseeding and mulching shall be coordinated with quarrying, following the completion of earthworks. In areas allocated for natural regeneration, particular exotic grass mixes may inhibit native seed strike so further investigation of surface treatment will be needed to ensure the best balance of erosion and weed control while promoting native seed propagation. Some trialling has been completed locally and nationally with native shrub and grass species, and with some moss and lichen species. However, this technology is not yet reliable enough for large scale application. Some experimentation should be undertaken.

7.5.9 NATURAL REGENERATION

Sites left to regenerate naturally with local native vegetation can often be the most successful means of getting vegetation established. For this to be achieved optimum site conditions must prevail. That is, sites altered by earthworks must be left in a condition that allows natural regeneration to occur (i.e. runoff controlled, suitable substrate, good seed source nearby, pest management strategy, etc). This process will take longer than on those sites that are assisted by planting or laying brush.

7.5.10 PLANTING

The aim of revegetation is to create “islands” of planted vegetation which spread outwards and assists the natural regeneration of adjacent areas through shelter and seed dispersal. The most favourable sites (micro sites) are selected for this planting, and they need not cover more than 10% of the site.

On all areas that are revegetated, the following practices should be adopted:

- Plant sourcing will require proactive planning so that the right species are planted at the right time – usually a year’s lead time is required to enable sufficient quantities of appropriate locally-sourced plant species to be propagated.
- The extent of planting programmed for each year needs to be determined in relation to resources available for maintenance in successive years.
- Species should be sourced from local plant populations to ensure that they are ecologically compatible and suitable for the environs (i.e. eco-sourced).
- All plants should be suitably acclimatised to local conditions prior to planting. If plants are propagated outside the Wellington district this may involve bringing them to a suitable local holding area or nursery several months before they are planted.
- Small grade plants should be used because they will acclimatise and establish more readily than large grades.
- Plants should be densely planted with the object of attaining ‘canopy closure’ as quickly as possible (ie. the sooner plants coalesce the better, because this assists in their survival and also reduces competition from pest plants and other unwanted plants).

7.5.11 STAGING

KPQ site rehabilitation has a timeframe measured in several decades. Revegetation of the first sections should be well advanced by the time the south face quarry closes. Staging revegetation over several years is critical to its success, allowing flexibility to adapt to any unexpected seasonal events such as a particularly wet winter or particularly dry summer. It also enables adjustments to be made in terms of ongoing maintenance practice, species composition, pest management, timing, and methods of planting taking into account monitoring of previous planting. Staging revegetation work over several years also allows maintenance to be more easily accommodated.

7.5.12 TRIAL PLANTING

Each area will have unique features and combinations of soil, slope, moisture, sun and wind. Each annual implementation plan should contain some plant trials to test the efficacy of certain species and planting treatments.

The use of biodegradable geo-textile mats should be considered. These can be very effective in some situations but can be expensive relative to other methods. A number of suitable products are now available made from biodegradable materials such as coconut fibre. Mats should be considered and trialled but will generally be used as a supplementary rather than primary rehabilitation method.

7.5.13 MAINTENANCE

All areas of planting within the quarry (10% of the site) will require some maintenance and pest management. Maintenance should be programmed and costed for the first five years following each planting stage. At the completion of this time frame, planting should be well established and

self-sustaining. On exposed sites, maintenance work will involve replacing failed plants ('blanking') and cutting back / removing unwanted and competing species.

7.5.14 MONITORING

Commitment to ongoing monitoring of the rehabilitation progress and commitment to remedial maintenance is critical to the success of rehabilitation. Ongoing monitoring will be essential so that:

- trends can be recognised early and optimised (e.g. recognising most favourable micro-sites or the most successful species);
- pest problems (plant and animal) can be dealt to when signs are first observed (e.g. pull seedlings while still young);
- the effects of changeable climatic conditions can be managed (e.g. Delaying planting in drought years);
- trial plots can be set up and observed for improved overall results (hydroseeding, mulching, plant and material trials).

Monitoring and agreement to appropriate management responses will form part of the rehabilitation contract documentation. Whilst some management measures need to be in place at the outset, for others ongoing monitoring will be required to decide what action needs to be taken and when. This may simply be a matter of refining the rehabilitation method used but it may require significantly altering the method or the timing. Site management then becomes responsive and tailored to progress from year to year.

An annual monitoring inspection will be included within the implementation plan and associated reporting will cover:

- identification of successes of past and previous year
- identification of deficiencies or inadequacies
- identification of opportunities
- the programme for the coming year.

Comprehensive record keeping will be important to ensure the accumulation of knowledge, which will result in increased efficiency and reduced costs over the life of the rehabilitation project. Progress photographs, taken at key vantage points, will be used as a valuable monitoring tool.

7.6 ASSOCIATED REHABILITATION AREAS

Beyond the three main sites of the quarry (north and south faces and grazing area) a number of additional rehabilitation projects should be undertaken

7.6.1 BUFFER AREAS

- (1) Pines: pines should be removed from nearby areas regenerating to native vegetation, particularly in the native vegetation between the north face and Fraser Avenue. Branches and foliage can be mulched and utilised in soil rehabilitation on the finished quarry benches. Large logs can be placed and secured on benches to provide micro-sites for rehabilitation.
- (2) Management of invasive pest plants: such plants should be removed on an ongoing basis. In particular, continued efforts should be directed at vines such as old man's beard,

convolvulus, blackberry and ivy which are currently invading the stream margins and the regenerating forests between the northern quarry workings and Fraser Avenue.

Reference:

- District Plan Rules 7.1.3.3.6

7.6.2 NGAURANGA GORGE (WAITOHI) STREAM

Like the forests of Ngauranga Gorge, the stream which once dominated the narrow bottom of the gorge has also been substantially modified to the extent that much of it is piped underground and those vestiges still above ground are largely hidden behind industrial development. Watercourses extend from Fraser Avenue, running to the west of the north face and a large stormwater outlet from Johnsonville emerges at the existing quarry site. These feed the stream that flows behind the abattoir and is then piped underground and taken across SH1, north of the site.

It has been noted in previous investigations that this stream is seriously degraded. It would benefit from extensive rehabilitation. Stream rehabilitation is specialised and requires consultation with affected parties including the Taylor Preston management, Greater Wellington Regional Council and iwi, before specific rehabilitation is initiated under the annual implementation plan. Stream rehabilitation should address the removal of any introduced industrial waste from the streambed and slopes, diversion and treatment of contaminated runoff, pest plant removal and enhancement of riparian revegetation.

7.7 REHABILITATION SUMMARY

The principles for rehabilitation of the KPQ include all of the following steps.

- (1) Preparation of an annual implementation plan, including coordinated staging of works closure to achieve best ecological outcomes.
- (2) Programme for clearance of vegetation, mulching and composting and stockpiling.
- (3) Methods for limiting disruption to streams and freshwater habitat.
- (4) Vegetative screening of work areas.
- (5) At the completion of the quarry operation – the quarry landform shall be re-contoured to reflect the former landforms/ topography of the area. Achieving a combination of revegetated benches and more natural unvegetated landforms including large rock outcrops, bluffs, screes and gullies to reflect the surrounding topography is the desired outcome.
- (6) Creation of new soil substrate in all planting areas (benches, screes etc), to encourage rapid vegetation of the slopes, reducing the duration of visual impacts.
- (7) Trialling of a range of onsite revegetation methods for ensuring rapid vegetation cover, and maintenance of revegetated areas.
- (8) Preparation of pest plant, pest animal and fire control programme.
- (9) A monitoring and maintenance programme.

It is intended that experience and monitoring in early stages of rehabilitation will feed back into the continuing rehabilitation process.

8. LONG TERM USE

8.1 NORTHERN QUARRY AREA

The concept design for the existing northern quarry site has been based on the following staging plan:

- *Stage 1*, quarry area A and the area behind Downer
- *Stage 2*, quarry area C and fill areas A and F
- *Stage 3*, quarry area B and fill areas C and F
- *Stage 4*, quarry and fill area D
- *Stage 5*, quarry and fill area E (Taylor Preston Carpark)
- *Stage 6*, develop area G
- *Stage 7*, develop area J (reference 3.2)
- *Final Stage*, final quarrying/filling, creating level platforms, access road etc.

Appendix 5 details the staging plans for the Northern Quarry site. In the long term, a range of permitted or consented activities will be able to establish on the site.

8.2 SOUTHERN QUARRY-AREA

District Plan Change 25 changed the zoning to Suburban Centres but restricted development other than quarrying and cleanfilling.

Given the expected duration of up to 50 years for development of the southern part of the quarry, there is opportunity to consider the future use of the land through District Plan reviews and other Council strategies.

9. MANAGEMENT OF COMPLAINTS

9.1 MANAGEMENT OF COMPLAINTS

It is the responsibility of the quarry operator to record all complaints. The quarry operator is responsible for acting on and, rectifying the cause of complaints.

All complaints received in respect of the quarry operation shall be recorded in written form using the Holcim Information Management System (IMS):

- Date, event, name, address and contact details of the complainant (where provided)
- Action to resolve the issue/complaint and action to prevent similar complaints
- Date of oral response and date of written response
- Complaint reference number

The quarry operator shall respond to complaints within the following timeframes following receipt:

- 8 hours – oral response
- 24 hours - acknowledgement
- 5 working days – full written response, which confirms details of the complaint and indicates what action has been taken or is proposed to be taken.
- It shall be made clear that if the complainant is not satisfied; he or she can contact the Wellington City Council on 499 4444.
- A summary of all complaints received shall be presented in the monthly report to the Council.

Reference:

- Holcim NZ Ltd Incident Management System (INX)
- Holcim NZ Ltd Business Management System

10. FURTHER INFORMATION

If you would like any further information on the KPQ please, contact

THE COUNCIL

The Manager

City Networks

Wellington City Council

PO Box 2199

Wellington 6140

Tel: (04) 499 4444

Web: <http://www.Wellington.govt.nz>

THE QUARRY OPERATOR

Holcim (New Zealand) Ltd

Kiwi Point Quarry

PO Box 13-341

Johnsonville

Wellington 6440

Tel: (04) 815 9440

Fax: (04) 815 9432

Web: <http://www.holcim.com/nz>

11. REFERENCES

- Health & Safety in Employment (Mining Operations and Quarrying Operations) regulations 2013
- Health & Safety in Employment amendment Act 2013
- Holcim NZ Ltd Health & Safety Plan
- Kiwi Point Quarry Management Plan – March 2006 and June 2009
- Rehabilitation Plan – Kiwi Point Quarry April 2005
- Kiwi Point Quarry - Quarry Storm-Water Management Plan June 2005; Opus Consultants
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews) www.minex.co.nz
- Australian Standard – Explosives – Storage, transport and use – Part 1: Storage and Part 2 Use of explosives
- Holcim NZ Ltd Business Management System
- Wellington City Council Kiwi Point Quarry Design Detail February 2006 Beca Infrastructure
- A Guide to the Management of Cleanfills
- Wellington City District Plan
- Hazardous Substances & New Organisms Act (HSNO) 1996 and related regulations (and subsequent reviews)
- Resource Management Act 1991
- Holcim NZ Ltd Fatality Prevention elements (FPE) and subsequent revisions
- Electricity (Safety) Regulations 2010
- GWRC Resource Consents

APPENDIX 1 DISTRICT PLAN RULES (DISTRICT PLAN CHANGE 64)



Council Decision on Proposed District Plan Change 64

Amendments to Kiwi Point Quarry provisions

November 2008

Plan Change Document

WELLINGTON CITY DISTRICT PLAN

PROPOSED DISTRICT PLAN CHANGE 64 – AMENDMENTS TO KIWI POINT QUARRY PROVISIONS

Includes the recommendations to Council. Text to be added is highlighted (abcdefghijkl). Text to be deleted is highlighted and struck through (abcdefghijkl).

Note – some consequential renumbering has taken place as a result of additions and deletions.

ALTERATIONS TO THE WELLINGTON CITY DISTRICT PLAN

Detailed below are the alterations to the Wellington City District Plan. To assist the understanding of the new provisions, an annotated copy of the Suburban Centre (Chapter 6) and Suburban Centre Rule (Chapter 7) chapters of the District Plan is provided as a separate document (Attachment 1).

A. ALTERATIONS TO VOLUME ONE, SUBURBAN CENTRES

Chapter 6, 'SUBURBAN CENTRES'. Delete and insert new provisions by making the following amendments:

6.1 Introduction

1. **Delete** the final paragraph under the 'Introduction' and **Replace** with a new final paragraph to the Introduction to read:

The Kiwi Point Quarry is also included within Suburban Centres. The quarry is subject to specific rules as well as to other relevant rules applying elsewhere in Suburban Centres to mitigate adverse effects. The provisions recognise the quarry's economic importance to the City and wider region. As the long term future of the southern part of the Kiwi Point Quarry (being the area south of the access point off State Highway One) has not yet been determined, the provisions of this Plan require that any use of this area other than quarrying and cleanfilling will require consent as a non-complying activity. It is expected that the long term future of this area will be addressed during a subsequent plan review or by a Plan Change in association with the City's open space strategy at that time.

Policy 6.2.1.2

2. **Delete** the sixth paragraph of explanatory text under Policy 6.2.1.2 and **Replace** with a new sixth paragraph of explanatory text under Policy 6.2.1.2 to read:

Specific rules apply to the Kiwi Point Quarry. These rules allow for quarrying and related activities, which are not otherwise provided for in the City, subject to specific rules. For the southern part of the Kiwi Point Quarry (being the area south of the access point from State Highway One), the rules restrict alternative future uses. As the area has a long life as a quarry, future uses will be evaluated at a later date as part of a plan review or by a Plan Change.

Policy 6.2.3.3A

3. **Delete** existing Policy 6.2.3.3A and **Replace** with a new Policy 6.2.3.3A to read:

6.2.3.3A Provide for the development and site rehabilitation of the Kiwi Point Quarry to the extent specified in the Plan in a way that avoids, mitigates or remedies adverse effects.

METHODS

- Rules (including Appendices showing the extent of quarry areas)
- A quarry management plan

Kiwi Point Quarry is an established quarry, involving ongoing extraction, processing, cleanfilling and rehabilitation. As the continuing availability of aggregate and other quarry materials is economically important for the City and wider region, the Plan makes specific provision for the ongoing use and development of the quarry. For both the older and newer areas of the quarry, specific rules and a development plan are incorporated. These provisions provide for the avoidance or mitigation of adverse effects from the quarry activity and the long-term mitigation of effects on landscape and landform following quarrying. It is the Council's intention that cut faces should be designed to yield a relatively natural landform in the long term and that rehabilitation of cut faces should begin as early as practicable. The staging of quarry development, and the day to day management of quarry activities are further detailed and controlled through the application of a quarry management plan.

A quarry management plan shall be prepared and regularly updated, which sets out:

- *intended staging of the excavation and cleanfilling activities*
- *the means of management of surface and groundwater*
- *management of on-site traffic*
- *provision for any onsite processing and temporary storage of quarry material*
- *any specific provisions relating to onsite management of noise, dust, vibration, visual impact, water quality*
- *a procedure for addressing any complaints*
- *objectives and principles for the rehabilitation of the site, including:*
 - *a timetable for the rehabilitation of prominent quarry faces*
 - *measures to create soil conditions which will support plant growth*
 - *measures to create a variety of site conditions to support a range of species*
 - *means of controlling runoff to avoid erosion*
 - *means of control of plant and animal pests*
 - *measures to avoid fire risks*
 - *means to assist native vegetation to regenerate on grazing land*
 - *rehabilitation which is compatible with Open Space strategy for adjacent areas of land*
- *management of buffer areas*
- *practices and methods that will be adopted to ensure that all permitted activity conditions applying to the activities will be met.*

The quarry management plan will complement the other rules applying to the quarry activity and will provide additional management details. It will be reviewed at least every five years and any necessary adjustments will be made.

As progressive rehabilitation of the area is an important aspect of quarry management, the Quarry Management Plan includes rehabilitation provisions. As quarrying and cleanfilling activities are completed on the site, an implementation plan shall be prepared annually in accordance with the Quarry Management Plan.

The requirement that regular monitoring is undertaken and regular progress reports are completed and submitted to the Council is a key element. This requirement is included because successful rehabilitation of any disturbed area requires constant monitoring as site conditions vary considerably and evolve over time. Regular observation and recording of results is an essential part of managing the process.

A vegetated buffer area is included within the Suburban Centres Area as part of the development of the southern part of the quarry. At the northern end, the necessary buffer area is within the Open Space B Area.

It is important also that rehabilitation of the quarry area should recognise and in the longer term be able to be integrated as appropriate with the Open Space strategy developed by the Council for adjacent areas of land. Current Council policy is for the creation of further Green Belt areas on the steep hill sides of the Ngauranga Gorge and, for instance, it may be possible to allow continuation or linking of proposed walkways.

Overall, the environmental result will be the availability of quarry materials for the City and wider region in the short and medium term, and long-term achievement of well-vegetated quarry faces with the appearance of natural landforms which will be integrated with Council development of Open Space areas in this vicinity.

B. ALTERATIONS TO VOLUME ONE, SUBURBAN CENTRE RULES

Chapter 7, 'SUBURBAN CENTRE RULES'. Delete and insert new provisions by making the following amendments:

Rule 7.1.1

4. **Delete** the following text from the sixth bullet point after the words 'rule 7.1.3':
"A in part of Extension"
5. **Insert** the following text into the sixth bullet point after the words 'Kiwi Point':
"Quarry"
6. **Delete** the following text from the end of the eighth bullet point:
"and 7.1.3A"
7. **Delete** the following text from the ninth bullet point after the words 'any activity in the'
"area defined as the Kiwi Point Quarry Extension Area"
8. **Insert** the following text into the ninth bullet point after the words 'any activity in the'
"southern part of the Kiwi Point Quarry (defined as the area south of the access point from State Highway One)"
9. **Delete** the letter "A" at the end of the ninth bullet point.

Rules 7.1.3 and 7.1.3A

10. **Delete** existing Rules 7.1.3 and 7.1.3A and **Replace** with the following new Rule 7.1.3 to read:

7.1.3 Quarrying and clean filling on part Lot 1, and part Lot 2 DP 72995, part Lot 4, part Lot 5 and part Lot 6 DP 72996, part Lot 1 DP 34015, part Lot 1 DP 65030 and part Lot 2 DP 91179 Ngauranga Gorge (known as Kiwi Point Quarry) is a Permitted Activity provided that it complies with the following conditions:

7.1.3.1 Any relevant provisions of rules 7.1.1 and 7.1.2 except that rule 7.1.1.6.2 does not apply to the temporary stockpiling or storage of quarried rock material.

7.1.3.2 Dust

7.1.3.2.1 Dust control measures shall be undertaken to avoid creating a dust nuisance beyond the Quarry Boundary.

7.1.3.3 Quarry activities

7.1.3.3.1 Quarry activities shall be restricted to the area within the Suburban Centre Area north of the abattoir and south of the access road, excluding the area shown as a buffer area, as identified on the plan included as Appendix 5.

7.1.3.3.2 Some blasting may be carried out as part of the normal quarrying operations. Blasting of faces for crushed rock production must take place between 10.00am and 2.00pm Monday to Friday only. ~~Other minor blasting and small shots fired for training purposes may be carried out at any time between 9am and 4pm Monday to Friday inclusive.~~

7.1.3.3.3 In all cases, residents of Tarawera Road, Plumer Street, 113, 130, 170 and 175 Fraser Avenue, and 146 Burma Road ~~the following property owners~~ must be notified by mail no less than one week in advance of blasting. ~~faces for crushed rock production, or through an agreed system between the quarry operator and the owners of the properties listed as follows:~~

- ~~9 and 14 Plumer Street, Johnsonville~~
- ~~73, 75, 84, and 86 Tarawera Road, Johnsonville~~
- ~~113, 130, 170 and 175 Fraser Avenue, Johnsonville~~
- ~~146 Burma Road, Johnsonville~~

Blasting must be immediately preceded by a siren or hooter with a sound which distinguishes it from normal Police, Ambulance or Fire Service sirens.

7.1.3.3.4 The ~~maximum finished~~ slope of quarry faces ~~a batter (i.e between benched areas)~~ shall not exceed 55 degrees from the horizontal

7.1.3.3.5 The maximum height of ~~a finished~~ batters shall ~~not exceed~~ ~~be no more than~~ 15 metres.

7.1.3.3.6 A buffer area with a minimum width of 25 metres shall be maintained on the uphill boundary of the site as shown on Appendix 5. This area will be allowed to revegetate naturally except where there is a need for additional planting.

Note: At the north end of the quarry near Plumer Street and Tarawera Road, the buffer area is within the Open Space B Area as shown in Appendix 5 and is governed by the Open Space provisions.

7.1.3.3.7 A fence must be maintained adjacent to any properties in the Residential Area along the quarry boundary to a height of 1.2m.

7.1.3.3.8 Prior to commencement of operations in any area, a security fence must be installed and maintained along the outer edge of the buffer area.

7.1.3.3.9 No quarry activities shall be undertaken within the buffer area unless agreed by Council.

7.1.3.4 Cleanfill activities

7.1.3.4.1 Cleanfill activities shall be restricted to the area shown on the plan included as Appendix 5.

7.1.3.4.2 The cleanfill shall comply with the definition of cleanfill in Section 3 (Definitions) of this District Plan.

7.1.3.5 Location of quarry plant

The primary crusher may be moved as the quarry face recedes and new faces are worked. Any processing plant or buildings within the southern part of the quarry shall be relocatable.

7.1.3.6 Traffic movement

There shall be one entry point to the quarry, via Crossing Place 22 from State Highway One (also the main access to the adjacent Abattoir). This must be the sole means of entry and exit for quarry vehicles. This access must be maintained to the standard of local streets.

7.1.3.7 Rehabilitation and treatment of stripped areas

7.1.3.7.1 All land encompassed within the quarry boundary shall be progressively rehabilitated (except where used for other permitted or consented activities). Any planting will take place as soon as practicable following the completion of the quarry or cleanfill activity. Planting will be undertaken using indigenous species from local sources, except where exotic species are required to provide erosion control and/or temporary nurse cover for revegetation with indigenous species.

~~7.1.3.6.2 When the stripping of vegetation and overburden is undertaken to expose rock, dust control measures shall be undertaken to avoid creating a dust nuisance outside quarry boundaries.~~

7.1.3.7.2 Excluding the Abattoir area, areas shown on Appendix 5 which are not shown as areas for quarrying and/or cleanfilling shall be allowed to revegetate.

7.1.3.7.3 All exposed surfaces of fill shall be hydro-seeded, or any other approved method, immediately following completion of works as a dust and erosion control measure.

Kiwi Point Quarry is an established quarry activity which is being developed in accordance with the plan in Appendix 5. Rock extraction and other activities associated with the quarry, such as processing and aggregate storage, and restoration of the cut faces will continue. The specific rules that apply to the quarry

area limit the effects of quarrying. The Quarry Management Plan will also ensure that any potential effects will be mitigated.

These provisions allow for the ongoing operation of the Kiwi Point Quarry to the extent shown in Appendix 5. As the potential visual and landscape effects of a quarry in this area have been in part mitigated by reducing the extent of hillside to be removed but allowing the quarry to excavate to below the level of the road, cleanfilling of part of the excavated areas, and site rehabilitation is also provided for.

As the long term future of the southern part of the Kiwi Point Quarry(i.e south of the access point on State Highway One) has not been determined, any other type of activity in this area will be a non-complying activity). At present the Council's Open Space strategy in Capital Spaces indicates that open space is a vital component of the future of the Ngauranga Gorge. It is important that any possible policy issues as to future uses of the southern part of the Kiwi Point Quarry once quarrying is completed are resolved by the Council and the community. Because of the long duration of the quarry activity, the plan leaves any decision on the future of the land to a plan review or future plan change.

Rule 7.3.10

11. **Delete** existing Rule 7.3.10 and Replace it with a new Rule 7.3.10 to read:

7.3.10 **Quarrying and cleanfilling activities in Ngauranga Gorge (Kiwi Point Quarry) that do not comply with one or more of the following conditions for Permitted Activities:**

7.3.10.1 **Matters in rules 7.1.3.1**

7.3.10.2 **Quarry activities**

7.3.10.3 **Cleanfill activities**

7.3.10.4 **Location of quarry plant**

7.3.10.5 **Traffic movement**

7.3.10.6 **Rehabilitation and treatment of stripped areas**

are Discretionary Activities (Restricted) in respect of the condition(s) not met.

Non-notification

The written approval of affected persons will not be necessary in respect of rules 7.3.10.1 – 7.3.10.6. Notice of applications need not be served on affected persons and applications need not be notified.

Standards and Terms

The standards and terms which apply in rules 7.3.1 and 7.3.2 shall apply to all applications under 7.3.10.1.

The duration of a consent granted for processing plant or buildings in the southern part under rule 7.3.10 shall not exceed 10 years.

Assessment Criteria

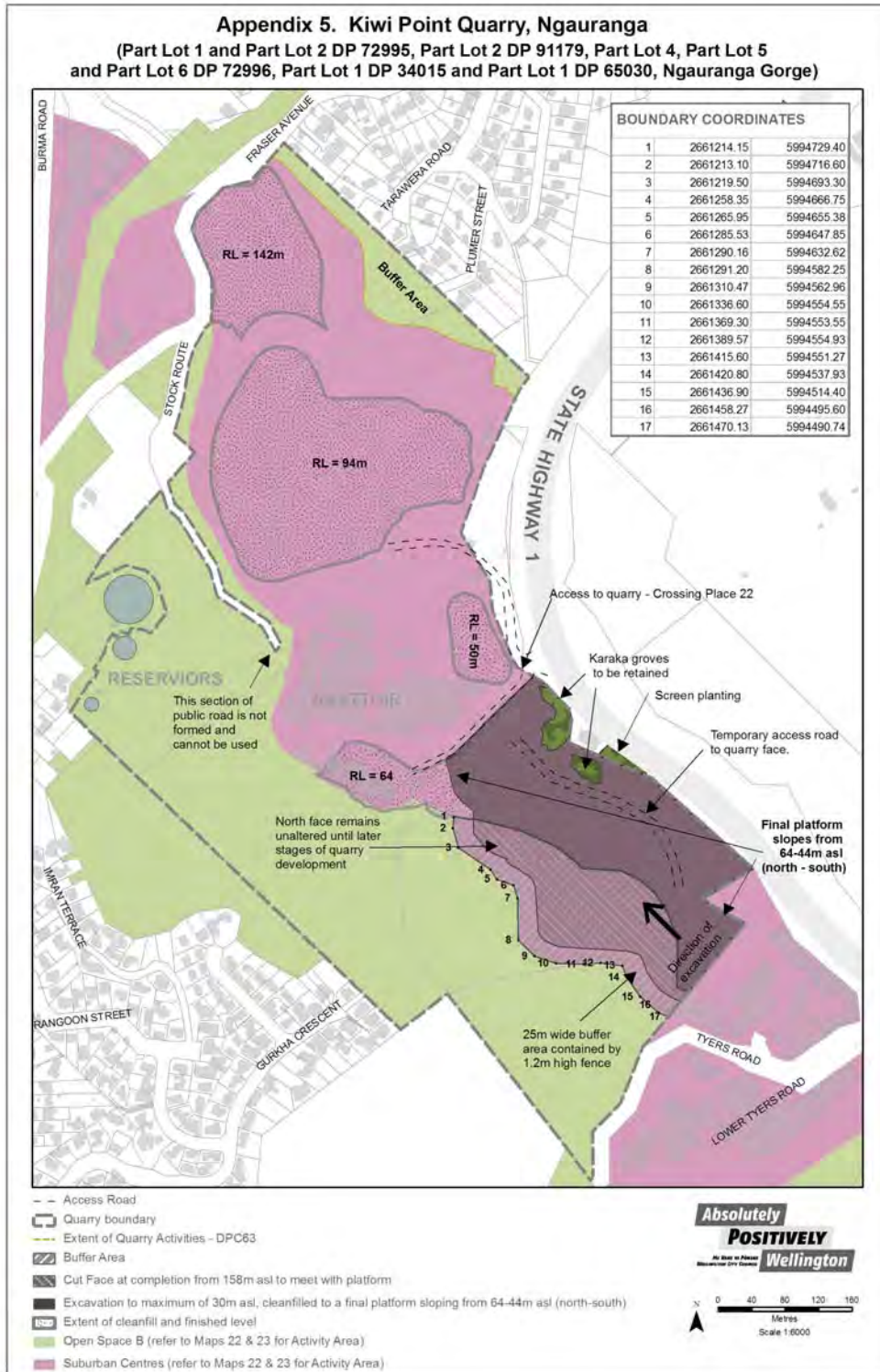
In determining whether to grant consent and what conditions, if any, to impose, Council will have regard to, but not be limited to, the following criteria:

7.3.10.7.1 Whether the activity is necessary to facilitate the effective and efficient use of the quarry.

7.3.10.7.2 The extent to which the proposal will result in adverse visual, amenity or safety and efficiency effects, including those effects on the State Highway, Fraser Avenue, Tyers Road, on nearby existing activities, and on occupants of nearby dwellings.

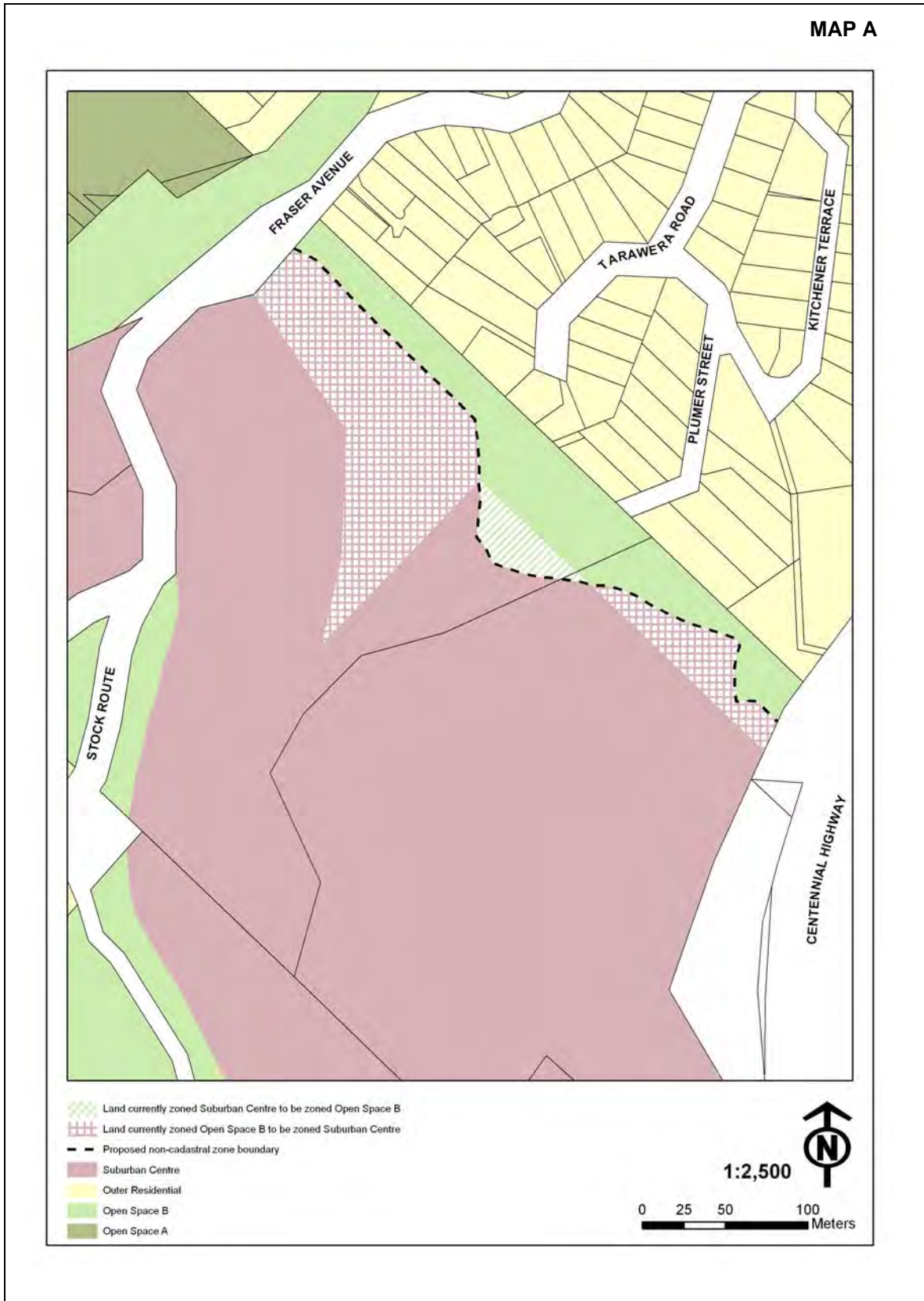
Chapter 7 - Appendix 5 & Appendix 5A

12. **Delete** the existing Appendix 5 and Appendix 5A maps and Replace with new Appendix 5 Map as shown below:



C. ALTERATIONS TO VOLUME THREE, MAPS

13. Provide for the **part rezoning** of sites shown on 'Map A' below:



**ANNOTATED CHAPTERS OF THE OPERATIVE DISTRICT PLAN
INCLUDING PROPOSED DISTRICT PLAN CHANGE
PROVISIONS**

Note: This annotated version does not form part of the plan change, and is included for information purposes to show the plan change proposal in context.

*Proposed **additions** to text are shown as underlined (abcdefghijkl) and proposed **deletions** are shown as struck through (~~abcdefghijkl~~).*

Includes the recommendations to Council. Text to be added is highlighted (abcdefghijkl). Text to be deleted is highlighted and struck through (~~abcdefghijkl~~).

6. SUBURBAN CENTRES

6.1 Introduction

The Suburban Centre provisions in the District Plan cover the more significant retail and industrial centres in the suburban areas of Wellington City. The Shelly Bay site which was a former military base is also included. These important areas provide a base for a wide range of economic activity essential for the City's growth and development. Note: The extent of the Shelly Bay Suburban Centre area is mapped in Appendix 6 to Chapter 7 for information purposes.

These centres have developed historically, many from the early days of colonial settlement, as either local shopping/service centres or industrial areas. Most of the industrial areas developed along with the major port, railway or airport functions in the City. Others were originally the location of particular industries such as quarries, abattoirs or gas works.

In more recent times the distinction between established retail and industrial centres has diminished markedly. Market forces have changed the focus of most industrial areas from purely industrial to mixed retail, service and industrial centres. Retailing in these centres is directed generally to the sale of heavy or bulky goods from drive-in locations.

The nature of retail centres has also changed, with the development of supermarkets and similar operations requiring extensive parking areas. Distinctions between retail and industrial uses within predominantly retail centres have also declined with the general commercialisation of industrial properties.

The District Plan recognises these changing patterns in Suburban Centres by enabling most activities (with limited exceptions) to be Permitted Activities. This will provide flexibility for centres to respond to changing market situations.

Council intends to promote the development of existing retail centres through its retail strategy and related initiatives. In this way the primary retail focus of these centres for their surrounding suburban communities should be retained.

To avoid, remedy or mitigate the adverse impacts on Residential Areas, the Plan provides for the general containment of Suburban Centres. Any expansion beyond the identified Suburban Centre boundaries requires a plan change. This will enable a full assessment of any environmental effects.

In addition, performance standards have been imposed on Suburban Centre activities to avoid, remedy or mitigate the impact of development on Residential Areas. More stringent standards apply in the interface between Suburban Centres and Residential Areas so that residents will have added protection. Maintaining the character, appearance and environment in and around Suburban Centres is an important objective of the Plan.

Specific provision is also made in the Plan for Suburban Centres which have special characteristics. Building development in the Newtown Centre has a predominantly nineteenth-century character, and this character will be maintained and enhanced through the use of design guidelines.

The Suburban Centres at Greta Point and Shelly Bay are special in that they abut the coastline. Additional provisions have been included at Greta Point to encourage opportunities for public access to the water's edge. At Shelly Bay design guidelines apply to promote new development generally in accordance with the quality and character of the area and that respects the special coastal location. The Shelly Bay provisions are in accordance with decisions of the Environment Court (refer Minister of Defence v Wellington City Council W66/99 and W85/99).

Council is particularly concerned to raise the general standards of design in Suburban Centres, and intends to promote urban design initiatives and further District Plan measures to achieve this end.

~~Kiwi Point Quarry and the Kiwi Point Quarry Extension Area are also included within Suburban Centres. Both areas are subject to specific rules as well as to other relevant rules applying elsewhere in Suburban Centres to mitigate adverse effects. This provision recognises both the existing quarry and its economic importance to the City and wider region, and the future importance of the extension area, which will be commenced within the life of this District Plan. As the long term future of the Kiwi Point Quarry Extension Area following completion of quarrying has not yet been determined, the provisions of this Plan require that any use of this area other than quarrying will require consent as a non-complying activity. It is expected that the long term future of this area will be addressed during a subsequent plan review or by a Plan Change in association with the City's open space strategy at that time.~~

The Kiwi Point Quarry is also included within Suburban Centres. The quarry is subject to specific rules as well as to other relevant rules applying elsewhere in Suburban Centres to mitigate adverse effects. The provisions recognise the quarry's economic importance to the City and wider region. As the long term future of the southern part of the Kiwi Point Quarry (being the area south of the access point off State Highway One) has not yet been determined, the provisions of this Plan require that any use of this area other than quarrying and cleanfilling will require consent as a non-complying activity. It is expected that the long term future of this area will be addressed during a subsequent plan review or by a Plan Change in association with the City's open space strategy at that time.

...

6.2 Suburban Centre Objectives and Policies

OBJECTIVE

- 6.2.1 To promote the efficient use and development of natural and physical resources within Suburban Centre areas.**

POLICIES

To achieve this objective, Council will:

- 6.2.1.1 Generally contain existing Suburban Centres within defined boundaries.**

METHOD

- Rules

Most Wellington Suburban Centres have existed for a long time and already contain the development and infrastructure necessary to fulfil their function as service, employment and social centres.

The majority of centres are also appropriately located on or near main arterial routes and are well situated to service their surrounding communities.

To permit their continued functioning and development with a minimum of regulation, Suburban Centres have been identified in the Plan.

Suburban Centres will also be contained to protect established residential neighbourhoods from the effects of non-residential encroachments. Future expansion of Suburban Centres is not prohibited, but extensions may be considered as a Plan Change so that a full assessment may be made of environmental effects.

The establishment of new Suburban Centres also requires a Plan Change. Council is particularly concerned to ensure that any new centres are suitably located and that surrounding Residential Areas are protected.

The environmental results will be the maintenance of Suburban Centres which provide for the servicing of local communities and help protect Residential Areas from adverse environmental effects.

- 6.2.1.2 Encourage a wide range of activities by allowing most uses or activities within a Suburban Centre provided that the conditions specified in the Plan are satisfied.**

METHOD

- Rules

A wide range of uses are permitted within Suburban Centres, as Council does not wish to direct activity through regulatory means. Where Council wishes to encourage activities such as retailing in particular locations, this will be promoted through strategic planning, urban design or related initiatives.

This flexible approach to the location of land use and activities is intended to enable owners or developers to respond swiftly and easily to meet market needs or other economic or technological changes. Performance standards are applied to ensure that activities have minimal unwanted side effects.

Activities under the Third Schedule of the Health Act are not permitted to be established in the Suburban Centres because of their offensive or noxious nature.

Within the Suburban Centre areas adjoining Wellington International Airport there is a need to recognise the potential effects of airport noise on new residential development and conversely, the potential constraints which new residential development have on the airport. The discretionary (unrestricted) rule relating to residential development in Suburban Centres near the airport (being the land inside the airnoise boundary depicted on Map 35) reflects these issues. Reference will also be made to the objectives and policies in Chapter 10 of this Plan when considering resource consent applications for residential development within that area.

Helicopter landing areas are included as Discretionary Activities (Unrestricted) to ensure that adverse noise effects and public safety issues can be addressed.

~~*Specific rules apply to Kiwi Point Quarry and the Kiwi Point Quarry Extension area. These rules allow for quarrying and related activities, which are not otherwise provided for in the City, subject to specific rules. For the Kiwi Point Quarry Extension Area, the rules restrict alternative future uses. As the area has a long life as a quarry, future uses will be evaluated at a later date as part of a plan review or by a Plan Change.*~~

Specific rules apply to the Kiwi Point Quarry. These rules allow for quarrying and related activities, which are not otherwise provided for in the City, subject to specific rules. For the southern part of the Kiwi Point Quarry (being the area south of the access point from State Highway One), the rules restrict alternative future uses. As the area has a long life as a quarry, future uses will be evaluated at a later date as part of a plan review or by a Plan Change.

The environmental results will be the development of Suburban Centres to provide the services, facilities and employment opportunities that the community wants without harming the surrounding environment.

...

NOTE – for the sake of this plan change, existing Policy 6.2.3.3A is to be deleted and replaced with the new Policy 6.2.3.3A outlined below.

OBJECTIVE

6.2.3 To maintain and enhance the physical character, townscape and streetscape of Suburban Centres.

POLICIES

To achieve this objective, Council will:

6.2.3.1 Maintain and enhance the streetscape by controlling the siting and design of structures on or over roads, and through continuing programmes of street improvements.

METHODS

- Rules
- Operational activities (Urban Design Strategies)

The appearance of buildings on or over streets, and of the streets themselves, has a significant bearing on the visual quality of Suburban Centres. Council intends to improve the quality of Suburban Centre streetscapes. Council, through its Urban Design Unit, will work to improve the quality of Suburban Centre environments by implementing urban design strategies for streetscapes that will include some Suburban Centres. This will coordinate Council action.

Council also undertakes a wide range of works which improve the City's streetscape. Priority has been given to enhancing areas with high pedestrian counts. This focus will continue.

Where building in the air space above roads is proposed, particular consideration will be given to the impact on the streetscape. Such development is controlled and carefully assessed.

The environmental result will be improvement of the quality of Suburban Centre streetscapes.

- 6.2.3.2 Maintain the particular nineteenth-century character of the main commercial centres of Newtown and Tinakori Road in Thorndon by requiring that all new building work, alterations and additions to existing buildings are assessed against Design Guides.**

METHODS

- Rules
- Design Guides (Newtown, Thorndon)

The shopping areas of Newtown and Tinakori Road in Thorndon have a nineteenth-century character which Council seeks to protect and enhance. The Newtown Suburban Centre Design Guide and the Thorndon Design Guide identify major elements that characterise the existing commercial developments. It is Council's desire to see that these elements are reflected when development is undertaken. New buildings will not have to duplicate nineteenth-century building forms.

The environmental result will be the maintenance and enhancement of the character of the Newtown and Tinakori Road shopping centres.

- 6.2.3.3 Ensure that any new development at Shelly Bay generally reflects the quality and character of the area and has regard to the site's special coastal location.**

METHODS

- Rules
- Design Guide (Shelly Bay)

Shelly Bay is a special Suburban Centre site covering the former military base. Development on the site is characterised by a collection of individual buildings of one or two storeys above ground level. It is council's intention that new building development at Shelly Bay should reflect the character of established development on both sides of the main road through the site, and provide for a pedestrian promenade along the water's edge.

The environmental result will be the development of Shelly Bay in a manner that reflects the sensitive nature of the site between the sea and the open space of the Miramar headland.

6.2.3.3A Provide for the development and site rehabilitation of the Kiwi Point Quarry to the extent specified in the Plan in a way that avoids, mitigates or remedies adverse effects.

METHODS

- Rules (including Appendices showing the extent of quarry areas)
- A quarry management plan

Kiwi Point Quarry is an established quarry, involving ongoing extraction, processing, cleanfilling and rehabilitation. As the continuing availability of aggregate and other quarry materials is economically important for the City and wider region, the Plan makes specific provision for the ongoing use and development of the quarry. For both the older and newer areas of the quarry, specific rules and a development plan are incorporated. These provisions provide for the avoidance or mitigation of adverse effects from the quarry activity and the long-term mitigation of effects on landscape and landform following quarrying. It is the Council's intention that cut faces should be designed to yield a relatively natural landform in the long term and that rehabilitation of cut faces should begin as early as practicable. The staging of quarry development, and the day to day management of quarry activities are further detailed and controlled through the application of a quarry management plan.

A quarry management plan shall be prepared and regularly updated, which sets out:

- intended staging of the excavation and cleanfilling activities
- the means of management of surface and groundwater
- management of on-site traffic
- provision for any onsite processing and temporary storage of quarry material
- any specific provisions relating to onsite management of noise, dust, vibration, visual impact, water quality
- a procedure for addressing any complaints
- objectives and principles for the rehabilitation of the site, including:
 - a timetable for the rehabilitation of prominent quarry faces
 - measures to create soil conditions which will support plant growth
 - measures to create a variety of site conditions to support a range of species
 - means of controlling runoff to avoid erosion
 - means of control of plant and animal pests
 - measures to avoid fire risks
 - means to assist native vegetation to regenerate on grazing land
 - rehabilitation which is compatible with Open Space strategy for adjacent areas of land
- management of buffer areas
- practices and methods that will be adopted to ensure that all permitted activity conditions applying to the activities will be met.

The quarry management plan will complement the other rules applying to the quarry activity and will provide additional management details. It will be reviewed at least every five years and any necessary adjustments will be made.

As progressive rehabilitation of the area is an important aspect of quarry management, the Quarry Management Plan includes rehabilitation provisions. As quarrying and cleanfilling activities are completed on the site, an implementation plan shall be prepared annually in accordance with the Quarry Management Plan.

The requirement that regular monitoring is undertaken and regular progress reports are completed and submitted to the Council is a key element. This requirement is included because successful rehabilitation of any disturbed area requires constant monitoring as site conditions vary considerably and evolve over time. Regular observation and recording of results is an essential part of managing the process.

A vegetated buffer area is included within the Suburban Centres Area as part of the development of the southern part of the quarry. At the northern end, the necessary buffer area is within the Open Space B Area.

It is important also that rehabilitation of the quarry area should recognise and in the longer term be able to be integrated as appropriate with the Open Space strategy developed by the Council for adjacent areas of land. Current Council policy is for the creation of further Green Belt areas on the steep hill sides of the Ngauranga Gorge and, for instance, it may be possible to allow continuation or linking of proposed walkways.

Overall, the environmental result will be the availability of quarry materials for the City and wider region in the short and medium term, and long-term achievement of well-vegetated quarry faces with the appearance of natural landforms which will be integrated with Council development of Open Space areas in this vicinity.

...

Chapter 7. Suburban Centre Rules

Guide to Rules

NOTE: The following table is intended as a guide only and does not form part of the District Plan. Refer to specified rules for detailed requirements.

P refers to Permitted Activities, C to Controlled Activities, DR to Discretionary Activities (Restricted) and DU to Discretionary Activities (Unrestricted).

Uses/Activities	Rule	P	C	DR	DU
Any activity (with some exceptions) subject to conditions	7.1.1	●			
Activities not complying with conditions	7.3.1			●	
Any activity or building involving the provision of more than 120 parking spaces	7.3.4			●	
Quarrying and cleanfilling - Kiwi Point Quarry or Kiwi Point Quarry Extension Area (Ngauranga Gorge) subject to conditions	7.1.3	●			
Quarrying and cleanfilling - Kiwi Point Quarry or Kiwi Point Quarry Extension Area (Ngauranga Gorge) not complying with conditions	7.3.10			●	
Critical facilities in a Hazard Area	7.3.6			●	
Any use of a contaminated site	7.4.3				●
Any activity listed in Section 3.5.2.2 (hazardous substances)	7.2.4		●		
Earthworks Tawa Hazard (Flooding) Area	7.2.5		●		
Earthworks Tawa Hazard (Flooding) Area	7.3.7			●	
Earthworks Takapu Hazard (Flooding) Area	7.3.8			●	
Earthworks Takapu Hazard (Flooding) Tawa Hazard (Flooding) Area	7.4.7				●
Helicopter landing areas	7.4.6				●
Buildings	Rule	P	C	DR	DU
Construction of, alteration of and addition to buildings and structures subject to conditions	7.1.2	●			
Construction of three or more residential dwellings at ground level	7.3.5			●	
Construction of new residential buildings within the airnoise boundary	7.4.4				●
Construction of, alteration of and addition to buildings and structures in the Thorndon Character Area or the Newtown Suburban Centre Character Area	7.2.1		●		
Construction, alteration of, and addition to buildings, including accessory buildings in the Tawa Hazard (Flooding) Area	7.2.5		●		
Construction, alteration of, and addition to buildings, including accessory buildings in the Tawa Hazard (Flooding) Area	7.3.7			●	
Construction, alteration of, and addition to buildings, including accessory buildings in the Takapua Hazard (Flooding) Area	7.3.8			●	
Construction, alteration and addition to buildings or structures in the Hazard (Fault Line) Area	7.3.9			●	
Construction, alteration of, and addition to buildings, including accessory buildings, less than 5 metres from Porirua Stream within the Tawa Hazard (Flooding) Area, and the Takapua Stream within the Takapua Hazard (Flooding) Area	7.4.7				●
Construction, alteration of and addition to buildings and structures not complying with conditions or standards and terms	7.3.2			●	

Pedestrian bridges, buildings and structures over roads	7.4.1				●
Demolition or removal of pre-1930s buildings in the Thorndon Character Area	7.4.2				●
Construction of, alteration of, and addition to buildings and structures in the Shelly Bay Suburban Centre subject to conditions	7.2.2		●		
Construction of, alteration of, and addition to buildings and structures in the Shelly Bay Suburban Centre that do not meet conditions	7.3.3			●	
Section 1.01 Subdivision	Rule	P	C	DR	DU
Subdivision except for company lease, cross lease and unit title subdivision, subject to conditions	7.1.4	●			
Company lease, cross lease and unit title subdivision	7.2.3		●		
Subdivision not being Permitted or Controlled Activities	7.4.5				●
Section 1.02 Heritage	Rule	P	C	DR	DU
Activities affecting heritage items	21.0	●	●		●
Section 1.03 Utilities	Rule	P	C	DR	DU
Utilities	23.0	●	●	●	●

Schedule of Appendices

Number	Appendix
1	Noise
2	Vehicle Parking Standards
3	Loading Standards
4	Site Access for Vehicles
5	Kiwi Point Quarry (Ngauranga Gorge)
5A	Kiwi Point Quarry Extension Area (Ngauranga Gorge)
6	Shelley Bay Suburban Centre – Boundary Location
7	The Area in Grenada situated between the Northern (Mid Grenada) Landfill and the Motorway (Lincolnshire Farm)

7. SUBURBAN CENTRE RULES

7.1 Permitted Activities

The following activities are permitted in the Suburban Centres provided that they comply with any specified conditions and the payment of any financial contribution (refer to rule 3.4):

7.1.1 Any activity, except for:

- those specified as **Controlled Activities, Discretionary Activities (Restricted) or Discretionary Activities (Unrestricted)**
- **new residential activities, within the airnoise boundary depicted on Map 35 (refer to rule 7.4.4)**
- **those activities listed under the Third Schedule to the Health Act 1956**
- **helicopter landing areas**
- **the total or partial demolition, destruction or removal of any building constructed prior to 1930 in the Thorndon Character Area**
- **cleanfills greater than 100m³ [, except as provided for in rule 7.1.3, ~~A in part of the Kiwi Point Extension Quarry~~ Area in Ngauranga Gorge.]**
- **landfills**
- **[quarrying, other than that provided for in Ngauranga Gorge under rules 7.1.3 and ~~7.1.3A.~~**
- **any activity in the ~~area defined as the Kiwi Point Quarry Extension Area~~ southern part of the Kiwi Point Quarry (defined as the area south of the access point from State Highway One) in Ngauranga Gorge, other than that provided for in rule 7.1.3A.]**

Refer to District Plan Maps 17 and 18

is a Permitted Activity provided that it complies with the following conditions:

...

NOTE – for the sake of this plan change, existing Rules 7.1.3 and 7.1.3A are to be deleted and replaced with the following Rule 7.1.3

7.1.3 Quarrying and clean filling on part Lot 1, and part Lot 2 DP 72995, part Lot 4, part Lot 5 and part Lot 6 DP 72996, part Lot 1 DP 34015, part Lot 1 DP 65030 and part Lot 2 DP 91179 Ngauranga Gorge (known as Kiwi Point Quarry) is a Permitted Activity provided that it complies with the following conditions:

7.1.3.1 Any relevant provisions of rules 7.1.1 and 7.1.2 except that rule 7.1.1.6.2 does not apply to the temporary stockpiling or storage of quarried rock material.

7.1.3.2 Dust

7.1.3.2.1 Dust control measures shall be undertaken to avoid creating a dust nuisance beyond the Quarry Boundary.

7.1.3.3 Quarry activities

7.1.3.3.1 Quarry activities shall be restricted to the area within the Suburban Centre Area north of the abattoir and south of the access road, excluding the area shown as a buffer area, as identified on the plan included as Appendix 5.

7.1.3.3.2 Some blasting may be carried out as part of the normal quarrying operations. Blasting of faces for crushed rock production must take place between 10.00am and 2.00pm Monday to Friday only. ~~Other minor blasting and small shots fired for training purposes may be carried out at any time between 9am and 4pm Monday to Friday inclusive.~~

7.1.3.3.3 In all cases, residents of Tarawera Road, Plumer Street, 113, 130, 170 and 175 Fraser Avenue, and 146 Burma Road ~~the following property owners~~ must be notified by mail no less than one week in advance of blasting. ~~faces for crushed rock production, or through an agreed system between the quarry operator and the owners of the properties listed as follows:~~

- ~~9 and 14 Plumer Street, Johnsonville~~
- ~~73, 75, 84, and 86 Tarawera Road, Johnsonville~~
- ~~113, 130, 170 and 175 Fraser Avenue, Johnsonville~~
- ~~146 Burma Road, Johnsonville~~

Blasting must be immediately preceded by a siren or hooter with a sound which distinguishes it from normal Police, Ambulance or Fire Service sirens.

7.1.3.3.4 The ~~maximum~~ finished slope of quarry faces ~~a batter (i.e between benched areas)~~ shall not exceed 55 degrees from the horizontal

7.1.3.3.5 The maximum height of ~~a finished~~ batters shall ~~not exceed~~ ~~be no more than~~ 15 metres.

7.1.3.3.6 A buffer area with a minimum width of 25 metres shall be maintained on the uphill boundary of the site as shown on Appendix 5. This area will be allowed to revegetate naturally except where there is a need for additional planting.

Note: At the north end of the quarry near Plumer Street and Tarawera Road, the buffer area is within the Open Space B Area as shown in Appendix 5 and is governed by the Open Space provisions.

7.1.3.3.7 A fence must be maintained adjacent to any properties in the Residential Area along the quarry boundary to a height of 1.2m.

7.1.3.3.8 Prior to commencement of operations in any area, a security fence must be installed and maintained along the outer edge of the buffer area.

7.1.3.3.9 No quarry activities shall be undertaken within the buffer area unless agreed by Council.

7.1.3.4 Cleanfill activities

7.1.3.4.1 Cleanfill activities shall be restricted to the area shown on the plan included as Appendix 5.

7.1.3.4.2 The cleanfill shall comply with the definition of cleanfill in Section 3 (Definitions) of this District Plan.

7.1.3.5 Location of quarry plant

The primary crusher may be moved as the quarry face recedes and new faces are worked. Any processing plant or buildings within the southern part of the quarry shall be relocatable.

7.1.3.6 Traffic movement

There shall be one entry point to the quarry, via Crossing Place 22 from State Highway One (also the main access to the adjacent Abattoir). This must be the sole means of entry and exit for quarry vehicles. This access must be maintained to the standard of local streets.

7.1.3.7 Rehabilitation and treatment of stripped areas

7.1.3.7.1 All land encompassed within the quarry boundary shall be progressively rehabilitated (except where used for other permitted or consented activities). Any planting will take place as soon as practicable following the completion of the quarry or cleanfill activity. Planting will be undertaken using indigenous species from local sources, except where exotic species are required to provide erosion control and/or temporary nurse cover for revegetation with indigenous species.

7.1.3.6.2 When the stripping of vegetation and overburden is undertaken to expose rock, dust control measures shall be undertaken to avoid creating a dust nuisance outside quarry boundaries.

7.1.3.7.2 Excluding the Abattoir area, areas shown on Appendix 5 which are not shown as areas for quarrying and/or cleanfilling shall be allowed to revegetate.

7.1.3.7.3 All exposed surfaces of fill shall be hydro-seeded, or any other approved method, immediately following completion of works as a dust and erosion control measure.

Kiwi Point Quarry is an established quarry activity which is being developed in accordance with the plan in Appendix 5. Rock extraction and other activities associated with the quarry, such as processing and aggregate storage, and restoration of the cut faces will continue. The specific rules that apply to the quarry area limit the effects of quarrying. The Quarry Management Plan will also ensure that any potential effects will be mitigated.

These provisions allow for the ongoing operation of the Kiwi Point Quarry to the extent shown in Appendix 5. As the potential visual and landscape effects of a quarry in this area have been in part mitigated by reducing the extent of hillside to be removed but allowing the quarry to excavate to below the level of the road, cleanfilling of part of the excavated areas, and site rehabilitation is also provided for.

As the long term future of the southern part of the Kiwi Point Quarry (i.e south of the access point on State Highway One) has not been determined, any other type of activity in this area will be a non-complying activity. At present the Council's open space strategy in Capital Spaces indicates that Open Space is a vital component of the future of the Ngauranga Gorge. It is important that any possible policy issues as to future uses of the southern part of the Kiwi Point Quarry once quarrying is completed are resolved by the Council and the community. Because of the long duration of the quarry activity, the plan leaves any decision on the future of the land to a plan review or future plan change.

...

NOTE – for the sake of this plan change, existing Rule 7.3.10 is to be deleted and replaced with the following Rule 7.3.10

7.3 Discretionary Activities (Restricted)

Section 7.3 describes which activities are Discretionary Activities (Restricted) in Suburban Centres. Consent may be refused or granted subject to conditions. Grounds for refusal and conditions will be restricted to the matters specified in rules 7.3.1 – 7.3.[10.]¹ The decision on whether or not a resource consent application will be notified will be made in accordance with the provisions on notification in the Act.

...

7.3.10 Quarrying and cleanfilling activities in Ngauranga Gorge (Kiwi Point Quarry) that do not comply with one or more of the following conditions for Permitted Activities:

7.3.10.1 Matters in rules 7.1.3.1

7.3.10.2 Quarry activities

7.3.10.3 Cleanfill activities

7.3.10.4 Location of quarry plant

7.3.10.5 Traffic movement

7.3.10.6 Rehabilitation and treatment of stripped areas

are Discretionary Activities (Restricted) in respect of the condition(s) not met.

Non-notification

The written approval of affected persons will not be necessary in respect of rules 7.3.10.1 – 7.3.10.6. Notice of applications need not be served on affected persons and applications need not be notified.

Standards and Terms

The standards and terms which apply in rules 7.3.1 and 7.3.2 shall apply to all applications under 7.3.10.1.

The duration of a consent granted for processing plant or buildings in the southern part under rule 7.3.10 shall not exceed 10 years.

Assessment Criteria

In determining whether to grant consent and what conditions, if any, to impose, Council will have regard to, but not be limited to, the following criteria:

7.3.10.7.1 Whether the activity is necessary to facilitate the effective and efficient use of the quarry.

7.3.10.7.2 The extent to which the proposal will result in adverse visual, amenity or safety and efficiency effects, including those effects on the State Highway, Fraser Avenue, Tyers Road, on nearby existing activities, and on occupants of nearby dwellings.

...

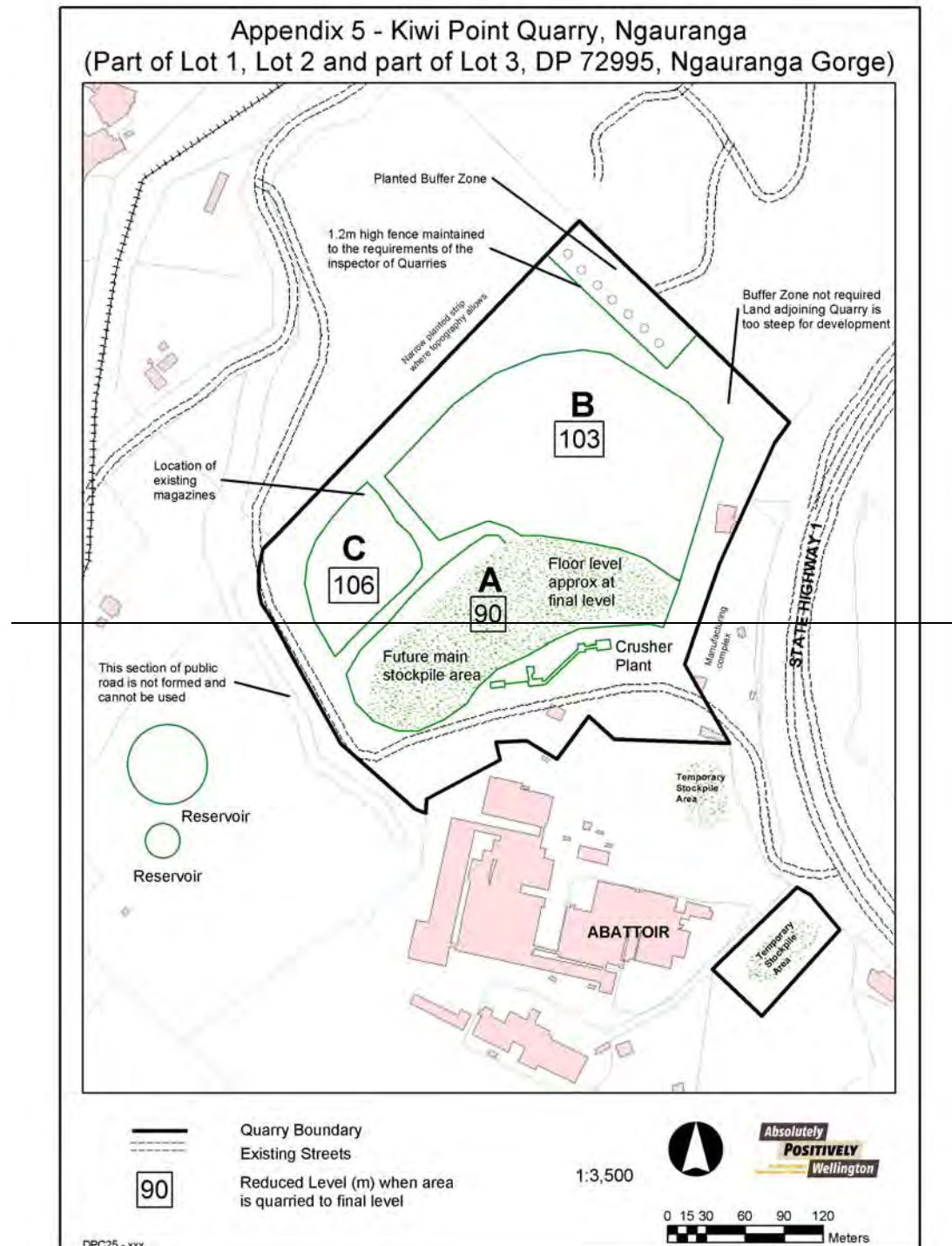
7.5 Non-Complying Activities

Activities that contravene a rule in the Plan, and which have not been provided for as Discretionary Activities (Restricted) or Discretionary Activities (Unrestricted) are Non-Complying Activities. Resource consents will be assessed in terms of section 105(2A)(b) of the Resource Management Act.

The decision on whether or not a resource consent application will be notified will be made in accordance with the provisions on notification in the Act.

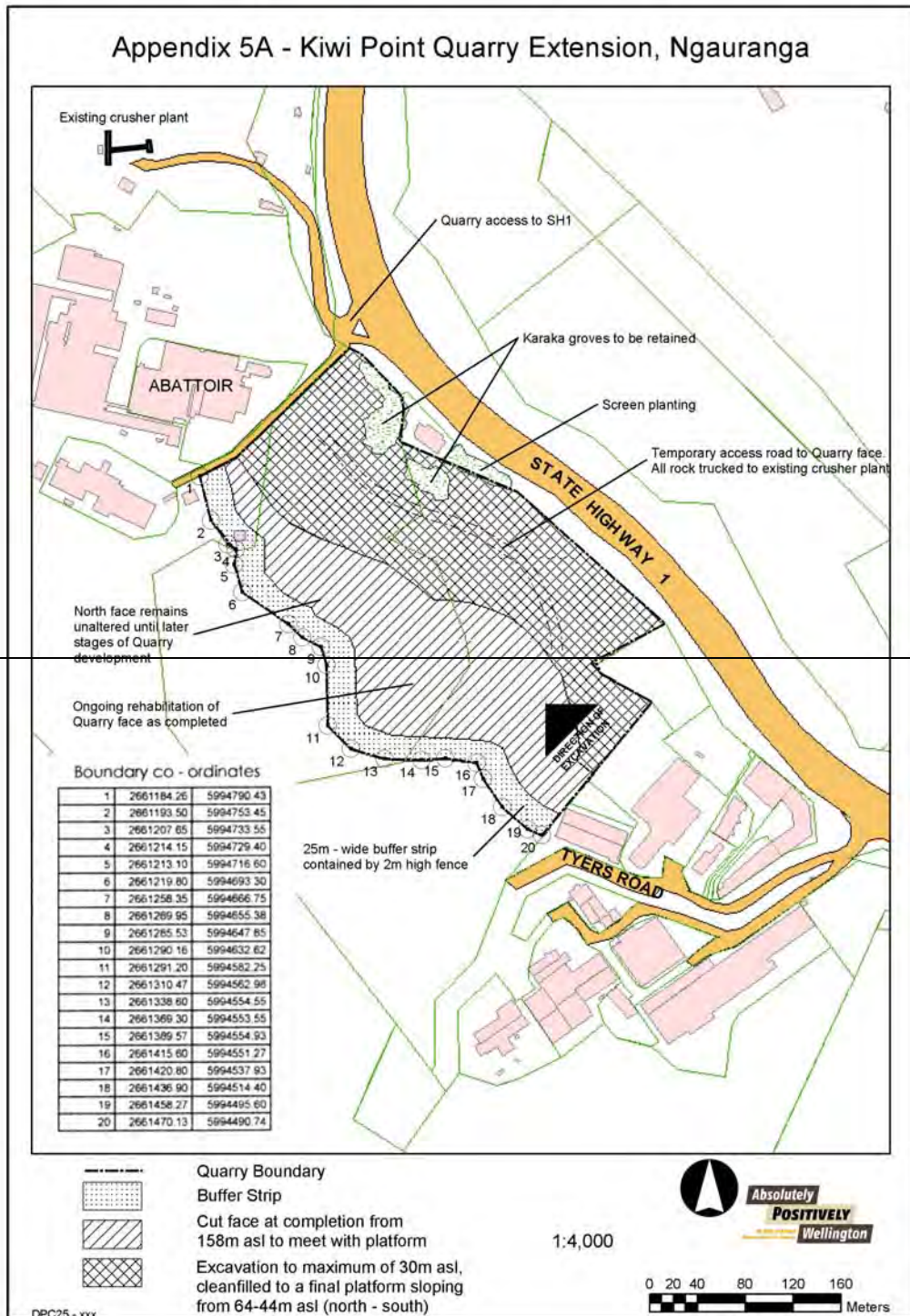
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Appendix 5. ~~Kiwi Point Quarry (Part of Lot 1, Lot 2 and part of Lot 3, DP 72995, Ngauranga Gorge)~~

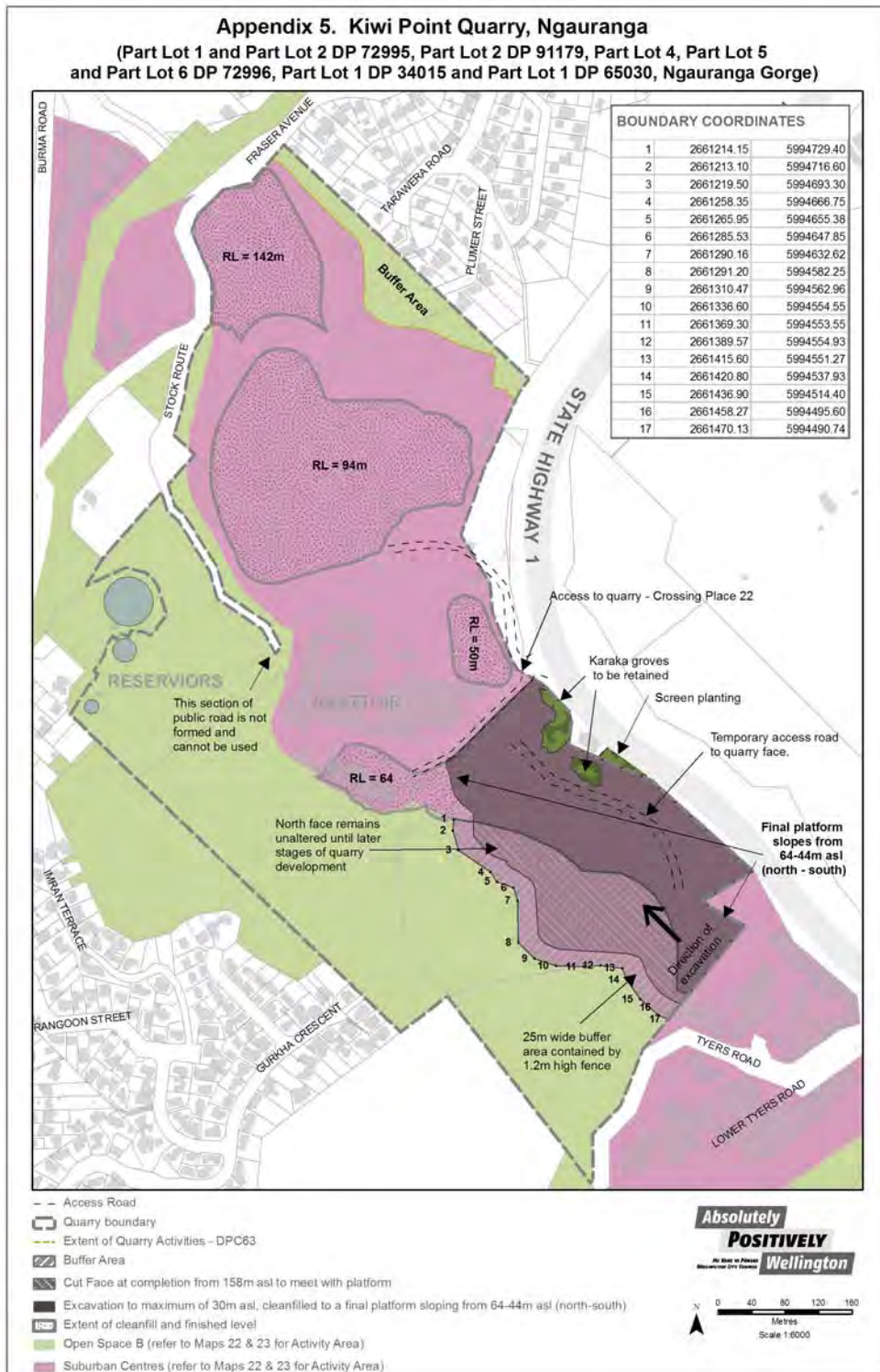


Map amended by District Plan Change No.25 – Kiwi Point Quarry Extension, Ngauranga Gorge (Operative 6 July 2006)

Appendix 5A. Kiwi Point Quarry Extension Area



Appendix 5. Kiwi Point Quarry



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APPENDIX 2 QUARRY MANAGEMENT PLAN MARCH 2006 ERROR! BOOKMARK NOT DEFINED.

APPENDIX 3 HEALTH AND SAFETY IN EMPLOYMENT (MINING ADMINISTRATION) REGULATIONS 1996 ERROR! BOOKMARK NOT DEFINED.

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APPENDIX 5 NORTH FACE STAGING PLANS ERROR! BOOKMARK NOT DEFINED.

APPENDIX 6 SOUTH FACING STAGING PLANS ERROR! BOOKMARK NOT DEFINED.

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APPENDIX 8 COMPLAINTS FORM QF 7.3 ERROR! BOOKMARK NOT DEFINED.

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APPENDICES

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- APPENDIX 2 QUARRY MANAGEMENT PLAN MARCH 2006**
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- APPENDIX 9 STORMWATER MANAGEMENT PLAN**

EXECUTIVE SUMMARY

Wellington City Council's Kiwi Point Quarry (KPQ or Quarry) is a strategic Council asset and operates as a permitted activity under the Suburban Centre provisions of the Wellington District Plan with its core business being supplying a key infrastructural resource to the City and Region. The Quarry is located in the Ngauranga Gorge, adjacent to State Highway 1. The site is within an industrial area, which is located at the bottom of a basin surrounded by high ridges.

In December 2004, the Council approved a District Plan Change (Plan Change 25) for the expansion of the Quarry into a previously quarried area to the south of the original Quarry operation. A further plan change in December 2008 (Plan Change 64) has consolidated the provisions for the Quarry area as a whole and brings the whole of the Quarry operation under a single regime in the District Plan.

The Plan Changes ensure the Council and the City has continued access to a quality Quarry rock resource. Included in the Plan Changes are strict conditions to ensure adverse effects will be avoided, remedied or mitigated and sets out the requirements for a Quarry Management Plan (QMP) (this document) and how the site is to be progressively re-habilitated as quarrying operations proceed.

The Quarry currently produces around 350,000 tonnes, with production expected to increase to 500,000 tonnes per year over the term of this plan, of crushed greywacke comprising a full range of products from low grade to high quality sealing and asphalt aggregates for the Wellington roading and infrastructure market.

From 1997 to 2006, the Quarry operated under Council management through the Quarry Business Unit (QBU). Under Council management the Quarry achieved a high level of performance on matters such as health and safety, community relations, resident satisfaction, and environmental performance.

Since 2006 the Quarry has been operated by an independent contractor under a long term Quarry Development Services Contract.

The Quarry resource available at current extraction rates is estimated to provide for a further 50 years plus.

This document has been prepared in accordance with the requirements of the Wellington City District Plan.

This version of the plan is to be effective as from 01 July 2009 and supersedes all earlier versions.

1. INTRODUCTION

1.1 KIWI POINT QUARRY

The Kiwi Point Quarry (KPQ) operates as a permitted activity under the Suburban Centre provisions in the Wellington District Plan and is one of the City and region's key resources for development. Rock material from quarries is essential to providing and maintaining housing, building and infrastructure.

In December 2004 the Council approved a District Plan Change (Plan Change 25) to extend the Quarry into a formerly-worked area in Ngauranga Gorge to the south of the present Quarry. The development of this area is expected to provide a supply of rock material and aggregates for a further 50 years.

As part of the Plan Change 25 process, considerable investigations into all aspects of the future development of KPQ were undertaken so that the Council and community could be assured that the Quarry activity could be extended into the new area proposed without significant adverse effects. The Quarry extension area is to be used for the extraction of the rock resource, the temporary storage of material prior to transport to the crushing, screening and sale areas, and in the longer term for a temporary clean filling activity to restore the more deeply excavated areas back to a development level. A Quarry Management Plan (QMP) was identified as necessary as part of this process.

In December 2008, the Council undertook another plan change, Plan Change 64, to consolidate the provisions of the District Plan so that the whole of the quarry operated under one set of rules. Further modification of the quarry boundaries and rezoning of land allowed for the facilitation of the ongoing quarry operation. This QMP update reflects the amended provisions of the District Plan and has been prepared as part of the Plan Change 64 process.

This version of the QMP is to be effective as from 01 July 2009, and supersedes all earlier QMP versions from that date.

1.2 SITE LOCATION

KPQ is located in the Ngauranga Gorge to the west of State Highway One, prior to the Newlands off-ramp at or about map reference NZMS 260: R27; 611.952. Figure 1 shows the general location of KPQ.

1.3 LEGAL DESCRIPTION

The legal descriptions of the land are Lot 1, and Lot 2 DP 72995, Lot 2 DP 91179, Lot 4, Lot 5 and Lot 6 DP72996, Lot 1 DP34015 and Sec1 SO36728 Ngauranga Gorge. Wellington City Council owns the Quarry land as well as surrounding land occupied by Taylor Preston Limited, Allied Concrete and Downer EDI Works. Please refer to Figure 1.

1.4 QUARRY AREA ACTIVITIES

Not all areas of the site will be subject to quarry activities. The areas subject to quarrying and therefore this Management Plan are discussed in section 5 and depicted in Appendices 4 and 5.

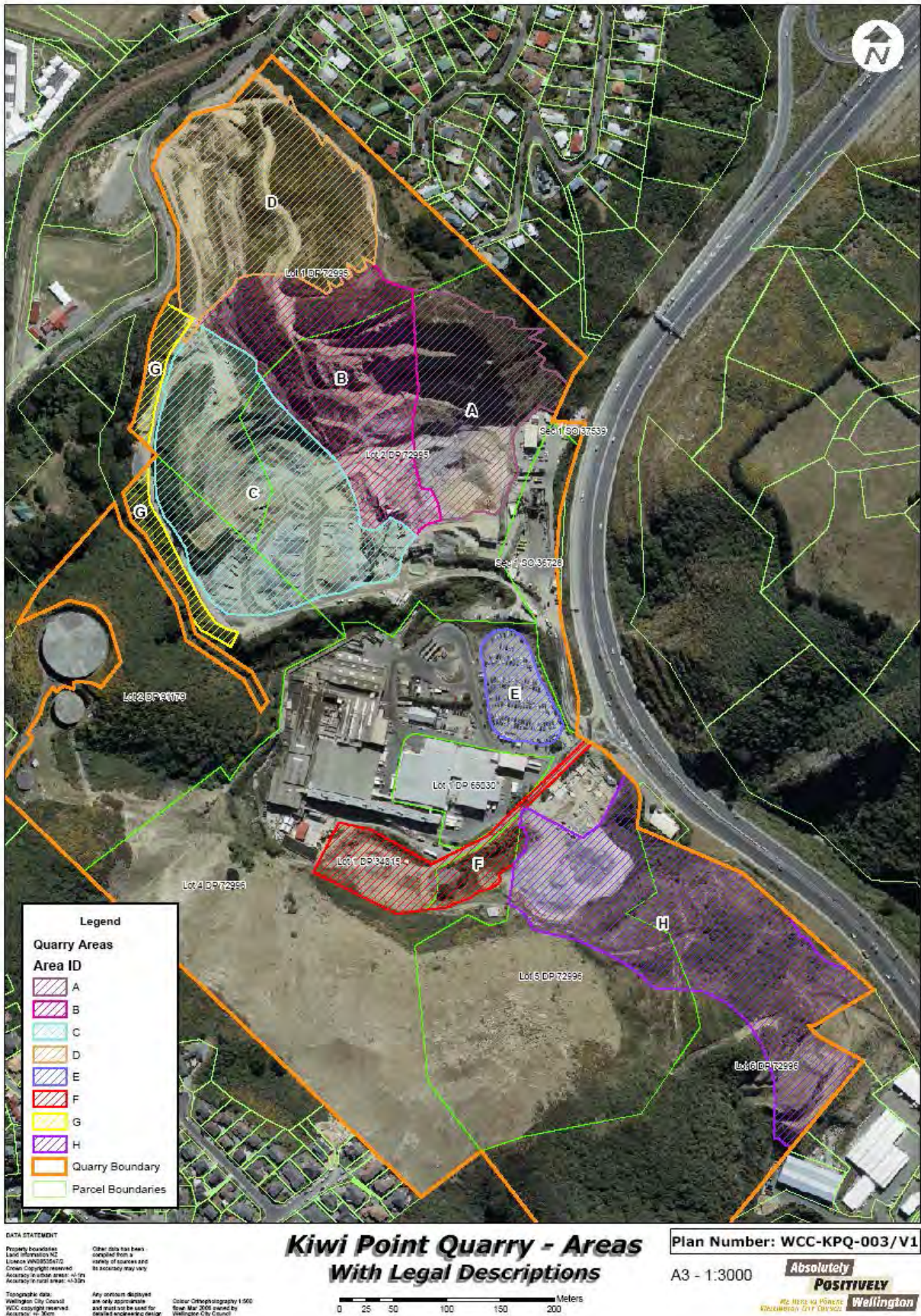


Figure 1

1.5 LAND USE ZONING

KPQ is predominantly zoned as Suburban Centre with some areas zoned Open Space B. The surrounding land is zoned Open Space B. Rule 7.1.3 of the Wellington District Plan allows for quarrying and cleanfilling as permitted activity within specified parts of the KPQ area, subject to conditions. The full wording of the relevant rules is included in Appendix 1.

Policy 6.2.3.3A of the District Plan provides for the development and site rehabilitation of the Quarry. A method to achieve this policy is a requirement for a Quarry Management Plan to be developed and for the operation of the Quarry to be in accordance with that Plan. The Method states:

A QMP shall be prepared and regularly updated, which sets out:

- *intended staging of the excavation and cleanfilling activities*
- *the means of management of surface and groundwater*
- *management of on-site traffic*
- *provision for any onsite processing and temporary storage of quarry material*
- *any specific provisions relating to onsite management of noise, dust, vibration, visual impact, water quality*
- *a procedure for addressing any complaints*
- *objectives and principles for the rehabilitation of the site, including:*
 - *a timetable for the rehabilitation of prominent quarry faces*
 - *measures to create soil conditions which will support plant growth*
 - *measures to create a variety of site conditions to support a range of species*
 - *means of controlling runoff to avoid erosion*
 - *means of control of plant and animal pests*
 - *measures to avoid fire risks*
 - *means to assist native vegetation to regenerate on grazing land*
 - *rehabilitation which is compatible with Open Space strategy for adjacent areas of land*
- *management of buffer areas*
- *practices and methods that will be adopted to ensure that all permitted activity conditions applying to the activities will be met.*

The QMP will complement the other rules applying to the quarry activity and will provide additional management details. It will be reviewed at least every five years and any necessary adjustments will be made.

As progressive rehabilitation of the area is an important aspect of quarry management, the QMP includes rehabilitation provisions. As quarrying and cleanfilling activities are completed on the site, an implementation plan shall be prepared annually in accordance with the QMP.

The requirement that regular monitoring is undertaken and regular progress reports are completed and submitted to the Council is a key element. This requirement is included because successful rehabilitation of any disturbed area requires constant monitoring as site conditions vary considerably and evolve over time. Regular observation and recording of results is an essential part of managing the process.

A vegetated buffer area is included within the Suburban Centres Area as part of the development of the southern part of the Quarry. At the northern end, the necessary buffer area is within the Open Space B Area.

It is important also that rehabilitation of the Quarry area should recognise and in the longer term be able to be integrated as appropriate with the Open Space strategy developed by the Council for adjacent areas of land. Current Council policy is for the creation of further Green

Belt areas on the steep hill sides of the Ngauranga Gorge and, for instance, it may be possible to allow continuation or linking of proposed walkways.

Overall, the environmental result will be the availability of quarry materials for the City and wider region in the short and medium term, and long-term achievement of well-vegetated quarry faces with the appearance of a natural landform which will be integrated with Council development of Open Space areas in this vicinity.

This QMP has been prepared in accordance with these requirements of the Wellington City District Plan.

1.6 PURPOSE OF THE QUARRY MANAGEMENT PLAN

The purpose of this QMP is to provide an overall framework that outlines how the Council will operate, manage and develop all the land area at Kiwi Point which is owned by the Wellington City Council for the purpose of quarrying in order to:

- Ensure compliance with the specific planning provisions contained within the Wellington City District Plan; and
- Guide management of the KPQ and rehabilitate quarried areas in accordance with the District Plan requirements.

1.7 SCOPE OF THE PLAN

The scope of this plan includes:

All the land within Ngauranga Gorge related to Quarrying and associated rehabilitation as indicated on the Plan in Figure 1:

- The carrying out of the Quarry operations in a prescribed manner
- The items and detail necessary to achieve the District Plan objectives. Cross-links to other management documents are provided when these deal with an issue in more detail.

The management plan is intended to be a practical working document to:

- ✓ *Ensure that the KPQ site is operated in a safe manner, and that environmental effects are properly controlled.*

1.8 CONSULTATION TO DATE

The Council undertook consultation on the KPQ during 2003 and 2004 as part of Plan Change 25.

The consultation involved the general public, neighbours and stakeholders such as community groups through media releases, public notices, and the Council's web site. Substantial information was made available through these mechanisms, and also through a brochure and an information pack sent out to stakeholders, potentially affected residents and any others who requested it.

Consultation was also undertaken with the general public, neighbours and stakeholders as part of Plan Change 64. Consultation related to the proposed amendment of the provisions of Chapters 6 and 7 of the Suburban Centres chapter of the District Plan, the modification of the quarry boundaries, and the rezoning of land.

Ongoing consultation will be conducted as and when it becomes necessary. A community liaison group is currently not considered necessary due to the absence of issues associated with the Quarry activities in relation to the surrounding residents.

1.9 CHANGES TO QUARRY MANAGEMENT PLAN – MARCH 2006

The QMP is intended to be a practical working document to:

- ✓ *Ensure that the KPQ site is operated in a safe manner, and that environmental effects are properly controlled. KPQ is currently operated in accordance with the QMP adopted in March 2006.*

The June 2009 QMP (this document) will become effective from 01 July 2009. This covers all the land area at Kiwi Point which is owned by the Wellington City Council for the purpose of Quarrying and will replace the March 2006 Quarry Management Plan.

The key change provided for in this revised plan is the adopting of a single management plan for the whole of the KPQ area as a single entity.

1.10 RELATIONSHIP WITH OTHER COUNCIL DOCUMENTS

Document	Purpose
Wellington City District Plan	<ul style="list-style-type: none"> ▪ Imposes conditions under which the Quarry must operate
Stormwater Management Plan - July 2005	<ul style="list-style-type: none"> ▪ Demonstrates how Quarry stormwater is managed on site
Wellington City Council Kiwi Point Quarry Design – February 2006	<ul style="list-style-type: none"> ▪ Design of Northern face
Kiwi Point Quarry Development Service contract between the Council and the Quarry Operator	<ul style="list-style-type: none"> ▪ Contract terms and conditions (Confidential and commercially sensitive)
Quarry Quality & Procedures Manual (This manual is owned by the Quarry operator and it is a requirement of the Council)	<ul style="list-style-type: none"> ▪ Overall operational management consistent with the Quarry's Quality Management System (ISO 9001:2008 accredited) ▪ Provides the detailed operational procedures for the Quarry including extraction and environmental management

1.11 FACILITIES NOT INCLUDED IN PLAN

The following facilities are hosted at the KPQ site on Council leased land and are not subject to this QMP:

- Downers EDi Works – Asphalt Plant
- Taylor Preston's – Meat Processing Plant
- Allied Concrete – Concrete Plant

1.12 PLAN REVIEW

This QMP will be reviewed every five years as required by the District Plan and Quarry license provisions. The review will include (without limitation):

- (1) Updates to satisfy the District Plan requirements;
- (2) Resource extraction rates in relation to Site Development projections;
- (3) Site Development issues that may have arisen;
- (4) Changes in Best Industry Practice or relevant Standards and Codes of Practice;
- (5) Quarry Health & Safety;
- (6) Quarry Operations Complaints;

- (7) Any other relevant matters in relation to the KPQ site and the carrying out of quarrying and cleanfilling operations;
- (8) Updates to matters covered in the QMP which are no longer required or changed.

The results of each review will be reported back to the Council.

2. LEGISLATIVE INFLUENCES

2.1 LEGISLATIVE INFLUENCES

The following external documents, studies and legislative changes have been identified as having an influence on the development of the QMP.

- Health & Safety in Employment (Mining Administration) Regulations 1996;
- Section 4: Meaning of “Quarry”
- Section 7: Manager and Acting Manager – (1)
- Section 8: Manager Required to hold Certificate – (1)
- Section 13: Certificate of Competence of Manager of Quarry
- Section 32: Offences
- Hazardous Substances & New Organisms Act (HAZNO) 1996 and related regulations (and subsequent reviews)
- Resource Management Act 1991

2.2 NON STATUTORY DOCUMENTS

- A Guide to the Management of Cleanfills
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews)
- Guidelines for management of hazards associated with crushing and screening plants – March 2008 (and subsequent reviews)
- Guidelines for the control of hazards in stockpiles and dumps – March 2008 (and subsequent reviews)
- Guidelines for the control of dust and associated hazards in surface Mines and Quarries – March 2008 (and subsequent reviews)
- Guidelines for the safe use, storage, and disposal of explosives in surface Mines and Quarries – March 2008 (and subsequent reviews)
- Guidelines for the safe operations of mobile plant – March 2008 (and subsequent reviews)
- Guidelines for emergency preparedness in Mines and Quarries – March 2008 (and subsequent reviews)
- Guidelines for noise control in Mines, Quarries and Tunnels – March 2008 (and subsequent reviews)
- Guidelines for isolation and lockout within Mines, Quarries and Tunnels – March 2008 (and subsequent reviews)

3. QUARRY ASSET

3.1 QUARRY ASSET DESCRIPTION

The KPQ was established in the 1930s and has always been owned by the Wellington City Council. Originally, the Council simply utilised the Quarry for its own roading needs. However, since 1995 Quarry products have been available to the public.

The site is within an industrial area, which is located at the bottom of a basin surrounded by high ridges. Residential areas are situated at the top of these ridges.

The current available rock resource available for extraction on the current northern workings is estimated at 8mT with the volume of rock available on the southern resource estimated to be 10mT. Both volumes are based on pit Quarry operations.

Quarrying of all areas within the KPQ site will release both valuable commercial site opportunities and space for cleanfill activities.

The KPQ site contains the following infrastructure assets owned by the Council:

- 0.5 km of roads (sealed)
- 3 km of roads (unsealed)
- 1 office administration building
- 1 staff facility
- 1 workshop building

In addition to these infrastructure assets, the quarry operator owns and operates a significant plant on site.

3.2 DEVELOPMENT

To maximise efficiency of Quarry operations, site work to be completed will include filling in the current culvert flume and stream area at least to a point where a suitably graded road for truck access to the nominated Quarry stockpile areas can be achieved and will also include:

- the culverting of the Ngauranga Stream within the Quarry and abattoir boundaries.
- infilling the upper gully area from Fraser Avenue, down and through the Quarry operation area. This infilling will effectively provide further industrial land. The stream has been piped from Fraser Avenue to the existing Quarry road and significantly infilled. This upper filled area (area D) is expected to release approximately 19,500 sq. metres.

4. QUARRY OPERATIONS

4.1 GENERAL

Current annual production from the Quarry is about 350,000 tonnes of material per annum. Of this around 150,000 is high grade stone used in infrastructural projects such as roading and building.

4.1.1 HOURS OF OPERATION

KPQ operating hours are:

- Monday to Saturday 0600 to 2200; and
- Sunday 0800 to 2200;

except for administration activities, the maintenance of plant and machinery, and the loading, unloading and movement of vehicles all of which may occur at any time.

4.2 QUARRY OPERATIONS – EXTRACTION AND PROCESSING

4.2.1 OVERBURDEN STRIPPING

The Quarry operator or his/her delegated representative shall ensure that soil stripping within the Quarry is a controlled activity and that best practice guidelines are referenced.

4.2.2 ROCK EXCAVATIONS AND TIP AREAS

The Quarry operator or his/her delegated representative shall ensure that excavations and tip areas are designed, constructed, operated and maintained so as to ensure that -

- (1) instability; or
- (2) movement,

which is likely to give rise to a risk to the Health and Safety of any person is avoided.

4.2.3 EXTRACTION

Extraction of rock from the Quarry is carried out by firstly drilling and blasting (where required) and then removal by excavators. Extracted rock is then delivered to the crushing plant(s) by loaders or dumpers depending on requirements of the crushing plant(s).

It is the duty of the Quarry operator or his/her delegated representative to develop and ensure compliance with suitable and sufficient rules covering excavation to ensure the safe construction and operation of excavations. Such rules shall in particular specify the following matters -

- (1) the manner in which such activities are to be carried out;
- (2) the nature and extent of supervision of such activities; and
- (3) the precautions to be taken during such activities to properly avoid, mitigate or minimise risks to the health and safety of any person and the safety and stability of the excavation.

Reference

- KPQ ISO 9001:2008 Quality & Procedures Manual, QP 3 Extraction and Processing Procedure and 7.5 Responsibility, Authority and Communication
- KPQ Health and Safety Plan, Section 9.1 Hazard Identification
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews)

4.2.4 APPRAISAL OF EXCAVATION

The Quarry operator or his/her delegated representative shall ensure that a suitable and sufficient appraisal of all proposed or existing excavations at the Quarry is undertaken by a competent person in order to determine whether any such excavation is a significant hazard.

- (1) The Quarry operator or his/her delegated representative shall ensure that -
 - (a) any significant findings made during an appraisal, any conclusions reached and the reasons for those conclusions are recorded by the competent person undertaking the appraisal;
 - (b) the competent person signs and dates any such record; and
 - (c) the record made in accordance with sub-paragraph (a) is made available to each employer of persons at work at the Quarry and to all persons at work at the Quarry.
- (2) Where the conclusion reached by the competent person following an appraisal is that the excavation presents no significant hazard then further such appraisals shall be carried out by a competent person -
 - (a) at appropriate intervals;
 - (b) whenever there is any reason to suspect that there has been or will be a significant change to -
 - (i) the matters to which the appraisal relates, or
 - (ii) any neighbouring land which may be affected by movement by or instability of the excavation to which the appraisal relates; and
 - (c) whenever there is any reason to doubt the validity of the conclusion of the current appraisal.
- (3) Where the conclusion reached by the competent person following an appraisal is that the excavation represents a significant hazard, the Quarry operator or his/her delegated representative shall close the excavations down as soon as is reasonably practicable pending an assessment of the site and or a geotechnical assessment

The Quarry operator or his/her delegated representative shall ensure that -

- (a) any significant findings made during an assessment or geotechnical assessment are recorded; and
- (b) any remedial works identified during the assessment are undertaken by the date specified.

Reference

- Quarry operator's Log Book
- KPQ ISO 9001:2008 Quality & Procedure Manual, QF34, Site check sheet
- KPQ Health and Safety Plan, and section 9.1 Hazard Identification

4.2.5 DUTIES IN RELATION TO A SIGNIFICANT HAZARD – EXCAVATIONS

Where the conclusion recorded following an assessment of a proposed or existing excavation is that the excavation represents a significant hazard by way of instability or movement, the Quarry operator or his/her delegated representative shall ensure, that a geotechnical assessment of the excavation is carried out as soon as is reasonably practicable.

Reference:

- KPQ ISO 9001:2008 Quality & Procedures Manual, QP 3.3 Extraction and 7.5 Responsibility, Authority and Communication
- KPQ Health & Safety Plan, section 9.1 Hazard Identification
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008(and subsequent reviews)
- Health & Safety in Employment Regulations 1992
- Health and Safety in Employment (Mining Administration) Regulations 1996

4.3 ROCK PROCESSING (CRUSHING, SCREENING AND WASHING)

4.3.1 GENERAL

This section describes the current mode and scope of the quarrying operations carried out at the Quarry. Quarry operations will vary over time in accordance with operational requirements and changes in quarrying technology and methods.

4.3.2 PROCESS

The process begins with the loosening of rock by blasting and excavation on the Quarry face. This material is then transferred to the crushing plant by front-end loader or dump truck.

4.3.3 PRIMARY CRUSHING

Aggregate transferred to the primary feed bin passes over a primary scalping screen where oversize material is processed through a 36 x 24 Jaw Crusher. Undersized aggregate from the scalping screen bypasses the primary crusher and is transferred to produce by-products. The use of this screen reduces the overall load on the primary crusher. Aggregate is then passed to the main feed belt where it is transferred into the secondary feed bin.

4.3.4 SECONDARY CRUSHING

Aggregate from the secondary feed bin passes over a scalping screen, with the undersized bypassing the crusher, again reducing the load on the secondary crusher. The remaining aggregate passes through a four-ft El Jay cone crusher. The aggregate is then conveyed to a 3600x1200 triple deck screen for initial separation. Aggregate greater than 40 mm is returned to the secondary crusher for further reduction. Aggregate less than 40 mm and greater than 20 mm is split out and sent to a 3ft tertiary crusher. Aggregate less than 5 mm is passed onto a conveyor belt for removal to the appropriate sand stockpile or washing.

Product between the 5 mm and 20 mm range is transferred to a Barmac 9600 duopactor for shaping.

4.3.5 TERTIARY CRUSHING

Aggregate passed into the tertiary section is processed through a 3 ft Symonds cone crusher to reduce before being sent over a 3600x1200 double deck screen. Here the top size is sent back to the Symonds for further reduction with all products passing -20mm sent to the Barmac and product less than 5 mm passed onto a conveyor belt for removal to the appropriate sand stockpile or washing.

Following shaping aggregate is screened over a 3600x1500 triple deck screen to separate aggregate less than 20 mm but greater than 5 mm to the washing plant for final screening and product less than 5 mm is passed onto a conveyor belt for removal to the appropriate sand stockpile or washing.

4.3.6 AGGREGATE WASHING

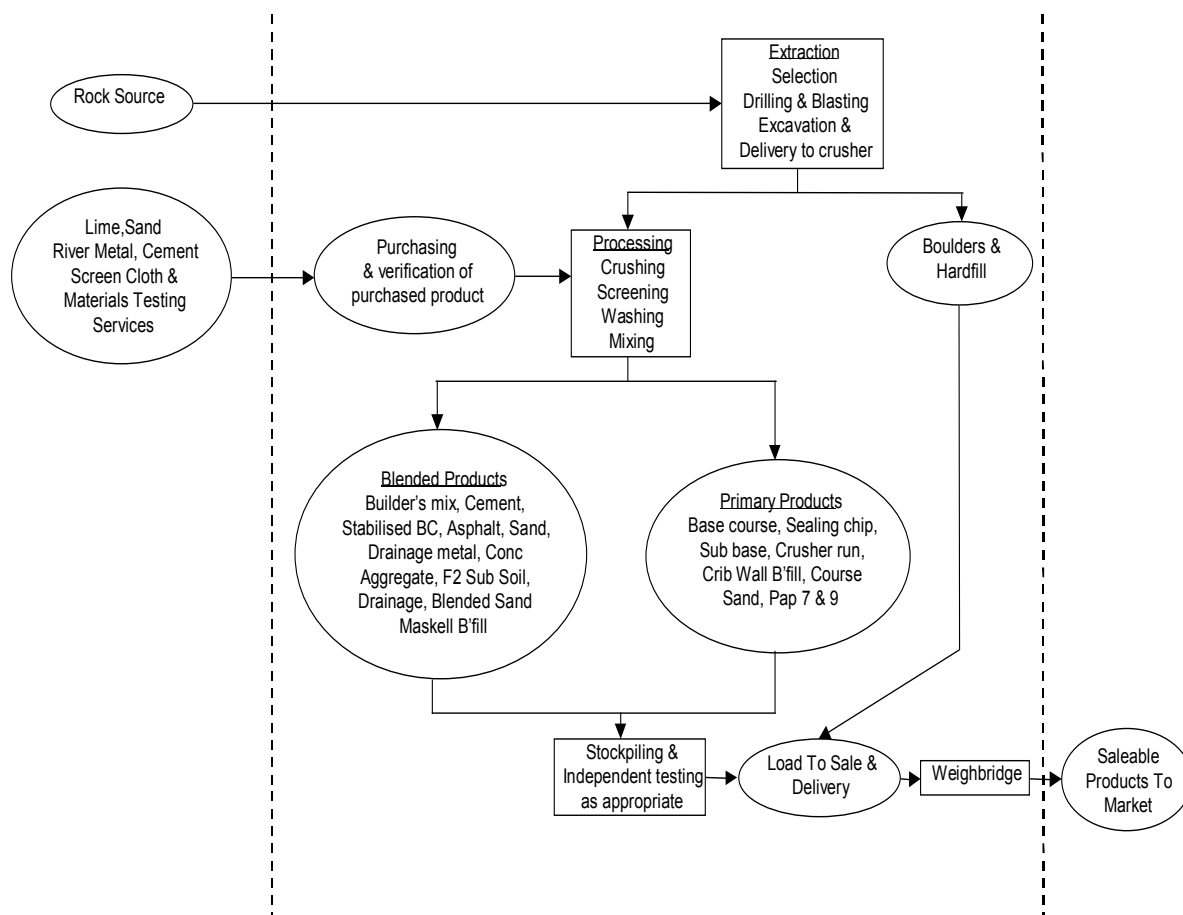
Aggregate feed to the wash plant is primary washed over a 3600x1500 triple deck screen where aggregate less than 6 mm but greater than 4.75 mm is sent to the Grade six hopper and product

less than 4.75 mm (sand) is sent to the sand screw and cyclone for final processing and dewatering.

Remaining aggregate is then sent by conveyor to a 3600x1200 double deck chip screen where product less than 20 mm and greater than 13 mm is separated and final screened to remove product to the Grade 4 & 5 hoppers. Remaining product is then sent by conveyor to a 3600x1200 double deck screen for final screening and slipping into Grade 3 & 2 feed hoppers.

All products having been processed are then transported to specified storage areas for stockpiling.

4.3.7 PROCESS FLOW



Reference:

- KPQ ISO 9001:2008 Quality & Procedures Manual, 3.4 Crushing Plant Operation and 7.5 Responsibility, Authority & Communication
- KPQ Health & Safety Plan and Section 9.1 Hazard Identification
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews)
- Guidelines for management of hazards associated with crushing and screening plant – March 2008 (and subsequent reviews)
- Guidelines for the control of dust and associated hazards in surface Mines and Quarries – March 2008 (and subsequent reviews)

- Guidelines for noise control in Mines, Quarries and tunnels – March 2008 (and subsequent reviews)

4.4 CLEANFILLING

4.4.1 CLEANFILLING SITES

The Quarry operator or his/her delegated representative shall ensure that a suitable and sufficient appraisal of all proposed or existing cleanfilling sites at the Quarry is undertaken by a competent person in order to determine whether any such cleanfilling site is a significant hazard.

- (1) The Quarry operator or his/her delegated representative shall ensure that -
 - (a) any significant findings made during an appraisal, any conclusions and the reasons for those conclusions are recorded by the competent person undertaking the appraisal;
 - (b) the competent person signs and dates any such record; and
 - (c) the record made in accordance with sub-paragraph (a) is made available to each employer of persons at work at the Quarry and to all persons at work at the Quarry.
- (2) Where the conclusion reached by the competent person following an appraisal is that the cleanfill site presents no significant hazard, then further such appraisals shall be carried out by a competent person
 - (a) at appropriate intervals

4.4.2 POTENTIAL EFFECTS OF CLEANFILLING ACTIVITIES

The main effect of any cleanfill which is not immediately used or restored is to:

- occupy space within or outside the working area,
- be visible,
- be a source of dust,
- be a source of sediment and other contamination in run-off,
- affect the surface water regime, e.g. by changing surface water flow in a flood plain.

The implications of carrying out cleanfilling activities can be minimised by Good Practice.

Greater Wellington Regional Council approved a resource consent application to discharge dust in association with cleanfill activities on 6 July 2005. A copy of the discharge permit is included in Appendix 4.

Reference:

- A guide to the Management of Cleanfills
- Quarry operator's log book
- KPQ ISO 9001:2008 Quality and Procedure Manual, QF34, Site check sheet and 7.5 Responsibility, Authority and communication

4.5 QUARRY OPERATIONS – SAFETY

4.5.1 INSPECTIONS

The Quarry operator or his/her delegated representative shall prepare and keep an up to date written log of complaints, inspection, maintenance and, where appropriate, testing of -

- (1) all complaints (environmental, operational and other),
- (2) all buildings (whether temporary or permanent) at the Quarry,
- (3) any plant at the Quarry; and
- (4) the carrying out of quarry operations.

Reference:

- Quarry operator's log book
- KPQ ISO 9001:2008 Quality and Procedure Manual, QF34, Site check sheet and 7.5 Responsibility, Authority and Communication
- QMP Section 9, Management of Complaints
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews)

4.5.2 BENCHES AND HAUL ROADS

The Quarry operator or his/her delegated representative shall ensure that -

- (1) Benches and haul roads are investigated, designed, constructed and monitored by a competent person so as to allow vehicles and plant to be used and moved upon them safely -
 - (a) a written report by a competent person that includes the statement that the intended height is safe and water discharge and collection is managed
 - (b) each working bench should have separate loading arrangements and of sufficient length and breadth to provide safe working conditions for the vehicles and equipment used on it as determined by a competent person.
 - (c) working benches shall be designed in such a way that no water is discharged over a lower face bench
- (2) The overburden or top of the Quarry shall be cleared far enough back from the edge of the Quarry to provide safe working environment
- (3) All vehicle access roads within the Quarry shall be so constructed and maintained that the width and surface of the carriageways are safe for the purpose for which they are to be used. Where access roads to benches are used to transport the quarried product by vehicle down a gradient, then the maximum gradient shall be 1 in 10 and in no case shall it exceed a gradient of 1 in 5.
- (4) Where necessary, effective precautions shall be taken, by the installation of barriers or otherwise, to prevent vehicles or plant accidentally leaving any bench or haul road.

Reference:

- KPQ ISO 9001:2008 Quality and Procedure Manual 3.3
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews)
- Guidelines for control of Hazards in stockpile and dumps – March 2008 (and subsequent reviews)
- Guidelines for the safe operations of mobile plant – March 2008 (and subsequent reviews)

4.5.3 QUARRY OPERATIONAL AND FINISHED FACES

The Quarry operator or his/her delegated representative shall ensure, so far as is reasonably practicable, that -

- (1) a face should not be worked in a manner that will create an over hang of the face
- (2) where unconsolidated ground is quarried, the face and sides should be battered to prevent collapse
- (3) a face should not be undercut by excavation of a slot at the toe of the face
- (4) where a person is required to work at the toe of a Quarry face or on the face itself, the face must be safely scaled of loose rock that could fall on the person
- (5) faces should be left in a safe condition at the end of each days work
- (6) finished slope of quarry faces shall not exceed 55 degrees from the horizontal
- (7) maximum height of finished batters shall not exceed 15 meters

Reference:

- KPQ ISO 9001:2008 Quality and procedure Manual QF34, Site check sheet 3.3.
- Industry Code of Practice Surface Mining and Quarry Industries – March 2008 (and subsequent reviews)
- Guideline for the control of hazards in stockpiles and dumps – March 2008 (and subsequent reviews)
- Guidelines for safe operations of mobile plant – March 2008 (and subsequent reviews)
- District Plan Rules 7.1.3.3.4 and 7.1.3.3.5

4.5.4 BARRIERS AND/OR FENCES

The Quarry operator or his/her delegated representative shall ensure that, where appropriate, a barrier suitable for the purpose of discouraging trespass is placed around the boundary of the Quarry and is properly maintained. Please also refer to sections 4.5.10 and 5.2.2 of this QMP.

Reference:

- KPQ ISO 9001:2008 Quality and Procedure Manual, QF 34 Site check sheet

- District Plan Rules 7.1.3.3.7 and 7.1.3.3.8

4.5.5 SIGNS

The Quarry Operator or his/her delegated representative shall ensure that signs are positioned throughout the Quarry site providing safety and general site information.

Reference:

- KPQ ISO 9001: 2008 Quality and Procedure Manual, QF34, Site check list

4.5.6 ESCAPE AND RESCUE FACILITIES AT THE QUARRY

The Quarry operator or his/her delegated representative shall ensure that -

- (1) adequate means of escape and rescue are provided and maintained so as to permit persons in the Quarry to leave the Quarry promptly and safely in the event of danger;
- (2) adequate means of communication and warning are provided to enable assistance, escape and rescue operations to be launched at once when required;
- (3) written instructions concerning the use of emergency equipment and the action to be taken in the event of an emergency at or near the Quarry are prepared;
- (4) persons at work at the Quarry are trained in appropriate action to be taken in the event of an emergency; and
- (5) rescue equipment is provided at readily accessible, appropriately sited and clearly sign-posted places and kept ready for use.

Reference

- KPQ Health and Safety Manual, Section 11, Emergency Procedure
- Industry Code of Practice Surface mining and Quarrying Industries – March 2008 (and subsequent reviews)
- Guidelines for emergency preparedness in Mines and Quarries – March 2008 (and subsequent reviews)

4.5.7 SAFETY DRILLS

The Quarry operator or his/her delegated representative shall ensure that safety drills are held at regular intervals for persons at work at the Quarry, and that the results of the safety drills are recorded.

Such safety drills shall be for the following purposes -

- (1) to train the persons who work at the Quarry in the appropriate actions to be taken in an emergency including, where appropriate, the correct use, handling or operation of emergency equipment; and
- (2) to train and check the skills of such persons to whom specific duties involving the use, handling or operation of such equipment have been assigned in the event of an emergency.

Reference:

- KPQ Health and Safety Manual Section 11 Emergency Procedures and QF 3.6 Emergency Drill Form
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews)
- Guidelines for emergency preparedness in Mines and Quarries - March 2008 (and subsequent reviews)

4.5.8 FIRE AND EXPLOSION HAZARDS

The Quarry operator or his/her delegated representative shall ensure that -

- (1) No person at work at the Quarry uses a naked flame or carries out any work which could give rise to a risk of an unintended explosion or fire unless sufficient measures to prevent such an explosion or fire are taken.
- (2) No person shall smoke in any part of the Quarry where there is a risk of fire or explosion.

4.5.9 CONTROL OF HARMFUL AND EXPLOSIVE ATMOSPHERES

- (1) It is the duty of the Quarry operator or his/her delegated representative shall ensure that -
 - (a) steps are taken in order to determine whether potentially explosive substances are present in the atmosphere and, where such substances are present,
 - (b) at any place in the Quarry where there is a risk of the occurrence or accumulation of an explosive atmosphere, all necessary measures are taken with a view to -
 - (i) preventing such occurrence and accumulation, or, where this is not practicable,
 - (ii) preventing the ignition of such an atmosphere; and
 - (c) at any place in the Quarry where there is a risk of the occurrence or accumulation of a substance harmful to health in the atmosphere, appropriate measures are taken in order to -
 - (i) prevent such occurrence and accumulation, or, where this is not practicable,
 - (ii) extract or disperse that harmful substance,in such a way that persons are not placed at risk.
- (2) Whenever persons at work are present at any place in the Quarry where they may be exposed to a substance harmful to health in the atmosphere -
 - (a) appropriate and sufficient breathing and resuscitation equipment shall be made available; and
 - (b) a sufficient number of persons trained in the use of such equipment shall be present.
- (3) The Quarry operator or his/her delegated representative shall ensure that equipment referred to at paragraph (2) (a) is suitably stored and maintained.

4.5.10 DANGER AREAS

The Quarry operator or his/her delegated representative shall ensure that -

- (1) any danger areas in the Quarry are clearly marked;
- (2) equipment or barriers designed to prevent inadvertent entry by any unauthorised person are installed at any danger area in the Quarry in which, because of the nature of the work being carried out there or for any other reason there is -
 - (a) risk of a person falling a distance likely to cause personal injury,
 - (b) risk of a person being struck by a falling object likely to cause personal injury, or
 - (c) a significant risk to the health and safety of persons; and
 - (d) where any person at work is authorised to enter a danger area, appropriate measures are taken to protect his/her Health and Safety.

Reference:

- KPQ Health & Safety Plan and Section 9.1 Hazard Identification
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews)

4.6 QUARRY OPERATIONS – EXPLOSIVES, DRILLING AND BLASTING

This section shall apply to the storage, transport and use of explosives at the Quarry.

Reference:

- KPQ Health & Safety Manual Section 16 Blasting
- Hazardous Substance & New Organisms ACT (HAZNO) 1996 and related regulations (and subsequent reviews)
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews)
- Guidelines for safe use, storage and disposal of explosives in Surface Mines and Quarries – March 2008 (and subsequent reviews)
- KPQ ISO 9001:2008 Quality and Procedure Manual, 7.5 Responsibility, Authority and communication QF44 Explosive Authorisation Procedure, QF45 Explosive (Approved Handler) form and QF3.1 Blast log form.

4.6.1 QUARRY OPERATOR OR HIS/HER DELEGATED REPRESENTATIVE - DUTIES

- (1) The Quarry operator or his/her delegated representative shall ensure that -
 - (a) so far as is reasonably practicable, that all explosives are stored, transported and used safely and securely; Refer 4.6.4

- (b) the appointment of one or more qualified (Approved Handlers) to organise and supervise all work at the Quarry involving the use of explosives ("the Explosives Supervisor"); and
 - (c) that at no time is there more than one person acting as the Explosives Supervisor at the Quarry.
- (2) It shall be the duty of the Quarry operator or his/her delegated representative to ensure that -
- (a) suitable and sufficient rules are made which lay down in writing procedures for –
 - (i) shotfiring operations at the Quarry, Refer 4.6.2
 - (ii) appointing shotfirer, and trainee shotfirer,
 - (iii) authorising other persons who will be involved with the storage, transport or use of explosives,
 - (iv) dealing with misfires, Refer 4.6.3 and
 - (v) ensuring, so far as is reasonably practicable, that such rules are complied with;
 - (b) an adequate written design (whether produced by him/her or not) is prepared for each shotfiring operation at the Quarry to ensure, so far as is reasonably practicable, that when such firing occurs it will not give rise to danger (Ref: Blast log form QF 3.1; and
 - (c) a copy of the specification referred to in sub-paragraph (b) is given to any person upon whom it imposes duties.
- (3) The Quarry operator or his/her delegated representative shall ensure that operations involving the storage, transport or use of explosives are carried out by -
- (a) a duly authorised and qualified (Approved Handlers); or
 - (b) a trainee under the close supervision of a qualified (Approved Handlers).
- (4) The Quarry operator or his/her delegated representative shall ensure that -
- (a) such facilities and equipment as are necessary to enable shotfiring operations to be carried out safely are provided;
 - (b) any vehicle which is provided for use in relation to shotfiring operations is so marked as to be readily identifiable from a distance;
 - (c) detonators are stored in separate containers from other explosives; and
 - (d) explosives are kept at all times either in a locked explosives store or under the constant supervision of a suitable person.
- (5) The Quarry Operator or his/her delegated representative shall ensure -
- so far as is reasonably practicable, that each shotfiring operation is carried out safely and in accordance with the rules required to be made in pursuance of paragraph (2)(a) and any specification required to be prepared in pursuance of paragraph (2)(b).

Reference:

- KPQ Health and Safety Manual Section 16 Blasting
- Hazardous Substances & New Organisms Act (HAZNO) 1996 and related regulations
- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews)
- Guidelines for the safe use, storage, and disposal of explosives in surface Mines and Quarries – March 2008 (and subsequent reviews)
- Explosive log held by Quarry operator
- KPQ ISO 9001:2008 Quality and Procedure Manual, 7.5 Responsibility, Authority and Communication, QF44, Explosive Authorisation Procedure, QF45, Explosive (Approved Handler) form, and QF3.1, Blast log form.

4.6.2 SHOT FIRES – DUTIES

Before a shot is fired, the shotfirer shall -

- (1) check the shotfiring system or circuit to ensure that it has been connected correctly
- (2) where appropriate, ensure that the electrical integrity of the shotfiring system or circuit is such as to make a misfire unlikely; and
- (3) ensure that the shot is fired from a safe place.

Reference:

- KPQ Health and Safety Manual Section 16 Blasting
- Explosive log held by Quarry operator

4.6.3 MISFIRES

In the event of a misfire the Quarry operator's "the Explosives Supervisor" shall consult the individual appointed and ensure, so far as is reasonably practicable, that -

- (1) apart from him/herself, no person other than the Explosives Supervisor, shotfirer, trainee shotfirer or any other person authorised by him/her enters the danger area -
 - (a) where the shot was fired by means of safety fuse, wait until a period of 30 minutes has elapsed since the misfire, or
 - (b) where the shot was fired by other means, wait until a period of 5 minutes has elapsed since the misfire and any shotfiring apparatus has been disconnected from the shot;
- (2) appropriate steps are taken to determine the cause of and to deal with the misfire; and
- (3) a suitable record is kept of the misfire.

Reference:

- KPQ Health and Safety Manual Section 16 Blasting
- Explosive log held by Quarry operator

4.6.4 TRANSPORT OF EXPLOSIVES

- (1) No person (other than a person engaged in the transport of explosives to or from the Quarry, a shotfirer, trainee shotfirer, a person authorised to handle explosives at a Quarry, or a person appointed to be in charge of the explosives store) shall handle explosives at the Quarry.
- (2) No person shall bring any substance or article (other than explosives) likely to cause an unintended explosion or fire within 10 metres of any explosives or (except for the purpose of lighting igniter cord or safety fuse) take any naked flame within 10 metres of any explosives.
- (3) No person shall forcibly remove any detonator lead, safety fuse or other system for initiating shots from a shothole after the shothole has been charged and primed.
- (4) No person shall charge or fire a shot -
 - (a) unless there is sufficient visibility to ensure that work preparatory to shotfiring, the shotfiring operation and any site inspection after the shot is fired can be carried out safely;
 - (b) in a shothole which has previously been fired, unless he is dealing with a misfire in accordance with action taken in pursuance of regulation 28(b); or
 - (c) in any tunnel or other excavation (not being merely a shothole) in the face or side of the Quarry for the purpose of extracting minerals or products of minerals.
- (5) No person shall fire a shot -
 - (a) unless he/she is a shotfirer or trainee shotfirer; and
 - (b) other than by means of a suitable exploder or suitable safety fuse.
- (6) No person shall cap a safety fuse with a detonator unless he is using equipment designed for the purpose and he is in a suitably sheltered place designated by the operator for the purpose.

Reference:

- KPQ Health and Safety Manual Section 16 Blasting
- Hazardous Substances & New Organisms Act (HAZNO) 1996 and related regulations (and subsequent reviews)
- Guidelines for the safe use, storage, and disposal of explosives in surface Mines and Quarries – March 2008 (and subsequent reviews)

4.6.5 BLAST TIMING

Blasting of Quarry workings/faces for extraction of rock for production shall be carried out in accordance with the District Plan rules between 10.00am and 2.00pm, Monday to Friday only using approved industry practices.

- (1) In all cases applicable property owners shall be notified as required by the District Plan by mail one week in advance or through an agreed system between the Quarry operator and the property owners.

(2) The owners of the following properties shall be notified:

- 9 and 14 Plumer Street, Johnsonville
- 73 and 75 Tarawera Road, Johnsonville
- 84 and 86 Tarawera Road, Johnsonville
- 113, 130, 170 and 175 Fraser Avenue, Johnsonville
- 146 Burma Road, Johnsonville

Where required they will also be advised by phone 5 minutes before firing of the blast. And

- (3) Immediately preceding all blasts and following the all clear being given by the “Explosive Supervisor” the shot fire shall activate an all clear siren. The siren sound shall distinguish it from normal Police, Ambulance or Fire service sirens.
- (4) Adjoining business operations of Downer EDI Works, Allied Concrete and Taylor Preston shall also be notified by mail one week in advance or through an agreed system between the Quarry operator and the businesses.

Immediately preceding all blasts and following the all clear being given by "the Explosives Supervisor" the shot firer shall activate an all clear siren.

Reference:

- District Plan Rules 7.1.3.3.2 and 7.1.3.3.3
- KPQ Health and Safety Manual Section 16 Blasting
- Hazardous Substances & New Organisms Act (HAZNO) 1996 and related regulations (and subsequent reviews)
- Guidelines for the safe use, storage, and disposal of explosives in surface Mines and Quarries – March 2008 (and subsequent reviews)

4.6.6 BLAST DESIGN

In general, the blast design is determined by the geology of the material at the Quarry to be broken and the fragmentation required. The degree of fragmentation required is related to the type and size of both the loading equipment and primary crusher(s).

A written design shall be prepared for each blasting operation to ensure, so far as is reasonably practicable, that when blasting occurs it will not give rise to danger to persons or property.

Reference

- KPQ ISO 9001:2008 Quality and Procedure Manual, QP3 Drilling and Blasting 3.3.4.2 and QF3.1 Blasting log form
- KPQ Health and Safety Manual Section 16 Blasting
- Hazardous Substances & New Organisms Act (HAZNO) 1996 and related regulations (and subsequent reviews)
- Guidelines for the safe use, storage, and disposal of explosives in surface Mines and Quarries – March 2008 (and subsequent reviews)

4.6.7 BLAST IMPACT ON ENVIRONMENT

To reduce the effects of blasting (noise, flyrock, vibration) on the environment blast impacts shall be controlled by good design and operations.

To reduce the effects of blasting operations the following planning conditions relating to blasting in most cases will reduce the effects. These conditions include:

- no blasting outside the permitted blasting hours (see 4.6.5 above)

Reference:

- KPQ Health and Safety Manual Section 16 Blasting

5. QUARRY DEVELOPMENT PLANS

5.1 SITE & QUARRY DEVELOPMENT PLANS

5.1.1 STAGING PLANS

Detailed staging plans have been produced to:

- Ensure staging is progressed in a manner that will be consistent with the requirements of the District Plan, including the final finished contour levels;
- Provide detailed engineering guidance for the Quarry activities; and
- Be used in determining the visual impact assessment of the Quarry.

The Quarry operations are designed to minimise the working face visible to the public at any time, and reduce the extent of visible modification to the prominent ridge. It aims to minimise the area that will be disturbed and create a final landform of comparatively natural appearance, finished to facilitate rehabilitation, while also maximising quarried rock volumes.

5.1.2 NORTHERN QUARRY AREA

The Northern Quarry area staging plans have been updated to reflect the finished design of this face of the Quarry which is expected to close first. To that end cleanfilling is proposed to fill the extracted area such that suitable contours can be obtained for rehabilitation of the area. The North Face staging plans are included in Appendix 5.

Reference

- Wellington City Council Kiwi Point Quarry Design – February 2006
- Kiwi Point Quarry Annual Work Plan

5.1.3 SOUTHERN QUARRY AREA

The concept staging plan through to finished design for the southern face indicates removal of the lower part of the spur that separates the abattoir from the industrial area on Tyers Road. This would eventually see the lower end of the spur entirely removed from 158m asl down to the bottom of the gorge where a platform resulting from the quarrying would be formed approximately 10 – 15 metres above the level of SH1. Then the quarrying would continue down to a platform level of 30m asl, before backfilling with cleanfill. The final finished ground level would form a platform sloping north south from 64 – 44m asl, which would vary between 0 and 10 metres above the level of SH1.

Quarrying would start on the south side of the spur and work progressively north. The following six representative stages are illustrated in Figures 2(a) 2(b) and 2(c) (Appendix 6) to show how the landform will progressively change during the Quarry's life span. The figures show the large-scale landform modification and staging and show regular benching required for overall slope stability and working access during the Quarry's operation. However, as the Quarry face is completed the final finishing will be designed in detail and progressively implemented, as part of site rehabilitation, to stagger the benching, vary gradients and vary ground conditions to achieve a more natural appearance and to aid plant establishment.

- Stage 1:* Set-up stage: construction of an access road to a working platform at 94m asl with screening bunds around the outer edge, screen planting adjacent to the WRC Pumping station.
- Stage 2:* Quarrying of the south face from 154m asl to an enlarged working platform at 94m asl (i.e. level of the preliminary working platform).
- Stage 3:* Quarrying of the south face from 94m asl down to the Quarry pit platform by progressively excavating and lowering the level of the working platform.
- Stage 4:* Quarrying to remove the remainder of the spur landform within the site from 158m asl to the Quarry pit platform, working from south to north and final contouring of the finished face.
- Stage 5:* Quarrying of the Quarry pit to 30m asl into the Quarry pit platform.
- Stage 6:* Backfilling of the Quarry pit to the level of the finished platform sloping north south from 64 - 44m asl.

The staging plans are included in Appendix 6. Figure 2a covers Stages 1 – 2. Figure 2b covers Stages 3 – 4. Figure 2c covers Stages 5 – 6.

5.2 BUFFER AREAS_& ASSOCIATED FEATURES - NORTHERN AND SOUTHERN QUARRY AREAS

5.2.1 BUFFER AREAS

A buffer area is to be maintained along the north-eastern boundary of the site near Plumer Street and Tarawera Road.

A 25 metre wide buffer area will be maintained on the uphill boundary of the site around the steep sides and top of the southern area to be excavated. This buffer area will be allowed to revegetate naturally except where additional planting is required.

5.2.2 FENCING

The top boundary of the northern buffer area shall be fenced and will continue to be while the Quarry is in operation, and pending any future use consideration.

A steel pole wire mesh fence must be maintained adjacent to any properties in the Residential Area along the quarry boundary to a height of 1.2 metres.

A security fence will be installed and maintained along the outer edge of the buffer area prior to commencement of operations in any area to exclude members of the public.

5.2.3 SCREENING

Screening of the southern face shall be provided by maintaining a bund on the site adjacent to State Highway 1 while carrying out operations..

Bunds on the outer edge of the access road and the main working platform (South to Tyers Road) will provide a visual screen, noise and dust buffer, and safety barrier during quarrying of the southern spur. The bunds will be a minimum of 2m height and will be created by excavating the road and working platform to a level 2m or more below the outer edge, which will be left in situ to

form a 'rim'. As the working platform is lowered, the bund will be adjusted to maintain the minimum height above the working area.

The earth bunds formed on the outer edge of the access road and main working platform will reduce the visible extent of the working area and screen truck movement from viewpoints below – namely SH1 and industry in the gorge. The bunds will be formed by leaving the outer edge of the road and working platform in place as a 'rim' and will be gradually lowered as the level of quarrying descends. Forming them in this way not only reduces the risk of rock fall from road and platform construction but also minimises the amount of ground disturbance on the slope below the working area.

5.3.5 SCREEN PLANTING

Screen planting will be in place south of the pumping station during Stage 1 of development of the southern face. By the time the quarrying operations reached end of stage 4, the plants would have grown tall enough to block views of the quarrying operations from southbound SH1 traffic. At this time the working platform is also expected to be at the level of SH1. The planting will consist of fast-growing eco-sourced trees, common to the area. This planting will complement the two existing karaka stands beside the pumping station that are to be retained.

5.2.4 BUILDINGS AND PLANT

The existing operational area at the Quarry, including the processing plant, office, and temporary stockpiling and customer service area will be maintained. Consequently, no permanent buildings or fixed machinery will be located at the southern part of the Quarry.

5.3.3 ACCESS ROAD

An access road will be constructed around the lower part of the southern spur to enable machinery to reach the south face (which will be quarried first) and transport the rock material back to the existing Quarry facilities for washing and stockpiling. This road will eventually be removed as the quarrying excavates below its level.

5.3.6 TEMPORARY HYDROSEEDING

As the access road is likely to be in place for at least 10 years, and the batters will be noticeable to southbound SH1 travellers, the batters will be hydroseeded to reduce the degree of contrast with the adjacent hillside. Machine access tracks to the working face of the southern part of the Quarry will be progressively constructed, removed and reconstructed as the landform is excavated.

5.3.7 STOCKPILES

Temporary stock piling of Quarry material is provided for in the southern part of the Quarry for short periods prior to trucking to the processing area in the northern part of the Quarry.

5.4 LOCATION OF CRUSHING PLANT AND STOCKPILES - CURRENT AREA

The crushing plant is intended to be maintained at its existing location. A future decision on its continued operation at this location may arise if:

- The existing plant becomes uneconomic to operate;
- Through consideration of possible end land uses for the northern part of the Quarry site.

Future options for crushing activity may require less extensive plant machinery and mobile crushing plant technology. Any processing plant used in the southern part of the quarry shall be relocatable

The existing stockpiles in the northern part of the Quarry will continue to be used for Quarry sales. Temporary stockpiles (pre-processing) may be used within the southern part of the quarry in accordance with the provisions of the District Plan.

6. QUARRY MANAGEMENT MEASURES

6.1 DISTRICT PLAN PROVISIONS

The following table cross-references how requirements of the District Plan outlined in Section 1.5 of this plan are in practice achieved through operational practice.

REQUIREMENT	DP REF's	MANAGEMENT PLAN & OTHER DOCUMENT LINKS
<i>Provide for the development and site rehabilitation of the Kiwi Point Quarry to the extent specified in the Plan in a way that avoids, mitigates, or remedies adverse effects</i>	6.2.3.3A	Staging Plans as included in this document. The District Plan (including rehabilitation provisions) as a Method, as provided for in this document Other effects as dealt with in this document
Practices and methods that will be adopted to ensure that all permitted activity conditions applying to the activities will be met	6.2.3.3A Method	Quarry Quality & Procedures Manual Quarry Operating procedures – QP1 – QP11 Resource Consents (Regional Council) Compliance
Staging of the excavation and cleanfilling activities	6.2.3.3A Method	Staging Plans as included in this document QP3 Extraction & Processing procedure
Management of surface and groundwater	6.2.3.3A Method	This document Resource Consents (Regional Council) Compliance Stormwater Management Plan QP7 Control & Monitoring of Nuisance Procedure
Management of on-site traffic	6.2.3.3A Method	QP8 General Site & Plant Maintenance Procedures
Management of any on-site processing and temporary storage of Quarry materials	6.2.3.3A Method	This document QP3 Extraction & Processing procedure Resource Consent Compliance
Specific provisions relating to on-site management of noise, dust, vibration, visual impact and water quality	6.2.3.3A Method	QP7 Control & Monitoring of Nuisance Procedure Resource Consent Compliance
Rehabilitation objectives and principles for the rehabilitation of the site	6.2.3.3A Method 7.1.3.7	This document Annual Implementation Plan
Complaints procedure	6.2.3.3A Method	Included as part of QP7 Control & Monitoring of Nuisance Procedure
Blasting times and notification	7.1.3.3.2	This document
Review the Quarry Management Plan every 5 years	6.2.3.3A Method	As per this document

6.2 GREATER WELLINGTON REGIONAL COUNCIL CONSENTS

The following activities are subject to greater Wellington Regional Council consents that will be maintained during the life of Quarry operations:

- Permit to take Water (WGN 030170 [22607]): For aggregate washing and dust suppression. Expires 26 March 2013.
- Permit to Discharge to Stream (WGN 950173): To intermittently discharge a mix of treated and settled storm water run-off and wash water into Ngauranga Stream. Expires 25 March 2011.
- Permit to Discharge to Air (WGN 050352 [24540]): To discharge contaminants to air from the operation of cleanfill. Expires 6 July 2020.
- Land Use Consent (WGN 050352 [24518]) and Water Permit (WGN050352 [24519]): To pipe and divert watercourses within Kiwi Point Quarry. Lapse 22 August 2010 unless implemented. Expires 22 Aug 2040. Land Use Consent (WGN 060255 [2519]): To undertake soil disturbance and vegetation clearance on erosion-prone land. Expires 26 November 2016.
- Land Use Consent (WGN 060255 [25260]): To pipe a 20-metre section of a tributary of the Ngauranga Stream and carry out associated disturbance of the stream bed. Expires 26 November 2041.
- Land Use Consent (WGN 060255 [25159]): To undertake soil disturbance and vegetation clearance on erosion-prone land. Expires 26 November 2016.

All resource consents are attached in Appendix 4.

6.3 STORMWATER MANAGEMENT

A stormwater management plan has been established for the KPQ and submitted to Greater Wellington Regional Council in June 2005. This plan provides for appropriate stormwater controls such as sediment ponds and maintenance schedules. These measures ensure that any sediment laden run off is adequately treated prior to leaving the site. In addition to these measures, two watercourses flowing through the site will be piped, further reducing the likelihood of downstream sedimentation.

Reference

- Appendix 9 – Stormwater Management Plan
- KPQ ISO 9001:2008 Quality and Producers Manual, QF Site check sheet

6.4 FUEL & SPILL CONTAINMENT MANAGEMENT

The operation of the quarry shall be undertaken in a way that ensures that -

- refuelling of equipment shall only be done within the established fuelling station structure;
- a spill contingency plan to deal with any spills of fuel, oil, lubricants or hydraulic fluids shall be maintained;
- an emergency spill containment kit shall be maintained on site;

- any spill of fuel, oil, lubricants or hydraulic fluids or other deleterious substances shall be immediately contained, reported and remediated.

6.5 DUST MANAGEMENT

Dust from the operation of the Quarry and Cleanfilling operations shall be managed in line with the requirements of Resource Consent WGN 050352 [24540] attached in Appendix 4.

Reference:

- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews)
- Guidelines for the control of dust and associated hazards in surface Mines and Quarries – March 2008 (and subsequent reviews)
- Greater Wellington Regional Council Permit to Discharge to Air (WGN 050352 [24540]): To discharge contaminants to air from the operation of the cleanfill.

6.6 NOISE MANAGEMENT

6.6.1 NOISE

In order to ensure that noise emissions from the Quarry site remains acceptable, it is of fundamental importance that the equipment on site is well maintained.

6.6.2 EQUIPMENT NOISE

All equipment used on site will be regularly maintained and of high standard to assist reduce noise.

6.6.3 VEHICLE REVERSING ALARMS

One specific item of equipment that can cause complaints is the use of vehicle reversing alarms. These are provided for safety reasons for the workforce, and need to generate a certain level of noise to achieve this. However, all items of plant operating at the Quarry will be fitted with reversing alarms such as directional and adjustable systems, which can help to minimise the noise impact.

6.6.4 BLASTING NOISE

As previously stated in this Quarry Management Plan, times where blasting is permitted to be undertaken is restricted to certain times of the day to help minimise the impact of noise.

Reference:

- Industry Code of Practice Surface Mining and Quarrying Industries – March 2008 (and subsequent reviews)
- Guidelines for noise control in Mines, Quarries and Tunnels – March 2008 (and subsequent reviews)

6.7 MANAGEMENT OF OTHER EFFECTS

6.7.1 MANAGEMENT OF TRAFFIC

There are two-entry points to the Quarry. However, the entry/exit on Fraser Avenue has been closed (temporarily) to reduce heavy truck traffic within the community.

The main entry to the Quarry is from State Highway 1 and shall during the period of this QMP be maintained to a standard required for industrial use. As per the District Plan this is the only access point for Quarry vehicles. This access is also the main access route for Taylor Preston's meat works, Allied Concrete and the Downers EDI Works Asphalt complex.

During the period covered by this plan it is intended to upgrade the Fraser Avenue entrance. This will allow more use to be made of the site for development once quarrying is completed.

Access routes for the cartage of Quarry materials from both the northern and southern Quarry operations will be maintained to a standard that complies with the requirements for the operation of heavy earth moving equipment.

Other than the access point, there are no restrictions on traffic movement to or from the Quarry.

Reference:

- District Plan Rules 7.1.3.6

7. KIWI POINT QUARRY REHABILITATION

7.1 INTRODUCTION AND REHABILITATION APPROACH

The rehabilitation of the quarry will extend to all areas within the boundaries of the site, which are located within both the Suburban Centres and Open Space Activity Areas under the District Plan, including the grazing areas, Ngauranga Gorge (Waitohi) stream, and buffer areas above the north and south quarry faces. (Refer to Appendix 9).

This section of the QMP establishes an objective, a set of principles and a process for the rehabilitation of KPQ. Each of the principles will be integrated within planning, design and management as each stage of the Quarry operation is completed. Detailed plans and budgets will be prepared annually to ensure the integrated and ongoing coordination of rehabilitation and quarry operations.

The quarry requires substantial site modification over time. Therefore specific rehabilitation activities are to be planned and carried out on an annual basis as part of an implementation plan. Each implementation plan will be tailored to the progress of quarry face closures, incorporating knowledge gained from ongoing monitoring. Each implementation plan will guide contract documentation for the physical works involved in the rehabilitation of the site. This will ensure maximum flexibility to respond to new situations as the excavations continue.

The implementation plans will be adequately funded on an ongoing basis as part of the Quarry operation, as there is little or no value in commencing rehabilitation unless there are resources available to implement and complete successive stages and monitor results. The rehabilitation of KPQ is to be monitored, and re-evaluated annually for the remaining life of the quarry, anticipated to be approximately 50 years, and followed by several years of maintenance.

The long period of Quarry operations allows for a substantial element of trialling and testing in finding solutions to best meet the rehabilitation specifics of the site. Because the precise nature of the final landform can only be determined for each section of the Quarry once the variations in rock type become evident, the preparation of a detailed Quarry rehabilitation implementation plan is not practicable in advance. However, the Quarry Staging Plans in Appendices 5 and 6 will provide a starting point for rehabilitation.

The overall objective of the proposed rehabilitation is to establish native vegetation cover that contributes to the Council's vision of Ngauranga Gorge as part of the City's inner green belt network. Rehabilitation will focus on bringing all areas where quarry operations have ceased to a state where native vegetation will re-establish. It is intended that all land encompassed within the KPQ Boundary in Figure 1 will be progressively rehabilitated, other than areas which are to be used in future for permitted or consented activities.

These latter areas comprise areas of cleanfill north of the access road that will be hydroseeded and left to settle. No additional planting or rehabilitation of the cleanfill will be required. Elsewhere active revegetation through planting will be required for approximately 10% of the existing quarry site. It is intended that the 10% will be distributed across the site to act as "islands" of planted small hardwood shrubs to establish seed sources.

7.2 SITE DESCRIPTION

The site is located in the central part of Ngauranga Gorge, adjacent to SH1, a major transport corridor, and surrounded by industrial landuse and open space areas. The site is overlooked by elevated residential suburbs. The landscape is highly modified, resulting from clearance of the original native forest cover followed by a long and ongoing history of major landform modification. The District Plan provides for the KPQ to operate within this unique environment until the completion of the southern area, which will mark the end of the Quarry operations. The main areas of the KPQ requiring rehabilitation work are listed below:

Main Rehabilitation Areas

- North Face
- South Face
- Grazing Area
- Buffers
- Stream

7.3 REHABILITATION OBJECTIVE AND PRINCIPLES

The overall objective of the KPQ rehabilitation *“is to establish native vegetation cover that contributes to the Council’s vision for Ngauranga Gorge to become part of the identified inner green belts”*.

While rehabilitation of the KPQ does not imply restoration of the site to its original pre-quarry state, it is important that the specific landscape qualities of Ngauranga Gorge are reflected in the rehabilitation of the site. Quarrying dramatically alters landforms and disrupts ecological processes and habitats. The primary aim of rehabilitation is to provide the conditions that enable natural processes to resume functioning albeit in a modified form.

Prior planning, landscape and ecological assessments, and consultation, have identified the following five general rehabilitation principles:

- (1) To promote Wellington’s indigenous biodiversity and rehabilitate natural processes within the site.
- (2) To conduct rehabilitation concurrently with quarry operations, coordinating progressive completion with rehabilitation.
- (3) To finish the quarry faces to resemble the steep bluff landforms that would have occurred naturally in the Ngauranga Gorge.
- (4) To conduct rehabilitation in a manner that encourages rapid vegetation of the slopes, reducing the duration of adverse visual impacts.
- (5) To revegetate the quarry in a way that supports the vision of the City’s Inner Green Belts.

Most effective rehabilitation occurs when the work is integrated as part of the overall operation and is implemented progressively, as each section of the Quarry is completed. At the same time the creation of scree slopes, bench ripping, return of over-burden to soften excavated terraces and faces and importation of soils provides opportunities for re-vegetation. Coordination of these activities ensure a high success rate for re-vegetation and encourage rapid vegetation.

Rehabilitation attempts to maximise favourable environmental conditions for plant growth and hasten natural revegetation processes by controlling those factors that are able to be controlled, monitoring results, and where necessary, progressively adapting activities to improve results.

Initial planting must be considered using known effective methods and techniques, and locally proven, rapid growing and robust plant species with a high likelihood of survival in a range of site conditions. In time, when site conditions have been moderated by the initial nursery cover, other species can be introduced.

Key factors that are likely to influence the success of this rehabilitation project are:

- Width, height and stability of terraces, size of screens
- The proximity and condition of remaining areas of adjacent native vegetation
- Quality of topsoil, cleanfill or redistributed stockpile
- Control of plant and animal pests
- Contamination of water sources
- Prevention of fire
- Monitoring of progress

Rehabilitation measures for each area will vary according to the specific micro climate, exposure aspect and substrate of the different sites. Specific detail for the varying conditions and appropriate measures will be included in the annual implementation plans.

7.4 NGAURANGA GORGE VALUES

To determine how best to rehabilitate the site, the contextual values of the site must be described and understood so that the rehabilitation techniques can re-integrate the quarry into the Ngauranga gorge landscape, and so that natural systems can be re-established to allow revegetation that approximates to the original patterns.

The Ngauranga Gorge has been identified as an area of strategic significance to the city and is recognised as a ‘working’ city gateway containing industrial and commercial uses and a major transport corridor that is made memorable by the views of Wellington Harbour. The Council’s open space strategy, *Capital Spaces*, refers to the Ngauranga Gorge as one of four proposed inner green belts. The return of closed canopy forest to the Ngauranga Gorge hillsides will enhance and realise the Council’s vision for a green belt in the Ngauranga Gorge. It will also be a positive factor in creating plant and animal habitat, soil protection and enhancing indigenous biodiversity. The rehabilitation of the Quarry seeks to support this vision.

The values of Ngauranga Gorge, identified in *Capital Spaces*, and their contribution to the Gorge landscape are summarised as:

Ecological values: Coastal forest is under-represented in Wellington. There is potential for native forest to be gradually restored on the steep hillsides of the gorge increasing this uncommon forest type and providing an almost continuous green corridor between the Wellington fault escarpment (Hutt Road Scarp), Ngauranga Gorge bush, Tyers Bush and the lowland reserves in Khandallah and Johnsonville, and the regenerating native forest of Mt Kaukau and the outer green belt.

Landscape Values: The gorge is an important threshold in and out of Wellington Harbour, experienced by thousands of people every day, and the regenerating native vegetation is noted in the strategy as providing the basis for a *“striking gateway to the harbour in the future”*.

Recreational values: Recreational values in the Ngauranga Gorge are currently limited by the steep open space terrain; SH1, which is a major cross-gorge barrier for pedestrian and cycle movement; and the dominance of industry on the valley floor. However, the Council has long term plans to develop more recreation routes along the western hills of the harbour, and opportunities to develop more recreational access through the gorge are likely to be explored further.

Heritage values: The entire gorge landscape is of historic interest, dating back to Maori settlement at the mouth of the gorge and then the history of the transport corridor and associated land uses, which have involved major modifications to the gorge landscape and the supply of quarry materials to the city and region for over 100 years.

7.5 IMPLEMENTATION TECHNIQUES

The KPQ has a number of factors which will make its rehabilitation challenging. The techniques in this section are to be applied generically across the site to the greatest practicable extent. The annual implementation plan should progressively develop specific rehabilitation proposals for each of the areas to cater for the unique combination of soil, slope, exposure and aspect within the site to which revegetation activities must respond. The implementation plan shall be prepared annually. The responsibilities of each technique are outlined below:

7.5.1 PLANNING

Ideally rehabilitation planning should commence at an early enough stage to ensure that remaining values of the site that are not directly affected by quarrying are protected and that maximum opportunities are provided for future rehabilitation in the quarried areas. The annual implementation plan should demonstrate an appropriate level of planning in order to achieve the rehabilitation principles.

An annual implementation plan will be developed. Each part of the site will have unique limitations and opportunities, so planning should not be too rigid. Regular monitoring enables rehabilitation actions and management to be reviewed and revised in response to results. Implementation will evolve over time, and will be reviewed and refined each year. Achieving a final landform that reflects the earlier features and topography of the area will require further detail and developed design to be carried out through annual implementation plans closer to the time of each individual quarry face closure.

7.5.2 VEGETATION PROTECTION

Prior to commencement of operations the extent of earthworks adjacent to vegetated buffers and stream margins should be clearly marked on site along with areas of vegetation and topsoil that are to be stripped and areas of vegetation that are to be retained.

The vegetation that is to remain must be clearly marked to prevent accidental removal. These remnants of vegetation have a vital role in future rehabilitation, acting as a seed source, providing shelter and providing habitat for birds that will encourage natural seed dispersal.

The removal of pine trees and other pest species must be immediately initiated throughout the site. The buffer areas above the northern face have been identified for pine removal. This should be initiated and continued through the development of future implementation plans.

7.5.3 STOCKPILING

There is currently no material "soil or overburden" stockpiled on the KPQ site. Future short term stockpiling of cleared vegetation and on-site soil material for re-spreading shall be determined and implemented within the annual implementation plans as appropriate.

In addition to topsoil and overburden stripped from quarried areas and the composted vegetation, other quarry by-products, such as grit and sludge, can potentially be used in the preparation of substrate. The addition of a 'blended' combination of these different materials to the uppermost layer of fill can improve both physical properties and fertility and thereby make these areas more suitable for plant establishment and growth.

7.5.4 ROCK FACE SHAPING

Rehabilitation will involve physical re-shaping of the quarry site to achieve the landform principle (Principle 3) and to support revegetation, before any planting is carried out. In accordance with the landform principle, the final shaping of the quarry faces is a critical phase of the rehabilitation of Kiwi Point Quarry, in order to address the high visual prominence of the quarry and its location in an important gateway to the city and existing residential suburbs.

A series of benches and haul roads will remain at completion of quarry extraction activities. These platforms are one of the most distinctive features that indicate an area has been quarried. These benches run against the 'grain' of the landscape and removing some of them or breaking them up is the key to reducing their visibility.

Some benches can be fully or partly demolished as part of the planned face finishing, but some benching is likely to need to remain to ensure slope stability. With care, key components of the surrounding landscape can be mirrored in the modified quarry face including large rock bluffs, screes and gullies.

The rehabilitation works also need to ensure continued safe access across the site for staff undertaking ongoing rehabilitation works such as planting and pest management. Retaining some benching on a temporary or permanent basis can ensure this.

The implementation plans shall provide that the absolute maximum slope of a quarry face (batter) shall not exceed 55 degrees from the horizontal (ie between benched areas) and the maximum height of a batter shall be no more than 15 metres in height. However, variety and visual interest shall be provided for by varying the batter angle and heights and creating features as described above.

Reference:

District Plan Rules 7.1.3.3.4 and 7.1.3.3.5

7.5.5 DRAINAGE

Care is needed in managing water and associated erosion. Benches direct and concentrate water flow and so drainage needs to be considered to prevent scouring and erosion. Cut-off drains are particularly important on the benches to prevent erosion and scouring of the replaced soils.

Routes for stormwater drains need to be determined in consultation with the rehabilitation adviser to ensure that routes are aligned to avoid tall trees and advanced native vegetation, and that appropriate remedial work is undertaken to prevent future erosion. This should be developed within the annual implementation plan.

7.5.6 SOIL PREPARATION

A fundamental process of rehabilitating the site will be the preparation of the substrate and the quality of topsoil for all planting areas, including areas left to regenerate naturally. Topsoil shall conform to the following specification:

Topsoil shall exhibit the presence of biological activity as evidenced by adequate aggregation and organic matter content. The material shall be acceptable for growing all of the appropriate species, given adequate management, and shall not contain any substances injurious to plant growth.

The mix of rubble, blended fill and topsoil needs to be determined for areas of both the north and south faces to reflect their unique climatic properties and planting requirements. Once laid, the exposed soils should be hydroseeded (or any other approved method) immediately to prevent erosion and dust problems, and also to limit germination of some pest plants.

The treatment of rock benches is important before re-spreading of onsite topsoil is possible. The surface of the bench usually needs to be ripped to create a zone of fractured rock which will allow the topsoil to be 'keyed in' and prevent the formation of extensive slip planes between the two materials. The fractured zone also serves to retain moisture and provides secure rooting.

7.5.7 REVEGETATION

The objective is to achieve a vegetation cover that relates to the existing vegetation remnants in the area. This provides continuity of habitat and linkages for wildlife movement.

There are three common methods appropriate for establishing vegetation cover on the earth-worked areas. Using a combination of methods at KPQ will mean that the most appropriate method can be used for the prevailing site conditions. There may be a need for fertilizing to enhance vegetation. The methods are:

- Hydroseeding (where appropriate)
- Natural regeneration by providing suitable conditions for vegetation establishment
- Planting with locally eco-sourced native species.

Planting will be co coordinated within the annual implementation plan to ensure appropriate plants species and numbers are available for the following planting season.

7.5.8 HYDROSEEDING

Hydroseeding or hydromulching of exposed soils will reduce runoff and erosion, bind soils preventing dust problems, and will inhibit some invasive pest plants. Hydroseeding will assist in stabilising loose soils primarily on benches and where appropriate some lower batter slopes; however its application to rock face and steep batter slopes is not yet proven as a reliable rehabilitation technique. Trials and development of new hydroseeding techniques should be initiated and monitored to find one or more solutions that meet the specifics of the site.

Hydroseeding and mulching shall be coordinated with quarrying, following the completion of earthworks. In areas allocated for natural regeneration, particular exotic grass mixes may inhibit native seed strike so further investigation of surface treatment will be needed to ensure the best balance of erosion and weed control while promoting native seed propagation. Some trialling has been completed locally and nationally with native shrub and grass species, and with some moss and lichen species. However, this technology is not yet reliable enough for large scale application. Some experimentation should be undertaken.

7.5.9 NATURAL REGENERATION

Sites left to regenerate naturally with local native vegetation can often be the most successful means of getting vegetation established. For this to be achieved optimum site conditions must prevail. That is, sites altered by earthworks must be left in a condition that allows natural regeneration to occur (i.e. runoff controlled, suitable substrate, good seed source nearby, pest

management strategy, etc). This process will take longer than on those sites that are assisted by planting or laying brush.

7.5.10 PLANTING

The aim of revegetation is to create “islands” of planted vegetation which spread outwards and assists the natural regeneration of adjacent areas through shelter and seed dispersal. The most favourable sites (micro sites) are selected for this planting, and they need not cover more than 10% of the site.

On all areas that are revegetated, the following practices should be adopted:

- Plant sourcing will require proactive planning so that the right species are planted at the right time – usually a year’s lead time is required to enable sufficient quantities of appropriate locally-sourced plant species to be propagated.
- The extent of planting programmed for each year needs to be determined in relation to resources available for maintenance in successive years.
- Species should be sourced from local plant populations to ensure that they are ecologically compatible and suitable for the environs (i.e. eco-sourced).
- All plants should be suitably acclimatised to local conditions prior to planting. If plants are propagated outside the Wellington district this may involve bringing them to a suitable local holding area or nursery several months before they are planted.
- Small grade plants should be used because they will acclimatise and establish more readily than large grades.
- Plants should be densely planted with the object of attaining ‘canopy closure’ as quickly as possible (ie. the sooner plants coalesce the better, because this assists in their survival and also reduces competition from pest plants and other unwanted plants).

7.5.11 STAGING

KPQ site rehabilitation has a timeframe measured in several decades. Revegetation of the first sections should be well advanced by the time south face quarry closes. Staging revegetation over several years is critical to its success, allowing flexibility to adapt to any unexpected seasonal events such as a particularly wet winter or particularly dry summer. It also enables adjustments to be made in terms of ongoing maintenance practice, species composition, pest management, timing, and methods of planting taking into account monitoring of previous planting. Staging revegetation work over several years also allows maintenance to be more easily accommodated.

7.5.12 TRIAL PLANTING

Each area will have unique features and combinations of soil, slope, moisture, sun and wind. Each annual implementation plan should contain some plant trials to test the efficacy of certain species and planting treatments.

The use of biodegradable geo-textile mats should be considered. These can be very effective in some situations but can be expensive relative to other methods. A number of suitable products are now available made from biodegradable materials such as coconut fibre. Mats should be considered and trialled but will generally be used as a supplementary rather than primary rehabilitation method.

7.5.13 MAINTENANCE

All areas of planting within the KPQ (10% of the site) will require some maintenance and pest management. Maintenance should be programmed and costed for the first five years following each planting stage. At the completion of this time frame, planting should be well established and self-sustaining. On exposed sites, maintenance work will involve replacing failed plants ('blanking') and cutting back / removing unwanted and competing species.

7.5.14 MONITORING

Commitment to ongoing monitoring of the rehabilitation progress and commitment to remedial maintenance is critical to the success of rehabilitation. Ongoing monitoring will be essential so that:

- trends can be recognised early and optimised (e.g. recognising most favourable micro-sites or the most successful species);
- pest problems (plant and animal) can be dealt to when signs are first observed (e.g. pull seedlings while still young);
- the effects of changeable climatic conditions can be managed (e.g. Delaying planting in drought years);
- trial plots can be set up and observed for improved overall results (hydroseeding, mulching, plant and material trials).

Monitoring and agreement to appropriate management responses will form part of the rehabilitation contract documentation. Whilst some management measures need to be in place at the outset, for others ongoing monitoring will be required to decide what action needs to be taken and when. This may simply be a matter of refining the rehabilitation method used but it may require significantly altering the method or the timing. Site management then becomes responsive and tailored to progress from year to year.

An annual monitoring inspection will be included within the implementation plan and associated reporting will cover:

- identification of successes of past and previous year
- identification of deficiencies or inadequacies
- identification of opportunities
- the programme for the coming year.

Comprehensive record keeping will be important to ensure the accumulation of knowledge, which will result in increased efficiency and reduced costs over the life of the rehabilitation project. Progress photographs, taken at key vantage points, will be used as a valuable monitoring tool.

7.6 ASSOCIATED REHABILITATION AREAS

Beyond the three main sites of the quarry (north and south faces and grazing area) a number of additional rehabilitation projects should be undertaken

7.6.1 BUFFER AREAS

- (1) Pines: pines should be removed from nearby areas regenerating to native vegetation, particularly in the native vegetation between the north face and Fraser Avenue. Branches and foliage can be mulched and utilised in soil rehabilitation on the finished quarry benches. Large logs can be placed and secured on benches to provide micro-sites for rehabilitation.
- (2) Management of invasive pest plants: such plants should be removed on an ongoing basis. In particular, continued efforts should be directed at vines such as old man's beard, convolvulus, blackberry and ivy which are currently invading the stream margins and the regenerating forests between the northern quarry workings and Fraser Avenue.

Reference:

- District Plan Rules 7.1.3.3.6

7.6.2 NGAURANGA GORGE (WAITOHI) STREAM

Like the forests of Ngauranga Gorge, the stream which once dominated the narrow bottom of the gorge has also been substantially modified to the extent that much of it is piped underground and those vestiges still above ground are largely hidden behind industrial development. Watercourses extend from Fraser Ave, running to the west of the north face and a large stormwater outlet from Johnsonville emerges at the existing quarry site. These feed the stream that flows behind the abattoir and is then piped underground and taken across SH1, north of the site.

It has been noted in previous investigations that this stream is seriously degraded. It would benefit from extensive rehabilitation. Stream rehabilitation is specialised and requires consultation with affected parties including the Taylor Preston management, Greater Wellington Regional Council and iwi, before specific rehabilitation is initiated under the annual implementation plan. Stream rehabilitation should address the removal of any introduced industrial waste from the streambed and slopes, diversion and treatment of contaminated runoff, pest plant removal and enhancement of riparian revegetation.

7.7 REHABILITATION SUMMARY

The principles for rehabilitation of the KPQ include all of the following steps.

- (1) Preparation of an annual implementation plan, including coordinated staging of works closure to achieve best ecological outcomes.
- (2) Programme for clearance of vegetation, mulching and composting and stockpiling.
- (3) Methods for limiting disruption to streams and freshwater habitat.
- (4) Vegetative screening of work areas.
- (5) At the completion of the quarry operation – the quarry landform shall be re-contoured to reflect the former landforms/ topography of the area. Achieving a combination of revegetated benches and more natural unvegetated landforms including large rock outcrops, bluffs, screes and gullies to reflect the surrounding topography is the desired outcome.

- (6) Creation of new soil substrate in all planting areas (benches, screes etc), to encourage rapid vegetation of the slopes, reducing the duration of visual impacts.
- (7) Trialling of a range of onsite revegetation methods for ensuring rapid vegetation cover, and maintenance of revegetated areas.
- (8) Preparation of pest plant, pest animal and fire control programme.
- (9) A monitoring and maintenance programme.

It is intended that experience and monitoring in early stages of rehabilitation will feed back into the continuing rehabilitation process.

8. LONG TERM USE

8.1 NORTHERN QUARRY AREA

The concept design for the existing northern quarry site has been based on the following staging plan:

- *Stage 1*, quarry area A and the area behind Downer EDI Works
- *Stage 2*, quarry area C and fill areas A and F
- *Stage 3*, quarry area B and fill areas C and F
- *Stage 4*, quarry and fill area D
- *Stage 5*, quarry and fill area E (Taylor Preston Carpark)
- *Stage 6*, develop area G
- *Final Stage*, final quarrying/filling, creating level platforms, access road etc.

Appendix 5 details the staging plans for the Northern Quarry site. In the long term, a range of permitted or consented activities will be able to establish on the site.

8.2 SOUTHERN QUARRY-AREA

District Plan Change 25 changed the zoning to Suburban Centres but restricted development other than quarrying and cleanfilling.

Given the expected duration of up to 50 years for development of the Southern part of the Quarry, there is opportunity to consider the future use of the land through District Plan reviews and other Council strategies.

9. MANAGEMENT OF COMPLAINTS

9.1 MANAGEMENT OF COMPLAINTS

It is the responsibility of the quarry operator to record all complaints. The quarry operator is responsible for acting on and, rectifying the cause of complaints.

All complaints received in respect of the Quarry operation shall be recorded on a Complaints Register Form QF 7.3, Appendix 8, for the collation into the complaints register. The forms record the following details of each complaint received either verbally or in written form:

- Date, event, name, address and contact details of the complainant (where provided)
- Action to resolve the issue/complaint and action to prevent similar complaints
- Date of oral response and date of written response

The quarry operator shall respond to complaints within the following timeframes following receipt:

- 8 hours – oral response
- 3 days – written response, which confirms details of the complaint and indicates what action has been taken or is proposed to be taken.
- It shall be made clear that if the complainant is not satisfied; he or she can contact the Council's Infrastructure Director
- A summary of all complaints received shall be presented in the monthly report to the Council.

Reference:

- KPQ ISO 9001:2008 Quality and Procedure Manual, QF 7.3 Complaints form
- KPQ Complaints Register

10. FURTHER INFORMATION

If you would like any further information on the Kiwi Point Quarry please, contact

THE COUNCIL

The Director Infrastructure

Wellington City Council

PO Box 2199

Wellington 6140

Tel: (04) 499 4444

Web: <http://www.Wellington.govt.nz>

THE QUARRY OPERATOR

Atom Hire Ltd

Kiwi Point Quarry

PO Box 9538

Wellington 6141

Tel: (04) 472 6958

Fax: (04) 472 8268

11. REFERENCES

- Health & Safety in Employment (Mining Administration) Regulations 1996
- Health & Safety in Employment Regulations 1992
- Atom Hire (Quarry operator) Health & Safety Plan – January 2009
- Kiwi Point Quarry Management Plan – March 2006; Opus Consultants
- Kiwi Point Quarry - Quarry Storm-water Management Plan June 2005; Opus Consultants
- Guidelines for the control of dust and associated hazards in Surface Mines and Quarries – March 2008
- Guidelines for the safe use, storage, and disposal of explosives in surface Mines and Quarries – March 2008
- Guidelines for noise control in Mines, Quarries and Tunnels – March 2008 (and subsequent reviews)
- Guidelines for emergency preparedness in Mines and Quarries – March 2008 (and subsequent reviews)
- Guidelines for management of hazards associated with crushing and screening plants in Mines and Quarries – March 2008 (and subsequent reviews)
- Guidelines for the safe operation of mobile plant in Mines and Quarries – March 2008 (and subsequent reviews)
- Guidelines for the control of hazards in stockpiles and dumps in Mines and Quarries – March 2008 (and subsequent reviews)
- Industry Code of Practice Surface Mining and Quarry Industries – March 2008 (and subsequent reviews)
- Wellington City Council Kiwi Point Quarry Design Detail February 2006 Beca Infrastructure
- A Guide to the Management of Cleanfills
- Wellington City council District Plan
- Hazardous Substances & New Organisms Act (HAZNO) 1996 and related regulations (and subsequent reviews)
- Resource Management Act 1991



**APPENDIX 3 HEALTH AND SAFETY IN EMPLOYMENT (MINING
OPERATIONS AND QUARRYING OPERATIONS) REGULATIONS 2003**

HEALTH AND SAFETY IN EMPLOYMENT AMENDMENT ACT 2013



Health and Safety in Employment Amendment Act 2013

Public Act 2013 No 95
Date of assent 18 November 2013
Commencement see section 2

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Part 2B

**Worker participation in health and safety in
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The Parliament of New Zealand enacts as follows:

- 1 Title**
This Act is the Health and Safety in Employment Amendment Act 2013.
- 2 Commencement**
This Act comes into force on 16 December 2013.
- 3 Principal Act**
This Act amends the Health and Safety in Employment Act 1992 (the **principal Act**).
- 4 Section 2 amended (Interpretation)**
 - (1) In section 2(1), insert in their appropriate alphabetical order:
 - “**Board** means the New Zealand Mining Board of Examiners established under section 20D
 - “**coal** has the meaning given to it in section 19L
 - “**industry health and safety representative** has the meaning given to it in section 19L
 - “**mine operator** has the meaning given to it in section 19L
 - “**mine worker** has the meaning given to it in section 19L
 - “**mineral** has the meaning given to it in section 19L
 - “**mining operation** has the meaning given to it in section 19L
 - “**permit operator** has the meaning given to it in section 19L
 - “**quarrying operation** has the meaning given to it in section 19N
 - “**site health and safety committee** has the meaning given to it in section 19L

“**site health and safety representative** has the meaning given to it in section 19L

“**site senior executive** has the meaning given to it in section 19L

“**tourist mining operation** has the meaning given to it in section 19L

“**tunnelling operation** has the meaning given to it in section 19O

“**WorkSafe** means WorkSafe New Zealand established by section 5 of the WorkSafe New Zealand Act 2013”.

- (2) In section 2(1), replace the definition of **approved code of practice** with:

“**approved code of practice** means a code of practice for the time being approved under section 20A; but where any amendment of the code of practice has been approved under that section, means the code of practice as amended”.

- (3) In section 2(1), replace the definition of **hazard notice** with:

“**hazard notice** has the meaning given to it in section 19ZF(1) or 46A(1), as applicable”.

- (4) In section 2(1), replace the definition of **improvement notice** with:

“**improvement notice** means a notice under section 39(1) or (2) or 39A”.

- (5) In section 2(1), replace the definition of **prohibition notice** with:

“**prohibition notice** means a notice under section 41(1) or 41A”.

5 **New section 3G inserted (Provisions affecting application of amendments to this Act)**

After section 3F, insert:

- “**3G Provisions affecting application of amendments to this Act** Schedule 1AA contains application, transitional, and savings provisions that affect other provisions of this Act as from time to time amended, repealed, or repealed and replaced (*see* section 63).”

6 Section 11 amended (Employees to be given results of monitoring)

After section 11(3), insert:

- “(4) An employer is not required under this section to give an employee the results of monitoring to the extent that those results have already been provided to the employee under section 12A.”

7 New sections 12A and 12B and cross-heading inserted

After section 12, insert:

“Duties of mine operators in relation to information

“12A Mine workers to be given results of monitoring

- “(1) This section applies to the results of any monitoring of any mine worker or any mining operation undertaken in compliance with this Act or regulations made under this Act if the monitoring was—
- “(a) undertaken by or on behalf of a mine operator; or
 - “(b) undertaken by or on behalf of a department (within the meaning of the State Sector Act 1988) or WorkSafe and the results have been given to a mine operator.
- “(2) Subject to subsection (3), every mine operator must ensure that—
- “(a) every mine worker is given all results to which this section applies of monitoring of the mine worker (whether as an individual or as one of a number of mine workers) in relation to health or safety; and
 - “(b) all mine workers are given all results to which this section applies of general monitoring of—
 - “(i) conditions in the mining operation; or
 - “(ii) the health or safety of mine workers there.
- “(3) Every mine operator must ensure that—
- “(a) there are omitted from all results to which this section applies given to any individual mine worker all information that identifies, or discloses anything about, any other individual mine worker; and
 - “(b) there are omitted from all results to which this section applies given to any group of mine workers all infor-

mation that identifies, or discloses anything about, any individual mine worker.

“12B Information for site health and safety representatives

A mine operator must ensure that all site health and safety representatives in the mining operation have ready access to sufficient information about health and safety systems and health and safety issues in the mining operation to enable the representatives to perform their functions and exercise their powers effectively.”

8 New section 13AA and cross-heading inserted

After section 13, insert:

“Duties of mine operators in relation to training and supervision

“13AA Training and supervision of mine workers

Every mine operator must take all practicable steps to ensure that every mine worker who does work of any kind, or uses plant of any kind, or deals with a substance of any kind, in a mining operation—

- “(a) has, or is so supervised by a person who has, such knowledge and experience of similar places, and work, plant, or substances of that kind, as to ensure that the mine worker’s doing the work, using the plant, or dealing with the substance is not likely to cause harm to the mine worker or other people; and
- “(b) is adequately trained in the safe use of all plant, objects, substances, and protective clothing and equipment that the mine worker is or may be required to use or handle.”

9 Section 19G amended (Minister may approve occupational health and safety training)

After section 19G(4), insert:

- “(5) For the purposes of Part 2B, the reference to a health and safety representative in section 19G(2)(b) means a site health and safety representative.”

10 New section 19J inserted (Relationship of this Part with Part 2B)

After section 19I, insert:

“19J Relationship of this Part with Part 2B

Except as provided in this Part or Part 2B, nothing in this Part applies to a mining operation.”

11 New Part 2B inserted

After Part 2A, insert:

“Part 2B

“Worker participation in health and safety in mining sector

“19K Purpose of Part

The purpose of this Part is to require the participation of mine workers in processes relating to health and safety in a mining operation so that—

- “(a) all persons with relevant knowledge and expertise can help make the mining operation healthy and safe; and
- “(b) when making decisions that affect mine workers and their work, a mine operator has information from mine workers who face the health and safety issues in practice.

“19L Interpretation

In this Act,—

“**alluvial mining operation** means a mining operation carried out above ground and associated with—

- “(a) the extraction of gold from river deposits of sand or gravel:
- “(b) the extraction of ironsand from sand or gravel

“**coal** means anthracite, bituminous coal, sub-bituminous coal, and lignite, and—

- “(a) includes every other substance worked or normally worked with coal; but
- “(b) does not include coal in the form of peat

“**industry health and safety representative** means a person appointed in accordance with section 19ZU

“**licence or other permission** means a lease, licence, or other instrument under which a person with an interest in land (including, for example, the owner of the land) permits another person to carry out a mining operation on the land

“**mine operator** means,—

“(a) in respect of a mining operation carried out under a permit granted under the Crown Minerals Act 1991,—

“(i) the person appointed by the permit operator to manage and control the mining operation; or

“(ii) the permit operator, if no such person has been appointed:

“(b) in respect of a mining operation (not being a mining operation described in paragraph (a)) carried out under a licence or other permission,—

“(i) the person appointed to manage and control the mining operation by the person who holds the licence or other permission to carry out mining operations; or

“(ii) the person who holds the licence or other permission to carry out mining operations, if no such person has been appointed:

“(c) in any other case,—

“(i) the person appointed to manage and control the mining operation by the owner of the land where the mining operation is being carried out; or

“(ii) the owner of the land where the mining operation is being carried out, if no such person has been appointed

“**mine worker** means a person who works in a mining operation, either as an employee or as a self-employed person

“**mineral** means a naturally occurring inorganic substance beneath or at the surface of the earth, and—

“(a) includes metallic minerals, non-metallic minerals, and precious stones; but

“(b) does not include clay, coal, gravel, limestone, sand, or stone

“**mining operation** has the meaning given to it in section 19M

“**peat** means combustible, soft, porous, or compressed sedimentary deposit of plant origin with a high water content

“**permit operator** has the same meaning as in section 2 of the Crown Minerals Act 1991

“**quarrying operation** has the meaning given to it in section 19N

“**site health and safety committee** means a committee established to support the ongoing improvement of health and safety in a mining operation

“**site health and safety representative** means a mine worker elected as a site health and safety representative, as an individual or as a member of a site health and safety committee, or both

“**site senior executive** means the person appointed as the site senior executive by the mine operator

“**tourist mining operation** means an operation that has the purpose of—

“(a) mine education; or

“(b) mine research; or

“(c) mine tourism

“**tunnelling operation** has the meaning given to it in section 19O.

“19M Meaning of mining operation

In this Act, **mining operation**—

“(a) means the extraction of coal and minerals and the place at which the extraction is carried out; and

“(b) includes any of the following activities and the place at which they are carried out:

“(i) exploring for coal:

“(ii) mining for coal or minerals:

“(iii) processing coal or minerals associated with a mine:

“(iv) producing or maintaining tailings, spoil heaps, and waste dumps:

“(v) the excavation, removal, handling, transport, and storage of coal, minerals, substances, contaminants, and wastes at the place where the activities described in subparagraphs (i) to (iv) are carried out:

- “(vi) the construction, operation, maintenance, and removal of plant and buildings at the place where the activities described in subparagraphs (i) to (iv) are carried out:
- “(vii) preparatory, maintenance, and repair activities associated with the activities described in subparagraphs (i) to (iv); and
- “(c) includes—
 - “(i) a tourist mining operation:
 - “(ii) a tunnelling operation; but
- “(d) does not include—
 - “(i) exploring for minerals:
 - “(ii) an alluvial mining operation:
 - “(iii) a mining operation wholly on or under the seabed on the seaward side of the mean high-water mark:
 - “(iv) a quarrying operation.

“19N Meaning of quarrying operation

- “(1) In this Act, **quarrying operation**—
- “(a) means an activity carried out above ground for the purpose of—
 - “(i) extracting any material, other than any coal or any mineral, from the earth; or
 - “(ii) processing any material, other than any coal or any mineral, at the place where the material is extracted; and
 - “(b) includes the place where an activity described in paragraph (a) is carried out; and
 - “(c) includes any place in which any material extracted or processed in a quarry is crushed or screened.
- “(2) Subsection (1) applies whether or not the material is to be extracted or processed for commercial gain and whether or not the material is extracted or processed by the use of explosives.

“19O Meaning of tunnelling operation

- In this Act, **tunnelling operation**—
- “(a) means an operation involving extraction of fill with the purpose of creating a tunnel or shaft or enlarging or extending any tunnel or shaft; and

- “(b) includes the place where an operation described in paragraph (a) is carried out; but
- “(c) excludes any tunnelling operation of a kind declared under section 19P not to be a tunnelling operation.

“19P Governor-General may, by Order in Council, exclude operations from section 19O

The Governor-General may, by Order in Council made on the recommendation of the Minister, declare that certain operations or classes of operation are not tunnelling operations for the purposes of section 19O.

“19Q General duty to involve mine workers in health and safety matters

- “(1) Every mine operator must ensure that there is, for a mining operation, a documented worker participation system that provides reasonable opportunities for the mine workers to participate effectively in ongoing processes for the improvement of health and safety in the mining operation.
- “(2) Without limiting subsection (1), **ongoing processes for the improvement of health and safety** include the matters referred to in sections 6 to 13AA.
- “(3) In complying with this Part, a mine operator must take into account any relevant approved code of practice.
- “(4) If a site health and safety committee or a site health and safety representative makes a recommendation regarding health and safety in a mining operation, the mine operator must either adopt the proposal or provide a written statement to the site health and safety committee or site health and safety representative setting out the reasons for not adopting the proposal.
- “(5) In subsection (1), **reasonable opportunities** means opportunities that are reasonable in the circumstances, having regard to relevant matters such as—
 - “(a) the number of mine workers in the mining operation; and
 - “(b) the likely potential sources or causes of harm in the mining operation; and

- “(c) the nature of the work that is performed and the way that it is arranged or managed by the mine operator; and
- “(d) the nature of the employment arrangements or contracting arrangements, including the extent and regularity of employment or engagement of temporary mine workers; and
- “(e) the willingness of mine workers and unions to develop worker participation systems; and
- “(f) in relation to employers and employees, the overriding duty to act in good faith.

“Worker participation system

“19R Development of worker participation system

- “(1) The following persons must co-operate in good faith to seek to develop, agree, implement, and maintain a worker participation system that sets out the ways in which the mine operator must seek to comply with section 19Q(1):
 - “(a) the mine operator;
 - “(b) the mine workers who wish to be involved;
 - “(c) a union or unions representing any of the mine workers.
- “(2) A worker participation system may include any matters that the mine operator, mine workers, and any union representing them, agree comply with this Part.
- “(3) If the system includes provision for site health and safety representatives, those representatives must be elected by the mine workers in the mining operation.
- “(4) If 1 or more mine workers request that the system include provision for site health and safety representatives, there must be provision for the election of at least 1 site health and safety representative.
- “(5) A system may allow for more than 1 site health and safety representative or 1 site health and safety committee and, in that case, each representative or committee may represent a particular type of work of the mine operator, or another grouping agreed in, or determined in accordance with, the system.

“19S Training of site health and safety representatives

- “(1) Sections 19E to 19G apply to any site health and safety representative under this Part who is an employee.
- “(2) A worker participation system may include a provision increasing or decreasing the maximum—
- “(a) number of days’ paid leave that the employers of mine workers are required to allow site health and safety representatives who are employees to take for health and safety training under section 19E(1) (as applied by subsection (1));
 - “(b) total number of days’ paid leave that employers of mine workers are required to allow site health and safety representatives and health and safety representatives to take for health and safety training under sections 19E(2) and 19F (as applied by subsection (1)).
- “(3) Despite subsection (2) and section 19E(1) and (2) (as applied by subsection (1)), a worker participation system must ensure that every site health and safety representative who is an employee has sufficient paid leave to attend training reasonably required to attain the competency requirements for site health and safety representatives prescribed by or under regulations made under this Act.

“19T Review and replacement of worker participation systems

- “(1) A worker participation system must specify a process by which it must be reviewed.
- “(2) At any time after the expiry of 12 months from the date the system is agreed, 1 or more mine workers or a union on their behalf may initiate the development of a new system in accordance with this Act.
- “(3) If a system is no longer in place, or functioning, a new system must be developed, agreed, implemented, and maintained in accordance with section 19R.

“19U Prescribed provisions apply if no scheme in place

- “(1) The provisions prescribed in regulations made under this Act apply if a worker participation system is not developed—

- “(a) within 3 months of the date on which a mining operation begins; or
 - “(b) if section 19T(3) applies, within 3 months of the date on which any person initiates the development of a new system.
- “(2) If the prescribed provisions apply, and have applied continuously for a period of 6 months or more, 1 or more mine workers or a union on their behalf may initiate the development of a new system in accordance with section 19R.

“Site health and safety representatives

“19V Election of site health and safety representatives

If a worker participation system provides for the election of 1 or more site health and safety representatives, but does not provide for the conduct of those elections, the requirements for the conduct of elections prescribed in regulations made under this Act apply.

“19W Functions of site health and safety representatives

The functions of a site health and safety representative are, in relation to the mining operation in respect of which the representative is appointed,—

- “(a) to represent mine workers in matters relating to health and safety:
- “(b) to investigate complaints from mine workers regarding health and safety:
- “(c) if requested by a mine worker, to represent the worker in relation to a matter relating to health and safety (including a complaint):
- “(d) to identify hazards in the mining operation and bring them to the attention of the mine operator or site senior executive:
- “(e) to monitor measures taken by the mine operator that are relevant to health and safety:
- “(f) to provide feedback to the mine operator or site senior executive about whether the requirements of this Act or regulations made under this Act are being complied with:

“(g) to promote the interests of mine workers who have been harmed at work, including in relation to arrangements for harmed workers’ rehabilitation and return to work.

“19X No duty on site health and safety representatives

Nothing in this Act imposes a duty on a site health and safety representative in that capacity.

“Powers of site health and safety representatives

“19Y Competency requirements for exercise of certain powers

A site health and safety representative must not exercise any power under section 19ZA, 19ZG, or 19ZH unless he or she meets the competency requirements for site health and safety representatives prescribed by or under regulations made under this Act.

“19Z Power of site health and safety representative to attend interview

With the consent of the mine worker, a site health and safety representative may attend any interview relating to health and safety that the worker has with the mine operator, the site senior executive or any other representative of the mine operator, or an inspector.

“19ZA Power of site health and safety representative to enter and inspect mining operation

- “(1) A site health and safety representative may enter and inspect any area of a mining operation at any reasonable time to perform the functions of the site health and safety representative.
- “(2) Before exercising the power under this section, the site health and safety representative must give reasonable notice to the site senior executive.
- “(3) In exercising the power under this section, the site health and safety representative must comply with any reasonable procedures and requirements applying in the mining operation that relate to health and safety.

“19ZB Power of site health and safety representative to examine and copy documents

A site health and safety representative may examine and copy any documents relevant to health and safety that are held by the mine operator, if the site health and safety representative has reason to believe that the documents contain information required to assess whether procedures at the mining operation are sufficient to achieve compliance with this Act and any regulations made under this Act.

“19ZC Power to require assistance

A site health and safety representative may require the site senior executive or person in charge of the relevant part or aspect of a mining operation to give the site health and safety representative reasonable assistance in the exercise of a power under section 19ZA or 19ZB.

“19ZD Power of site health and safety representative to accompany inspector

- “(1) A site health and safety representative may accompany an inspector who has, under section 31, entered a mining operation.
- “(2) An inspector may refuse to allow a site health and safety representative accompanying the inspector under this section to be present—
- “(a) during any discussion in which personal information may be disclosed (unless the person who is the subject of the information has expressly consented to the site health and safety representative being present):
 - “(b) if the inspector believes that the presence of the site health and safety representative would prejudice the maintenance of the law, including the investigation and prosecution of offences.
- “(3) In this section, **personal information** has the meaning given to it in section 2(1) of the Privacy Act 1993.

“19ZE Site health and safety representative may consult inspector

A site health and safety representative may consult with an inspector on any health and safety issue.

“19ZF Trained site health and safety representatives may issue hazard notices

“(1) In this section,—

“**hazard notice** means a notice that—

“(a) describes a hazard identified in a mining operation; and

“(b) is in the prescribed form; and

“(c) may set out suggested steps to deal with the hazard

“**trained site health and safety representative** means a site health and safety representative who has achieved a level of competency in health and safety practice specified by the Minister by notice in the *Gazette* or who has completed an appropriate course approved under section 19G.

“(2) Subsection (3) applies if a trained site health and safety representative—

“(a) believes on reasonable grounds that there is a hazard in the mining operation; and

“(b) has brought the hazard to the attention of the site senior executive; and

“(c) has discussed or attempted to discuss with the site senior executive steps for dealing with the hazard.

“(3) The trained site health and safety representative may give the site senior executive on behalf of the mine operator a hazard notice if—

“(a) the site senior executive refuses to discuss, or take steps to deal with, the hazard; or

“(b) the site senior executive and representative do not agree on the steps that must be taken, or the time within which the steps must be taken, to deal with the hazard; or

“(c) the representative believes on reasonable grounds that the mine operator or site senior executive has failed to meet the requirements of this Act or regulations made under this Act in relation to the hazard within a time agreed during the discussion.

“(4) If a hazard notice has been given by a trained site health and safety representative, the site senior executive must notify WorkSafe of that fact.

“19ZG Power of site health and safety representative to give notice requiring suspension of mining operation

- “(1) This section applies if a site health and safety representative—
- “(a) believes on reasonable grounds that the whole, or a part or an aspect, of a mining operation is likely to cause serious harm to any person; and
 - “(b) has discussed or attempted to discuss the matter likely to cause serious harm with the site senior executive.
- “(2) The site health and safety representative may give a written notice to the site senior executive ordering the suspension of the whole, or a part or an aspect, of the mining operation.
- “(3) The notice must set out the reasons for the site health and safety representative’s belief.
- “(4) If the site senior executive receives a notice under subsection (2), the site senior executive must stop the mining operation, or the part or aspect of the mining operation, mentioned in the notice.
- “(5) If a notice ordering the suspension of the whole, or a part or an aspect, of the mining operation has been given by a site health and safety representative, the site senior executive must notify WorkSafe of that fact.

“19ZH Power of site health and safety representative to require mining operation to stop in case of imminent serious harm

- “(1) This section applies if a site health and safety representative believes on reasonable grounds that serious harm to any person is likely to be caused imminently by the whole, or a part or an aspect, of a mining operation.
- “(2) The site health and safety representative may—
- “(a) stop the whole, or a part or an aspect, of the mining operation and immediately advise the person in charge of the operation or part or aspect of the operation; or
 - “(b) require the person in charge of the operation or part or aspect of the operation to stop the operation.
- “(3) If a site health and safety representative requires a person to stop the whole, or a part or an aspect, of a mining operation, that person must do so.

- “(4) The site health and safety representative must, as soon as practicable after exercising the power under subsection (2), advise the site senior executive of the action taken under that subsection and the reasons for the action taken.
- “(5) If a site health and safety representative has advised the site senior executive of action taken under subsection (2), the site senior executive must notify WorkSafe of that fact.

“19ZI Inspector may cancel order to suspend mining operation

An inspector may cancel the whole or part of a notice given under section 19ZG (whether or not mining operations have stopped pursuant to the notice) or an action taken by a site health and safety representative under section 19ZH(2) if the inspector does not consider that the operation or the part or aspect of the mining operation concerned is likely to cause serious harm to any person.

“19ZJ Workers must do other work

If the whole or a part or an aspect of a mining operation is stopped under section 19ZG or 19ZH, a mine worker who is an employee and who was working in the operation or part or aspect of the operation must do any other work within the scope of the worker’s employment agreement that the employer’s employer reasonably requests.

“19ZK Work not to restart until no likelihood of serious harm

The site senior executive must ensure that the operation or part or aspect of the mining operation stopped because a notice is given under section 19ZG, or stopped or required to be stopped under section 19ZH, is not restarted until the site senior executive is satisfied that it is not likely to cause serious harm to any person.

“19ZL Protection of site health and safety representatives performing functions or exercising powers

A mine operator or site senior executive must not—

- “(a) prevent or attempt to prevent a site health and safety representative from performing his or her functions or exercising his or her powers; or
- “(b) penalise a site health and safety representative for performing his or her functions or exercising his or her powers.

“19ZM Functions and powers for health and safety purposes only

A site health and safety representative must not perform a function or exercise a power under this Part for a purpose other than a health and safety purpose.

“19ZN Information to be used for health and safety purposes only

- “(1) This section applies to any information obtained by a site health and safety representative in the performance of the site health and safety representative’s functions or the exercise of the site health and safety representative’s powers under this Act.
- “(2) A site health and safety representative may—
 - “(a) disclose or use the information,—
 - “(i) if the information is about a person, only with the person’s consent:
 - “(ii) only to the extent necessary for the performance of the site health and safety representative’s functions or the exercise of the site health and safety representative’s powers under this Act:
 - “(b) disclose the information—
 - “(i) to WorkSafe or a person authorised by WorkSafe only if WorkSafe reasonably believes the disclosure is necessary for administering, monitoring, or enforcing compliance with this Act or any relevant health and safety legislation (as defined in section 3 of the WorkSafe New Zealand Act 2013):
 - “(ii) only if the disclosure is authorised or required by law.

“(3) In subsection (2), **disclose** includes to give any person access to information.

“**19ZO Health and safety representative not to unnecessarily impede production**

A site health and safety representative must not unnecessarily impede production at a mining operation when performing functions or exercising powers under this Part.

“**19ZP Protection from civil and criminal liability**

A site health and safety representative is protected from civil and criminal liability for any act that he or she does or omits to do—

- “(a) in the performance or intended performance of his or her functions or the exercise or intended exercise of his or her powers under this Act; and
- “(b) in good faith.

“**19ZQ Obligations of mine operators**

A mine operator must—

- “(a) allow a site health and safety representative to spend such time as is reasonably necessary to perform his or her functions and exercise his or her powers; and
- “(b) provide a site health and safety representative with such access to facilities that is reasonably necessary or prescribed in regulations made under this Act to enable the representative to perform his or her functions and exercise his or her powers.

“Removal of site health and safety representative

“**19ZR WorkSafe may remove site health and safety representative**

- “(1) WorkSafe may, by notice in writing, remove a site health and safety representative from office if WorkSafe considers that the site health and safety representative has failed to perform his or her functions or exercise his or her powers satisfactorily (for example, if the representative has exercised his or her

powers for an improper purpose in breach of section 19ZM or disclosed information in breach of section 19ZN).

“(2) The notice under subsection (1) must set out the reasons for WorkSafe’s opinion.

“19ZS Election of another site health and safety representative

“(1) If a site health and safety representative is removed from office by WorkSafe, another site health and safety representative may be elected.

“(2) Except as provided for in subsection (3), no election for a site health and safety representative to replace the representative who has been removed may be held until the expiry of the period for appeal under section 19ZT or, if an appeal is lodged, until a decision is made on the appeal.

“(3) One or more mine workers may initiate the election of a temporary site health and safety representative to replace the representative who has been removed.

“(4) The term of office of any temporary site health and safety representative ends on the expiry of the period for appeal under section 19ZT or, if an appeal is lodged, when a decision is made on the appeal.

“(5) A temporary health and safety representative has the functions and powers set out in sections 19W and 19Z to 19ZH, and those sections and sections 19X, 19Y, and 19ZI to 19ZQ apply with any necessary modifications.

“19ZT Site health and safety representative may appeal against removal

“(1) A site health and safety representative may appeal to a District Court against a decision of WorkSafe to remove him or her.

“(2) The appeal must be brought within 28 days of the date of the notice under section 19ZR.

“Industry health and safety representatives

“19ZU Appointment of industry health and safety representatives

“(1) This section and sections 19ZV to 19ZZD apply only to—

- “(a) a mining operation associated with the extraction of coal and where any person works below ground (**underground coal mining operation**):
 - “(b) mine workers who work in an underground coal mining operation:
 - “(c) any union that represents mine workers who work in an underground coal mining operation.
- “(2) A union or group of mine workers may, in any manner determined by the union or group, appoint a person to be an industry health and safety representative.
- “(3) The person appointed must meet the competency requirements for industry health and safety representatives prescribed in regulations made under this Act.
- “(4) The union or group of mine workers that appoints an industry health and safety representative must meet the costs of the representative.

“**19ZV Notice to WorkSafe of appointment or cessation of appointment of representative**

A union or group of mine workers that appoints an industry health and safety representative must—

- “(a) give notice to WorkSafe of that appointment; and
- “(b) provide the prescribed information in relation to that appointment, and a photograph of the representative authenticated in accordance with any prescribed requirements; and
- “(c) give notice to WorkSafe within 14 days after the date on which the person ceases to be a representative.

“**19ZW Functions and powers of industry health and safety representatives**

- “(1) An industry health and safety representative has, in respect of any mining operation and any mine worker, the functions and powers set out in sections 19W and 19Z to 19ZH, and those sections and sections 19X and 19ZI to 19ZP apply with any necessary modifications.

- “(2) In addition to the functions and powers referred to in subsection (1), an industry health and safety representative has the following functions:
- “(a) to participate in investigations into accidents in mining operations that resulted, or could have resulted, in serious harm;
 - “(b) to assist with industry-wide initiatives to improve health and safety in mining operations.

“19ZX Further provision concerning scope of functions and powers of industry health and safety representatives

An industry health and safety representative may perform his or her functions and exercise his or her powers in relation to any mining operation or mine worker whether or not,—

- “(a) in the case of a representative appointed by a union, any worker in the mine, or the relevant mine worker, as the case may be, is a member of that union; or
- “(b) in the case of a representative appointed by a group of mine workers, any worker in the mine, or relevant mine worker, as the case may be, is a member of that group.

“19ZY Identity cards

- “(1) WorkSafe must give each industry health and safety representative an identity card.
- “(2) The identity card must be in the prescribed form.
- “(3) A person who ceases to be an industry health and safety representative must return his or her identity card to WorkSafe as soon as possible, but within 14 days, after the date on which the person ceases to be a representative.

“19ZZ Production or display of identity card

- “(1) Before an industry health and safety representative exercises a power under this Part in relation to any person, the representative must—
 - “(a) produce his or her identity card to the person; or
 - “(b) display the identity card so it is clearly visible to that person.

- “(2) An industry health and safety representative who exercises a power under section 19ZA must—
- “(a) produce his or her identity card to the person apparently in charge of the part of the mining operation being entered; or
 - “(b) display the identity card so it is clearly visible to that person.
- “(3) If the representative is unable, despite reasonable efforts, to comply with subsection (2), the representative must, before leaving the mining operation, leave a written notice stating—
- “(a) the representative’s identity; and
 - “(b) the address of a place where the representative may be contacted; and
 - “(c) the date and time of entry onto the mining operation; and
 - “(d) the representative’s reasons for entering onto the mining operation.

“19ZZA Removal of industry health and safety representative

Sections 19ZR and 19ZT apply to an industry health and safety representative with any necessary modifications.

“19ZZB Register of industry health and safety representatives

- “(1) WorkSafe must keep and maintain a register of industry health and safety representatives.
- “(2) The purpose of the register is to enable members of the public to know the names and contact details of industry health and safety representatives.
- “(3) The register may be kept in any manner that WorkSafe thinks fit.
- “(4) The register must contain the prescribed information.

“19ZZC Alterations to register

WorkSafe may at any time make any amendments to the register that are necessary to reflect any changes in the information referred to in section 19ZZB(4).

“19ZZD Search of register

- “(1) A person may search the register for a purpose set out in section 19ZZB(2).
- “(2) WorkSafe must—
- “(a) make the register available for public inspection, without fee, at reasonable hours at the head office of WorkSafe; and
 - “(b) supply to any person, on request and on payment of a reasonable charge, a copy of the register or any extract from it.”

12 Section 20 replaced (Codes of practice)

Replace section 20 with:

“20 Codes of practice

- “(1) WorkSafe may from time to time issue any instrument (a **code of practice**) that is—
- “(a) a statement of preferred work practices or arrangements; or
 - “(b) a statement of preferred aims, arrangements, practices, or principles (or any 2 or more of those matters) for the design of plant, protective clothing, or protective equipment, of any kind or description; or
 - “(c) a statement of preferred arrangements, characteristics, components, configurations, elements, or states (or any 2 or more of those matters) for manufactured plant, manufactured protective clothing, or manufactured protective equipment, of any kind or description; or
 - “(d) a statement of preferred characteristics for any manufactured or processed substance used or capable of being used—
 - “(i) in or in connection with any protective clothing or protective equipment; or
 - “(ii) otherwise for or in connection with protecting people from hazards; or
 - “(e) a statement of preferred practices or arrangements relating to employee participation in health and safety in the place of work; or
 - “(f) a statement of preferred practices or arrangements relating to worker participation in a mining operation.

- “(2) WorkSafe may issue any amendment or revocation of a code of practice.
- “(3) Subject to subsection (4), a code of practice may incorporate, adopt, or apply, with or without modification, all or any part of any other document prepared or issued by any body or authority, including the Environmental Protection Authority established by section 7 of the Environmental Protection Authority Act 2011.
- “(4) WorkSafe must not issue or amend a code of practice in a way that adopts with modification any document previously approved by another Minister of the Crown or any compliance document (within the meaning of the Building Act 2004) without the consent of the other Minister or the chief executive of the department of State responsible for the administration of the Building Act 2004 (as relevant).

“20A Code to be approved by Minister

- “(1) A code of practice, an amendment to a code of practice, or a revocation of a code of practice has no force or effect until it has been approved by the Minister.
- “(2) The Minister must not approve any code, amendment, or revocation, unless—
 - “(a) at least 28 days have passed since the publication in the *Gazette* of a notice of the intention of WorkSafe to apply for approval; and
 - “(b) the Minister has consulted any persons that will be affected by the code, amendment, or revocation (or representatives of those persons), and they have had the opportunity to consider its possible effects and to comment on the effects to the Minister; and
 - “(c) the Minister has considered any comments made to the Minister concerning the effects.
- “(3) However, the Minister may approve a code, amendment, or revocation without complying with the requirements of subsection (2)(a) or (b) if the Minister is satisfied that sufficient consultation has already taken place in respect of the matters in the code, amendment, or revocation.

- “(4) When the Minister approves a code, amendment, or revocation, the Minister must—
- “(a) publish a notice of the approval in the *Gazette*; and
 - “(b) show the date of the approval on the code, amendment, or revocation and publish it in any manner the Minister thinks fit.
- “(5) The fact that the Minister has published a notice of approval in the *Gazette* under subsection (4)(a) is conclusive proof that the requirements of this section have been complied with in respect of the approval.

“20B Court may have regard to code

- “(1) A court may, in determining whether or not a person charged with failing to comply with any provision of this Act has complied with the provision, have regard to any approved code of practice that—
- “(a) was in force at the time of the alleged failure; and
 - “(b) in the form in which it was then in force, related to matters of a kind to which the provision relates.
- “(2) In any proceedings, a document purporting to be an approved code of practice, or an amendment of an approved code of practice, issued by WorkSafe is, in the absence of proof to the contrary, deemed to be an approved code of practice or an amendment of an approved code of practice.
- “(3) Subsection (2) does not affect any other method of proof of an approved code of practice or an amendment of an approved code of practice.

“20C Codes to be made available

- “(1) WorkSafe must ensure that every approved code of practice is, at all reasonable times, made available to the public for inspection free of charge—
- “(a) in hard copy at every office of WorkSafe; and
 - “(b) on an Internet site maintained by, or on behalf of, WorkSafe.
- “(2) WorkSafe may charge any person a reasonable fee for—
- “(a) providing the person with a hard copy of an approved code of practice; or

- “(b) allowing the person to use equipment under WorkSafe’s control to copy all or any part of an approved code of practice.
- “(3) Nothing in this section requires WorkSafe to allow any person to use equipment under WorkSafe’s control to copy all or any part of an approved code of practice.

“Competencies in mining industry

“20D New Zealand Mining Board of Examiners

WorkSafe must establish a board to be known as the New Zealand Mining Board of Examiners.

“20E Functions of Board

The Board has the following functions:

- “(a) to advise WorkSafe on competency requirements for mine workers:
- “(b) to examine applicants, or have applicants examined, for certificates of competence:
- “(c) to issue, renew, cancel, and suspend certificates of competence:
- “(d) any other function relating to training and competency requirements for participants in the extractives industry conferred on the Board by regulations made under this Act.

“20F Membership of Board

- “(1) WorkSafe may at any time appoint a member of the Board.
- “(2) The appointment of a member of the board must be for a specified period.
- “(3) WorkSafe must appoint one of the members of the Board as the chairperson of the board.
- “(4) When appointing a member of the Board, WorkSafe must have regard to the need to ensure that the Board has among its members knowledge and experience of—
 - “(a) mining operations:
 - “(b) health and safety inspection in the mining industry:
 - “(c) mining education:
 - “(d) mining industry training.

- “(5) Without limiting subsection (4), the Board may include 1 or more employees of WorkSafe.
- “(6) A member of the board may resign by notice in writing to WorkSafe.
- “(7) Clause 15 of Schedule 5 of the Crown Entities Act 2004 (**Schedule 5**) applies to the members of the Board as if they were members of a committee appointed under clause 14 of Schedule 5 by the board of a Crown entity.

“**20G Proceedings of Board**

The Board may determine its own procedure.

“**20H Board levy**

- “(1) The Governor-General may, by Order in Council, in accordance with a recommendation of the Minister, make regulations imposing a levy on mine operators to fund the direct and indirect costs incurred by the Board in performing the Board’s functions to the extent they relate to mining operations.
- “(2) The regulations must—
 - “(a) specify how the levy rate or rates are calculated:
 - “(b) specify the mine operators or classes of mine operators responsible for paying the levy:
 - “(c) specify, if the levy is to be paid at different rates, the mine operators, mining operations, thing being extracted, or other things or the classes of mine operators, mining operations, thing being extracted, or other things to which the different rates apply:
 - “(d) specify when and how the levy is to be paid:
 - “(e) specify the persons or classes of persons, if any, exempt from paying the levy.
- “(3) Without limiting subsections (1) and (2), the regulations may—
 - “(a) specify the returns to be made to WorkSafe or some other person or body for the purpose of enabling or assisting the determination of amounts of levy payable:
 - “(b) specify the circumstances in which, and conditions subject to which, persons may be allowed extensions of time for paying the levy:

- “(c) for the purpose of ascertaining whether the regulations are being complied with,—
 - “(i) require the keeping of accounts, statements, and records of a specified class or description by either or both of WorkSafe and the persons responsible for paying the levy; and
 - “(ii) require the retention of the accounts, statements, and records for a specified period:
 - “(d) provide for the establishment of a dispute resolution process for disputes relating to levies, including—
 - “(i) the appointment of persons to resolve the disputes; and
 - “(ii) the procedures to be followed by the persons; and
 - “(iii) the remuneration of the persons.
- “(4) Before making a recommendation under this section, the Minister must—
- “(a) receive advice from WorkSafe on the proposed levy; and
 - “(b) consult the people responsible for paying the proposed levy.”

13 Section 21 amended (Regulations)

Replace section 21(1)(b) with:

- “(b) without limiting paragraph (a), imposing duties relating to the health or safety of mine workers on—
 - “(i) mine operators:
 - “(ii) mine workers:
 - “(iii) site senior executives:
- “(c) the default worker participation system for the purpose of section 19U:
- “(d) the requirements for conducting elections of site health and safety representatives for the purpose of section 19V(1):
- “(e) the form of the identity card to be held by an industry health and safety representative:
- “(f) prescribing the information to be provided to WorkSafe for the purpose of section 19ZV(b) and any requirements concerning the authentication of any photograph provided under that section:

- “(g) prescribing the information to be contained in the register kept under section 19ZZB:
- “(h) prescribing functions of the New Zealand Mining Board of Examiners for the purpose of section 20E(d):
- “(i) providing for any other matters contemplated by this Act and necessary for its administration or necessary for giving it full effect.”

14 Section 22 amended (Application of regulations)

In section 22, insert as subsection (2):

- “(2) Regulations under section 21(1)(b) may impose duties—
 - “(a) on all mine operators:
 - “(b) on mine operators of a particular kind or description:
 - “(c) on all site senior executives:
 - “(d) on site senior executives of a particular kind or description:
 - “(e) on all mine workers:
 - “(f) on mine workers of a particular kind or description:
 - “(g) in relation to all mining operations:
 - “(h) in relation to mining operations of a particular class or description.”

15 Section 23 amended (Other provisions relating to regulations)

- (1) In section 23, replace “section 21(1)(a)” with “section 21(1)(a) or (b)” in each place.
- (2) After section 23(1)(e), insert:
 - “(ea) the competency requirements to be met by site health and safety representatives and industry health and safety representatives:”.
- (3) After section 23(1)(f), insert:
 - “(fa) the prescribing by WorkSafe, by notice in the *Gazette*, of—
 - “(i) requirements to be met for the granting of certificates of competence:
 - “(ii) other competency requirements for mine workers, site senior executives, site health and safety

representatives, and industry health and safety representatives.”.

16 Section 31 amended (Powers of entry and inspection)

After section 31(6), insert:

- “(7) In this section, a reference to an employee includes any mine worker and a reference to an employer includes any mine operator.”

17 Section 33 amended (Powers to take samples and other objects and things)

After section 33(3), insert:

- “(4) In this section, a reference to an employer includes any mine operator.”

18 New section 39A inserted (Inspectors may issue improvement notices in relation to mining operation)

After section 39, insert:

“39A Inspectors may issue improvement notices in relation to mining operation

- “(1) An inspector may, in relation to a mining operation, give a person written notice to comply with a provision of this Act or of regulations made under this Act, if the inspector believes on reasonable grounds that the person is failing to comply with that provision or is likely to fail to comply with that provision.
- “(2) An improvement notice must state that the inspector concerned believes that the person to whom or which it relates is failing, or is likely to fail, to comply with the provision, and must specify—
- “(a) the provision; and
 - “(b) the inspector’s reasons for believing that the person is failing, or is likely to fail, to comply with the provision; and
 - “(c) the nature of the failure or likely failure; and
 - “(d) a day before which compliance is to be completed.
- “(3) An improvement notice may specify steps that could be taken to ensure compliance with the provision concerned.

- “(4) Every person to whom or to which an improvement notice is given or posted must comply with it.
- “(5) Nothing in this section limits the power of an inspector under section 39.”

19 New section 41A inserted (Inspectors may issue prohibition notices in relation to mining operation)

After section 41, insert:

“41A Inspectors may issue prohibition notices in relation to mining operation

- “(1) This section applies if, in relation to a mining operation,—
 - “(a) an inspector believes that there is a likelihood of serious harm to any person because of a failure to comply with any provision of this Act or of regulations made under this Act; or
 - “(b) an inspector believes on reasonable grounds that it is likely that a person will fail to comply with any provision of this Act or of regulations made under this Act and that failure would be likely to cause serious harm to any person.
- “(2) The inspector may give written notice to stop, or not start, the carrying on, continuing, operating, storing, transporting, or use of the activity, building, place of work, plant, process, situation, structure, or substance, that the inspector believes to constitute the hazard that is likely to cause serious harm until an inspector is satisfied that measures sufficient to eliminate the hazard, or minimise the likelihood that the hazard will be a source of harm, have been taken.
- “(3) A prohibition notice must specify—
 - “(a) the hazard to which it relates; and
 - “(b) the inspector’s reasons for believing that the hazard is likely to cause serious harm.
- “(4) A prohibition notice may require the withdrawal of all mine workers of a specified kind or description except such mine workers as may be necessary to deal with the hazard.
- “(5) A prohibition notice may specify steps that could be taken to eliminate the hazard or minimise the likelihood that the hazard will be a source of harm.

“(6) Nothing in this section limits the power of an inspector under section 41.”

20 Section 42 amended (Service of prohibition notices)

(1) In section 42(1), after “prohibition notice”, insert “under section 41”.

(2) In section 42(2), after “notice”, insert “under section 41”.

(3) After section 42(2) insert:

“(3) An inspector who gives a prohibition notice under section 41A may—

“(a) fix the notice to or near the part of the place of work or plant to which it relates and give a copy of it to the site senior executive, or another representative of the mine operator, on behalf of the mine operator; or

“(b) give the notice to the site senior executive, or another representative of the mine operator, on behalf of the mine operator.

“(4) No person may remove a notice under section 41A served in accordance with subsection (3)(a) unless authorised by an inspector.”

21 Section 43 amended (Compliance with prohibition notices)

(1) In section 43, after “notice”, insert “under section 41”.

(2) In section 43, insert as subsection (2):

“(2) A mine operator to whom a prohibition notice under section 41A is given must ensure that no action is taken in contravention of it.”

22 Section 50 amended (Other offences)

In section 50(1)(b), after “19B,”, insert “section 19Q(1), section 19ZN(2), section 19ZG(4), section 19ZH(3), section 19ZL,”.

23 Section 56D amended (Inspector may require information)

(1) After section 56D(1)(b)(iii), insert:

“(iiia) a mine operator:

- “(iiib) a mine worker:
- “(iiic) a site senior executive:”.

- (2) After section 56D(2)(b)(i), insert:
- “(ia) a mine operator:”.

24 Section 59 amended (Funding)

- (1) In section 59(1), insert in its appropriate alphabetical order:
- “**certain Crown costs** means the expected cost to the Crown of—
- “(a) WorkSafe carrying out its functions under any enactment:
 - “(b) any agency designated under section 28B of this Act carrying out functions under this Act and enforcing the Hazardous Substances and New Organisms Act 1996 in places of work:
 - “(c) the Crown administering the relevant health and safety legislation (within the meaning of section 3 of the Work-Safe New Zealand Act 2013):
 - “(d) collecting the funding levy”.
- (2) In section 59(2), replace “the expected cost to the Crown of the administration of this Act” with “certain Crown costs”.
- (3) In section 59(5), replace “the Secretary” with “WorkSafe”.

25 New section 63 and Schedule 1AA inserted

- (1) After section 62, insert:
- “**63 Application, savings, and transitional provisions**
The application, savings, and transitional provisions set out in Schedule 1AA have effect for the purposes of this Act.”
- (2) Before Schedule 1, insert the Schedule 1AA set out in Schedule 1 of this Act.

26 Further amendments

The enactments specified in Schedule 2 are amended in the manner set out in that schedule.

Schedule 1

s 25

**New Schedule 1AA inserted in principal
Act****Schedule 1AA**

s 63

Part 1**Transitional provisions relating to Health
and Safety in Employment Amendment Act
2013****1 Existing mining operations**

- (1) This clause applies to any mining operation that was in operation immediately before the date on which the Health and Safety in Employment Amendment Act 2013 came into force.
- (2) Nothing in sections 12A, 13AA, 39A, or 41A of the principal Act, as inserted by the Health and Safety in Employment Amendment Act 2013, applies in respect of the mining operation until 1 January 2015.
- (3) The mine operator may, but is not required to, comply with section 19Q(1) of the principal Act, as inserted by the Health and Safety in Employment Amendment Act 2013, before 1 January 2015.
- (4) Section 19J of the principal Act, as inserted by the Health and Safety in Employment Amendment Act 2013, applies in respect of the mining operation from the earlier of—
 - (a) the date on which the mine operator complies with section 19Q(1) of the principal Act, as inserted by the Health and Safety in Employment Amendment Act 2013; and
 - (b) 1 January 2015.
- (5) If, on 1 January 2015, the mining operation does not have a documented worker participation system referred to in section 19Q(1) of the principal Act, as inserted by the Health and Safety in Employment Amendment Act 2013, the prescribed provisions referred to in section 19U(1) of the principal Act, as inserted by the Health and Safety in Employment Amendment Act 2013, apply.
- (6) Nothing in subclause (3) limits the application of sections 19ZU to 19ZZ of the principal Act, as inserted by the Health

Part 1—*continued*

and Safety in Employment Amendment Act 2013, in respect of the mining operation.

2 Notices, etc, before site senior executive appointed for existing mining operation

- (1) This clause applies to any mining operation to which clause 1 applies before the mine operator has appointed a site senior executive for the first time in accordance with regulations made under section 21 of the principal Act.
- (2) Any notice required or enabled by the Act to be given to the site senior executive of the mining operation may be given to the mine operator or a representative of the mine operator.
- (3) Sections 19ZF, 19ZG, 19ZH, and 19ZK of the principal Act, as inserted by the Health and Safety in Employment Amendment Act 2013, apply, with any necessary modifications, as if references to the site senior executive were references to the mine operator or a representative of the mine operator.

3 Exemptions of mining operations from regulations for limited period

- (1) Regulations made under section 21(1)(b) of the principal Act may provide for the granting by WorkSafe of an exemption (unconditionally or subject to conditions) in respect of any particular mining operation (whether or not it is one to which clause 1 applies) from one or more obligations or requirements under the regulations for any specified period, or periods, of up to a total of 36 months and ending not later than 31 December 2017.
- (2) The regulations must—
 - (a) specify the reasons for which exemptions may be granted; and
 - (b) require WorkSafe to specify in an exemption the reasons for which the exemption is granted.
- (3) An exemption granted under the regulations is not a disallowable instrument for the purposes of the Legislation Act 2012 and does not have to be presented to the House of Representatives under section 41 of that Act.

Part 1—*continued*

- (4) Nothing in this clause limits section 23(1)(k) of the principal Act.
-

Schedule 2

s 26

Consequential amendments**Employment Relations Act 2000 (2000 No 24)**

Replace section 107(2) with:

“(2) An employee who is representing employees under the Health and Safety in Employment Act 1992, whether as a health and safety representative or a site health and safety representative (as those terms are defined in that Act) or otherwise, is to be treated as if he or she were a delegate of other employees for the purposes of subsection (1)(g).”

Privacy Act 1993 (1993 No 28)

In Schedule 2, Part 1, insert in its appropriate alphabetical order:

Health and Safety in Employment Act 1992 section 19ZZB

Legislative history

12 November 2013	Divided from Health and Safety (Pike River Implementation) Bill (Bill 130–2) by committee of the whole House as Bill 130–3B
14 November 2013	Third reading
18 November 2013	Royal assent

This Act is administered by the Ministry of Business, Innovation, and Employment.

**Reprint
as at 31 December 2013**



**Health and Safety in Employment
(Mining Operations and Quarrying
Operations) Regulations 2013**
(SR 2013/483)

Jerry Mateparae, Governor-General

Order in Council

At Wellington this 9th day of December 2013

Present:

The Right Hon John Key presiding in Council

Pursuant to section 21 of the Health and Safety in Employment Act 1992, His Excellency the Governor-General, acting on the advice and with the consent of the Executive Council and in accordance with a recommendation of the Minister of Labour, makes the following regulations.

Note

Changes authorised by subpart 2 of Part 2 of the Legislation Act 2012 have been made in this reprint.

Note 4 at the end of this reprint provides a list of the amendments incorporated.

These regulations are administered by the Ministry of Business, Innovation, and Employment.

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Regulations

- 1 Title**
These regulations are the Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013.
- 2 Commencement**
These regulations come into force on 16 December 2013.

3 Interpretation

(1) In these regulations, unless the context otherwise requires,—

Act means the Health and Safety in Employment Act 1992

acting manager means the person designated for the purpose referred to in regulation 23

alluvial mine operator means a person who controls an alluvial mining operation and, in relation to a particular alluvial mining operation, means the person who controls that operation

alluvial mine worker means a person who works in an alluvial mining operation, either as an employee or as a self-employed person

alluvial mining operation has the meaning given to it in section 19L of the Act

Board has the meaning given to it in section 2(1) of the Act

borehole—

(a) means a hole of any diameter that has been bored or drilled for any purpose (including exploration, quality control, geological investigation, or geotechnical investigation in the mining operation) either from the surface or from an underground location; but

(b) does not include a drill hole that has been drilled for the purpose of blasting operations

brushing means removing a layer of material from the floor, roof, or side of a heading or cut-through

certificate of competence means a certificate issued by the Board under regulation 41

changeover station means a facility located within the underground parts of an underground mining operation or tunnelling operation that allows a mine worker to safely—

(a) change or recharge his or her breathing apparatus; or

(b) replace a self-contained self-rescuer

coal has the meaning given to it in section 19L of the Act

coal mining operation means any mining operation associated with the exploration or extraction of coal

competent person means a person who—

- (a) has the relevant knowledge, experience, and skill to carry out a task required or permitted by these regulations to be carried out by a competent person; and
- (b) has—
 - (i) a relevant qualification evidencing the person's possession of that knowledge, experience, and skill; or
 - (ii) if the person is an employee, a certificate issued by the person's employer evidencing the person's possession of that knowledge, experience, and skill

current, in relation to a certificate of competence, means a certificate of competence that has been issued under regulation 41 and has not expired or been cancelled or suspended by the Board

electrical plant—

- (a) means plant that utilises or is powered by electricity; and
- (b) includes appliances and fittings

electrical system—

- (a) means an electrical system in which all the electrical plant is, or is capable of being, electrically connected to a common source of electrical energy; and
- (b) includes the source and the plant

emplacement area means an area where the overburden or tailings of a mining operation are deposited within or beyond the excavated areas of the mining operation

ERZ0 means—

- (a) an underground coal mining operation, or any part of it, where the general body concentration of methane is known to be, or is identified by a risk assessment as likely to be, greater than 1.25%;
- (b) any part of an underground coal mining operation that is an ERZ1 or a NERZ if the general body concentration of methane in that part of the mining operation becomes greater than 1.25%:

- (c) an area of an underground coal mining operation that is classified by the mine operator as an ERZ0 under regulation 190

ERZ1—

- (a) means—
 - (i) an underground coal mining operation, or any part of it, where the general body concentration of methane is known to be, or is identified by a risk assessment as likely to be, greater than 0.25% but not more than 1.25%; or
 - (ii) an area of an underground coal mining operation that is classified by the mine operator as an ERZ1 under regulation 190; and
- (b) includes—
 - (i) a workplace where coal or other material is being mined (except where the work is undertaken in a shaft or roadway driven from the surface in material other than coal or between seams predominantly driven in material other than coal) other than by brushing in an outbye location:
 - (ii) a place where adequate standards of ventilation in relation to methane cannot be assured taking into account abnormal circumstances in the mining operation:
 - (iii) a place where connections, or repairs, to a methane drainage pipeline are being carried out:
 - (iv) a place where holes are being drilled underground in the coal seam or adjacent strata for exploration or seam gas drainage:
 - (v) a place, in a panel, other than a longwall panel that is being extracted, inbye the panel's last completed cut-through:
 - (vi) a goaf area:
 - (vii) each place on the return air side of any of the places in subparagraphs (i) to (vi), unless the place is an ERZ0:
 - (viii) any development heading

explosion protected means, in respect of any plant or installation, that the plant or installation is, or includes features that

are, designed, manufactured, and maintained to prevent the plant or installation acting as an ignition source when exposed to an explosive atmosphere

explosion risk zone means an ERZ0, an ERZ1, or a NERZ

explosive means a substance that is capable of sudden expansion owing to a release of internal energy; and includes the capability to generate—

- (a) deflagration; or
- (b) pyrotechnic effects,—

and **explosion** has a corresponding meaning

explosive atmosphere means a mixture with air of flammable substances in the form of dusts, fibres, gases, mists, or vapours that, if ignited, may lead to an explosion

fresh air has the meaning given to it in regulation 4

health and safety management system means the system developed under Part 2 and includes any principal hazard management plan or principal control plan

highwall mining means mining conducted by remote-controlled equipment that drives an excavation from the surface of an opencast mining operation into a coal seam underground

hot work means welding, soldering, heating, cutting, grinding, or vulcanising in which the surface temperature of the work or a tool for the work is likely to exceed 150°C

industry health and safety representative has the meaning given to it in section 19L of the Act

industry training organisation means a body corporate for the time being recognised under section 5 or 8(1) of the Industry Training Act 1992 in respect of the extractives industry

licensed cadastral surveyor has the meaning given to it in section 4 of the Cadastral Survey Act 2002

live electrical work—

- (a) means any work carried out on electrical plant in an ERZ0 or ERZ1, including testing or maintenance, that compromises the explosion protection techniques of that equipment; and
- (b) includes the use of testing equipment that is not certified for use in the explosion risk zone where it is, or is intended to be, used

main fan means the fan that is the principal source of—

- (a) providing fresh air to the underground parts of a mining operation; and
- (b) controlling the accumulation of methane, noxious gases, dust, and other contaminants in the underground parts of a mining operation

medical practitioner means a health practitioner who is, or is deemed to be, registered with the Medical Council of New Zealand continued by section 114(1)(a) of the Health Practitioners Competence Assurance Act 2003, as a practitioner of the profession of medicine

metalliferous mining operation means any mining operation associated with the extraction of minerals

methane means methane and associated hydrocarbons

mine operator—

- (a) has the meaning given to it in section 19L of the Act; and
- (b) in relation to a particular mining operation, means the mine operator for that mining operation

mine worker has the meaning given to it in section 19L of the Act

mineral has the meaning given to it in section 19L of the Act

Mines Rescue Trust means the board recognised under section 7 of the Mines Rescue Act 2013

mining operation has the meaning given to it in section 19L of the Act

mobile plant means plant that is capable of moving—

- (a) under its own power while energised by an internal power source, including a battery, compressed air, or an internal combustion engine; and
- (b) while energised by a reeling cable or trailing cable

NERZ (or **negligible explosion risk zone**) means—

- (a) an underground coal mining operation, or any part of it, where the general body concentration of methane is demonstrated by means of continuous and recorded monitoring to be less than 0.25%; or
- (b) any part of an underground coal mining operation that is submerged by water

notifiable accident mean an accident specified in Schedule 8
old workings, in relation to a mining operation (**mining operation A**),—

- (a) means the workings or any part of the workings of an abandoned or suspended mining operation that are above, below, or within 200 metres of the boundary of mining operation A; and
- (b) includes roadways, voids, and goafs that were created as part of the abandoned or suspended mining operation

opencast coal mining operation means any mining operation associated with the exploration or extraction of coal and where no person works underground

opencast metalliferous mining operation means any mining operation associated with the extraction of minerals and where no person works underground

permit holder has the same meaning as it has in the Crown Minerals Act 1991

ppm means parts per million

principal control plan means a plan required under regulation 92

principal hazard has the meaning given to it in regulation 65

principal hazard management plan means a plan required under regulation 66

quarry operator means a person who controls a quarrying operation and, in relation to a particular quarrying operation, means the person who controls that operation

quarry worker means a person who works in a quarrying operation, either as an employee or as a self-employed person

quarrying operation has the meaning given to it in section 19N of the Act

reeling cable means a cable that is used or placed in position for the conveyance of electricity from an electrical system to mobile plant and capable of being wound onto a reeling drum

refuge means a facility located within the underground parts of an underground mining operation or tunnelling operation that—

- (a) can be sealed during an emergency at the operation to prevent the entry of contaminated air; and
- (b) has a supply of fresh air independent of the normal ventilation system

safety-critical equipment means electrical plant critical to maintaining safe conditions at the mining operation and that is permitted to remain energised at times when the supply of electricity to plant or to a part or the whole of the mining operation is otherwise required to be isolated

secondary workings—

- (a) means the extraction of material from a place following the initial development phase; and
- (b) includes pillar extraction, splitting pillars, caving, stoping, longwalling, and bottom coaling

shaft means an opening in an underground mining operation or tunnelling operation having an inclination above the horizontal of 15° or more—

- (a) through which the mine workers or materials are transported; or
- (b) that is used as a main intake or outlet for ventilation

site health and safety representative has the meaning given to it in section 19L of the Act

site office means a place at an operation for the time being designated by the site senior executive as the site office for that operation

site senior executive—

- (a) has the meaning given to it in section 19L of the Act; and
- (b) in relation to a particular mining operation, means the site senior executive for that mining operation

suspended means,—

- (a) in relation to a mining operation other than a tunnelling operation, that the activities listed in 19M(a) and (b) of the Act are for the time being not being carried out, but the mining operation has not been abandoned; and

- (b) in relation to a tunnelling operation, that tunnelling activities are for the time being not being carried out, but the tunnelling operation has not been abandoned

trailing cable means a cable, other than a reeling cable, that is used or placed in position for the conveyance of electricity from an electrical system to mobile plant

tunnelling operation has the meaning given to it in section 19O of the Act

underground coal mining operation means any underground mining operation associated with the exploration or extraction of coal

underground metalliferous mining operation means any underground mining operation associated with the extraction of minerals

underground mining operation means any mining operation, other than a tunnelling operation, where any person works underground

winder means any machinery used to raise or lower, by means of a rope or ropes, a conveyance up or down a shaft or slope, but does not include any lifting machine, endless rope haulage, or scraper winch installation

winding system means the equipment used to raise or lower a conveyance up or down a shaft or slope

WorkSafe means WorkSafe New Zealand established by section 5 of the WorkSafe New Zealand Act 2013.

- (2) For the purpose of these regulations, **abandoned**, in relation to the whole or, as the case may be, a part of a mining operation, means,—
- (a) in relation to a mining operation other than a tunnelling operation,—
- (i) that the whole or, as the case may be, the part of the mining operation has been closed or sealed; and
- (ii) that the activities described in section 19M(a) to (c) of the Act are no longer being carried out in the whole or, as the case may be, the part of the mining operation and any hazards associated

- with the carrying out of those activities in that place have been eliminated or isolated; and
- (b) in relation to a tunnelling operation,—
 - (i) that the tunnel or shaft has been completed or that the whole or, as the case may be, the part of the tunnelling operation has been closed or sealed; and
 - (ii) that tunnelling activities are no longer being carried out in the whole or, as the case may be, the part of the tunnelling operation and any hazards associated with the carrying out of those activities in that place have been eliminated or isolated.

4 Meaning of fresh air

A reference in these regulations to **fresh air** means that the air—

- (a) contains not less than 19% by volume of oxygen; and
- (b) contains not more than 0.25% methane; and
- (c) contains not more than 25 ppm of carbon monoxide; and
- (d) contains not more than 5 000 ppm of carbon dioxide; and
- (e) contains no other substance at a level that is likely to cause harm to a mine worker over the period that the mine worker is exposed to the substance at the mining operation.

5 Relationship between Act and regulations

A person on whom a duty is imposed by these regulations in relation to a particular set of circumstances must, on the occurrence of those circumstances, comply with that duty, despite the fact that the Act may impose the same, a similar, or an additional duty on that person in relation to that set of circumstances.

6 Provisions affecting application of these regulations

Schedule 1 contains application, transitional, and savings provisions that affect other provisions of these regulations as from

time to time amended, revoked, or repealed and replaced (*see* regulation 232).

Part 1

Safety-critical roles and competency requirements

Subpart 1—Site senior executive

7 Appointment of site senior executive

- (1) The mine operator of a mining operation must appoint a site senior executive for that mining operation.
- (2) Subject to regulation 10, a mine operator that has more than 1 mining operation may appoint a person to be the site senior executive for more than 1 mining operation.

8 Competency requirements for appointment as site senior executive

- (1) The mine operator and the site senior executive must ensure that the site senior executive holds a current certificate of competence as a site senior executive and any other certificate or competency required by subclause (2).
- (2) In addition to the requirements of subclause (1),—
 - (a) if appointed for an underground coal mining operation, the site senior executive must hold a current certificate of competence as—
 - (i) a first-class coal mine manager; or
 - (ii) if not more than 5 mine workers ordinarily work underground at the underground coal mining operation at any one time, a coal mine underviewer:
 - (b) if appointed for an underground metalliferous mining operation, the site senior executive must hold a current certificate of competence as—
 - (i) a first class mine manager; or
 - (ii) if at least 3 but not more than 10 mine workers ordinarily work underground at the underground metalliferous mining operation at any one time, an A-grade tunnel manager; or
 - (iii) if fewer than 3 mine workers ordinarily work underground at the underground metalliferous

mining operation at any one time, an A-grade tunnel manager or B-grade tunnel manager:

- (c) if appointed for a tunnelling operation, the site senior executive must have successfully completed any additional competencies prescribed by WorkSafe under regulation 34(d) for a site senior executive of a tunnelling operation.
- (3) Subclause (2)(a) does not apply during any period of time where the only activities at the mining operation are those described in regulation 16(2).
- (4) If there is disagreement between the mine manager and the site senior executive in relation to any operational matter at the mining operation, the manager's view prevails if the site senior executive does not hold a relevant certificate of competence as a manager or holds a lower certificate of competence than the manager (of the relevant certificates of competence in regulation 35(b) to (j) applicable to the particular type of mining operation).
- (5) Nothing in subclause (4) limits or affects the application of the Act to any matter arising at the mining operation.

9 Notice of appointment of site senior executive

- (1) The mine operator who appoints a site senior executive must give notice of that appointment to the person appointed, and to WorkSafe.
- (2) The notice must specify the identity of the site senior executive and the mining operation or mining operations for which he or she has been appointed as site senior executive.

10 WorkSafe may advise appointment not suitable

- (1) Within 30 days of the date on which notice is given to WorkSafe under regulation 9 of the appointment of a site senior executive, WorkSafe may give notice to the mine operator that it considers the appointment to be unsuitable—
 - (a) because the person does not hold the required certificates of competence; or
 - (b) because the person has been appointed as site senior executive for more than 1 mining operation and will not

- be able to effectively perform his or her role as a site senior executive at each of those mining operations; or
- (c) for any other reason relating to the suitability of the person to perform the role of site senior executive at the mining operation or mining operations to which the person has been appointed.
- (2) WorkSafe may require the mine operator to supply information relating to the appointment in order to assist it to form an opinion for the purpose of subclause (1).
- (3) The mine operator must terminate or modify the appointment in accordance with any notice given under subclause (1).

11 Mine operator must ensure site senior executive has sufficient resources

The mine operator must ensure that the site senior executive has sufficient resources and authority to perform his or her functions, duties, and powers under the Act and these regulations.

12 Appointment of acting site senior executive during temporary absence

- (1) If the site senior executive of a mining operation is temporarily unable to perform his or her duties as site senior executive for the mining operation, the mine operator must appoint, in writing, a person to act as the site senior executive during the absence.
- (2) The mine operator must ensure that the acting site senior executive is a fit and proper person to act in the place of the site senior executive.
- (3) Subject to subclause (2), it is not necessary that the acting site senior executive hold any certificate of competence.
- (4) The mine operator must ensure that written notice of an appointment as acting site senior executive is given to the person appointed, and to WorkSafe.
- (5) The person acting as the site senior executive is subject to all of the obligations of a site senior executive.
- (6) No act done by an acting site senior executive purporting in good faith to act as the site senior executive may in any pro-

ceedings be questioned on the ground that the occasion for that site senior executive to act had not arisen or had ceased.

Subpart 2—Manager

13 Manager of mining operation

The mine operator of a mining operation must appoint a person to—

- (a) manage the mining operation; and
- (b) supervise the health and safety aspects of the mining operation on every day on which any mine worker is at work.

14 Manager of quarrying operation

The quarry operator of a quarrying operation must appoint a person to—

- (a) manage the quarrying operation; and
- (b) supervise the health and safety aspects of the quarrying operation on every day on which any quarry worker is at work.

15 Manager of alluvial mining operation

The alluvial mine operator of an alluvial mining operation must appoint a person to—

- (a) manage the alluvial mining operation; and
- (b) supervise the health and safety aspects of the alluvial mining operation on every day on which any alluvial mine worker is at work.

16 Manager must hold certificate

- (1) The mine operator or, as the case may be, the quarry operator or alluvial mine operator, and the manager must ensure that the manager holds a current certificate of competence specified in regulations 17 to 22 for the kind of mining operation or quarrying operation or alluvial mining operation to which the manager is appointed.
- (2) Subclause (1) does not apply to—
 - (a) any operation in which any activity is carried out pursuant to a prospecting licence or an exploration licence

granted under the Mining Act 1971 or a coal prospecting licence granted under the Coal Mines Act 1979 or a prospecting permit or an exploration permit granted under the Crown Minerals Act 1991, being in each case a licence or permit in force; or

- (b) any operation in which any exploratory activity is carried out by machinery for the purpose of ascertaining whether a mine or quarry may be worked.

17 Certificate of competence of manager of metalliferous mining operation

- (1) Subject to subclauses (2) to (5), a manager appointed to a metalliferous mining operation must hold a certificate of competence as a first-class mine manager.
- (2) A manager appointed to an underground metalliferous mining operation in which more than 3 but not more than 10 mine workers ordinarily work underground at any one time may hold a certificate of competence as an A-grade tunnel manager.
- (3) A manager appointed to an underground metalliferous mining operation in which not more than 3 mine workers ordinarily work underground at any one time may hold—
 - (a) a certificate of competence as an A-grade tunnel manager; or
 - (b) a certificate of competence as a B-grade tunnel manager.
- (4) A manager appointed to an opencast metalliferous mining operation in which more than 4 mine workers ordinarily work at any one time may hold a certificate of competence as an A-grade quarry manager.
- (5) A manager appointed to an opencast metalliferous mining operation in which not more than 4 mine workers ordinarily work at any one time may hold—
 - (a) a certificate of competence as an A-grade quarry manager; or
 - (b) a certificate of competence as a B-grade quarry manager.

18 Certificate of competence of manager of underground coal mining operation

- (1) Subject to subclause (2), a manager appointed to an underground coal mining operation must hold a certificate of competence as a first-class coal mine manager.
- (2) A manager appointed to an underground coal mining operation in which not more than 5 mine workers ordinarily work underground at any one time may hold a certificate of competence as a coal mine interviewer.

19 Certificate of competence of manager of opencast coal mining operation

A manager appointed to an opencast coal mining operation must hold a certificate of competence as an A-grade opencast coal mine manager.

20 Certificate of competence of manager of tunnelling operation

- (1) Subject to subclause (2), a manager appointed to a tunnelling operation must hold a certificate of competence as an A-grade tunnel manager.
- (2) A manager appointed to a tunnelling operation in which not more than 2 mine workers ordinarily work underground at any one time may hold a certificate of competence as a B-grade tunnel manager.

21 Certificate of competence of manager of quarrying operation

- (1) Subject to subclauses (2) and (3), a manager appointed to a quarrying operation must hold a certificate of competence as an A-grade quarry manager.
- (2) A manager appointed to a quarrying operation in which no explosives are used and not more than 4 quarry workers ordinarily work at any one time may hold a certificate of competence as a B-grade quarry manager.
- (3) A manager appointed to a quarrying operation in which no explosives are used may hold—

- (a) a certificate of competence as a B-grade quarry manager; or
- (b) a certificate of competence as a manager to manage that quarry, being the quarry specified in the certificate.

22 Certificate of competence of manager of alluvial mining operation

- (1) Subject to subclauses (2) and (3), a manager appointed to an alluvial mining operation must hold a certificate of competence as a first-class mine manager.
- (2) A manager appointed to an alluvial mining operation in which more than 4 alluvial mine workers ordinarily work at any one time may hold a certificate of competence as an A-grade quarry manager.
- (3) A manager appointed to an alluvial mining operation in which not more than 4 alluvial mine workers ordinarily work at any one time may hold—
 - (a) a certificate of competence as an A-grade quarry manager; or
 - (b) a certificate of competence as a B-grade quarry manager.

23 Acting manager

- (1) If for any reason the manager is unable to act as manager for any period, the mine operator or, as the case may be, the quarry operator or alluvial mine operator must designate a person to act as manager for that period or for 10 weeks, whichever is shorter.
- (2) The mine operator, quarry operator, or alluvial mine operator must ensure that the acting manager is a fit and proper person to act in the place of the manager.
- (3) Subject to subclause (2), it is not necessary that the acting manager hold any certificate of competence.
- (4) No act done by an acting manager purporting in good faith to act as the manager may in any proceedings be questioned on the ground that the occasion for that manager to act had not arisen or had ceased.

24 Notification of appointment of manager or acting manager

The mine operator or, as the case may be, the quarry operator or the alluvial mine operator must ensure that—

- (a) written notice of an appointment as manager or a designation as acting manager is given to the person appointed or designated, as the case may require, and to WorkSafe; and
- (b) all mine workers or, as the case may be, quarry workers or alluvial mine workers are informed of the name of the manager or acting manager.

25 Mine operator must ensure workers comply with instructions of manager or acting manager

The mine operator or, as the case may be, the quarry operator or alluvial mine operator must ensure that, in order to ensure compliance with the Act and these regulations, all mine workers comply with all reasonable instructions given by—

- (a) the manager; and
- (b) any acting manager.

Subpart 3—Other safety-critical roles

26 Electrical superintendent

- (1) The site senior executive of a mining operation must appoint an electrical superintendent for the mining operation if an electrical engineering principal control plan is in place, or required to be put in place, at the mining operation.
- (2) The site senior executive and the person appointed as an electrical superintendent must ensure that the person holds a current certificate of competence as an electrical superintendent.

27 Mechanical superintendent

- (1) The site senior executive of a mining operation must appoint a mechanical superintendent for the mining operation if a mechanical engineering control plan is in place, or required to be put in place, at the mining operation.

- (2) The site senior executive and the person appointed as a mechanical superintendent must ensure that the person holds a current certificate of competence as a mechanical superintendent.

28 Mine surveyor

- (1) The site senior executive of an underground mining operation or tunnelling operation must appoint a mine surveyor for the operation.
- (2) The site senior executive and the person appointed as a mine surveyor at an underground mining operation must ensure that the person holds a current certificate of competence as a mine surveyor.
- (3) The site senior executive and the person appointed as a mine surveyor at a tunnelling operation must ensure that the person holds a current certificate of competence as a mine surveyor or is a licensed cadastral surveyor.
- (4) In considering any appointment of a mine surveyor, the site senior executive must consider—
 - (a) the education, knowledge, and experience of the person, having regard to the type and size of the mining operation and the nature and complexity of the technology used at the mining operation; and
 - (b) the fitness and capacity of the person to exercise the skills required as a mine surveyor.
- (5) Unless expressly authorised by WorkSafe, no underground mining operation or tunnelling operation may operate for longer than 28 days without a person holding the position of mine surveyor.

29 Ventilation officer

- (1) The site senior executive of a mining operation must appoint a ventilation officer for the mining operation if a ventilation control plan is in place, or required to be put in place, at the mining operation.
- (2) The site senior executive and the person appointed as a ventilation officer must ensure that the person holds a current certificate of competence as a ventilation officer.

30 Underviewer

- (1) The site senior executive of an underground coal mining operation must appoint an underviewer for each production shift at the mining operation.
- (2) Subject to subclause (3), the site senior executive and the person appointed as an underviewer must ensure that the person holds a current certificate of competence as a first-class coal mine manager or an underviewer.
- (3) WorkSafe may at any time give notice to the site senior executive that the person appointed as underviewer must hold a current certificate of competence as a first-class coal mine manager.
- (4) The site senior executive must ensure that an underviewer is present at each production shift at the mining operation.

31 Supervisor

- (1) The site senior executive of a mining operation other than an underground coal mining operation must appoint a supervisor for each production shift.
- (2) The site senior executive and the person appointed as a supervisor of an underground metalliferous mining operation must ensure that the person holds a certificate of competence as a B-grade tunnel manager, an A-grade tunnel manager, or a first-class mine manager.
- (3) The site senior executive and the person appointed as a supervisor of a tunnelling operation must ensure that the person holds a current certificate of competence as a B-grade tunnel manager or an A-grade tunnel manager.
- (4) The site senior executive and a person appointed as a supervisor of an opencast coal mining operation must ensure that the person holds a current certificate of competence as a B-grade opencast coal mine manager or an A-grade opencast coal mine manager.
- (5) The site senior executive and a person appointed as a supervisor of an opencast metalliferous mining operation must ensure that the person holds a current certificate of competence as a B-grade quarry manager, an A-grade quarry manager, or a first-class mine manager.

- (6) Despite subclauses (2) to (5), WorkSafe may at any time give notice to the site senior executive that the person appointed as supervisor must hold a certificate of competence of one of the kinds described in regulation 35(b) or (d) to (j).
- (7) The site senior executive must ensure that a supervisor is present at each production shift at the mining operation.

32 Other workers required to hold certificates

The site senior executive of a mining operation must take all practicable steps to ensure that a worker required to carry out the duties normally associated with a coal mine deputy or a winding engine driver holds a current certificate of competence issued in accordance with these regulations.

33 Appointment of person to more than 1 role

- (1) The site senior executive may appoint—
 - (a) a person to more than 1 of the roles in regulations 13 to 32:
 - (b) the site senior executive himself or herself to 1 or more of the roles in regulations 13 to 32, in addition to his or her role as site senior executive.
- (2) The site senior executive must be satisfied that—
 - (a) the person or, as the case may be, the site senior executive himself or herself, holds the required certificates of competence for each role to be performed; and
 - (b) the person or, as the case may be, the site senior executive himself or herself, will be able to carry out each role effectively.
- (3) At any time WorkSafe may give written notice to the site senior executive that it considers that a person (including the site senior executive) appointed to more than 1 role is not able to carry out each role effectively because the person does not meet either or both of the criteria in subclause (2)(a) and(b).
- (4) WorkSafe may require information from the site senior executive relating to the appointment in order to assist it to form an opinion for the purpose of subclause (3).

- (5) The site senior executive must terminate or modify any appointment in accordance with any notice given under sub-clause (3).

Subpart 4—Certificates of competence and other competence requirements

34 WorkSafe may prescribe requirements

WorkSafe may, after consultation with the Board, by notice in the *Gazette* prescribe—

- (a) the requirements to be met for the granting of certificates of competence for mine workers, quarry managers, alluvial mine managers, and site senior executives, including—
 - (i) the qualifications and experience required for the granting of a certificate of competence; and
 - (ii) the continuing education required to be completed for the granting of a renewal of a certificate of competence; and
- (b) competency requirements to be met, including unit standards to be achieved, by mine workers who do not require a certificate of competence; and
- (c) competency requirements to be met, including unit standards to be achieved, by a site senior executive in addition to holding a certificate of competence; and
- (d) competency requirements to be met by site health and safety representatives.

35 Certificates of competence

The following kinds of certificate of competence may be issued under regulation 41:

- (a) site senior executive:
- (b) first-class mine manager:
- (c) first-class coal mine manager:
- (d) A-grade opencast coal mine manager:
- (e) B-grade opencast coal mine manager:
- (f) A-grade quarry manager:
- (g) B-grade quarry manager:

- (h) a certificate of competence as a manager to manage the quarrying operation specified in the certificate:
- (i) A-grade tunnel manager:
- (j) B-grade tunnel manager:
- (k) coal mine underviewer:
- (l) supervisor:
- (m) coal mine deputy:
- (n) electrical superintendent:
- (o) mechanical superintendent:
- (p) mine surveyor:
- (q) ventilation officer:
- (r) winding engine driver.

36 Application for certificate of competence

An application for a certificate of competence must be made to the Board and be accompanied by the fee prescribed in Schedule 2.

37 Application to contain evidence

An application for a certificate of competence must contain evidence of the matters referred to in regulation 38.

38 Requirements for applicants

An applicant for a certificate of competence must—

- (a) have the qualifications and experience prescribed under regulation 34 for a holder of that certificate of competence; and
- (b) be a fit and proper person to hold that certificate of competence.

39 Investigations by Board

(1) For the purpose of investigating whether an applicant for a certificate of competence is a person to whom regulation 38 applies, the Board may—

- (a) request the applicant to supply information on relevant matters; and
- (b) request any person who the Board believes is able to provide relevant information to provide information on relevant matters.

- (2) A request under subclause (1)—
 - (a) must specify those matters on which the Board seeks information; and
 - (b) may be made from time to time.
- (3) A person has the same privileges in relation to the giving of information to the Board as witnesses have in any court.

40 Use of information

- (1) For the purpose of determining whether an applicant is a person to whom regulation 38 applies, the Board may take into account any information received in response to the exercise of the powers in regulation 39.
- (2) The Board may refuse an application if it is unable to obtain sufficient information to satisfy it that the applicant is a person to whom regulation 38 applies.

41 Board to issue certificate of competence

- (1) The Board must issue the certificate of competence sought in the application if it is satisfied—
 - (a) that the application was made in accordance with regulations 36 and 37; and
 - (b) that the applicant is a person to whom regulation 38 applies.
- (2) If the Board refuses to issue a certificate of competence, it must supply to the applicant a statement of the reasons for the refusal.

42 Duration of certificate of competence

- (1) Unless cancelled earlier, a certificate of competence expires 5 years after the date on which it was issued.
- (2) The certificate of competence must show on its face the date on which it expires.

43 Continuing professional development condition of certificate

The holder of a certificate of competence must comply with the continuing education requirements prescribed under regulation 34 for a holder of that certificate of competence.

44 Renewal of certificate of competence

- (1) An application for the renewal of a certificate of competence must—
 - (a) be made to the Board not less than 2 months before the day on which the certificate expires; and
 - (b) be accompanied by—
 - (i) evidence of the applicant's compliance with the requirements of regulation 43; and
 - (ii) the fee, if any, prescribed in Schedule 2.
- (2) If an application is made in accordance with this regulation, the Board must renew the certificate of competence to which the application relates if it is satisfied that the applicant has complied with the requirements of regulation 43.
- (3) Subclause (2) is subject to regulation 45.
- (4) A certificate of competence may be renewed before or after the day on which the certificate expires, but in each case the renewed certificate comes into force on the day after the date on which it expires.
- (5) Regulation 38 applies to a certificate of competence renewed under this regulation.

45 Cancellation or suspension of certificate of competence

- (1) The Board must cancel a certificate of competence if it is satisfied on reasonable grounds that the holder has died.
- (2) The Board must cancel a certificate of competence if, after giving the holder at least 14 days' notice and an opportunity to be heard (including in person), it is satisfied on reasonable grounds—
 - (a) that the certificate was issued in error; or
 - (b) that the holder's application for the certificate contained any false information or evidence; or
 - (c) that the holder either never has been or is no longer a person to whom regulation 38 applies.
- (3) The Board must cancel or suspend a certificate of competence for such period as it thinks fit if, after giving the holder at least 14 days' notice and an opportunity to be heard (including in person), it is satisfied on reasonable grounds—

- (a) that the holder has been so negligent in carrying out any task that the holder of the certificate could reasonably be expected to perform to a reasonable standard that the life of any person has been or could have been endangered; or
 - (b) that the holder has shown himself or herself unfit to be the holder of the certificate by the improper manner in which he or she has carried out any task that the holder of the certificate could reasonably be expected to perform in a proper manner.
- (4) The Board may suspend or cancel a certificate of competence if it is satisfied that the holder of the certificate has not complied with the requirements of regulation 43.
- (5) A person whose certificate of competence is suspended or cancelled must return the certificate to the Board within 14 days after the date of the suspension or cancellation.

46 Replacement of certificate of competence

- (1) An application for a duplicate of a certificate of competence must be made to the Board and be accompanied by the fee, if any, prescribed in Schedule 2.
- (2) If the Board is satisfied that a certificate of competence has been lost or destroyed, it must issue a duplicate of that certificate.

47 Register

- (1) The Board must keep a register of the individuals to whom it has issued a certificate of competence.
- (2) The register must show—
 - (a) the full name of the holder:
 - (b) the kind of certificate the holder holds:
 - (c) the date on which the certificate expires:
 - (d) in relation to a certificate that has been suspended, the date on which the suspension took effect and the date on which the suspension ends:
 - (e) in relation to a certificate that has been cancelled, the date of cancellation.

48 Access to register

- (1) Any person may apply to the Board for a copy of the register or an extract from it for the purpose of ascertaining whether an identified person—
 - (a) holds a current certificate of competence; or
 - (b) holds a certificate of competence that is suspended; or
 - (c) held a certificate of competence that has subsequently expired or been cancelled.
- (2) If the Board is satisfied that the person has a proper interest in the information and the information is required for a purpose specified in any of subclauses (1)(a) to (c), the Board may, on payment of the prescribed fee, if any, provide the person with a copy of or an extract from the register.

49 Appeal to District Court

- (1) An appeal may be made to a District Court by—
 - (a) an applicant who is dissatisfied with a refusal to issue a certificate of competence under regulation 41;
 - (b) a holder of a certificate of competence who is dissatisfied with a refusal to renew the certificate of competence under regulation 44;
 - (c) a holder of a certificate of competence who is dissatisfied with the cancellation or suspension of the certificate of competence under regulation 45;
 - (d) a holder of a certificate of competence who is dissatisfied with a refusal to issue a duplicate of that certificate under regulation 46.
- (2) Part 14 of the District Courts Rules 2009 applies to an appeal brought under subclause (1).
- (3) The decision of the District Court on any appeal brought under subclause (1) is final.

*Competency requirements for mine workers***50 Supervision of untrained mine workers**

- (1) This regulation applies to any mine worker who does not require a certificate of competence of a kind in regulation 35.
- (2) A mine worker (A) who has not achieved the unit standards prescribed by WorkSafe under regulation 34 or received

equivalent training provided at the mining operation by the mine operator must be accompanied at all times by a mine worker (**B**) who—

- (a) has achieved the unit standards or received equivalent training at the mining operation or holds a certificate of competence of a kind in regulation 35 relevant to the work being done; and
 - (b) has at least 12 months' experience working at the same kind of mining operation at which B is to accompany A.
- (3) For the purposes of this regulation, **equivalent training** means training that has been assessed by an assessor registered with an industry training organisation as being such that satisfactory completion of the training would otherwise have entitled the mine worker to achieve the prescribed unit standards.

*Competencies of persons appointed as health
and safety inspectors who inspect mining
operations*

51 Competencies of persons appointed as health and safety inspectors who inspect mining operations

- (1) This regulation prescribes examinations for the purpose of section 29(1) of the Act and applies in respect of any person appointed as a health and safety inspector who is to inspect mining operations.
- (2) Unless the person already has experience relevant to health and safety in mining operations, the person must have passed an examination or examinations in areas of knowledge Work-Safe is satisfied are specifically relevant to health and safety in mining operations.
- (3) The examinations prescribed by this regulation are in addition to those prescribed in regulation 6 of the Health and Safety in Employment (Prescribed Matters) Regulations 2003.

Part 2

Health and safety management system

Subpart 1—Responsibility for health and safety management system

52 Mine operator must ensure health and safety management system developed, implemented, and maintained

The mine operator must ensure that the site senior executive develops, implements, and maintains a health and safety management system for the mining operation that complies with these regulations.

53 Site senior executive must develop, implement, and maintain health and safety management system

- (1) The site senior executive must develop, implement, and maintain a health and safety management system that complies with these regulations.
- (2) The health and safety management system must be in place,—
 - (a) in the case of a coal mining operation, from when exploration activities commence until the operation is abandoned; and
 - (b) in the case of a metalliferous mining operation, from the commencement of the physical development of the mining operation and construction of mining infrastructure, including earthworks, until the operation is abandoned; and
 - (c) in the case of a tunnelling operation, from the commencement of the physical development of the tunnel until all tunnelling activities cease.

Subpart 2—Risk assessment

54 Risk appraisal

The site senior executive must ensure that—

- (a) a process is in place to systematically identify the hazards to mine workers at the mining operation; and
- (b) the process is used when developing, implementing, and maintaining the health and safety management system, including, without limitation, each time the health

and safety management system or any aspect of it is reviewed.

55 Risk assessment

- (1) The site senior executive must ensure that—
 - (a) a process is in place to assess the inherent risk of harm to mine workers from identified hazards at the mining operation and to identify the controls required to manage that risk; and
 - (b) the process is used when developing, implementing, and maintaining the health and safety management system, including, without limitation, each time the health and safety management system or any aspect of it is reviewed.
- (2) Nothing in this regulation limits any specific provision in Parts 3 and 4 relating to the assessment of risks.

**Subpart 3—Content of health and safety
management system**

56 Content of health and safety management system

- (1) The health and safety management system must contain at least the following:
 - (a) the mine operator's health and safety policy, including broad aims in relation to the healthy and safe operation of the mine;
 - (b) a description of the processes used to identify the hazards present at the mining operation, to assess the inherent risk of harm to workers from those hazards, and to identify the controls required to manage that risk as required by regulations 54 and 55;
 - (c) the means of reporting and recording relevant health and safety information, including the setting of key performance indicators and investigation of accidents;
 - (d) a description of the systems, procedures, and other risk control measures in place to manage hazards and to respond to increased levels of risk in relation to any hazard:

- (e) a description of the measures that will be used to identify material changes at the mining operation that may create hazards:
 - (f) a description of the management structure for the management of the health and safety at the mining operation, including competency requirements and arrangements for filling temporary and permanent vacancies, and competency requirements for acting positions in the structure:
 - (g) monitoring and audit matters as required by regulation 57:
 - (h) a description of the arrangements in place to monitor the health and safety of mine workers at the mining operation:
 - (i) the principal hazard management plans and principal control plans required for the mining operation by these regulations:
 - (j) a description of arrangements in place to monitor, assess, and inspect working places within the mining operation:
 - (k) any other matter required by these regulations to be included in the health and safety management system.
- (2) The health and safety management system must be set out at a level of detail commensurate with the nature, size, and complexity of the mining operation and the hazards and any other relevant matters associated with the mining operation.
- (3) The health and safety management system must be prepared in a form and expressed in a way that it is easily understood by any mine worker.

Subpart 4—Review, consultation, and records

57 Audit and monitoring of health and safety management system

The health and safety management system must—

- (a) set out performance standards for measuring the effectiveness of all aspects of the health and safety management system that—

- (i) are in sufficient detail that the mine operator's ability to ensure the effectiveness of the system is apparent from the documentation; and
- (ii) include steps to be taken to continually improve all aspects of the system; and
- (b) include a description of the way in which the performance standards are to be met; and
- (c) set out the process for auditing the effectiveness of the health and safety management system against those performance standards, including the methods, frequency, and results of the audit process.

58 Periodic review of health and safety management system

The site senior executive must ensure that the health and safety management system is reviewed and, if necessary, revised—

- (a) not later than 12 months after the date on which the mining operation begins; and
- (b) at least every 3 years after the date of the first review.

59 Additional reviews of health and safety management system

The site senior executive must ensure that, in addition to any review required under regulation 58, the health and safety management system, or, as the case may be, any relevant part of it, is reviewed and, if necessary, revised—

- (a) before a significant or material change is made to the mining operation:
- (b) if a notifiable accident occurs in the mining operation:
- (c) if an audit of the health and safety management system, or any part of it, indicates a deficiency in the management of hazards in the mining operation:
- (d) if there is evidence that a hazard in the mining operation is not adequately controlled by the measures outlined in the system:
- (e) if a site health and safety representative or industry health and safety representative requests the review:
- (f) if and when the mining operation is suspended:
- (g) if the mining operation has been suspended, before the mining operation recommences.

60 Consultation

The site senior executive must consult with mine workers and site health and safety representatives about the content of the health and safety management system when—

- (a) preparing the health and safety management system; and
- (b) reviewing the health and safety management system, or any part of it.

61 Maintenance of records of health and safety management system

- (1) The mine operator must ensure that the following records are kept:
 - (a) the current version of the health and safety management system;
 - (b) any previous versions of the health and safety management system that applied in the preceding 7 year period;
 - (c) records of all reviews and audits of the health and safety management system, or any part of it, that have been conducted in the preceding 7 year period;
 - (d) records of any risk appraisal carried out to identify principal hazards at the mining operation as required by regulation 66(1)(a).
- (2) The mine operator must ensure that the records referred to in subclause (1) are maintained in such a way that—
 - (a) the current version of the health and safety management system can be clearly identified; and
 - (b) every previous version of the health and safety management system required to be kept is kept as it was while it was current and shows the period during which it was current.
- (3) The mine operator must ensure that the records referred to in subclause (1) are made available, on request, to WorkSafe, a site health and safety representative, or an industry health and safety representative.

Subpart 5—Providing health and safety
management system documentation to mine
workers

**62 Providing health and safety management system
documentation to mine workers**

- (1) The mine operator for a mining operation must ensure that, before a mine worker commences work at the mining operation,—
 - (a) the mine worker is given a written summary of the health and safety management system for the mining operation; and
 - (b) the mine worker is informed of the right to access the current version of the health and safety management system.
- (2) The mine operator must ensure that the current version of the health and safety management system is readily accessible by a mine worker at the mining operation.
- (3) The mine operator must ensure that a mine worker is given access to—
 - (a) the current versions of the principal hazard management plans that are relevant to the work the mine worker is to carry out; and
 - (b) the current versions of the principal control plans that are relevant to the work the mine worker is to carry out; and
 - (c) the current versions of any other plans or documented processes for the management of hazards that are relevant to the work the mine worker is to carry out.
- (4) If the health and safety management system is revised under subpart 4, the mine operator must ensure that each mine worker at the mining operation is made aware of any revision that is relevant to work being carried out by that mine worker.

**63 Providing health and safety management system
documentation to contractor**

- (1) This regulation applies to a person who is engaged by the mine operator to provide services where the person's employees or

other workers engaged by the person to provide those services will be mine workers in relation to the mine operator.

- (2) The mine operator must ensure that the current version of the health and safety management system, and records of all audits and reviews of the health and safety management system, or any part of it, and other audits of the site itself that have been conducted, are made available on request to any person to whom this regulation applies.

64 Duty to provide instruction

The mine operator for a mining operation must ensure that mine workers at the mining operation are provided with suitable instruction in relation to the health and safety management system before commencing work and that a record of this instruction is kept.

Part 3

Principal hazard management plans

65 Meaning of principal hazard

In these regulations, **principal hazard** means—

- (a) any hazard arising at any mining operation that could create a risk of multiple fatalities in a single accident or a series of recurring accidents at the mining operation in relation to any of the following:
- (i) ground or strata instability:
 - (ii) inundation and inrush of any substance:
 - (iii) mine shafts and winding systems:
 - (iv) roads and other vehicle operating areas:
 - (v) tips, ponds, and voids:
 - (vi) air quality:
 - (vii) fire or explosion:
 - (viii) explosives:
 - (ix) gas outbursts:
 - (x) spontaneous combustion in underground coal mining operations; and
- (b) any other hazard at the mining operation that has been identified by the site senior executive under regulation 66 as a hazard that could create a risk of multiple fatal-

ities in a single accident, or a series of recurring accidents at the mining operation.

- 66 Site senior executive responsible for identifying principal hazards and having principal hazard management plan**
- (1) The site senior executive must—
- (a) carry out an appraisal of the mining operation to identify principal hazards at the mining operation; and
 - (b) ensure there is a principal hazard management plan for each principal hazard identified.
- (2) Without limiting subclause (1),—
- (a) the following mining operations must have a principal hazard management plan for fire or explosion:
 - (i) an underground coal mining operation;
 - (ii) an underground metalliferous mining operation or tunnelling operation if methane is detected at the mining operation;
 - (b) any mining operation where explosives are used must have a principal hazard management plan for explosives;
 - (c) a mining operation must have a principal hazard management plan for tips, ponds, and voids if a tip at the mining operation is—
 - (i) located on a slope; and
 - (ii) is greater than 15 metres in height; and
 - (iii) is greater than 100 000 cubic metres in volume.
- 67 General purposes of principal hazard management plans**
- The general purposes of the principal hazard management plans are to—
- (a) identify the nature of all principal hazards at any mining operation;
 - (b) set out the measures that will be used to ensure that all principal hazards are effectively managed.
- 68 Content of principal hazard management plans**
- Each principal hazard management plan must include the following:

- (a) a statement as to the nature of a principal hazard addressed by the principal hazard management plan:
- (b) a description of how all risk assessments will be conducted in relation to the principal hazard:
- (c) the results of any risk assessment completed in respect of the principal hazard:
- (d) a description of the control measures to be implemented to manage the principal hazard and the risk of harm it presents to the health and safety of mine workers:
- (e) a description of how any specific requirements or duties in the regulations that apply to the principal hazard will be complied with:
- (f) a description of the emergency preparedness for the principal hazard:
- (g) a description of the roles and their corresponding responsibilities under the principal hazard management plan, including the competencies required to carry out the roles and the details of the responsibilities:
- (h) a statement of the periodic review of the principal hazard management plan's continued suitability and effectiveness in managing the principal hazard and the risks related to the hazard at the mining operation, in accordance with regulation 69:
- (i) a description of the audit programme in accordance with regulation 70:
- (j) any other matter required by these regulations in relation to particular principal hazards.

69 Review and revision of principal hazard management plans

- (1) In addition to the requirements of regulation 58, the site senior executive must ensure that each principal hazard management plan is reviewed at least once every 2 years after the date the principal hazard management plan is approved by the site senior executive.
- (2) In addition to the requirements of regulation 59, the site senior executive must ensure that a principal hazard management plan is reviewed after—

- (a) the occurrence of an accident at the mining operation involving a principal hazard that it was intended to manage:
 - (b) a material change in the management structure at the mining operation that may affect the principal hazard management plan:
 - (c) a material change in plant used or installed at the mining operation that may affect the principal hazard management plan:
 - (d) the occurrence of any other event as provided in a principal hazard management plan as requiring a review of the plan.
- (3) Any review of a principal hazard management plan under subclause (1) must include—
- (a) a review of the risk assessment in relation to the relevant principal hazard; and
 - (b) a review of all other aspects of the principal hazard management plan.
- (4) In addition to the requirements of regulation 61, the mine operator must ensure that records of all reviews and revisions of principal hazard management plans are kept for at least 12 months from the date on which the mining operation is abandoned.
- (5) The mine operator must, on request, provide records relating to a review of a principal hazard management plan to an inspector or a site health and safety representative.

70 Audits of principal hazard management plans

- (1) The mine operator must engage, and pay for, a competent person to carry out an independent external audit of all principal hazard management plans, ensuring that—
- (a) external audits are carried out once every 3 years after the date the principal hazard management plan is approved by the site senior executive.; and
 - (b) the external auditors are independent of the mining operation.
- (2) In addition to the requirements of regulation 61, the mine operator must ensure that records of all audits of principal hazard

management plans are kept for at least 12 months from the date on which the mining operation is abandoned.

Ground or strata instability

- 71 Principal hazard management plans for ground or strata instability**
- (1) Following the identification of ground or strata instability as a principal hazard at a mining operation, the site senior executive must ensure that a geotechnical assessment is completed by a competent person to determine the level of ground or strata support required to safely conduct the mining operation.
 - (2) A principal hazard management plan in relation to ground or strata instability must, at a minimum, address the following:
 - (a) circumstances under which ground or strata failure may occur at the mining operation; and
 - (b) ways in which potential ground or strata failure could be avoided through the design of suitable ground or strata support methods that must have regard to—
 - (i) the characteristics of the area to be supported, including natural and geotechnical features:
 - (ii) the surrounding workings, including abandoned or previously excavated workings:
 - (iii) the activities to be carried out, including proposed activities:
 - (iv) in relation to underground mining operations and tunnelling operations, the size and geometry of the openings in the underground workings; and
 - (c) suitable ground or strata support methods that are able to be implemented by means of clear directions and diagrams; and
 - (d) continuous modelling, testing, and updating, where required, of the ground or strata support methods; and
 - (e) appropriate equipment and procedures to monitor, record, interpret, and analyse data about seismic activity and its impact on the mining operation; and
 - (f) collection, analysis, and interpretation of relevant geotechnical data, including monitoring of openings and excavations, where appropriate; and

- (g) maintaining the integrity of ground or strata support, including, for example, by replacing defective supports; and
- (h) allowing for higher standards of support to be installed (for example, more support installed at more frequent intervals) than that required by the principal hazard management plan.

Inundation and inrush

72 Meaning of inundation and inrush

- (1) In these regulations, **inundation and inrush** refers to the sudden and unplanned entry into workings of a mining operation of liquid, gas, or other materials or substances.
- (2) Subclause (1) applies unless a provision of these regulations provides otherwise.

73 Consideration of whether inundation and inrush is a principal hazard

- (1) In the course of an appraisal as required under regulation 66(1)(a) to identify inundation and inrush as a principal hazard at a mining operation, the site senior executive must ensure that a suitably qualified and experienced person reviews relevant plans in accordance with subclauses (2) to (4).
- (2) The suitably qualified and experienced person must include consideration of the following in the review:
 - (a) any mine plans of the mining operation, made and kept as required under these regulations;
 - (b) any relevant historical mine or survey plans.
- (3) The review by the suitably qualified and experienced person must include—
 - (a) identifying and locating old workings that may be in the vicinity of the proposed activities to be undertaken at the mining operation; and
 - (b) ascertaining whether the old workings contain accumulation of any matter than may flow, including those in a solid, liquid, or gaseous state.
- (4) The suitably qualified and experienced person must, following the completion of the review,—

- (a) report the findings in writing; and
 - (b) have the written report peer reviewed by a competent person who is independent of the mining operation; and
 - (c) give a copy of the peer-reviewed report to the site senior executive.
- (5) The site senior executive must, on request, make the peer-reviewed report available to WorkSafe within a reasonable period of time.

74 Principal hazard management plans for inundation and inrush

- (1) The following matters must be considered in the development of a principal hazard management plan in relation to inundation and inrush:
- (a) the proposed activities to be undertaken:
 - (b) the potential sources of inundation and inrush:
 - (c) the nature and magnitude of the rate of flow of the potential sources of inundation and inrush:
 - (d) the location of adjacent workings and the strength of the ground between workings:
 - (e) the location, design, and construction of dams, ponds, tailings dams, emplacement areas, and any other bodies of water or material (including material entering a mining operation due to adverse weather conditions or other natural events):
 - (f) the reasonably foreseeable harm that could result from each potential source of inundation and inrush, having regard to matters such as—
 - (i) the accuracy of plans of the mining operation:
 - (ii) the location of the potential sources of inundation and inrush:
 - (iii) variation in rock properties:
 - (iv) geological weaknesses:
 - (v) future activities at the mining operation:
 - (vi) geological changes and similar unknown matters:
 - (g) the potential for an accumulation of liquid, gas, or other materials or substances that could flow into other workings or locations:

- (h) the monitoring system that will be needed to provide warnings of conditions that may—
 - (i) lead to an occurrence of inundation and inrush; and
 - (ii) warrant a reassessment of the nature of the inundation and inrush hazard.
- (2) A principal hazard management plan in relation to inundation and inrush must, at a minimum, include the following:
 - (a) a written summary of the nature and magnitude of the identified risks of inundation and inrush;
 - (b) the assumptions made in developing the principal hazard management plan;
 - (c) a description of special systems that have been developed for working at the mining operation and in inrush control zones (including the assumptions underpinning the development of those systems);
 - (d) identification of the inrush control zones that have been or will be established and maintained;
 - (e) confirmation of the location of all old workings in the vicinity of an area in which work is to be carried out, before work is commenced in a new area of the mining operation;
 - (f) means of sealing or otherwise controlling boreholes to prevent inundation and inrush.

75 Additional ground of review of principal hazard management plans relating to inundation and inrush

In addition to the requirements of regulation 59, the site senior executive must ensure that a principal hazard management plan relating to inundation and inrush is reviewed and, if necessary, revised in the following circumstances:

- (a) before the workings of the mining operation are extended into any new area;
- (b) before any work is carried out in an inrush control zone.

76 Obligations relating to work in inrush control zone

- (1) Prior to commencement of any work in an inrush control zone, the site senior executive must carry out a risk assessment.

- (2) The purpose of the risk assessment is to determine the risk of inundation and inrush from working in an inrush control zone.
- (3) As part of the notification under regulation 229, the site senior executive must provide WorkSafe with—
 - (a) the results of the risk assessment; and
 - (b) the details of the intended control measures.
- (4) The principal hazard management plan must be updated with the following information after the risk assessment has been completed:
 - (a) methods used to manage the risk of inundation and inrush:
 - (b) any procedures developed to manage the risk of inundation and inrush when working in an inrush control zone, such as the use of exploratory boreholes:
 - (c) relevant details of the plan of the mining operation.

Mine shafts and winding systems

77 Principal hazard management plans for mine shafts and winding systems

- (1) A principal hazard management plan for mine shafts and winding systems must be based on an assessment of the following matters:
 - (a) the stability and integrity of the shaft:
 - (b) the potential for fires developing in the underground parts of the mining operation, the shaft, or the vicinity of the winding engine:
 - (c) the potential for any unintended or uncontrolled movement of the conveyances within the shaft:
 - (d) the potential for a detached conveyance to fall down the shaft:
 - (e) the potential for any person, plant, material, or support structure to fall into, or within, the shaft:
 - (f) the potential for failure of, or damage to, safety-related plant and controls, including—
 - (i) ropes bearing the weight of the shaft conveyance; and
 - (ii) controls and limiting devices to prevent the shaft conveyance from exceeding safe limits (includ-

- ing winding speed, and the top and bottom ends of the shaft) and any other relevant limits:
- (iii) measures to—
 - (A) detect and prevent slack rope, drum slip, or tail rope malfunctions; and
 - (B) stop the winding engine in the event that a malfunction occurs; and
 - (iv) braking system (including emergency brakes) and measures preventing unrestrained or uncontrolled descent of a shaft conveyance; and
 - (v) warning systems for any emergency in the shaft conveyance; and
 - (vi) communication systems:
- (g) the potential for injury to any person in a shaft conveyance from any material—
- (i) being carried in the shaft conveyance; or
 - (ii) falling from a shaft conveyance:
- (h) systems ensuring that all persons can escape from a stalled shaft conveyance:
- (i) any other relevant matter.
- (2) A principal hazard management plan for mine shafts and winding systems must, at a minimum, provide for the following:
- (a) the measures to be used to eliminate, isolate, or minimise—
 - (i) the occurrence of fires in a shaft; and
 - (ii) the unintended movement or falling of people, plant, substance, or any other material or object:
 - (b) a description of the winding systems to be used, including the ropes or other means that will enable the conveyance to carry the weight that it will be expected to carry:
 - (c) the control measures that will ensure that every winding system at the mining operation remains in a safe condition:
 - (d) the measures to—
 - (i) prevent and detect malfunction in the winding engine and associated plant; and
 - (ii) stop the winding engine in the event of any slack rope, drum slip, or tail rope:

- (e) the means for any person to escape from a stalled shaft conveyance:
- (f) the means of communication between the winding engine room, shaft conveyances that carry people, and the entrance to every shaft in use:
- (g) the means to prevent uncontrolled contact between shaft conveyances, other equipment installed in the shaft, and the sides of the shaft:
- (h) requirements for regular testing and inspection of the winding system and its components:
- (i) the means of preventing hazards materialising from the design, construction, manufacture, installation, commissioning, maintenance, testing, repair, use, decommissioning, and disposal of mine shafts and winding systems:
- (j) the means by which the mining operation would manage any hazards that could arise in relation to mine shafts and winding systems.

78 Additional requirements for principal hazard management plans in relation to automatic winding systems

In addition to the requirements in regulation 77, for a mining operation with an automatic winding system, a principal hazard management plan for mine shafts and winding systems must include the following:

- (a) the measures to monitor the winding engine from outside the winding engine room:
- (b) the warning systems to alert all persons at the mining operation of any emergency in a mine shaft:
- (c) the measures to prevent spillage into the shaft during loading of any plant or material onto or into a shaft conveyance.

79 Additional requirements for principal hazard management plans in relation to dual-purpose shafts

In addition to the requirements in regulation 77, for a mining operation with a dual-purpose shaft for conveying materials

and persons, the principal hazard management plan must include the following:

- (a) the measures to ensure the adequate protection of any person being carried in a shaft conveyance from any material in the shaft or conveyance that may cause injury to that person:
- (b) the measures used to prevent any person from being carried in a shaft conveyance while any material is being carried in the shaft conveyance:
- (c) the measures to be used to prevent any material being carried in a shaft conveyance from protruding horizontally outside the conveyance:
- (d) the measures to ensure that any material being carried in a shaft conveyance is properly secured and will not become unsecured during transportation.

Roads and other vehicle operating areas

80 Principal hazard management plans for roads and other vehicle operating areas

- (1) The principal hazard management plan for roads and other vehicle operating areas within the mining operation must, at a minimum, provide for the following:
 - (a) the measures to be taken to ensure that the design, layout, operation, construction, and maintenance of each road and other vehicle operating area at the mining operation is safe for all authorised users:
 - (b) the measures to be taken to manage the risks associated with land adjacent to the road or other vehicle operating area at the mining operation:
 - (c) having regard to the volume and speed of traffic and other relevant matters, the measures to be taken to manage the risks associated with interactions between the following:
 - (i) vehicles (of the same or different types):
 - (ii) vehicles and persons (including in parking areas and around earth-moving machinery in operation):
 - (d) the measures to be taken to manage the risks associated with interactions between mobile plant and other traffic:

- (e) the measures to be taken to manage the risks associated with interactions between mobile plant and fixed structures (including overhead and underground power lines, tunnel walls, and roofs):
- (f) the measures to be taken to manage the risks associated with the use of remote control vehicles at the mining operation:
- (g) the procedures to be followed for the operation and movement of load-shifting equipment:
- (h) the listing of prohibited zones, including consideration of whether to add new, or make changes to existing, prohibited zones:
- (i) the procedure for discharging loads from fixed or mobile plant:
- (j) in relation to dump trucks,—
 - (i) the design, construction, and maintenance of safety berms, windrows, and bunds on roads used by trucks; and
 - (ii) the risks of the trucks overturning, and measures to manage those risks; and
 - (iii) the safe dumping areas and routes; and
 - (iv) the recommended methods of safe working:
- (k) the availability of safe means of transport for mine workers' access to and exit from their place of work within the mining operation:
- (l) the conditions for the safe operation of equipment or vehicles transporting people or equipment:
- (m) the minimum dimensions and conditions of the roads and other areas on which equipment or vehicles transporting people or equipment are to operate:
- (n) the maximum load that may be carried or towed by vehicles and equipment, whether by reference to weight, dimensions, or other criteria:
- (o) the rules relating to the safe carriage of persons, including the segregation of people from the load, the provision of seating, and the use of seat belts, other harnesses, or restraint devices:

- (p) the measures to be taken for safety of persons working or travelling on or near roads or other areas used by vehicles:
 - (q) the measures to be taken for safe parking, refuelling (including safe storage of fuel for vehicles), and recharging of vehicles or equipment:
 - (r) the requirements for periodic inspection and testing of the braking systems of vehicles:
 - (s) the procedure to be followed before equipment or vehicles transporting people or equipment are operated:
 - (t) the procedure to be used on the discovery of a defect in equipment or vehicles used, or to be used, for transporting people or equipment.
- (2) The site senior executive must ensure that the measures and matters in subclause (1) are determined after the following factors have been taken into account:
- (a) the characteristics of the vehicles and other mobile plant to be used in the mining operation:
 - (b) the conditions of the road or other vehicle operating area in the particular area of the mining operation (including environmental conditions such as the time of day, visibility, temperature, and the effects of weather).
- (3) In this regulation, **prohibited zone** means any place in the mining operation where any vehicle (including any remote-operated vehicle), any other mobile plant, or any person must not enter at certain times, or at all times, as provided in a principal hazard management plan and notified at relevant places near the place concerned.

Tips, ponds, and voids

81 Principal hazard management plans for tips, ponds, and voids

The principal hazard management plan in relation to tips, ponds, and voids must, at a minimum, provide for the following:

- (a) the procedures and processes to ensure the safe design, construction, and maintenance of any tips, ponds, or voids at the mining operation:

- (b) a geotechnical assessment to be carried out commensurate with the type and scale of tipping operations and having regard to—
 - (i) the underlying geotechnical structure at the location of a tip; and
 - (ii) the properties of the material being tipped; and
 - (iii) the creation of any ponds or voids:
- (c) roading design and traffic movement connected with tipping operations:
- (d) the tipping rules relating to the use of tips:
- (e) records to be kept of the materials that have been tipped:
- (f) an inspection and monitoring regime.

82 Risk reassessment in relation to tips, ponds, and voids

In addition to the requirements of regulation 55, the site senior executive must ensure that a reassessment of the stability of the tip, pond, or void is carried out by a competent person—

- (a) at least once every 2 years after the date the principal hazard management plan is approved by the site senior executive; and
- (b) if a tip, pond, or void as constructed deviates from the geotechnical design; and
- (c) if a new tip, pond, or void is created.

83 Inspection of tips

If the principal hazard management plan for tips, ponds, and voids requires regular inspections to be carried out, the principal hazard management plan must specify—

- (a) the nature and interval of inspections; and
- (b) the appointment of a competent person to supervise the conduct of tipping operations, including a requirement that this person supervise every inspections of a tip at the mining operation.

*Air quality: managing dust and other airborne
contaminants*

84 Principal hazard management plans for air quality

- (1) The following matters must be considered in the development of the principal hazard management plan for air quality:
 - (a) the levels of oxygen in the natural or supplied air at the mining operation:
 - (b) the temperature and humidity of the air at the mining operation:
 - (c) the types of dust and other contaminants that are likely to be in the air from both natural and introduced sources and that may be hazardous for the health and safety of any mine workers exposed to the dust or contaminants:
 - (d) the levels of dust and other contaminants in the natural or supplied air at the mining operation:
 - (e) the length of exposure of mine workers at the mining operation to airborne dust or other contaminants, taking into account such matters as extended shifts and reduced recovery periods between shifts and any other relevant matters.
- (2) The principal hazard management plan must, at a minimum, identify the measures that will be taken to—
 - (a) monitor and assess airborne dust and contaminants at the mine:
 - (b) regularly monitor the atmosphere at the mining operation to manage hazards associated with unsafe concentrations of oxygen, methane, and other gases in the air:
 - (c) effectively reduce, dilute, or extract airborne dust and other contaminants, including through the use of appropriate suppression, ventilation, or exhaust extraction systems:
 - (d) ensure air provided by the ventilation system at the mining operation is of sufficient volume, velocity, and quality to remove airborne dust and contaminants from the mining operation and to maintain a safe and healthy atmosphere at the mining operation:
 - (e) ensure that the supply of fresh air to the ventilation system used in the underground parts of the mining operation is from the purest source available:

- (f) suppress dust that may arise as a result of activities at the mining operation, including through the use of dust collection and dust suppression plant where appropriate.

Fire or explosion

85 Principal hazard management plan for fire or explosion

- (1) The following matters must be considered in the development of the principal hazard management plan for fire or explosion:
 - (a) potential sources of fire and explosion at the mining operation:
 - (b) potential sources of flammable, combustible, and explosive materials, both natural and introduced, including gas, dust, fuels, solvents, and timber:
 - (c) potential sources of ignition including equipment, static electricity, electricity, spontaneous combustion, lightning, hot work, and other work practices:
 - (d) potential for propagation of fire or explosion to other parts of the mining operation:
 - (e) the use, presence, and storage of flammable and explosive substances including combustible ore, sulphide dust, coal dust, or methane.
- (2) The principal hazard management plan for fire or explosion must include—
 - (a) a description of the potential sources described in subclause (1)(a) to (c) and of the potential for propagation of fire or explosion:
 - (b) procedures for the use, presence, and storage of flammable and explosive substances:
 - (c) provision for hot-work procedures, including any restrictions on doing hot work if applicable under regulation 161:
 - (d) provision for live electrical work procedures, including any restrictions on doing live electrical work if applicable under regulation 195:
 - (e) details of the type and location of the systems for prevention, early detection, and suppression of fire (including remote monitoring systems) and of the equipment for firefighting at the mining operation:

- (f) where a gas monitoring system is in place, provision for the use of portable gas detectors fitted with suitable extension probes to monitor the presence of methane in the event that the gas monitoring system, or part of it, fails or becomes non-operational:
 - (g) reference to the principal control plan for emergency management and the location of changeover stations, or refuge chambers, where they exist:
 - (h) in respect of coal mining operations, the methods that will be used to limit the generation of coal dust, which must include the use of dust suppression systems at coal crushers, coal conveyors, and conveyor transfer points.
- (3) In the case of an underground coal mining operation, the principal hazard management plan must also set out the methods that will be used to—
- (a) minimise the amount of coal dust resulting from the use of mechanical mining systems:
 - (b) minimise the accumulation of coal dust on roadways and on other surfaces in the roadways, and remove accumulations of coal dust from the roadways and other surfaces:
 - (c) suppress airborne coal dust and remove it from the workings of the mining operation:
 - (d) determine the rate of application of stone dust that is necessary to minimise the risk of a coal dust explosion:
 - (e) suppress coal dust explosions and limit propagation of coal dust explosions to other parts of the mining operation:
 - (f) monitor and take samples of roadway dust, including any stone dust that has been applied, to ensure that the methods outlined in the principal hazard management plan are adequate and sufficiently implemented to prevent and suppress coal dust explosions.

Explosives

86 Principal hazard management plan for explosives

The principal hazard management plan for explosives must, at a minimum, address the following matters:

- (a) transportation of explosives at the mining operation:

- (b) explosive precursors:
- (c) inspection of and reporting on the safety of equipment used at the mining operation for manufacturing, storing, transporting, and delivering explosives:
- (d) the appropriate action to be taken to make safe the equipment mentioned in paragraph (c):
- (e) how explosives brought into the mining operation and used at the mining operation will be accounted for:
- (f) how explosives will be checked for any deterioration in the explosives and isolated if they have deteriorated:
- (g) the establishment of secure storage for explosives at the mining operation, including a system for signing explosives in and out of storage:
- (h) in the case of underground mining operations and tunnelling operations, a process to remove explosives from under ground at the operation unless there is an approved facility to store the explosives under ground:
- (i) the identification and control of hazards that may arise—
 - (i) during the charging and firing of explosives; and
 - (ii) in particular places, including, for example, in a storage bin feeder in which an explosive is to be used to clear a blockage:
- (j) the establishment of declared danger zones that no person may enter while blasting operations are taking place:
- (k) the procedure to find, recover, and detonate misfired explosives:
- (l) a record to be kept of misfired explosives:
- (m) a register of people at or providing a service to the mining operation who are approved handlers under the Hazardous Substances and New Organisms Act 1996 to handle explosives:
- (n) the co-operation required between the mining operation and any person authorised under the Hazardous Substances and New Organisms Act 1996 regarding the safety of the storage, handling, transportation, and use of explosives at the mining operation, including compliance with any conditions attached to the authorisation

under the Hazardous Substances and New Organisms Act 1996 of the person handling the explosive.

Gas outbursts

87 Principal hazard management plan for gas outbursts

- (1) The following matters must be considered in the development of the principal hazard management plan for gas outbursts:
 - (a) the potential for gas to be released into the working areas of a mining operation from natural or introduced sources at concentration levels that could lead to fire, explosion, or asphyxiation:
 - (b) the nature of the gas that could be released:
 - (c) the levels of gas in the material being mined:
 - (d) gas seam pressures.
- (2) The following must be undertaken during the development of the principal hazard management plan for gas outbursts:
 - (a) analysis of samples taken of *in situ* gas content:
 - (b) geotechnical investigation and analysis:
 - (c) statistical analysis of the data obtained as part of a technical review undertaken to determine what gas thresholds for safe mining should be applied at the mining operation.
- (3) The principal hazard management plan for gas outbursts must, at a minimum, include the following matters:
 - (a) the determined risk of gas outbursts, measuring such factors as the *in situ* methane and carbon dioxide gas levels per tonne of material:
 - (b) the specific geological risk features that are able to be identified in the area to be mined:
 - (c) the control processes to be used to manage the risk of gas outbursts, which must include, but not be limited to, monitoring the following matters (where relevant) and comparing the measurements to the predetermined gas thresholds and mining rates adopted in the plan:
 - (i) carbon dioxide and methane gas content and desorption rates:
 - (ii) ventilation:
 - (iii) gas drainage:

- (iv) bore hole surveying;
 - (v) the rate of development of the workings of the mining operation:
- (d) a procedure for work to be authorised by the mine manager before that work first commences in a particular part of the underground parts of the mining operation and at specified intervals following the commencement of work.
- (4) The procedure developed as required by subclause (3)(d) must include a requirement for the mine manager, before authorising work, to verify that the information necessary to assess the risk of harm to mine workers from gas outbursts has been obtained and that all necessary control measures have been implemented, including—
- (a) requirements (subject to any stricter requirements in Part 7 or 8) for readings and records to be taken at least once every 2 hours of the concentration of gas in the general body of air at the face; and
 - (b) requirements to continuously identify geological structures; and
 - (c) provision for the rate of roadway advance to be modified; and
 - (d) the use of surveys and sample drill holes; and
 - (e) the training of workers to identify the signs of gas outbursts; and
 - (f) the training of workers in rescue and escape procedures following outbursts; and
 - (g) the provision of personal protective equipment to mine workers operating mobile plant.

Spontaneous combustion

- 88 Appraisal of likelihood of spontaneous combustion to occur required at all underground coal mining operations**
- (1) The appraisal of an underground coal mining operation as required by regulation 66(1)(a) must, in respect of assessing the likelihood of spontaneous combustion to occur, include, but is not limited to, the following:

- (a) an independent test of the coal to be mined at the operation as to its propensity for spontaneous combustion; and
 - (b) consideration of all sections of the operation and the nature of the operation; and
 - (c) evaluation of the spontaneous combustion-related history of the operation and any adjacent or prior operations in the same seam and coal measures; and
 - (d) a review of the experiences of spontaneous combustion at other underground coal mining operations.
- (2) The site senior executive must ensure that a determination that there is not the potential for spontaneous combustion to occur at an underground coal mining operation is reviewed at least once every 3 years following the initial determination and in the following situations:
- (a) where there is evidence that spontaneous combustion has occurred or may be occurring in a coal seam or in coal that has been extracted from a coal seam at the underground mining operation, regardless of where the extracted coal is located when the evidence of spontaneous combustion is discovered; or
 - (b) where the workings of the mining operation move into or near another coal seam that has not previously formed part of the assessment of the likelihood of spontaneous combustion to occur at the mining operation; or
 - (c) whenever an audit of the health and safety management system, or any part of it, indicates that the likelihood of spontaneous combustion occurring at the underground coal mining operation should be reassessed; or
 - (d) a site health and safety representative or industry health and safety representative requests the review.

89 Ongoing review of information about spontaneous combustion

In addition to the requirements of regulation 69(3), the following must be assessed when a principal hazard management plan for spontaneous combustion is reviewed under regulations 69(1):

- (a) available information about spontaneous combustion at underground coal mining operations; and
- (b) emerging technology regarding the control of spontaneous combustion in underground coal mines.

90 Principal hazard management plan for spontaneous combustion

The principal hazard management plan for spontaneous combustion must, at a minimum, include the following matters:

- (a) a description of the characteristics of the operation as they relate to the control of spontaneous combustion at the operation:
- (b) an inspection programme for spontaneous combustion that includes taking recordings and making a written report on findings:
- (c) the means to ensure all mine workers are trained in the standards and work practices that may contribute to, and in the early detection of, spontaneous combustion:
- (d) a description of the controls in place at the mining operation to eliminate, isolate, or minimise spontaneous combustion:
- (e) the details of the monitoring programme to determine when the controls referred to in paragraphs (f) and (g) must be used, including—
 - (i) early detection of spontaneous combustion using gas analysis and sensory indicators:
 - (ii) the locations for continuous monitoring of gas to take place:
 - (iii) the location and calibration of gas monitoring instruments:
 - (iv) monitoring of air flow rates and pressure differentials in the underground parts of the mining operation:
- (f) the details of the actions to be taken in response to a spontaneous combustion event, which must include—
 - (i) the procedure for withdrawing mine workers from the underground parts of the mining operation; and

- (ii) the particular responsibilities and competencies required of mine workers responding to the event:
- (g) the procedure or processes for emergency sealing of a part or parts of the underground parts of the mining operation in response to a spontaneous combustion event, including, but not limited to, the details of the sealing procedures and seal design required to comply with Part 8:
- (h) the minimum amount and type of materials required for the construction of emergency seals to be kept at the mining operation, or guaranteed to be readily available to the mining operation, at all times:
- (i) the details of any corrective action to be taken when non-conformance with the principal hazard management plan is identified.

91 Recording of spontaneous combustion events

- (1) The mine operator must ensure that a record is kept of—
 - (a) any spontaneous combustion events that occur at or in the vicinity of the mining operation; and
 - (b) issues, decisions, and actions, and the consequences of those actions, that arise from or are taken as a result of every spontaneous combustion event; and
 - (c) the spontaneous combustion characteristics specific to the mining operation; and
 - (d) all variations from the principal hazard management plan, the causes of non-conformance, and action taken to correct variations.
- (2) The mine operator must ensure that the record required by sub-clause (1) is—
 - (a) made available on request to an inspector, a site health and safety representative, or an industry health and safety representative; and
 - (b) kept for at least 12 months from the date on which the mining operation is abandoned.

Part 4

Principal control plans

92 Site senior executive responsible for having principal control plans

If a subpart of this Part applies to a mining operation, the site senior executive must ensure that there is a principal control plan for the mining operation that complies with that subpart.

93 General purpose of principal control plans

The purpose of a principal control plan is to document—

- (a) the systems and processes in place at the mining operation to manage hazards at the operation; and
- (b) the measures that are necessary to manage principal hazards at the mining operation.

94 Review and revision of principal control plans

- (1) In addition to the requirements of regulation 58, the site senior executive must ensure that each principal control plan is reviewed at least once every 2 years after the date on which the principal control plan is approved by the site senior executive.
- (2) In addition to the requirements of regulation 59, the site senior executive must ensure that a principal control plan is reviewed after—
 - (a) the occurrence of an accident at the mining operation involving any hazard that the principal control plan was intended to manage;
 - (b) a material change in the management structure at the mining operation that may affect the principal control plan;
 - (c) a material change in plant used or installed at the mining operation that may affect the principal control plan;
 - (d) the occurrence of any other event identified in a principal control plan as requiring a review of the plan.
- (3) In addition to the requirements of regulation 61, the mine operator must ensure that records of all reviews and revisions of principal control plans are kept for at least 12 months from the date on which the mining operation is abandoned.

- (4) The mine operator must, on request, provide records relating to a review of a principal control plan to an inspector or a site health and safety representative.

95 Audits of principal control plans

- (1) The mine operator must engage, and pay for, a competent person to carry out an independent external audit of all principal control plans, ensuring that—
- (a) external audits are carried out once every 3 years after the date the principal control plan is approved by the site senior executive.; and
 - (b) the external auditors are independent of the mining operation.
- (2) In addition to the requirements of regulation 61, the mine operator must ensure that results of all audits of principal control plans are kept for at least 12 months from the date on which the mining operation is abandoned.

Subpart 1—Mechanical engineering

96 Application

This subpart applies to any mining operation where 1 or more principal hazards have been identified that may involve hazards or controls of a mechanical type.

97 Risk assessment in relation to mechanical engineering control plan

The following matters must be considered when developing the mechanical engineering control plan:

- (a) the hazards presented by mechanical equipment, plant and installations over their lifetime;
- (b) the potential for mine workers to be harmed by sources of stored energy, which is energy associated with mechanical equipment, plant, and installations other than electrical energy;
- (c) the measures required to prevent the uncontrolled release of stored energy and to prevent the unintended operation of mechanical plant and installations, including

- mechanical plant and installations restarting on restoration of the supply of electricity:
- (d) the potential for, and need to prevent, catastrophic failure of mechanical equipment, plant, or installations:
 - (e) the potential for, and need to prevent, fires being initiated or fuelled by mechanical equipment, plant, or installations:
 - (f) the potential for, and need to prevent, cutting equipment acting as an ignition source for gas or coal dust explosions:
 - (g) the potential for, and need to minimise, exposure of mine workers to toxic or harmful materials associated with mechanical plant and installations:
 - (h) the need for safeguards for mechanical plant and installations to have a probability of failure appropriate to the degree of risk posed by the mechanical plant or installation to which they relate:
 - (i) in the case of an underground coal mining operation, the potential for, and need to prevent, stored energy providing a source of ignition for gas or coal dust explosions:
 - (j) any other matter that deals with the safe management of mechanical plant and installations.

98 Mechanical engineering control plan

The mechanical engineering control plan must, at a minimum, address the following matters:

- (a) the standards of engineering practice to be followed at the mining operation regarding mechanical plant and installations throughout their life cycle, including, but not limited to, the following:
 - (i) arrangements for the acquisition and operation of fit-for-purpose mechanical plant and installations:
 - (ii) inspection and testing systems to ensure mechanical plant and installations are and remain safe to operate:
 - (iii) arrangements for the maintenance, repair, and alteration of mechanical plant and installations:

- (iv) arrangements for the commissioning of mechanical plant and installations and for such commissioning to be documented:
- (v) the competencies required of mine workers who may deal with mechanical plant and installations during the life cycle of the equipment, plant, and installations at the mining operation:
- (vi) arrangements for the mine workers installing, commissioning, maintaining, and repairing mechanical plant and installations to be supervised by competent persons:
- (vii) safe work procedures for mine workers who may deal with mechanical plant and installations during the life cycle of the equipment, plant, and installations at the operation:
- (viii) the identification, assessment, rectification, and management of defects in mechanical plant and installations:
- (b) the safe operation of conveyors, winding system, mobile plant, and dredges:
- (c) the safety of mechanical plant and installations:
- (d) the fitting of appropriate automatic fire suppression and engine or fuel pump shutdown systems to safety-critical equipment and all underground diesel engines:
- (e) the fitting of heat detection and automatic trip sensors on safety-critical mechanical components to ensure they stop operating if they may become a danger to health and safety:
- (f) the fitting of devices to protect the operator of mobile plant from the hazards involving mobile plant overturning, objects falling on or coming into contact with the operator, and the operator being ejected from the seat, in the form of the following:
 - (i) rollover protection and falling object protection on mobile plant that is suitable for the mining operation:
 - (ii) seat belts or other devices used to restrain the operator on mobile plant:

- (iii) protective canopies on mobile plant working under an unsupported roof when they are controlled by an on-board operator:
- (g) the safe use and storage of pressurised fluids (including managing the hazards associated with compressed air and pressurised hydraulic fluids):
- (h) means for the prevention, detection, and suppression of fires on mobile plant and conveyors:
- (i) the control of diesel engine plant and installations, including the following:
 - (i) limiting the number of diesel engines permitted underground in any underground mining operation or tunnelling operation consistent with the safe operation of the mining operation and capacity of the ventilation system to reduce exhaust emissions to an acceptable level:
 - (ii) limiting the use of diesel engine plant and installations in the underground parts of an underground coal mining operation to diesel engine plant and installations that are approved for use in an underground coal mining operation:
 - (iii) where diesel engines are used on plant underground, the fitting of such plant with steel fuel tanks, automatic fire suppression of adequate delivery means and capacity, and a ready method of battery isolation:
 - (iv) the maintenance of explosion-protected plant in an explosion-protected state:
- (j) the use of fire-resistant hydraulic fluids in high-risk applications underground in an underground mining operation or tunnelling operation:
- (k) the engine management systems used to control diesel pollutants emitted underground in an underground mining operation or tunnelling operation:
- (l) the arrangements for hot work to be done safely, including an approval system for hot work to be done if the mining operation is an underground coal mining operation or an underground metalliferous mining oper-

ation or tunnelling operation where methane has been detected.

Subpart 2—Electrical engineering

99 Application

This subpart applies to—

- (a) any mining operation where 1 or more principal hazards have been identified that may involve hazards or controls of an electrical type; and
- (b) any underground mining operation or tunnelling operation.

100 Electrical engineering control plan

- (1) The electrical engineering control plan must, at a minimum, address the following matters:
 - (a) the prevention of harm to people from sources of electrical energy:
 - (b) the prevention of fires being ignited by electrical energy:
 - (c) the prevention of electrical plant being unintentionally operated:
 - (d) the provision of electrical safeguards for electrical and non-electrical hazards with a probability of failure appropriate to the likelihood of the hazard occurring and the severity of harm that could result:
 - (e) the competencies required of mine workers carrying out electrical work at the mining operation:
 - (f) the reliability of electrical plant and installations used in the monitoring and control of hazards and of electronic communication equipment:
 - (g) the use of a maintenance management system that includes the keeping of commissioning, inspection, and test reports and certification documentation of electrical plant and installations throughout the life cycle of the plant and installations:
 - (h) safe working practices for working on high voltage installations:
 - (i) any other requirements of these regulations relating to the management of the safety of electrical plant and in-

stallations and electrical engineering practices, and any requirements of regulations made under the Electricity Act 1992 relevant to the use of electricity at the mining operation.

- (2) In the case of an underground mining operation or tunnelling operation, the electrical engineering control plan must, in addition to the matters in subclause (1), include provision for—
- (a) the design, installation, operation, and maintenance of electrical plant and installations at the mining operation, to minimise the potential impacts from voltage rise due to lightning, static electricity, voltage surges and other transient voltages to within acceptable limits, including—
 - (i) the prevention of the ignition of gas by a static charge:
 - (ii) the prevention of the effects of lightning being transferred to the underground parts of the mining operation:
 - (b) the safe operation of every electrical control system at the mining operation under all operating conditions, including instability or failure of the electricity supply:
 - (c) the isolation of the supply of electricity to all electrical plant or installations in the event of—
 - (i) unsafe electrical plant or installations being detected; or
 - (ii) unsafe electrical practices being detected:
 - (d) the isolation of the supply of electricity to any particular item of electrical plant or to any installation in the event that a failure to maintain that electrical plant or installation in accordance with the electrical engineering control plan is detected:
 - (e) reasonable access to works by people undertaking installation, maintenance, or emergency work for those works:
 - (f) the safety of any person undertaking installation, maintenance, or emergency work on works:
 - (g) specific procedures for the following:
 - (i) use of electric welding plant:

- (ii) use of electrical test equipment, including instruments:
 - (iii) work near overhead power lines and cables:
 - (iv) treatment of electric shocks and electric burns:
 - (h) the security and maintenance of the mining operation's electrical control system software and control circuits, including—
 - (i) controlling the modification of the software and circuits:
 - (ii) keeping records of any modifications:
 - (i) the safe use of lasers, including fibre-optic equipment at the mining operation.
- (3) In the case of an underground coal mining operation, the electrical engineering control plan must, in addition to the matters in subclauses (1) and (2), provide for—
 - (a) the prevention of electrical energy acting as an ignition source for gas or coal dust explosions:
 - (b) for each explosion risk zone, ensuring the use only of electrical plant and installations, including cables and electrical plant on diesel vehicles, that are appropriate to the explosion risk zone in which they are located or being used:
 - (c) the approval system under which live electrical work may be carried out:
 - (d) the isolation of the supply of electricity to the underground parts of the mining operation, but not the supply to safety-critical equipment, in the event of the following circumstances:
 - (i) the presence of methane levels at or above,—
 - (A) in an NERZ, 0.5%:
 - (B) in an ERZ1, 1.25%:
 - (ii) if ventilation falls below the specified quantity set by the electrical engineering control plan:
 - (e) the safe restoration of the supply of electricity to the underground parts of the mining operation by a competent person:
 - (f) the plant and procedures used to ensure that, in the event of a failure of the main ventilation system, the supply of electricity entering the underground parts of the mining

operation (other than power to plant or installations that have been designed so that they are incapable of producing heat or sparks sufficient to ignite an explosive atmosphere)—

- (i) is automatically and systematically isolated:
 - (ii) is incapable of being restored before the main ventilation system is repaired and restarted:
 - (iii) is not restored until a competent person determines it is safe to do so.
- (4) For the purpose of this regulation, **works** has the meaning given to it in section 2 of the Electricity Act 1992.

Subpart 3—Ventilation

101 Application

This subpart applies to any underground mining operation or tunnelling operation.

102 Ventilation control plan

- (1) The ventilation control plan must, at a minimum, address the following matters:
- (a) the installation of ventilation control devices to control the supply of ventilation to the underground parts of the mining operation and the means used to ensure that ventilation control devices are not interfered with:
 - (b) the development of procedures for the construction, installation, use, and maintenance of ventilation control devices at the mining operation:
 - (c) the placement of the main fans, and provision of other devices for a main fan, such as measuring or monitoring devices:
 - (d) the maintenance of return airways in a suitable condition so that they are accessible to those who must inspect them or maintain them or travel through them in an emergency:
 - (e) the competencies of mine workers who operate, maintain, or adjust any part or the whole of the ventilation system at the mining operation:

- (f) the processes that will ensure that only mine workers with the required competencies operate, maintain, or adjust any part or the whole of the ventilation system at the mining operation:
 - (g) the means by which heat stress conditions will be monitored and controlled:
 - (h) reporting procedures relating to ventilation:
 - (i) the maintenance of ventilation records and plans:
 - (j) if it is possible that an area or areas of the underground parts of the mining operation may need to be sealed, the manner of sealing such areas, and the precautions to be taken:
 - (k) ensuring that no person enters any area of the mining operation that is sealed, disused, or otherwise not ventilated:
 - (l) the procedures to be followed in the event of a failure of a part or the whole of the main ventilation system at the mining operation and, where considered necessary, the safe withdrawal of people from underground in the mining operation.
- (2) In the case of an underground mining operation or tunnelling operation, the ventilation control plan must, in addition to the matters in subclause (1), address the following matters:
- (a) how the exposure of mine workers to engine pollutants in the atmosphere at the mining operation will be controlled, including—
 - (i) the provision of sufficient ventilation to dilute harmful exhaust pollutants at the mining operation; and
 - (ii) regular testing, on at least a monthly basis, of the exhaust material from each diesel engine at the mining operation to verify that the ventilation provided is sufficient to dilute any harmful exhaust pollutants emitted by the engines:
 - (b) a procedure for the starting of a main fan:
 - (c) procedures for using the following types of fans, where they form part of the mining operation's ventilation system, including starting and stopping procedures:
 - (i) auxiliary fans; and

- (ii) booster fans; and
 - (iii) scrubber fans:
 - (d) the levels of methane at which a methane detector will activate its alarm, and the procedures to be followed when that occurs:
 - (e) measures to be taken if the effective temperature in the underground parts of the mining operation exceeds 28°C:
 - (f) providing for the recording of instances referred to in paragraph (e) as part of the health and safety management system:
 - (g) the procedure regarding the action to be taken when monitoring identifies the presence of noxious gases:
 - (h) the criteria for determining that ventilation is inadequate in a part or the whole of the underground parts of the mining operation, having regard to the quality, quantity, and velocity of air provided by the ventilation system such that workers must be evacuated from the affected part or the whole of the operation as required by regulation 149:
 - (i) the procedure in the event that the main ventilation system at the mining operation fails (which, if the operation is ventilated by more than 1 main ventilation fan, means a failure of 1 or more of the fans), including—
 - (i) the action to be taken to ensure the safety of mine workers if the ventilation system fails in part or totally for at least 30 consecutive minutes; and
 - (ii) the safe withdrawal of mine workers from the underground parts of the mining operation to a place of safety when it is necessary to withdraw them from the underground parts; and
 - (iii) how the system that monitors the operation of the main ventilation fan or fans at the mining operation will ensure an alarm is given at the surface part of the mining operation in the event that 1 or more of the main ventilation fans stops.
- (3) In the case of an underground coal mining operation, the ventilation control plan must, in addition to the matters in sub-clauses (1) and (2), address the following matters:

- (a) an assessment of potentially explosive gas contained within the coal seam that is being mined:
- (b) based on the assessment required by paragraph (a), the establishment of a system for the delivery of adequate ventilation that is designed to maintain the concentration of methane below 0.5% of the general body of air in any production area:
- (c) the design, monitoring, and control of the underground ventilation arrangements to ensure that the atmosphere underground in the mining operation is kept within the prescribed limits (including design, monitoring, and control of arrangements required to support air quality, dust, and airborne contaminant management, gas outburst management, spontaneous combustion management, or other hazard management arrangements at the mining operation that are dependent on ventilation):
- (d) the development and implementation of a procedure to ventilate the underground parts of the mining operation where work is performed, including specification of the maximum distances from the face where ventilation ducting and brattice lines may be located:
- (e) the placement of every main ventilation fan in a location and under such conditions that will prevent the fan being damaged during an explosion occurring underground at the mining operation.

Subpart 4—Emergency management

103 Application

This subpart applies to any mining operation where 1 or more principal hazards have been identified.

104 Consultation with emergency services

When developing an emergency management control plan, the site senior executive must consult—

- (a) fire, police, and ambulance emergency services that have responsibility for the area in which the mining operation is located; and
- (b) in the case of a coal mining operation, an underground metalliferous mining operation, or a tunnelling oper-

ation where a tunnel is intended to be 150 metres or more in length, the Mines Rescue Trust.

105 Emergency management control plan

- (1) The emergency management control plan must, at a minimum, address the following matters:
 - (a) the co-ordination and control of emergencies at the mining operation:
 - (b) the people (or positions) at the mining operation who, or that, will have responsibilities in relation to emergencies at the mining operation, and the detail of those responsibilities:
 - (c) the events that trigger the activation of the plan:
 - (d) the use of communication systems in emergencies at the mining operation:
 - (e) the giving of timely notice, information, and warnings about emergencies to anyone potentially affected by an emergency at the mining operation, including to the persons nominated as next of kin by mine workers:
 - (f) measures to be taken to isolate an area of the mining operation affected by an emergency:
 - (g) the availability of the Mines Rescue Trust and other emergency services to respond to an emergency at the mining operation:
 - (h) the means to locate and account for people at the mining operation in the event of an emergency at the mining operation:
 - (i) the maintenance of an accurate record of all people underground at a mining operation at all times and their likely location, and the availability of that record for the purposes of responding to emergencies at the mining operation:
 - (j) the evacuation of the mining operation in an emergency, including the conditions that will prompt withdrawal of mine workers from the mining operation where there is an imminent risk of harm to mine workers:
 - (k) appropriate transportation from the mining operation:

- (l) first-aid arrangements at the mining operation, including first-aid equipment, facilities, and services and the mine workers who are qualified to provide first aid;
 - (m) provision for all aspects of firefighting, including adequate and compatible firefighting equipment, procedures for firefighting, and training mine workers in firefighting;
 - (n) a procedure to ensure prompt notification of all relevant emergency services and the Mines Rescue Trust.
- (2) In the case of an underground mining operation or tunnelling operation, the emergency management control plan must, in addition to the matters in subclause (1), include provision for ensuring—
- (a) there is an effective means of communicating between the surface of the mining operation and any part of the mining operation where people may be located underground; and
 - (b) the availability of a suitable number of people trained in mines rescue who will be able to respond to an emergency at a mining operation; and
 - (c) there is adequately maintained equipment at the mining operation that will—
 - (i) allow for rapid and continuous rescue operations to take place at the mining operation in conditions of reduced visibility and irrespirable and irritant atmospheres; and
 - (ii) assist the escape or safe recovery of any mine worker or other person from a mining operation where necessary; and
 - (d) the safe escape of people from underground in the mining operation through conditions of reduced visibility and irrespirable and irritant atmospheres (including adequately maintained self-rescuers and other facilities to aid escape where appropriate); and
 - (e) there is an appropriate means of escape to the surface part of the mining operation; and
 - (f) the maintenance of an up-to-date plan of—
 - (i) the exits from the underground parts of the mining operation; and

- (ii) the changeover stations and refuges in the underground parts of the mining operation.
- (3) In the case of an underground coal mining operation, the emergency management control plan must, in addition to the matters in subclauses (1) and (2), include the processes for—
 - (a) safely sealing the whole of the underground parts of the mining operation in an emergency; and
 - (b) the safe use of inertisation equipment.

106 Testing, etc, of emergency management control plan

- (1) In addition to the requirements of regulation 69, the site senior executive must ensure that—
 - (a) the emergency management control plan is regularly tested—
 - (i) using practice drills; and
 - (ii) involving the services referred to in regulation 104; and
 - (b) mine workers are provided with training in the emergency management control plan and that the provision of this training is recorded.
- (2) The mine operator must ensure that the mining operation is provided with adequate resources to—
 - (a) effectively implement the emergency management control plan; and
 - (b) keep facilities and equipment regularly inspected and maintained in a fully operational condition.
- (3) In addition to the requirements of regulation 62, the site senior executive must ensure that a copy of the current emergency management control plan is given to the Mines Rescue Trust, where relevant, and other emergency services referred to in regulation 104.

Subpart 5—Worker health**107 Application**

This subpart applies to any mining operation where 1 or more principal hazards have been identified that may have long-term effects on the health of mine workers.

108 Worker health control plan

- (1) The worker health control plan must, at a minimum, address how the following hazards are to be monitored and controlled where they are present at the operation:
 - (a) noise:
 - (b) vibration:
 - (c) dust, including asbestos dust, coal dust, silica dust, or mixed dust (being dust that contains mixtures of more than 1 different kind of dust):
 - (d) diesel particulates:
 - (e) fumes, including exhaust fumes, welding fumes and other fumes arising from metallic sources:
 - (f) temperature, including extreme hot and cold temperatures, and humidity:
 - (g) changes in atmospheric pressure:
 - (h) manual handling and lifting:
 - (i) hours of work and fatigue:
 - (j) psychosocial hazards:
 - (k) ultraviolet radiation:
 - (l) ionising radiation:
 - (m) biological hazards:
 - (n) any other hazard that may adversely affect the health of mine workers who work at the mining operation.
- (2) The worker health control plan must also—
 - (a) provide for the development of strategies (proportionate to the hazards present at the mining operation and to how a mine worker's behaviour may affect the worker's safety or the safety of others at the mining operation) to deal with fatigue or consumption of drugs and alcohol; and
 - (b) set out a detailed process for obtaining urgent medical treatment for mine workers who suffer serious harm at the mining operation, taking into account the nature of the terrain where the mining operation is located and the remoteness of the mining operation from the nearest hospital or other place where medical assistance may be provided.

Part 5

Worker participation systems

109 Default worker participation system

The provisions in Schedule 3 are the prescribed provisions for the purposes of section 19U of the Act.

110 Process for election of site health and safety representatives

- (1) The provisions in subclauses (2) and (3) are the prescribed provisions for the purposes of section 19V(1) of the Act.
- (2) An election for a site health and safety representative must—
 - (a) involve only candidates who—
 - (i) work sufficiently regularly and for a sufficient duration to enable them to carry out their functions effectively; and
 - (ii) have worked for a minimum of 2 years in a mining operation of the kind at which the person will be a site health and safety representative; and
 - (iii) are willing to take on the position; and
 - (b) be conducted through a secret ballot; and
 - (c) give all mine workers, or all mine workers in a relevant grouping for the purposes of section 19R(5) of the Act, a reasonable opportunity to vote; and
 - (d) be determined by the wishes of the majority of those who vote.
- (3) An election is not required if—
 - (a) there is only 1 candidate for a position, in which case the candidate automatically fills the position; or
 - (b) there are no candidates for a position, in which case the position is not filled.

111 Competency requirements for appointment as industry health and safety representative

- (1) An industry health and safety representative must hold at least 1 of the following certificates of competence:
 - (a) first-class coal mine manager;
 - (b) coal mine underviewer;
 - (c) coal mine deputy.

- (2) In addition to the requirements of subclause (1), an industry health and safety representative must have successfully completed any other competency requirements for an industry health and safety representative that are prescribed by WorkSafe under regulation 34.

112 Form of identity cards

- (1) This regulation applies to an identity card that WorkSafe is required to give to an industry health and safety representative under section 19ZY of the Act.
- (2) The front of the identity card must—
- (a) clearly identify the representative as an industry health and safety representative; and
 - (b) display the following information:
 - (i) a recent photograph of the representative; and
 - (ii) the representative's full name; and
 - (iii) the name of the union or group of mine workers that appointed the representative.

*Information required in relation to appointment
of industry health and safety representative*

113 Notice to WorkSafe in relation to appointment of industry health and safety representative

The information required to be given for the purpose of section 19ZV(b) of the Act is—

- (a) the name of the industry health and safety representative; and
- (b) the contact details of the representative, including telephone numbers, a physical address (which need not be the person's residential address), and email addresses (if any); and
- (c) the date of appointment of the representative; and
- (d) if the representative was appointed by a union, the name and contact details of the union, including telephone numbers, physical addresses, and email addresses (if any); and
- (e) if the representative was appointed by a group of mine workers, the name and contact details of a person or persons who may be contacted on behalf of the group

- about the appointment of the representative, including telephone numbers, physical addresses, and email addresses (if any); and
- (f) evidence that the industry health and safety representative meets the requirements of regulation 111.

*Register of industry health and safety
representatives*

114 Register of industry health and safety representatives

The information required to be contained in the register required under section 19ZZB of the Act is as follows:

- (a) the name of the industry health and safety representative; and
- (b) the contact details of the representative, including telephone numbers, a physical address (which need not be the person's residential address) and email addresses (if any); and
- (c) the date of appointment of the representative; and
- (d) if the representative was appointed by a union, the name and contact details of the union, including telephone numbers, physical addresses, and email addresses (if any); and
- (e) if the representative was appointed by a group of mine workers, the name and contact details of a person or persons who may be contacted on behalf of the group about the appointment of the representative, including telephone numbers, physical addresses and email addresses (if any).

*Action following reporting of hazard by mine
worker*

115 Mine operator must investigate reported hazard

- (1) If a mine worker reports the existence of a hazard in the mining operation, including (without limitation) any action done or not done in contravention of any system, procedure, or other risk-control measure in place at the mining operation to control a hazard, the mine operator must ensure that the report is investigated.

- (2) The investigation must be completed as soon as practicable, having regard to the seriousness of the hazard.

116 Mine operator must advise mine worker of result of investigation

When the investigation required by regulation 115 is completed, the mine operator must ensure that the mine worker who reported the hazard is promptly advised of the result of the investigation.

**Part 6
Specific duties in all mining operations**

117 Application

This Part applies to all mining operations, unless specifically provided otherwise.

Ground or strata instability

118 Installation of ground or strata support

The mine operator must ensure that—

- (a) no person enters an area of the mining operation that has unsupported ground or strata unless that person is installing or supervising the installation of ground or strata support; and
- (b) where any mine worker who is installing or supervising the installation of ground or strata support will be exposed to a hazard associated with unsupported ground or strata, temporary support is provided to protect that mine worker from the hazard.

119 Obligations relating to ground or strata support

The manager must ensure—

- (a) that suitable ground or strata support methods are designed and implemented for all working areas, in accordance with regulation 118; and
- (b) that plans showing the ground or strata support arrangements put in place are displayed in locations readily accessible to all mine workers.

*Roads and other vehicle operating areas***120 Roads and other vehicle operating areas**

The mine operator must ensure that the following are given adequate consideration in the design, layout, operation, construction, and maintenance of each road within the mining operation:

- (a) the grade and width of the road:
- (b) the drainage system for the road:
- (c) the characteristics of the mobile plant to be used at the mine, including stopping distances, manoeuvrability, operating speeds, driver position, and remote control:
- (d) the movement of mobile plant when forming dumps or stockpiles:
- (e) the interaction between light and heavy vehicles at the mining operation.

121 Operation of mobile plant by authorised mine workers only

The mine operator must ensure that no mobile plant is operated at the mining operation except by a competent person who is authorised in writing by the mine operator to do so.

*Defects discovered during inspection of tips***122 Defects discovered during inspection of tips**

- (1) The mine operator must ensure that any person who carries out an inspection of a tip at the mining operation—
 - (a) makes a written record of all defects discovered during the inspection; and
 - (b) informs the mine manager of the defects that require immediate rectification.
- (2) The mine operator must ensure that a written record is made of the action taken to remedy any defect in a tip discovered during an inspection of the tip.
- (3) The mine operator must ensure that the records required by subclauses (1)(a) and (2) are kept as part of the health and safety management system.

Explosives

123 Explosives

- (1) The mine operator must ensure that—
 - (a) no person uses, handles, or issues explosives at the mining operation unless the person meets the requirements of an approved handler for the purposes of the Hazardous Substances and New Organisms Act 1996:
 - (b) explosives used at the mining operation are—
 - (i) authorised for use by the mine operator:
 - (ii) stable:
 - (iii) fit for their intended use:
 - (iv) insensitive to shock, sparks, friction, and the environment in which they will be stored, transported, and used:
 - (v) simple to store, use, transport, and control:
 - (c) every person who designs or initiates a shot does so in a manner that ensures that the shot and any material expelled outside the declared danger zone do not cause harm to any person in, or in the vicinity of, the mining operation.
- (2) In subclause (1)(c), **declared danger zone** means the area that no person may enter while blasting operations are to take place, established in accordance with the principal hazard management plan for explosives.

Conveyor belts

124 Conveyor belts

- (1) The mine operator must ensure that, where a conveyor belt or belts are used at the mining operation, the conveyor belt or belts are—
 - (a) designed, installed, and used in such a way that will address any hazard that may arise when the conveyor belt is started. This must include the use of pre-start warnings:
 - (b) fitted with an emergency stop system that can be activated at any point along the length of the conveyor belt accessible by any person:

- (c) designed, installed, and used in such a way that will protect any person near or travelling under a conveyor belt from being struck by a falling object or objects:
 - (d) designed, installed, and used in such a way that will address the hazards arising from the interaction between people and the conveyor belt. This must include provision for the safe crossing of conveyor belts, where they may be crossed:
 - (e) in the case of an underground metalliferous mining operation or tunnelling operation where no methane has been detected, fitted with certified fire resistant conveyor belting and drum lagging:
 - (f) in the case of an underground metalliferous mining operation or tunnelling operation where methane has been detected, or an underground coal mining operation, fitted with certified fire resistant and anti-static conveyor belting and drum lagging.
- (2) The mine operator must ensure that a written maintenance programme is in place and is complied with for the maintenance of the conveyor belt to ensure that it complies with subclause (1).

Emergency

125 Crush injuries

The mine operator must ensure that there are adequate and appropriate means available at the mining operation to deal with any crush injuries that may occur and to rescue a trapped or injured person.

126 Treatment and transport of sick and injured mine workers

- (1) The mine operator must ensure that suitable and sufficient facilities, including first-aid equipment, and mine workers trained in first aid are available at the mining operation to provide first aid to sick or injured mine workers, including in the underground parts of an underground mining operation or tunnelling operation.

- (2) The mine operator must ensure that arrangements are in place, or an appropriate vehicle is available at the mining operation, to transport sick or injured workers from the mining operation to a place where they can receive further medical attention if required.
- (3) In the case of an underground mining operation or tunnelling operation, the arrangements or vehicle required under sub-clause (2) must enable the transportation of sick or injured mine workers from the underground parts of the operation to the surface.

127 Resuscitation equipment

The mine operator must ensure that—

- (a) suitable resuscitation equipment is available for all parts of the mining operation; and
- (b) people trained to use the equipment are available at the mining operation; and
- (c) there is a procedure for any mine worker to raise the alarm when resuscitation equipment is required.

Worker health monitoring

128 Worker health monitoring

- (1) The mine operator must offer medical examinations to each mine worker at the following times:
 - (a) immediately before the mine worker starts work at the mining operation; and
 - (b) immediately before the mine worker ceases working at the mining operation, if the mine worker has not been examined within the 12 months before that date; and
 - (c) periodically throughout the time that the mine worker is working at the mining operation, but no less than once every 5 years.
- (2) If a mine worker wishes to be examined, the mine operator must ensure the mine worker is examined, at the expense of the mine operator, by a medical practitioner or nurse chosen after consultation with the mine worker.
- (3) The purpose of the examinations is to establish the level of health of the mine worker at each of the points in time specified

in subclause (1) as it relates to the work that the worker is performing at the mining operation at that time.

- (4) The mine operator must ensure that—
- (a) the records of the monitoring done in accordance with this regulation are made available to WorkSafe on request (ensuring that no record identifies, or discloses anything about, any individual mine worker except with the mine worker's consent); and
 - (b) the records of the monitoring done in accordance with this regulation in relation to each mine worker are kept,—
 - (i) in the case of any hazard the worker may have been exposed to that is known to have a cumulative or delayed effect, for at least 30 years following the making of the record; and
 - (ii) in the case of all other hazards, for at least 7 years after the record is made or until the mine worker to whom the record relates stops working at the mining operation, whichever is the later.

129 Records of first aid provided to mine workers

The mine operator must ensure that records of first aid provided to mine workers who are seriously harmed at the mining operation are kept for at least 7 years after the accident concerned.

Part 7

**Specific duties in underground mining
operations and tunnelling operations**

130 Application

This Part applies only to underground mining operations and tunnelling operations, unless specifically provided otherwise.

Ground or strata failure

131 Steps to be taken following ground or strata failure

- (1) The mine operator must ensure that,—

- (a) in the case of an underground coal mining operation, the interviewer is made aware of any actual or suspected unplanned fall of rock or coal; or
 - (b) in the case of an underground metalliferous mining operation, the supervisor is made aware of any actual or suspected unplanned fall of rock or coal.
- (2) Without limiting the requirements of section 7(2) of the Act or regulation 228, the mine operator must ensure—
 - (a) that every report by a mine worker about an unplanned fall of rock or coal is assessed to determine whether the fall of rock or coal could have resulted in serious harm to a mine worker had the circumstances been different; and
 - (b) if the fall of rock or coal could have resulted in serious harm to a mine worker had the circumstances been different, that an investigation is carried out.
- (3) If the investigation reveals that the cause of the ground or strata control is attributable, in part or in full, to a ground or strata support design fault, the mine operator must ensure that the design is reviewed by a competent person who—
 - (a) is independent of the mining operation; and
 - (b) was not involved in the development of the original ground or strata design.
- (4) In addition to the requirements of regulation 61, the mine operator must ensure that the records of any ground or strata failure that caused or had the potential to cause serious harm to any person (including records of the investigation into the causes of the failure) are kept at least until the date that is 12 months from the date on which the mining operation is abandoned.

Inundation and inrush

132 Holes to be kept in advance of working places

- (1) If accurate survey information is not available, the mine operator must ensure that drill holes of sufficient length to indicate a dangerous proximity are kept in advance of a working in a mining operation that is within 50 metres of—
 - (a) old workings; or

- (b) a place containing or likely to contain an accumulation of flammable or noxious gases or an accumulation of water or mud.
- (2) Subclause (3) applies when a risk assessment determines that it is likely that workings in an underground mining operation or tunnelling operation will break through into a place containing or likely to contain an accumulation of water or material that flows when wet and that the water or material may create a hazard if it flows into the workings.
- (3) The mine operator must ensure that the following precautions are observed until conditions in the place are ascertained:
- (a) the width of the working is reduced as far as possible; and
 - (b) a borehole at least 10 metres long is kept constantly extended near the centre of the working face; and
 - (c) flank boreholes are maintained on each side at intervals of not less than 4.5 metres.

133 Information to workers

The mine operator must ensure that every mine worker is informed of the faces being advanced at the underground mining operation or tunnelling operation and their proximity to adjacent workings, including old workings.

134 Connection to be investigated

The mine operator must ensure that, before an attempt is made to connect workings in an underground mining operation or tunnelling operation to other workings, including old workings, the other workings are investigated to ascertain whether any hazard is present in those workings.

135 Holing into old workings

- (1) Every mine worker who inadvertently holes into old workings in an underground mining operation or tunnelling operation must ensure that—
- (a) first, if possible, the hole is stopped up immediately; and
 - (b) secondly, the underviewer, in the case of an underground coal mining operation, or the supervisor, in the case of an underground metalliferous mining operation

or tunnelling operation, and then the manager are notified.

- (2) The site senior executive must promptly notify WorkSafe of an incident described in subclause (1).

136 Protection against inundation

The mine operator must ensure that, if the workings in an underground mining operation or tunnelling operation are liable to an inundation or an inrush of water or material that flows when wet, such additional chambers, drives, shafts, or other workings are provided as are necessary to ensure that mine workers in an underground mining operation or tunnelling operation can escape safely.

137 Stopping of work

If the mine operator considers that it is not possible to manage an inundation or inrush hazard in a part or the whole of the mining operation, the mine operator must stop all work in the affected part, or the whole, of the mining operation.

Mine shafts and winding systems

138 Equipment for raising and lowering mine workers, coal, minerals, or material

- (1) The mine operator must ensure, in relation to every egress required by regulations 170 to 172 that is a shaft, that equipment for raising or lowering mine workers, coal, minerals, or material to or from the surface is—
 - (a) suitable for the purpose; and
 - (b) ready for immediate use.
- (2) The mine operator must ensure that the requirements in Schedule 4 are complied with in respect of vertical shafts of a depth greater than 60 metres and slopes.

139 Operation of manually operated winders, slope haulage, and hoist equipment

- (1) The mine operator must ensure that—
 - (a) no person operates a manually operated winder or slope haulage or hoist equipment at the mining operation un-

- less the person holds a certificate of competence as a winding engine driver; and
- (b) there are a sufficient number of mine workers at the mining operation who are qualified as required by paragraph (a) to operate that equipment on each shift.
- (2) The mine operator of a mining operation that uses signals to communicate with the operator of a winding system or slope haulage or hoist equipment must ensure that the health and safety management system for the operation includes a signal code and that the signal code is—
- (a) easily accessible to each mine worker at the mining operation;
 - (b) displayed in clear and direct view of the operator of the winder or slope haulage or hoist equipment;
 - (c) displayed at every place where a person may contact the operator using the signals code;
 - (d) notified to WorkSafe.
- (3) The mine operator must ensure that every mine worker who may need to use the signals code is provided with training in how to use the code.

Ventilation

140 Separation of airways

- (1) If the mining operation has more than 1 main airway, the mine operator must ensure that the airways are separated sufficiently to ensure—
- (a) stability; and
 - (b) ventilation to the standards required by regulation 141(a) and (b).
- (2) The mine operator must ensure that no more than 2 temporary stoppings are installed in a line of stoppings that separate an intake airway from a return airway immediately adjacent to the last line of cut-throughs in the panel.

141 Air quality and temperature

The mine operator must ensure, in relation to the underground mining operation or tunnelling operation, that—

- (a) there is fresh air at the commencement of every section of the workings that has a working face; and
- (b) the humidity of the air is maintained at such a level as to minimise the likelihood of heat stress; and
- (c) measurements to ensure compliance with this regulation are made at suitable intervals, and at suitable locations, using methods and measuring devices capable of giving accurate results; and
- (d) there is no recirculation of air within a working face other than through a scrubber fan.

142 Measurement of air from fans

- (1) The mine operator of an underground coal mining operation must ensure that, at least once in every week, a competent person—
 - (a) measures the quantity of air being delivered to every working place in the underground parts of the mining operation; and
 - (b) determines whether air is being recirculated in the underground parts of the mining operation and takes suitable action to stop any such recirculation.
- (2) The mine operator of an underground metalliferous mining operation or tunnelling operation must ensure that, at least once in every month, a competent person—
 - (a) measures the quantity of air being delivered to every working place in the underground parts of the mining operation; and
 - (b) determines whether air is being recirculated in the underground parts of the mining operation and takes suitable action to stop any such recirculation.

143 Quantity and velocity of air

- (1) The mine operator must ensure that—
 - (a) the volume of air passing through an active working face, other than a longwall working face, is not less than 0.3 cubic metres per second for each square metre of normal development cross-sectional area; and

- (b) the volume of air passing through an active longwall working face is not less than 4 cubic metres per second for each metre of extracted height in the face.
- (2) The mine operator must ensure, in respect of any underground parts of a mining operation where a mine worker is doing work or may travel, that the air in that part is provided at an adequate quantity and velocity to ensure the mine worker will not be exposed to a concentration of dust that is likely to cause harm to the mine worker.

144 Ventilation fans other than auxiliary fans

The mine operator must ensure that,—

- (a) where the main ventilation fan or fans, other than a portable fan that is the main ventilation fan for a tunnelling operation with a single entry tunnel, are on the surface of the mining operation, an effective airlock is provided and maintained on the surface at each shaft or outlet connected to the main ventilation fan or fans that is used for winding or the transport of people, plant, or material; and
- (b) each main ventilation fan has the following devices connected to it:
 - (i) a pressure gauge that continuously indicates the air pressure; and
 - (ii) a device that continuously indicates and records the volume of air passing through the fan; and
 - (iii) a device that continuously indicates and records the number of revolutions per minute of the fan; and
- (c) each main ventilation fan is fitted with a device that continuously monitors and records the condition of the fan, including the temperature, vibration levels, and static pressure, and that will, when the device detects a significant departure from the fan's normal operating parameters,—
 - (i) first, trigger a visible alarm; and
 - (ii) following such period of time as will provide a mine worker with a reasonable opportunity to respond to the alarm, isolate the supply of electri-

- city to the fan if no other action has been taken by a mine worker in response to the departure from normal operating parameters; and
- (iii) record the date and time that an alarm is triggered and the supply of electricity is isolated; and
- (d) each booster fan installed underground is fitted with a device that continuously monitors and records the condition of the fan, including the temperature, vibration levels, and static pressure, and that will, when the device detects a significant departure from the fan's normal operating parameters,—
- (i) first, trigger a visible alarm; and
 - (ii) following such period of time as will provide a mine worker with a reasonable opportunity to respond to the alarm, isolate the supply of electricity to the fan if no other action has been taken by a mine worker in response to the departure from normal operating parameters; and
 - (iii) record the date and time that an alarm is triggered and the supply of electricity to the fan is isolated; and
- (e) each of the monitoring devices referred to in paragraphs (c) and (d) is designed and installed so that the part of the device that displays the results of the monitoring is located where it can be easily accessed by a mine worker required to check the condition of the fan; and
- (f) the devices referred to in paragraphs (b) to (d) are maintained; and
- (g) any scrubber fan used at the mining operation is located and operated in a way that prevents the uncontrolled recirculation of air through the fan.

145 Auxiliary fans

The mine operator must ensure that—

- (a) no auxiliary fan is installed or used unless the quantity of air reaching it is, at all times, sufficient to ensure that air is not recirculated by the fan; and

- (b) every forcing auxiliary fan is installed at least 5 metres from the intake side of the place to be ventilated by the fan; and
- (c) every exhaust auxiliary fan is installed at least 5 metres from the return side of the place to be ventilated by the fan; and
- (d) when forcing and exhaust auxiliary fans are used in an overlap system to simultaneously ventilate the same face,—
 - (i) the secondary fan is installed more than 15 metres from the face; and
 - (ii) the installed capacity of the secondary fan is less than the installed capacity of the primary fan; and
- (e) there is installed and maintained with every auxiliary fan an air duct for conducting a sufficient supply of air to and from the face or place to be ventilated; and
- (f) every auxiliary fan, whether powered by electricity or otherwise, is constructed in such a way as to prevent the possibility of an accumulation of an electrostatic charge; and
- (g) if an auxiliary fan is installed in a place, no mine worker enters or remains in that place while the fan is not operating, unless a competent person has inspected the place and found it to be safe.

146 Additional requirements for auxiliary fans installed in underground coal mining operations

The mine operator of an underground coal mining operation must ensure that—

- (a) any auxiliary fan, other than an auxiliary fan powered by compressed air, that is used at the mining operation will switch off automatically if the main ventilation system fails; and
- (b) any auxiliary fan powered by compressed air that is used at the mining operation will be de-energised promptly if the main ventilation system fails; and
- (c) where 1 auxiliary fan is operating in a panel at the mining operation, the quantity of air flowing to the panel

is not less than 30% of the open circuit capacity of the auxiliary fan; and

- (d) where 2 or more auxiliary fans are operating in a panel at the mining operation, the quantity of air flowing to the panel is not less than the sum of—
 - (i) the open circuit capacity of each auxiliary fan operating in the panel; and
 - (ii) 30% of the open circuit capacity of the largest auxiliary fan operating in the panel.

147 Starting, stopping, etc, of fans

The mine operator must ensure that—

- (a) no mine worker starts, stops, removes, or alters a fan that is ventilating a place underground unless the mine worker is authorised by the mine operator to do so; and
- (b) before a mine worker starts, stops, removes, or alters a fan that is ventilating a place underground, the mine worker ensures that every other mine worker likely to be affected by the action is notified about it.

148 Ventilation of work areas to be adequate before entry

The mine operator must ensure that—

- (a) all areas underground at the mining operation that mine workers are permitted to enter are adequately ventilated before any mine worker may go underground; and
- (b) if at any time the requirements of the ventilation control plan are not being met in relation to a part or the whole of the mining operation that is underground, no mine worker enters the affected part or, as the case may be, the whole of the mining operation; and
- (c) despite paragraphs (a) and (b), if any area underground that mine workers are permitted to enter is not adequately ventilated, a mine worker may, if authorised by the mine operator, go underground—
 - (i) to restore ventilation to adequate levels; or
 - (ii) in the case of an emergency.

149 Withdrawal of mine workers if ventilation inadequate

The mine operator must ensure that, if ventilation is found to be inadequate or a ventilation control device fails in a part or the whole of the mining operation that is underground,—

- (a) every mine worker withdraws from the affected part or the whole of the mining operation; and
- (b) the mine worker with responsibility for the affected part or parts—
 - (i) immediately takes such measures as are available to the mine worker to restore adequate ventilation; and
 - (ii) notifies the ventilation officer.

150 Quantity of air to be measured

The mine operator must ensure that a competent person measures, at least once in every month, the quantity of air—

- (a) in the main current; and
- (b) in every split; and
- (c) at the commencement of the main return airway; and
- (d) in each ventilating district; and
- (e) at any additional place identified by the mine operator as a hazard.

151 Plan of ventilation system to be updated every month

- (1) The mine operator must ensure that a plan of the ventilation system is prepared and updated at least once a month.
- (2) The plan must show—
 - (a) the direction, course, and volume of airflow; and
 - (b) the location and description of every device used to regulate or distribute air; and
 - (c) the measurements taken as required by regulation 150.

152 Application of regulation 153

Regulation 153 applies to—

- (a) any underground coal mining operation; and
- (b) any underground metalliferous mining operation or tunnelling operation where methane has been detected.

153 Ventilation

The mine operator of a mining operation to which this regulation applies must ensure that—

- (a) the percentage of methane in the general body of air in the underground parts of the mining operation where a mine worker is or may be present is not more than 2% by volume; and
- (b) a quantity of fresh air adequate to ensure that paragraph (a) is complied with is circulated throughout the underground parts of the mining operation—
 - (i) before a mine worker enters the underground parts of the mining operation; and
 - (ii) whenever a mine worker is in the mine; and
- (c) there is fresh air at the following places:
 - (i) the commencement of an ERZ1:
 - (ii) every location that is 100 metres outbye of the most inbye completed line of cross-cuts in a panel or of a longwall or shortwall face; and
- (d) no air current passes through any stopping, or any unsealed, abandoned, or worked out area, before ventilating or passing through an active working place; and
- (e) the total number of mine workers ordinarily present in a ventilation district or ventilation circuit in the mine is kept to a minimum; and
- (f) a competent person measures, at least once in every week, the percentage of methane in the main return and split returns.

154 Exposure to diesel emissions

The mine operator must ensure that—

- (a) the design and maintenance of the ventilation system and transport system are such that no mine worker is exposed to diesel emissions that could cause harm to the mine worker; and
- (b) if 1 or more diesel engines are being operated in a ventilating current, the volume of air is not less than the greater of—

- (i) 0.05 cubic metres per second for each kilowatt of the maximum combined output capability of the engines; and
- (ii) 3.5 cubic metres per second.

155 Assessment of hazards associated with fuel additives

The mine operator must ensure that any hazard to mine workers associated with fuel additives used in diesel engines underground at the mining operation is assessed, including by—

- (a) comparison testing of underground diesel engines at appropriate load points; and
- (b) regular testing of undiluted exhaust emissions, including from the surrounding atmosphere.

*Fire and explosion***156 Use of petrol engines prohibited**

The mine operator must ensure that no plant with a petrol-driven engine is used underground in the operation.

157 Fire protection and early warning systems

- (1) The mine operator must ensure that suitable and sufficient devices are installed in the underground parts of the mining operation to monitor for early signs of fire.
- (2) If a device installed as required by subclause (1) detects signs of fire in the underground parts of the mining operation, the device must—
 - (a) activate an audible alarm that will warn mine workers in the affected part or parts of the mining operation to escape to a place of safety; and
 - (b) activate an alarm at the surface of the mining operation.
- (3) The mine operator must ensure that suitable and sufficient fire extinguishers are provided beside all high-voltage electrical plant and, if a significant risk of fire exists, beside all other electrical plant.

158 Testing for methane

- (1) The mine operator must ensure that testing for the presence of methane in the underground parts of the mining operation is carried out—
 - (a) as often as practicable; and
 - (b) with a suitable device.
- (2) The mine operator must ensure that, in respect of the devices used to test for the presence of methane, suitable procedures are in place dealing with—
 - (a) their safe use for that purpose; and
 - (b) their examination and maintenance; and
 - (c) their regular calibration.
- (3) The mine operator must ensure that no locked flame safety lamps are taken into or used in the underground parts of the mining operation.

159 Application of regulations 160 to 162

Regulations 160 to 162 apply to—

- (a) any underground coal mining operation; and
- (b) any underground metalliferous mining operation or tunnelling operation where methane has been detected.

160 Sparks or naked flames

A mine operator of a mining operation to which this regulation applies must ensure that no device or material, including smoking materials, likely to cause a spark or naked flame is taken into or used in the underground parts of the mining operation.

161 Restrictions on hot work

- (1) The mine operator of an underground coal mining operation must ensure that no hot work is done in an ERZ0 at any time.
- (2) The mine operator of an underground coal mining operation must ensure that no hot work is done in an NERZ or ERZ1 except under an approval system established as part of a mechanical engineering control plan.
- (3) The mine operator of any other mining operation to which this regulation applies must ensure that no hot work is done in the

mining operation except under an approval system established as part of a mechanical engineering control plan.

162 Monitoring for methane

The mine operator of a mining operation to which this regulation applies must ensure that monitoring is carried out continuously at every working face where methane has been detected and a mine worker is present.

163 Mine worker must inform person in charge of hazard from methane or noxious gas

- (1) If a mine worker knows or suspects that a location in the underground parts of the mining operation constitutes a hazard by reason of the presence of methane or noxious gas, the mine worker must immediately inform,—
 - (a) in the case of an underground coal mining operation, the interviewer; or
 - (b) in the case of an underground metalliferous mining operation or tunnelling operation, the supervisor; or
 - (c) the mine worker responsible for the part of the mining operation that includes the location that constitutes or is suspected to constitute a hazard.
- (2) A mine worker of the kind described in subclauses (1)(a) to (c) who is informed that a location in the underground parts of the mining operation may or does constitute a hazard by reason of the presence of methane or noxious gases must inspect the location as soon as practicable and as far as is safely possible.

164 Withdrawal of mine workers when high level of methane present

- (1) This regulation applies when the level of methane in the general body of air in a part or the whole of the underground parts of an underground mining operation or tunnelling operation is detected to be 2% by volume or more.
- (2) The mine operator must ensure that—
 - (a) every mine worker in the affected part or parts of the mining operation withdraws from the affected part or parts including, as the case requires, the whole of the underground parts of the mining operation; and

- (b) the only person who enters the affected part or parts of the mining operation or, as the case requires, any part of the underground parts of the mining operation, is—
 - (i) a competent person, to test for the presence of methane; or
 - (ii) a mine worker, to inquire into the cause of the presence of the methane or to remove the methane; and
- (c) no other mine worker enters the affected part or parts of the mining operation, or, as the case requires, any part of the underground parts of the mining operation, until a competent person reports to the manager that it is safe to do so.

165 Combustible material

- (1) The mine operator must ensure that any hazards associated with the storage of combustible materials are managed.
- (2) Without limiting subclause (1), the mine operator must ensure that flammable materials with a flashpoint of 23°C or lower are not stored underground in the mining operation, unless they are kept in a fireproof room, compartment, or box.

Emergency

166 Competent person at surface when mine workers underground

The mine operator must ensure that at all times when mine workers are underground there is a person above ground at the mining operation who—

- (a) is trained to answer alarms; and
- (b) is capable of isolating the supply of electricity to the underground parts of the mining operation; and
- (c) has authority to take action in the event of an emergency.

167 Emergency contact details

The mine operator must prepare and regularly update a list of emergency contact details for each mine worker.

168 Self-rescuers

- (1) The mine operator must ensure that any mine worker who goes underground is issued with a self-contained self-rescuer and carries it with him or her at all times while the mine worker is underground at the mining operation.
- (2) The mine operator must ensure that—
 - (a) all self-rescuers used at the mining operation are provided and maintained in good order and condition; and
 - (b) any mine worker who goes underground is trained in the use of the self-rescuer provided.

169 Training in use of self-rescuers

The mine operator must ensure that—

- (a) any mine worker who goes underground is trained at least once every 3 months on how to don and change over the self-rescuer provided; and
- (b) the training in paragraph (a) is carried out in an environment that simulates emergency conditions in the underground parts of the mining operation; and
- (c) records are kept of the training provided to mine workers under this regulation.

170 Escapeways in underground coal mining operation

- (1) The mine operator of an underground coal mining operation must ensure that the mining operation has at least 2 egresses trafficable on foot (**escapeways**) to the surface that are separated in a way that prevents any reasonably foreseeable event happening in 1 of the escapeways that may stop a person from being able to escape through the other escapeway.
- (2) The mine operator must ensure each ERZ1 at the underground coal mining operation in which a mine worker works has 2 escapeways leading to the surface or a refuge.
- (3) Subclause (2) does not apply to an ERZ1—
 - (a) in which an inspection is being carried out under the mining operation's health and safety management system and no other mine worker is working in the ERZ1; or
 - (b) where the ERZ1 is located in a single-entry drive or shaft that is being sunk.

- (4) The mine operator must ensure that at least 1 of the escapeways at the underground coal mining operation is designated as the primary escapeway and is—
- (a) an intake airway or a combination of adjacent intake airways; and
 - (b) separated, as far as is reasonably practicable, from all other roadways by a separation stopping that is anti-static, fire-resistant, and of substantial construction that will ensure there is minimal leakage through the stopping; and
 - (c) as far as practicable, free from hazards associated with fire; and
 - (d) trafficable by a vehicle; and
 - (e) fitted with fire fighting equipment located on, or near, any equipment installed in the escapeway.

171 Escapeways in underground metalliferous mining operations and tunnelling operations

- (1) The mine operator of an underground metalliferous mining operation or tunnelling operation must ensure that there are adequate means of escape from the underground parts of the mining operation.
- (2) When determining the means of escape from the underground parts of the mining operation, the mine operator must consider—
- (a) the need for mine workers to escape from the underground parts of the mining operation during an emergency; and
 - (b) the inclusion and placement of refuges.
- (3) The mine operator must ensure that a record is kept of the process undertaken to determine the means of escape from the underground parts of the mining operation, including the reasons for the final determination.

172 Additional requirements for escapeways in underground metalliferous mining operations

The mine operator of an underground metalliferous mining operation must ensure that, before stopping operations start at the

mining operation, the operation has at least 2 egresses trafficable on foot (**escapeways**) that—

- (a) are accessible from all stoping operations and lead to the surface; and
- (b) are located strategically in response to the hazards that may arise at the mining operation and that will require evacuation; and
- (c) allow for the passage of rescuers and rescue equipment, including stretchers; and
- (d) are separated in such a way that a reasonably foreseeable event happening in one of the escapeways would not prevent persons escaping through the other escapeway; and
- (e) are maintained in a safe, accessible, and useable condition.

173 Changeover stations and refuges

- (1) If a mine worker may not be able to escape from the underground parts of the mining operation during an emergency, or the use only of the self-contained self-rescuer provided to a mine worker as required by regulation 168 may not be sufficient to ensure the mine worker is able to escape from the underground parts of the mining operation during an emergency, the mine operator must ensure that the mining operation has 1 or more of the following:
 - (a) changeover stations:
 - (b) refuges:
 - (c) secure areas where mine workers can be protected from harm during the emergency.
- (2) Subject to subclause (3), when determining the type, number, and nature of the facilities required by subclause (1), the mine operator must have regard to the nature, complexity, and size of the mining operation and the activities carried out underground.
- (3) A changeover station that is intended to be used for mine workers to replace their self-contained self-rescuers must—
 - (a) have a secure supply of air that is independent of the rest of the underground parts of the mining operation; and

- (b) not allow the entry of contaminated air into the changeover station.

174 Navigational aids

- (1) The mine operator must ensure that navigational aids are provided marking all pathways to—
 - (a) the surface; and
 - (b) changeover stations, if any; and
 - (c) refuges, if any.
- (2) Any mine worker who may be required to use the pathways described in subclause (1) must be made familiar with them.

175 Communications systems

- (1) The mine operator must ensure that a communication system is provided that allows for oral communication between people on the surface and in the underground parts of the mining operation during an emergency.
- (2) In the case of an underground coal mining operation, the mine operator must ensure that—
 - (a) the communication system incorporates an adequate backup power supply; and
 - (b) the components for the system that are installed underground are recognised as being safe to operate in an explosive atmosphere, unless the components are installed in a drift or shaft being driven from the surface in material other than coal.

176 Continued monitoring of atmospheric conditions underground during emergency

- (1) The mine operator of an underground coal mining operation must ensure that a system is provided that monitors the atmospheric conditions in the underground parts of the mining operation during an emergency and provides information about those conditions to people on the surface.
- (2) The mine operator must ensure that—
 - (a) the system incorporates an adequate backup power supply; and

- (b) the components for the system that are installed underground are recognised as being safe to operate in an explosive atmosphere, unless the components are installed in a drift or shaft being driven from the surface in material other than coal.

Part 8

Specific duties in underground coal mining operations only

177 Application

This Part applies only to underground coal mining operations, unless specifically provided otherwise.

Ventilation

178 Failure of ventilation system

In the event of a failure of the ventilation system to a part or the whole of an underground coal mining operation, the mine operator must ensure that—

- (a) the supply of electricity to the underground parts of the mining operation, but not the supply to safety-critical equipment, is isolated as soon as is reasonably practicable; and
- (b) every battery-operated mobile plant located in the affected parts of the mining operation is brought out without any delay to—
 - (i) a main intake airway or main intake airways; or
 - (ii) a charging or repair station of suitable fireproof construction that is normally ventilated with intake air; and
- (c) the supply of electricity is not restored until after the ventilation system has been safely restored and a competent person considers it is safe to restore the supply of electricity.

179 Air across and to working face

The mine operator must ensure that an adequate quantity and velocity of air is delivered across the working face of any production or development place, and within the roadways lead-

ing to any working face, to dilute and render harmless any accumulations or layering of methane.

180 Sealed goafs

If an underground coal mining operation has a sealed goaf, the mine operator must ensure that appropriate steps are taken to control any hazards that may be presented or caused by the emission of methane and noxious gases from the sealed goaf, including by—

- (a) preventing intake air from travelling across the face of a permanent seal at the mining operation; or
- (b) minimising the risks of inrush and leakage of atmospheric contaminants from sealed goaf areas and abandoned or sealed workings into intake airways, which must include—
 - (i) use of no less than a type C seal; and
 - (ii) minimising leakage through seals; and
 - (iii) preventing damage to seals; and
 - (iv) installing a monitoring device in each intake airway on the return side of the seals over which the intake air passes to detect the intake airway's general body concentration of—
 - (A) oxygen; and
 - (B) carbon dioxide, if it is present behind the seal in a general body concentration greater than 3%; and
 - (C) any other gas that is present behind the seal in a quantity and concentration that is likely to create a hazard if it enters the intake airway adjacent to the seal; and
- (v) for longwall workings, installing a monitoring device at the intersection of the longwall face and the intake airway to detect the intake airway's general body concentration of—
 - (A) oxygen; and
 - (B) carbon dioxide, if it is present behind the seal in a general body concentration greater than 3%; and

- (C) any other gas that is present behind the seal in a quantity and concentration that is likely to create a hazard if it enters the intake airway adjacent to the seal; and
- (vi) ensuring that every monitoring device installed as required by subparagraphs (iv) and (v) triggers an alarm to warn every mine worker who may be affected when a gas required to be detected by the device is present at the predetermined concentration.

181 Position and electricity supply of main ventilation fan

- (1) The mine operator must ensure that no main ventilation fan is located in the underground parts of the mining operation.
- (2) The mine operator must ensure that the supply of electricity to the main ventilation fan does not enter into or travel through the underground parts of the mining operation.

182 Ventilation control devices

The mine operator must ensure that all ventilation control devices, including seals, are designed, constructed, and maintained to meet the design criteria specified in Schedule 5.

183 Standards for sealing

The mine operator must ensure that a seal installed at the mining operation is of the following types or higher:

- (a) if the level of naturally occurring methane at the mine is insufficient to reach the lower explosive limit for the gas under any circumstances, type B:
- (b) if a mine worker or mine workers may remain underground when an explosive atmosphere exists and there is a possibility of spontaneous combustion, spark, or another ignition source, type D:
- (c) in any other situation relating to an underground part of the mining operation, type C:
- (d) for sealing the entrance to the underground parts of the mining operation, type E.

Sealing underground coal mining operation

184 Facilities required for sealing

The mine operator must ensure that—

- (a) every entrance from the surface to the underground parts of the mining operation is capable of being readily sealed, with an engineered structure capable of withstanding an air blast of 70 kPa from within the underground parts of the mining operation when it is open, at the following locations:
 - (i) at the surface, without requiring any person to travel in front of the entrance in order to seal it; or
 - (ii) where the entrance is a vertical shaft,—
 - (A) at the surface, without requiring any person to travel across the entrance in order to seal it; or
 - (B) in a roadway at the bottom of the shaft; and
- (b) at least 1 entrance from the surface to the underground parts of the mining operation has the facilities available to fit an airlock; and
- (c) the seals on the surface of the mining operation are constructed and have appropriate facilities available to support inertisation; and
- (d) when sealed, the mining operation has facilities allowing the following:
 - (i) the use of inertisation equipment from a safe position; and
 - (ii) monitoring of the atmosphere behind the seal from a safe position; and
 - (iii) re-entry by people to the underground parts of the mining operation.

185 Notice of intention to seal underground coal mining operation

- (1) The mine operator must give notice to WorkSafe of any intention to seal the whole of the underground parts of the mining operation.
- (2) Except in case of emergency sealing, the notice must be given, 1 month in advance of the activity taking place.

- (3) The notice must include—
 - (a) the proposed locations of the seals to be installed; and
 - (b) the proposed sealing procedure; and
 - (c) a summary of hazards identified and how they will be managed; and
 - (d) any evidence of the presence of an ignition source in a part or the whole of the underground parts of the mining operation; and
 - (e) predictions of the rates at which methane and other gases will accumulate in the underground parts of the mining operation; and
 - (f) the gas monitoring procedures to be carried out during and after the sealing.
- (4) If sealing becomes impracticable in the way in which the procedure was described in the notice provided to WorkSafe, the mine operator must—
 - (a) promptly notify WorkSafe of the changes from the initial proposed method of sealing the underground coal mining operation; and
 - (b) if the notification under paragraph (a) is not in writing, confirm the notification in writing to WorkSafe as soon as reasonably practicable.

186 Sealing not to be done unless notified

- (1) Except as provided in regulation 187, the mine operator must ensure that the whole of the underground parts of a mining operation is not sealed unless WorkSafe has been notified of the intention to seal the mining operation as required by regulation 185.
- (2) The mine operator must ensure that the whole of the underground parts of the mining operation is sealed in the way that has been notified to WorkSafe.

187 Emergency sealing

- (1) This regulation applies if there is evidence that there is an immediate likelihood of an explosive atmosphere developing in a part or the whole of the underground parts of the mining operation.
- (2) The mine operator must ensure that—

- (a) a risk appraisal and risk assessment is conducted in relation to the emergency sealing of a part or the whole of the underground parts of the mining operation; and
 - (b) the emergency sealing is carried out in a manner that manages any potential hazards.
- (3) The site senior executive must notify WorkSafe of the intention to seal the part or the whole of the underground parts of the mining operation and must confirm in writing as soon as practicable that the sealing has been carried out.

188 Testing of inertisation equipment

The mine operator must ensure that—

- (a) the following facilities at the mining operation are tested at appropriate intervals to ensure that the facilities are capable of being used in an emergency:
 - (i) every seal required to be used with the inertisation equipment;
 - (ii) every connection point for using the inertisation equipment; and
- (b) the necessary facilities, including water and cleared areas, are available for use with inertisation equipment; and
- (c) modelling is carried out at least once a year to ensure that the inertisation points are located in places that will support effective inertisation in an emergency.

Fire and explosion

189 Compressed air

The mine operator must provide for sufficient electrical bonding and earthing of compressed air equipment, hoses, and pipes that are likely while in operation to develop static electrical charges that are capable of causing an electric shock to a person or a spark.

190 Establishment of explosion risk zones

- (1) The mine operator must ensure that—

- (a) a risk appraisal and risk assessment are conducted to identify the location and type of each explosion risk zone required at the mining operation; and
 - (b) explosion risk zones are established for the mining operation.
- (2) The mine operator may temporarily classify any NERZ at the mining operation as an ERZ0 or an ERZ1.

191 Signposting of explosion risk zones

- (1) The mine operator must ensure that—
- (a) the boundaries of each explosion risk zone at the mining operation are clearly indicated by signage at each boundary; and
 - (b) a plan showing the explosion risk zone boundaries is displayed at the surface of the mining operation where mine workers will see it; and
 - (c) the plan is updated at the end of each shift to reflect any changes to the location of a boundary or boundaries.
- (2) In the event that a temporary change in conditions results in a temporary change in the location of the boundary of an explosion risk zone, the signage required by subclause (1) is not required to be changed if the mine operator ensures that appropriate precautions are taken to control mine workers and mobile plant entering an explosion risk zone affected by the temporary change.

192 Signposting of boundaries between explosion risk zones

If a mine worker or mobile plant can physically move through a boundary between an NERZ and an ERZ1 or between an ERZ1 and an ERZ0, the mine operator must ensure that the actual location of the boundary is signposted in each intake airway and vehicle access leading to,—

- (a) in respect of a boundary between an NERZ and an ERZ1, the ERZ1; or
- (b) in respect of a boundary between an ERZ1 and an ERZ0, the ERZ0.

193 Machinery restrictions in explosion risk zones

The mine operator must ensure that—

- (a) no plant, including mobile plant, or installations powered by electricity that are not explosion-protected are used or located in an ERZ0 or an ERZ1; and
- (b) all mobile plant powered by electricity or a diesel engine used in an NERZ that is not explosion-protected must be fitted with a device that ensures the mobile plant is automatically shut down if it passes beyond an NERZ; and
- (c) no diesel engine is used to power plant, including mobile plant, or installations used or located in an ERZ0; and
- (d) no diesel engine that is not explosion-protected is used to power plant, including mobile plant, or installations used or located in an ERZ1.

194 Use of diesel engines in underground coal mining operations

The mine operator must ensure that diesel engines are used to power plant, including mobile plant, or installations in an underground coal mining operation only in accordance with the following requirements:

- (a) in respect of plant, including mobile plant, and installations located or used in an NERZ, a diesel engine that is not explosion-protected may be used to power the plant or installation only where—
 - (i) a risk assessment has been carried out regarding the use of the engine and any risk controls identified by the risk assessment have been implemented; and
 - (ii) in respect of mobile plant, an automatic system is in place to ensure that the plant cannot enter an ERZ1 or an ERZ0 and that system is either fail-safe or includes multiple redundancy devices; and
 - (iii) the diesel engine is clearly marked as a non-explosion-protected engine:
- (b) in respect of plant, including mobile plant, and installations located or used in an ERZ1, an explosion-pro-

tected diesel engine may be used to power the plant or installation only if—

- (i) the diesel engine—
 - (A) has been tested by an accredited testing station in accordance with AS/NZS 3584.2:2008 Diesel engine systems for underground coal mines—Explosion protected; and
 - (B) is clearly marked with information identifying when the test report was done and by whom; and
- (ii) the diesel engine has been assessed by the engine's manufacturer as being safe to use in an ERZ1 and is clearly marked with information identifying that the engine has been assessed as safe to use in an ERZ1, when that assessment was done, and by whom.

195 Restrictions on live electrical work in ERZ0 or ERZ1

The mine operator must ensure that no live electrical work is done in an ERZ0 or ERZ1 except under an approval system established as part of the electrical engineering control plan.

Methane monitors

196 Monitoring for methane at working face

The mine operator must ensure that monitoring for the presence of methane—

- (a) is continuous at every working face of the mining operation at which a mine worker is present and is carried out—
 - (i) as near to the face as possible; and
 - (ii) at an elevation determined by the principal hazard management plan for fire or explosion; and
- (b) is also carried out when required by regulation 162.

197 Methane monitors in intake airways

The mine operator must ensure that—

- (a) there is at least 1 methane monitor in each intake airway at the boundary between an NERZ and an ERZ1; and
- (b) every methane monitor located at the boundary between an NERZ and an ERZ1 is visible at the boundary and will,—
 - (i) if the concentration of methane detected in the general body of air at the boundary reaches 0.25% or more, automatically activate a visible alarm; and
 - (ii) if the concentration of methane detected in the general body of air at the boundary reaches 0.5% or more, automatically isolate the supply of electricity to all plant, other than safety critical equipment, in—
 - (A) the ERZ1 and the NERZ; or
 - (B) if the NERZ has been subdivided, the ERZ1 and the subdivided part of the NERZ adjacent to the ERZ1.

198 Methane monitors in return airways

The mine operator must ensure that—

- (a) there is at least 1 methane monitor in each main return airway and in each return airway in a ventilation split; and
- (b) every methane monitor located in a return airway automatically activates a visible alarm at the surface of the mining operation when the concentration of methane detected in the general body of air in the return airway reaches or exceeds the percentage stated in the ventilation control plan as the percentage at which the methane detector activates its alarm; and
- (c) a record is kept of every occasion that the methane monitor activates a visible alarm as required by paragraph (b).

199 Methane monitors on mobile plant powered by battery or diesel engine

- (1) The mine operator must ensure that all mobile plant used in an ERZ1 that is powered by a battery or diesel engine is fitted with a methane monitor that will,—
 - (a) if the concentration of methane detected in the general body of air around the mobile plant reaches 1% or more, automatically activate a visible alarm to warn the operator of the mobile plant; and
 - (b) if the concentration of methane detected in the general body of air around the mobile plant reaches 1.25% or more,—
 - (i) automatically shut down the mobile plant; and
 - (ii) in the case of mobile plant powered by a diesel engine, automatically prevent the diesel engine from restarting.
- (2) The mine operator must ensure that, in the case of non-explosion-protected mobile plant that is powered by a battery or diesel engine and that is fitted with an automatic methane monitor, the mine worker operating the mobile plant immediately parks and shuts down the plant if the methane monitor fails while the mobile plant is in use.

200 Methane monitors on certain mobile plant powered by electricity through trailing or reeling cable

- (1) The mine operator must ensure that every coal cutter, continuous miner, tunnel-boring machine, road-heading machine, and longwall shearer used at the mining operation is fitted with a methane monitor that will,—
 - (a) if the concentration of methane detected in the general body of air around the mobile plant reaches 1% or more, automatically—
 - (i) activate a visible alarm to warn the operator of the mobile plant; and
 - (ii) isolate the electricity supply to the cutters:
 - (b) if the concentration of methane detected in the general body of air around the mobile plant reaches 1.25% or more, automatically isolate the supply of electricity to

the trailing cable or reeling cable supplying the mobile plant.

- (2) The mine operator must ensure that every mobile bolting machine, loader, load-haul-dump vehicle, and shuttle car used at the mining operation is fitted with a methane monitor that will,—
 - (a) if the concentration of methane detected in the general body of air around the mobile plant reaches 1% or more, automatically activate a visible alarm to warn the operator of the mobile plant; and
 - (b) if the concentration of methane detected in the general body of air around the mobile plant reaches 1.25% or more, automatically isolate the supply of electricity to the trailing cable or reeling cable supplying the mobile plant.

201 Monitoring of other mobile plant powered by electricity through trailing or reeling cable

- (1) This regulation applies to any mobile plant of a kind other than that specified in regulation 200.
- (2) The mine operator must ensure—
 - (a) that the mobile plant is fitted with a methane monitor that will perform the functions described in regulation 200(2); or
 - (b) that the mobile plant is recognised as being suitable for use in an ERZO by or under the Electricity (Safety) Regulations 2010; or
 - (c) in any other case, that any mine worker who detects a concentration of methane in the general body of air that reaches 1.25% or more immediately isolates the supply of electricity to the trailing cable or reeling cable supplying the mobile plant.

202 Auxiliary and booster fans

- (1) The mine operator must ensure that each auxiliary and booster fan is fitted with a methane monitor and that,—
 - (a) if the concentration of methane detected in the general body of air around an auxiliary fan reaches 1.25%

- or more, the supply of electricity to the auxiliary fan is automatically isolated; and
- (b) if the concentration of methane detected in the general body of air around a booster fan reaches 1.25% or more, the methane monitor automatically activates an audible and visible alarm.
- (2) The audibility and visibility of the alarm required by subclause (1)(b) must be sufficient to ensure that necessary action will be taken in response to the alarm.
 - (3) Nothing in this regulation applies to an auxiliary fan or a booster fan located in a drift or shaft being driven from the surface of a mining operation in material other than coal.

203 Recording and notification of isolation of electricity supply

- (1) If the supply of electricity is automatically isolated or mobile plant is shut down as required by any of regulations 197 and 199 to 202 (except to cutters as required by regulation 200(1)(a)(ii)), the mine operator must ensure that a record is kept of the date, time, and location of the event.
- (2) If the supply of electricity is automatically isolated as required by regulation 197(b)(ii), the mine operator must ensure that WorkSafe is notified as soon as practicable.

204 Failure of methane monitoring system

- (1) This regulation applies if the methane monitoring system fails or becomes non-operational, affecting a part or the whole of the underground parts of the mining operation, and the mining operation does not have—
 - (a) a procedure for the use of portable monitors to detect methane; or
 - (b) a sufficient number of portable monitors to continually monitor the affected part or the whole of the underground parts of the mining operation to the extent necessary to ensure that the levels of methane in the affected part or the whole of the underground parts of the mining operation remain below 2%.

- (2) The mine operator must ensure that every mine worker underground is withdrawn to a place of safety.
- (3) The mine operator must ensure that no mine worker enters or remains in an unsafe part of the underground parts of the mining operation, except to repair or replace the affected parts of the methane monitoring system.
- (4) For the purposes of subclause (3), a part or the whole of the underground parts of the mining operation is unsafe if the concentration of methane in the general body of air in that part or the whole of the underground parts of the mining operation cannot be monitored as required by these regulations.

Dust sampling

205 Sampling of roadway dust

- (1) The mine operator must ensure that—
 - (a) dust sampling and analysis is carried out in accordance with this regulation at no less than the following intervals:
 - (i) for a strip or spot sample of dust in an ERZ0, once a week; and
 - (ii) for a strip sample of dust in an ERZ1, once a month; and
 - (iii) for a strip sample of dust in an NERZ, once every 3 months; and
 - (b) the samples of dust are taken by a competent person from the complete perimeter of the roadway and the structures in it, over a length of roadway of at least 45 metres, and by using strip samples; and
 - (c) if the dust on the floor of a roadway appears to contain a different content of incombustible material from the dust on the roof and sides of the roadway, the dust on the floor is sampled and tested separately from the dust on the roof and sides of the roadway; and
 - (d) each sample of the layer of dust is taken from the layer to a depth not greater than 5 millimetres; and
 - (e) if a location is resampled, the individual strips from which dust is taken for a strip sample are not the same as those from which a previous sample has been taken.

- (2) The mine operator must ensure that the analysis of dust samples is carried out in an independent testing facility.
- (3) In subclause (1), **strip sample** means the collection of dust from a series of transverse strips of equal width and that are equally spaced not more than 5 metres apart over an area that is at least 1% of the total area sampled.

206 Recording of dust sampling and analysis

The mine operator must ensure that—

- (a) the mine worker in charge of the part of the mining operation where a sample of dust was taken is given notice of the results of the analysis of that sample; and
- (b) a record is kept of the following information for each roadway dust sample taken at the mining operation:
 - (i) the date the sample was taken; and
 - (ii) the location from which the sample was taken; and
 - (iii) the volume and type of incombustible material in the sample; and
 - (iv) the method used to analyse the sample; and
- (c) the results of the analysis of the dust sample, in particular the volume and type of incombustible material content, are marked on a plan of the mining operation.

207 Minimum content of incombustible material in roadway dust

The mine operator must ensure that the content of incombustible material in roadway dust at the mining operation is kept at or above 80% of the volume of the roadway dust.

208 Mine operator must have standard operating procedure for application of incombustible material to roadway

- (1) The mine operator must ensure that a standard operating procedure for the application of incombustible material to roadways is in place to keep the proportion of incombustible material at or above 80% of the volume of roadway dust in every part of the underground parts of the mining operation.

- (2) The standing operating procedure required by subclause (1) must be included in the health and safety management system for the mining operation.

209 Requirements for stone-dusting new roads

The mine operator must ensure that—

- (a) as soon as a 30-metre length of roadway is driven, that entire length is stone-dusted; and
(b) each new part of the roadway is stone-dusted within 24 hours of the part being driven.

Explosion barriers

210 Explosion barriers

- (1) The mine operator must ensure that—
- (a) an explosion barrier is installed and maintained in the part of any roadway in a panel, other than a single-entry roadway, containing a conveyor belt; and
(b) an explosion barrier is installed and maintained in the part of any return roadway in a panel, other than a single-entry roadway; and
(c) adequate explosion-suppression measures are installed and maintained in single-entry roadways.
- (2) For the purpose of subclause (1), an explosion barrier is taken to be installed in a part of a roadway if the most inbye part of the barrier is in the part of the roadway.
- (3) The mine operator must ensure that a risk appraisal and risk assessment are carried out to determine—
- (a) the type of the explosion barriers to be installed as required by subclause (1) that will effectively limit the development of, and contain, an ignition of coal dust or methane; and
(b) whether any additional explosion barriers need to be installed, and the type and location of those explosion barriers.
- (4) The mine operator must ensure that any explosion barriers installed at the mining operation are designed, constructed, and maintained to prevent, as far as is reasonably practicable, a coal dust explosion in one part of the underground parts of the

mining operation from propagating to other parts of the mining operation.

Part 9

Notification and reporting

211 WorkSafe to be notified of commencement, recommencement, installation, or cessation

- (1) The mine operator must ensure that—
 - (a) WorkSafe is notified of the matters specified in sub-clauses (2) to (5) at the times specified in those sub-clauses; and
 - (b) every notification includes details as to—
 - (i) the name and contact details of the mine operator, including postal and business addresses; and
 - (ii) the location of the mining operation; and
 - (iii) the nature of the mining operation; and
 - (iv) the proposed date of commencement, recommencement, installation, or cessation (including suspension or abandonment); and
 - (v) the name and contact details of the site senior executive; and
 - (vi) the name and contact details of a person who can be contacted about the notification to be given under this regulation if the site senior executive is not available.
- (2) The first matter is the proposed date of commencement of the mining operation. In the case of a mining operation that operates intermittently, the notification must be given not less than 24 hours before the proposed date of commencement. In any other case, the notification must be given not less than 2 months before the proposed date of commencement.
- (3) The second matter is the proposed date of recommencement of a mining operation that has not operated within the 2 months immediately before that date. The notification must be given not less than 14 days before the proposed date of recommencement.
- (4) The third matter is the proposed date of installation of—
 - (a) a shaft; or

(b) a winding system.

The notification must be given not less than 14 days before the proposed date of installation.

- (5) The fourth matter is the proposed date of suspension or abandonment of a mining operation. In the case of a mining operation that has been conducted for fewer than 12 months, the notification must be given not less than 24 hours before the proposed date of suspension or abandonment. In any other case, the notification must be given not less than 14 days before the proposed date of suspension or abandonment.
- (6) If a tunnelling operation or shaft becomes an underground mining operation, subclauses (1) to (5) apply in respect of the underground mining operation.

212 Giving draft principal hazard management plans and principal control plans to WorkSafe

- (1) A mine operator must give the following to WorkSafe not less than 2 months before the mining operation commences:
- (a) all draft principal hazard management plans for the mining operation; and
 - (b) all draft principal control plans for the mining operation.
- (2) Nothing in subclause (1) applies where a mining operation recommences after being suspended.

213 Plans of mining operation

- (1) The mine operator must ensure that a plan is made of the mining operation as at the date of commencement of the mining operation.
- (2) The mine operator must ensure that the plan of the mining operation is reviewed and, if necessary, updated—
- (a) at least once every 3 months in relation to the parts of the plan that identify points of access, egresses, and refuges;
 - (b) when there has been a significant modification to the mining operation;
 - (c) if the mining operation has been suspended, before the mining operation recommences;
 - (d) otherwise, at least once every 6 months.

- (3) The plan, including any updated plan, must—
 - (a) be prepared by a mine surveyor using the New Zealand Geodetic Datum 2000 and to a suitable scale; and
 - (b) be kept at the site office; and
 - (c) be available for inspection at all times at which a mine worker is present at the mining operation.
- (4) The mine surveyor who prepares the plan must hold a certificate of competence as a mine surveyor or, in the case of an opencast mining operation or tunnelling operation only, be a licensed cadastral surveyor.

214 Copy of plan of mining operation to be given to WorkSafe

The mine operator must ensure that a copy of the plan of the mining operation is given to WorkSafe—

- (a) as soon as practicable after the date of completion of the plan for the first time; and
- (b) at intervals of 12 months after that date; and
- (c) whenever any significant changes are made to the plan.

215 Copy of plan of mining operation to be available to industry health and safety representative

The mine operator must ensure that the plan of the mining operation, including any updated plan, is made available, on request, to an industry health and safety representative.

216 Plans of ceased mining operation

- (1) The mine operator must ensure that, immediately following the suspension or abandonment of the mining operation, a plan is made of the mining operation.
- (2) The plan must be—
 - (a) prepared by a mine surveyor using the New Zealand Geodetic Datum 2000 and to a suitable scale; and
 - (b) correct as at the date of suspension or abandonment; and
 - (c) copied to WorkSafe.

217 Details to be included in plans

The mine operator must ensure that the plans, including any updated plans, prepared under regulations 213 and 216 include such details as exist of—

- (a) every explosion risk zone:
- (b) every area of an underground metalliferous mining operation or tunnelling operation where methane has been detected:
- (c) tenure boundaries:
- (d) the angle of inclination, datum level at the collar, depth, and location of every borehole or shaft:
- (e) the direction, extent, and location of every known barrier, fault, intrusive dyke, old workings, washout, water accumulation, or aquifer:
- (f) the floor levels and location of every traverse station:
- (g) the angle of dip, direction, nature, and thickness of every known coal seam:
- (h) the cross and longitudinal sections of every level and lode:
- (i) the horizontal and vertical sections of the ventilation system, including details of—
 - (i) the direction, course, and volume of air flow; and
 - (ii) the location and description of every device used to regulate or distribute air; and
 - (iii) the location of firefighting, rescue, and emergency facilities, including emergency egresses, changeover stations, refuges, and first-aid stations:
- (j) the separation distances between shafts:
- (k) the location of inrush control zones:
- (l) the location of electrical installations, including the route and voltage of all conductors (excluding trailing cables) and the position of all major switchgear:
- (m) water dams, tailing dams, and tip heads:
- (n) areas where spontaneous combustion has occurred, including sealed areas:
- (o) places where hydrocarbons and explosives are stored:
- (p) roads and other key features of the traffic management system within the mining operation:

- (q) any other identified hazards present at or close to the mining operation:
- (r) natural features surrounding the mining operation:
- (s) the location of every device that provides for oral communication between the underground parts of the mining operation and the surface:
- (t) an indication of every location at which it is proposed to develop the mining operation with the next 12 months.

218 Plan showing firefighting, rescue, and emergency facilities to be posted

The mine operator must ensure that—

- (a) a version of the plan required by regulation 213 is prepared showing the matters described in regulation 217(i)(iii); and
- (b) copies of the version of the plan required by subclause (a) are displayed at a prominent and secure position on the surface part of the mining operation and at locations underground where they will—
 - (i) assist any person who may have to escape from the mining operation in an emergency; or
 - (ii) assist with the rescue of mine workers from the underground parts of the mining operation in an emergency.

219 Mining operation records

- (1) The mine operator must ensure that mining operations records—
 - (a) are kept at the site office; and
 - (b) are available for inspection by a mine worker or the site senior executive at any time at which a mine worker or the site senior executive is present at the mining operation.
- (2) The mining operations records must consist of—
 - (a) information about the mine operator, including the information provided in the notice given to WorkSafe under regulation 211:
 - (b) information about the appointment of the site senior executive, including the person's name:

- (c) all notifications and reports to WorkSafe under regulations 211 and 227 to 229:
 - (d) the current and all previous plans of the mining operation:
 - (e) plans of any abandoned mining operation above, below, or within 200 metres of the boundary of the mining operation, including where any part of an abandoned mining operation is above, below, or within 200 metres of the boundary of the mining operation:
 - (f) records of the certificates of competence held by mine workers at the mining operation and any other training or qualifications they have received:
 - (g) records of mine workers underground:
 - (h) the register of accidents and incidents required under section 25 of the Act and the records kept under regulation 226:
 - (i) the results of examinations performed under regulation 222:
 - (j) statutory notices received from WorkSafe and the responses to those notices, including any remedial action taken as a result of those notices:
 - (k) the details of any inspections completed by a site health and safety representative or industry health and safety representative and any actions taken by a site health and safety representative or industry health and safety representative, including any notices issued under sections 19ZF to 19ZH of the Act.
- (3) A matter must be kept in the mining operation record for 7 years after the matter is included in the record.

220 Record of mine workers underground

The mine operator must ensure that—

- (a) no mine worker is allowed to enter the underground parts of an underground mining operation or tunnelling operation without the permission of the manager; and
- (b) an accurate record is made of every mine worker's entry into, and exit from, the underground parts of an underground mining operation or tunnelling operation; and
- (c) the record, or a copy of it, is kept at the entry point.

221 Shift reports

- (1) The mine operator of an underground coal mining operation must ensure that—
 - (a) the underviewer of each shift at the underground coal mining operation completes a written report on—
 - (i) the current state of the workings of the mining operation and plant at the mining operation; and
 - (ii) any material matters that may affect the health and safety of mine workers arising from work done during the shift; and
 - (iii) any hazards or potential hazards identified during the shift; and
 - (iv) the controls (if any) put in place during the shift to manage those hazards; and
 - (b) the underviewer communicates the content of the written report to the underviewer of the incoming shift; and
 - (c) the content of the written report is communicated to the mine workers on the incoming shift.
- (2) The mine operator of a mining operation other than an underground coal mining operation must ensure that—
 - (a) the supervisor of each shift at the mining operation completes a written report on—
 - (i) the current state of the workings of the mining operation and plant at the mining operation; and
 - (ii) any material matters that may affect the health and safety of mine workers arising from work done during the shift; and
 - (iii) any hazards or potential hazards identified during the shift; and
 - (iv) the controls (if any) put in place during the shift to manage those hazards; and
 - (b) the supervisor communicates the content of the written report to the supervisor of the incoming shift; and
 - (c) the content of the written report is communicated to the mine workers on the incoming shift.
- (3) If the content of the written report is communicated to the underviewer or supervisor of the incoming shift orally under subclause (1)(b) or (2)(b), the mine operator must ensure that the

written report is made available to the underviewer or supervisor of the incoming shift during his or her shift.

- (4) A procedure for performing the tasks described in subclauses (1) and (2) must be included in the health and safety management system for the mining operation.

222 Examination of mining operations

- (1) The mine operator must ensure that a competent person—
- (a) examines,—
 - (i) before the start of each working shift and at suitable times during each working shift, every area of the mining operation where a mine worker is or will be present; and
 - (ii) at least weekly, every accessible area of the mining operation, including every area containing barriers, machinery, seals, underground or surface infrastructure, and ventilation stoppings; and
 - (iii) at least weekly, every vehicle in the mining operation; and
 - (iv) before it is started, any fixed or mobile plant in the mining operation that has been stopped for the preceding 24 hours or longer; and
 - (b) takes all practicable steps to eliminate, isolate, or minimise any significant hazard identified during the examination; and
 - (c) ensures that all plant examined either is safe or is made safe.
- (2) The mine operator must ensure that a written procedure for the conduct of examinations required by subclause (1) is included in the health and safety management system for the mining operation and sets out—
- (a) the matters to be covered by the examination; and
 - (b) a timetable (subject to the minimum requirements of subclause (1)) for the carrying out of the examinations; and
 - (c) the process for recording findings; and
 - (d) the process for taking action as a result of findings.

223 Barometer, hygrometer, and thermometer

- (1) The mine operator of an underground mining operation or tunnelling operation must ensure that—
 - (a) a barometer and thermometer are placed on the surface of the mining operation in a conspicuous position near the entrance to the underground parts of the mining operation; and
 - (b) a hygrometer is available for use in every underground mining operation or tunnelling operation.
- (2) The mine operator must ensure that a competent person reads the barometer and thermometer before the examinations required by regulation 222(1).

224 Visits to solitary mine workers

- The mine operator of an underground mining operation or tunnelling operation must ensure that—
- (a) a competent person visits or contacts a mine worker required to be alone in the underground parts of the mining operation at least twice during each shift and at intervals not exceeding 4 hours; and
 - (b) a record is kept of visits to or contact made with a mine worker as required by paragraph (a).

225 Hazard notices

The prescribed form for the purposes of section 19ZF of the Act (which relates to the issuing of hazard notices by trained site health and safety representatives) is the form set out in Schedule 6 of these regulations.

226 Register of accidents and serious harm

- (1) The mine operator must record the particulars of the following in relation to any mine worker:
 - (a) every accident that harmed (or, as the case may be, might have harmed) the mine worker at the mining operation; and
 - (b) every occurrence of serious harm to the mine worker at work, or as a result of any hazard to which the mine worker was exposed while at the mining operation.

- (2) For each accident or occurrence of serious harm, the particulars prescribed in Schedule 7 must be recorded in a register of accidents and serious harm maintained by the mine operator.
- (3) The mine operator must ensure that a copy of the register is provided to WorkSafe at intervals of not more than 6 months.
- (4) For the avoidance of doubt, a mine operator is not required, in relation to any mine worker, to maintain a separate register of accidents and serious harm under section 25(1) or (1B) of the Act.

227 Notification of accidents and serious harm

- (1) For the purpose of section 25(2)(b) of the Act, every accident specified in Schedule 8 is required to be notified to WorkSafe if the accident occurs at a mining operation.
- (2) For the purpose of section 25(3)(b) of the Act, the mine operator must notify the following to WorkSafe:
 - (a) every accident specified in Schedule 8 if the accident occurs at the mining operation; and
 - (b) every occurrence of serious harm at the mining operation.
- (3) The mine operator must notify the accident or serious harm to WorkSafe by providing the particulars prescribed in Schedule 7 to WorkSafe.
- (4) The mine operator must also provide the particulars of the accident or serious harm, except for personal information about any mine worker, to every site health and safety representative at the mining operation.
- (5) WorkSafe must make the particulars of the accident or serious harm, except for personal information about any mine worker, available to industry health and safety representatives.
- (6) For the avoidance of doubt, a mine operator is not required, in relation to any mine worker, to separately notify the accident or serious harm to WorkSafe on the basis that the mine worker is an employee of or a self-employed person contracted to the mine operator.

228 Accident investigations

- (1) The mine operator must ensure that—

- (a) any accident at the mining operation is investigated; and
 - (b) the investigation findings are made available to the mine workers at the mining operation.
- (2) If the accident is a notifiable accident, the mine operator must ensure that a report of the investigation findings is provided to WorkSafe within 30 days of the date on which the accident occurred.
 - (3) A procedure for making findings available to workers must be included in the health and safety management system.
 - (4) Nothing in this regulation affects section 7(2) of the Act.

229 Notification of high-risk activities

- (1) Before a high-risk activity specified in Schedule 9 is undertaken, the mine operator must ensure that notice of the activity is given to WorkSafe.
- (2) The period of notice to be given is the waiting period specified in Schedule 9 in relation to that activity, or any other longer or shorter period of notice that WorkSafe, by notice in writing, directs.
- (3) The notice must specify—
 - (a) the nature of the high-risk activity; and
 - (b) the intended commencement date of the activity.
- (4) The date that notice is given is the date that the notice is received by WorkSafe.
- (5) WorkSafe may request further information about the activity between the time of the notification of the activity by the mine operator and the expiry of the waiting period.
- (6) The mine operator must ensure that the high-risk activity is not commenced until the period of notice under subclause (2) has expired.

230 Quarterly report to WorkSafe

- (1) The mine operator must give WorkSafe the information set out in Schedule 10.
- (2) The information must be given every 3 months.

Part 10 Offences

231 Offences

- (1) The provisions to which this regulation applies are regulations 7 to 9, 10(3), 12 to 16, 23 to 32, 33(5), 45(5), 52 to 55, 58 to 64, 66, 69, 70, 71, 73(1), 75, 76(1), 82, 88(2), 91, 92, 94, 95, 104, 106, 115, 116, 118 to 129, 131 to 151, 153 to 158, 160 to 176, 178 to 224, and 226 to 230.
- (2) The provisions referred to in subclause (1) are provisions to which section 50 of the Act applies.

Part 11

Transitional provisions, revocations, and consequential amendments

232 Application, savings, and transitional provisions

The application, savings, and transitional provisions set out in Schedule 1 have effect for the purposes of these regulations.

233 Revocations

The following regulations are revoked:

- (a) the Health and Safety in Employment (Mining—Administration) Regulations 1996 (SR 1996/220);
- (b) the Health and Safety in Employment (Mining Underground) Regulations 1999 (SR 1999/331).

234 Consequential amendments to Health and Safety in Employment (Prescribed Matters) Regulations 2003

- (1) This regulation amends the Health and Safety in Employment (Prescribed Matters) Regulations 2003 (the **principal regulations**).
- (2) After regulation 4(3), insert:
“(4) Subclauses (1) and (2) do not apply to a mine operator who is required to maintain a register of accidents and serious harm that occur at a mining operation in accordance with regulation 226 of the Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013.”
- (3) After regulation 5(3), insert:

“(4) Subclause (1) does not apply to a mine operator who is required to notify an accident or occurrence of serious harm at a mining operation in accordance with regulation 227 of the Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013.”

235 Consequential amendments to Health and Safety in Employment Regulations 1995

- (1) This regulation amends the Health and Safety in Employment Regulations 1995 (the **principal regulations**).
- (2) In regulation 2, insert in its appropriate alphabetical order:
“**alluvial mining operation** has the meaning given to it in the Act”.
- (3) In regulation 2, replace the definition of **mine** with:
“**mining operation** has the meaning given to it in the Act”.
- (4) In regulation 2, replace the definition of **quarry** with:
“**quarrying operation** has the meaning given to it in the Act”.
- (5) In regulation 2, revoke the definition of **tunnel**.
- (6) Replace regulation 19(2)(n) with:
“(n) any machinery used in an alluvial mining operation, a mining operation, or a quarrying operation.”

236 Consequential amendments to Hazardous Substances (Classes 1 to 5 Controls) Regulations 2001

- (1) This regulation amends the Hazardous Substances (Classes 1 to 5 Controls) Regulations 2001 (the **principal regulations**).
- (2) Revoke regulation 59(2) and (8).
- (3) In regulation 78(2), replace “Health and Safety in Employment (Mining—Underground) Regulations 1999” with “Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013”.
- (4) In regulation 83(2), replace “Health and Safety of Employment (Mining Underground) Regulations 1999” with “Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013”.

**237 Consequential amendment to Electricity (Safety)
Regulations 2010**

[Revoked]

Regulation 237: revoked, on 31 December 2013, by regulation 237.

Schedule 1

r 232

**Application, savings, and transitional
provisions**

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1 Interpretation

In this schedule, a mining operation or, as the case may be, a quarrying operation or an alluvial mining operation—

- (a) is an existing mining operation or, as the case may be, an existing quarrying operation or existing alluvial mining operation if, immediately before the date on which these regulations came into force, it was in operation or suspended; and
- (b) ceases to be an existing mining operation or, as the case may be, an existing quarrying operation or existing alluvial mining operation if it is abandoned.

Provisions relating to existing mining operations

2 Application of Parts 2 to 4 and 6 to 10 to existing mining operation

Until 1 January 2015, nothing in Parts 2 to 4 or 6 to 10 of these regulations applies to an existing mining operation.

3 Application of Health and Safety in Employment (Mining—Underground) Regulations 1999

- (1) Subclause (2) applies to an existing mining operation to which the Health and Safety in Employment (Mining—Underground) Regulations 1999 apply.
- (2) Until 1 January 2015, the Health and Safety in Employment (Mining—Underground) Regulations 1999 continue to have effect in relation to the existing mining operations as if they had not been revoked by regulation 233.

4 Transitional provision for escapeways in underground coal mining operation

Until 16 December 2024, nothing in regulation 170(1) applies to an existing mining operation that is an underground coal mining operation.

5 Application of regulations 180(b)(i) and 183 to seals in existing mining operations

Nothing in regulation 180(b)(i) or 183 applies in respect of any seal that was constructed and in place in an existing mining operation immediately before 16 December 2013.

6 Application of regulation 182 to certain ventilation control devices in existing mining operations

Nothing in regulation 182 applies in respect of any of the following ventilation control devices that were constructed and in place at an existing mining operation immediately before 16 December 2013:

- (a) stoppings, doors, overcasts, and regulators installed as part of the main ventilation system:
- (b) stoppings, doors, overcasts, and regulators installed as part of the ventilation system for a panel:
- (c) mine entry airlock:
- (d) seals.

Exemptions

7 WorkSafe may grant exemptions from requirements

- (1) WorkSafe may, by notice in writing to the mine operator, exempt an existing mining operation from any requirement or requirements of these regulations if WorkSafe is satisfied that the mining operation is unable to comply with the requirement or requirements.
- (2) WorkSafe may grant a renewal of an exemption granted under subclause (1).
- (3) The total period of any exemption granted under subclause (1) (combined with any period of renewal granted under subclause (2)) must not exceed 36 months and must end no later than 31 December 2017.

8 WorkSafe may request information

WorkSafe may request that a mine operator provide it with any information that will assist WorkSafe to decide whether to grant the mining operation an exemption under clause 7(1) or a renewal under clause 7(2).

9 Exemption may be subject to conditions

An exemption (or renewal of an exemption) granted under clause 7 may be subject to any condition or conditions that WorkSafe thinks fit.

Provisions relating to safety-critical roles and competencies

10 Existing holders of safety-critical roles

(1) This clause applies to any person who, immediately before the date on which these regulations come into force, holds any of the following positions in an existing mining operation or existing quarrying operation and holds any necessary qualifications required in relation to that position under the Health and Safety in Employment (Mining Administration) Regulations 1996:

- (a) manager of a mining operation:
- (b) manager of a quarrying operation:
- (c) manager of an alluvial mining operation:
- (d) coal mine underviewer:
- (e) coal mine deputy:
- (f) gas tester:
- (g) mine surveyor:
- (h) winding engine driver.

(2) On the date on which these regulations come into force a person to whom this regulation applies continues to hold the position he or she held immediately before that date.

11 Appointment of manager of mining operation, quarrying operation, or alluvial mining operation

(1) On or before 1 January 2015, the mine operator of an existing mining operation or, as the case may be, an existing quarrying operation or alluvial mining operation must ensure that a manager is appointed for the operation in accordance with regulation 13, 14, or 15 and, except as provided in this regulation, that person must hold a current certificate of competence as required by these regulations.

(2) If the person appointed held the position of manager immediately before the date on which these regulations came into

force, until the relevant date specified in subclause (3), nothing in regulations 16 to 22 applies in respect of the person, provided that the person holds any necessary qualifications that would have been required in relation to that position under the Health and Safety in Employment (Mining Administration) Regulations 1996.

- (3) The relevant dates are,—
- (a) if the person's certificate of competence has an expiry date, whichever is the earlier of—
 - (i) the date that is 12 months after the expiry date; and
 - (ii) 1 January 2016; or
 - (b) if the person's certificate of competence does not have an expiry date, 1 January 2016.

12 Appointment of electrical superintendent, mechanical superintendent, and ventilation officer

- (1) On or before 1 March 2015, the site senior executive of an existing mining operation must ensure that a person is appointed to each of the safety critical roles described in regulations 26, 27, and 29 if required in relation to that mining operation in accordance with those regulations.
- (2) Until 1 January 2016, nothing in regulation 26(2), 27(2), or 29(2) requires a person appointed as an electrical superintendent, mechanical superintendent, or ventilation officer to hold any certificate of competence issued under these regulations.

13 Appointment of other safety-critical roles

- (1) On or before 1 March 2015, the site senior executive of an existing mining operation must ensure that a person is appointed to each of the safety-critical roles described in regulations 28, 30, and 31 if required in relation to that mining operation in accordance with those regulations and, except as provided in this regulation, each person must hold the appropriate current certificate of competence as required by these regulations.
- (2) If a person appointed to a role described in regulation 28, 30, 31, or 32 held that position immediately before the commencement of these regulations, until the relevant date specified in

subclause (3), nothing in regulation 28(2), 30(2) and (3), 31(2) to (5), or 32 applies in respect of the person, provided that the person holds any necessary qualifications that would have been required in relation to that position under the Health and Safety in Employment (Mining Administration) Regulations 1996.

- (3) The relevant dates are,—
- (a) if the person's certificate of competence has an expiry date, whichever is the earlier of—
 - (i) the date that is 12 months after the expiry date; and
 - (ii) 1 January 2016; or
 - (b) if the person's certificate of competence does not have an expiry date, 1 January 2016.

14 Appointment of site senior executive for mining operations

- (1) Nothing in regulation 7 applies in respect of an existing mining operation until 1 July 2014.
- (2) Until 1 January 2016, nothing in regulation 8(1) to (3) applies in respect of a site senior executive appointed in respect of any mining operation (whether or not an existing mining operation).

15 Appointment of safety-critical roles for new mining operations

In respect of any mining operation, quarrying operation, or alluvial mining operation that is not an existing mining operation, existing quarrying operation, or existing alluvial mining operation,—

- (a) until 1 January 2016, nothing in regulations 16 to 22 applies in respect of a person appointed as manager, provided that the person holds any necessary qualifications that would have been required in relation to that position under the Health and Safety in Employment (Mining Administration) Regulations 1996;
- (b) until 1 January 2016, nothing in regulations 26(2), 27(2), or 29(2) requires a person appointed as an electrical superintendent, mechanical superintendent, or

ventilation officer to hold any certificate of competence issued under these regulations:

- (c) until 1 January 2016, nothing in regulations 28(2), 30(2) and (3), 31(2) to (5), or 32 applies in respect of a person appointed as mine surveyor, underviewer, supervisor, coal mine deputy, or winding engine driver, provided that the person holds any necessary qualifications that would have been required in relation to that position under the Health and Safety in Employment (Mining Administration) Regulations 1996.

Applications and other matters in relation to
certificates of competence

16 Applications and other matters in relation to certificates of competence before 1 January 2015

- (1) Until 1 January 2015, any application for a certificate of competence of a kind specified in regulation 16 of the Health and Safety in Employment (Mining Administration) Regulations 1996 must be made and dealt with under those regulations.
- (2) Any application for the renewal or replacement of a certificate of competence issued under those regulations must be made and dealt with under those regulations.
- (3) Despite subclauses (1) and (2), the prescribed fees for the making of the applications are those set out in Schedule 2 of these regulations.
- (4) The cancellation or suspension of a certificate of competence issued under the Health and Safety in Employment (Mining Administration) Regulations 1996 must be dealt with under those regulations.
- (5) Any certificate granted or renewed in accordance with this clause expires on 31 December 2015 unless it has an earlier expiry date shown on its face.

17 Applications, etc, for certificates of competence as at 1 January 2015

- (1) This clause applies to any application for a certificate of competence or for a renewal of a certificate of competence under the Health and Safety in Employment (Mining Administra-

tion) Regulations 1996 that, immediately before 1 January 2015, had been made but not yet determined.

- (2) The application must be treated as if it was made to the Board of Examiners, and the Board must deal with it in accordance with the Health and Safety in Employment (Mining Administration) Regulations 1996.
- (3) Any certificate granted or renewed in accordance with this clause expires on 31 December 2015 unless it has an earlier expiry date shown on its face.

18 Application of Health and Safety in Employment (Mining Administration) Regulations 1996

For the purpose of clauses 10 to 17,—

- (a) the Health and Safety in Employment (Mining Administration) Regulations 1996 (except Schedule 1) continue to have effect with any necessary modifications as if they had not been revoked by regulation 233; and
- (b) the recognition of any organisation under regulation 17 of the Health and Safety in Employment (Mining Administration) Regulations 1996 that was in effect immediately before these regulations came into force continues to have effect.

Schedule 2

rr 36, 44, 46

**Fees for issue, renewal, and replacement
for certificate of competence**

Type of fee	\$
Issue of any certificate of competence	140.00
Renewal of any certificate of competence	80.00
Replacement of any certificate of competence	30.00

Schedule 3

r 109

Mine worker participation system

Mine health and safety representatives

1 Consultation with mine workers

If the Act or these regulations require the mine operator or site senior executive to consult with mine workers, that consultation,—

- (a) if a site health and safety representative or representatives have been elected for the mining operation,—
 - (i) must be done with the site health and safety representative or representatives; and
 - (ii) may, in addition, be done directly with the affected mine workers and any other representative of 1 or more mine workers; or
- (b) otherwise, may be done directly with the affected mine workers and any representative of 1 or more mine workers.

2 Mine workers and union may elect site health and safety representatives

The mine workers, together with any union representing them, may hold an election for at least 1 site health and safety representative (which may include 1 or more site health and safety representatives elected for each particular type of work of the mine operator, or another grouping) to carry out the functions in section 19W of the Act.

3 Mine workers or union may require mine operator to hold election for site health and safety representative

- (1) If an election may or must be held under clause 2, the mine workers, together with any unions representing them, may, instead of holding the election themselves, notify the site senior executive that they require the mine operator to hold the election.
- (2) The mine operator must hold the election within 2 months of receiving notification.

4 Method of electing site health and safety representative

- (1) An election for a site health and safety representative must—
 - (a) involve only candidates who—
 - (i) work sufficiently regularly and for a sufficient duration to enable them to carry out their functions effectively; and
 - (ii) have worked for a minimum of 2 years in a mining operation of the kind at which the person will be a site health and safety representative; and
 - (iii) are willing to take on the position; and
 - (b) be conducted through a secret ballot; and
 - (c) give all mine workers, or all mine workers in a relevant grouping for the purposes of section 19R(5) of the Act, a reasonable opportunity to vote; and
 - (d) be determined by the wishes of the majority of those who vote.
- (2) An election is not required if—
 - (a) there is only 1 candidate for a position, in which case the candidate automatically fills the position; or
 - (b) there are no candidates for a position, in which case the position is not filled.

5 Filling vacancy for health and safety representative

The mine workers, together with any unions representing them, may hold an election (or require the mine operator under clause 3 to hold an election) if a vacancy arises in a position of site health and safety representative.

Mine health and safety committees

6 Mine health and safety committees

- (1) The site senior executive may establish a mine health and safety committee.
- (2) Despite subclause (1), the site senior executive must establish a mine health and safety committee if requested to do so by—
 - (a) a site health and safety representative; or
 - (b) 5 or more mine workers at the mining operation.

7 Membership of committee

- (1) Subject to this clause, the membership of a health and safety committee may be agreed between the mine operator and the mine workers.
- (2) If there is a site health and safety representative, that representative, if he or she consents, is a member of the committee.
- (3) If there are 2 or more site health and safety representatives, those representatives may choose 1 or more of their number (who consent) to be members of the committee.
- (4) At least half of the members of the committee must be mine workers who are not nominated by the mine operator.
- (5) The committee must include at least 1 member nominated by the mine operator to represent the mine operator and who has the authority to allocate financial and other resources on behalf of the mine operator.

8 Functions of committee

The functions of a health and safety committee are—

- (a) to facilitate co-operation between the mine operator and the mine workers in developing, reviewing, and implementing measures designed to ensure the health and safety of the mine workers at work:
- (b) to assist in developing and reviewing standards, rules, and procedures relating to health and safety that are to be followed or complied with in the mining operation:
- (c) to perform any other function agreed between the committee and the mine operator.

9 Meetings of committee

A health and safety committee must meet at least once every 3 months.

Schedule 4

r 138(2)

**Standards for equipment for raising and
lowering mine workers, coal, minerals,
and materials**

Winder or slope haulage

- 1 A winder or slope haulage used at the mining operation must have at least 2 independent brakes.
- 2 The brakes must not include a single line component that, if it failed, would prevent the braking system from safely stopping the winder.
- 3 Each brake must be designed, adjusted, and maintained so as to safely stop and hold the conveyance or conveyances under all conditions of loading, directions of travel, and speeds under or at which it will travel.
- 4 Each brake on a drum winder must be capable of supporting 2 times the maximum static load normally hoisted by the drum winder from the lowest operating position in the shaft.
- 5 Each brake on a friction winder must be capable of producing a braking torque,—
 - (a) when transporting persons, at least 3 times the maximum out-of-balance static torque applied to the driving sheave by the loads normally carried by the winder; and
 - (b) when transporting rock or materials, at least 2 times the maximum out-of-balance static torque applied to the driving sheave by the loads normally carried by the winder.
- 6 The braking system of each winding system at the mining operation must be designed in such a way that the failure of any one component in the winding system will not prevent the conveyance from being brought safely to a rest.
- 7 Every winder used at the mining operation must have—

- (a) an automatic device to prevent the winder over-winding; and
 - (b) a device to prevent a descending conveyance from being landed at the lowest entrance to the shaft at a speed exceeding 2 metres per second; and
 - (c) a device to indicate the position of each conveyance in the shaft; and
 - (d) for a manually controlled winder that is capable of exceeding speeds of 4 metres per second, a rope speed indicator located on the winder where it can be read by the winder operator.
- 8 Every slope haulage used at the mining operation must have—
- (a) an automatic device installed to prevent overtravel; and
 - (b) a device that indicates the position of each rope-hauled line of vehicles in the roadway; and
 - (c) for manually controlled slope haulage that is capable of exceeding speeds of 2 metres per second, a rope speed indicator located on the slope haulage where it can be read by the slope haulage operator.
- 9 Where electric automatic devices are used to prevent over winding, over travel, or over speeding, the device must provide an equivalent level of safety as a non-electronic automatic device used for the same purpose.
- 10 Where an electronic automatic device is used to prevent over winding, over travel, or over speeding and the device includes a single line component that could cause the device to fail to an unsafe mode, the device must have a separate supervisory device with an independent drive that will safely bring the winding system to a rest in the event of over wind, over travel, or over speed.
- 11 If a supervisory device is brought into operation for any reason or a supervisory device fails, further operation of the winding system associated with the supervisory device must be stopped until,—

- (a) in the case of the supervisory device being brought into operation, the electric automatic device is examined and proved to be effective; or
 - (b) in the case of the failure of the supervisory device, the cause of the failure has been remedied.
- 12 If an electronic automatic device has separate modes for winding persons and for winding materials, the device must be set to the mode for winding persons before any person is allowed to enter the conveyance, and, except in relation to a shaft being sunk, the mode to which the device has been set must be displayed at every landing in such a way that it will be clearly visible to any person transmitting signals from a landing.

Controls and safety devices for conveyances

- 13 The headframe or tower of a shaft used for winding at the mining operation must have—
- (a) equipment that is designed and installed to ensure the conveyance or counterweight will stop safely if the conveyance is overwound; and
 - (b) safety devices that are designed and installed so that when a conveyance or counterweight has stopped or become detached from the winding rope, the conveyance will not fall down the shaft; and
 - (c) means by which people can safely leave an overwound or stalled conveyance, including a way out of the conveyance.
- 14 Where there may be uncontrolled contact between the conveyances in a shaft, a conveyance and equipment installed in the shaft, or a conveyance and the side of the shafts, the shaft must contain suitable guides for each conveyance and counterweight.
- 15 Winders used to transport persons at the mining operation must be fitted with brake locking devices that are interlocked with any other safety-related plant in the shaft and that will prevent the winder moving during normal transport of persons if—

- (a) any shaft side barrier or gate is not closed; or
 - (b) the conveyance gates are not fully closed and latched;
or
 - (c) any emergency stop button has not been reset after an
emergency stop signal has been activated.
- 16 Each winder at the mining operation must have suspension equipment capable of withstanding stall conditions or a hook that can detach an ascending conveyance from the rope in the event that the conveyance overwinds.
- 17 Every winder and slope haulage used at the mining operation that is not directly supervised must have suitable equipment, such as fire extinguishers, that will operate automatically to extinguish fire in the plant's engine room.
- 18 Every friction winder at the mining operation must have a device that cuts power to the winding system and stops the winding drum or sheave by applying brakes automatically before a conveyance, counterweight, or rope attachment reaches a permanent obstruction to its passage in the shaft.
- 19 Every winder used at the mining operation must automatically synchronise the position of the conveyance in a shaft with the conveyance's position indicator and safety devices.
- 20 Any adjustment to the synchronisation of the position of the conveyance with its position indicator and safety devices may be done only while the conveyance's brakes are applied and the winder is stationary.
- 21 The speed of a friction winder used at the mining operation must not exceed the following speeds:
- (a) in the case of friction winders used to raise or lower people, 16 metres per second:
 - (b) in the case of friction winders used to raise or lower material, 18 metres per second.

- 22 The brakes on a friction winder used at the mining operation must—
- (a) apply automatically when the power to the winder fails:
 - (b) when applied automatically in any situation, not be likely to cause the winding rope to slip on the driving sheave:
 - (c) in the case of a manually controlled friction winder, be able to be applied manually by the winder operator.
- 23 Every winder's brakes must apply automatically and prevent the winder being operated if the brake linings become worn to an extent that jeopardises the safe operation of the brakes.
- 24 Sufficient information about the operating requirements of any winder, slope haulage, or hoist intended to be used at the mining operation must be given to the supplier of the plant so that the supplier is able to provide plant that is appropriate to be installed at the operation, and so that the installer is able to install the plant appropriately for the operation, and a record of the information provided to the supplier is kept.
- 25 Any plant utilising winders, slope haulage, or hoists must be tested before being used at the mining operation to confirm that it meets the operating requirements, and a record of the test results must be kept.
- 26 Where it is intended to use a winder, slope haulage, or hoist outside its operating requirements, a design check by a competent person must be carried out and any necessary modification to the plant must be completed before it is used outside the specified operating requirements.
- 27 Every shaft that exceeds 60 metres in depth and that may be used as a means of egress by mine workers, including in an emergency, must have an automatic cage or skip installed that is suitable for raising or lowering mine workers.

Rope used for winding and slope haulage

- 28 A rope must not be used for winding or slope haulage at the mining operation unless the mine operator has obtained a certificate from the manufacturer of the rope stating—
- (a) the date the rope was manufactured; and
 - (b) the tensile strength, diameter, length, and mass of the rope; and
 - (c) the class of steel used in the rope's construction.
- 29 A rope must not be used for winding or slope haulage at the mining operation unless the rope's tensile strength has been tested by an independent testing facility and a certificate stating the tensile strength has been obtained from the testing facility.
- 30 For a rope other than a friction winder rope, a sample of at least 2 metres must cut from the end of the rope during recapping, sent to an independent testing facility for testing its tensile strength, and a certificate stating the tensile strength obtained from the testing facility.
- 31 Where a certificate obtained from an independent testing facility states that the tensile strength of the rope is less than 90% of the rope's tensile strength when new, the rope must not be used for winding or slope haulage at the mine.
- 32 Only rope recommended by the manufacturer of the winding system may be used at the mining operation.
- 33 Only rope dressing recommended by the manufacturer of the rope may be used.
- 34 The load applied to any rope used for drum winding at the mining operation must not result in a factor of safety less than the minimum factor of safety as set out in the following paragraphs (where L is the depth of the wind in metres):
- (a) for a friction winder—

Proposed use	Minimum factor of safety		
	Single rope	2 or 3 ropes	4 or more ropes
Transporting persons or where the safety of persons is involved	7.5	6.9	6.3
Transporting rock or materials, where the safety of persons is not involved	6.8	6.2	5.6
Transporting rock in a shaft used only for that purpose	6.3	5.7	5.1
Transporting plant at a speed of less than 2 metres per second	5.0	5.0	5.0
Balance ropes	6.0	6.0	6.0

(b) for a winder other than a friction winder—

Proposed use	Minimum factor of safety
Transporting persons or where safety of mine persons is involved	7.5 – 0.001L
Transporting rock or materials, where the safety of persons is not involved	5.5 – 0.0003L
Transporting rock in a shaft used only for that purpose	4.5
Transporting plant at a speed of less than 2 metres per second	5

(c) for stage ropes used in shaft sinking—6.

- 35 Each winder rope on a multi-rope winder must be attached at the conveyance or counterweight by a device that loads the ropes in as uniform a manner as is reasonably practicable.
- 36 If rope attachments are connected directly to the conveyance or counterweight, devices must be provided to adjust the rope length and indicate rope tension; and there must be regular monitoring and testing of winder or slope haulage ropes that does not damage or destroy the ropes.
- 37 Each winder rope used at the mining operation must be re-capped at least once every 6 months.

- 38 When recapping is done as required by clause 10, the capping location must be moved at least 150 millimetres along the rope towards the standing end of the rope.
- 39 There must be criteria in place for when rope must be discarded.
- 40 Unsuitable rope must be discarded.
-

Schedule 5
**Ventilation control devices and design
criteria**

r 182

Ventilation control device	Design criteria
Ventilation ducting	Anti-static and fire-resistant
Brattice line or temporary stopping	Anti-static and fire-resistant
Separation stopping for a primary escapeway	Anti-static, fire-resistant and of substantial construction that will ensure minimal leakage
Stoppings, doors, overcast, or regulator installed as part of the main ventilation system	Capable of withstanding an overpressure of 35 kPa
Stoppings, doors, overcast, or regulator installed as part of the ventilation system for a panel	Capable of withstanding an overpressure of 14 kPa
Mine entry airlock	Capable of withstanding an overpressure of 70 kPa whilst it is open
Type B seal	Capable of withstanding an overpressure of 35 kPa
Type C seal	Capable of withstanding an overpressure of 140 kPa
Type D seal	Capable of withstanding an overpressure of 345 kPa
Type E seal	Capable of withstanding an overpressure of 70 kPa

Schedule 6
Hazard notice

r 225

Form
Hazard notice*Section 19ZF, Health and Safety in Employment Act 1992***To:** *[name of site senior executive]*I believe that there is a hazard in our mining operation at *[state physical address or describe location of mining operation]*.This hazard is *[describe hazard]*.I suggest the steps that should be taken to deal with this hazard are: *[state details—it is optional whether to provide this information]*.I confirm that: *[all these statements must apply before a hazard notice may be issued]*

- I believe on reasonable grounds that there is a hazard in our mining operation; and
- I have brought the hazard to your attention; and
- I have discussed or attempted to discuss with you steps for dealing with the hazard.

and*[One of the following statements must apply – delete statements that do not apply.]*

You refuse to discuss the hazard.

or

You refuse to take steps to deal with the hazard.

or

You and I do not agree on the steps that must be taken to deal with the hazard.

or

I believe on reasonable grounds that you and the mine operator have failed to meet the requirements of this Act or regulations made under this Act in relation to the hazard within a time agreed during the discussion.

Signature:

(Trained site health and safety representative)

Form—*continued*

Name:

Date:

Notes for site health and safety representative

- 1 You may issue a hazard notice only if you are a trained site health and safety representative within the meaning of section 19ZF of the Health and Safety in Employment Act 1992. To be a trained site health and safety representative, you must have—
 - achieved a level of competence in health and safety practice specified by the Minister by notice in the *Gazette*; or
 - completed an appropriate course of training that has been approved under section 19G of the Health and Safety in Employment Act 1992.
- 2 You may (but do not have to) notify a health and safety inspector that you have issued this notice. If you do, you should ensure you provide your name and contact details to the inspector.

Notes for mine operator

- 1 This hazard notice sets out a description of a hazard that a trained site health and safety representative believes exists in your mining operation.
 - 2 There is no penalty attached to this notice. However, it serves as a prior warning if an infringement notice is issued by an inspector under section 56B of the Health and Safety in Employment Act 1992.
-

Schedule 7

rr 226(2), 227(3)

**Particulars of accident or serious harm
to be recorded in register and notified to
WorkSafe****1 Particulars of mining operation**

- (1) Mining operation: [*include location*]
- (2) Particulars of mining operator: [*name, business address, telephone number, and email address*]
- (3) Particulars of site senior executive: [*name, business address, telephone number, and email address*]

2 Description of accident or serious harm

- (1) Where and how did the accident or serious harm occur? [*describe the events leading up to the accident or serious harm*]
- (2) Has an investigation been carried out? *Yes/No*
- (3) Describe any hazards involved:
- (4) Were any of the hazards a significant hazard? *Yes/No*
- (5) Identify the hazards that were significant hazards:

3 Particulars of accident or serious harm

- (1) Location within mining operation where accident or serious harm occurred:
- (2) Time and date of accident or serious harm:
- (3) Shift: [*select 1 of the following*:
 - *day*
 - *afternoon*
 - *night*]
- (4) Hours worked since arrival at work:
- (5) Description of any plant involved in accident: [*include make and model*]
- (6) Type of accident (if any): [*indicate the type of accident (if any) specified in Schedule 6 that best describes the accident*]
- (7) Name of injured person (if any):
- (8) Was the injured person seriously harmed? *Yes/No*

**4 Additional particulars required in cases of serious harm
(if any)**

Particulars of injured person (if any)

- (1) Residential address:
- (2) Date of birth:
- (3) Sex:
- (4) Occupation or job title:
- (5) Self-employed: *Yes/No*
- (6) Employer:
- (7) Period of employment (employees only): [*select 1 of the following:*
 - *first week*
 - *first month*
 - *1–6 months*
 - *6 months–1 year*
 - *1–5 years*
 - *over 5 years*]

Particulars of injury (if any)

- (8) Treatment: [*select 1 of the following:*
 - *none*
 - *first aid only*
 - *doctor but no hospitalisation*
 - *hospitalisation*]
- (9) Body part affected: [*select 1 or more of the following:*
 - *head*
 - *neck*
 - *trunk*
 - *upper limb*
 - *lower limb*
 - *multiple locations*
 - *systemic internal organs*]
- (10) Nature of injury or harm: [*select 1 or more of the following:*
 - *fatal*
 - *fracture of spine*
 - *fracture other than spine fracture*
 - *dislocation*

- *sprain or strain*
- *head injury*
- *internal injury of trunk*
- *amputation (including eye)*
- *open wound*
- *superficial injury*
- *bruising or crushing*
- *foreign body*
- *burns*
- *nerves or spinal cord*
- *multiple injuries*
- *puncture wound*
- *poisoning or toxic effects*
- *damage to artificial aid*
- *disease, nervous system*
- *disease, musculoskeletal system*
- *disease, skin*
- *disease, digestive system*
- *disease, infectious or parasitic*
- *disease, respiratory system*
- *disease, circulatory system*
- *tumour (malignant or benign)*
- *mental disorder]*

Further particulars of serious harm

- (11) Mechanism of serious harm: [*select 1 or more of the following:*
- *fall, trip, or slip*
 - *sound or pressure*
 - *body stressing*
 - *biological factors*
 - *mental stress*
 - *hitting objects with part of the body*
 - *being hit by moving objects*
 - *heat, radiation, or energy*
 - *chemicals or other substances]*

- (12) Agency of serious harm: [*select 1 or more of the following:*
- *machinery or (mainly) fixed plant*
 - *mobile plant or transport*
 - *powered equipment, tool, or appliance*
 - *non-powered handtool, appliance, or equipment*
 - *chemical or chemical product*
 - *material or substance*
 - *environmental exposure (eg, dust or gas)*
 - *animal, human, or biological agency (other than bacteria or virus)*
 - *bacteria or virus*]
-

Schedule 8

Notifiable accidents

r 227

A notifiable accident is any of the following that occurs at a mining operation:

Fire, ignition, explosion, or smoke

- (1) any outbreak of fire underground involving open flame
- (2) the ignition underground of any gas or dust
- (3) any accident where mine workers are required to evacuate a part or the whole of the underground parts of an underground mining operation or tunnelling operation because of smoke
- (4) the outbreak of any fire on the surface that endangers mine workers on the surface or in the underground parts of the mining operation
- (5) any fire on plant, including mobile plant, or a building associated with mining or tunnelling activities
- (6) in relation to a coal mining operation, the detection of any spontaneous combustion

Ventilation and gas

- (1) any accident where mine workers are required to evacuate a part or the whole of the underground parts of a mining operation or tunnelling operation because of methane or any other gas
- (2) any unplanned stoppage of the main fan in excess of 30 minutes
- (3) any unplanned accumulation of methane or other gas requiring formal degassing operations
- (4) the loss of consciousness of any mine worker including asphyxia

Outburst, inundation, or inrush

- (1) any violent outburst of coal, gas or solid matter
- (2) any windblast event capable of injuring or causing death to any mine worker or damaging seals or stoppings
- (3) any inundation or inrush of water or material that flows when wet

- (4) any structural failure of a tip, pond, or dam resulting in unintended movement or release of material or fluids

Ground, geotechnical, and other structural failures

- (1) any failure of ground control that prevents persons from passing through the area or otherwise exposes them to danger
- (2) any ground movement of a surface slope, face, bench, or haul road which has the potential to cause injury or death
- (3) any movement of a surface slope or face that adversely affects any building, footpath, waterway, public utility, or other area of public access
- (4) in relation to the surface of a mining operation, the structural failure of any gantry, storage bunker, tower, or other elevated structure

Emergency, escape, and rescue

- (1) any initiation of the mine emergency plan other than during a planned exercise
- (2) use of emergency escape equipment, including self-contained self-rescuers or other breathing apparatus, except during training
- (3) failure in use or training of any emergency escape equipment or mines rescue breathing apparatus
- (4) any emergency evacuation of a part or the whole of a mining operation
- (5) the unplanned unavailability of 1 or more of the emergency escapeways from an underground mining operation or tunnelling operation
- (6) any occasion where a mine worker or mine workers are trapped or unable to leave their place of work in a mining operation

Vehicles and plant

- (1) any collision of mobile plant with other plant, including mobile plant, with a potential to cause serious harm
- (2) any overturning of mobile plant, regardless of which part of the mobile plant is against the ground when it comes to a rest

- (3) any unintended movement or brake failure of mobile plant that could have caused serious harm
- (4) any occasion on which mobile plant breaches a safety berm or windrow
- (5) a failure of any part of a powered shaft winding system causing danger
- (6) the sinking of any waterborne craft

Shot-firing

- (1) any misfire of a round of shots on a face
- (2) any unplanned or premature ignition of a shot
- (3) any accident where a person suffers injury or dies as a result of shot-firing
- (4) any accident where material is projected beyond the declared danger zone or otherwise exposes any person to danger during blasting operations

Electricity

- (1) unintended contact of any mobile plant with conductors, whether overhead or underground
 - (2) any occurrence of electrical arcing or electric shock
-

**Schedule 9
High-risk activities**

r 229

Applies to	High-risk activity	Length of time between notification and when activity can be undertaken
All mining operations	Commencement of highwall mining	1 month
	Entering a highwall mining excavation	48 hours
All mining operations	Shot-firing underground, where shot-firing has not been undertaken within a year prior to the intended time of shot-firing	7 days
All mining operations	Commissioning or use of mine shaft and winding systems plant	3 months
Underground mining operations and tunnelling operations	Working within inrush control zones	1 month
Underground mining operations and tunnelling operations	Entry by any mine worker into any sealed area of the underground parts of the mining operation	7 days
Underground metalliferous mining operations and tunnelling operations where methane has been detected	Hot work in the underground parts of the mining operation	1 month before first hot work covered by hot work approval system 24 hours before each occasion of hot work thereafter
Underground mining operations	Single entry development (being the development of a roadway or a drift for more than 200 metres without forming an intersection)	1 month
Underground mining operations	Shaft or drift sinking, raise boring or development of a new entry to the underground parts of the mining operation	3 months
Underground mining operations	The use of voltages in excess of 1 200 V in ERZ1 for electrical plant other than electrical plant and cables associated with longwall mining	3 months

Applies to	High-risk activity	Length of time between notification and when activity can be undertaken
Underground metalliferous mining operations	Newly devised method of mining a rise involving drill and blast and entry to the rise	1 month
Coal mining operations	The establishment or discontinuance of emplacement areas	3 months
Coal mining operations	Secondary workings: <ul style="list-style-type: none"> • pillar or pillar dimension reduction • longwall • miniwall • shortwall 	3 months
Underground coal mining operations	Injection or application of polymeric material for ventilation or strata	24 hours
Underground coal mining operations	Driving an underground roadway with a width greater than 5.5 metres	7 days
Underground coal mining operations	Widening an existing underground roadway	7 days
Underground coal mining operations	Installation of a booster fan underground	3 months
Underground coal mining operations	Hot work in an ERZ1	1 month before first hot work covered by hot work approval system 24 hours before each occasion of hot work thereafter
Underground coal mining operations	Hot work in an NERZ	1 month before first hot work covered by hot work approval system 24 hours before each occasion of hot work thereafter
Underground coal mining operations	Live electrical work in an ERZ0 or ERZ1	7 days before first live electrical work covered by live electrical work approval system

Applies to	High-risk activity	Length of time between notification and when activity can be undertaken
		24 hours before each occasion of live electrical work thereafter
Underground coal mining operations	The introduction for the first time of a vehicle with a non-flameproof (fire-protected) diesel engine to an NERZ	3 months
Underground coal mining operations	The use of voltages in excess of 4 000 V in an ERZ1 for electrical plant and cables associated with longwall mining	3 months
Underground coal mining operations	Barrier mining (meaning the mining of a barrier or protective pillar against the external boundaries of the workings of the mining operation, against any outcrop of the seam and between any underground workings and any open cut workings. The requirement to notify is triggered when the width of the barrier is proposed to be less than 40 metres between adjoining workings of adjacent mining operations)	3 months
Underground coal mining operations	<ul style="list-style-type: none"> • Multi-seam mining • Formations of small pillars • Shallow depth of cover • Mining under massive roof conditions • Mining under significant bodies of water 	3 months

Schedule 10

r 230

**Information to be given to WorkSafe in
quarterly report****1 Description of mining operation**

The following descriptive details for the mining operation:

- (a) the name of the mine operator, the site senior executive, and the mine manager; and
- (b) the location of the mining operation; and
- (c) the business contact details of the mine operator, the site senior executive, and the mine manager; and
- (d) the nature of the mining operation, including whether it is an opencast or underground mining operation or tunnelling operation, and the kind of material that is extracted.

2 Commodity processed

A description of the primary commodity processed at the mining operation during the reporting period.

3 Number of workers

The average number of mine workers who worked at the mining operation during the reporting period.

4 Number of hours worked

The total number of full-time equivalent, additional shift, and overtime hours worked at the mining operation during the reporting period.

5 Number of accidents

The total number of notifiable accidents required to be notified under section 25 of the Act and regulation 227 that occurred during the reporting period.

6 Number of lost-time injuries

The total number of incidents referred to in clause 5 that involved injury or disease of a mine worker that resulted in the inability of the worker to work for 1 day or more (not includ-

ing the incident day) during the reporting period (whether the worker is rostered on that day or not).

7 Days lost from work

The total number of days (not including the incident day) lost from work by mine workers as a result of accidents referred to in clause 5 during the reporting period.

8 Number of alternative duties injuries

The total number of accidents referred to in clause 5 that involved injury or disease of a mine worker that resulted in the worker being on alternative duties during the reporting period.

9 Number of alternative duty days

The total number of days (not including the accident day) on which mine workers worked on alternative duties during the reporting period as a result of accidents referred to in clause 8.

10 Number of medical treatment injuries

- (1) The total number of work-related injuries of mine workers that required medical treatment during the reporting period but did not require a day lost from work or alternative duties (other than the accident day).
- (2) In subclass (1), **medical treatment** means the management or care of a patient, and—
 - (a) includes—
 - (i) the suturing of a wound; and
 - (ii) the treatment of fractures; and
 - (iii) the treatment of bruises by drainage of blood; and
 - (iv) the treatment of second- and third-degree burns; but
 - (b) does not include diagnostic procedures, observation, counselling, first aid, or therapeutic measures taken solely for preventative purposes.

11 Number of fatalities

The total number of fatalities that occurred during the reporting period as a result of an accident referred to in clause 5.

12 Reporting figures to specify employees of mine operator separately

Each amount required by clauses 3 to 11 to be reported must be supplied in a form showing the total amount separated in respect of the following 2 categories:

- (a) mine workers employed by the mine operator; and
- (b) mine workers other than employees of the mine operator.

Rebecca Kitteridge,
Clerk of the Executive Council.

Issued under the authority of the Legislation Act 2012.
Date of notification in *Gazette*: 12 December 2013.

Reprints notes

1 *General*

This is a reprint of the Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013 that incorporates all the amendments to those regulations as at the date of the last amendment to them.

2 *Legal status*

Reprints are presumed to correctly state, as at the date of the reprint, the law enacted by the principal enactment and by any amendments to that enactment. Section 18 of the Legislation Act 2012 provides that this reprint, published in electronic form, will have the status of an official version once issued by the Chief Parliamentary Counsel under section 17(1) of that Act.

3 *Editorial and format changes*

Editorial and format changes to reprints are made using the powers under sections 24 to 26 of the Legislation Act 2012. See also <http://www.pco.parliament.govt.nz/editorial-conventions/>.

4 *Amendments incorporated in this reprint*

Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013 (SR 2013/483): regulation 237

APPENDIX 4 RESOURCE CONSENTS



Resource Consent

RESOURCE MANAGEMENT ACT 1991
Consent No. WGN050352 [24540]
Category: Discharge permit

Pursuant to sections 104B and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Kiwi Point Quarry Business Unit, Wellington City Council	
Address	P O Box 2199, Wellington	
Term of consent	Effective: 6 July 2005	Expires: 6 July 2020
Purpose for which right is granted	To discharge contaminants to air from the operation of a cleanfill.	
Location	Kiwi Point Quarry, Centennial Highway, Ngauranga at or about map reference NZMS 260: R27;611.951	
Legal description of land	Lots 1, 2 and 3 DP 72995	
Volume/quantity/rate	NA	
Conditions	1-15 as attached	

For and on behalf of
 WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: 6 July 2005



Conditions to Resource Consent

WGN050352 [24540]

- (1) The location, design, implementation and operation of the works shall be in accordance with the consent application and its associated plans and documents lodged with the Wellington Regional Council on 2 June 2005, and amendments received by fax on 28 June 2005.
- (2) The permit holder shall pass a copy of this consent including any relevant site plans and attachments to the operator undertaking the works.
- (3) The Manager, Consent Management shall be given a minimum of 48 hours notice prior to works commencing.
- (4) Only material such as clay, soil, rock, concrete, or brick, that are free of combustible or putrescible components or hazardous substances or materials likely to create a hazardous leachate by means of biological breakdown, shall be deposited within the cleanfill site.

Materials considered to meet the above definition are outlined in Table 4.1 of the publication A Guide to the Management of Cleanfills by Ministry for the Environment (2002).

- (5) Cleanfill shall only be deposited in Areas A, B, C and D identified on the aerial photo attached to the application as Appendix One.
- (6) The permit holder shall ensure that there shall be no discharges to air resulting from the exercise of this consent that are noxious, dangerous, offensive or objectionable at or beyond the legal boundary of the property where the activity is to be carried out, being Lots 1, 2 & 3 DP 72995.
- (7) All work areas associated with the operation of the cleanfill are to be managed in such a way as to keep fugitive dust emissions to a minimum. This shall include, but not be limited to wetting unsealed areas with sufficient water as required.
- (8) The permit holder shall operate the cleanfill in accordance with Kiwi Point Quarry Quality Procedures, subject to any changes required to meet the conditions of this consent. A copy of this document shall be forwarded to the Manager, Consents Management within two months of commencement of the activity authorised by this permit.
- (9) Upon achieving the desired completion levels (as identified in the rehabilitation plan) cleanfilled areas shall be topsoiled and planted upon completion. The topsoil shall be of sufficient depth such that no concrete or other rubble is visible. Vegetation shall be established as soon as practical after topsoiling.
- (10) The permit holder shall supply a copy of the comprehensive rehabilitation plan to the Manager, Consents Management, within six months of commencement of the activity authorised by this permit. This plan should include details of the final levels of rehabilitated areas and details of the proposed plantings to occur and timeframes from completion.
- (11) Depositing of cleanfill shall be supervised by Kiwi Point Quarry Staff at all times.
- (12) The permit holder shall record details of each load of material that is deposited within the cleanfill, including:
 - (a) the date and time of receipt of the material at the cleanfill site;
 - (b) quantity;
 - (c) source;
 - (d) description of material deposited (e.g. soil, concrete, bricks);
 - (e) name of the contractor depositing the material;


6/7/05

This information shall be forwarded to the Manager, Consents Management, Wellington Regional Council at periods ending 31 March and 30 September each year, and shall be made available for inspection when requested.

- (13) The permit holder shall keep a permanent record of any complaints received alleging adverse effects from the permit holder's operations. The complaints record shall contain the following where practicable:
- (a) the name and address of the complainant, if supplied;
 - (b) identification of the nature of the complaint;
 - (c) date and time of the complaint and alleged event;
 - (d) weather conditions at the time of the alleged event;
 - (e) results of the permit holder's investigations; and,
 - (f) any mitigation measures adopted.

The complaints' record shall be made available to the Wellington Regional Council on request.

The permit holder shall notify the Manager, Consents Management, Wellington Regional Council, of any complaints received, which relate to the exercise of this permit, within 24 hours of being received, or the next working day.

- (14) The permit holder shall keep a record of any incident that has or could have resulted in a condition of this permit being contravened. The incident record shall be made available to the Wellington Regional Council upon request.

The permit holder shall notify the Manager, Consents Management, Wellington Regional Council of any such incident, within twenty four hours of the incident being brought to the attention of the permit holder, or the next working day.

- (15) The Wellington Regional Council may review any or all conditions of this permit by giving notice of its intention to do so pursuant to section 128 of the Resource Management Act 1991, at any time within three months of the first, third, fifth, seventh, ninth, eleventh and thirteenth anniversaries of the date of the granting of this permit for any of the following purposes:
- (a) To deal with any adverse effects on the environment which may arise from the exercise of this permit, and which are appropriate to deal with at a later stage.
 - (b) To review the adequacy of any plans and/or monitoring requirements prepared for this consent so as to incorporate into the permit any modification which may become necessary to deal with any adverse effects on the environment arising from the exercise of this permit.
 - (c) The Wellington Regional Council shall be entitled to recover from the permit holder the actual and reasonable costs of the conduct of any review, calculated in accordance with, and limited to, that council's scale of charges in-force and applicable at that time pursuant to Section 36 of the Resource Management Act 1991.



Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN110099 [30687]

Category: Discharge permit

Pursuant to sections 104B, 105, 107 and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Wellington City Council	
Address	PO Box 2199, Wellington	
Duration of consent	Effective: 14 October 2010	Expires: 14 October 2020
Purpose for which right is granted	To discharge a mixture of treated and settled stormwater runoff and/or treated washwater, into Ngauranga Stream at a maximum rate of 200 litres per second with a maximum suspended solids concentration of 120g/m ³ .	
Location	Kiwi Point Quarry at or about map reference NZMS 260: R227; 2661136.5995042	
Legal description of land	Lot 2 DP 72995 on CT 42C/682	
Conditions	1-18 as attached	

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Gracey Const
Manager, Environmental Regulation
Date: 14/10/10

Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent as you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to change or cancel any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal change to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. If you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information, Greater Wellington may cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It is important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges may be reviewed every year. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not give effect to it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If you wish to apply for an extension of this lapse date please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is awaiting hearing or awaiting settlement by the Crown.

Conditions to Resource Consent WGN110099 [30687]

General condition

1. The location, design, implementation and operation of the activity/structure shall be in general accordance with the consent application and its associated plans and documents lodged with the Wellington Regional Council on 17 September 2010.

For the avoidance of doubt, where information contained in the application is contrary to conditions of this consent, the conditions shall prevail.

2. The consent holder shall ensure that a copy of this consent and all documents and plans referred to in this consent, are kept on site at all times and presented to any Wellington Regional Council officer on request.

Receiving water standards

3. The discharge of stormwater and /or washwater shall not result in any of the following effects in the Ngauranga Stream after reasonable mixing in up to a 2 year return period rain event downstream of the two discharge points:

- The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
- Any conspicuous change in colour or visual clarity;
- Any emission of objectionable odour;
- Any significant adverse effects on aquatic life.

Note: A two year rain event is deemed to have occurred when more than 60mm of rain has been recorded at the Greater Wellington Regional Council, Seton Nossiter Park raingauge monitoring site, over a 12 hour period.

Suspended solids and ph levels

4. During wet weather (in up to a two year return period event) the suspended solids content of the discharge shall not exceed 120g/m³.
5. During dry weather the suspended solids content of the discharge shall not exceed 15g/m³ unless prior approval is received from the Manager, Environmental Regulation, Wellington Regional Council.
6. The consent holder shall take all practicable steps to minimise the suspended solid content of any discharge to the Ngauranga Stream from the Kiwi Point Quarry site.
7. The consent holder shall ensure that the ph level of the treated stormwater and/or washwater discharge to the Ngauranga Stream does not drop below 5.5 unless prior approval is received from the Manager, Environmental Regulation, Wellington Regional Council.

Ongoing maintenance

8. The consent holder shall ensure that all aspects of the water treatment system are maintained and operated to minimise any discharge to the Ngauranga Stream from the Kiwi Point Quarry site. This should include but not necessarily be limited to reusing water on site.
9. The operation and maintenance of the water treatment system shall be to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council.

14/10/10
[Signature]

Monitoring and reporting requirements

10. To monitor compliance with conditions 4, 5, and 7 of this consent the consent holder shall establish monitoring locations for the treated stormwater and/or washwater discharge and for the Ngauranga Stream up stream of the discharge. The monitoring locations shall be supplied to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council within 1 month of the grant of this consent.
11. The consent holder shall undertake sampling at the locations established in condition 10 of this consent whenever 20mm or more of rain has been received (measured from the Greater Wellington Regional Council Seton Nossiter Park raingauge monitoring site) during the preceding 24 hour period. These samples shall be analysed for suspended solid content and ph level.
12. In addition to the sampling undertaken in accordance with condition 11 of this consent, the consent holder shall undertake sampling at the location established in accordance with condition 10 of this consent on a monthly basis. These samples shall be analysed for suspended solid content and ph level.
13. If results from monitoring undertaken in accordance with condition 11 and 12 of this consent show suspended solid concentrations of the treated stormwater and/or wash water exceed 120g/m³ the consent holder shall notify the Manager Environmental Regulation, Wellington Regional Council as soon as possible but no later than 48 hours after the result is detected. The consent holder shall then liaise with the Manager Environmental Regulation, Wellington Regional Council on an appropriate course of action.
14. If results from monitoring undertaken in accordance with condition 11 and 12 of this consent indicate that the discharge of the treated stormwater and/or wash water has a ph level of at, or below 5.5, the dosing of water with liquid coagulant and/or flocculant shall cease immediately. In this event the Manager Environmental Regulation, Wellington Regional Council shall be notified as soon as possible, and within 48 hours of the result being detected. The consent holder shall then liaise with the Manager Environmental Regulation, Wellington Regional Council on an appropriate course of action.
15. The results of samples undertaken in accordance with conditions 11 and 12 of this consent shall be keep as a permanent record and shall be submitted to the Manager Environmental Regulation in the form of a annual report no later that 30 June each year, or on request.
16. The consent holder shall undertake ongoing investigation and implementation of measures to reduce suspended solid concentrations in discharges to the Ngauranga Stream. The investigation shall be undertaken to the satisfaction of the Manager, Environmental Regulation, Greater Wellington Regional Council.
17. The consent holder shall submit the results of the investigation including measures implemented undertaken in accordance with condition 16 of this consent to the Manager, Environmental Regulation, Greater Wellington Regional Council as part of the annual report required by condition 15 of this consent.

Review

18. The Wellington Regional Council may review any or all conditions of this consent by going notice to do so pursuant to section 128 of the Resource Management Act 1991, at any time within six months of the second and fifth anniversary of the date of grant of this consent for either of the following purposes:
 - To review the adequacy, and if necessary amend the monitoring requirements outlined in this consent, and/or
 - To address any adverse effects on the environment which may arise from the exercise of this consent.

The review of conditions shall allow for the deletion or amendment of conditions of this consent; and the addition of such new conditions as are shown to be necessary to avoid, remedy or mitigate any adverse significant adverse effects in the environment.

Note: Additional resource consents from your local council may be required to undertake this proposal. We advise you to contact the Wellington City Council prior to commencing works.

44/01/10



Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN060255 [25159]
Category: Land use consent

Pursuant to sections 104C and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Kiwi Point Quarry Business Unit, Wellington City Council	
Address	PO Box 2199, Wellington 6140	
Term of consent	Effective: 28 November 2006	Expires: 28 November 2016
Purpose for which right is granted	To undertake soil disturbance and vegetation clearance on erosion-prone land.	
Location	Kiwi Point Quarry, Ngauranga Gorge at or about map reference NZMS 260: R27;610.954	
Legal description of land	Lots 1, 2 and 3 DP 72995, Lots 4, 5 and 6 DP 72996, Lot 1 DP 65030, Lot 1 DP 34015, Sec 1 SO 37539, Sec 1 SO 36728.	
Conditions	1-13 as attached	

For and on behalf of
 WELLINGTON REGIONAL COUNCIL

Manager, Environmental Regulation

Date: 28 November 2006



Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent how you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to alter or delete any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal variation to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. So if you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information Greater Wellington may ask the Environment Court to cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It's important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges are usually fixed every three years. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not exercise it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If this lapsing is going to be a problem for you please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You also have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is pending hearing or whether it is a claim that is awaiting settlement by the Crown.

Conditions to Resource Consent

WGN060255 [25159]

- (1) The location, design, implementation and operation of the works shall be in accordance with the consent application and its associated plans and documents lodged with the Wellington Regional Council on 10 March 2006 and further information lodged 3 April 2006, 29 May 2006 and 17 October 2006.

Note: For the purposes of clarity, where there is inconsistencies between the information provided at different times, the most recent information applies; and where there are inconsistencies between the information provided and the conditions of this consent, the conditions shall prevail.

- (2) The Manager, Environmental Regulation, Wellington Regional Council, shall be given a minimum of 48 hours notice prior to the works commencing in each development Area (identified as Areas D, G and F in Survey Drawing number 0068R055 supplied on 29 May 2006).
- (3) The consent holder shall provide a copy of this consent, including conditions, and site plans lodged with the application, and the erosion and sediment control plan to any contractor undertaking works authorised by this consent, prior to works commencing.
- (4) A copy of this consent, and the Erosion and Sediment Control Plan for each area (as referred to in condition 2) shall be held on site for the duration of works and be made available to any Wellington Regional Council officer on request.
- (5) An annual work programme shall be provided by 31 May each year. The work programme shall outline the general work in each area (as referred to in condition 2) to be undertaken over the next 12 months.
- (6) The consent holder shall prepare an Erosion and Sediment Control Plan (ESCP) for each Area and submit that ESCP to the Manager, Environmental Regulation, Wellington Regional Council for approval, at least 5 working days prior to works commencing in that Area. The ESCP shall include the following:
 - Details of what erosion and sediment control measures are to be implemented, and design information regarding these;
 - Location of individual erosion and sediment control measures;
 - Catchment boundaries for the sediment controls, and stormwater flow directions;
 - A maintenance schedule for all sediment control measures, and a template checklist to be used for weekly/monthly compliance audits by consent holder;
 - A staging programme for managing the exposed areas, including progressive stabilisation; and
 - The identification of experienced staff to ensure the consent conditions and ESCP are adhered to, and emergency contact phone number(s) for those persons.

The consent holder shall obtain the written approval of the Manager, Environmental Regulation, Wellington Regional Council for the ESCP prior to soil disturbance commencing. Any amendments to the ESCP shall also be approved in writing.

- (7) The consent holder shall ensure that all sediment-laden runoff from the site is treated in accordance with any ESCP approved under condition 6.
- (8) All works and measures details in each ESCP shall be operational prior to commencement of works within each area, and be maintained to perform at full operational capacity until each area has been adequately stabilised in accordance with condition 11.

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- (9) All erosion and sediment control measures shall be installed, operated and maintained in accordance with the Erosion and Sediment Control Guidelines for the Wellington Region (September 2002) unless written approval has been obtained for the Manager, Environmental Regulation, Wellington Regional Council.
- (10) All 'clearwater' runoff from stabilised and unexposed surfaces including catchment areas above each site shall, as far as practicable, be diverted away from exposed areas.
- (11) No erosion or sediment control measures implemented under the ESCP are to be removed unless that removal is first approved by the Manager, Environmental Regulation, Wellington Regional Council, or the relevant site or area is stabilised.

For the purposes of this condition "stabilised" in relation to a site or areas means an area inherently resistant to erosion or rendered resistant, such as by using indurated rock or by the application of basecourse, colluvium, grassing, mulch, or another method to the reasonable satisfaction of the Manager, Environmental Regulation, Wellington Regional Council. Areas of disturbed land that are greater than 280 from horizontal shall be stabilised by the planting of woody species. Where seeding or grassing is used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once, on reasonable visual inspection by a Wellington Regional Council officer, an 80% vegetative ground cover has been established.

- (12) The consent holder shall take all practicable steps to minimise sedimentation and increased turbidity in surface water as a result of any soil disturbance, including:
 - (a) installing and maintaining appropriate sediment control measures;
 - (b) completing all works in the minimum time practicable;
 - (c) avoiding working in extended wet periods; and
 - (d) ensuring, as far as practicable, soil and excavated material is kept well away from flowing water.
- (13) All works including tidy up on completion of the works shall be to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council.

20/11/10



Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN050352 [24519]
Category: Water permit

Pursuant to sections 104B and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Kiwi Point Quarry Business Unit, Wellington City Council	
Address	P O Box 2199, Wellington	
Term of consent	Effective: 22 August 2005	Expires: 22 August 2040
Purpose for which right is granted	To permanently divert the upper section of a tributary of the Ngauranga Stream, and to temporarily divert the lower section of a tributary of the Ngauranga Stream.	
Location	Kiwi Point Quarry, Ngauranga Gorge between approximate map references NZMS 260: R27;609.955 and NZMS 260:R27;610.952, and at or about map reference NZMS 260: R27;612.948	
Legal description of land	Lot 1, 2 and 3 DP 72995, Lot 4 DP 72996	
Volume/quantity/rate	NA	
Conditions	1-8 as attached	

For and on behalf of
 WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: 22 August 2005



Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent how you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to alter or delete any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal variation to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. So if you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information Greater Wellington may ask the Environment Court to cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It's important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges are usually fixed every three years. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not exercise it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If this lapsing is going to be a problem for you please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You also have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is pending hearing or whether it is a claim that is awaiting settlement by the Crown.

Conditions to Resource Consent

WGN050352 [24519]

- (1) The location, design, implementation and operation of the works shall be in accordance with the consent application and its associated plans and documents lodged with the Wellington Regional Council on 2 June 2005 and 13 June 2005.
- (2) The Manager, Consents Management, Wellington Regional Council, shall be given a minimum of 48 hours notice prior to the diversion takes place.
- (3) The permit holder shall pass a copy of this permit including any relevant site plans and attachments to the operator undertaking the works.
- (4) The permit holder shall take all practicable steps to minimise sedimentation and increased turbidity in the stream as a result of the works, including:
 - (a) undertaking the work during dry weather and when stream flows are low to moderate;
 - (b) completing all works in the minimum time practicable;
 - (c) avoiding excavated material from entering the flowing channel;
 - (d) minimising works in the flowing channel where practicable;
 - (e) ensuring the digger spends as little time as practicable in the active flowing channel of the stream; and
 - (f) constructing diversion channels in the dry as far as is practicable.
- (5) No contaminants (including but not limited to oil, petrol, diesel and hydraulic fluid) shall be released into the water from equipment being used for the works. No machinery or equipment shall be cleaned, stored or refuelled within 10 metres of the stream bed, and all machinery shall be well maintained at all times to prevent leakage or spillage of oil or other chemicals into the stream.
- (6) Any erosion of the stream bank or bed (including at the confluence with the Ngauranga Stream) that is attributable to the diversion of water carried out as part of this consent shall be repaired by the consent holder, to the satisfaction of the Manager, Consents Management, Wellington Regional Council.
- (7) The permit holder shall ensure that any fish that are stranded during the diversion of water are immediately placed back in the active flowing channel.
- (8) All works affecting the stream including tidy up on completion of the works shall be to the satisfaction of the Manager, Consents Management, Wellington Regional Council.

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24/8/05



Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN060255 [25260]

Category: Land use consent

Pursuant to sections 104B and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Kiwi Point Quarry Business Unit, Wellington City Council	
Address	PO Box 2199, Wellington 6140	
Term of consent	Effective: 28 November 2006	Expires: 28 November 2041
Purpose for which right is granted	To pipe a 20-metre section of a tributary of the Ngauranga Stream and carry out associated disturbance of the stream bed.	
Location	Kiwi Point Quarry, Ngauranga Gorge at or about map reference NZMS 260: R27;613.949	
Legal description of land	Lot 5 DP 72996.	
Conditions	1-9 as attached	

For and on behalf of
WELLINGTON REGIONAL COUNCIL


Manager, Environmental Regulation

Date: 28 November 2006



Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent how you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to alter or delete any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal variation to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. So if you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information Greater Wellington may ask the Environment Court to cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It's important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges are usually fixed every three years. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not exercise it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If this lapsing is going to be a problem for you please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You also have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is pending hearing or whether it is a claim that is awaiting settlement by the Crown.

Conditions to Resource Consent WGN060255 [25260]

- (1) The location, design, implementation and operation of the works shall be in accordance with the consent application and its associated plans and documents lodged with the Wellington Regional Council on 10 March 2006 and further information lodged 3 April 2006, 29 May 2006 and 17 October 2006.
- (2) The Manager, Environmental Regulation, Wellington Regional Council, shall be given a minimum of 48 hours notice prior to the works commencing.
- (3) The consent holder shall provide a copy of this consent, including conditions, and site plans lodged with the application to any contractor undertaking works authorised by this consent, prior to works commencing.
- (4) A copy of this consent shall be held on site for the duration of the works and be made available to any Wellington Regional Council officer upon request.
- (5) The consent holder shall take all practicable steps to minimise sedimentation and increased turbidity in the stream as a result of the works, including:
 - (a) undertaking the work during dry weather and when stream flows are low to moderate;
 - (b) completing all works in the minimum time practicable;
 - (c) avoiding excavated material from entering the flowing channel;
 - (d) diverting or pumping, or both, the flow of the stream around the work site during excavation and construction works; and
 - (e) ensuring, as far as practicable, that no construction materials or debris enter flowing water.
- (6) No contaminants (including but not limited to oil, petrol, diesel and hydraulic fluid) shall be released into the water from equipment being used for the works. No machinery or equipment shall be cleaned, stored or refuelled within 10 metres of the stream bed, and all machinery shall be well maintained at all times to prevent leakage or spillage of oil or other chemicals into the stream.
- (7) The works shall remain the responsibility of the consent holder and shall be maintained so that:
 - (a) any erosion of the stream bed or banks (including at the confluence with the Ngauranga Stream) that is attributable to the works carried out as part of this consent is repaired by the consent holder, to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council; and
 - (b) fish passage is not impeded upon completion of the works.
- (8) The consent holder shall ensure that any fish that are stranded during the works are immediately placed back in the clear flowing water.
- (9) All works affecting the stream including tidy up on completion of the works shall be to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council.

20/11/06



Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN050352 [24518]
Category: Land use consent

Pursuant to sections 104B and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Kiwi Point Quarry Business Unit, Wellington City Council	
Address	P O Box 2199, Wellington	
Term of consent	Effective: 22 August 2005	Expires: 22 August 2040
Purpose for which right is granted	To pipe and reclaim two sections of a tributary of the Ngauranga Stream, and carry out the associated disturbance of the stream bed.	
Location	Kiwi Point Quarry, Ngauranga Gorge between approximate map references NZMS 260: R27;609.955 and NZMS 260:R27;610.952, and at or about map reference NZMS 260: R27;612.948	
Legal description of land	Lot 1, 2 and 3 DP 72995, Lot 4 DP 72996	
Volume/quantity/rate	NA	
Conditions	1-8 as attached	

For and on behalf of
 WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: 22 August 2005



Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent how you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to alter or delete any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal variation to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. So if you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information Greater Wellington may ask the Environment Court to cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It's important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges are usually fixed every three years. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not exercise it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If this lapsing is going to be a problem for you please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You also have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is pending hearing or whether it is a claim that is awaiting settlement by the Crown.

Conditions to Resource Consent

WGN050352 [24518]

- (1) The location, design, implementation and operation of the works shall be in accordance with the consent application and its associated plans and documents lodged with the Wellington Regional Council on 2 June 2005 and 13 June 2005.
- (2) The Manager, Consents Management, Wellington Regional Council, shall be given a minimum of 48 hours notice prior to the works commencing.
- (3) The consent holder shall provide a copy of this consent, including conditions, and site plans lodged with the application to any contractor undertaking works authorised by this consent, prior to works commencing.
- (4) The consent holder shall take all practicable steps to minimise sedimentation and increased turbidity in the stream as a result of the works, including:
 - (a) undertaking the work during dry weather and when stream flows are low to moderate;
 - (b) completing all works in the minimum time practicable;
 - (c) avoiding excavated material from entering the flowing channel;
 - (d) minimising works in the flowing channel where practicable;
 - (e) ensuring the digger spends as little time as practicable in the active flowing channel of the stream;
 - (f) constructing diversion channels in the dry as far as is practicable; and
 - (g) ensuring reclamation does not occur until piping has been completed.
- (5) No contaminants (including but not limited to oil, petrol, diesel and hydraulic fluid) shall be released into the water from equipment being used for the works. No machinery or equipment shall be cleaned, stored or refuelled within 10 metres of the stream bed, and all machinery shall be well maintained at all times to prevent leakage or spillage of oil or other chemicals into the stream.
- (6) The works shall remain the responsibility of the consent holder and shall be maintained so that:
 - (a) any erosion of the stream bed or banks (including at the confluence with the Ngauranga Stream) that is attributable to the works carried out as part of this consent is repaired by the consent holder, to the satisfaction of the Manager, Consents Management, Wellington Regional Council; and
 - (b) fish passage is not impeded during the works, or upon completion of the works.
- (7) The permit holder shall ensure that any fish that are stranded during the works are immediately placed back in the clear flowing water.
- (8) All works affecting the stream including tidy up on completion of the works shall be to the satisfaction of the Manager, Consents Management, Wellington Regional Council.

22/8/05



Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN130058 [31916]**Category: Water permit
Surface water take**

Pursuant to sections 104B and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Wellington City Council	
Address	PO Box 2199, Wellington 6140	
Duration of consent	Effective: 8 November 2012	Expires: 8 November 2022
Purpose for which right is granted	To take and use surface water from the Ngauranga Stream using an existing intake structure for use at a quarry including aggregate washing and dust suppression purposes.	
Location	Ngauranga Stream, Kiwi Point Quarry at or about map reference NZTM: 1751199.5433346	
Legal description of land	Lot 2 DP 72995	
Water meter ID number	N/A	
Volume/Quantity/Rate	To take up to 12,707.5m ³ /year, at 55.25m ³ /day, at a calculated average pumping rate of 2.36 litres/second.	
Conditions	1-8 as attached	

For and on behalf of
WELLINGTON REGIONAL COUNCIL


.....
Manager, Environmental Regulation

Date: 8 / 11 / 2012

Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent as you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to change or cancel any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal change to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. If you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information, Greater Wellington may cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It is important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges may be reviewed every year. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not give effect to it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If you wish to apply for an extension of this lapse date please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is awaiting hearing or awaiting settlement by the Crown.

Conditions to Resource Consent WGN130058 [31916]

General condition

1. The location, design, implementation and operation of the take shall be in general accordance with the consent application and its associated plans and documents lodged with the Wellington Regional Council on 21 September 2012.

For the avoidance of doubt, where information contained in the application is contrary to conditions of this consent, the conditions shall prevail.

Note: Any change from the location, design concepts and parameters, implementation and/or operation may require a new resource consent or a change of consent conditions pursuant to section 127 of the Resource Management Act 1991.

Rate and point of take

2. The rate at which water is taken from the Ngauranga Stream at or about approximate map reference NZTM: 1751199.5433346 shall not exceed 12,707.5m³/year, at 55.25m³/day at a calculated average pumping rate of 2.36 litres/second.

Note 1: This equates to 6.5 hours/day and 230 days/year based on the calculated average pumping rate. The point of take, as noted in the map reference above, is deemed to be the location of the intake pipe.

Low flow condition

3. The consent holder shall ensure that the intake structure is operated and maintained such that flows in the Ngauranga Stream immediately downstream of the intake structure are maintained at all times.

Note: The intent of this condition is that no water is abstracted during times of low flow in the stream. This condition does not apply if the stream is not flowing during drought conditions.

Low flow photographs

4. The consent holder shall take photographs during the summer months **each year** for the duration of this consent to record low flows in the Ngauranga Stream. The photographs shall be taken on at least three occasions during the summer months (December to March inclusive) when the stream is in low flow conditions to show that no water is being abstracted at these times.

The photographs shall show the stream flow at the location of the intake structure and the stream channel immediately downstream of the intake structure.

The photographs shall be submitted to the Manager, Environmental Regulation, Wellington Regional Council by **31 March each year**.

All submitted photographs shall include:

- The date and time the photographs were taken
- A description of what the photograph shows

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9/11/12

The photographs and details shall be to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council.

Note 1: Photographic records i.e. electronic picture files from digital cameras can be emailed to notifications@gw.govt.nz. Please include the consent number WGN130058 date and time photographs were taken and a description of the site location (e.g. map reference, address).

Intake structure

5. The intake structure is the responsibility of the consent holder and shall be maintained to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council.

Water conservation and efficient use

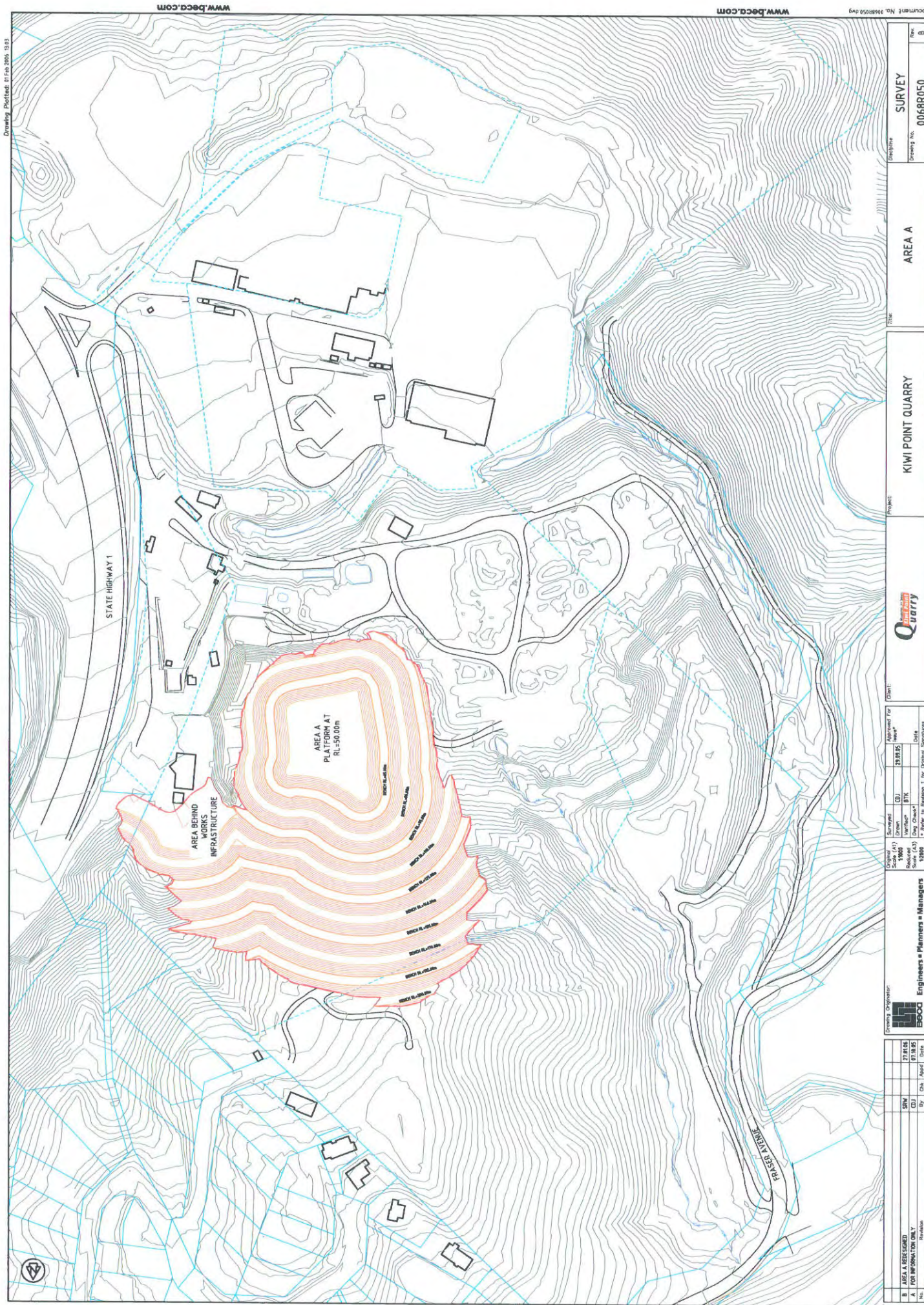
6. The reticulation system and connections shall be designed and maintained so that water does not run to waste.
7. The pump and associated equipment shall be well maintained at all times to prevent leakage or spill of oil or other chemicals into Ngauranga Stream.

Review conditions

8. The Wellington Regional Council may review any or all conditions of this consent by giving notice of its intention to do so pursuant to section 128 of the Resource Management Act 1991, at any time within three months of the 30 June each year for the duration of this consent, for the purpose of:
 - Reviewing surface water allocation requirements; and/or
 - Reviewing low flow restrictions and monitoring requirements; and/or
 - Reviewing metering and reporting requirements; and/or
 - Dealing with any adverse effects on the environment which may arise from the exercise of this consent, and which is appropriate to deal with at a later stage; and/or
 - Enabling consistency with the relevant Regional Plan(s)

..... 8/11/2012

APPENDIX 5 NORTH FACE STAGING PLANS



Drawing: Projected: 81 Feb 2005 13:53

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Drawing: Projected: 81 Feb 2005 13:53 www.becq.com		Drawing No. 0068R050 Rev. B		SURVEY 0068R050	
Project:		Title:		AREA A	
Client:		Project:		KIWI POINT QUARRY	
Drawing:		Surveyed:		Approved For:	
Original (A)	Scale:	Drawn:	Date:	Name:	Date:
Reduced (B)	1:5000	Written:	29.03.05	BK	BK
Revised (C)	1:5000	Checked:	29.03.05	BK	BK
No.	Date	By:	Date	By:	Date
1	27.01.05	BK	27.01.05	BK	27.01.05
2	27.01.05	BK	27.01.05	BK	27.01.05
3	27.01.05	BK	27.01.05	BK	27.01.05
4	27.01.05	BK	27.01.05	BK	27.01.05
5	27.01.05	BK	27.01.05	BK	27.01.05
6	27.01.05	BK	27.01.05	BK	27.01.05
7	27.01.05	BK	27.01.05	BK	27.01.05
8	27.01.05	BK	27.01.05	BK	27.01.05
9	27.01.05	BK	27.01.05	BK	27.01.05
10	27.01.05	BK	27.01.05	BK	27.01.05
11	27.01.05	BK	27.01.05	BK	27.01.05
12	27.01.05	BK	27.01.05	BK	27.01.05
13	27.01.05	BK	27.01.05	BK	27.01.05
14	27.01.05	BK	27.01.05	BK	27.01.05
15	27.01.05	BK	27.01.05	BK	27.01.05
16	27.01.05	BK	27.01.05	BK	27.01.05
17	27.01.05	BK	27.01.05	BK	27.01.05
18	27.01.05	BK	27.01.05	BK	27.01.05
19	27.01.05	BK	27.01.05	BK	27.01.05
20	27.01.05	BK	27.01.05	BK	27.01.05
21	27.01.05	BK	27.01.05	BK	27.01.05
22	27.01.05	BK	27.01.05	BK	27.01.05
23	27.01.05	BK	27.01.05	BK	27.01.05
24	27.01.05	BK	27.01.05	BK	27.01.05
25	27.01.05	BK	27.01.05	BK	27.01.05
26	27.01.05	BK	27.01.05	BK	27.01.05
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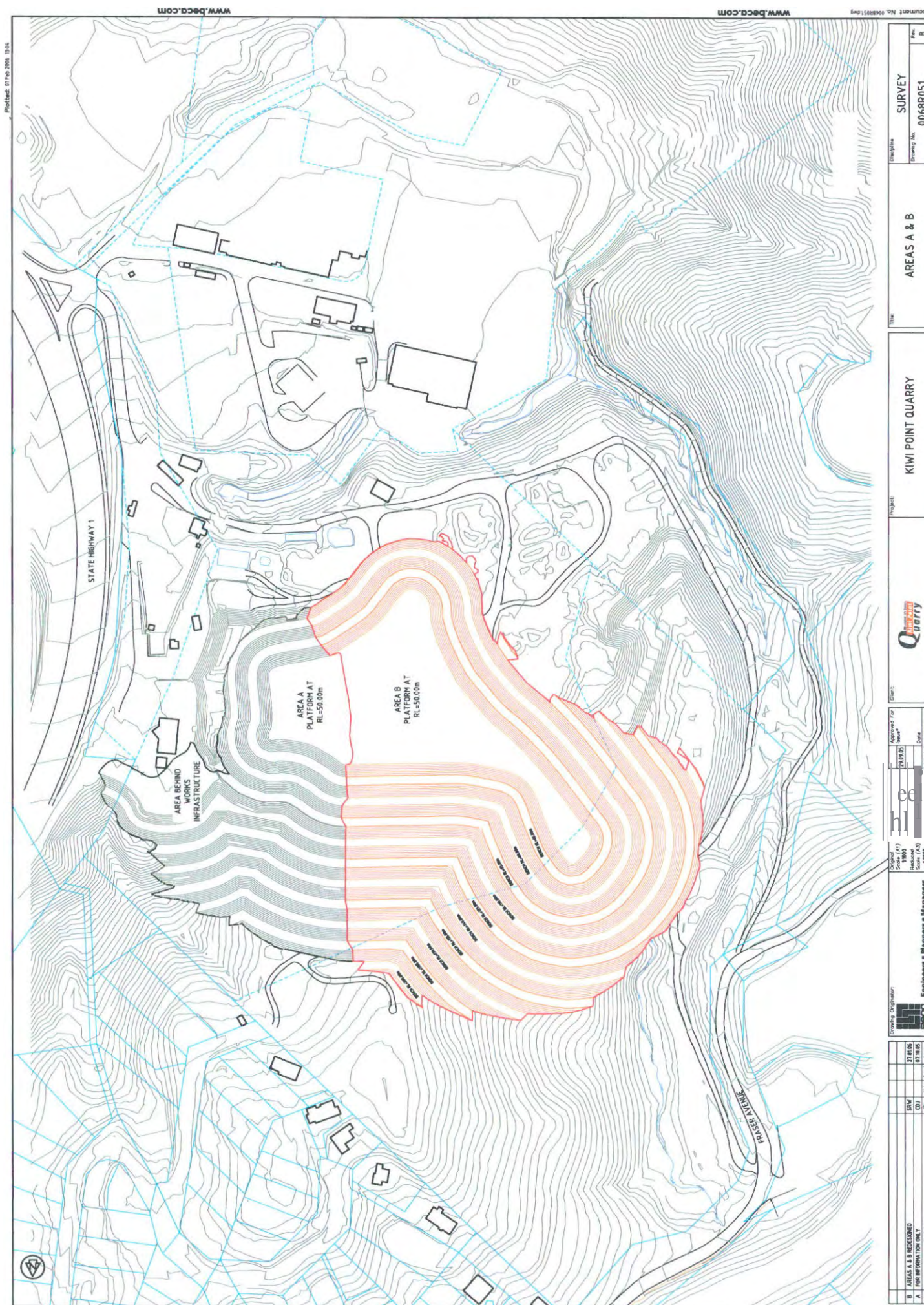
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Engineers & Planners & Managers

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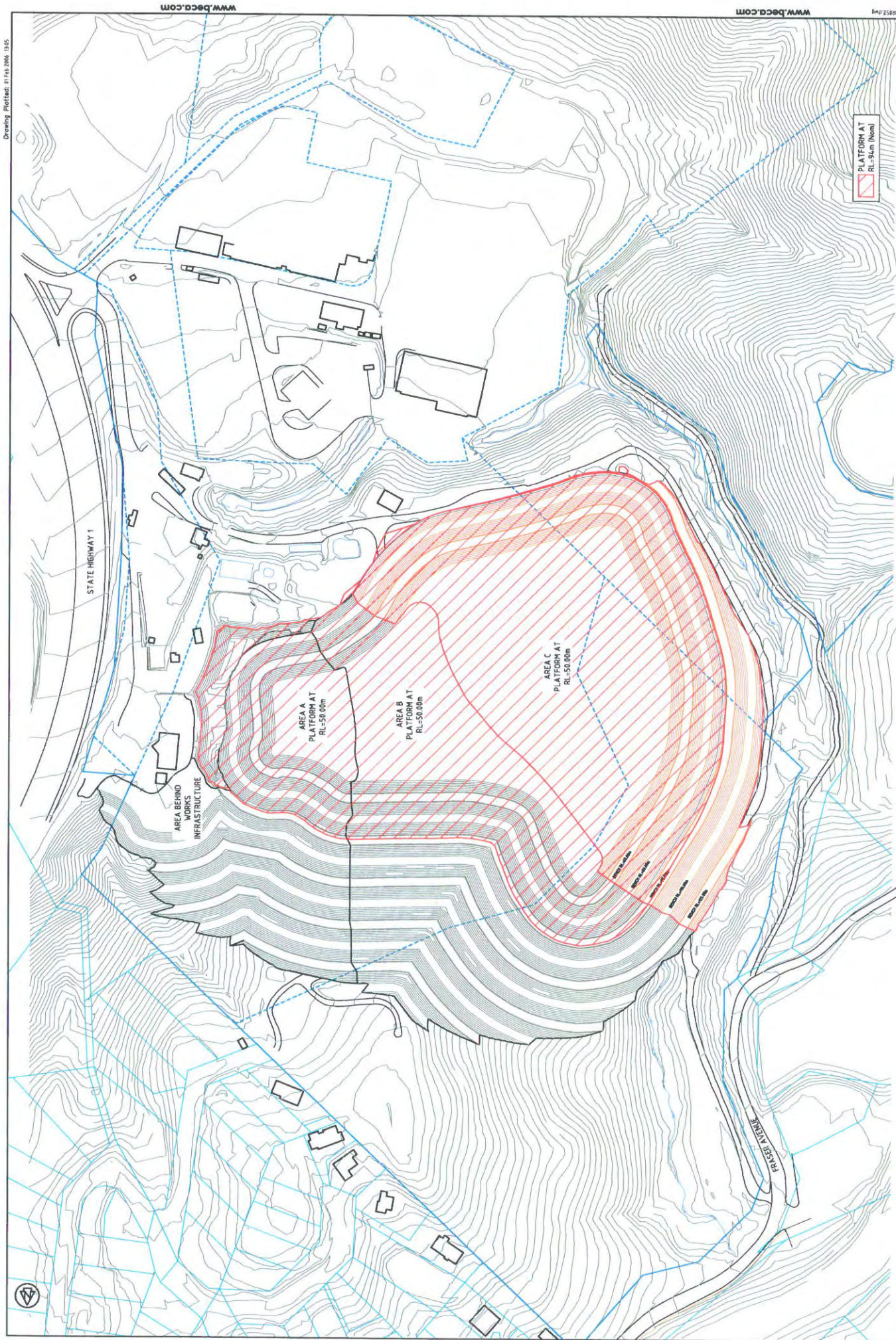
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NO. 1 B AREAS A & B REDESIGNED A FOR INFORMATION ONLY Revision		Date: 27/01/05 By: [Signature]	Date: 17/08/05 By: [Signature]	Date: 27/01/05 By: [Signature]	Date: 17/08/05 By: [Signature]
Forming Organisation BOCO Engineers & Planners & Managers		Scale (A1) Scale (A2) Scale (A3) Scale (A4)		Approved For Date Original Signature	
Project KIWI POINT QUARRY				Title AREAS A & B	
Description SURVEY		Drawing No. 0068R051		Sheet B	

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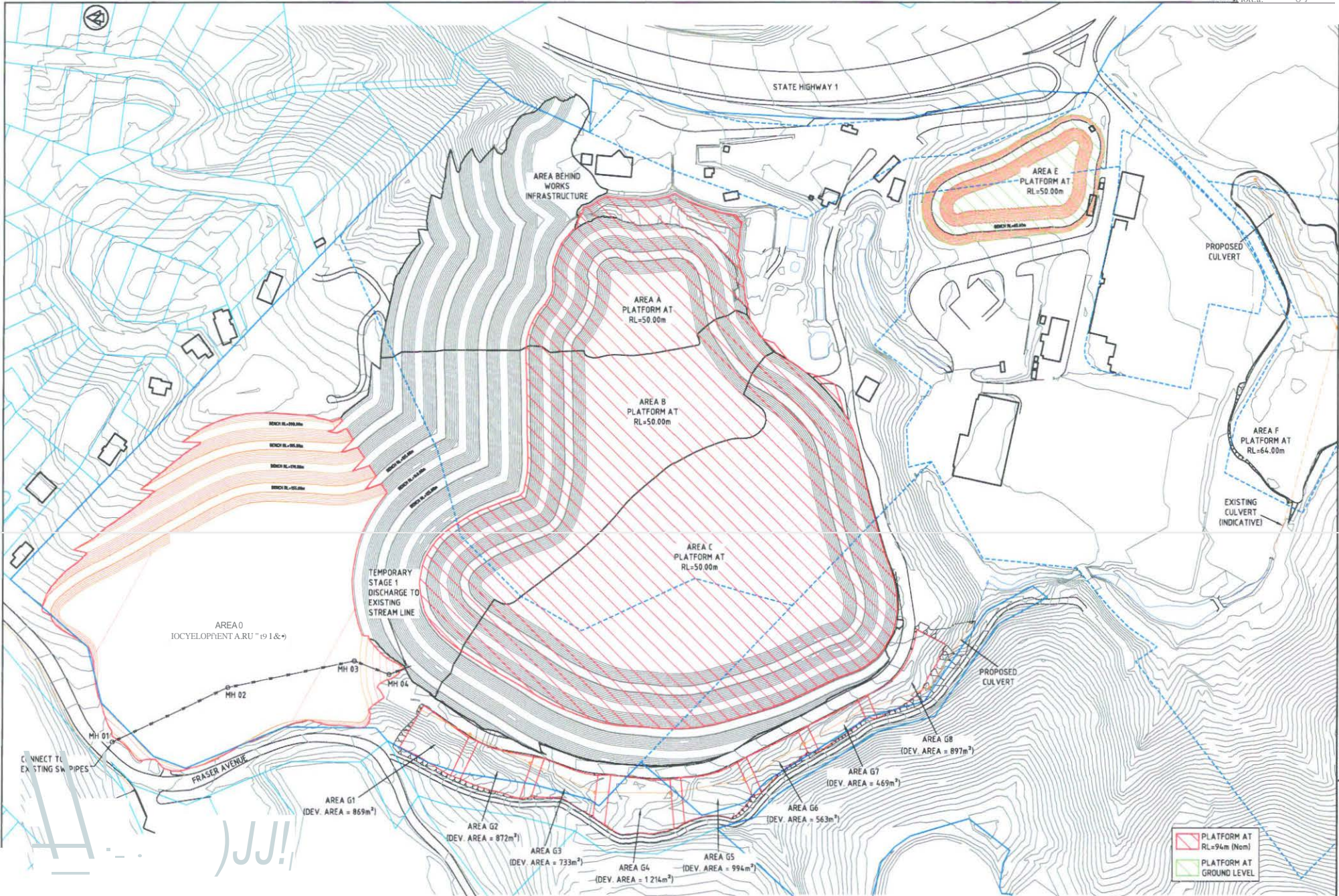


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AREAS A, B & C DEVELOPED FOR INFORMATION ONLY No. 1 Revision		Date: 31 MAR 05 By: CDJ Drawn: CDJ Checked: CDJ Date: 07 MAR 05		Engineers & Planners & Managers 		Drawing Designer:		Approved For Issue: 29 FEB 05 Date:		Checked:		Project: KIWI POINT QUARRY		Title: AREAS A, B & C		Drawing No: 0068R052		Survey: SURVEY		Scale: B	
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CDJ	07.10.05
MY	08.09.05

Drawing Originator:
BECA Engineers • Planners • Managers

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Reduced Scale (A3)	1:2000	Verified*	Dwg Check*			Date

* Refer to Revision 1 for Original Signatures

Client:
Quarry

Project: **KIWI POINT QUARY**

Title: **AREAS A - G**

Client: **SURVEY**
 Drawing No. **0068R053**
 Rev: **B**



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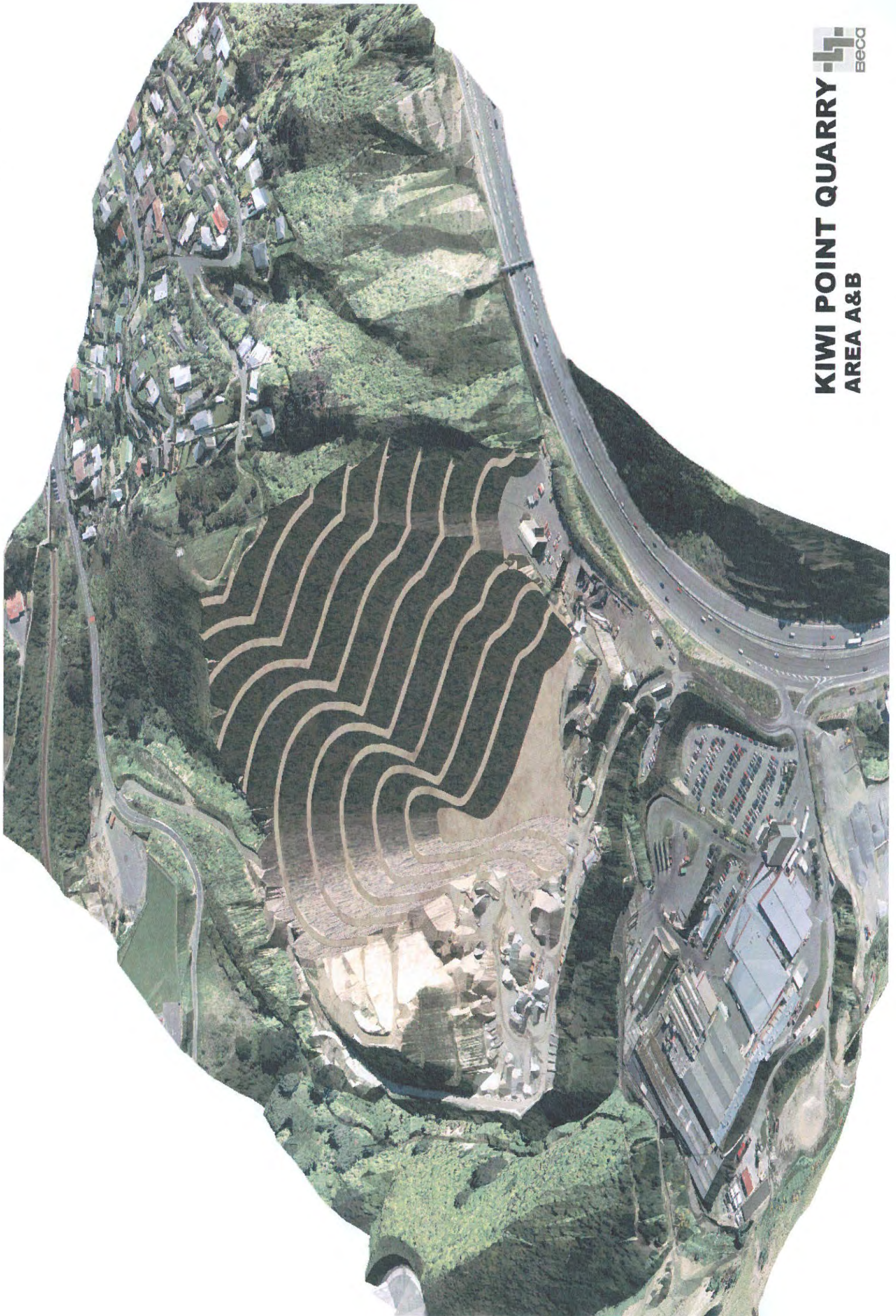


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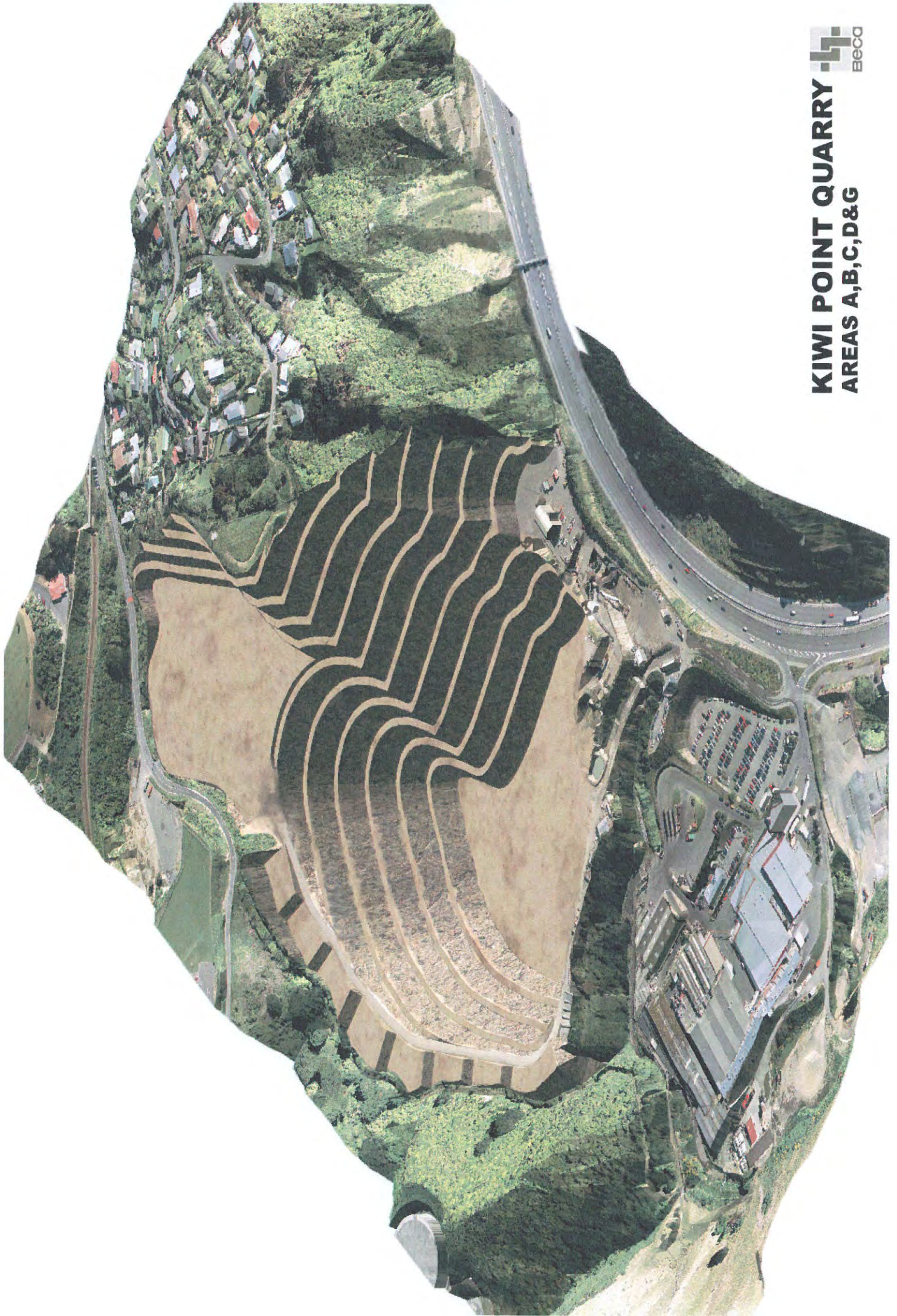
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KIWI POINT QUARRY
AREA A&B





KIWI POINT QUARRY
AREAS A, B, C, D & G





KIWI POINT QUARRY
AREAS A,B,C,D&G
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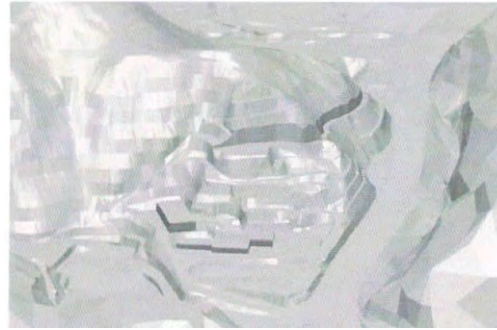


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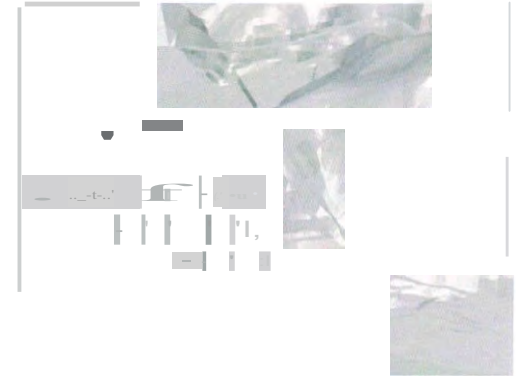
APPENDIX 6 SOUTH FACE CONCEPT STAGING PLANS



Stage 1 - Initial Road Access to South Face (Volume=21,500m³)



End of Stage 1 - View looking towards South Face



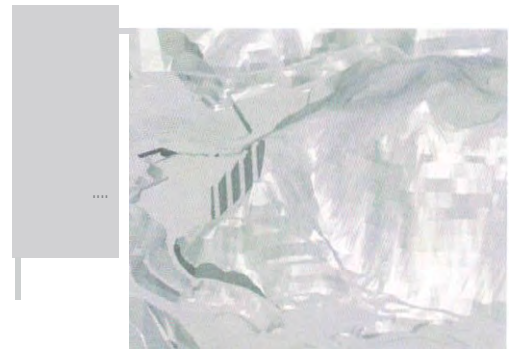
End of Stage 1 - View looking towards North Face

RL Q4

Stage 2 - Excavation of South Face to RL94 (Volume=305,400m³)



End of Stage 2 - View looking towards South Face



End of Stage 2 - View looking towards North Face

BOFFA
MISKELL

NOTION FATHWBKS

Temporary regular benching, as shown, is required for slope stability and working access. The final face will be finished with vertical benching, gradients and ground conditions to appear more rural in landscape.

KIWI POINT QUARRY
SOUTHERN EXTENSION
Development - Stages 1-2

NOTION ILLUSTRATIONS

The views are from the oblique viewpoints. The views are illustrative and do not represent any actual or proposed ground views.

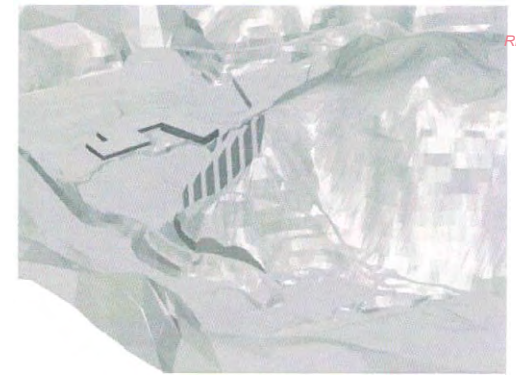
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FIGURE 20
1 - May 2004

Stage 3A- Excavation of South Face to

RL52(Volume=1,035,500m3)

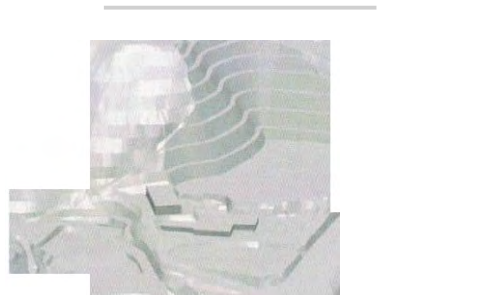


End of Stage 3A- View looking towards South Face



RL52

End of Stage 3A- View looking towards North Face



End of Stage 36 - View looking towards South Face



End of Stage 36- View looking towards North Face

Stage 38 - Advanced Excavation of South Face at RL52

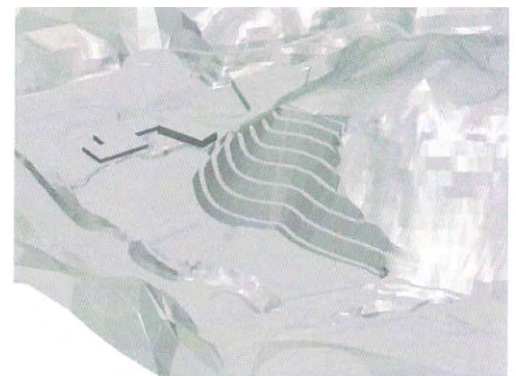
RL84

RL52

Stage 4 - Excavation to RL52 (Volume=1,078,800m3)



End of Stage 4 - View looking towards South Face



End of Stage 4 - View looking towards North Face



End of Stage 5 - View looking towards South Face



End of Stage 5 - View looking towards North Face



End of Stage 6 - View looking towards South Face



End of Stage 6 - View looking towards North Face

APPENDIX 7 BUDGET DETAILS 08/09 TO 18/19

C556 - Kiwi Point Quarry	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
Re vegetation											
Retired pasture											
Fencing	5,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Planting	11,000	27,000	27,000	13,000	13,000	13,000	13,000	13,000	13,000	13,000	13,000
Removal of pine trees- Buffer zone		13,000					2,000				
Planting buffer zone			2,000	1,000							
Weed and pest control buffer zone			1,000	1,000	1,000	1,000					
Annual rehabilitation planting plan preparation		8,000	5,000	5,000	8,000	5,000	5,000	8,000	5,000	5,000	8,000
Area A											
Plant removal			2,000								
Soil improvement/preparation			5,000	2,000	2,000	2,000					
Planting				10,000	2,000	2,000	1,000	1,000	1,000	1,000	1,000
Pest (e.g rabbits, possum)and weed control			2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Hydro seeding				2,000	2,000	1000					
Area B											
Plant removal					2,000						
Soil improvement/preparation					5,000	2,000	2,000	2,000			
Planting						10,000	2,000	2,000	1,000	1,000	1,000
Pest(e.g rabbits, possum)and weed control					2,000	2,000	2,000	2,000	2,000	2,000	2,000
Hydro seeding						2,000	2,000	1,000			
Area C											
Plant removal							2,000				
Soil improvement/preparation							5,000	2,000	2,000	2,000	1,000
Planting								10,000	2,000	2,000	1,000
Pest (e.g rabbits, possum)and weed control							2,000	2,000	2,000	2,000	2,000
Hydro seeding								2,000	2,000	1,000	
Building											
Mis items require replacement		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Project management cost		31,200	31,200	31,200	31,200	40,000	31,200	31,200	31,200	31,200	31,200
Legal and consulting		10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Fencing											
Depends on the out come of Plan Change											
Total	16,000	95,200	91,200	83,200	86,200	98,000	87,200	94,200	79,200	78,200	78,200

APPENDIX 8 STORMWATER MANAGEMENT PLAN

Wellington City Council

Stormwater Management Plan

Kiwi Point Quarry

Stormwater Management Plan

Kiwi Point Quarry

Prepared By Romae Duns
Manager, Resource &
Environmental Management

Reviewed By Cathy Swan
Environmental Consultant

Opus International Consultants Limited
Environmental
Level 9, Majestic Centre
100 Willis Street, PO Box 12-003
Wellington, New Zealand

Telephone: +64 4 471 7000
Facsimile: +64 4 499 3699

Date: January 2005
Reference: 355226.00
Status: Final

Approved for
issue to Client

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plan.doc

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1 Introduction

Kiwi Point Quarry (KPQ) is a Wellington City Council Business Unit, producing a range of quarry materials and products. KPQ is a site of naturally occurring hard rock that is mined for rock and gravels. The products from quarry operations are used for roading, building and the like. KPQ is an important provider of quarry products within a regional context. It produces about 350,000 tonnes of material per annum. Quarry material used in the Wellington Region is of the order of 2,000,000 tonnes per annum.

KPQ is ISO 9001:2000 registered and is operated to a high standard ensuring compliance with the ISO registration. The quarry is operated in accordance with the *Kiwi Point Quarry Quality Procedure*, which includes specific actions relating to stormwater control. While stormwater management has been addressed by that document, this stormwater management plan has been produced as a separate document at the request of Wellington Regional Council. This plan has been prepared with reference to Wellington Regional Council's *Erosion and Sediment Control Guidelines* and is considered consistent with those guidelines.

1.1 Resource Consent for Discharge to Water

KPQ operates a discharge of sediment laden stormwater under resource consent WGN950173 [2571]. Condition 9 of this resource consent states

The consent holder shall take all practicable steps to minimise the suspended solids content of the discharge to Ngauranga Stream. The water treatment system shall be operated and maintained efficiently and to the satisfaction of the Manager, Consents Management, Wellington Regional Council, upon request.

This stormwater management plan has been prepared to demonstrate compliance with this condition and to ensure that all practicable steps are taken to minimise the suspended solids content of the discharge to the Ngauranga Stream.

2 Site Layout

KPQ is located in the Ngauranga Gorge to the west of State Highway one, prior to the Newlands off ramp at or about map reference NZMS 260: R27; 611.952. Figure 2.1 shows the general location of KPQ. The legal descriptions of the land are DP 72995, Lot 1 DP 72995, Lot 2 DP72995, and Lot 1 DP65030. Wellington City Council owns the quarry land as well as surrounding land occupied by Taylor Preston Limited and Works Infrastructure. Access to the site is via the existing Quarry/Taylor Preston access way from Ngauranga Gorge.

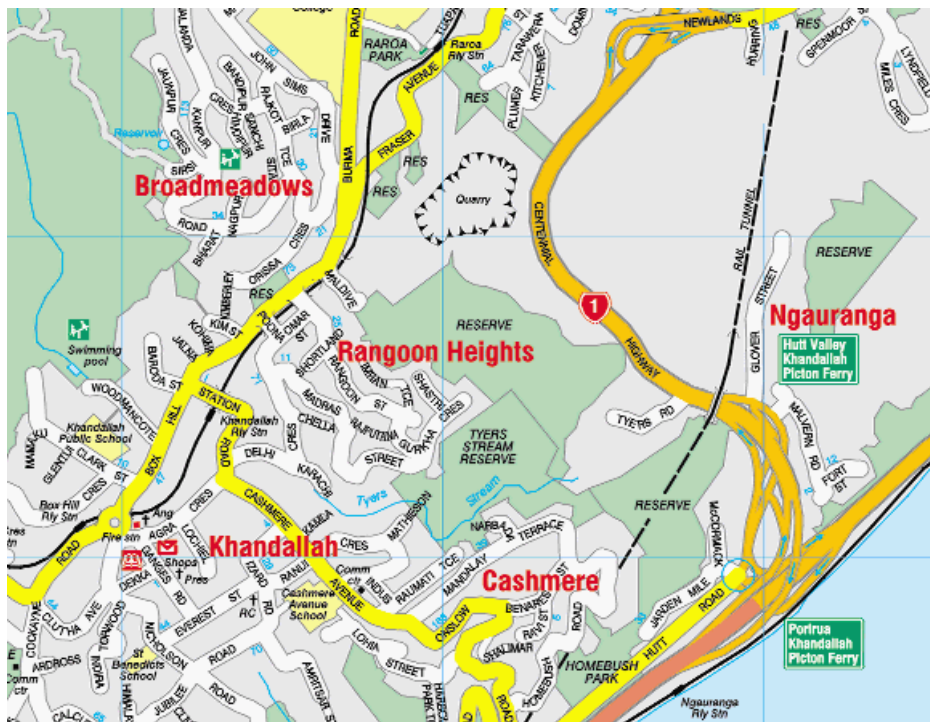
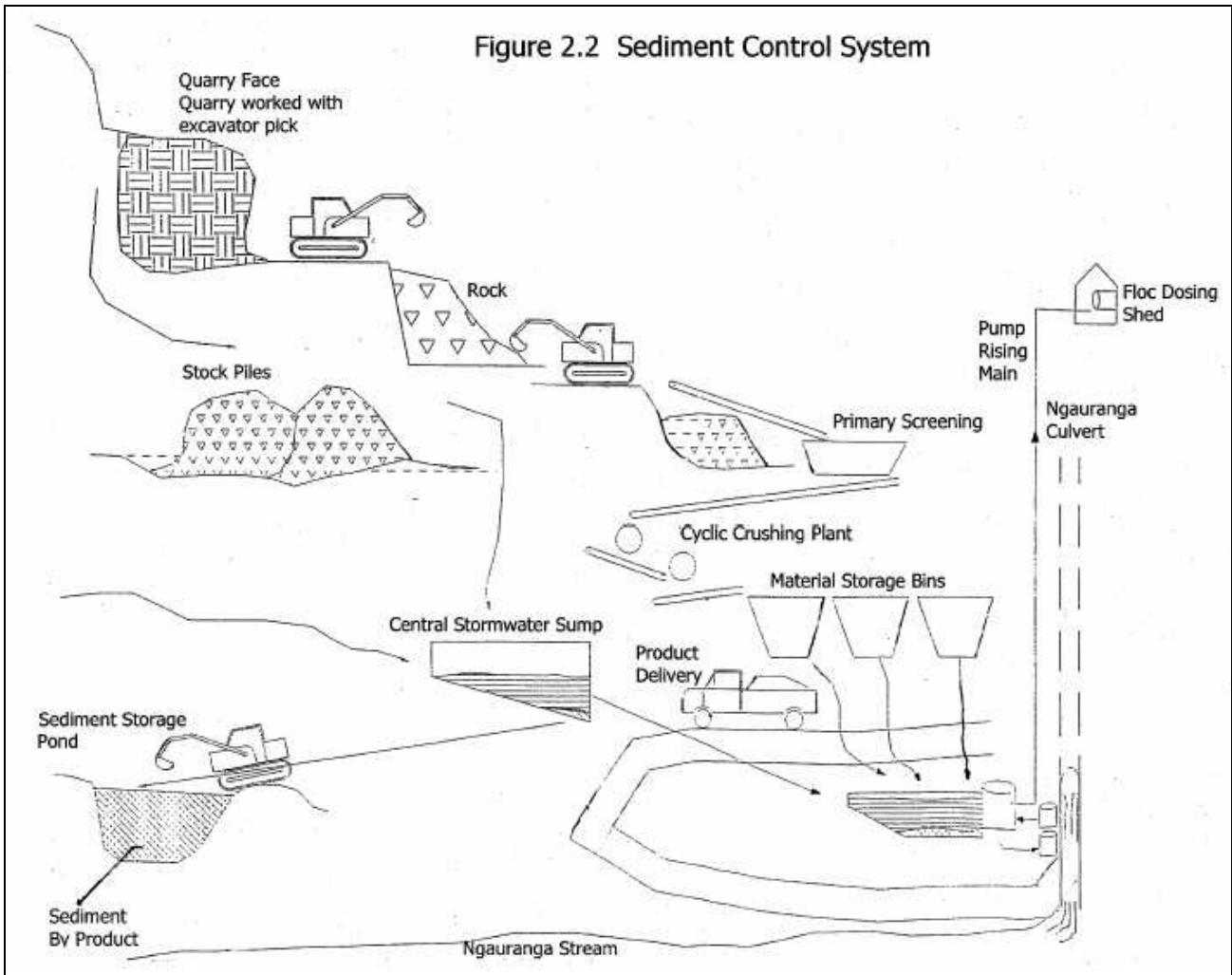


Figure 2.1: Site Location of Kiwi Point Quarry

Figure 2.2 shows the stormwater management system as well as the plant wash water treatment system. These two systems operate independently and the stormwater must be prevented from entering the plant system through maintenance of the bunds and channels discussed in section 4.

The stormwater management system allows for the collection of stormwater that may be contaminated with sediment via a series of bunds and channels. Such areas include the concreted area under the plant, the quarry road and the active face. This stormwater is diverted to a primary retention pond and settled solids are regularly cleared. From primary retention pond it is piped to the main holding pond. Once in the main holding pond the stormwater is dosed with a coagulant, to aid settling of solids prior to discharge to the plant treatment system.

The plant treatment system operates in the following manner. The system used includes a Krebs Cyclone and a Lamella Clarifier Thickener, LT 50. The cyclone removes grit and sand. The Lamella principle utilises a series of closely spaced inclined plates to increase the settling area available per unit of plant area. Solids settle onto and slide down each lamella plate for discharge into the sludge hopper. The process is aided by the addition of a viscous liquid coagulant and a powder flocculant. The coagulant and flocculant additions are controlled via an automatic dosing system. Thickened sludge is then pumped to a sludge pond and subsequently trucked off site for appropriate disposal. The clear treated water is of sufficient quality to be reused and is returned to a collection chamber beside the main settling pond. Any excess water is discharged to Ngauranga Stream.



3 Stormwater Management

Areas within the quarry may be left open for long periods of time and these can be exposed to erosion (wind action and rain). Consequently, KPQ has undertaken actions to ensure that the quarry is well managed to minimise the movement of sediment into Ngauranga Stream. This objective is consistent with condition 9 of resource consent WGN950173. KPQ has established a Quarry Management Plan. This plan sets out the operational (day-to-day) functions of a quarry. Included in that plan is the management of the quarry to minimise erosion and sedimentation. The following sections outline the specific issues that may arise from the on site operations.

3.1 Stormwater

The key to managing stormwater quality is by minimising the amount of water coming into contact with contaminants from the quarry operation. In accordance with this principal, the stormwater is collected in a network of drainage channels by which it is conveyed to the settling ponds. There are no natural watercourses running through the site.

To the maximum degree practicable, wash and process water is collected at the plant and recycled. The solids are removed as it passes through the Lamella plant and any spillage is conveyed via the drainage channels to the settling ponds. Water from the settling ponds is returned to the Lamella plant for processing and any surplus is discharged to the Ngauranga Stream.

As part of the procedures for monitoring and control of the stormwater systems at the quarry, it is the responsibility of the Quarry Manager that resource consent conditions are complied with.

In accordance with the Sediment Control and Erosion Guidelines for the Wellington Region all existing sediment control structures and drain are designed to cater to the 5% AEP rainfall event (20 year return period). Any further structures and drains will also be designed to this standard.

3.2 Sediment Ponds

The sediment ponds must be regularly inspected on a weekly basis to ensure ongoing functionality. The ponds must be emptied once a month and more regularly if required, i.e. after prolonged rainfall events when sediment build up is likely to be significant. If the material excavated is not of saleable quality, it must be disposed of to landfill, unless it is used for site rehabilitation.

3.3 Stockpile Areas

Stockpile areas are used for stockpiling both for raw or finished quarry products prior to further processing or final dispatch. Contaminated runoff in these areas is controlled by drainage channels that ensure all contaminated runoff is diverted to the settling ponds. The stockpiles are positioned and must remain well away from any waterbodies and runoff flow paths.

3.4 Road Access

The access road is a potential source of sediment. The road must be regularly watered to ensure not only dust suppression but also the removal of this sediment to the adjacent grassed area. The access road must be also regularly swept to further minimise sediment build up in this location. Watering must occur on a daily basis and sweeping once a week to ensure there is no sediment build up that could be flushed from the site and to Ngauranga Stream during a significant rainfall event.

3.5 Overburden Disposal

Overburden stripping must only occur over the minimum area practicable to extract the required volume of material. Any overburden material that is not of saleable quality must

be disposed of to landfill and must not be retained on site, unless it is suitable for site rehabilitation.

3.6 Rehabilitation of Worked Out Areas

Planning for rehabilitation is an integral part of all quarry operations. As part of a recent plan change in the Wellington City Council District Plan, KPQ is preparing a comprehensive rehabilitation plan for the quarry. This rehabilitation programme will maintain the site in a condition so that erosion and contaminated runoff are minimised. The plan includes the following

- Establishment of suitable final ground contours.
- Establishment of a suitable environment for vegetation growth.
- Revegetation of the site with suitable vegetation cover.

3.7 Riparian Protection Areas

Riparian protection areas use vegetation to provide a buffer between the quarry operations and the Ngauranga Stream. This margin acts as a physical barrier and sediment trap for diffuse runoff and/or unforeseen discharges. Riparian margins must be regularly maintain to ensure effectiveness.

4 Maintenance Schedule

It is important to develop a maintenance schedule for any control/treatment structures. Resources allocated on designing and constructing control/ treatment structures will be wasted if structures are not adequately maintained. Properly maintained structures provide optimum performance at all times, minimising the adverse environmental effects of the quarry operation. KPQ has made a significant investment ensuring sediment control structures are. Consequently it is important to ensure their functionality as poorly maintained structures are likely to result in unsatisfactory environmental protection despite initially being well designed and constructed.

Inspection and maintenance of control/treatment structures is a high priority at KPQ. Appropriate persons involved in the operation are familiar with all aspects of erosion and sediment control, including the quarry's resource consent conditions.

It is the responsibility of the Quarry Foreperson to ensure that various drainage channels and settling ponds are maintained regularly in accordance with the cleanup duties as listed and at the frequencies shown on the *Quarry Monitoring Check Sheet QF7.1*, Appendix 1.

It is also the responsibility of the Quarry Foreperson to ensure that all drains are maintained twice monthly, including the clearing of silt traps, inlet and outlet structures. The removal of litter, growth, silt etc. as necessary to protect the site from erosion, and to

ensure that surface water is prevented from entering the Ngauranga Stream before the removal of any contaminants. Sediment cleared from the silt ponds and drainage channels is either sold or disposed of to landfill.

Control/treatment structures are inspected after significant rainfall events, or during prolonged rainfall in addition to any regular scheduled inspections, to ensure they are working adequately at all times.

5 Monitoring

In accordance with the resource consents, the Quarry Manager will ensure that all sampling is carried out in accordance with the resource consent. The Quarry Manager shall arrange for the sampling and testing of stormwater and washwater discharge in 6 separate occasions per annum. Testing shall be undertaken by an independent certified testing laboratory, who shall submit their findings to the Quarry Manager with a copy to the Business Unit Manager.

Should the results reveal that any of the contaminant levels have been exceeded then the Quarry Manager shall take the following action:

- Immediately notify the Business Unit Manager, who will in turn notify the Manager, Consents Management, Wellington Regional Council.
- Immediately investigate the reasons for the occurrence and develop a plan to eliminate the cause.
- Retest the stormwater discharge immediately following the result in accordance with the above sampling procedure. This will help determine if it has been an isolated incident.
- If the results of the contaminants that failed the first time are still over the limits, then the following corrective actions shall be taken:
 - Immediately investigate the reasons for the occurrence and develop a plan to eliminate the cause.

6 Complaints Procedure

It is the responsibility of the Quarry Manager or his/her authorised representative to record all complaints. The Quarry Manager is responsible for acting on, rectifying the cause and reporting complaints.

All complaints received in respect of the Quarry discharge shall be recorded on a *Complaints Register Form QF 7.3, Appendix 1*, for the collation into the complaints register, which is maintained by the Office Administrator. The forms record the following details of each complaint received either verbally or in written form:

- Date of complaint
- Date of event
- Name, address and contact details of the complainant (where provided)
- Details of complaint
- Action to resolve the issue/complaint
- Action to prevent further similar complaints
- Date of oral response
- Date of written response

The Quarry Manager shall respond to complaints within the following timeframes following receipt:

- 8 hours – oral response
- 3 days – written response, which confirms details of the complaint and indicates what action has been taken or is proposed to be taken.

It shall be made clear that if the complainant is not satisfied; he or she can contact the Business Unit Manager. Copies of complaint records, including all details shall be forwarded to the Business Unit Manager within 3 days. A summary of all complaints received shall be presented in an annual report to the Manager, Consents Management, Wellington Regional Council.

Appendix One: Quarry Monitoring Check Sheet

Quarry Monitoring Check Sheet
KIWI POINT QUARRY

Quality Form QF 7.1

Completed by:..... Date:..... Signature:.....

Activity Description	D	W	M	6M	Y	Activity Description	D	W	M	6M	Y
Ground Maintenance						Security & Building maintenance					
Grass height within tolerance		✓				Security lights operational	✓				
Weed spraying complete			✓			Buildings clean and tidy	✓				
Sweep Car-park		✓									
Access Way Maintenance						Health & safety					
Potholes repaired		✓				First aid kit stocked			✓		
Access to Quarry face clear	✓					Fire extinguishers operational					
Access ways swept	✓					Check safety clothing stocks			✓		
Dust control measures in place	✓					Radio network operational	✓				
Quarry Operations						Administration					
Dust control measures in place	✓					Plant serviceability forms completed		✓			
Quarry face stable						Complaints system operating			✓		
Process water decontaminated	✓					Complaints doseout status check			✓		
Stockpiles tidy			✓			Annual report data recorded			✓		
Weightbridge area swept	✓					Annual report completed					✓
Signage clear and visible	✓					Training undertaken					
Process & Stormwater control						Non compliance system in place		✓			
Empty silt ponds						Audits undertaken				✓	
Check safety fences	✓					Quality system review undertaken				✓	
Sumps & silt traps clear		✓									
Drainage channels clear			✓								
Ngauranga Stream visual check	✓										
Ngauranga Stream samples tested x6					✓						
Storm water samples tested x6					✓						

REPORT

KIWI POINT QUARRY AIR QUALITY ASSESSMENT

Prepared for Wellington City Council

12 July 2016



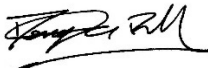


BUILDING A BETTER WORLD

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QUALITY STATEMENT

PROJECT MANAGER		PROJECT TECHNICAL LEAD	
Tom Kerr		Doug Boddy	
PREPARED BY			
Doug Boddy			12/07/2016
CHECKED BY			
Paul Heveldt			11/07/2016
REVIEWED BY			
David Cameron			14/07/2016...
APPROVED FOR ISSUE BY			14/07/2016...

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REVISION SCHEDULE

Rev No	Date	Description	Signature or Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by

Executive Summary

MWH New Zealand Limited (MWH) was commissioned by Wellington City Council to undertake an air quality impact assessment for activities undertaken at the existing Kiwi Point Quarry located off Centennial Highway in Ngauranga, Wellington.

In order to determine the potential for dust nuisance effects in the surrounding community due to dust emissions at the project site, MWH has undertaken a qualitative (risk-based) assessment of the existing and proposed dust emissions on the site and their potential to cause dust nuisance effects beyond the site boundary. In addition, this assessment also involved undertaking a review of the project site's complaints record, in order to predict the level of impact that may be experienced in the surrounding community. According to the Greater Wellington Regional Council's complaints database, there have been three dust nuisance complaints relating to activities undertaken at the Kiwi Point Quarry. These complaints were made on 14 January 2009, 18 December 2009 and 20 December 2011.

Overall, the existing and proposed activities undertaken at the Kiwi Point Quarry are considered to have a slight adverse effect within the surrounding community.

These potential effects are considered to be no more than minor and are based on a consideration of the different magnitude of effects at individual receptor locations, and the sensitivity and type of receptor that would potentially experience these effects. MWH considers that it is unlikely that the Ministry for the Environment's 24-hour mean trigger value of 100 µg/m³ will be exceeded beyond the Kiwi Point Quarry site boundary or at any sensitive receptor location as a result of total suspended particles (TSP) or dust emissions at the quarry. The results of the qualitative assessment indicate that there are unlikely to be any dust nuisance effects beyond the Kiwi Point Quarry site boundary, provided that the mitigation measures recommended in this report are implemented and the existing measures are adhered to.

Furthermore, the results of the assessment indicate that the existing and proposed activities are of low risk, and that the most 'at-risk' receptors are as follows:

- R11 170 Fraser Avenue Medium residual emissions primarily from Areas A, B & C;
- R12 130 Fraser Avenue Small residual emissions primarily from Areas C, D & G;
- R13 134 Burma Road Medium residual emissions primarily from Areas A, B, C, D & G;
- R14 159 Burma Road Small residual emissions primarily from Areas D & G;
- R15 113 Fraser Avenue Small residual emissions primarily from Areas C, D & G; and,
- R16 9 Plumer Street Medium residual emissions primarily from Areas A, B & C.

Based on the results of the qualitative assessment for dust, MWH considers that it is unlikely that there will be any exceedances of the 24-hour mean National Environmental Standard (NES) for particles less than 10 microns in diameter (PM₁₀) beyond the Kiwi Point Quarry site boundary or at any sensitive receptor location as a result of PM₁₀ emissions at the quarry, provided that the mitigation measures recommended in this report are implemented.

Wellington City Council

Kiwi Point Quarry Air Quality Assessment

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1 Introduction

1.1 Project Overview

MWH New Zealand Limited (MWH) was commissioned by Wellington City Council (WCC or the 'Council') to undertake an air quality impact assessment for activities undertaken at the existing Kiwi Point Quarry located off Centennial Highway/State Highway 1 (SH1) in Ngauranga, Wellington (the 'project site' or the 'quarry'). Kiwi Point Quarry is an established greywacke quarry located in the Ngauranga Gorge, involving ongoing extraction, processing, a cleanfill and rehabilitation, and is operated by Holcim New Zealand Limited (Holcim) under contract to WCC.

The aim of the air quality impact assessment is to determine the potential for dust nuisance effects beyond the boundary of the project site. Resource consent number WGN050352 [24540] authorises the discharge to air of contaminants from a cleanfill located at the project site and was granted to WCC by Greater Wellington Regional Council (GWRC) on 6 July 2005. The consent will expire on 6 July 2020. A copy of the resource consent is contained in Appendix A. Note that there is currently no resource consent for the discharges to air from the quarrying (extraction) and processing (crushing and screening) activities undertaken on the project site.

MWH prepared an Assessment of Environmental Effects (AEE) report entitled '*Kiwi Point Quarry Southern Extension Assessment of Effects on the Environment*' in May 2016. The AEE was prepared in support of WCC's bundled resource consent application to GWRC for discharges to air and surface water and other activities undertaken at the site with regards to WCC's proposed expansion of the existing quarry in the south-east corner of the site towards Tyers Road (hereafter the 'southern extension'). Refer to the AEE for additional information.

The purpose of this report is to address the additional resource consent applications requested by GWRC under section 91 of the Resource Management Act (1991); one of which is a resource consent to discharge contaminants to air (predominantly dust/particulate matter) from site-wide activities, including:

- Soil/vegetation removal and overburden stripping and associated earthworks (including soil handling and storage). Overburden is disposed of in designated areas onsite;
- Drilling and blasting;
- Open-cast extraction and quarrying;
- Transfer of aggregate from the blast area(s) to crushing, screening and washing plant;
- Crushing, screening, and processing of aggregate;
- Stockpiling of aggregate products for retail; and,
- Transfer of aggregate products from stockpiles to customer's trucks via front-end loader for transport off site (product load-out).

This report examines the potential air quality effects that may arise during the operation of the quarry, including the proposed quarry expansion (southern extension). A number of mitigation measures are currently implemented onsite by Holcim to control dust emissions, however, a number of additional mitigation measures have been recommended by MWH in this report to further reduce the potential for dust nuisance effects in the surrounding community.

This report supports WCC's resource consent application to GWRC to discharge to air contaminants (predominantly dust) associated with the extraction (quarrying) and processing (crushing and screening) activities undertaken at the project site.

1.2 Study Overview

This report seeks to assess the potential air quality effects associated with the existing and proposed quarrying activities at the nearest identified sensitive receptors, and to make recommendations regarding the control of dust/particulate matter at the site, where required, as this is the principal contaminant of concern.

In order to determine the potential for dust nuisance effects in the surrounding community due to dust emissions at the project site, MWH has undertaken a qualitative (risk-based) assessment of the existing and proposed dust emissions on the site and their potential to cause dust nuisance effects beyond the

site boundary. In addition, this assessment also involved undertaking a review of the project site's complaints record, in order to predict the level of impact that may be experienced in the surrounding community (refer to Section 5 for further details).

The assessment undertaken in this report was carried out in accordance with the following national and international guidance documents:

- Ministry for the Environment's (MfE) 'Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions' (MfE, 2001).¹ This Good Practice Guide (GPG) is currently under review by the MfE;
- IAQM, 2014. 'Guidance on the assessment of dust from demolition and construction', Institute of Air Quality Management, February 2014; and,
- IAQM, 2016. 'Guidance on the assessment of mineral dust impacts for planning, Institute of Air Quality Management, May 2016.

1.3 Study Location

The project site is located at 137 Centennial Highway/SH1 in the Ngauranga Gorge, Wellington and is legally described as Lots 1, 2 & 3 DP 72995, Lot 4 DP 72996, Lot 5 DP 72996, Lot 1 DP 34815, and Lot 6 DP 72996.

The site is situated on the western side of Ngauranga Gorge, within an industrial area, which is located at the base of a basin surrounded by high ridges. Residential areas are situated at the top of these ridges.

The site covers an area of approximately 44.92 hectares (ha) or 0.45 km², based on the map contained in Appendix 2 of the Wellington City District Plan, which is shown in Figure 1-1. The figure shows that there is a buffer area which is zoned 'Open Space B' in the Wellington City District Plan surrounding the existing quarry/extraction area, zoned 'Business 2' in the Wellington City District Plan. Restoration planting within the buffer zone will be undertaken in accordance with WCC's Quarry Management Plan (WCC, 2014).²

The centre of the project site is located at 315860 metres East, 5432680 metres North Universal Transverse Mercator (UTM) Zone 60 South (or latitude 41.236222 °South, longitude 174.803046 °East). The project site is located approximately 4.5 km north-east of the Wellington central business district.

¹ 'Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions', Ministry for the Environment, September 2001 (MfE, 2001).

² WCC, 2014. Kiwi Point Quarry Management Plan (QMP), Wellington City Council, 2014.

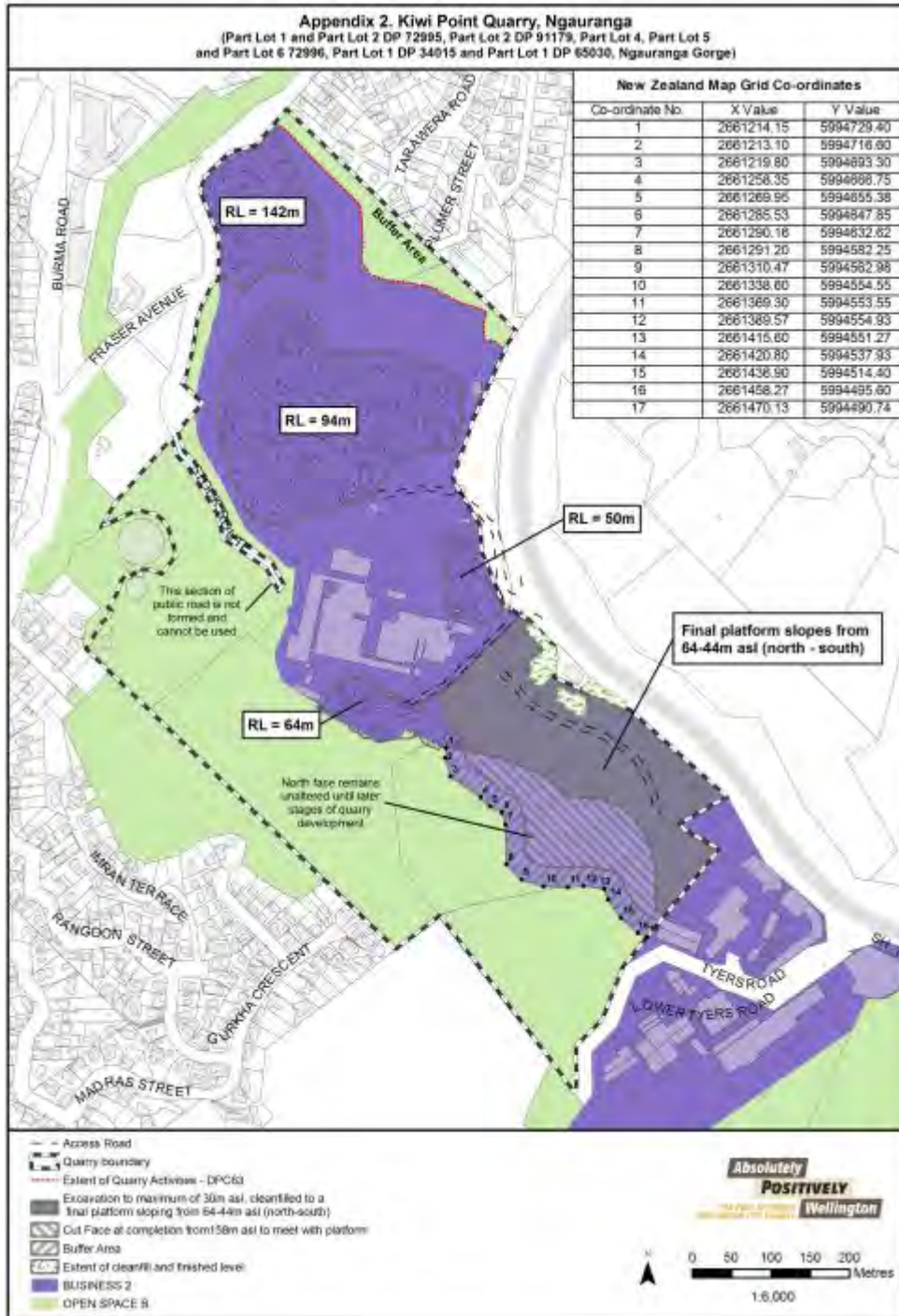


Figure 1-1: Location of the Kiwi Point Quarry

The location of the project site is shown in Figure 1-2. The figure was produced using OpenStreetMap (OSM) under the Open Database License. OSM has been used throughout this report and MWH has acknowledged OSM and its contributors, where relevant. The Open Database License can be read in full on the OSM website.³

Figure 1-2 shows the indicative Kiwi Point Quarry site boundary (solid red line), which is based on Figure 1-1, the area occupied by Taylor Preston Limited's abattoir and meat works (dashed red line) and the proposed southern extension area (dashed orange line).

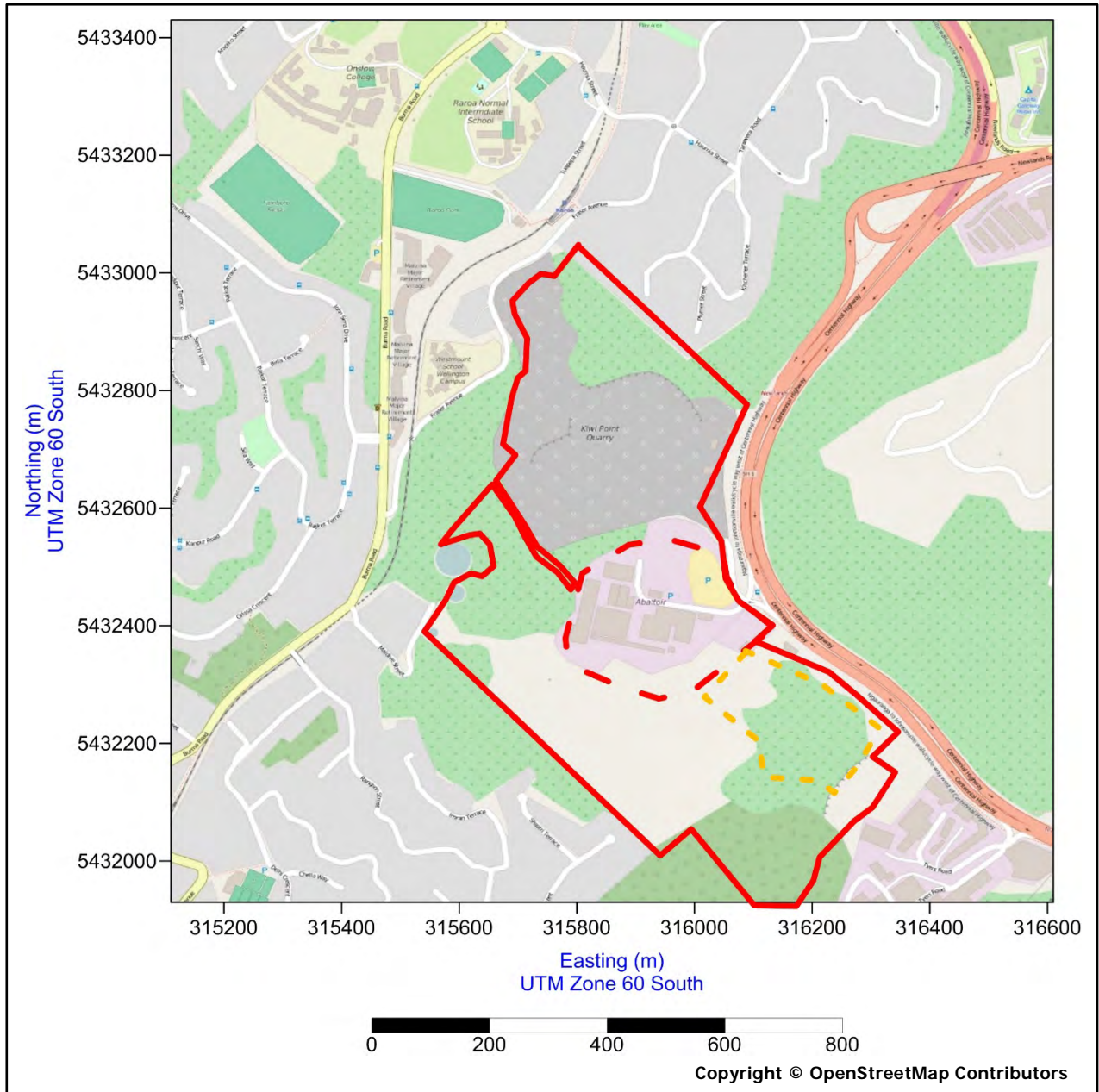


Figure 1-2: Location of the Kiwi Point Quarry Showing an OSM Basemap

³ <http://opendatacommons.org/licenses/odbl/1.0/>

1.4 Existing and Proposed Activities

1.4.1 Site History

Kiwi Point Quarry began operating in the 1930s and is the last remaining quarry within the Wellington region. The quarry is an important provider of quarry products, producing approximately 350,000 tonnes of aggregate per annum (tpa), approximately 16 percent of the annual production for the region.

1.4.2 Existing Activities

The current extraction area (the 'existing' or 'northern' quarry) is shown in Figure 1-3 as areas A, B, C and D.

The quarrying activity is undertaken in accordance with the Kiwi Point Quarry Management Plan (WCC, 2014).⁴ The existing (northern) quarry has been excavated from south to north into a ridge at the northern boundary of the site, resulting in a batter slope rising steeply to the north. Greywacke rock is dry quarried through drilling and blasting and mechanical excavation. Material suitable for crushing is loaded on dump trucks and transported to the onsite crushing plant where it is crushed to reduce size, screened into various grades of aggregate and washed.

The following plant and machinery are present onsite:

- Three crushers (1 jaw crusher (primary), 1 cone crusher and 1 Barmac shaper (both secondary));
- Two screening plants (primary and secondary);
- One washing screening plant;
- Several conveyor belts for transporting finished products;
- Three front-end loaders (e.g. for transferring product, including product load-out);
- Three excavators;
- One bulldozer; and,
- One fork-lift truck (e.g. for moving conveyor belts).

The quarry's customers are predominantly contractors and access to the public is restricted: public trailer sales ceased in May 2014. Trucks vary in size from 3 tonne to 35 tonne capacities. Customer numbers vary per day and is dependent on their contractual requirements. The product sale hours are 57 hours per week and are currently as follows:

- Monday to Thursday 7:00 am – 5:00 pm;
- Friday 7:00 am – 4:00 pm; and,
- Saturday 7:00 am – 3:00 pm.

The quarry can operate 24 hours a day, 7 days a week, and the production volumes vary per hour and day as there are many variables. However, daily production can range from 1,500 to 2,600 tonnes per day. Approximately 10,000 to 16,000 tonnes of aggregate products are stored onsite. Currently, drilling and blasting occurs on a monthly basis but can occasionally occur twice a month. The blast times are restricted to the hours of 10:00 am to 2:00 pm.

The principal emissions to air associated with the above quarrying processes and activities include dust and particulate matter. There is also the potential for dust to be generated by site vehicles and customer (offsite) vehicles as they travel on the unsealed haul roads and across the quarry floor to the product stockpile areas. The unsealed haul roads are sprayed with water using a water truck, and the stockpile areas are also sprayed with water in order to control dust emissions. The sealed road has a sprinkler system for dust suppression.

An aerial photograph of the existing quarry areas A, B and C is shown Figure 1-4.

A photograph of the existing processing plant is shown in Figure 1-5.

⁴ WCC, 2014. Kiwi Point Quarry Management Plan, Wellington City Council, 2014.

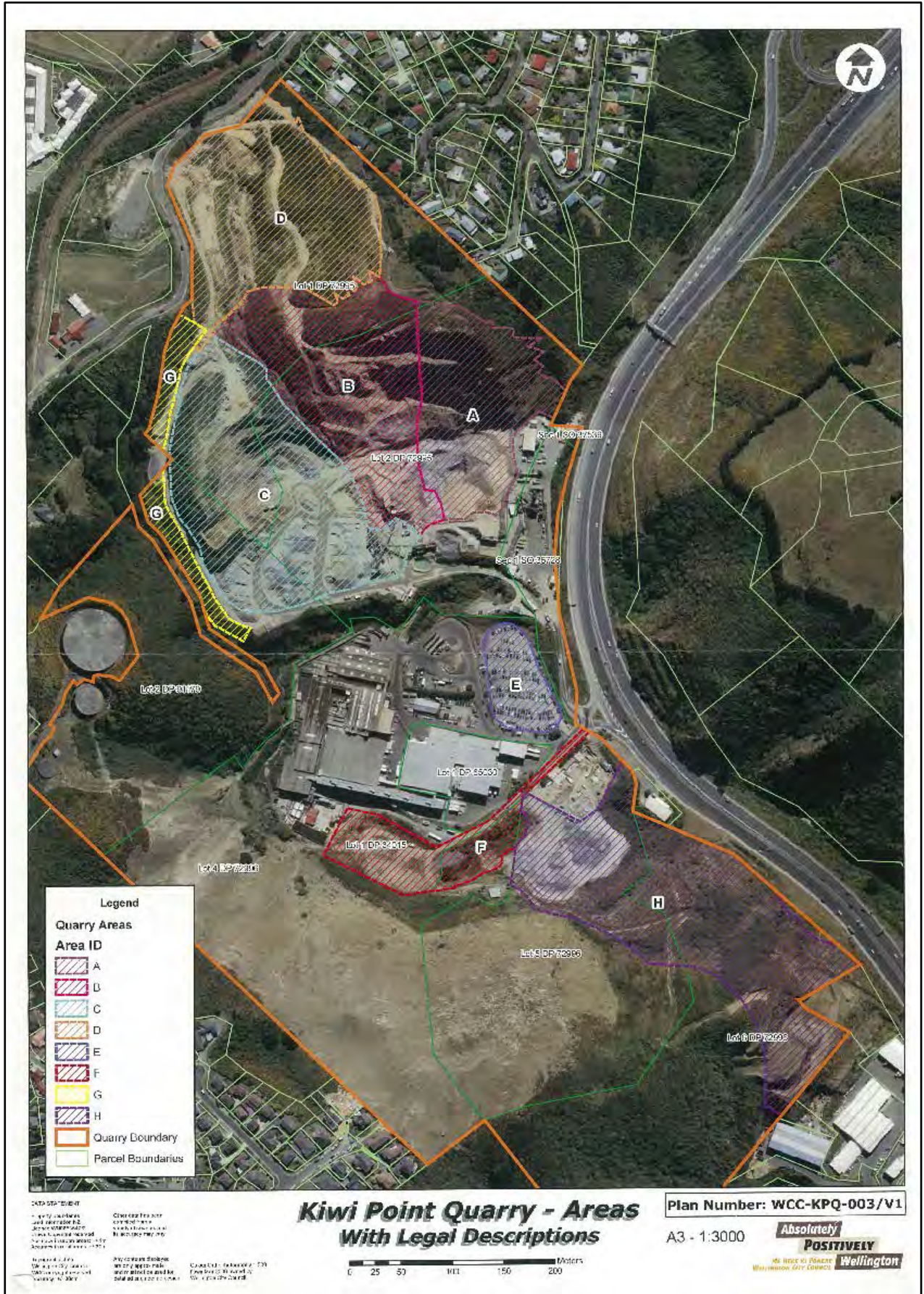


Figure 1-3: Plan of the Kiwi Point Quarry



Figure 1-4: Plan of the Kiwi Point Quarry Showing Areas A, B and C



Figure 1-5: Photograph of the Kiwi Point Quarry Processing Plant at its Existing Location

1.4.3 Proposed Activities

Ultimately the development of the site will include infilling the upper gully area from Fraser Avenue, down and through the quarry operation area, which will effectively provide further industrial land (Areas A, B, C, D and G in Figure 1-3). The Quarry Management Plan (QMP) includes a rehabilitation plan for both the existing (northern) quarry and the proposed quarry expansion into the southern ridge towards Tyers Road. In addition, Ormiston (2016) prepared a report as part of the QMP for the proposed southern extension.⁵

The proposed southern extension area is shown in Figure 1-3 as Area H and a photograph of the southern ridge is shown in Figure 1-6. The existing jaw crusher, one excavator and two loaders will be moved to the southern extension area along with 1 excavator and 1 to 2 loaders upon commencing the extraction of this resource.

The proposed activities also include:

- Soil stripping, vegetation clearance and overburden removal at both the existing quarry and in the southern extension area;
- Placement of cleanfill material (only in Areas A, B, C, D, F and H as shown in Figure 1-3);
- Taking of water from Ngauranga Stream to be used for dust suppression and aggregate washing in the southern extension area; and,
- Intermittent discharge of stormwater and washwater from the southern extension area to Ngauranga Stream.



Figure 1-6: Photograph of the Kiwi Point Quarry Southern Ridge Looking South

⁵ Ormiston, 2016. Report on the Proposed Development for the Business Centre Area South Ridge—Kiwi Point Quarry, prepared by Ormiston Associated Limited for Holcim New Zealand Limited, February, 2016.

1.5 Surrounding Environment and Topography

1.5.1 Terrain

The surface elevation (terrain) data were taken from Lakes Environmental Software’s website (www.webGIS.com), which was based on the Shuttle Radar Topography Mission (SRTM-1 Global Version 3) digital elevation model data (at approximately 30 m resolution) originally produced by NASA.

Figure 1-7 shows the location of the potentially affected sensitive receptors identified in Section 3.1 of this report (solid yellow circles), the indicative Kiwi Point Quarry site boundary (solid red line with red fill), the area occupied by Taylor Preston Limited’s abattoir and meat works (dashed red line) and the southern extension area (dashed orange line with orange fill). Whilst it is noted that the contour lines (elevations) shown within the Kiwi Point Quarry site boundary are not accurate as they do not reflect the current or proposed final elevations, the figure does show that the quarry and proposed southern extension area are situated in much lower terrain than the nearest sensitive receptor locations.

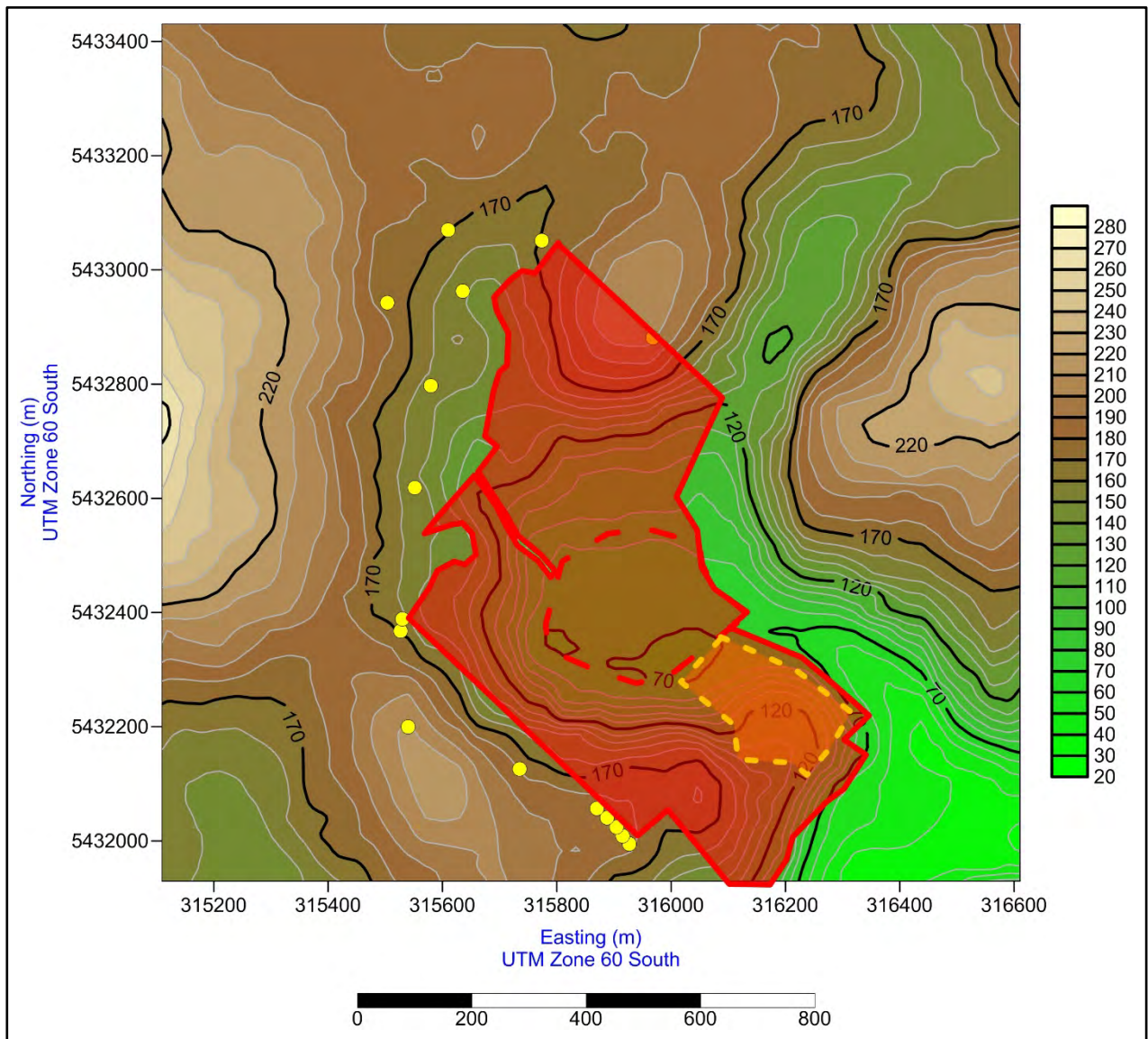


Figure 1-7: Location of the Kiwi Point Quarry Showing Terrain

1.5.2 Land Use

The potentially affected sensitive receptors identified in Section 3.1 of this report are situated within the 'Outer Residential' or 'Business 1' zones of the operative Wellington City District Plan (see Section 2.3), while the project site itself is situated within the 'Business 2 and 'Open Space B' zones of the Plan.

The Kiwi Point Quarry boundary surrounds the sites currently occupied by Taylor Preston Limited's abattoir and meat works (located at 131 Centennial Highway), the Downer Group's hot mix facility (also located on the quarry site at 137 Centennial Highway, approximately 60 m to the north-east of Taylor Preston) and Allied Concrete's concrete batching facility situated 40 m to the south-east of Taylor Preston). A water supply pumping station operated by Wellington Water is situated approximately 10 m to the north-north-east of the Kiwi Point Quarry boundary on Centennial Highway/SH1.

In other words, in addition to the potential for dust to be generated by activities undertaken at the Kiwi Point Quarry, there is also the potential for dust emissions to occur at the hot mix and concrete batching facilities. However, the cumulative PM₁₀ concentrations beyond the boundary of the Kiwi Point Quarry are unlikely to exceed any national or regional ambient air quality standards or guidelines (see Section 5) and, therefore, the need for a detailed assessment involving dispersion modelling or ambient monitoring can be scoped out (excluded from) this study.

In addition, there are existing odour emissions from activities undertaken at Taylor Preston (see Section 1.7) and at the hot mix facility.

1.6 History of Complaints Due to Activities at the Kiwi Point Quarry

According to the GWRC's complaints database, there have been three dust nuisance complaints relating to activities undertaken at the Kiwi Point Quarry. These complaints are summarised in Table 1-1.

Table 1-1: History of Dust Complaints at Kiwi Point Quarry

Address	Date/Time	UTM Zone 60 South		Direction from Site Boundary	Distance from Site Boundary (m)
		Easting (m)	Northing (m)		
407 Burma Rd (Ref. C1)	14/01/2009 9:20 am	315504	5432975	WNW	200
134 Burma Rd (Ref. C2)	18/12/2009 9:10 am	315503	5432943	WNW	200
105 Fraser Ave (Ref. C3)	20/12/2011 9:40 am	315812	5433084	N	60

The location of the complainants' properties are shown in Figure 1-8 as solid yellow circles. The properties 'C1' and 'C2' are the Malvina Major Retirement Village, while property C3 is a private residential property. The figure also shows the indicative Kiwi Point Quarry site boundary (solid red line with red fill), the area occupied by Taylor Preston Limited's abattoir and meat works (dashed red line) and the southern extension area (dashed orange line with orange fill).

MWH understands that whilst these dust nuisance complaints were not verified by a GWRC enforcement officer, the file notes on the complaints database indicate that the incidents were relatively minor and of short duration. Given that these complaints occurred between 4.5 and 7.5 years ago, it is difficult to relate these complaints to actual activities that were undertaken at the quarry at the time. However, it is possible, given that the complaints occurred in the summer, that dry and windy conditions coupled with dust-generating activities taking place on the northern part of the quarry (towards Fraser Avenue) may have been the cause of the incidents.

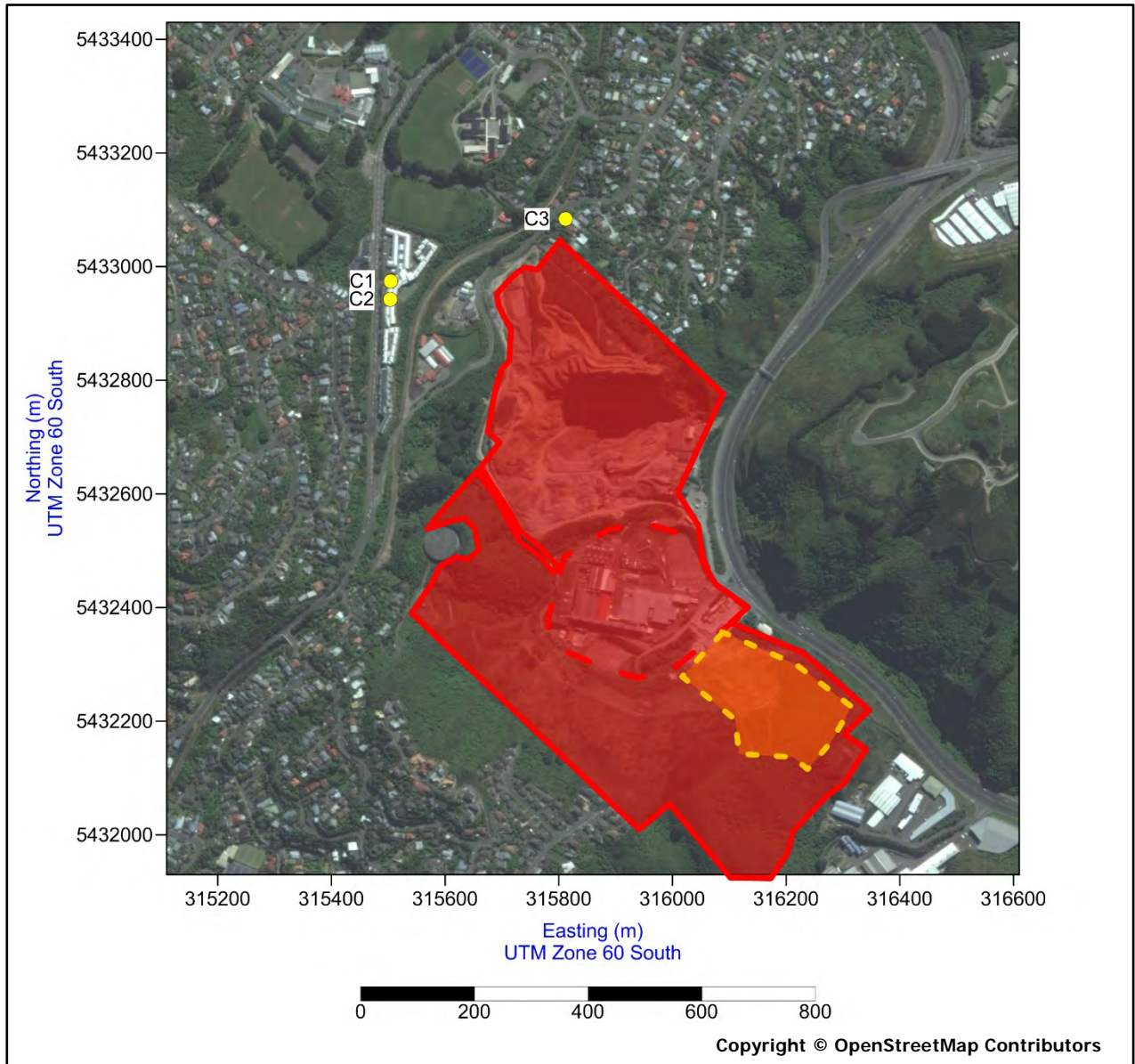


Figure 1-8: Location of the Complainants' Properties – Alleged Dust from Kiwi Point Quarry

1.7 History of Complaints Due to Activities at Taylor Preston

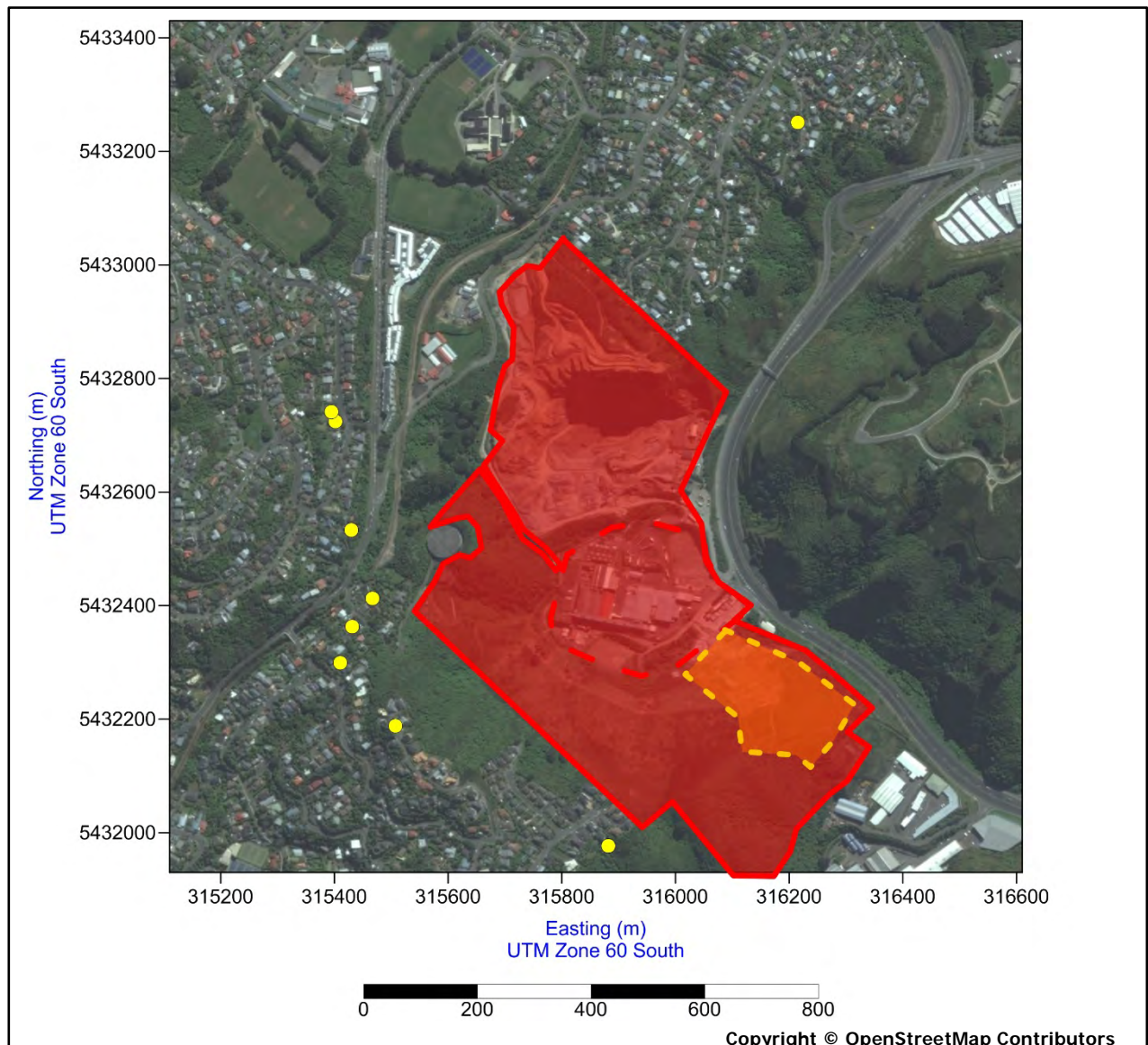
According to the GWRC's complaints database, there have been 20 odour nuisance complaints relating to activities undertaken at Taylor Preston's abattoir and meat works between 6 December 2014 and 7 June 2016. The location of the complainants' properties (which are all private residences) are summarised in Table 1-2 and are shown in Figure 1-9 as solid yellow circles. Note that the property located at 4 Jalna Avenue is not shown in the figure as it is situated beyond the map extents.

Analysis of the complaints indicates that whilst there have been 20 odour complaints, there have only been 10 complainants. With the exception of the complainant situated at 36 Gurkha Crescent (300 m to the south of the Taylor Preston site boundary), all the complainants have been located to the north-north-east, north-west, west-north-west, west or west-south-west of the Taylor Preston site boundary.

Based on the analysis of the local meteorological data shown in Section 4 and in view of the local terrain features (namely the Ngauranga Gorge and the quarry itself), the potential for further odour nuisance effects in the surrounding community due to odour discharges at Taylor Preston following the completion of the southern extension at the Kiwi Point Quarry is considered to be low.

Table 1-2: Location of Odour Complainants Properties (Odour Discharges at Taylor Preston)

Address	UTM Zone 60 South		Direction from Site Boundary	Distance from Site Boundary (m)
	Easting (m)	Northing (m)		
3 John Sims Drive	315402	5432724	NW	460
36 Gurkha Crescent	315882	5431977	S	300
27 Imran Terrace	315507	5432188	SW	310
4 Maldive Street	315431	5432363	W	340
7 Rangoon Street	315410	5432299	WSW	360
5 John Sims Drive	315395	5432741	NW	480
4 Jalna Avenue	315021	5432153	WSW	780
103 Burma Road	315430	5432533	WNW	370
18 Dominion Park Street	316215	5433251	NNE	750
92 Burma Road	315467	5432413	W	310


Figure 1-9: Location of the Complainants' Properties – Alleged Odour from Taylor Preston

1.8 Limitations

MWH has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of WCC and Holcim. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person.

This disclaimer shall apply notwithstanding that the report may be made available to GWRC and other persons for an application for permission or approval to fulfil a legal requirement.

This report is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report.

This report was prepared in July 2016 and is based on the conditions encountered and information reviewed at the time of preparation. MWH disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

2 Assessment Criteria

2.1 National Assessment Criteria

2.1.1 Resource Management Act 1991

Section 5(1) sets out the purpose of the RMA, which is “to promote the sustainable management of natural and physical resources”.

Section 5(2)(c) provides for this to occur while “avoiding, remedying, or mitigating any adverse effects of activities on the environment”.

Section 2 of the RMA defines ‘environment’ and ‘amenity values’ as follows:

“Environment

includes –

- (a) ecosystems and their constituent parts, including people and communities; and*
- (b) all natural and physical resources; and*
- (c) amenity values; and*
- (d) the social, economic, aesthetic, and cultural conditions which affect the matters stated in paragraphs (a) to (c) of this definition or which are affected by those matters.*

Amenity values

those natural or physical qualities and characteristics of an area that contribute to people’s appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes.”

Since emissions of dust/particulate matter at quarries can be considered to cause potential effects on amenity values, people and communities, they should be managed under the RMA. Since dust is considered to be an air contaminant, its discharge to air is therefore controlled under section 15 of the RMA. Under section 15(1) of the RMA, discharges from industrial or trade premises are only allowed if they are authorised by a rule in a regional plan, a resource consent, or regulations. If the activity is prohibited under the plan, then no resource consent can be obtained.

Section 15 states:

- 1) “No person may discharge any:
 - (a) contaminant or water into water; or*
 - (b) contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water; or*
 - (c) contaminant from any industrial or trade premises into air; or*
 - (d) contaminant from any industrial or trade premises onto or into land—*
unless the discharge is expressly allowed by a national environmental standard or other regulations, a rule in a regional plan as well as a rule in a proposed regional plan for the same region (if there is one), or a resource consent.
- 2) No person may discharge a contaminant into the air, or into or onto land, from a place or any other source, whether moveable or not, in a manner that contravenes a national environmental standard unless the discharge:
 - (a) is expressly allowed by other regulations; or*
 - (b) is expressly allowed by a resource consent; or*
 - (c) is an activity allowed by section 20A.*

(2A) No person may discharge a contaminant into the air, or into or onto land, from a place or any other source, whether moveable or not, in a manner that contravenes a regional rule unless the discharge:

- (a) is expressly allowed by a national environmental standard or other regulations; or*
- (b) is expressly allowed by a resource consent; or*
- (c) is an activity allowed by section 20A.*

3) This section shall not apply to anything to which section 15A or section 15B applies.”

As mentioned earlier, WCC is currently authorised under resource consent number WGN050352 [24540] to discharge contaminants to air associated with the cleanfill and associated activities undertaken at the project site.

As part of this application, WCC is seeking a resource consent to discharge to air contaminants (predominantly dust) associated with the extraction (quarrying) and processing (crushing and screening) activities undertaken at the project site. Refer to Section 5 of this report for further details of the actual and potential environmental effects associated with these activities.

2.1.2 National Environmental Standards

The Ministry for the Environment (MfE) first promulgated the Resource Management (National Environmental Standards (NES) for Air Quality) Regulations on 6 September 2004 (the ‘Regulations’). Since that time there have been a number of amendments to the NES, with the most recent amendment occurring in June 2011.

The Regulations set out a number of restrictions on certain activities that discharge contaminants to air, including prohibitions, performance requirements and ambient air quality standards. None of the prohibitions in Regulations 6 to 12 apply to the activities undertaken by WCC/Holcim at the project site.

Regulations 13 to 16 impose requirements on regional councils to meet ambient air quality standards for five air pollutants: fine and coarse particles that are less than 10 microns (μm) in diameter (as PM_{10}), carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and ozone (O_3).

Regulations 22 to 27 apply to woodburners, domestic solid-fuel open fires and landfill gas flaring, and do not apply to the activities undertaken by WCC/Holcim.

While Regulations 17 to 19 apply to activities involving the discharge to air of fine and coarse particles (PM_{10}), Regulations 17A to 19 were revoked in June 2011. Regulation 20 applies to discharges to air of CO , oxides of nitrogen (NO_x) and volatile organic compounds (VOCs), while Regulation 21 applies to discharges to air of SO_2 .

It is considered that Regulation 17(1) does not apply to this assessment as the principal emissions to air from the site will comprise of larger particles of more than $30\ \mu\text{m}$ in diameter (e.g. total suspended particles or ‘TSP’) as opposed to PM_{10} . Furthermore, whilst WCC does not currently hold a resource consent for the existing and proposed extraction and processing activities at Kiwi Point Quarry, WCC/Holcim is not seeking to increase its existing production rates as part of the consent application and the Kiwi Point Quarry is not situated within a polluted airshed.⁶ In view of the foregoing, Regulations 17 to 20 do not apply to the activities undertaken by WCC/Holcim.

Table 2-1 lists the ambient air quality NES for PM_{10} , CO , NO_2 , SO_2 and O_3 . The NES criteria for CO , NO_2 , SO_2 and O_3 do not apply to this assessment. Whilst the NES for PM_{10} is the only criterion which applies to this assessment, it is noted that the principal emissions to air at the project site are larger particles (e.g. greater than $30\ \mu\text{m}$ in diameter, including TSP). There are currently no NES criteria for larger particles, including TSP.

⁶ Airsheds have been identified based on regional councils’ knowledge of existing ambient air quality and the location of significant emission sources and factors that affect the dispersion of pollutants (such as local topography and meteorology). These airsheds have been published in the New Zealand Gazette. An airshed becomes a ‘polluted airshed’ in accordance with Regulation 17(4) of the Resource Management (National Environmental Standards for Air Quality) Regulations 2004.

Table 2-1: Ambient Air Quality National Environmental Standards

Contaminant	Threshold Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period	Number of Exceedances Allowed Each Year
PM ₁₀	50	24-hour	One 24-hour period
CO	10,000	8-hour	One 8-hour period
NO ₂	200	1-hour	Nine 1-hour periods
SO ₂	570	1-hour	None
	350	1-hour	Nine 1-hour periods
O ₃	150	1-hour	None

Whilst the NES are not strictly assessment criteria, the Regulations require that any discharge of one of the NES contaminants must not result in a breach of the relevant Standard. Consequently, the NES must be considered as assessment criteria.

The Regulations place constraints on resource consents depending on the pollutant, the existing air quality of an airshed relative to the NES and the date of the application. A 'significant' discharge of PM₁₀ is classified as a maximum 24-hour mean PM₁₀ concentration beyond the site boundary of greater than or equal to 5% of the NES for PM₁₀ (i.e. 2.5 $\mu\text{g}/\text{m}^3$), in accordance with MfE (2011).⁷

2.1.3 National Ambient Air Quality Guidelines

The National Ambient Air Quality Guidelines (NAAQGs) were published by the MfE in 2002 following a comprehensive review of international and national research, and are widely accepted among New Zealand air quality practitioners. The NAAQG criteria provide the minimum requirements that ambient air quality should meet in order to protect human health and the environment.

Guideline levels for pollutants and averaging periods not covered by the NES criteria still apply. The NES criteria replace any previous guideline levels for that particular pollutant and averaging period. The NAAQG criteria set for the protection of human-health for PM₁₀, CO, NO₂, SO₂ and O₃ are presented in Table 2-2. The NAAQG for PM₁₀ are the only criteria which apply to this assessment.

Table 2-2: National Ambient Air Quality Guidelines

Contaminant	Threshold Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period	Key Health Effects
PM ₁₀	50	24-hour	Mortality, morbidity, hospitalisation, work-affected days, increased use of medication
	20	Annual	
CO	30,000	1-hour	Reduced birth weight (non-smoking mothers), decreased work capacity, increased duration of angina (for those with ischaemic heart disease), decrease in visual perception, decreased manual dexterity, and decreased ability to learn
	10,000	8-hour	
NO ₂	200	1-hour	Apparent contribution to morbidity and mortality, especially in susceptible subgroups, including young children, asthmatics and those with chronic inflammatory airway disease.
	100	24-hour	
SO ₂	350	1-hour	Daily mortality, hospital admissions and emergency room attendances for respiratory and cardiovascular disease, increases in respiratory symptoms and decreases in lung function
	120	24-hour	

⁷ MfE 2011. 'Clean Healthy Air for All New Zealanders: The National Air Quality Compliance Strategy to Meet the PM10 Standard' (August, 2011; referred to hereafter as the 'NAQCS for PM10' or 'MfE, 2011').

Contaminant	Threshold Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period	Key Health Effects
O_3	150 100	1-hour 8-hour	Increased daily mortality, respiratory and cardiovascular disease; decreases in lung function; increases in hospitalisations, and in respiratory illnesses such as cough, phlegm and wheeze

In addition to the health-based NAAQGs reviewed above, the MfE has recommended a set of trigger levels for deposited and suspended particulate. These trigger levels for deposited dust and TSP are summarised in Table 2-3 and were taken from MfE (2001).⁸

Table 2-3: MfE Trigger Levels for Deposited Dust and TSP

Contaminant	Trigger Level	Preferred Monitoring Method
Deposited dust	4 g/m ² /30 days (above background)	ISO DIS-4222.2
TSP	80 $\mu\text{g}/\text{m}^3$ (24-hour mean) — sensitive area	AS-3580.9.6:2015
	100 $\mu\text{g}/\text{m}^3$ (24-hour mean) — moderately sensitive area	
	120 $\mu\text{g}/\text{m}^3$ (24-hour mean) — non-sensitive area	

A 'sensitive area' is defined in MfE (2001)⁹ as being a site surrounded by '*significant residential development*', whereas a non-sensitive area could be defined as '*a sparsely populated rural area ... [which is] relatively insensitive to some discharges*'.

A 'non-sensitive area' could also be described as a 'low sensitive area', and would apply to a site located in, for example, a 'heavy industrial' zone (provided that there are no industrial activities sensitive to dust/particulate, such as vehicle showrooms, food manufacturers, electronics manufacturers, or other sensitive receptors in the surrounding community).

The project site is considered in this assessment to be situated in a '*moderately sensitive area*' given that it is within the 'Business 2' zone of the Wellington City District Plan, and given that there are very few residential properties located within 400 m of the existing and proposed extraction and processing areas (see Section 3). MWH considers that the MfE's trigger value for TSP of 100 $\mu\text{g}/\text{m}^3$ (as a 24-hour mean concentration) applies in this assessment. This is in accordance with Section 3 which contains a more detailed discussion on the sensitivity of the surrounding environment.

2.2 Regional Assessment Criteria

2.2.1 Operative Regional Air Quality Management Plan

The Wellington Regional Air Quality Management Plan (RAQMP or the 'Regional Plan') became operative on 8 May 2000. Change 1 to the RAQMP was made operative on 1 September 2003.

The RAQMP applies to discharges to air in the whole of the Wellington region, except for the coastal marine area. Discharges to air in the coastal marine area (CMA) are covered in the Regional Coastal Plan (RQP), which became operative on 19 June 2000. The CMA is situated approximately 1 km to the

⁸ 'Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions', Ministry for the Environment, September 2001 (MfE, 2001).

⁹ *Ibid.*

south-east of the project site boundary and, in the absence of adequate dust mitigation, there is the potential for the propagation of dust beyond the site boundary and towards the CMA under certain meteorological conditions. However, for the reasons outlined in Sections 3, 4 and 5, it is considered unlikely that there will be any adverse effects within the CMA. Therefore, the objectives, policies and rules of the RAQMP have been considered in this report, rather than those stated in the RQP. Incidentally, the Commercial Port Area (CPA) is situated approximately 2 km to the south-west of the project site boundary.

The RAQMP identifies issues to be addressed so that air can be sustainably managed. Objectives, policies, and rules have been adopted to address these issues.

Rule 10 of the RAQMP (as amended 2003) covers the extraction (quarrying) and processing (size reduction and screening) of minerals and states that *“the extraction, quarrying [and mining of minerals and the size reduction and screening of wood products and minerals]”* is a permitted activity provided that it complies with the following conditions (emphasis added as **bold text**):

- *“For the area shown as the Operational Port Area, included within the Wellington City District Plan, any discharge shall not result in odour, dust, gas or vapour which is noxious, dangerous, offensive or objectionable to such an extent that it has, or is likely to have, an adverse effect on the environment outside the Operational Port Area; and*
- *For all other areas, any discharge **shall not result in dust, odour, gas or vapour, which is noxious, dangerous, offensive or objectionable at or beyond the boundary of the property.**”*

In other words, the existing and proposed quarrying and processing activities undertaken at the Kiwi Point Quarry are permitted under Rule 10 provided that there are no *“noxious, dangerous, offensive or objectionable”* effects associated with the discharges to air from the site beyond the site boundary.

The RAQMP also contains a set of regional ambient air quality guidelines (RAAQGs) for particulate matter (not specifically ‘PM₁₀’ and assumed herein as TSP), CO, NO₂, SO₂, O₃ and a number of other pollutants. The RAAQGs for particulate matter (as TSP), CO, NO₂, SO₂, O₃ are presented in Table 2-4.

Table 2-4: Regional Ambient Air Quality Guidelines

Contaminant	Maximum Desirable Concentration (µg/m ³)	Maximum Acceptable Concentration (µg/m ³)	Averaging Period
Particulate (as TSP)	70	120	24-hour
	40	40	Annual
CO	6,000	10,000	8-hour
NO ₂	95	300	1-hour
	30	100	24-hour
SO ₂	None	500	10-minute
		350	1-hour
		125	24-hour
		50	Annual
O ₃	100	150	1-hour
		100	8-hour

The NES, NAAQGs and MfE trigger level for TSP adopted in this assessment are more stringent than the RAAQGs shown above.

The term ‘cleanfill’ is defined in the RAAQP as follows:

“materials such as clay, soil, rock, concrete, or brick, that are free of combustible or putrescible components or hazardous substances or materials likely to create a hazardous leachate by means of biological or chemical breakdown.”

The term 'landfill' is defined in the RAAQP as follows (emphasis added as **bold text**):

*“a waste disposal site of any size used for the controlled deposit of solid wastes onto or into land, **but not including deposition associated with a quarry or other cleanfill material.**”*

The term 'dust' is defined in the RAAQP as follows:

“... small particulates containing metallic elements, organic and other materials including, but not limited to, fertilisers, cement, coal, coke, soot, carbon tars, wood, fibres, and pathogens.”

2.2.2 Proposed Natural Resources Plan for the Wellington Region

In recent years, GWRC has been working to review the existing regional plans for the Wellington region. As a result of this review, the Proposed Natural Resources Plan for the Wellington Region (PNRP or the 'Proposed Regional Plan') was developed. The Proposed Regional Plan was approved by Council for public notification on 31 July 2015. It combines coastal and regional plans, as well as incorporating regulatory and non-regulatory methods (rules).

Rule R27 of the PNRP provides for the handling of aggregate and is very similar to Rule 10 of the operative RAQMP (as amended 2003). Rule R27 of the PNRP states that (emphasis added as **bold text**):

“The discharge of contaminants into air from the handling of aggregate (rock, sand and shingle) including blasting, extraction, crushing, screening, processing, stockpiling, handling, conveyance and storage is a permitted activity, provided the following condition is met:

*(a) the discharge **shall not cause noxious, dangerous, offensive or objectionable odour, dust, particulate, smoke, vapours, droplets or ash beyond the boundary of the property.**”*

In other words, and as per the operative Rule 10 of the RAQMP, existing and proposed quarrying and processing activities undertaken at the Kiwi Point Quarry are permitted under Rule R27 of the PNRP provided that there are no “*noxious, dangerous, offensive or objectionable*” effects associated with the discharges to air from the site beyond the site boundary.

Objective O41 of the PNRP states (emphasis added as **bold text**):

*“The adverse effects of odour, smoke and **dust** on amenity values and people’s well-being are reduced.”*

Policy P55 of the PNRP is entitled 'managing air amenity and states (emphasis added as **bold text**):

*“Air quality amenity in urban, rural and the coastal marine areas shall be managed to minimise offensive or objectionable odour, smoke and **particulate matter**, fumes, ash and visible emissions.”*

Policy P58 of the PNRP covers industrial point source discharges and fugitive emissions and states:

“Industrial point source discharges and fugitive emissions into air will be minimised by using good management practices.”

Policy P61 of the PNRP covers discharges to air within polluted airsheds. This policy does not apply as the Kiwi Point Quarry is not situated within a polluted airshed.

The PNRP contains a set of regional ambient air quality targets (RAAQTs) for PM₁₀, PM_{2.5}, CO, NO₂, SO₂, O₃ and a number of other pollutants. The RAAQTs for PM₁₀, particles less than 2.5 µm in diameter (PM_{2.5} or fine particles), CO, NO₂, SO₂ and O₃ are presented in Table 2-5 and are based on the NAAQGs, as outlined below:

- **Action** Exceeds the NAAQG value. Exceedances of the NAAQG are a cause for concern and warrant action if they occur on a regular basis.
- **Alert** Between 66% and 100% of the NAAQG value. This is a warning level, which can lead to exceedances if trends are not curbed.
- **Acceptable** Between 33% and 66% of the NAAQG value. This is a broad category, where maximum values might be of concern in some locations, but are generally at a level that does not warrant action.
- **Good** Between 10% and 33% of the NAAQG value. Peak measurements in this range are unlikely to affect air quality.
- **Excellent** Less than 10% of the NAAQG value. Values are of little concern. If maximum values are less than a tenth of the guideline, average values are likely to be much less.

Table 2-5: Regional Ambient Air Quality Targets

Contaminant	Concentration (µg/m ³)				Averaging Period
	'Excellent'	'Good'	'Acceptable'	'Alert'	
PM ₁₀	No targets	17 7	33 13	50 20	24-hour Annual
PM _{2.5}	No targets	8 3	17 7	25 10	24-hour Annual
CO	3,000 1,000	10,000 3,000	20,000 7,000	30,000 10,000	1-hour 8-hour
NO ₂	20 10	66 33	132 66	200 100	1-hour 24-hour
SO ₂	35 12	115 40	231 79	350 120	1-hour 24-hour
O ₃	15 10	50 33	99 66	150 100	1-hour 8-hour

The 'alert' level RAAQTs are the same as the NAAQGs, except that the latter do not contain a guideline for PM_{2.5}.

2.2.3 Operative Regional Policy Statement

The Wellington Regional Policy Statement (RPS) became operative in 1995 and sets out the framework and priorities for resource management in the Wellington region. The RMA requires all regional councils to produce an RPS for their region and to review it every 10 years.

The second generation Regional Policy Statement for the Wellington region (RPS) was made operative on 24 April 2013. The RPS identifies the regionally significant issues around the management of the region's natural and physical resources and sets out what needs to be achieved (objectives) and the way in which the objectives will be achieved (policies and methods).

It is stated in the operative RPS that (emphasis added as **bold** text):

*"Odours, smoke and **dust** from people's activities can reduce the amenity of an area, affect people's health and social and cultural wellbeing, create annoyance, and sometimes cause poor visibility."*

Air Quality Objective 1 of the RPS states (emphasis added as **bold** text):

*"Odour, smoke and **dust** affect amenity values and people's wellbeing. These effects are generally localised and result from the following activities or land uses:*

- (a) odour from activities – such as, rendering, spray painting and solvent use, landfills,*
- (b) sewage treatment plants, silage feeding and effluent spreading*
- (c) smoke from domestic fires and backyard burning*
- (d) dust from land uses or activities – such as, earthworks, **quarries**, and land clearance."*

2.2.4 Existing Resource Consent

Resource consent number WGN050352 [24540] authorises the discharge to air of contaminants from a cleanfill located at the project site and was granted to WCC by GWRC on 6 July 2005. The consent will expire on 6 July 2020.

A copy of the resource consent is contained in Appendix A.

As mentioned earlier, WCC currently does not hold a resource consent for the existing or proposed extraction and processing activities.

The main conditions seeking to control dust emissions from the operation of the cleanfill are as follows:

- (4) *“Only material such as clay, soil, rock, concrete or brick that are free of combustible or putrescible components or hazardous substances or materials likely to create leachate by means of biological breakdown, shall be deposited within the cleanfill site.*
Materials considered to meet the above definition are outlined in Table 4.1 of the publication A Guide to the Management of Cleanfills by the Ministry for the Environment (2002).
- (5) *Cleanfill shall only be deposited in Areas A, B, C and D identified on the aerial photo attached to the application as Appendix One.*
- (6) *The permit holder shall ensure that there shall be no discharges to air resulting from the exercise of this consent that are noxious, dangerous, offensive or objectionable at or beyond the legal boundary of the property where the activity is to be carried out, being Lots 1, 2 & 3 DP 72995.*
- (7) *All work areas associated with the operation of the cleanfill are to be managed in such a way as to keep fugitive dust emissions to a minimum. This includes but not be limited to wetting unsealed areas with sufficient water as required.*
- (9) *Upon achieving the desired completion levels (as identified in the rehabilitation plan), cleanfilled areas shall be topsoiled and planted upon completion. The topsoil shall be of sufficient depth such that no concrete or other rubble is visible. Vegetation shall be established as soon as practical after topsoiling.*
- (11) *Depositing of cleanfill shall be supervised by Kiwi Point Quarry Staff at all times.*
- (12) *The permit holder shall record details of each load of material that is deposited within the cleanfill, including:*
 - (a) *the date and time of receipt of material at the cleanfill site;*
 - (b) *quantity;*
 - (c) *source;*
 - (d) *description of material deposited (e.g. soil, concrete, bricks);*
 - (e) *name of the contractor depositing the material.**This information shall be forwarded to the Manager, Consents Management, Wellington Regional Council at periods ending 31 March and 30 September each year, and shall be made available for inspection when requested.*
- (13) *The permit holder will keep a permanent record of any complaints received alleging adverse effects from the permit holder’s operations. The complaints record shall contain the following where practicable:*
 - (a) *the name and address of the complainant, if supplied;*
 - (b) *identification of the nature of the complaint;*
 - (c) *date and time of the complaint and alleged event;*
 - (d) *weather conditions at the time of the alleged event;*
 - (e) *results of the permit holder’s investigations; and,*

(f) any mitigation measures adopted.

The complaints records shall be made available to the Wellington Regional Council on request.

- (14) *The permit holder shall keep a record of any incident that has or could have resulted in a condition of this permit being contravened. The incident record shall be made available to the Wellington Regional Council upon request.*

The permit holder shall notify the Manager, Consents Management, Wellington Regional Council of any such incident, within 24 hours of the incident being brought to the attention of the permit holder, or the next working day.”

2.3 Wellington City District Plan

The Kiwi Point Quarry is situated within the Business 2 and Open Space B zones of the Wellington City District Plan (WCDP or the ‘Plan’), which became operative in July 2000 and was amended in November 2014. The quarry is subject to specific rules recognising its economic importance to Wellington City and the wider region as well as to other relevant rules applying elsewhere in Business Areas to mitigate adverse effects.

Business 2 is defined in the WCDP as “*traditional business areas where a range of industrial activities including warehousing, manufacturing and commercial services can occur.*”

It is stated in the WCDP that “*the Business 2 Areas generally have lower amenity values than other areas of the City and are, by and large, more utilitarian in character. Business 2 Areas provide a place where industry can locate without having to compete for land and without interference from non-industrial activities requiring higher amenity standards.*”

Rule 33.2.2.7 of the WCDP provides for the “*development and site rehabilitation of the Kiwi Point Quarry to the extent specified in the Plan in a way that avoids, mitigates or remedies adverse effects*” and states that (emphasis added as **bold** text):

*“Kiwi Point Quarry is an established quarry located in the Ngauranga Gorge, involving ongoing extraction, processing, cleanfilling and rehabilitation. As the continuing availability of aggregate and other quarry materials is economically important for the City and wider region, the Plan makes specific provision for the ongoing use and development of the quarry. For both the older and newer areas of the quarry, specific rules and a development plan are incorporated. These provisions provide for the **avoidance or mitigation of adverse effects from the quarry activity** and the long-term mitigation of effects on landscape and landform following quarrying. It is the Council’s intention that cut faces should be designed to yield a relatively natural landform in the long term and that rehabilitation of cut faces should begin as early as practicable. The staging of quarry development, and the day to day management of quarry activities are further detailed and controlled through the application of a quarry management plan.*

A quarry management plan shall be prepared and regularly updated by Council, which sets out:

- *intended staging of the excavation and cleanfilling activities*
- *the means of management of surface and groundwater*
- *management of on-site traffic*
- *provision for any onsite processing and temporary storage of quarry material*
- *any specific provisions relating to onsite management of noise, **dust**, vibration, visual impact, water quality*
- *a procedure for addressing any **complaints***
- *objectives and principles for the rehabilitation of the site, including:*
 - *a timetable for the rehabilitation of prominent quarry faces*
 - *measures to create soil conditions which will support plant growth*
 - *measures to create a variety of site conditions to support a range of species*

- means of controlling runoff to avoid erosion
- means of control of plant and animal pests
- measures to avoid fire risks
- means to assist native vegetation to regenerate on grazing land
- rehabilitation which is compatible with Open Space strategy for adjacent areas of land
- management of buffer areas
- practices and methods that will be adopted to ensure that all permitted activity conditions applying to the activities will be met.

The quarry management plan will complement the other rules applying to the quarry activity and will provide additional management details. It will be reviewed by Council at least every five years and any necessary adjustments will be made.

The progressive rehabilitation of the area is an important aspect of quarry management, and accordingly the Quarry Management Plan includes rehabilitation provisions. As quarrying and cleanfilling activities are completed on the site, an implementation plan shall be prepared annually by the consent holder in accordance with the Quarry Management Plan.

The requirement that regular monitoring is undertaken and regular progress reports are completed and submitted to the Council is a key element. This requirement is included because successful rehabilitation of any disturbed area requires constant monitoring as site conditions vary considerably and evolve over time. Regular observation and recording of results is an essential part of managing the process.

A vegetated buffer area is included within the area as part of the development of the southern part of the quarry. At the northern end, the necessary buffer area is within the Open Space B Area.

It is important also that rehabilitation of the quarry area should recognise and in the longer term be able to be integrated as appropriate with the Open Space strategy developed by the Council for the adjacent areas of land. Current Council policy is for the creation of further Green Belt areas on the steep hill sides of the Ngauranga Gorge and, for instance, it may be possible to allow continuation or linking of proposed walkways.

Overall, the environmental result will be the availability of quarry materials for the City and wider region in the short and medium term, and long-term achievement of well-vegetated quarry faces with the appearance of natural landforms which will be integrated with Council development of Open Space areas in this vicinity.”

Rule 34.6.1.10 of the WCDP states (emphasis added as **bold** text):

“34.6.1.10.1

Activities must not create a dust nuisance. A **dust nuisance** will occur if:

- there is visible evidence of suspended solids in the air beyond the site boundary; or
- there is visible evidence of suspended solids traceable from a dust source settling on the ground, building or structure on a neighbouring site, or water.

34.6.1.10.2

With regard to the above provisions, where sites are contiguous and are held under the same ownership then any dust nuisance shall be measured at the periphery of the land holding within the District Plan area.”

2.4 Assessment Criteria Adopted in this Report

Table 2-6 lists the assessment criteria adopted in this report. Note that only assessment criteria for particulate matter (as PM_{2.5}, PM₁₀, and TSP) apply in this assessment.

Table 2-6: Assessment Criteria Adopted in this Report

Contaminant	Assessment Criteria (µg/m ³)	Averaging Period	Reference
TSP	100	24-hour	MfE (2001)
PM ₁₀	50 20	24-hour Annual	NES / NAAQG / RAAQT NAAQG / RAAQT
PM _{2.5}	25 10	24-hour Annual	RAAQT RAAQT

In light of the dust-generating activities undertaken on the project site (see Section 1), the reasons outlined in Section 3.2 and the existing dust mitigation measures employed onsite (see Section 5), the principal assessment criteria adopted in this assessment are as follows:

- 100 µg/m³ for TSP (MfE's 24-hour mean trigger value); and,
- 50 µg/m³ for PM₁₀ (24-hour mean NES).

3 Assessment Methodology

3.1 Sensitive Receptors

In the context of this assessment, the term 'sensitive receptor' includes any persons, locations or ecosystems that may be susceptible to changes in airborne particulate concentrations and/or dust deposition as a result of dust emissions at Kiwi Point Quarry. An 'adverse effect' at a sensitive receptor may manifest itself as disamenity due to soiling (annoyance or nuisance), increased morbidity or mortality due to exposure to PM₁₀, or plant dieback due to reduced photosynthesis. Typical locations for sensitive receptors include:

- Residential properties, including retirement villages;
- Hospitals or medical centres;
- Schools and libraries;
- Marae;
- Public outdoor locations (e.g. parks, reserves, sports fields, beaches); and,
- Ecological receptors (habitats that might be sensitive to dust).

A desk-study was undertaken to identify sensitive receptors within a radius of 1 km of the project site boundary. The nearest potentially affected sensitive receptors are shown in Table 3-1.

Table 3-1: Sensitive Receptor Locations

Ref.	Type	Address	UTM Zone 60 South		Direction from Boundary	Distance from Boundary (m)
			Easting (m)	Northing (m)		
R1	Residential	42 Gurkha Crescent	315927	5431995	SW	0
R2	Residential	44 Gurkha Crescent	315915	5432008	SW	0
R3	Residential	46 Gurkha Crescent	315904	5432024	SW	0
R4	Residential	39 Gurkha Crescent	315888	5432041	SW	0
R5	Residential	37 Gurkha Crescent	315870	5432057	SW	0
R6	Residential	18 Shastri Terrace	315735	5432126	SW	40
R7	Residential	26 Imran Terrace	315540	5432200	SW	120
R8	Residential	7 Maldive Street	315527	5432367	W	10
R9	Residential	94 Burma Road	315530	5432389	NW	20
R10	Residential	175 Fraser Avenue	315551	5432618	NW	50
R11	School	170 Fraser Avenue	315580	5432797	NW	80
R12	Business	130 Fraser Avenue	315636	5432963	NW	30
R13	Retirement Village	134 Burma Road	315503	5432943	WNW	160
R14	Park	159 Burma Road	315610	5433070	NW	110
R15	Residential	113 Fraser Avenue	315774	5433051	NE	0
R16	Residential	9 Plumer Street	315968	5432881	NE	0

The nearest sensitive receptors to the Kiwi Point quarry boundary are receptors R1 to R5, R15 and R16 and are all residential properties situated adjacent to the quarry boundary. Receptor R11 is the Westmount School located on Fraser Avenue, Receptor R12 is a business located on Fraser Avenue, while receptor R13 is the Malvina Major Retirement Village. Receptor R14 is the Raroa Park (area of public open space).

Figure 3-1 shows the location of the potentially affected sensitive receptors identified in this assessment (solid yellow circles), the indicative quarry site boundary (solid red line), the area occupied by Taylor Preston (dashed red line) and the southern extension area (dashed orange line) on a Bing aerial basemap.

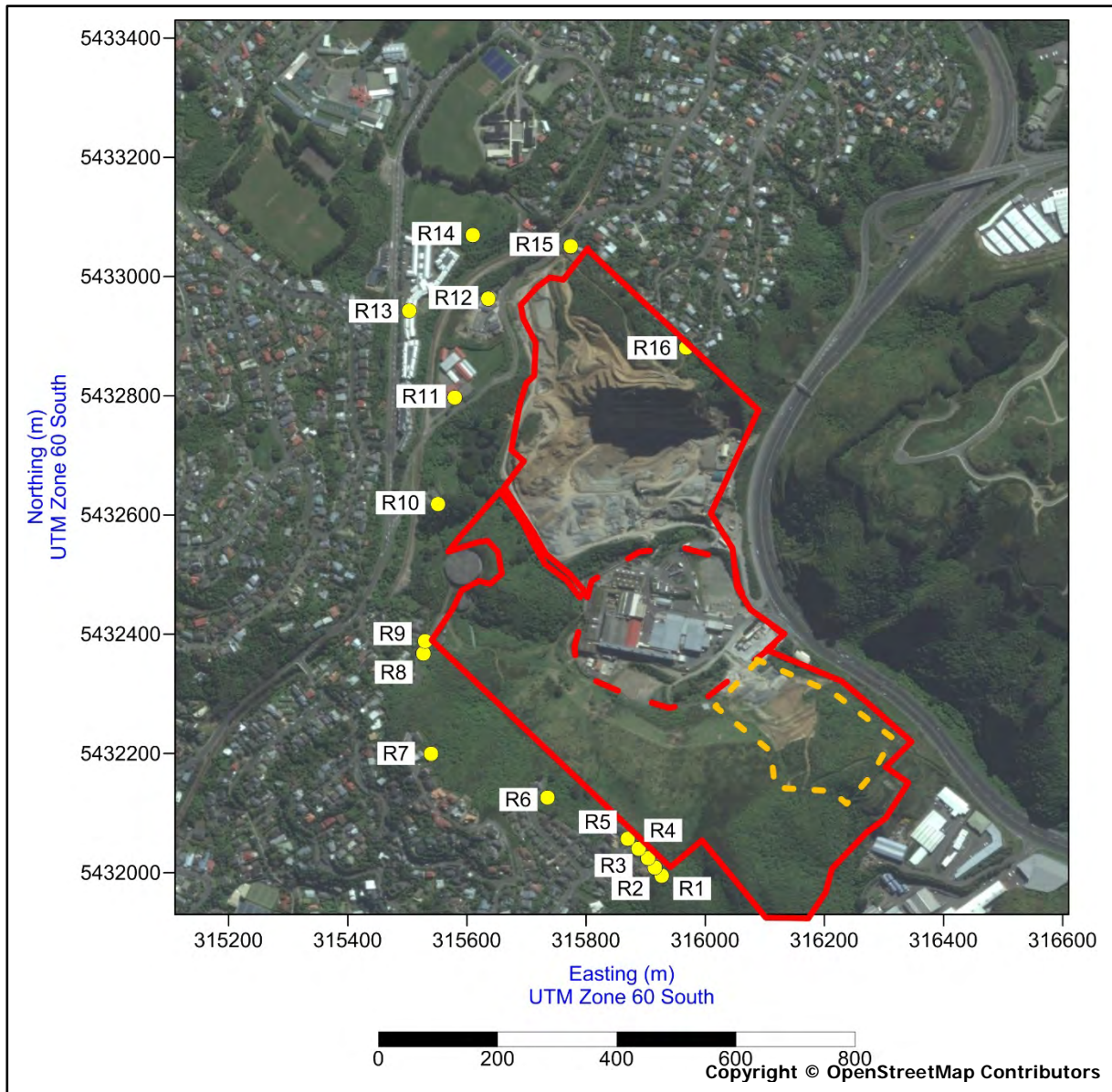


Figure 3-1: Sensitive Receptor Locations Showing a Bing Aerial Basemap

Whilst the existing businesses located on Tyers Road to the south-east of the quarry site boundary (and shown in Figure 3-1) have not been included as sensitive receptors in this report, a qualitative assessment has been undertaken in Section 5 to assess the potential risk at these properties as a result of dust emissions generated during the proposed southern extension works.

Figure 3-2 shows the location of the potentially affected sensitive receptors identified in this assessment (solid yellow circles) and the other features shown in Figure 3-1 on an OSM basemap.

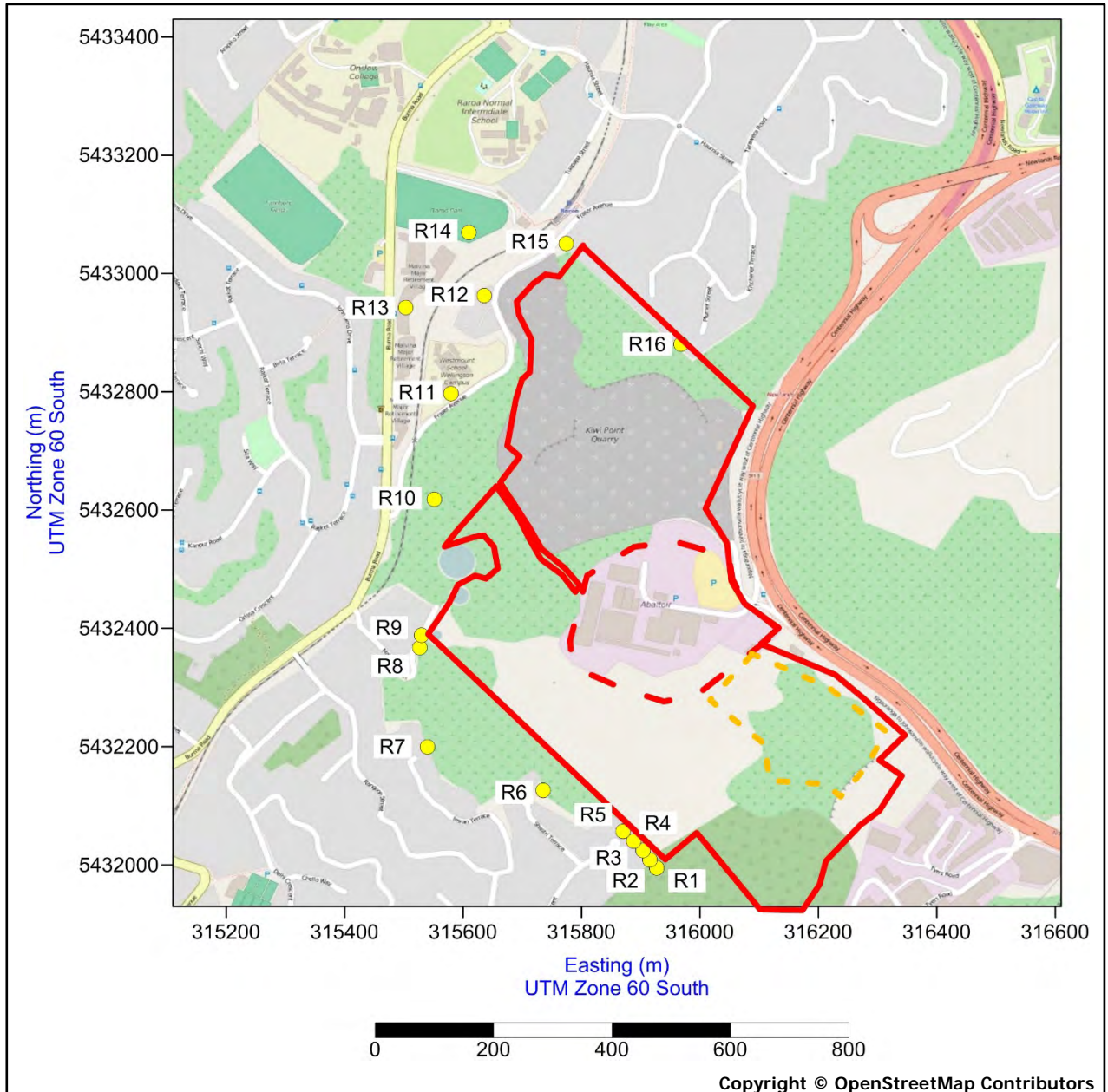


Figure 3-2: Sensitive Receptor Locations Showing an OSM Basemap

The receptors that are residential properties and the retirement village are considered to be of 'high' sensitivity¹⁰ to potential dust emissions at Kiwi Point Quarry, for the reasons outlined below:

- The location of a person(s) who could reasonably be expected to enjoy a high level of amenity; or
- The appearance, aesthetics or value of a person's property could be diminished by soiling; and the people or property could reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.

Receptor R11 (school) and receptor R12 (business) are considered to be of 'moderate' sensitivity, while Receptor R14 (park) is of 'low' sensitivity to potential dust emissions at Kiwi Point Quarry.

¹⁰ Other examples of high sensitivity receptors include, but are not limited to: marae, museums and other culturally important collections, medium- and long-term car parks (or parking areas used for work/residential) and car showrooms, electronics manufacturers, amenity areas and horticultural operations (e.g. salad or soft-fruit production). None of these types of receptors were identified from the desk-top study within the area immediately surrounding the quarry site boundary.

3.2 Dust and its Potential to Cause Nuisance

Dust has been defined in IAQM (2016) as follows:

“Solid particles that are suspended in air, or have settled out onto a surface after having been suspended in air. The terms dust and particulate matter (PM) are often used fairly interchangeably, although in some contexts one term tends to be used in preference to the other ... the term ‘dust’ has been used to include the particles that give rise to soiling and to human health and ecological effects.”

The above definition has been adopted in this assessment. Dust emissions arising from drilling and blasting, quarrying (extraction), rock crushing and processing (screening), and the movement of vehicles on unsealed haul roads have the potential to cause nuisance both within and beyond the Kiwi Point Quarry site boundary, in the absence of appropriate mitigation measures. Within the site boundary, dust has the potential to cause mechanical or electrical faults to equipment, such as computers and printers, and could increase abrasion of moving parts in plant and machinery, and clogging of filters. In the surrounding environment, dust/particulate has the potential to cause annoyance to neighbours by the soiling of property, in particular, windows, cars and also of washed clothes that have been hung out to dry.

Table 3-2 summarises the potential effects of dust/particulate on people and the environment associated with dust nuisance, as opposed to health-related effects associated with dust particles getting into eyes and mouth, or falling onto skin, hair and lips, or fine particles (PM_{2.5}) and coarse particles (PM_{2.5-10}) getting into the respiratory tract.

The focus of this air quality impact assessment is on the larger particles, usually termed dust or TSP, which tend to settle out of the air quickly, and their potential to cause offsite dust nuisance effects.

The UK's Minerals Policy Statement 2 (MPS2)¹¹ states that:

“Large dust particles (greater than 30 µm), which make up the greatest proportion of dust emitted from mineral workings, will largely deposit within 100 m of sources. Intermediate-sized particles (10–30 µm) are likely to travel up to 200–500 m. Smaller particles (less than 10 µm) which make up a small proportion of the dust emitted from most mineral workings, are only deposited slowly but may travel 1000 m or more. Concentrations decrease rapidly on moving away from the source, due to dispersion and dilution. Large- and intermediate-sized particles are often referred to as nuisance dust, while small particles (PM₁₀) are associated with effects on human health.”

As MPS2 suggests, any larger dust particles (e.g. greater than 30 µm in diameter) released during the activities undertaken onsite are likely to settle within 100 m of the source over flat terrain (e.g. map distance). IAQM (2016) states that larger particles (such as TSP) are unlikely to travel more than 400 m downwind of a dust source on a minerals site, even at the most dusty quarries, based on monitoring data presented in the report.

The residual emissions to air (after the implementation of mitigation measures) of coarse particles (PM_{2.5-10}) and fine particles (PM_{2.5}) as a result of activities undertaken on the project site are not likely to be significant.

¹¹ Minerals Policy Statement 2 (MPS2), Annex 1: Dust, Office of the Deputy Prime Minister, 2005.

Table 3-2: Potential Nuisance Effects of Particles on People and the Environment

People or Resources Affected	Potential Effects
People: People at home, workplaces, community facilities, schools, hospitals etc.	Nuisance through surface soiling
Environmental resources: Landscape and nature conservation	<ul style="list-style-type: none"> • Loss of visual amenity through deposition • Covering of the leaf surface, resulting in shading and consequently reduction in net photosynthesis, altered pigment levels and/or reduced productivity • Blocking of stomatal pores to prevent them from fully functioning • Alteration of leaf surface chemistry that may affect disease resistance • Addition of nutrients from the dust that may lead to increased growth and/or deficiencies • Changes in pH levels over time if the dust has different pH conditions to surrounding soils • Soil pollution via deposition from the air or water run-off • Creation of a surface film on still water bodies
Environmental resources: Water quality	Increase in suspended and dissolved material in water courses with knock-on effects on aquatic ecology
Environmental resources: Air quality	Increased ambient concentrations of particulate
Environmental resources: Cultural heritage	Surface soiling and damage during cleaning

3.3 Qualitative Risk Assessment for Dust

In this report, MfE (2011), IAQM (2014)¹² and IAQM (2016)¹³ were used to develop a qualitative (risk-based) assessment methodology to assess the potential effects arising from the dust-generating activities at the project site. The aim of the qualitative dust impact assessment is as follows:

- To determine the risk of dust emissions originating from the project site causing loss of amenity and/or health, cultural or ecological effects; and,
- To assess the magnitude (or scale) of the actual or potential effects beyond the site boundary.

The risk of dust emissions from a particular project site causing loss of amenity and/or health, cultural or ecological effects is related to:

- The dust-generating activities being undertaken at the project site (e.g. drilling and blasting, quarrying, crushing and screening of aggregate (including stockpiling of material) and vehicle movements on unsealed roads);
- The frequency and duration (including phasing) of these dust-generating activities;
- The size of the project site and/or the size of the dust-generating activity area;
- The local terrain and meteorological conditions (e.g. wind speed, wind direction and rainfall);
- The proximity of sensitive receptors to the dust-generating activities;
- The sensitivity of the receptors to dust/particulate; and,
- The adequacy of the mitigation measures applied onsite to reduce or eliminate dust emissions.

¹² IAQM, 2014. 'Guidance on the assessment of dust from demolition and construction', Institute of Air Quality Management, February 2014.

¹³ IAQM, 2016. 'Guidance on the assessment of mineral dust impacts for planning, Institute of Air Quality Management, May 2016.

The quantity of dust emitted from a particular project site will be related to the area of land where dust-generating activities occur, and the level of the activities (nature, magnitude and duration). Emissions from onsite vehicles passing over unsealed ground may be particularly important, and may be related to the silt content of the soil (if applicable), as well as the speed and weight of the vehicle, the surface moisture content, the distance covered and the frequency of vehicle movements. Soil has been defined by the US Environmental Protection Agency (US EPA) as particles smaller than 75 µm in diameter. Incidentally, British Standard 6069 defines 'dust' as particles up to 75 µm in diameter.

The wind direction, wind speed and rainfall, at the time when a dust-generating activity is taking place, will also influence whether there is likely to be a dust impact. Due to the variability of the weather, it is impossible to predict what the weather conditions will be when specific activities will be undertaken. However, the purpose of a dust impact assessment will be to determine the potential dust impacts for specific (e.g. worst-case) meteorological conditions.

Local terrain features coupled with wind speed and direction influence the propagation and dispersion of dust. This will also influence the frequency that a sensitive receptor is situated downwind of a dust-generating activity (emission source), and will depend on the distance and change in elevation between the source and receptor. Higher wind speeds in flat terrain and under dry meteorological (low moisture) conditions will result in the highest potential for the release of dust from a site. Buildings, structures and trees can also influence dispersion and the potential for offsite dust nuisance effects.

Adverse effects can occur in any direction from a project site. They are, however, more likely to occur downwind of the prevailing wind directions and/or close to the site (or dust emission source). It should be noted that the 'prevailing' wind direction is usually the most frequent direction over a long period such as a year; whereas a particular dust-generating activity may occur over a period of weeks or months (e.g. summer only) during which the most frequent wind direction might be quite different. The most frequent wind direction may also not be the direction from which the wind speeds are highest. The use of the annual mean prevailing wind direction in the assessment of risk is most useful, therefore, for activities of long duration, such as those undertaken at the Kiwi Point Quarry. However, as rainfall acts as a natural dust suppressant, the potential for dust impacts is greater during the drier summer months. Therefore, consideration should be given in this report to seasonal meteorological data (e.g. rainfall amount, wind direction and wind speed), where site-specific or local data are available.

Local terrain and vegetation conditions also need to be taken into account. Topography and natural barriers (e.g. woodland and other vegetation) will reduce airborne particulate concentrations due to impaction. In addition, if the locality has a history of dust-generating activities, such as quarrying or abrasive blasting, a given level of additional dust may be more acceptable (i.e. more readily tolerated, than in a suburban residential area), as is the case at the Kiwi Point Quarry. Alternatively, impacts may be less acceptable where nearby residents have become sensitised to dust or have a history of complaining and may therefore be more likely to complain about a new dust source. Similarly, in rural areas agricultural activities may generate dust and this should be taken into account in the assessment of risk.

For PM₁₀ and PM_{2.5}, local ambient air quality monitoring and/or atmospheric dispersion modelling data can be used to determine whether the 24-hour mean standards and guidelines are likely to be exceeded as a result of the proposed dust-generating activities. The risk of PM₁₀ NES exceedances will be greatest at receptors very close to the site boundary (or dust emission source), especially if combined with PM₁₀ from a major road (e.g. State Highway), or another PM₁₀ emission source. However, a quantitative assessment is not considered to be required as part of this study, based on the results of the qualitative assessment presented in Section 5.

3.4 Methodology

The qualitative (risk-based) assessment methodology outlined below is based IAQM (2014) and IAQM (2016) and has been modified by MWH for the activities undertaken at the project site. The overall approach followed by MWH draws parallels with the FIDOL¹⁴ method recommended in MfE (2001).

In accordance with IAQM (2014), the potential dust impacts have been assessed separately for each activity for the following categories:

- 1) Annoyance (or nuisance) due to dust soiling (deposition); and,
- 2) The risk of health effects due to an increase in exposure to PM₁₀.

It is noted that as no ecological or culturally sensitive receptors were identified from the desk-top study to be located within close proximity to the quarry site boundary, the potential impacts of dust-generating activities undertaken at the project site on these types of receptors are considered to be negligible and have not been considered further in this assessment.

The methodology follows the source-pathway-receptor (S-P-R) concept and represents the hypothetical relationship between the dust emission source (S), the pathway (P) by which nuisance or exposure might occur and the receptor (R) that could be adversely effected, and would apply equally to the human, cultural and ecological receptors.

The first step in the qualitative assessment is to determine the risk of dust arising in sufficient quantities to cause annoyance and/or health impacts (and/or cultural impacts and/or ecological impacts, where applicable) using four risk categories: 'negligible', 'low', 'medium' and 'high' risk. It first involves defining the site characteristics, onsite dust-generating activities and baseline environmental conditions (including meteorology, terrain, surrounding land use and ambient air quality).

A site is allocated a risk category based on two factors:

- The scale and nature of the dust-generating activities, which determines the potential dust emission magnitude as 'small', 'medium' or 'large' (Step 1); and,
- The sensitivity of the area to dust impacts (Step 2), which is defined as 'low', 'medium' or 'high' sensitivity (see Section 3.1), including the factors influencing the 'pathway' term, such as the position of receptors relative to the prevailing wind direction, distance between source and receptor, the topography, terrain and physical features (including vegetation cover and buildings). This step is also referred to as determining the pathway effectiveness.

These two factors (the 'source' term in Step 1 and the 'pathway' term in Step 2) are combined in Step 3 to determine the risk of dust impacts at each receptor location. The risk category assigned to the site can be different for individual site activities (e.g. drilling/blasting, quarrying, rock crushing and screening, material handling and storage (stockpiling) and vehicle movements). More than one of these activities may occur onsite at any one time.

Where appropriate, the site can be divided into 'zones' for the dust risk assessment. This may result in different mitigation levels being applied to each zone. This could be where different parts of a large site are different distances from the nearest receptors, or where activities move away from or closer towards a receptor, during a new stage of the quarry development (e.g. during the proposed southern extension).

However, MWH recommends that on complex sites where activities are not easily segregated, the mitigation appropriate for the highest risk category should be applied. The aim is to ensure that it is clear what mitigation is supposed to be implemented on a site and to make auditing this simpler not only for regulatory authorities but also for onsite (operational) staff.

3.4.1 Step One – Estimate Dust Impact Risk and Potential Residual Emissions

The residual dust emission magnitude is based on the scale of the anticipated works and should be classified as 'imperceptible', 'small', 'medium', or 'large' after the 'designed-in' mitigation measures have been taken into account. For the purposes of this assessment, the 'designed-in' mitigation measures are assumed to be the existing mitigation measures employed onsite by Holcim (as opposed to the additional measures recommended in Section 6). In addition, landscaping (including existing/proposed trees and vegetation cover), existing/proposed terrain elevations between dust emission sources and

¹⁴ The Frequency (F), Intensity (I), Duration (D), Offensiveness (O) and Location (L) of the dust effect (nuisance).

receptors and the site-specific / local meteorology (e.g. frequency of moderate to high wind speed conditions at the site and the propagation of dust by wind) should also be considered.

An 'imperceptible' impact magnitude is one where there is predicted to be no discernible change as a result of the scheme/activity. For example, there is predicted to be a variation in local ambient concentrations of TSP, PM₁₀ or PM_{2.5} of less than 1% of the relevant ambient air quality standards and guidelines. However, for simplicity, MWH has adopted the following classifications in this assessment: 'small', 'medium' and 'large'.

Examples of how the potential dust emission magnitude for different activities can be defined are shown in Table 3-3 and were based on the examples provided in IAQM (2016) for site preparation / restoration, mineral extraction, materials handling, onsite transportation, mineral processing, stockpiles / exposed surfaces and offsite transportation. Note that, in each case, not all the criteria need to be met, and that other criteria may be used if justified in the assessment. The 'medium' magnitude residual dust emissions would fall between the 'small' and 'large' categories.

Table 3-3: Determining Residual Source Emissions

Activity	'Small' Emissions	'Large' Emissions
Site Preparation / Restoration	<ul style="list-style-type: none"> • Small working area (<2.5 ha) • Low bunds (<4 m in height) • <20,000 m³ material movement • <5 heavy plant simultaneously active • All bunds seeded • Material with a high moisture content (low dust potential) 	<ul style="list-style-type: none"> • Large working area (>10 ha) • High bunds (>8 m in height) • >100,000 m³ material movement • >10 heavy plant simultaneously active • All bunds un-seeded • Fine grained and friable material (high dust potential)
Mineral Extraction	<ul style="list-style-type: none"> • Small working area (<20 ha) • Low energy extraction methods (hydraulic excavator) • Material of low dust potential (e.g. coarse and/or high moisture content) • Low extraction rate (<200,000 tpa) 	<ul style="list-style-type: none"> • Large working area (>100 ha) • High energy extraction methods (drilling and blasting frequently used) • Material of high dust potential (e.g. small particles and/or low moisture content) • High extraction rate (e.g. 1,000,000 tpa)
Materials Handling	<ul style="list-style-type: none"> • Low number of heavy plant (<5 plant more than 100 m from site boundary within quarry void or clean hardstanding) • Transferring material of low dust potential and/or high moisture content 	<ul style="list-style-type: none"> • High number of heavy plant (>10 loading plant less than 50 m from site and/or on unconsolidated, surface with low moisture content) • Transferring material of high dust potential and/or low moisture content
Onsite Transportation	<ul style="list-style-type: none"> • Use of (covered) conveyors for majority of onsite material transportation • Paved haul roads • Road surface of low dust potential • Low number of HDV movements (<100 vehicle movements per day) and/or surface materials of compacted aggregate • Low total length of haul roads (<500 m in length) • Controlled (low) vehicle speed (<25 kph) 	<ul style="list-style-type: none"> • Use of unconsolidated haul roads for majority of onsite material transportation • Unpaved haul roads • Road surface of high dust potential • High number of HDV movements (>250 vehicle movements per day) and/or surface materials of compacted aggregate • High total length of haul roads (>2 km in length) • Uncontrolled vehicle speed
Mineral Processing	<ul style="list-style-type: none"> • Raw material of low dust potential and/or fixed screening plant with effective dust control • End product of low dust potential (high moisture e.g. wet sand/gravel) 	<ul style="list-style-type: none"> • Raw material of high dust potential and/or mobile crusher and screening plant with low dust control • End product of high dust potential (low moisture e.g. hard rock)

Activity	'Small' Emissions	'Large' Emissions
	<ul style="list-style-type: none"> • Single process or product • Low volume material processed (<200,000 tpa) 	<ul style="list-style-type: none"> • Complex or combination of processes • High volume material processed (>1,000,000 tpa)
Stockpiles / Exposed Surfaces	<ul style="list-style-type: none"> • Short-term stockpile (<1 month) and/or quarry production <200,000 tpa • Infrequent material transfers (weekly) • Material of low dust potential (high moisture content) • Ground surface hardstanding / clean • Stockpiles well within quarry void and more than 100 m from site boundary • Small areas of exposed surfaces (<2.5 ha) • Low wind speeds / high dust threshold 	<ul style="list-style-type: none"> • Long-term stockpile (>12 months) and/or quarry production >1,000,000 tpa • Frequent material transfers (daily) • Material of high dust potential (low moisture content) • Ground surface unconsolidated / un-kept • Stockpiles or exposed surfaces within 50 m from site boundary • Large areas of exposed surfaces (>10 ha) • High wind speeds / low dust threshold
Offsite Transportation (trackout)	<ul style="list-style-type: none"> • Low number of HDV movements (<25 per day) • Paved (sealed) surface road and/or use of road sweeper (truck) or manual cleaning • Extensive vehicle cleaning facilities • Low total length of access road (<20 m) 	<ul style="list-style-type: none"> • High number of HDV movements (>200 per day) • Unconsolidated access road and/or no road sweeper or manual cleaning • Limited or no vehicle cleaning facilities • High total length of access road (>50 m)

3.4.2 Step Two – Determine Receptor Sensitivity and Pathway Effectiveness

The sensitivity of the receptors identified in this assessment has taken the following factors into account:

- Specific sensitivities of receptors (see examples shown in Section 3.1). In this assessment, all residential properties (including the retirement village) were considered to be of ‘high’ sensitivity to potential dust emissions at the quarry. The school and business were considered to be of ‘moderate’ sensitivity, while the park was of ‘low’ sensitivity to dust emissions at the quarry;
- The level of amenity;
- The proximity and type of sensitive receptors (including frequency that receptors are situated downwind of dust-generating activities during prevailing wind directions);
- Where an assessment for PM₁₀ is required, the local PM₁₀ background concentration and compliance against the NES for PM₁₀ (not applicable in this assessment); and,
- Site-specific factors, such as whether there are any man-made earth bunds, local terrain features (the latter are considered to be significant at Kiwi Point Quarry, as shown in Section 1.5), or natural shelters, such as trees and other types of vegetation, to reduce the risk of wind-blown dust.

In accordance with IAQM (2016), the effectiveness of the pathway to each sensitive receptor location was determined by considering the distance and direction of the receptors relative to the prevailing wind directions (based on 5 years’ wind speed and direction data for Kelburn AWS as shown in Section 4, in the absence of site-specific data), and the criteria used in this assessment are summarised in Table 3-4 and Table 3-5, respectively. However, the criteria shown in the tables do not consider the change in elevation between the dust emission source and receptor, and this limitation has the potential to lead to an over-prediction (more conservative assessment) of the potential impacts.

Table 3-4: Categorisation of Frequency of Potentially Dusty Winds

Frequency Category	Criteria*
Infrequent	Frequency of winds (>5.5 m/s) from the direction of the dust source on all days are less than 5%
Moderately frequent	Frequency of winds (>5.5 m/s) from the direction of the dust source on dry days are between 5% and 12%
Frequent	Frequency of winds (>5.5 m/s) from the direction of the dust source on dry days are between 12% and 20%
Very frequent	Frequency of winds (>5.5 m/s) from the direction of the dust source on dry days are greater than 20%

N.B. * For a worst-case assessment, include all days.

High-risk conditions for dust emissions at the site are associated with dry days with measured winds above moderate breeze (5.5 m/s). However, this assessment has not taken into account the potential for rainy days to reduce the frequency of potential ‘high-risk’ conditions. In other words, the frequency of ‘potentially dusty winds’ determined in Section 4 for the Kiwi Point Quarry is based on Table 3-4 and for ‘all days’ (including rainy days).

Given that the Kiwi Point Quarry is not situated within a polluted airshed and in the absence of actual site-specific or local (e.g. GWRC) ambient air quality monitoring data, it was assumed that the 24-hour mean background concentration of PM₁₀ beyond the project site boundary was 28 µg/m³. Reference should also be made to the New Zealand Transport Agency’s interactive background air quality maps¹⁵, which indicates that the existing 24-hour mean background concentration of PM₁₀ within Raroa, Ngauranga West, Ngauranga East and Rangoon Heights is 28 µg/m³.

¹⁵ <http://nzta.maps.arcgis.com/apps/OnePane/basicviewer/index.html?appid=9ba0e52d1b3d4770ab031bb843d6198f>

Table 3-5: Categorisation of Receptor Distance from Source

Frequency Category	Criteria*
Distant	Receptor is between 200 m and 400 m from the dust source
Intermediate	Receptor is between 100 m and 200 m from the dust source
Close	Receptor is less than 100 m from the dust source

N.B. * For a worst-case assessment, do not take into account changes in terrain elevations or the influence of vegetation cover and buildings.

The pathway effectiveness is determined from the outputs from Table 3-4 and Table 3-5 and using Table 3-6.

Table 3-6: Pathway Effectiveness

Receptor Distance	Frequency of Potentially Dusty Winds			
	Infrequent	Moderately Frequent	Frequent	Very Frequent
Close	Ineffective	Moderately Effective	Highly Effective	Highly Effective
Intermediate	Ineffective	Moderately Effective	Moderately Effective	Highly Effective
Distant	Ineffective	Ineffective	Moderately Effective	Moderately Effective

N.B. * For a worst-case assessment, do not take into account changes in terrain elevations or the influence of vegetation cover and buildings.

3.4.3 Step Three – Define the Potential Dust Impact Risk for Each Activity

The third step is to combine the residual source emissions (Step 1) and the pathway effectiveness (Step 2) to predict the dust impact risk for each dust-generating activity (and/or phase) and receptor as shown in Table 3-7.

Table 3-7: Dust Impact Risk Assessment Criteria

Pathway Effectiveness (Step 2)	Residual Source Emissions (Step 1)		
	Small	Medium	Large
Highly Effective Pathway	Low Risk	Medium Risk	High Risk
Moderately Effective Pathway	Negligible Risk	Low Risk	Medium Risk
Ineffective Pathway	Negligible Risk	Negligible Risk	Low Risk

The final step in the assessment is to determine the magnitude (scale) of the potential dust impact risks predicted at each receptor location. For complex sites it may be necessary to determine the risk for individual activities or phases and an overall assessment should be made based on the highest (worst-case) risk activity/phase. The dust impact magnitude criteria used in this assessment are shown in Table 3-8.

Table 3-8: Dust Impact Magnitude Criteria

Dust Impact Risk	Receptor Sensitivity		
	Low	Medium	High
High Risk	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
Medium Risk	Negligible Effect	Slight Adverse Effect	Moderate Adverse Effect
Low Risk	Negligible Effect	Negligible Effect	Slight Adverse Effect
Negligible Risk	Negligible Effect	Negligible Effect	Negligible Effect

4 Local Meteorological Conditions

4.1 Wind Speed and Direction

The nearest automated weather stations (AWS) to Kiwi Point Quarry are the Kaukau Top and Kelburn AWS sites. The details of these surface meteorological stations, which are all included in the national climate database (CliFlo) maintained by NIWA, are summarised in Table 4-1.

Table 4-1: Nearest Weather Stations to the Project Site

Name	Agent Number	Operator	UTM Zone 60 South		Distance (km) and Direction from Site Boundary	
			Easting (m)	Northing (m)		
Kaukau Top	03375	NIWA	313702	5432772	1.9	WNW
Kelburn AWS	25354	MetService	313119	5427300	5.5	SW

The Kaukau Top weather station site is situated at an elevation of 425 m above mean sea level (MSL), which indicates that whilst it is closer to the site than the Kelburn AWS, it is likely to experience higher wind speed conditions than at Kelburn or at the Kiwi Point Quarry. The Kelburn AWS site is situated at an elevation of 125 m above MSL, compared with the proposed final elevations within the void (floor) of the existing quarry (Area A) and the proposed southern extension (Area H) of 50 m and 55 m above MSL, respectively. However, it is noted that the elevations along the ridgelines surrounding the quarry upon which the nearest sensitive receptors are located are situated at elevations of between approximately 150 m and 210 m and in the absence of any site-specific or more local meteorological data, it is considered appropriate in this assessment to use the data from the Kelburn AWS.

Hourly wind speed and direction data for these two meteorological stations between 1 January 2008 and 31 December 2012 (i.e. over a 5 year period) were analysed. The data availability at both AWS sites over the 5-year period was excellent at 99.5% (Kaukau Top) and 99.7% (Kelburn AWS). The data availability for each year is shown in Table 4-2.

Table 4-2: Data Availability at Kaukau Top and Kelburn AWS between 2008 and 2012

Year	Kaukau Top		Kelburn AWS	
	Number of Missing Data Hours	Percentage of Missing Data Hours (%)	Number of Missing Data Hours	Percentage of Missing Data Hours (%)
2008	123	1.4	72	0.8
2009	10	0.1	29	0.3
2010	12	0.1	4	0.1
2011	36	0.4	8	0.1
2012	28	0.3	19	0.2

The percentage calms (or winds less than 0.45 m/s) and the annual mean wind speed measured at both sites for each year is shown in Table 4-3. As expected, the annual mean wind speeds measured at Kelburn AWS were significantly lower than at Kaukau Top, however, the percentage of calms was somewhat unexpectedly lower at Kelburn AWS than at Kaukau Top.

Table 4-3: Frequency of Calms and Annual Mean Wind Speeds between 2008 and 2012

Year	Kaukau Top		Kelburn AWS	
	Percentage of Calm Hours (%)	Annual Mean Wind Speed (m/s)	Percentage of Calm Hours (%)	Annual Mean Wind Speed (m/s)
2008	1.5	11.1	0.2	5.1
2009	1.1	11.8	0.1	5.6
2010	2.3	11.3	0.2	5.3
2011	2.1	10.8	0.2	5.1
2012	2.1	10.8	0.3	5.1

Analysis of hourly wind speed and direction data for these two meteorological stations between 2008 and 2012 indicates that winds from all directions are experienced at each monitoring site, and are therefore likely to be experienced at Kiwi Point Quarry.

The predominant winds (63.8% in total) measured at the Kelburn AWS were from the south-south-east (SSE, 17.7%), south (S, 13.7%), north-west (NW, 12.2%), north (N, 10.5%) and south-east (SE, 9.6%), as shown in Table 4-4 and in the wind rose shown in Figure 4-1.

Table 4-4: Wind Speed and Direction Frequencies at Kelburn AWS between 2008 and 2012

Wind Direction	Wind Speed (m/s)						Total (%)
	0.5 to 1.5 (%)	1.5 to 3.0 (%)	3.0 to 5.5 (%)	5.5 to 8.0 (%)	8.0 to 10.5 (%)	>10.5 (%)	
N	0.6	1.8	4.1	2.9	0.9	0.2	10.5
NNE	0.7	1.3	2.2	1.5	0.4	0.1	6.1
NE	0.6	0.9	0.6	0.3	0.1	0.0	2.5
ENE	0.6	0.7	0.4	0.1	0.0	0.0	1.8
E	0.5	0.6	0.5	0.2	0.1	0.0	1.9
ESE	0.4	0.5	0.8	0.4	0.2	0.0	2.5
SE	0.4	1.2	3.3	2.7	1.5	0.5	9.6
SSE	0.5	1.9	7.1	5.3	2.4	0.6	17.7
S	0.6	1.7	4.7	3.2	2.4	1.2	13.7
SSW	0.4	0.8	1.4	0.6	0.3	0.2	3.7
SW	0.3	0.5	0.6	0.2	0.0	0.0	1.7
WSW	0.5	0.7	0.3	0.1	0.0	0.0	1.5
W	0.8	1.1	0.5	0.2	0.1	0.0	2.8
WNW	0.7	0.7	1.3	1.4	0.9	0.6	5.6
NW	0.6	0.8	2.5	3.2	2.9	2.3	12.2
NNW	0.5	0.9	2.4	1.2	0.4	0.2	5.6
Sub-Total	8.8	16.2	32.5	23.3	12.6	6.0	99.5
Calms							0.2
Missing							0.3
Total							100.0

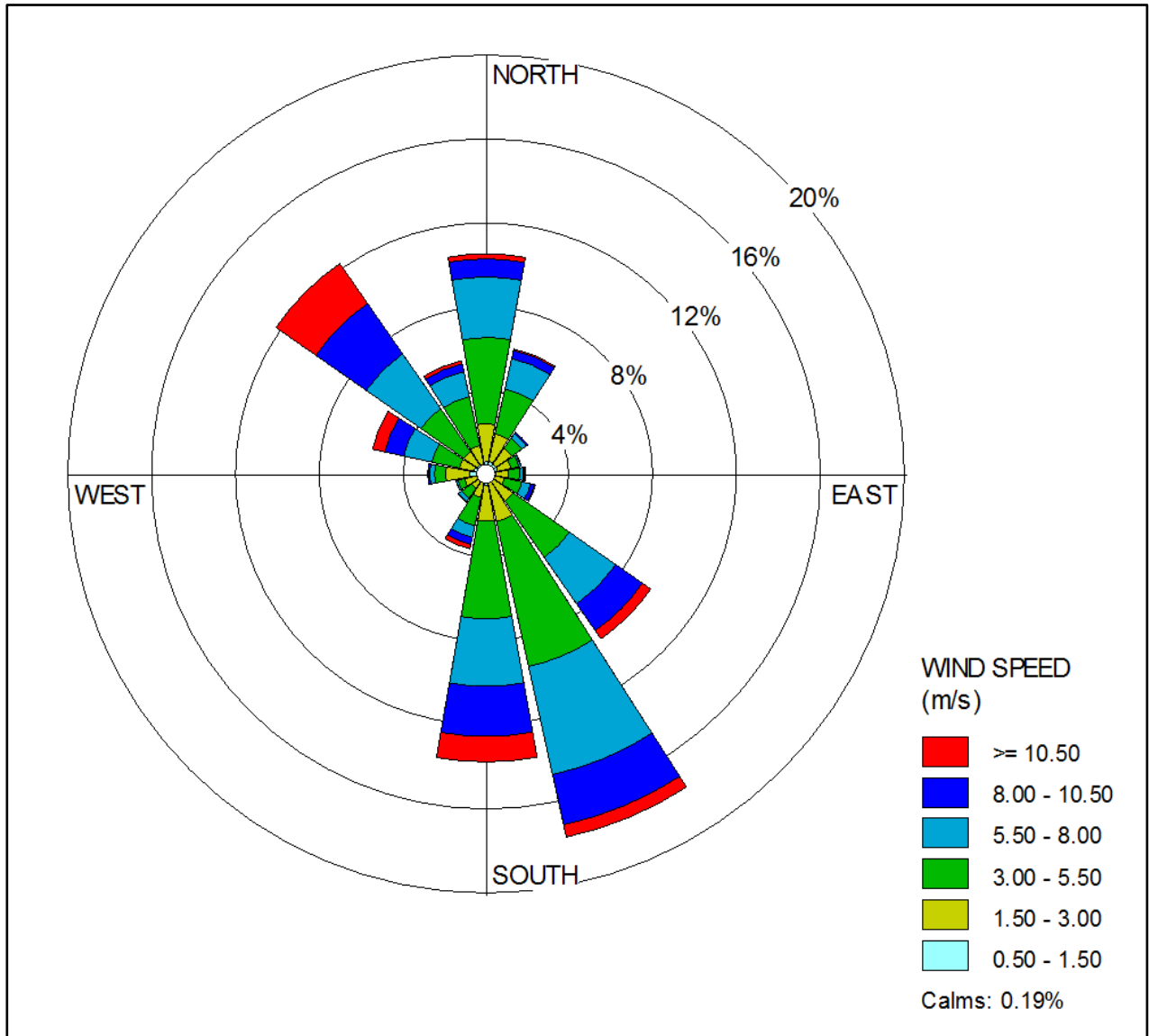


Figure 4-1: Wind Rose for Kelburn AWS for 2008 to 2012

The wind speed frequency distribution for Kelburn AWS for each year is shown in Figure 4-2. The figure indicates that 41.5% of the hourly mean wind speeds were above 5.5 m/s, which is significant as this has been adopted in this assessment as the threshold above which there is the potential for the propagation of dust in dry conditions, based on IAQM (2016). A 5.5 m/s mean wind speed corresponds to 19.8 km/hr or 'moderate breeze' (Beaufort 4) or 'moderate' winds, as defined by the MetService. Further analysis has been undertaken of the data to determine the percentage frequency that sensitive receptor locations are likely to be situated downwind of potentially dusty winds blowing over the quarry (refer Section 3).

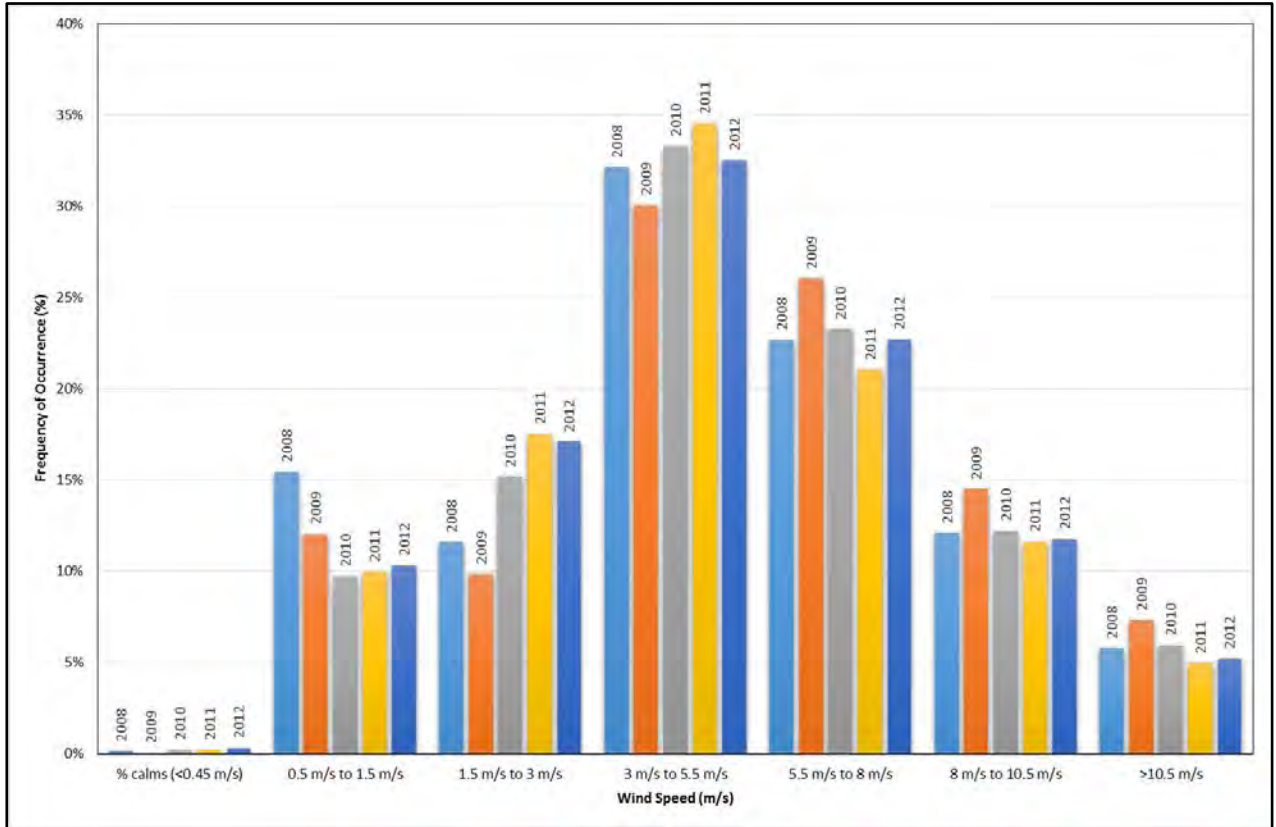


Figure 4-2: Wind Speed Frequency Distribution for Kelburn AWS for 2008 to 2012

The predominant winds above 5.5 m/s measured at the Kelburn AWS were from the NW (8.4%), SSE (8.3%), S (6.8%), SE (4.7%) and N (4%), which corresponds to 32.2% of the total winds above 5.5 m/s, as shown in Table 4-5 and in the wind rose shown in Figure 4-3.

Table 4-5: Moderate to High Wind Speed and Direction Frequencies at Kelburn AWS

Wind Direction	Wind Speed for 2008 to 2012 (m/s)			Total (%)
	5.5 to 8.0 (%)	8.0 to 10.5 (%)	>10.5 (%)	
N	2.9	0.9	0.2	4.0
NNE	1.5	0.4	0.1	2.0
NE	0.3	0.1	0.0	0.3
ENE	0.1	0.0	0.0	0.1
E	0.2	0.1	0.0	0.3
ESE	0.4	0.2	0.0	0.7
SE	2.7	1.5	0.5	4.7
SSE	5.3	2.4	0.6	8.3
S	3.2	2.4	1.2	6.8
SSW	0.6	0.3	0.2	1.1
SW	0.2	0.0	0.0	0.2
WSW	0.1	0.0	0.0	0.1
W	0.2	0.1	0.0	0.3
WNW	1.4	0.9	0.6	2.9
NW	3.2	2.9	2.3	8.4
NNW	1.2	0.4	0.2	1.8
Sub-Total	23.3	12.6	6.0	42.0
Calms				0.2
<5.5 m/s				57.5
Missing				0.3
Total				100.0

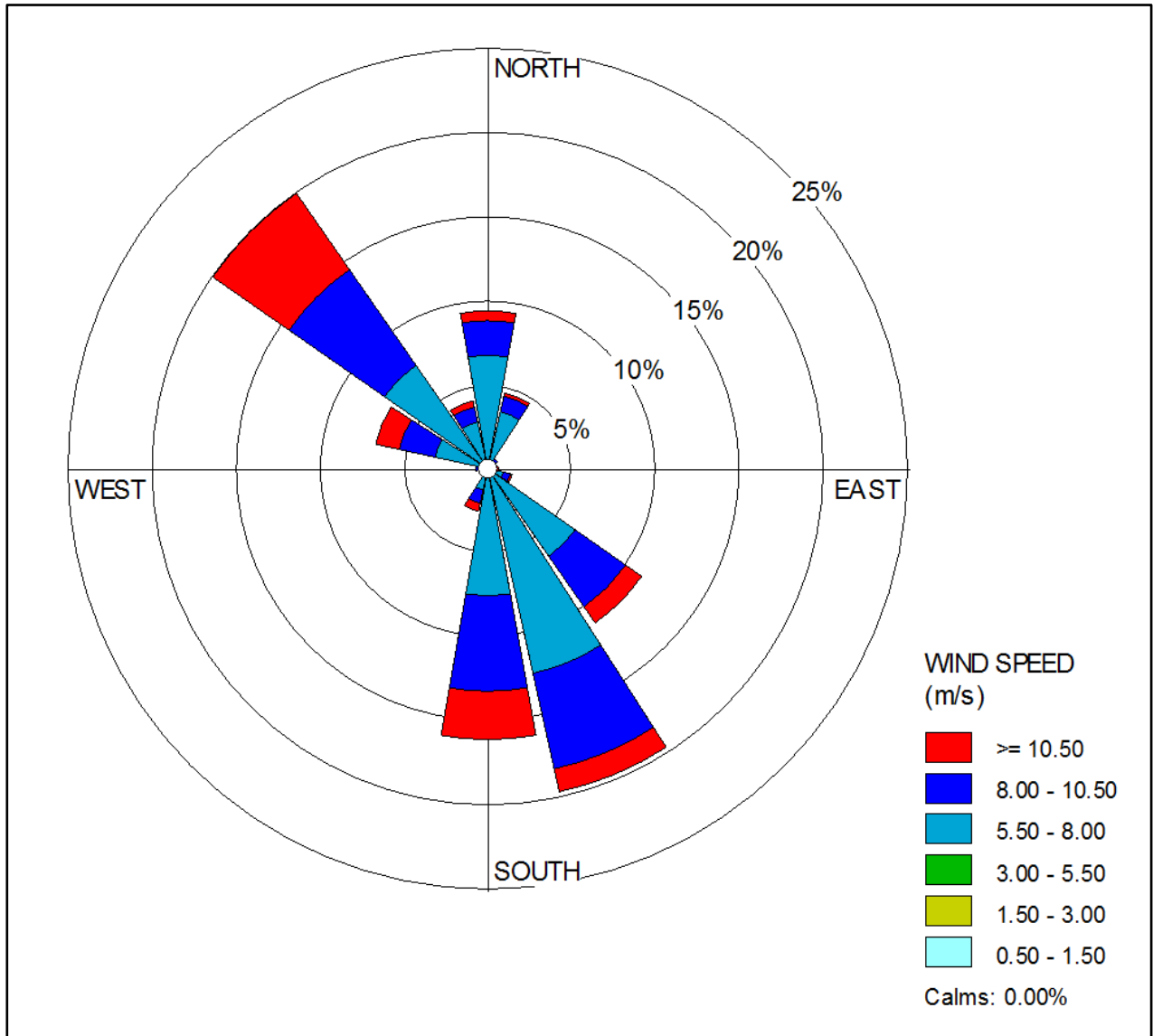


Figure 4-3: Wind Rose for Moderate to High Wind Speeds at Kelburn AWS for 2008 to 2012

The frequency of wind speeds above 5.5 m/s (moderate to high wind conditions or potentially dusty winds) are shown in Table 4-6, along with the distance of each sensitive receptor relative to the direction from the nearest potential dust emission source(s) up to a maximum map-distance of 400 m, in accordance with IAQM (2016). The pathway effectiveness (Step 2 of the methodology) is also shown for each receptor. It is noted that no further analysis of the wind speed and direction data has been undertaken to exclude rainy days, in order to allow for a robust (conservative) assessment.

Table 4-6: Frequency of Potentially Dusty Winds and Receptor Pathway Effectiveness

ID	Receptor Address	Direction From Nearest Dust Source to Receptor	Total Wind Speeds >5.5 m/s (%)	Freq. of Potential Dusty Winds	Receptor Distance and Description from Source (m)	Pathway Effectiveness
R1	42 Gurkha Crescent	NNE to E	2.7	Infrequent	230 / Distant	Ineffective
R2	44 Gurkha Crescent	NNE to E	2.7	Infrequent	230 / Distant	Ineffective
R3	46 Gurkha Crescent	NNE to E	2.7	Infrequent	250 / Distant	Ineffective
R4	39 Gurkha Crescent	NNE to E	2.7	Infrequent	260 / Distant	Ineffective
R5	37 Gurkha Crescent	NNE to E	2.7	Infrequent	260 / Distant	Ineffective
R6	18 Shastri Terrace	NNE to E	2.7	Infrequent	300 / Distant	Ineffective
R7	26 Imran Terrace	NNE to E	2.7	Infrequent	380 / Distant	Ineffective
R8	7 Maldive Street	NNE to ENE	2.4	Infrequent	270 / Distant	Ineffective
R9	94 Burma Road	NNE to ENE	2.4	Infrequent	240 / Distant	Ineffective
R10	175 Fraser Avenue	NE to ESE	1.4	Infrequent	120 / Intermediate	Ineffective
R11	170 Fraser Avenue	NE to SE	6.1	Moderately Frequent	100 / Intermediate	Moderately Effective
R12	130 Fraser Avenue	ENE to S	20.9	Very Frequent	50 / Close	Highly Effective
R13	134 Burma Road	E to SSE	14.0	Frequent	200 / Distant	Moderately Effective
R14	159 Burma Road	ESE to S	20.5	Very Frequent	120 / Intermediate	Highly Effective
R15	113 Fraser Avenue	SE to SW	21.2	Very Frequent	100 / Intermediate	Highly Effective
R16	9 Plumer Street	SSE to W	16.9	Frequent	160 / Intermediate	Moderately Effective

4.2 Rainfall

Chappell (2014)¹⁶ indicates that average annual rainfall within the Wellington region is highly variable due to topographical effects which influence airflows and thus the patterns of precipitation.

The monthly and annual rainfall normals (in mm) for Wellington Airport (Site A) and Gracefield, Lower Hutt (Site B), which are the two closest weather stations to the project site where rainfall measurements are undertaken by NIWA, are shown in Table 4-7.

Table 4-7: Monthly and Annual Rainfall Normals for Wellington and Gracefield for 1981 to 2010

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
A	58	61	67	68	86	101	113	93	75	95	75	65	957
B	44	55	60	50	70	84	87	76	59	67	62	55	767

The percentage of annual rainfall totals for each month for Wellington Airport (Site A) and Gracefield, Lower Hutt (Site B), are shown in Table 4-8.

Table 4-8: Percentage of Annual Rainfall Totals for Each Month for Wellington and Gracefield

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
A	6	6	7	7	9	11	12	10	8	10	8	7	-
B	4	6	9	5	13	11	14	8	8	7	8	8	-

The rainfall data for Wellington Airport and Gracefield indicate that rainfall is highest at these locations, as expected, during the winter months (June to August) and is lowest during the summer months (December to February). Whilst there is a higher potential for high-risk conditions for dust emissions at the site to occur during summer (e.g. dry days with measured winds above moderate breeze (5.5 m/s)), the rainfall data indicate that there is still a moderate to high potential for rainy days to occur at this time of year, which will dampen down unsealed surfaces and stockpiles at the quarry, thus reducing the potential for wind-blown dust at the site.

¹⁶ Chappell, P.R., 2014. The Climate and Weather of Wellington, Second Edition, NIWA Science and Technology Series Number 65, 2014.

5 Air Quality Impact Assessment

5.1 Existing Dust Mitigation Measures

Existing dust mitigation measures implemented onsite by Holcim include:

- **Visual inspection (monitoring) for dust.** Quarry staff undertake regular visual inspections for dust emissions on the site, and implement control measures (e.g. sprinklers, water cart) as required;
- **Mineral Processing and Materials handling.** The crushing and screening plant and aggregate product stockpiles are located within a low-lying part of the site (the quarry floor or void) which reduces the potential for propagation by wind erosion and weathering. In addition, overburden extracted on site will be used to construct noise/visual bunds around the perimeter of the site (along the boundary with SH1). There is the potential for these bunds to be planted with native vegetation which, in addition to the other vegetation located around the perimeter of the site, in addition to the terrain elevations, will significantly reduce the potential for dust to be picked and carried by the wind from the sources located on the quarry floor; and,
- **Dampening surfaces and stockpiles using water.** The unsealed haul roads are sprayed with water using a water truck, and the stockpiles area is also sprayed in order to control dust emissions. The sealed road has a sprinkler system for dust suppression.

Reference should be made to the QMP for additional information regarding existing dust control.

5.2 Impact Assessment

5.2.1 Dust Emissions

Emissions of dust/particulate to air at the project site during the continuation of the existing quarrying operation and during the proposed southern extension have the potential to occur during extraction (quarrying) and processing (crushing and screening) and associated activities, such as vehicle movements and aggregate handling and stockpiling. Emissions are likely to vary substantially from day to day, depending on the level of activity, the specific operations being undertaken, the weather conditions and the location of the activity (e.g. quarrying/overburden placement within the existing (northern) quarry or the southern extension area).

A large proportion of the emissions are likely to result from the quarrying and rock crushing and screening plant, aggregate stockpiles and from road vehicles moving over unsealed site roads and yard surfaces. The scale of the impacts associated with these activities depends on the dust suppression and other mitigation measures applied by Holcim (as discussed in Section 5.1).

While there is the potential for some dust and particulate emissions to arise during the operation of the crushers and screening plant and from the product stockpiles, these sources are located within low-lying parts of the quarry (quarry floor, or Area A as shown in Figure 1-4), away from the site boundary and will be surrounded by noise/visual bunds (along the boundary with SH1) and native vegetation, which offer protection from the wind. It is also noted that Holcim uses a water cart to dampen down the quarry-floor area and sprinklers to control dust emissions from the crushing and screening plant, unsealed surfaces and stockpiles, as required during dry and windy meteorological conditions. The crushers and screening plant are shut-down during strong winds in order to reduce the dust emissions from the plant. Furthermore, the soil/overburden removal areas and stockpiles or bunds will continue to be hydroseeded and watered regularly by Holcim, in order to control the potential dust emissions from these sources.

A meteorological station is not currently situated on the site (although one is recommended in Section 6 to be installed onsite). It is therefore acknowledged that Holcim currently puts dust suppression measures into action based on visual inspections around the site (i.e. if there are visible emissions of dust). A meteorological station could be used to record wind speed, wind direction, temperature and rainfall, and the data could be reviewed prior to undertaking blasting within the southern extension area.

5.2.2 Actual and Potential Air Quality Effects

The main air quality impacts that may arise during quarrying (including drilling and blasting), aggregate processing and associated activities are as follows:

- 1) Dust deposition, resulting in the soiling of surfaces; and,
- 2) Elevated PM₁₀ concentrations, as a result of dust generating activities onsite.

It is noted that visible dust plumes, which are evidence of dust emissions, may also occur from time to time, in the absence of adequate mitigation (dust suppression).

Dust soiling has the potential to arise from the deposition of dust in all size fractions. The ambient dust/particulate relevant to health outcomes will be that measured as PM₁₀ and PM_{2.5} although most of this will be in the coarse (PM_{2.5-10}) fraction, rather than the fine (PM_{2.5}) fraction. Research undertaken in the USA suggests that 85% to 90% by weight of the fugitive dust emissions of PM₁₀ from construction sites are PM_{2.5-10} and 10% to 15% are in the PM_{2.5} fraction. Consequently, the potential for elevated PM_{2.5} concentrations as a result of dust-generating activities on the project site is considered to be extremely low, and has not been considered further in this assessment.

Experience of assessing the exhaust emissions from onsite non-road mobile machinery (NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. Consequently, the potential for elevated concentrations of NO₂, CO and PM₁₀ as a result of exhaust emissions from onsite plant on the project site is considered to be extremely low, and has not been considered further in this assessment.

MWH has determined the potential residual dust emission magnitudes for the existing and proposed activities to be undertaken on the project site by Holcim (Step 1 of the methodology). The residual dust emission magnitudes and the predicted dust impacts at each receptor are summarised in Table 5-1.

Overall, the existing and proposed activities undertaken at the Kiwi Point Quarry are considered to have a slight adverse effect within the surrounding community. These potential effects are considered to be no more than minor and are based on a consideration of the different magnitude of effects at individual receptor locations, and the sensitivity and type of receptor that would potentially experience these effects.

Whilst the results of the assessment indicate that the designed-in (existing) operational mitigation measures are considered appropriate to mitigate the potential effects on the surrounding area, a number of additional mitigation measures have been recommended in the following section, which take into account current best practice. The results indicate that there are unlikely to be any dust nuisance effects beyond the Kiwi Point Quarry site boundary.

Table 5-1: Summary of Predicted Dust Impacts

ID	Receptor Type and Address	Nearest Dust Source	Residual Source Emissions	Pathway Effectiveness	Dust Impact Risk	Receptor Sensitivity	Magnitude of Dust Effect
R1	Residential 42 Gurkha Crescent	Southern Extension Works	Medium	Ineffective	Negligible Risk	High	Negligible Effect
R2	Residential 44 Gurkha Crescent	Southern Extension Works	Medium	Ineffective	Negligible Risk	High	Negligible Effect
R3	Residential 46 Gurkha Crescent	Southern Extension Works	Medium	Ineffective	Negligible Risk	High	Negligible Effect
R4	Residential 39 Gurkha Crescent	Southern Extension Works	Medium	Ineffective	Negligible Risk	High	Negligible Effect
R5	Residential 37 Gurkha Crescent	Southern Extension Works	Medium	Ineffective	Negligible Risk	High	Negligible Effect
R6	Residential 18 Shastri Terrace	Southern Extension Works	Medium	Ineffective	Negligible Risk	High	Negligible Effect
R7	Residential 26 Imran Terrace	Existing Quarry Works	Medium	Ineffective	Negligible Risk	High	Negligible Effect
R8	Residential 7 Maldive Street	Existing Quarry Works	Medium	Ineffective	Negligible Risk	High	Negligible Effect
R9	Residential 94 Burma Road	Existing Quarry Works	Medium	Ineffective	Negligible Risk	High	Negligible Effect
R10	Residential 175 Fraser Avenue	Existing Quarry Works	Medium	Ineffective	Negligible Risk	High	Negligible Effect
R11	School 170 Fraser Avenue	Existing Quarry Works	Medium	Moderately Effective	Low Risk	Medium	Negligible Effect
R12	Business 130 Fraser Avenue	Existing Quarry Works	Small	Highly Effective	Low Risk	Medium	Negligible Effect
R13	Retirement Village 134 Burma Road	Existing Quarry Works	Medium	Moderately Effective	Low Risk	High	Slight Adverse Effect
R14	Park 159 Burma Road	Existing Quarry Works	Small	Highly Effective	Low Risk	Low	Negligible Effect
R15	Residential 113 Fraser Avenue	Existing Quarry Works	Small	Highly Effective	Low Risk	High	Slight Adverse Effect
R16	Residential 9 Plumer Street	Existing Quarry Works	Medium	Moderately Effective	Low Risk	High	Slight Adverse Effect

Figure 5-1 shows the predicted dust impacts at each receptor (solid circles), the indicative Kiwi Point Quarry site boundary (solid red line), the area occupied by Taylor Preston (dashed red line), the southern extension area (dashed orange line) and the wind rose for Kelburn AWS (2008 to 2012) for wind speeds greater than 5.5 m/s (i.e. moderate to high wind speeds or 'potentially dusty winds'). The figure indicates that slight adverse effects were predicted at receptors R13, R15 and R16 and negligible effects were predicted at the remaining receptors. It is noted that restoration planting within the buffer zone (area zoned Open Space B in the WCDP as shown in Figure 1-1) will be undertaken in accordance with the QMP, and this will reduce the potential for adverse effects at receptors R13, R15 and R16.

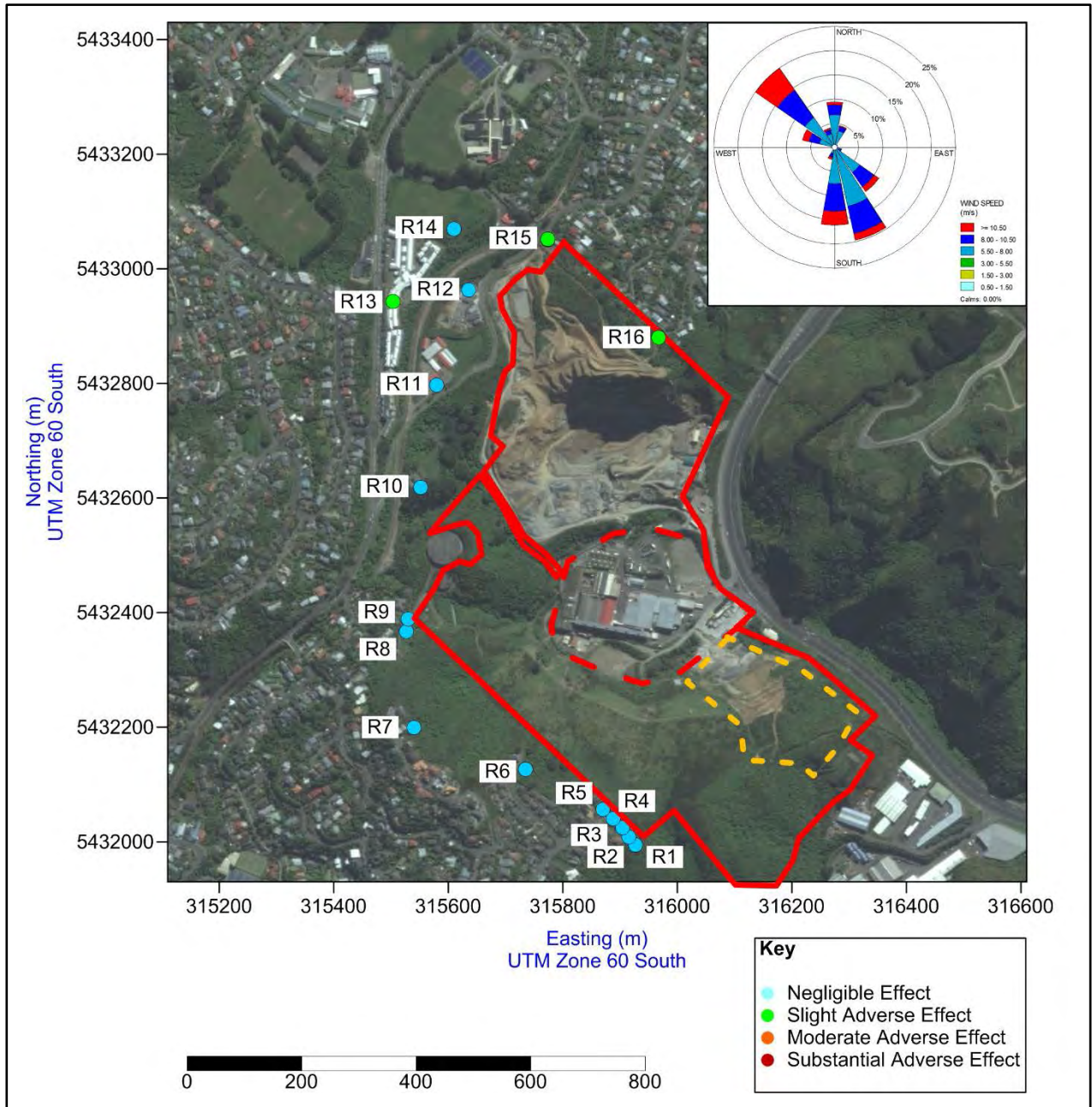


Figure 5-1: Summary of Predicted Dust Impacts

5.3 Impact Summary

5.3.1 24-hour Mean Concentrations of TSP (Dust)

Overall, the existing and proposed activities undertaken at the Kiwi Point Quarry are considered to have a slight adverse effect within the surrounding community.

These potential effects are considered to be no more than minor and are based on a consideration of the different magnitude of effects at individual receptor locations, and the sensitivity and type of receptor that would potentially experience these effects. MWH considers that it is unlikely that the MfE's 24-hour mean trigger value of 100 µg/m³ will be exceeded beyond the Kiwi Point Quarry site boundary or at any sensitive receptor location as a result of TSP/dust emissions at the quarry. The results of the qualitative assessment indicate that there are unlikely to be any dust nuisance effects beyond the Kiwi Point Quarry site boundary.

Furthermore, the results of the assessment indicate that the existing and proposed activities are of low risk, and that the most 'at-risk' receptors are as follows:

- R11 170 Fraser Avenue Medium residual emissions primarily from Areas A, B & C;
- R12 130 Fraser Avenue Small residual emissions primarily from Areas C, D & G;
- R13 134 Burma Road Medium residual emissions primarily from Areas A, B, C, D & G;
- R14 159 Burma Road Small residual emissions primarily from Areas D & G;
- R15 113 Fraser Avenue Small residual emissions primarily from Areas C, D & G; and,
- R16 9 Plumer Street Medium residual emissions primarily from Areas A, B & C.

The results of the assessment indicate that the designed-in (existing) operational mitigation measures are considered appropriate to mitigate the potential effects on the surrounding area. This is corroborated by the fact that there have only been three dust nuisance complaints relating to dust-generating activities undertaken at the quarry and these complaints occurred between 4.5 and 7.5 years ago (see Section 1.6).

Whilst the existing businesses located on Tyers Road have not been included as sensitive receptors in this report, a qualitative assessment is provided below for completeness, to assess the potential risk associated with the proposed southern extension works at these properties.

In accordance with IAQM (2016), the properties are considered to be of 'medium' sensitivity to potential dust emissions generated during the proposed southern extension works. This is based on the principle that users would expect to enjoy a reasonable level of amenity but would not be reasonably expected to enjoy the same level of amenity as they would in their home. Whilst the appearance, aesthetics or value of their properties could potentially be diminished by soiling, MWH understands that no dust-sensitive activities (e.g. electronics manufacturing, food production or car showrooms) are undertaken at these properties. In addition, these properties are a place of work and it would be reasonable to assume that people will only be present at these locations for up to 8 hours a day.

Based on the qualitative (risk-based) methodology presented in this report, the Tyers Road businesses were determined to be of 'low' risk to dust emissions generated during the proposed southern extension and the potential effects are predicted to be 'negligible' based on the following assumptions:

- Based on the Kelburn AWS wind speed and direction data for 2008 to 2012, the receptors are likely to be 'frequently' exposed to potentially dusty winds (wind speeds above 5.5 m/s and blowing from the W to the WNW (towards the receptors) occur 13.4% of the time);
- The receptors are of 'medium' sensitivity and are situated 110 m to the SE of the proposed southern extension area (i.e. they are an 'intermediate' distance downwind of a dust source);
- The receptor pathway is 'moderately effective'; and,
- The residual dust emissions will be 'medium', based on the designed-in mitigation measures (see below). However, the additional mitigation measures recommended in Section 6 will further reduce the potential for dust emissions to occur, particularly during the drilling and blasting operations.

The existing elevations (terrain heights) along a transect through the centre of the southern extraction area and on a heading of 130 degrees from north (i.e. from the north-west boundary of the extraction area towards the south-east / Tyers Road) increases from 70 m ASL to 140 m ASL (over a map distance of 170 m and a ground distance of 180 m). The south-east ridge (at 140 m ASL) is situated approximately 80 m north-west of the Tyers Road businesses. The existing terrain profile from the north-

west boundary of the southern extension area towards the south-east / Tyers Road (on a heading of 130 degrees from north) is shown in Figure 5-2, and is based on terrain data presented in Figure 1-7.

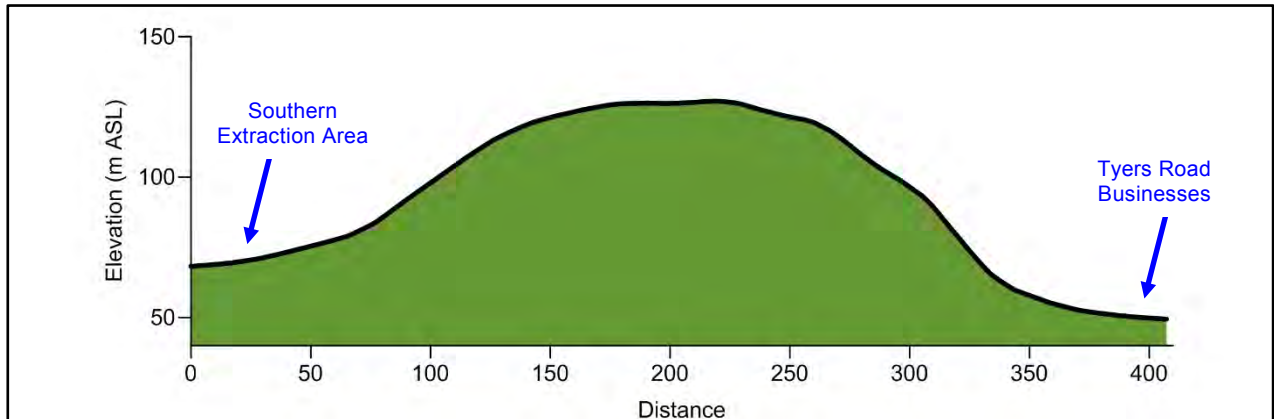


Figure 5-2: Terrain Profile of the Southern Extension Area from the North-West to the South-East

The proposed southern extension extraction works, as stated in Ormiston (2016), will be undertaken in two stages. Stage 1 will involve extending the quarry towards the south-east (i.e. Tyers Road) and then, under Stage 2, towards the south-west.

The batter slope profiles will be constructed at between 45 and 55 degrees and the floor of the quarry upon completion of both stages will be 55 m ASL. Upon completion of Stage 1, the elevation at the top of the batter slope is anticipated to be between 140 m and 145 m ASL. Therefore, the greatest risk of offsite dust nuisance effects is likely to be during the mid to latter phases of Stage 2, as more of the resource on the south-east boundary (the closest boundary to the Tyers Road receptors) of the extraction area is removed.

The terrain height (elevation) at the south-east boundary of the southern extension area is expected to be at least 70 m ASL upon completion of Stage 2. Therefore, given that the majority of the dust-generating activities will be undertaken within the low-lying parts of the quarry extension and in view of the residual dust emission magnitude criteria presented in Section 3, residual dust emissions are anticipated to be 'medium', as outlined below:

- **Site Preparation / Restoration:** the southern extension working area is approximately 3.8 ha and is therefore of 'medium' size, the bunds will be constructed to a height of 2 m and will therefore be 'small', all bunds will be seeded and up to 5 heavy plant will be operational at any one time. The worst-case residual dust emissions from this activity are therefore considered to be 'medium';
- **Mineral Extraction:** the southern extension working area is approximately 3.8 ha and is a 'small' extraction area. However, as the resource is hard rock and drilling and blasting will be undertaken on a monthly basis, and there is the potential for material of high dust potential to be extracted and handled at a medium extraction rate, the overall residual dust emissions from this activity are considered to be 'medium';
- **Materials Handling:** there is the potential for material of medium dust potential to be handled, although this will be mostly within low-lying parts of the extraction area, and more than 300 m from the nearest offsite sensitive receptors. The overall residual dust emissions from this activity are considered to be 'medium';
- **Onsite Transportation:** while there is the potential for dust to be generated by onsite vehicles travelling on unsealed quarry surfaces and haul roads within the southern extraction area, the total length of the haul routes and area of the quarry floor surface is considered to be small. Therefore, the residual dust emissions from this activity are considered to be 'small';
- **Mineral Processing:** while there is the potential for dust to be generated from the jaw crusher, it will be situated within a low-lying part of the quarry or will be sheltered from the wind by a 2 m bund, thus the emissions are considered to be small. Therefore, the residual dust emissions from this activity are typically likely to be 'small', or 'moderate' as a worst-case;
- **Stockpiles / Exposed Surfaces:** all stockpiles and exposed surfaces will be dampened down as required and will be situated within a low-lying part of the quarry or will be sheltered from the wind by a 2 m bund and be located more than 100 m from the quarry site boundary, thus the emissions

are considered to be small. Therefore, the residual dust emissions from this activity are considered to be 'small'; and,

- **Offsite Transportation:** there will be a low number of HDV movements each day (e.g. <25 movements per day) and the length of the access routes within the southern area will be short (<20 m), thus the emissions are considered to be small. Therefore, the residual dust emissions from this activity are considered to be 'small'.
- Overall, the worst-case residual emissions are considered to be 'medium'.

Based on the qualitative assessment, there are predicted to be negligible dust effects at the Tyers Road receptors, providing that the dust mitigation measures are implemented. MWH recommends implementing a regular monitoring programme for dust emissions during this phase of the quarry works. This can range from visual inspections for visible dust plumes and dust deposition/flux monitoring, but could also include real-time PM₁₀ continuous monitoring on the SE boundary of the southern extension area, particularly during Stage 2. The monitoring data could be used as a management tool to implement dust mitigation (dust suppression) measures, as required, particularly during dry conditions and under moderate to high wind speeds (>5.5 m/s) blowing from the W to the WNW (i.e. towards Tyers Road).

5.3.2 24-hour Mean Concentrations of PM₁₀

The 24-hour mean background concentration of PM₁₀ beyond the Kiwi Point Quarry site boundary was assumed in this assessment to be 28 µg/m³, based on the New Zealand Transport Agency's interactive background air quality maps¹⁷.

Whilst there is the potential for coarse (PM_{2.5-10}) and fine (PM_{2.5}) particles to travel up to 400 m from the dust emission source, the majority of the wind-blown dust (including TSP and PM₁₀) will travel a relatively short distance onsite from its source (e.g. <100 m) and mostly within low-lying parts of the quarry (voids).

In view of the foregoing, and taking into account the distance from the nearest dust emission source to the site boundary and offsite sensitive receptors, and the findings of the qualitative assessment for dust, MWH considers that it is unlikely that there will be any exceedances of the 24-hour mean NES for PM₁₀ beyond the Kiwi Point Quarry site boundary or at any sensitive receptor location as a result of PM₁₀ emissions at the quarry.

¹⁷ <http://nzta.maps.arcgis.com/apps/OnePane/basicviewer/index.html?appid=9ba0e52d1b3d4770ab031bb843d6198f>

6 Additional Mitigation Measures

6.1 Dust Mitigation Measures

The following additional mitigation measures should be implemented onsite where possible and practicable to reduce the potential for dust nuisance effects in the surrounding community.

MWH has split these mitigation measures into ‘design’ controls (Table 6-1) and ‘operational’ controls (Table 6-2).

Table 6-1: Design Mitigation Measures

Activity	Description
Phasing of extraction activities (including Stage 1 and Stage 2 of the proposed southern extension works)	Consideration should be given to the relationship of site activities to sensitive receptor locations beyond the site boundary. As far as practicable, dust-generating activities should be located away from high and medium sensitive receptors (as identified in this report). It is important that the minimisation of dust through site design is addressed for each phase of the works operation.
Design and location of dust-generating activities	Dust-generating activities should, where possible, be located where maximum protection can be obtained from topography, trees and vegetation cover or other sheltering features. Stockpiles, haul roads, tips and mounds, and exposed areas should be located as far away as possible from sensitive receptors. Where practicable, they should not be located directly upwind of sensitive receptors with respect to the potentially dusty wind directions determined in this report.
Provision for dust-mitigation measures	For longer periods of activity, perimeter screening bunds (ideally vegetated) or semi-permeable fences, and over shorter periods netting screens may be effective. If adequate protection is not provided by requirements for landscaping works, then consideration should be given to the need for a zone adjacent to the perimeter within which works are not conducted (i.e. create a “sensitive zone”, which might also be known as a standoff distance, separation zone or buffer zone). Planning and design of the scheme should make provision for water supply to meet the site demand for mitigation and damping.
Equipment and vehicles	The site should be designed to minimise haul route distances and to locate haul routes away from sensitive receptors. Consideration should be given to the installation of a wheel or vehicle washing facility, where feasible, and the construction of a sealed (paved) road after the vehicle washing facility in order to reduce trackout beyond the site boundary and onto the Centennial Highway. A separate sealed (paved) parking area for offsite vehicles, such as staff cars, with no access to the working areas, can also help to prevent trackout of mud onto the public highway.
Planting	Refer to QMP for further details of the rehabilitation planting within the buffer area. Existing trees and vegetation cover along site boundaries (where applicable) should be retained where possible. Advance planting of native trees and shrubs should be considered.

Table 6-2: Operational Mitigation Measures

Activity / Item	Description
Management	<p>A Dust Management Plan (DMP) should be produced and adhered to. The DMP could be incorporated into the existing Kiwi Point Quarry QMP.</p> <p>Effective site management practices are critical to demonstrate the willingness of the operator to control dust emissions and provides a mechanism for auditing of site operations. Such management procedures should be outlined within the DMP.</p> <p>Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.</p>
Training	<p>Provide training to the site personnel on dust mitigation and visual inspections for dust. Training should also cover 'emergency preparedness plans' to react quickly in case of any failure of the planned dust mitigation.</p>
Monitoring	<p>Implement an appropriate monitoring scheme. This can range from visual inspections, dust deposition/flux monitoring, to real-time PM₁₀ continuous monitoring locations.</p> <p>Undertake daily onsite and offsite inspections, audit the monitoring programme: carry out regular site inspections to monitor compliance with the DMP and adjust the frequency of site inspections according to dust risk (higher frequency in dry and windy conditions).</p>
Communication	<p>Maintain good communication to help alleviate anxieties between the operators and the surrounding communities.</p> <p>Set up regular, accessible liaison arrangements and providing information as freely as possible.</p>
Planning of Activities	<p>Some activities should ideally be planned only during favourable weather conditions. Where possible, particularly dusty activities should be avoided during extended periods of dry and windy conditions.</p>
Vehicle Movements	<p>Standard good practices for site haulage include:</p> <ul style="list-style-type: none"> • avoiding abrupt changes in direction; • regular clearing, grading and maintenance of haul routes; • setting appropriate site speed limits. If practicable, set site-specific and enforceable speed limits (e.g. 25 kph on unmade routes). Where not practicable, the Quarry Manager should set speed limits according to operating conditions at the time; • fitting heavy plant with upswept exhausts and radiator fan shields; • evenly loading vehicles to avoid spillages; • regular application of water, whether by bowser or by fixed sprays, in dry conditions; • use sealed (paved) roads where practicable, ensure mobile plant has upward directing exhausts and radiator fan shields. <p>It is also important to avoid trackout from offsite transportation. Clean heavy duty vehicles used to transport minerals before they leave the site using an effective wheel- or vehicle-washing facility.</p>
Soil and Overburden Handling	<p>Site stripping and reinstatement operations, and overburden handling activities should be avoided during dry and windy conditions. Soil handling is generally a short-lived seasonal activity and there is considerable flexibility as to its timing. Overburden can usually be worked at higher moisture contents than soils which can reduce the risk of unacceptable dust emissions.</p> <p>Use of soil scrapers is effective in minimising soil handling where the sites are flat, and permit their use. In case of sites with complex topography, use of bulldozers, loaders and dump trucks may be effective and practical to remove soils.</p>

Activity / Item	Description
Mineral Extraction (including drilling and blasting)	<p>For all mineral handling it is appropriate to minimise handling and reduce drop heights.</p> <p>Blasting may be avoided if appropriate alternatives can be employed, for example modern hydraulic excavators and breakers. Equipment used for abrasive blasting should be fitted with dust extraction systems.</p>
Mineral Processing (crushing and screening)	<p>Wherever practicable, crushing and screening should take place within fully enclosed structures, or where this is not possible (e.g. in the case of mobile plant) mineral processing should take place within a sheltered part of the quarry, away from boundaries with offsite sensitive receptors. The following measures are considered to be effective in minimising dust emissions during mineral processing:</p> <ul style="list-style-type: none"> • dampen material, for example, wetting down of rock stockpiles prior to crushing operation; • protect equipment (for example, conveyors, process plant) by partial or complete enclosure within housing; • use crushing and screening plant within its design capacity; and, • maintain good standards of all plant and equipment.
Materials Handling	<p>Enclose transfer points and conveyor discharges where visible dust emissions occur. As a general provision, other potential impacts should be mitigated wherever practicable by:</p> <ul style="list-style-type: none"> • installation on an even alignment with no abrupt changes in grade; • return belt cleaners, with arisings collected into a bin or cleaned up; • maintenance of the structures and rollers to minimise spillages; • shrouding of feed hoppers, transfer points and discharges; • fixed sprays where required; • clearance of any spillages to minimise accumulations of loose dry material around the structures; • minimisation of drop heights at feed hoppers and discharges; • control and restrict the duration of the site activities where practicable; • storing material under cover, and protecting material from wind; • screening material to remove dusty fractions prior to external storage; • dampen material using sprays, mists, microfoam or foam; • spray exposed surfaces with chemical binders (after consultation with GWRC) and spray exposed surfaces of mounds regularly to maintain surface moisture (unless mound surface has formed a crust after rainfall or is grassed); • design hopper load systems to ensure a good match with truck size, and enclose fully on all sides • vegetate exposed surfaces, e.g. overburden mounds, with quick growing plants; • filtration equipment may be used to remove silty wastes from waste slurries, and the resulting 'cake' can then be disposed while it is wet.

MWH recommends that WCC/Holcim should consider installing a meteorological station onsite and should review the meteorological data prior to blasting. For example, no blasting within the southern extension area should occur when the wind speed exceeds 12 m/s and is blowing from the NE and NW (i.e. towards the residential properties located on Gurkha Crescent and Shastri Terrace, and the businesses on Tyers Road, respectively). In addition, all extraction, crushing and screening works should cease in the event that the onsite wind speed during NE and NW wind directions exceeds 12 m/s for a sustained period of time (e.g. >4 hours). The Quarry Manager should keep a record of all visual inspections undertaken on the site for visible dust emissions, all instances that the processing plant is shut-down to reduce dust emissions (e.g. when wind speeds exceed 12 m/s) and when dust mitigation measures are undertaken.

Prior to blasting, dust extraction equipment and filters should be used to control dust emissions from the drill rig. Any dusty material that has collected on the blast area during the drilling should be removed

prior to detonation in order to reduce the potential for the generation of dust emissions. Prior warning should be given to the residents of Gurkha Crescent and Shastri Terrace before undertaking blasting.

6.2 Monitoring

Based on the qualitative assessment presented in Section 5, there are predicted to be negligible dust effects at the Tyers Road receptors, providing that the existing and proposed (additional) mitigation measures are implemented.

MWH recommends implementing a regular monitoring programme for dust emissions during this phase of the quarry works. This can range from visual inspections for visible dust plumes and dust deposition/flux monitoring, but could also include real-time PM₁₀ continuous monitoring on the south-east boundary of the southern extension area. The monitoring data could be used as a management tool to implement dust mitigation (suppression) measures, as required, particularly during dry conditions and under moderate to high wind speeds (>5.5 m/s) blowing from the W to the WNW (i.e. towards Tyers Road).

6.3 Weather Station

It is recommended that an automatic weather station is established in a suitable location on the site to measure, as a minimum, the onsite wind speed and direction. Other parameters which could also be measured at little additional cost include: ambient temperature; relative humidity; atmospheric pressure; and rainfall.

The weather station should be positioned as far away from buildings and trees as possible, as these structures affect wind flow. The onsite meteorological data may be used for the following reasons:

- To manage the occasions when the propagation of dust occurs at the site. For example, it may be necessary to avoid undertaking drilling, blasting, quarrying (extraction) and processing (crushing and screening) activities under moderate to strong winds blowing towards the nearest sensitive receptors as these conditions may, in the absence of adequate mitigation, cause dust complaints;
- To corroborate (or contradict) any dust nuisance complaints that may arise during the continued operation of the quarry.

The weather station should be sited and operated in accordance with the MfE's *'Good Practice Guide for Air Quality Monitoring and Data Management'* (MfE, 2009) and the following documents:

- US EPA, 2000. Meteorological Monitoring Guidance for Regulatory Modeling Applications, United States Environmental Protection Agency (US EPA), February, 2000;
- Australian/New Zealand Standard (AS/NZS) 3580.14:2014, Methods for Sampling and Analysis of Ambient Air—Meteorological Monitoring for Ambient Air Quality Monitoring Applications; and,
- WMO, 2008. Guide to Meteorological Instruments and Methods of Observation, World Meteorological Organization (WMO), WMO-No. 8, Geneva, Seventh Edition, 2008.

7 Conclusions

MWH was commissioned by WCC to undertake an air quality impact assessment for activities undertaken at the existing Kiwi Point Quarry located off Centennial Highway/SH1 in Ngauranga, Wellington. Kiwi Point Quarry is an established greywacke quarry located in the Ngauranga Gorge, involving ongoing extraction, processing, a cleanfill and rehabilitation, and is operated by Holcim under contract to WCC.

In order to determine the potential for dust nuisance effects in the surrounding community due to dust emissions at the project site, MWH has undertaken a qualitative (risk-based) assessment of the existing and proposed dust emissions on the site and their potential to cause dust nuisance effects beyond the site boundary. In addition, this assessment also involved undertaking a review of the project site's complaints record, in order to predict the level of impact that may be experienced in the surrounding community. According to the GWRC's complaints database, there have been three dust nuisance complaints relating to activities undertaken at the Kiwi Point Quarry. These complaints were made on 14 January 2009, 18 December 2009 and 20 December 2011.

Overall, the existing and proposed activities undertaken at the Kiwi Point Quarry are considered to have a slight adverse effect within the surrounding community.

These potential effects are considered to be no more than minor and are based on a consideration of the different magnitude of effects at individual receptor locations, and the sensitivity and type of receptor that would potentially experience these effects. MWH considers that it is unlikely that the MfE's 24-hour mean trigger value of $100 \mu\text{g}/\text{m}^3$ will be exceeded beyond the Kiwi Point Quarry site boundary or at any sensitive receptor location as a result of TSP/dust emissions at the quarry. The results of the qualitative assessment indicate that there are unlikely to be any dust nuisance effects beyond the Kiwi Point Quarry site boundary, provided that the mitigation measures recommended in Section 6 are implemented. This is corroborated by the fact that there have only been three dust nuisance complaints relating to dust-generating activities undertaken at the quarry and that these complaints occurred between 4.5 and 7.5 years ago.

Furthermore, the results of the assessment indicate that the existing and proposed activities are of low risk, and that the most 'at-risk' receptors are as follows:

- R11 170 Fraser Avenue Medium residual emissions primarily from Areas A, B & C;
- R12 130 Fraser Avenue Small residual emissions primarily from Areas C, D & G;
- R13 134 Burma Road Medium residual emissions primarily from Areas A, B, C, D & G;
- R14 159 Burma Road Small residual emissions primarily from Areas D & G;
- R15 113 Fraser Avenue Small residual emissions primarily from Areas C, D & G; and,
- R16 9 Plumer Street Medium residual emissions primarily from Areas A, B & C.

Based on the results of the qualitative assessment for dust, MWH considers that it is unlikely that there will be any exceedances of the 24-hour mean NES for PM_{10} beyond the Kiwi Point Quarry site boundary or at any sensitive receptor location as a result of PM_{10} emissions at the quarry, provided that the mitigation measures recommended in Section 6 are implemented.

8 References

- Australian/New Zealand Standard (AS/NZS) 3580.14:2014, Methods for Sampling and Analysis of Ambient Air—Meteorological Monitoring for Ambient Air Quality Monitoring Applications.
- Chappell, P.R., 2014. The Climate and Weather of Wellington, Second Edition, NIWA Science and Technology Series Number 65, 2014.
- IAQM, 2014. Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management (IAQM), February 2014.
- IAQM, 2016. Guidance on the assessment of mineral dust impacts for planning, Institute of Air Quality Management (IAQM), May 2016.
- MfE, 2001. Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions, Ministry for the Environment (MfE), September 2001.
- MfE, 2009. Good Practice Guide for Air Quality Monitoring and Data Management, Ministry for the Environment (MfE), April 2009.
- MfE, 2011. Clean Healthy Air for All New Zealanders: The National Air Quality Compliance Strategy to Meet the PM₁₀ Standard, Ministry for the Environment (MfE), August, 2011.
- Ormiston, 2016. Report on the Proposed Development for the Business Centre Area South Ridge—Kiwi Point Quarry, prepared by Ormiston Associated Limited for Holcim New Zealand Limited, February, 2016.
- US EPA, 2000. Meteorological Monitoring Guidance for Regulatory Modeling Applications, United States Environmental Protection Agency (US EPA), February, 2000.
- WCC, 2014. Kiwi Point Quarry Management Plan (QMP), Wellington City Council, 2014.
- WMO, 2008. Guide to Meteorological Instruments and Methods of Observation, World Meteorological Organization (WMO), WMO-No. 8, Geneva, Seventh Edition, 2008.

Appendix A Existing Resource Consent



Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN050352 [24540]

Category: Discharge permit

Pursuant to sections 104B and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Kiwi Point Quarry Business Unit, Wellington City Council	
Address	P O Box 2199, Wellington	
Term of consent	Effective: 6 July 2005	Expires: 6 July 2020
Purpose for which right is granted	To discharge contaminants to air from the operation of a cleanfill.	
Location	Kiwi Point Quarry, Centennial Highway, Ngauranga at or about map reference NZMS 260: R27;611.951	
Legal description of land	Lots 1, 2 and 3 DP 72995	
Volume/quantity/rate	NA	
Conditions	1-15 as attached	

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: 6 July 2005



Conditions to Resource Consent WGN050352 [24540]

- (1) The location, design, implementation and operation of the works shall be in accordance with the consent application and its associated plans and documents lodged with the Wellington Regional Council on 2 June 2005, and amendments received by fax on 28 June 2005.
- (2) The permit holder shall pass a copy of this consent including any relevant site plans and attachments to the operator undertaking the works.
- (3) The Manager, Consent Management shall be given a minimum of 48 hours notice prior to works commencing.
- (4) Only material such as clay, soil, rock, concrete, or brick, that are free of combustible or putrescible components or hazardous substances or materials likely to create a hazardous leachate by means of biological breakdown, shall be deposited within the cleanfill site.

Materials considered to meet the above definition are outlined in Table 4.1 of the publication A Guide to the Management of Cleanfills by Ministry for the Environment (2002).

- (5) Cleanfill shall only be deposited in Areas A, B, C and D identified on the aerial photo attached to the application as Appendix One.
- (6) The permit holder shall ensure that there shall be no discharges to air resulting from the exercise of this consent that are noxious, dangerous, offensive or objectionable at or beyond the legal boundary of the property where the activity is to be carried out, being Lots 1, 2 & 3 DP 72995.
- (7) All work areas associated with the operation of the cleanfill are to be managed in such a way as to keep fugitive dust emissions to a minimum. This shall include, but not be limited to wetting unsealed areas with sufficient water as required.
- (8) The permit holder shall operate the cleanfill in accordance with Kiwi Point Quarry Quality Procedures, subject to any changes required to meet the conditions of this consent. A copy of this document shall be forwarded to the Manager, Consents Management within two months of commencement of the activity authorised by this permit.
- (9) Upon achieving the desired completion levels (as identified in the rehabilitation plan) cleanfilled areas shall be topsoiled and planted upon completion. The topsoil shall be of sufficient depth such that no concrete or other rubble is visible. Vegetation shall be established as soon as practical after topsoiling.
- (10) The permit holder shall supply a copy of the comprehensive rehabilitation plan to the Manager, Consents Management, within six months of commencement of the activity authorised by this permit. This plan should include details of the final levels of rehabilitated areas and details of the proposed plantings to occur and timeframes from completion.
- (11) Depositing of cleanfill shall be supervised by Kiwi Point Quarry Staff at all times.
- (12) The permit holder shall record details of each load of material that is deposited within the cleanfill, including:
 - (a) the date and time of receipt of the material at the cleanfill site;
 - (b) quantity;
 - (c) source;
 - (d) description of material deposited (e.g. soil, concrete, bricks);
 - (e) name of the contractor depositing the material;

[Handwritten signature]
6/7/05

This information shall be forwarded to the Manager, Consents Management, Wellington Regional Council at periods ending 31 March and 30 September each year, and shall be made available for inspection when requested.

(13) The permit holder shall keep a permanent record of any complaints received alleging adverse effects from the permit holder's operations. The complaints record shall contain the following where practicable:

- (a) the name and address of the complainant, if supplied;
- (b) identification of the nature of the complaint;
- (c) date and time of the complaint and alleged event;
- (d) weather conditions at the time of the alleged event;
- (e) results of the permit holder's investigations; and,
- (f) any mitigation measures adopted.

The complaints' record shall be made available to the Wellington Regional Council on request.

The permit holder shall notify the Manager, Consents Management, Wellington Regional Council, of any complaints received, which relate to the exercise of this permit, within 24 hours of being received, or the next working day.

(14) The permit holder shall keep a record of any incident that has or could have resulted in a condition of this permit being contravened. The incident record shall be made available to the Wellington Regional Council upon request.

The permit holder shall notify the Manager, Consents Management, Wellington Regional Council of any such incident, within twenty four hours of the incident being brought to the attention of the permit holder, or the next working day.

(15) The Wellington Regional Council may review any or all conditions of this permit by giving notice of its intention to do so pursuant to section 128 of the Resource Management Act 1991, at any time within three months of the first, third, fifth, seventh, ninth, eleventh and thirteenth anniversaries of the date of the granting of this permit for any of the following purposes:

- (a) To deal with any adverse effects on the environment which may arise from the exercise of this permit, and which are appropriate to deal with at a later stage.
- (b) To review the adequacy of any plans and/or monitoring requirements prepared for this consent so as to incorporate into the permit any modification which may become necessary to deal with any adverse effects on the environment arising from the exercise of this permit.
- (c) The Wellington Regional Council shall be entitled to recover from the permit holder the actual and reasonable costs of the conduct of any review, calculated in accordance with, and limited to, that council's scale of charges in-force and applicable at that time pursuant to Section 36 of the Resource Management Act 1991.

ASSESSMENT OF ECOLOGICAL EFFECTS FOR PROPOSED EXPANSION OF THE KIWI POINT QUARRY, NGAURANGA GORGE, WELLINGTON



 providing
outstanding
ecological
services to
sustain
and improve our
environments



ASSESSMENT OF ECOLOGICAL EFFECTS FOR PROPOSED EXPANSION OF THE KIWI POINT QUARRY, NGAURANGA GORGE, WELLINGTON



Māhoe forest on the shady side of the ridge, within the proposed quarry footprint.

Contract Report No. 4378

July 2017

Project Team:

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Prepared for:

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Reviewed and approved for release by:



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1. INTRODUCTION

Kiwi Point Quarry has been operating on Wellington City Council (WCC)-owned land in the Ngauranga Gorge since the 1920s. The current pit is about 40 metres deep and will be deepened by another 15 metres to reach the highest value rock. Only four to five years of rock remains within the current pit and WCC and the quarry operator hope to extend the life of the centrally-located quarry by extending mining southward. This would require an amendment to the current Open Space B zoning for some of the land required, through a plan change to the Business 2 Zone under the Wellington City District Plan.

The final landform of the proposed quarry would comprise a tall, steep, benched, northeast-facing slope above the excavated pit, which would have similarly-benched slopes rising a shorter distance on other aspects.

The proposed quarry expansion has the potential to affect ecological values, including vegetation that has been identified as being potentially ecologically significant as a Wellington City Council (WCC) EcoSite (Wildland Consultation 2016), and the Ngauranga Stream and Tyers Stream. WCC staff undertook a brief site survey to assess potential effects on ecological values and suggested that a more detailed assessment should be undertaken.

Potential quarry expansion boundaries have already been adjusted to avoid the most mature vegetation types (c.f. Park 1999), but an assessment of ecological effects is required to accompany documents to be submitted by early August 2017. As such, this report includes descriptions of the current vegetation and habitat types, fauna observations (or evaluation of the likelihood of occurrence), potential effects on vegetation (including adjacent to the site), terrestrial fauna, and stream habitat values, measures to avoid or minimise potential adverse effects, and potential mitigation opportunities based on best practice biodiversity offsetting. A subsequent report may be required to provide additional information on site values (for example information on lizards and invertebrates), and details of any mitigation opportunities identified.

2. METHODS

2.1 Review of information

Relevant information on the site and its context was reviewed, including information from databases such as eBird (www.ebird.org/content/newzealand/) and the Department of Conservation's Bioweb Herpetofauna database, the Freshwater Fish database maintained by NIWA, the threatened environment classification, and spatial layers showing land held by Wellington City Council, including existing reserve land.

2.2 Field survey

A five hour site visit was undertaken on 4 July 2017, during which representative areas of indigenous vegetation and habitats were traversed on foot. The weather during the site visit was fine and sunny with light winds. The scope of the site visit was to provide more comprehensive information on habitats, vegetation, and plant

species present. Areas of indigenous vegetation and habitat were mapped and described, and all vascular plant species observed during the site visit were recorded. Birds using the site were also recorded. However the brief period over which the survey was undertaken would only provide a snapshot of bird use of habitats at the site. The winter timeframe of this survey also means that summer-green plant species, such as most orchids, would not be detected, but may be present.

3. ECOLOGICAL CONTEXT

3.1 Site description

The landform on which the proposed quarry would operate, comprises a ridge extending northeast from Gurkha Crescent in the adjacent residential area (Figure 1). The portion of this ridge closest to State Highway 1 is zoned Business 2 (Figure 2) and has previously been subject to disturbance and development, including quarrying on both sides of the ridge at lower elevation, resulting in rocky, terraced hillsides. A bulldozed track also crosses the ridge in this part of the site, and areas of existing indigenous forest have been fragmented. The western part of the ridge, currently within the Open Space B zone (Figure 2), is covered by indigenous forest on the shady, southern side of the ridge, and mostly by exotic scrub and grassland on the northern, sunny side of the ridge.

In this report, ‘the site’ refers to the area currently zoned as Business 2 and the area zoned Open Space B that would require rezoning if the full quarry development goes ahead. The site ranges from 60-180 metres elevation above sea level, and covers 13.3 hectares.

3.2 Wellington Ecological District

The site is located within Wellington Ecological District. The Wellington Ecological District is differentiated from the adjacent Tararua Ecological District by virtue of its more fertile soils and relative scarcity of beech (*Fuscospora* spp.) forest (McEwen 1987). The prevailing winds are from the west and northwest, with high wind run and frequent gales, while warm summers, mild winters, and evenly-distributed annual rainfall of 900-1,400 mm also characterise the climate of Wellington Ecological District (McEwen 1987).

3.3 Land cover

Land cover types in Wellington Ecological District¹ are quite varied, and include a notable 11,340 hectares of built-up urban land, covering 22 percent of the Ecological District. Other extensive land cover types within the Wellington Ecological District include high producing exotic grassland (13,904 hectares; 27% cover), broadleaved indigenous hardwoods (8,036 hectares; 15% cover), and gorse and/or broom

¹ Defined by the Land Cover Database version 4.1.



(7,622 hectares; 15% cover). The indigenous forest cover type, which describes more mature indigenous forest, covers 998 hectares or just under two percent of Wellington Ecological District.

3.4 Protected areas

Very few areas of indigenous vegetation and habitat in the vicinity of the site are legally protected. Fort Street Conservation Area is located between Fort Street and State Highway 2 at the base of the Ngauranga Gorge. The next closest area of conservation land is the Otari Scenic Reserve some five kilometres to the southwest of the proposed quarry site.

There are no Queen Elizabeth the Second Open Space Covenants (QEII covenants) near the proposed quarry site, the nearest being some 3-5 kilometres to the southwest, northwest, and east.

However, Wellington City Council reserves are relatively plentiful in the local area and include the Tyers Stream Reserve adjacent to the southwestern boundary of the site, and the Imran Terrace/Maldives Street Reserve c.150 metres to the west of the site.

Potential significant natural areas (SNAs) are more extensive locally, and include all of the more extensive indigenous forest patches within the site, and other areas of indigenous forest on both sides of the Ngauranga Gorge.

4. VEGETATION AND HABITATS

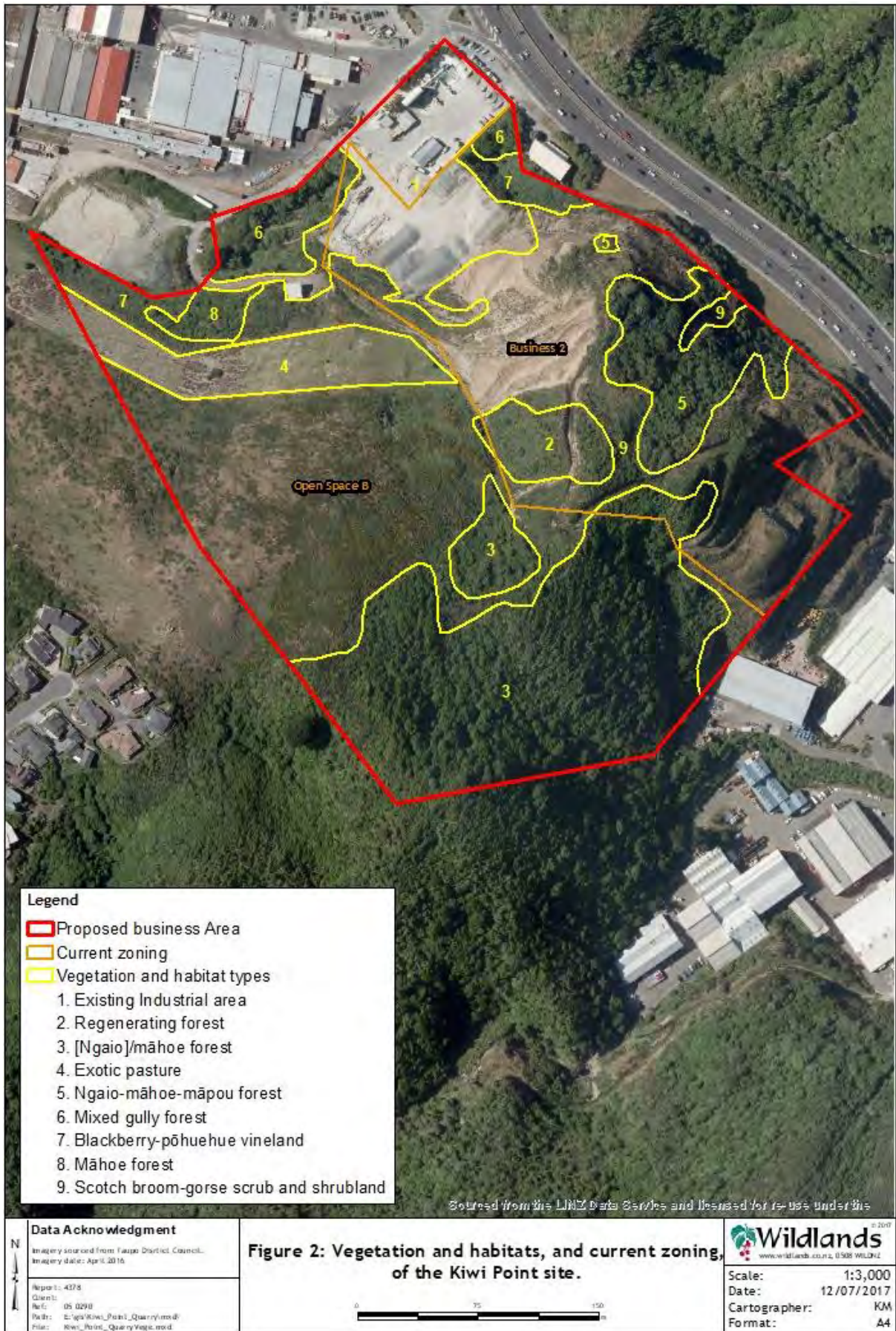
Eight different vegetation/habitat types were identified at the site:

- [Ngaio]/māhoe forest
- Ngaio-māhoe-māpou forest
- Māhoe forest
- Regenerating forest
- Mixed gully forest
- Scotch broom-gorse scrub and shrubland
- Blackberry-pōhuehue vineland
- Exotic pasture.

These habitat types are described in more detail below and mapped in Figure 2.

4.1 [Ngaio]/māhoe forest

Forest on the steep south-eastern faces of the ridge above Tyers Stream comprises low (3-4 metres tall) māhoe (*Melicytus ramiflorus*) forest (Plate 1), with scattered taller and larger ngaio (*Myoporum laetum*). Other canopy trees at lower abundance were mamaku (*Cyathea medullaris*), whauwhaupaku (*Pseudopanax arboreus*), māpou (*Myrsine australis*), and mānuka (*Leptospermum scoparium*). Lianes are abundant in



the forest canopy; these are mostly *Parsonsia heterophylla*, but there is also occasional pōhuehue (*Muehlenbeckia australis*) and rare clematis (*Clematis paniculata*). Kawakawa (*Macropiper excelsum*) is abundant in the understorey (Plate 1), with locally common rangiora (*Brachyglottis repanda*) and hangehange (*Geniostoma ligustrifolium*), occasional kanono (*Coprosma grandifolia*), and rare ponga (*Cyathea dealbata*). Shining spleenwort (*Asplenium oblongifolium*), hound's tongue fern (*Microsorium pustulatum*), and seedlings of *Parsonsia heterophylla* form the main ground covers, with scattered *Lastreopsis glabella*. Ground cover is sparse in the eastern part of this forest, but dense in the western part.



Plate 1: Interior of [Ngaio]/māhoe forest showing the relatively low canopy height and abundant kawakawa in the understorey.

This is a relatively young patch of secondary forest, which represents recent regeneration of māhoe and other broadleaved trees after historic disturbance that left only scattered ngaio trees standing. There is a gradient of disturbance across the slope, with western parts of the forest appearing older and more intact, compared with eastern parts. One patch of this forest type occurs on the northern slope of the ridge, separated from the larger patch on the southeastern slopes by a former bulldozed track that is now largely occupied by Scotch broom (*Cytisus scoparius*) and gorse (*Ulex europaeus*).

4.2 Ngaio-māhoe-māpou forest

On steep northeast facing slopes above State Highway 1, there are patches of forest of different composition. Scattered apparently older ngaio trees occur in a 4-5 m tall canopy dominated by māhoe, but patches of māpou dominance are also present. A

variety of other canopy trees occur in lower abundances, especially where the canopy is shorter (2-3 metres tall), including kowhai (*Sophora microphylla*; one individual), kānuka (*Kunzea robusta*), *Hebe parviflora*, karamū (*Coprosma robusta*), akiraho (*Olearia paniculata*), and poataniwha (*Melicope simplex*). The understorey is mostly sparse but has occasional dense patches dominated by kawakawa. Poataniwha, *Coprosma rhamnoides*, hangehange, and rangiora are occasionally present. Shining spleenwort, button fern (*Pellaea rotundifolia*), *Polystichum neozelandicum* subsp. *xerophyllum*, and occasional *Lastreopsis glabella* are occasional in the ground layer. Rocky areas support a relatively diverse assemblage of indigenous fern species, including those listed above as well as hound's tongue fern and jointed fern (*Arthropteris tenella*). Dense swards of veldt grass (*Ehrharta erecta*) and common blackberry (*Rubus fruticosus*) occur on forest margins.



Plate 2: Frequent māpou trees can be seen in the canopy of ngaio-māhoe-mapou forest.

This forest type is reasonably representative of the original forest and scrub that would have naturally occurred on these steep and sometimes rocky, exposed, slopes. Thin soils in rocky areas would have allowed the shorter trees and shrubs to persist, while deeper soils would have supported taller trees such as māhoe, māpou, ngaio, and kowhai.

4.3 Māhoe forest

A small patch of māhoe-dominant forest occurs on the toeslope near the meat processing works (Plate 3). This vegetation was not inspected closely, but appears to be relatively young secondary forest.

4.4 Regenerating forest

A patch of strongly-modified vegetation at the end of the Gurkha Crescent ridge, incorporating bulldozed tracks and other disturbed areas, mostly comprises Scotch broom, gorse, and fennel (*Foeniculum vulgare*), but there are several small regenerating trees of māpou and māhoe. Shrubs of boneseed (*Chrysanthemoides monilifera*) and Darwin's barberry (*Berberis darwinii*) were also seen within this vegetation, and exotic grasses and herbs including browntop (*Agrostis capillaris*) and catsear (*Hypochaeris radicata*) are common.



Plate 3: Māhoe-dominant forest on the toeslope below exotic pasture and Scotch broom-gorse scrub. Blackberry-pohuehue vineland can be seen to the right of the māhoe forest.

In the absence of further disturbance, this vegetation would slowly become more dominated by indigenous trees, but Darwin's barberry would likely persist due to its tolerance of shade and ability to grow beneath a forest canopy.

4.5 Mixed gully forest

Gullies near the margin of the industrial land near the meat processing works contain a mix of indigenous and exotic trees and shrubs. Indigenous species in these gullies include mamaku, ngaio, karamū, taupata (*Coprosma repens*), koromiko (*Hebe stricta*), kawakawa, māhoe, and karaka (*Corynocarpus laevigatus*). Exotic species include radiata pine (*Pinus radiata*), buddleia (*Buddleja davidii*), blackberry, Scotch broom, brush wattle (*Paraserianthes lophantha*), pampas, tree lucerne (*Chamaecytisus palmensis*), willow (*Salix* sp.), and climbing dock (*Rumex sagittatus*).

4.6 Scotch broom- gorse shrubland

Scrub and shrubland dominated by Scotch broom and gorse occupy the northwest-facing slopes of the ridge that stretch down toward the meat processing works and other industrial land (Plates 3 and 4), the eastern corner of the site in the Tyers Creek catchment, and in other areas that have been more recently disturbed by bulldozing and tracking. Fennel, holly-leaved senecio (*Senecio glastifolius*), and exotic grasses are common species in these shrublands, while occasional blackberry, pampas

(*Cortaderia selloana*), climbing dock, vetch (*Vicia sativa*), karamū, māhoe and kānuka are also present. The indigenous shrub *Melicytus crassifolius* was reported in rocky habitat on the sunny faces within this vegetation by Wellington City Council staff.



Plate 4: Scotch broom-gorse scrub is dominant on the sunny slopes of the ridge. A strip of exotic pasture can be seen at lower left, below which is a small patch of māhoe forest.

4.7 Blackberry-pohuehue vineland

In one area on the northwestern toeslopes, and in a gully near State Highway 1, a dense vineland of blackberry and pōhuehue occurs. Occasional māhoe and ngaio trees emerge from this vineland, in which climbing dock is also frequent.

4.8 Exotic pasture

A horizontal strip of exotic pasture is located on the lower northwestern slopes (Plates 3 and 4). It was not assessed in detail but comprises exotic grasses and herbs.

5. FLORA

A total of 98 vascular plant species were observed during the site visit, of which 55 (56 percent) were indigenous species and 43 (44 percent) exotic. No nationally Threatened or At Risk plant species were recorded at the site, but kowhai, of which only one individual was seen, is uncommon in Wellington Ecological District.

6. BIRDS

A relatively low diversity of bird species was observed during the site visit, however road noise was significant and reduced detectability. Three exotic bird species and three indigenous bird species were observed using habitats at the site, and the indigenous karoro/black-backed gull (*Larus dominicanus*) was observed flying over the site (Table 1). Pipihi/silvereye (*Zosterops lateralis*) was the species observed most commonly in forest vegetation at the site.

Table 1: Bird species recorded at and flying over the Kiwi Point site.

Species	Common Name	Status
<i>Emberiza citrinella</i>	Yellowhammer	Introduced and Naturalised
<i>Fringilla coelebs</i>	Chaffinch	Introduced and Naturalised
<i>Turdus merula</i>	Blackbird	Introduced and Naturalised
<i>Rhipidura fuliginosa</i>	Piwaiwaka; Fantail	Endemic; Not Threatened
<i>Larus dominicanus</i>	Karoro; black-backed gull	Indigenous; Not Threatened
<i>Gerygone igata</i>	Riroriro; grey warbler	Endemic; Not Threatened
<i>Zosterops lateralis</i>	Pipihi; silvereye	Indigenous; Not Threatened

Additional bird species that are mostly likely to regularly use the proposed quarry were inferred using recent records from nearby forested sites where bird observations have been made on multiple occasions, including two sites in the adjacent Tyers Stream Reserve and one in coastal forest. The indigenous tūi/kōkō (*Prothemadera novaeseelandiae*) and exotic starling (*Sturnus vulgaris*) are almost certainly regular seasonal users of habitats at the proposed quarry site, while house sparrow (*Passer domesticus*) and goldfinch (*Carduelis carduelis*) are also very likely to use these habitats (Table 2). Other indigenous species that are likely to be present at times are pīpīwharau/roa/shining cuckoo (*Chrysococcyx lucida*) and kererū (*Hemiphaga novaeseelandiae*), which have both been observed at lower frequency and abundance at two sites within the adjacent Tyers Stream Reserve (Table 2).

Table 2: Bird species recorded within one kilometre of the site at three sites where multiple observations have been submitted to the Ebird database (2011-2013 data).

Species	Common Name	Frequency (n=3)	Total Number Observed
<i>Carduelis carduelis</i>	Goldfinch	67	11
<i>Emberiza citrinella</i>	Yellowhammer	33	1
<i>Fringilla coelebs</i>	Chaffinch	100	26
<i>Carduelis chloris</i>	Greenfinch	67	5
<i>Passer domesticus</i>	House sparrow	67	22
<i>Prothemadera novaeseelandiae</i>	Kōkō; tui	100	19
<i>Prunella modularis</i>	Dunnock	33	1
<i>Sturnus vulgaris</i>	Starling	100	12
<i>Turdus philomelos</i>	Song thrush	67	4
<i>Chrysococcyx lucida</i>	Shining cuckoo	33	1
<i>Callipepla californica</i>	Californian quail	33	1
<i>Hemiphaga novaeseelandiae</i>	Kererū	33	3
<i>Turdus merula</i>	Blackbird	100	30
<i>Rhipidura fuliginosa</i>	Piwaiwaka; Fantail	100	10
<i>Larus dominicanus</i>	Karoro; black-backed gull	100	8

Species	Common Name	Frequency (n=3)	Total Number Observed
<i>Gerygone igata</i>	Riroriro; grey warbler	100	27
<i>Zosterops lateralis</i>	Pipihi; silvereye	100	28

7. LIZARDS

A number of lizard observations have also been made within one kilometre of the proposed quarry site, though most of these relate to residential areas, and date from the 1990s. These observations cover seven indigenous lizard species, four of which have a current threat status of At Risk-Declining (Table 3). All of these lizard species are able to occupy forest, shrubland, and dense grassland habitats in the Wellington area (Adams 2009) and thus they all may be present within the site.

Table 3: Lizard records within one kilometre of the site (Department of Conservation Herpetofauna database).

Species	Common Name	Threat Status
<i>Mokopirirakau granulatus</i> ¹	Forest gecko	At Risk-Declining
<i>Nautilunus punctatus</i>	Barking gecko	At Risk-Declining
<i>Oligosoma aeneum</i>	Copper skink	Not Threatened
<i>Oligosoma ornatum</i>	Ornate skink	At Risk-Declining
<i>Oligosoma polychroma</i> Clade 1	Northern grass skink	Not Threatened
<i>Oligosoma zelandicum</i>	Glossy brown skink	At Risk-Declining
<i>Woodworthia maculata</i>	Raukawa gecko	Not Threatened

¹This record probably more accurately refers to the Ngahere gecko, *Mokopirirakau* “southern North Island”, which has the same threat status.

8. FISH

A tributary of Ngauranga Stream passes through the more modified part of the site adjacent to the meat processing works (Plate 5), and is partly confined to underground piped channels in this area. There are no records from this stream in the New Zealand Freshwater Fish database. Four freshwater fish lists dating from 2009 to 2016 have been compiled from sampling within Tyers Stream, within the Tyers Stream Reserve (Table 4).

Table 4: Freshwater fish records from Tyers Stream (from NIWA Freshwater Fish database).

Species	Common Name	Status
<i>Anguilla dieffenbachii</i>	Longfin eel	At Risk-Declining
<i>Anguilla australis</i>	Shortfin eel	Not Threatened
<i>Galaxias brevipinnis</i>	Koaro	At Risk-Declining
<i>Galaxias fasciatus</i>	Banded kokopu	Not Threatened



Plate 5: Ngauranga Stream tributary adjacent to the meat processing works.

9. ECOLOGICAL SIGNIFICANCE

Ecological significance of indigenous vegetation and habitats of indigenous fauna at the site has been determined below using the ecological significance criteria in the Greater Wellington Regional Policy Statement. The assessment has been undertaken at the scale of the Wellington Ecological District, where scale is relevant to a criterion.

(a) **Representativeness:** *the ecosystems or habitats that are typical and characteristic examples of the full range of the original or current natural diversity of ecosystem and habitat types in a district or in the region, and:*

- (i) *are no longer commonplace (less than about 30% remaining); or*
- (ii) *are poorly represented in existing protected areas (less than about 20% legally protected).*

Assessment

This criterion requires ecosystems or habitats to be not only typical and characteristic, but also to be significantly reduced and poorly represented in protected areas.

Of the two more intact areas of indigenous vegetation and habitat at the site, the ngaio-māhoe-māpou forest on sunny, exposed slopes is more representative of the original (pre-human) vegetation than the [ngaio]/māhoe forest on shady slopes. The [ngaio]/māhoe forest is a relatively young stand of secondary forest that has quite a

different structure and composition to the taller and more diverse podocarp/broadleaved forest that would have originally occupied this part of the site.

Secondary broadleaved forest dominated by māhoe is relatively widespread in Wellington Ecological District, while the more diverse ngaio-māhoe-māpou forest is more reduced. Nevertheless, as Wellington Ecological District would have been largely forest-covered, and the total current area of indigenous forest and broadleaved indigenous hardwoods only occupies 15 percent of Wellington Ecological District (see Section 3.3), both types can be regarded as no longer commonplace.

With respect to protection status, protected areas are small and scattered across Wellington Ecological District, thus both of the above habitat types will have much less than 20 percent of their area protected within Wellington Ecological District.

In summary, the ngaio-māhoe-māpou forest is representative, strongly reduced, and poorly protected, and thus meets the definition of representativeness. [Ngaio]/māhoe forest is not representative of the former vegetation, and therefore is not significant under this criterion, but is also strongly reduced and poorly-protected within Wellington Ecological District.

*(b) **Rarity:** the ecosystem or habitat has biological or physical features that are scarce or threatened in a local, regional or national context. This can include individual species, rare and distinctive biological communities and physical features that are unusual or rare.*

Assessment

As described above, both of the indigenous vegetation types present within the site are considerably reduced, and the ngaio-māhoe-māpou forest type is likely to be quite scarce in Wellington Ecological District. Kōwhai is an uncommon species in Wellington Ecological District. Indigenous lizards with At Risk-Declining status are likely to be present in habitats within the site, and the tributary of Ngauranga Stream that passes through the more modified part of the site may provide habitat for indigenous fish with At Risk-Declining status.

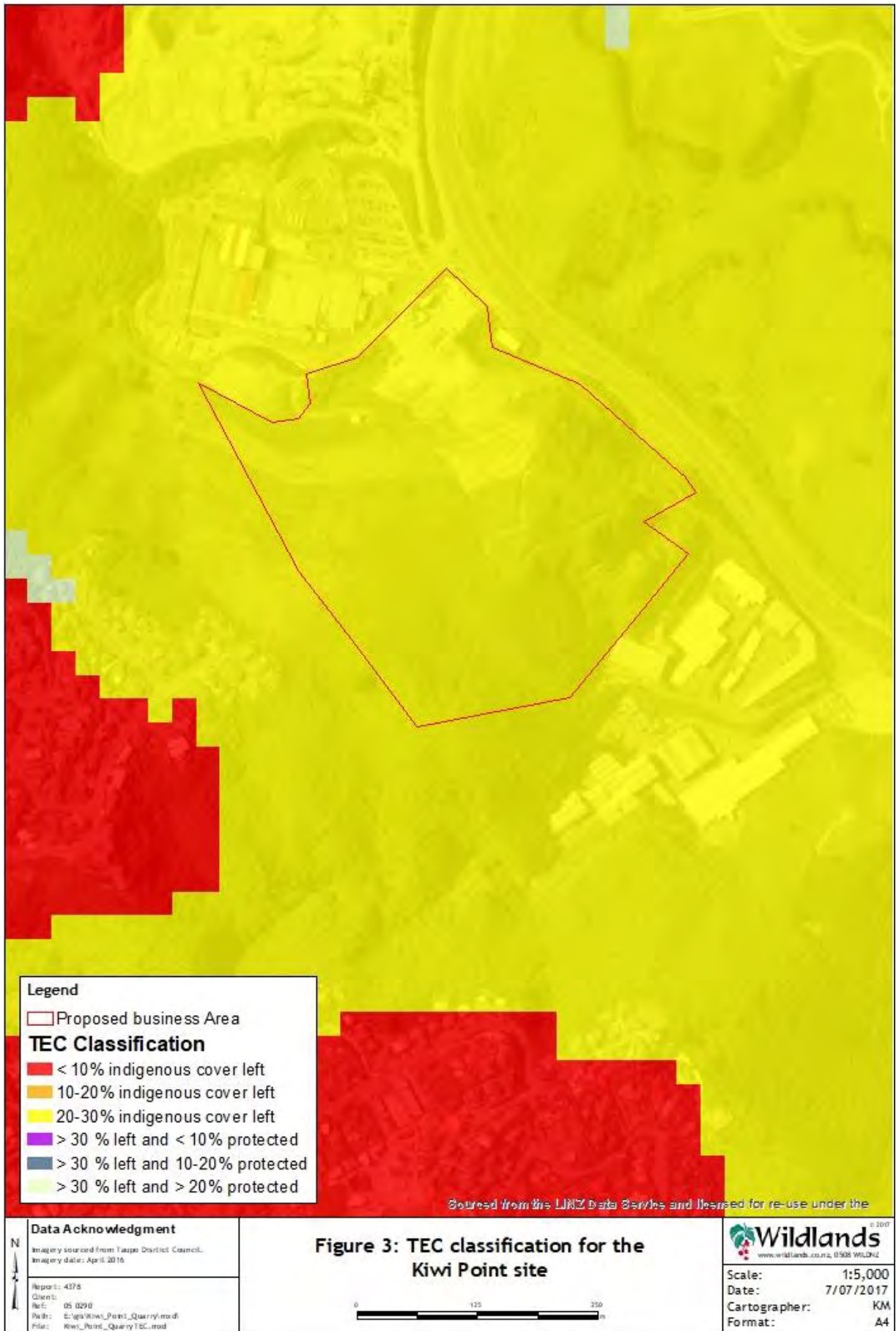
National priorities for the protection of rare and threatened indigenous biodiversity on private land (MfE and DOC 2007) are listed below and site values have been assessed in relation to each one:

1. *Indigenous vegetation on land environments that have less than 20% of their indigenous cover remaining.*

The site is located within At Risk land environments that have 20-30% of their indigenous cover remaining (Figure 3).

2. *Indigenous vegetation associated with sand dunes and wetlands.*

No sand dune or wetland habitats are present within the site.



3. *Indigenous vegetation associated with originally rare ecosystems.*

No originally rare ecosystems were recorded at the site.

4. *Habitats of acutely and chronically threatened species.*

The ‘acutely threatened’ and ‘chronically threatened’ categories have been superseded by a more recent threat classification system (Townsend *et al.* 2008), and now correspond to the Threatened and At Risk-Declining categories of Townsend *et al.* (2008). As described above, indigenous lizards, and potentially fish, with At Risk-Declining status are likely to be present within the site.

On the basis of the above, the ngaio-māhoe-māpou forest meets this criterion, as does kōwhai. Parts of the site that provide habitat for At Risk lizards or fish may also be significant.

(c) **Diversity:** *the ecosystem or habitat has a natural diversity of ecological units, ecosystems, species and physical features within an area.*

Assessment

The site has remnants of its natural diversity, as represented by different forest types on landforms with different aspects, but overall has a relatively low diversity of indigenous plant species. The most diverse plant habitat within the site is the ngaio-māhoe-māpou forest above State Highway 1. The diversity of indigenous lizards, birds, and fish is not known. A preliminary assessment based on indigenous habitats and plant species is that the site overall is not significant according to this criterion, but the ngaio-māhoe-māpou forest is significant.

(d) **Ecological context of an area:** *the ecosystem or habitat:*

- (i) *enhances connectivity or otherwise buffers representative, rare or diverse indigenous ecosystems and habitats; or*
- (ii) *provides seasonal or core habitat for protected or threatened indigenous species.*

Assessment

Indigenous forest at the site mostly comprises fleshy-fruited trees that would provide an important seasonal food source for frugivorous birds such as kererū, kōkō/tūī, and pipihi/silvereye. The mixed gully forest at the site also contains several fleshy-fruited trees which would provide food sources for these birds. In addition, tree lucerne (*Chamaecytisus palmensis*) foliage in these gully forests would provide a useful winter food source for kererū. When in flower, Scotch broom also provides a seasonal food source for kererū.

The site is connected to and helps to buffer the Tyers Stream Reserve, which contains representative lowland forest. Overall, the Tyers Stream Reserve and the indigenous forest at the proposed quarry site provide a large area of seasonal habitat for indigenous frugivores and permanent habitat for other indigenous bird species. Loss of the indigenous forest within the site could result in reductions in

the local population sizes of these species, because a large amount of habitat would be removed.

- (e) **Tangata whenua values:** the ecosystem or habitat contains characteristics of special spiritual, historical or cultural significance to tangata whenua, identified in accordance with tikanga Māori.

Assessment

This is not an ecological criterion, though can be informed by the ecological information in this report, for example by providing a list of plant species that may be taonga species for local tangata whenua. This criterion has not been assessed.

Summary of Significance Assessment

In summary, forest vegetation at the site is significant because it provides locally important seasonal habitat for indigenous forest birds. The ngaio-māhoe-māpou forest is also significant because it better represents the likely pre-human vegetation of its site, has moderately high plant species diversity, and provides habitat for a locally uncommon plant species. Other habitats may be significant depending on their significance for indigenous lizards and fish.

10. POTENTIAL ADVERSE EFFECTS

The main potential adverse effects of quarry development would be clearance of a relatively large area - approximately 3.5 hectares - of indigenous forest vegetation and habitat that is locally important for indigenous forest birds, and probably also indigenous lizards. Some lizards would probably be killed during quarry excavation. Small amounts of indigenous forest would be left on quarry margins, but these would be exposed to edge effects, which for the forest remnants above State Highway 1, would be very significant. The adjacent Tyers Stream Reserve would have reduced buffering from the effects of wind and spread of ecological weeds.

These effects would be significant, and if quarry development cannot avoid these effects, it will require substantive mitigation and/or remediation.

11. MITIGATION OF CLEARANCE OF VEGETATION AND HABITATS

The following mitigation options are suggested based on a scenario of full quarry development. In principle, mitigation should be in kind (like for like), on a site with similar environmental gradients, close to the affected area, and with the potential for additional conservation actions over a larger area (ideally at least three times larger) than the affected area.

Key habitats that would be affected by the quarrying are the [ngaio]/māhoe forest on shady slopes, and the ngaio-māhoe-māpou forest on the steep, more sunny and exposed faces above State Highway 1. Thus a mitigation site would need to incorporate both sunny and shady aspects and gradients of exposure.

Three nearby sites have been identified (Figure 4) that could potentially be legally protected and/or rehabilitated and/or enhanced, and thus would help to mitigate the adverse effects of vegetation and habitat clearance:

- a) A package of sites close to the proposed quarry site. These include three distinct areas:
 - Part of the ridge and upper hill slopes immediately west of the proposed quarry site - adjacent to the suburb of Rangoon Heights - currently supports 2.7 ha of scattered tī kouka/cabbage tree (*Cordyline australis*) within Scotch broom-gorse shrubland, and approximately 0.8 ha of advanced growth regenerating māhoe forest. These areas could be legally protected and restoration actions undertaken to more quickly return these areas to indigenous forest. This site would represent only sunny and exposed aspects, and would be at higher elevation to most of the affected areas of indigenous vegetation and habitat. A key advantage of this component of mitigation would be to provide a forested connection between the Tyers Stream Reserve and other areas of indigenous forest.
 - Forest below the water tanks and their Maldive Street access. Approximately 2.5 ha of māhoe-dominant forest is present within this area, and there is also an area with scattered trees in a vineland matrix that could potentially be enhanced through active restoration. These areas include some lower elevation land. Legally protecting these areas would help to slow the rate of future loss of māhoe forest.
 - A 1.62 ha triangle of low elevation māhoe-dominant forest between the potentially affected [ngaio]-māhoe forest and the Tyers Stream Reserve, which could be legally protected to prevent future development activities. The benefits of this would be to slow the rate of future loss of this forest type.
- b) A ridge extending from the suburb of Cashmere, immediately down-valley of the site to be affected, currently supports indigenous forest remnants and Scotch broom/ gorse scrub on its sunny and exposed side, and exotic plantation forest on its shady side. This ridge has similar topography and aspect and exposure differences to the site to be affected, but is slightly lower. It has an area of 13.6 hectares, and is therefore very similar to the overall size of the subject site, and approximately 3.5 times the size of the areas of indigenous forest to be affected. This site could also potentially be legally protected and rehabilitated to indigenous forest. An electricity transmission line crosses the ridge, but would pose few constraints to ecological restoration.
- c) An area of northwest-facing upper slopes on the northern side of Ngauranga Gorge comprises Wellington City Council reserve land and is currently covered by regenerating indigenous broadleaved forest and Scotch broom-gorse scrub.

This area is relatively higher (140-200 metres above sea level) than the affected areas, and its predominant aspect is also different to aspects of the indigenous vegetation and habitat to be affected. It is approximately 9.8 hectares, and thus about 2.5 times the size of the affected areas of indigenous forest.

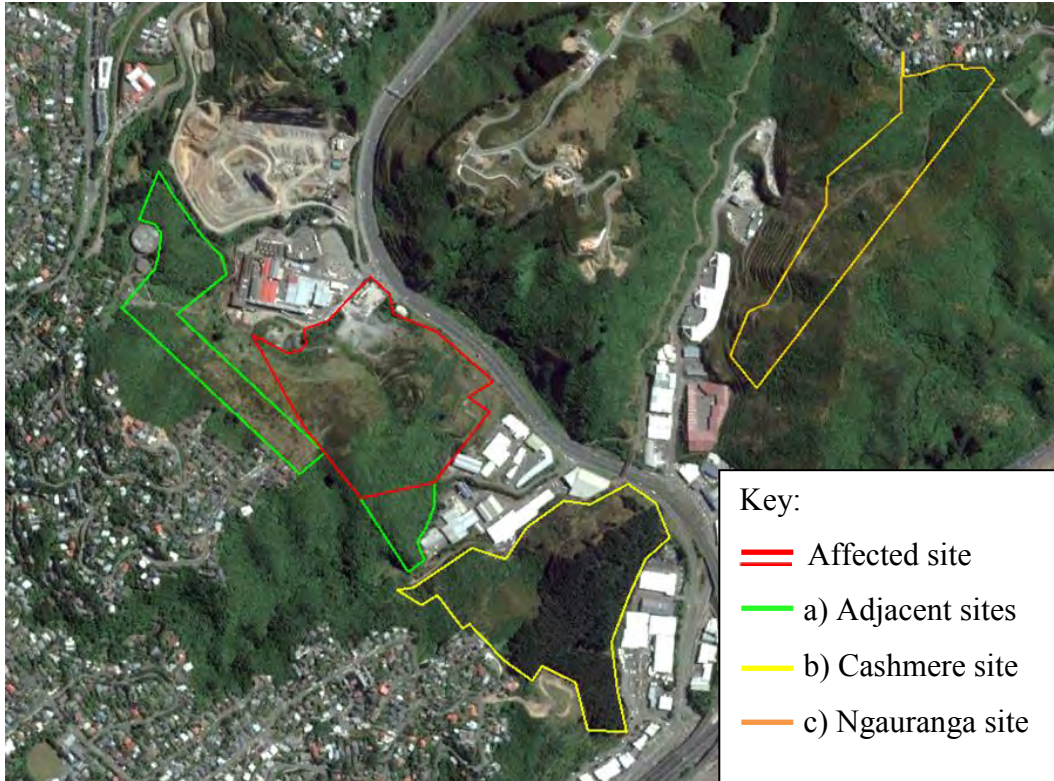


Figure 4: Potential local sites for which mitigation options could be considered.

Advantages and disadvantages of these three sites for mitigation of the adverse effects of clearance are summarised in Table 5.

Table 5: Attributes of the suggested mitigation sites in relation to the areas to be affected.

Factors Compared to Areas to be Affected	Potential Mitigation Sites		
	a) Adjacent Sites	b) Cashmere (b)	c) Ngauranga
Size	Twice as large	3.5 times larger	2.5 times larger
WCC owned?	Yes	No	Yes
Similar landform?	Partly	Yes	No
Similar aspects?	Partly	Fully	Partly
Indigenous forest cover?	c.50% of area	c.10% of area	c.50% of area
Similar vegetation?	Partly	Partly	Partly
Similar elevation?	More at higher elevation, less at lower elevation.	More at lower elevation, less at higher elevation.	Mostly higher elevation.
Other factors			

Factors Compared to Areas to be Affected	Potential Mitigation Sites		
	a) Adjacent Sites	b) Cashmere (b)	c) Ngauranga
Opportunity for landscape mitigation?	Moderate, local mitigation	Significant if pines replaced with indigenous forest.	Limited as mostly on a successional trajectory to full indigenous dominance.
Additionality	Moderate	Strong if pines are replaced.	Limited as mostly on a successional trajectory to full indigenous dominance.

Overall, the Cashmere site stands out as being a similar landform of significant size with strong potential for ecological restoration and also has potential to remove the landscape effects of pine forest. It also represents a slightly lower elevation site, which would better help to mitigate the more extensive loss of indigenous vegetation in lowland environments. The main constraint with this site is that it is not owned by Wellington City Council. Nevertheless, this increases the additionality of conservation actions for the site, such as legal protection.

The package of adjacent sites incorporating legal protection and ecological restoration has the advantages of being closest to the affected site and through ecological restoration, better-connecting existing areas of indigenous forest. This would be sufficient to mitigate adverse effects of quarry development on māhoe-dominant forest, but would not mitigate the effects of clearance of the representative ngaio-mahoe-mapou forest.

The Ngauranga site lacks close similarity with the site to be affected, and ecological restoration at this site would not be fully additional given that the existing vegetation is currently on a successional trajectory to greater cover of indigenous forest.

Other sites owned by Wellington City Council may be available for mitigation in the wider area, and in particular, a site where restoration actions to mitigate the loss of ngaio-mahoe-mapou forest should be sought. Any such sites should also be assessed for environmental similarity and scope to undertake additional conservation activities that would not otherwise occur. However, it would be preferable to undertake mitigation activities close to the site to be affected, where possible.

12. REMEDIATION

12.1 Vegetation

The final quarry pit slopes will be have a range of landforms and aspects and should provide areas of sheltered habitat. Wind modelling of the final pit landform should be undertaken, to identify potentially sheltered areas. When quarrying ceases these should be a focus for active rehabilitation of indigenous vegetation and habitat. This will require topsoil to be stockpiled for use in any planting sites on quarry benches.

12.2 Lizard habitat

More exposed benches could be rehabilitated to promote lizard habitat. This should include provision of rock jumbles and/or artificial lizard habitat on benches, together with planting of potential food and habitat resources, such as *Melicytus crassifolius*.

13. CONCLUSIONS

The proposed quarry site contains two types of indigenous forest that represent the main vegetation values of the site. Forest patches above State Highway 1 are a more representative, diverse, and reduced type of forest than the more extensive, secondary broadleaved forest on shady slopes adjacent to the Tyers Stream Reserve. Both forest types provide locally important, seasonal habitat for indigenous forest birds, and are ecologically significant according to the significance criteria in the Greater Wellington Regional Policy Statement. There is a reasonable likelihood that additional indigenous lizard and freshwater fish values are present in habitats within the site, and surveys for these fauna should be undertaken.

Adverse effects of clearance of these habitats for quarry development would be significant, and would require mitigation and remediation. Ideally, mitigation should occur on a nearby site that has features similar to the areas to be affected and where conservation actions would be strongly additional. There is good potential for mitigation on the neighbouring ridge down-valley, which is similar to the areas to be affected, but as this site is private land it would need to be purchased by Wellington City Council for this potential to be realised. Sites adjacent to the proposed quarry have potential for mitigation for adverse effects on māhoe-dominant forest, but an alternative site should be chosen to address mitigation for loss of ngaio-mahoe-mapou forest.

In addition to mitigation, there is potential for remediation of some adverse effects once the quarry operation has ceased. However, this would only take place in the future, and would be significantly constrained by quarrying. As such, it should be seen as a retrospective action which will address some effects, but only after the quarry operation has ceased. It will also take some time to achieve significant ecological (and landscape) effects. Overall, site remediation is important but should be considered to be complementary to mitigation.

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REFERENCES

Adams L. 2009: Lizard action plan for Poneke area, Wellington Conservancy. Department of Conservation, Wellington.

- MfE and DOC 2007: Protecting our places. Introducing the national priorities for protecting rare and threatened native biodiversity on private land. Ministry for the Environment, Wellington.
- Goodman J.M., Dunn N.R., Ravenscoft P.J., Allibone R.M., Boubée J.A.T., David B.O., Griffiths M., Ling N., Hitchmough R., and Rolfe J.R. 2014: Conservation status of New Zealand freshwater fish, 2013. *New Zealand Threat Classification Series 7*. Department of Conservation, Wellington. 12 pp.
- Hitchmough R., Barr B., Lettink M., Monks J., Reardon J., Tocher M., van Winkel D., and Rolfe J. 2016: Conservation status of New Zealand reptiles, 2015. *New Zealand Threat Classification Series 17*. Department of Conservation, Wellington. 14 pp.
- de Lange P., Rolfe J., Champion P., Courtney S., Heenan P., Barkla J., Cameron E., Norton D. and Hitchmough R. 2013: Conservation status of New Zealand indigenous vascular plants, 2012. *New Zealand Threat Classification Series 3*. Department of Conservation, Wellington. 70 pp.
- McEwen M. 1987. Ecological districts and regions of New Zealand. *New Zealand Biological Resources Centre Publication No 5, Part 3*. Department of Conservation, Wellington.
- Park G. 1999: An inventory of the surviving traces of the primary forest of Wellington City. Wellington City Council, Wellington: 11 pp plus appendices.
- Townsend A.J., de Lange P.J., Duffy C.A.J., Miskelly C.M., Molloy J., and Norton D.A. 2008: New Zealand threat classification system manual. Department of Conservation, Wellington.
- Wildland Consultants 2016: Audit of potentially significant natural areas for Wellington City: Stage 1 desktop analysis. *Wildland Consultants Ltd Contract Report, No. 3942*. Prepared for Wellington City Council, Wellington. 117 pp.

VASCULAR PLANT SPECIES RECORDED AT THE SITE

*Denotes exotic species. Abundance is expressed across the whole site

Species	Common Name	Plant Type	Abundance
<i>Acaena anserinifolia</i>	Bidibidi	Dicot herb	Rare
<i>Agapanthus orientalis</i> *	Agapanthus	Dicot herb	Rare
<i>Agrostis capillaris</i> *	Browntop	Grass	Occasional
<i>Anagallis arvensis</i> *	Scarlet pimpernel	Dicot herb	Rare
<i>Apium graveolens</i> *	Wild parsley	Dicot herb	Occasional
<i>Arthropteris tenella</i>		Fern	Rare
<i>Asplenium appendiculatum</i>	Ground spleenwort	Fern	Rare
<i>Asplenium bulbiferum</i>	Hen and chicken fern	Fern	Rare
<i>Asplenium flabellifolium</i>	Necklace fern	Fern	Rare
<i>Asplenium hookerianum</i>	Hooker's spleenwort	Fern	Rare
<i>Asplenium oblongifolium</i>	Shining spleenwort	Fern	Frequent
<i>Beilschmiedia tawa</i>	Tawa	Tree	Rare
<i>Berberis darwinii</i> *	Darwin's barberry	Shrub	Occasional
<i>Brachyglottis repanda</i>	Rangiora	Tree	Occasional
<i>Brassica napus</i> *		Dicot herb	Occasional
<i>Buddleja davidii</i> *	Buddleia	Shrub	Occasional
<i>Centaurium erythraea</i> *	Centaury	Dicot herb	Rare
<i>Centranthus ruber</i> *	Spur valerian	Dicot herb	Occasional
<i>Cerastium fontanum</i> *	Mouse-ear chickweed	Dicot herb	Rare
<i>Chamaecytisus palmensis</i> *	Tree lucerne	Tree	Occasional
<i>Chrysanthemoides monilifera</i> *	Boneseed	Shrub	Rare
<i>Clematis paniculata</i>	Puawananga	Vine	Occasional
<i>Coprosma grandifolia</i>	Kanono	Tree	Occasional
<i>Coprosma</i> hybrid	<i>Coprosma</i> hybrid	Shrub	Rare
<i>Coprosma propinqua</i>	Mingimingi	Shrub	Occasional
<i>Coprosma repens</i>	Taupata	Shrub	Rare
<i>Coprosma rhamnoides</i>		Shrub	Occasional
<i>Coprosma robusta</i>	Karamu	Tree	Occasional
<i>Cordyline australis</i>	Cabbage tree / ti kouka	Tree	Rare
<i>Cortaderia selloana</i>	Pampas	Grass	Occasional
<i>Corynocarpus laevigatus</i>	Karaka	Tree	Occasional
<i>Cyathea dealbata</i>	Ponga	Fern	Occasional
<i>Cyathea medullaris</i>	Mamaku	Fern	Occasional
<i>Cytisus scoparius</i> *	Scotch broom	Shrub	Abundant
<i>Dactylis glomerata</i> *	Cocksfoot	Grass	Occasional
<i>Digitalis purpurea</i> *	Foxglove	Dicot herb	Rare
<i>Ehrharta erecta</i> *	Veldt grass	Grass	Frequent
<i>Erigeron canadensis</i> *	Canadian fleabane	Dicot herb	Occasional
<i>Euchiton audax</i>	Native cudweed	Dicot herb	Rare
<i>Foeniculum vulgare</i> *	Fennel	Dicot herb	Frequent
<i>Fumaria muralis</i> *	Scrambling fumitory	Dicot herb	Rare
<i>Geniostoma ligustrifolium</i>	Hangehange	Tree	Frequent
<i>Hebe parviflora</i>		Shrub	Rare
<i>Hebe stricta</i>	Koromiko	Shrub	Occasional
<i>Hedycarya arborea</i>	Pigeonwood / porokaiwhiri	Tree	Rare
<i>Hypochaeris radicata</i> *	Catsear	Dicot herb	Occasional
<i>Hypolepis ambigua</i>		Fern	Rare
<i>Kunzea robusta</i>	Kanuka	Tree	Occasional

Species	Common Name	Plant Type	Abundance
<i>Lastreopsis glabella</i>	Smooth shield fern	Fern	Occasional
<i>Lathyrus latifolius</i> *	Everlasting pea	Dicot herb	Rare
<i>Leptospermum scoparium</i>	Manuka	Tree	Frequent
<i>Linaria purpurea</i> *	Purple linaria	Dicot herb	Occasional
<i>Macropiper excelsum</i>	Kawakawa	Tree	Abundant
<i>Melicope simplex</i>	Poataniwha	Tree	Rare
<i>Melicytus ramiflorus</i>	Māhoe	Tree	Occasional
<i>Metrosideros diffusa</i>	White climbing rata	Vine	Rare
<i>Metrosideros excelsa</i>	Pohutukawa	Tree	Occasional
<i>Microsorium pustulatum</i>	Hound's tongue fern	Fern	Frequent
<i>Muehlenbeckia australis</i>	Pōhuehue	Vine	Frequent
<i>Myoporum laetum</i>	Ngaio	Tree	Frequent
<i>Myrsine australis</i>	Mapou	Tree	Occasional
<i>Myrsine divaricata</i>	Weeping matipo	Tree	Rare
<i>Olearia paniculata</i>	Akiraho	Tree	Rare
<i>Oxalis incarnata</i> *	Lilac oxalis	Dicot herb	Rare
<i>Ozothamnus leptophyllus</i>	Tauhinu	Shrub	Rare
<i>Paraserianthes lophantha</i> *	Brush wattle	Tree	Occasional
<i>Parsonsia heterophylla</i>	Native jasmine	Vine	Abundant
<i>Pellaea rotundifolia</i>	Button fern	Fern	Occasional
<i>Pennantia corymbosa</i>	Kaikomako	Tree	Rare
<i>Phytolacca octandra</i> *	Inkweed	Dicot herb	Occasional
<i>Pinus radiata</i> *	Radiata pine	Tree	Rare
<i>Pittosporum crassifolium</i>	Karo	Tree	Occasional
<i>Plantago lanceolata</i> *	Narrow-leaved plantain	Dicot herb	Occasional
<i>Poa anceps</i>		Grass	Rare
<i>Polystichum neozelandicum</i>	Shield fern	Fern	Occasional
<i>Prunus sp.</i> *	Wild plum	Tree	Rare
<i>Pseudopanax arboreus</i>	Five-finger, whauwhaupaku	Tree	Occasional
<i>Pseudopanax crassifolius</i>	Lancewood / horoeka	Tree	Rare
<i>Pteridium esculentum</i>	Bracken	Fern	Occasional
<i>Pyrrosia eleagnifolia</i>	Leatherleaf fern	Fern	Occasional
<i>Rubus cissoides</i>	Lawyer	Vine	Rare
<i>Rubus fruticosus</i> *	Blackberry	Shrub	Frequent
<i>Rumex sagittatus</i> *	Climbing dock	Dicot herb	Occasional
<i>Rytidosperma racemosum</i> *	Danthonia	Grass	Occasional
<i>Salix sp.</i> *	Willow	Tree	Rare
<i>Senecio glastifolius</i> *	Holly-leaved senecio	Dicot herb	Frequent
<i>Senecio skirrhodon</i> *	Gravel groundsel	Dicot herb	Rare
<i>Solanum chenopodioides</i> *	Velvety nightshade	Dicot herb	Frequent
<i>Solanum laciniatum</i>	Poroporo	Shrub	Rare
<i>Sonchus oleraceus</i> *	Puha / sow thistle	Dicot herb	Rare
<i>Sophora microphylla</i>	Kowhai	Tree	Rare
<i>Stellaria media</i> *	Chickweed	Dicot herb	Occasional
<i>Stellaria parviflora</i>	Native chickweed	Dicot herb	Rare
<i>Tradescantia fluminensis</i> *	Tradescantia	Dicot herb	Occasional
<i>Trifolium hybridum</i> *	Alsike clover	Dicot herb	Rare
<i>Trifolium repens</i> *	White clover	Dicot herb	Occasional
<i>Ulex europaeus</i> *	Gorse	Shrub	Frequent
<i>Vicia sativa</i> *	Vetch	Dicot herb	Occasional



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ASSESSMENT OF LIZARDS FOR A PROPOSED EXPANSION OF THE KIWI POINT QUARRY, NGAURANGA GORGE, WELLINGTON



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ASSESSMENT OF LIZARDS FOR A PROPOSED EXPANSION OF THE KIWI POINT QUARRY, NGAURANGA GORGE, WELLINGTON



Barking gecko (Naultinus punctatus), one of the lizard species potentially present within the proposed quarry footprint.

Contract Report No. 4378b

December 2017

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1. INTRODUCTION

Kiwi Point Quarry has been operating on Wellington City Council (WCC)-owned land in the Ngauranga Gorge since the 1920s. The current pit is about 40 metres deep and will be deepened by another 15 metres to reach the highest value rock. Only four to five years of rock remains within the current pit and WCC and the quarry operator hope to extend the life of the centrally-located quarry by extending mining southward.

The proposed quarry expansion and associated development has the potential to adversely affect ecological features and values, including indigenous lizard populations and their habitats. This would trigger the need to produce a lizard management plan outlining appropriate mitigation measures, and to apply for a Wildlife Act Authority permit from the Department of Conservation; required where indigenous lizards and/or their habitats are potentially affected by development. A survey to assess the lizard species present, their distribution, abundance, and habitats is an essential requirement to inform any lizard management plan, Wildlife Act Authority, and consent applications. Measures to avoid or minimise potential adverse effects on lizards, and potential mitigation opportunities based on best practice biodiversity offsetting can then be evaluated. This report describes a lizard survey undertaken at the Kiwi Point quarry proposed expansion site in December 2017 and also addresses requirements for further work.

2. DESKTOP ASSESSMENT OF WELLINGTON LIZARD TAXA

The Wellington Region currently has 12 indigenous lizard (gecko and skink) taxa known to remain on the mainland. Based on an assessment of nearby records from the Department of Conservation's Herpetofauna database, seven species were identified as being potentially present at the subject site prior to the field survey. All seven have been recorded within two kilometers of the proposed quarry. Four of these species have a current threat status of 'At Risk-Declining' (Table 1). In the Wellington Region, lizards live in a range of environments, from rocky coastal scree slopes to wetlands, forests, and even urban gardens, as such they often live close to people and can be vulnerable to disturbance. The lizard fauna of the Wellington Region is diverse relative to other urban centres in New Zealand and warrants a greater focus in consenting processes.

Table 1: Lizard records within two kilometres of the Kiwi Point Quarry site (Department of Conservation Herpetofauna database), their threat status (Hitchmough et al. 2016), and distributions.

Common Name (Bell 2014)	Scientific Name	NZ Threat Status	Nearest Report(s) and Dates
Ngahere gecko	<i>Mokopirirakau</i> sp. "Southern North Island"	At Risk, Declining	1.6 km Khandallah 2014
Barking gecko	<i>Naultinus punctatus</i>	At Risk, Declining	900 m Broadmeadows 1997 1.4 km Khandallah 1994
Ornate skink	<i>Oligosoma ornatum</i>	At Risk, Declining	540 m Khandallah 1951 1.3 km Khandallah 1956
Glossy brown skink	<i>Oligosoma zelandicum</i>	At Risk, Declining	750 m Khandallah 2005 Several older reports from Khandallah

Common Name (Bell 2014)	Scientific Name	NZ Threat Status	Nearest Report(s) and Dates
Raukawa gecko	<i>Woodworthia maculata</i>	Not Threatened	350 m Khandallah 2002 1 km Broadmeadows 2013
Copper skink	<i>Oligosoma aeneum</i>	Not Threatened	250 m Tyers Stream 1994 470 m Khandallah 2013 Several older reports from Khandallah
Northern grass skink	<i>Oligosoma polychroma</i>	Not Threatened	300 m Khandallah 2013 800 m Khandallah 1993

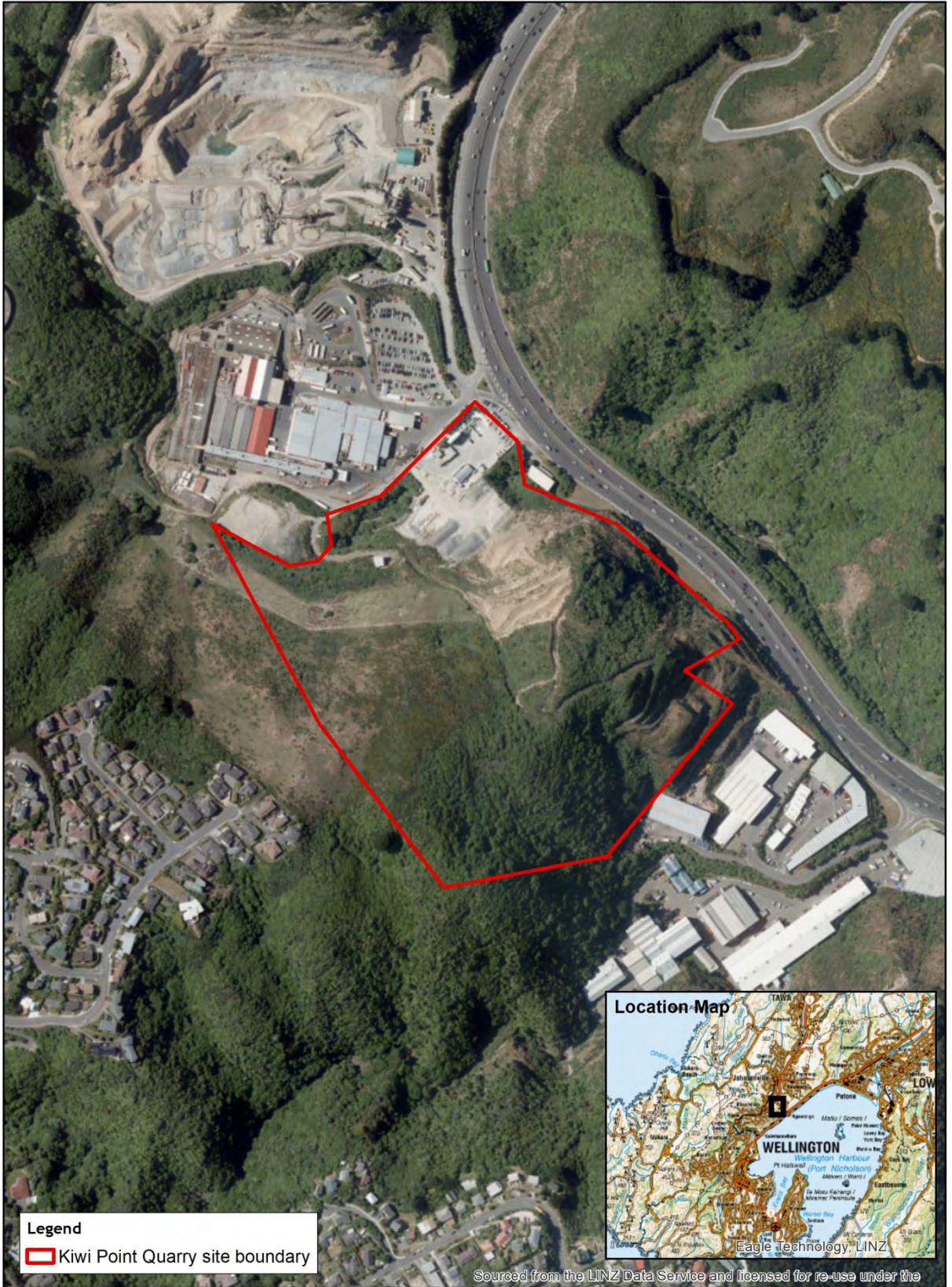
In the Wellington Region, lizards should be assumed to be present until proven otherwise. Lizards can live in a wide range of indigenous, exotic, natural, and artificial habitats. As such, lizard habitats can sometimes be surprising to lay people (for example long grass on road sides can provide important habitat for species such as the northern grass skink). A key requirement is that a thoroughly-experienced lizard expert is used to assess sites for lizards, as the Wellington Region has cryptic lizard species that can be difficult to detect, such as Ngahere gecko (*Mokopirirakau* sp. 'Southern North Island') and barking gecko (*Naultinus punctatus*).

The subject site (Figure 1) is covered with indigenous forest on the shady, southern side of the ridge, and mostly by exotic scrub (gorse (*Ulex europaeus*), broom (*Cytisus scoparius*), and blackberry (*Rubus fruticosus*)) and grassland on the northern, sunny side of the ridge (Wildland Consultants 2017). Forest on the southern side is dominated by ngaio (*Myoporum laetum*), māhoe (*Melicytus ramiflorus*), and māpou (*Myrsine australis*), often with overlying *Muehlenbeckia* vines. The canopy height is quite short throughout much of the site, being less than four metres. The site ranges from 60-180 metres elevation above sea level, and covers 13.3 hectares.

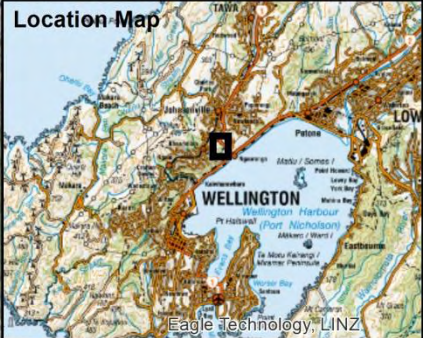
3. SURVEY METHODS

3.1 Overview

Best practice search techniques vary with lizard species and habitat, and thus, there is no one method that adequately covers all species. As such, a range of techniques must be utilised to ensure adequate coverage and sufficient detection probabilities. Best practice detection techniques used for each species are outlined in Table 2 below, along with the methods used during this survey. Although potentially useful for locating the four terrestrial skink species potentially present, pitfall trapping was not used during this survey, as the survey was limited to two days and pitfall trapping is best undertaken over three or more consecutive days (pitfall traps must be checked daily when open). More thorough descriptions of each search technique employed are given in the following section.



Legend
 Kiwi Point Quarry site boundary



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	<p>Data Acknowledgment</p> <p>Imagery sourced from Taupo District Council. Imagery date: April 2016</p>
	<p>Report: 4378b Client: Ref: 04 0395 Path: E:\gis\Kiwi_Point_Quarry\mxd\ File: Figure1_Kiwi_Point_Lizard.mxd</p>

Figure 1: Location of the Kiwi Point Quarry site

<p>www.wildlands.co.nz, 0508 WILDNZ</p>	<p>Scale: 1:5,000</p>
	<p>Date: 19/12/2017</p>
	<p>Cartographer: KM</p>
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Table 2: Survey or detection methods used for lizards during the Kiwi Point survey.

Common Name	Habitat	Best practice survey methods	Survey methods employed
Ngahere gecko	Forest, shrubland.	Tree covers, spotlighting.	Tree covers, spotlighting.
Barking gecko	Forest, shrubland.	Day searching, spotlighting.	Day searching, spotlighting.
Ornate skink	Forest, shrubland, leaf litter.	Pitfall trapping, Onduline, raking.	Raking, Onduline.
Glossy brown skink	Damp habitats with dense cover.	Day searching, pitfall trapping, Onduline, raking.	Day search, raking, Onduline.
Raukawa gecko	Rocky areas or clay banks.	Day search, spotlight, Onduline.	Day search, spotlight, Onduline.
Copper skink	Forest, shrubland, leaf litter.	Pitfall trapping, Onduline, raking.	Raking, Onduline.
Northern grass skink	Grassland, shrubland.	Day searching, pitfall trapping, Onduline, raking.	Day search, raking, Onduline.

3.2 Survey methods used

Each of the survey methods used to attempt to locate lizards at the Kiwi Point site is described in detail below.

Spotlighting

Spotlighting was undertaken within the Kiwi Point site over two warm nights, with night time temperatures well over 10°C. The survey was aligned with a period of warm weather in December 2017. The focus was on locating active or emergent Ngahere gecko and barking gecko as they undertake hunting or foraging at night, or as they rest on branches or amongst foliage. The biggest advantage of spotlighting is that it is usually more effective than day-searching for locating Ngahere gecko and barking gecko in tall vegetation, i.e. three metres or taller. It is very difficult to see geckos from underneath during the day because they appear as black silhouettes against the sky. When spotlighting, the full range of vegetation heights from ground level to near the tops of tall trees was searched. Head-mounted LED Lenser H7 spotlights or similar were used to look for the white undersides of geckos amongst the vegetation and/or eye shine produced by reflection of the torch beam on the geckos retinas. Barking geckos do not utilise artificial retreats and are best detected in forest habitats by spotlighting (they can also be spotted basking by day in foliage). Raukawa geckos can be detected by spotlighting, or by examination of rocky areas.

Day Searches and Raking

Day searches were undertaken at the Kiwi Point site over two days in fine, warm weather. These searches focused on bush edges, low canopy bush, shrubland, and grassland. Day searches focused on looking for both emergent or basking lizards, and lizards using refugia, e.g. under rocks, amongst dense ground cover, amongst dense foliage, tree holes, and under piles of leaf litter. Raking of leaf litter was used to target detection of ornate and copper skinks. This technique disturbs lizards sheltering in leaf litter, which can subsequently be caught and identified. Northern grass skink (*Oligosoma polychroma*) and glossy brown skink (*Oligosoma zelandicum*) can often be spotted basking in grassland or other sunny spots close to cover. In contrast, ornate skink (*Oligosoma ornatum*) and copper skink (*Oligosoma aeneum*) are not avid

baskers, preferring to shelter in leaf litter, so can be difficult to detect visually, but raking of leaf litter is an effective method for detection.

Tree Covers and Onduline Retreats

Easily the most effective detection technique for Ngahere geckos is via the use of artificial tree covers which mimic loose bark (made from closed-cell foam (Bell, 2009); Plate 1). Tree covers for detection of arboreal lizards are constructed from closed-cell foam (Bell, 2009). Forest-inhabiting lizards use loose bark and hollows on trees as refugia. The use of these tree covers (dimensions: 30 cm wide x 70 cm long) placed on tree trunks and branches presumably mimics these microhabitats. These tree covers have proven to be several times more effective than spotlighting for forest geckos (*Mokopirirakau* sp.) in the North Island and have detected these cryptic geckos often where spotlighting has failed to do so.

Onduline ACOs create a thermally stable retreat for lizards that mimics the conditions of a rock crevice, which form natural retreats for lizards (Lettink & Cree, 2007). Onduline ACOs generally consist of a stack of two or three 50 x 40 cm corrugated Onduline sheets with 1-2 cm spacing between each layer (Plate 2).

Forty Onduline retreats and forty tree covers (made from closed cell foam) were installed, but will not be checked until March 2018, as they require at least three months settling time before being checked, in order to give lizards sufficient time to find the retreats and begin habitually using them. The positions of all tree covers and Onduline retreats were recorded as GPS coordinates. As this survey was planned with insufficient time to allow for prior set up of Onduline retreats and tree covers, this report will be updated subsequent to March 2018 following checking of the artificial retreats. Without the use of tree covers and Onduline retreats only a partial assessment is possible and some species are likely to be overlooked. Therefore, it is likely that lizards will be detected in March 2018.

Survey Effort

Two days of field work, including night surveys were undertaken at the Kiwi Point site. Across the two days, 16-person hours (two personal for eight hours) were spent transporting the artificial retreats (tree covers and Onduline) onto site and installing them. Twelve-person hours were spent day-searching for basking lizards, including terrestrial skinks and terrestrial and arboreal geckos under rocks and amongst dense foliage, and raking leaf litter. During day-searches, basking terrestrial skinks were targeted in grassland, shrubland, and on bush edges in the morning whilst temperatures were not too hot. Barking geckos were searched for in dense foliage, particularly *Muehlenbeckia* and mapou. This involved both looking for geckos basking and physical parting of dense vegetation looking for geckos sheltering within, or movement that may indicate the presence of a gecko. Raking took place mostly during the hottest parts of the day under the forest canopy targeting potential copper skink and ornate skink habitat. Night time spotlighting was undertaken for 14-person hours in total across the two nights.

3.3 Information collected during the survey

The start time, finish time, personnel, and weather conditions (air temperature, wind (Beaufort scale), rain and cloud cover (eighths)) were recorded for all day searches and night spotlighting. The following information would be recorded for any lizard found: location, habitat notes, sex, life-history stage (adult, sub-adult or juvenile), snout-vent length (SVL), vent-to-tail length (VTL), and pregnancy status of mature females.



Plate 1: Tree covers (closed cell foam).



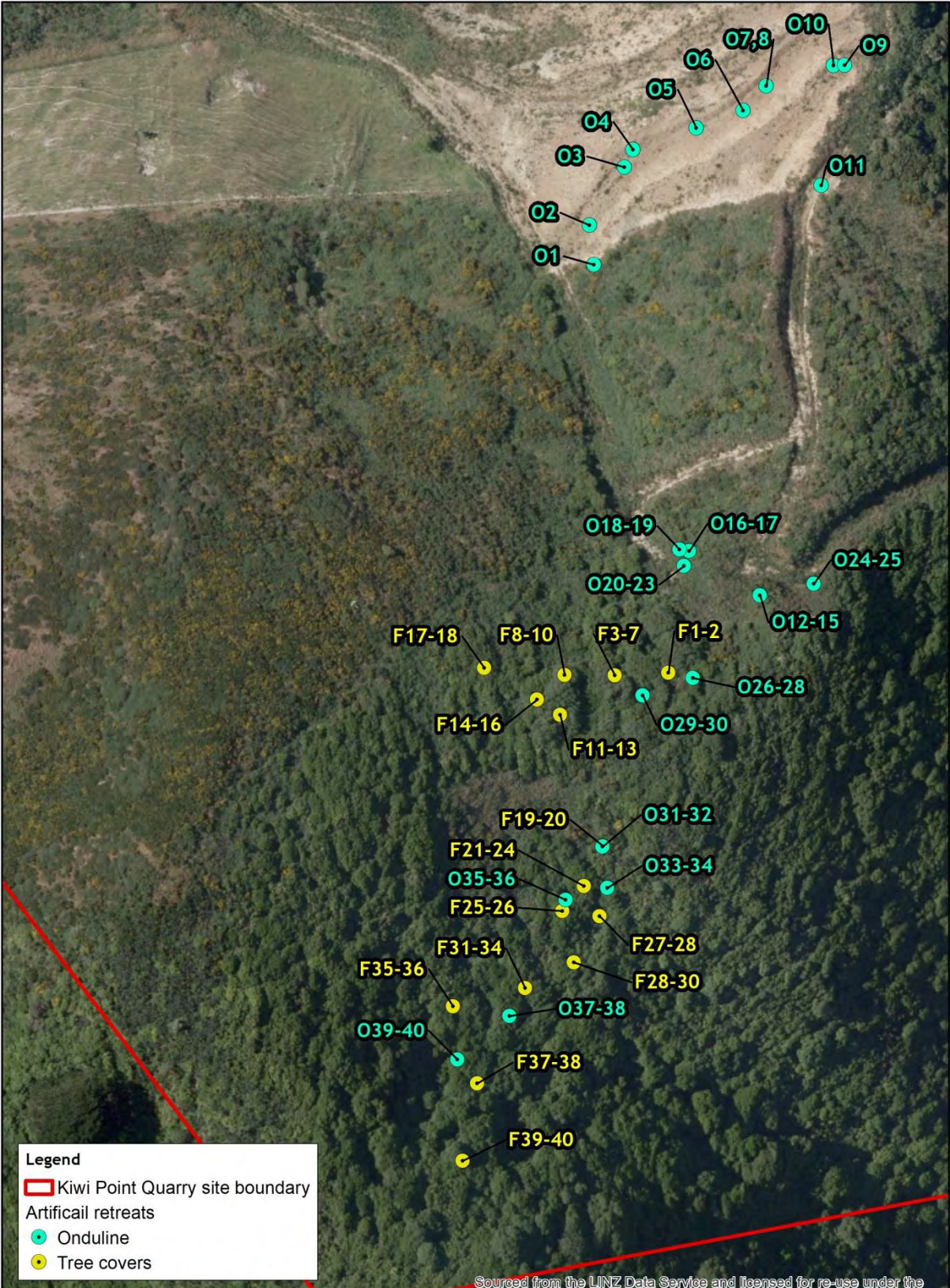
Plate 2: Onduline lizard retreat.

4. SURVEY RESULTS

No lizards were located during the two days and night of field work. The survey coincided with a period of very warm weather with both days being clear and sunny with light winds. The day time high was 24°C on the first day and 26°C on the second day. These high day-time temperatures may have restricted lizard emergence and activity somewhat during daylight hours, particularly in the afternoon, and may have decreased detection probability of some species (if present). Night time temperatures, however, were considered suitable for emergence of Ngahere gecko and barking gecko. Both nights were warm with the air temperature of 14°C and 17°C on the first and second nights respectively at the commencement of spotlighting.

The location of installed tree covers and Onduline retreats is shown in Figure 2. Onduline retreats were installed in a variety of habitats as follows: grassland and rocky areas around the access track on the northern side in an attempt to target northern grass skink and raukawa gecko (n = 11)¹, grassland and shrubland near the bush edge targeting all four terrestrial skink species (n = 14)¹, and under the forest canopy amongst dense leaf litter or in partial sunlit clearings targeting copper skink and ornate skink (n = 15)¹. Tree covers targeting Ngahere gecko were installed primarily on the larger ngaio and mahoe trees spread from the top of the hill down the south side towards the southwest corner of the site.

¹ Number of Onduline retreats.



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Figure 2: Location of 40 tree covers (F1-F40) and 40 onduline retreats (O1-O40) installed in an attempt to detect lizards at the Kiwi Point site.

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Scale:	1:1,200
Date:	19/12/2017
Cartographer:	KM
Format:	A4

Although no lizards were detected during this brief two-day survey, checking of the artificial retreats in March 2018 will allow for a second opportunity to detect lizards on site. The likelihood of each species being present on site, given current information, is discussed in the following section.

4.1 Likelihood of species presence

The likelihood of each of the seven potential lizard species (as outlined in Table 1) being present at the site is discussed below.

Ngahere gecko: At Risk-Declining

Ngahere gecko (Plate 3) are considered moderately likely to be present, based on their presence in several other indigenous forest remnants throughout the area, including in Belmont, Khandallah, Ngaio, Otari-Wiltons Bush, Korokoro, and Newlands. The closest record from the site is 1.6 kilometres away in Khandallah, and is recent (2014). Other recent surveys have located Ngahere geckos in similar indigenous forest remnants in Wellington, indicating that these inner-City regenerating bush areas are of local importance to this declining species. The best method (by far) of detecting these geckos is the use of tree covers. Detection by spotlighting is associated with more uncertainty. As such, it is likely that this species will be found in March 2018 under the tree covers. The largest trees were selected for installation of the foam covers. These larger trees are likely to be more attractive to Ngahere gecko than smaller trees, so we expect the geckos to locate the covers within the three-month timeframe. If Ngahere gecko are not detected in the tree covers, this will not necessarily mean that they are not present on site, but would suggest that if present, their population density is likely to be very low.



Plate 3: Ngahere gecko (*Mokopirirakau* sp. "Southern North Island").

Barking gecko: At Risk-Declining

Barking gecko is a cryptic species that can be difficult to detect, in part due to its sparseness and apparent rarity. The species appears to be widespread in the Wellington Region, but nowhere particularly abundant, and is thought to be in decline. There are scattered records throughout Wellington City and surrounds, but many are decades old. Of most relevance to this survey, single barking geckos were recorded at Broadmeadows some 900 metres from the site in 1997 and Khandallah 1.4 kilometres from the site in 1994. More recently, but much further afield, barking geckos have been reported from Belmont Regional Park 5.5 kilometres to the

northeast of the site. The likelihood of barking gecko being present at the Kiwi Point site is considered low, due to the lack of recent records in the area, history of disturbance, and marginal habitat. Barking gecko are most frequently recorded from kānuka shrubland or forest, which is not present at the Kiwi Point site, aside from 1-2 small patches. The *Muehlenbeckia*-covered mapou and mahoe/ngaio low forest represents potential habitat for the species, but this was searched thoroughly by day and night without any geckos being located.

Ornate skink: At Risk-Declining

All records of ornate skinks from within two kilometres of the site are from the 1950s (Table 1), so it is unlikely that they are still present. There are also no recent reports from any of the surrounding suburbs. Nonetheless, some potential habitat is present on site, so their presence cannot be ruled out.

Glossy brown skink: At Risk-Declining

Glossy brown skinks have been recorded several times from Khandallah, and as close as 750 metres from the site boundary in 2005. However, the survey did not identify particularly suitable habitat for this species. Glossy brown skink are known to prefer densely vegetated ground cover and damp habitats, and much of the Kiwi Point site is not overly damp or dense at ground level. Glossy brown skink are therefore unlikely to be present.

Raukawa gecko: Not Threatened

There are few records of raukawa geckos from the surrounding area, however one was located only 300 metres from the site in 2002 in a roof cavity. In the Wellington Region this species typically lives in rocky areas where it shelters in rock crevices/under rocks by day, or under driftwood on beaches. These geckos are primarily active at night (except for possible basking by day) and can be located spotlighting. Accessible rocky parts of the site were examined and no geckos were found, or any evidence of their presence (sloughed skins or faeces). Raukawa geckos are therefore unlikely to be present at Kiwi Point, although small numbers could be present.

Copper skink: Not Threatened

Copper skink (Plate 4) are one of the most widespread indigenous lizards on the North Island mainland and are well known from the Wellington Region. There are several recent records from Khandallah with the closest being only 250 metres from the site boundary at Tyers stream. As such it is moderately likely that copper skinks are present, at least in small numbers, and they may be detected when the Onduline retreats are checked in March 2018.



Plate 4: Copper skink (*Oligosoma aeneum*).

Northern grass skink: Not Threatened

As with copper skink, northern grass skink could be present at the site in low numbers, as there are recent reports from surrounding areas (Table 1) and potential habitat is available on-site. The Onduline retreats should be attractive to this species, so once again, there will be a second opportunity to detect them in March 2018.

Overall Assessment

A tabulated summary of the relative likelihood of each of the seven taxa being present at the site is set out in Table 3. Threat status for each species is from Hitchmough *et al.* (2016).

Table 3: Likelihood of the presence of indigenous lizard species at Kiwi Point quarry.

Common Name	Threat Status	Likelihood	Reasoning
Ngahere gecko	At Risk-Declining	Moderate	Nearby records, suitable habitat, difficult to detect without tree covers.
Barking gecko	At Risk-Declining	Low	Lack of recent reports from surrounding areas. Marginal habitat.
Ornate skink	At Risk-Declining	Unlikely	Lack of recent reports from surrounding areas.
Glossy brown skink	At Risk-Declining	Unlikely	Largely unsuitable habitat for this species.
Raukawa gecko	Not threatened	Low	Not detected in suitable rocky habitat. Few records nearby.
Copper skink	Not threatened	Moderate	Nearby records, suitable habitat.
Northern grass skink	Not threatened	Moderate	Nearby records, suitable habitat.

5. SURVEY LIMITATIONS

At this stage, despite the lack of lizard detection in the current survey, it is assumed that indigenous lizards of one or more species are nevertheless present on-site and that they have simply avoided detection, possibly due to the survey coinciding with very warm weather. It is considered highly likely that at least one species will be present on site and that some mitigation effort will be required to address adverse effects on lizard habitat.

6. POTENTIAL ADVERSE EFFECTS

The main potential adverse effects of quarry development would be clearance of a relatively large area - approximately 3.5 hectares - of indigenous forest vegetation and habitat that may be locally important for indigenous lizards. Some lizards may also be present in adjacent areas of grassland or shrubland, even if dominated by exotic weeds, such as gorse, broom, and blackberry. Some lizards would probably be killed during quarry excavation. Other lizards may be displaced by habitat loss and subsequently be more likely to be extirpated by predators or be at an increased risk of other causes of mortality.

Twelve lizard species have been recorded on the mainland around Wellington, including seven within two kilometres of the Kiwi Point quarry, and the area is quite diverse in terms of its assemblage of lizards relative to other urban centres around New Zealand. For example, only one lizard species has been reported from both Dunedin City and Hamilton City. Although Wellington's assemblage of lizards is diverse, most (or all) species appear to be in decline and some species are slowly disappearing from the Region. Losses of habitat for these species could be potentially significant on a regional or national scale.

7. POSSIBLE MITIGATION FOR CLEARANCE OF LIZARD HABITAT

Options for mitigation to address the loss of lizards (if found, or assumed present, and based on a scenario of full quarry development) include pest control, habitat creation, and salvage and relocation. Pest control needs to be undertaken long-term and be done over a large scale to have a noticeable benefit to lizard populations. As such, mitigation that focuses on improving or creating habitats is considered more likely to address losses in lizard abundance (and therefore constitute appropriate mitigation), as opposed to small-scale or temporary pest control programmes where it is difficult to achieve or monitor effectiveness.

Lizard mitigation can work alongside proposed mitigation for vegetation losses (Wildlands Consultants, 2017). A lizard restoration site should be chosen which encompasses suitable lizard habitat and allows room for habitat expansion and improvement. A site for appropriate creation of such habitat would be somewhere within a protected area and should be selected by a herpetologist. Subject to species and number of lizards located during the March 2018 visit, an appropriate amount of rock could be utilised from the Kiwi Point quarry or from rocks excavated as part of the new quarry development. Rock piles could be created in areas dominated by

grassland or exotic vegetation (such as gorse and broom) but with suitable lizard habitats adjacent or nearby (indigenous shrubland, rank grassland, or indigenous bush edges) to allow for easy colonisation by lizards. These rock piles need to be constructed carefully, incorporating advice from a herpetologist on site. Some rocks will need to be strategically placed by hand, to ensure that they comprise suitable retreat sites.

A one-off brief salvage effort to remove as many lizards as possible from the development footprint and place them in the newly-created habitat could occur no earlier than three months following completion of the created habitat; to allow for the habitat to settle and some invertebrates to colonise. However, it is understood that not all lizards would be able to be salvaged from the site due to their cryptic nature and the difficulties in finding them or extracting them from their retreats. In addition, some lizards may recolonise or re-enter the development footprint between the time of the salvage and the time of actual development. As such, it won't be possible to completely avoid the loss of individual lizards.

At least 50 lizard-friendly indigenous plants encompassing equal proportions of kānuka, *Coprosma propinqua*, and *Melicytus crassifolius* should be planted around the rock piles within the proposed protected area. These shrubs create dense foliage and habitat that is favoured by both skinks and geckos. These plants also support abundant insects and/or fruit, providing lizards with reliable food sources. Plants should be monitored over a period of five years, until well established, and any plants that die should be replaced. More details on what is required for lizard mitigation can be outlined in a Wildlife Act Authority application and Lizard Management Plan if lizards are detected in the March 2018 check of the artificial retreats.

Monitoring to show the effectiveness of the mitigation should be undertaken. This could be done by installing a small number of Onduline retreats around each rock pile and checking these at least three months later. If lizards colonise the rock piles then they will begin utilising the Onduline retreats, and when the retreats are lifted, either the lizards, their shed skins, or their droppings, will be evident. Evidence of lizards colonising each rock pile and evidence of breeding females and young could be used as indicators of effective mitigation. A report on the mitigation activities and subsequent monitoring (usually a condition of the permit) should be submitted to the Department of Conservation.

8. PERMIT REQUIREMENTS

A Wildlife Act Authority from the Department of Conservation will need to be applied for in order to gain a permit to destroy indigenous lizards and/or their habitats. A form is available from: <http://www.doc.govt.nz/Documents/about-doc/concessions-and-permits/wildlife-research-permits/wildlife-act-authority-application-9.pdf>.

A lizard management plan (could be a sub-section of a larger ecological management plan) should be produced outlining appropriate mitigation measures and these can be referred to in the Wildlife Act Authority application.

The Department of Conservation will assess the Wildlife Act Authority application and (usually) approval will be obtained to proceed with development with conditions in regards to lizard mitigation attached. The Department will either agree with the proposed mitigation option/s or suggest additional (or alternative) measures to mitigate for effects on lizards.

9. CONCLUSIONS

The proposed quarry site contains indigenous forest and exotic grassland and shrubland that represents potential habitat for up to seven lizard species, with three species most likely to be present: Ngahere gecko, copper skink, and northern grass skink.

Adverse effects of clearance of these habitats for quarry development on lizards may be significant, and require mitigation. If this is the case, then a Wildlife Act Authority and Lizard Management Plan will be required. Ideally, mitigation for any adverse effects on lizards should occur at a nearby site that has features similar to the areas to be affected and where habitat can be expanded and enhanced.

ACKNOWLEDGMENTS

Logen Logeswaran of Wellington City Council provided project liaison.

REFERENCES

- Bell T. 2009: A novel technique for monitoring highly cryptic lizard species in forests. *Herpetological Conservation and Biology* 4: 415-425.
- Bell T. 2014: Standardised common names for New Zealand reptiles. *BioGecko* 2: 8-11.
- Hitchmough R., Barr B., Lettink M., Monks J., Reardon J., Tocher M., van Winkel D., and Rolfe J. 2016: Conservation status of New Zealand reptiles, 2015. Department of Conservation, Wellington.
- Lettink M. and Cree A. 2007: Relative use of three types of artificial retreats by terrestrial lizards in grazed coastal shrubland, New Zealand. *Applied Herpetology* 4(3): 227-243.
- Wildlands Consultants 2017: Assessment of ecological effects for proposed expansion of the Kiwi Point quarry, Ngauranga Gorge, Wellington. *Wildland Consultants Ltd Contract Report No. 4378*. Prepared for Wellington City Council, Wellington. 31 pp.



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Kiwi Point Quarry Expansion

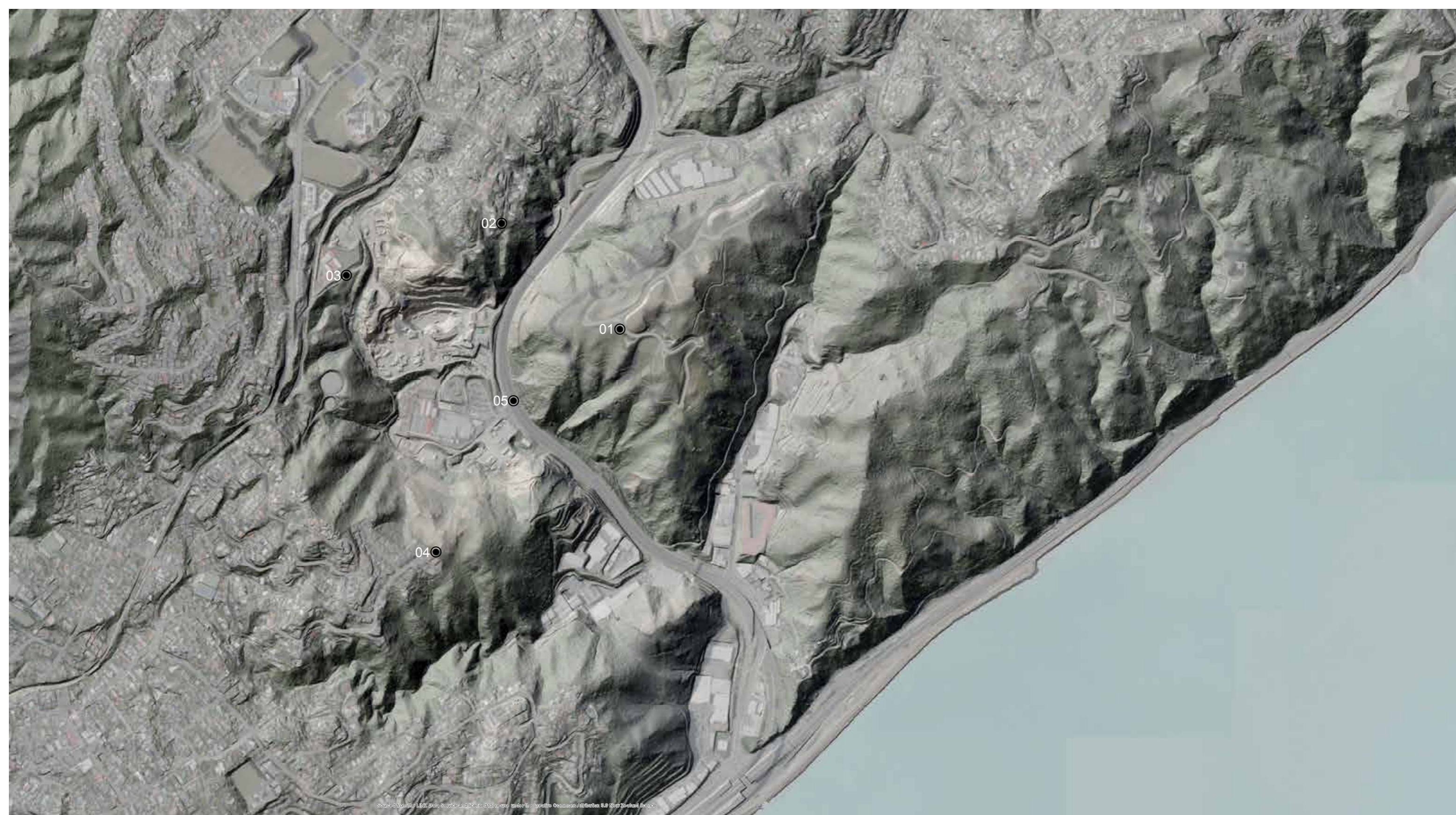
APPENDIX

July 2017

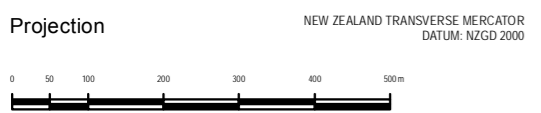
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4/07/2017

Job Name

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Client

Wellington City Council

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Job No.

3706

North



Drawing Title

Photo Locations

170620

Drawing No.

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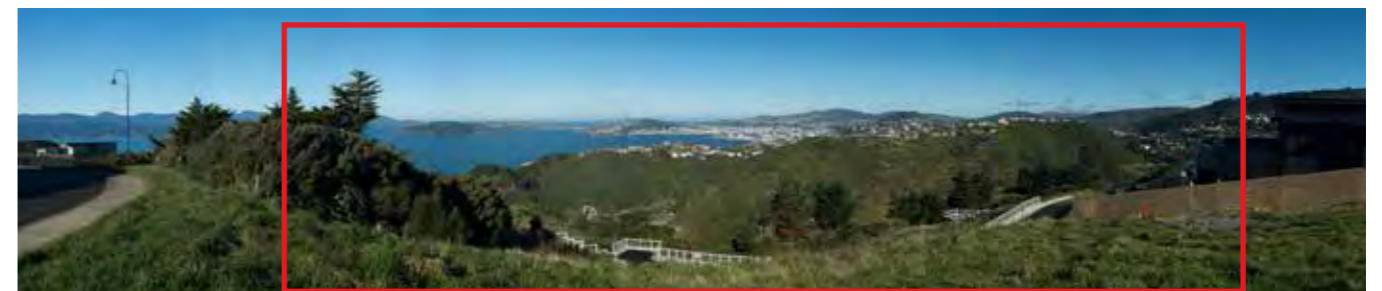


Viewpoint 1 - Existing

Looking south west near the intersection of Grumman Lane and Spenmoor Street

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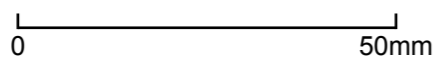
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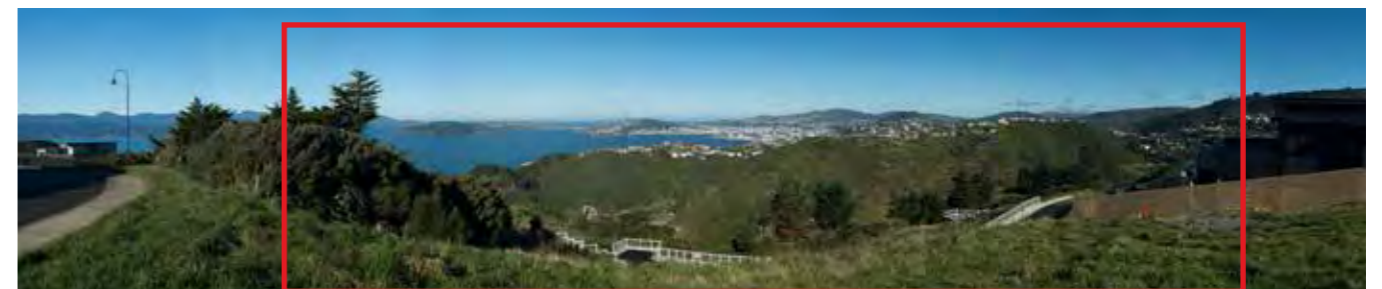
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Viewpoint 1 - Medium Development - Unmitigated

Looking south west near the intersection of Grumman Lane and Spenmoor Street



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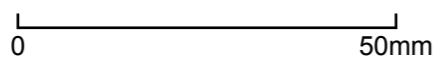
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

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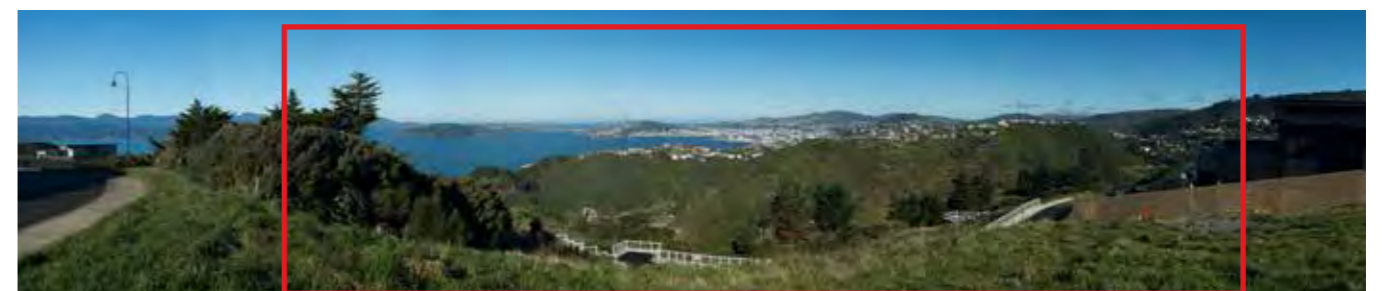


Viewpoint 1 - Medium Development - Early Mitigation
1 year after quarrying

Looking south west near the intersection of Grumman Lane and Spenmoor Street

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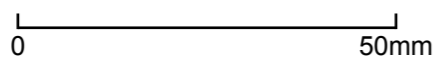
Kiwi Point Quarry

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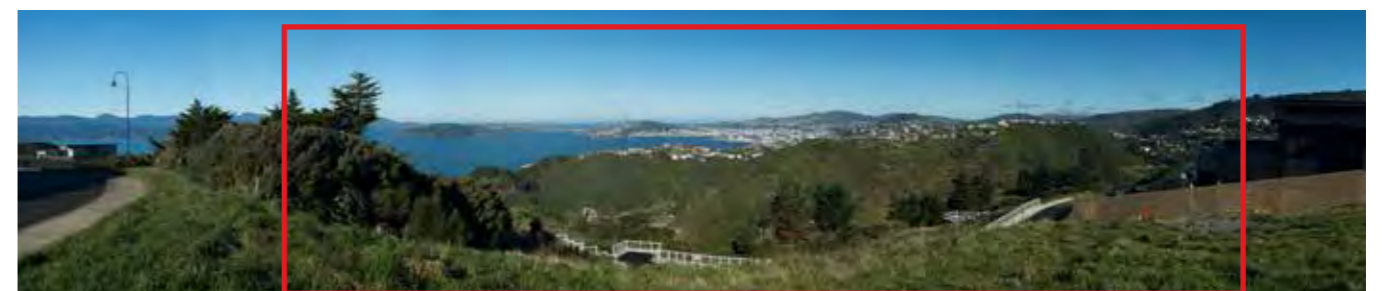


Viewpoint 1 - Medium Development - Mitigated
15 - 20 years after quarrying

Looking south west near the intersection of Grumman Lane and Spenmoor Street

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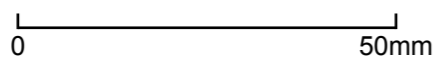
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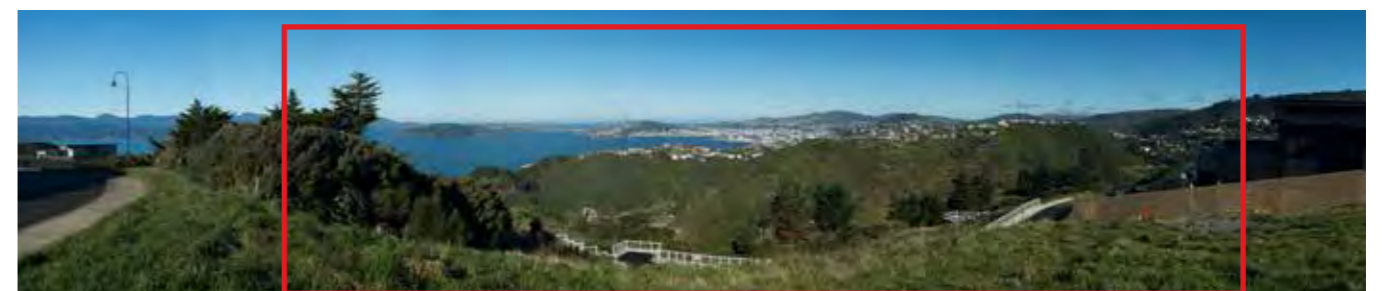


Viewpoint 1 - Maximum Development - Unmitigated

Looking south west near the intersection of Grumman Lane and Spenmoor Street

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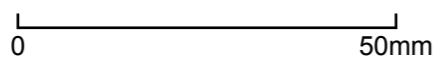
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

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Field of View: 55° per A3 page



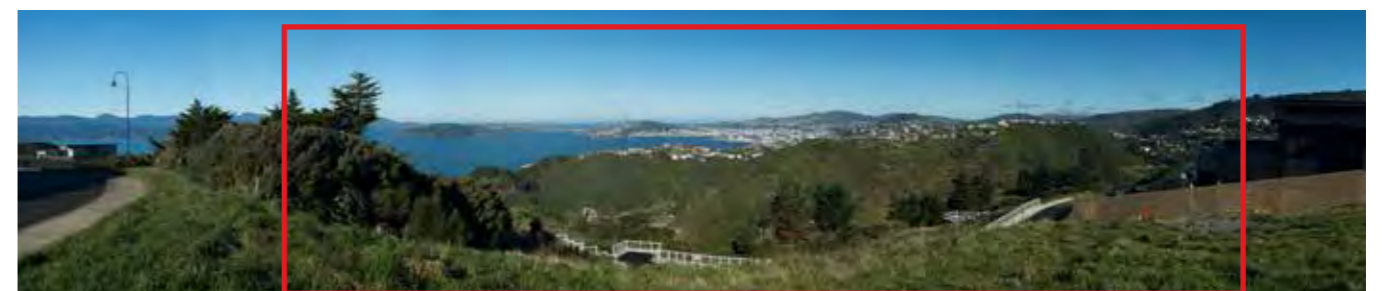


Viewpoint 1 - Maximum Development - Early Mitigation
1 year after quarrying

Looking south west near the intersection of Grumman Lane and Spenmoor Street

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Field of View: 55° per A3 page

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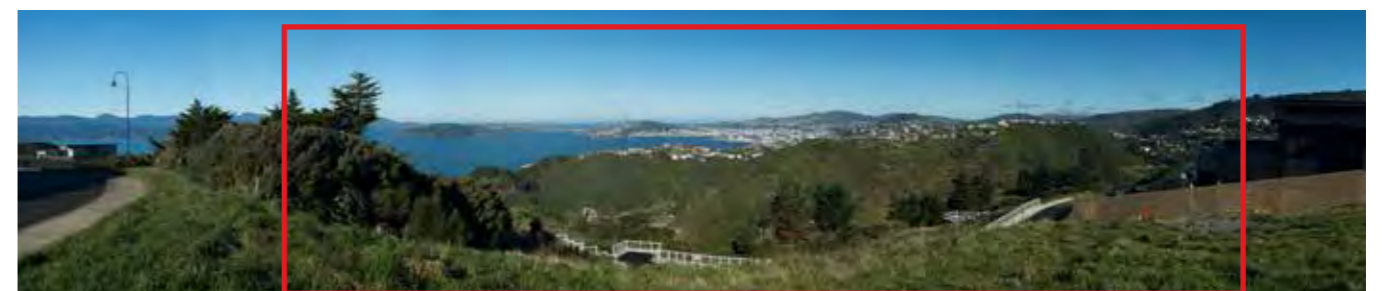


**Viewpoint 1 - Maximum Development - Mitigated
15 - 20 years after quarrying**

Looking south west near the intersection of Grumman Lane and Spenmoor Street

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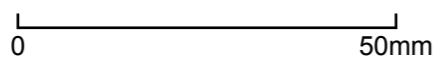
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 224m

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Field of View: 55° per A3 page





Viewpoint 2 - Existing

Looking south west outside 25 Kitchener Terrace

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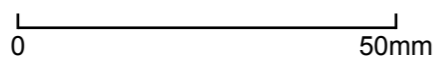
Kiwi Point Quarry

Original Photo Alan England | 50mm | DSLR Nikon D800 | 11:37pm 20 June 2017 | N 5433730 E 1751285 (NZTM)

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Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page





Viewpoint 2 - Medium Development - Unmitigated

Looking south west outside 25 Kitchener Terrace

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Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 176m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page

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Viewpoint 2 - Medium Development - Early Mitigation
1 year after quarrying

Looking south west outside 25 Kitchener Terrace

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Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 176m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page

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Viewpoint 2 - Medium Development - Mitigated

15 - 20 years after quarrying

Looking south west outside 25 Kitchener Terrace



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Kiwi Point Quarry

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Reading distance for correct scale: 400mm | Viewpoint Elevation: 176m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page

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Viewpoint 2 - Maximum Development - Unmitigated

Looking south west outside 25 Kitchener Terrace

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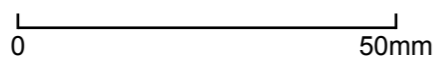
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Simulation: 3DS Max + Photoshop | Chris Combrink

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Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page





**Viewpoint 2 - Maximum Development - Early Mitigation
1 year after quarrying**

Looking south west outside 25 Kitchener Terrace

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Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

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Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page

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Viewpoint 2 - Maximum Development - Mitigated
15 - 20 years after quarrying

Looking south west outside 25 Kitchener Terrace

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Kiwi Point Quarry

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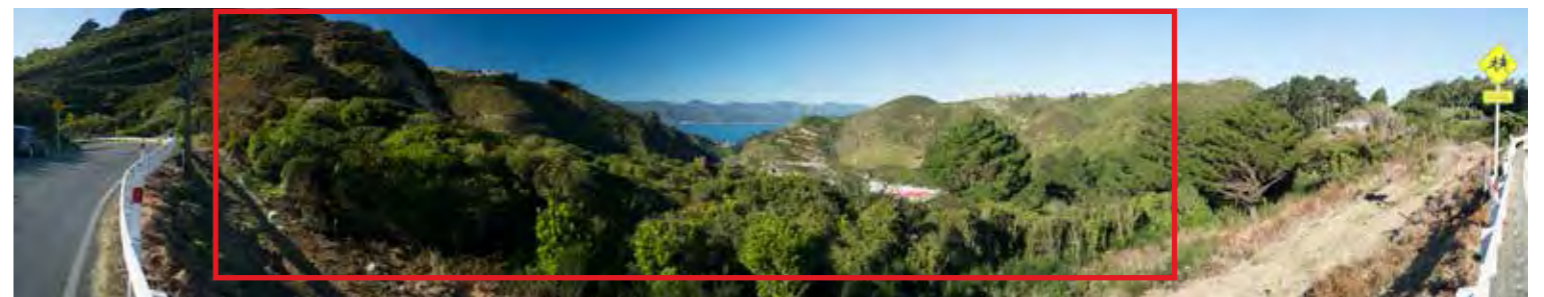
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Viewpoint 3 - Existing

Looking south east from Fraser Ave below Westmount School



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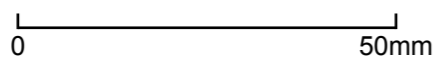
Kiwi Point Quarry

Original Photo Alan England | 50mm | DSLR Nikon D800 | 11:47pm 20 June 2017 | N 5433582 E 1750846 (NZTM)

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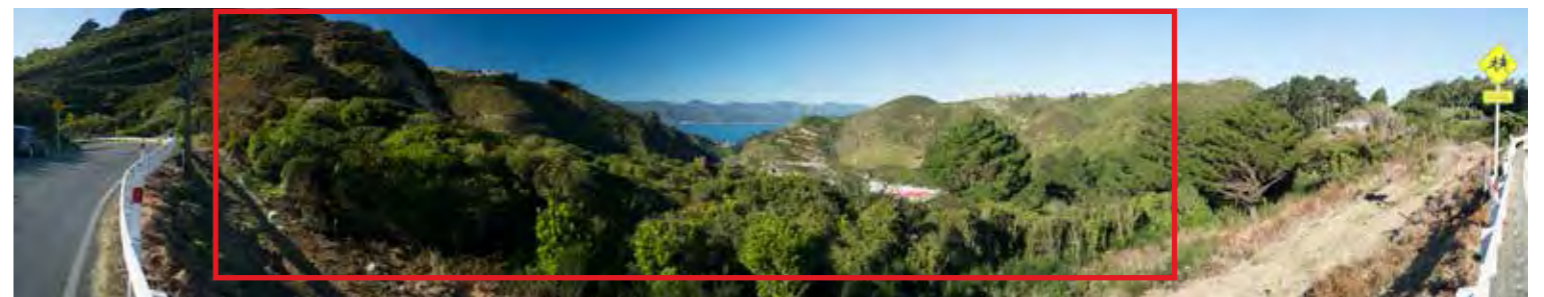
Field of View: 55° per A3 page





Viewpoint 3 - Medium Development - Unmitigated

Looking south east from Fraser Ave below Westmount School



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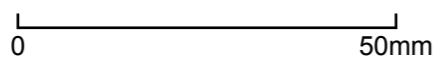
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 145m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page



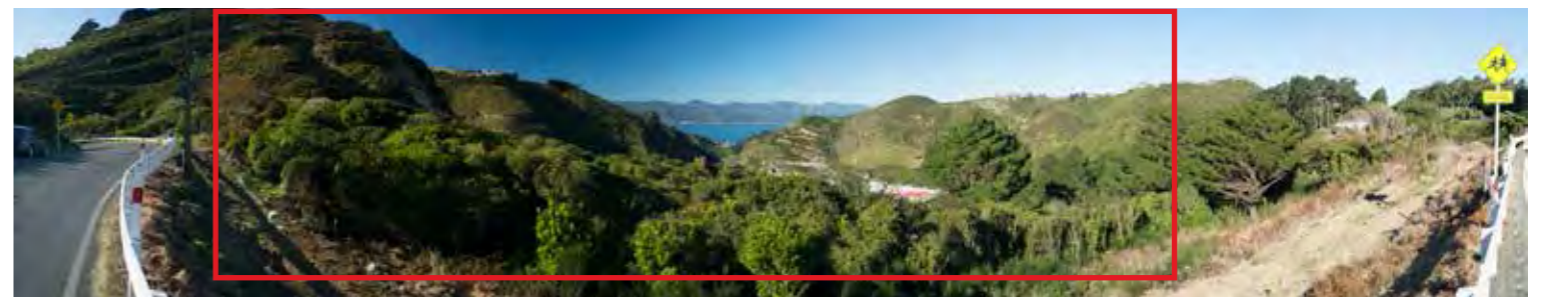


Viewpoint 3 - Medium Development - Early Mitigation
1 year after quarrying

Looking south east from Fraser Ave below Westmount School

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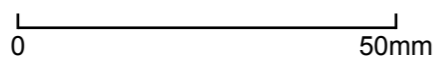
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 145m

Photomontages should be used as a guide to field observations

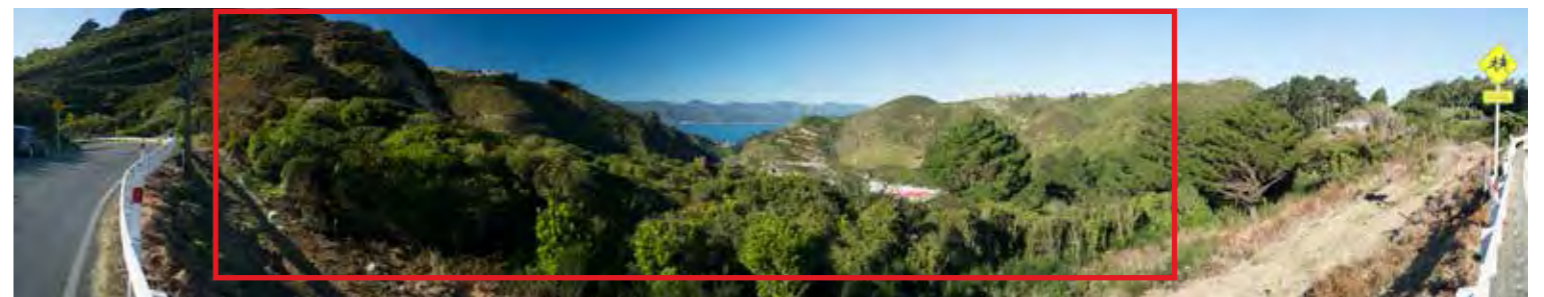
Field of View: 55° per A3 page





Viewpoint 3 - Medium Development - Mitigated
15 - 20 years after quarrying

Looking south east from Fraser Ave below Westmount School



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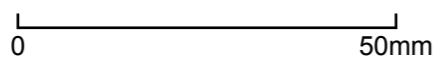
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

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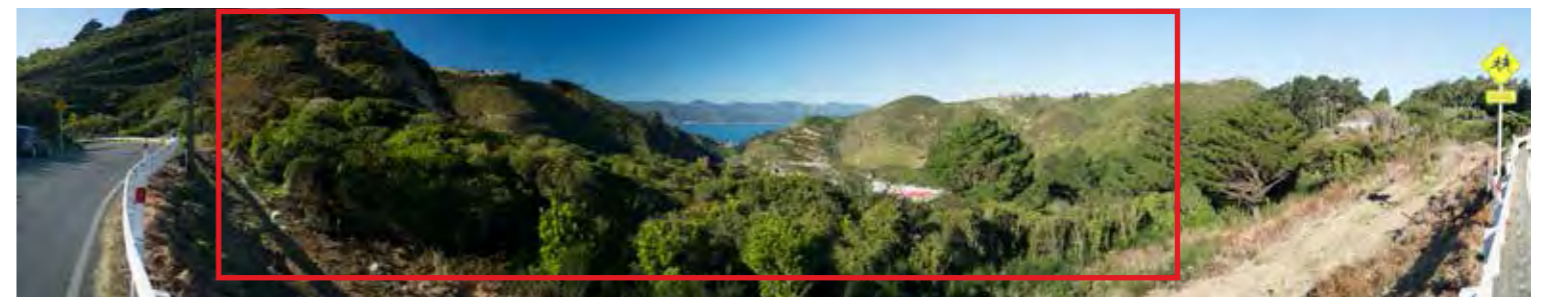
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Viewpoint 3 - Maximum Development - Unmitigated

Looking south east from Fraser Ave below Westmount School



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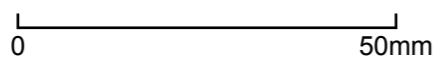
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 145m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page



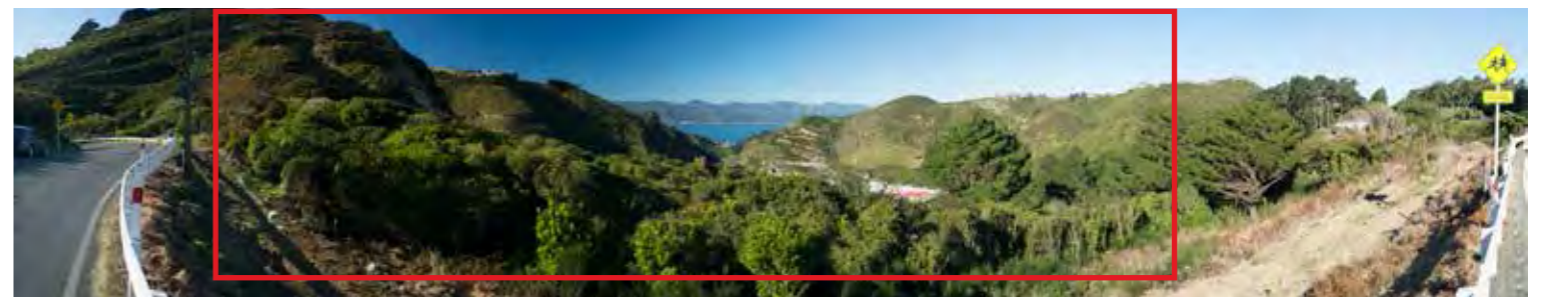


**Viewpoint 3 - Maximum Development - Early Mitigation
1 year after quarrying**

Looking south east from Fraser Ave below Westmount School

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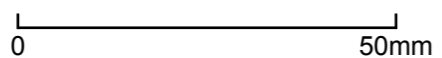
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 145m

Photomontages should be used as a guide to field observations

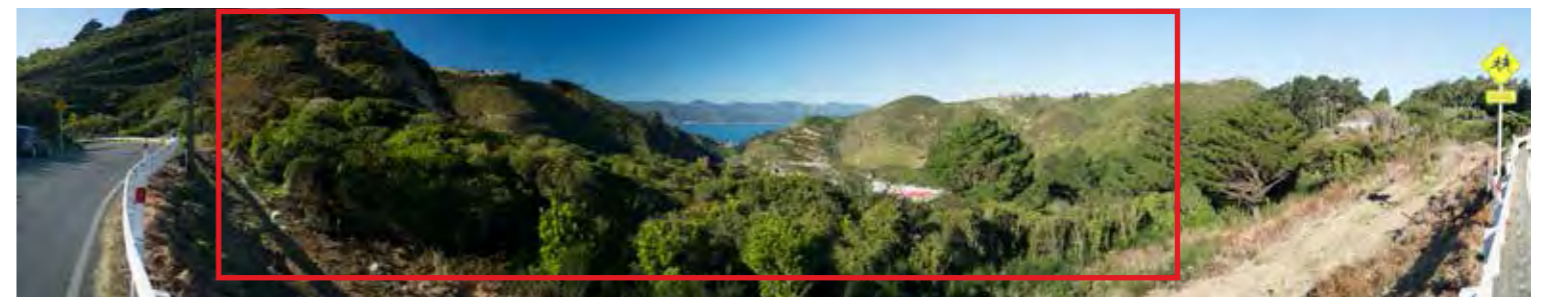
Field of View: 55° per A3 page





**Viewpoint 3 - Maximum development - Mitigated
15 - 20 years after quarrying**

Looking south east from Fraser Ave below Westmount School



P44 July 2017 • 3706 • Kiwi Point Quarry - FOR INFORMATION ONLY



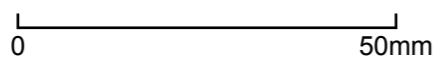
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 145m

Photomontages should be used as a guide to field observations

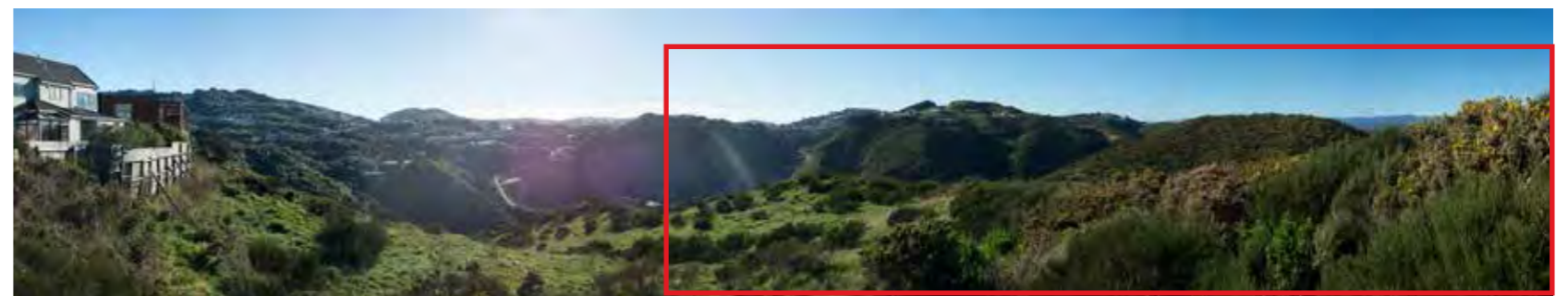
Field of View: 55° per A3 page





Viewpoint 4 - Existing

Looking north from reserve below Shastri Terrace



P46 July 2017 • 3706 • Kiwi Point Quarry - FOR INFORMATION ONLY



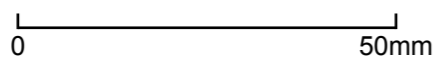
Kiwi Point Quarry

Original Photo Alan England | 50mm | DSLR Nikon D800 | 13:21pm 20 June 2017 | N 5432801 E 1751098 (NZTM)

Reading distance for correct scale: 400mm | Viewpoint Elevation: 183m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page



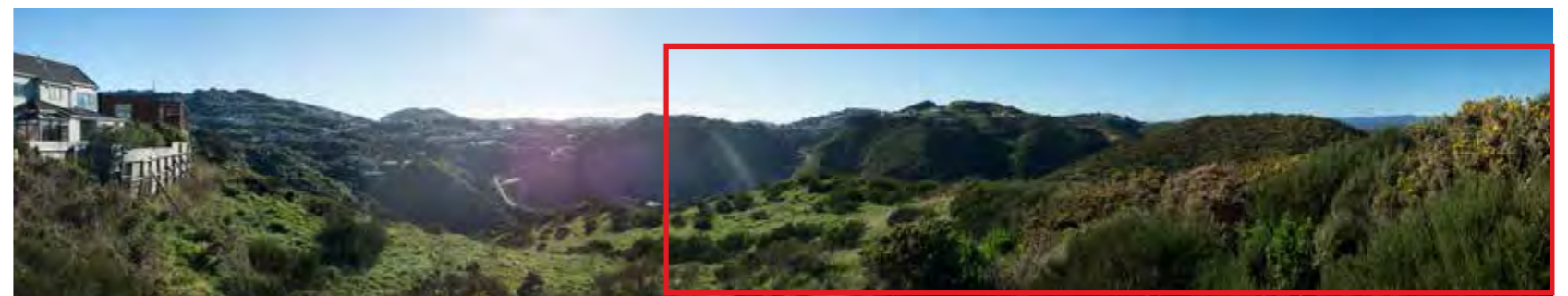


Viewpoint 4 - Medium Development - Unmitigated

Looking north from reserve below Shastri Terrace

P48 July 2017 • 3706 • Kiwi Point Quarry - FOR INFORMATION ONLY

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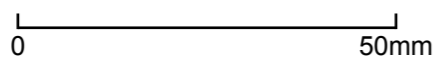
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 183m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page



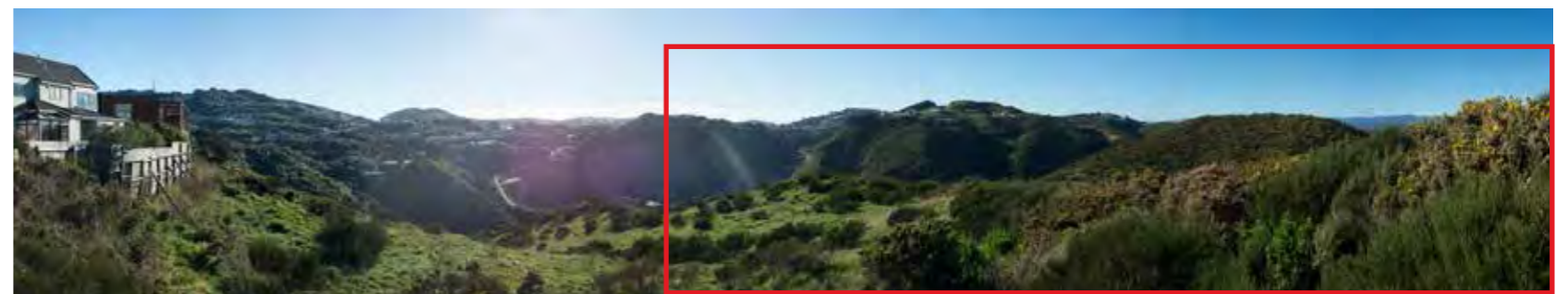


Viewpoint 4 - Medium Development - Early Mitigation
1 year after quarrying

Looking north from reserve below Shastri Terrace

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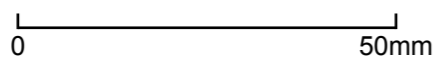
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 183m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page



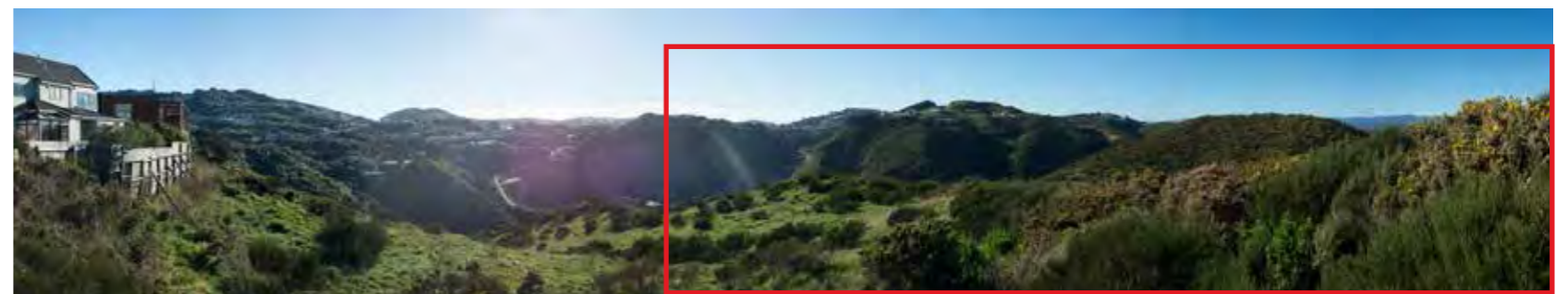


Viewpoint 4 - Medium Development- Mitigated
15 - 20 years after quarrying

Looking north from reserve below Shastri Terrace

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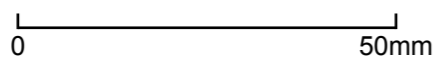
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 183m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page



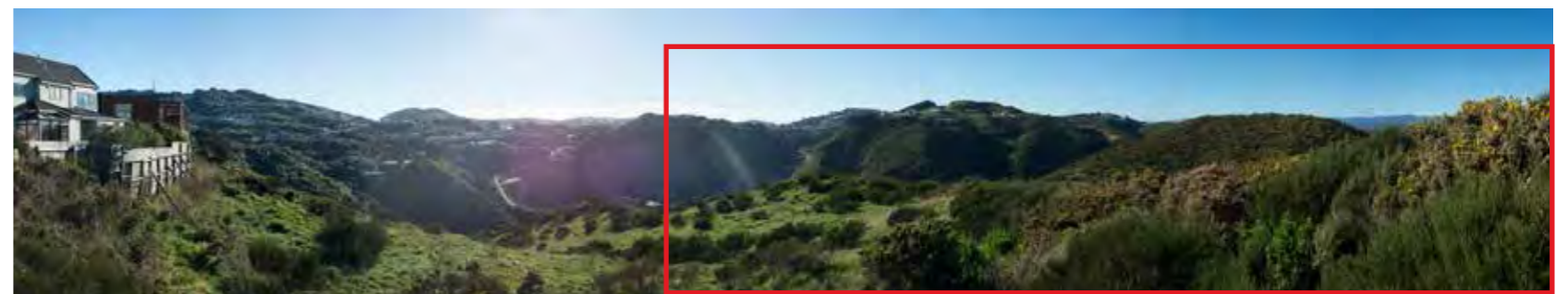


Viewpoint 4 - Maximum Development - Unmitigated

Looking north from reserve below Shastri Terrace

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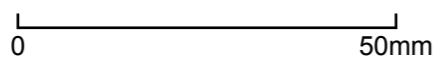
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 183m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page



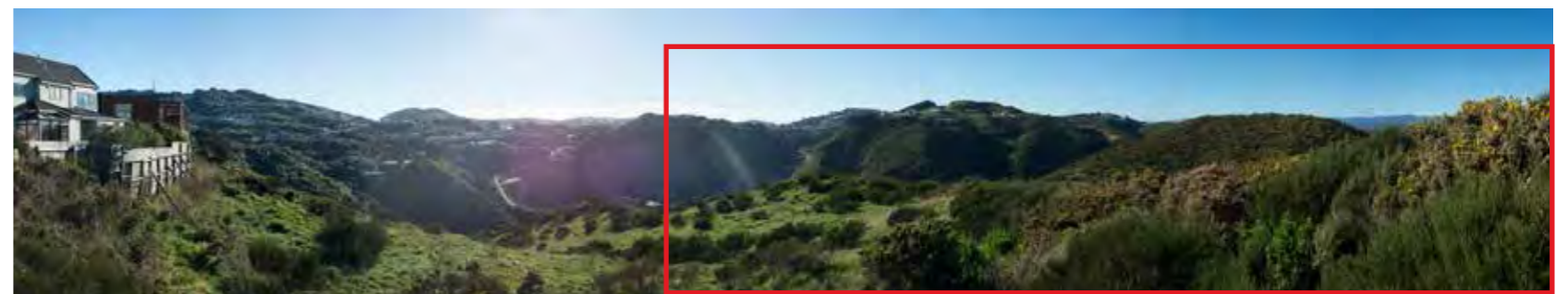


**Viewpoint 4 - Maximum Development - Early Mitigation
1 year after quarrying**

Looking north from reserve below Shastri Terrace

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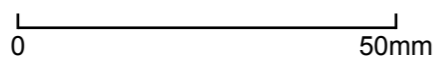
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 183m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page



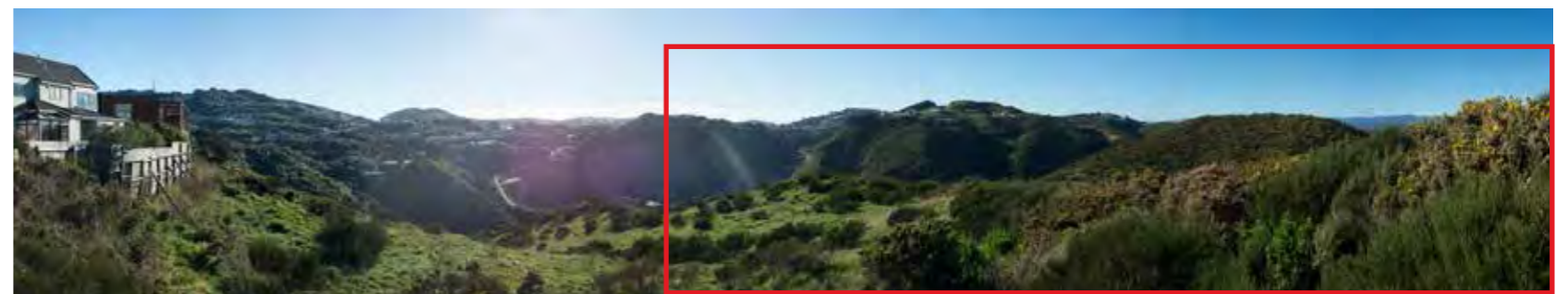


Viewpoint 4 - Maximum Development - Mitigated
15 - 20 years after quarrying

Looking north from reserve below Shastri Terrace

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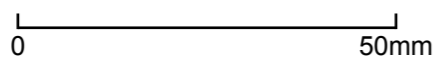
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 183m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page





Viewpoint 5 - Existing

Looking south from SH1



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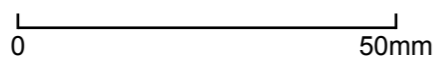
Kiwi Point Quarry

Original Photo Lisa Rimmer | 50mm | DSLR Nikon D700 | 14:56pm 29 June 2017 | N 5433356 E 1751302 (NZTM)

Reading distance for correct scale: 400mm | Viewpoint Elevation: 84m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page





Viewpoint 5 - Medium Development - Unmitigated

Looking south from SH1



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Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 84m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page

0 50mm



Viewpoint 5 - Medium Development - Early Mitigation

1 year after quarrying

Looking south from SH1





STOCK
EFFLUENT
DISPOSAL
NEXT EXIT

 NEXT
EXIT



Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 84m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page

0 50mm



**Viewpoint 5 - Medium Development - Mitigated
15 - 20 years after quarrying**

Looking south from SH1





Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 84m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page

0 50mm



Viewpoint 5 - Maximum Development - Unmitigated

Looking south from SH1



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Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 84m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page

0 50mm



Viewpoint 5 - Maximum Development - Early Mitigation

1 year after quarrying

Looking south from SH1





Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 84m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page

0 50mm



**Viewpoint 5 - Maximum development - Mitigated
15 - 20 years after quarrying**

Looking south from SH1





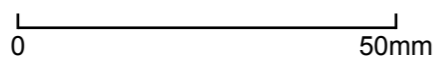
Kiwi Point Quarry

Simulation: 3DS Max + Photoshop | Chris Combrink

Reading distance for correct scale: 400mm | Viewpoint Elevation: 84m

Photomontages should be used as a guide to field observations

Field of View: 55° per A3 page



Printing Instructions

- Full bleed on double sided A3
- No scaling (100%)
- Min 100gsm paper

Photosimulation Methodology Statement

- Photos were taken with a fixed lens on DSLR camera. Locations were fixed using a handheld GPS unit with accuracy of 5m. Reference points in the landscape were also located to assist referencing of photo to digital terrain model.
- A sequence of photos was taken from each viewpoint and stitched to form panoramas. Photos were overlapped by approximately 30% and edges cropped prior to stitching to eliminate edge distortion.
- A digital terrain model was created incorporating 3D models of the proposed development. Computer images were generated within the digital model from the same locations as the photos. The image was overlaid and aligned with the photo using reference points and visual matching. (Photos were imported in RAW format to avoid degradation of the image, requiring resizing to match the computer image).
- The wire-frame digital terrain was then switched off leaving the proposed development in its correct location and scale relative to the photo. Lower parts of the proposed development were erased using Photoshop software where they would be behind foreground topography or vegetation.
- The time and weather when the photo was taken was entered to the programme in order to replicate lighting conditions.
- The completed photomontage is presented over two pages:
 - o The photos are produced to replicate correct scale at the nominated reading distance (in this case 400mm).
 - o Each photomontage is printed across two facing pages to illustrate a field of view of approximately 110° at a reading distance of 400mm. This approximates the field of human binocular vision. (But not peripheral vision which extends to approximately 200°)

Notes on use of Photosimulations:

- The Photosimulations are a useful tool but they cannot not precisely reproduce real life for the following reasons:
 - o 2D Photography flattens an image compared to binocular vision
 - o Photography is static, whereas the human vision can scan and remember information.
 - o Photographs are passive, whereas the eye seeks out detail.
 - o The human eye can see more contrast than can be reproduced through photography.
 - o Physical resolution of photography and printing is less than that of the human eye.

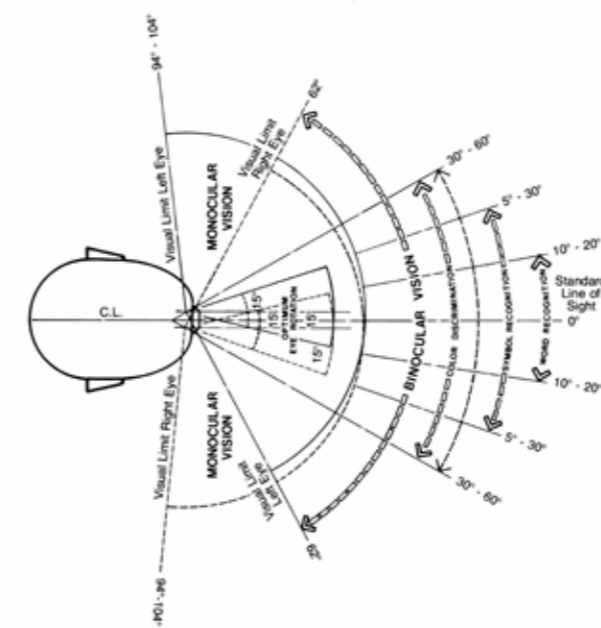
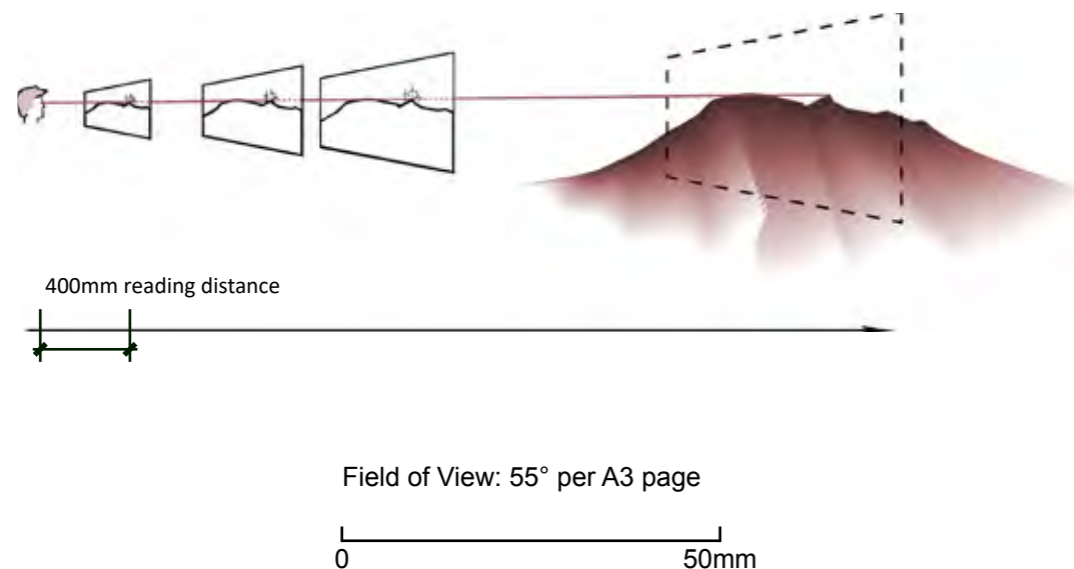


Figure 02: Binocular vision is approximately 124°. Field of view is approximately 110° across 2 x A3 pages at correct scale image for 400mm reading distance (vertical field of view is approximately 33°)

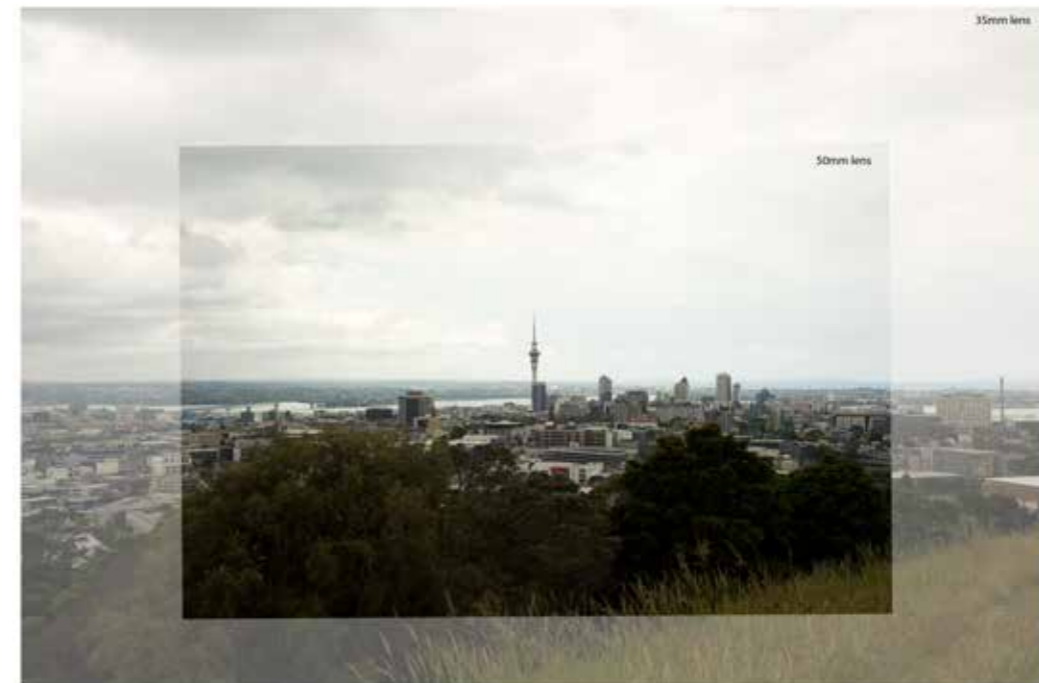


Figure 03: Comparison of 35mm lens and 50mm lens

Two images from the same location. With 35mm and 50mm lenses perspective is influenced by field of view, not by lens focal length. The overlaid portion is identical.