Proposed Private
District Plan Change 33

AMENDMENTS TO THE
EXTRACTION ACTIVITY AREA PROVISIONS

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REQUEST FOR PRIVATE PLAN CHANGE (MODIFIED FOLLOWING DISCUSSIONS WITH COUNCIL OFFICERS)

WINSTONE AGGREGATES (A DIVISION OF FLETCHER CONCRETE AND INFRASTRUCTURE)

RELATING TO CHAPTER 6D OF THE CITY OF LOWER HUTT DISTRICT PLAN

August 2013

Prepared by
Allan Planning & Research Ltd

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RELATING TO CHAPTER 6D OF THE CITY OF LOWER HUTT DISTRICT PLAN

August 2013

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1 INTRODUCTION

This document requests a change to the City of Lower Hutt District Plan. The request is made under Clause 21 of Part 2 of Schedule 1 to the Resource Management Act. The information provided in this document and its appendices meets the requirements of clause 22 of Part 2 of Schedule 1 to the Resource Management Act. The documentation also includes information about the consultation undertaken, the outcome of the consultation and, as relevant, to the matters raised in consultation.

1.1 Scope of the Plan Change Request

Winstone Aggregates, a division of Fletcher Concrete and Infrastructure Ltd (Winstones), owns and operates Belmont Quarry at Belmont, Lower Hutt.

The quarry is provided for within the City of Lower Hutt District Plan (the District Plan) on the Planning Maps and within the District Plan itself as an Extraction Activity Area, Chapter 6D, which is one of the Activity Areas within the Business Chapter of the District Plan[1]. Extraction activities are provided for as permitted activities within the Activity Area, subject to meeting stated permitted activity conditions.

One of the permitted activity conditions, Condition 6D2.1.1(l), is that areas identified in Appendix Extraction 2A and 2B (Appendices to Chapter 6D) *"shall maintain their indigenous vegetation cover"*. Appendix 2A applies to the Belmont Quarry, and shows two shaded Special Amenity Areas within the Activity Area Boundaries[2]. Condition 6D2.1.1(l) indicates that these areas are of visual importance and special amenity value along the escarpment.

The Plan Change Request seeks to modify and reduce the extent of the southern Special Amenity Area shown on Appendix Extraction 2A and to extend the northern Special Amenity Area on the same Appendix, as provided on the map and aerial photograph in Appendix 1 to this report[3]. A further map in Appendix 1 shows how Appendix Extraction 2A will look once the requested modifications have been made.

[1] There are only two areas within the Plan which are provided for in this Activity Area – the Belmont Quarry and the Dry Creek Cleanfill area. The Dry Creek area cannot be quarried, due to the cleanfill. It has currently only one or two years of life as a cleanfill and will then be closed.
[2] Appendix 2B applies to the Dry Creek Extraction Activity Area.
[3] The area requested to be removed is 6.69 hectares in extent, and the area requested to be added is 6.73 hectares in extent.

Following discussions with Hutt City Council officers, additional changes have also been requested[4]. These changes are to the text of the Extraction Activity Area, Chapter 6D, and make minor additions and changes to two existing policies and the explanation that accompanies one of the policies which is sought to be changed. It is also sought to modify one permitted activity condition and to add an additional permitted activity condition. All these requested changes are intended to clarify and better embed the requirement for a quarry management plan in relation to working quarry activities within the Extraction Activity Area, as a means of managing environmental effects.

The requested changes to the text of the Extraction Activity Area are set out as items 1 to 5 at the start of Appendix 1.

The two land titles which comprise the Belmont Quarry and the Extraction Activity Area are provided as Appendix 2.

The reasons why the request has been made and the purpose of the Plan Change Request are set out below.

1.2 Purpose of the Plan Change Request

The purpose of the Plan Change Request is to enable the remaining part of the Belmont Quarry Extraction Activity Area which contains high-quality useable rock, which is important to the economic functioning of the city and region, to be quarried over the next 30 to 40 years.

Investigations since 2004 have demonstrated that the rock resource in the Extraction Activity Area is more variable than had previously been understood. In particular, the expectation that it would be practicable to extend the quarry to the west and possibly into parts of the area known as the Cottle block, have been shown to be incorrect. This is due to the poorer quality of rock in these areas which makes it unsuitable for some types of use, and therefore uneconomic to extract. The higher quality rock has been found to be located in a band running almost due north/south from the Belmont Regional Park through the currently-worked area of the Belmont Quarry known as the “north face” to State Highway 2. This encompasses the western part of the “Firth Block” as well as part of the existing quarry area which is currently inaccessible due to topography and the shape of the current quarry. This contiguous area is the only remaining part of the Belmont Quarry which can be economically developed.

To enable quarrying to continue into the part of the Extraction Activity Area with remaining useable rock, it is necessary to modify the extent of the Special Amenity Areas. The Plan Change Request seeks to reduce the extent of the southern Special Amenity Area, and correspondingly,

[4] Clause 24 of Part 2 of Schedule 1 to the RMA provides that the Council may, with the agreement of the person making the request, modify the request. As the mechanism for such changes is not particularly clear, Winstones has sought to modify its request to take into account the types of changes discussed with the Council officers.

to increase the extent of the northern Special Amenity Area. Modifying these areas will enable the quarry activities to continue to extend from the current northern face to the east, while ensuring that a significant part of the Firth Block remains with its current vegetation cover.

The actual and potential adverse and beneficial effects of the proposed extension are set out later in this Plan Change Request.

The changes to the text of Chapter 6D that have been requested have the following purposes (references in brackets are to specific items at the start of Appendix 1 of this report):

- to add a new permitted activity condition (o) requirement for a quarry management plan to be prepared and maintained by the quarry operator, with regular progress reports (every two years at least) on the quarry and the effectiveness of the management regime being provided to the Council (item 5)
- to modify the existing permitted activity condition (m) to bring it into line with current expert advice on the most effective means of progressively rehabilitating the cut slopes of the quarry area (item 4)
- to modify and clarify existing Policy 6D1.1.1(a) to specify that means of managing adverse effects of extraction activities include permitted activity conditions and the quarry management plan (item 1)
- to add to the explanation to the above policy to specify what the quarry management plan should include, and also that the quarry management plan must be reviewed and updated at least every five years (item 2)
- add to the wording of Policy 6D1.2.1(c) to make a clear link between the progressive rehabilitation required and the provisions in the quarry management plan (as required under Policy 6D1.1.1(a)) (item 3).

The overall purpose of the wording changes are to strengthen and clarify the requirement for any quarry activity to be undertaken within the context of a quarry management plan, and to provide an enforceable performance-based condition relating to the quarry management plan.

1.3 Supporting Documents

This Plan Change Request is supported by the following technical documents and other relevant material, provided as Appendices 3 to 9:

- "Greywacke Aggregate Resources near Wellington" – Richard Barker, Consulting Geologist, June 2013 (Appendix 3)
- "Assessment of Economic Effects of Belmont Quarry Extension" – NZIER, June 2013 (Appendix 4)
- Proposed Quarry Management Plan – Winstone Aggregates, July 2013 (Appendix 5)

- “Belmont Quarry Extension – Landscape and Visual Assessment” – Boffa Miskell Ltd, August 2013 (Appendix 6)
- “Belmont Quarry Extension – Terrestrial Ecology Assessment” – Forbes Ecology, August 2013 (Appendix 7)
- Examples of Consultation Materials (Appendix 8)
- Correspondence from Tāngata Whenua Organisations (Appendix 9).

The Quarry Management Plan is provided in Appendix 5 as a “proposed” document. It has been provided in this form so that Hutt City Council can request changes prior to the finalisation of the current document. The Proposed Quarry Management Plan is also relevant to a number of regional resource consents which are to be sought from Greater Wellington Regional Council. Changes may also be made prior to finalisation as a result of those processes.

1.4 Reasons for the Plan Change Request

Belmont Quarry has operated as the sole hard rock quarry in the Hutt Valley since the mid 1980s[5]. It is now one of only three such quarries serving the Wellington urban region[6], which has seen a significant reduction in number of quarries over the last thirty years. A description of the trends in quarries in the Wellington region, and the current operating establishments (including river and beach sand and gravel operations), is provided in Appendix 3.

Aggregate is a key contributor to the development and maintenance of infrastructure and buildings, which reach high concentrations in urban areas. The average use of such materials reached a peak per head in New Zealand in 2005 at approximately 11 tonnes. Since 2011 it has been stable at about 6 tonnes per person per year[7].

Belmont quarry currently provides approximately one third of Wellington region’s aggregate, and more than half the aggregate used in concrete[8].

Based on current levels of demand, the constraints on extraction from within the Special Amenity Area would mean that Belmont Quarry would need to close within approximately 5 to 10 years[9]. This would leave the urban region reliant on the output of only two quarries, both of which would be within Wellington City’s area. This would reduce the range of suppliers and reduce the choices for aggregate users. It would also result in fewer jobs and result in redundant, surplus processing infrastructure ahead of normal replacement time. It would result in greater travel distances and therefore greater costs for some users[10], and more vehicular

[5] Prior to that, there were three working quarries within the Extraction Activity Area (two at Belmont and one at Dry Creek), each in a different ownership. Dry Creek was retired, along with the northernmost quarry at Belmont. The former working face of the northernmost quarry at Belmont is now largely covered in regenerating vegetation.
[6] Kiwi Point and Horokiwi in Wellington City are the other two. A quarry at Paraparaumu serves mainly the Kapiti Coast area. The area described as the Wellington urban region includes all of Wellington, Porirua and Lower and Upper Hutt Cities.
[7] About the same as Australia and the United States. Source, Aggregate News, June 2013.
[8] This includes the Wairarapa.
[9] Noting that regional demand in recent years has been at low levels.
[10] The industry rule of thumb is that the cost of aggregates doubles every 30km it has to be transported by truck – Aggregate and Quarry Association Factsheet.

transport on the region's roads generated by local aggregate resource users in the Hutt Valley. The economic consequences to the Wellington region are fully explained in Appendix 4, and include reduced operational lives for the two remaining quarries in Wellington City.

It would also mean that a conveniently-located high quality quarry resource of regional significance would need to be abandoned, as the chances of a quarry reopening on the site once closed, given the attendant infrastructure needs, is slight. As outlined in Appendix 3, new quarry resources are very limited within the Wellington urban region. As shown in Appendix 4, the cost of establishing a new quarry in the region, even if suitably located resources could be found, is high and such cost would need to be passed on to future users.

In summary, the main reason for the Plan Change Request is to enable the established Belmont Quarry to continue to operate for an additional approximately 30 to 40 years, and to make efficient and effective use of one of the City and Region's established and available natural and physical resources.

The changes to the text of Chapter 6D, the Extraction Activity Area, have been developed following discussions with Hutt City Council officers, and are intended to provide a more clear and effective relationship between the District Plan provisions for extraction activities and on-site management of effects through the quarry management plan. Rehabilitation is a particular focus given the information on effects in the documentation and the proposed staging of the remaining life of the Belmont Quarry, as set out in Appendix 5.

2 DESCRIPTION OF ENVIRONMENTAL EFFECTS

2.1 Basis for Assessment

2.1.1 Background

Clause 22(2) of Part 2, Schedule 1 of the RMA, relating to private plan change requests, requires that *"where environmental effects are anticipated, the request shall describe those effects"*. In describing effects, the provisions of Schedule 4 of the RMA provide a guide. The assessment of effects must be undertaken at a level of detail that corresponds with the scale and significance of the actual and potential environmental effects anticipated from the implementation of the requested change.

The environment as described in section 2 of the RMA encompasses:

" *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, aesthetics, and cultural conditions which affect the matters stated in paragraphs (a) to (c) or which are affected by those matters."

Effects as described in section 3 of the RMA include positive or adverse effects; temporary or permanent effects; past, present or future effects; cumulative effects; potential effects of high probability, and potential effects of low probability but with high potential effects.

In terms of this Plan Change Requested, the only part of the request that will potentially have effects on the environment is likely to be the part relating to Appendix Extraction 2A. The remaining changes relate to administration of the Extraction Activity Area. Any associated effects are likely to be minor, indirect and beneficial, so are not discussed further.

2.1.2 The Permitted Baseline

The starting point for an assessment of effects is usually the "permitted baseline", or what the District Plan allows to happen as of right, subject to any conditions or other limitations set out in the District Plan.

The Extraction Activity Area provides for "extraction activities"[11] to take place as a permitted activity (Rule 6D.2.1). There are currently fourteen conditions associated with this permitted

[11] Extraction activities are defined in Chapter 3 of the Plan to include: *"an operation in connection with prospecting, exploring and any mining operation including blasting, processing (crushing, screening, washing and blending), storage, distribution and sale of aggregates, ancillary earthworks, removal and deposition of overburden and rehabilitation works"*. Permitted activities also include ancillary offices and caretaker living quarters.

activity (Rule 6D.2.1.1). Two of these are proposed to be modified through the Plan Change Request, and a further condition is proposed to be added. All the others are to be complied with for future activities within the Extraction Activity Area, as they have been in the past. The conditions in Rule 6D.8.1.1 are briefly described as follows:

a) Sets maximum heights for buildings and structures.
b) Requires activities to be undertaken in a way that prevents a dust nuisance occurring beyond site boundaries.
c) Requires activities to be undertaken in a way that prevents offensive odours beyond the site boundaries.
d) Sets limits on light and glare occurring beyond the site boundaries.
e) Sets limits on blasting, including hours, number of blasts, notification of neighbours, monitoring (including vibration), and vibration standards which must not to be exceeded.
f) Limits hours of operation.
g) Requires building and structures to be maintained in a way that does not detract from the amenity values of surrounding land.
h) Limits direct access to the quarry from SH2.
i) Requires clear access for fire fighting equipment and cross-references the 1971 New Zealand Standard for Fire Safety.
j) Requires storage areas and waste management areas to be set aside.
k) Requires a 25m buffer strip of indigenous vegetation in areas shown in Appendix Extraction 1A (the northern and western site boundaries).
l) Requires areas shown in Appendix 2A to be maintained in indigenous vegetative cover for visual and amenity purposes. (Note: both areas shown are proposed to be modified by the requested Plan Change. One will be reduced in area and the other will be extended. See Appendix 1).
m) Requires progressive rehabilitation of areas where extraction activities have been completed using native species, except where exotic species are temporarily used to provide nurse cover for native plants.
n) Requires that activities do not increase the susceptibility of erosion-prone land or land prone to landslide hazards.

Note that condition (m) is proposed to be modified and a new condition (o) is to be added through the Plan Change Request. These changes are not relevant to be permitted baseline, and, in any case, would have no material effect.

But for the disturbance of vegetation in the area shown in Appendix 1, subject to meeting the other requirements set out above, under the present provisions of the District Plan, quarrying could occur across the majority of the Extraction Activity Area[12].

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[12] Note: part of the area inside and outside the area of Special Amenity Area in the Firth Block shown in Appendix 1 is identified as an area of Significant Natural Resource (SNR 15) and listed in Appendix 1 to Chapter 14E, and shown in Planning Map Appendix 1A. While these

The presence of the Special Amenity Area as currently configured however limits the ability to undertake extraction activities in the central part of the Extraction Activity Area. At present, quarrying is proceeding to the north, on the area known as the "north face". This will proceed to the edge of the 25 metre wide buffer area adjacent to the Regional Park[13]. However, the ability to quarry in this area is limited, due to the need to maintain stable south and west-facing slopes.

The Special Amenity Area, as currently configured, also effectively prevents access to practicable quarrying on most parts of the Firth Block. Extraction through the Firth concrete production plant area would be incompatible with that activity. Further, the northern part of the Firth Block could be quarried, but contains low quality rock and is also in part affected by a Special Amenity Area. The central part of the Firth Block has been quarried in the past.

Under the "permitted baseline", the existing quarry area would be excavated to the extent practicable over 5 to 10 years, and then the operation would close. Rehabilitation of the quarried faces would be completed over several subsequent years.

The permitted baseline allows for the clearance of all vegetation on the Firth Block and other parts of the Extraction Activity Area outside the Special Amenity Area. Hutt City Council has issued a Certificate of Compliance for such clearance (RM110286).

2.1.3 The Implications of the Plan Change Request

The Plan Change Request would result in a substantial change to the area which could be quarried effectively. This is shown in a series of plans in Appendix 5, the Proposed Quarry Management Plan. The development plans show that the ability to extend into the Firth Block enables the extension, firstly of the "north face", and then the extraction of areas of useable rock within and immediately to the south west of the Firth Block itself. Overall, the rock yielded through the requested Plan Change would extend the life of the Belmont Quarry by 30 to 40 years, with associated economic benefits.

The main physical change which would result from the requested Plan Change is the reduction in the height of the topography within the area which is currently shown as the southern Special Amenity Area. The ridge and crest would be lowered progressively from the north, undertaken in a way that maintains the vegetation cover on the slope facing the Hutt Valley. The current high point of 135m[14] within the Special Amenity Area would be reduced over time to a high point of approximately 95m, the new ridgeline merging with existing contours north and south. The

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areas remain in the Plan, they no longer have protection through any rule in the Plan. A Certificate of Compliance has been issued by Hutt City Council which confirms that the removal of vegetation across this area can be undertaken without a resource consent.

[13] The old sediment ponds are to be closed and the overburden including fines relocated to the Cottle overburden disposal area prior to quarrying. Where the buffer area currently contains a road, this is to be planted.

[14] All figures are given as above sea level.

lowest point on the future ridge would be approximately 65m (outside the Special Amenity Area), rising to approximately 180m towards the rear of the site (also currently outside the Special Amenity Area but proposed to be included within the northern Special Amenity Area through the requested Plan Change).

It should be noted that there will be no change in the day-to-day quarry operations. The rate of extraction will in the future, as now, be based on market demand. Most environmental effects will continue to be managed on the basis of the existing permitted activity conditions in the District Plan, with the slight administrative improvements resulting from the text changes in the Plan Change Request, or through necessary consents from the Greater Wellington Regional Council[15].

2.1.4 Actual and Potential Effects

Comparing the "permitted baseline" with what is proposed, the following effects are considered most relevant to assist with understanding the Plan Change Request:

- Visual/Landscape effects
- Amenity effects
- Ecological effects (terrestrial)
- Economic effects

When evaluating effects, mitigation proposed can be taken into account.

Each of the most relevant effects is now explained, along with information on the nature and extent of effects and the mitigation proposed.

Finally, other effects which may be associated with quarry activities are noted.

2.2 Visual/Landscape Effects

2.2.1 Nature and Extent of Effect

Appendix 6, "Belmont Quarry Extension – Landscape and Visual Assessment" by Boffa Miskell Ltd, provides an analysis and assessment of the visual and landscape effects of the quarry development over the 30 to 40 years that the Plan Change Request will provide for.

[15] The quarry operation involves several regional consents, some of which require renewal, including stormwater management. In addition, the range of Regional Plans now require two additional regional consents. These are being sought separately from the Plan Change Request.

The quarry extension will involve a reduction over time in the height of parts of the landform on the eastern side of the Extraction Activity Area. Depending on the viewing location, people will notice the ridge being lowered from behind. From some positions, this will result in the quarry faces further to the west and the north becoming visible over time.

Appendix 6 explains the process involved over time, which is set out in the Proposed Quarry Management Plan (Appendix 5) staging diagrams. The effects have been shown and assessed from a series of viewpoints in Figures 5 to 10 of Appendix 6 and a range of visual simulations. These give block diagrams, which are designed to highlight the areas which will change over the lifetime of the quarry, by the use of bright colours. The changing views over time from four typical viewpoints nearby in the Hutt Valley, including the eastern hills at Stokes Valley, have been simulated over time to show how the landscape will change as the quarry activity takes place and the rehabilitation proposed through the Proposed Quarry Management Plan is undertaken.

The analysis indicates that, at the localised site level, adverse landscape effects (i.e. changes to landform, vegetation and landscape character) are moderate. In the context of the landscape of the western escarpment area, however, the extent of any adverse landscape effects is low. Over time, the green backdrop of indigenous vegetation, which is protected through policies in the District Plan, will be restored.

When seen from a range of viewpoints across the Hutt Valley, the area of change is generally contained within the complex existing topography of the western hills. The nature of the change is associated with an established quarry activity, and is not new or unexpected. The visual effects from the ten representative locations which were assessed[16] are generally low or negligible. Only from the most elevated viewpoint (in Stokes Valley) and only at the mid-point of quarry development (at between 15 and 30 years) have moderate visual effects been assessed.

As noted, these example viewpoints are representative and are intended to present close to "worst case" areas where the changes over time will have maximum visibility. There are other locations where a similar level of effect can be expected, but over most of the valley, visual effects will be limited.

2.2.2 Mitigation

There are several provisions within the Proposed Quarry Management Plan which will mitigate the extent of any adverse visual and landscape effects. These are as follows:

[16] These viewpoints were SH2 approaching the quarry area from the north and south; Hutt River stopbank near to the quarry; Pomare Railway Station; Aldersgate Grove above Stokes Valley; Pomare School; Taita Shopping Centre; Harcourt Werry Drive, and Kelson.

1. The quarry activity which results in the lowering of the height of the ridge will take place from the west. There will be no clearance of vegetation on the escarpment face which faces the Hutt Valley itself.
2. The physical change enabled by the Plan Change will take place over a period of 10 to 15 years (when viewed from the Hutt Valley). It will not be a sudden change.
3. The proposed rehabilitation will take place on the southern and western sides of the quarry first before moving to the north and east faces. It is the western face which will start to be seen as the eastern face is lowered from behind. By the time the western side of the quarry becomes visible, it will already be softened by the start of the rehabilitation processes and the growing vegetation cover on the finished benches and slopes.
4. The ridge at the northern part of the Firth Block will remain intact and unmodified by quarry activities. This will continue to shield the view of the north face from most parts of the valley. This area is proposed to be protected as a new area of Special Amenity Area as part of the requested Plan Change.
5. Additional mitigation of potential adverse effects is provided by the geography of the valley itself, as follows:
   - from most parts of the valley, the ridge which is proposed to be lowered is not the highest part of the landform in the vicinity. The ridge which is a continuation of Kelson, and/or the landforms of the Belmont Regional Park, is higher. From many locations they provide a visual and landscape frame above and around the quarry.
   - some of the elevated housing in Stokes Valley, for example on Holborn Drive and Aldersgate Grove, will see more of the quarry area as the ridge height is reduced. However, at this height and distance, the Belmont Regional Park comprises the skyline and, because of the width of the Hutt Valley itself, the quarry sits within wide and extensive views from these areas.

2.2.3 Summary

The visual and landscape affects associated with the quarry extension which the Plan Change Request seeks to provide for are generally considered to be negligible or low, although there will be moderate visual impacts experienced over a period from elevated properties on the Eastern Hills above Stokes Valley. The proposed mitigation will be effective in ensuring a “green backdrop” is restored over time.

2.3 Amenity Effects

2.3.1 Nature and Extent of Effect

Amenity in terms of the RMA means those *“qualities and characteristics of an area that contribute to people’s appreciation of its pleasantness, aesthetic coherence, and cultural and* *recreational attributes"*. The shaded areas in Appendix Extraction 2A are identified as "Special Amenity Areas". The District Plan, however, does not explain what elements comprise the amenity values of these areas. Neither does it explain how the areas were identified or delineated.

It can be assumed that, as private land within the District Plan's Extraction Activity Areas, recreational or cultural values[17] are unlikely to be significant.

The protection of the area is of its natural vegetation cover. The District Plan's policy indicates in general terms (discussed later) that the main amenity value associated with the areas of "Special Amenity" is visual amenity, and that such areas are "part of the visual backdrop for the City"[18]. The intention is that the identified areas of the escarpment retain their indigenous vegetation.

Thus removing part of such areas from protection, as the Plan Change Request seeks, can be expected to have some adverse effect on visual and landscape values. This effect has been addressed in the previous section.

2.3.2 Mitigation

Mitigation proposed is also as covered in the previous section.

In terms of amenity values, there is, however, an additional consideration. As the proposed area to be added to the northern Special Amenity Area is directly adjacent to the Belmont Regional Park, its protection in indigenous vegetation cover will add to the expansiveness of the park in that area and therefore contribute in the long-term to the quality of the recreational opportunities that are provided[19].

2.4 Ecological Effects

2.4.1 Nature and Extent of Effect

The Special Amenity Area notation which the requested Plan Change seeks to modify is based on visual and amenity values. However, the protection of the area through the required retention of the existing indigenous vegetation cover also protects its current ecological values. Thus effects on ecological values are a relevant consideration.

Appendix 7, "Belmont Quarry Extension – Terrestrial Ecology Assessment" by Forbes Ecology reports on the extensive ecological investigations that have been undertaken over the past two

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[17] Cultural values have been the subject of consultation, and are discussed in section 5 of this report under that heading.
[18] Policy 6D.1.2.1(b).
[19] At the moment that part of the park is not well-used, as existing tracks are found only to the west and north of the block. That may change the future.

years to determine the ecological values of the area that would be affected by the proposed quarry extension activities, and thus to clarify the actual and potential effects of the requested Plan Change.

In summary, the investigations have found that the area which will be directly affected by the quarry activities has considerable ecological values. Two of the values which were thought to be associated with the area in the past have been found to not be the case (i.e. the area does not hold the southern-most extent of black beech and no northern rata have been found within the area). The report has assessed the significance of the ecological values using RPS Policy 23 criteria (see Appendix 7).

It found that both within the area affected by the quarry and the remainder of the Firth Block, the areas of tawa-dominant forests are representative and therefore significant; that the presence of pukatea and black beech as well as southern North Island forest gecko meet the criterion of rarity both within and outside the area affected by the quarry[20]; and that in terms of ecological context, both the area to be quarried and the remainder of the Firth Block are significant as they contribute to the ecological connectivity of the Western Hills forest area. The areas do not achieve significance in terms of diversity or of tāngata whenua values[21].

The extension of the quarry thus involves adverse effects on existing ecological values. However, only parts of the area have any current protection, through the Special Amenity Area notation, and the Plan Change Request proposes to extend the northern Special Amenity Area to an approximately equivalent area. It is acknowledged that the area of tawa forest in the new area proposed to be included is approximately 0.3ha less than that within the southern Special Amenity Area, that black beech are not known to be present in this area, and that other values will slightly differ.

As the area is native lizard habitat, the quarry activities will require a wildlife permit from the Department of Conservation to disturb the habitat. If it is determined desirable to trap and relocate individuals, that activity will also be covered by the permit.

Aquatic ecology is not considered to be adversely affected to more than a *de minimis* extent by the proposed quarry extension. There is a short length of small ephemeral stream within the affected area, which will be removed, and the catchment will instead contribute to the quarry catchment[22]. The residual part of the ephemeral stream will continue to drain the remaining catchment area, and discharge from the land via a culvert to the north of the Firth concrete plant.

[20] Note: black beech were not specifically identified outside the area to be quarried.
[21] See letter from Liz Mellish, Appendix 9.
[22] A consent will be required from Greater Wellington Regional Council to disturb this stream. It has been agreed with that Council that this will be sought at the time that the disturbance is to occur – anticipated to be 15 to 20 years away.

2.4.2 Mitigation

Mitigation of the adverse ecological effects will be achieved in the following ways:

1. Through providing for the protection of approximately an equivalent area of the Extraction Activity Area by extending the smaller northern Special Amenity Area to the north and west, along the boundary contiguous with the Belmont Regional Park. This ensures, together with the remainder of the southern Special Amenity Area, connectivity and habitat variety to support the range of fauna that use or pass through the area.
2. Through active rehabilitation of the quarry over time, as provided for in the Proposed Quarry Management Plan. This process is already under way in the few areas where quarrying has been completed. It will continue for the next 30 to 40 years as the various parts of the quarry are completed. Rehabilitation will eventually extend to the area which is sought to be taken out of the Special Amenity Area. Rehabilitation will replace some of the ecological values of the area over time, and will ensure a long-term indigenous vegetation cover for most of the quarry area.

It is considered that enabling the continuation of the quarry activities, and the associated rehabilitation which can be progressively achieved, will result in an area of overall enhanced values, including contributing to the ecological corridor along the western hills of the Hutt Valley, and ensuring specific provision for birds, lizards and invertebrates, as well as for the current floral biodiversity.

2.4.3 Summary

There will be some adverse effects on ecological values in the area. These include loss of some mature forested areas, but they are small in extent. In mitigation, provision is made to retain a similar (replacement) area with values that are likely, over time, to be approximately equivalent. The rehabilitation of the quarry faces over time will also provide for a larger area of regenerating indigenous floral species, and additional habitat for fauna, particularly for lizard species and some invertebrates.

2.5 Economic Effects

2.5.1 Nature and Extent of Effects

The visual and landscape effects, the effects on amenity values, and the effects on ecological values which are associated with the requested Plan Change may all be considered to be, to some extent in the short to medium term, adverse. In contrast, the economic effects are clearly positive.

Economic effects are addressed in detail in Appendix 4. The analysis which has been undertaken by NZIER identified the following beneficial effects from enabling the quarry extension:

- Continued access to quarry products in the Wellington urban region for the next 30 to 40 years (instead of the 22 years if Belmont Quarry closes).
- Aggregate price stability (avoiding potential for price increases if only two suppliers).
- Reduced transport-related greenhouse gas emission costs in supplying the Hutt Valley.
- Continuation of current jobs, and expenditure on salaries, wages, and operational requirements, and downstream or “multiplier” effects.
- Avoidance of costs associated with early write-off of plant.
- Expenditure on extended rehabilitation (due to larger area to be rehabilitated).

The dollar value of these economic implications is difficult to assess, as explained in Appendix 4. However, Figure 6 of that report gives an indication of some of the directly-attributable costs from an early closure of Belmont Quarry.

2.5.2 Mitigation

No adverse economic effects from enabling the extended quarry operation have been identified. Therefore, there is no need for any mitigation proposals.

2.5.3 Summary

The economic effects of the requested Plan Change are entirely positive and extend into many areas of economic and social wellbeing within the Hutt Valley and the wider region. There are no identified adverse economic effects.

2.6 Other Effects

There are a range of other potential adverse effects which can be associated with quarry activities in general terms. These could potentially be associated with the Belmont Quarry extension, if not properly controlled and managed.

Table 1 below sets out these potential effects and explains how they are already controlled and managed in terms of the existing quarry, and how they would be managed in the extended quarry area.

Table 1: Other Potential Effects

Potential Effect/ Nature of Effect	Basis for Control	Management of Effect/Extent of Effect
Noise can be associated with extraction, processing and transport of aggregate materials.	Noise from activities at Belmont Quarry is controlled through specific and general provisions of the District Plan. Rule 14C.2.1(b) applies noise levels (L_{10}) and a compliance measurement location along SH2 near the quarry. Meeting this requirement also protects residential areas from adverse effects. In addition, Rule 14C.2.1 specifics maximum night-time noise levels (L_{max}) from all activities, that can be experienced within Residential Activities Areas. The RMA also includes a general duty to avoid unreasonable noise.	Belmont Quarry activities must meet the noise requirements of the District Plan. In addition, Belmont Quarry has a noise management plan, which is part of the Proposed Quarry Management Plan (see Appendix 5). This is in accordance with Policies 6D.1.1 and 14C.1.1 of the District Plan. Although the proposed extension will bring the quarry technically slightly closer to residential areas in the Hutt Valley, there is still a significant distance between the quarry and residential activities. The topography of the site and the proposed escarpment area to be retained at the east of the site will still provide an effective buffer for noise from the extraction activities. The location and nature of the processing activities, which are the most consistent noise source on-site, will remain unchanged.
Vibration can be associated with blasting activities and the quarry.	Specific provisions in Rule 6D2.1.1(d) control any blasting operations at the quarry, including number of blasts per day, hours when blasting can take place, recording and monitoring of blasts and vibrations from blasting, and achievement of the range of New Zealand, Australian and International Standards referenced in the rule.	Belmont Quarry activities must meet the specific requirements for management of vibration in the District Plan. No change in approach is needed for the quarry extension area, and the extension will not require any different patterns of blasting activity from activities on the north face, or the current southern working area. Blasting will be further away from housing than it is at present.
Dust can be associated with a range of activities at the quarry.	Rule 6D2.1.1(b) requires dust generated by quarry activities to be managed in a way that avoids any dust nuisance beyond site boundaries.	Belmont Quarry has a dust management plan, which is part of the Proposed Quarry Management Plan (see Appendix 5). This involves a range of techniques to manage potential dust effects.

		The proposed extension of Belmont Quarry will not require any change in approach to ensure that the District Plan requirement is met. The working areas that would be enabled by the plan change will be further away from residents than some of the current working areas, and will be behind the area of escarpment retained at the east of the site.
Traffic/transport effects can be associated with the nature and volumes of quarry traffic (size of vehicles and patterns of travel).	Rule 6D2.1.1(h) requires that there is no direct access from the quarry onto SH2, and that all other relevant requirements relating to transport in the District Plan are met. Rule 6D2.1.1(f) specifies hours of operation, which also limits traffic movements.	Belmont Quarry is ideally located in relation to the State highway network. Vehicles accessing the quarry travel along Hebden Crescent (north or south) before joining the network, and do not pass through residential areas. Transport is associated with demand for quarry products, and will not change as a result of the proposed quarry extension.
Site infrastructure can be associated with a range of effects.	Site infrastructure is associated with quarry management, and includes roading, water and sediment management systems, processing and storage equipment and areas and their management, and administrative and staff facilities. There are specific requirements under Rule 6D2.1.1 which must be met in terms of building height, maintenance of building and storage facilities. In addition, there are requirements under regional RMA plans to limit sediment discharges, and to obtain consents to affect water courses.	No change is proposed to site infrastructure as a result of the proposed quarry extension. The approach to management of site infrastructure, including on-site water and sediment management, as part of the overall quarry development, is set out in the Proposed Quarry Management Plan (see Appendix 5). There will be a need to obtain replacement and new consents from Greater Wellington Regional Council (as some are due for renewal, and others are needed due to the new areas of ground disturbance). These will be sought at an appropriate stage. Conditions which may be attached to these consents will be complied with. Reference is also made to on-site roading and equipment in the parts of the Quarry Management Plan that relate to dust and noise.

Natural hazards such as land slippage and flooding could be associated with quarry activities.	Rule 6D2.2(n) requires that risks on land prone to erosion and landslide hazards are not increased. Rule 6D2.2(i) requires New Zealand Standards relating to fire hazards to be met on-site at all times.	The ongoing activities at Belmont Quarry, including the proposed extension area, are required to meet these conditions. This requirement is covered in the overall quarry design and every stage of its progressive development. It has been taken into account in the development concept through, e.g. the overall staging, angle and height of batter slopes, site design for drainage, and the remediation processes, as set out in the Proposed Quarry Management Plan (see Appendix 5). The extension area will be quarried from the west, adjacent to the existing working area. This is at a greater distance from residential areas, roading and services than part of the current area of activity, and poses no risk to other activities or lifelines.

Overall, there are no additional effects which exceed those which are associated with the current activity and/or which are not adequately controlled and managed under the District Plan (or the relevant regional planning instruments).

In addition, Winstones has provided a significantly more detailed Proposed Quarry Management Plan. This will be finalised following completion of the requested Plan Change processes. It is provided in compliance with the District Plan's policy framework, and is to be regularly updated. The Proposed Quarry Management Plan includes monitoring and complaints procedures, which provide further certainty in terms of managing on-site effects in a way which ensures that the wider environment, including people and nearby communities, are not adversely affected in terms of any of the matters in Table 1.

It is noted that the text changes included in the Plan Change Request will better embed the quarry management plan within the District Plan's provisions for the Extraction Activity Area through policy, explanation to policy, and as a permitted activity condition.

2.7 Conclusion on Effects

The proposed extension of Belmont Quarry, which will be enabled by the requested Plan Change, will result in topographic change which will have some visual and landscape effects, and vegetation clearance which will have ecological effects. Amenity effects are associated with such changes. Mitigation and remedy of the significance of these effects is built into the Plan Change through:

- the design of the quarry staging and the quarry's final form, which minimises visual effects by retaining the existing vegetation on the site facing towards the Hutt Valley and retires and remediates the faces behind which will become more visible over time.
- extension of the northern Special Amenity Area, so that an equivalent area within the Extraction Activity Area retains its existing ecological values – which will increase in time and which will have an additional benefit of being adjacent to Belmont Regional Park land.

The application of the Proposed Quarry Management Plan, including through improved policy and explanatory wording, and a specific permitted activity condition, provides certainty that the activities will be undertaken as described, and that all requirements of the District Plan are achieved.

There are considerable positive effects associated with the Plan Change in terms of the ongoing availability of quarry products, and jobs and expenditure in terms of the Hutt Valley and wider region. There are added regional benefits in terms of enhancing the overall availability of quarry products through a longer period, and thus extending the lives of all quarries which serve the Wellington urban region.

3 POLICY CONTEXT

3.1 Introduction

The Plan Change Request involves small changes to the existing policy of the District Plan. These changes have been sought following discussions with Council officers. The intent of these policy changes is to clarify and strengthen the applicable policy framework for the management of the effects of the extraction activity and the eventual progressive rehabilitation of the Belmont Quarry site's cut faces.

The change to Policy 6D1.1.1(a) would add reference to specified conditions (to the permitted activity rules for the extraction activity) and the quarry management plan which has hitherto only been referred to in the explanation to the policy. The change to the Explanation and Reasons section below this particular policy removes an existing erroneous reference to extraction activities being a restricted discretionary activity, and also some generic comments about the contents of quarry management plans. In the place of these removed sentences, more specific wording as to the contents of a quarry management plan and its relationship with the permitted activity condition, are provided along with a statement about the need to regularly review and update the contents of the Plan. Amongst the requirements are provisions which relate to site rehabilitation at the level of "objectives and processes", within which detailed rehabilitation plans would be prepared (see the rehabilitation section of the Proposed Quarry Management Plan in Appendix 5).

The change to Policy 6D1.2.1(c) adds a cross-reference to, and requires that rehabilitation be progressive and in accordance with the "objectives and processes" within the quarry management plan. This provides a clear link to Policy 6D1.1.1(a) and its explanation, and also assists with clarity in terms of interpreting permitted activity condition (m) in Rule 6D2.1.1 (which is sought to be slightly changed).

The main modifications to the District Plan that have been requested apply at the level of rules – the regulatory level. Therefore these should not be inconsistent with any of the policy framework, including national, regional and district policies.

This section discusses the policies that apply at each "level" and evaluates the implications of the requested modifications to the rules in the Plan Change Request in terms of relevant policy provisions. For the analysis in this section, it is assumed that the requested policy changes are in place and only the rule changes are under examination. This is because the requested policy changes are consistent with, and contribute clarity to, the existing policy framework.

3.2 RMA Part 2

Part 2 of the RMA sets out the Purposes and Principles of the legislation. Section 5 sets out the purpose of the legislation; section 6 requires that decision-makers must recognise and provide for stated matters of national significance; section 7 sets out other matters to which particular regard must be had when managing the use, development and protection of natural and physical resources; and section 8 requires that the purposes and principles of the Treaty of Waitangi must be had regard to.

3.2.1 RMA Section 5

This states:

" 1) The purpose of this Act is to promote the sustainable management of natural and physical resources.

2) In this Act, sustainable management means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while:

- *a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
- *b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and*
- *c) avoiding, remedying, or mitigating any adverse effects of activities on the environment."*

Two of the three changes to the rules that have been requested provide for clearer administration of the policy framework, by ensuring that the Council is kept informed of the state of the quarry management plan and its effectiveness in terms of the policies for the Activity Area (new permitted activity condition (o)), and by removing wording that would potentially inconsistently allow for the deferment of rehabilitation and which does not reflect best practice rehabilitation methodology (modification of wording of condition (m)).

These changes are clearly of minor importance in relation to this high-level policy, but would be generally consistent with the promotion of sustainable management.

The additional and main rule change sought through the Plan Change Request is to reduce the extent of one Special Amenity Area mapped within the only functional Extraction Activity Area in the District Plan, and increase the extent of the other Special Amenity Area. This enables the remaining good quality rock in the Extraction Activity Area to be quarried. At the same time, existing indigenous vegetation will be permanently retained in another part of the Area.

The requested Plan Change will achieve an appropriate balance of "use, development and protection" within the Extraction Activity Area, and will enable the district and regional community to have access to a valuable resource for a longer period than is currently possible (some 30 to 40 years). The requested Plan Change will therefore contribute to the social and economic well-being of these communities, particularly as quarry products are the basis of most of the community's stock of physical resources (buildings, roads and other infrastructure and hazards protection). Existing physical resources require quarry products for maintenance and replacement, and the overall stock of physical resources is anticipated to expand through the provision of new roading and building stock in the foreseeable future. Quarry products also assist in achieving the community's health and safety to the extent that they provide for the development and maintenance of lifelines, shelter and hazard management.

Minerals are not required to be sustained to meet the needs of future generations (section 5(2)(a)). However, the Plan Change Request will assist the present and next generation meet their needs for quarry products.

The life-supporting capacity of the soils and ecosystems (section 5(2)(b)) directly affected by the proposed quarry extension area will be lost (an area of some 6.8 hectares). However, an equivalent area will be placed in protection as part of the proposed expanded northern Special Amenity Area. In addition, the proposed rehabilitation over the wider are of the Extraction Activity Area, will, over time, develop new soils and an increasingly evolved "natural" ecosystem.

The adverse effects of the requested Plan Change (section 5(2)(c)) have been avoided or mitigated, as described in section 2 of this report, and are evaluated as minor. There are further opportunities to remedy, in particular, the adverse ecological effects of the change sought through rehabilitation of the quarry areas once they are fully worked. This remedy is long-term and will be progressively achieved. The rehabilitation also contributes to avoiding, mitigating and remedying adverse visual effects.

Overall, it is considered that the requested Plan Change will promote the sustainable management of natural and physical resources.

3.2.2 RMA Section 6

This section sets out matters which need to be recognised and provided for as matters of national importance. There are two matters that may be of relevance. These apply only to the requested change to Appendix Extraction 2A.

Section 6(b) is the protection of outstanding natural features and landscapes from inappropriate subdivision, use and development. The landform which has topography protected by the requirement to maintain its indigenous vegetation cover, is not identified as an outstanding natural feature or landscape, although it could be described as being identified as an amenity landscape. Thus it does not trigger any requirement for protection under section 6(b).

Section 6(c) is the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna. The proposed quarry extension affects an area of indigenous vegetation and habitat with significant values, but as noted earlier in this report the extent of the area is limited, and the Plan Change Request seeks to protect an equivalent area of regenerating bush nearby, with similar if not exactly equivalent values.

3.2.3 RMA Section 7

This section identifies other matters to which particular regard must be had. Of possible relevance are sections 7(a), 7(aa), 7(b), 7(c), 7(d), 7(f) and 7(g). These apply primarily to the requested change to Appendix Extraction 2A, and are discussed in the remainder of this section.

Section 7(a) relates to Kaitiakitanga. In preparing the Plan Change Request, tāngata whenua groups have been consulted. Letters relating to this are attached as Appendix 9. Winstones has agreed to facilitate a kaitiaki role through site visits and meetings with tāngata whenua as requested. Possible involvement in monitoring has also been discussed. The kaitiaki interests that have been expressed relate particularly to water quality and rehabilitation aspects.

Section 7(aa) is the ethic of stewardship. The land is owned, and will continue to be developed by Winstones as part of an ongoing effective and efficient quarry operation. Winstones has an Environmental Policy which requires it to manage its operations in a way that achieves all environmental health and safety standards and conditions, that applies best practicable options, and prevents pollution and "works towards environmental enhancement, particularly the maintenance and restoration of biodiversity, where practicable". The Proposed Quarry Management Plan for the Belmont Quarry incorporates a rehabilitation strategy and is operated in a way that demonstrates sound stewardship principles. Parts of the Plan Change Request provide enhanced requirements in terms of the quarry management plan.

Section 7(b) relates to the efficient use and development of natural and physical resources. Enabling the quarry extension will achieve this RMA provision very effectively in that:

- it will provide access to and for the use and development of a valued rock resource
- it does not require any new infrastructure, so makes efficient use of existing infrastructure
- it avoids the need to identify and establish a new quarry (which is shown to involve some difficulty and considerable expense) for Wellington's urban region for some 30 to 40 years

- its location in the Hutt Valley means that the community has a geographically-efficient source of aggregate.

Section 7(c) is the maintenance and enhancement of amenity values, and **section 7(f)** refers to the quality of the environment. As identified earlier, there will be some reduction in visual amenity values of parts of the site, particularly the reduction in the full height of the scarp, seen from various locations in the Hutt Valley and the eastern hills. This is a minor effect, and case law indicates that it is not realistic in all cases to maintain or enhance amenity values. In this case, the slight loss of amenity to some people must be balanced against the benefits of ongoing aggregate availability to the wider community. Section 7(f) is usually considered to relate to aspects such as water quality. The requirements of plans and consents relating to these matters will continue to be met.

Section 7(d) relates to the intrinsic values of ecosystems. As earlier identified, there are recognised ecosystem values in the area to be disturbed. However, provisions are included in the Plan Change Request to protect an equivalent area, which will ensure that a similar level of ecological connectivity remains in the area, and rehabilitation will provide extended habitat over time.

Section 7(g) refers to any finite characteristics of natural and physical resources[23]. The resource of accessible and useable greywacke rock for aggregate in the Wellington urban region is not finite, but it is limited and new quarries are expected to be difficult and costly to establish. The requested Plan Change will enable the use of an available part of a currently limited supply of hard rock quarry resource.

3.2.4 RMA Section 7

There are no known Treaty issues associated with the Plan Change Request. The land is not subject to Treaty claims, or part of any settlement.

Tāngata whenua have been consulted (see section 5 of this report) and have not raised any particular issues, other than a desire to continue to be consulted as quarry development proceeds.

3.3 National Policy Context

There are now a number of National Policy Statements against which the requested Plan Change must be checked for consistency. The analysis is as follows:

[23] It is noted that under RMA section 5(2)(a) minerals need not be sustained for future generations.

New Zealand Coastal Policy Statement (2010) – the location is well away from the area that could be identified as the coastal environment. Therefore the provisions of this national-level statement do not apply.

National Policy Statement on Electricity Transmission (2008) – this statement provides for the protection and management of Transpower's transmission access. There is a major substation near to the junction of SH2 and SH58, and transmission lines cross the Belmont hills immediately to the west of the Extraction Activity Area. The area affected by the Plan Change Request is towards the eastern side of the Extraction Activity Area and will not affect or be affected by the provisions of this national policy statement.

National Policy Statement for Renewable Energy Generation (2011) – this statement is intended to promote and manage renewable energy development. It is not relevant to the requested Plan Change.

National Policy Statement for Freshwater Management (2011) – this statement protects and manages water quantity and quality. Its objectives and policies are to be met primarily through regional planning mechanisms. A stream passes through the quarry area and is managed through the requirements of regional consents. It has been identified that the upper part of an ephemeral stream may be intersected in the later stages of the development of the extended quarry area which would be enabled by the requested Plan Change. The Regional Council has proposed that a consent to disturb the bed of this stream can be sought at a later date. Winstones uses water for various on-site uses and has a permit to take water from the on-site stream for use in quarry operations. There are no matters in the National Policy Statement for Freshwater Management that would require a different approach, or result in inconsistency between the requested Plan Change and that document.

There are no other operative national policy statements to be considered in relation to the Plan Change Request.

3.4 Regional Policy Statement

3.4.1 General

The Regional Policy Statement for the Wellington Regional (RPS) became operative in 2013. It identifies regionally significant issues relating to the region's natural and physical resources, and has a number of relevant sections and provisions. This includes policy which must be taken into account when considering, *inter alia*, a change to a district plan. There are also objectives and policies which territorial authorities are required to achieve through making provision for the matter in district plans[24]. The main relevant provisions of the RPS are outlined in the following sections, with an evaluative comment as to relevance and consistency.

There is an additional test, in that through the RMA the District Plan is required to “give effect” to the RPS[25], which is also considered in the analysis that follows.

3.4.2 Soils and Minerals

Under the heading Soils and Minerals, the introduction to Chapter 3.1 of the RPS discusses the need for quarries in the region. The following statement is made:

> “ *As the region’s population continues to expand, the demand for mineral resources, particularly aggregate, will increase. A sustained supply of aggregate will be needed to provide for building, construction and roading projects associated with this growth but also to maintain and redevelop existing infrastructure. Resource availability or inefficiencies in obtaining such resources has the potential to impact on the timely and efficient provision of regionally significant infrastructure – in particular new roading projects."*

It also acknowledges:

> “ *Mineral resources are fixed in location, unevenly distributed and finite. Extraction processes, sites and transportation routes can create adverse environmental effects."*

A discussion on resource sensitivity follows, addressing the need to protect established working sites and their access routes from encroaching incompatible activities. This is followed by commentary on transport effects of mineral resources, and the desirability of extracting and processing minerals as close to the area of use of the product as possible:

> “ *the transportation of mineral resources around, through and out of the region can give rise to adverse environmental effects and can have economic implications. There are benefits to allowing extraction and processing by extractive industries as close as possible to the location of use of the final product to avoid distributing adverse effects across a greater area than necessary to meet the need for these resources."*

This leads to the following Issues Statement:

> “ ***5. Limited Mineral Resources***
> *There are limited mineral resources in the region and demand for these will increase. A sustained supply of mineral resources is essential to provide for the well being of the regional*

[24] The RPS became operative only in April 2013. District plans in the region may not fully reflect the provisions. In interpreting policy relationships therefore, some assumptions must be made.
[25] RMA section 75(3)(c).

and local communities and the people of Wellington, and for the regional economy. There are also benefits from extracting mineral resources locally."

The Issue Statement is cross-referenced to **Objective 31** – *"The demand for mineral resources is met from resources located in close proximity to the areas of demand"*, with a further cross-reference to **Policy 60: Utilising the region's mineral resources – consideration** – "*When considering an application for a resource consent, notice of requirement, or a change, variation or review of a district or regional plan, particular regard shall be given to:*
(a) the social, economic, and environmental benefits from utilising mineral resources within the region; and
(b) protecting significant mineral resources from incompatible or inappropriate land uses alongside".

The main method for achieving the policy is through decisions on the range of resource management instruments, Policy 4. There is also a note to the effect that Method 52, when implemented, will identify the locations of significant mineral resources in the region[26]. The stated environmental outcome for Objective 31 is that aggregate and hard rock, for local use, is sourced from within the Wellington Region.

Comment

This set of policy provisions includes a specific objective, policy and methods. This framework would strongly support the continuation of the ability to develop a mineral resource which is as favourably-located as the Belmont Quarry. It would be inconsistent with this set of provisions to require the continuing protection of a small area of topography on the Belmont hills for visual amenity reasons, given the emphasis on the benefits of utilising local mineral resources[27].

However, information in Appendices 3 and 4 indicates that good-quality aggregate resources are relatively scarce; new sources will be difficult to find, probably difficult to consent, and expensive to establish; and transport costs are a significant consideration in terms of costs to users of aggregate resources.

The requested small change to the District Plan is in line with these directly relevant policy provisions in the RPS, and would help give effect to the objective.

3.4.3 Landscape

The modification that is requested through the Plan Change Request relates to land that is identified as Special Amenity Area. The meaning of the term is not identified in the District Plan,

[26] There is no stated date for this work to be undertaken. It is a responsibility which is allocated to both regional and territorial authorities in the RPS.
[27] It is acknowledged that Policy 60 refers to "resources in the region".

but, from the wording in the Chapter of the District Plan, it is based on a visual and landscape intention. Thus the RPS landscape policy may be relevant to a consideration of the appropriateness of the requested Plan Change.

Chapter 3.7 of the RPS sets out the expected approach to landscape identification and protection. The chapter recognises a hierarchy of landscape values as follows:

- outstanding natural features and landscapes
- special amenity landscapes
- all other landscapes.

The pressures on landscapes due to use and development are recognised, and the chapter includes a discussion on the ability of the different levels of the hierarchy to absorb change. It is stated that *"the scope for change within special amenity landscapes without losing their landscape values will be greater than for outstanding features and landscapes"*.

No part of the Belmont Quarry would, or could, be identified as an outstanding natural feature or landscape, so the potential relevant objective is **Objective 18**. This states:

> " *The region's special amenity landscapes are identified and those landscape values that contribute to amenity and the quality of the environment are maintained and enhanced."*

Associated policies are:

- **Policy 27**: identifying special amenity landscapes – district and regional plans; and
- **Policy 28**: managing special amenity landscape values – district and regional plans.

The associated methods require engagement with tāngata whenua, stakeholders and the wider community, and preparation of a regional landscape character description.

The two policies are expanded and their intended interpretation is explained later in the RPS. Explanatory material includes a description on how to identify special amenity landscapes in terms of **Policy 27**, and that **Policy 28** is not intended to prevent change: rather that change to identified Policy 27 landscapes needs to be *"carefully considered and appropriate in relation to the landscapes that may be identified"*.

<u>Comment</u>

The identification of the Special Amenity Areas within the District Plan's Extraction Activity Area predates the RPS by many years, and there is no information (in the District Plan or seemingly elsewhere) as to the basis for the identification of these areas. There is some doubt as to whether the areas would be identified as a special amenity landscape, under the RPS criteria[28].

Even if it was so identified, the level of protection afforded through the RPS is limited to careful consideration of the "appropriateness" of the landscape change which would result from a land use change. "Appropriateness" involves a judgement as to the acceptability and potential effects of the change. In this case, as discussed earlier, the adverse effects are generally minor or less due to the precise nature of the topographic change, the intended method of extraction (from the west), the retention of the vegetation on the remaining face of the area towards the Hutt Valley, and the rehabilitation over time of the quarry faces behind. The northern Special Amenity Area remains, and is proposed to be extended through the Plan Change Request.

"Appropriateness" may also take into account any community benefits from the proposed changes to the landscape. In this case there are significant benefits over a relatively long period from the availability of the high quality rock resource.

Thus the requested Plan Change enables a change that, in the RPS context, is appropriate. It is therefore consistent with the relevant landscape provisions in the RPS.

3.4.4 Indigenous Ecosystems

The modification to the Extraction Activity Area in the District Plan that is requested in the requested Plan Change, as earlier noted, will have some effect on an area of indigenous vegetation. Part of the land within the Special Amenity Area is shown in the District Plan as part of a significant natural resource area[29]. While this does not provide any protection, it does indicate that the area was identified as having some indigenous ecosystem values at some stage. Thus the RPS policy on Indigenous Ecosystems may be relevant.

Chapter 3.6 addresses indigenous ecosystems, and identifies two issues: the region's indigenous ecosystems are reduced in extent, and those that remain are under threat.

Objective 16 is that *"Indigenous ecosystems and habitats with significant biodiversity values are maintained and restored to a healthy functioning state"*. There are four associated policies:

- **Policy 23**: identifying indigeneous ecosystems and habitats with significant indigeneous biodiversity values;
- **Policy 24**: protecting indigeneous ecosystems and habitats with significant indigenous biodiversity values;

[28] It should also be noted that, at the time, the landowner did not oppose the identification. However, it was not known at the time that part of one of the areas contained the highest quality rock now remaining in the Extraction Activity Area.
[29] District Plan, Map Appendix A1.

- **Policy 47**: managing effects on indigeneous ecosystems and habitats with significant indigeneous biodiversity values; and
- **Policy 64**: supporting a whole of catchment approach.

The first two policies are to be addressed through district and regional plans, the second is a consideration in decisions on plans, plan changes and resource consent applications, and the final one is a non-regulatory policy.

The discussion and explanation relating to **Policy 23** sets out criteria by which significant ecosystems and habitats are to be recognised.

Policy 24 requires that District Plans include policies, rules and methods to protect indigenous ecosystems and habitats with significant indigenous biodiversity values from inappropriate subdivision, use and development.

Policy 47 sets out more detail of what may be inappropriate in terms of achieving Objective 16 when considering a plan, plan change or application. These matters include consideration of ecological corridors and buffers, avoiding cumulative effects, protecting life-supporting capacity, and remedying effects when avoidance is not practicably achievable.

The explanation for Policy 47 also notes that remedying or mitigation of adverse effects may also include offsetting.

Policy 64 promotes catchment management when restoring and enhancing indigenous ecosystems and habitats.

<u>Comment</u>

As with landscape values, the provisions of the District Plan predate the RPS. While the District Plan includes some information as to the basis on which the significant natural resource areas were identified, it is not clear how their boundaries were drawn. Further, following a decision of the Environment Court, the District Plan's rules do not protect all of the areas identified[30].

A comprehensive study of ecological and habitat values has been undertaken of the proposed Belmont Quarry extension area, and of the wider Firth Block, including the areas proposed to be removed from and added to the Special Amenity Area through the Plan Change Request (see Appendix 7). The criteria of RPS Policy 23 have been applied in the report on terrestrial ecology accompanying the Plan Change Request.

[30] Including those in the Extraction Activity Area. The relevant decision is Decision No W13/2003.

This has shown that the area to be affected by quarrying, and the wider Firth Block, including the area proposed to be included in the northern Special Amenity Area, demonstrates characteristics of significance. An evaluation must then be undertaken in terms of Policy 47 to determine whether the activity is inappropriate. The following points are made in terms of the considerations set out in this policy:

a) The Plan Change Request will maintain a similar level of connectivity to the present. To the north, the proposed expanded Special Amenity Area abuts the Belmont Regional Park, and to the south, a part of the southern Special Amenity Area remains in place, in the same relationship to the covenanted bush on the adjacent Cottle Block as at the present. As parts of the quarry are completed, rehabilitation will create new habitat which will begin to strengthen the connectivity further, in accordance with this consideration.

b) Buffering is not specifically provided for in the proposal. The buffers required on the quarry site will continue to be achieved and will be enhanced by growth of existing vegetation (and replanting of the road area adjacent to the Regional Park).

c) Wetlands are not affected by the proposal.

d) The Plan Change Request involves the loss of one valued area, but provides for the protection (through District Plan rule) of another nearby approximately equivalent area of similar, if not identical, values.

e) The small area of forest that will be lost provides both core and seasonal habitat for indigenous species. This includes habitat of lizards, which are protected, and birds, none of which are threatened. The area which is proposed to be included in the expanded northern Special Amenity Area has core and seasonal values, and the values of this wider area to be protected will increase over time. Rehabilitation areas will also provide a range of habitats, including for lizards and invertebrates.

f) The life-supporting capacity of the area to be incorporated within the extended quarry area will be lost. However, this loss will be in the context of protection of a similar area of indigenous vegetation, and eventual rehabilitation of the wider quarry area.

g) Effects are mitigated through the provision of "like for like" protection within the Extraction Activity Area as far as this can be achieved. Given the varying nature of the existing vegetation, it is not possible to exactly match the values. Remedy over time is proposed through rehabilitation of the wider quarry area, which will be undertaken as proposed in the strategy set out in the Proposed Quarry Management Plan using local seed and plant sources from within the affected and nearby areas.

h) The precautionary approach is acknowledged, and will be applied through minimising disturbance associated with the extraction activities and through active rehabilitation programmes.

Mitigation of effects, by providing for an expanded Special Amenity Area elsewhere on the site, and the ecological benefits of the rehabilitation as set out in the Proposed Quarry Management Plan (see Appendix 5), should result in the requested Plan Change, over time, achieving an outcome which is neutral if not beneficial to the ecology of the Extraction Activity Area and its surrounding area.

On close examination it cannot be said that the proposal is necessarily inappropriate in terms of the RPS objective under this heading. While some of the considerations suggest that it may be; others do not. Over time, the requested Plan Change, along with the quarry rehabilitation, is likely to make a positive contribution, even if small on the regional scale, to achieving the RPS objective under this heading.

The question of appropriateness, however, relies on a wider judgement, taking into account all RPS policy, and policy at national and district level. Within the RPS itself, there are tensions within the applicable policy framework in relation to the area of the Plan Change Request.

3.4.5 Summary on RPS Provisions

The requested Plan Change needs to be assessed in terms of three main policy areas at regional level. Overall the change to the District Plan which is sought will be of neutral or minor relevance in terms of Objectives 16 and 18, to the extent that they apply. However, the request clearly helps to give effect to Policy 31.

3.5 Regional Plan Policy

Policy in the various regional plans may be relevant to the matters for which regional resource consents are needed. The provisions in a district plan must not be inconsistent with a regional plan[31]. The policy in regional plans will be evaluated at the time that regional resource consents are sought. There is no direct relationship between the matters addressed by the requested Plan Change and any regional plan.

3.6 District Plan Policy

3.6.1 General

The requested Plan Change is seeking to modify both rules, and policy in the District Plan. However, the policy and explanation changes are minor and are intended to be clarifications and

[31] Section 75(4)(b).

improvements (see section 3.1 of this report). There is no desire or need to modify the intention of the policy – rather the intention is to make it more effective.

Rules in plans are intended to help territorial authorities carry out their functions under the RMA and help achieve the objectives and policies of the plan[32].

As the rule changes are of more significance, it is important that an assessment of these is undertaken in terms of relevant objectives and policies in the District Plan.

The relevant policy provisions in the District Plan are identified in the following sections with an evaluative comment as to the implications of the requested Plan Change in terms of those provisions. This addresses both the implications of the changes to policy which are included in the Plan Change Request and the implications of the rule changes requested.

3.6.2 District-wide Policy

Chapter 1 of the District Plan includes general introductory material. However, it also includes a description of the district-wide issues that are sought to be addressed and a number of district-wide policy provisions, together with explanatory material.

Section 1.10.2 sets out the basis for identification of the District Plan's Activity Areas, which is stated to be based on a character and amenity values. The objective is to maintain and enhance the character and amenity values of the different activity areas. The associated policy seeks to identify the *"general character and amenity values"* of each activity area. The explanation for the Extraction Activity Area in this policy context notes that *"the sites in this area are located on the Western Hills escarpment and can be seen from considerable distances. The stark contrast between excavated areas and regenerating native bush is a strong visual feature".*

Section 1.10.5 is headed Aggregate Mineral Resources, with the following objectives and policies:

> " ***Objective***
> *To ensure the Region's needs for aggregate material can continue to be met, while managing the adverse effects of hard rock extraction activities on the receiving environment and amenity values of the area and surrounding areas.*
>
> ***Policies***
> a) *That the naturally occurring aggregate resources in the City are able to meet the Region's demand for such material by maintaining reasonable accessibility and availability to the resource.*

[32] Section 76(1).

b) *That adverse effects of hard rock extraction activities on the receiving environment are avoided or mitigated by the provisions of the Extraction Activity Area.*
c) *That adverse effects generated by hard rock extraction activities be managed to enhance the amenity values of the area by the provisions of the Extraction Activity Area.*
d) *That reverse sensitivity is taken into account in managing land-use in the area surrounding hard rock quarries."*

The explanation that follows describes the Extraction Activity Area and its provisions in general terms. The District Plan is focussed on ensuring provision for aggregate extraction while addressing effects of the activity and potential resource sensitivity effects.

Comment

In terms of Section 1.10.2, the proposed extension of quarrying activity maintains the character and amenity values which are identified in this section of the District Plan. Different areas of quarry activity will be seen from different locations at different times, and regeneration through further proposed protection and rehabilitation will remain a visual feature of the area. The Plan Change Request is consistent with the District Plan's character and amenity identification for the Extraction Activity Area.

In terms of the statements, objectives and policies in Section 1.10.5, the requested Plan Change ensures that the objective and Policy (a) will continue to be achieved. The nature of the Plan Change Request is effectively a "swap" in areas of the Extraction Activity Area to be retained with indigenous vegetation cover, and the analysis in Appendix 6 shows that this, together with rehabilitation provisions will ensure that visual amenity values will be maintained in general terms and, over time, enhanced.

The small changes to the Extraction Activity Area policy requested will help ensure that rehabilitation will be carried out through the quarry management plan and more detailed plans as extraction is completed in different areas of the quarry, consistent with this District-wide policy.

3.6.3 Extraction Activity Area Policy

Chapter 6, the Business Chapter of the District Plan, includes a preamble relating to each of the activity areas under the Business heading. For the Extraction Activity Area, the preamble states the need to take a balanced approach to these areas and also to avoid or mitigate adverse effects on the receiving environment. The importance of a quarry management plan is noted here.

There are two policy areas in the Extraction Activity Area, 6D1. Firstly, a policy area relating to the local area and particularly the environmental effects of extraction activities, as follows:

> " ***Objective***
> *To ensure that the adverse effects of extraction activities on the receiving environment and local amenity values are avoided, remedied or mitigated.*
>
> ***Policies***
> a) *That adverse effects of extraction activities on the receiving environment are avoided or mitigated.*
> b) *That adverse effects generated by extraction activities be managed to maintain and enhance the amenity values of the area.*
> c) *That buffer strips be provided to reduce any adverse effects of extraction activities on the nearest residential activity areas.*
> d) *That industrial activities allied to extraction activities be accommodated in the Extraction Activity Area provided that they are managed to avoid or mitigate adverse effects on the receiving environment and amenity values of the area."*

The second policy area is under the headings of Site Development Issues and Effects on the Visual Quality of the Area, 6D.1.2.1, and provides:

> " ***Objective***
> *To maintain and enhance the visual amenity values of the area.*
>
> ***Policies***
> a) *That adverse effects generated by extraction activities be managed to enhance the visual quality of the area.*
> b) *That extraction activities retain the indigenous vegetation on the face of the escarpment, particularly in areas of special amenity, as part of the visual backdrop for the City.*
> c) *That having taken into account planned future development, progressive rehabilitation measures be provided.*
> d) *That the design and external appearance of all buildings and structures be managed to maintain and enhance the amenity values of the area."*

In particular, the explanation and reasons set out under 6D1.2.1(6) refer to the "green backdrop" that the escarpment provides to the City, and the need to maintain the vegetation cover of the areas of special amenity value in Appendix 2(a) and 2(b).

<u>Comment</u>

This policy, tailored specifically to managing the Extraction Activity Area, is highly relevant to the Plan Change Request. It is proposed to be enhanced by an addition to Policy 6D1.1.1(a) along with a rewording of the associated explanatory paragraphs. Similarly, words are proposed to be added to Policy 6D1.2.1(c) which tie the rehabilitation processes to a planned best practice approach to be set out in the quarry management plan. This approach has already been provided through the applicable section in the Proposed Quarry Management Plan in Appendix 5 of this documentation.

The requested change to the permitted activity rule condition (m), and new proposed condition (o), give greater force to the policy through:

- requiring that the rehabilitation is undertaken progressively in line with stated objectives and processes, and
- that the quarry management plan is provided to the Council, and
- progress reporting on effectiveness is provided to the Council on at least a two-year basis.

The detailed analysis in Appendix 6 shows that by effective rehabilitation over time, along with the offsetting expansion of the northernmost Special Amenity Area, the visual and amenity changes that the requested Plan Change provide for are neutral in terms of achieving this objective.

In other words, if the requested Plan Change comes into effect, while quarrying may remove one area of elevated landform, over time the quarry faces elsewhere in the area that will be exposed will become “greened” over time. In addition, the Plan Change Request incorporates protection of an enlarged northern Special Amenity Area. The remaining part of the southern Special Amenity Area will continue to provide a visual buffer to many parts of the Hutt Valley, along with the expanded northern Special Amenity Area.

Overall, the requested Plan Change continues to retain, strengthen and protect the values that the District Plan’s policy for the Extraction Activity Area seeks. It also helps to achieve all of the Anticipated Environmental Results set out in 6D3 of the District Plan.

3.6.4 Chapter 14E Significant Natural, Cultural and Archaeological Resources

As noted earlier, part of the proposed expansion area of Belmont Quarry extends into an area mapped and identified as a Significant Natural Resource[33]. This listing, however, does not provide for protection of the existing vegetation[34]. Where Item 15 is within the Special Amenity Area, it is protected for visual, rather than habitat or ecological, values under the policy and rules of the Extraction Activity Area.

[33] Schedule 1, Chapter 14, Item 15, Haywards Quarry Bush.

[34] Winstones has confirmed this through obtaining a certificate of compliance for removal of all indigenous vegetation on the Firth Block outside the Special Amenity Areas, and also through correspondence with the Council.

The objective that relates to the identification of this bush area in Chapter 14E of the District Plan is *"to identify and protect significant natural .... resources in the City from inappropriate subdivision, use and development"*. Even if this were to be applied, it is unlikely that the proposed quarry extension would be found to be inappropriate. This is because it enables use and development of a relatively scarce resource, and one that is necessary for the community. It would also be considered appropriate because of the minor nature of the effects, the attention that has been paid to limiting adverse effects through the Quarry Management Plan (including the rehabilitation), and the ecological benefits that will be derived from protecting an approximately equivalent area of land within the Extraction Activity Area alongside the Belmont Regional Park.

3.7 Conclusion in Terms of Policy Context

The analysis in this section shows that there should be no problem in approving the requested Plan Change in terms of the policy context that applies. This includes recognition that the Plan Change Request includes policy and rule components that are intended to strengthen the effectiveness of the existing policy content within the Extraction Activity Area in the District Plan.

The requested Plan Change, on a balanced comprehensive assessment, is in accordance with Part 2 RMA matters.

It raises no issues in terms of national policy instruments.

Regional policy in the RPS provides no impediments to the extension of Belmont Quarry, subject to the proposed mitigation and the remedies which will be achieved over time. Specific regional policy supports the utilisation of available local mineral resources for the benefit of the community.

Because of the detail of the requested Plan Change, and the limited nature and extent of associated adverse effects, there is an enhancement of existing District Plan policy, and no conflict with the policy direction – before or following the requested Plan Change.

4 SECTION 32 ANALYSIS

4.1 General

RMA section 32, consideration of alternatives, benefits and costs, is a requirement of any plan change, variation or new plan. Relevant parts of section 32 are set out in full here.

" 1. *In achieving the purpose of this Act, before a proposed plan, proposed policy statement, change, or variation is publicly notified, a national policy statement or New Zealand coastal policy statement is notified under section 48, or a regulation is made, an evaluation must be carried out by:*
   - a) *the Minister, for a national environmental standard or a national policy statement; or*
   - b) *the Minister of Conservation, for the New Zealand coastal policy statement; or*
   - ba) *the Minister of Aquaculture, for regulations made under section 360A; or*
   - c) *the local authority, for a policy statement or a plan (except for plan changes that have been requested and the request accepted under clause 25(2)(b) of Schedule 1); or*
   - d) *the person who made the request, for plan changes that have been requested and the request accepted under clause 25(2)(b) of Schedule 1.*

2. *A further evaluation must also be made by:*
   - a) *a local authority before making a decision under clause 10 or clause 29(4) of Schedule 1; and*
   - b) *the relevant Minister before issuing a national policy statement or New Zealand coastal policy statement.*

3. *An evaluation must examine:*
   - a) *the extent to which each objective is the most appropriate way to achieve the purpose of this Act; and*
   - b) *whether, having regard to their efficiency and effectiveness, the policies, rules, or other methods are the most appropriate for achieving the objectives.*

3A. -

4. *For the purposes of the examinations referred to in subsections (3) and (3A), an evaluation must take into account:*
   - a) *the benefits and costs of policies, rules, or other methods; and*
   - b) *the risk of acting or not acting if there is uncertain or insufficient information about the subject matter of the policies, rules, or other methods.*

5. *The person required to carry out an evaluation under subsection (1) must prepare a report summarising the evaluation and giving reasons for that evaluation."*

As a requested Plan Change, the processes in section 32(1)(d) and (5) apply at this stage and this section meets those requirements.

In this case, there are no modifications to the range of objectives that frame the Plan Change Request, so there is no requirement for a section 32 analysis relating to section 32(3)(a). The change to the District Plan that is sought is limited to minor wording changes to two policies, a change of wording to one permitted activity rule, and to a modified component of another permitted activity rule which relates to specific locations in one of the two Extraction Activity Areas. A new permitted activity condition is also proposed to be added. Therefore the section 32 evaluation must consider, in terms of section 32(3)(b):

> " *whether, having regard to their efficiency and effectiveness, the policies* [and] *rules .... are the most appropriate for achieving the objectives"*.[35]

This implies that there may be a range of ways of achieving the objectives, so an evaluation of alternatives to the change included in the Plan Change Request must be considered.

Section 3 of this report has evaluated the extent to which the Plan Change Request is consistent with the policy framework particularly at regional and district level, but also in terms of the purpose and principles of the RMA. No inconsistencies were found: rather, the change is consistent with the purpose and principles of the RMA and would give effect to a range of stated regional and district objectives and policies.

4.2 Evaluation of Options – Policy

The small modifications proposed to the policies have been put forward following discussions with Council officers, as a means of meetings concerns expressed about the current wording of parts of the policies and associated explanations.

The options considered in relation to the policy content of the Extraction Activity Area were to retain the current wording (i.e. to do nothing) or the proposed wording. There has been no suggestion that the objectives for the Extraction Activity Area should be changed and, in the context of a requested Plan Change, it would be reasonable therefore to limit changes to those minor wording changes which might improve the meaning or implementation of the policy framework.

Table 2 sets out the analysis of the proposed policy changes.

[35] The other matters that are relevant under section 32(3)(b) are methods, but the District Plan does not include Methods, and none are proposed in the Plan Change Request.

Table 2: Analysis of the Proposed Policy Changes

Options	Efficiency and Effectiveness	Benefits	Costs
Retain current wording	This would be efficient and effective. The current provisions have been in place for a long period and there have been no identified problems with the quarry. However, the two policies which are sought to have their wording modified are not particularly meaningfully worded. For example, the policy (a) under 6D1.1.1 is basically a repeat of the objective under the same heading and makes no connection to the rules in the Plan, or to the method of a quarry management plan, which is only referred to in the Explanation and Reasons section. Similarly, the policy (c) under 6D1.2.1 does not provide an effective basis for the necessary rehabilitation of the cut faces of the quarry, which in some cases are visible beyond the site.	There would be no changes to the Plan wording.	There would be no costs involved.
Modify wording as proposed	This would equally be efficient and effective as part of a Plan Change Request which will enable ongoing use of the Extraction Activity Area for its intended purpose. The modified wording proposed provides an improved basis on which to upgrade and maintain the quarry management plan, and to undertake best practice rehabilitation over time. It also removes some wording in the Plan which is currently incorrect or imprecise.	The benefits are greater clarity in methods of managing effects through the quarry management plan and rehabilitation requirements.	Costs are small, as they are an ancillary part of a plan change request which focuses on rules.

There are small improvements in clarity, and therefore in efficiency and effectiveness, at low cost, from the requested changes. They are therefore appropriate.

4.3 Evaluation of Options – Rules

4.3.1 Modification to Appendix Extraction 2A

The evaluation of the efficiency and effectiveness, benefits and costs of options considered in developing the Plan Change Request relating to the modification of Appendix Extraction 2A is set out in Table 3 below.

The following options have been assessed:

1. **Retain Current Provisions** – this is the "do nothing" approach. It would retain the Special Amenity Area, but result in quarry closure within 5 to 10 years as the available resource is worked out.
2. **Retain Current Provisions – Seek Consent as a Discretionary Activity** – this option would involve no change to the District Plan and would be a possible approach, but, as the whole of the quarry activity on the site is only permitted while all the permitted activity conditions are met, there would be a considerable risk to the ongoing quarry operations associated with this course of action. It would also result in loss of integrity in terms of Appendix Extraction 2A of the District Plan, as the areas indentified would not be protected.
3. **Retain Current Provisions except for Change to Special Amenity Areas on Appendix Extraction 2A** – this is the option which forms the basis for the Plan Change Request. It aligns the mapped areas with the permitted activity condition as currently provided for, and retains District Plan integrity.
4. **More Complex Rule Changes** – this option would involve changing the rules so that the protection of the Special Amenity Area required under Rule 6D2.1.1(l) was not associated with quarrying in the remainder of the Extraction Activity Area. For example, the requirement could be removed from the permitted activity conditions (Rule 6D2.1.1(l) and replaced with a requirement that any extraction activity in the Special Amenity Areas in Appendix Extraction 2A was a discretionary activity. This would be complex to evaluate and would result in administrative difficulty (for both consent-holder and the Council), with the status of the activity being different in one part of the Extraction Activity Area from immediately adjoining areas – i.e. one part of the continuous quarry activity may have to operate under different conditions from the remainder of the quarry. Also, there would be lack of plan integrity in terms of the protection of the mapped Special Amenity Areas in Appendix Extraction 2A.

Table 3: Analysis of Options

Options	Efficiency and Effectiveness	Benefits	Costs
Retain Current Provisions	No longer efficient and effective, as it creates a significant barrier to the use and development of the remaining area of useable quarry material within the only functioning Extraction Activity Area in the District Plan. The importance of the quarry resource is identified in the District Plan as a District Wide matter. The information about the nature of the quarry material over the Expansion Activity Area was not known at the time the provisions in Appendix Extraction 2A were introduced. While consent could be sought, there are significant barriers in terms of how the rules for the Activity Area work (see Option 2). This option would retain an elevated area with its current topography and vegetation cover.	Retains part of the "green backdrop" to the valley floor.	Prevents access to a valued quarry resource, and will lead to the early closure of the Belmont Quarry – the only hard rock quarry in the district.
Retain Current Provisions – Seek Consent as a Discretionary Activity	This option is not efficient and effective due to the high risk to the existing quarry activity (i.e. a consent would be needed for the whole of the quarry activity, as a permitted activity condition would not be met and Rule 6D2.2(b) would apply). There are costs and potential ongoing administrative issues for the consent-holder (assuming consent was granted) and the Council with this option. The integrity of the District Plan would also be affected, as the areas in Appendix Extraction 2A would no longer be protected if consent was granted.	No particular benefits identified.	• Costs of preparing full application for consenting the whole of the quarry. • Cost of uncertainty in new additional controls or decline of consent for the whole quarry. • Ongoing costs in administering consent, for Council and applicant.

Retain Current Provisions except for Change to Special Amenity Areas on Appendix Extraction 2A (see Appendix 1 to this report)	Efficient and effective, as it enables access to the remaining useable resource in the Extraction Activity Area. It also clearly establishes protected areas and avoids the need for an additional consent. The District Plan will retain its integrity and an approximately equivalent area of landform and vegetation would be protected under the requested Plan Change.	Access is provided to the remaining useable resource in the Extraction Activity Area and extends the life of the Belmont Quarry (and the other two quarries in Wellington City area) by 30 to 40 years. The District Plan's integrity is retained and an extension to the northern protected area is provided.	Costs of Plan Change Request only.
More Complex Rule Changes	Not efficient, and unlikely to be effective. Any change would affect several provisions in the District Plan and would introduce different quarry activity status in different parts of the Extraction Activity Area. It would mean that one part of the quarry would operate under a consent and the remainder would not. Plan integrity would also be at issue, as this option would also involve a consent being sought to quarry an area protected under the District Plan.	Could have some benefits if the District Plan did not require the quarry to operate under an integrated Quarry Management Plan.	• Costs of plan change and consent process. • Ongoing costs in administering a complex consent without clear boundaries for Council and applicant. • Costs of risks due to the consenting process and District Plan integrity issue (see comment in first column).

The analysis above identifies that Option 3 – the option provided for through the Plan Change Request – is the most efficient and effective, and also involves the greatest benefits and probably the least cost (including costs of uncertainty) once in place. It is also the only option that enables the Special Amenity Area provisions to retain their integrity.

It is therefore the most appropriate for achieving the RPS and District Plan's objectives, including those relating to availability of quarry products, and also those relating to maintenance of visual and ecological values.

4.3.2 Modification to Permitted Activity Condition (m)

The modifications to permitted activity condition (m) add a connection to the quarry management plan whereby progressive rehabilitation must take place in accordance with objectives and processes for site rehabilitation set out therein. This is a measurable performance requirement, which is in accordance with typical best practice for management plans (for example, under consent conditions). At the same time, wording that is inappropriately constructed (and already partly found in the Explanation and Reasons (c), under 6D1.2.1) is to be removed. The outcome will be wording for this condition that reads more like a rule than a policy.

The only options considered have been to retain the current wording or to make the change proposed. Table 4 sets out the analysis.

Table 4: Analysis of Options – Modification to Permitted Activity Condition (m)

Options	Efficiency and Effectiveness	Benefits	Costs
Retain current provision	Would be difficult to enforce and/or to demonstrate compliance because of loose wording.	No particular benefits identified.	No costs involved.
Reword as proposed (see Appendix 1, Item 4)	Meaningful and measurably at any time, and therefore likely to be efficient and effective.	Benefits to Council and community through a clear staged progressive rehabilitation approach set out in the quarry management plan provided to the Council, and regularly reported on and reviewed.	Costs for quarry operator in planning rehabilitation programme through the quarry management plan.

The second option is therefore the most appropriate in terms of achieving acceptable rehabilitation outcomes, and in meeting the statutory requirements of certainty and measurability for conditions in rules in the District Plan.

4.3.3 New Permitted Activity Condition (o)

The requested new permitted activity condition which sets out specific requirements for a quarry management plan to be developed, provided to the Council, regularly reviewed and a progress report on its effectiveness to be provided to the Council every two years, is intended to close a "gap" in terms of the permitted activity conditions in relation to the quarry management plan. The quarry management plan is recognised and provided for in the policy framework for the Extraction Activity Area as an important method for avoiding, remedying or mitigating adverse effects.

However, the District Plan's rules framework have lacked any means of enforcing the policy. The proposed additional condition is clear and its achievement will be measurable. It will form a basis for communication between Council and quarry operator, and for iterative improvements to practice through monitoring effectiveness and modifying and improving the management plan itself.

The only options considered have been to omit such a rule or to have the rule as proposed. Table 5 sets out the analysis.

Table 5: Analysis of Options – New Permitted Activity Condition (o)

Options	Efficiency and Effectiveness	Benefits	Costs
No condition requiring quarry management plan (i.e. status quo)	No basis for enforcement and/or demonstration of achievement of policy requirement, therefore ineffective.	No particular benefits.	No particular costs.
Proposed new condition	Efficient and effective, as the wording provides a number of measurable performance requirements.	Benefits in provision of information on a regular and purposeful basis to demonstrate achievement of condition.	Costs to quarry operator and new requirement for a performance report every two years. Small cost to the Council in reviewing the reports and any engagement with the quarry operator.

The second option is efficient and effective, and will help achieve the objectives and policies set out in the District Plan relating to the quarry management plan as a method of managing effects in the Extraction Activity Area. It is therefore the most appropriate.

4.4 Risks of Acting or Not Acting

This matter needs to be evaluated if there is "uncertain or insufficient information about the subject matter" of, in this case, the proposed minor policy improvements and changes to relevant rules.

It is considered that the policy changes are so minor that no risks are involved either way. Without the changes, the District Plan provisions would continue to be able to be administered effectively. However, the changes to provide some additional clarity on how the provisions are inter-related and the wording is improved.

In terms of the change relating to the Appendix Extraction 2A rule requirement, at the time that the provision was brought in, it was thought that the remainder of the Extraction Activity Area held more good-quality rock resource, and that the area identified in Appendix Extraction 2A would not need to be quarried. As noted earlier, recent investigations have found that not to be the case, with the only remaining economic resource being in or adjacent to the Firth Block.

With this new information, it can be now stated with certainty that the existing Belmont Quarry has a very limited life if it is not able to be extended as shown in Appendix 5, the Proposed Quarry Management Plan. While that reduces the risk of uncertainty, it clearly indicates that the achievement of the RPS and District Plan objectives relating to availability of quarry materials is at risk, due to the imminent closure of the only quarry in the City of Lower Hutt and the associated reduction in life of the Kiwi Point and Horokiwi quarries, if the requested Plan Change does not proceed.

Consideration of risk under section 32(4)(b) leads to a realisation that there is some urgency in making the requested Plan Change to reduce the current risk to achievement of the existing objectives and policies of the District Plan.

The documentation provided with the requested Plan Change has also investigated the associated visual and ecological implications. It has addressed these potential issues through including a new area of protected vegetation, thereby reducing potential adverse ecological effects and providing for some visual mitigation. Further visual mitigation is provided through a rehabilitation plan component in the Quarry Management Plan. Thus there are no unidentified areas of risk associated with these aspects of the requested Plan Change.

The other two requested changes relating to the rules – rewording of permitted activity condition (m) and new condition (o), remove the following risks:

- A risk in (m) as currently worded that the site could be left un-rehabilitated until quarry activities are completed. This risk arises from the inadequate wording of the second paragraph of the rule. The replacement wording ties the progressive rehabilitation requirement into the staging requirements and rehabilitation approach set out in the quarry management plan (required under policy (a) of 6D1.1.1, and the associated explanation, and policy (c) of 6D1.2.1, which also refers to the quarry management plan through the proposed policy changes.
- A risk that the Council may not have the ability to view the quarry management plan, nor to check its effectiveness. The proposed new condition (o) specifically addresses this by requiring that the quarry management plan is provided to the Council and a monitoring report on its effectiveness is also provided to the Council every two years. Policy under 6D1.1.1 states that a 5-yearly or more frequent review and update of the quarry management plan must be undertaken by the quarry operator.

5 CONSULTATION

This section sets out the consultation undertaken for the proposed quarry extension. As Winstones Plan Change Request did not initially incorporate any text changes to Chapter 6D of the District Plan, all consultation was done on the basis of a change to the Special Amenity Area boundaries through Appendix Extraction 2A, and the associated extension of quarry activities in this area only.

Consultation programme development was undertaken to identify key stakeholders, including tāngata whenua, the Department of Conservation and Wellington Regional Council experts, local community groups, community committees for the nearby areas (including local Councillors), the Belmont Quarry Liaison Group (which has been in place for several years as a consequence of the overburden disposal resource consents) and finally the general public.

Information packs were prepared and sent out in advance to the range of people where meetings were proposed, including site visits (see Appendix 8). The Open Days were advertised in the Hutt News on two occasions (16th and 23rd July) and posters were put up in community places such as supermarket notice board areas inviting the public to attend to find out more about the proposed quarry extension. The Open Day display material included background, plans and visual simulations of the proposal so that people could understand how it might affect them.

In addition, meeting were held with Wellington Regional Council staff, Hutt City Council staff and the Mayor of Lower Hutt to explain the need for the proposal and how it is proposed to manage the development and its environmental effects.

The consultation programme undertaken was a thus multi-stage process which commenced in May 2013 and is ongoing through an “open door” policy. Outcomes to date are summarised in Table 3 below.

Table 6: Consultation Programme

Party	Consultation & Comments	Date
Stage One – Targeted Consultation		
Port Nicholson Block – Liz Mellish	Letter and consultation pack posted out 13th June. Followed up with a phone call and invitation for a site visit and / or meeting. Meeting – 12th July Letter received 30th July confirming support/no objection, subject to a few minor requests (see Appendix 9).	**June/July 2013**
Local Runanga (Te Runanganui o Taranaki Whanui ki te Upoko o te Ika	Letter and consultation pack posted out 13th June. Followed up with a phone call and invitation for a site visit and/or meeting.	**June/July 2013**

a Maui) – Teri Puketapu	Site visit – 3rd July Letter received 22nd July confirming support / no objection (see Appendix 9).	
Ngati Toa – Reina Solomon & Jennie Smeaton	Letter and consultation pack posted out 13th June. Followed up with a phone call and invitation for a site visit and/or meeting. Site visit – 11th July Email received 23rd July confirming support / no objection, subject to further discussion around a possible scholarship, internship or development initiative. Request for technical studies to be provided, once available (see Appendix 9).	**June/July 2013**
Department of Conservation Anna Glassie – Conservation support officer, planning Dan Palmer – Ranger David Moss – Ranger, biodiversity threats	Letter and consultation pack posted out 13th June. Followed up with a phone call and invitation for a site visit and / or meeting. Site visit – 11th July (Dan Palmer and David Moss) Bird and botany reports provided, along with draft vegetation maps on July 16th. Request for any further technical studies to be provided, once available. No formal feedback to date.	**June/July 2013**
Belmont Quarry Liaison Group	Letter, consultation pack, agenda and feedback form posted out 2nd July (60 in total). Meeting held 18th July, on site. One attendee (Alan Batson), positive feedback and no objection to the proposal. Feedback via email from Upul Wickremasinghe – not concerned about the proposal at this stage.	**6pm 18th July**
Fish and Game – Alexandra King	Letter and consultation pack posted out 1st July. Email from Alexandra King 22nd July. Alex has requested to be kept in the loop as the project develops and is keen to see the technical reports once they are available. Request for technical studies to be provided, once available.	**July 2013**
Belmont Regional Park Regional Council Parks team Owen Spearpoint and Lynly Selby-Neal	Letter and consultation pack posted out 1st July. Site visit 11th July Bird and botany reports provide, along with draft vegetation maps on July 16th. Request for any further technical studies to be provided, once available.	**July 2013**

	No formal feedback to date, although Hadyn Butler (biodiversity advisor) has advised that RPS 47 should be considered.	
Hutt City Council Parks team	Letter and consultation pack posted out 2nd July. No formal feedback to date.	**July 2013**
Friends of Belmont Regional Park	Letter and consultation pack posted out 2nd July. No formal feedback to date.	**July 2013**
The Tararua Tramping Club	Letter and consultation pack posted out 2nd July. No formal feedback to date.	**July 2013**
Submitters - Stokes Valley Subdivision	Letter and consultation pack posted out 2nd July (33 in total). Feedback from Peter Murphy, would be concerned if he could see the proposed development. Can't see Belmont Quarry at present. No further feedback to date	**July 2013**
Stage Two – Presentation to Community Committees		
Northern Community Committee Councillors Angus Finlayson Gwen McDonald	15 minute presentation, followed by questions and answers. No specific issues were raised.	**July 2013** Evening 10th July
Western Community Committee Councillors Margret Cousins Max Shierlaw	15 minute presentation, followed by questions and answers. Matters raised related to the proposed Kelson growth area, and general management of the quarry.	**July 2013** Evening 11th July
Stage Three – General Consultation		
General Consultation	Three public consultations events (Tui Glen School Hall, Pomare School Hall and Walter Nash Stadium). Four large display boards, double sided with two A1 posters on each side. Winstone Aggregates personnel were available to answer specific questions and queries (Geoff Cooke, Ian Wallace). They were supported by Sylvia Allan (planning consultant) and Rhys Girvan (visual impact assessment consultant). Times and locations were advertised via the Hutt newspaper on the 16th and 23rd of July. Flyers were put up at eight supermarkets within the Lower Hutt region.	**July 2013**

Tui Glen School Hall	**Two attendees.** 1st attendee lives in Holborn Drive. After viewing the information boards confirmed that he was not affected by the proposal. He can currently see the old Dry Creek Quarry from his property. 2nd attendee was a local roading contractor who was interested in the proposal after reading the advertisement in the local paper. No objection, interest only.	**2pm – 3.50pm 26th July**
Pomare School Hall	**Three attendees** 1st & 2nd attendees – elderly couple who live in Molesworth Street. Not specifically concerned about the proposal, however they did raise concern about the current operation. It was felt that dust from the site could be managed better, especially on dry/windy days. Quarry blasting is also notable. 3rd attendee – Passionate dislike of Fletcher Building, does not trust the company and does not want to see any further damage to the escarpment/hillside. Opposed.	**4.10pm – 6pm 26th July**
Walter Nash Stadium	**Six attendees** 1st & 2nd attendees – Couple who live in Molesworth Street. Raised concern about the current operation, dust control, noise and blasting. They stated that blasting was similar to a small earthquake, early morning noise is a disturbance and dust is an on-going problem. They acknowledged that the quarry has a role in terms of providing jobs and aggregate to local and regional areas. No specific concerns were raised about the proposal, other than current issues (blasting, dust and noise). It was noted that current concern is associated with work near to the SH at the south eastern part of the site – the proposal would be better shielded from valley residents. 2nd & 3rd attendees – Mature couple from Holborn Drive. Currently look across into the old Dry Creek Quarry. After consulting the map, they decided that they are not affected by the proposal. 4th to 6th attendees – Family from Liverton Road. They submitted on the overburden consents a couple of	**10.00am – midday 27th July**

	years ago (Cottle consents). They are still unhappy with the overburden works and wanted to know where overburden from the Firth Block will go (into the current overburden area). They can't see the quarry itself and from a visual point of view, it is understood that they will not be affected by the proposal.	
Quarry Site Tours	**Twelve attendees** Those who attended included western ward elected representatives, community committee representatives, and a number of people who had either attended an Open Day or received a letter about the proposals. Quarry staff provided a site tour. The information boards from the Open Days were also available for viewing.	**10am onwards, 3rd July**

To date, no major issues have been raised in terms of the proposal. The small number of concerns raised by residents about the current operation is related specifically to the current working area at the lower end of the site, or to the overburden disposal on the Cottle block nearby. There was a general recognition of the need for a quarry somewhere in the district. Technical experts associated with the Councils and the Department of Conservation are interested particularly in ecological values and seek that long-term remediation of the site should have ecological considerations built into the processes.

Tāngata whenua groups are generally neutral or supportive of the proposal. Two of the three organisations consulted sought the opportunity to maintain or develop closer links with the quarry, as demonstrated in the correspondence in Appendix 9.

It is considered that the small changes to the policies and rules which are now included within the Plan Change Request as a result of discussions with Council officers would not have made any difference to the consultation undertaken, or to its outcomes.

6 CONCLUSION

The main part of the Plan Change Request involves reducing the extent of one identified Special Amenity Area within the Extraction Activity Area in the City of Lower Hutt District Plan, while increasing the size of the other Special Amenity Area. This part involves a change to a single Appendix Map to the Extraction Activity Area provisions

As a result of discussions with Council officers since the request was initially lodged, Winstones has modified its Plan Change Request to incorporate minor changes to two policies and one associated explanation within the Chapter 6D, Extraction Activity Area provisions. It has also sought a wording change to one permitted activity condition and the addition of a further condition. These are intended to improve the current wording of the provisions.

The reason for the Plan Change Request, and the purpose it seeks to achieve, is to enable the ongoing extraction of good quality rock at Belmont Quarry, which occupies the only operational Extraction Activity Area within the City of Lower Hutt District Plan. Resource investigations in the past few years have revealed that parts of the area occupied by the southern Special Amenity Area include the only remaining economically viable rock resource suitable for extraction. Without the ability to extend the extraction area, the quarry would close within the next decade.

This report has been prepared in accordance with RMA requirements as a basis for initiating the procedures for a Plan Change that is not initiated by the Hutt City Council itself. All the information required to be provided to support such a change, including an assessment of effects, an analysis of the relevant policy context, and a RMA section 32 analysis is included. Additional material is provided in Appendices 1 to 9, to assist in an understanding of the Plan Change Request.

The material demonstrates that the changes to the City of Lower Hutt District Plan that are sought through the Plan Change Request meet the requirements of the RMA and are in accordance with the purpose of section 5 of that Act, in that the provisions of the Extraction Activity Area will provide for the wellbeing of the people and communities of the Hutt Valley and the wider Wellington region, while effectively avoiding, remedying and mitigating adverse effects on the environment.

APPENDIX 1 – REQUESTED PLAN CHANGE

- Changes to Text of Chapter 6D – Extraction Activity Area
- Changes Requested to Appendix Extraction 2A
- Aerial Photo showing Appendix Extraction 2A Context
- Appendix Extraction 2A Following Plan Change

Requested Changes to Text of Chapter 6D – Extraction Activity Area

1. Add the following words at the end of Policy (a) under 6D1.1.1: *"including through specified conditions and a quarry management plan".* The full policy would then read (additions underlined): "That adverse effects of extraction activities on the receiving environment are avoided or mitigated, including through specified conditions and a quarry management plan".

2. Amend the Explanation and Reasons under 6D1.1.1, section (b), second paragraph, to read (words to be removed shown struck out, and additional wording underlined): "Quarry management plans can be used to avoid, remedy or mitigate the adverse effects of extraction activities ~~in some circumstances~~. ~~These plans address a range of environmental issues, including topography, flora, hydrology, water and soil management, visual impacts, noise, dust, traffic, rehabilitation and monitoring.~~ Where active extraction activities are being undertaken, a quarry management plan shall be prepared and regularly updated, which sets out (as relevant):

    - intended staging of the quarry activity
    - the means of management of surface water
    - any specific provisions relating to on-site management of dust, noise, vibration and water quality
    - procedures for addressing any complaints
    - objectives and processes for site rehabilitation, including:
        - indicative staging for the rehabilitation of quarry faces
        - measures to create soil conditions to support plant growth
        - means of managing runoff to avoid erosion
    - management of buffer areas
    - any other practices and methods to ensure that permitted activity conditions applying to on-site activities are met.

    The quarry management plan will complement the permitted activity conditions that apply to the extraction activity and will provide additional management details. It will be reviewed at least every five years and any necessary adjustments will be made.
    The management of adverse effects is shared jointly with the Regional Council where discharge and other permits are required. ~~Extraction activities will be a Restricted Discretionary Activity to ensure that the quarry management plan shows compliance with the standards and terms.~~"

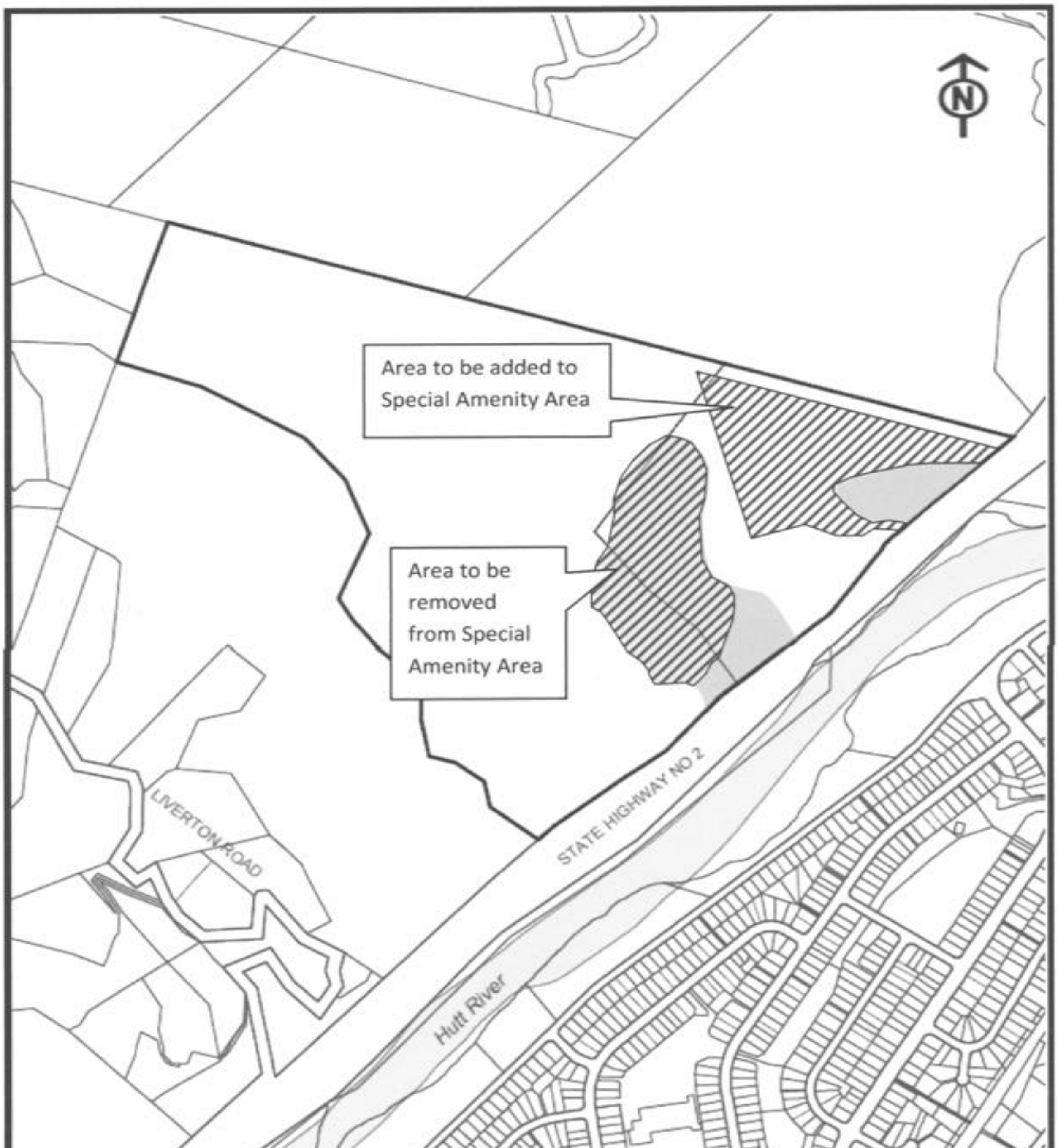
3. Add the following words at the end of Policy (c) under 6D 1.2.1: "*which apply objectives and processes set out in the quarry management plan*". The full policy will then read:

"That having taken into account planned future development, progressive rehabilitation measures be provided which apply the objectives and processes set out in the quarry management plan."

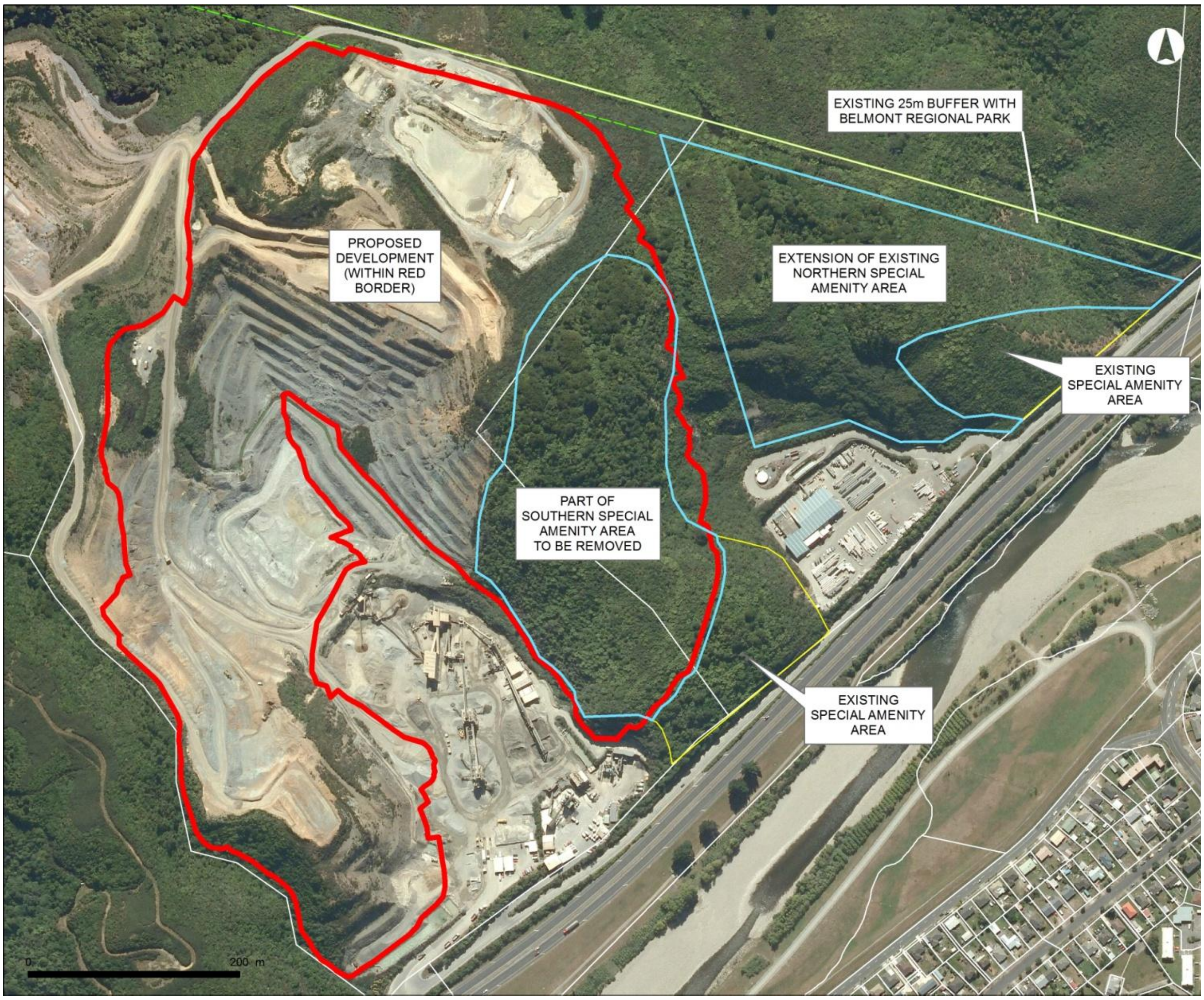
4. Modify 6D 2.1.1, Permitted Activities Condition (m), by removing the second paragraph, and by adding the following words at the end of the first paragraph: "*in accordance with the objectives and processes for site rehabilitation set out in the quarry management plan*". The rule would then read "The quarry shall be progressively rehabilitated taking into account planned future development in accordance with the objectives and processes for site rehabilitation set out in the quarry management plan. ~~When extraction activities cease, the site shall be rehabilitate by hydro seeding benches and cut faces, and rehabilitation of top soil and revegetation of the quarry floor. This shall be with native species except where exotic species may be used initially to provide nurse cover for native plants.~~"

Add a new Permitted Activity Condition (o) to 6D2.1.1, as follows: "**Quarry Management Plan:** Where active extraction activities are being undertaken, the quarry operator shall prepare and maintain a quarry management plan. A copy of the quarry management plan shall be provided to the Council and, no less than every two years, the operator shall provide a progress report to the Council on the effectiveness of the quarry management plan, and advise of any changes that have been made."

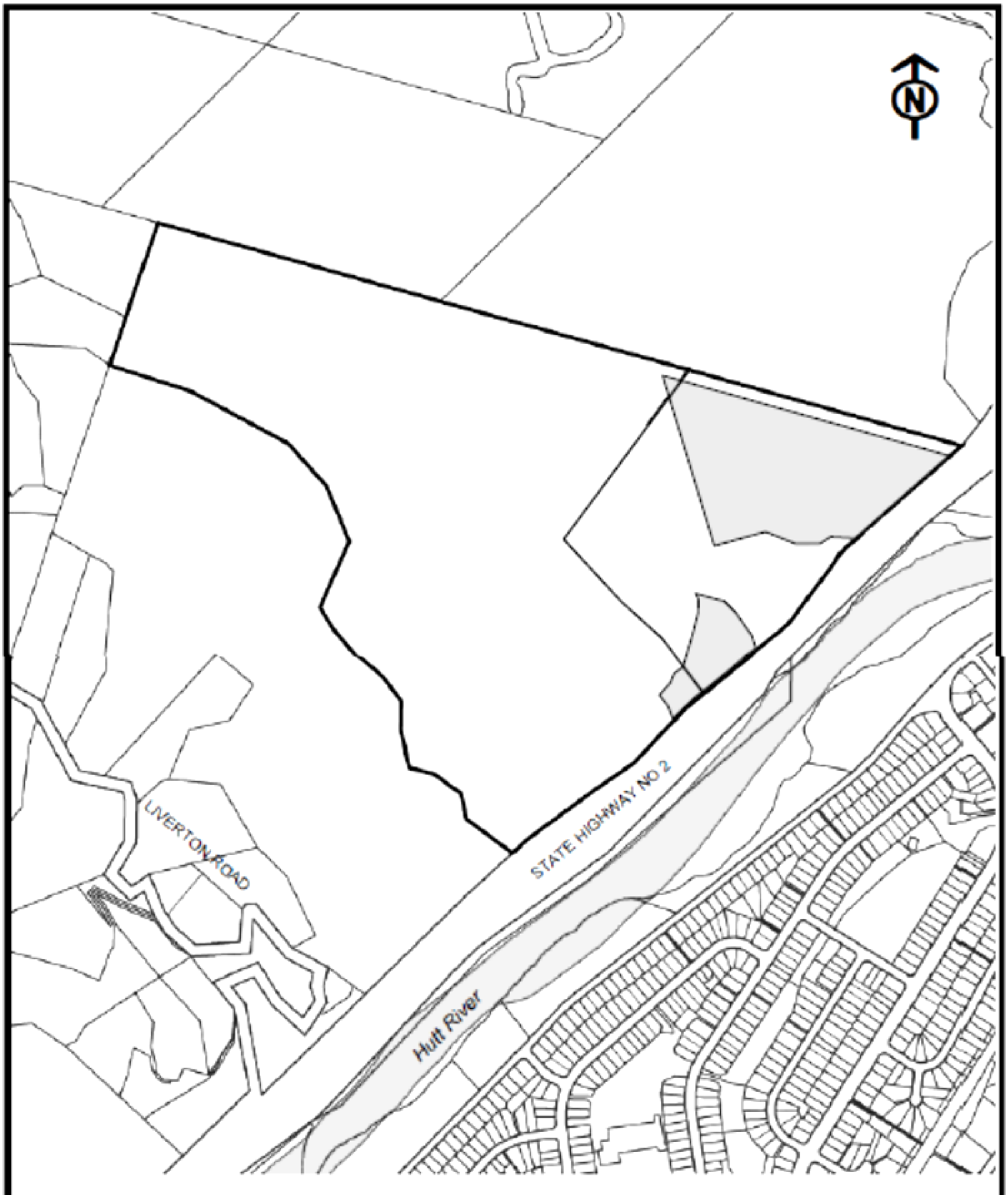
Appendix Extraction 2A - PLAN CHANGE REQUEST



Protection of Special Amenity Areas in the Extraction Activity Area near Liverton Road


EXISTING 25m BUFFER WITH
BELMONT REGIONAL PARK
PROPOSED
DEVELOPMENT
(WITHIN RED
BORDER)
EXTENSION OF EXISTING
NORTHERN SPECIAL
AMENITY AREA
EXISTING
SPECIAL AMENITY
AREA
PART OF
SOUTHERN SPECIAL
AMENITY AREA
TO BE REMOVED
EXISTING
SPECIAL AMENITY
AREA
0
200 m

Appendix Extraction 2A - FOLLOWING PLAN CHANGE



Protection of Special Amenity Areas in the Extraction Activity Area near Liverton Road

APPENDIX 2 – CERTIFICATES OF TITLE, BELMONT QUARRY

COMPUTER FREEHOLD REGISTER
UNDER LAND TRANSFER ACT 1952

Search Copy

REGISTRAR-GENERAL OF LAND NEW ZEALAND

R.W. Muir
Registrar-General
of Land

Identifier **WN31D/969**
Land Registration District **Wellington**
Date Issued 20 May 1988

Prior References
WN549/175

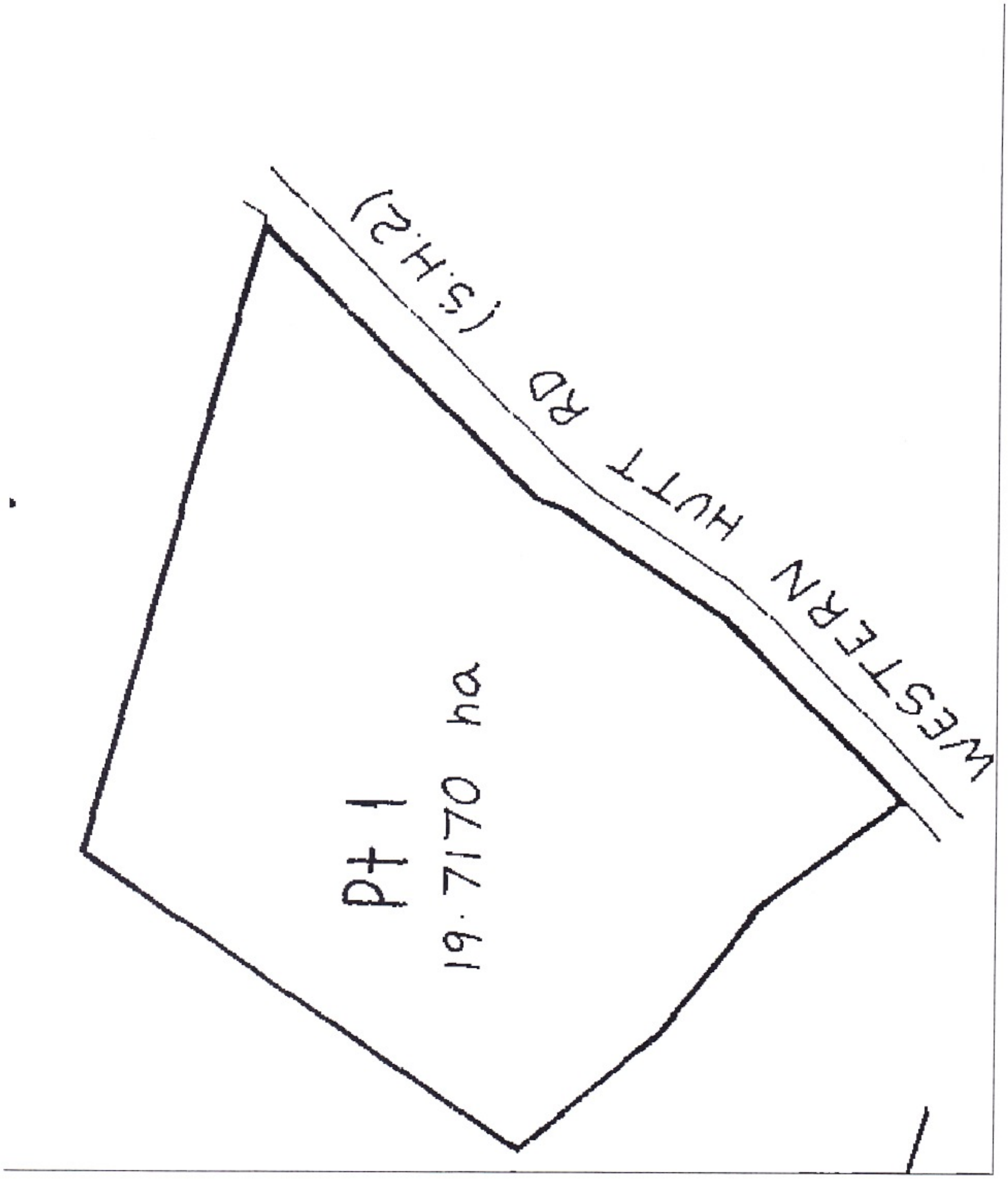
Estate	Fee Simple
Area	19.7170 hectares more or less
Legal Description	Part Lot 1 Deposited Plan 22561

Proprietors
Fletcher Concrete and Infrastructure Limited

Interests

9032630.1 Encumbrance to Hutt City Council - 28.9.2012 at 9:38 am

Identifier **WN31D/969**



Encumbrancer	**Fletcher Concrete and Infrastructure Limited**
Encumbrancee	**Hutt City Council**
Nature or security	Annual rent charge of $1.00 per annum
Length of term	999 years
Payment date(s)	1st of January of each year, if demanded
Rate(s) of interest	

Event(s) in which the sum, annuity, or rent charge becomes payable:

If demanded or if terms of encumbrance breached by Encumbrancer

ANNEXURE SCHEDULE

1 Parties

1.1 Fletcher Concrete and Infrastructure Limited ("the Encumbrancer").

1.2 **Hutt City Council**, a body corporate pursuant to the Local Government Act 2002 ("the Encumbrancee").

2 Background

2.1 The Encumbrancer applied to the Encumbrancee for a resource consent to undertake work on the land at 541-560 Hebden Crescent, Kelson Lower Hutt being:

(1) that parcel of land containing 19.7170 hectares more or less being Part Lot 1 on Deposited Plan 22561 and being all the land comprised and described in Certificate of Title WN31D/969; and

(2) that parcel of land containing 52.7260 hectares more or less being Lot 1 on Deposited Plan 60552 and being all the land comprised and described in Certificate of Title WN31B/39,

("the Land").

2.2 Resource Consent was applied for on 26 September 2011 under consent number RM110304 ("the resource consent").

2.3 As a condition of the granting of resource consent the Encumbrancer has agreed to enter into and execute this Memorandum for the purpose of formalising and legalising the protection of vegetation in a 7 metre wide area adjoining the northern boundary of Certificate of Title WN31D/969 [shown on Covenant Plan 452503 marked "Area A"] ("Vegetation Area") in order that no vegetation may be removed or destroyed from the Vegetation Area, except to control weeds.

3 Agreement

3.1 The Encumbrancer enters into this Memorandum of Encumbrance for the benefit of the Encumbrancee and covenants with the Encumbrancee as set out in clause 4 below.

4 Covenants and Conditions

4.1 The Encumbrancer covenants with the Encumbrancee to protect the Vegetation Area [marked " Area A " on Covenant Plan 452503] to the extent that no vegetation will be removed or destroyed from the Vegetation Area, except to control weeds.

4.2 The Encumbrancer covenants to otherwise comply with the terms of the rescource consent.

4.3 The Encumbrancer encumbers the land for the benefit of the Encumbrancee with an annual rent charge of $1.00 to be paid to the Encumbrancee by the first day of January in each year if demanded by that date. The first payment if so demanded is due on or before the 31st day of January next succeeding the date of this Memorandum.

4.4 No delay or failure by the Encumbrancee to enforce performance of any of the covenants set out in this Encumbrance and no indulgence granted to the Encumbrancer by the Encumbrancee shall prejudice the rights of the Encumbrancee to enforce any of their covenants or provisions of this Memorandum.

4.5 This Memorandum shall be fully binding on all transferees, assignees, successors in title, owners and occupiers of any estate or interest in the Land for the time being.

4.6 Section 203 Property Law Act 2007 applies to this Memorandum of Encumbrance as if it were a mortgage, provided however that a prior owner may be personally liable for a breach of a covenant of this Memorandum that occurred while such person was the owner of the Land notwithstanding that the owner for the time being of the Land is also liable for a breach of a covenant of this Memorandum.

4.7 Subject to the provisions of this Memorandum, the Encumbrancee will be entitled to all of the powers and remedies given to any party entitled to the benefit of an encumbrance under the Land Transfer Act 1952 and the Property Law Act 2007, but excluding the powers of sale afforded to a mortgagee.

4.8 The Encumbrancer shall permit the Encumbrancee (and its employees, contractors and agents) to enter onto the Land at reasonable times to ensure compliance with the covenants in this Memorandum.

4.9 The Encumbrancer shall pay the costs of the Encumbrancee relating to the preparation, registration and enforcement of this Memorandum.

4.10 The Encumbrancer shall and does indemnify and keep indemnified the Encumbrancee from and against all actions, suits, claims and demands which are made in consequence of or upon the grounds of the exercise of the Encumbrancee of its rights or remedies under this Memorandum.

4.11 If the Encumbrancer fails to comply with the covenants of this Memorandum, the Encumbrancee may at its sole discretion and at the cost of the Encumbrancer do all or some of the following:

4.11.1 Require the Encumbrancer to pay the rent charge;

4.11.2 Bring an action against the Encumbrancer for specific performance of the covenants of this Memorandum;

4.11.3 Prevent any person from approaching, using or occupying the Land;

4.11.4 Bring a prosecution under the Resource Management Act 1991, or any Act passed in substitution thereof;

4.11.5 Pursue any other remedies available to it.

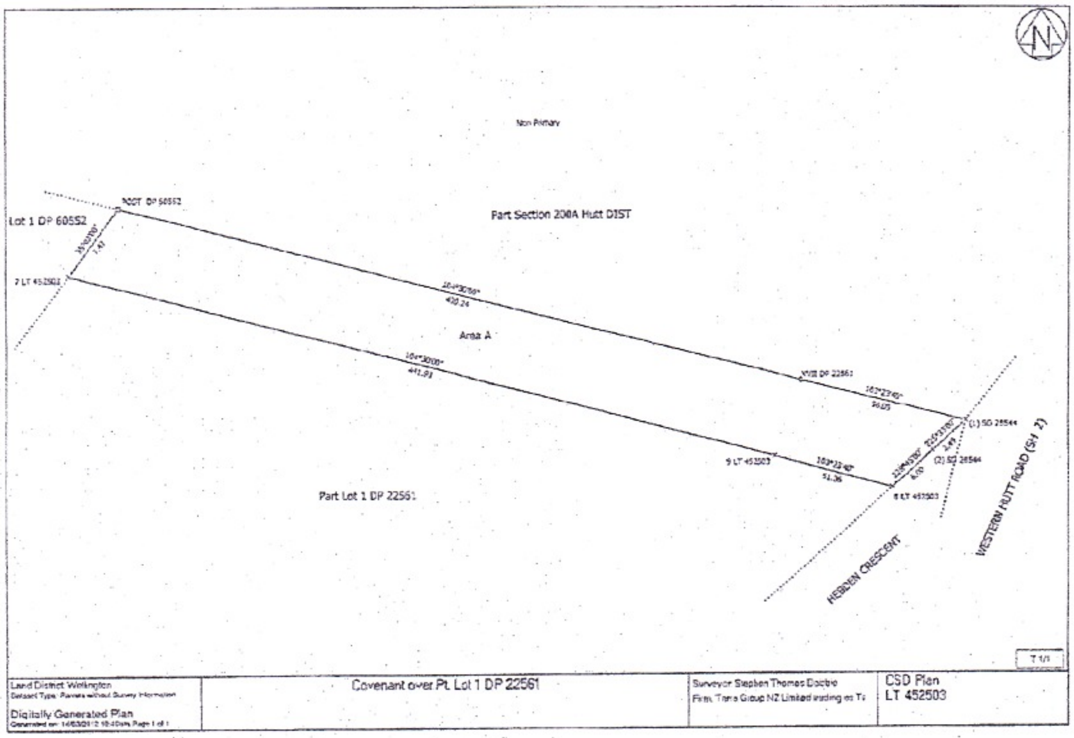
4.12 The Encumbrancer shall be entitled to a discharge of this Memorandum of Encumbrance if the covenants set out above become obsolete.

4.13 In this Memorandum, unless the context otherwise requires:

4.13.1 The expression "the Encumbrancer" shall include and bind the person executing these presents and its transferees, assignees, successors in title, and owners and occupiers for the time being.

4.13.2 Words importing one gender shall include the other as the case may require.

4.13.3 Words importing the singular or plural shall include the plural or singular number respectively.



Non Primary
Part Section 200A Hutt DIST
Lot 1 DP 60552
Area A
Part Lot 1 DP 22561
HEBDEN CRESCENT
WESTERN HUTT ROAD (SH 2)
Land District Wellington
Digitally Generated Plan
Covenant over Pt Lot 1 DP 22561
CSD Plan
LT 452503

COMPUTER FREEHOLD REGISTER
UNDER LAND TRANSFER ACT 1952

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**WN31B/39**
Land Registration District	**Wellington**
Date Issued	08 July 1987

Prior References

WN19A/709	WN348/92	WNE3/862

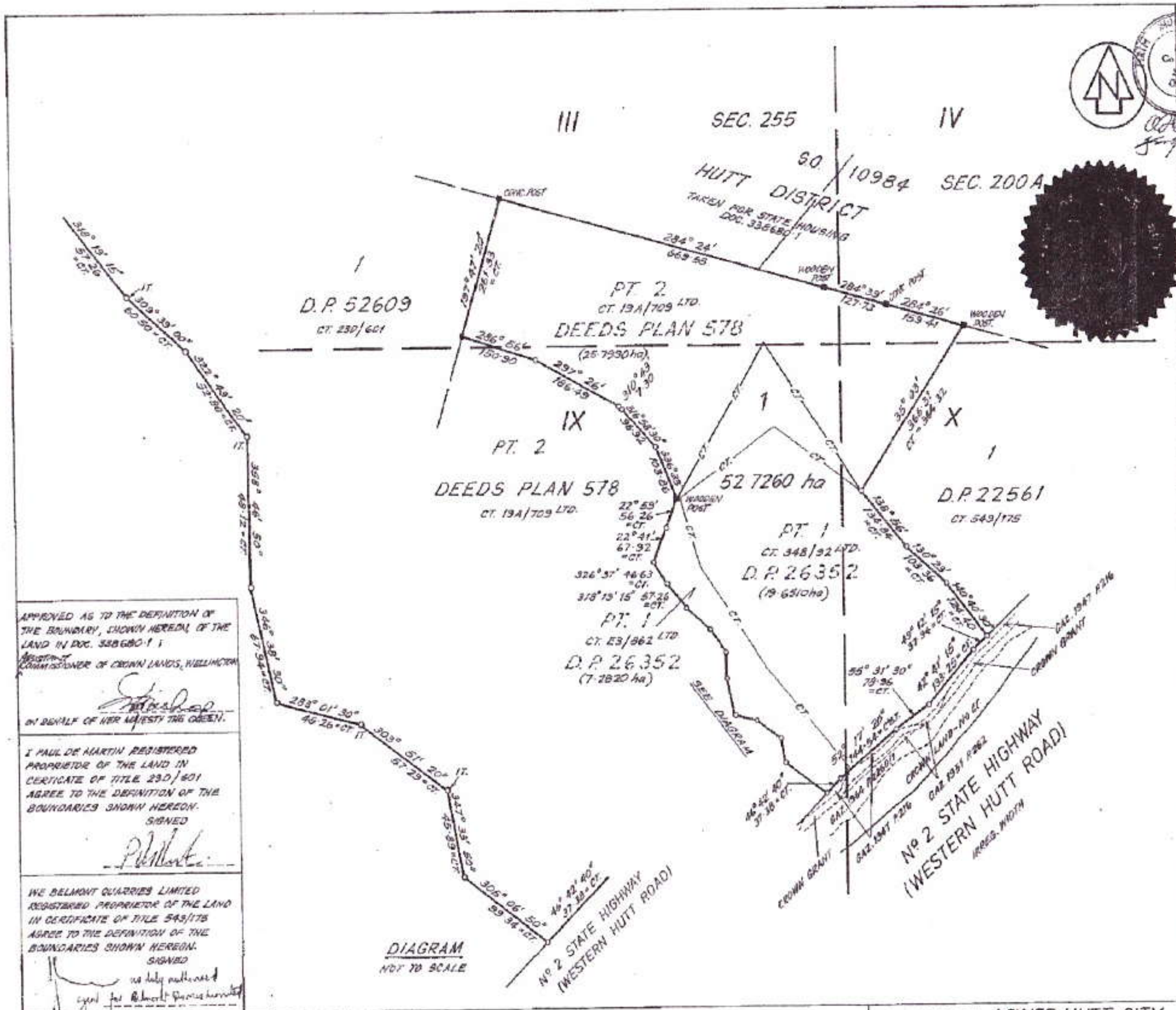
Estate	Fee Simple
Area	52.7260 hectares more or less
Legal Description	Lot 1 Deposited Plan 60552

Proprietors

Fletcher Concrete and Infrastructure Limited

Interests

Identifier **WN31B/39**



REGISTERED OWNERS

PURSUANT TO A RESOLUTION OF THE LOWER HUTT CITY COUNCIL PASSED ON THE 11th DAY OF July 1986 APPROVING PURSUANT TO SEC. 305 OF THE LOCAL GOVERNMENT ACT 1974, THIS SURVEY PLAN, AND CERTIFYING THAT THE PLAN IS IN ACCORDANCE WITH THE REQUIREMENTS AND PROVISIONS OF THE OPERATIVE DISTRICT SCHEME IN FORCE FOR THE AREA TO WHICH THE SURVEY PLAN RELATES AT THE DATE OF APPROVAL OF THE SCHEME PLAN, THE COMMON SEAL OF THE LOWER HUTT CITY COUNCIL WAS AFFIXED HERETO IN THE PRESENCE OF:

MAYOR

TOWN CLERK:

PURSUANT TO SEC. 306(1)(F)(I) OF THE LOCAL GOVERNMENT ACT 1974, I HEREBY CERTIFY THAT ALL THE CONDITIONS SHOWN ON OR REFERRED TO ON THE SCHEME PLAN OF SUBDIVISION HAVE BEEN COMPLIED WITH TO THE SATISFACTION OF THE LOWER HUTT CITY COUNCIL.
DATED AT Lower Hutt THIS 22nd DAY OF July 1986.
TOWN CLERK:

APPROVED AS TO THE DEFINITION OF THE BOUNDARY, SHOWN HEREON, OF THE LAND IN DOC. 338680.1:
ASSISTANT COMMISSIONER OF CROWN LANDS, WELLINGTON
ON BEHALF OF HER MAJESTY THE QUEEN.

I PAUL DE MARTIN REGISTERED PROPRIETOR OF THE LAND IN CERTIFICATE OF TITLE 23D/601 AGREE TO THE DEFINITION OF THE BOUNDARIES SHOWN HEREON.
SIGNED

WE BELMONT QUARRIES LIMITED REGISTERED PROPRIETOR OF THE LAND IN CERTIFICATE OF TITLE 549/175 AGREE TO THE DEFINITION OF THE BOUNDARIES SHOWN HEREON.
SIGNED
as duly authorised agent for Belmont Quarries Limited

Total Area 52.7260 ha

Comprised in CT. 348/32 LTD ALL & CT. E3/862 LTD ALL & CT. 19A/709 LTD PT

I, WILSON EDWARD LATTEY of PARAPARAUMU registered surveyor and holder of an annual practising certificate (or who may act as a registered surveyor pursuant to the proviso to section 33 (2) of the Surveyors Act 1986) hereby certify that this plan has been made from surveys executed by me or under my directions, and that both plan and survey are correct and have been made in accordance with the Survey Regulations 1972.
Dated at Wellington this 23 day of July 1986 Signature

Field Book 5662 p47-50 Traverse Book 920 p155-156

Reference Plans DEEDS PLAN 578, DP'S 22561, 26352, 52609 AND SO'S 20146, 20147, 25823, 27092, 10984.

Examined

Approved as to Survey
26.9.86 Deputy Chief Surveyor

Deposited this day of 1987
Land Registrar

LAND DISTRICT WELLINGTON
SURVEY BLK.& DIST. III, IV, IX, X BELMONT
NZMS 261 SHEET No. R27/5.1, 5.2
HUTT 76, 77

LOT 1 BEING A SUBDIVISION OF LOT 1 D.P. 26352 AND PART LOT 2 DEEDS PLAN 578

LOCAL AUTHORITY LOWER HUTT CITY
Surveyed by BRICKELL MOSS RAINES & STEVENS LTD.
Scale 1:5000 Date JUNE 1986

File 80083
Received 18.8.86
Instructions

60552

[redacted] [redacted]

Transaction Id
Client Reference www.cheaptitles.co.nz

APPENDIX 3 – GREYWACKE AGGREGATE RESOURCES NEAR WELLINGTON – RICHARD BARKER, CONSULTING GEOLOGIST, JUNE 2013

Greywacke aggregate resources near Wellington

Prepared for Winstone Aggregates

by

Richard Barker, Consulting Geologist

June 2013

Summary

Sources of aggregate for road making and building in the Hutt Valley and Wellington area to the south of Plimmerton have narrowed over the last 50 years from large scale river gravel extraction from the Hutt River (the largest river in the region) and about 12 operating quarries, to just three main quarries (Horokiwi, Belmont and Kiwi Point), all of which are working resources to the west of the Wellington Fault scarp. All three quarries are close to the main centres of population and have direct access to major transport routes of SH 1 and 2. The three existing quarries have been operating for more than 80 years.

River and coastal sediment (sand and gravel) deposits continue to be worked on a small scale, the rate of production being constrained by the natural rate of replenishment of river and coastal sediment deposits.

Although the greywacke sandstone that is the source material of both quarry rock and river sediments is not a scarce commodity and underlies most of the Wellington region, its suitability as aggregate varies, and widespread, deep weathering affects the strength of the rock making it unsuitable for most applications. No large, undeveloped aggregate resources have been identified in the available literature that meet the requirements of rock quality, lack of overburden, ready access to a major transport route and proximity to Wellington and the Hutt Valley. Known economic resources are confined to extensions to the existing Belmont and Horokiwi quarries. The size, quality and location of the aggregate resource at the Belmont quarry make it the most significant known resource in the Wellington region.

The available data shows that the area to the west of the Wellington Fault scarp, which includes the operating quarries, has the best potential for quarry rock near Wellington. There is no known alternative to the continued operation of the Belmont quarry that would not involve higher costs for consumers and increased transport impacts.

Richard Barker
MSc(Hons), MAusIMM
Consulting Geologist
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Tel: 64 9 5358955
Mob: 027 4416231

P O Box 54094
The Marina
Auckland 2144
New Zealand

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Introduction

Winstone Aggregates operates a quarry at Belmont near Wellington that is a significant supplier of aggregate to the region. Its continued operation will require approvals under the Resource Management Act. This report reviews available published and unpublished data on aggregate resources and production in the Wellington region to the west of the Rimutaka and Tararua Ranges, and as far north as Otaki. Its purpose is to determine whether the Belmont quarry output could be replaced by an alternative source of supply. No new field work has been undertaken for this study, which is confined to assessing the aggregate resources of the region and reviewing the significance of the Firth Block aggregate resource at Belmont.

A study by Reed and Grant-Taylor (1962) investigated the quarries and potential quarries of the region for supplying roading aggregate. Grant-Taylor (1976) investigated rock quality and resources, while Ward and Grant (1978) reviewed the planning implications of maintaining resource supplies. More recently, the mineral resources of the Wellington region have been summarised in the report accompanying a resource map of the southern North Island (Heron et al 1989) that includes a review of aggregate resources.

The Wellington urban area (Figure 1) includes Wellington city, the Hutt Valley and Porirua, which is separated from the Kapiti Coast (Waikanae and Paraparaumu), located 25 km to the north. Main access routes from Wellington are SH1 that extends to the north through Porirua and the Kapiti Coast, and SH2 that runs along the western side of the Hutt valley.

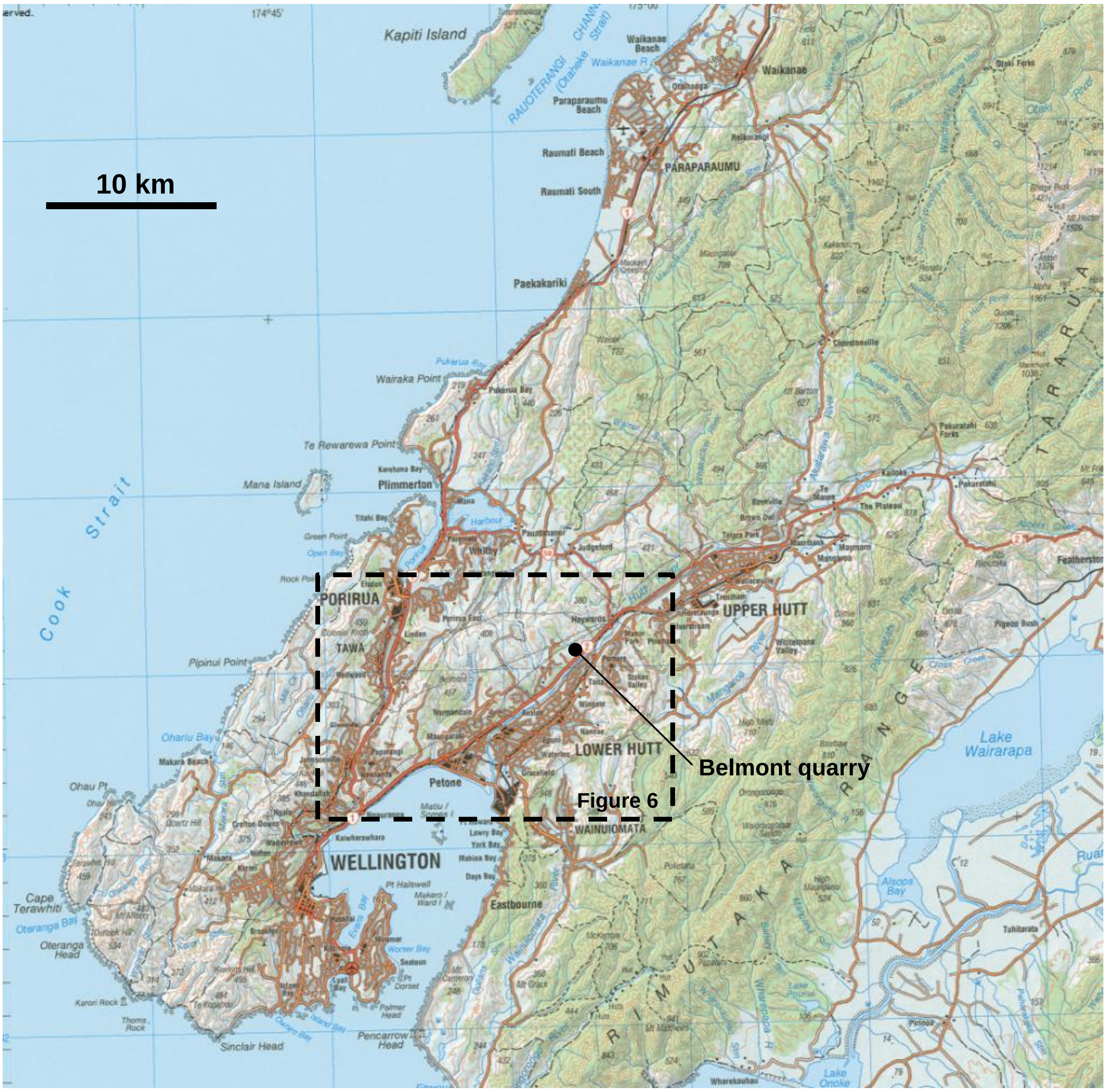

Figure 1. Location map of Belmont quarry and area covered by Figure 6.

Aggregate production

Production statistics for individual quarries were produced by Crown Minerals and its predecessors until 1993. Concerns about the release of commercially sensitive information led to the data being produced in compiled form only, with no site-specific details. Region-wide mineral production information is available from NZ Petroleum and Minerals, Ministry of Business, Innovation and Employment (NZP&M). They have provided a list of current operators (without production details) for this study (Table 1).

New Zealand's aggregate production since 1993 amounts to nearly 500 million tonnes of quarried rock, sand and gravel (NZP&M 2011). Its main use is for road construction and maintenance, which accounts for nearly two thirds of total demand. Its other major use is for building and construction (as the main ingredient of ready mix concrete) which accounts for 27% of production. Other applications include the use of large angular blocks of rock (armour rock or rip-rap) for protecting the coast and river banks from erosion, and for reclamation. The cost of aggregate production and transport has a major effect on the cost of constructing and maintaining public infrastructure. Recorded aggregate production (www.nzpam.govt.nz) from the Wellington region between 2002 and 2011 totalled 18.9 million tonnes, an average of 1.9 million tonnes per year. Aggregate for road making accounts for 49% of this total and building uses, for 31%.

Aggregate needs to meet quality standards to be suitable for roading and building purposes, and because of the high cost of transport, it needs to be produced close to where it is to be used. Aggregate is being produced from several hundred sites located throughout the country. These include quarries that are working in-situ rock (mainly greywacke and a range of volcanic rock types), and operations that are working riverbed and coastal deposits of transported gravel and sand which consists mainly of greywacke.

Geology

The Wellington region is underlain almost entirely by greywacke, which is a weakly metamorphosed sedimentary rock, and by sand and gravel deposits that are derived from the weathering and transport of greywacke (Figure 2). These rocks are of the Torlesse Complex, late Paleozoic to Mesozoic rocks that form the bedrock beneath large areas of New Zealand. The rocks are extensively faulted and folded, and the once-horizontal beds are commonly near-vertical.

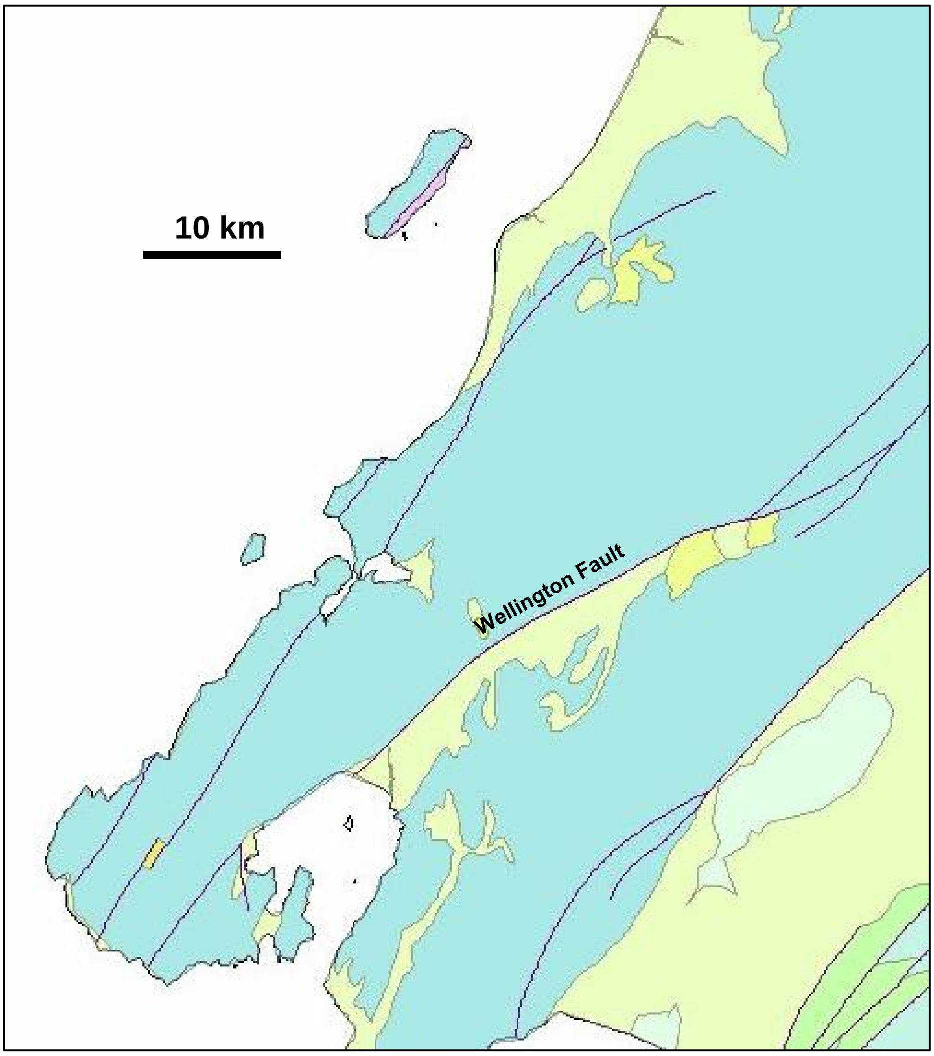

Figure 2. Geological map of the Wellington area. Source; GNS Science MINMAP

Blue = greywacke; yellow = gravel, sand, silt, peat; purple lines = faults

During the late Tertiary a relatively flat surface (termed the K-surface) formed in the Wellington area and is weathered to a depth greater than 30 metres in many places. Patches of this surface are preserved to the west of the Wellington Fault. More recently, fault movements and physical erosion here have produced hills, valleys, mountain ranges and basins including Wellington Harbour and the Hutt Valley. The Wellington Fault has been particularly active, with vertical displacement of up to 1 km and horizontal displacement of 10 – 12 km (Begg and Mazengarb, 1996).

Figure 3. Wellington Fault, looking northeast

Source: Begg et al 2008

Greywacke in the Wellington region is often covered by a thick layer of strongly weathered rock which needs to be stripped off, and deposited nearby to reach the usable rock underneath. The presence of thick overburden is a significant factor in defining workable resources. The active Wellington Fault is up-thrown along its western side, producing a prominent fault scarp (Figure 3). Physical erosion along this scarp has brought fresh rock to the surface, and explains why most past quarrying and known resources occur here.

Greywacke as an aggregate resource

The aggregates produced in New Zealand are derived mainly from greywacke. They are worked in numerous quarries in the North Island though river-deposited greywacke gravels are widely used in the South Island, particularly in Canterbury. Volcanic rocks are the source of most of the remaining aggregates.

Greywacke consists of alternating beds of sandstone, and finer-grained siltstone and mudstone (commonly referred to as argillite, Figure 4). Sandstone makes the best quality aggregate and forms the bulk of the aggregate resources, the argillite generally being weaker. Selective quarrying and processing can be needed to maintain the quality of the materials that are produced.

The quality of greywacke aggregate is also affected by the presence of clay minerals that are low strength materials. Some clay minerals (smectites) can expand and contract when wetted and dried. Clay minerals may be primary – formed during sedimentary and metamorphic processes - or secondary as a result of weathering or alteration of pre-existing minerals by hot water. Zeolite formed during metamorphism is another low strength mineral that can affect the quality of greywacke.

New Zealand greywackes have been divided into 5 categories based on their geographical location and the nature of the source materials from which they have formed (Black, 2010). The Torlesse-type greywacke that occurs in the Wellington area forms much of the Tararua and Ruahine Ranges in the North Island and the Southern Alps in the South Island. Torlesse–type greywacke is generally of higher quality than the other types and is characterised by local intense shearing, fracturing and faulting, generally low content of smectite clay, and high crushing resistance. However, as greywacke quality is highly variable, the properties of rocks within the 5 categories may overlap.

Figure 4. Torlesse greywacke showing alternating beds of pale coloured sandstone and darker argillite (Source Black, 2010)

The Hutt River is the largest river in the Wellington region. Sand and shingle from the river bed has been used as a source of aggregate for many years. Abrasion during river transport of the greywacke sand and gravel breaks down the soft materials into fine material that is carried away by the river flow. This improves the quality of the material so the river bed and adjacent terraces provide a low cost source of high quality aggregate.

History of quarrying near Wellington.

Quarrying began in Wellington in the 19th century with weathered rock being used as fill for swamps and for coastal reclamation. Extraction of gravel from the Hutt River was encouraged for flood control, and by 1899 gravel was being dredged from the mouth of the Hutt River and barged to Wellington. Gravel extraction continued until the 1950s with the Hutt River being the source of most high quality aggregate, with quarries producing low quality material.

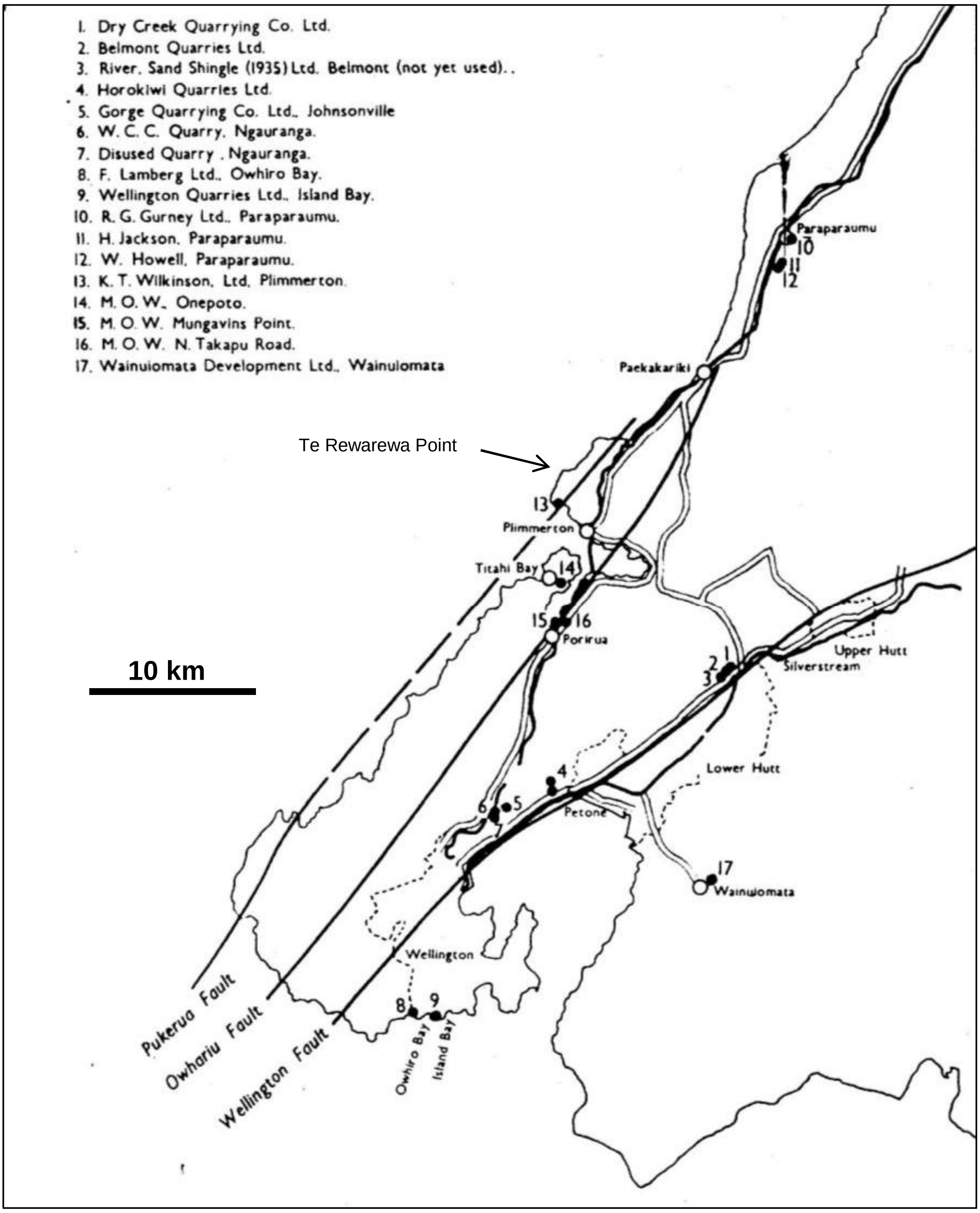

Figure 5. Location map of quarries and major faults. (Source: Reed and Grant-Taylor 1962)

In the 1960s controls on the rate of extraction of river gravel led to the rapid reopening of several old quarries and the development of new ones, though many produced low quality material. Reed and Grant-Taylor (1962) reported on these (Figure 5) and several operations were subsequently modified or closed down as a result (Grant-Taylor and Watters, 1976). Over the last 50 years the number of quarries has dwindled with just three – Kiwi Point, Horokiwi and Belmont – now operating south of the Kapiti Coast.

River sources

The rate of gravel extraction from the Hutt River exceeded the rate of replenishment during the mid-20th century, lowering the riverbed and affecting the flow of artesian water. During the 1960s the rate of extraction reached about 230,000 cubic metres (about 460,000 tonnes) per year which was at least twice the rate of supply for the catchment area (Reed and Grant-Taylor, 1962). The river bed is now surveyed regularly and river gravel extraction on a much smaller scale is used to manage flood risk. The Otaki and Waikanae Rivers are also surveyed regularly and gravel extraction is used to manage bed levels to maintain flood carrying capacity (Basher, 2007).

Gravel and sand have been obtained from the Wainuiomata River, from present day beaches between the mouth of the Orongorongo River and Pencarrrow Head and between Owhiro Bay and Tongue Point, and from raised beach ridges at Fitzroy Bay (Christie et al, 2001). Gravel continues to be extracted from Fitzroy Bay where sediment from the Orongorongo River accumulates, but the operation has been strongly opposed on environmental grounds, coastal erosion particularly. As a result the rate of extraction is restricted to 17,500 cubic metres (about 35,000 tonnes) per year.

Grant-Taylor (1976) reports that some aggregate has been obtained from the Tauherenikau River in the Southern Wairarapa and transported over the Rimutaka Hill, but the source is limited and cannot be considered as a long term supplement.

Sand and gravel production will continue from river beds and coastal deposits in the Wellington region but on a limited scale. The region will continue to depend on hard rock resources in the future.

Rip-rap

Large-sized rocks for use as rip-rap are relatively scarce in the Wellington greywacke deposits, although both the Belmont and Horokiwi quarries have produced this material. Large boulders have been obtained from raised beaches between the Orongorongo River and Cape Turakirae in the south coast to the east of Wellington and from Boulder Hill to the east of the Hutt Valley. Because of the lack of local supply, large blocks of dolomite have been transported by barge from Nelson and some has been transported from the Wairarapa (Christie et al, 2001).

Operating quarries near Wellington

Where minerals are owned by the Crown, a mining permit is required from NZP&M. Most minerals near cities are not owned by the Crown and only three sites have permits – Horokiwi quarry (where part of the resource is Crown owned), Fitzroy Bay which is offshore adjacent to the south coast, and the land-based gravel extraction operation of Winstone Aggregates near the Otaki River at Otaki. Winstone Aggregates also extracts gravel from the bed of the Otaki River that is processed at its nearby land-based operation, but volumes are restricted as noted above.

Table 1. Operating quarries 2011 -
Wellington region west of the Rimutaka and Tararua Ranges

Relative size	Quarry name	Operator
Large	Horokiwi Belmont	Horokiwi Quarries Winstone Aggregates
Medium	Kiwi Point Otaki	Holcim (NZ) Ltd Winstone Aggregates
Small	Waikanae Kapiti (Paraparaumu) Petone Plant Fitzroy Bay	Winstone Aggregates Higgins Aggregates Winstone Aggregates Horokiwi Quarries

Source: NZ Petroleum and Minerals, MBIE

NZ Petroleum and Minerals surveys aggregate producers throughout New Zealand to compile annual mine and quarry production statistics that are published. Detailed data on each quarry has not been published since 1993, but generalised, regional information is available. NZP&M has provided general information on operating quarries in the Wellington region. Table 1 lists those to the west of the Rimutaka and Tararua Ranges that are supplying the Wellington urban area and its northern extensions.

Data provided by the Ministry shows that south of Paraparaumu (50 km north of Wellington) only 3 quarries are now operating – Horokiwi, Belmont and Kiwi Point. All are located on the fault scarp to the west of the Wellington Fault (Figure 6). The remaining 9 that were operating in the 1960s (Reed and Grant-Taylor, 1962) have now closed, the most recent being Dry Creek that is now being used for the disposal of cleanfill.

The two largest producers – Horokiwi and Belmont provide most of the aggregate for Wellington and the Hutt Valley. Kiwi Point has been a smaller producer, but its redevelopment is planned In April 2012 Horokiwi quarry was granted a 40 year extension to its mining permit No 53910 that covers part of the area of the quarry. Resources here are sufficient to last for another 20 to 50 years (Baker, 2012). Production from Horokiwi has averaged 450,000 tonnes per annum for the last 10 years. Winstone Aggregates' Belmont quarry potentially has larger resources if the pit can be extended, requiring approvals under the Resource Management Act. Aggregate resources within the extended quarry are estimated at about 25 million tonnes, sufficient to maintain output for at least 50 years at the current rate of production. It has the largest known resources of good quality aggregate in the Wellington region.

The Hutt River has been a major source of aggregate in the past, but the effects of extraction exceeding the replenishment rate now restrict output to a level that is necessary to control flooding. The Petone Plant listed in Table 1 processes small amounts of river sand from the mouth of the Hutt River.

Similar restrictions apply to the Waikanae and Otaki Rivers. River gravels are no longer a major source of supply for the Wellington region. Horokiwi Quarries holds a mining permit (41261) over a near-shore area southeast of Pencarrow Head at Fitzroy Bay. This area is a small producer of sand and gravel. Its output is restricted to avoid coastal erosion.

Winstone Aggregates has a medium sized operation working river gravels at Otaki and a small hard rock quarry at Waikanae that is not operating at present. A third small quarry is operated by Higgins at Paraparaumu. These provide material for the coastal region to the north of Wellington. The Winstone's Otaki operation has a consent from the Regional Council to extract river gravel that expires in 2014, and a small, adjacent land based resource.

Winstone's Waikanae quarry is not operating at present. The resource here is of lower quality than that at Belmont. Consents and possibly a plan change would be needed to develop this resource.

A combination of transport constraints due to their distance from Wellington, limited resources and rock quality make these unfavourable alternatives to further development of the resources at Belmont as significant suppliers of aggregate to the Wellington – Hutt Valley area.

Aggregate resource potential

Previous investigations

The GERM digital mineral occurrence database operated by GNS Science (www.gns.cri.nz) lists more than 100 past quarry, sand and gravel extraction sites within the Wellington region (Heron et al 1989). Most are former gravel extraction sites though fewer than 20 have recorded production. Reports on past assessments have identified a number of possible resources of quarry rock. Reed and Grant-Taylor (1962) listed five that were accessible and contained rock of high quality. These were:

- The then disused WCC quarry (now operating as Kiwi Point quarry)

- Horokiwi quarry (that continues to operate)
- Wilkinsons quarry at Plimmerton (that has now closed and has severe access restrictions)
- Dry Creek Quarry (now used as a land fill)
- River Sand and Shingle (1935) Ltd Belmont quarry which preceded the Belmont quarry now operated by Winstone Aggregates.

Grant-Taylor (1976) listed two possibly significant greywacke rock resources: an outcrop of unweathered greywacke on Harris Road near the Haywards Hill road west of the Wellington Fault scarp and north of the Dry Creek quarry (GERM site e36 on Figure 6), and Clancys quarry site near Narrow Neck Stream on the western slopes of the Rimutaka Range in Mangaroa Valley about 10 km southeast of Upper Hutt. Neither of these sites has been developed, though the Mangaroa Valley area has been investigated as a potential source of armour rock. Inaccessibility appears to be the main development constraint here. Ward and Grant (1978) show a small quarry to be operating by Ponderosa quarries in Whitemans Valley areas, but its production appears to have been very small. Neither the Haywards Hill nor the Whitemans Valley sites appears to offer a significant advantage over the operating sites, which may explain why they have not been developed.

A study by Ward and Grant (1978) reviewed aggregate potential of the region, and their report includes a map outlining areas with “potential for economic access to unweathered rock”. These areas were all located to the west of the main faults that are shown in Figure 5 of this report. The report does not explain how they were derived, but noted that overburden was likely to be thinnest near the eastern margin of the main fault blocks (i.e. to the west of the active faults). In addition, the map shows areas that may be underlain by greywacke sandstone rock, (the source of high quality aggregate) based on available geological mapping. The only overlap of greywacke sandstone and areas with potential for unweathered rock is located to the west of the Wellington Fault between the Belmont and Dry Creek quarries.

No potential new deposits were defined. Inferred resources of 120 million tonnes were estimated at or near existing quarries. Resources near Wellington were dominated by Ngauranga Gorge, Horokiwi and “Western Hutt” resources that totalled 55 million tonnes, with an additional 30 million tonnes listed for the Owhiro Bay quarry that has now closed. An information centre has been built at the Owhiro Bay quarry site, which has been developed for visitors. The possibility of this resource being developed is remote. A large resource of 30 million tonnes is listed at Te Rewarewa Point on the coast west of Plimmerton (see Figure 5). This quarry, together with the smaller quarry nearby at Hongoeka Bay (No 13 on Figure 5) has closed also. Access from these quarries was via a road along the coast and through the settlement of Plimmerton. Despite potentially large resources, all coastal quarries near Wellington have now ceased producing.

No entirely new quarries producing high quality rock have been developed in the Wellington region for more than 50 years, though many have closed. The three main operating quarries (Horokiwi, Belmont and Kiwi Point) have been operating since the 1930s or earlier.

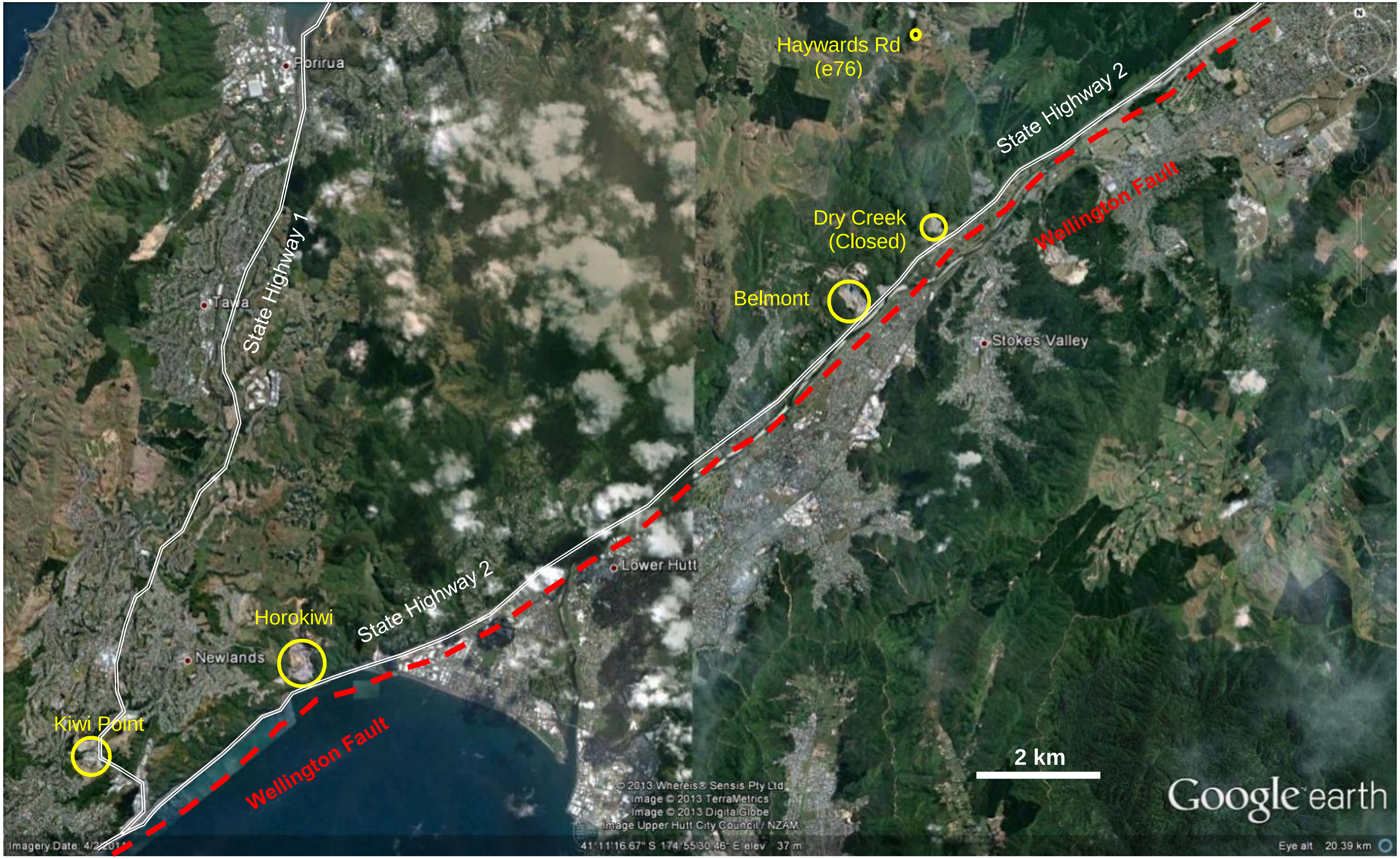

Figure 6. Current and recently operating quarries near Wellington (see Figure 1 for location)

Constraints on aggregate resources

Geological maps of the Wellington area show most of the region to be underlain by greywacke but economic resources of greywacke capable of supplying high quality aggregate are limited. Economic resources are constrained by a number of factors that include:

Rock quality. Faulting, shearing, intense fracturing and the presence of argillite and clay can affect the quality of the rock.

Weathering. Weathered rock contains clay, has low strength and is of limited use as aggregate. Deep weathering is widespread in the Wellington region.

Overburden thickness. Weathered rock and superficial deposits of rock debris must be stripped off and deposited near the quarry as such material has limited uses. Thick overburden makes otherwise economic resources unworkable.

Resource size and visual impact. The workings of large quarries generally extend into the sides of natural slopes or along ridges where there are large, accessible resources. Visual impact is an increasingly significant concern, and is difficult to control.

Competing land uses and values. Quarries involve the use of heavy machinery and blasting is generally required. Although quarry practices have advanced greatly in recent years, minimising their impacts, some offsite effects are inevitable. The establishment of new quarries is generally strongly opposed by nearby residents. Undeveloped areas where competing land uses are minimal often have natural values that would be affected by quarrying. This factor is constraining the development and expansion of existing quarries in several locations throughout New Zealand.

Accessibility. Quarries generate heavy traffic volume that requires good road access, and sites need to be close to main access routes. Constructing new road access is expensive and is strongly opposed by existing residents and land users. Recently established large quarries have generally been sited close to major access routes (e.g. the Holcim Bombay quarry alongside SH1 south of Auckland). The effects of heavy traffic through built up areas can be mitigated to a limited extent by restricting operating hours, but heavy transport from a quarry is unavoidable.

Transport. A recent transport study (Paling et al 2008) concluded that overall an estimated 1.1 billion tonne-kms of freight demand are produced in the aggregate sector in New Zealand. It found that all aggregate (apart from some railway ballast) moves by truck. The total tonnes lifted (estimated at 40.2 million tonnes) is the highest for any industry sector, though on a tonne-km basis, logs and wood products were higher (because of longer transport distances) and retail and couriers were highest, reflecting their national distribution patterns. The delivered cost of aggregate was found to increase sharply with distance, doubling every 30 km. Developing quarries further from the point of demand imposes significant costs on consumers.

Significance of the Firth Block Aggregate Resource

The Belmont Quarry is located alongside SH 2 to the northwest of the Wellington Fault (Figure 6). The quarry was producing in the 1960s and until the mid-1980s worked a small area now occupied by the plant and stockpiles near the access road (Figures 7 and 8). Since the mid-1980s the North Face of the quarry has been developed where higher quality rock occurs. Development to the west has been restricted by a wide zone of low quality argillite rock.

Figure 7. Belmont quarry development plan

Figure 8. Oblique view of Belmont quarry looking north.

Quarry development plan

Systematic investigations of the Belmont quarry began only in the mid-1980s. Since 2004 geological and resource models of the quarry have developed progressively through a series of drilling programmes accompanied by geological mapping of quarry faces and mining assessments, most recently in 2012. This work has been carried out by consultants to Winstone Aggregates.

Quarrying at Belmont is constrained by three main natural factors that have been the focus of geological investigations:

Rock type. The greywacke here consists of thick, near-vertical beds of sandstone and argillite trending approximately north-south across the quarry. The proportion of sandstone that is a source of high grade aggregate and argillite, a low strength material varies within the deposit.

Overburden which consists of weathered river gravels that pre-date movement along the active Wellington Fault, and loess (wind-blown dust) overlie weathered greywacke, the weathering intensity diminishing with depth. The highest quality material is located along the lower benches of the North Face.

Faults and fractures. Ancient faults displace the beds of sandstone and argillite and are usually surrounded by zones of fracturing, accompanied by localised deeper weathering that affects rock quality.

Operation constraints include the need to dispose of unsalable overburden near the quarry site, and maintaining overall pit wall slopes at angles that are stable.

The results from 20 holes drilled between 2004 and 2012 to the north and south of the quarry, and beneath the Firth Ridge have shown that the resource within the Cottle Block to the south of the quarry is limited by deep weathering and relatively high argillite content. The good quality material that has been worked in the lower benches of the North Face extends to the east beneath the Firth Ridge (Figure 8) with a manageable thickness of overburden.

Firth Block

The bulk of the better quality resource in the existing quarry is located behind the North Face and Firth Block. Further development of the quarry is constrained to the west by the presence of an increasing proportion of low quality argillite and to the east by the need to exclude the Firth Ridge (Figures 7 and 8) and maintain stable batter angles. Because of these constraints, further development of the quarry to the north will soon become uneconomic as the proportion of high quality material that could be produced from the lower benches diminishes. Resources beneath the existing quarry footprint are inaccessible because of the need to maintain stable pit slopes.

The effect of widening a pit is shown in Figure 9. In this example, increasing the width of a quarry face by 100% to the right of the property boundary increases the minable resource of high quality rock by 500% while the overall ratio of high quality rock to overburden falls by about 45%.

If the north face could be extended to the east to include the Firth Ridge, resources in the quarry would expand significantly for two reasons:

- Extension of the north face to the east would access resources beneath Firth Ridge
- The quarry workings within the existing quarry area could be developed to the north at the level of the present pit floor, expanding the resources to the west of Firth Ridge.

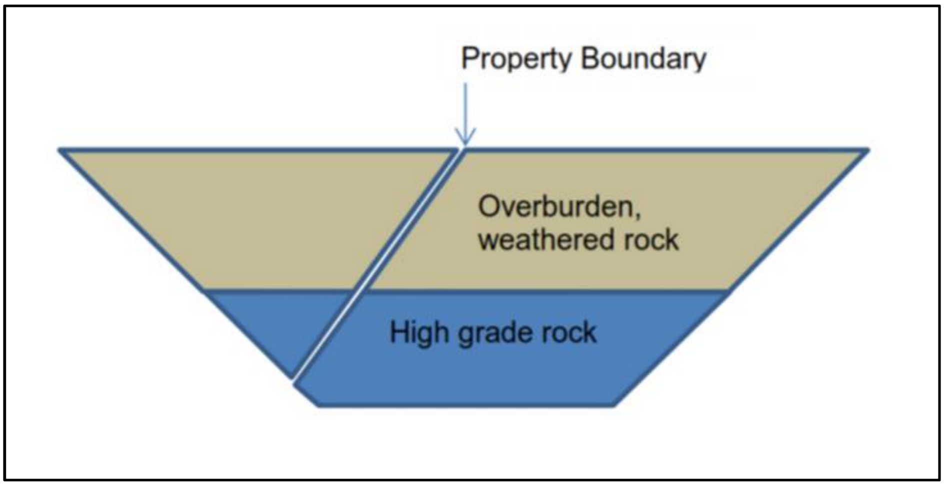

Figure 9. Diagram showing the effect of widening a pit face.

Conclusion

Until recently, Wellington relied on river gravel deposits and greywacke resources that were quarried on the coast and along the main fault scarps where relatively unweathered material was available. The Hutt River and other gravel sources are no longer significant suppliers as output is now restricted to the sustainable sediment supply, and the number of operating quarries has dwindled, due mainly to poor rock quality. Apart from the redevelopment of the Kiwi Point quarry, no significant new quarries have been developed for more than 50 years.

Unweathered coastal rock was a significant source of supply from quarries at Owhiro Bay, Island Bay and Plimmerton, but all of these have now ceased operating. The development of new resources on coastal cliffs near Wellington appears to be most unlikely because of access difficulties and their visual impact.

Access is an increasingly significant issue as quarrying involves heavy transport the effects of which are strongly opposed in residential areas. The three main operating quarries in Wellington have direct access to SH1 (Kiwi Point) or SH2 (Horokiwi and Belmont) which is a major advantage.

Wellington and the Hutt Valley now derive most of their aggregate supplies from the Belmont, Horokiwi and Kiwi Point quarries. These have the advantage of large, good quality resources, relatively thin weathered rock overburden, direct access to major transport routes and they are close to Wellington and the Hutt Valley. These advantages are the likely reason for their continued operation while all of the other quarries near the main urban areas have ceased to operate.

The Wellington Fault scarp has the most accessible, high quality aggregate resources close to the main urban areas of Wellington and the Hutt Valley. No other significant resources have been identified in the investigations that have been carried out to date. The Wellington Fault scarp has been the main source of aggregate and has the best potential for new resources. However, the constraints of nearby development (residential particularly) would impede the development of new resources here. Establishing a new quarry along the Wellington fault scarp is very unlikely to offer an advantage over the continued development of the Belmont quarry.

The replacement of these quarries will need to be faced eventually, but any alternative is likely to involve higher costs, longer transport routes, and greater environmental impact, particularly for transport. The closure of the Belmont quarry would accelerate the depletion of the resources at Horokiwi and Kiwi Point, and lead to significantly higher costs if more distant resources need to be developed. Loss of the Belmont production would bring forward the time when more distant alternatives would need to be investigated and developed, with higher costs for consumers and the possibility of increased environmental impact.

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APPENDIX 4 – ASSESSMENT OF ECONOMIC EFFECTS OF BELMONT QUARRY EXTENSION – NZIER, JUNE 2013

Report

Assessment of economic effects of Belmont Quarry extension

NZIER report to Winstone Aggregates Ltd

June 2013

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Authorship

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Executive summary

Aggregates are fundamental to New Zealanders' well-being, for without them the production of concrete and the development of buildings, roads, infrastructure and natural hazard protection would be hindered. Because aggregates are heavy relative to their volume they are expensive to transport, so regions benefit from proximity to accessible resources of versatile rock that can be used to provide a range of materials for building and construction.

Approval for the extension of the Belmont Quarry is sought to ensure that:

- the Quarry continues to operate and supply aggregates to Hutt City and the wider Wellington region
- economic value is created by utilising the natural resource at the Belmont site, supporting wages and purchases that make economic contribution to the Hutt City and wider regional economy
- the Wellington region continues to enjoy a competitively priced reliable supply of aggregate
- Hutt City and Wellington regions defer the date at which new aggregate resources are needed to meet local demand, which could result in increased cost of aggregate or reduced reliability of supply

Belmont Quarry is one of three major suppliers of aggregate to the Wellington region. (In 1978 the region was served by 32 quarries, but the number of major suppliers dwindled to 3 by 2003, due to a combination of exhaustion of accessible resources or by commercially viable quarries being squeezed out of expanding residential areas.)

Belmont Quarry supplies approximately one third of the Wellington region's demand for all aggregate and supplies more than half of the regional demand for aggregate used in concrete. The quarry is located close to main transport routes and produces a wide range of aggregates that meet the varied needs of consumers in the region. The capacity and location of the quarry make it a competitive supplier of aggregate to consumers in both the Hutt Valley and Wellington City.

The existing aggregate resource available to the Belmont Quarry is sufficient for about 5-10 further years at current production levels and will be depleted more quickly if demand increases from current levels, which are at a low point in a historic cycle. Unless approval is given to extend the Belmont Quarry through access to available resources within the part of the quarry known as the Firth Block, the Belmont Quarry is likely to be closed within 5 - 10 years. As the Firth block is immediately adjacent to the existing quarry workings extraction of aggregate would enjoy the same location advantages as the current quarry.

Prevention of the extension of the Belmont Quarry into the Firth Block would deprive the region of an economically accessible source of aggregate and prematurely require the region to switch to more expensive sources of supply. The alternative sources of supply are expected to be more expensive:

- initially because the remaining existing suppliers are further away from markets in the Hutt Valley and aggregate is relatively expensive to transport
- ultimately because a decision not to use economically accessible resources at Belmont will accelerate the depletion of the remaining quarries and require the development of new quarries, which will be more expensive than extension of an existing quarry (because of their greater capital costs), and are likely to be

located further away from markets than the existing quarry, increasing the transport cost of the aggregate.

Wellington urban region (comprising Wellington City, Hutt City, Porirua City, Upper Hutt City and the Kapiti Coast District), has known available aggregate resources sufficient for another 23 years at current production rates. The proposed extension at Belmont Quarry could extend this to up to 41 years.

The proposed extension of the Belmont Quarry will:

- extend its life by 20 to 40 years and ensure that the community will continue to have three major aggregate suppliers in the Wellington urban region
- slow the depletion of the other two major quarries and postpone the time at which the region will need to develop new quarries
- retain the operation of a third major quarry in the Wellington urban region, improving competition and the choice of supply.

The direct contribution made by the Quarry to the local economy in payments of wages and other purchases is modest but this is not a good indicator of its significance for community well-being. If the Belmont Quarry were to close because of inability to access the high quality resources in the Firth Block, the cost of aggregate supply into the Hutt Valley could increase by more than the loss of this direct contribution, and the cost of developing a new quarry to replace depleted resources would be brought forward and increase in present value terms. Both these effects would raise costs for all building and construction in the region.

Contents

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1. Introduction

This report provides an economic assessment of the proposed extension of the Belmont Quarry to use the area known as the Firth Block adjoining the current working face. This report focuses on the supply and demand situation for aggregate material in the Wellington urban region[1].

The Belmont Quarry has a current remaining resource estimated to be 2.3 million m^3, with 5 -10 years remaining under the current extraction zone rules and related consents. Extension of the Belmont Quarry would enable access to an additional 10.1 million m^3 of resource, and make a significant contribution to future supply of rock and aggregates to the Wellington urban region.

The purpose of the proposed quarry extension is to ensure an on-going supply of rock and aggregate to create valuable products of use to other industries such as building, construction and road maintenance in the Wellington urban region. This is of value to the quarry's operators, but also the wider community to the extent that it contributes to capacity available to meet local demands for aggregates, and avoids the resource costs and consequences of resorting to alternatives.

Forecasting the likely demand and supply of aggregates in future is a complex task, but it is possible to provide indicative information on the economic consequences of the Belmont Quarry extension, including cost savings and changing patterns of supply, given plausible assumptions about how the market would operate with and without the production from the quarry extension.

This report proceeds by:

- setting out a framework for considering economic effects (section 2)
- outlining the existing environment that the proposed quarry extension will affect, with particular attention to aggregate supply and demand (section 3)
- assessing effects of the Belmont Quarry extension (section 4)
- concluding with an overall assessment of the economic effects of the quarry's extension on both the local and national economies (section 5).

Sections 2 and 3 describe the context for the economic assessment of the effects of quarrying. Sections 4 and 5 are specific to the proposed Belmont Quarry extension, based on current expectations and available information.

[1] The Wellington urban region comprises Wellington City, Hutt City, Porirua City, Upper Hutt City and the Kapiti Coast District. Statistics for the Greater Wellington region differ in that they include the Wairarapa. The Wairarapa is excluded from this report as it is not where the bulk of demand lies, and because the cost of transporting aggregates over the Rimutakas is such that it is effectively in a different local market than the rest of the Greater Wellington region.

2. Framing the analysis

The principal purpose of the Belmont Quarry extension is to utilise a natural resource (rock) and convert it to something of value to people and communities (aggregates for roading, building materials and other products which underpin much of the community's economic activity). There are beneficial consequences of this for the quarry's operators, Winstone Aggregates, but also a variety of effects on third parties and the wider environment, of relevance to considerations under the Resource Management Act.

2.1 Economics, policy and the Resource Management Act

The purpose of the Resource Management Act (RMA) is to promote the sustainable management of natural and physical resources (section 5(1)). The Act's section 5(2) defines sustainable management as the use, development and protection of natural and physical resources in a way that enables people and communities to provide for their well-being and their health and safety, while sustaining the potential of those resources to meet reasonably foreseeable future needs and avoiding, remedying or mitigating any adverse effects of activities on the environment. Section 5(2)(a) explicitly excludes minerals from the sustaining potential requirement, in recognition that such a requirement would preclude any use of depletable non-renewable resources and prevent them from contributing towards community well-being.

The full depletion of the Belmont Quarry would not materially push the economy closer to a point where aggregate supplies approach a finite limit and will physically "run out". What it would do is push the economy to using other sources which are either less readily accessible and incur higher extraction costs, or more distant and incur higher transport costs in supplying material to users initially in the Hutt district and eventually in the wider Wellington urban region. It would also bring forward the date at which those other sources are fully depleted and bring forward the use of even higher cost sources.

2.2 Sources of economic value from the quarry extension

The measure of economic value of the Belmont Quarry extension is its contribution to economic well-being in the community at large. This includes the benefits it provides to producers (quarry operators and employees), consumers of aggregates and third parties, such as those facing the consequences it has for the wider environment. The scope of this benefit is national, not just confined to the local or regional economy, including[2]:

- creation of a valuable commodity from a naturally renewable resource
- displacement of supply from higher cost sources and avoidance of associated increased transport costs
- net effects on recreational and tourism opportunities and on local environmental amenity
- expenditure impacts from employment and purchases in the economy.

[2] Inclusion in this list does not necessarily imply these matters are nationally significant. They provide national benefits to the extent that local benefits contribute to the total of such benefits nationwide. Some matters, like recreational, tourism and amenity resource uses may be more valuable in a locality with few alternative opportunities than they are at national level where there are many.

2.3 Components of economic assessment

In economic reports prepared for an assessment of environmental effects for a proposed project seeking approvals, it is common to see an economic impact analysis that focuses on effects on the economy, either local or national, as changes in production, incomes or employment. Such reports may also contain a cost benefit analysis of the change brought about from the existing environment, should the proposed projects proceed.

In terms of the requirements of the Act, we interpret economics to encompass:

- not just matters covered by the company's financial transactions, but a broader definition covering external effects and how limited resources are used in the satisfaction of relatively unlimited human wants
- effects on "economic well-being" which can be viewed as synonymous with the technical term "economic welfare", the notional sum of all individuals' consumption and enjoyment of both tangible goods and services and less tangible aspects of the quality of life they enjoy[3]
- focusing on people's preferences for resource uses in ways that give them the most satisfaction – or "welfare" – and also on economic efficiency (as in the Act's s7(b)), which is obtained by maximising the value of welfare-enhancing outputs from a given set of inputs, or minimising inputs required for a given set of outputs.

Given this, economic assessment can be approached in different ways:

- economic impact analysis, to identify the effects of an activity on the economy, as indicated by such variables as production, value added (GDP contribution) and employment:
  - at the individual project level, these are more significant at the local than at the national level and can be taken as indicative of the direct contribution of the quarry extension to local economic well-being
- cost-benefit analysis or applied welfare analysis, which differs from impact analysis in:
  - covering effects over a period of years, not just a snapshot of current impacts
  - taking account of effects which do not show up in measured economic accounts and GDP, such as effects on environmental condition.

2.3.1 Components of economic impact analysis of a proposal

The construction and operation of any new facility would have an impact on the local economy. The elements of an impact analysis are:

- direct impacts:
  - spending on construction in the new facility's development, which may be measured as total expenditure on the project in the local economy,

[3] The quarry extension can have effects on environmental attributes, such as amenity or visual impact, which although in principle have economic consequences, are in practice difficult to quantify or attach value to. The scale and significance of such intangibles depends on the evaluation of experts in other disciplines, and the values that the community places on such matters, and are not assessed in this report.

the new jobs created by the project, and the incomes retained (in the local economy) from the project by suppliers of labour and materials

  - spending on the facility's operations and maintenance in subsequent years, measured as total expenditure on the project in the local economy, the new jobs created by the project, and the incomes retained (in the local economy) from the project by suppliers of labour and materials
  - rental income generated by the project (paid to landowners)
- non-direct impacts:
  - indirect effects - flow-on effects across other sectors in the local economy from new demand from the project for their services
  - induced effects - flow-on effects across other sectors in the local economy from new demand created by the recipients of direct income.

The impacts are generally greatest in the construction or establishment phase of a new development. Extending the Belmont Quarry can be achieved at less than the cost of alternatives for augmenting local supply, such as opening a new quarry in the Hutt Valley. Although opening a new quarry would inject more expenditure into the local economy and provide a short term stimulus for suppliers in the establishment phase, this would increase the cost of aggregates relative to those from an extended Belmont Quarry, so an impact analysis would be a misleading indicator of economic benefit.

Local economic impact analysis is of interest to local decision makers because of the stimulus impacts give to local business and economic well-being, but because it does not record trans-boundary effects across districts or resource reallocation across sectors it says little about the economic efficiency of resource use. More sophisticated general equilibrium modelling can address the resource reallocation caused by a project and enable a net impact to be calculated, but this is complex, data-demanding and often too costly for all but major projects.

2.3.2 Components of cost benefit analysis of a proposal

Resource use efficiency can be estimated through cost benefit analysis, so it is useful to view the effects in that framework. Such analysis focuses on economic surpluses of a project and the realisable value of the environmental resource being used. It also looks at the separable effects on consumers, producers and third parties (external effects), and the distinction between gains (benefits) and losses (costs) from available resources that are additional to what would otherwise have occurred.

In the case of the Belmont Quarry extension, the principal effects are likely to be:

- effects on consumers:
  - benefit from suppression of the potential rise in price of aggregate in the locality, due to deferment of the need to use higher cost aggregate supplies
  - benefit from reduced probability of supply disruption compared to supply from further afield – a quality improvement to the extent that supply in the Hutt Valley is less susceptible to interruption in transport and chains of supply
- effects on producers:
  - benefit from the realisable value of output from the quarry extension
  - costs incurred in extraction operations and maintenance.

The breadth of components in a cost benefit analysis means that it is best conducted from a national perspective, i.e. the costs and benefits that matter are those that affect residents of New Zealand. Thus, the consumer benefits of the quarry extension are relevant whether they are felt in the vicinity or anywhere else within New Zealand. But because of the high bulk, high transport costs and low value of aggregates, the benefit will be predominantly felt in the local economy.

2.4 Summary of the economic framework

The net value gain for the community is defined by the production value (net of production costs) relative to the alternative source of supply should the extension not proceed. As that alternative is likely to involve increased transport costs and environmental effects the avoidance of these is an additional benefit of the Belmont Quarry extension. The sum of quantifiable benefits less quantifiable costs is the quantifiable net benefit, which can be projected over time to estimate the net present value of utilising the Belmont Quarry extension.

In undertaking this cost benefit assessment it is necessary to project the future supply and demand for aggregates in the Hutt City and Wellington urban region, including the volumes likely to be required, the cost of supply from different sources (extraction costs and transport costs) and the extent to which cost increases may moderate demand. This includes consideration of the cost of alternative existing sources and the cost of prospecting, consenting and bringing new sources into production. On the basis of assumptions, we can then compare the outcomes with and without the Belmont Quarry extension.

3. Existing environment

In considering the environment in which Belmont Quarry operates, we focus on the market in Wellington urban region (comprising Wellington City, Hutt City, Porirua City, Upper Hutt City and the Kapiti Coast District). The Wellington region also encompasses Wairarapa, but travel distances mean that for practical purposes that is a separate market for rock and aggregates with little connection to the metropolitan area.

3.1 Quarrying in the economy

Nationally the ore and non-metallic mineral sector accounts for about 0.3% of New Zealand's gross domestic product.[4] That reflects its position as a primary product from a natural resource, an input supporting other economic activities and processes that generate more value added. The quarrying sector's output contributes 4.9% of the inputs by value to the non-metallic mineral production sector (which produces concrete and building products) and 4.3% of inputs to the heavy and civil engineering and construction sector. These sectors in turn provide the roads, buildings, pipelines and other infrastructure that support other economic and social activities. For many of these functions there are no feasible alternatives to rock and aggregate, and the significance of quarrying and its products belies its modest scale in the measured economy.

Rock and aggregates are abundant in the Earth's crust but the cost of extraction and use varies widely. The cost of producing aggregates reflects the amount of over-burden that must be removed to access the useable rock material, and the quality of the material once found. There is uncertainty about the extent and quality of rock in a given resource until it is extracted, and assessments of a given resource may change over time. The high weight of aggregate makes it expensive to transport relative to the cost of extraction, so aggregate markets in the economy tend to be localised. Closure of quarries and relocation of source materials by even a small number of kilometres can make an appreciable difference to the cost of material for its users.

3.2 The role of aggregates in the economy

Rock is a fundamental but often overlooked input into the infrastructure on which the economy runs. Aggregate is used in large quantities for roads and concrete, with lesser quantities for reclamation, other forms of fill, drainage material and harbour and river protection (riprap). In most of these uses the aggregate basically takes up space (bulk), while providing compressive strength necessary in the final product.

The following comments give a flavour for the contribution of aggregate to the built environment:

- over 4,000 tonnes of aggregates are used in the construction of just one kilometre of standard highway pavement, while the building of a new six lane motorway can consume in excess of 20,000 tonnes for the same distance
- up to 250 tonnes of aggregate can be used in the construction of a new house.

Aggregate is a low value product. The average national quarry gate value for aggregate over the past four years is about $13 per tonne and has fluctuated in a band of $10 to

[4] Statistics New Zealand, Input Output Tables 2007.

$15 per tonne[5]. The high weight of aggregate makes it expensive to transport. Estimates of transport costs vary widely. An industry rule of thumb[6] suggests transport costs of about $0.50 per tonne kilometre. Therefore locating quarries close to the point of use is important in ensuring aggregate is affordable.

3.3 Supply and demand for aggregate

3.3.1 Demand drivers

A long term (forty year)[7] study of demand for aggregate concluded that demand for aggregate is closely correlated with population and income growth. Cyclical fluctuations in demand are caused by peaks and troughs in roading and construction activity. The relationship allows for technical factors that have lowered the demand for aggregate such as change in building practices[8] and specification of better performing materials[9] for roading.

Over short periods the demand for aggregate can fluctuate widely. The cyclical peaks in demand over the past 5 years provide an indication of the supply capacity that is required to avoid shortages as well as the likely frequency of the shortages.

3.3.2 Demand in the Wellington region

Demand for aggregate in the Wellington region has averaged about 2.5 million tonnes per year over the ten year period from 2001 to 2011 with an average value of about $30 million. The volume of production equates to an average of about 4.6 tonnes per person per year over the period 2006 to 2011 ranging between 3.7 and 5.3 tonnes per person per year. The variations in both the level and composition of demand for aggregate in the Wellington region are shown in the following chart.

[5] Source: 'NEW ZEALAND INDUSTRIAL MINERAL PRODUCTION BY COMMODITY' published by New Zealand Petroleum and Minerals and available at http://www.nzpam.govt.nz/cms/minerals/facts-and-figures#Industrial

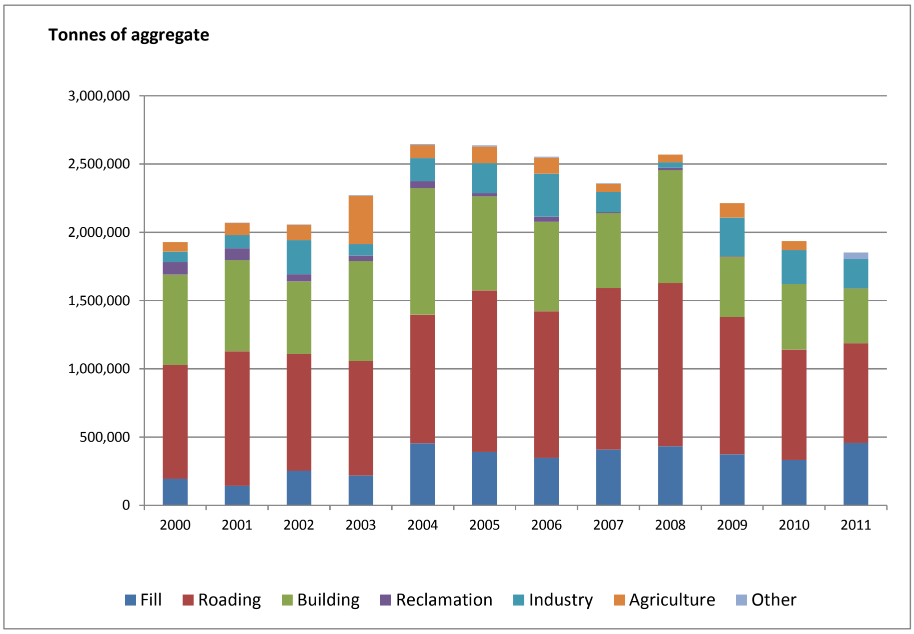
[6] Industry papers refer to a rule of thumb that transport costs for 30 kilometres equal the quarry-gate price of aggregate http://www.aqa.org.nz/documents/Aggregate%20Facts%202009.pdf.

[7] O.Brien J ' Planning for Growth? The Determinants of Aggregates Demand in New Zealand', IPENZ engineering TreNz 2006-003, 2006.

[8] Reduction in safety and load factors required for reinforced concrete, greater use of pre-stressed concrete factors and achievement of higher concrete strengths using additives noticeably affected demand for aggregate in the 1970s.

[9] Upgraded specifications for base course in roading have reduced the ratio of aggregate used in roading to that for building from about 6:1 in the 1950's to 2:1 in the mid 2000s.

Figure 1 Regional demand for aggregate



Source: NZIER based on Crown Minerals data

Current production in the region is at a historical low - about 30 percent below peak levels over the past 10 years. The recent decline in demand appears to be due to the coincidence of the recent completion of several major roading projects and general weakness in construction activity.

Table 1 Demand for aggregate in the 'greater'[10] Wellington region

Demand in the Wellington region as defined by Crown Minerals

Area	2006	2007	2008	2009	2010	2011
Demand volume (million tonnes)	2.40	2.30	2.51	2.11	1.87	1.80
Value at quarry gate ($ million)	33.59	31.46	35.43	33.52	29.02	31.95
Value per tonne ($)	13.15	13.34	13.78	15.14	14.99	17.25
Population	466,380	470,240	473,850	478,570	483,280	487,680
Demand per person (tonnes)	5.15	4.89	5.30	4.41	3.87	3.70

Source: NZIER Crown Minerals, Statistics New Zealand

Despite the fluctuations in production levels, average quarry gate prices for aggregate have risen from about $12 per tonne (2000 to 2003) to about $15 per tonne (2008 to 2011). In 2011 average prices reached $17 per tonne despite a cyclical low in production.

3.3.3 Location of demand

To estimate the location of demand for aggregate in the Wellington urban region we have multiplied the average demand for aggregate per person by the estimated population of each territorial local authority in the region. This suggests the following distribution of demand.

[10] This data is obtained from Crown Minerals. The Wellington region covered by this data includes the Wellington urban region and the Wairarapa district.

Table 2 Location of demand for aggregate

Estimated distribution of demand over the Wellington urban region based on population in 2011

Territorial Local Authority Area	Demand (Tonnes)	Share
Wellington City	739,560	41%
Porirua City	194,777	11%
Kapiti Coast District	184,058	10%
	1,118,395	**62%**
Hutt City	380,683	21%
Upper Hutt City	153,382	9%
	534,065	**30%**
Masterton District	86,855	5%
South Wairarapa	34,853	2%
Carterton	28,274	2%
	149,982	**8%**
Total	**1,802,442**	

Source: NZIER, with data from Crown Minerals, Statistics New Zealand

3.3.4 Future demand in the Wellington urban region

To estimate the potential future long term regional demand for aggregate we have combined the average demand for aggregate across the Wellington region with projected changes in population. This approach assumes that the average levels of roading and construction activity per person over the period 2006 to 2011 are representative of the likely future long term average levels for these activities per person. On this basis demand for aggregate is forecast to increase gradually in total from about 1.8 million tonnes now to approximately around 2.5 million tonnes by 2031 under a medium growth scenario. This is equivalent to an annual average percentage change of 0.4%.

(We have not been able to estimate the impact on demand for aggregate of major roading projects either completed in recent years or planned for the medium term, due to the lack of detailed information on the timing or aggregate requirements for these projects.)

Table 3 Future demand for aggregate in the Wellington region

Based on medium population growth forecasts

Aggregate per person (tonnes per year)	2016	2021	2026	2031
Low - 3.7 tonnes	1,872,570	1,923,630	1,967,290	2,002,440
Medium - 4.5 tonnes	2,302,755	2,365,545	2,419,235	2,462,460
High - 5.3 tonnes	2,682,330	2,755,470	2,818,010	2,868,360
Note: Actual demand in 2011 was 1,802,442 tonnes – approximately 3.70 tonnes per person, at the low end of the forecast scenarios.				

Source: NZIER, from Statistics New Zealand projections

3.3.5 Supply

National supply conditions for aggregate vary widely depending on the rate of population growth in the region, which impinges on available space, and the accessibility of resource. For example, supply is constrained in Auckland due to rapid population growth, lack of consented access to usable resource close to the point of end use but not in built up areas and consent limitations on many existing operations (hours of work/truck numbers etc.) so that a substantial share of demand (20 to 30 percent) is imported from outside the region. This has not yet been a prominent feature of supply in Wellington because of differences in the aggregate supply and demand situation and in patterns of truck movements.

The upgrading of standards for aggregate quality, the related cost of plant and activity and improvements in transport have caused a consolidation of the aggregate industry. Consolidation has also resulted in economies of scale.

3.4 Aggregates in the Wellington urban region

The region's resource endowment represents the natural occurrence of materials in the Earth's crust. It is a geological concept that represents an upper limit on the availability of useable terrestrial resources. But because the quality, concentration and proximity to the surface of resources are not evenly distributed, not all resources are equally accessible for extraction with current technologies. Reserves is an economic concept and divided between current reserves which are known resources that can be profitably extracted at current prices, and potential reserves which are those that would be available if the price people are willing to pay rises sufficiently to enable more costly resources to be extracted.[11] As there is uncertainty over the extent of underground resources until they are extracted, bodies such as the US Geological Survey and the Australian Joint Ore Reserves Committee have developed codes for measuring and reporting resources that distinguish resources according to the certainty of their measurement.

The Wellington region is underlain by greywacke, a sedimentary rock consisting of alternating beds of coarse sandstone and fine-grained siltstone and mudstone. Quarrying

[11] Tietenberg T (1988) Natural Resource Economics, 2nd Edition,Scott Foresman and Company.

extracts both from bedrock sources and from sand and gravel deposited by rivers and the sea. The quality of aggregates varies with the presence of low strength clay minerals (such as argillite) derived from mudstone. The best quality aggregates are obtained from coarse sandstones, and selective quarrying and processing is required to maintain the quality of materials.

Although greywacke is common, economic resources capable of supplying high quality aggregates with current technologies at current prices are limited by both natural characteristics and planning restrictions. In 1978 there were 32 active quarries in Wellington Region, but by 2003 just three sizeable operations remained: Belmont, Horokiwi and Kiwi Point (Ngauranga Gorge) Quarries. A report for Wellington City Council in 2003 into the future of the Kiwi Point Quarry[12], which the council then owned, identified some quality issues with the Horokiwi material's suitability for roading, which meant only Belmont and Kiwi Point offered Wellington a comprehensive range of product. Since then Horokiwi's resource appears to have been reassessed as having no such quality restrictions. Some smaller extraction operations are active or dormant, constrained either by river supply or uncertainty over the sustainable limits to extraction and material replenishment – or by the limited range or quality of materials extractable.

Table 4 below compares the production and available resources of the proposed Belmont extension (into the Firth Block) with the known production and apparent available resources of other existing quarries in the region. Available resources refers to known resources that are economically feasible to extract at current prices from consented or consentable sites,[13] and are defined here either by the expected extraction lifetime (at current rates of production) or by the remaining period on current extraction consents. The table also shows the road distance to central Hutt City, as an indication of the delivery costs and feasibility of supply into the district.

[12] Wellington City Council (2003) Kiwi Point Quarry and Future Quarry Materials Supply; Planning Department, Wellington City Council.

[13] This is similar to the economic concept of reserves, but for data requirements does not confirm to current code requirements.

Table 4 Annual production and available resource in Wellington region

Area	Annual Production	Annual Production	Available resource	Life-time	Distance to Hutt City
	M tonnes	M m^3	M m^3	Years	km
Belmont Quarry (current)	0.576	0.230	2.327	10.1	6.2
Horokiwi	0.450	0.180	*6.300*	20-50	5.5
Kiwi Point	0.350	0.140	4.200	*30*	11.2
Petone Sand Plant	0.100	0.050	*1.750*	35	4.0
Fitzroy Bay Sand/Gravel Plant	0.035	0.018	*0.525*	30	19.0
Paraparaumu	0.035	0.014	*1.000*	30	
Waikanae	0.000		4.500		53.8
Otaki river gravels	0.080	0.040	0.567	7	69.5
Otaki land based	*0.120*	*0.080*	0.500	4	69.5
Total excluding Firth Block	**1.746**	**0.752**	**21.669**	***23-29***	
Belmont Firth Block	0.580	0.232	10.100	20-40	6.2
Totals including Firth Block		**0.754**	**31.769**	***42***	
Belmont share of total available resources with Firth extension			35%	*42.3*	

Note: Data drawn from documents of Winstone Aggregates Ltd,[14] Holcim (NZ) Ltd[15] and other sources[16]
Numbers shown in italics are estimates
Years life across all resources calculated by dividing totals by current annual production across all quarries (29 years); current production of high quality versatile material from Horokiwi, Kiwi Point and Belmont could be sustained for 23 years before exhaustion
Conversion rates: 2.5 tonnes per cubic metre (m^3) in-ground from hard rock quarries; 2.0 tonnes per m^3 gravel from riverbed or beach; 1.5 tonnes per m^3 product out the gate

Source: NZIER

Relative to current total available resource of about 20 million cubic metres, the proposed Belmont Quarry extension would increase the available resource in the Wellington urban

[14] Data on resources and production for Belmont Quarry, Petone Sand Plant, Baring Head, Waikanae Quarry and Otaki Quarry from Winstone Aggregates.

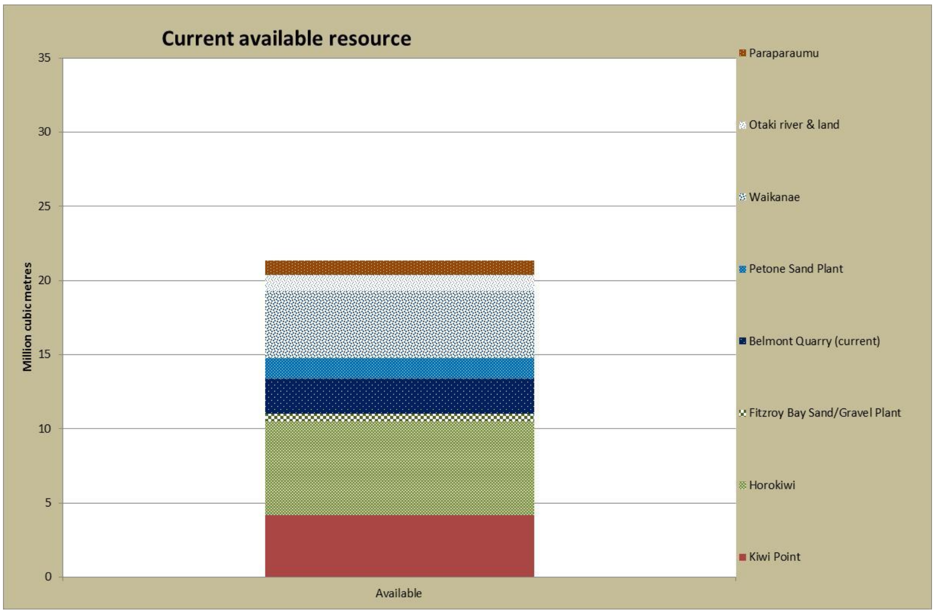
[15] Data on Kiwi Point Quarry production from Holcim NZ website.

[16] Data on Horokiwi Quarry Production based on average over last 10 years from Barker R (2012) Relinquishment report for ML 323202 – Wellington. Horokiwi Quarries Ltd. NZ Petroleum and Minerals, Ministry of Business, Innovation and Employment, open file report MR4883. (http://www.nzpam.govt.nz/cms/minerals/tech-data; data on Fitzroy Bay from Dominion Post

region by about 50% and comprise about 33% of the total available resource. Expressing the current available resource in terms of the number of years of current production levels it can sustain, the available resource could last 23 years without the Belmont extension or 41 years with the Belmont extension (into the Firth Block). This is an accurate indication of time to resource exhaustion if and only if the production stays at the current level to the time of exhaustion and no additions to available resource occur in the intervening period.

The graph below (Figure 2) shows the distribution of available resource across the currently operating or known potential quarry sites. While Kiwi Point, Horokiwi (with the affiliated Fittzroy Bay operation) and the Winstone Aggregates sites each have substantial available resource under current authorisations, only a quarter of the Winstone Aggregates are within the Wellington/Hutt urban area. When the current Belmont resource is exhausted, transport costs could reduce supply into the Wellington urban area to just two sources unless Winstone's available resources are augmented by the proposed Belmont extension.

Figure 2 Available aggregate resources in the Wellington region

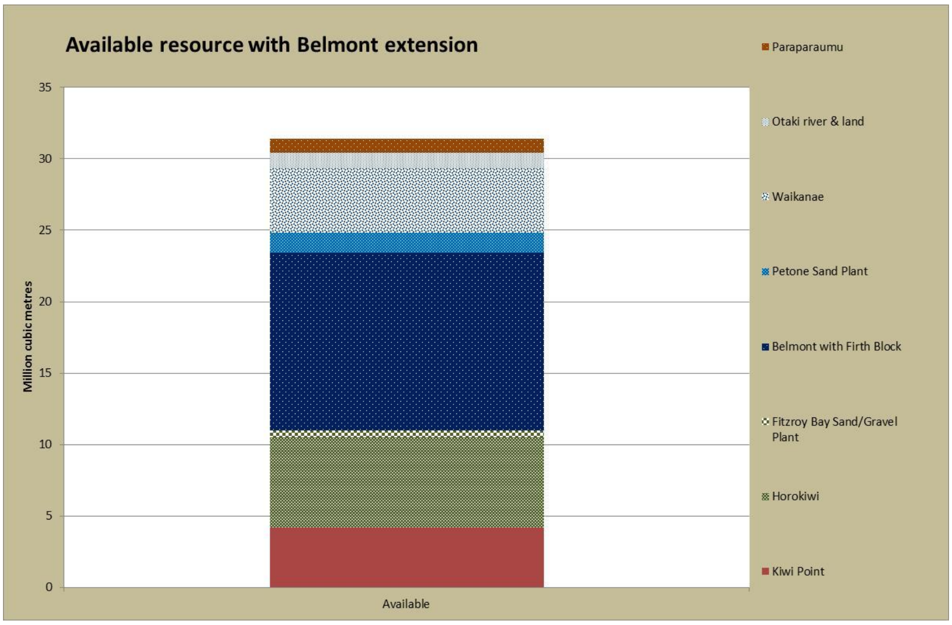


Note: Data drawn from documents of Winstone Aggregates Ltd, Holcim (NZ) Ltd and Horokiwi Quarries Ltd.

Source: NZIER

The extension of Belmont Quarry with the addition of the Firth Block would raise region-wide available aggregate resources to around 31 million cubic metres, or a little less to the extent that other existing available resources are worked out before the Firth Block becomes available (Figure 3). The Firth Block would then account for 33% of available resource or more, depending on how much other available resources had been depleted by then.

Figure 3 Available aggregate resources with Belmont extension



Note: Data drawn from documents of Winstone Aggregates Ltd, Holcim (NZ) Ltd and Horokiwi Quarries Ltd.

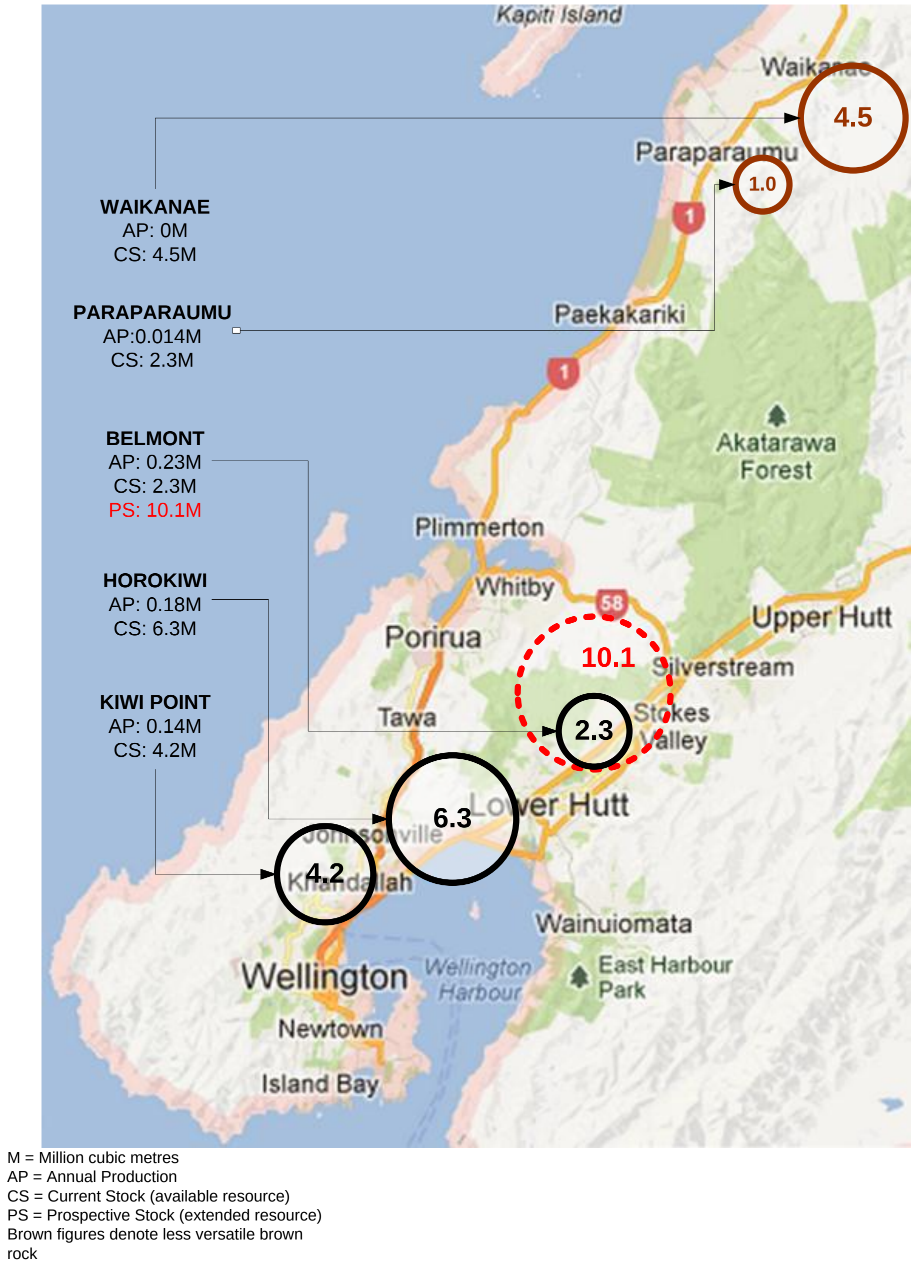
Source: NZIER

In the Wellington urban region, annual demand is more likely to increase than the extent of available resource, so the calculation of life-time is likely to overestimate the time to exhaustion. Development of new resources may be constrained close to urban areas because of limitations on quarry operations and heavy truck movements on local roads. Replacement of quarries is likely to involve higher costs, and longer transport routes as well as consent processes associated with removal and deposition of over-burden, extraction operations and transport of product.

Figure 4 shows the distribution of the main quarries and size of their respective available resources across the metropolitan districts in the Wellington region. Current production is concentrated along the fault-lines beside the State Highway 2 along the Hutt Road and beside State Highway 1 in the Ngauranga Gorge. Other sources in the region tend to be more distant from areas of demand, further from key transport routes or comprise more limited or lower grade resources with less versatility or economic viability for conversion into aggregate products.

Belmont is well positioned because of its proximity to versatile resource, good access roads, flat access and proximity to the Hutt and Wellington markets. Because of the effect of transport costs on delivered prices of aggregate products, without the Belmont Quarry extension supply for the Hutt City and the entire Wellington urban region in the foreseeable future would be reduced to only two substantial quarries with consented available resources within easy transport distance.

Figure 4 Distribution of the main available aggregate resources in the Wellington region



Note: Brown figures denote less versatile brown rock resources

Source: NZIER

4. Effects of Belmont Quarry extension

The basic economic question in the approval decision is what will be the difference in economic outcomes with the Belmont extension and without it. This means considering what would change with the Belmont extension authorised, compared to the consequence of no access to the aggregate resource in that location.

4.1 Local economic output, incomes and employment

The Belmont Quarry makes a positive contribution to the local economy in the Wellington region by extracting products of value from a naturally available resource. In doing so it generates revenues from its output to cover its expenditures, some of which stays in the Hutt City or wider Wellington urban region to stimulate other spending by other local businesses. This comes principally from the wages paid to employees and contractors, the margin on supply of goods and services from local businesses, and the flow-on effects of employees/contractors spending money in local shops (the economic multiplier effect).

Belmont's operational expenditures (including wages and contractors) have been about $6 million per year over the past 10 years. Much of this operational expenditure consists of intermediate consumption, for instance payments for inputs such as fuel or materials, which ultimately originate in more distant sources. Belmont Quarry has recently employed between 10 people (in low production years) and 18 people (in high production years), putting it close to the average size of business in the Hutt City. Its annual wages and salary bill has ranged between $700,000 and $1.25 million per year, depending on staff numbers, and has averaged about $850,000 over the past 10 years. Over the same period, it has paid an average of $440,000 per year to contractors in the region. Much of these payments are retained as people's income that is used for spending in Hutt City and the wider region, although some will leak out of the local economy to purchase goods imported into the region, or holidays by residents outside it.

Spending by the Belmont Quarry, like other businesses, will have an economic multiplier effect to the extent that the recipients of spending (wages or business receipts) use it to buy other things within the local economy. The smaller and less self-sufficient the economy of interest, the greater is the leakage of spending out of it and the smaller the multiplier. However, the smaller and more localised the economy, the weaker the statistical basis for their calculation and we do not rely on multipliers in this analysis.

In the Wellington region quarrying forms part of a broader mining sector that employed 186 people on average each year over the 2008-2010 period,[17] equivalent to 0.08% of the region's total employment. Despite its small size, it is one of the sectors that can contribute to a high gain in jobs year on year, reflecting cyclical changes in demand and production levels. Belmont Quarry's 10-18 employees are equivalent to 5-10% of the sector's employment in the region. It has a larger contribution as it is integrated with Winstone's Petone Sand Plant and some local trucking operations. This would add another 9 jobs directly dependent on the Belmont Quarry's continued operation, which would potentially be at risk if lack of available resource were to lead to Belmont Quarry's closure.

[17] Infometrics (2012), Wellington Labour Market and Economic Profile.

In that event, however, some of Belmont's production could be made up by increased production by other local quarries, in which case some of Belmont's economic contribution would simply be transferred to elsewhere in the region, likely with some loss of business from Hutt City to its neighbouring jurisdictions.

Although the local economic contribution of the Belmont Quarry is greater than is indicated by its operational spending, it is not a significant part of the Wellington regional economy, which in 2010 was estimated to have contributed $19.6 billion to GDP. Against this Belmont's operational expenditures or its annual wage bill average appear rather modest. But it does make a positive contribution to employment and wages spent in the region, and would appear less modest in relation to Hutt City's economy.

As indicated above, the main significance of quarrying lies not in its contribution to the measured economy, but in its role in supporting other value adding activities by providing materials and inputs to other sectors. Extending the resource available to the Belmont Quarry would enable its continued operation and contribution to that role.

4.2 The consequences of no access to the Firth Block

As shown in Table 4 and Figure 4, expanding the Belmont Quarry would materially increase the available resource of aggregate within the Wellington urban region. It would enable Winstone Aggregates to continue to operate a quarry and resulting processing facilities (including the nearby concrete plant) offering a wide range of products into the metropolitan Wellington market, adding to the supply of aggregate products to the Wellington urban region and reducing the time, energy and financial resources spent on transportation and storage from more distant sources.

4.2.1 Effects of closure on the life-span of available resources

In the absence of extraction at Firth Block, Belmont Quarry has sufficient available resource to continue production at about its current level for no more than ten years. As authorising the extension incurs a high proportion of cost which is fixed irrespective of the scale of the work being authorised, without a sizable increase in available resource to utilise the company may consider it is not worth the cost of maintaining its operation.

The estimated life-time of available resource across the urban region suggests that current stocks could continue to supply their current annual production levels (assuming no growth) for 23 years. Authorising the Belmont extension would add a further 18 years of current annual production, deferring the date when new resources need to be identified, consented and brought into production. If there is growth in demand in the Wellington region (for example, a new tranche of major roading projects), the remaining life-span of the available resources would be shortened.

The estimated life of available resource is calculated by dividing total available resource by total production and does not account for different qualities between resources. If high quality resources with the versatility of material to deliver a wide range of products within the Wellington market are only found in significant quantities at Belmont, Horokiwi and Kiwi Point, the estimate would result in shorter life-span for existing available resources.

As an illustration (not a forecast, as changing rates of production and new resource extensions would change the results), current production levels would exhaust the current Belmont quarry resource within 10 years. If at that point, without access to the Firth

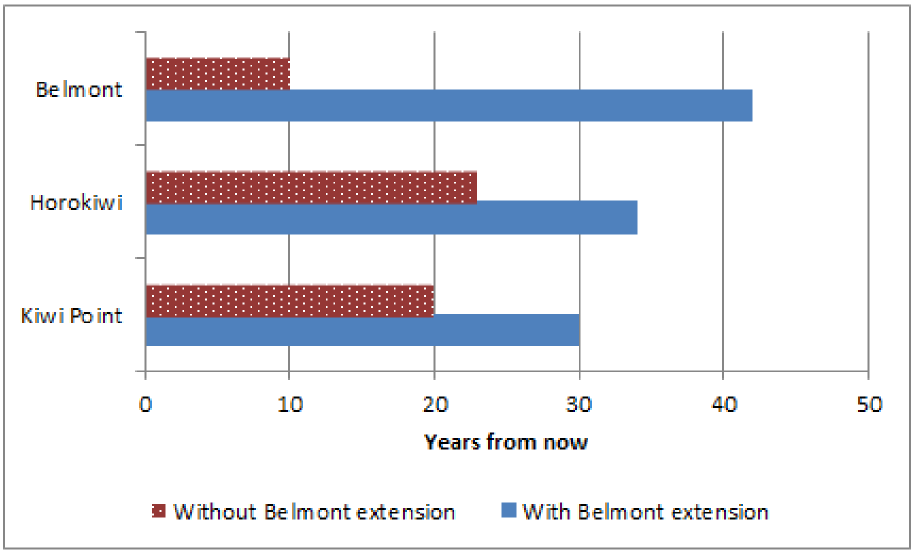
Block, Belmont Quarry closed and its current market sales were picked up by Horokiwi and Kiwi Point quarries in equal measure, the existing estimated available resource at Kiwi Point would be exhausted in a further 10 years (20 years from now), and if Horokiwi picked up the production, then its available resource would become exhausted two years later. So, on the basis of these estimates, other things held constant, the high quality hard rock available resource in urban Wellington region would be exhausted in 23 years' time.

Should the Belmont Quarry extension be approved, so that the Belmont Quarry remained open, that critical date of current resource exhaustion would occur 19 years later. All three quarries could continue to supply current production for 30 years before Kiwi Point resource is exhausted. If Belmont and Horokiwi picked up half of Kiwi Point's ceased production, the Howokiwi resource would last a further 4 years, and the extended Belmont a further 8 years beyond that (42 years from now) after picking up the ceased production of Horokiwi (Figure 5).

There are many reasons why the future may turn out differently, for instance, if site constraints at Kiwi Point mean its available resource is smaller than estimated here, or if a pick-up in demand for construction and road building materials necessitates an increase in annual production. The existing quarries may also find it impractical to step up production to cover the production ceasing from other quarries: Belmont's closure would require production from Horokiwi and Kiwi Point to increase by around 60 and 80% respectively, which may not be feasible given the size of the workable face and the limits of working shifts. The point of the illustration is simply that available resources are finite and the contraction or cessation of Belmont Quarry on the basis of the restriction of its available resource would make a material shortening of the available resources in the Wellington urban region, bringing forward the date at which either material would need to be trucked in from further afield, or new quarries are brought into production within the Wellington urban region. Both those options are likely to increase the cost of aggregate supply in the region.

Figure 5 Timeline of available resource with and without Belmont quarry extension

Dates at which resources would be exhausted in meeting current annual production



Source: NZIER

With a forecast annual average percentage growth in population and demand of 0.4%, the date of exhaustion of Kiwi Point and Horokiwi available resources would be brought forward by one year, to 19 and 21 years from now, respectively, based on the assumptions used above in the illustration without Belmont extension.

4.2.2 The cost of accelerated depletion of other available resources

There is an economic value for deferring the date at which new resources need to be brought into production. If Horokiwi and Kiwi Point quarries could gain access to new available resources at their existing sites, the cost of not having access to the Firth Block would be confined to the earlier approval costs incurred by both the quarries and the relevant authorities. As the current available resources of the three largest quarries could last for 23 years at current production levels, but would be extended to 41 years with the extension of the Belmont Quarry into the Firth Block, any new approval costs at existing sites is unlikely to be more than minor in present value terms. It becomes more significant if the finding of new available resources requires establishing one or more new quarries.

From information obtained from Winstones, the cost of establishing a new quarry could be around $29 million in current value terms, of which approximately $2.5 million would be spent on obtaining approvals. The difference in present value cost between installing a new quarry in 22 years (when other high quality quarries are exhausted without the Belmont Quarry extension) or in 41 years (with the Belmont extension) is $2.7 million at 12% discount rate, or $6.5 million at the 8% public sector discount rate as currently recommended by Treasury for public infrastructure investment.

Assuming a new quarry is required to maintain a minimum of two large suppliers in the region, the choice is between developing a new quarry in about 20 years' time when Kiwi Point is expected to close if Belmont has no extension, or in about 32 years' time when Horokiwi faces closure if Belmont is granted extension. The present value of the difference between spending $29 million in 20 years' time or 32 years' time (allowing for approvals to be obtained one year ahead of when the new available resource is required for operations) would be $3.3 million at a 12% discount rate, or $6.1 million using an 8% discount rate.

This cost would be borne primarily by the quarry companies in the first instance, but has wider ramifications to the extent that it would increase the cost of supply of aggregate within the region, compared to the case where new quarries were avoided.

4.3 Possible alternatives to Belmont Quarry extension

Current production from the Belmont Quarry accounts for about a third of the total aggregate production in the Wellington region and would need to be replaced by either a new large scale quarry or re-allocation of the Belmont production between the Kiwi Point and Horokiwi quarries.

Alternatives to the Belmont Quarry should the extension not be authorised are principally:

- sourcing material from other existing quarries
- establishing new quarries
- recycling material recovered from existing demolition and similar work (although this is unlikely to be a substitute for the full range of materials and volumes obtained from new extracted materials, as explained below).

4.3.1 Other existing quarries

While Winstone Aggregates has other quarry sites in the region, none of these is a close substitute for the versatile[18] material to be obtained from the current Belmont quarry or its extension into the Firth Block. The Petone Sand Plant supplies only sand (and has significant volume constraints with annual extraction consent limited to 65,000 m^3 in any one year, with maximum averaging 50,000 m^3 over the past 5 years), and is a complementary operation to the processing that occurs at Belmont Quarry and the nearby Firth Concrete plant.[19] Waikanae Quarry has low quality material and is not currently in production, and there is also extraction from river gravels and land deposits at Otaki, but supply from both of these is penalised by distance from the Wellington urban region.

An industry rule of thumb is that price of aggregates doubles with every 30 kilometres transported.[20] If the price at the Quarry gate were $15 per tonne, transporting material 30 kilometres would incur another $15 per tonne, implying a cost of $0.50/tonne-kilometres travelled. A 2010 report from the Ministry of Transport suggested the median cost of truck operations per kilometre in the range of $1.98 - $2.78, depending on road characteristics. For a truck with an average payload of 7 tonnes, it found the average cost per net tonne-kilometre in 2009 dollars would be about $0.40. [21] That would imply that sourcing from

[18] We understand from Winstone that Belmont can provide a full range of products from high value concrete aggregates, seal chip, high-spec base courses, low-spec base courses, general fill, clay etc – None of the other Winstone quarries in the region can produce that full range at volumes that Belmont can produce.

[19] There is also a small alluvial resource at Baring Head, provided for in the District Plan, which has not been economic to develop because it could supply only a limited range of aggregate materials, and would have a distance penalty in delivering to other sites in Hutt City.

[20] Aggregate and Quarry Association http://www.aqa.org.nz/documents/Aggregate%20Facts%202009.pdf

[21] Ministry of Transport (2010) "Understanding Transport Costs and Charges – Phase Two – Transport Costs in Freight Logistics", Wellington

Waikanae would add about $20 to the delivered price in Wellington, a considerable price disadvantage to sources in closer proximity to the demand.

Table 5 illustrates the transport cost per tonne of material between each of the quarry sources and the metropolitan centres in the region, at $0.50/tonne-kilometre carried. Analysis of Winstone's average sales prices for 'all classes' of aggregate over the 2003-2012 period, shows transport doubles the price 'all classes' of aggregate for distances in excess of about 50 kilometres, which would apply to sourcing material from Waikanae or Otaki. It would require a cost per tonne-kilometre of about $0.60 to double the price at 30 kilometres distance. Compared to the lower price for roading materials, however, $0.50/tonne-kilometre would double the price at little over 30 kilometres, in line with the industry rule of thumb cited above.

Table 5 Transport costs between sources and regional cities

Quarry	Distance to city centres (km)			Transport cost to city centres ($ per tonne)		
	Lower Hutt Centre	Upper Hutt	Wgtn	Lower Hutt Centre	Upper Hutt	Wgtn
Belmont Quarry	6.2	9.7	23.0	3.10	4.85	11.50
Horokiwi	5.5	21.5	11.2	2.75	10.74	5.61
Kiwi Point	11.2	27.1	9.24	5.62	13.57	4.62
Petone Sand Plant	4.0	21.6	16.7	2.00	10.80	8.35
Fitzroy Bay	19.0	35.1	36.1	9.50	17.55	18.04
Waikanae	53.8	57.3	57.9	26.90	28.65	28.97
Otaki	69.5	73.0	73.6	34.75	36.50	36.82

Source: NZIER, from data of Winstone and other sources

Winstone have provided costs per truck-kilometre in the range of $2.50-$3.50, a little higher than the corresponding $1.98-$2.78 in the 2010 Ministry of Transport study. This indicates the cost penalty for transporting long distances will have worsened slightly in recent years, reducing the feasibility of more distant sources being competitive alternatives to the quarries in the Wellington urban region.

4.3.2 How much can existing quarry production be increased?

To replace the aggregate supplied by the Belmont Quarry, the Kiwi Point and Horokiwi quarries would need to increase their combined output by approximately 40 percent. The existing Kiwi Point and Horokiwi quarries have sufficient available resources to replace the supply from the Belmont Quarry in the immediate future.

However, it is not clear how easily such a large increase in production could be achieved or whether this would affect traffic movement on State Highway 2. In particular:

- unless the quarries can extend the area of the face they are currently working or work more intensively on the existing face then they would need to extend their hours of operation to meet the additional demand
- the quarries will need to invest in new plant and equipment to replace the scrapped processing capacity at Belmont - it is difficult to estimate the size of this increase
- increased production at the remaining quarries may include potential environmental effects at these quarries as well as increase traffic movements at these sites – conversely consent conditions may restrict the possibilities for extension, in which case meeting Belmont's foregone production, could necessitate either a reduction in volumes produced in the region or volume made up from more distant sources, at higher cost of supply
- customers of the Belmont Quarry are likely to face an increase in transport costs[22]. The size of the increase will depend on how the increase in production is shared between Kiwi Point and Horokiwi quarries. At the minimum, customers of the Belmont Quarry (north of the quarry) could expect to face price increases equal to the transport cost between Belmont and Horokiwi. Horokiwi could raise its prices to just under the cost of the next best alternative – Kiwi Point plus its transport cost – to convert some of its locational advantage into profit.

The alternative source of supply would also affect the profitability of the Firth concrete plant and Fulton Hogan asphalt plant located adjacent to the Belmont Quarry. (At the moment the Belmont Quarry supplies a relatively high share of the aggregate used in building and construction because of its supply of aggregate to the Firth concrete plant and Fulton Hogan asphalt plant at minimal transport cost.)

4.3.3 Establishing new quarries

As noted, the cost of establishing a new quarry is estimated to be in the region of $29 million, including land purchase, consenting, installation of road access and processing plant and initial over-burden stripping to reveal enough rock resource to sustain required production rates. These figures are not based on a particular location, (selection of which depends on finding a suitable combination of resource quality, accessibility, and minimal effect on residential neighbourhoods), so are only indicative of establishment costs of a new quarry.

While new quarries will be developed at some stage as available resources become depleted in the long term, it is unlikely that a new quarry will be established to replace the loss of supply if Belmont closes given the available resources at Kiwi Point and Horokiwi, for the following reasons:

- information on sites with suitable quality rock is limited and rather dated. This suggests a potential developer would need to incur the cost of a prospecting programme to identify suitable resource
- consenting and developing a new quarry is an uncertain and expensive process. These additional costs have been largely written-off by existing operators in the

[22] Each of the quarries offer similar quality of rock and should face similar extraction costs. Transport cost equate to a price difference of 3 percent per tonne kilometre. Therefore we assume that price signals are already encouraging customers to buy aggregate from the quarry that is closest to them.

market and therefore give them a pricing advantage over a new quarry. (Based on the information provided by Winstone for the cost of developing a new quarry and assuming these costs are amortised over a 20 year period prices from the new quarry would need to be at least 20 percent higher to recover the development costs)

- history of quarrying in the region suggests that it will be very unlikely that a quarry site can be found that is closer to markets than the Belmont Quarry leaving the new operator at a transport cost disadvantage.

Eventually demand will rise relative to supply, either because of growth in aggregate applications or depletion of resources in the region, at which point higher cost alternatives from further away will make developing a new quarry in the region more competitive. However, until that time the closure of Belmont Quarry is likely to leave the Wellington urban region with only two sources of high versatility hard rock, and any constraints on their operation could reduce supply and raise costs of aggregate in the region.

4.3.4 Recycling material

Crushed aggregate from demolition concrete can be used as an alternative to coarse aggregate for use in new concrete products or roading or drainage materials.[23] However, this is typically blended with raw coarse aggregate, as it is difficult to know the properties of recovered material and a high percentage of recycled aggregate can negatively affect new concrete's strength. As with fresh aggregate, the high cost of cartage and need for a reliable source of recovered material at a consistent grade affect the economic feasibility[24] of recycling materials. As recycling material faces added transport costs (both gathering material as well as distributing product), and higher production costs to overcome quality issues, it seems very unlikely that recycled aggregate could substitute for the range of materials available from Belmont Quarry, and we do not consider this an alternative for the requirements of the Wellington region.

4.4 Impacts on the local market and economy

The effects of not authorising Belmont Quarry's extension depend on the ability of alternative sources of aggregates to meet long term demand, the market effects of a major supplier disappearing, impact on the regional economy in Wellington and implications for wider environmental effects.

4.4.1 Alternative suppliers' ability to meet long term demand

If Belmont Quarry ceased operating, and more distant quarries in Waikanae or Otaki are uncompetitive due to transport cost and product mix, the local market would be reduced to two suppliers for aggregates other than the sand available from local sources.

A Wellington City Council Report in 2003 endorsed the operational and financial performance of the Kiwi Point Quarry, which it owned at the time. Kiwi Point has since

[23] CCANZ (2010) Recycled aggregates in new concrete; Technical Report TR 14, Cement and Concrete Association of New Zealand.

[24] We understand from Winstone that recycled aggregates are very expensive to produce and are of limited use in concrete. They can be used to make a low grade base course but this product is far more expensive than the excess low grade scalped material – a by-product of the production processes of other local greywacke quarries.

been bought by Swiss-based multinational Holcim Ltd. Quarrying is provided for by specific provisions in Wellington City District Plan, and it was recently extended by a change in the Plan.

Horokiwi has long term resource consents that last until 2035 and sufficient available resource to continue its current annual production for about 25 years. Urban encroachment around the boundaries and issues around overburden removal may limit its future extension on the site.[25] It is a joint venture owned by Fulton Hogan and Higgins, both major roading contractors in the region.

4.4.2 Market effects of a major supplier disappearing

Removal of one of the three major suppliers of rock and aggregate in the region raises issues reduced competition. While Section 104(2A)(3)(a) of the RMA specifies that consent authorities must not have regard to trade competition when considering an application, that provision is aimed at deterring competitors from raising objections on the grounds of the redistribution of profits, which is not an environmental effect under the Act. However, the possibility of reduced competition is not just about distribution of profits but has implications for resource allocation and efficiency, which is relevant to section 7(b) of the Act.

The issue is whether the withdrawal of a significant competitor in the Wellington and Hutt markets for aggregate and rock would remove constraints on pricing and result in the price of supply being materially higher, or service levels lower, than in the situation with the continuation of three operating quarries. Given the locations of Kiwi Point and Horokiwi, there is a risk of a bifurcation in the market, with Horokiwi capturing much of the business in Upper Hutt because of the transport cost differential, and Kiwi Point dominating the more distant areas of Wellington (such as Island Bay and Miramar) for similar reasons. Where there is an appreciable difference in delivery cost, a supplier enjoying local dominance can in principle raise prices to just under the delivered price of the alternative supplier, in effect converting some transport cost differential into profit.

In New Zealand, matters of competition are principally dealt with by the Commerce Commission, which examines the market implications of mergers and acquisitions, and also investigates specific complaints. The Commission applies a number of tests to the merits of each case, but has not issued any general guidance on how many competitors, or what distribution of market share, is required to ensure workable competition.

Many of its decisions rest on the potential for new entry to exert competitive constraint on incumbent suppliers. In the case of quarries in the Wellington metropolitan area, because of the hurdles faced in finding suitable resource, sufficiently close to transport and overcoming consenting requirements, the threat of new entry is rather less than in more footloose industries.

To illustrate the potential for price increases from reduced competition, Table 6 calculates the difference in transport costs between Horokiwi and a central point in each of Hutt City, Upper Hutt and Wellington, and the corresponding costs from Kiwi Point. Kiwi Point is $0.99 cheaper than Horokiwi for delivery into central Wellington, but about $2.80 more expensive for delivery into each of Hutt City and Upper Hutt.

Horokiwi has a locational advantage in supplying the Hutt Valley, so could price up its deliveries in the Hutt Valley by, say, 90% of its cost difference, to convert most of that advantage into profit. Customers in the Hutt Valley would then pay about $2.50 a tonne

[25] Wellington City Council (2003).

extra for their current demand which, other things held constant, would have a total cost of about $1.7 million a year. Conversely, Horokiwi could discount its deliveries into Wellington to become more competitive with Kiwi Point in the larger Wellington market, cross-subsidising its deliveries from the profit in the Hutt Valley.

The incentives for Kiwi Point to act in the same way are not as strong, as it has less to gain from discounting into the Hutt Valley. It could raise its prices into Wellington by $0.90/tonne and still undercut Horokiwi. But it would have to discount more deeply to be competitive in the smaller Hutt Valley markets, undermining its overall return.

Table 6 Potential excess pricing from reduced competition

Aggregate	Transport cost to city centres ($ per tonne)		
	Hutt Centre	Upper Hutt	Wgtn
Horokiwi	2.75	10.74	5.61
Kiwi Point	5.62	13.57	4.62
Difference in delivery cost	-2.87	-2.83	0.99
Current demand (million tonnes)	0.469	0.189	0.910
Price excess ($million per year)	-1.21	-0.48	0.81
Hutt Valley combined ($million per year)	**-1.69**		

Source: NZIER

In principle it is possible that Horokiwi could price up in the Hutt Valley and Kiwi Point price up in Wellington, which on the figures above would increase costs of aggregate supply across the region by $2.5 million per year. In the longer term, if the local suppliers do get into the habit of pricing up to the back-stop alternative, and if the prospect of new quarry within a competitive distance is precluded by approval and transport constraints, there could be a gradual drift up of prices.

Reducing suppliers from three to two creates a real possibility of such price distortions, particularly over the longer term if there is little prospect of new quarries being authorised. The risk of cost increase is most salient in the Hutt Valley.

Such risk would be reduced, if not eliminated, with the continuation of Belmont Quarry as a sizeable competitor in the Hutt Valley. Belmont faces more competition with Horokiwi in Lower Hutt and has less to gain from exploiting its dominant position in Upper Hutt.

4.4.3 Impact on the Wellington urban region economy

On the assumption that a new quarry is unlikely to be established in competition with the two remaining incumbents, the expenditure impacts of the Belmont Quarry extension not being approved are relatively minor. The 10-18 full time jobs at the Belmont operation would cease, but to the extent that Horokiwi and Kiwi Point pick up their production we would expect most[26] of these jobs to transfer to these other sites. Some of the income and expenditure consequent on these jobs may relocate outside of the Hutt City if the transferred jobs go to workers resident in other districts, but across the regional economy the effect of Belmont closure on direct incomes and indirect expenditures is likely to be minor, with losses at the Belmont site offset by new business at the other quarries.

4.4.4 Implications for the wider environment

Any significant change in the patterns of supply of material goods will have implications for wider environmental effects. There will be changes in the environmental effects at other quarries that step up production to meet new demand, and changes in the traffic movements around these sites. It is possible that there may be more than minor effects, given the substantial step up in production (by about 70%) from existing quarries to meet the demand currently met by Belmont Quarry. Such implications are unknown and are beyond the scope of this report.

[26] Site administration functions, weighbridge and some operational and management functions would be rationalised.

5. Net economic effect of Belmont Quarry extension

The net economic effect of Belmont Quarry extension is summarised in Figure 6. We have set the counter-factual case of the future without the Belmont extension as one in which the Belmont quarry closes and its production is taken up by other existing quarries in the region. This changes the local market relative to its current operation, with a number of costs and consequences that would be avoided if the Belmont extension is approved. We have also looked at the economic implications of adverse effects that would arise with the Firth Block consented, compared to if it is not.

5.1 Impact on the local economy

The impacts of Belmont's closure on the local economy are likely to be small, both because quarrying is a small part of the measured economy and because much of the business currently served by Belmont Quarry is likely to transfer and be picked up by other quarries in the region. We have no reason to expect operating expenditures or wages paid by other quarries to be much different from those at Belmont, so much of the expenditure would simply relocate to other quarries. Indirect and flow on effects would also be very similar, albeit with some relocation of business. As Belmont's closure would probably result in some business relocated from Hutt City to the Kiwi Point quarry in Wellington City, the impact on the Hutt economy will be more noticeable than that on the wider region.

It is possible, though unlikely, that a new quarry could be established to service demand currently met by Belmont, although this is likely to face increased costs from capital repayment and transport compared to the incumbent suppliers. Establishing such a quarry would inject more funds into the local economy and provide a greater impact than continuing with the Belmont operation, even though it results in higher cost supply from the new quarry. Economic impact analysis is fundamentally the wrong type of analysis for assessing the economic efficiency of resource use, as required by the Act's section 7(b).

5.2 Change in the local economic environment

Should Belmont Quarry close for lack of feasible resources, the regional market for supply of rock and aggregates would change from one in which there are three similar sized suppliers in the Wellington urban region to one in which there are only two. This creates a likelihood of price rises, not just because the market is reduced to two effective competitors but also because the location of the two quarries gives them a competitive advantage over part of the market relative to the remaining competitor which they can exploit.

This creates potential for price increases with firms capturing some of the difference in transport costs as profits. This effect is likely to be stronger in the Hutt Valley than in Wellington City. Assuming a transport cost of 50c/tonne-kilometre, this could increase the cost of current aggregate supply by about $1.6 million a year in Hutt valley and $0.8 million a year in Wellington City. Aggregate demand is not so price sensitive that this would reduce requirements much, but it would use resources on aggregates which could be used on other things if prices were more competitive. Reduced competition may also blunt the incentive for innovation and improvement in resource use efficiencies.

Retention of a third quarry at Belmont would reduce this potential, with a third competitor and a smaller differential in transport costs between them.

Other effects of having a third quarry are less readily quantified, but include enhanced security of supply, with less risk to availability of supply from disruption at one site. A third quarry may also affect the range of products available at any point in time, providing value for end use consumers.

5.3 Change in the long term availability of aggregate

If approved, extending Belmont Quarry to use the Firth Block would add another 30 years to the life of the quarry at current production, and result in the existing quarries in Wellington lasting a further 19 years, compared to the situation without it. The effect of not approving a plan change to enable the extension of the Belmont Quarry would be to accelerate the depletion of the other known available resources in the region, bringing forward the date when new available resources will be required, to about 20-24 years from now (depending on growth in demand).

As existing quarries have constraints on their current sites, finding new available resources may mean finding new quarry sites. Establishing a new quarry is estimated to cost $29 million in today's prices, so the present value cost discounted at 8% public sector rate would be $7.6 million in 22 years' time (without Belmont extension) or $1.1 million in 41 years' time (with Belmont extension), so the present value of bringing this quarry replacement forward from 41 years to 22 years' time would be $6.5 million (at 8% public sector rate).[27] As such a new quarry would also more likely be further from the main market in the urban region area than current quarries there will also be an increase in annual delivered cost which will be brought forward, but the location is uncertain and we have not quantified this.

[27] The corresponding present value figures discounted at a commercial 12% rate would be 2.8 million in 22 years' time or $0.1 million in 41 years/ time, with the difference in bringing forward the commissioning date of $2.7 million in present value terms.

Figure 6 Summary of net economic effects in Wellington urban region

	Without Belmont extension	With Belmont extension
Impacts on the economy		
Jobs in quarrying in Hutt area	Less than 10-18 picked up by other quarries	10-18 at Belmont, 9 at Petone
Salaries and wages in Hutt area	Similar per person elsewhere, but applied to a smaller number	Annual average $850k per year; plus $420k on contractors
Other operational expenditure	If output shifts to other quarries, probably similar elsewhere	$4.9M per year at Belmont (excluding wages & contractors)
Belmont closure and rehabilitation	Unknown, incurred in 10 years' time	Unknown, incurred in 41 years
Indirect flow-on impacts	Minor, some relocation out of Hutt City	Minor
Capital expenditures	Upgrade for new production	Write-off plant
Likely demand growth	0.4% per year	0.4% per year
Benefit of proceeding with Belmont extension		
Value of rock and aggregate material	2 quarries in region risks price rise of $2.5M/year	3 quarries avoids cost rise of $2.5M/year
Accelerated depreciation of remaining available resources	New quarry required in 22 years at present value cost of $7.6M	New quarry required in 41 years at present value cost of $1.1M
Enhanced value for customers from secured local supply and wider choice of aggregate suppliers		Not quantified but positive
Avoided cost of greenhouse gas emission on transport in supply	Minor increase in emission costs	Reduced emission costs in supplying Hutt
Cost of proceeding with Belmont extension		
Costs of capital, labour and other operations and maintenance cost	Commercial decisions of other companies	Commercial decisions of Winstones

Source: NZIER

6. Conclusions

This report has examined the economic issues surrounding the proposed extension of the Belmont Quarry.

6.1 What is the economic crux of the decision

Approval for extending the Belmont Quarry onto the Firth Block is sought to ensure that the Wellington urban region continues to enjoy a competitively priced reliable supply of aggregate. From an economic perspective the decision on the extension of the Belmont Quarry is whether or not to prematurely expose:

- the Hutt City to the partial and potentially full loss of the contribution to local economic activity from the quarry operations
- consumers of aggregate in the Hutt City and the wider Wellington urban region to increased costs of aggregate supply.

6.2 Realities of quarrying

Rock is a fundamental but often overlooked input into the infrastructure on which the economy runs. There are no cost effective substitutes for the input of quarried rock. Aggregate is expensive to transport relative to its cost of extraction. As a rule of thumb transporting aggregate 30 kilometres doubles its price. The private cost of aggregate and associated transport cost externalities (e.g. emissions and road accident risk) are minimised with short distances between the quarry and the location where the aggregate is used.

Development of new quarries is expensive. All other things being equal aggregate from a new quarry would cost about 20 percent more than from one of the existing quarries. If the new quarry is located further away from markets than existing quarries the price of aggregate will be higher again – approximately 3 percent higher for every additional kilometre of distance travelled.

The cost of aggregate to consumers is function of the cost of extraction and the costs of transporting the costs of aggregate to its point of use. Typically quarry operators select sites and product mixes that minimise and equalise the cost of extraction. Therefore the main variant in cost of aggregate to the consumer becomes the distance the aggregate needs to be transported. Also most people object to quarry operations near their residence creating a strong pressure for quarries to be located out of sight and earshot of residential areas or face restrictions on their operations and transport movements. In combination these factors make it highly likely that any alternative to the Belmont quarry extension will increase the cost of aggregate to consumers.

In simple terms consumers expect aggregate to be readily available at low cost out of sight and out of mind. This objective is best met by using economically accessible resources as close as feasible to the point of end use.

6.3 Outlook for Wellington

Wellington region has known aggregate available resources sufficient for another 23 years at current production rates.

Current demand is at a cyclical low – at least 15 percent below the average over the past six years. Also, regional demand for aggregate is expected to increase gradually over the next 25 years as the regional population increases, suggesting known available resources will be depleted in less than 24 years.

Belmont Quarry is one of three major suppliers of aggregate to the Wellington region. It supplies approximately one third of the Wellington region demand for aggregate and supplies more than half of the regional demand for aggregate used in concrete.

The existing available resources of the Belmont Quarry will be depleted within the next 10 years and unless authorisation is given to access new resources on the Firth Block the Belmont Quarry is likely to be closed.

6.4 Consequences of the decision

Approval to extend the Belmont Quarry into the Firth Block will:

- extend the life of the Belmont Quarry by 20 to 40 years and underpin continuation of three major aggregate suppliers in the region
- slow the depletion of the other two major quarries and postpone the time at which the region will need to develop more expensive new quarries
- avoid the probable closure of the Belmont Quarry, retaining a third competitor in the Wellington aggregate market and suppressing possible price rises.

If the Belmont Quarry closes, its production is most likely to be picked up by existing incumbent suppliers. The market will be reduced to two dominant suppliers, creating potential for price rise due to:

- increased transport costs for delivery to some areas in the region
- reduction in competition and positioning of remaining quarries that allows each to raise prices up towards the level that their competitor can supply.

Appendix A Key messages

Sought

Approval for a plan change to enable extension of the Belmont Quarry into the Firth Block is sought to ensure that it continues operation beyond its current consented period and:

- Hutt City continues to receive the contribution made by the Quarry to its aggregate supply and its wider economy
- the Wellington region continues to enjoy a competitively priced reliable supply of aggregate
- Hutt City and the wider Wellington urban region are not prematurely exposed to the avoidable risks of resorting to more costly alternative sources or facing reduced reliability of supply.

Context

Aggregates are an essential input into the production of concrete, buildings and other infrastructure, on which economic and social activity depends. The main significance of quarrying is in supporting community well-being is in providing materials and inputs to other sectors, rather than in its contribution to the measured economy of expenditures and jobs, which is positive but small relative to the regional economy.

Aggregates have high weight relative to volume and are costly to transport, so low cost supply requires access to materials close to built-up areas where demand is concentrated.

Greywacke rock is common in the Wellington region, but economically workable resources of versatile quality rock, close to the surface and with easy access to good transport are limited by both natural site characteristics and planning restrictions on site operations.

Belmont Quarry is one of the three major suppliers of aggregate to the Wellington region. There are also six smaller sites which have either more limited material or more distant location. The number of quarries in the region has declined from 32 quarries in 1978.

Belmont Quarry supplies approximately one third of the Wellington region's demand for aggregate and more than half of the aggregate used in concrete. As an established operation close to the Hutt City and main transport routes producing a wide range of aggregates to meet the varied needs of consumers in the region, its capacity and location make it a competitive supplier of aggregate to customers in the Hutt Valley and Wellington City.

Implications

Approval of the proposed extension of the Belmont Quarry will:

- extend its life by 20 to 40 years and ensure that the community will continue to have three major aggregate suppliers in the Wellington urban region
- slow the depletion of the other two major quarries and postpone the time at which the region will need to find alternative sources or develop new quarries
- continue the contribution of the Belmont Quarry to the Hutt City economy

- avoid exposing consumers in the Wellington urban region to a premature and avoidable increase in the cost of aggregate.

Preventing the extension of the Belmont Quarry into the Firth Block would deprive it of high quality versatile rock and cause the Quarry's closure. This would affect the viability of other operations that rely on it, including the Belmont Concrete plant and Petone Sand extraction plant, as well as other customers outside the Winstone Aggregates group.

Such closure would deprive the region of an economically accessible source of aggregate and prematurely require the region to switch to more expensive sources of supply. The alternative sources of supply are expected to be more expensive:

- initially because the remaining existing suppliers are further away from markets in the Hutt Valley and aggregate is relatively expensive to transport
- ultimately because a decision not to use economically accessible resources at Belmont will accelerate the depletion of the remaining quarries and require the development of new sources of supply which will be more costly, because of both higher transport costs from location further from the main demand centres in Hutt Valley and Wellington and new quarries' capital costs of development.

APPENDIX 5 – PROPOSED QUARRY MANAGEMENT PLAN – WINSTONE AGGREGATES, JULY 2013

PROPOSED QUARRY MANAGEMENT PLAN

BELMONT QUARRY

Prepared by Winstone Aggregates

July 2013

PROPOSED QUARRY MANAGEMENT PLAN

BELMONT QUARRY

This Quarry Management Plan has been prepared to accompany the Plan Change Request by Winstone Aggregates (a Division of Fletcher Concrete and Infrastructure), relating to Chapter 6D of the City of Lower Hutt District Plan.

A Quarry Management Plan for the Belmont Quarry is a requirement of Chapter 6D, Extraction Activity Area, as a means of meeting objectives and policies for the area under 6D1.1.1 and 6D1.1.2 of the City of Lower Hutt District Plan.

It replaces any previous Quarry Management Plan, and will become fully effective once the Plan Change Request has been processed, and all necessary Regional Council Consents have been obtained. It may incorporate changes as a result of those processes.

The Quarry Management Plan consists of 5 sections as follows:

1. **Erosion and Sediment Control Plan and Site Layout and Development Figures**
2. **Noise Management Plan**
3. **Dust Management Plan**
4. **Hazardous Substances and Spill Response Plan**
5. **Rehabilitation Strategy**

The Quarry Management Plan is a "live" document, and will be reviewed at least every 5 years.

BELMONT QUARRY

SECTION 1

EROSION AND SEDIMENT CONTROL PLAN

Note: Appendix 2 contains only those resource consents held by Belmont Quarry relevant to this Erosion and Sediment Control Plan.

Belmont Quarry

Erosion and Sediment Control Plan

Introduction

The following Erosion and Sediment Control Plan provides an overview and guidance to land disturbance, works in watercourses, and discharges to land and water operations and activities at Belmont Quarry.

This plan describes general quarry operations and details the management, monitoring procedures, sediment and erosion control methodologies and procedures, and contingency plans necessary to comply with conditions of consent for earthworks, works in watercourses, and discharges.

Separate Erosion and Sediment Control Plans may be required for individual earthworks projects, stream diversions and works within watercourses.

This plan has been developed in general accordance with existing site procedures and the Erosion and Sediment Control Guidelines for the Wellington Region dated September 2002.

This document also forms part of the Quarry Management Plan referred to in the Extraction Activity Area provisions in the City of Lower Hutt District Plan.

Relevant consents must be read in conjunction with this plan whenever undertaking earthworks, stream diversions or works within watercourses.

In the event that there is a discrepancy between this Erosion and Sediment Control Plan and the conditions within the resource consents, the conditions of consent will take precedence.

Resource Consents held by Belmont Quarry requiring Erosion and Sediment Controls

Land disturbance, works in watercourses and discharge consents granted for the operation of Belmont Quarry relevant to this plan are:

- WGN050048[23907] – to place use and maintain a pipe in the bed of an unnamed watercourse (quarry tributary) and to reclaim parts of the stream bed with that pipe and the placement of cleanfill;
- WGN050276[23909] – to intermittently discharge contaminated water (sediment laden) from an area of bulk earthworks greater than 0.3ha to an unnamed watercourse (quarry tributary);
- WGN060276[25205] – to discharge sediment laden stormwater to land in circumstances where it will enter the Hutt River;
- WGN060276[25206] – to discharge sediment laden stormwater to water in circumstances where it will enter the Hutt River;
- WGN060276[25313] – to undertake works in the bed of an unnamed tributary of the Hutt River associated with the diversion of that tributary (quarry tributary);
- WGN060276[25314] – to divert the full flow of an unnamed tributary of the Hutt River (quarry tributary);

- WGN130019[31854] – to place, and maintain a pipe in the bed of an unnamed tributary of the Hutt River (quarry tributary), including any associated disturbance of water during construction.

Additional authorisations will be sought when these consents expire or new activities are undertaken or new areas are worked. Additional procedures or methods to those set out in this Erosion and Sediment Control Plan may be required to fully implement new or additional authorisations.

Description of Site Operations

The following is a description of site operations, identifying features which potentially impact on the sediment and erosion control at the site especially stormwater flows and discharges.

Site layout and development Figures 1 to 7 are contained within Appendix 1. The location and positioning of stormwater discharge ponds, stormwater flow paths, pit pumps and the quarry stream on Figures 4 to 7 are indicative only. The actual location of these features will be determined prior to each stage of the quarry development.

Rock Extraction and Processing

Rock is currently being excavated from both the northern and southern quarry faces within the existing quarry. Future quarry excavations are proposed to be undertaken within the Firth Block (subject to obtaining the appropriate authorisations), the northern quarry face and within the current stockpile area.

Rock extraction is undertaken using excavators and loaders. Blasting to loosen the rock resource is only generally undertaken in the lower faces, and is subject to District Plan requirements.

The excavated rock is processed in either fixed or mobile aggregate processing plant located within the quarry operational area. Water is used in the aggregate processing plant to wash and grade the aggregate and for dust suppression.

Water discharged from the aggregate processing plant is settled in a water treatment plant and re-used. The entrained fines are collected and placed within a fines deposition area.

Overburden Removal and Disposal Operations

Quarry operations currently require the removal of overburden from above the southern quarry faces. In the future, overburden will be removed from the Firth Block and from above the current northern faces.

Overburden removal will generally be undertaken as a separate earthworks contracts. Some material may be excavated between these earthworks contract periods and placed by quarry personnel within the overburden disposal areas.

Overburden is currently being placed in the Cottle Overburden Disposal Area. In the future overburden may be placed elsewhere on the site, including in worked out areas of the quarry pit.

Clay Borrow Pit

A clay borrow pit is located to the north of the northern quarry face.

Clay is excavated from this area and either placed in the stockpile area for sale or directly loaded into off-site road trucks and trailers.

Plant Fines Disposal Area

Fines arising from the processing of aggregate are separated from the water used to process the aggregate in the process water treatment plant. This material is taken by tanker to the Cottle Overburden Disposal Area where it is placed in fines disposal area cells.

Fines produced when the Cottle Overburden Disposal Area is not available for use are taken to the out of hours fines disposal area located above the northern quarry face, adjacent to the former fines disposal area.

The former fines disposal area above the northern quarry faces is currently not being used for fines disposal. Silt deposited in this area will be excavated as quarry excavation progress into this area

Stockpiling and Loadout

Stockpiles of sand and aggregate are located adjacent to the processing plant and within the stockpile area. Some product stockpiles are also be located from time to time within the quarry pit or former overburden disposal areas. Stockpile areas will be surfaced with an aggregate running course.

Runoff from the stockpile area is directed to either the discharge water pond at the quarry entrance or to the water treatment plant (for those stockpiles located immediately adjacent to the aggregate wash plant).

Site Infrastructure

Site infrastructure consists of haul roads and access roads, a weighbridge and office, aggregate processing plant, a water treatment plant, staff amenities and a car park. Site infrastructure also includes an above ground diesel tank and a truck and trailer tray wash out area.

The description and operation of the diesel tank together with the storage of oils and lubricants are contained within the site Hazardous Substances and Spill Response Plan.

A washout area has been established for customers to clean truck and trailer trays. Wash down of plant prior to servicing is either undertaken off-site or on a wash-down pad with an oil / water separator installed.

Runoff from these areas is directed to the site water management systems.

Stormwater Controls

Runoff from quarry operational areas is directed to either stormwater treatment ponds prior to discharge from the site or to the quarry pit floor.

The quarry pit floor is used for both stormwater treatment and on-site storage of the site water requirements. Pumps are located in the base of the quarry with the pumped water being used on-site or discharged to the quarry tributary.

Stormwater diversion drains, channels and bunds are located to control stormwater runoff with sediment retention ponds being located within the quarry operational area and at discharge points to provide adequate treatment of stormwater prior to discharge.

The existing stormwater discharge pond at the site entrance will continue to be maintained to treat discharges from the site with new stormwater treatment ponds and quarry pit sumps constructed as required to adequately treat stormwater discharges.

Bunding and temporary ponding areas will be constructed in the overburden disposal area while earthworks are being undertaken and will be maintained until the works have been stabilised.

Process Water Management

A water treatment plant is used to recycle water used in the processing of aggregate. The water is re-circulated with entrained sediment separated from the process water and deposited in designated disposal areas.

A chemical flocculent or coagulant is added to the process water to settle entrained fines.

Makeup water for the water treatment plant is taken from the quarry tributary and from quarry pit excavations.

Dewatering of Quarry Excavations

Quarry excavations are dewatered to maintain a dry working floor as the quarry pit is excavated.

Excess water from the quarry pit is pumped to discharge to the quarry tributary.

Discharge water quality is maintained by careful operation of the pump. The pump intake is located above the base of the quarry pit sump.

Diversions of and Works within the Quarry Tributary

An unnamed tributary of the Hutt River is located within the quarry operational area (quarry tributary). This tributary has been diverted and modified by quarry operations and is currently located on a quarry bench within the current pit area and in a channel adjacent to the plant and stockpile area.

The tributary is separated from quarry operations by bunds.

This tributary will be diverted as the quarry development proceeds and culvert crossings will be established for access to the lower northern and Firth Block quarry faces.

Site Rehabilitation

Rehabilitation of the site will be undertaken progressively as landforms are completed and areas of the site are retired from quarry operations (see specific sections of the Quarry Management Plan).

With regard to sediment and erosion control, the objectives of the rehabilitation will be to ensure that:

i) The area of bare soil/earthen surfaces is kept to a minimum;

ii) It requires no more management than that required in adjacent catchments which are unaffected by quarrying activities;
iii) The land cover is generally consistent with the adjacent areas unaffected by quarrying;
iv) The quality of the water discharging from the rehabilitated land is consistent with the discharge from adjacent catchments unaffected by quarrying; and
v) Nuisance plant species are removed on a regular basis and plantings are maintained.

Any discharge of untreated surface runoff from rehabilitated land will only occur once the disturbed area has been stabilised.

The main issues which will be considered before such discharges are made are:

i) The quality of runoff from the rehabilitated land;
ii) The quality of runoff from surrounding land under a similar landuse;
iii) The quality of the receiving water;
iv) The potential effects of increased flow within the receiving water course; and
v) Intended on-going land management practices.

Description and Principles of Erosion and Sediment Control with Site Development

Erosion and sediment control at Belmont Quarry will continue to be undertaken in general accordance with the Wellington Regional Council publication Erosion and Sediment Control Guidelines for the Wellington Region dated September 2002, in particular Section 7, Quarries.

Experience and Training – site personnel will be trained and regularly updated on site management practices with input and assistance from Winstone Aggregate management and technical personnel.

<u>Erosion and Sediment Control Principles</u>

The key principles of Erosion and Sediment Control (Wellington Regional Council Guidelines – Section 3) will continue to be followed to appropriately control and treat stormwater runoff such that all stormwater discharges from operational areas are appropriately treated prior to discharge and that uncontrolled discharges are avoided.

Key Principles of Erosion and Sediment Control:

- Minimise Disturbance – limit areas of disturbance (especially soils and overburden) to that required to efficiently undertake quarry operations
- Stage Construction – plan development to undertake operations in a tidy and progressive manner that minimises disturbed areas
- Protect Steep Slopes – design overburden cuts and batters with bunds and diversion channels to limit the potential for erosion and wash of sediment
- Protect Waterbodies – use bunds, lips and channels to avoid uncontrolled discharges from the quarry operational area to the quarry tributary and to the Hutt River
- Stabilise Exposed Areas Rapidly – stabilise exposed areas with the potential to result in an uncontrolled sediment laden runoff with minimal delay
- Install Perimeter Controls – use drainage channels and bunds to direct stormwater runoff away from operational areas
- Employ Detention Devices – use sediment retention ponds and ponding areas to appropriately treat stormwater runoff from operational areas prior to discharge
- Plan Review and Evolution – review and revise this plan as site development progresses

- Assess and Adjust – inspect, monitor and maintain erosion and sediment control devices and structures especially following large or intense rainfall events

The long term nature of Belmont Quarry requires special attention to erosion and sediment control measures, in particular:

- Bunding between the quarry tributary and quarry operational area to prevent uncontrolled discharges to the Hutt River,
- Appropriate site water discharge water ponds and sumps,
- Practices and controls within the water treatment plant area, and
- Management of site dewatering discharges

Description of Erosion and Sediment Controls

- Quarry Area and Overburden Faces

Rock is currently being excavated from both the northern and southern quarry faces. Development will shortly concentrate on the southern quarry faces and the mid-section below the main quarry haulroad. Future quarry excavations are proposed to be undertaken within the Firth Block (subject to obtaining the appropriate authorisations), the north face and within the current stockpile area.

Practices that have proved effective in the past will be used again in this area, as follows:

- Rock bunds will be maintained to outside edges of the excavation area to prevent stormwater and rock debris being discharged over outside slopes.
- Benches will be graded with a crossfall and bunded to avoid uncontrolled discharges over quarry faces.
- Overburden batters and benches will be designed to minimise scour with long term batters stabilised by hydroseeding or other methods to establish a vegetation cover.
- Ponding areas will be established on benches to treat sediment laden runoff at source and to reduce peak flows in lower catchment areas during rainfall events.
- Stormwater flow paths down haul roads will be designed and armoured to minimise scour and washouts.
- Cut off benches will be designed to minimise discharges to the quarry tributary especially from the upper overburden benches. Discharges to the quarry tributary will only be from the lower rock benches.

Stormwater runoff from the overburden batters and benches will be directed around the quarry pit area via stabilised channels to the quarry pit sumps and site discharge ponds.

- Clay Borrow Pit

The clay borrow pit above the northern quarry faces has a high potential for generating sediment laden runoff. Controls are placed on the winning of clay material with flat benches, steep batter faces and bunds to reduce the potential of sediment laden discharges from this area.

In addition, water is ponded on the benches and the benches are kept tidy with excavated stockpiled material kept to a minimum. Ponding areas to settle runoff and reduce peak stormwater flows from the clay borrow pit runoff are located adjacent to the clay borrow pit area.

- Stockpile Area

Although the stockpile area will be stabilised with aggregate, there remains a potential for sediment laden runoff as this area is trafficked and some stockpiles contain fine material.

The surface will be graded to shed water and to direct runoff to either the water treatment plant or the quarry site entrance discharge pond.

- Overburden Disposal Area

Overburden will be placed in the Cottle Overburden Disposal Area and then elsewhere on the site, including in worked out areas of the quarry.

When placing overburden within worked out areas of the quarry, or elsewhere, specific erosion and sediment control plans will be prepared.

In addition, to prevent clayey material from being trafficked to and from the overburden disposal area, haulroads will be maintained with bunds and drainage inverts to prevent uncontrolled discharges of sediment laden stormwater.

- Fines Disposal Area

The fines deposition areas are contained by embankments to prevent the escape of the deposited fine material. Adequate freeboard is maintained and the contributing catchment is controlled to avoid the overtopping of the deposition cells.

The former fines deposition area above the northern quarry faces is being allowed to revegetate now that the placement of fines in that area has ceased. The fines deposition area in the Cottle Overburden Disposal Area is being progressively hydroseeded.

- Quarry Roads

The site access road off Hebdon Crescent is sealed. Haul roads within the quarry are metalled and cambered to shed water. Roadside drainage is maintained to avoid trafficking through water and to prevent scour or erosion of the road surface or drain. Rock riprap is used as required to armour drains over steep or unstable ground.

- Site Facilities

Stormwater arising from buildings and parking areas is collected and directed to site stormwater drains and discharge water ponds.

- Stormwater Channels

Stormwater channels will be appropriately designed to avoid scour and erosion with rock protection over area of steeper gradients or soft ground. Ponding areas may be established at the base of steeper gradients to allow eroded material to be deposited.

Stockpiles of soils, overburden, rock or aggregate will not be placed adjacent to stormwater channels where that material may be washed into the channel or effective treatment of sediment laden runoff from the stockpile is impeded.

- Quarry Tributary

Diversions of the quarry tributary will be undertaken to minimise effects of water quality. Works will be undertaken with minimal delay with the diversion channel constructed prior to the flow being diverted. Diversion channels will be constructed in rock and placement of excavated material in the flowing channel will be avoided.

A construction methodology will be prepared for each crossing. Culvert crossings will generally be constructed in times of low flow and with minimal delay. Aggregate will be used as bedding for pipes and provisions for diversion and/or treatment of flow will be contained within the construction methodology.

Excess material from the construction and implementation of the works will be removed from the bed and banks of the channel and disposed of in an appropriate manner.

The first flush of the channel after works have been completed will generally be diverted to the water take pond to allow sediment to settle prior to discharging to the Hutt River. The water take pond will be emptied prior to the first flush occurring to ensure adequate capacity is available to treat the first flush of the works.

Any erosion of channel banks or beds that is attributable to works within the quarry tributary will be repaired and the channel banks or beds stabilised.

Winstones is aware of the cultural values associated with the on-site stream, and the desire of tangata whenua to ensure environmental quality.

- Site Discharge Points

New discharge water ponds and outfall structures will be constructed in accordance with acceptable and reliable civil engineering practices. Discharge water ponds will generally include a riser and culvert outlet with a floating decant. Inlets and outfalls will be stabilised to prevent scour and erosion.

Coarse sediment traps prior to discharge water ponds will be constructed and maintained to reduce the volume of sediment accumulating in the main ponding area.

Discharge water ponds will be designed to provide adequate treatment for stormwater discharges prior to discharge from the site in terms of both suspended solid and turbidity. Chemical treatment may be used to treat discharge water.

Monitoring and Maintenance of Erosion and Sediment Controls

Erosion and sediment controls will be maintained and progressively installed as the site development progresses. Regular inspections will be undertaken to maintain these controls.

All settlement ponds and sumps will be inspected monthly and after heavy or prolonged rainfall. Accumulated material will be removed as required to maintain the efficiency of the ponds.

Any maintenance required to be undertaken will be undertaken as soon as is practical. If there is any delay or difficulty in undertaking any maintenance works, alternative controls may be put in place.

Inspection and Auditing Schedule

Erosion and sediment controls will be continuously reviewed as the operation proceeds. A weekly inspection of all sediment and erosion controls will be undertaken by the Belmont Quarry Manager or his designated deputy.

In addition, erosion and sediment controls will be inspected and reviewed following heavy or prolonged rainfall.

A record will be kept of maintenance undertaken on erosion and sediment controls.

Prior to overburden stripping works commencing an inspection of all relevant sediment and erosion controls will be undertaken.

An annual audit of the site will be undertaken by a suitably experienced and qualified person to ensure that the erosion and sediment controls are being maintained in accordance with this Erosion and Sediment Control Plan.

Table 1 – Erosion and Sediment Controls Inspection Schedule

Erosion and Sediment Control	Inspection Schedule
General Site Inspection	Weekly and following heavy or prolonged rainfall
Annual Audit	Prior to submission of annual report
Diversion Channels	Monthly during the months of May to November
Settlement Ponds and Sumps	Monthly and following heavy or prolonged rainfall
Overburden Earthworks	Prior to undertaking earthworks

Environmental Monitoring and Reporting

Stormwater Discharges

Discharges from the quarry entrance stormwater pond will be sampled and analysed for suspended solids and turbidity within 4 hours of a rainfall event greater than 15mm in the preceding 24 hours. If chemical treatment has been used to treat discharges, pH will also be measured.

Discharge of Pit Sump Water to the Quarry Tributary

Discharges of pit sump water to the quarry tributary will be sampled and analysed for suspended solids and turbidity within 4 hours of a rainfall event greater than 15mm in the preceding 24 hours.

Quarry Tributary

Quarterly monitoring of water quality (upstream and downstream of the quarry operational area – samples analysed for suspended solids and turbidity) with an inspection undertaken to maintain the mana of the tributary.

Hutt River

The Hutt River 10 metres upstream and 50 metres downstream of where the quarry tributary enters the Hutt River together with the discharge from the quarry tributary will be sampled and analysed for suspended solids and turbidity within 4 hours of a rainfall event greater than 15mm in the preceding 24 hours

Rainfall

Rainfall will be measured on a daily basis, at the same time each day (9.00am).

Database

An electronic database of the monitoring results will be maintained together with the following:

- Any difficulty (such as breakdowns) in the operation of the system;
- The reason for any difficulties;
- Any difficulties in achieving compliance with any condition of consent; and
- Any maintenance works which are necessary, proposed or have been carried out.

Reporting

The Wellington Regional Council will be notified if any contaminants (including sediment) are released from the site to the Hutt River that may either directly or indirectly causes or is likely to cause adverse ecological effects on the tributary, Hutt River or Wellington Harbour due to any of the following:

- discharges from un-stabilised areas that are not treated by sediment control measures;
- failure of any sediment retention ponding area or clean water diversion structure, perimeter controls or other erosion and sediment control measures; and
- any other incident at Belmont Quarry which either directly or indirectly causes or is likely to cause more than minor ecological effects on the tributary, Hutt River or Wellington Harbour.

The Wellington Regional Council will be notified within 24 hours of an incident being brought to the attention of the Belmont Quarry Manager, or the next working day. Incidents will also include chemical spills, power or mechanical failure or unusual discharges.

The Wellington Regional Council will be notified if the discharge from Belmont Quarry results in a noticeable discolouration of the Hutt River.

Winstone Aggregates will liaise with the Wellington Regional Council to establish what remediation or rehabilitation works are required and whether such works are practical to implement. Any remedial works will be carried out to the satisfaction of the Wellington Regional Council.

If required by the Wellington Regional Council, a written report will be prepared and provided to the Manager of the Wellington Regional Council detailing the nature, manner and cause of the release of contaminants, and the steps taken to contain any further release, and to remedy any adverse ecological on the tributary, Hutt River or Wellington Harbour. On request this will be provided to the Hutt City Council.

An annual report will be prepared and forwarded to the Wellington Regional Council containing the results of the monitoring together with relevant details of the performance of the water management and treatment system as follows:

i) Any difficulty (such as breakdowns) in the operation of the system;

ii) The reason for any difficulties;
iii) Any difficulties in achieving compliance with any condition of consent;
iv) Any maintenance works which are necessary proposed or have been carried out; and
v) Any trends in water quality with the potential for causing adverse effects.

Overburden Stripping Earthworks

An Erosion and Sediment Control Plan will be submitted to the Greater Wellington Regional Council at least 30 working days prior to each overburden stripping earthwork season within the quarry area, if overburden stripping and/or disposal is proposed on-site.

Table 2: Environmental Monitoring and Reporting Schedule

	Location	Parameter	Frequency	Reporting
Daily Rainfall Measurement	Site	Rainfall	Daily at 9.00am	Annually
Pit Dewatering Discharges	Pit Dewatering Discharge Point	Suspended solids and turbidity	Within 4 hours of recording 15mm of rainfall within 24 hour	Annually
Site Discharge Pond	Quarry Entrance Pond	Suspended solids and turbidity	Within 4 hours of recording 15mm of rainfall within 24 hour	Annually
Quarry Tributary	Upstream and Downstream of Quarry Area	Suspended solids and turbidity	Quarterly with an inspection	Annually
Hutt River	Hutt River and Quarry Discharge	Suspended solids and turbidity	Within 4 hours of recording 15mm of rainfall within 24 hour	Annually
Incident Reporting	Site	Unauthorised discharge or System Failure	Within 24 hours or the following working day	Within 24 hours or the following working day

Discharge Standards and Limits

Winstone Aggregates will take all practicable steps to minimise any discharge to the Hutt River which may result in the following effects after reasonable mixing:

- The production of any conspicuous oil or grease films, scums or foams or floatable or suspended material;
- Any conspicuous change in colour or visual clarity;
- Any significant adverse effect on aquatic life; or
- A change in more than 3 degrees Celsius in the natural temperature of the water.

Contingency Plans

Contingency planning is required should uncontrolled or unforeseen discharges from the quarry arise. The discharges may involve sediment laden discharges or discharges contaminated with chemicals or hydrocarbons.

Contingency plans for discharges contaminated with chemicals or hydrocarbons are contained within the Hazardous Substances and Spill Response Plan.

Unforeseen or Uncontrolled Discharges of Sediment Laden Water

The site will be regularly inspected and audited for erosion and sediment controls. Hazards and environmental incidences will be noted and reported. Should an unforeseen or uncontrolled discharge occur, the following will be undertaken:

- Undertake immediate steps to halt the discharge when it is safe and practical to do so
- Report the discharge to the Wellington Regional Council within 24 hours of becoming aware of the incidence
- Install erosion and sediment controls as required to avoid a reoccurrence of the discharge
- In consultation with the Wellington Regional Council remediate any adverse effects arising from the discharge including any scour or erosion of the discharge point

Additional Treatment of Site Discharges

In addition to a chemical flocculent or coagulant being used to settle entrained fines in the process water, a flocculent or coagulant may also be used to treat site discharges. This may include either pumped discharges or gravity stormwater discharges. Floc Blocks (MAGNASOL®AN) an anionic flocculant in the form of a solid block may be used to treat isolated discharges.

Appendix 1

Site Layout and Development Figures

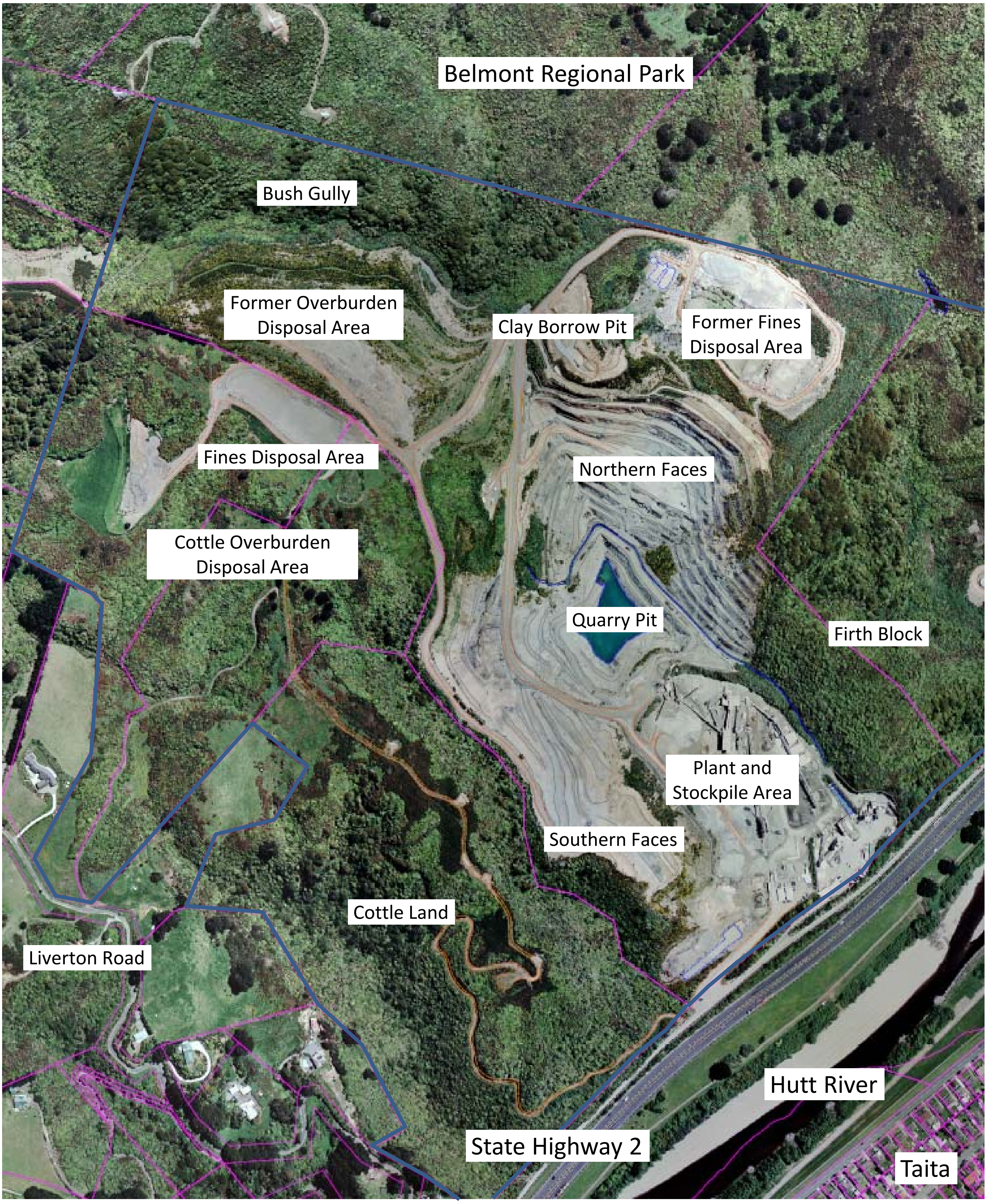


Figure 1 - Belmont Quarry Site Features Location Plan

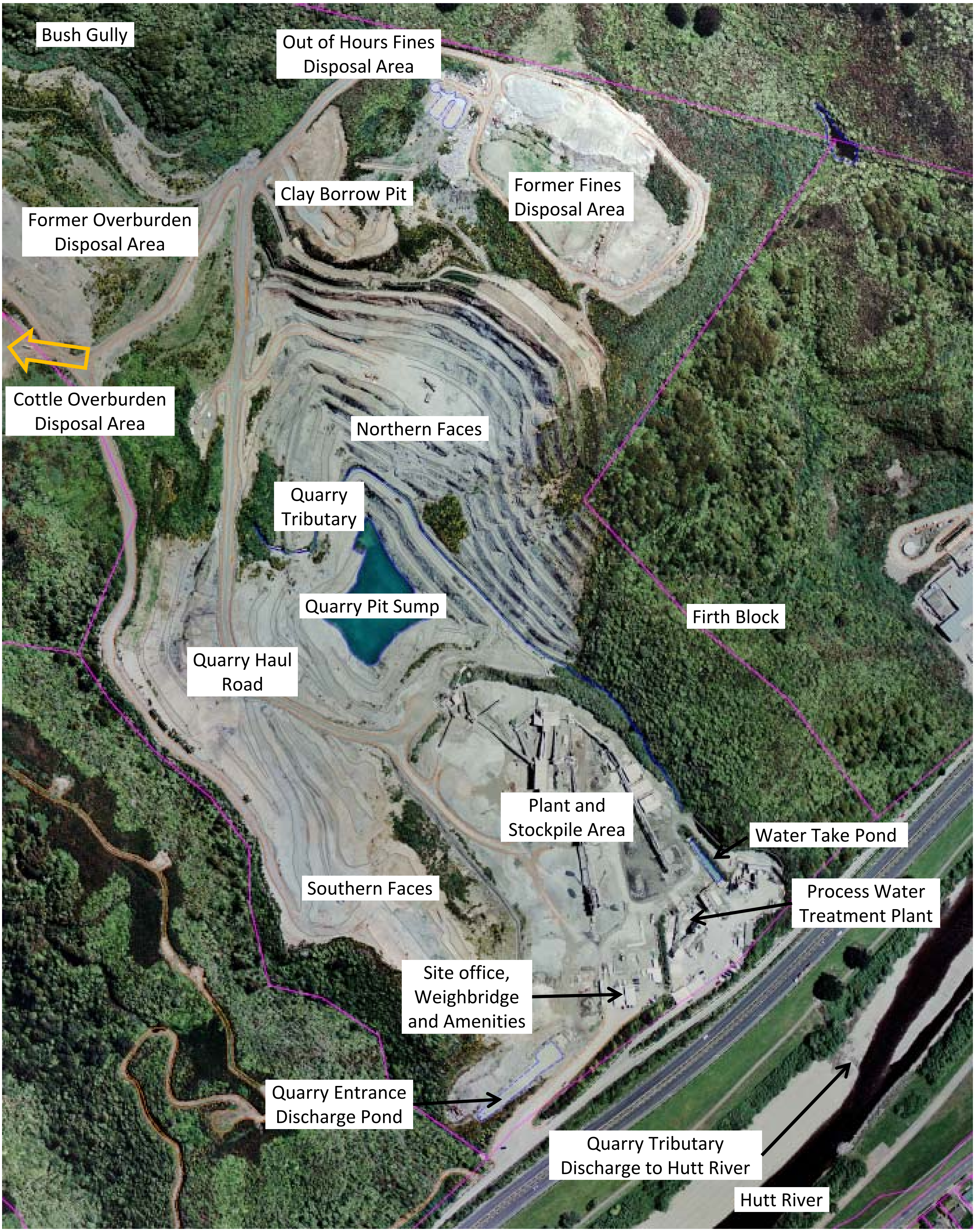


Figure 2 - Quarry Operational Area Site Features Location Plan

Figure 3 - Existing Quarry Operational Area Water Management Features

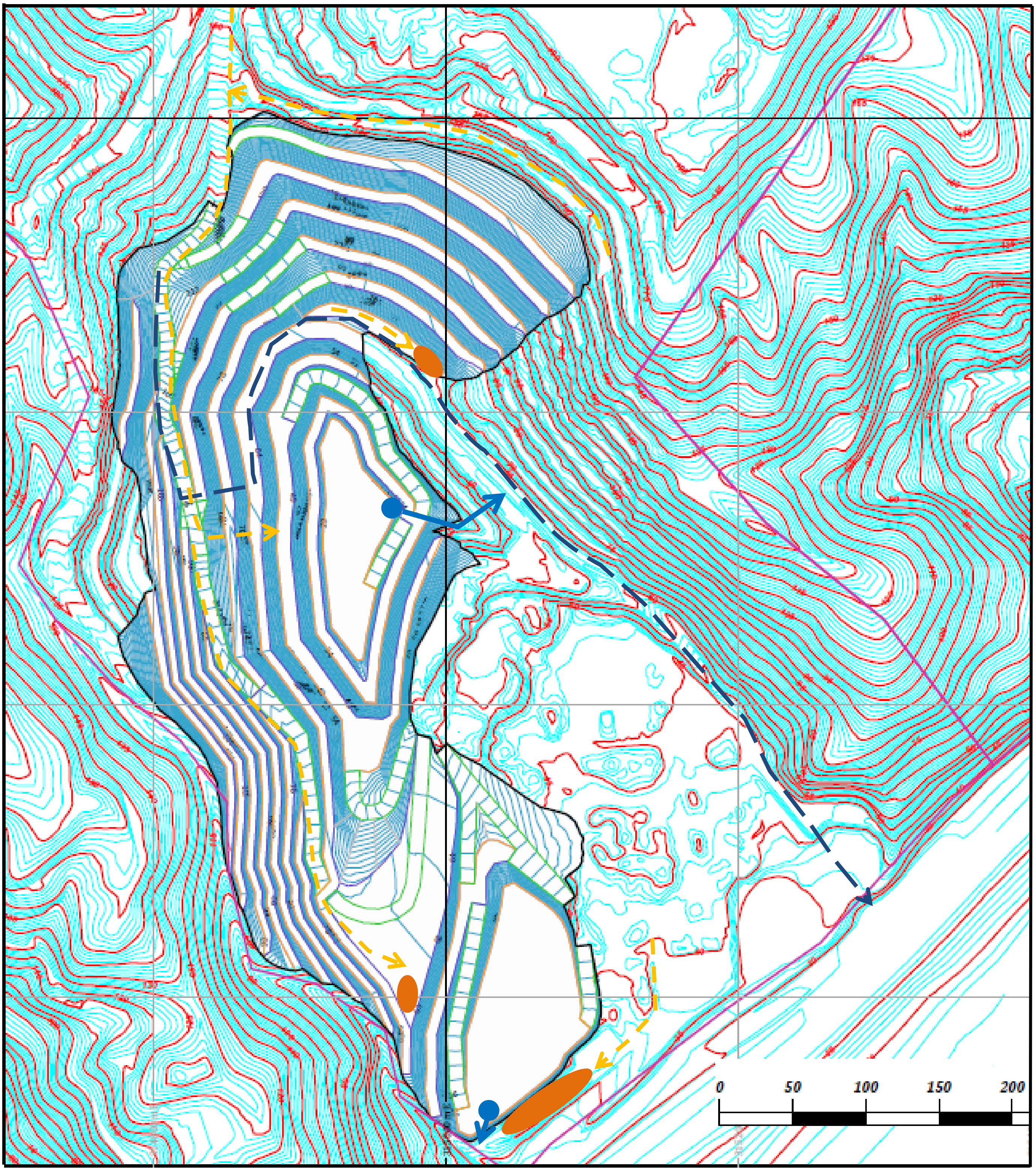


Figure 4 - 5 Year Quarry Development

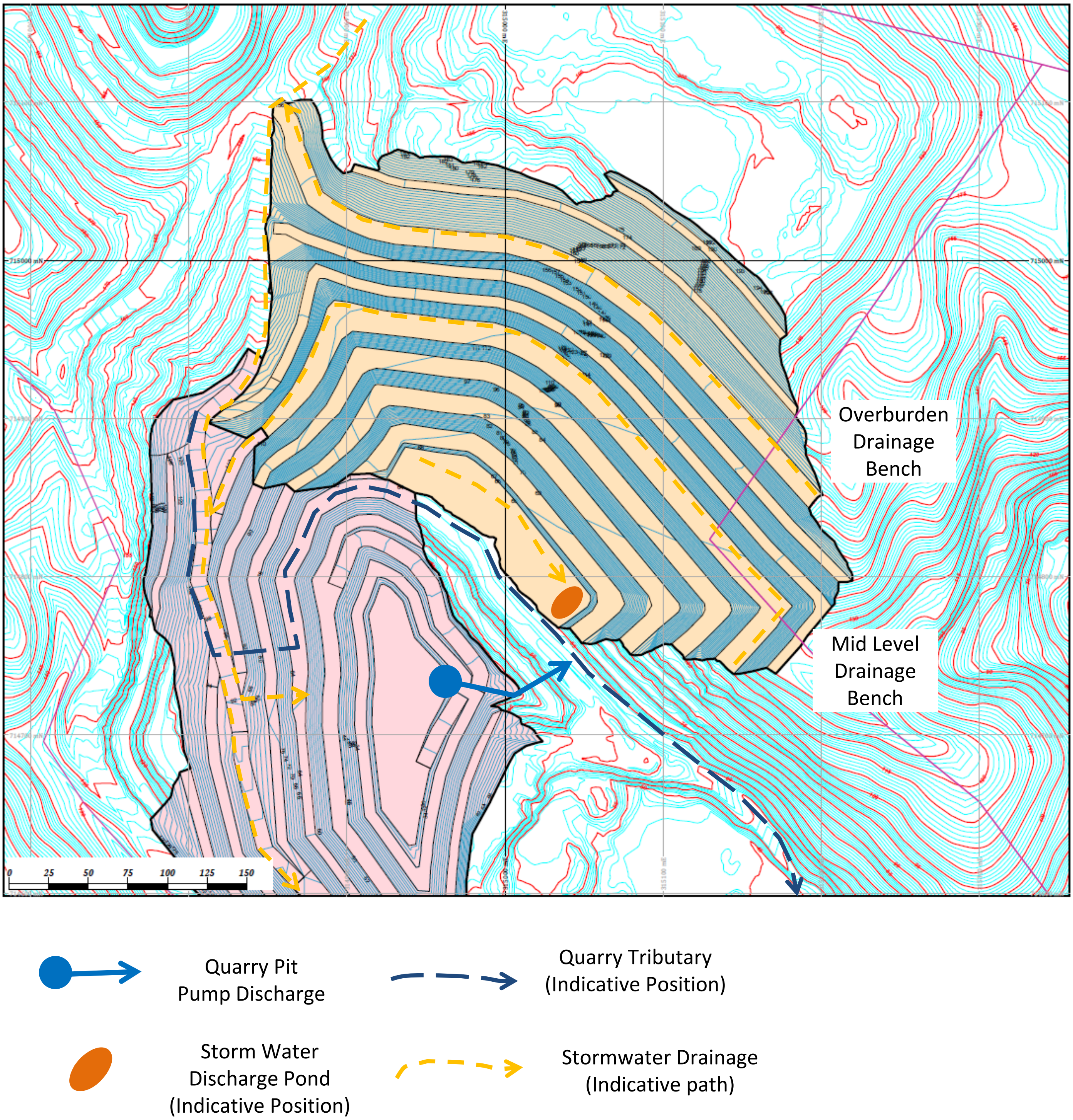


Figure 5 - Medium Term Northern Quarry Development

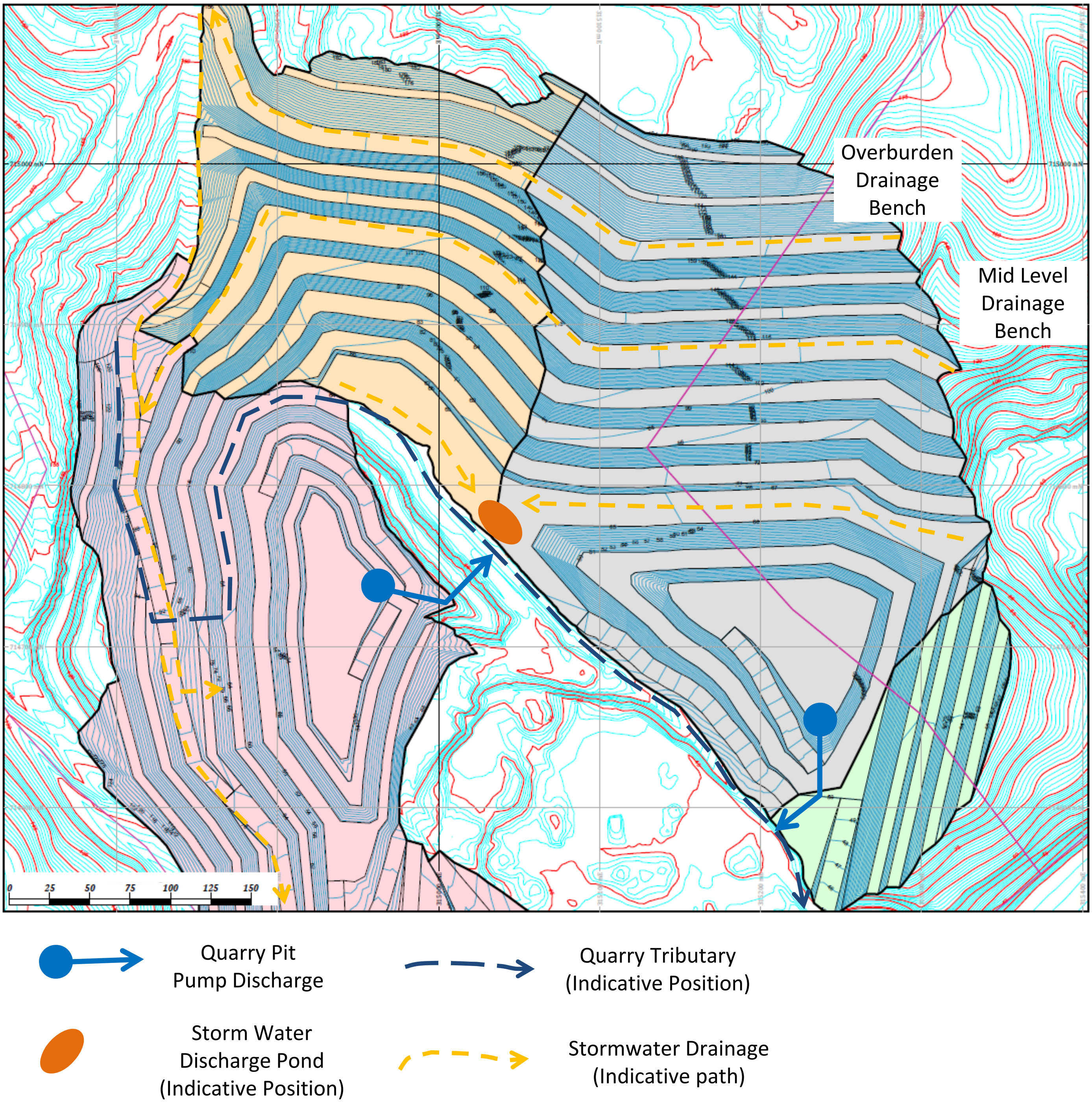


Figure 6 - Medium to Long Term Northern Quarry Development

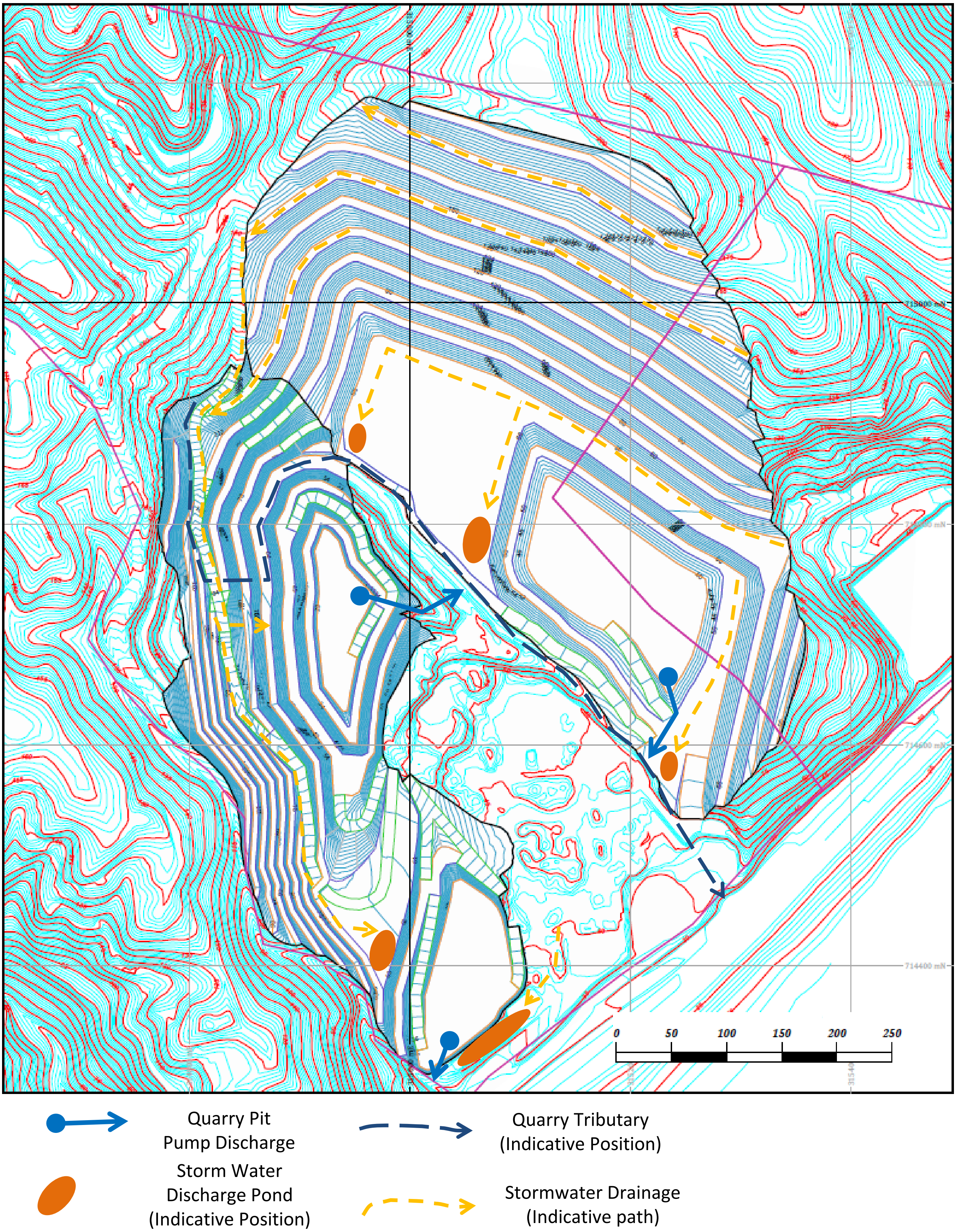


Figure 7 - Long Term Quarry Development

Appendix 2

Land Disturbance and Discharge Consents

Resource Consents:

WGN050048[23907], WGN050276[23909], WGN060276[25205], WGN060276[25206], WGN060276[25313], WGN060276[25314] and WGN130019[31854].

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN050048 [23907] **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	Winstone Aggregates	
Address	P O Box 31 447, Lower Hutt	
Term of consent	Effective: 4 October 2004	Expires: 4 October 2039
Purpose for which right is granted	To place, use and maintain a pipe in the bed of an unnamed watercourse and to reclaim parts of the stream bed with that pipe and the placement of cleanfill.	
Location	Belmont Quarry, Hebden Crescent, Belmont, Lower Hutt at or about map reference NZMS 260: R27;738.029 and NZMS 260:R27;738:028	
Legal description of land	Lot 1 DP 60552	
Volume/quantity/rate	N/A	
Conditions	1-9 as attached	

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: 14 October 2004

TELARC REGISTERED SUPPLIER

Conditions to Resource Consent WGN050048 [23907]

(1) The location, design and implementation of all works shall be in accordance with the consent application and its associated plans and documents, received by the Wellington Regional Council on 2 September 2004 and 30 September 2004.

(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 pass a copy of the consent, including any relevant plans and attachments, to the contractor undertaking the works authorised by this consent, prior to the works commencing.

(4) All practicable steps shall be taken to minimise sediment loading and increased turbidity of the stream during the implementation, construction and maintenance of the works, including, but not limited to:

(a) completing all works in the minimum time practicable;

(b) avoiding placement of excavated material in the flowing channel; and

(c) separation of construction activities from flowing water, where practicable.

(5) No contaminants (including but not limited to oil, petrol, diesel, hydraulic fluid) shall be released into water from equipment being used for the works, and no machinery shall be cleaned, stored, or refuelled within 10 metres of the stream.

(6) 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.

(7) Any excess material from the construction and implementation of the works shall be removed from the bed and banks of the stream, and disposed of in an appropriate manner.

(8) The permit holder shall ensure that any fish that are stranded during dewatering of the section of the stream bed being diverted are immediately placed back in the active flowing channel downstream of the works

(9) The works shall remain the responsibility of the consent holder and shall be maintained so that:

- The waterway of the culvert remains substantively clear of debris;
- Any erosion of the stream banks or bed that is attributable to the works carried out as part of this consent is repaired by the consent holder; and
- The structural integrity of the culvert remains sound.

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN050048 [23909] **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	Winstone Aggregates	
Address	P O Box 31 447, Lower Hutt	
Term of consent	Effective: 4 October 2004	Expires: 4 October 2014
Purpose for which right is granted	To intermittently discharge contaminated water (sediment laden) from an area of bulk earthworks greater than 0.3 ha to an unnamed watercourse.	
Location	Belmont Quarry, Hebden Crescent, Belmont, Lower Hutt at or about map reference NZMS 260: R27;738.029	
Legal description of land	Lot 1 DP 60552	
Volume/quantity/rate	N/A	
Conditions	1-14 as attached	

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: 4-10-04

TELARC REGISTERED SUPPLIER

Conditions to Resource Consent WGN050048 [23909]

(1) The location, design and implementation of all works shall be in accordance with the consent application and its associated plans and documents, received by the Wellington Regional Council on 2 September 2004 and 30 September 2004.

(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 pass a copy of the consent, including any relevant plans and attachments, to the contractor undertaking the works authorised by this consent, prior to the works commencing.

(4) Prior to undertaking the works, the consent holder shall prepare an erosion and sediment control plan aimed at minimising the amount of sediment released to water during the works. The erosion and sediment control plan shall include, but not be limited to:

- a programme for managing and progressively stabilising exposed areas of soil;
- details on contingencies in the event of high rainfall or flood events; and
- monitoring and maintenance schedules for erosion and sediment controls.

(5) The erosion and sediment control plan prepared under condition (4) above shall be submitted to the Manager, Consents Management, Wellington Regional Council at least four weeks prior to commencement. The written approval of the Manager, Consents Management, Wellington Regional Council shall be obtained prior to commencement of activities covered by this consent.

(6) The permit holder shall ensure that all sediment-laden runoff from the site is treated by sediment control measures as outlined in the sediment control plan prepared under condition (4).

(7) All erosion and sediment control measures shall be installed, operated and maintained in accordance with Wellington Regional Council's Erosion and Sediment Control Guidelines for the Wellington Region (2002), except as circumstances warrant and as specifically agreed with the Manager, Consents Management, Wellington Regional Council.

(8) During the exercise of this permit, the permit holder shall take all practicable steps to minimise any discharge to the watercourse, which may result in any of the following effects after reasonable mixing:

- The production of any conspicuous oil or grease films, scums or foams or floatable or suspended material;
- Any conspicuous change in colour or visual clarity;
- A change of more than 3° Celsius in the natural temperature of the water.

(9) Temporary stockpiles of soil shall not be placed adjacent to any watercourse or in any location where efficient treatment of sediment-laden runoff from the stockpile is impeded.

(10) The discharge shall remain the responsibility of the permit holder and shall be maintained to the satisfaction of the Manager, Consents Management, Wellington Regional Council.

(11) The permit holder shall keep a record of the maintenance undertaken on the sediment pond, and shall make this record available to the Manager, Consents Management, Wellington Regional Council, upon request

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(12) The permit holder shall not decommission any sediment control device without the prior approval of the Manager, Consents Management, Wellington Regional Council, and the relevant site or area is stabilised.

Note: For the purposes of this condition "stabilised" means 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, Consents Management, Wellington Regional Council and as specified in Erosion and Sediment Control Guidelines in the Wellington region, September 2002. 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 the Manager, Consents Management, Wellington Regional Council, 80% vegetative ground cover has been established.

(13) If, due to the exercise of this consent, any release of contaminants (including suspended solids) to the unnamed stream either directly or indirectly causes or is likely to cause adverse ecological effects on the stream or Wellington Harbour, the permit holder shall:

a) Immediately notify the Manager, Consents Management, Wellington Regional Council, of the release of any contaminants or material;

b) Liase with the Wellington Regional Council to establish what remediation or rehabilitation works are required and whether such works are practical to implement; and

c) Carry out any remedial action as required by and to the satisfaction of the Manager, Consents Management, Wellington Regional Council.

d) If required by the Manager, Consents Management, Wellington Regional Council, provide a written report to the Manager, detailing the nature, manner and cause of the release of the contaminants, and the steps taken to contain any further release, and to remedy the adverse ecological effects on the stream or Wellington Harbour.

(14) 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 six months of the first, third, fifth and seventh anniversaries of the date of granting of this permit 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, or any changes in best practice for sediment control.

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN060276 [25205]

Category: Discharge permit

Pursuant to sections 104, 105 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	Winstone Aggregates – A Division of Fletcher Concrete and Infrastructure Limited	
Address	P O Box 31-447, Lower Hutt	
Term of consent	Effective: 21 June 2006	Expires: 21 June 2016
Purpose for which right is granted	To discharge sediment-laden stormwater to land in circumstances where it will enter the Hutt River	
Location	Hebden Crescent, Belmont at or about map reference NZMS 260: R27;740.025	
Legal description of land	Lot 1 DP 60552	
Conditions	1-8 as attached	

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: 21 June 2006

Conditions to Resource Consent WGN060276 [25205]

(1) The location, design and implementation of all works shall be in accordance with the consent application and its associated plans and documents, received by the Wellington Regional Council on 22 December 2005, 23 March 2006 and 10 May 2006, and further information received on 31 May 2006.

(2) A copy of this permit shall be held on site for the duration of the activity and be made available to any Wellington Regional Council officer on request.

(3) The permit holder shall ensure that all sediment-laden runoff from the site is treated by sediment control measures as outlined in the Stormwater Management Plan dated March 2006 which was provided with the application and the further information received on 31 May 2006 or any update approved in general accordance with condition 7.

(4) Not withstanding condition 3, all erosion and sediment control measures shall be designed and constructed, and maintained in accordance with the Wellington Regional Council guideline document entitled "Erosion and Sediment Control Guidelines for the Wellington Region", dated September 2002, unless specifically agreed with the Manager, Consents Management, Wellington Regional Council.

(5) Temporary stockpiles of soil shall not be placed immediately adjacent to any watercourse or in any location where efficient treatment of sediment-laden runoff from the stockpile is impeded.

(6) The permit holder shall not decommission any sediment control device without the prior approval of the Manager, Consents Management, Wellington Regional Council, and the relevant site or area is stabilised as outlined in the Stormwater Management Plan dated March 2006 which was provided with the application, or any subsequent update.

(7) Any changes to the Stormwater Management Plan must be approved in writing by the Manager, Consents Management, Wellington Regional Council prior to implementation.

(8) 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 six months of the first, third, fifth and seventh anniversaries of the date of granting of this permit 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, or any changes in best practice for sediment control.

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN060276 [25206]

Category: Discharge permit

Pursuant to sections 104, 105 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	Winstone Aggregates – A Division of Fletcher Concrete and Infrastructure Limited
Address	P O Box 31-447, Lower Hutt
Term of consent	Effective: 21 June 2006 — Expires: 21 June 2016
Purpose for which right is granted	To discharge sediment-laden stormwater to water in circumstances where it will enter the Hutt River
Location	Hebden Crescent, Belmont at or about map references NZMS 260: R27;742.024 and NZMS 260:R27;742.022
Legal description of land	Lot 1 DP 60552
Conditions	1-8 as attached

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: 21 June 2006

Conditions to Resource Consent WGN060276 [25206]

(1) The location, design and implementation of all works shall be in accordance with the consent application and its associated plans and documents, received by the Wellington Regional Council on 22 December 2005, 23 March 2006 and 10 May 2006, and further information received on 31 May 2006.

(2) A copy of this permit shall be held on site for the duration of the activity and be made available to any Wellington Regional Council officer on request.

(3) During the exercise of this permit, the permit holder shall take all practicable steps to minimise any discharge to the Hutt River, which may result in any of the following effects after reasonable mixing:

- The production of any conspicuous oil or grease films, scums or foams or floatable or suspended material;
- Any conspicuous change in colour or visual clarity;
- Any significant adverse effect on aquatic life;
- A change of more than 3o Celsius in the natural temperature of the water.

(4) If, due to the exercise of this permit, any release of contaminants (including suspended solids) to the unnamed stream either directly or indirectly causes or is likely to cause adverse ecological effects on the Hutt River, the permit holder shall:

a) Immediately notify the Manager, Consents Management, Wellington Regional Council, of the release of any contaminants or material;

b) Liaise with the Wellington Regional Council to establish what remediation or rehabilitation works are required and whether such works are practical to implement; and

c) Carry out any remedial action as required by and to the satisfaction of the Manager, Consents Management, Wellington Regional Council.

d) If required by the Manager, Consents Management, Wellington Regional Council, provide a written report to the Manager, detailing the nature, manner and cause of the release of the contaminants, and the steps taken to contain any further release, and to remedy the adverse ecological effects on the Hutt River

(5) The permit holder shall monitor turbidity at appropriate locations (as set out in the further information provided on 31 May 2006) within 4 hours of recording a rainfall event equal to or in excess of 15mm in the previous 24 hours. Rainfall is to be measured at approximately the same time each day that the quarry is operating.

(6) Results of monitoring undertaken in accordance with condition 5 shall be provided to the Consents Manager, Wellington Regional Council annually by 31 May.

(7) 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 on 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.

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Note: For the purposes of this consent, incidents include but are not limited to incidents such as chemical spills, power or mechanical failure or unusual discharges.

(8) 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 six months of the first, third, fifth and seventh anniversaries of the date of granting of this permit 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, or any changes in best practice for sediment control.

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN060276 [25313]

Category: Land use consent

Pursuant to sections 104 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	Winstone Aggregates – A Division of Fletcher Concrete and Infrastructure Limited	
Address	P O Box 31-447, Lower Hutt	
Term of consent	Effective: 21 June 2006	Expires: 21 June 2016
Purpose for which right is granted	To undertake works in the bed of an unnamed tributary of the Hutt River associated with the diversion of that tributary.	
Location	Hebden Crescent, Belmont at or about map reference NZMS 260: R27;741.024	
Legal description of land	Lot 1 DP 60552	
Conditions	1-11 as attached	

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: 21 June 2006

Conditions to Resource Consent WGN060276 [25313]

(1) The location, design and implementation of all works shall be in accordance with the consent application and its associated plans and documents, received by the Wellington Regional Council on 22 December 2005, 23 March 2006 and 10 May 2006, and further information received on 31 May 2006.

(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 pass a copy of the consent, including any relevant plans and attachments, to the contractor undertaking the works authorised by this consent, prior to the works commencing.

(4) A copy of this consent shall be held on site for the duration of the activity and be made available to any Wellington Regional Council officer on request.

(5) All practicable steps shall be taken to minimise sediment loading and increased turbidity of the stream during the implementation, construction and maintenance of the works, including, but not limited to:

(a) completing all works in the minimum time practicable;

(b) avoiding placement of excavated material in the flowing channel; and

(c) separating construction activities from flowing water, where practicable.

(6) No contaminants (including but not limited to oil, petrol, diesel, hydraulic fluid) shall be released into water from equipment being used for the works, and no machinery shall be cleaned, stored, or refuelled within 10 metres of the stream.

(7) 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

(8) Any excess material from the construction and implementation of the works shall be removed from the bed and banks of the stream, and disposed of in an appropriate manner.

(9) The works shall remain the responsibility of the consent holder and shall be maintained so that any erosion of the stream banks or bed that is attributable to the works carried out as part of this consent is repaired by the consent holder.

(10) Prior to the watercourse being re-diverted as outlined in the application, the consent holder shall submit the proposed plans and methodology for approval to the Manager, Consents Management, Wellington Regional Council before diversion works can commence.

(11) If any additional channel protection is required in the new channel the consent holder provide plans and proposed methodology for approval from the Manager, Consents Management, Wellington Regional Council prior to placement.

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN060276 [25314]

Category: Water permit

Pursuant to sections 104 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	Winstone Aggregates – A Division of Fletcher Concrete and Infrastructure Limited	
Address	P O Box 31-447, Lower Hutt	
Term of consent	Effective: 21 June 2006	Expires: 21 June 2016
Purpose for which right is granted	To divert the full flow of an unnamed tributary of the Hutt River	
Location	Hebden Crescent, Belmont at or about map reference NZMS 260: R27;741.024	
Legal description of land	Lot 1 DP 60552	
Conditions	1-9 as attached	

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: 21 June 2006

Conditions to Resource Consent WGN060276 [25314]

(1) The location, design and implementation of all works shall be in accordance with the consent application and its associated plans and documents, received by the Wellington Regional Council on 22 December 2005, 23 March 2006 and 10 May 2006, and further information received on 31 May 2006.

(2) The Manager, Consents Management, Wellington Regional Council, shall be given a minimum of 48 hours notice prior to the diversion commencing.

(3) The permit holder shall pass a copy of the permit, including any relevant plans and attachments, to the contractor undertaking the works authorised by this permit, prior to the works commencing.

(4) A copy of this permit shall be held on site for the duration of the activity and be made available to any Wellington Regional Council officer on request

(5) The permit holder shall at all times take all practicable steps to minimise sedimentation and increased turbidity of the watercourse during the implementation of the diversion.

(6) The diversion shall remain the responsibility of the permit holder and shall be maintained to the satisfaction of the Manager, Consents Management, Wellington Regional Council.

(7) Prior to the watercourse being re-diverted as outlined in the application, the permit holder shall submit the proposed plans and methodology for approval to the Manager, Consents Management, Wellington Regional Council before diversion works can commence.

(8) The 'first flush' of the diversion will be directed to the water take pond to allow sediment to settle prior to discharging to the Hutt River.

(9) The water take pond shall be emptied prior to the initial diversion occurring to ensure adequate capacity is available to treat the first flush of the diversion channel.

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN130019 [31854]

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	Winstone Aggregates (a Division of Fletcher Concrete and Infrastructure Limited)	
Address	PO Box 17195, Greenlane, Auckland 1546	
Duration of consent	Effective: 7 September 2012	Expires: 21 June 2016
Purpose for which right is granted	To place, use and maintain a pipe in the bed of an unnamed tributary of the Hutt River, including any associated disturbance of, and deposition of material onto the bed of that stream, and temporary diversion of water during construction.	
Location	Belmont Quarry, Hebden Crescent, Lower Hutt between approximate map references NZTM: 1763959.5440935 and 1764169.5440830	
Legal description of land	Lot 1 DP 60552	
Conditions	1-14 as attached	

For and on behalf of
WELLINGTON REGIONAL COUNCIL

pp Manager, Environmental Regulation

Date: 7/9/2012

Conditions to Resource Consent WGN130019 [31854]

1. The location, design, implementation and operation of the structure shall be in general accordance with the consent application and its associated plans and documents lodged with the Wellington Regional Council on 9 August 2012, and further information provided on 5 September 2012.

   Where there may be contradiction or inconsistencies between the application and further information provided by the applicant, the most recent information applies. In addition, where there may be inconsistencies between information provided by the applicant and conditions of the consent, the conditions apply.

   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.

2. The Manager, Environmental Regulation, Wellington Regional Council, shall be given a **minimum of two working days (48 hours) notice prior to the works commencing.**

   Note: Notifications can be emailed to notifications@gw.govt.nz. Please include the consent reference (WGN130019) and the name and phone number of a contact person responsible for the proposed works.

3. The consent holder shall provide a copy of this consent and any documents and plans referred to in this consent to each operator or contractor the undertaking works authorised by this consent, prior to the works commencing.

   Note: It is recommended that the contractors be verbally briefed on the requirements of the conditions of this consent prior to works commencing.

4. 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.

5. All works affecting the unnamed tributary of the Hutt River including tidy up on completion of the works shall be completed to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council.

Construction methodology

6. The consent holder shall undertake the works in accordance with the construction methodology detailed in the application and supporting document *Belmont Quarry Resource consent application* dated 7 August 2012 provided with the consent application.

   If any changes are proposed to the Construction Methodology, the consent holder shall provide a final plan that has been prepared in consultation with the contractor undertaking the works to the Manager, Environmental Regulation, Wellington Regional Council at least **15 working days prior to the works commencing.**

   No works shall commence until the consent holder has received written notification that the final Construction Methodology is to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council.

   Note: The final construction methodology can be emailed to notifications@gw.govt.nz.

Reducing effects on water quality

7. The consent holder shall take all steps to minimise sedimentation and increased turbidity of the unnamed tributary of the Hutt River during the works, including but not limited to:

4 7/10/2017

a) Completing all works in the minimum time practicable

b) Undertaking works in low flow conditions, as far as practicable

c) Avoiding the placement of construction or excavated material in the wetted channel except as specified in the application, and

d) Utilising the up and downstream existing diversions into Belmont Quarry water take pond and sedimentation pond respectively should high flows occur, or significant sedimentation occur as a result of the works

8. In the event of a spill of fuel, hydraulic fluid, or other potential liquid contaminants, immediate steps shall be taken to contain the spilt contaminant. The spilt contaminants and any material used to contain it shall be removed from the site and disposed of at authorised landfill. The consent holder shall also immediately notify the Manager, Environmental Regulation, Wellington Regional Council of the spill and actions to be taken.

9. The consent holder shall ensure that no dry cement product, unset concrete, concrete wash water or any water contaminated with concrete enters the flowing channel of the unnamed tributary of the Hutt River or any water during, or as a result of, the works.

10. Upon completion of the works all unused material from the works shall be immediately removed from the bed and banks of the stream and disposed of in an appropriate manner that is to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council.

Temporary diversions associated with the placement or removal of the pipe

11. The consent holder shall ensure the overflow spillway and water diversion to the quarry sediment pond is fully functional prior to any instream works (excavation and construction) commencing within the diversion channel. Sufficient capacity shall be available within the water take pond and quarry sediment pond to accept the quantity of water diverted from the diversion channel during the placement or removal of the pipe. These temporary diversions shall be implemented and maintained in accordance with the methodology outlined in the application documents and further information, received by Wellington Regional Council on 9 August 2012 and 9 September 2012 respectively, and to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council.

Complaints

12. The consent holder shall maintain a permanent record of any complaints received alleging adverse effects from or related to the works. This record shall include:

a) The name and address of the complainant (if provided)

b) The date and time that the complaint was received

c) Details of the alleged event

d) Weather conditions at the time of the complaint, and

e) Any measures taken to mitigate/remedy the cause of the complaint

This record shall be made available to the Manager, Environmental Regulation, Wellington Regional Council, on request.

Photographic record

13. The consent holder shall compile photographic records of the area of works authorised by this consent. These photographic records shall include, but not be limited to, photographs of the following items:

b
21/9/2012

a) The location of the proposed works: incorporating the works area and the stretches of the Hutt River that may be affected by the works (i.e. **prior to the works commencing**)

b) The site **during the works**: incorporating the works area and stretches of the Hutt River identified in (a), and

c) The site immediately **upon the completion** of the works (within one week): incorporating the works area and stretches of the Hutt River identified in (a)

The photographic record of items identified in (a), (b) and (c) shall be submitted to the Manager, Environmental Regulation, Wellington Regional Council as soon as possible but within one month of the completion of the works identified in (a), (b) and (c).

All submitted photographs shall include:

- The date the photographs were taken
- The time the photographs were taken
- A description of the site location (e.g. map reference, address) of where the photograph was taken, and
- A description of what aspect of the works the photograph relates to

The photographs and details shall be to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council.

Note 1: The photographic record should demonstrate compliance with the conditions of this consent.

Note 2: Photographic records i.e. electronic picture files from digital cameras can be emailed to notifications@gw.govt.nz. Please include the consent number (WGN130019), date and time photographs were taken and a description of the site location (e.g. map reference, address).

Maintenance of works

14. The works shall remain the responsibility of the consent holder and shall be maintained to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council so that:

a) Any erosion, scour or instability of the stream bed or banks that is attributable to the works carried out as part of this consent is remedied by the consent holder, and

b) Any adverse effects caused by the presence of the structure that limit or restrict fish passage shall be rectified by the consent holder, and

c) The structural integrity of the structures remains sound in the opinion of a Professional Chartered Engineer

Note: Maintenance does not include any works outside of the scope of the application. Any additional works (including structures, reshaping or disturbance to the bed of the watercourse) following completion of the construction works as proposed in the application, may require further resource consents.

Note: Additional resource consents from your local council may be required to undertake this proposal. We advise you to contact the Hutt City Council prior to commencing works.

7/4/20

BELMONT QUARRY

SECTION 2

NOISE MANAGEMENT PLAN

1.0 INTRODUCTION

This Noise Management Plan has been prepared in accordance with the City of Lower Hutt District Plan's Extraction Activity Area provisions and forms part of the overall Quarry Management Plan.

It records all management, monitoring and operational procedures necessary to comply with the District Plan's rules.

A copy of this management plan shall be kept on site and will be available for use by site personnel at all times.

2.0 PLANNING REQUIREMENTS

Hutt City District Plan – Extraction Activity Area

The specific requirement to be met for the Belmont Quarry are set out in Rule 14C 2.1.8. This provides that, when measured at SH2 (see Appendix Map 38 in the District Plan), L_{10} noise levels shall not exceed 70dBA between 6am and 10pm, and 45dBA between 10pm and 6am. In addition, the following requirements apply.

14C 2.1 Permitted Activity - Conditions

In all Activity Areas

(a) These rules are without prejudice to the powers of Council pursuant to the Act.

(b) These rules are without prejudice to the powers of any Medical Officer of Health pursuant to the Health Act 1956.

(c) The noise levels shall be measured in accordance with NZS 6801:1991 "Measurement of Sound", and assessed in accordance with NZS 6802:1991 "Assessment of Environmental Sound". The noise level is the L10 descriptor, as defined in NZS 6801:1991.

(d) The lower levels shall apply between the commencement of the lower level on a Saturday evening and Monday morning, and Public Holidays, unless otherwise specified.

(e) The maximum sound level shall not exceed Lmax75dBA during the hours 10.00pm - 7.00am, measured anywhere within a residential activity area.

(f) All construction, demolition, and maintenance work shall comply with NZS 6803P "Measurement and Assessment of Noise from Construction, Maintenance and Demolition Work".

(g) Sirens being used in response to an emergency (and routine testing and maintenance) are exempt from the Permitted Activity Condition standards.

(h) Noise from electricity distribution transformers not exceeding 1.5 MVA capacity, which are designed, constructed, installed and maintained to good New Zealand industry practice, providing the maximum noise level, measured at a distance of two metres in front of any window of any living area or bedroom of any residential building, shall be less than 50dBA.

3.0 NOISE MANAGEMENT PLAN

The methods set out below will be applied to ensure that noise from construction and day to day operations of the Belmont Quarry complies with the City of Lower Hutt District Plan.

This plan also sets out the framework for applying the Best Practicable Option (BPO) to ensure the emission of noise from the site does not exceed a reasonable level in accordance with Section 16 of the Resource Management Act 1991 (RMA).

The best practicable option is defined as follows:

The best method for preventing or minimizing the adverse effects on the environment having regard to, among other things, to

(a) The nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and
(b) The financial implications, and the effects on the environment, of that option when compared with other options; and
(c) The current state of technical knowledge and the likelihood that the option can be successfully applied.

This Noise Management Plan will be reviewed if any significantly new or altered activities are introduced or construction activities are changed in such a manner as to increase the potential for increased noise emission received at the notional boundaries of the dwellings in the area.

4.0 CONSTRUCTION EQUIPMENT

The following items of equipment have been identified as the significant noise sources at Belmont Quarry.

- Excavators
- Bulldozers
- Dump trucks
- Compactors
- Water Carts

5.0 NOISE MITIGATION MEASURES

The following noise mitigation measures will be adopted. The measures have been split into two groups – standard good practice and activity specific.

This will ensure that noise limits are not exceeded due to poorly maintained equipment, or machinery which has not been envisaged, and ensure that noise emissions from construction work are kept to a reasonable minimum level. Such measures will be included as an integral part of any contract or subcontract let for construction work.

Good Practice

(a) All construction equipment will be selected taking into consideration the sound power level of the equipment and the need to comply with the specified noise limits.

(b) All noise generating equipment will be maintained to a high standard at all times. Any defects will be repaired as soon as practicable, this will include damaged pipes, mufflers, etc or equipment that is assessed as being potentially noise.

(c) Alternative reversing alarms to the standard high pitched "pip" will be used. This will include the broadband "swish" alternative.

(d) Operators of noisy machinery will be instructed and trained in noise minimisation techniques. Excessive engine revving, excess use of horns or other audible devices will not be tolerated.

(e) Where practicable, noisy operations will be carried out at times when noise effects to residents in the vicinity are minimised.

(f) Works activities will generally be undertaken between the hours of 7am and 6pm Monday to Friday excluding public holidays.

Activity Specific

(g) Where practicable alternative quieter equipment will be used. This is an activity specific consideration as there will be other factors apart from noise that will determine what sort of equipment can be used to carry out the work.

(h) Noisy equipment will be generally excluded where practicable from areas that are particularly sensitive to noise emissions.

6.0 STAFF TRAINING

All staff (including contractors and sub contractors) will be made aware of this Management Plan through the site induction process, and pre-commencement and construction meetings. Compliance with the plan will become part of all contracts and any non conformance will be dealt with as a serious matter. As part of staff training, special attention will be given to the following:

- Proper selection, use and maintenance of tools, machinery, and related noise control devices
- Positioning of machinery on site

- Avoidance of unnecessary noise
- Procedures for receiving, referral and investigation of complaints

The following operator requirements will be incorporated into standard operating procedures:

- Do not accelerate, brake or rev vehicles unnecessarily
- Do not use horns unnecessarily
- Adhere to road speed limits at all times
- Where practicable communication is over the radio/phone – no shouting or swearing
- All radios and amplified music in the cabs of vehicles to be turned off prior to the doors being opened
- Ensure trucks are maintained to minimise exhaust smoke and odour, and are fitted with appropriate noise suppression controls and any defects are acted upon immediately.

All staff will be made aware that noise can also create major disturbance to our neighbours and that the affect of noise on neighbours should be considered when undertaking any major works. The names of drivers or operators not complying with the requirements of this plan will be recorded by the Belmont Quarry Manager and their employer notified. A record of staff training will be retained on site.

7.0 COMPLAINTS

All complaints received will be dealt with in a prompt and professional manner.

When a complaint is received the following information will be recorded.

- Name of the Complainant
- Date and Time of the Complaint
- Nature of the Complaint
- Contact Telephone number for follow up

Any complaints received will be immediately reported to the Belmont Quarry Manager.

Once the complaint has been logged, immediate steps will be taken to investigate the noise source(s). Following the investigation, if the noise source(s) is assessed as complying with the relevant noise level criteria, then no action will be required although regard will be had to ensuring BPO is being achieved. However, if the assessment deems non-compliance with the relevant noise level criteria, steps will immediately be taken to reduce noise from the activity. Following this the Belmont Quarry Manager will be responsible for contacting the complainant within one day of the complaint being received to explain how the matter has been or is being dealt with.

A log of noise complaints will be kept by the Belmont Quarry Manager. This log is available for inspection by Hutt City Council officers during normal working hours.

8.0 NEIGHBOURHOOD LIAISON

Belmont Quarry has a Community Liaison Group in place. Meetings are generally held every 3-6 months at Belmont Quarry. The purpose of this group was to provide a forum for two way communication between the Quarry and local residents. Where appropriate this group will be used to disseminate further information/answer any queries that local residents may have.

Belmont Quarry also has its own community section on the Winstone Aggregates website www.winstoneaggregates.co.nz. Where practicable this website will be used to store information of interest to local residents.

BELMONT QUARRY

SECTION 3

DUST MANAGEMENT PLAN

1.0 INTRODUCTION

This Dust Management Plan has been prepared in accordance with the City of Lower Hutt District Plan's Extraction Activity Area provisions and the requirements of the Wellington Regional Air Quality Management Plan. It forms part of the overall Quarry Management Plan.

It records all management, monitoring and operational procedures necessary to comply with the District and Regional Plan rules.

A copy of this management plan shall be kept on site and will be available for use by site personnel at all times.

2.0 PLANNING REQUIREMENTS

<u>Hutt City District Plan – Extraction Activity Area</u>

6D 2.1.1 Permitted Activities - Conditions

(a) Maximum Height of Buildings and Structures:

24.0m - On any part of the area where the ground level is RL 45m or lower at the time of installation or construction of the structure.

12.0m - On any part of the area where the ground level is greater than RL 45m at the time of installation or construction of the structure.

For the purpose of this Rule, RL = MSL, 1949 Geodetic Datum.

(b) Dust:

All outside areas shall be sealed, surfaced, or managed appropriately so that there is no dust nuisance at or beyond the boundary of the site.

All use, handling and storage of goods, raw materials and waste materials shall be undertaken in such a manner so as to prevent adverse effects from dust so that there is no dust nuisance at or beyond the boundary of the site.

<u>Greater Wellington Regional Air Quality Management Plan</u>

Rule 10 Mineral extraction, and the sorting and storage of powdered or bulk products
The discharge of contaminants into air in connection with:

1) sorting, storage and conveying (including loading and unloading) of fertiliser, grains, berries, coal, coke, wood chips, sawdust, wood shavings, timber and logs, bark, sand, soda ash, aggregates, live animals and other bulk products (whether in solid or liquid form, other than hydrocarbons which are covered by Rule 8); and/or
2) the extraction, quarrying and mining of minerals and the size reduction and screening of wood products and minerals; is a **Permitted Activity**, provided it complies with the conditions below, and **excluding** discharges of contaminants to air arising from processes involving:

    (b) the pneumatic conveying of bulk materials.

Conditions
Permitted Activities shall comply with the following conditions:

1) 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
2) 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.

3.0 GENERAL RESPONSIBILITIES

Winstone Aggregates

The Belmont Quarry Manager is responsible for and manages all site operations including those undertaken in the Cottle OBDA. (Note - a separate Management Plan is in place for the Cottle Land, which is located outside of the Extraction Activity Area zone.

Winstone Aggregates has a responsibility to implement and to abide by this Management Plan.

This responsibility includes ensuring that all contractors operating on site are familiar with the requirements of these documents and are undertaking their activities in accordance with the requirements.

Winstone Aggregates Staff

Every Winstone Aggregates employee has a duty to avoid, remedy or mitigate any adverse environmental effect arising from an activity carried out by them or on their behalf.

Every Winstone Aggregates employee has a duty to adopt the best practicable option to ensure that dust emissions remain within permitted levels.

Contractors

Every contractor has a duty to avoid, remedy or mitigate any adverse environmental effect arising from an activity carried out by them or on their behalf.

Every contractor has a duty to adopt the best practicable option to ensure that dust emissions remain within permitted levels.

4.0 TRAINING

The success of this Dust Management Plan depends on appropriate actions by site personnel in day to day operations at Belmont Quarry. Training will be provided to staff and contractors during site inductions and regular environmental meetings will provide a forum to discuss:

- on site practices relating to minimising dust emissions
- procedures for reporting and dealing with dust emissions as they arise.

Winstone personnel and all contractors operating on site will be made aware of all potential adverse effects of dust emissions and shall be proactive in identifying actual and potential dust sources.

Job descriptions and annual training reviews will identify individual staff training requirements in aspects of the dust control. The Quarry Manager will oversee training, and ensure that it is appropriate. A record of staff training will be maintained on site.

The Quarry Manager will ensure that any training provided by any earthmoving contractors to their staff also meets the requirements with respect to dust control.

5.0 DUST MITIGATION MEASURES

Dust from disturbed or unpaved surfaces such as haul roads and the overburden disposal area can be thrown into the air by wind or vehicle movements. Dust pick-up by wind is usually only significant at wind speeds above 5 metres per second (18kph), but vehicle re-entrainment can occur under any conditions.

In order to minimise dust emissions at Belmont Quarry the following mitigation measures will be used:

<u>Water Cart</u>

Spraying the surface of the ground with water is readily available and highly effective method of suppressing dust.

Water carts on site will provide onsite control of fugitive dust on haul roads and disturbed surfaces on an as-required basis. The frequency of watering depends on several factors; including weather, soil type, and construction traffic. Water should be applied at a rate so that the soil surface is wet, but not saturated or muddy.

Where practicable, the water cart will start prior to works commencing to ensure that the water gets a chance to soak into the road. The water cart will then continue to operate periodically throughout the day.

Truck Spillage

Dust emissions may be caused by the spillage of material from a trucks traveling along the Belmont Quarry haul roads. Spilled material could further act as a source of dust emission if it is crushed by traffic movements.

Spillage from trucks will be minimised by not overloading or otherwise incorrectly loading trucks. Any spill material will be promptly cleaned up.

Vehicle Exhausts

All vehicles will be regularly maintained to ensure minimum emissions. Earthmoving equipment will not have downward facing exhausts as these may act to raise dust in dry conditions.

Speed Limit

Vehicles traveling over paved or unpaved surfaces tend to pulverize any surface particles and other debris. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong air currents due to turbulent shear between the wheels and the surface. Dust particles are also sucked into the turbulent wake created behind moving vehicles.

Dust emissions due to moving vehicles will be minimised by restricting speed so that dust does not rise above the wheel height of trucks and machinery accessing and using the site and/or visible dust travelling for more than 25 metres within the site.

The site speed limit is 20 km/h

Following Distances

All drivers will be advised to maintain a good following distance between vehicles when using the haulroads to minimise the potential for cumulative dust emissions arising from closely traveling vehicles.

Haul Road Maintenance

Haul roads will be regularly graded to maintain an even surface with potholes and bumps smoothed over as soon as is reasonably practical.

Daily inspections of the haulroads will be undertaken to identify any surface deterioration that may result in increased dust generation. Site personnel will be encouraged to immediately report any deterioration of the haul road surface.

6.0 KEY DUST MITIGATION RESPONSIBILITIES

Key responsibilities for Dust Mitigation are as follows:

- inspection of works for visible dust emissions
- inspection of haul roads
- use of water cart
- limits on exposed areas
- limits on vegetation clearance
- cessation of work
- temporary cover requirements.

The Belmont Quarry Manager will be responsible for implementing these key dust mitigation responsibilities and making day-to-day decisions. The Belmont Quarry Manager may delegate some or all of these responsibilities to his deputy or site foreman, or to the earthworks contractor. Any such delegation will be documented and recorded. Records will be available at the Belmont Quarry site office.

7.0 INCIDENTS

A permanent record of any incidents that results, or could result, in an adverse effect on the environment beyond the boundary of the Belmont Quarry will be maintained. This incident register will be made available to the Wellington Regional Council and / or Hutt City Council, on request.

The Wellington Regional Council and Hutt City Council will be notified of any such incident within 24 hours of the incident being brought to the attention of Winstone Aggregates (or the next working day should this occur on a weekend or public holiday).

An incident report will be forwarded to the Wellington Regional Council and Hutt City Council within seven working days of the incident occurring (unless otherwise agreed with the Wellington Regional Council and Hutt City Council). The report will describe reasons for the incident, measures taken to mitigate the incident, and measures to prevent recurrence.

8.0 PUBLIC COMPLAINTS

<u>Following Complaints</u>

Once a complaint is received it will be promptly investigated and if found to be valid, appropriate measures will be put in place with the objective of avoiding a reoccurrence of the complaint.

A template to investigate dust complaints is attached to this plan as Appendix A.

A permanent record of any complaints received alleging adverse effects from or related to the exercise of this permit will be maintained.

This record will include the following, where practicable:

(a) the name and address of the complainant, if supplied;
(b) date, time and details of the alleged event;
(c) weather conditions at the time of the alleged event;
(d) investigations undertaken by the permit holder in regards to the complaint and any measures adopted to remedy the effects of the incident/complaint; and
(e) measures put in place to prevent occurrence of a similar incident.

The Wellington Regional Council and Hutt City Council will be notified of any complaints received, which relate to the exercise of this permit, within 24 hours of being received.

The complaints record will be made available to the officers of the Wellington Regional Council and Hutt City Council on request.

SECTION 3 – APPENDIX A – DUST COMPLAINT TEMPLATE

DUST INVESTIGATION CHECK SHEET

WINSTONE AGGREGATES

PART A: COMPLAINT DETAILS

Date:	**Time:**	**Received By:**
Name and Address:		
Contact Phone Numbers:		
Complaint Details and Initial Response (if any):		

PART B: SITE INVESTIGATION

Date:	**Time:**	**Received By:**
Location:		
People spoken to on site:		
What was the weather like a the time of the complaint: **(Note wind speed and direction, and any significant rainfall over the previous 24 hours)**		
Are there any visible dust deposits/clouds? **(describe approx extent)**		
Describe the appearance of the dust? **(is there any pollen around)**		

Does the problem extend to other properties?
Process Information **(What works are being undertaken on site? Anything unusual?**

Vehicle Information **(What machines/vehicles were operating on the site at the time of the complaint?)**
External Causes **(Check for road works, construction activities, burn offs etc)**
Any other relevant observations?

Suggested Causes (yours or the complainants?)

Remedial Action Undertaken (if required)

Signature of the Quarry Manager
(to be signed once the investigation is completed and the complainant has been contacted)

BELMONT QUARRY

SECTION 4

HAZARDOUS SUBSTANCES AND SPILL RESPONSE PLAN

1.0 PURPOSE AND POLICY

This Hazardous Substances and Spill Management Plan describes the procedures and management of the storage, and use of hazardous substances utilised at the Belmont site. This includes an inventory of substances and procedures to minimise risk and response plans that will be followed in the case of any emergency that relates to spillage of substances liable to pollute the environment. It forms part of the overall Quarry Management Plan.

2.0 HAZARDOUS SUBSTANCES (HSNO 1996)

Substance means:

(a) Any element, defined mixture of elements, compounds, or defined mixture of compounds, either naturally occurring or synthetically, or any mixtures thereof:

(b) Any isotope, allotrope, isomer, congener, radical, or ion of an elements or compound which has been declared by the Authority, by notice in the Gazette, to be a different substance from that element or compound:

(c) Any mixtures or combinations of the above:

(d) Any manufactured article containing, incorporating, or including any hazardous substance with explosive properties:

Hazardous substance means:

A hazardous substance is a defined mixture of elements or compounds either naturally occurring or produced synthetically. Such substances can readily explode, burn, oxidise (accelerate the combustion of other material) or corrode (metals or biological tissue), and/or be toxic to people and ecosystems.

A substance is hazardous if it exceeds the threshold for one or more hazardous properties. Most hazardous substances will have more than one hazardous property, for example petrol is flammable, toxic and eco-toxic.

The hazardous properties are:

- Explosive (Class 1)
- Flammable (Classes 2, 3, 4)
- Oxidising (Class 5)
- Toxic (Class 6)
- Corrosive (Class 8)
- Eco-toxic (Class 9)

3.0 HAZARDOUS SUBSTANCES REGISTER

Keeping an accurate inventory of what substances and what volumes of substances are held on site is vital to good hazardous substances management. Substances identified in Appendix 1 are those that have been identified as possible environmental contaminants should they enter surface waterways or groundwater through soil. Due to the potential environmental effects that these substances could cause Winstone Aggregates has chosen to include substances that have not officially been classified as hazardous under the Hazardous Substances (Classification) Regulations 2001.

The Site Manager, in consultation with site staff reviews the Hazardous Substances Register either annually or whenever a new hazardous substance has been acquired.

4.0 HAZARDOUS SUBSTANCE STORAGE

Labeling and Packaging

Hazardous substances need to be packaged in containers strong enough to prevent potentially hazardous incidents. Suppliers or sellers of hazardous substances must ensure that it meets the minimum standards of comprehensibility, clarity and durability (generally this will by way of labels) specified in the Hazardous Substances (Identification) Regulations 2001 as amended.

For the site managers, the practical effect of packaging is generally limited to repackaging hazardous substances and re-using containers on site as the container the hazardous substances has been supplied in should already meet the packaging requirements (must check that this packaging is not damaged). The person in charge of the place where the hazardous substances are stored must ensure that the information requirements continue to be met (i.e. Labels stay intact and legible).

Make sure when decanting substances into smaller containers of use in the work area that these containers are of good quality and clearly labeled, so if for example, someone gets a corrosive substance on their hands they know what it is and what to do. Strictly avoid using commonly recognizable bottles such as water and milk bottles for this.

Storage/ Bunding

All hazardous substances such as disinfectants, fuels, oils, detergents, poisons, solvents, alkaline or acidic solutions in greater than domestic quantities are to be stored in a designated bunded areas.

Bunding means containing your containers. Bunds can range from major facilities able to contain all liquids stored in the containers inside them, to low nib walls which stop spills from indoor workspaces escaping into yards. A bund lets you detect and control any small or slow leaks and will contain spills from sudden ruptures of tanks and drums.

Bunds, tanks and pipe work should be regularly inspected for signs of leaks, spills or damage. Any debris or accumulated stormwater that is contaminated should be removed, clean stormwater can be drained. Any defects to the bund walls or lining should be repaired promptly and damage to tanks, containers or pipe work should be dealt with immediately.

How big should a bund be?

The size of a bund depends on how much is stored in it.

Tanks – a bund around a tank or tanks must be big enough to contain:

At least 100% of the capacity of the largest tank + 10% of the capacity of the second largest tank + 100% of the other major volumes displaced below the bunded crest + Room for 175mm of rain – unless the bund is covered = Size of bund for a tank or tanks

Drums – a bund around a drum or drums must be big enough to contain:

At least 25% of the volume stored, if less than 10,000 litres (about 45x44-gallon drums) + 10% of any volume over and above 10,000 litres ($10m^3$) + Room for 175mm of rain – unless the bund is covered = Size of bund for a drum or drums

Don't forget...

- Remember the pumps, pipes and decanting vessels associated with your bunded containers – the bund should be able to cope with a spill from them.
- Locate loading points within the bund.
- Make sure bund floors and walls and joints on pipework are impervious to and compatible with the material stored.
- Maintain the required minimum separation distances for dangerous goods.
- Store incompatible substances in separate bunds.
- Thanks and drums should be separated from the inner edge of the bund by a distance of half the height of the tank or stack of drums.
- If empty drums are stored, the bund should be sized as if all drums are full – this will benefit you if your operations change, and the future leasers or purchasers of your site.
- Consider having separate or compartmentalised bunds for different materials – this will help you collect spilled material for re-use.

Signage

Signage at a location where hazardous substances are present provides information that is necessary to ensure that people entering the location understand the hazards posed by those substances and take the appropriate precautions. Also, to facilitate an immediate effective response to incidents, emergency responders need accurate, comprehensive and clear information. Fire fighters, Police and those first at the site of an incident need information that can be readily distinguished and correctly interpreted at a distance. Such personnel are trained to interpret graphical and coded information which is normally provided by signage.

Where a hazardous substance reaches the trigger quantity for signage the site manager will ensure that signs:

- Are located where they will be noticed by persons entering the site where hazardous substances are located (at above the specified trigger quantities) and must;
- Advise that the location contains hazardous substances,
- Describe the hazardous property and nature of the hazard(s) of the substance,
- Describe the precautions needed to safely manage the substance,
- Identify appropriate emergency response agency(s) or personnel and the means of contacting them,
- Provide sufficient information to advise trained personnel and the emergency service provider(s) of the immediate emergency response actions for the hazardous substances present,
- Be easily understood
- Be able to be easily read at a distance under varying conditions.

(Code of Practice: Code of Practice HSNOCOP 2-1)

In addition signs will also be placed onsite to indicate the location of the spill kits

5.0 TRAINING

It is the site manager’s responsibility to ensure that staff members have the appropriate certification to be handling all substances held on site.

Furthermore, it is the site manager’s responsibility to ensure that all staff members are trained in the areas identified below and that training undertaken is recorded.

Site Manager:

- All site refuelling procedures;
- All spill procedures;
- Company reporting procedures (Environmental Management Manual);
- Relevant provisions of the Resource Management Act 1991 and the Hazardous Substances and New Organisms Act 2006;
- Knowledge of all Material Data Sheets for substances stored on site;
- Knowledge of the local natural environment.

Site Supervisor:

- All site refuelling procedures;
- All spill procedures;
- Company reporting procedures (Environmental Management Manual);
- Relevant provisions of the Hazardous Substances and New Organisms Act;
- Knowledge of all Material Data Sheets for substances stored on site.

All Employees:

- All site refuelling procedures;
- All spill procedures;
- Reporting responsibilities identified within this plan;
- Knowledge of Material Data Sheets for all substances dealt with on site.

6.0 SAFETY

The safety of people overrides all other considerations.

In the event of spillage of flammable or explosive hydrocarbons, all sources of ignition must be shut down and the area checked for flammable vapours before deploying machinery in the area. Operations in conditions that endanger personnel must be suspended until conditions improve.

NO CLEAN UP OF ANY SPILL IS TO COMMENCE UNTIL IT HAS BEEN DETERMINED SAFE TO DO SO

"Safe to do so" means each person must make a judgment based on their training and experience in coping with the situation faced.

Personnel involved in a clean-up must be appropriately trained and issued with the appropriate protective clothing and safety equipment.

All actions taken by personnel with regard to procedures within this plan shall be in accordance with the company's Health and Safety policy.

7.0 POTENTIAL SPILL SOURCES AND RISKS

This section identifies scenarios that have the potential to result in a spill of hazardous substances. The design of the spill procedures set out in later sections of this plan has taken into consideration all the different potential spill scenarios. It is not considered necessary to have different spill procedures for each scenario.

This plan excludes scenarios associated with fire hazard as these are covered within the site health and safety procedures.

Diesel and hazardous substance storage including mobile plant:

The following are situations where there is potential for a spill of diesel, oil or lubricant:

- Re-filling, servicing
- Rupture
- Vandalism
- Submersion by flooding
- Equipment malfunction

8.0 PREVENTATIVE MEASURES IN PLACE

Bulk diesel storage

- Fuel is supplied by a fuel delivery contractor. The fuel delivery contractor will have a procedure for re-filling the bulk diesel tank. The supplier will have a spill kit, fire extinguisher and first aid kit on the re-fuelling vehicle and delivery staff will be trained to deal with spills.
- There are emergency telephone numbers on the bulk diesel tank to obtain advice from the supplier if required.
- The bulk diesel tank is bunded and the bund regularly cleaned out to ensure there is capacity to cope with a spill from the tank.
- Inside the tank bund is a matasorb pillow at the drain tap. This is for absorbing any substance apart from water when draining bund of accumulated rainfall when required.
- The bulk diesel tank is positioned so that mobile plant working around the site is unlikely to collide with it and is on site map hand out given to new employee's, contractors and visitors.
- The bulk diesel tank has hazardous substances warning signs on it.
- The bulk diesel tank is locked when not in use so that fuel cannot be dispensed.
- There is a procedure for re-fuelling operations from the bulk diesel tank.
- There is an automatic cut-off on the tank dispenser that prevents over filling.
- Manual stock takes of the bulk diesel tank are made monthly using a dip gauge.
- Fuel volumes used are reconciled monthly against stock take and delivery dockets.
- The fuel supplier carries out an annual check of the bulk diesel tank and dispenser.

Mobile plant

- The plant operator is required to remain in attendance at all times when refuelling.
- Fuel volumes dispensed are logged against individual vehicles.
- All mobile plant is locked overnight.
- The fuel caps on the excavator and loader are locked after refuelling.
- The site is secured overnight by a locked gate.
- There are safe working procedures located within the site operational manual for operating mobile plant close to the water filled excavation. These procedures are intended to minimise the risk of plant slipping or toppling into the excavation.
- Regular preventative maintenance is carried out on all mobile plant to ensure plant failure is minimised.
- There are weekly checks of all mobile plant, which are signed off by the site manager or his appointee.

- Plant operators are required to inspect their vehicles daily for signs of oil or fuel leaks, and wear and tear of hydraulic hoses, fittings and fixtures.
- Any major equipment failures are reported to the site manager as soon as possible.

Other hazardous substance storage

- All hazardous substances are stored and handled in accordance with the MSD sheets for each substance.
- Gas cylinders are securely stored in the workshop container.
- All hazardous substance storage facilities are locked overnight.
- Catch trays are used during oil changes.
- All spills are contained as soon as possible using the eliminate, isolate and minimise hierarchy. Spill kits and absorbent materials are used to clean up spill and disposed of through the appropriate channels.

9.0 RESPONSIBILITIES

The following positions with Winstone Aggregates have the responsibilities for putting this plan into action as and when is required, as noted:

All employees

All employees have a duty to:

- Respond initially to a spill by raising the alarm;
- Warn other personnel on site;
- Report to site manager;
- Take action to stop source of spill if practical and safe to do so;
- Take action to contain spill if practical and safe to do so;
- If not practical and safe to taken action then he/she shall stand by in a safe location until instructed to take part in the clean-up exercise if needed.

Site Manager

The site manager, or their assignee, has a duty to:

- Implement all measures and procedures contained within this plan including but not limited to:
- Take all practical steps to minimise the risk of any spill occurring on site;
- Take all appropriate actions in response to spills that occur;
- Ensure all personnel are appropriately trained in the use and handling of hazardous substances;

- Ensure all personnel are appropriately trained to respond to spills in accordance with this plan;
- Communicate to company management, regulatory authorities and other potentially affected parties if a significant spill does take place.

Environmental Manager

The Environmental Manager has responsibility to:

Provide appropriate technical guidance and support to the Site Manager to help ensure that all measures and procedures within this plan can be adequately implemented.

Regional Manager

The Regional Manager has the responsibility to:

Ensure appropriate support and resources are provided to the Site Manager to ensure that all measures and procedures within this plan can be adequately implemented.

General Manager:

The General Manager has the responsibility to:

Provide all appropriate support and resources to the Regional Manager and the Site Manager to ensure that all measures and procedures within this plan can be adequately implemented.

10.0 CATEGORY OF SPILLS

For the purposes of reporting there are three categories of spills for the site:

- **Minor:** No significant environmental effect
- **Serious:** Significant environmental effect but contained within the site boundary
- **Critical:** Significant environmental effect, outside the site boundary.

Note: For the purposes of this Hazardous Substances and Spill Response Plan, all spills of oil/diesel/lubricant into the excavation area will be treated as serious.

11.0 SPILL RESPONSE PROCEDURES

The procedures below are intended to cover all spill categories identified in section 10 (Category of Spills)

Immediate Response (all spills)

The person who discovers the spill will:

- Make an initial assessment of the spill including:
- What has been spilled
- Approximate volume or size of the spill
- Whether spill has entered the excavation area
- Likely source of the spill and
- Whether the spill is still occurring.

Note: Action is only to be taken if it is considered safe to do so.

The Site Manager or their appointee shall make an assessment of the significance of the spill and its potential for adverse environmental effects as soon as possible. The spill shall be categorised in accordance with Spill Debriefing section of this plan and the appropriate action and reporting taken as set out in the spill response procedures as follows:

Spill Response Procedure for Minor Spills (for example, less than 20 litres onto land)

1. Stop the source of the spill.
2. Contain the spill.
3. Mop up spill with sand and/or absorbent material in spill response kit and remove contaminated material in secure container.
4. Report details of spill to Site Manager or his appointee as soon as practical.
5. Site Manager or his appointee is to arrange for appropriate removal off site of any contaminated material.

Spill Response Procedure for Spill Categories Serious and Critical

1. If the spill is still occurring, try and locate its source, estimate size and likely volume.

2. If spill source located, take immediate steps to limit any further spillage e.g. shutting down pumps, closing valves or taking whatever action is appropriate (as long as it is safe to do so).
3. Inform Site Manger or his appointee as soon as practicable. The Site Manager shall make an assessment of the significance of the spill and its potential for adverse environmental effects as soon as possible.
4. If spill is onto land, contain spill and mop up spill with sand and/or absorbent material from spill response kit and remove contaminated material in secure container.
5. If spill is lubricant or hydraulic oil into water, utilise Matasorb pads or similar to absorb the spill.
6. Once the spill has been categorised by the Site Manager or his appointee the spill shall be reported as set out below.
7. If the spill is a critical one then in addition to the above steps, the Site Manager, in liaison with the Company General Manager shall implement all reasonable instructions made by the Regional Council for the clean-up of the spill.

What to do in case of a spill or a leak

1. BE SAFE

- Identify the spilt material.
- Do you need additional safety gear?

NO CLEAN-UP OF ANY SPILL IS TO COMMENCE UNTIL IT HAS BEEN DETERMINED SAFE TO DO SO.

2. STOP THE SOURCE

- For example, turn off the tap or valve; plug the leak, or upright the container.

3. CONTAIN THE SPILL

- Confine the spill with booms or other suitable material.

4. NOTIFY

- Tell your supervisor
- Your supervisor will inform other agencies such as the Fire Service or your local councils Pollution Hotline if the spill escapes your control.

5. CLEAN UP

- Neutralise the hazardous substance by using something like Spillsorb
- Pump/sweep/dig/scrape contaminated material into a safe container
- Clean up all residues without allowing wash water or contaminated material to get into a water body.

6. DISPOSE RESPONSIBLY

- Dispose of contaminated materials as a waste or ask your waste disposal contractor for assistance.

7. RESTOCK AND REVIEW

- Immediately replace any contaminated equipment or PPE
- Assess the cause of the spill and take any steps necessary to prevent reoccurrence.
- Check your spill procedure-can you improve or update it following the incident?
- Record the incident in JOBSAFE!

WINSTONE AGGREGATES

Reporting

Incident Type	Reporting Requirements
Minor	Record in JobSafe
Serious	Record in JobSafe Conduct an incident investigation Inform Site Manager / Environmental Manager / Regional Manager
Critical	Record in JobSafe Conduct an incident investigation Inform Site Manager / Environmental Manager / Regional Manager / Senior Management (including the General Manager)

Where Winstone Aggregates is required to notify Greater Wellington Regional Council the initial contact will be made within 48 hours of the spill occurring.
All spill incidents should be recorded in JobSafe and in the monthly environmental report. These records should include the following information:

- why the spill occurred
- the extent of the spill
- the effects on the environment
- the measures taken to control and clean up the incident and
- Actions taken to avoid re-occurrence.

If necessary the Systems Improvement Request process should be utilised to implement changes required to avoid re-occurrence.

12.0 SPILL RESPONSE EQUIPMENT AVAILABLE ON SITE

A spill kit is located in the workshop container.

The kit contains:

- Spillsorb
- Absorbent Matasorb mats and wool;

Fire fighting equipment is located in the office and the workshop container.

13.0 SPILL DEBRIEFING

Within two weeks of any serious or critical spill, the Environmental Manager and the Site Manager are to carry out a debriefing to assess all matters relating to the spill and the responses. The main purpose of the debriefing shall not be to apportion blame but to reduce the risk of a similar spill occurring in the future and establish if any improvements can be made to spill responses.

14.0 MEDIA RELEASES

All media queries regarding spills shall be directed to the Company General Manager in the first instance however if available they should be directed to the Environmental Manager.
Site staff and the Site Manager should not directly respond to media questions.
All media releases shall be authorised by the General Manager prior to release.

15.0 DOCUMENT REVIEW

The Site Manager, in consultation with site staff and the Environmental Manager shall review the Hazardous Substances and Spill Plan either annually or whenever a change to the plan has been made or a new hazardous substance has been acquired.

Furthermore, the Hazardous Substances Environmental Management Plan shall be tested at least every 12 months or within 3 months of a change to the plan (including permissions identified in the plan). Part of this review shall be to test the spill response procedures and all spill preventative and emergency response equipment.

Testing must demonstrate that every procedure or action in the plan is workable and effective. Records of testing shall be kept for at least 2 years.

SECTION 4 – APPENDIX A – HAZARDOUS SUBSTANCES REGISTER

HAZARDOUS SUBSTANCES REGISTER

Please enter the details of all Fuels, gases, liquids, cleaners, poisons, paints, sealants etc

Belmont Quarry

Person in charge: Geoff Cooke **Date completed: August 2013** **Impac review: August 2013**

Name of Chemical	Volume on site	HSNO Location certificate required ?	MSDS	Where it is stored	Comments and recommendations (site wide)
Castrol Rx super plus - Engine oil	50 litres	No	Yes	Oil Store - clearly labelled.	
TFC450 - Drive train oil	180 litres	No	Yes	Oil Store - clearly labelled.	
Alpha SP 150 - Gear oil	250 litres	No	Yes	Oil Store - clearly labelled	
LSX 90 & 140 - Gear oil	30 litres	No	Yes	Oil Store - clearly labelled	
CRF10W - Trans fluid	300 litres	No	Yes	Oil Store - clearly labelled	
Agri Power trans	140 litres	No	Yes	Oil Store - clearly labelled	
600W Super cylinder oil	20L	No	No	Oil Store - clearly labelled	
SBX2 - Grease	15 kg	No	Yes	Oil Store - sealed container attached to grease pump.	
Transmax M Trans fluid	20 litres	No	No	Oil Store - clearly labelled	

EPX 80/90 - Oil	20 litres	No	No	Oil Store - clearly labelled	
Torquefluid 434	15 litres	No	No	Oil Store - clearly labelled	
LMX grease	10 kg	No	Yes	Oil Store - cartridges for hand pumps	
BTX Grease	210 kg	No	Yes	Oil Store - clearly labelled	
Castrol Rx super plus - Engine oil	150 Litres	No	Yes	Mobile plant workshop	
Agri Power trans	80 Litres	No	Yes	Mobile plant workshop	
PD2 Grease	10 kg	No	No	Mobile plant workshop	
BP diesel	10700 litres	Yes	Yes	Aboveground tank certified	
LPG	18 kg	No (Limit is 100 Kg)	No	In workshop	
Oxygen	8 bottles	Possible (limit is 100kg)	No	Approved bottles chained up to wall of workshop	
Acetylene	7 bottles	Possible (limit is 100kg)	No	Approved bottles chained up to wall of workshop	
Paints	28 litres	No	No	Dangerous goods store	

Gun wash	20 litres	No (limit is 50litres)	No	Dangerous goods store	
Thinners	12 litres	No (limit is 50 llitres)	No	Dangerous goods store	

SECTION 4 – APPENDIX B – SITE PROCEDURES

WINSTONE AGGREGATES

Hazardous Substances Storage Guide

SUBSTANCE / CLASSIFICATIONS	MAXIMUM VOLUMES UNDER THRESHOLD	SEPARATION FROM OTHER SUBSTANCES	SEPARATION FROM SOURCES OF IGNITION	BUNDING REQUIREMENTS	OTHER
Diesel **3.1D, 6.1E, 6.3B,9.1B**	Over 5000 L Above –ground requires SCS Certificate (any quantity below-ground requires a SCS Certificate)	Store away from LPG, Acetylene, Aerosols and Oxygen. May be stored with other class 3 substances.	N/A	Consider storing portable diesel drums or containers in an approved flammable liquids cabinet or bunker fitted with a bund.	Secondary containment required for quantities greater than 1000 L
Petrol **3.1A, 6.1E, 6.3B,6.7B,9.1B**	Over 50 L requires a location certificate & signage, over 100 L requires approved handler	Store away from LPG, Acetylene, Aerosols and Oxygen. May be stored with other class 3 substances.	Store well away from heat, sparks, and open flames, 5 M in closed containers, 15 M in use. Keep containers closed when not in use. Use approved fuel containers.	Consider storing petrol containers in an approved flammable liquids cabinet or bunker fitted with a bund.	Secondary containment required for quantities greater than 100 L
LPG **2.1.1A**	Over 100 Kg requires approved handler and location certificate	Store away from all class 3 substances, segregate from Oxygen by 3 M	Keep valves closed when not in use, store upright, well ventilated area, 2 M away from drains, pits, depressions, ignition sources, or openings into buildings	N/A	
Acetylene **2.1.1A**	Over 100m^3 requires approved handler and location certificate	Store away from all class 3 substances, segregate from Oxygen by 3 M (except oxy-acetylene welding trolleys).	Keep valves closed when not in use, store upright, secure tall cylinders to prevent toppling, 2 M from sources of ignition	N/A	Strongly recommend the use of flashback arrestors fitted to cylinders in use on welding trolleys.
Kerosene **3.1C, 6.1E, 6.3B, 9.1B**	Over 250 L requires a location certificate	Store away from LPG, Acetylene, Aerosols and Oxygen. May be stored with other class 3 substances.	Store well away from heat, sparks, and open flames, keep containers closed when not in use.	Consider storing Kerosene containers in an approved flammable liquids cabinet or bunker fitted with a bund.	
Thinners **3.1B**	Over 50 L requires a location certificate	Store away from LPG, Acetylene, Aerosols and Oxygen. May be stored with other class 3 substances.	Store well away from heat, sparks, and open flames, keep containers closed when not in use.	Consider storing thinners containers in an approved flammable liquids cabinet or bunker fitted with a bund.	
Paints (solvent based) / spraying (non aerosol) **3.1B, 6.1E, 6.4A, 6.8B, 6.9A, 9.1D**	Over 50 L requires a location certificate	Store away from LPG, Acetylene, Aerosols and Oxygen. May be stored with other class 3 substances.	Store well away from heat, sparks, and open flames, keep containers closed when not in use.	Consider storing paint containers in an approved flammable liquids cabinet or bunker fitted with a bund.	
Paints (mineral based) **3.1C, 6.1E,6.3B,9.1B**	Over 250 L requires a location certificate	Store away from LPG, Acetylene, Aerosols and Oxygen. May be stored with other class 3 substances.	Store well away from heat, sparks, and open flames, keep containers closed when not in use.	Consider storing paint containers in an approved flammable liquids cabinet or bunker fitted with a bund.	
Flammable Aerosols (including spray paint) **2.1.2A**	Over 3000 L requires location and approved handler certificates	Store away from LPG, Acetylene, class 3 substances and Oxygen	Store well away from heat and open flames.	N/A	
Oxygen **5.1.2A**	Over 100m^3 (approx 9-10 large G cylinders) requires an emergency response plan	Store away from all class 2 and 3 substances by minimum 3 M (except oxy-acetylene welding trolleys).	Keep valves closed when not in use, store upright, secure tall cylinders to prevent toppling. Store well away from heat, sparks, open flames, oils and greases	N/A	Strongly recommend the use of flashback arrestors fitted to cylinders in use on welding trolleys.
Antifreeze (Ethylene glycol) **6.1E, 6.4A, 6.9A, 9.3C**	Over 10,000 L	N/A	N/A	N/A	
Lubricants / Greases	Not Classified under HSNO	N/A	N/A	N/A	
Oils	Not Classified under HSNO	N/A	N/A	N/A	Secondary Containment recommended.
Degreasers	Depends on hazardous classifications – consult material safety data sheet for each				

NOTE: Volume means total container capacity – not how full a container is

If you need more information phone the HSNO Compliance Line on 0800 376 234

BELMONT QUARRY

SECTION 5

REHABILITATION STRATEGY

This section of the Quarry Management Plan has been prepared by consultants for Winstone Aggregates. Detailed Rehabilitation Plans will be prepared progressively within the context of this strategy as parts of the quarry become available for permanent rehabilitation.

Belmont Quarry Extension

Rehabilitation Strategy

Prepared for Winstone Aggregates

1 August 2013

Report prepared by:
Boffa Miskell Ltd
&
Tonkin & Taylor Ltd

Document Quality Assurance

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CONTENTS

1.0 Introduction

1.1 Purpose

Winstone Aggregates commissioned Boffa Miskell and Tonkin & Taylor to prepare a rehabilitation strategy associated with the proposal to extend extraction activity within Belmont Quarry, Lower Hutt.

This Rehabilitation Strategy describes the following:

- The location and landscape context of Belmont Quarry;
- General principles of quarry rehabilitation; and
- The processes and stages of the proposed rehabilitation works.

The purpose of the proposed rehabilitation works is to enable the modified quarried landform to be re-integrated into the Hutt Valley landscape. This includes enabling natural systems to be re-established to allow revegetation that approximates the original patterns.

This long-term vision can be expressed as follows:

> ***"To facilitate the successful rehabilitation of quarried areas in a manner that will re-establish native vegetation as part of the 'green visual backdrop' of the Hutt Valley"***

1.2 Background

By its very nature, the rehabilitation of extraction activity is a lengthy process. The degree of site modification is also such that there is a substantial element of trialling and testing involved in finding solutions to meet the specifics of the site. It is difficult to develop a detailed plan in advance because the precise nature of the final landform can only be determined for each section of quarry as extraction activity is completed. This is due to the variations in rock type that can become evident as quarrying proceeds. Notwithstanding this, the foundation concepts and general approaches based on widely accepted best practice can be outlined at this preliminary design stage.

This document seeks to establish objectives and inform the process required for successful rehabilitation following extraction activity. This strategy forms the framework and sets out the principles to be followed in the rehabilitation plans, and is intended to demonstrate that the rehabilitation will meet best practice[1] and is operationally achievable.

In this document the term 'rehabilitation' is used rather than 'restoration'. Restoration implies returning the quarry to its former condition. The nature of a quarry operation is both destructive and extractive meaning that landform and landmass are removed and cannot be restored to their original form. However, despite this, landforms can be created that are generally commensurate with broader landscape patterns and can be engineered so that finished landforms are able to support and sustain ecological values of a similar nature.

[1] Such as Minerals Council of Australia (1998) Mine Rehabilitation Handbook

2.0 Location and Context of Belmont Quarry

2.1 Location

Belmont Quarry is located off Hebden Crescent and west of State Highway 2 in the Hutt Valley, approximately 6km north-east of the centre of Lower Hutt Central Business District.

The nearest residential properties are located approximately 300 metres to the east of the Proposed Extraction Area at Pomare and form part of the wider residential area of the Hutt Valley. Additional residential properties are located to the south-west of the site along part of the western escarpment and include properties along Liverton Road located approximately 350 metres to the south of the Proposed Extraction Area.

Over longer distance to the east of the Hutt Valley (beyond approximately 1 km) people living in hillside residential properties on the western edge of Stokes Valley have views across the Hutt Valley and towards Belmont Quarry. Such properties include dwellings accessed along Holborn Drive and its connecting roads.

2.2 Landscape Context

At a broader scale, Belmont Quarry is adjacent to the Wellington Fault escarpment, a legible landform which is recognised as contributing to the distinctive character of the Region.

At the District scale, the escarpment runs along the western edge of the Hutt Valley, rising above the Hutt Valley floor[2]. Residential areas occupy approximately 37% of this area with the remainder being 'undeveloped'. The escarpment generally has a dense cover of native and exotic woody vegetation which adds to the distinctiveness of the escarpment landform as a backdrop to the Hutt Valley floor.

The Belmont Hills rise to the west of the Hutt Valley and include the rounded hilltops and slopes above the Wellington Fault escarpment. This area is part of an ancient uplifted erosion surface. Much of this area is included in Belmont Regional Park, which combines land for recreation, conservation and farming purposes.

At the local 'site' scale, existing quarrying activity influences much of the immediate character of this area. This includes an operational plant surrounded by a series of exposed stepped benches associated with extraction activity. A mix of young and well established regenerating native vegetation also encloses extraction activity within the quarry, particularly along the faces of the western escarpment and in elevated areas continuing north-west into Belmont Regional Park. When viewed from the Hutt Valley, such indigenous vegetation forms a key characteristic of adjoining areas along the wider scarp slope and provides some softening and containment of extraction activity when viewed along SH2.

The pattern of vegetation distribution reflects the turbulent history of the natural environment in the wider District. The original landscape was clothed with mature beech-podocarp forest with coastal broadleaved elements. Beech forest once dominated in altitudes above 600 masl, with kāmahi (*Weinmannia racemosa*), tawa (*Beilschmiedia tawa*) and hard beech (*Nothofagus truncata*) particularly common on the slopes and in gullies such as around the Belmont Quarry area. Human-induced fires and vegetation clearance in the past for farming has seen the continuous tall forest reduced to small fragments of relict beech and podocarp fragments.

Now those patches are surrounded by a landscape of exotic pasture and reverting native scrub from abandoned or retired farmland. The landscape is currently in an ecologically vibrant phase with the bright green growth of young, regenerating forest coming through weedy gorse and broom fields. Wildlife corridors are reconnecting across the landscape as indigenous vegetation links remnant

[2] Boffa Miskell(2012) Hutt Landscape Study: Landscape Character Description

patches and as young scrub naturally reverts to more diverse plant communities capable of attracting and supporting a greater range of native birds, insects and other wildlife.

Long-lived native trees are being more widely dispersed as birds move into areas, casting wide their seed. Beeches and some other ecologically important (and visually representative) native trees are spreading at a slower pace across the landscape, as their seed travels only short distances each generation; these are the species that would benefit most from human assistance to accelerate native forest restoration across the Hutt Valley area.

2.3 Policy Context

Existing extraction activity within Belmont Quarry is a permitted activity within the Extraction Activity Area identified in the City of Lower Hutt District Plan (the District Plan). The process of rehabilitation is set out with reference to rule 6D 2.1.1(m) in the District Plan which states;

> ***"The quarry shall be progressively rehabilitated taking into account planned future development. When extraction activities cease, the site shall be rehabilitated by hydro seeding benches and cut faces, and rehabilitation of top soil and revegetation of the quarry floor. This shall be with native species except where exotic species may be used initially to provide nurse cover for native plants."***

The extension of extraction activity requires removal of an area of existing vegetation within and adjacent to the Firth Block which is identified as part of a Special Amenity Area (SAA). Relevant policies from Section 6D 1.2.1of the District Plan include:

(a) That adverse effects generated by extraction activities be managed to enhance the visual quality of the area
(b) That extraction activities retain the indigenous vegetation on the face of the escarpment, particularly in areas of special amenity, as part of the visual backdrop for the City.
(c) That having taken into account planned future development, progressive rehabilitation measures be provided

As a result of removing existing indigenous vegetation within the SAA, a key element of the Rehabilitation Strategy is to hasten the reinstatement of indigenous vegetation on previously extracted faces in order to ensure that the recognised 'green visual backdrop' is maintained and enhanced.

Conditions within the District Plan recognise that sites that may be difficult to rehabilitate can make full use of regenerative processes that are not always native dominated. The Hutt Valley, with its large areas of reverting farmland to native forest, is dominated by several exotic weeds. Two of these, European gorse (*Ulex europaeus*) and exotic broom (*Cytisus scoparius*), are well-known nursery crops or ecological pre-cursors to the establishment of native pioneer plant species. A cursory look around the Hutt Valley shows all stages of this process under way. This process is also recognised in Greater Wellington Regional Council's Restoration Planting Guide[3], which identifies the valuable role gorse and broom can play in protecting young native seedlings and identifying that these potential weeds can be described as a natural 'nursery crop' which will eventually be shaded out by the growing natives.

[3] Greater Wellington Regional Council (2004) Restoration Planting: A guide to planning restoration planting projects in the Wellington region

2.4 Belmont Quarry History

Belmont Quarry has been a source of rock since the 1920s. Part of this history is evidenced by terracing associated with previous quarrying activity adjoining the existing Firth Concrete Masonry Plant, with regenerating vegetation now predominately covering this area.

As part of understanding the changes that have occurred across the site including the changing patterns of surrounding areas of vegetation which can occur, an analysis of historic aerial photography was carried out. Such changes are illustrated on **Figures 1 - 6** described below. The Figures also show the extent of the District Plan's Extraction Activity Area (in yellow), and the remaining area proposed for quarrying over the next 30 or so years (in red).

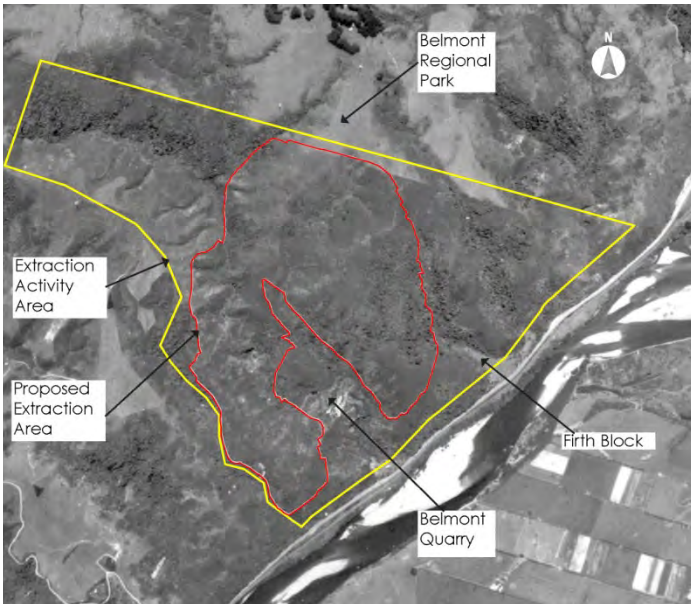

Figure 1: *1941*
Limited extraction activity is visible at the base of the current area of the operational quarry. A grass clearing is visible at the base of the Firth Block which may have resulted from extraction activity in this area. The majority of the site and adjoining areas of the western escarpment is covered in vegetation. Adjoining areas of Belmont Regional Park are grazed to a fenceline along the site's northern boundary.

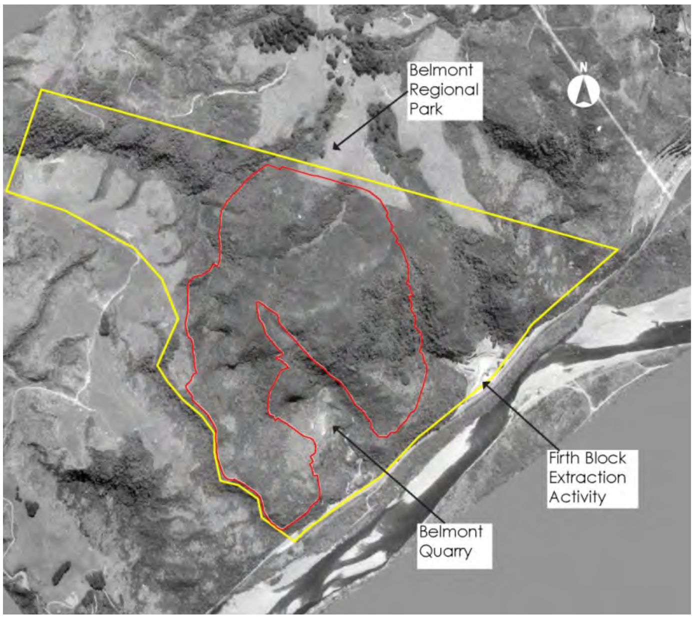

Figure 2: *1958*
Some minor tracking and limited further extraction activity is evident in the current area of the operational quarry. A larger clearing and obvious extraction activity is evident in the Firth Block. Grazing remains apparent within the adjoining areas of Belmont Regional Park.

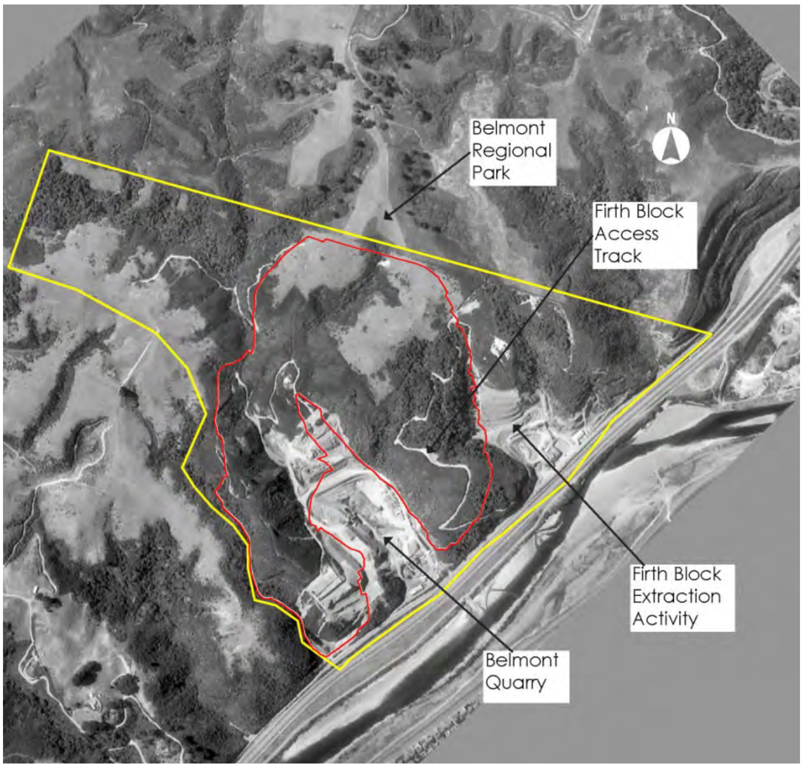

Figure 3: *1974*
Extraction activity within Belmont Quarry and the Firth Block is well established. Tracking has also been introduced along the intervening spur separating the two and accesses the elevated plateau to the west of the Firth Block. Grazing activity has also been extended along the upper spurs to the north and south of Belmont Quarry.

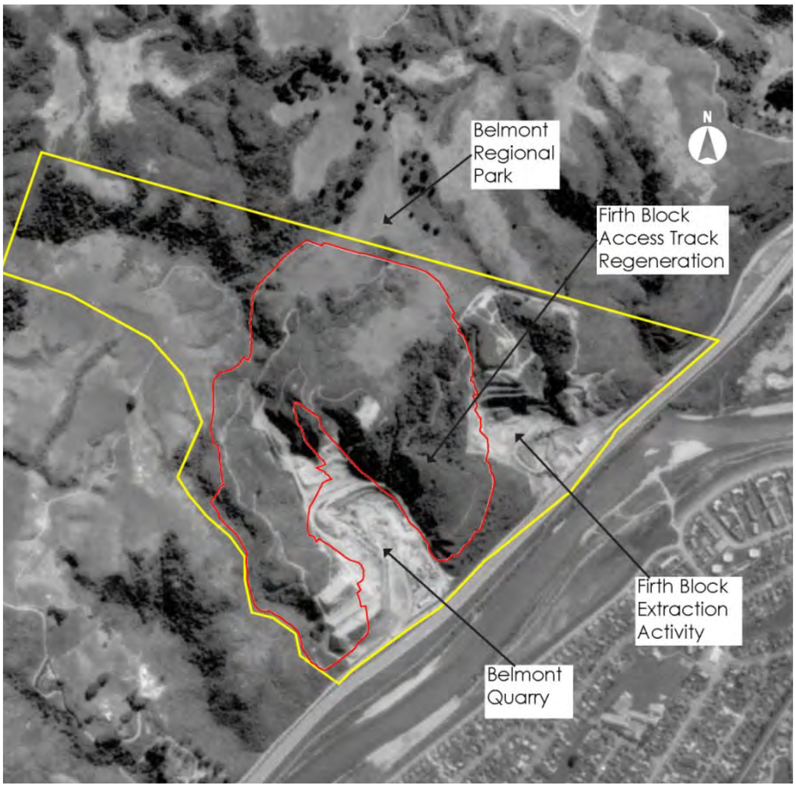

Figure 4: *1980*
Extraction activity within both Belmont Quarry and the Firth Block remains apparent, with tracking accessing the intervening spur becoming partially covered with vegetation. Grazing on the upper spurs of Belmont Quarry remains evident.

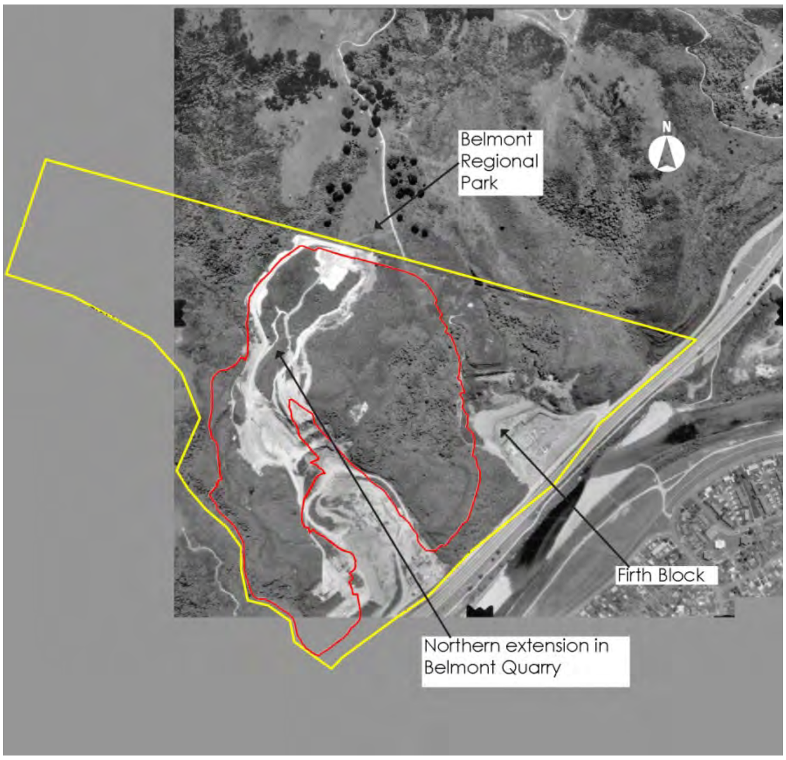

Figure 5: *1988*
Extraction activity and tracking has continued north into the currently operational area of the quarry with previously extracted areas in the Firth Block increasingly reverting to a cover of vegetation. Regenerating vegetation surrounds extraction activity on the upper spurs of Belmont Quarry with grazing no longer evident in these areas.

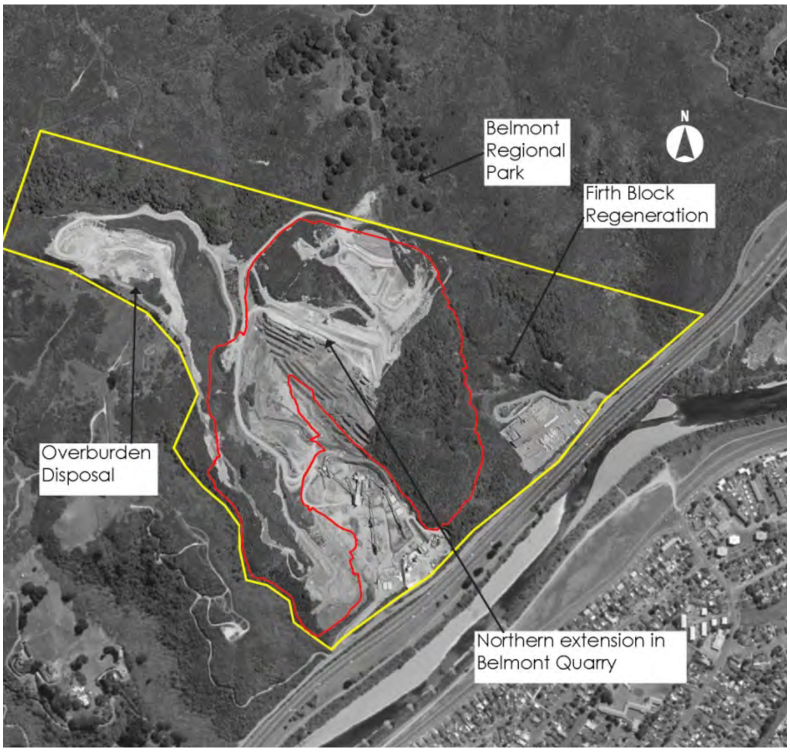

Figure 6: *2010*
Extraction activity has continued further north within the quarry. The area formerly accommodating extraction activity within the Firth Block now appears covered with regenerating native vegetation with further areas of native vegetation extending into adjoining valleys in Belmont Regional Park. An overburden disposal area is also visible to the north-west of the Quarry.

3.0 Factors Influencing Rehabilitation

The success of rehabilitation requires an understanding of the context and influences within which it will occur. This includes an understanding of the key environmental influences on future rehabilitation. This understanding will be further developed as the Rehabilitation Strategy is implemented.

A brief summary of the key influences relating to Belmont Quarry is set out below.

3.1 Geology and Soils

The Wellington Fault has had an important role in shaping the landforms of the Hutt Valley area. The land to the west has been pushed up to create the Western Hills and Belmont Hills. The rounded forms of the Belmont Hills result from erosion processes over a long period, distinct from the more recent alluvial processes influencing the Hutt Valley floor.

At the local scale, the detailed geology associated with Belmont Quarry directly influences how and where extraction is carried out. The soils along the Western Escarpment are primarily derived from the weathering of the underlying predominantly greywacke rock, with some potential for erosion.

3.2 Aspect

The 'Western Escarpment' runs south-west to north-east through the Hutt Valley and typically maintains an eastern aspect.

Extraction activity within Belmont Quarry will extend an 'amphitheatre form' within the natural scarp creating variety of aspects generally facing east and south-south-west. An area of western aspect is also created to the east of the site adjoining an area of vegetation to be retained along Hebden Crescent. The aspects of extraction activity are illustrated on **Figure 7**.

3.3 Slope

Extraction of material from the quarry entails the creation of sloping faces and benches. The resultant faces of extraction works are between 26º (approximately 1:2) and reach 65º (approximately 2:1) in some areas. Benches are graded to accommodate machinery during operation of the quarry and typically have a gradient of between 1:20 and 1:8, similar to much of the quarry floor. The proposed gradient of extraction works are illustrated on **Figure 8.**

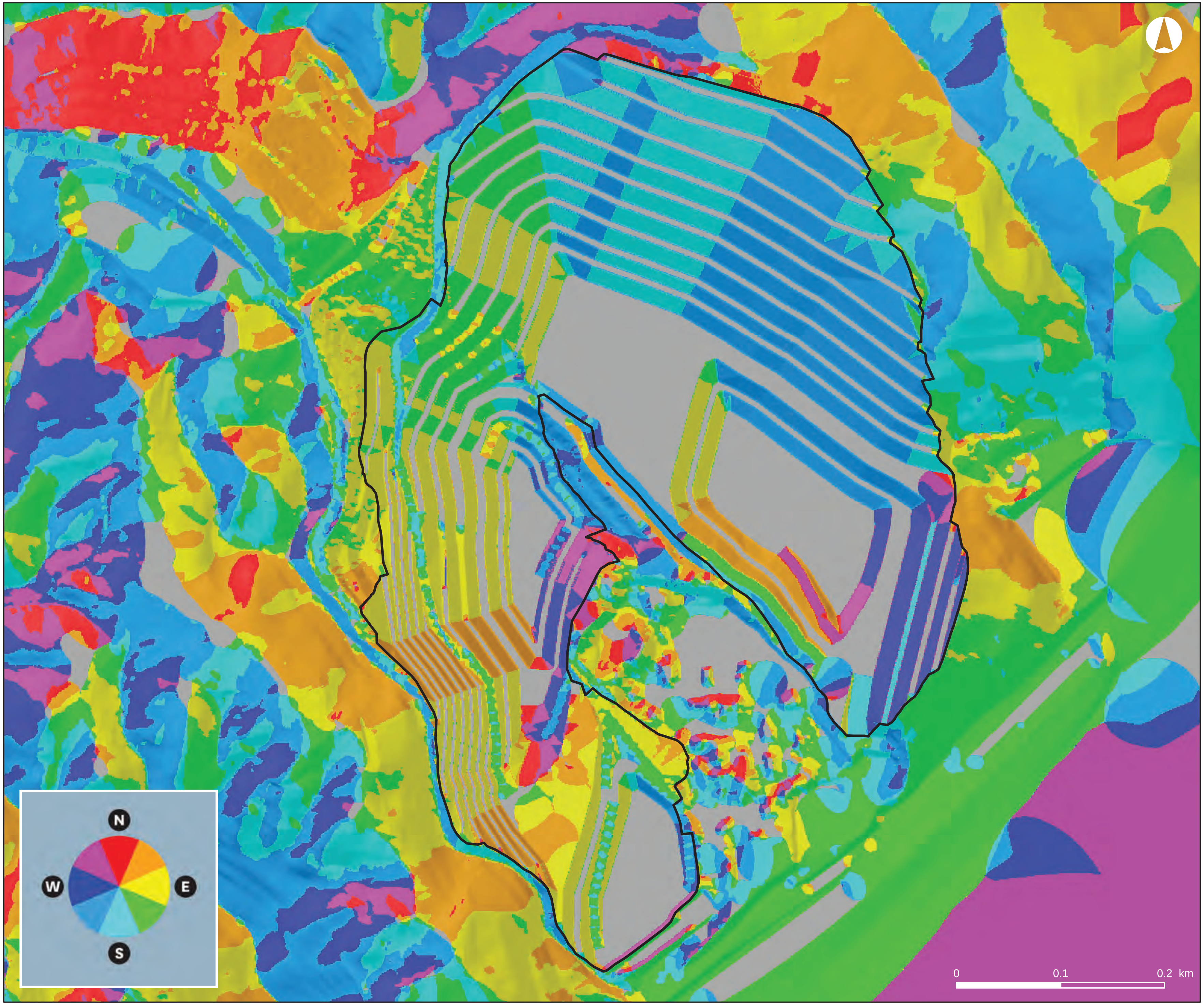

Figure 7 : Illustration of Sun Aspect on extracted faces

File Ref: W12052_07_Aspect_A3.mxd

WINSTONE AGGREGATES

BELMONT QUARRY
REHABILITATION
STRATEGY

SUN ASPECT

Date: July 2013
Revision: 1

Plan Prepared for Winstones Aggregates Ltd
by Boffa Miskell Limited

Author: PM
Checked: RG

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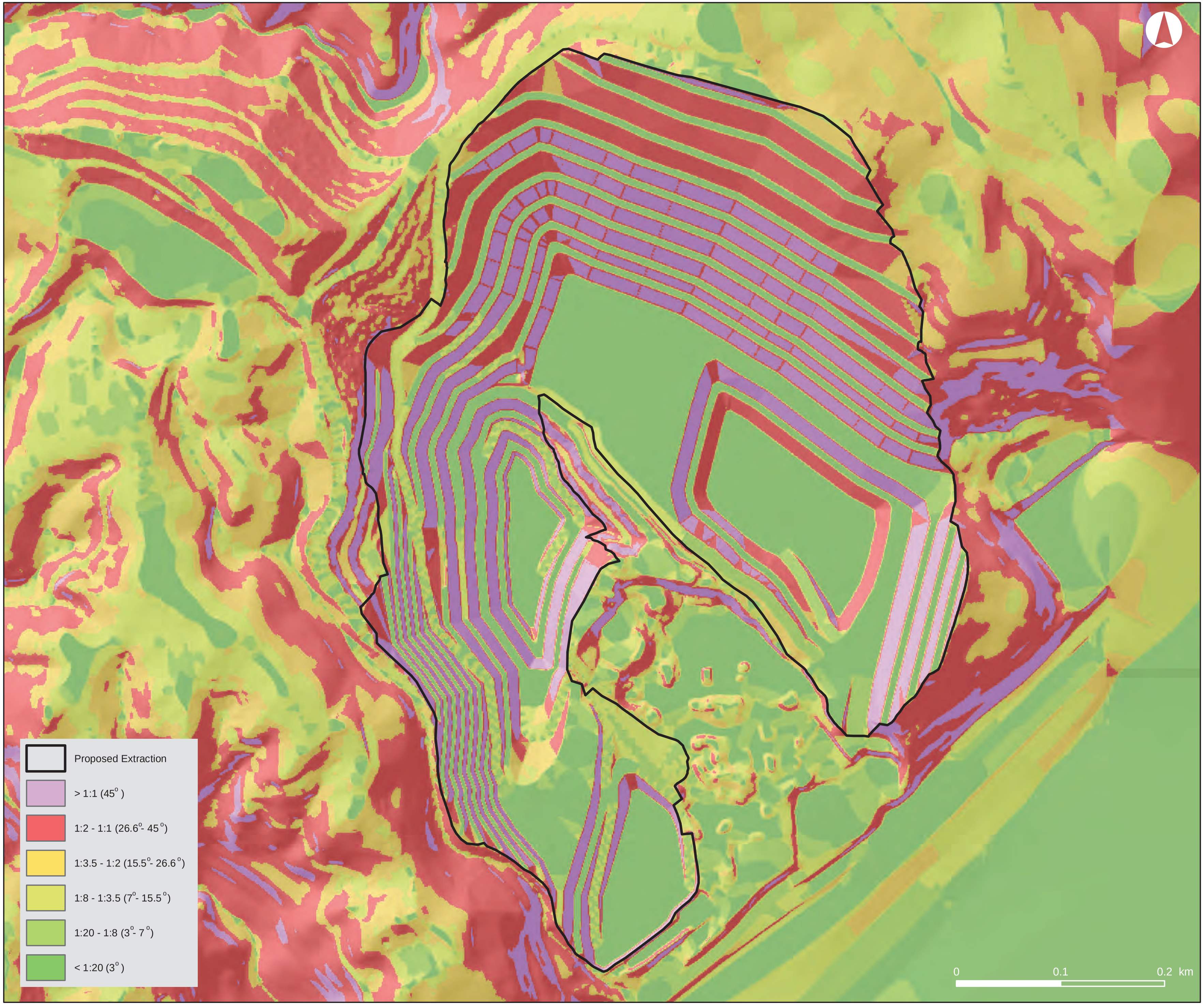

Figure 8 : Illustration of proposed slopes across the site resulting from extraction activity

File Ref: W12052_08_Slope_A3.mxd

WINSTONE AGGREGATES

BELMONT QUARRY REHABILITATION STRATEGY

SLOPE ANALYSIS

Date: July 2013
Revision: 2

Plan Prepared for Winstones Aggregates Ltd by Boffa Miskell Limited

Author: PM
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3.4 Climate

Frequent and strong northerly winds prevail with the northern area of the site which is also exposed to less frequent but strong southerlies (see **Figure 9**). The elevated parts of the extraction area on the spurs are most exposed to the strong winds. Below these, much of the site maintains an amphitheatre enclosure which reduces wind exposure.

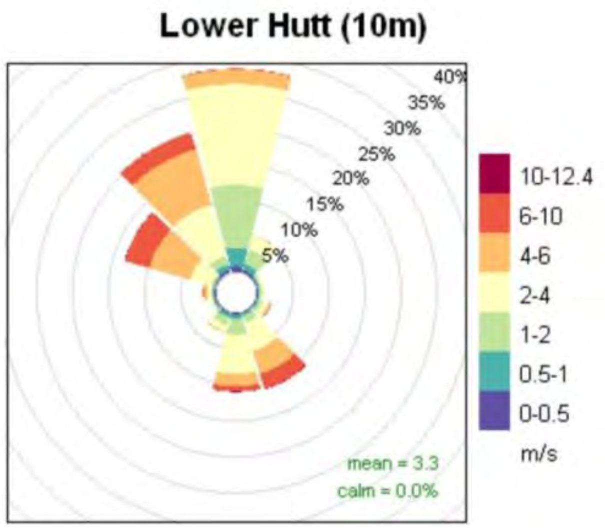


Figure 9: Average wind direction in the Hutt Valley (Source: GWRC)

The recent range of temperatures in the Hutt Valley range between -1 and 14º in winter and 8 and 32º in summer with rainfall fairly consistent throughout the year (see **Figure 10**).

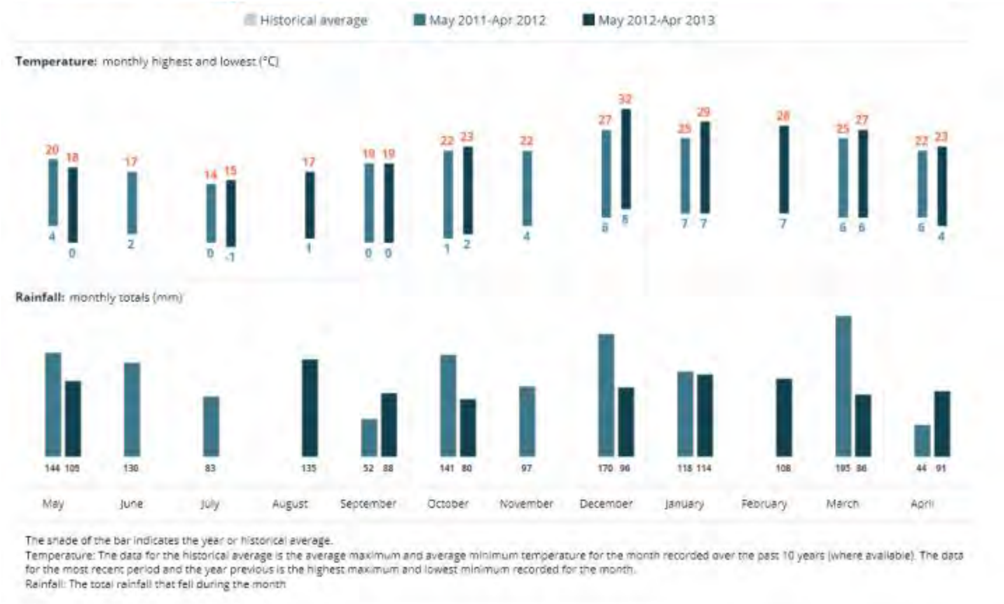


Figure 10: Average Hutt Valley Temperature and Rainfall (source: Metservice)

3.5 Vegetation and Ecology

The operational quarry face is largely devoid of existing vegetation. Exotic and native vegetation at various stages of development is, however, well established in areas where extraction activity has not occurred or areas where extraction activity has ceased. The proposed extraction area extends into an area of established vegetation to the north-east of the site. Some of this includes areas of lowland forest. Some exotic scrub and pine is also present in this area. A terrestrial ecological appraisal assessing the value of vegetation within the Firth block has been prepared by Forbes Ecology. A map of the vegetation types which have been identified is illustrated in **Figure 11** with vegetation types listed in **Table 1**.

The results of the survey are summarised below:

- The proposed extension area affects approximately 6.8 ha of vegetation at the southern and western edges of the Firth Block;
- The Firth Block overall contains ecological values of high local and regional significance, due mainly to the old-growth tawa-dominated forest that comprises 2.3 ha of the block (1 ha of which is within the proposed extraction area);
- Like the surrounding landscape, the Firth Block is a mosaic of vegetation types. The dominant vegetation type by coverage is young native regeneration with various portions of mainly gorse, broom and buddleja. Lesser components by coverage include various seral stages of native forest from species-poor kanuka forest to mixed species regenerating scrublands, tree fern dominated communities and mid-successional broadleaved forest; and
- The Firth Block supports a broad range of vegetation types, with many exhibiting a comparatively high level of plant species richness for the local area. The old-growth tawa forest is one of the largest remaining remnants in the Hutt Valley area and is characteristic of the pre-human vegetation composition across this part of the landscape.

Overall, the ecology appraisal found some 90 native plant species within the ca. 6.8 ha area proposed for resource extraction, with most of these also represented in adjacent areas of the Firth Block and Neighbouring Belmont Regional Park. Native forest gecko and native common skink were also recorded outside the Proposed Extraction Area.

One of the key principles of the Rehabilitation Strategy is to return indigenous vegetation cover to the post-quarrying landscape. Vegetation communities present within the Firth Block and surrounding regenerating landscape provide a guide as to native species that are appropriate to replant and those that are likely to successfully establish. This is reflected in the objectives of this Strategy and the approach taken with encouraging environmental conditions that will benefit native plant establishment and rapid growth.

The speed at which retired lands in the Hutt Valley hills progress through weedy phases to native-dominated communities also provides a good yardstick by which to set targets and monitor progress of the Belmont rehabilitation programme. There are numerous examples of natural and human-assisted revegetation on site at Belmont Quarry which collectively indicates that revegetation to native communities can be achieved relatively quickly and with a high level of confidence.

3.6 Visual Amenity

As part of assessing the effects of extraction activity on visual amenity, a key consideration also relates to potential visual impact within the context of the visual backdrop of the Quarry seen from the surrounding landscape. This assessment is set out in detail within the Landscape and Visual Assessment[4]. In visual terms, a key outcome seeks to maintain a 'green visual backdrop' as extraction activity continues across the site. This typically relates to elevated areas of the site which are potentially visible from parts of the wider Hutt Valley, including elevated locations above Stokes Valley. Retired areas outside the Proposed Extraction Area have also been taken into account where these remain visible in the context of the larger Proposed Extraction Area.

[4] Boffa Miskell (2013) Belmont Quarry Extension: Landscape and Visual Assessment

Table 1: *Key to vegetation types contained within the Proposed Extraction Area*[5]

Vegetation description	Map symbol	Number for map	Slope corrected area (ha) Total polygon area	Inside of footprint	Outside of footprint
Titoki forest	Ae	1	0.1499	0	0.1499
Mahoe-five finger-mamaku forest	Mr-Pa-Cm	2	0.1977	0	0.1977
Mamaku-mahoe forest	Cm-Mr	3	0.6115	0.1785	0.433
Broadleaved-tree fern forest		4	1.2483	1.2483	0
Gorse forest	Ee	5	0.0603	0.0603	0
Tawa forest	Bt	6	0.4652	0.0037	0.4615
Gorse-mahoe forest	Ee-Mr	7	0.225	0	0.225
Mamaku forest	Cm	8	0.2086	0.0507	0.1579
Mapou forest	Ma	9	0.2987	0.2987	0
Broadleaved-tree fern low forest		10	1.9312	1.9312	0
Mahoe-broadleaf forest	Mr-Gl	11	0.925	0.925	0
Mahoe-buddleja scrub	Mr-Bd	12	0.6294	0.1627	0.4667
Buddleja-gorse shrubland	Bd-Ee	13	0.5256	0.0263	0.4993
Buddleja-gorse shrubland	Bd-Ee	14	0.6312	0	0.6312
Karamu shrubland	Cr	15	0.0353	0	0.0353
Mapou-mahoe-pigeonwood forest	Ma-Mr-Ha	16a	0.201	0.201	0
Tawa forest	Bt	16b	0.7447	0.7447	0
Rewarewa forest	Ke	17	0.5086	0.5086	0
Mahoe/gorse-buddleja	Mr/Ee-Bd	18	0.7735	0.4541	0.3194
Bare ground	Bare ground	19	0.0229	0	0.0229
Mixed indigenous and exotic low forest		20	2.456	0	2.456
Mixed indigenous and exotic shrubland		21	0.9757	0	0.9757
Low indigenous broadleaved forest		22	0.4458	0	0.4458
Tawa forest	Bt	23	0.3368	0.3368	0
Manuka-broadleaved forest		24	0.602	0	0.602
Tawa/mamaku-pigeonwood forest	Bt/Cm-Ha	25	0.1281	0	0.1281
Gorse scrub		26	0	0.01	0
Podocarp-broadleaved forest		27	0.1588	0	0.1588
Broadleaved-tree fern forest		28	0.0478	0	0.0478
Rewarewa/broadleaved-tree fern forest		29	0.2091	0	0.2091
Tawa forest		30	0.8159	0	0.8159
Various exotic pioneering weeds		31	6.0971	3.8813	2.2158
Sums (ha):					
Exotic dominant vegetation =			**7.94**	**4.13**	**3.81**
Indigenous, and predominantly indigenous vegetation =			**14.72**	**6.88**	**7.84**

[5] Forbes Ecology (2013), Key to Draft Vegetation Map

Figure 11: Vegetation types within the Proposed Extraction Area

4.0 Rehabilitation Objectives

4.1 Overview

This document forms part of the Belmont Quarry Management Plan. Within this framework, stage plans will be used to specify rehabilitation procedures, maintenance of indigenous vegetation cover and monitoring to be undertaken as the quarrying activity proceeds. The process of rehabilitation works is to be implemented incrementally as each stage of extraction activity is completed. On this basis the rehabilitation plan has a timeframe measured in decades with revegetation undertaken following the initial stages of extraction activity being well advanced by the time the last stages of the quarry have been completed.

Because each quarry site is different, every rehabilitation programme represents an element of experimentation (adaptive or responsive management). This means that rehabilitation programmes usually include some degree of trialling of techniques to identify suitable methods and approaches specific to that site. The strategy also includes revegetation trials as an essential element to determine the effectiveness and speed with which rehabilitation can be successfully undertaken.

A process of ‘adaptive rehabilitation’ is important because it improves certainty of anticipated outcome as experience from previous stages is acquired and re-applied to the site. Revegetation measures for each area will also vary according to the specific climate, exposure, aspect and substrate.

4.2 Objectives

The proposed Rehabilitation Strategy will work together in an integrated way with the proposed extraction activity over the duration of the quarrying.

Monitoring and management of the rehabilitation will also continue after extraction works are complete. Rehabilitation works are integral to the operation of the quarry and implemented at the completion of each stage of extraction activity. It is, therefore, important that a sequential staging plan is adopted which can be adhered to over the duration of the works. Whilst timing of stage completion can adapt to fluctuations in demand, the sequence of extraction activity forms the basis upon which rehabilitation processes will occur.

The overall objectives of the rehabilitation works are as follows:

- Coordination of the various steps in the operating sequence for optimum operating and rehabilitation efficiency;
- Creation of a final landform that integrates with the adjacent topography and optimises effective revegetation conditions;
- Creation of a drainage pattern that avoids ponding and erosion;
- Provision of ground cover to control erosion and promote landform stability such as grass and woody vegetation, as soon as soil conditions allow;
- Facilitate the establishment of woody native plant communities to return long-term landscape and indigenous biodiversity values; and
- Apply rapid revegetation techniques in highly visible areas, to reduce the duration of visual impacts.

4.3 Timeframes

A key objective of the Rehabilitation Strategy is speeding up the natural regeneration processes which would otherwise occur. The dynamics of the process of natural regeneration is largely influenced by the following:

- Aspect;
- Wind;
- Soils;
- Seed; and
- Animal and Plant Pests.

The time frames required to achieve a reasonable woody native vegetation cover can be reduced by utilising revegetation techniques such as:

- Ripping, blasting and fill placement to create screes and suitable substrates for plant establishment;
- Creating and /or adding soil forming materials and/or organic soils to create suitable substrates for natural regeneration or planting;
- Encouraging the establishment of gorse or other appropriate exotic seral woody species where they can assist establishment of native plant communities;
- Planting appropriate rock-habitat adventive species and 'nursery' plants; and
- Discouraging key pest-plant and animal species and managing those that occur.

The goal for rehabilitation is to match timeframes for natural regeneration on un-modified landforms. **Table 2** and **3** below provide an indicative guide to the timeframes (in years) that can be expected at this site. This includes timeframes for successful revegetation (based upon estimates of revegetation on a natural landscape), and a worst case situation where revegetation occurs without assistance (based on an analysis of historic aerial photography).

Table 2: Cover on Benches and Slopes (Completed slopes less than 26° (1: 2))

Vegetation type	With rehabilitation		Without rehabilitation	
	North Aspect	South Aspect	North Aspect	South Aspect
Grass Cover (>75%)	1 year	1year	10 years	5 years
10% woody cover	1	1	15+	10+
50% woody cover	3	2	30+	20+
Up to 100% woody cover	5	3	60+	40+
50% second growth native forest	20+	15+	100+	80+
100% second growth native forest	50+	40+	150+	150+

Table 3: Cover on faces (Completed slopes greater than 26° (1:2)) - based on 15m height faces and 7.5m wide benches

Vegetation type	With Rehabilitation		Without rehabilitation	
	North Aspect	South Aspect	North Aspect	South Aspect
Grass Cover (>50% through direct growth)	15 years	10 years	30+ years	20+ years
10% woody cover (through growth on benches obscuring faces)	1	1	30+	20+
50% woody cover (through growth on benches obscuring faces)	30+	20+	100+	60+
Up to 100% woody cover	Maybe never	Maybe never	Maybe never	Maybe never
50% second growth native forest	Maybe never	Maybe never	Maybe never	Maybe never
100% second growth native forest	Maybe never	Maybe never	Maybe never	Maybe never

From the above tables it can be seen that faces represent a far greater challenge to effectively revegetate, particularly with native plants, than benches or slopes. The table of estimated timeframes for faces (**Table 3**) is based on faces of 15m height where plant growth beyond 3-4m is slow and may never achieve a 15m height given the comparatively poor growing substrate available and relatively narrow bands of planting achievable.

By comparison, design of faces and benches at a smaller scale (see next section) to 7m face height and 5m bench width provides opportunities to obscure landforms with woody vegetation on a substantially shorter timescale (**Table 4**). With landform modification undertaken as part of the rehabilitation process, a scree will be formed 2m up the face to create a plantable slope on which fast-growing woody vegetation will be encouraged. This will be followed by underplanting with native trees and shrubs several years later.

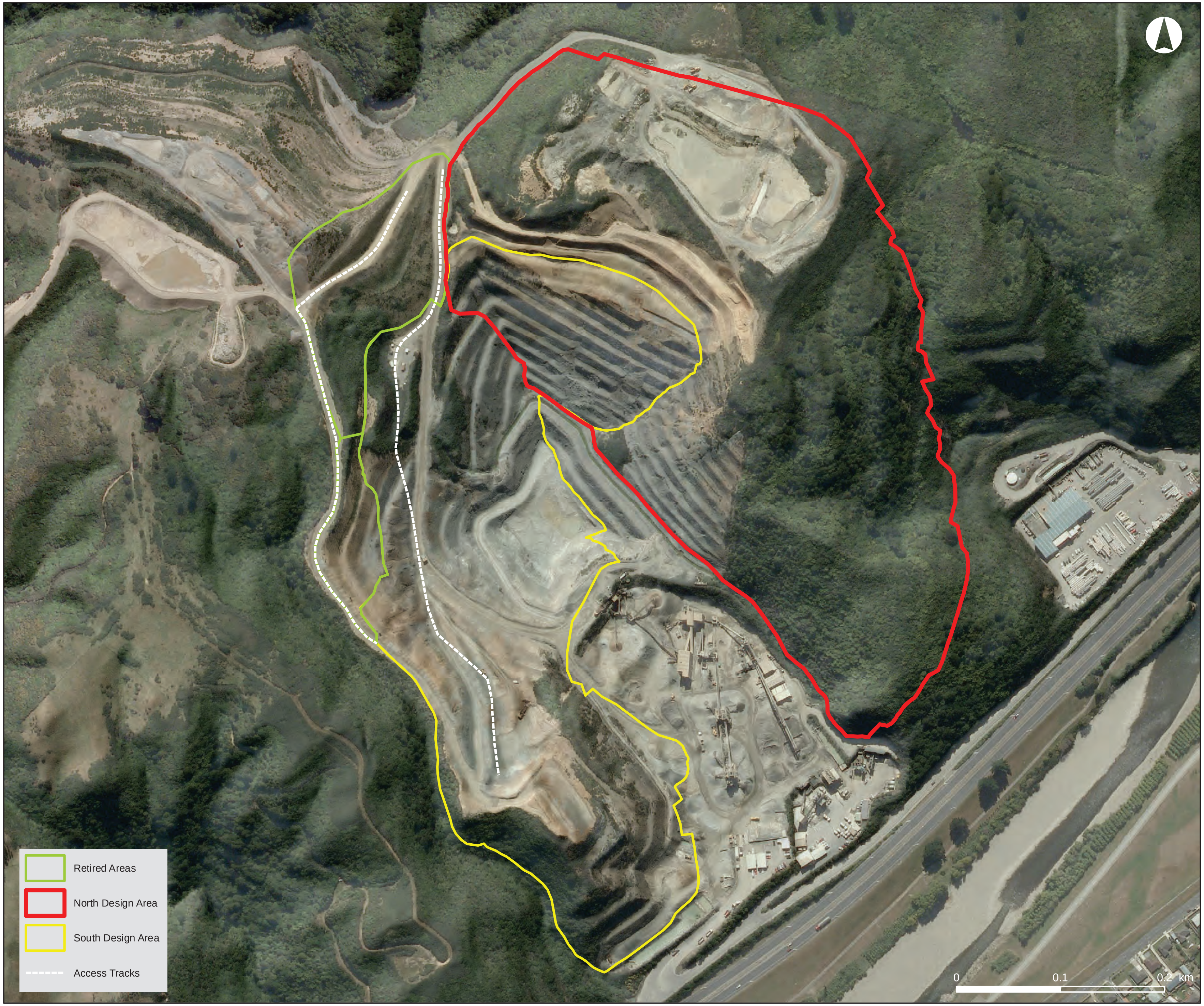
Table 4: Timescale to obscure faces (based on 7m height faces and 5m wide benches)

Land type	**With Rehabilitation**		**Without rehabilitation**	
	North Aspect	**South Aspect**	**North Aspect**	**South Aspect**
Grass Cover (>50% faces through direct growth)	15 years	10 years	30+ years	20+ years
10% woody cover (through growth on benches obscuring faces)	1	1	20	10
50% woody cover (through growth on benches obscuring faces)	7	5	40+	20
Potential 75% woody cover	15	10	50+	30+
50% second growth native forest	20	15	70+	50+
100% second growth native forest	40+	30+	90+	70+

5.0 Proposed Extraction Area and Staged Works

The full extent of the Proposed Extraction Area (North and South Design) and Retired Areas addressed within the Site Rehabilitation Strategy are illustrated on **Figure 12: Proposed Extraction Activity**.

Extraction activity results in faces, benches and access roads which will have different dimensions and slope across the site. Retired areas adjoining the Proposed Extraction Area but not subject to further extraction activity have also been included in this strategy where these provide part of the 'green visual backdrop' visible from within the Hutt Valley.



WINSTONE AGGREGATES

BELMONT QUARRY
REHABILITATION
STRATEGY

PROPOSED EXTRACTION ACTIVITY

Date: July 2013
Revision: 0

Plan Prepared for Winstones Aggregates Ltd
by Boffa Miskell Limited

Author: PM
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File Ref: W12052_12_Extraction_A3.mxd

Figure 12

Key components of the quarry landscape covered by this Rehabilitation Strategy include:

Faces (Completed slope greater than 26°): The faces which result from extraction activity extend to a height of approximately 15 metres and will be formed up to a gradient of approximately 65° (2:1). In order to reduce the visibility of faces in key areas, some face heights will be reduced to a height of approximately 7 metres as part of the rehabilitation works. Faces typically have cracks and joints although have little or no fines or soils to support woody vegetation growth. Faces typically fritter over several years, and in doing so provide micro-habitats for the natural establishment of plants.

Benches and slopes (Completed slope up to 26°): Benches resulting from the extraction activity typically extend between approximately 5 and 7.5 metres wide. Where feasible, scree slopes will be formed on benches to assist with obscuring lower faces and to provide a platform to support plant growth. The advantages of managing benches in this way are that it maximises the plantable area, provides elevated planting platforms and thus reduces time to achieve significant visual amenity outcomes; as can be seen by comparing Tables 2 and 3 with Table 4. Typical bench substrate conditions following quarrying are compacted rock or unmodified underlying substrate. Benches will be ripped to approximately 200 mm prior to completion of extraction activity to provide for keying in of materials deposited to support plant growth and to improve drainage.

Access roads: Road access to working areas is required until stages are fully worked and available for rehabilitation. Rehabilitation on the physical road footprint and nearby bench and faces cannot be undertaken until roads are removed and final profiles of faces and benches are completed. This means that some parts of completed phases will remain un-rehabilitated until later pit phases are complete and access roads can be removed.

Areas below 65 m above sea level: This Rehabilitation Strategy focuses on the mitigation of visual effects. Visual impact modelling indicates that areas of the existing quarry and proposed extension area below 65 masl will not be subject to the degree of visual exposure as those areas above 65 masl. The end-use of areas below 65 masl has not yet been determined and not included within the Rehabilitation Strategy.

Previously retired areas and areas of overburden disposal: There will also be areas outside of the Proposed Extraction Area which have been retired or will retain overburden disposal on-site. These will be treated in a similar manner in terms of achieving rehabilitation objectives.

Table 5 shows the proposed treatment for faces of specified heights. In practice, these heights represent two ends of a continuum of face heights and intermediate heights will also be found in the post-quarrying landscape. Therefore, the timescales provided in Tables 2, 3 and 4 and the rehabilitation processes described in the following sections also represent ends of a continuum of management practice and anticipated outcomes across the site, with a mixture of approaches applied to faces that fall between these extremes.

Table 5: Typical landform treatment of faces within specified height limits

Face height	Corresponding bench width	Typical landform treatment for rehabilitation
15 m	7.5 m	Formed scree slope typically 30⁰ angle of repose covering up to 4m of bench width and up to 3m height to obscure lower face, leaving ca. 12m face height to vegetate or obscure with plantings over time.
7 m	5 m	Formed scree slope typically 30⁰ angle of repose covering up to 2.5m of bench width and up to 2m height to obscure lower face, leaving ca. 5m face height to vegetate or obscure with plantings over time.

6.0 Quarry Rehabilitation Process

6.1 Staging of Extraction Works

Planning for future rehabilitation has commenced on the formation of this report. Rehabilitation planning that is integrated with extraction sequences will ensure that rehabilitation is undertaken in areas where quarrying activity has concluded, as early as possible. It also ensures that rehabilitation effort is not wasted on areas which will be disturbed again later.

Action:

1. Ensure extraction activity adopts a sequential approach to rehabilitation that avoids or mitigates future disturbance of completed areas.

6.2 Vegetation Protection

Remnants of vegetation provide a vital role in future rehabilitation, acting as a seed source, providing shelter and habitat for birds which will encourage natural seed dispersal. Prior to the commencement of operations in each stage, the extent of quarry activities will be clearly understood and may include marking on the ground to prevent accidental removal.

Action:

2. Prior to commencement of extraction works, ensure that the limits of vegetation clearance are clearly known and understood to prevent vehicle access and unintended vegetation clearance or damage outside approved clearance areas.

6.3 Vegetation Removal and Stockpiling

Vegetation that is stripped from the site, both exotic and native, will be mulched and stockpiled where practicable. Similarly the top layers of material will be stockpiled separately where practicable such that soils or substrates in the top 200 mm of the pre-quarried ground surface are kept separate from the underlying overburden materials and subsoil. This is important for the successful re-use of the top layers as rehabilitation growth and seed media for establishing vegetation cover. The mulch can also be mixed with the top layer material to provide suitable substrate for planting and natural regeneration in addition to topsoil.

Mulch and topsoil stockpiles need to be in suitable locations within the quarry where they will not be subject to compaction by machinery. Stockpiles should be no higher than 1.5 metres height (to prevent anoxic conditions forming within the stockpile core which depletes nutrient and beneficial microbial activity levels), and will be grassed to stabilise and reduce dust. The maximum duration for stockpiling of mulch and topsoil will be 2 years. The process of rehabilitation shall ensure that the soil is stored for as short as time as possible to prevent deterioration. This will entail a co-ordinated programme of stripping, storage and re-spreading as required.

In addition to top layer and mulched vegetation there are un-saleable or low value quarry by-products such as overburden, grit and sludge, which can potentially be used in the preparation of planting substrate. The addition of a 'blended' combination of these different materials to the uppermost layer of fill can improve both physical properties and fertility making the resultant areas more suitable for plant establishment and growth. The need for such a blend will depend on the properties of the fill material, and would be investigated during the first years of the rehabilitation plan.

Action:

3. Where practicable, separate the top 200 mm of surface soils and mulched vegetation from subsoil and underlying overburden and store separately in stockpiles no more than 1.5m height.

6.4 Quarry Finish - Landform Modification

Benches and faces that indicate an area has been, or is being quarried usually run along the contour of the site and against the natural ‘grain’ of the landscape (see **Figure 13**). Removing them, softening them or breaking them up is often the key to reducing their visibility.

Landform modification forms an integral part of the overall operation and will be implemented progressively as extraction activity is completed. This will include operations carried out to prepare the site for revegetation. Such landform modification will include the creation of scree slopes, bench ripping, careful return of over-burden to visually ‘soften’ excavated terraces and faces and placing of growing medium. An element of benching will likely still be required to meet drainage and future access requirements.

Prior to depositing scree material, the, surface of the benches will need to be ripped to create a zone of fractured rock, and faces scarified to allow scree and topsoil to be ‘keyed in’ and to minimise slip planes between the two materials. The fractured and ripped zones also serve to retain moisture and provide secure rooting (see **Figure 14**).

Action:

4. Ensure that the final landform will facilitate rehabilitation measures which ‘soften’ visible faces and facilitate future reinstatement of native vegetation.
5. Identify and allocate the necessary volume of overburden material to undertake rehabilitation works.
6. Programme bench ripping, face scarification and deposit of overburden as an integral part of the overall operation.

6.5 Drainage

Benches direct and concentrate water flow and so drainage needs to be considered to prevent scouring and erosion across benches and down faces, which may damage rehabilitation plantings. Cut-off drains or berms are particularly important on the benches to prevent erosion and scouring of replaced soils, to create stable post-quarrying environments for plant establishment and to ensure safe environments for maintenance in future years.

Cut-off drains and berms will be designed to keep water within benches and slow its release to the receiving environment. Rehabilitation substrates are likely to be free-draining aggregates and water retention will be important to successful establishment and progressive development of vegetation communities in these areas (see **Figure 15**).

Action:

7. Ensure drainage is included as part of the landform modification process to prevent scouring and erosion of adjacent vegetation and rehabilitated landforms.

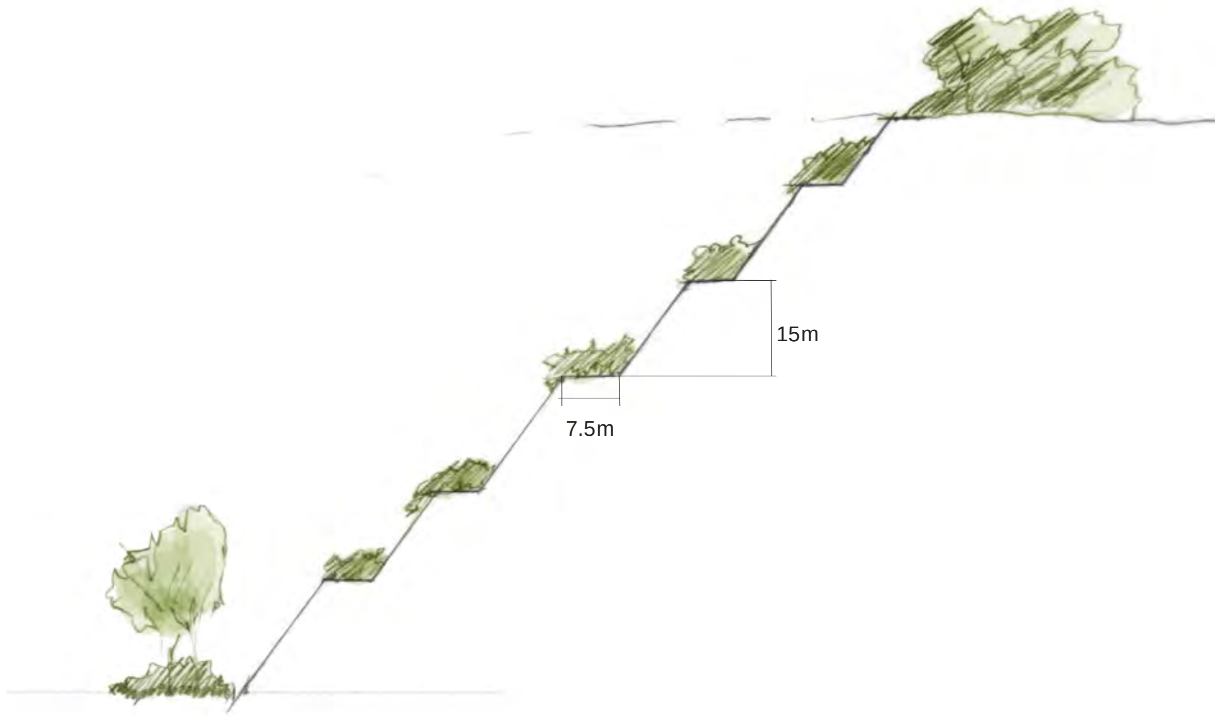

Figure 13: Indicative stepped benches typical of completed extraction activity

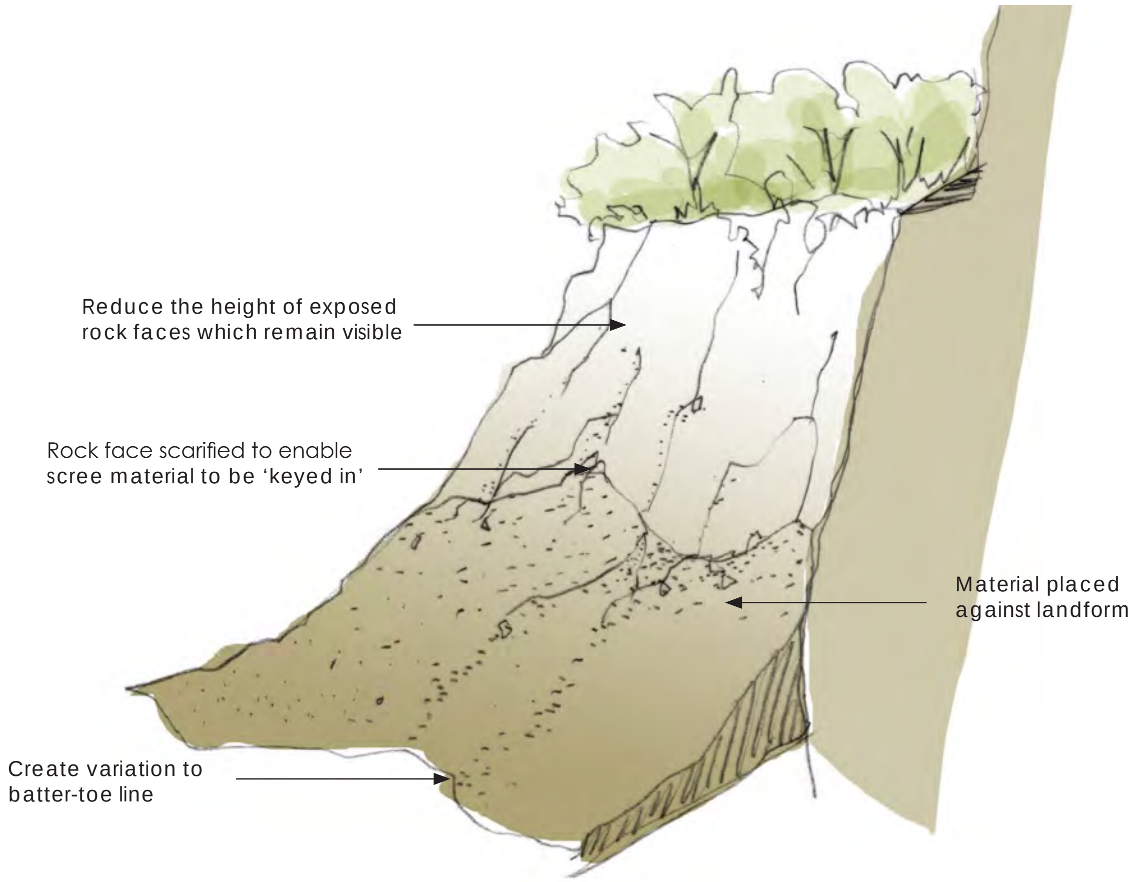

Figure 14: Creation of scree slope against extracted face

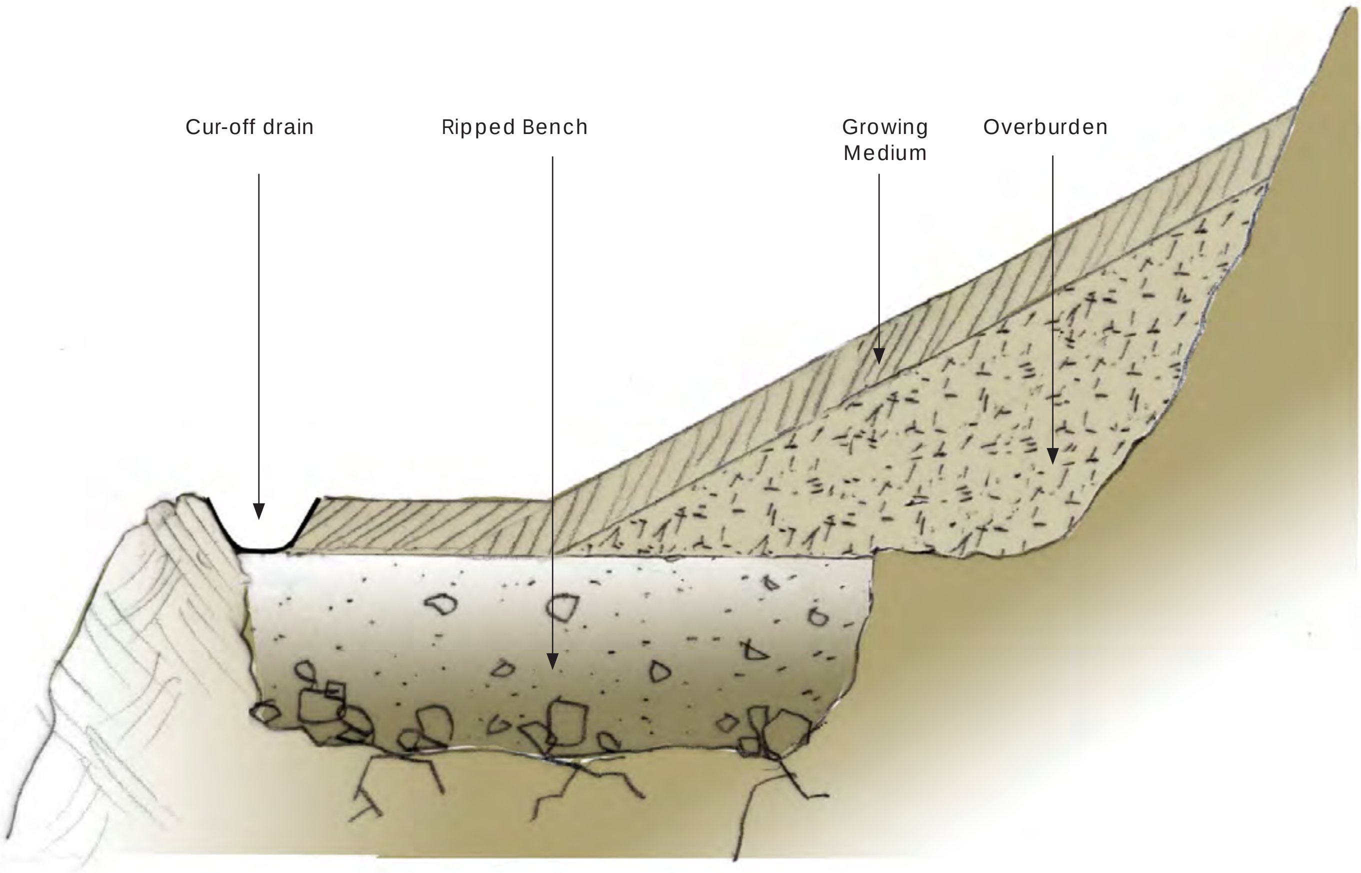

Figure 15: Bench modified by ripping and soil rehabilitation

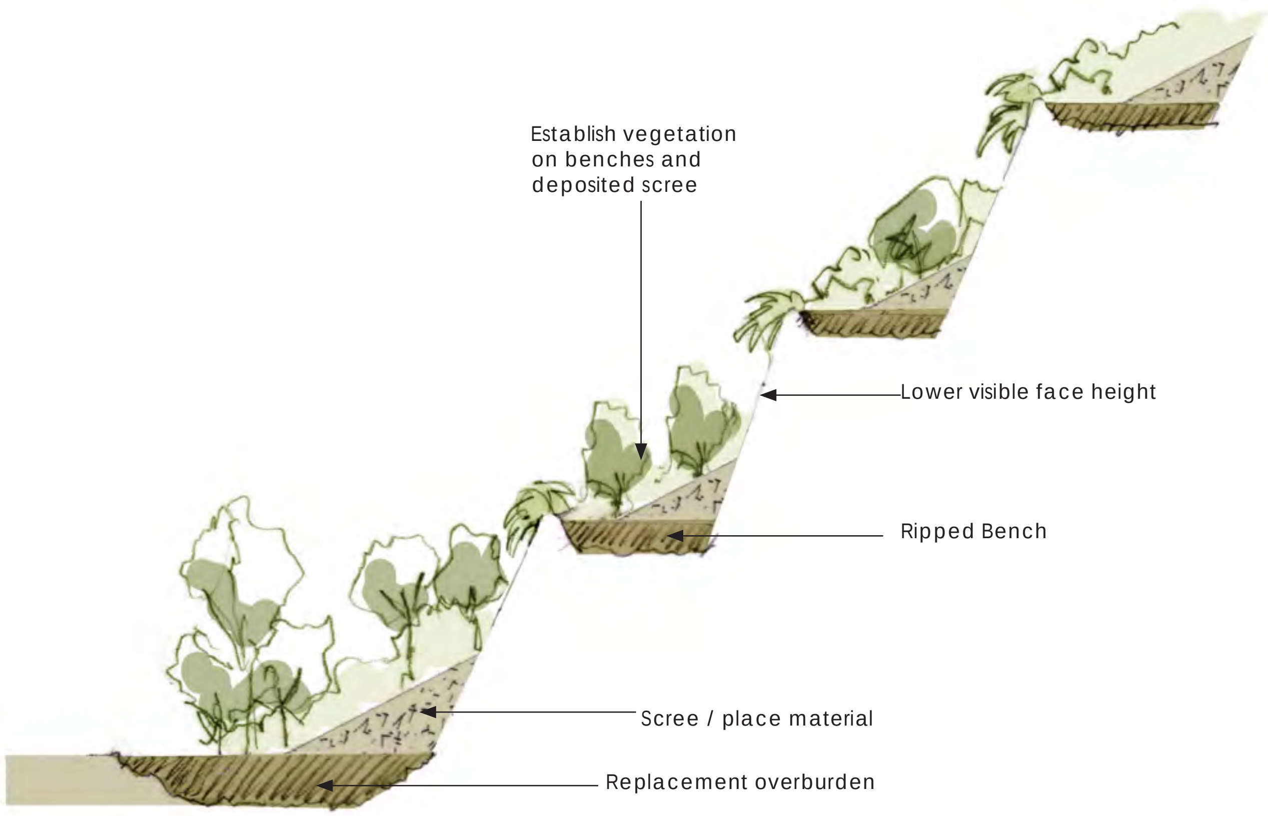

Figure 16: Landform modification can extend growing zone and soften profile

6.6 Soil Preparation

Soil preparation is a key element of a successful rehabilitation plan both for areas left to regenerate naturally and for areas to be planted. With good planning, a reasonable proportion of the soil can be sourced from the site by mulching vegetation, stockpiling of topsoil and inclusion of quarry by-products. This strategy does not need to rely on imported topsoil, though this may be needed.

The mix of rubble, blended fill and topsoil needs to be determined for each site depending on its unique properties and planting needs. Adequate fertilisation of plants also needs to be considered in the final mix. Soils will be stabilised as each section of quarry face is completed to reduce erosion and dust problems. Benches will be ripped to approximately 200mm deep before the application of coarse aggregates, overburden and surface soils as part of the rehabilitation process (see **Figure 16**).

At Belmont Quarry, historical land uses, and current rehabilitation trials indicate that there are unlikely to be soils within the Proposed Extraction Area that are free from gorse (and in some cases broom) seed. Use of such soils for rehabilitation purposes are expected to generate a high rate of initial germination of weed seeds; however this can be beneficial to rehabilitation goals.

This Rehabilitation Strategy seeks to make use of a suitable ‘growing medium’ at Belmont Quarry in five key ways:

1. To support a fast-growing, dense woody vegetation that (together with grass hydro-seeding or seeding) protects soils from erosion;

2. To use gorse and broom as soil conditioners to improve soils for future native plants;

3. To provide sheltered growing conditions for planted or naturally occurring native plants;

4. Overall, to use gorse and broom nurse crops to accelerate conditions that enable the establishment and rapid growth of native plants appropriate to the site (including overtopping and eventually killing the nurse crop); and

5. To control any other invasive and unwanted weeds that may prevent effective establishment of native plant communities.

At Belmont Quarry, retired areas demonstrate the potential uses of gorse seed-bearing soils in rehabilitation, with dense seedling crops of native mahoe (*Melicytus ramiflorus*) and Coprosma spp. establishing amongst 3m tall broom and gorse on slopes spread with overburden (without topsoil) 5 years ago. Informal trials with native tree planting and topsoiled areas on the southern slope of the nearby offsite overburden disposal area also demonstrates the protective effects of gorse for native saplings. Sites planted in native species that have subsequently been colonised by gorse and broom, now up to 3m tall, support native saplings up to 2m tall, indicating that planted trees will survive amongst gorse and broom, and that gorse and broom can attract and support naturally colonisation by native plants. By comparison, areas firstly cleared of gorse and then planted with native trees show very low survival rates (such as the southern slope of the current OBDA) due to wind-twist, pest animal browse and desiccation.

Action:

8. Investigate the blending of stockpiled surface soils with mulches and low value quarry by-products to improve surface fill characteristics for plant establishment and growth.
9. Identify and allocate the necessary volume of growth medium required and include spreading of a suitable growth medium as an integral part of the overall operation.

6.7 Revegetation

The principal objective of the Rehabilitation Strategy is to achieve an initial visual greening of the finished landform with eventual return to a self-sustaining native plant community. This recognises that the process of returning vegetated cover to the finished landform is more about achieving functional and structural goals of revegetation than achieving compositional replacement (i.e. species for species).

The finished landforms will provide environmental conditions that differ from most of the conditions currently experienced by native vegetation within the Firth Block. Whilst most of the longer-lived native species within the areas still to be cleared may find conditions inhospitable, some are better adapted to the engineered soil conditions and mostly edge growing environments which are provided by the finished landform.

The drivers for revegetation design and for including plant species have:

- Known high survival rate in planted landscapes;
- Known tolerance of extreme environmental conditions in nature e.g. from persistently wet to seasonally dry sites;
- Fast growth under good growing conditions, with known capability of persisting or out-competing gorse and broom;
- Branching growth form so as to provide screening of cut faces from a young age;
- Provide attractants to birds e.g. seeds or flowers in order to encourage the self-introduction of new native plant species to the site over time; and be
- Relatively long lives, so as to persist within sites and to prevent high rates of turnover of individuals (which creates opportunities for invasive weeds to establish)

The proximity of native seral and mid-successional plant communities surrounding the quarry, and the availability of seed sources of longer-lived trees within the Firth Block indicates that there is a substantial natural seed rain over time in the area. Therefore, the approach taken for this planting programme is to include only one planting event (and follow-up infill planting) comprising seral plant species. The ongoing management of plant and animal pests forms a key element which needs to occur alongside such planting as this will significantly enhance its success.

This makes the reasonable assumption that well established seral plant communities will develop micro-habitats capable of supporting a range of plants including longer-lived canopy trees and lower stature forms such as mosses, ferns and vines. This process may take several decades to achieve, however, there is evidence of this occurring naturally in areas around Belmont Quarry, including on old retired workings in the Firth Block as indicated in historic aerial photography. There is scope to trial the planting of longer-lived canopy species; however at a site such as Belmont Quarry there is considerable uncertainty over the timing and soil conditions required to achieve a high degree of plant survival.

6.7.1 Natural Regeneration

Sites left to regenerate naturally can often be the most successful means of getting vegetation established. However, for this to be achieved, optimum site conditions must prevail. This has the greatest potential to occur on benches left in a condition that allows natural regeneration to occur (ie. runoff controlled, suitable substrate, good growth medium with seed source etc.). This process may also entail an initial successional phase with an exotic crop like gorse or broom, such as is the succession typical of the Hutt Valley hills and surrounding areas.

Natural establishment of native vegetation takes longer on bare rock areas. The lack of suitable soils and (usually) nutrient deficiencies means that concealment by woody vegetation may take several decades to fully establish, and a progression through to a final vegetation community may not occur. Often, fundamental differences between original and post-quarrying environments means that native plants species that establish on cut faces represent only a small sub-set of those originally present prior to quarrying.

6.7.2 Hydroseeding or Other Suitable Alternative

In the short term, hydroseeding or other alternative such as straw mulch and grass seeding helps to stabilise cut and batter slopes, reduce runoff and erosion, bind soils preventing dust problems, provides rapid visual greening and inhibits invasion by some pest plants.

Hydroseeding needs to be carried out very soon after completion of preparatory works, before the cut face and batter slopes dry out. Coordinating the hydroseeding with withdrawal from the face is important. In some instances, no further revegetation work, apart from hydroseeding / hydromulching would be required.

Once hydroseeded, areas can simply be left to nature's devices. To achieve this, the selection of grass species is important to ensure woody vegetation can establish through grass cover. Previous hydro-seeding at Belmont Quarry has typically used perennial exotic grass mixes to provide a thick and lasting sward. Experience at Belmont shows that even thick swards of grass are gradually subsumed by gorse and broom if left unmanaged for long periods i.e. grass can slow woody weed invasion, but not prevent it. Under this Rehabilitation Strategy, exotic plant establishment is a desired short-term outcome for most revegetation areas. Doing so provides deeper soil binding results than can be delivered by grasses, and also accelerates the development of a thick weed sward and subsequent succession to native dominated plant communities.

Experimentation with native grass, shrub, moss and lichen species could be undertaken at Belmont Quarry. Of these methods, moss hydro-seeding on selected faces at Belmont Quarry may be the most likely method of achieving short-term establishment of vegetation on bare rock faces. The technique involves the use of moss and lichen fragments harvested from near the site or from a regional source, mixing with a binding agent and where necessary, a fertiliser, then applying the pulp as a spray-on film to rock surfaces. Establishment time varies with environmental conditions at the receiving site; however results are typically seen after 6 months with mosses gradually spreading to take over fractured, and then smooth areas of the rock face.

6.7.3 Planting

The aim of planting developed for revegetation purposes is to create 'islands' of planted vegetation which spreads outwards and assists the natural regeneration of adjacent areas through shelter and seed dispersal. The most favourable sites (microsites) will be selected for planting to cover approximately 20% of benches across the site. All areas of planting are to be accompanied by a full planting specification to be developed progressively as part of the staged plans.

This strategy provides an indication of the plant species that may be used and the relative importance of them (Table 6) in a prospective planting programme for areas as they become available for rehabilitation. As evidence from previously retired areas and from natural regeneration on adjacent lands cleared for farming shows, native plant species will readily colonise, establish and form self-sustaining plant communities with a minimum of human intervention.

A secondary objective of this Strategy is to encourage consistent, fast and high quality native vegetation cover over rehabilitated sites. To achieve this, plant survival and growth for various native plants needs to be assessed and planting plans designed and refined over time as information on previous plantings becomes available. Thus, this Strategy provides a framework for trialling, testing and refining plant lists and schedules over time (see section on Area B trials), and requires that planting plans be developed for each area of rehabilitation as they become available. This is expressly so that planting plans can be refined to offer the best opportunities to incorporate a wide variety of native plants, be assured of successfully establishment and allow managers to accurately predict the future performance of plantings at providing screening and erosion control and for returning as full a coverage of native vegetation to the site as is feasible.

Revegetation planting is quite different to what would be carried out under a 'normal' horticultural planting regime; in principle it is more akin to forestry planting. In addition, each site will have unique features and combinations of soil, slope, moisture, sun and wind.

On all areas that are planted as part of the revegetation strategy, the following practices will be adopted:

- Planting needs to be well planned so that the right species are planted at the right time. Usually a year lead time is required to enable sufficient quantities of appropriate locally sourced plant species to be propagated;

- The extent of planting programmed to be done each year needs to be determined in relation to the resources available for maintenance in subsequent years;
- Species will be sourced from local plant populations to ensure that they are ecologically compatible and suitable for the environs (i.e eco-sourced);
- All plants will 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 holding area or nursery several months before they are planted;
- Small grade plants will be used (i.e. up to PB3 or 1L grade) because they will acclimatise and establish more readily than larger grades;
- Areas to be planted will need to be spot sprayed with a contact herbicide or openings cut in woody nurse crops to reduce local competition for light and resources as part of site preparation prior to any planting works;
- Plants will receive locally applied fertiliser (e.g. fertiliser tab or long-release granules) and be marked with a stake to facilitate re-location in the future;
- Where planting sites are devoid of any woody vegetation, plants are densely planted (i.e. 1.0 m centres) with the objective of attaining 'canopy closure' as quickly as possible (i.e. the sooner plants coalesce from pest plants and other unwanted plants). Where planting sites are within established nurse crops, plantings are at low density (i.e 3.0 m centres) using key pioneer species, given that survival rates are typically much greater than open ground plantings; and
- Plants are generally planted in a coherent pattern that is easy to locate in the future during follow up maintenance work and so that the level of plant survival can be easily determined.

All revegetation work requires some maintenance; plants will most likely need to be 'released' from competing unwanted species, particularly if invasive woody weeds, smothering grasses or climbing invasive vines are present. Brush wattle, an aggressive leguminous tree species is present in the quarry and also all along the escarpment. It will require managing as it can become a major pest plant as it has in many places along the escarpment and elsewhere.

Where planting is undertaken, maintenance will be programmed and costed for at least the first two to three years after planting; after that plants will likely be well established and self-sustaining. On an exposed site, maintenance work will initially involve replacing dead plants ('blanking') and cutting back / removing unwanted and competing species. Parts of Belmont Quarry may require maintenance for a longer period than 3 years, for instance where secondary plantings are proposed of longer-lived canopy species once initial colonising species have fully established.

Staging a revegetation programme over several years is critical to its success. This will accommodate any unexpected seasonal events such as a particularly wet winter or a particularly dry summer. It also enables any adjustments to be made with regard to species composition timing and methods of planting that are obtained from monitoring previous planting.

Staging revegetation work over several years also allows maintenance to be more easily accommodated. The amount of planting done each year will be relative to the level of resources available for maintenance in successive years. Many revegetation programmes have failed when very large areas of planting have been completed in year one but there are insufficient resources for maintenance in subsequent years.

Plant species proposed are listed in **Table 6**. All of these species are present within the surrounding landscape and seed or cuttings can be sourced locally from naturally occurring populations to provide material for propagation.

Table 6: Indicative plant species list for propagation and inclusion in the rehabilitation planting programme. It is expected that this plant species list will be refined as part of an ongoing

process of measuring on-site plant performance and tailoring planting lists to specific site characteristics.

Plant species	Plant on north facing sites (indicative percentage composition of plantings)	Plant on south facing sites (indicative percentage composition of plantings)
kanuka	10%	
karamu	20%	10%
coastal flax	20%	
mahoe	20%	20%
mapou	10%	
wineberry	5%	10%
pigeonwood		10%
manuka	10%	10%
fivefinger		10%
Heketara (tree daisy)	5%	
Tarata (lemonwood)		10%
Kohuhu		10%
Marbleleaf		10%

Action:

10. Preparation of detailed revegetation plan prior to each area or sub-area becoming available for rehabilitation.
11. Revegetation programme to include design specifications and a monitoring and maintenance programme.
12. Information from monitored trial revegetation and rehabilitation sites will be used to inform future rehabilitation, including planting programmes, to maximise revegetation outcomes.
13. Where the availability of resources at prospective revegetation sites differs markedly from that described in this Strategy, a full analysis of options and implications will be undertaken.

7.0 Monitoring and Review

7.1 Monitoring background

On-going annual monitoring will be essential so that:

- Trends can be recognised early and optimised (e.g. recognising more favourable micro-sites or the most successful plant species for revegetation);
- Pest problems (plant and animal) can be dealt to when signs are first observed (e.g. pulled seedlings while still young);
- The effects of changeable climatic conditions can be managed (e.g. delaying planting in drought years); and
- Trial plots can be set up and observed to test novel approaches to improve revegetation outcomes.

Monitoring will include all aspects of the project, not just plant survival. Erosion, water quality, soil fertility, drainage and pest management will also be monitored.

Monitoring and appropriate management responses will form part of the rehabilitation 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 be simply a matter of refining the rehabilitation method used or it may require significantly altering the method and timing. Site management will be tailored to progress from year to year.

An annual monitoring inspection would result in a report that covers:

- Identification of successes of past and previous year;
- Identification of deficiencies or inadequacies including pest plants and animals;
- Identification of opportunities; and
- The programme for the coming year.

Comprehensive record keeping will be important and allow the accumulation of knowledge. This will result in increased efficiency and reduced costs over the life of the rehabilitation project. Progress photographs, including aerial photography and photographs taken from key vantage points looking towards the site can be a valuable monitoring tool.

7.2 Monitoring programme

Monitoring and associated site management will include the following:

- Extent of areas rehabilitated against proposed annual targets;
- Observations of finished landform stability, including small-scale slumping and rock falls that may affect revegetation success. This inspection is for revegetation purposes only and will not constitute a geotechnical inspection of land stability.
- If monitoring of plant growth shows patchy plant survival or slower than anticipated growth rates, monitoring of soil fertility to inform on needs for fertiliser;
- Signs of animal pest damage to revegetation areas as a trigger for undertaking pest control;
- Incidence and persistence of invasive plant pests, particularly those required to be controlled under statutory documents (e.g. Regional Pest Management Strategy) or those deemed to present a risk of to the success of revegetation areas;

- The success of hydro-seeding at providing vegetative cover to areas such as benches, batters and faces (strike rate and vigour);
- Survival and growth rates of planted trees and shrubs to direct infilling planting and future planting programmes towards species most likely to survive;
- Fire risk; and
- Trial / experimental plots to provide direction on overall rehabilitation approaches.

7.3 Methods

A monitoring programme will be developed in more detail for each stage of extraction activity. Monitoring methodologies are likely to include such methods as:

- Walk-over observations of features;
- Permanent photo-points to track visual progress towards rehabilitation objectives;
- Permanent transects for measuring plant survival and growth across a sample of sites and to track progress against informal targets represented in Tables 3, 4 and 5; and
- Soil sampling and laboratory analysis to assess nutrient composition of soils used for rehabilitation.

8.0 Rehabilitation Strategy

The Rehabilitation Strategy has been prepared in accordance with the assumed sequential operation of Belmont Quarry, the intended Quarry Rehabilitation Process (Section 5.0) and Monitoring and Review (Section 6.0). The stages indicated in the Rehabilitation Strategy, differ from the stages of extraction activity in taking account of the finished form of the proposed extraction works. The staging of completing extraction activity which makes up the Rehabilitation Strategy is set out **Figure 17** and described as follows.

Table 7 provides an estimate of the bench and faces area (taking into account topography) as a guide to the exposed surfaces that will form the overall focus of this Rehabilitation Strategy.

Table 7: Areas of the finished landform comprising benches and cut faces for which rehabilitation revegetation is proposed in the current and proposed extraction areas. Refer to **Figure 17** for location of Areas.

Area	Bench (m^2)	Face (taking account slope)(m^2)
A	14,000	11,000
B	4,000	5,500
C	11,500	23,500
D	7,000	11,000
E	2,500	5,500
F	2,500	6,000
G	40,500	95,000
Total	**82,000 (8.2 ha)**	**157,500 (15.8 ha)**

8.1 Rehabilitation Strategy: Retired Areas (Areas A and B)

8.1.1 Background

Retired areas have the potential to form part of the larger visible western face of Belmont Quarry. These are areas where no further extraction activity is intended. The majority of these faces are east facing, with some warmer north facing and cooler south-east facing slopes providing damper conditions that encourage plant establishment and survival.

8.1.2 Objectives

Retired areas upon which vegetation has become established (predominately Area A) should remain undisturbed during the continuation of extraction activity in adjoining areas. Where vegetation has yet to be established, modification of the landform should endeavour, if practicable, to accelerate the rehabilitation process and can be investigated as part of the trial rehabilitation techniques.

The overriding objectives for these areas are outlined as follows:

1. To retain areas of vegetation cover which has become established and progress these towards mixed native vegetation either by interplanting with native species (if currently gorse dominated) or controlling weeds (to promote growth of existing native plants if present);
2. To endeavour to modify extracted faces in areas where vegetation is not yet established as part of blending these with the surrounding topography; and
3. To encourage exotic seral plant species (particularly gorse and broom) as part of accelerating the establishment of predominately native, self-sustaining vegetation.

8.1.3 Process

In areas where rehabilitation has already commenced, maintenance will primarily involve controlling aggressive, unwanted woody pest species (apart from gorse and broom). The faces would be monitored annually to check the progress and to ascertain if aggressive past species such as brush wattle, Darwin's barberry and *Clematis vitalba* were present. If so they would be treated with herbicide.

In areas where rehabilitation is yet to occur, rehabilitation will include landform modification where practicable to enable natural regeneration and trials as set out below.

8.1.4 Trials

Area B has been worked to its planned profile and is available for rehabilitation. This area is east to south-east facing and has a mixture of tall and short cut faces with benches typically 7.5m wide. The site offers the opportunity to undertake several investigations into rehabilitation effectiveness and to return results that will be applied to future rehabilitation elsewhere.

The trials proposed in this strategy for Area B include comparisons of revegetation success:

1. Between
   a. ripped bench, versus
   b. ripped bench with 500mm deep overburden added, versus
   c. ripped bench with 500mm deep overburden and 200 mm topsoil applied, and
   d. ripped bench with 500mm deep overburden and 200 mm topsoil applied and native plants planted at high density (e.g. 1 plant per 1m^2, release plants)

(all treatments to receive hydro-seeded exotic grasses as are normally applied at Belmont Quarry).

2. Between

    a. ripped benches with 500mm deep overburden and 200 mm topsoil applied, versus

    b. ripped benches with 500mm deep overburden and 200 mm topsoil applied to form a scree slope at a 30^0 angle of repose, and

    c. ripped benches with 500mm deep overburden and 200 mm topsoil applied to form a scree slope at a 30^0 angle of repose and native plants planted at high density (e.g. 1 plant per horizontal $1m^2$, release plants)

    (all treatments to receive hydro-seeded exotic grasses as are normally applied at Belmont Quarry).

3. Between

    a. Bare cut faces, versus

    b. Bare cut faces with hydro-seeded exotic grasses, and

    c. Bare cut faces with hydro-seeded mosses and lichens.

The preliminary field design is to apply the above treatments across ca. 20m adjoining lengths of a single bench or two benches at most in Area B. Replication across multiple benches is not able to be undertaken because of limited availability of trial areas. Multiple samples from each treatment will be collected from each trial site to provide the level of replication needed to adequately describe different results between trials.

Trials will be monitored several times each year to assess (where appropriate):

- Rates of plant survival, health and growth for each planted species;
- Rates of woody weed cover and growth rates;
- Rates of vegetation cover over rock faces and contribution by grasses, mosses or woody vegetation; and
- Face height obscured by vegetation types (exotic, native) and best performing species.

8.2 Rehabilitation Strategy: South Design (Areas C, D and E)

8.2.1 Background

This forms the first phase of new extraction activity to be undertaken. At the completion of extraction activity in this area, two types of extracted faces will form part of the Rehabilitation Strategy, namely those which can be permanently rehabilitated (Area C) and those through which future access will be required to the operational quarry (Areas D and E). Extraction activity in these areas is expected to be completed over the next 5 years.

8.2.2 Objectives

Upper areas of the initial stages of the Proposed Extraction Area (Area C) will become increasingly visible as this area is exposed by the removal of landform to the north-east of the Proposed Extraction Area (Firth Block Ridge). A staged rehabilitation programme which facilitates rehabilitation is proposed to screen visible faces in this area and retain a ‘visual green backdrop’ in this area. The associated objectives for rehabilitation of this area of the site can be outlined as follows:

- To progressively finish the final contours to blend in as much as possible with the adjacent landform; and

- To facilitate the permanent establishment of native vegetation.

8.2.3 Process

The completion of extraction activity within the South Design will happen over a short time frame. This will include the completion of extraction activity along faces both above and below the access road. In recognition of the higher visual impact in Area C and the prolonged visibility of exposed faces which may otherwise occur, permanent faces will be modified through the extraction process to ensure they reach an average height of 7m. The detailed rehabilitation process will encompass the following elements:

Planning

Plan - Preparation of detailed rehabilitation plan prior to each area or sub-area becoming available for rehabilitation.

Preliminary Co-ordination - In the financial year leading up to retirement, on-site meetings will be held between the rehabilitation advisor, quarry manager and key contractors to confirm key elements and timing of withdrawal from the face. In particular the stabilisation contractor will be briefed in advance and the timing and details of their involvement confirmed.

Stockpiling

Topsoil - As the new face is opened, areas of topsoil will be stripped and stockpiled separately

Mulch -Where practicable removed vegetation will be mulched and stockpiled for use in replacement soil. (Note: as areas C and D have been previously quarried, there is likely to be little overburden or organic matter compared with Areas F and G).

Soils - In the months leading up to retirement and commencement of rehabilitation, investigations will be made regarding the quantities of mulch, topsoil overburden and quarry by-products which are available to blend to form replacement soils.

Enrichment - Tests will be conducted to determine the addition of fertilisers necessary to enrich these by-products prior to blending with existing soils.

Establishment
These steps need to be undertaken prior to quarry completion

Ripping – all benches capable of carrying tall vegetation will be ripped to allow root penetration.

Drainage - Construct cut-off drain or berm near the bench edge.

Landform - Add scree material along the lower part of the face to soften landform at a natural repose of 30^o and keyed in along a scarified face to encourage plant growth.

Topsoil - Add growing medium.

Stabilisation – All surfaces will be stabilised as are currently for benches and faces with low-density grass mix using perennial grass mix.

Trialling – Depending on the results of trials in Area B, further trials may be undertaken in Area C, particularly if results point towards potential future revegetation management that may provide improved outcomes and which has not been tested in Area B.

Revegetation

Planting – Undertake focused ‘island’ planting in accordance with trial results.

Infill planting – Depending on the outcome of trial results, under plant with native vegetation at year 5 according to 6.7.3.

Maintenance

Release - all planted areas will be released from competing unwanted species, particularly if invasive woody weeds, smothering grasses or climbing invasive vines are present.

Control - aggressive, unwanted woody pest species (apart from gorse and broom) will be removed.

Monitoring

Rehabilitation areas will be monitored annually to check the progress and to ascertain if aggressive animal and plant pest species such as brush wattle, Darwin's barberry and *Clematis vitalba* were present. If so pest control measures will be undertaken.

8.3 Rehabilitation Strategy: North Design (Areas F and G)

8.3.1 Background

Extraction activity in the North Design area will commence in approximately 5 to 10 years, and includes Stages 1 to 5 of the Proposed Extraction Area. During this stage of extraction activity vegetation will be progressively removed. A key element of the Rehabilitation Strategy seeks to reduce the visual impact in remaining areas of the quarry resulting from this work. The south facing aspect of the site in this area is an advantage because the cooler, damper conditions are better for plant survival and establishment.

8.3.2 Objectives

The rehabilitation objectives in this area are outlined as follows:

- To progressively finish the final contours to blend in as much as possible with the adjacent landform;
- To revegetate the quarry face with a predominately native, self sustaining vegetation cover appropriate to the rocky, south facing bluff environment; and
- To progressively stage the quarry operation so that the area of working face is kept to a minimum and completed areas of the face are progressively rehabilitated during the life of the extension.

8.3.3 Process

The same techniques and overall approach to rehabilitation will be developed in this area as for earlier stages of extraction activity within the Proposed Extraction Area. The experience gained during the rehabilitation of previous stages will provide an added knowledge base. In particular, soil blending, handling and plant selection will be informed by success rates observed in previous working stages.

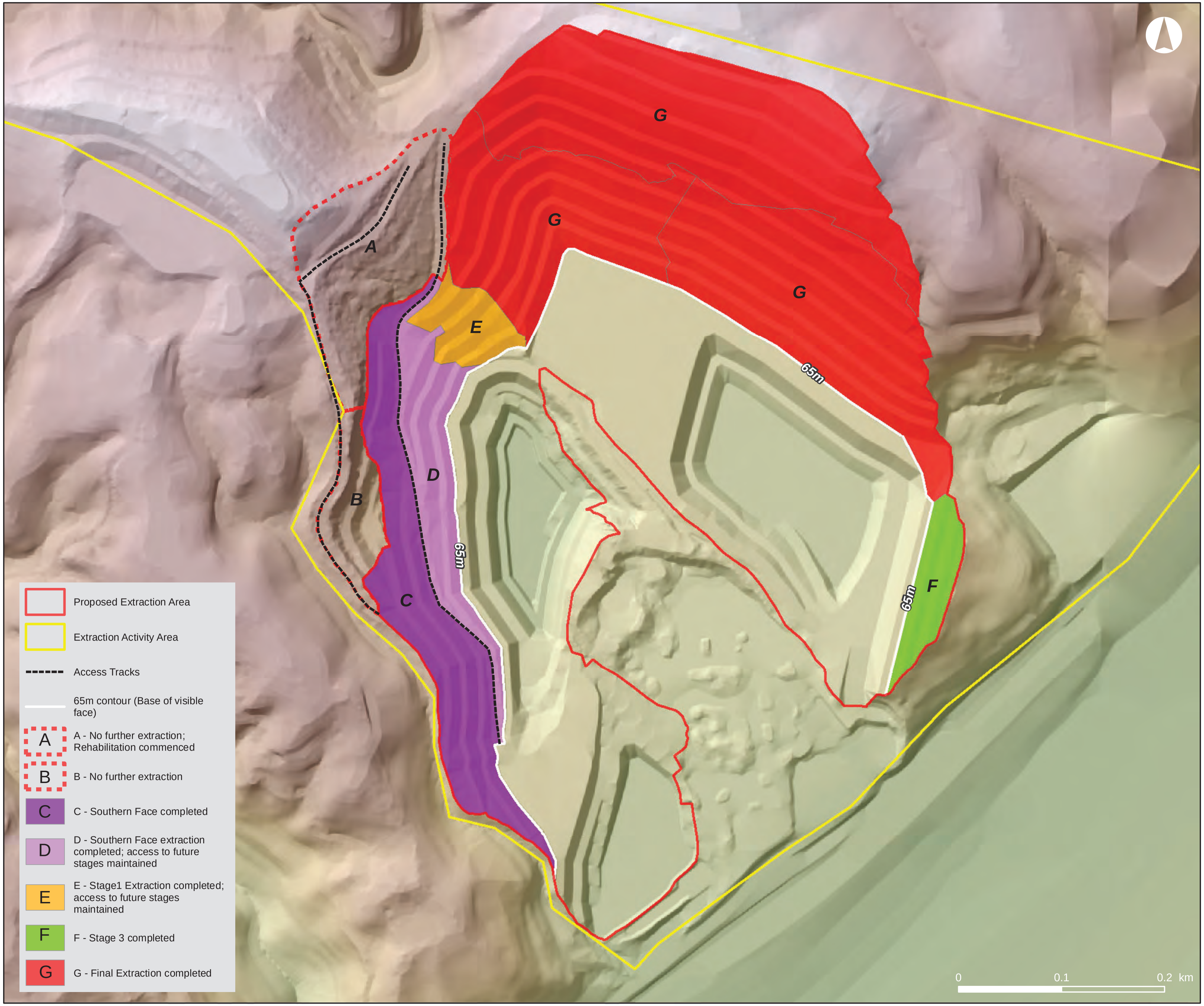

Figure 17

File Ref: W12052_17_Rehab_A3.mxd

WINSTONE AGGREGATES

BELMONT QUARRY
REHABILITATION
STRATEGY

REHABILITATION STRATEGY

Date: July 2013
Revision: 0

Plan Prepared for Winstones Aggregates Ltd
by Boffa Miskell Limited

Author: PM
Checked: RG

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9.0 Management Action Summary

1. Ensure extraction activity adopts a sequential approach to rehabilitation that avoids or mitigates future disturbance of completed areas.
2. Prior to commencement of extraction works, ensure that the limits of vegetation clearance are clearly known and understood to prevent vehicle access and unintended vegetation clearance or damage outside approved clearance areas.
3. Where practicable, separate the top 200 mm of surface soils and mulched vegetation from subsoil and underlying overburden and store separately in stockpiles no more than 1.5m height.
4. Ensure that the final landform will facilitate rehabilitation measures which 'soften' visible faces and facilitate future reinstatement of native vegetation.
5. Identify and allocate the necessary volume of overburden material to undertake rehabilitation works.
6. Programme bench ripping, face scarification and deposit of overburden as an integral part of the overall operation.
7. Ensure drainage is included as part of the landform modification process to prevent scouring and erosion of adjacent vegetation and rehabilitated landforms.
8. Investigate the blending of stockpiled surface soils with mulches and low value quarry by-products to improve surface fill characteristics for plant establishment and growth.
9. Identify and allocate the necessary volume of growth medium required and include spreading of a suitable growth medium as an integral part of the overall operation.
10. Preparation of detailed revegetation plan prior to each area or sub-area becoming available for rehabilitation.
11. Revegetation programme to include design specifications and a monitoring and maintenance programme.
12. Information from monitored trial revegetation and rehabilitation sites will be used to inform future rehabilitation, including planting programmes, to maximise revegetation outcomes.
13. Where the availability of resources at prospective revegetation sites differs markedly from that described in this Strategy, a full analysis of options and implications will be undertaken.

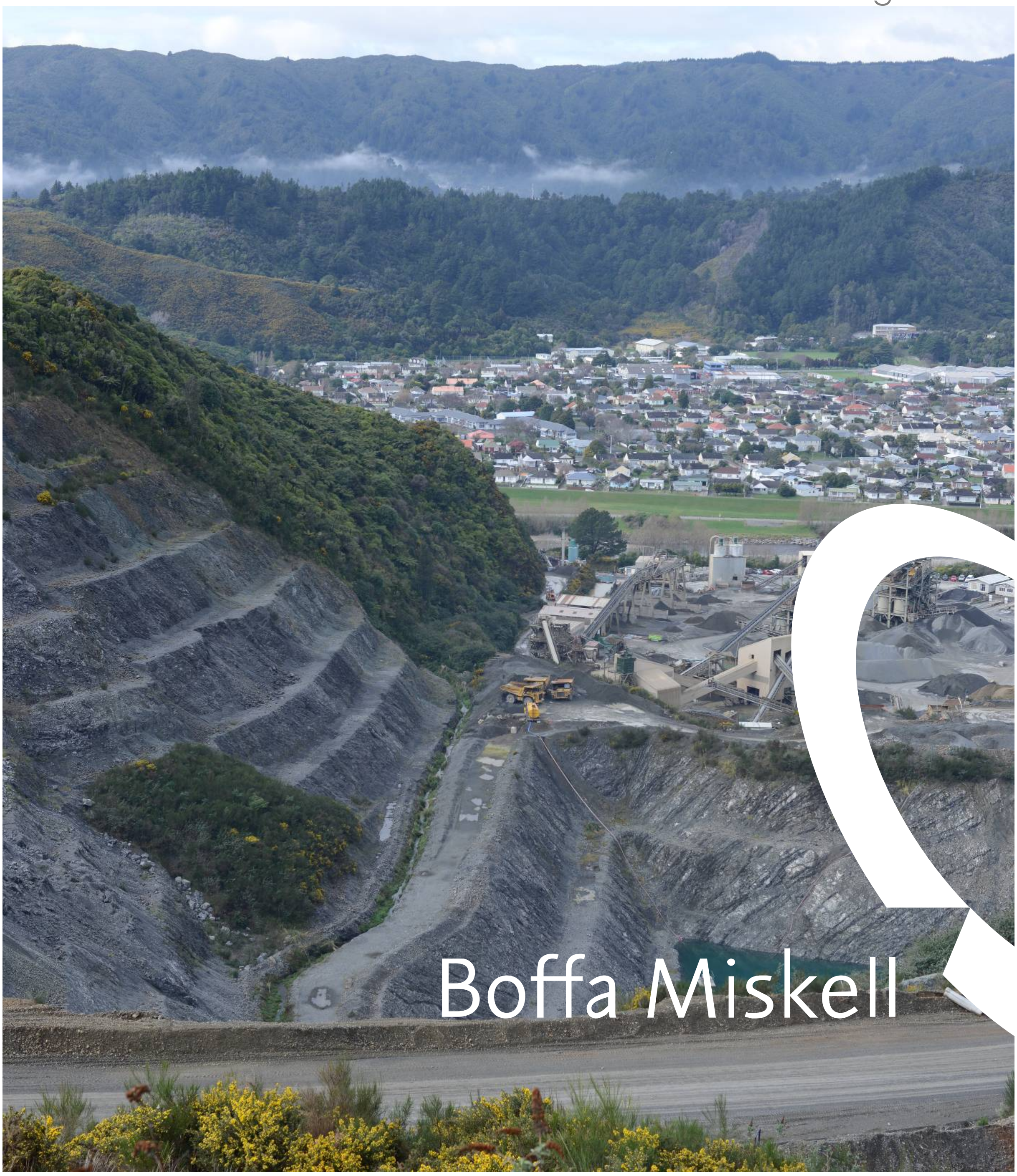
APPENDIX 6 – BELMONT QUARRY EXTENSION – LANDSCAPE AND VISUAL ASSESSMENT – BOFFA MISKELL LTD, AUGUST 2013

Belmont Quarry Extension

Landscape and Visual Assessment

Prepared for Winstone Aggregates

2 August 2013



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1.0 Introduction

1.1 As part of the Assessment of Environmental Effects (AEE), Winstone Aggregates ('Winstone'), a division of Fletcher Concrete and Infrastructure Limited commissioned Boffa Miskell to prepare a landscape and visual assessment and rehabilitation strategy for a proposal to extend extraction activity within Belmont Quarry (the 'Site').

1.2 The Proposed Extraction Area is located entirely within the Extraction Activity Area as identified in the Hutt City District Plan (the 'District Plan'). It also includes areas identified as a 'Special Amenity Area' (SAA) where the landscape is protected by a permitted activity condition preventing the removal of the indigenous vegetation cover.

1.3 The purpose of this assessment is to identify the potential landscape and visual effects of extending extraction activity within Belmont Quarry and removing protection from an area of land which is currently protected within the Extraction Activity Area ('Proposed Development'). Based on this assessment, recommendations have been drawn in relation to mitigation included in the Rehabilitation Strategy and the overall significance and nature of any resultant landscape or visual effects.

2.0 Existing Environment

2.1 Site Location

2.1.1 Belmont Quarry is accessed off Hebden Crescent and located to the west of SH2, approximately 150 metres from the Hutt River (see **Figure 1**). The existing extent of Belmont Quarry occupies part of the larger western escarpment defining the edge of the Hutt Valley and part of the lower slopes of the Belmont Hills, approximately 6 km north-east of the Lower Hutt Central Business District.

2.1.2 The Proposed Extraction Area would extend the existing quarry operation to the north-east and also into the area known as the Firth Block. The extraction activity will extend to the 25m Buffer Strip along the quarry's north-eastern boundary, 50m from the Firth Concrete Masonry Plant along its eastern boundary and approximately 50m from Hebden Crescent along its southern boundary.

2.2 Landscape Description

Landform

2.2.1 The Belmont Quarry topography in the Extraction Activity Area ranges between approximately 35 metres above sea level (masl) along the existing quarry floor and rises to approximately 200 masl along the north-eastern boundary adjoining Belmont Regional Park.

2.2.2 The topography surrounding the Site is associated with the Wellington Fault scarp, a regionally legible land feature. In the local context this contains a series of spurs and gullies which collectively rise from the valley Floor. In the vicinity of Belmont Quarry, areas of terracing reflecting existing and historic quarrying are also visible alongside steeper areas of unmodified vegetated terrain.

2.2.3 In a broader landscape context, the Site forms the lower eastern flanks of the Belmont Hills which rise to the west of the Hutt Valley. This landform becomes more rounded as it reaches approximately 440 masl at the summit of Boulder Hill approximately 2.3 km to the north-west of the Site, part of an ancient uplifted erosion surface.

Land cover

2.2.4 Vegetation within the Site is limited because of quarrying but there is exotic scrub and more substantial native vegetation present in areas where quarrying has ceased or is yet to be established. The more extensive areas of native vegetation, including lowland forest, occur within the Firth Block.

2.2.5 The SAA supports a range of vegetation types. A full description and a botanical survey of the Site is included in the ecological assessment[1].

2.2.6 Hutt City has provided a certificate of compliance in the areas of the Proposed Extraction Area which falls outside the SAA[2] which means that the land can be cleared.

2.2.7 From a landscape perspective, this forms the baseline against which effects of vegetation loss have been considered.

Land use

2.2.8 Existing quarrying activity influences much of the immediate character of the Proposed Extraction Area manifested as a series of stepped terraces from which material has previously been extracted. Further historic terracing as result of earlier quarrying is also visible to the north-east of the Proposed Extraction Area adjoining the Firth Concrete Masonry Plant. This terracing has been largely masked by regenerating native and exotic vegetation.

2.2.9 In the immediate site context, regenerating and established vegetation also occupies land to the north and south of the quarry and provides enclosure to extraction activity restricting views from surrounding areas along the Western Escarpment. When viewed from areas to the east of the site along the valley floor, native vegetation is a key characteristic of this area of western escarpment.

2.2.10 The nearest residential properties are located approximately 300 metres to the east of the Proposed Extraction Area along Taita Drive. This forms part of the wider residential area within the Hutt Valley which extends east of the Hutt River. Residential properties are also located to the south-west of the Site along part of the western escarpment and include properties along Liverton Road located approximately 350 metres to the south of the Proposed Extraction Area.

2.2.11 Over longer distance to the east of the Hutt Valley (beyond approximately 1 km) elevated properties on the western edge of Stokes Valley also have views towards Belmont Quarry. Such properties include dwellings accessed along Holborn Drive and its connecting roads including Aldersgate Grove.

[1] Forbes Ecology – "Terrestrial Ecology Assessment", August 2013

[2] This includes an area identified in the District Plan as a Significant Natural Resource. There are no rules in the District Plan which protect vegetation in this area.

2.3 Landscape Character

2.3.1 As illustrated on **Figure 2**, the district's landscape character was described in a 2012 report[3]. This report is the first phase of a proposed larger landscape study for the district ,which would include an evaluation stage identifying the outstanding natural features and landscapes and significant amenity landscapes as set out in the Landscape chapter of the Wellington Regional Policy Statement.

2.3.2 Within the Hutt Landscape Study, the Proposed Extraction Area straddles the boundary between the Western Escarpment character area and the Belmont Hills character area. The boundaries of these landscape character areas are illustrated on **Figure 2;** extracts of relevant character areas are reproduced below.

Western Escarpment Character Area

The Western Escarpment character area includes the steep escarpment on the north-west side of the Hutt Valley from Riverstone Terraces in the north-east to Petone in the south-west. The Wellington fault line runs along the north-western edge of the Hutt Valley; the Belmont Hills have gradually been pushed up while the Eastern Hutt hills have gradually been tilted down, thus creating the Hutt Valley.

The Escarpment's steepness compared to the surrounding landscape makes it a very distinctive feature of the Hutt Valley and clearly defines the valley's western edge. At a more local scale, the Escarpment is fragmented by numerous steep gullies that drain the Western Hills, resulting in a topographically convoluted landscape.

...

In the vicinity of Manor Park / Haywards Hill Road there is a cluster of infrastructure, including operating and closed quarries, Haywards Substation, transmission lines, water reservoirs and SH58 (Haywards Hill Road). Further south, in Normandale, is the largest area of suburban commercial development around Dowse Drive and around Hebden Crescent is an area that is zoned general business.

Residential areas occupy approximately 37% of the character area with the remainder being 'undeveloped'. The escarpment generally has a dense cover of native and exotic woody vegetation, which adds to its distinctiveness as a landform and as backdrop to the wider Hutt Valley landscape. The vegetation comprises a mix of mature exotic trees such as macrocarpa and pine, patches of gorse, small areas of pine plantation, and regenerating podocarp / tawa forest particularly in the gullies where moist, fertile conditions have allowed a dense under storey to thrive.

...

As in much of the Wellington Region, wind is frequent and has influenced the vegetation cover and the way residential subdivision has been developed; the escarpment is a significant barrier and lifts the wind and channels it through the gullies.

[3] Boffa Miskell (2012), *Hutt Landscape Study: Hutt Character Description*.

Belmont Hills Character Area

> *The Belmont Hills character area includes the rounded hilltops and slopes above the Wellington Fault escarpment, adjacent to the lower reaches of Te Awa Kairangi/Hutt River. The hills with their distinctive flat tops form part of a central plateau separating Wellington Harbour and the Hutt Valley from Porirua Harbour. This plateau is part of an ancient peneplain that has been uplifted and subjected to the freeze-thaw action of the most recent ice age, which has had a smoothing influence on ridge tops and spurs. At 410m asl, Round Knob is the highest point on this part of the peneplain. Broad basins, gullies and fault-defined valleys create diverse microclimates within the character area.*
>
> *As in much of the Wellington region, wind in this character area is significant at times, with the gullies channelling and eddying the wind which shapes the vegetation.*
>
> *Much of this character area is part of the Belmont Regional Park, the first park in New Zealand to combine land for recreation, conservation and farming purposes. In pre-European times this would have been covered in podocarp forest. However, the elevated and open hilltops are now in pasture and grazed primarily by sheep. In the lower and more sheltered slopes and gullies, broadleaf indigenous hardwoods are present, although there are also large sections of gorse and broom and some pine plantations, particularly in the area to the east of Haywards Hill Road (SH58).*
>
> *West of Haywards Hill Road, remnant native forest around Dry Creek includes pukatea, matai and kahikatea...*
>
> *...*
>
> *Easily accessible from Porirua and the Hutt Valley, the Belmont Hills including Belmont Regional Park, are popular for recreational activities such as walking, running, horse riding and mountain biking. Generally, development in the area is sparse, although the area surrounding Sweetacres Drive, Stratton Street and upper Kelson contains a number of small farms and lifestyle blocks.*

2.4 Summary of Context and Character

2.4.1 Belmont Quarry occupies part of a larger elevated escarpment which contains the western edge of the Hutt Valley and rises steeply from the valley floor. Extraction activity within Belmont Quarry influences the immediate site context and in a broader context the Site forms part of the larger elevated escarpment, which rises more steeply to the west from Hutt River towards the more rounded Belmont Hills.

2.4.2 A mosaic of secondary vegetation is located around the periphery of the Quarry and is a key characteristic of the Wellington Fault scarp, which extends to the north-east into Belmont Regional Park.

2.4.3 Land use in the wider landscape includes extensive areas of residential development contained along the valley floor and areas of more dispersed residential development, along with some infrastructure development, extending onto the walls of the Hutt Valley.

3.0 Statutory Planning Context

3.1 Resource Management Act

3.1.1 The relevant RMA provisions addressed in this report will be in respect of:

Section 7(c) – the maintenance and enhancement of amenity values

Section 7(f) – the maintenance and enhancement of the quality of the environment

3.2 Wellington Regional Policy Statement

3.2.1 The Wellington Regional Policy Statement (RPS) became operative on the 24 April 2013 and provides the current framework for the sustainable management of the regions natural resources.

3.2.2 Within the RPS, Objective 17 is relevant to the Region's outstanding natural features and landscapes. Under this objective, Policies 25 ,26 and 50 require the identification, protection and management of outstanding natural features and landscapes. Objective 18 refers to the Region's special amenity landscapes with policies 27 and 28 referring to their identification and management.

3.2.3 No outstanding natural landscapes or significant amenity landscapes are identified within the RPS.

3.3 Hutt City District Plan

3.3.1 The extent of the Proposed Extraction Area and its relationship with the Statutory Context as identified in the City of Lower Hutt District Plan ('District Plan') is illustrated on **Figure 1: Statutory Context**. The Proposed Extraction Area is entirely contained within an Extraction Activity Area as defined in the District Plan. Part of the Proposed Extraction Area also includes a Special Amenity Area (SAA). It is understood that Significant Natural Resource (SNR) areas on private land are not protected by rules.

3.3.2 Section 6D 1.1 of the District Plan identifies Local Area Issues which include 'environmental effects of extraction activities' in Section 6D.1.1.1. This identifies that extraction activities have potential to cause adverse effects on amenity values and the receiving environment. Polices relevant to such effects which are considered relevant to potential landscape and visual effects resulting from the Proposed Development inlcude:

- *(a) That adverse effects of extraction activities on the receiving environment are avoided or mitigated.*
- *(b) That adverse effects generated by extraction activities be managed to maintain and enhance the amenity values of the area.*
- *(c) That buffer strips be provided to reduce any adverse effects if extraction activities on the nearest residential activity areas*

3.3.3 Section 6D1.2 of the District Plan refers to Site Development Issues in relation to Extraction Activity Areas. This includes Section 6D1.2.1 which refers to 'effects on the visual quality of the area'. This identifies that extraction activities can impact on the visual amenity values of the area through vegetation clearance, the extent and appearance of the cut face, and the design and external appearance of the buildings and structures. Relevant policies identified to address these issues include:

(a) *That adverse effects generated by extraction activities be managed to enhance the visual quality of the area.*

(b) *That extraction activities retain the indigenous vegetation on the face of the escarpment, particularly in areas of special amenity, as part of the visual backdrop for the City.*

(c) *That having taken into account planned future development, progressive rehabilitation measures be provided*

3.3.4 The explanation and reasons relevant to the above policies identify that the escarpment in Belmont is part of the 'green backdrop' to the City. In this context, adverse effects on the quality and amenity values of the area are to be managed through compliance with various measures, including landscaping and screening controls. Included in such controls is the requirement that areas of special amenity which are visible from other parts of the City be maintained with their indigenous vegetation cover.

3.4 Analysis against Statutory Provisions

3.4.1 Following the above analysis, the following can be concluded:

- The Proposed Extraction Area is contained within a wider Extraction Activity Area as defined in the District Plan.
- The Proposed Extraction Area does not form part of any identified outstanding natural landscapes or special amenity landscapes as defined at the regional or district levels.
- The Proposed Extraction Area requires removal of indigenous vegetation currently protected as part of a SAA. SAAs primarily refer to the effects of the visual qualities of the area and seek to ensure that extraction activities retain indigenous vegetation on the face of the escarpment where this contributes towards a 'visual green backdrop'.

4.0 The Proposal

4.1.1 A description of the Proposed Development, including the processes of quarrying, is included in the Proposed Quarry Management Plan attached to the Plan Change Request. The total extent of the Proposed Extraction Area covers approximately 30.6 ha. The existing and proposed contours over this area are illustrated on **Figure 3**.

4.1.2 Parts of the proposed extraction area extend to a maximum elevation of approximately 200 metres above sea level (masl) along the northern edge of the pit. The resulting quarried faces consist of a series of faces similar to the existing quarried faces with approximately 15m high batters and 7.5 m benches. The faces of the quarry typically rise from the quarry floor which predominately occurs below approximately 65 masl. Within this area, the lowest areas of extraction activity reach 10 metres below the present level at approximately 30 masl.

4.1.3 To assist understanding of the sequence of changes to the landform over time, the project is described in six stages which commence from the completion of quarrying activity within the existing quarry (South Design) and then entail five subsequent stages which make up the North Design. This is illustrated in **Figure 3** and described as follows:

- **South Design:** This area forms part of the working quarry and covers a total area of 13.7 hectares along the southern edge of the Proposed Extraction Area;
- **North Design (Stage 1)**: This extends extraction activity to the north and east of the quarry and covers a total area of 8.6 hectares.
- **North Design (Stage 2)**: This extends extraction activity to the south-east of Stage 1 along the northern face of the quarry and covers a total area of 2.2 hectares.
- **North Design (Stage 3)**: This extends the quarry to the south and east of Stage 2, culminating along a vegetated spur retained along the southern edge of the quarry. This area of extraction covers a total area of 6.7 hectares.
- **North Design (Stage 4)**: This extends extraction activity to the north of stage 3 and covers a total area of 9.0 hectares
- **North Design (Stage 5)**: The final stage of extraction activity forms the northern face of the quarry and occupies a combined total area of 19.5 hectares.

4.2 Sequence of Works

4.2.1 The sequence of works involves three main activities in terms of generating potential landscape and visual effects. This sequence of works are expected to extend approximately 30 to 40 years and cover the following elements:

- Stripping any existing vegetation and topsoil in the area to be quarried;
- Extraction of rock and overburden as indicated in the pit design; and
- Rehabilitation of extracted areas.

4.3 Site Rehabilitation

4.3.1 Site rehabilitation has been addressed as an integral part of the project. The proposed Rehabilitation Strategy is set out within the Proposed Quarry Management Plan (see Rehabilitation Strategy, July 2013). The overall objectives of the Rehabilitation Strategy are as follows:

- Coordination of the various steps in the operating sequence for optimum operating and rehabilitation efficiency;
- Creation of a final landform that integrates with the adjacent topography and optimises effective revegetation conditions;
- Creation of a drainage pattern that avoids ponding and erosion;
- Provision of ground cover to control erosion and promote landform stability, such as grass and woody vegetation, as soon as soil conditions allow;

- Enables the establishment of woody native plant communities to return long-term landscape and indigenous biodiversity values; and
- Apply rapid revegetation techniques in highly visible areas, to reduce the duration of visual impacts.

5.0 Visual Appraisal

5.1.1 The process of visual appraisal includes an analysis of the likely visibility of the Site followed by fieldwork to identify the viewing audience and obtain representative photographs.

5.2 Visibility Analysis / Zone of Theoretical Visibility (ZTV)

5.2.1 As an initial step in the visual analysis, Zone of Theoretical Visibility (ZTV) mapping was undertaken of the Proposed Extraction Area to determine its potential visibility in the wider landscape. This analysis has been included on **Figure 4**. The assessment methodology used is described in **Appendix 1**.

5.2.2 ZTV mapping has been based on the existing ground level from which proposed extraction would occur and therefore represents the 'worst case scenario' in terms of potential views of extraction activity from the surrounding landscape. As extraction activity continues, visibility will be reduced over time as the resultant extraction activity lowers the contours of the Site.

5.2.3 This analysis is also based entirely on 'bare ground' topographic data and does not take into account the screening effects of intervening vegetation or structures in the landscape. Similarly, ZTV does not indicate the magnitude of view and changes which occur in relation to increases in viewing distance.

5.3 Viewing Audience and Representative Viewpoints

5.3.1 Following the ZTV analysis, field work was carried out to determine the actual extent of visibility and to check the localised screening effect of topography, buildings and vegetation. This helped to determine the potential visibility of the Site, which extends across a wide area of the Hutt Valley, including the Eastern Hills above Stokes Valley. Further areas of visibility are identified within elevated areas of the Belmont Hills to the south-west of the Site, including some residential areas to the north of Kelson.

5.3.2 Representative viewpoints were identified from and photographs taken to demonstrate visibility and the Site's contextual relationship. The representative viewpoints do not include views from private properties.

5.3.3 Selection of representative viewpoints was based on the following criteria:

- The requirement to provide an even spread of representative viewpoints within the visual envelope, and around all sides of the site;
- From locations which represent a range of near, middle and long distance views; and

- Whilst private views are relevant, public viewpoints are used to provide representative views from private dwellings. These represent the 'worst case scenario' in terms of potential public views of extraction activity and are representative of the private views which may also be available but are more typically curtailed by building location and orientation, intervening fences, vegetation or other buildings.

5.3.4 Using the above criteria, 10 representative viewpoints were identified and the effects of the proposal have been assessed[4]. The locations of these viewpoints are illustrated on **Figure 4** and summarised in **Table 1** below:

Table 1: Viewpoint number and location

VIEWPOINT	LOCATION	REPRESENTED VIEWING AUDIENCE
1	SH2	Commuters using SH2 approaching the Site from the south
2	Hutt River Stop Bank (Immediately east of Site)	Recreation users of Hutt River Corridor and residential dwellings along Taita Drive
3	SH2	Commuters using SH2 approaching the Site from the north
4	Hutt River Stop Bank (North)	Recreation users of Hutt River Corridor
5	Pomare Railway Station	Commuters using Pomare Railway Station
6	Alersgate Grove	Elevated residential dwellings in Stokes Valley
7	Pomare School	Recreation users and residential dwellings in Pomare
8	Taita Shopping Centre	Commercial and residential dwellings in Taita
9	Hutt River Stop Bank (South)	Recreation users of Hutt River Corridor
10	Kaitangata Crescent	Residential dwellings in Kelson

6.0 Landscape and Visual Assessment

6.1.1 Landscape and visual assessments are separate, although linked, procedures. The existing landscape and its existing visual context all contribute to the existing 'baseline' for landscape and visual assessments. Visual effects are assessed as one of the interrelated effects on people. The assessment of the potential effect on landscape is carried out as an effect on an environmental resource, ie. landscape features or landscape character. Such effects can be summarised as follows:

> ***Visual effects*** relate to the changes that arise in the landscape including composition of views as a result of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity.
>
> ***Landscape effects*** derive from changes in the physical landscape, which may give rise to changes in its character and how this is experienced. This may in turn affect the perceived value ascribed to the landscape.

[4] The locations of representative viewpoints have been discussed with Bronwyn Little of Hutt City Council.

6.1.2 In summary, the assessment of effects aims to:

- identify systematically, the landscape resource and viewing audience;
- assess the potential magnitude of landscape and visual effects which will result from the Proposed Development;
- indicate the measures proposed to avoid, remedy or mitigate those effects; and
- provide an overall assessment and professional judgement as to the significance of landscape and visual effects taking the proposed mitigation into account.

6.1.3 Effects may be positive (beneficial), neutral (no discernible change), or negative (adverse). Effects can also be direct or indirect, and can be temporary (short, medium, or long term), permanent or cumulative. They can also arise at different scales (local, regional, or national) and have different levels of significance.

6.2 Approach and Methodology

6.2.1 A preliminary assessment was undertaken during the early design stages of the project as part of a wider scoping exercise for the expansion of Belmont Quarry. A limited number of representative viewpoints were used in this assessment. Following this analysis, Winstone prepared final development plans including the staging of extraction.

6.2.2 Using this information, this assessment considers the potential landscape effects of the proposal in the context of the Site and wider landscape, together with effects on views. The methodology used for the assessment involved a combination of fieldwork, visibility analysis and indicative visual simulations prepared from key representative viewpoints. The findings of this assessment are set out in Sections 7.0 and 8.0 below and adopt the following seven point scale to determine the overall significance of effect:

Extreme / very high / high / moderate / low / very low / negligible

6.2.3 In combination with assessing the significance of effects, the assessment also considers the nature of effects in terms of whether this will be positive (beneficial) or negative (adverse) in the landscape context within which they occur. The full methodology used to assess and identify the significance landscape and visual effects of extraction activity is set out in full in **Appendix 1: Assessment Methodology**.

7.0 Landscape Effects

7.1.1 Landscape effects have been considered in terms of physical effects on landscape features and effects on the character and amenity of the landscape at the local scale and as part of the wider Landscape Character Area defining the Western Escarpment.

7.1.2 Assessing the significance of landscape effects provides judgement of the amount of change that is likely to occur to both existing landscape features and the changes to landscape character. It is important that the size or scale of the effect and the geographical extent of the area influenced is defined together with the duration of the effect, including whether this is reversible. In some cases, the loss or change to existing landscape elements such as vegetation or earthworks can also be quantified. **Table 2** below has been compiled to help quantify the significance of landscape effects which have been considered.

Table 2: Determining the significance of landscape effects

Contributing Factors	Higher	Lower
Susceptibility to change	- The landscape is highly valued such as a landscape requiring protection as a matter of national importance.	- The landscape is of low or local importance.
Size or scale	- Loss or addition of key features or elements; - Changes in key characteristics of the landscape including significant aesthetic or perceptual elements	- Most key features or elements retained - Key characteristics of landscape remain intact with limited aesthetics or perceptual change apparent
Geographical extent	- Landscape character area scale	- Site scale, immediate setting
Duration and reversibility	- Permanent - Long term	- Reversible - Short term

7.2 Physical Effects

Landform

7.2.1 The proposed extraction activity will extend the operation of an existing quarry within the Extraction Activity Area. At completion this will cover approximately 30.6 hectares. Such landform modification will remain consistent with existing extraction activity, which is well established in this part of the Hutt Valley.

7.2.2 The process of landform modification will occur over a long time frame, at least 30 – 40 years. This continues a pattern of incremental change across the Site with each stage of quarrying extending over several years. The resultant landform will change gradually rather than quickly and dramatically.

7.2.3 During quarrying and periods of extraction activity, the machinery and activity involved in extraction will provide additional cues of landform modification. While this activity will increase awareness of change, this will not be inconsistent with the existing established pattern of operation.

7.2.4 As extraction progresses, part of the spur along the western escarpment to the east of the Proposed Extraction Area will be retained. This reaches approximately 95 masl and rises approximately 65 metres above State Highway 2, in the vicinity of the Site. This will enable part of the amphitheatre enclosure to be retained which is within the broader form of the Belmont Hills.

7.2.5 At completion of quarying activity, most of the quarry floor will be below approximately 65 metres masl and predominately contained from view. Above this, faces and benches will be stepped back towards the Western Escarpment and will provide evidence of extraction activity having occurred. Faces typically reach approximately 15 metres in height and benches typically approximately 7.5m wide. In areas that are more visible from within the Hutt Valley, such as the Southern Design faces, heights have been reduced to 7m to enable vegetation to be established to screen the faces over a shorter time frame in these particular areas.

7.2.6 Overall, the effects of landform modification will represent a moderate significance of effect at the Site scale and extend an established pattern of landform modification into adjoining areas. Such modification will be consistent with existing quarrying activity and remain contained in the local context.

Land cover

7.2.7 To increase the area of extraction activity, approximately 6.8 hectares of predominately indigenous vegetation will be removed, including approximately 6.6 hectares within an SAA. Winstone holds a Certificate of Compliance from Hutt City Council to clear all vegetation within the Extraction Activity Area outside SAAs.

7.2.8 Vegetation proposed to be removed is described as indigenous forest of varying species composition and structural form[5]. This forms part of a broader area of indigenous vegetation which extends outside the SAAs and continues north into Belmont Regional Park. In landscape terms, this wider area of vegetation also contributes to the green backdrop provided along much of the western escarpment and adds to the landscape character of this area.

7.2.9 As with landform effects, the loss of vegetation will occur incrementally across the Site over a number of years and will not occur suddenly and dramatically. Coinciding with this, staged quarrying will occur over approximately 30 – 40 years and enables rehabilitation to establish a cover of vegetation on areas where quarrying was completed over a similar time frame. This will contribute to the appearance and greening of extracted faces and establishes a process of re-establishing native vegetation as quarrying extends into new areas.

7.2.10 Whilst the removal of established areas of native vegetation will generate adverse landscape effects, the process of rehabilitation and the visual greening which will occur ensures that the potential magnitude of such landscape effects is reduced. Such loss will be managed to ensure a visual green backdrop is re-established and long term regeneration of native vegetation occurs. In landscape terms, at the Site scale, such change will generate a moderate significance of effect.

7.3 Landscape Character Effects

7.3.1 At the Site scale, the effects on landscape character include:

- the extension of extraction activity within an existing Extraction Activity Area; and
- the removal of vegetation with recognised ecological value and associated visual amenity value in contributing to wider green backdrop viewed from the Hutt Valley.

7.3.2 The ability to extend extraction activity involves the permanent removal of some areas of remnant indigenous vegetation. Such change will occur in the context of an existing quarry and will not appear foreign or out of context within this setting. Accordingly, landscape character effects at the Site scale will generate a moderate significance of effect and primarily reflect a loss of ecological value.

[5] Forbes Ecology – "Terrestrial Ecology Assessment", August 2013

7.3.3 At the district scale, the proposed quarrying will extend extraction activity along part of the Western Escarpment character area predominantly viewed from within the Hutt Valley. Such change will typically be viewed below the more elevated backdrop of the Belmont Hills and seen in the context of established extraction activity.

7.3.4 As landforms are modified, rehabilitation of vegetation will also occur and enable a significant visual green backdrop to be reinstated as extraction activity extends into new areas. As this occurs, the extension of extraction activity will remain localised along a wider green backdrop and remain compatible with the existing influence of quarrying activity currently established.

7.3.5 At the broader landscape scale, the proposed changes to landscape character along the Western Escarpment will generate a low significance of effect. As with effects at the Site scale, the nature of such change is adverse because of the recognised value of indigenous vegetation, which will be permanently lost.

7.4 Summary of Landscape Effects

7.4.1 Based on the above assessment of landscape effects the following significance and nature of effects have been summarised in table 3 below:

Table 3: Summary of significance and nature of landscape effects

	Description of Change	Significance of Effect[6]	Nature of Effect[7]
Physical Effects on Landform (Site)	Modification to the existing landform will remain localised in association with existing extraction activity established along the Western Escarpment.	Moderate	Neutral
Physical Effects on Vegetation (Site)	Removal of native vegetation containing remnant forest will be rehabilitated through the successive reinstatement of vegetation across retired areas. This will reinstate a green backdrop and facilitate the long term succession of native vegetation.	Moderate	Adverse
Landscape Character (Site)	The scale of extraction activity will increase and existing vegetation which has not previously been disturbed will be affected; however, the resultant quarry face will remain compatible with the established character at the site scale.	Moderate	Adverse
Landscape Character (Western Escarpment)	The extension of extraction activity will transform part of an established green backdrop. The process of rehabilitation will ensure that visible quarrying activity will be offset be regenerating vegetation and will not appear dominant when compared with the existing level of extraction activity which presently occurs. Longer term, the site will become reinstated as part of a green backdrop of native vegetation.	Low	Adverse

[6] Significance of Effect assessed as: Extreme, Very High, High, Medium, Low, Very Low or Negligible

[7] Nature of Effect assessed as: Adverse, Neutral or Beneficial

8.0 Visual Effects

8.1.1 The methodology used to assess potential visual effects is set out in the methodology included in **Appendix 1**. This has included a Zone of Theoretical Visibility (ZTV) analysis followed by fieldwork used to identify the actual location and nature of available views.

8.1.2 As illustrated on **Figure 4**, theoretical visibility of the Site extends across a large area of the Hutt Valley and continues along the eastern hills and Stokes Valley. Further areas of visibility are identified within elevated areas of the Belmont Hills to the north-east and south-west of the Site, including some residential areas to the north of Kelson.

8.1.3 In addition to potential views associated with introducing new areas of extraction activity within the Site, there is also potential for cumulative visibility of extraction activity across a larger area. This has potential to increase the extent of quarrying visible within the wider area of Belmont Quarry and decrease the extent of vegetation seen which contributes to the character of the wider Western Escarpment.

8.1.4 Given the above analysis, the availability of views and potential for visual effects assessed has occurred from the following key areas:

- Users of SH2 (Viewpoints 1 and 3)
- Recreation users along the Hutt River corridor (Viewpoints 2, 4 and 9)
- Residential dwellings within Hutt Valley (Viewpoints 5, 7 and 8)
- Elevated residential dwellings in Stokes Valley (Viewpoint 6)
- Elevated residential dwellings in Kelson (Viewpoint 10)

8.2 Viewpoint Analysis and Assessment of Visual Effects

8.2.1 To assess the overall significance and nature of visual effects, the potential visual sensitivity of the identified viewing audience was considered together with the overall magnitude of change resulting from the Proposed Development. As noted earlier, views from private properties were not assessed. Views of a development do not necessarily equate to visual effects. Visual impact is not always negative and a change in view is not automatically unacceptable. Factors contributing to the potential significance of visual effects that were considered are set out in **Table 4** below.

Table 4: Determining the significance of visual effects

Contributing Factors	Higher	Lower
Susceptibility to change	- Views from dwellings and recreation areas where attention is typically focussed on the landscape	- Views from places of employment and other places where the focus is typically incidental to its landscape context
Size or scale	- Loss or addition of key features in the view - High degree of contrast with existing landscape	- Most key features of view retained - Low degree of contrast with existing landscape

	elements (ie. in terms of form scale, mass, line, height, colour and texture) - Full view of the development	elements (ie. in terms of form scale, mass, line, height, colour and texture) - Glimpse view of the development
Geographical extent	- Frontal views - Near distance views - Change visible across wide extent of view	- Oblique views - Long distance views - Small portion of change visible
Duration and reversibility	- Permanent - Long term (over 10 years)	- Transient - Short term (0-5 years)

8.2.2 To understand the Proposed Development once complete, the assessment has included an indicative visual simulation indicating the extent of quarrying, which will be visible from each of the 10 representative viewpoints. Photographs from representative public viewpoints and modelling of the completed landform viewed from these locations are included in **Figures 5** to **8**. These are described as follows:

Viewpoint 1: Users of SH2 (approaching the site from the south)

The Proposed Extraction Area would appear partially contained beyond existing vegetation separating SH2 and Hebden Crescent. Beyond this, views of the Proposed Extraction Area would remove part of an established green backdrop and extend quarrying activity onto a more visible area of the Western Escarpment.

Viewpoint 2: Recreational users and residential dwellings adjoining the Hutt River Corridor

The overall height of vegetation on the spur within the Firth Block which contains the Site will be reduced whilst retaining a sense of enclosure to the northern area of the quarry. Apart from a small area in right hand side of the view, this landform and its associated vegetation unaffected by quarrying will continue to form the skyline. However, there will be a small increase in the extent of extraction activity visible associated with the existing quarry.

Viewpoint 3: SH2 (approaching the Site from the north)

When viewed from SH2 to the north of the Site, there would be a reduction in the extent of vegetation visible along the Western Escarpment. However, the extent of vegetation outside of the Site would provide an effective buffer to the north-east of the quarry, and retain a comprehensive green backdrop.

Viewpoint 4: Recreational users along Hutt River Stop Bank (north)

Part of a vegetated spur along the northern edge of the quarry will be removed and expose views of the southern face of the quarry. Consequently, this will increase the visibility of this area and reduce the extent of green backdrop observed.

Viewpoint 5: Commuters using Pomare Railway Station

The quarry will become more visible along the backdrop to development on the valley floor. Part of the existing quarry will be screened by a vegetated spur but the quarry will be extended further within the Site and along the Western Escarpment. The quarry will appear below vegetation established along the skyline.

Viewpoint 6: Residential properties (Stokes Valley)

Further to the east, from the edge of Stokes Valley, the extent of quarry visible will also increase. Quarrying will be extended further within the Site but below the backdrop of the Belmont Hills. Views of quarrying activity and the operational pit floor will remain enclosed by the vegetated spur.

Viewpoint 7: Pomare School

There will be an increase in the extent of quarrying visible and a reduction in the green backdrop observed beyond intervening development and vegetation on the valley floor. Vegetation retained on the intervening spur will conceal open views into the northern area of the quarry and maintain an 'amphitheatre' form which conceals part of the extension of quarrying activity.

Viewpoint 8: Taita Shopping Centre

Long distance views of quarrying within the site will be increased. Such views will reduce the green backdrop along part of the Western Escarpment and gradually extend the existing visible quarry face observed.

Viewpoint 9: Hutt River Stop Bank (south)

Long distance views of the northern face of the quarry will replace existing views of vegetation growing along the sequence of visible spurs forming the Western Escarpment. Views of quarrying activity a will reduce the extent of green backdrop visible in this localised area.

Viewpoint 10: Residential properties (Kelson)

The western edge of the proposed extension to the quarry is visible in the context of the existing quarry. Such views do not include vegetation within the Firth Block to be removed on account of landforms and vegetation which enclose the southern edge of the quarry.

8.2.3 Following extraction activity, the Rehabilitation Strategy forms an integral part of the Proposed Development. This establishes a sequence of vegetation being re-established on quarried faces as they are completed. Accordingly, an assessment considering the significance and nature of visual effects must also take account of the effectiveness of rehabilitation measures as proposed.

8.2.4 To understand the changes resulting from implementing the Rehabilitation Strategy, four visual simulations have been prepared from key representative viewpoints[8].

8.2.5 These simulations have been prepared in accordance with best practice as described in **Appendix 1**. Although the depiction of vegetation cover and the rate of re-growth on the final simulations is indicative, the terrain model on which they have been based is based on detailed contour and spot height information (1.0m contours for the Proposed Extraction Area and immediate environs were used).

8.2.6 The simulations prepared from Viewpoints 2, 4, 6 and 7 are included at the end of this report; each viewpoint contains the following:

1. ZTV of the extent of extraction activity visible following the completion of each stage of extraction activity
2. The existing view (overlaid with redline boundary of Proposed Extraction Area)
3. Diagrammatic views showing the five stages of extraction activity proposed

[8] The locations of key representative viewpoints have also been discussed with Bronwyn Little of Hutt City Council.

4. Illustrative Visual Simulations showing the view of the Project at the following stages:

   a. Following completion of Stage 1 (approximately 5 years)

   b. Following completion of Stage 3 (approximately 15 years)

   c. Following completion of Stage 5 (approximately 30 - 40 years)

8.2.7 Based on the information shown on the Visual Simulations, the assessment of visual effects identified from these viewpoints have been described in **table 5** below:

Table 5: Assessment of Significance and Nature of Visual Effects from Key Representative Viewpoints

Viewpoint	Stage	Approximate time frame	Assessment	Significance of effect	Nature of effect
2 **Recreation users and residential dwellings adjoining the Hutt River Corridor**	Stage 1	5 years	During stage 1, extraction activity will be clearly visible within the existing area of Belmont Quarry.	Low	Neutral
	Stage 3	15 years	During stage 3 rehabilitation of the South Design will begin to re-establish a green backdrop. To the north-east of this, a small part of the extension of the quarry will be visible beyond vegetation retaining a green backdrop along the front face of the western escarpment.	Low	Adverse
	Stage 5	30 - 40 years	At the completion of stage 5, vegetation along the previously extracted southern area of the quarry will have become established and the green backdrop re-established. Similar to extraction undertaken during stage 3, views of most of the extension of the quarry will be curtailed beyond vegetation retained along the front face of the Western Escarpment.	Low	Adverse
4 **Recreation users along Hutt River Stop Bank (north)**	Stage 1	5 years	During stage 1, the extent of extraction activity visible in Belmont Quarry will remain effectively contained beyond an intervening vegetated spur with no noticeable increase in extraction activity apparent.	Negligible	Neutral
	Stage 3	15 years	During stage 3, part of the northern spur within the Firth Block will be removed providing an ability to view previously extracted areas to the south of the quarry. Given the sequence of rehabilitation works undertaken, exposed faces will have established 15 years of vegetation growth and reinstate a visual green backdrop which replaces vegetation lost.	Low	Adverse
	Stage 5	30 - 40 years	At the completion of stage 5, views into the enclosure containing Belmont Quarry will become apparent; however, such views will be of a rehabilitated quarry face. Whilst the landform upon which vegetation has been established will have been modified there will be limited change in the extent of green backdrop which characterises this area of the Western Escarpment.	Very Low	Adverse
6 **Residential properties (Stokes**	Stage 1	5 years	During stage 1, there will be no material difference in the extent of extraction activity observed within the quarry.	Negligible	Neutral
	Stage 3	15 years	During stage 3, part of the spur within the Firth Block will be reduced increasing visibility towards the southern area of the	Moderate	Adverse

Viewpoint	Stage	Approximate time frame	Assessment	Significance of effect	Nature of effect
Valley)			quarry. As this occurs, the rehabilitation process will establish increasing areas of vegetation along retired extraction faces thus reducing the extent of extraction activity which is visible.		
	Stage 5	30 - 40 years	At the completion of stage 5, rehabilitation of the southern area of the quarry will have established an effective green backdrop beyond quarrying activity extended to the north.	Low	Adverse
7 **Pomare School**	Stage 1	5 years	During stage 1 the extent of extraction activity seen within the quarry will remain consistent with that currently visible, albeit extending further west and away from this viewpoint.	Negligible	Neutral
	Stage 3	15 years	During stage 3, extraction activity will begin to extend beyond intervening vegetation retained along the face of the western escarpment and below the more distant backdrop of the Belmont Hills. Where new areas of extraction activity become visible, the process of rehabilitation will ensure vegetation becomes established across the southern area of the quarry so that the wider green backdrop of the Western Escarpment remains apparent.	Low	Adverse
	Stage 5	30 - 40 years	At the completion of stage 5, rehabilitation of the South Design will be effective in reinstating a green backdrop and compensate for the shift in extraction activity to the northern area of the site.	Very Low	Adverse

8.2.8 As previously noted, the incremental extension of extraction activity to the north which removes vegetation within the SAA will coincide with the growth of vegetation established on the face of the southern area of the quarry in accordance with the Rehabilitation Strategy. While the extent of extracted areas will expand within the Site, the process of vegetation removal and subsequent rehabilitation will ensure that the visual impact of this progression will be reduced. Consequently the green backdrop will be reinstated as subsequent landforms are removed.

8.2.9 Overall, the approach to rehabilitation identified in the Rehabilitation Strategy will be effective in mitigating adverse visual effects. At the completion of quarrying, the Rehabilitation Strategy will continue to reduce the magnitude of visual effects as successive stages of native vegetation become re-established.

8.3 Summary of Visual Effects

8.3.1 The majority of views associated with the extension of the quarry will have low significance of effect. This results from the established presence of the quarry along this area of the Western Escarpment and the inclusion of effective detailed staged rehabilitation process which will ensure that a green backdrop is re-established as extraction activity extends into new areas.

8.3.2 The highest potential significance of visual effects occurs from elevated properties to the east of the Hutt Valley where the proposed extension of extraction activity within Site would reduce the sense of containment within Belmont Quarry along its northern edge. When viewed from this area, however, the Rehabilitation Strategy will ensure that areas of the quarry exposed by such work are progressively rehabilitated with vegetation to become assimilated within the green backdrop of the Western Escarpment. Any resultant effects will therefore be of moderate level of significance and limited in duration.

8.3.3 The lowest significance of effects occur from areas where extraction activity remains effectively contained by intervening areas of topography and vegetation, including existing vegetation established outside the Site. Such containment is identified from views along SH2 to the north and from the representative viewpoint along Kaitangata Crescent to the south-west of the Site.

8.3.4 A detailed analysis and description of the changes that are likely to result from each representative viewpoint as set out in **Appendix 2**.

8.4 Mitigation

8.4.1 The Rehabilitation Strategy[9] forms the principle landscape mitigation applied and forms part of the Quarry Management Plan. The use of this strategy will form the framework of rehabilitation principles to be followed and informs the preparation of staged rehabilitation plans developed as each stage of extraction activity is progressed across the Site.

8.4.2 The key Management Actions which will be undertaken under the Rehabilitation Strategy and considered in this assessment include the following:

1. Ensure extraction activity adopts a sequential approach to rehabilitation that avoids or mitigates future disturbance of completed areas.
2. Prior to commencement of extraction works, ensure that the limits of vegetation clearance are clearly known and understood to prevent vehicle access and unintended vegetation clearance or damage outside approved clearance areas.
3. Ensure that the final landform will facilitate rehabilitation measures which 'soften' visible faces and facilitate future reinstatement of native vegetation.
4. Include bench ripping, face scarification and deposit of overburden as an integral part of the overall operation.
5. Ensure drainage is included as part of the landform modification process to prevent scouring and erosion of adjacent vegetation and rehabilitated landforms.
6. Preparation of detailed revegetation plan prior to each area or sub-area becoming available for rehabilitation and include a monitoring and maintenance programme.

[9] Boffa Miskell and Tonkin & Taylor (2013) Belmont Quarry Rehabilitation Strategy

9.0 Analysis against Statutory Provisions

District Plan

9.1.1 The Proposed Development is contained entirely within an Extraction Activity Area and is not subject to any boarder landscape classifications identified at the district or regional scales.

9.1.2 Within the Extraction Activity Area, policies relevant to landscape and visual effects have been identified in Sections 6D 1.1 and 6D1.2 of the District Plan as described in Section 3.0.

9.1.3 The adverse effects generated by extraction activity were identified early in the design process through a scoping exercise. Winstone has developed a comprehensive rehabilitation strategy which identifies the nature of visual effects and provides a process of re-establishing vegetation within exposed areas to reinstate a green backdrop contributing to the visual quality of the area.

9.1.4 Whilst areas of indigenous vegetation on the face of the escarpment will be removed to extend the life and operation of the quarry within the Extraction Activity Area, the process of rehabilitation will ensure that extracted faces are ‘softened’ and topsoil and mulched vegetation is redistributed as a viable growth medium and seed source. This process of rehabilitation utilises natural regeneration and planting to effectively rehabilitate a cover of native vegetation in the long term.

9.1.5 Overall, the proposed Rehabilitation Strategy is considered to take account of the planned future development to ensure that areas of formerly extracted areas will be effectively rehabilitated as future extraction activity is continued. A key outcome of this process will ensure that a green backdrop is maintained and adverse landscape and visual effects are managed in order to maintain the amenity values associated with this area.

RMA

9.1.6 In the context of a project of this nature, landscape aspects of amenity values and quality of the environment are considered to be properly maintained in terms of sections 7(c) and 7(f). Whilst areas of indigenous forest will be removed, adverse effects relating to the amenity and quality of the environment generated by this change will be mitigated through a process of re-establishing vegetation within exposed areas so that a green backdrop and succession towards native vegetation is re-established.

10.0 Summary and Conclusion

10.1 The application seeks to extend existing extraction activity contained within the Extraction Activity Area accommodating Belmont Quarry.

10.2 The extension of extraction activity will remove part of an existing vegetated spur which currently accommodates indigenous vegetation and contributes to the green backdrop of the Hutt Valley. This area is protected as a Significant Amenity Area (SAA) and has recognised ecological values.

10.3 The extension of extraction activity will be visible from various locations across the Hutt Valley for the duration of the operation. This includes private and public viewpoints which include SH2 approaching the Site from the north and south, recreation users along the Hutt River Corridor, residential properties within the Hutt Valley and elevated residential properties on the Eastern Hills of Stokes Valley and along the northern edge of Kelson.

10.4 Where visible, extraction activity will occur incrementally and will not appear simultaneously. The continuation of extraction activity will not appear foreign or unexpected in the context of the existing quarry operation which has been established and will continue as an ‘amphitheatre’ which helps contain landscape and visual effects.

10.5 A key element of mitigation relating to the extension of extraction activity includes rehabilitation of previously extracted areas. Such rehabilitation has been outlined in a comprehensive Rehabilitation Strategy as part of the Quarry Management Plan and will ensure accelerated vegetation cover will occur in areas which have potential to become visually more exposed. As extraction continues, the ongoing management of these areas will ensure that a green backdrop is retained.

10.6 Overall, the extension of Belmont Quarry will result in a low significance of landscape and visual effects or less as extraction activity is rehabilitated as part of a staged sequence of works. Whilst moderate landscape and visual effects will occur at the Site scale and from localised long distance elevated views along the western edge of Stokes Valley during parts of the operation, ongoing rehabilitation will ensure such effects will be reduced as the Site becomes effectively re-assimilated along the wider green backdrop. This will ensure that any potential adverse landscape character and visual effects will be minimised in the long term and result in no more than a low significance of effect.

Figures

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WINSTONE AGGREGATES

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Statutory Context

| **Date: August 2013** | **Revision: 1** |

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

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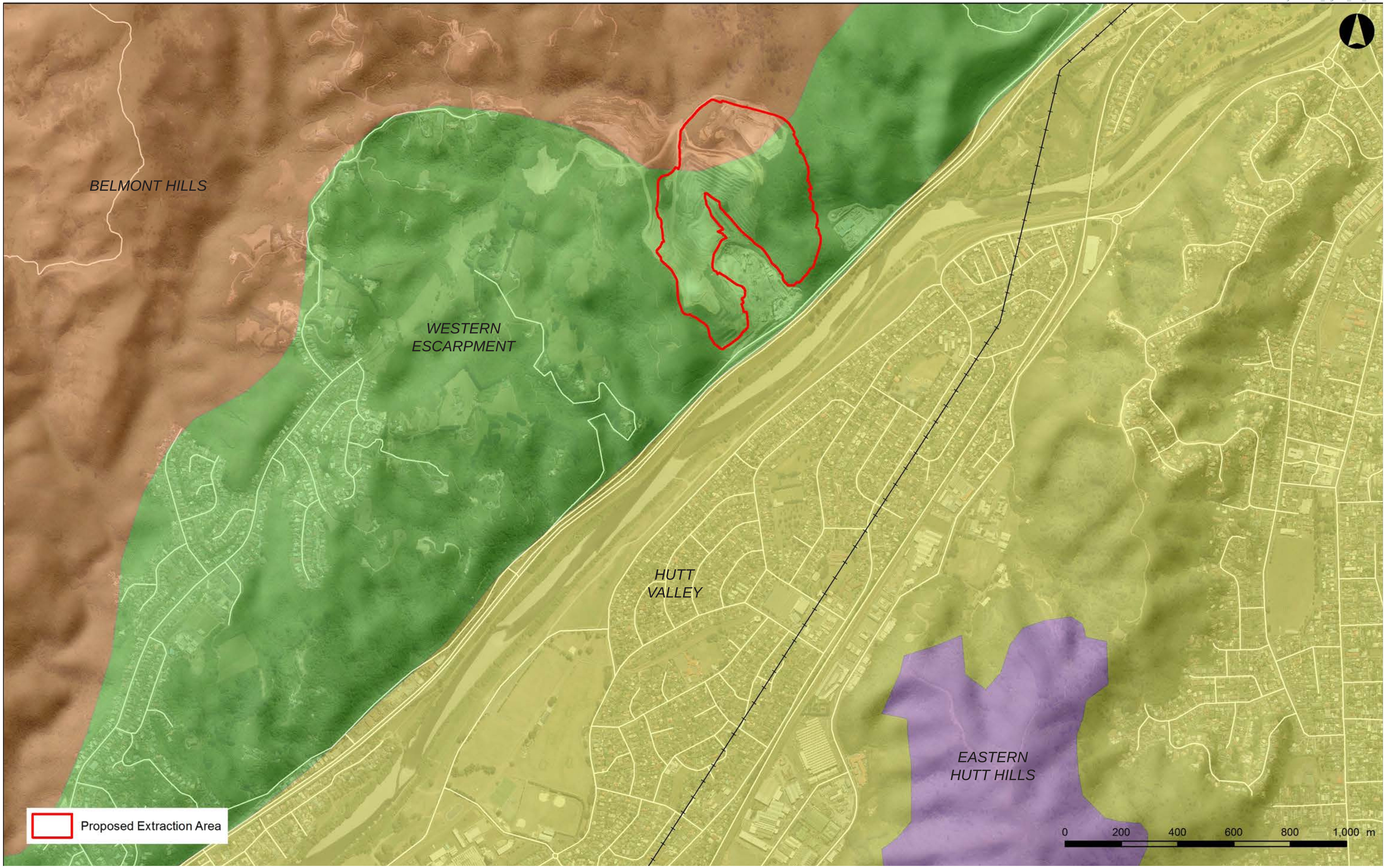
FIGURE
1

File Ref: W12052_Figures_LVA_v3.indd



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WINSTONE AGGREGATES

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Landscape Character Context

| **Date: August 2013** | **Revision: 1** |

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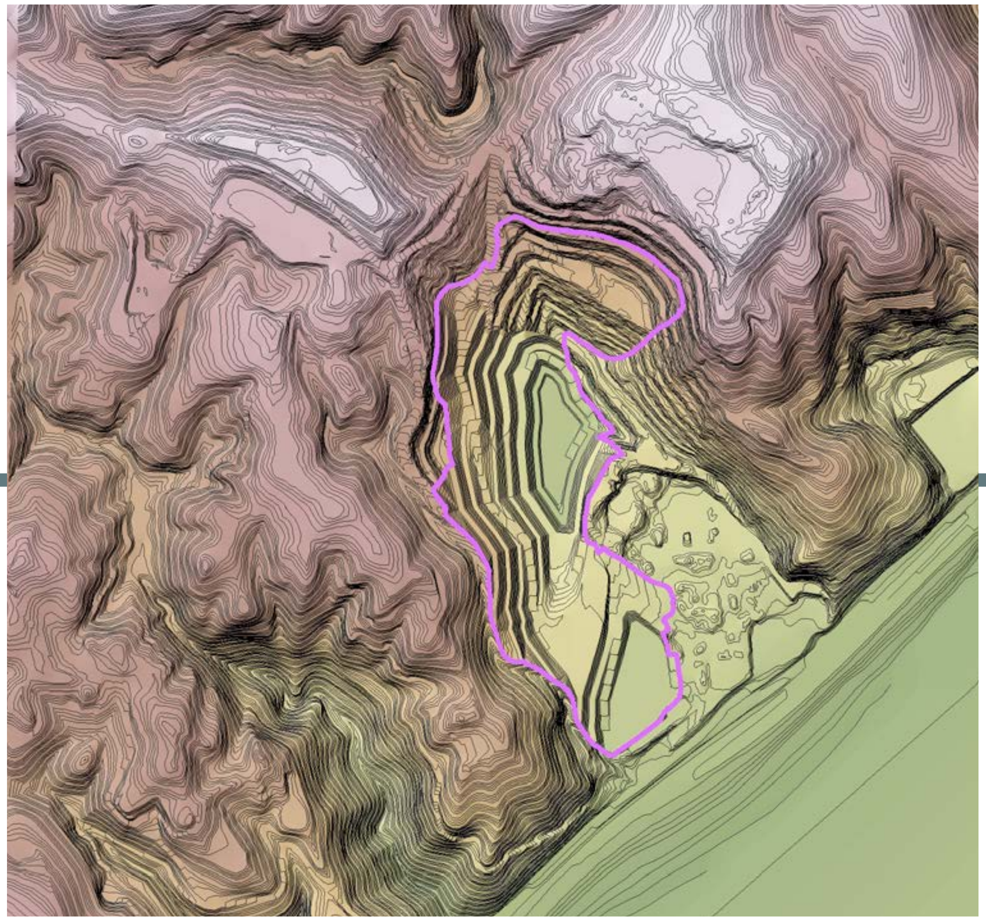
FIGURE

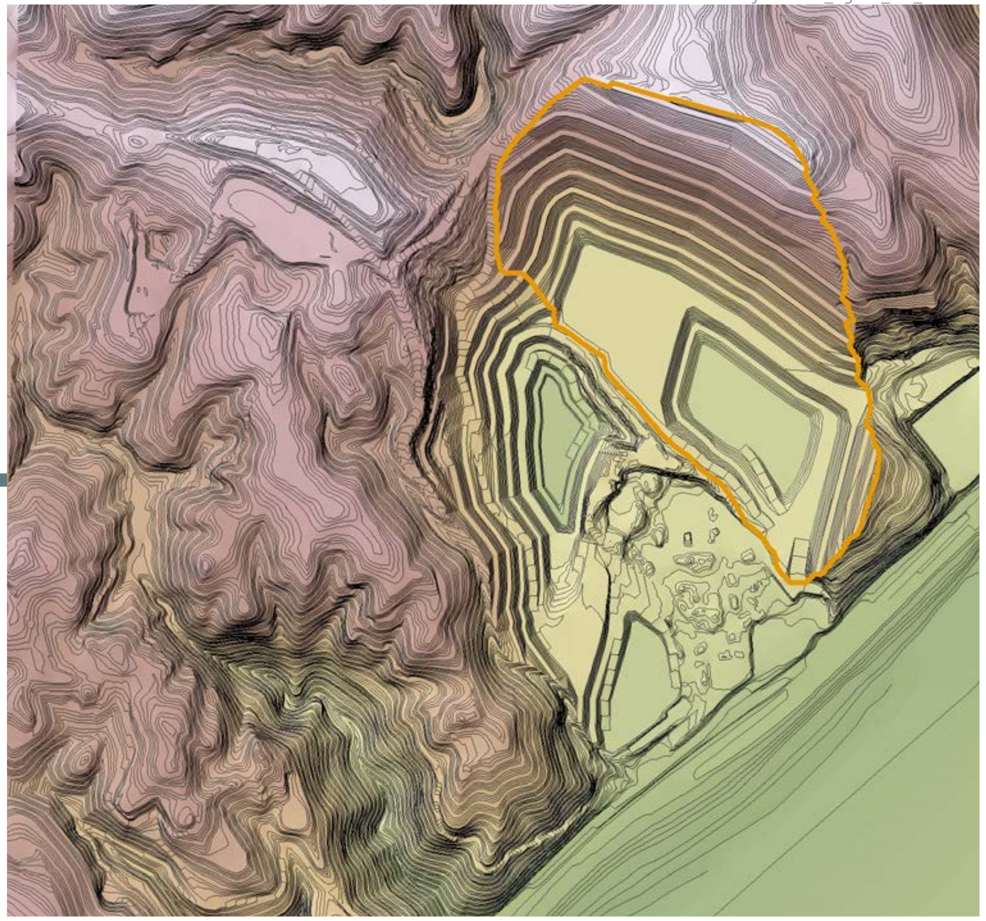
2

File Ref: W12052_Figures_LVA_v3.indd

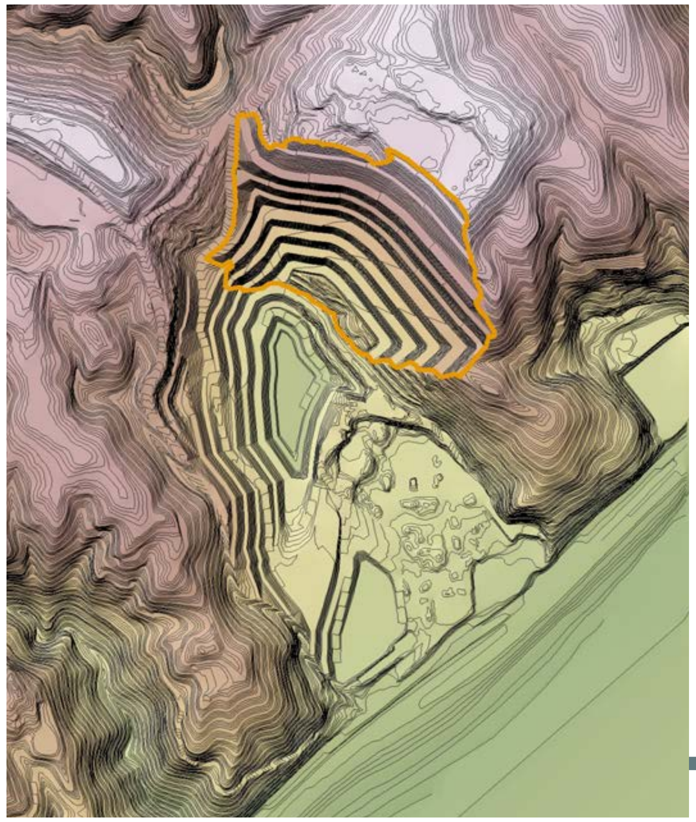
Proposed Extraction Area (Existing Landform)



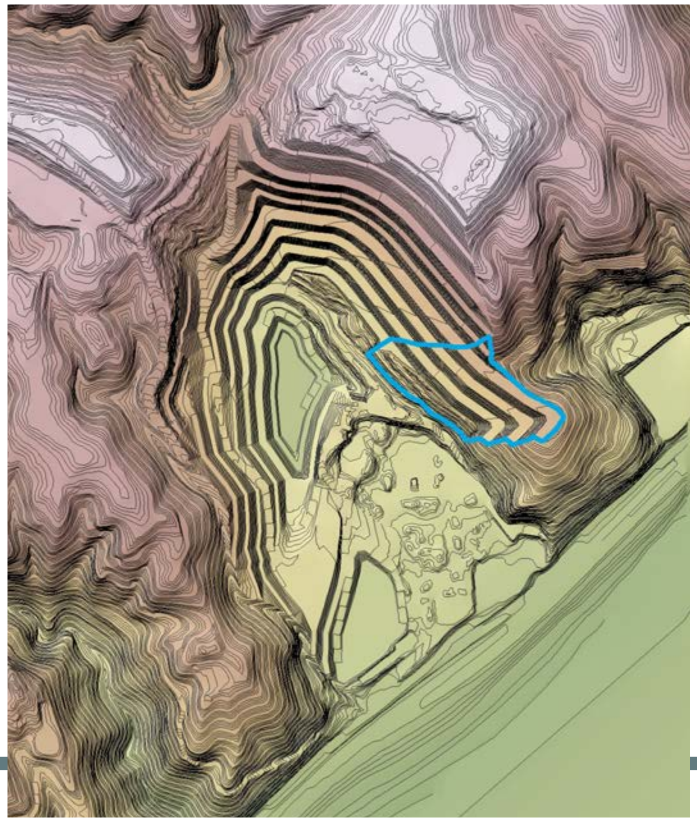
South Design Landform Completed



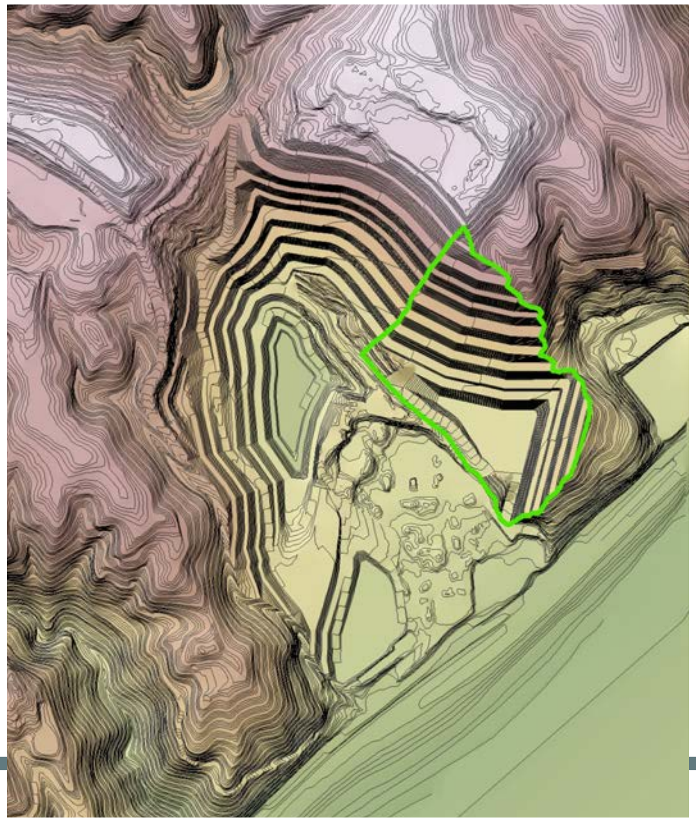
North Design (Stage 5) Landform Completed



North Design (Stage 1)



North Design (Stage 2)



North Design (Stage 3)

North Design (Stage 4)

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WINSTONE AGGREGATES

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Proposed Stages of Development

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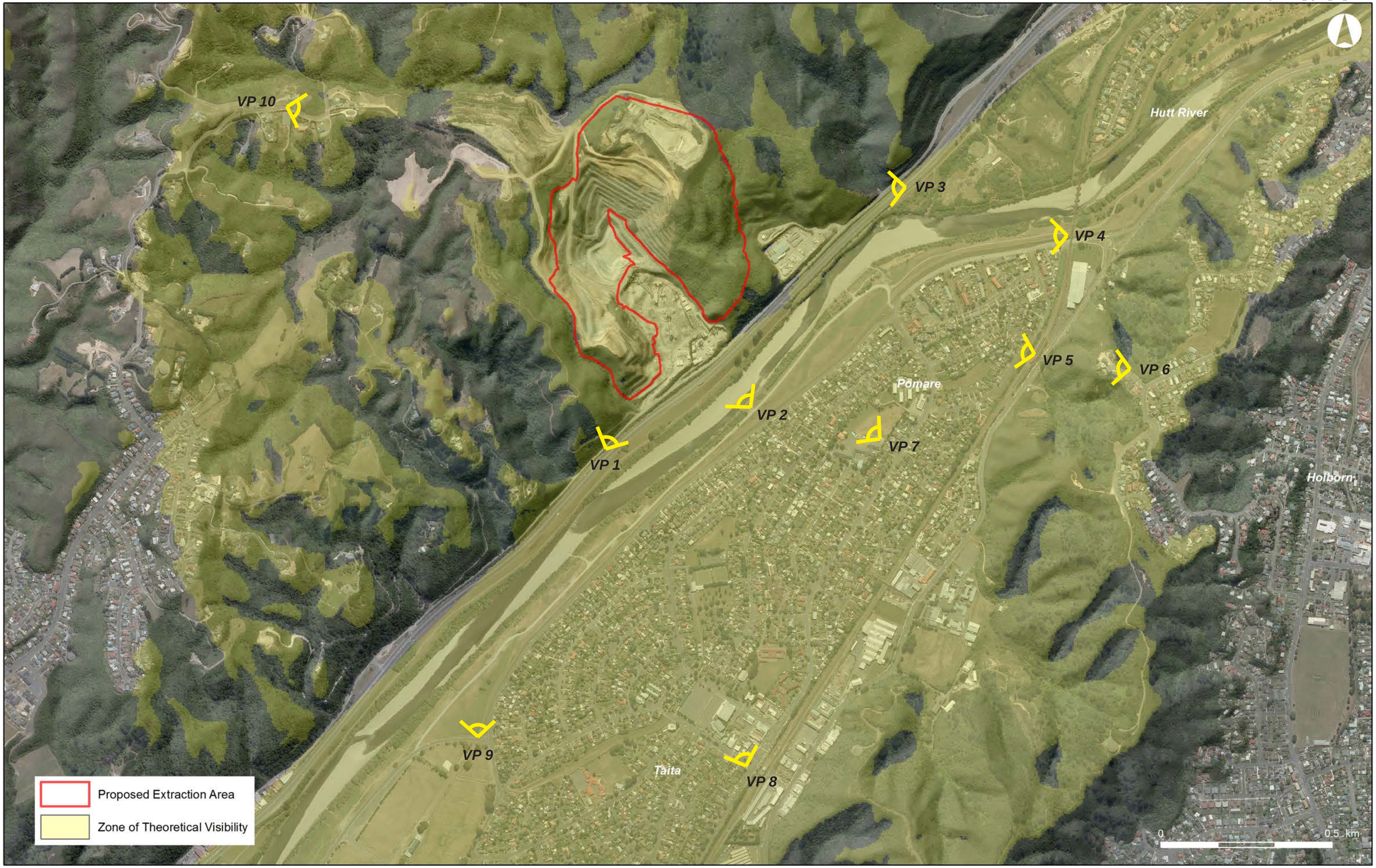
FIGURE
3



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WINSTONE AGGREGATES

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Zone of Theoretical Visibility & Viewpoint Locations

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FIGURE
4

Viewpoint 1: Taken from State Highway 2 looking north

Distance to Site : 500m

Viewpoint 2: Taken from the eastern banks of the Hutt River looking west

Distance to Site : 300m

Viewpoint 3: Taken from State Highway 2 looking south

Distance to Site : 420m

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WINSTONE AGGREGATES

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Photographs and modelling of Completed Landform

| **Date: August 2013** | **Revision: 1** |

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FIGURE

5

Viewpoint 4: Taken from Hutt River Stop Bank looking south-west

Distance to Site : 920m

Viewpoint 5: Taken from Pomare Railway Station looking west

Distance to Site : 870m

Viewpoint 6: Taken from Aldersgate Grove looking west

Distance to Site : 1100m

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WINSTONE AGGREGATES

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Photographs and modelling of Completed Landform

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FIGURE
6

Viewpoint 7: Taken from Pomare School looking west

Distance to Site : 570m

Viewpoint 8: Taken from corner of Taine Street and High Street in Taita looking north-west

Distance to Site : 1,300m

Viewpoint 9: Taken from Hutt River Stop Bank adjoining Harcourt Werry Drive looking north

Distance to Site : 1,400m

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WINSTONE AGGREGATES

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Photographs and modelling of Completed Landform

| **Date: August 2013** | **Revision: 1** |

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FIGURE
7

Viewpoint 10: Taken from Kaitangata Crescent looking north-east

Distance to Site : 900m

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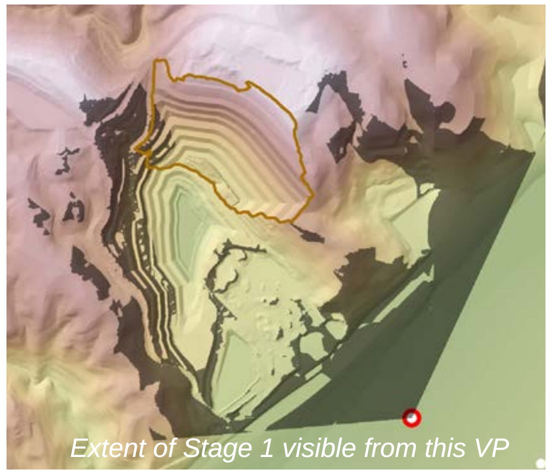
Visual Simulations

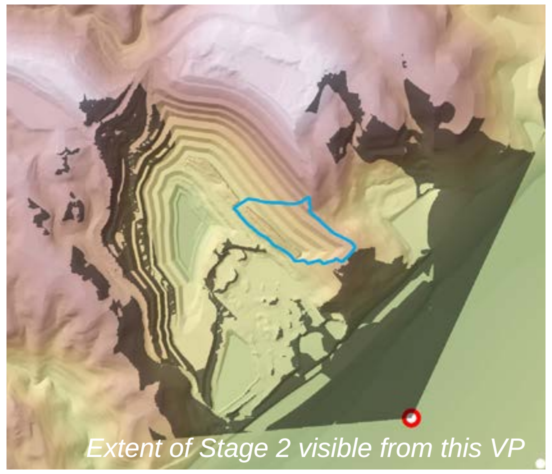
Viewpoint 2: Recreational users along Hutt River Stop Bank (east)

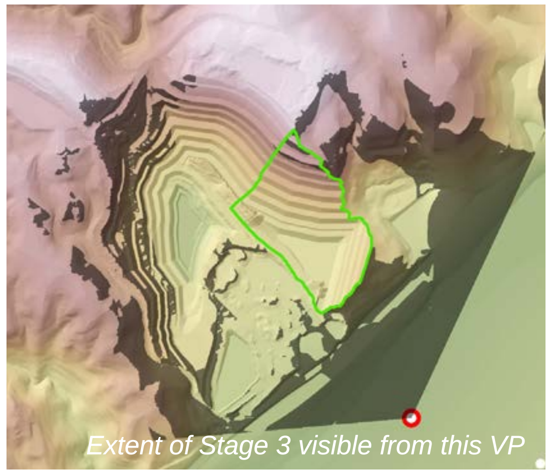
Viewpoint 4: Recreational users along Hutt River Stop Bank (north)

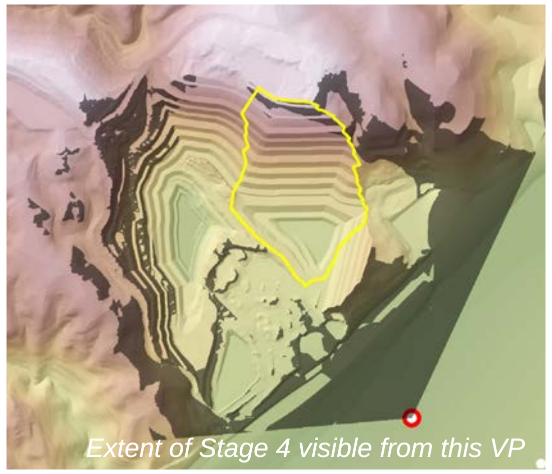
Viewpoint 6: Residential properties in Stokes Valley (Aldersgate Drive)

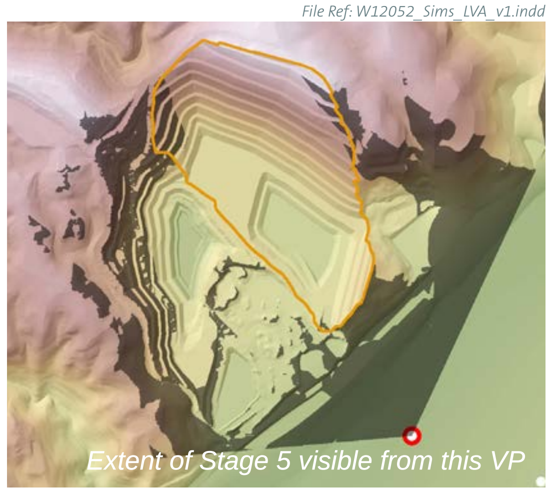
Viewpoint 7: Recreation and residential properties in Pomare (Pomare School)





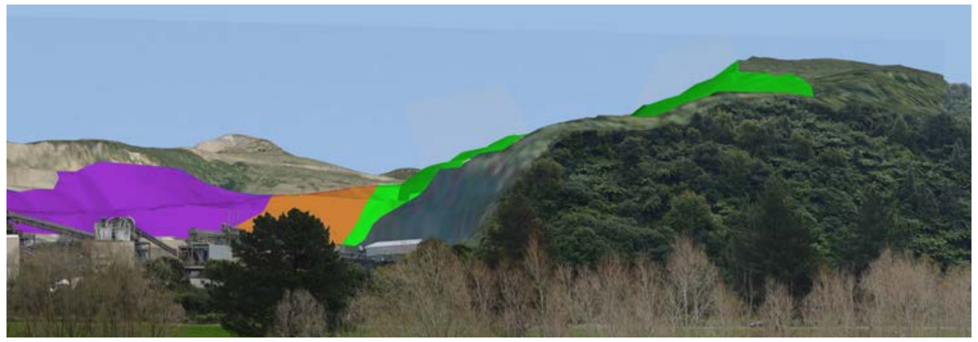






Stage 1

Stage 2



Stage 3

- South Design
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5

Stage 4

Stage 5

WINSTONE AGGREGATES

Viewpoint Details

NZTM Easting	:	1 764500 mE
NZTM Northing	:	5 440 439 mN
Elevation	:	25m Approx
Date of Photography	:	March 2013
Field of View of Viewshed Analysis:		120^0

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Views from Hutt River Stopbank looking Northwest

| **Date: August 2013** | **Revision: 0** |

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Author: rhys.girvan@boffamiskell.co.nz | *Checked:* BE

VIEWPOINT

2

Stage 1 (approx 5 years)

Stage 3 (approx 15 years)

Stage 5 (approx 30 years)

Optimum Reading Distances : A3 = 18 cm / A1 = 36 cm

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

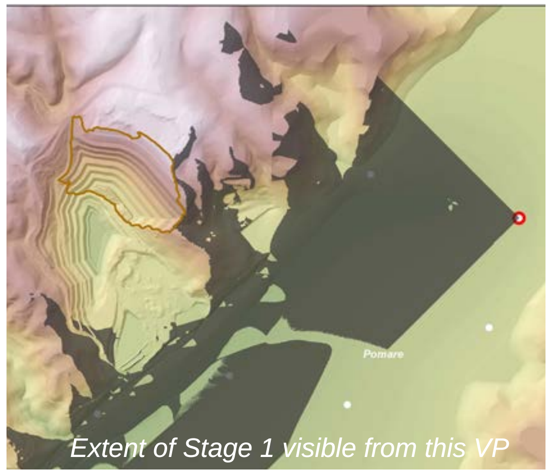
Indicative Simulations - Hutt River Stopbank

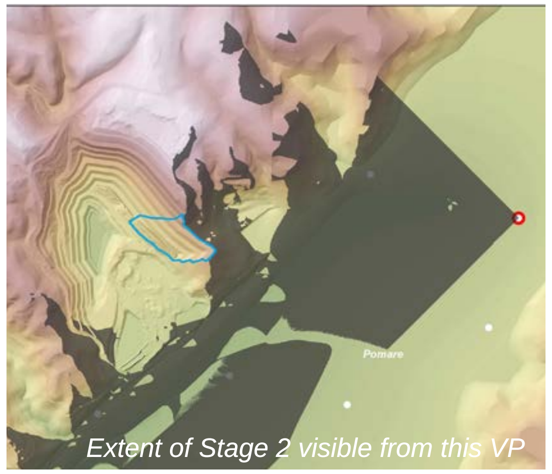
| **Date: August 2013** | **Revision: 0** |

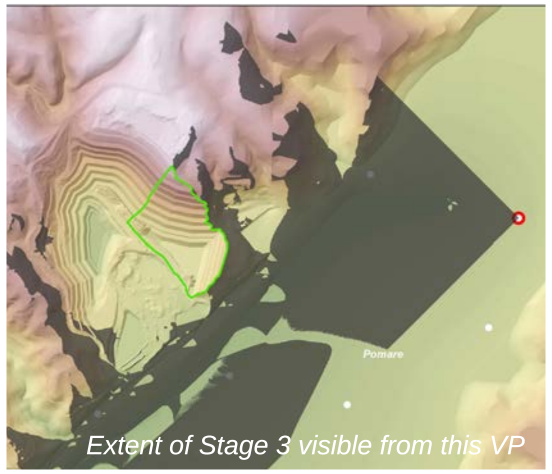
Plan prepared for Winstone Aggregates by Boffa Miskell Limited

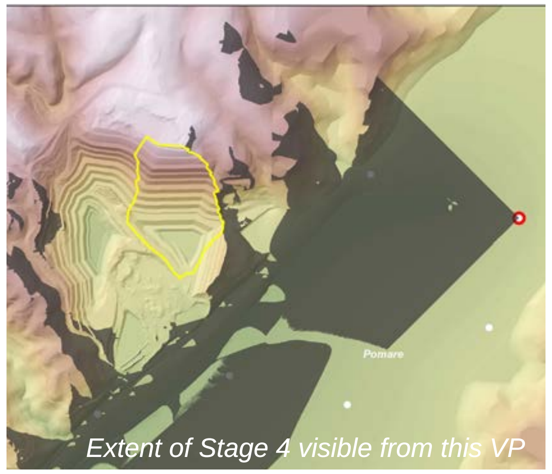
Author: **rhys.girvan@boffamiskell.co.nz** | *Checked:* BE

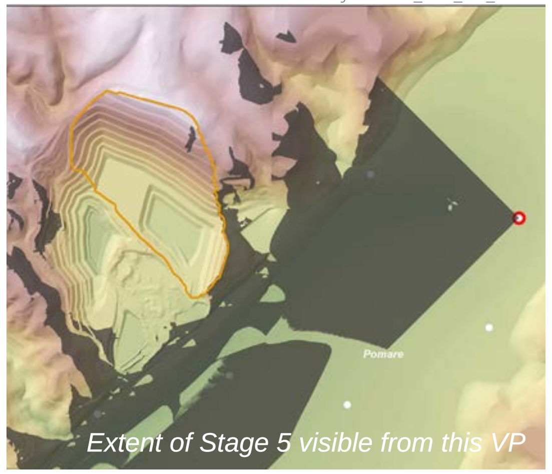
VIEWPOINT 2





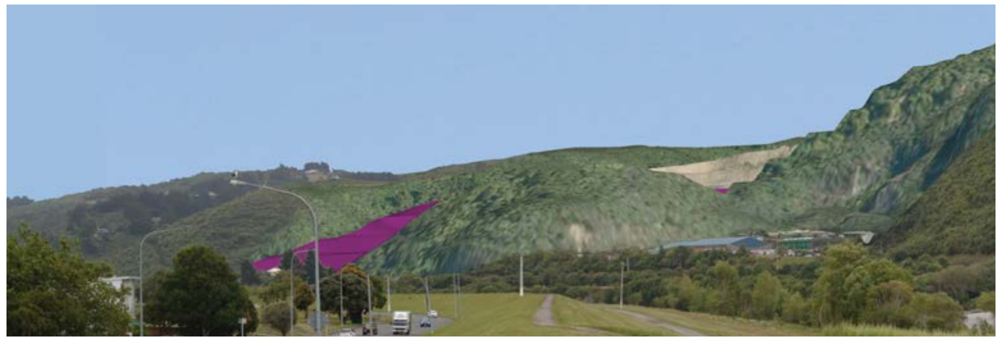




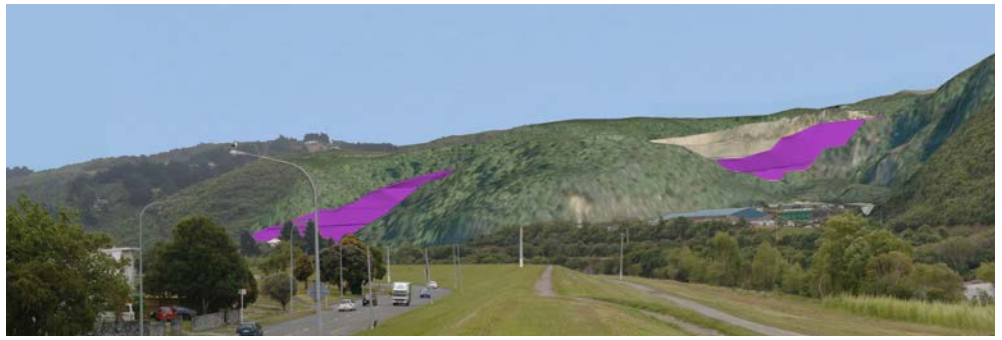


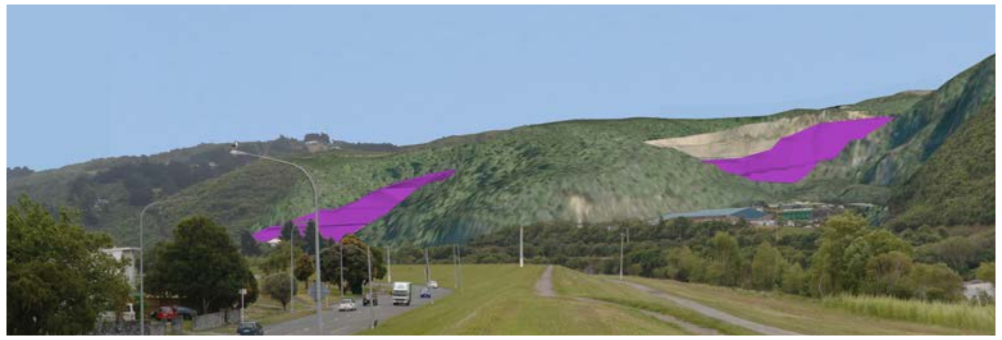

Stage 1


Stage 2


Stage 3

(purple)	South Design
(orange)	Stage 1
(light blue)	Stage 2
(green)	Stage 3
(yellow)	Stage 4
(brown)	Stage 5


Stage 4


Stage 5

WINSTONE AGGREGATES

Viewpoint Details

NZTM Easting : 1 765 330 mE
NZTM Northing : 5 440 927 mN
Elevation : 35m Approx
Date of Photography : March 2013
Field of View of Viewshed Analysis: 90°

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Views from Stopbank (North) looking West

| **Date: August 2013** | **Revision: 0** |

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Author: **rhys.girvan@boffamiskell.co.nz** | *Checked:* BE

VIEWPOINT 4

Optimum Reading Distances : A3 = 27.5 cm / A1 = 55 cm

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Indicative Simulations - Stopbank (North)

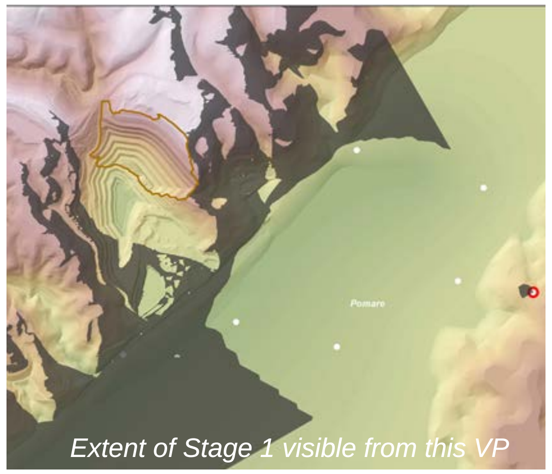
| **Date: August 2013** | **Revision: 0** |

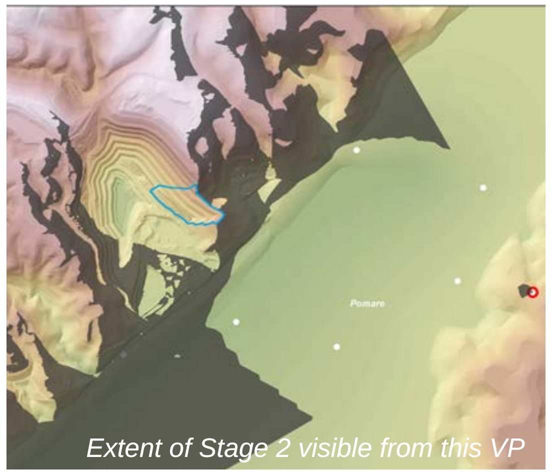
Plan prepared for Winstone Aggregates by Boffa Miskell Limited

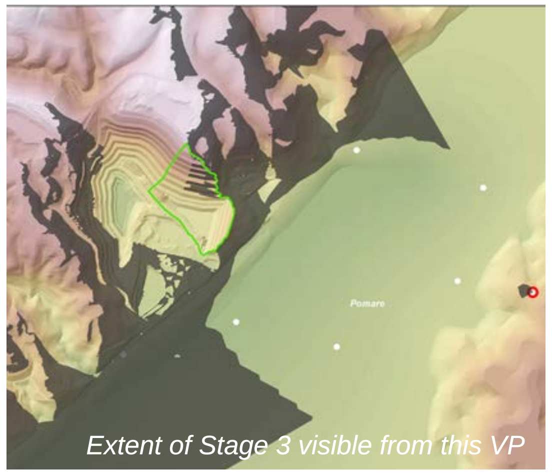
Author: **rhys.girvan@boffamiskell.co.nz** | *Checked:* BE

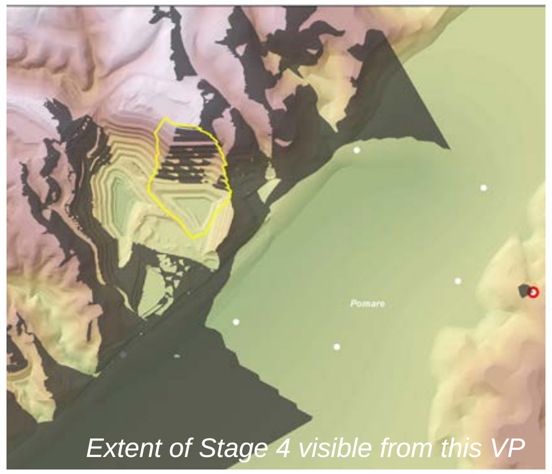
VIEWPOINT

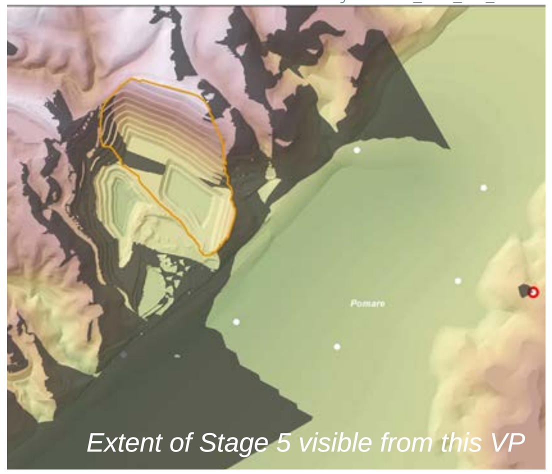
4


Extent of Stage 1 visible from this VP


Extent of Stage 2 visible from this VP


Extent of Stage 3 visible from this VP


Extent of Stage 4 visible from this VP


Extent of Stage 5 visible from this VP


Distance to Site : 1100m
Extent of Proposed Extraction Area indicated


Stage 1


Stage 2


Stage 3

- South Design
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5


Stage 4


Stage 5

WINSTONE AGGREGATES

Viewpoint Details

NZTM Easting : 1 765 528 mE
NZTM Northing : 5 440 539 mN
Elevation : 110m Approx
Date of Photography : March 2013
Field of View of Viewshed Analysis: 90°

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Views from Aldersgate Grove looking West

| **Date: August 2013** | **Revision: 0** |

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Author: rhys.girvan@boffamiskell.co.nz | Checked: BE

VIEWPOINT 6

Stage 1 (approx 5 years)

Stage 3 (approx 15 years)

Stage 5 (approx 30 years)

Optimum Reading Distances : A3 = 27.5 cm / A1 = 55 cm

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Indicative Simulations - Aldersgate Grove

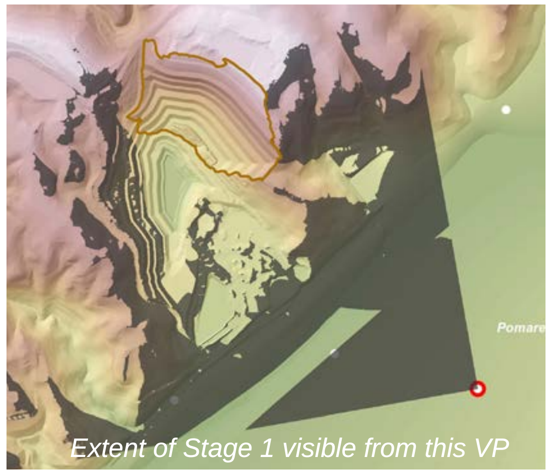
| **Date: August 2013** | **Revision: 0** |

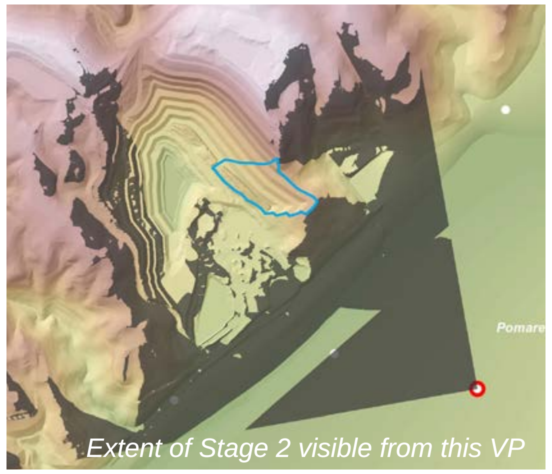
Plan prepared for Winstone Aggregates by Boffa Miskell Limited

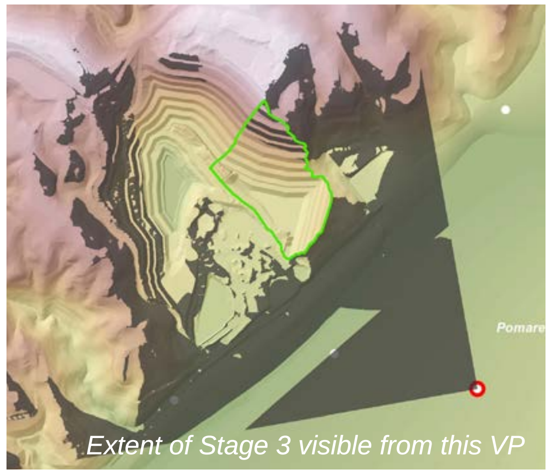
Author: **rhys.girvan@boffamiskell.co.nz** | *Checked:* BE

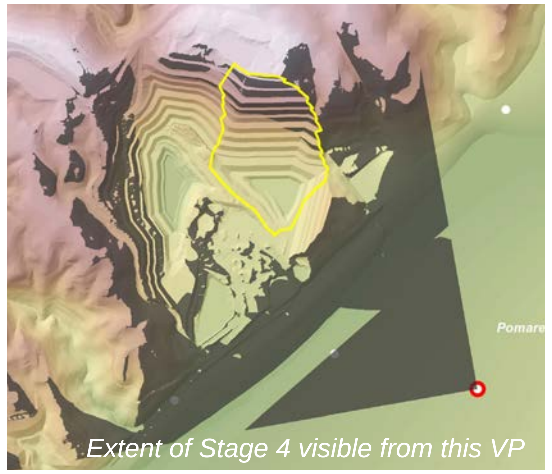
VIEWPOINT

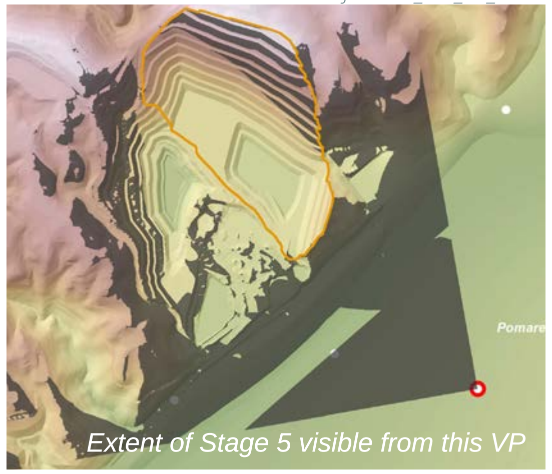
6











Stage 1

Stage 2

Stage 3

- South Design
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5

Stage 4

Stage 5

WINSTONE AGGREGATES

Viewpoint Details

NZTM Easting	:	1 764 785 mE
NZTM Northing	:	5 440 333 mN
Elevation	:	30m Approx
Date of Photography	:	March 2013
Field of View of Viewshed Analysis	:	90^0

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Views from Pomare School looking West

| **Date: August 2013** | **Revision: 0** |

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Author: **rhys.girvan@boffamiskell.co.nz** | *Checked:* BE

VIEWPOINT

7

File Ref: W12052_Sims_LVA_v1.indd

Stage 1 (approx 5 years)

Stage 3 (approx 15 years)

Stage 5 (approx 30 years)

Optimum Reading Distances : A3 = 27.5 cm / A1 = 55 cm

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Indicative Simulations - Pomare School

| **Date: August 2013** | **Revision: 0** |

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Author: rhys.girvan@boffamiskell.co.nz | *Checked:* BE

VIEWPOINT
7

Appendix 1: Assessment Methodology

Introduction

The landscape and visual assessment process provides a framework for assessing and identifying the nature and significance of potential landscape and visual effects. Such effects can occur in relation to physical features, viewing audiences and visual amenity and/or on the site's contribution to the existing landscape character and rural amenity values. When undertaking landscape and visual assessments, it is important that a structured and consistent approach is used to ensure that findings are as objective as possible. Judgement should always be based on training and experience, and be supported by clear evidence and reasoned argument.

The assessment of landscape and visual effects are separate, although linked, procedures. The existing landscape and its existing visual context or visual envelope all contributes to the existing 'baseline' for landscape and visual assessment studies. The assessment of the potential effect on the landscape is carried out as an effect on an environmental resource (i.e. the landscape features or character). Visual effects are assessed as one of the interrelated effects on the surrounding viewing audience. The differences between these types of effects can be summarised as follows:

> **Landscape effects** derive from changes in the physical landscape, which may give rise to changes in its character and how this is experienced. This may in turn affect the perceived value ascribed to the landscape.
>
> **Visual effects** relate to the changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity.

To determine the overall nature and significance of landscape and visual effects, an understanding of the sensitivity of the landscape or viewing audience has been combined with an assessment of the magnitude of change resulting from the proposal in order to determine an overall assessment of the significance of effect. This methodology is in accordance with current best practice guidance[10].

Landscape effects

Landscape character assessment and particularly the stage of characterisation, is the basic tool for understanding the landscape and forms a starting point for landscape baseline surveys. This process includes an analysis of how biophysical, sensory and associative attributes come together to create landscape character. This process is outlined further within NZILA Best Practice Note 10.1: Landscape Assessment and Sustainable Management[11].

To assess potential landscape effects, the landscape baseline should provide a concise description of the existing character of the landscape surrounding the site. This may include the characterisation of the landscape into distinct character areas or types, which share common features and characteristics. The condition of the landscape (i.e. the state of an individual area of landscape or landscape features) should also be described to form the basis for a judgement made on the value or importance of the affected landscape.

The sensitivity of the landscape depends upon the degree that a particular landscape or feature can accommodate change without detrimental effects on its character. This will vary upon the following factors:

- Existing land use;
- The pattern and scale of the landscape;
- Visual enclosure / openness of views and distribution of the viewing audience;
- The value or importance placed on the landscape; and
- The scope for mitigation, which would be in character with the existing landscape.

[10] Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment (Version 3).

[11] NZILA Education Foundation (2010) Best Practice Note 10.1: Landscape Assessment and Sustainable Management.

The determination of the sensitivity of the landscape resource is dependent upon the susceptibility to change. This is similar to 'landscape sensitivity' identified within a landscape character area but is specific to the particular development proposal. It takes account of both the attributes of the receiving environment and the characteristics and effects of the Proposed Development. Landscape value or importance such as underlying Outstanding Landscape or Significant Amenity Landscape classifications must also be taken into account.

Assessing the magnitude of landscape effects provides a judgement about the amount of change that is likely to occur to the existing landscape. In undertaking this assessment it is also important that the size or scale of the affect and the geographical extent of the area influenced is defined alongside the duration of the affect, including whether this is reversible. In some cases the loss or change to existing landscape elements such as vegetation or earthworks can be quantified.

There are no hard and fast rules about what makes a significant landscape effect. It is important to be clear about what factors have been considered when making professional judgements. **Table 1** below has been compiled to help quantify the significance of landscape effects.

Table 1: Determining the significance of landscape effects

Contributing Factors	Higher	Lower
Susceptibility to change	- The landscape requires protection as a matter of national importance.	- The landscape is of low or local importance.
Size or scale	- Loss or addition of key features or elements; - Changes in key characteristics of the landscape including significant aesthetic or perceptual elements	- Most key features or elements retained - Key characteristics of landscape remain intact with limited aesthetics or perceptual change apparent
Geographical extent	- Landscape character area scale	- Site scale, immediate setting
Duration and reversibility	- Permanent - Long term	- Reversible - Short term

Visual effects

The visual baseline identifies the potential viewing audience which has the ability to obtain views towards the site. This is the groups of properties, roads, footpaths and public open spaces that lie within the visual envelope or zone of visual influence of the site.

As an initial step in the visual analysis, a Zone of Theoretical Visibility (ZTV) mapping exercise is undertaken of the site in its context to determine the likely extent of visibility in the wider landscape. ZTV mapping represents the area that a development may theoretically be seen – that is, it may not actually be visible in reality due to localised screening from intervening vegetation, buildings or other structures. In addition, ZTV mapping does not convey the nature or magnitude of visual impacts, for example whether visibility will result in positive or negative effects and whether these will be significant

'Zone of Theoretical Visibility' (ZTV) is based on a Digital Terrain Model (DTM) overlaid on a map base. It is also known as a Zone of Visual Influence (ZVI), Visual Envelope Map (VEM) or Viewshed Map. The term ZTV is preferred for its emphasis of two key factors that are often misunderstood:

- Visibility maps represent where a development may be seen theoretically – that is, it may not actually be visible in reality, for example due to localised screening from intervening vegetation, buildings or other structures which is not represented by the DTM; and
- the maps indicate potential visibility only – that is, the areas within which there may be a line of sight. They do not convey the nature or magnitude of visual impacts, for example whether visibility will result in positive or negative effects and whether these will be significant or not.

ZTVs are calculated by computer, using any one of a number of available software packages and based upon a DTM that represents topography. The resulting ZTV is usually produced as an overlay upon a base map, representing theoretical visibility within a defined study area.

As the ZTV mapping is based entirely on 'bare ground' topographic data, it does not take into account the screening, unless LIDAR based vegetation data is used to generate the DTM. In addition, the level of reliability of the contour information will influence the accuracy of the mapping. ZTV mapping does however take into account factors relating to the curvature of the earth and light refraction. =ZTV is helpful where to focus field work but it should be remembered that while ZTV is a useful assessment tool, is important to recognise its limitations.

<u>For this project, the following parameters were used:</u>

Nature of target points:	Existing ground level from which extraction activity is proposed to occur
No of target points:	100
Location of target points:	Randomly generated (minimum separation of 20m)
Height of target points:	Existing ground level within the Proposed Extraction Area
Observer Eye Height:	2.0m
Coefficient of Earth Curvature and Refraction:	0.07
Base Spheroid used for computation:	WGS 84

Following the ZTV analysis, field work is used to determine the actual extent of visibility of the site, including the selection of key viewpoints from public areas. This stage is also used to identify the potential 'viewing audience' e.g. residential, visitors, recreation users, and other groups of viewers who can see the site. During fieldwork, photographs are taken to represent existing views from key viewpoints identified in respect of the viewing audience.

Once the viewing audience has been identified, the assessment then considers the visual sensitivity of individuals or groups which make up the viewing audience. The sensitivity of the viewing audience is dependent upon the susceptibility of the viewing audience to change and the value attached to available views:

- The expectations and occupation or activity of the viewing audience;
- The extent to which their interest or activity may therefore be focussed on available views; and
- The importance or value attached to particular views (which may be determined with respect to its popularity or numbers of people affected, its appearance in guide books or tourist maps, facilities provided for its enjoyment and reference to it in literature or art).

Following an assessment of the potential sensitivity of the available viewing audience, the visual assessment then considers the potential change which will result from visibility of the Proposed Development. It should be remembered that views of a development do not necessarily equate to visual effects. Visual impact is not always negative and a change in view is not automatically wrong.

As part of the assessment process, Indicative Visual Simulations have been prepared in accordance with NZILA Best Practice Guide: Visual Simulations BPG 10.2[12]. This has entailed taking digital photographs from each of the identified viewpoints and recording their GPS locations. Preparation of visual simulations required than required the preparation of a 3D model of the proposed landform using 1 metre contour information supplied by Winstone Aggregates. The GPS coordinates for each viewpoint were also added to the model and using the same focal length parameters as that of the camera, an image of the 3D wire frame of the proposed landform was then generated for each viewpoint. This was then registered over the actual photograph, using known reference points to bring

[12] NZILA Education Foundation (2010) Best Practice Guide 10.2: Visual Simulations

the two together. The surface of the proposed landform was then rendered to approximate the likely appearance of the Site taking account of the process identified in the Rehabilitation Strategy.

In association with the visual simulation exercise described above, an assessment considering the magnitude of visual effects was undertaken to provide an objective framework from which such effects can be quantified. It is also recognised that some degree of subjectivity will be evident on account of local sentiment and cultural associations which have not been taken into account. This assessment must therefore rely on professional judgement gained through training and experience.

Following the preparation of visual simulations and based on professional judgement, the Proposed Development is then assessed to understand the likely significance of visual effects taking all of the above factors into account. **Table 2** below has been prepared to help guide this process:

Table 2: Determining the significance of visual effects

Contributing Factors	Higher	Lower
Susceptibility to change	- Views from dwellings and recreation areas where attention is typically focussed on the landscape	- Views from places of employment and other places where the focus is typically incidental to its landscape context
Size or scale	- Loss or addition of key features in the view - High degree of contrast with existing landscape elements (ie. in terms of form scale, mass, line, height, colour and texture) - Full view of the development	- Most key features of view retained - Low degree of contrast with existing landscape elements (ie. in terms of form scale, mass, line, height, colour and texture) - Glimpse view of the development
Geographical extent	- Frontal views - Near distance views - Change visible across wide extent of view	- Oblique views - Long distance views - Small portion of change visible
Duration and reversibility	- Permanent - Long term (over 10 years)	- Transient - Short term (0-5 years)

Nature of effects

In combination with assessing the significance of effects, the assessment also considers the nature of effects in terms of whether this will be positive (beneficial) or negative (adverse) in the context within which it occurs. Neutral effects can also occur where landscape or visual change is considered to be benign in the context of where it occurs.

The type or nature of change identified can be assessed as follows:

Adverse (negative): The proposal would be out of scale with the landscape or at odds with the local pattern and landform. The project will leave an adverse landscape and visual impact on a landscape of recognised quality

Neutral (benign): The project would complement (or blend in with) the scale, landform and pattern of the landscape maintaining existing landscape and visual values

Beneficial (positive): The project would enhance the scale, landform and pattern of the landscape, improving the landscape and visual quality through removal of damage caused by existing land uses or addition of positive features

Determining the Overall Significance of Landscape and Visual Effects

The landscape and visual assessment concludes with an overall assessment of the likely significance of landscape and visual effects. This step also takes account of the nature of effects and the effectiveness of any proposed mitigation. The following levels of effect can be used to guide the significance of landscape and visual effects using the seven point scale as identified in NZILA's Best Practice Note:

Extreme: Total loss to key elements / features / characteristics of a highly valued landscape, i.e. elements considered to be totally uncharacteristic when set within the attributes of the receiving landscape such that it amounts to complete change of highly recognised landscape values.

Very High: Major modification to most key elements / features / characteristics of a valued landscape, i.e. introduction of elements considered to be largely uncharacteristic with the attributes of the receiving landscape such that little of the pre-development landscape character remains.

High: Major modifications to key elements / features / characteristics of the baseline, i.e. introduction of elements considered uncharacteristic with the attributes of the receiving landscape such that the pre-development landscape character remains evident but materially changed.

Moderate: Partial loss of or modification to one or more key elements / features / characteristics of the baseline, i.e. introduction of new elements may be prominent but not necessarily uncharacteristic when set within the attributes of the receiving landscape.

Low: Minor loss of or modification to one or more key elements / features / characteristics of the baseline, i.e. new elements may not be prominent or uncharacteristic when set within the attributes of the receiving landscape.

Very Low: No material loss of or modification to key elements / features / characteristics of the baseline, such that the pre-development landscape or view and/or introduction of elements are not uncharacteristic and absorbed within the attributes of the receiving landscape.

Negligible: Very minor or no loss of or modification to key elements/ features/ characteristics of the baseline, i.e. approximating a 'no change' situation.

Summary of Landscape and Visual Assessment Methodology:

STEP 1: COMPILE LANDSCAPE AND VISUAL BASELINE

- Describe existing landscape character
- Prepare Zone of Theoretical Visibility (ZTV)analysis
- Identify potential 'viewing audience'
- Undertake viewpoint photography

STEP 2: ASSESS THE SENSITIVITY OF THE LANDSCAPE AND VISUAL BASELINE

- Assess the sensitivity of the landform, land cover and landscape character
- Determine the sensitivity of the viewing audience:
  - residential dwellings
  - recreation areas
  - roads
  - places of work

STEP 3: ASSESS POTENTIAL MAGNITUDE OF CHANGE

- Prepare visual simulations (photomontages) from representative viewpoints
- Assess degree of change in available views
- Assess degree of change on landscape features and landscape character

Iterative design process seeking to avoid, remedy or mitigate adverse effects

STEP 4: INFORM FINAL QUARRY DESIGN AND LANDSCAPE REHABILITATION STRATEGY

- Work collaboratively with pit engineer to inform final pit design and stages of work
- Work collaboratively with ecologist to identify areas to be planted and indicative species list
- Establish principles to facilitate successful site rehabilitation

STEP 5: DETERMINE OVERALL SIGNIFICANCE OF LANDSCAPE AND VISUAL EFFECTS

- Combine assessment of landscape and visual sensitivity with predicted magnitude of change to determine overall significance of effects

Appendix 2: Summary Table of the Nature and Significance of Visual Effects

Viewpoint	Description of Viewing Audience	Approximate Minimum Distance to Site	Orientation of Views[13]	Degree of Visibility[14]	Proportion of Development Visible[15]	Duration	Summary of Key Visual Changes (With mitigation identified in Rehabilitation Strategy)	Nature of Effect[16]	Significance of Visual Effects[17]
1	Users of SH2 approaching the Site from the south	Near distance (300 m)	Oblique	Partial	Small Amount	Transient	- Partially concealed by vegetation following the margins of SH2 - Visibility of extraction activity along the horizon removing visible green backdrop in transient views - Long term rehabilitation of native vegetation in accordance with Rehabilitation Strategy	Adverse	Low
2	Residential properties along Taita Drive and recreational users along Hutt River Corridor	Near distance (300 m)	Frontal	Open	Partial	Permanent / Transient	- Extended extraction activity remains largely screened and will not appear obtrusive - Small increase visibility of quarrying activity within the existing extraction area - Rapid reinstatement of green backdrop on more visible previously extracted faces - Long term rehabilitation of native vegetation in accordance with Rehabilitation Strategy	Adverse	Low
3	SH2 (Approaching the Site from the north)	Middle distance (500m)	Oblique	Partial	None	Transient	- Reduced extent of vegetation and landform forming green backdrop along the horizon - Extraction activity remains screened beyond areas of retained vegetation	Neutral	Very Low

[13] Orientation of Views: Frontal, Oblique or Rear

[14] Nature of View: Open, Partial, Glimpse or None

[15] Proportion of Development Visible: Full, Most, Partial, Small Amount, None

[16] Nature of Effect: Adverse, Neutral, Beneficial

[17] Significance of Effects: Negligible, Very Low, Low, Moderate, High, Very High, Extreme

4	Recreational users along Hutt River Stop Bank (North)	Middle distance (900m)	Frontal /Oblique	Open / Partial	Partial	Transient	- Loss of part of a vegetated spur landform providing containment to Belmont Quarry - Increased visibility of quarry undergoing rapid reinstatement of green backdrop on more visible previously extracted faces - Long term rehabilitation of native vegetation in accordance with Rehabilitation Strategy	Adverse	Low
5	Commuters using Pomare Railway Station	Middle distance (870m)	Frontal	Partial	Partial	Transient	- Increased view of extraction activity within Belmont Quarry viewed below Belmont Hills - Rapid reinstatement of green backdrop on more visible previously extracted faces - Partial containment of North Design by retention of vegetated spur along Western Escapement - Long term rehabilitation of native vegetation in accordance with Rehabilitation Strategy	Adverse	Low
6	Residential Properties (Stokes Valley)	Long distance (1,100 m)	Frontal	Open	Most	Permanent	- Increased view of extraction activity within Belmont Quarry below green backdrop of the Belmont Hills - Rapid reinstatement of green backdrop on more visible previously extracted faces - Containment of quarry floor by retention of vegetated spur along Western Escarpment - Long term rehabilitation of native vegetation in accordance with Rehabilitation Strategy to ensure any moderate visual effects will be temporary	Adverse	Moderate
7	Pomare School (Recreation/ residential properties in Pomare)	Middle distance (600 m)	Frontal	Open	Most	Permanent	- Increased view of extraction activity within Belmont Quarry below more elevated Belmont Hills - Rapid reinstatement of green backdrop on more visible previously extracted faces - Partial containment of North Design by retention of vegetated	Adverse	Low

							spur along Western Escapement - Long term rehabilitation of native vegetation in accordance with Rehabilitation Strategy		
8	Taita Shopping Centre (commercial / residential properties in Taita)	Long distance (1,300m)	Frontal / Oblique	Open / partial	Partial	Permanent	- Increased view of extraction activity seen within context of existing extraction activity at Belmont Quarry - Long term rehabilitation of native vegetation in accordance with Rehabilitation Strategy	Adverse	Low
9	Recreational users along Hutt River Stop Bank (South)	Long distance (1,400m)	Oblique	Partial	Partial	Transient	- Long distance views of extraction activity extended along sequence of vegetated spurs forming the Western Escarpment - Removed landform exposed existing vegetation which contributes to Green Backdrop - Long term rehabilitation of native vegetation in accordance with Rehabilitation Strategy	Adverse	Low
10	Residential Properties (Kelson)	Middle Distance (700m)	Frontal	Partial	Partial	Permanent	- Extraction activity within the Site would extend the existing quarry not presently characterised by native vegetation - Views of the Site are largely curtailed by intervening topography and vegetation - Long term rehabilitation of native vegetation in accordance with Rehabilitation Strategy	Adverse	Very Low

APPENDIX 7 – BELMONT QUARRY EXTENSION – TERRESTRIAL ECOLOGY ASSESSMENT – FORBES ECOLOGY, AUGUST 2013

Achieving sustainability together

Belmont Quarry Extension: Terrestrial Ecology Assessment

Prepared for Winstone Aggregates

Adam Forbes (MSc)

Forbes Ecology

August 2013

Quality Assurance Statement:

Author	Signed	Date
Adam Forbes	AForbes	03/08/2013
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Cover photograph: View to the north of the mixed broadleaved forest of Unit 11.

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1.0 INTRODUCTION

1.1 Purpose

Forbes Ecology was engaged by MWH New Zealand Limited to provide an assessment of the Terrestrial Ecology values relating to a proposed extension of the Belmont Quarry. This report provides an assessment of the terrestrial ecology values, and the ecological significance of those values, associated with the proposed extension of the Belmont Quarry into the area known as the Firth Block. It is intended that this report be used to inform statutory planning processes associated with the proposal.

1.2 Scope

The scope for this assessment was defined by Winstone Aggregates as set out in the brief titled "Proposed Expansion of Belmont Quarry Ecology Scope". The project scope was to undertake a comprehensive terrestrial ecology assessment.

1.3 Objectives

The objective of this report is to provide an assessment of the Firth Block's terrestrial ecology values, and their significance, and to assist Winstone Aggregates with decisions relating to their project planning.

1.4 Specific investigations underpinning this assessment

This assessment is informed by a collection of supporting studies. Reports from those studies are enclosed as appendices.

- Appendix C: Report on Botanical Significance of Firth Block, Hebden Crescent, Lower Hutt. March 2013. C. Horne & B. Mitcalfe.
- Appendix D a & b: Bird Monitoring: Firth Block Assessment. March 2013. B. Stephenson. Raw data also appended.
- Appendix E: An Assessment of the Lizard Fauna of the Belmont Quarry Firth Block Extension. August 2013. T. Bell, S. Herbert, S. Melzer.

1.5 Outline of the proposal

Winstone Aggregates are investigating an extension to the existing Belmont Quarry. The proposed extension area is generally termed the "Firth Block".

The proposed Firth Block extension is located to the north-east of the existing Belmont Quarry Pit, on the hill country surrounding the Belmont Quarry and Firth yard.

The proposed Firth Block extension to the Belmont Quarry would directly affect ca. 6.8 ha of the 19.62 ha of the Firth Block. The south-eastern portion of the proposed extension area is predominantly vegetated in indigenous forest of varying species composition and structural form.

The area which would be the maximum extent of the proposed quarry, within the Firth Block property boundary, is termed "proposed extraction area" in this report.

1.6 Report appendices

For reference, appendices to this report are as listed below.

Appendix A: Site Photographs.

Appendix B: Notable Ecological Features.

Appendix C: Botany Report.

Appendix D: (a) Avifauna Report.

Appendix D: (b) Avifauna Survey Data.

Appendix E: Herpetology Report.

2.0 METHODS

2.1 Vegetation classification

Vegetation classification of the Firth Block was undertaken by Adam Forbes (partly with assistance from C. Horne and B. Mitcalfe) over the 5th – 8th March 2013. The methods used are based on Atkinson 1985. Within mature forest (i.e. Units 16 and 31) Point Centre Quarter plot-less sampling (Mueller-Dombois & Ellenbery, 2002) was carried out at 40 m along transects with predetermined start points. This yielded density, diameter, and composition data—as well as qualitative understorey data—for those forest units.

Due to the steep topography and impenetrable nature of much of the younger vegetation on the site, the remainder of the vegetation composition was surveyed using a point sampling technique, where transects were set out visually using binoculars and species composition at uniform points along a given transect was recorded from a distance. This yielded species composition data for the canopy, and allowed for delineation of vegetation Units.

The results from field sampling were mapped in conjunction with review of historical aerial images of the site, which go back as early as 1941.

2.2 Landscape context

Landscape context was assessed both by C. Horne and B. Mitcalfe (who assessed presence of other tawa forest within the vicinity of the site) and A. Forbes (who assessed presence of other tawa forest and landscape ecology, in the vicinity of the site) over March and April 2013. The area covered by A. Forbes was along the western Hutt Hills from Korokoro in the South to Keith Gorge Memorial Park in the north.

In this case, in terms of the scale at which 'landscape' is defined at, of most relevance are those distances travelled by birds and associated processes such as seed dispersal by bird vectors—therefore consideration of landscape elements within a 10 km radius of the Firth Block is appropriate.

2.3 Other Specialists' methods

Other specialist's methods are as reported in their respective reports. Bird data presented in this report was collected by Dr. B. Stephenson and the raw data was compiled for plotting by A. Forbes. The statistical software package R (R Development Core Team, 2013) was used for all data analysis and plotting.

3.0 TERRESTRIAL ECOLOGY VALUES

3.1 Physical and climatic characteristics

The Firth Block is located to the west of the Wellington Fault, generally at E2674272 N6002725, on predominantly scarp face, gully, and terrace landforms. Elevation range from 60 – 180 m above mean sea level. While the site generally overlooks the Hutt River Valley to the east, aspects are present from north-facing through eastern aspects to south-facing. The main scarp and terrace landforms are dissected by several minor gullies, which although small in scale (relative to the host landform), are important with regard to within site topographical heterogeneity. Consequently, over the relatively small area of the Firth Block a range of slopes, aspects, and topographical features are present.

Undulating hill tops feature well-drained soils of low fertility from loess with some fine alluvium. Hill slopes are also well drained mudstone, sandstone, and argillite of moderate fertility (Mitcalfe, 1997). It is likely that historical forest cover by rimu-rata/tawa forest was a contributing factor to soil development in the area (Gibbs, 1958).

The climate is generally mild, with high solar radiation, moderate vapour pressure deficits and low annual water deficits (Leithwick et al., 2003). Rainfall rates are variable throughout the calendar year, with mean January rainfall of 86 – 140 mm, mean July rainfall of 135 – 229 mm, and mean annual rainfall of 1,200 – 2,400 mm. Consequently rainfall is not considered to have been a factor limiting natural forest development at the Firth Block. Air temperatures are characterised by a mean maximum January temperature of 26°C, mean minimum temperature in July of -1°C, and a mean annual daily temperature of 12°C.

3.2 Vegetation and habitats

3.2.1 Vegetation types

Summary of vegetation types and areas

Table 1 and Figure 1 provide a summary of the vegetation community types present across the extent of extraction and remainder of the Firth Block site (note – areas have been corrected for slope, so do not match with areas which may be stated elsewhere).

Table 1: Vegetation summary, composition and areas within the proposed extraction area and the remainder of the Firth Block.

Vegetation description	Map symbol	Number for map	Slope corrected area (ha)		
			Total polygon area	Inside of footprint	Outside of footprint
Titoki forest	Ae	1	0.1499	0	0.1499
Mahoe-five finger-mamaku forest	Mr-Pa-Cm	2	0.1977	0	0.1977
Mamaku-mahoe forest	Cm-Mr	3	0.6115	0.1785	0.433
Broadleaved-tree fern forest		4	1.2483	1.2483	0
Gorse forest	Ee	5	0.0603	0.0603	0
[rewarewa]/tawa/mamaku forest	Bt	6	0.4652	0.0037	0.4615
Gorse-mahoe forest	Ee-Mr	7	0.225	0	0.225
Mamaku forest	Cm	8	0.2086	0.0507	0.1579
Broadleaved low forest	Ma	9	0.2987	0.2987	0
Broadleaved-tree fern low forest		10	1.9312	1.9312	0
Mixed broadleaf forest	Mr-Gl	11	0.9499	0.9499	0
Mahoe-buddleja scrub	Mr-Bd	12	0.6294	0.1627	0.4667
Buddleja-gorse shrubland	Bd-Ee	13	0.5256	0.0263	0.4993
Buddleja-gorse shrubland	Bd-Ee	14	0.6312	0	0.6312
Karamu shrubland	Cr	15	0.0353	0	0.0353
Tawa forest	Bt	16	0.7197	0.7197	0
Mapou-mahoe-pigeonwood low forest	Ma-Mr-Ha	17	0.201	0.201	0
Rewarewa/tawa-mahoe forest	Ke/Bt-Mr	18	0.5086	0.5086	0
Mahoe/gorse-buddleja	Mr/Ee-Bd	19	0.7735	0.4541	0.3194
Bare ground	Bare ground	20	0.0229	0	0.0229
Mixed indigenous and exotic low forest		21	2.456	0	2.456
Mixed indigenous and exotic shrubland		22	0.9757	0	0.9757
Low indigenous broadleaved forest		23	0.4458	0	0.4458
Tawa forest	Bt	24	0.3807	0.3807	0
Manuka-broadleaved forest		25	0.602	0	0.602
Tawa/mamaku-pigeonwood forest	Bt/Cm-Ha	26	0.1281	0	0.1281
Gorse scrub		27	0.038	0	0.038
Podocarp-broadleaved forest		28	0.1588	0	0.1588
Broadleaved-tree fern low forest		29	0.0478	0	0.0478
Rewarewa/broadleaved-tree fern forest		30	0.2091	0	0.2091
Tawa forest		31	0.8159	0	0.8159
Various exotic pioneering weeds		32	6.0971	3.8813	2.2158
Sums (ha):			**22.7485**	**11.0557**	**11.6928**
Exotic dominant vegetation =			**7.98**	**4.13**	**3.85**
Indigenous, and predominantly indigenous vegetation =			**14.77**	**6.93**	**7.84**

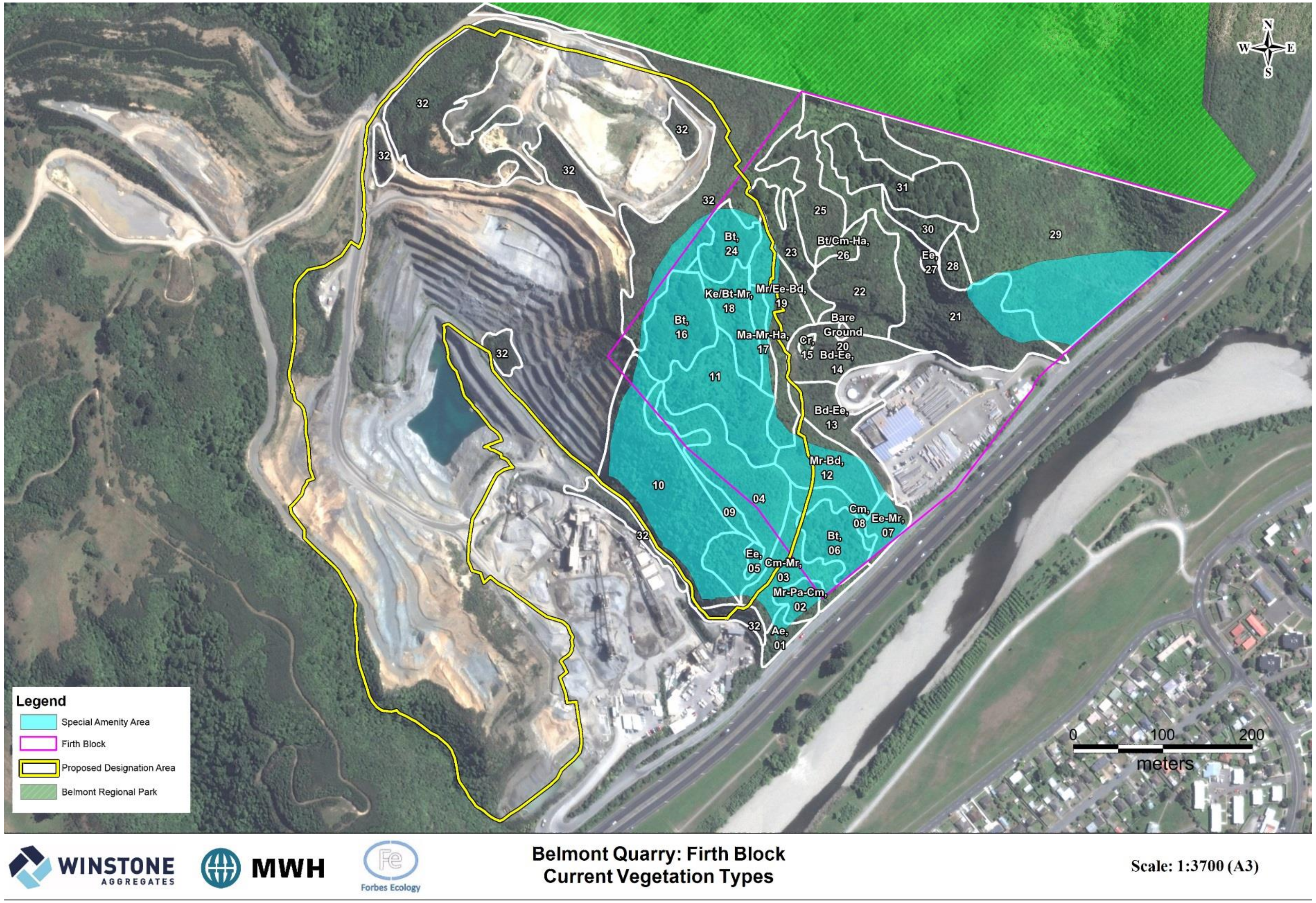

Figure 1: Current vegetation patterns of the proposed extraction area and wider Firth Block. See Table 1 for map key.

Proposed extraction area

Tawa forest (Units 16 and 24). Two almost contiguous areas of mature tawa forest are located on the Hawera Series terrace formation, in a position towards the central area of the proposed extraction area. Those two forest areas are referred to herein as Unit 16 (the southern-most forest stand) and Unit 24 (the northern-most forest stand, 0.38 ha). For the purposes of this description these two areas are considered to be very similar in character, and the following description of Unit 16 is provided to cover both areas.

Unit 16 has a tree basal area (BA) of 37.9m^2/ha, a tree density of 440.7 stems/ha, and an area of ca. 0.71 ha. The forest canopy is dominated by tawa (66.2% BA), with mahoe (8.3% BA), hinau (5.5% BA), pigeonwood (4.9% BA), and five finger (2.2 % BA) as more minor canopy components[1]. Mapou and nikau were also observed in the forest canopy outside of the PCQ survey plots. Emergent above the tawa canopy are rewarewa, which are significant in terms of forest composition—comprising 12.8% BA. The forest canopy ranges in height from ca. 12 – 20 m. Nikau appears to have a strong association with landform in this area, with mixed age nikau stands occurring on wetter, low-lying sites, often in association with wineberry, kawakawa, supplejack, kiekie, and New Zealand passionfruit.

Tree ferns are an important part of the forest understorey structure—silver fern is the most frequent, with trunk heights of 0.2 – 5.2 m measured during the survey. Rough tree fern, and mamaku are also present. A diverse assemblage of seedlings and saplings of indigenous shrub and tree species is typical. Seedlings and saplings of tawa, hinau, rewarewa, nikau, pigeonwood, kawakawa, marbleleaf, lancewood, karamu, kohuhu, and mahoe were all observed in varying densities. One miro seedling <5 cm tall was found within this area[2]. Groundcover comprises a well composed forest litter layer along with areas of ground ferns, such as thread fern and filmy fern. The observed species and structural diversity from the forest understorey provides a good indication that processes such as pollination, propagule dispersal, seedling establishment, and forest recruitment are functions performing well within this forest.

Mixed broadleaved forest (Unit 11). A forest area of considerable floristic diversity and retaining old-age forest attributes is located in the face and gully landforms of Unit 11. The crowns of three very mature pukatea[3] trees are prominent when this area is viewed

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[1] See Appendix A, Photograph 1.
[2] Miro seedling found at location: E2674260 N6002731 (NZMG).
[3] One pukatea located at E2674338 N6002588 (NZMG) and two pukatea located at E2674362 N6002586 (NZMG).

from a distance[4] (looking up and toward the south from the Firth Yard turn-around area), as are three mature black beech trees.

The pukatea trees are located at mid–lower portion of a very steeply sloping face[5] (ca. 30 – 35° slope). The characteristic 'plank buttressed trunks' make DBH measurement of these pukatea difficult—however trunk diameters for these three trees are all greater than 70 cm DBH, the largest two trees being ca. 100 cm DBH. Large diameter (ca. 11 cm DBH) New Zealand passionfruit vines climb the pukatea trees and pukatea limbs host epiphytic growth of puka (*Griselinia lucida*), perching astelia (*Astelia solandri*), and spring orchid (*Earina mucronata*). The New Zealand passionfruit vines present are of considerable age, possibly up to ca. 100 years old (Horne & Mitcalfe, 2013), and as they presumably would have required pukatea to be of tree stature to establish—their presence helps corroborate the notion that these pukatea are indeed old trees. Based on their diameter, the diversity of epiphytes, and presence of old vines it is clear these trees are relict components of an earlier forest cover at the site, rather than originating from the predominant forest cohort they are currently located within. There are few pukatea remaining in the Hutt Valley on the western side of the Wellington Fault of this cohort (Horne & Mitcalfe, 2013). It is quite probable that these trees established during pre-European times, adding to the significance of the forest in this area. Pukatea seedlings are present on the forest floor, within the vicinity of these mature trees.

Three black beech trees are located in hot and dry north facing positions on the face landform within Unit 11[6], overlooking the Firth Masonry Plant[7]. These specimens were previously considered to be of particular significance as they were thought to represent the southernmost occurrence of the species on the western side of the Wellington Fault. However, during the course of this assessment two mature black beech trees were observed approximately 6 km further to the south, in a position directly adjacent to Harbour View Road. Black beech has a naturally patchy distribution within the lower North Island. The broader species distribution includes the Tararua-Rimutaka mountain complex, and areas to the east and southeast of the Hutt Valley, including the Aorangi Range (Wardle, 1969). The Hutt River catchment defines the species western boundary (Wardle, 1969) and the species is uncommon to the west of the Wellington Fault (Horne & Mitcalfe, 2013). In this context the specimens from the Firth Block are part of a small number of individuals located at or near the southwestern extent of the (regional) species range.

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[4] See Appendix A, Photographs 2 and 3.
[5] See Appendix A, Photograph 4; and Appendix B.
[6] See Appendix A, Photograph 5; and Appendix B.
[7] One specimen of 0.58 m DBH located at E2674422 N6002587 (NZMG) and a pair, the largest of 76 cm DBH located at E2674369 N6002576 (NZMG).

Other attributes of the forest tree composition include mature broadleaf (*Griselina littoralis*), mahoe up to 50 cm DBH, mature nikau with prolific seedling stocks, and small-leaved milk tree (*Streblus heterophyllus*). Two fern species—*Arthropteris tenella* and *Trichomanes endlicherianum*—not found elsewhere on the Firth Block were found on a rock outcrop in this area. Prolific growth of supplejack is a characteristic of gully landforms in this area and the presence of kiekie provides further evidence to support the idea that this forest area has old-age attributes.

Rewarewa/tawa-mahoe forest (Unit 18). A defined ridgeline ascends from Unit 11 towards Unit 24. This area features a narrow ridge crest, with a very steeply sloping face overlooking the Firth Yard to the east, and an easier contoured gully to the west, abutting Unit 16. Unit 18 supports a diversity of broadleaved forest tree species, with canopy heights ranging from 3 – 6 m. Mahoe and tawa are most prominent within the forest canopy, and rewarewa are emergent. Pigeonwood and mapou are common components of the forest canopy here, and hinau, nikau, and lancewood also occur. A pole of miro[8] was noted on the ridgeline on a south facing position at E2674351 N6002719 (NZMG). Its crown was in the canopy along with mapou and rewarewa. The podocarp observation provides an indication that further podocarp regeneration within this forest remnant could be expected over time. Also present on the dry ridgeline was a twin trunked mapou—with trunks of ca. 25 and 28 cm DBH, kamahi of 20 cm DBH, and one small-leaved milk tree of ca. 7 m tall.

Mapou-mahoe-pigeonwood low forest (Unit 17). Downslope from Unit 18, above the border of what was actively quarried in the 1980s, is a belt of low statue broadleaved forest. This area does not have the emergent rewarewa component seen in Unit 18. As well as the main canopy species—mapou, mahoe, and pigeonwood—lancewood, broadleaf (*Griselina littoralis*), and rough tree fern are present, as are areas of exotic weeds such as gorse and broom (presumably in areas at the fringe of the area formerly disturbed by quarrying).

Broadleaved-tree fern low forest (Unit 10). This steeply sloping south-facing site is of a very mixed composition of indigenous broadleaved trees with areas dominated by stands of tree ferns, of ca. 1.93 ha[9]. An exotic vegetation component is evident towards the toe of the slope, presumably the result of disturbance to the lower slopes in past decades. Review of historical aerial photographs from the 1960s provide evidence to corroborate our view that the vegetation cover of Unit 10 is more advanced than Units 9 or 4, but

[8] Height of 6 m and DBH of 8 cm DBH.
[9] See Appendix A, Photograph 6.

should still be regarded as early–mid successional in the context of a forest succession characteristic of the Firth Block.

Broadleaved low forest (Units 4 and 9). These areas of ridge and face landform support early and early–mid successional communities which are recovering from past clearance, much of the regeneration has developed in a succession from gorse. Evidence of this is provided by remnants of gorse—both living (e.g. Unit 5) and dead gorse trunks/stems—and from the vegetation map contained within the 1997 Significant Natural Resource assessment (Mitcalfe, 1997).

Tree fern and tree fern-broadleaved forest (Units 3 and 8). The western portions of both of these Units fall within the proposed extraction area. A low forest canopy is formed by continuous or semi-continuous mamaku (*Cyathea medularis*) cover[10]. While those broadleaved species which are common to the site are dispersed across these areas, canopy cover is dominated by tree fern cover. Tree ferns are renowned for the heavy shade cast down from their fronds (Coomes et al., 2005), and it is quite possible that successional development from these areas of the Firth Block would be slower (perhaps even arrested) than from areas under indigenous broadleaved forest canopy.

Predominantly exotic communities (Units 5, 12, 13, 19, and 32). Unit 5 is a small area of gorse which is currently being outcompeted by indigenous forest growth. This area provides an insight into recent successional processes (indigenous succession from gorse) in this area of the Firth Block, and provides evidence that provided that maintenance of a temporary gorse cover is acceptable to management aims, at sites like this, indigenous succession from gorse is a viable successional pathway at the Firth Block.

Units 12, 13, and 19 represent ground disturbed from past quarry activity at the Firth Block. Ground disturbance from quarrying activities occurred at different intensities and times over areas within these Units. It appears these areas were generally retired from extraction over the period 1980 – 1988, making it ca. 25 – 33 years since retirement. Vegetation has a substantial exotic plant pest component; these areas are some of the poorest developed within the Firth Block in terms of indigenous flora values. In many areas ground slopes are steep and topsoil appears to be shallow, and is underlain with rock. Those plant species present characteristically fill the pioneering phase of successional forest development. Examples include (exotic) buddleia, gorse, broom, Himalayan honeysuckle—and (indigenous) manuka, mahoe, koromiko, rough tree fern, tutu, and karamu.

[10] See Appendix A, Photograph 7.

Unit 32 represents a mixed composition of exotic pioneering plant pests such as broom, gorse, and buddleia. These areas are recently disturbed and are of low ecological value.

Outside of proposed extraction area

Southern-most Special Amenity Area—area proposed to be retained (Units 1, 2, 3, 6, 7, 8). This area of the Firth Block features well developed indigenous forest cover (relative to other areas of the site). The main floristic features include: Unit 1, ca. 0.14 ha of titoki forest; Unit 2, ca. 0.19 ha of mahoe-five finger-mamaku forest; Unit 3, ca. 0.61 ha of mamaku-mahoe forest; Unit 6, ca. 0.46 ha of rewarewa/tawa/mamaku forest. The tree fern, mamaku, is a common component across this area, and the role that fern is having in forest succession would be worth considering if the area was to be considered in a restoration context. Elsewhere (Units 7, 8, and 12) within this Special Amenity Area vegetation is early–mid successional, with varying proportions of indigenous and exotic species composition. Overall this area is of considerable indigenous forest value. Value is derived from the occurrence of structured forest communities (e.g. titoki, tawa, rewarewa) and the restoration potential of the area is worthy of further consideration.

Central, northern, and eastern Firth Block (Units 14, 15, 19, 20 – 22, 23, 25 – 31). This area, generally to the north of the buildings on the Firth Masonry Plant, is an area of complex topography and disturbance history. Ground disturbance associated with quarrying that occurred over parts of Units 14, 15, 19, 20, 21, 22 from as early as 1958, but certainly at greater intensity during the 1970–1980s. This is partly evident from the ground terracing of Unit 22. Yet other areas (Units 28, 30, 31) were not affected by extraction or the forest clearance which had occurred earlier, probably associated with pastoral conversion, across the surrounding landscape. Consequently today's vegetation pattern across this area is varied, ranging from communities of Unit 14 comprising exotic and indigenous pioneering and early successional species through seral communities of broadleaved and grey shrubs/trees (e.g. Units 21 and 25)[11] to areas of high value mature broadleaved forest (e.g. Unit 31), and patchy podocarp regeneration amongst broadleaved forest (Unit 28).

The existing northern-most Special Amenity Area, and its proposed extension cover a considerable proportion of this area. Part of Units 21 and 29 are within the existing Special Amenity Area; and Units 21, 22, 25, 26, 28, 29, 30 and 31 are within the area proposed to be added to this Special Amenity Area. Units 31, 30, and 28 are the key floristic features of these areas. Unit 31 represents an area of ca. 0.81 ha of mature tawa forest on Hawera Terrace landform. Hinau and pukatea are occasional within the

[11] See Appendix A, Photograph 8.

forest canopy. The forest understorey is complex and floristically diverse. Healthy forest regeneration is apparent within this forest area. This site is highly viable and a logical component of any potential future restoration programme. Further potential may be derived from its position almost contiguous with the Belmont Regional Park. Unit 30 represents broadleaved forest with a significant mamaku component, and emergent rewarewa. Abutting to the south, Unit 28 is floristically very interesting insofar as the podocarps—rimu, totara, and miro—are established and regenerating amongst broadleaved forest. Unit 28 represents the highest concentration of podocarps anywhere on the Firth Block.

3.3 Avifauna

3.3.1 Firth Block bird community

The bird community of the Firth Block is representative of a community from a lower North Island lowland indigenous forest ecosystem. The common indigenous species present in March 2013 were: silvereye, bellbird, tui, New Zealand pigeon, fantail, and grey warbler. Indigenous species richness (expressed as the number of different indigenous species detected per count site) at the Firth Block is comparable to mean richness statistics from both Wellington City and Wairarapa bush reserves (data from 2012, see Figure 3.1 in McArthur, Moylan, and Crisp (2012)). Indigenous species abundance accounted for ca. 75% of the bird community at the time of the March 2013 bird counts; while exotic species accounted for the remaining ca. 25% (Figure 2).

The relative abundance of indigenous species would change throughout the year as seasonal food supplies from vegetation come-and-go. This would be particularly the case for New Zealand pigeon, which were found in relatively high numbers at the Firth Block during the March 2013 bird counts—while tawa was in fruit. It is likely that 10+ pigeon were in the area at that time. Also tui and bellbird are likely to show seasonal patterns in abundance—rewarewa at the site would provide a seasonal nectar supply. This is a particularly important consideration in the context of an Acutely Threatened Environment, such as this, where <10% indigenous cover remains, and only a proportion of that cover provides fruit and nectar sources. This increases the seasonal importance of those resources provided by the Firth Block.

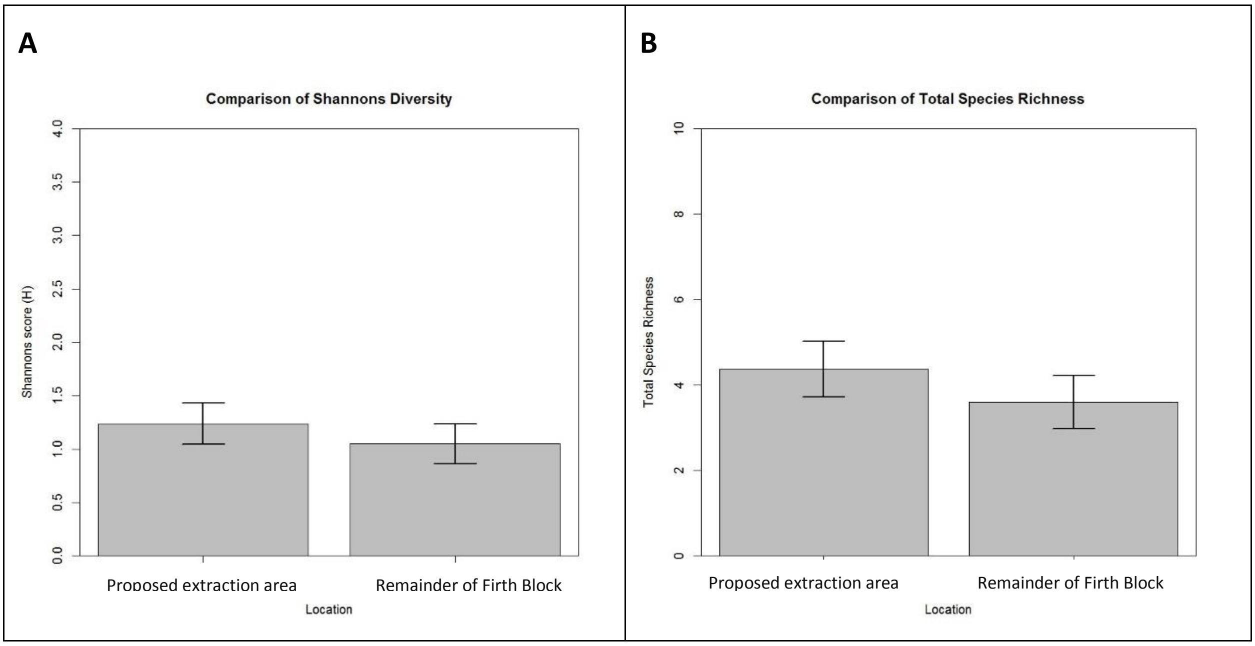
The presence of healthy populations of New Zealand pigeon, tui, and bellbird is an important observation with regard to ecological valuation of the Firth Block as these species are regarded as keystone species (Anderson, Kelly, Robertson, Ladley, & Innes, 2006) in New Zealand lowland forest ecosystems. They are responsible for a disproportionally large proportion of pollination and seed dispersal functions and without them it is considered diversity aspects of forest systems would largely collapse (Anderson et al., 2006). That pollination and seed dispersal functions via bird vectors is occurring at the Firth Block is clearly evident from indicators such as karaka seedlings dispersed across the site, podocarp establishment remote from podocarp stands, and it is probably also reflected in what is a moderate floral diversity within the Firth Block itself—despite the site's history of simplification by land clearance and modification of cover.

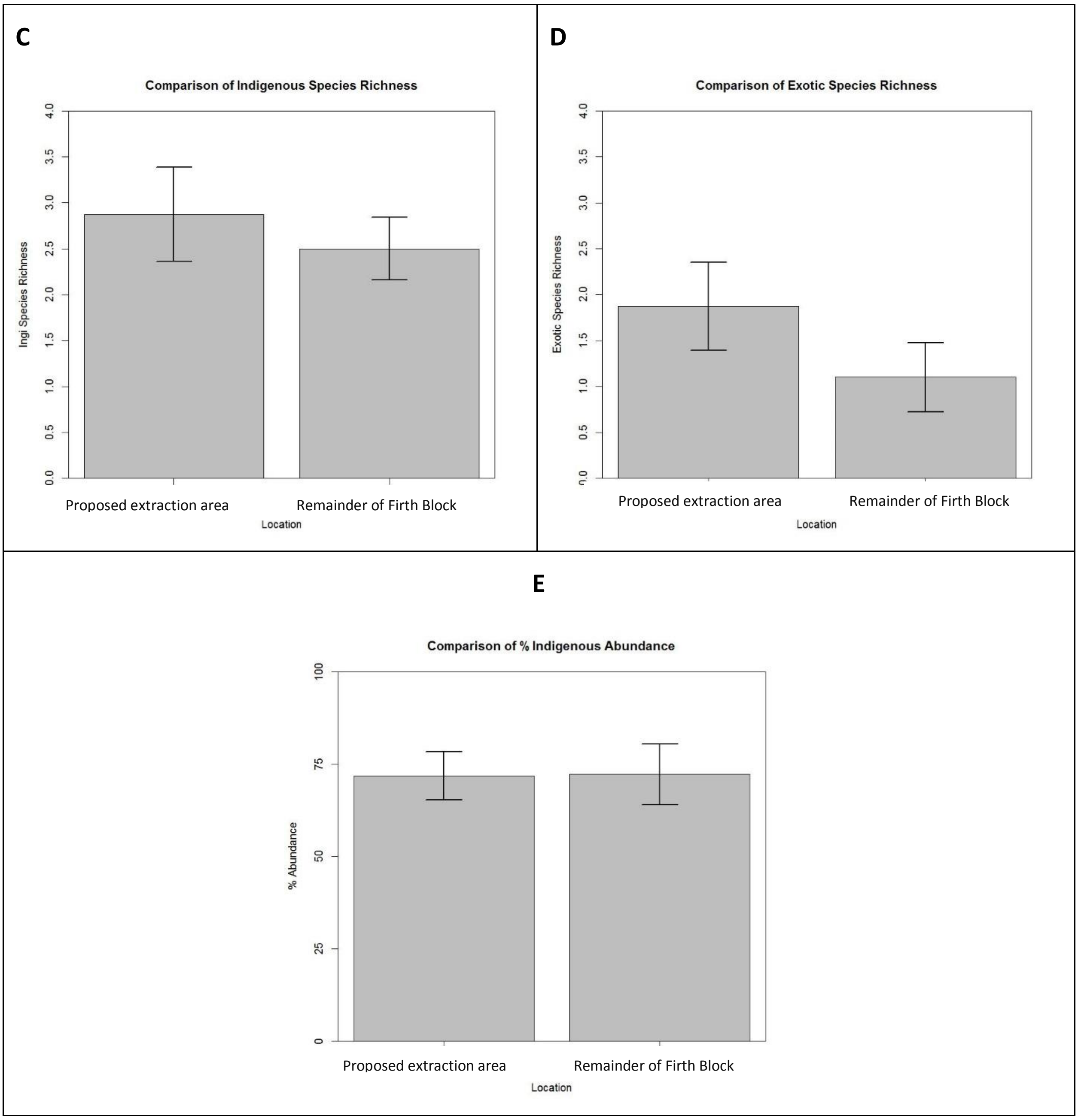
Not detected by the bird counts, but also present at the Firth Block were the indigenous owl—morepork, and little pied cormorant (see Stephenson, 2013). Shinning bronze-cuckoo would almost certainly be present at the site during spring and summer when they return to New Zealand to breed. Long-tailed cuckoo may occasionally pass through the site, but given its parasitic host was not detected at the site, they are unlikely to breed at the site. Harrier frequent the wider area and falcon may pass through the site infrequently.

Of the bird species observed in the March 2013 survey; only one bird holding a National Threat Classification (see Miskelly et al. (2008)) was found to be present—little pied cormorant (Naturally Uncommon).

3.3.2 Comparison between proposed extraction area and remainder of site

Results from the March 2013 bird counts were allocated based on location to be either within the proposed extraction area or from the remainder of the site. Comparison of means from the two data sets shows bird diversity, species richness, and percentage relative indigenous abundance are similar across the site (see Figure 2).

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Comparison of Indigenous Species Richness
Ingi Species Richness
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0
Proposed extraction area
Remainder of Firth Block
Location
D
Comparison of Exotic Species Richness
Exotic Species Richness
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0
Proposed extraction area
Remainder of Firth Block
Location
E
Comparison of % Indigenous Abundance
% Abundance
0 25 50 75 100
Proposed extraction area
Remainder of Firth Block
Location

F

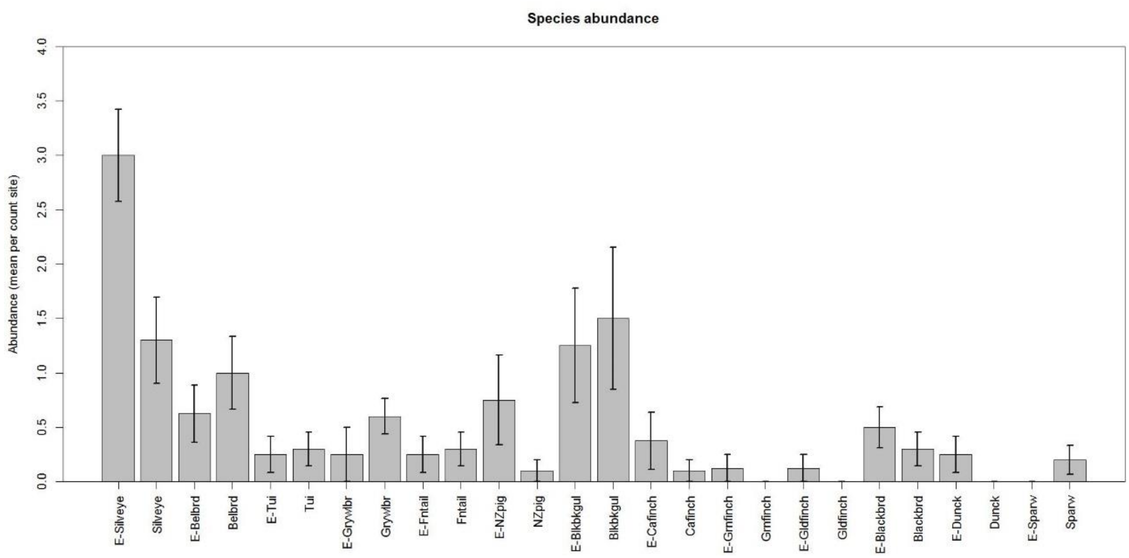

Figure 2: Data summarised from 5-minute bird counts. Data from count stations grouped according to location within or outside of the proposed extraction area. (A) Comparison of Shannon-Weiner Diversity Index scores, (B) Comparison of mean total species richness, (C) Comparison of mean indigenous species richness, (D) Comparison of mean exotic species richness, (E) Comparison of mean % indigenous species abundance, (F) Mean relative abundance of all species surveyed. Error bars represent one standard error of the mean.

3.3.3 Landscape scale avifauna values

Bird survey records from nearby forest areas provide some wider context of the local bird community. New Zealand kaka, parakeets (*Cyanoramphus* sp.), sacred kingfisher, rifleman, whitehead, North Island robin and North Island tomtit were not detected at the Firth Block in March 2013 but are found in low numbers in some other nearby areas such as the Belmont Regional Park, Keith George Memorial Park, other Upper Hutt reserves, and Wi Tako Reserve (McArthur, Moylan, & Crisp, 2012).

Interestingly, ca. 10 km to the south of the Firth Block, the Korokoro and Horokiwi Valleys have been receiving intensive multi-species pest control for a number of years, and consequently the area is loosely being managed as a “Mainland Island”. Heavily depressed predator numbers have facilitated several re-colonisation events by previously locally-extinct indigenous bird species—namely: red-crowned kakariki, tomtit, whitehead, and bellbird (personal communication N. McArthur, 10 April 2013). This provides an indication of the potential of forests in the area to provide habitat for special bird species, in the presence of targeted management.

The Korokoro and Horokiwi Valleys, the Cannons Creek entrance, and the Dry Creek entrance to the Belmont Regional Park have been subject of bird surveys over recent years. Presence-absence data from those surveys is presented in Table 2. This data provides an indication that the bird community of the Firth Block is comparable with bird communities from those Belmont Regional Park sites with regard to occurrence of common species. The presence at the Firth Block (temporary or otherwise) of more unusual species, listed above as ephemeral in their occurrence in lowland forests near the Firth Block, has not been confirmed from the current assessment.

Lower Hutt Forest and Bird ("Forest & Bird", 2013) promote a notion of ecological corridors within the Wellington Region, one being from Haywards along the western Hutt hills—taking in parts of the Belmont Regional Park, including the Firth Block, and other areas of indigenous forest along the hill country to Korokoro and beyond. It can be accepted that in a modified landscape such as the Hutt valley, where urban and pastoral development has led to removal of much of the native cover, such tracts of indigenous vegetation take on a heightened importance with regard to habitat which facilitates the persistence and movement of species and genes across the landscape.

The value of such features is greater where they provide scarce habitat attributes or unusual resources—such as seasonal supplies of certain foods which maintains or contributes to the ecological health or functioning of an area. In this context, the Firth Block is part of what is considered to be an 'ecological corridor', and although removal of the proposed extraction area would not cause a break in continuity of the corridor, elements of the vegetation composition in the Firth Block—most principally tawa and rewarewa, (but also other plant species) certainly provide an uncommon seasonal resource for birds from the nectar and fruit feeding guilds.

Table 2: Bird presence/absence data from three Belmont Regional Park sites and the Firth Block. Data from personal communication N. McArthur 10 April 2013, and Stephenson (2013).

Species	**Kokokoro & Horokiwi**	**Cannon's Creek**	**Dry Creek**	**Firth Block (entire site)**
Australasian magpie	×			?
Australasian harrier			×	?
Bellbird	×		×	×
Black-backed gull	×		×	×
Californian quail				×
Common blackbird	×	×	×	×
Chaffinch	×	×	×	

Species	Kokokoro & Horokiwi	Cannon's Creek	Dry Creek	Firth Block (entire site)
Dunnock	×	×	×	×
Eastern rosella	×			×
Feral goose	×			
Goldfinch	×	×		
Great cormorant				?
Greenfinch	×	×		
Grey warbler	×	×	×	×
House sparrow	×	×		
Kaka	×			?
Kereru	×	×	×	×
Little black cormorant		×		?
Little pied cormorant				×
Long-tailed cuckoo				
Mallard duck	×	×		×
Morepork				×
New Zealand fantail	×	×	×	×
New Zealand falcon	×		×	?
New Zealand kingfisher	×			?
North Island robin				?
North Island tomtit				?
Pacific black duck				?
Paradise shelduck	×			?
Red-billed gull		×		?
Black-bulled gull				?
Red-crowned parakeet	×			?
Yellow-crowned parakeet				?
Redpoll	×	×		
Rifleman				?
Rock pigeon				?
Shinning cuckoo	×			?
Silvereye	×	×	×	×
Skylark	×	×	×	
Song thrush	×			×
Masked lapwing				×
Starling	×	×		×
Tomtit	×		×	

Species	Kokokoro & Horokiwi	Cannon's Creek	Dry Creek	Firth Block (entire site)
Tui	×	×	×	×
Welcome swallow	×	×		?
Whitehead	×	×	×	?
Yellowhammer	×	×		

Notes: × = present. ? = possibly present at the Firth Block based on historical records.

3.4 Herpetofauna

The assessment undertaken in relation to lizard values at the Firth Block is reported separately and in full by Bell et al. (2013). Therefore an overview of key points to support the assessment of environmental effects is provided here (in particular see summary in Table 4).

A review of records for extant gecko and skink taxa known to occur from the Tararua and Wellington Ecological Districts coupled with an appraisal of the likelihood of their presence within the Firth Block found that (also see Table 4):

1. There was a high likelihood of two gecko and one skink species to be present;
2. A moderate likelihood of one further gecko and two further skink species to be present; and,
3. A low likelihood of one further gecko species to be present.

Three geckos and one skink species are known from the adjacent Belmont Regional Park (see Table 4).

Within the proposed extraction area, lizard habitat quality is of moderate to high value. The area of highest quality habitat in the vicinity of proposed extraction area, actually falls outside of the development footprint—it is the area of regenerating indigenous shrubland/young forest of Unit 25. This area provides ideal habitat for all species considered to be potentially present—with the exception of common skink. Of highest value to lizards within the proposed extraction area are the ridge-top areas within the forested habitats of Units 16, 10, 9, and 4. These ridge-top habitats would provide suitable habitat for all species considered potentially present except for common skink, and possibly common gecko. Although notable for their forest flora and bird habitat values, the younger forest areas of Units 1, 2, 3, and 6 (of which Units 1, 2, and 6 are outside of the proposed extraction area) are likely to be too shaded to provide quality lizard habitat.

A total of 13 entire lizards and one gecko skin were found. The 13 occurrences comprised of two species—common skink and southern North Island forest gecko. No traces of lizards were found in the adjacent Belmont Regional Park, which could have possibly been due to low survey replication in that area

The common skink was found at 12:28 pm on 21st May 2012, during day searching in the vicinity of the silt ponds (E2674304.7 N6002955.9 (NZMG)). The skink was found underneath at rock of dimensions 10 × 20 cm amongst a pile of tailings on the disturbed north-eastern edge of the road leading to the silt ponds. This common skink record comes from an area outside of the Firth Block, but within the footprint of the proposed extraction area. The record comes from what would be considered the vegetation type of Unit 32, albeit perhaps this location is more open in character.

Twelve southern North Island forest gecko results were located in the Firth Block, along with one gecko skin. Nine of those geckos were found within the proposed extraction area on the Firth Block. The gecko skin was also found within the proposed extraction area on the Firth Block, in Unit 10 (broadleaved-tree fern low forest). The remaining four geckos were found outside of the proposed extraction area—in Units 25 (manuka-broadleaved forest) and 29 (broadleaved-tree fern forest).

Despite not detecting Wellington green gecko during the survey, it is considered highly likely that the species is present at the site—but was simply not detected through survey work to date. This is on the basis that green gecko are a highly cryptic species that is extremely difficult to detect in complex and tall forest. However, high quality Green gecko habitat does exist on the Firth Block for this species, and the presence of green gecko’s in the Firth Block cannot be ruled out.

Table 3: Summary of southern North Island forest gecko (and gecko skin) finds within the Firth Block.

Forest gecko number[#]	**Transect-cover**	**Vegetation Unit**	**Within proposed extraction area**	**Description**
1	C-16	~9	Yes	Mapou forest
8	C-16	~9	Yes	Mapou forest
2	C-26	~9 & 4	Yes	Mapou forest, broadleaved-tree fern forest
Skin	D-8	10	Yes	Broadleaved-tree fern low forest
13	Spotlight^	10	Yes	Broadleaved-tree fern low forest
12	D-24	~16, 32	Yes	Tawa forest (at outside margin of)
12	D-24	~16, 32	Yes	Tawa forest (at outside margin of)
3	E-18	18	Yes	Rewarewa/tawa-mahoe forest
4	E-18	18	Yes	Rewarewa/tawa-mahoe forest
9	E-18	18	Yes	Rewarewa/tawa-mahoe forest
5	F-3	25	No	Manuka-broadleaved forest
10	F-3	25	No	Manuka-broadleaved forest
11	F-26	25	No	Manuka-broadleaved forest
7	F-29	25	No	Manuka-broadleaved forest
6	G-1	29	No	Broadleaved-tree fern forest

Notes: # Numbering follows Bell et al. (2013), Table 7. ^ E2674241.1 N6002614.8 (NZMG).

Table 4: Likelihood of gecko and skink species occurrence based on desktop assessment; reproduced from Bell et al. (2013).

Species name	**Likelihood of occurrence**	**Threat classification#**	**Known from BRP^**	**Detected within Firth Block¥**
		Geckos		
Southern North Island forest gecko, (*Mokopirikakau* sp.) 'Southern North Island'	High	At Risk—Declining	Yes	Yes
Wellington green gecko, (*Naultinus punctatus*)	High	At Risk—Declining	Yes	No
Pacific gecko (*Dactylocnemis pacificus*)	Moderate	At Risk—Relict	No	No
Common gecko (*Woodworthia maculata*)	Low	Not Threatened	Yes	No
		Skinks		
Common skink (*Oligosoma* aff. *Polychroma*) Clade 1a	High	Not Threatened	Yes	Yes
Ornate skink (*Oligosoma ornatum*)	Moderate	At Risk—Declining	No	No
Copper skink	Moderate	Not Threatened	No	No

Notes: #Threat classification follows Hitchmough et al. (2005). ^Based on Department of Conservation BioWeb Herpetofauna Database records (accessed 1 July 2013). ¥Survey results from Bell et al. (2013).

3.5 Landscape scale ecology considerations

The Firth Block is embedded within a landscape featuring tracts of broadleaved indigenous forest, mainly of early–mid-successional stages along with large expansive areas of high producing exotic grassland and built-up settlement areas. The Firth Block has landscape scale linkages to both the adjacent Belmont Regional Park, which in itself is a substantial natural area, and also to the regenerating indigenous forests of the western Hutt Hills[12]. The Firth Block itself is classified under the Threatened Environments (TENZ) system as "At Risk"[13], with the upper terrace where Units 16 and 24 are located being "Acutely Threatened"[14] land environments (Walker et al., 2007). This pattern extends to the wider landscape, with ridge top areas of the western Hutt Hills, and the Hutt Valley floor, being classed as "Acutely Threatened" land environments—nested within "At Risk" land environments. More distant areas which are obviously held under conservation management frameworks, where afforded legal protection, meets the classification criterion "Less Reduced and Better Protected"[15]. Following the TENZ rationale, clearance of indigenous cover from the Firth Block would exacerbate, perhaps disproportionally, existing effects of landscape modification to biodiversity.

Tawa dominated forest—which along with emergent rimu and northern rata was once the characteristic forest type of this area—is today very scarce within the landscape. Small pockets of tawa dominant forest are located off the end of Mossburn Grove (above Hebden Crescent) ca. 2 km to the south-west of the Firth Block. Small area(s) of tawa are also present on the Cottle Block, near the Firth Block and Unit 31 vegetation is present outside of the proposed extraction area, and within the Firth Block itself (and within the

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[12] Appendix A, Photograph 9.

[13] Biodiversity in these environments has been much reduced and habitats are seriously fragmented. Therefore, although loss is not as advanced as in Categories 1 and 2, the future persistence of species dependent on habitats in these environments is already compromised. Further habitat loss will exacerbate threats and decrease the security of biodiversity associated with these environments.

[14] Indigenous biodiversity in these environments has been severely reduced and remaining habitats are sparsely distributed in the landscape. Risks to biodiversity from fragmentation have become severe, threatening the persistence of many species in these environments. Further habitat loss will disproportionally exacerbate risks to biodiversity.

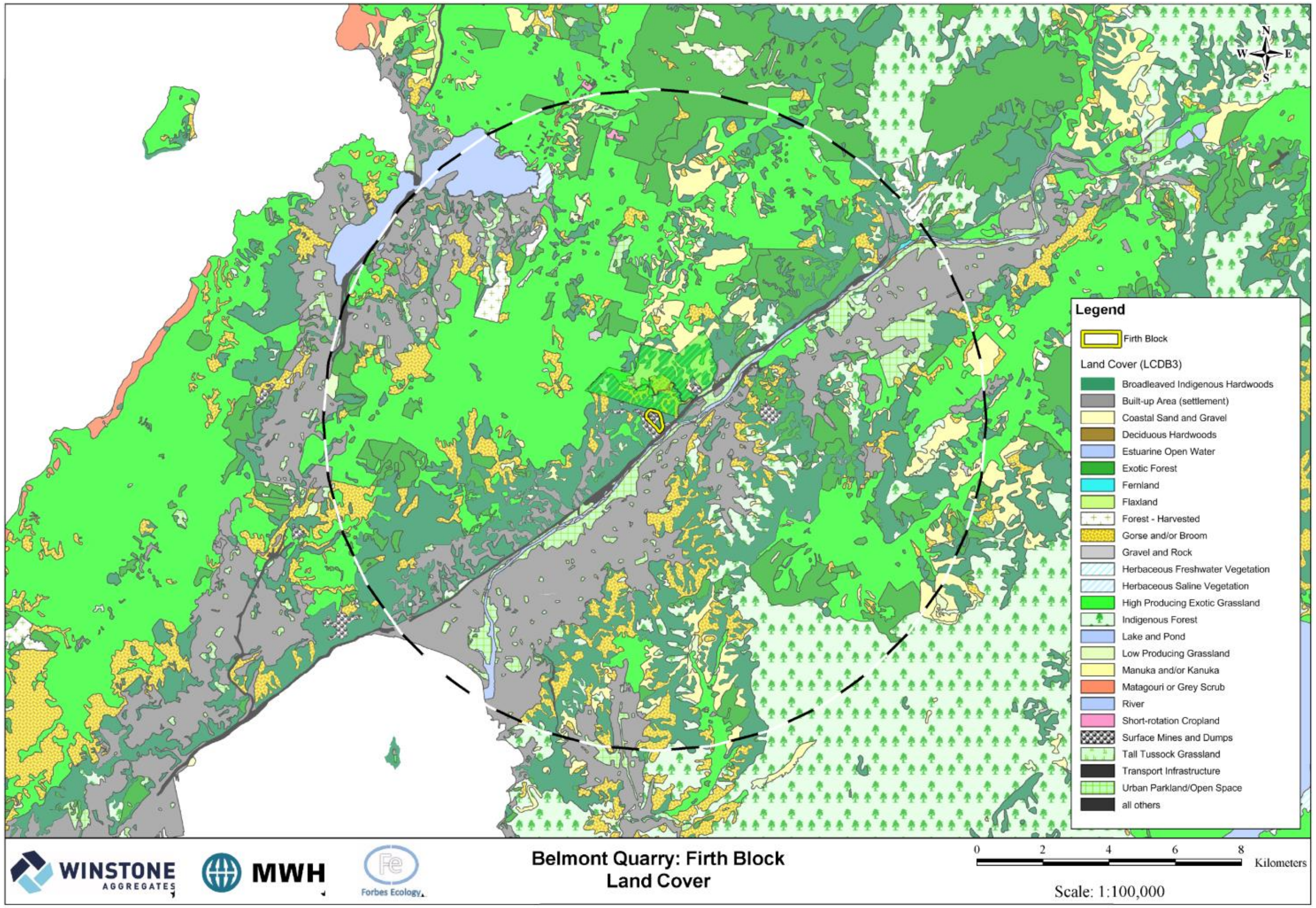
[15] Biodiversity is probably more secure from direct clearance of indigenous vegetation than in any other category. However biodiversity remains vulnerable to other threats such as pests, weeds and extractive land uses. Natural areas here will typically be larger, more intact and better connected, and will often support species, community types and ecotones that now remain only in relatively intact ecosystems. Many threatened species, including most threatened frogs, birds and bats now survive only here.

Special Amenity Area that is requested to be expanded). Further afield, ca. 3.2 km to the north-east, on a similar position above the Wellington Fault, Keith George Memorial Park provides the closest substantial forest area with tawa as a major component of the forest canopy. Over this distance it is likely that seed dispersal by birds would be less effective than dispersal over shorter distances, an important functional consideration when considering the value of indigenous forest remnants in a landscape context.

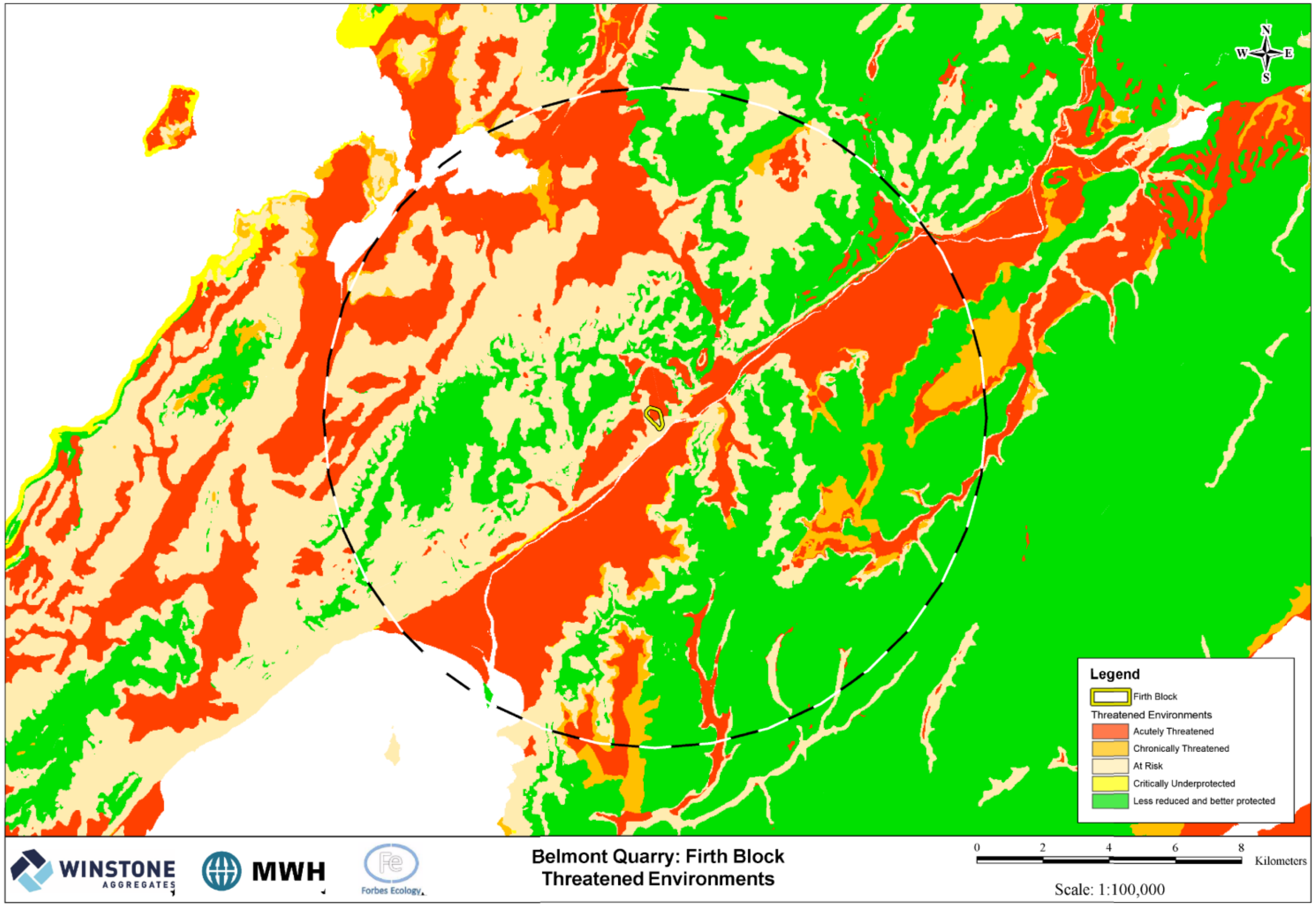
The notion of a wildlife corridor along this area of the Hutt Hills is valid with regard to the types of lowland birds which are present, the forest types they inhabit, and their ability to move across the landscape between patches of favourable habitat. Given the scarcity of tawa dominant forest within the landscape, and the important seasonal food source tawa forest from the Firth Block can provide, the loss of forest from the proposed extraction area would have to also be recognised as a loss at the landscape scale—in terms of loss of uncommon habitat and associated seasonal resources (e.g. tawa fruit, rewarewa nectar).

While not at the same spatial scale as birds, it is clear too that the lizard community of the proposed extraction area also have landscape scale values, insofar as the proposed extraction area provide a species source from which re-colonisation of surrounding areas (e.g. restored quarry areas) may occur from in the future. In this sense removal of forests within the extraction area constitute lost future opportunities for this dispersal to occur here.

A


Legend
Firth Block
Land Cover (LCDB3)
Broadleaved Indigenous Hardwoods
Built-up Area (settlement)
Coastal Sand and Gravel
Deciduous Hardwoods
Estuarine Open Water
Exotic Forest
Fernland
Flaxland
Forest - Harvested
Gorse and/or Broom
Gravel and Rock
Herbaceous Freshwater Vegetation
Herbaceous Saline Vegetation
High Producing Exotic Grassland
Indigenous Forest
Lake and Pond
Low Producing Grassland
Manuka and/or Kanuka
Matagouri or Grey Scrub
River
Short-rotation Cropland
Surface Mines and Dumps
Tall Tussock Grassland
Transport Infrastructure
Urban Parkland/Open Space
all others
N
W
E
S
WINSTONE
AGGREGATES
MWH
Forbes Ecology
Belmont Quarry: Firth Block
Land Cover
0
2
4
6
8
Kilometers
Scale: 1:100,000

B


Legend
Firth Block
Threatened Environments
Acutely Threatened
Chronically Threatened
At Risk
Critically Underprotected
Less reduced and better protected
N
S
E
W
WINSTONE AGGREGATES
MWH
Forbes Ecology
Belmont Quarry: Firth Block
Threatened Environments
0 2 4 6 8 Kilometers
Scale: 1:100,000

C


Legend
Firth Block
Belmont Regional Park
N
S
E
W
Belmont Quarry: Firth Block
Site Outline
0
2
4
6
8
Kilometers
Scale: 1:100,000

D

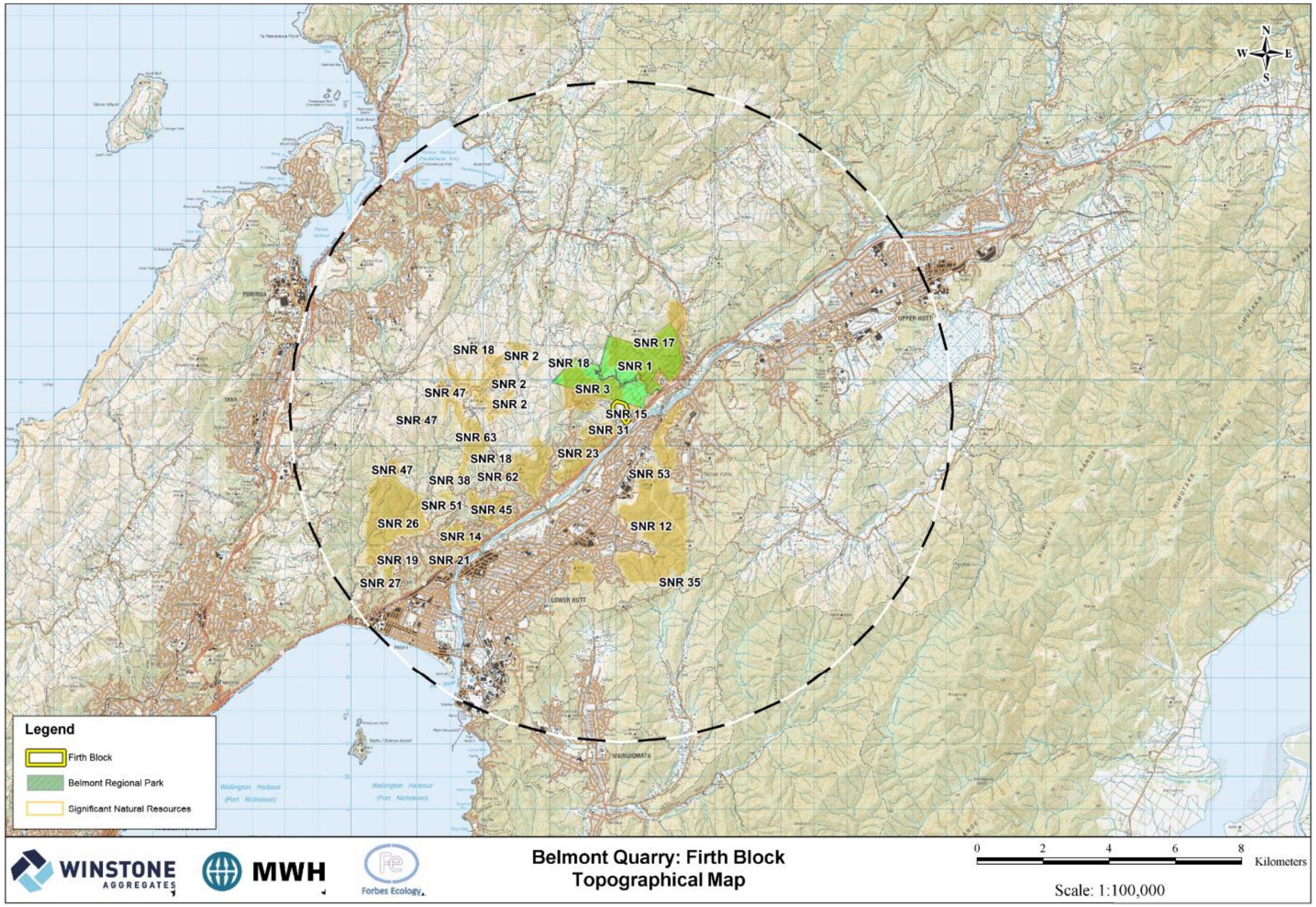


Figure 3: Ten km radius with overlays of (A) Land Cover Database 3, (B) Threatened Environments, (C) Aerial photograph, (D) Topographical map.

4.0 ECOLOGICAL SIGNIFICANCE ASSESSMENT

4.1 Relevant assessment criteria[16]

The Greater Wellington Regional Council Regional Policy Statement (GWRC, 2013), Policy 23 sets out criteria which are to be used by regional and district plans to identify and evaluate indigenous ecosystems and habitats with significant indigenous biodiversity values. Those criteria cover the Representativeness, Rarity, Diversity, and Ecological context of a feature. To be classed as having significant biodiversity values an indigenous ecosystem or habitat must fit one or more of the listed criteria. An analysis of the Firth Block, with separate consideration of the proposed extraction area is provided in Table 5 below.

[16] The Hutt District Plan does recognise parts of the Firth Block as a Significant Natural Resource, but does not provide any protection for such areas. Also that Plan has criteria for identification of such areas, but those criteria have been superseded by the 2013 GWRC RPS criteria (Policy 23), which have used as the basis for the following ecological significance assessment.

4.2 Ecological Significance of the Firth Block

Table 5: Application of GWRC criteria for the identification of indigenous ecosystems and habitats with significant indigenous biodiversity values.

GWRC Policy 23: Criteria for the identification of indigenous ecosystems and habitats with significant indigenous biodiversity values	Comment on applicability to Firth Block and proposed extraction area	Result against criterion
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).	The tawa dominant forest is representative of the original (pre-European) forests on these landforms. Those old forests also comprised emergent rimu and northern rata. Despite rimu being absent from the proposed extraction area, and only limited to a handful of specimens in Unit 28—and northern rata being absent entirely—the tawa remnants present are representative examples of this former forest type. Lowland tawa forest is no longer commonplace within the Wellington Ecological District (ED) and is scarce to the west of the Wellington Fault. The tawa stands of the proposed extraction area are Acutely Threatened environments (i.e. Land Environments with <20% indigenous cover remaining). Further—only 6% percent of the Wellington ED is legally protected for nature conservation (DoC,	Proposed extraction area: **Significant** Remainder of Firth Block: **Significant**

GWRC Policy 23: Criteria for the identification of indigenous ecosystems and habitats with significant indigenous biodiversity values	Comment on applicability to Firth Block and proposed extraction area	Result against criterion
	1996) so it is probable that <20% of remaining lowland tawa forest is legally protected. Tawa forests of the Firth Block are certainly no longer commonplace, and quite probably <20% of extant lowland tawa forest within the Wellington ED is legally protected.	
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.	The pukatea cohort of which the three pukatea trees are from—relict from what is considered to be pre-European times—is uncommon within the Hutt Valley, on the western side of the Wellington Fault. The three large black beech trees are among the few, southernmost-known, naturally occurring, mature black beech trees on the western side of the Wellington Fault, in the Hutt Valley. Southern North Island forest gecko (and if present Wellington green gecko) have the national threat classification of At Risk—Declining (Hitchmough et al., 2013). These species meet the Rarity criterion as they have	Proposed extraction area: **Significant** Remainder of Firth Block: **Significant**

GWRC Policy 23: Criteria for the identification of indigenous ecosystems and habitats with significant indigenous biodiversity values	**Comment on applicability to Firth Block and proposed extraction area**	**Result against criterion**
	national populations which are characterised as scarce and declining—albeit not facing an imminent threat of extinction.	
Diversity: the ecosystem or habitat has a natural diversity of ecological units, ecosystems, species and physical features within an area.	The proposed extraction area has a moderate flora diversity, and bird diversity comparable to Wellington and Wairarapa reserves (as reported in McArthur et al. (2012)). While both the proposed extraction area and the remainder of the Firth Block support a good diversity of indigenous plants and birds, the level of diversity is not outstanding, and therefore is not a significant attribute of the site—in its own right.	Proposed extraction area: **Not significant** Firth Block: **Not significant**
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.	As part of a belt of indigenous forest running along the western Hutt Hills, from Haywards (and beyond) to Korokoro (and beyond) the indigenous cover of the Firth Block contributes to connectivity across this area of the landscape—which includes a role connecting other significant areas (e.g. Belmont Regional Park and local Significant Natural Resources). What adds to the attractiveness of both the proposed extraction area and	Proposed extraction area: **Significant** Remainder of Firth Block: **Significant**

GWRC Policy 23: Criteria for the identification of indigenous ecosystems and habitats with significant indigenous biodiversity values	Comment on applicability to Firth Block and proposed extraction area	Result against criterion
	remainder of the Firth Block as a stepping stone is the presence of substantial areas of tawa (with rewarewa) forest—which provides an important seasonal food source for birds of fruit and nectar feeding guilds within the landscape. There is however no firm evidence to say that threatened indigenous birds benefit from seasonal food supplied by the forests of the Firth Block. On this basis the Firth Block is in our opinion to be significant in its role connecting between other significant sites, especially due to the seasonal attractiveness of the site, which adds to this function.	

5.0 ASSESSMENT OF EFFECTS TO TERRESTRIAL ECOLOGY

5.1 Forest flora and habitat

If developed to its full extent, proposed extension of the Belmont Quarry would result in complete and irreversible removal of ca. 6.39 ha of predominantly indigenous vegetation cover within the Firth Block. Included in this area, and of particular ecological importance with regard to assessment of effects, are:

1. The potential removal of ca. 1.10 ha (in two patches) of mature tawa forest located on Hawera Series terrace landform—which is a feature of the site deemed to be significant for the Representativeness criterion under local criteria (i.e. GWRC Policy 23) for determining ecological significance.
2. Loss of what are considered to be relicts of pre-European forest attributes—three very mature pukatea hosting abundant epiphytes and ca. 11 cm DBH coils of New Zealand passionfruit, and extensive kiekie.
3. Three specimens of black beech, which at this locality are significant as they are specimens at the south-western extent of the regional distribution.

5.2 Landscape scale effects

The ca. 6.39 ha area cited above, and as listed in Table 1, includes areas of forest, additional to the tawa forest (ca. 1.10 ha)—which provide considerable seasonal resources to birds. These include, ca. 0.5 ha of rewarewa/tawa-mahoe forest (Unit 18), and ca. 0.2 ha of mapou-mahoe-pigeonwood forest (Unit 17). Combined these forest areas sum to ca. 1.81 ha.

Aside from the loss of ca. 4.58 ha of more common early–mid-successional regenerating forest, the landscape pattern would lose ca. 1.81 ha of high quality (mature) indigenous forest. This forest is deemed to be a substantial attribute of the Firth Block's ecology. While very difficult to quantify, it is our opinion that a loss of forest of this nature, in the ecological context of the subject landscape, would be apparent at a landscape scale in terms of uncommon habitat and associated seasonal resources (e.g. tawa fruit, rewarewa nectar).

5.3 Avifauna

As described above, the proposed extraction area contains forests which are valuable for the habitat they provide for birds of the area. The indigenous bird community of the Firth Block is comparable to indigenous species richness counts from Wellington and Wairarapa reserves. The Firth Block is part of a tract of vegetation which crosses an area of land otherwise denuded of naturally occurring mature forest communities. Effects of clearance are best described as direct loss of nesting/rearing (varying depending on season of clearance), and loss of habitat for nesting/rearing and future habitation and feeding habitat—in particular loss of seasonal food supply. The loss of forest would be evident at both site and landscape scales (see discussion above) and would be felt by a range of common indigenous and exotic bird species—none of which have a national threat classification.

The loss of habitat also represents a loss of future potential use of the forest by nationally threatened species due to enhancement measures such as pest control.

5.4 Herpetofauna

Lizards of two species—common skink (Not Threatened) and southern North Island forest gecko (At Risk-Declining) have been found in low densities within the proposed extraction area. It is also considered of high likelihood that Wellington green gecko (At Risk-Declining) would be present within the proposed extraction area—only it is incredibly difficult to detect. The southern North Island forest gecko (and if present also Wellington green gecko) is a significant component of the Firth Block's ecological value. Loss from destruction of the forests within the proposed extraction area would result in removal and fragmentation of moderate to high quality lizard habitat, and would result in deaths and injuries to individual lizards.

5.5 Mitigation

Due to the nature of the quarrying extraction activity avoidance of most of the impacts outlined above will not be possible. Mitigation measures, such as remediation or mitigation will also not be possible in the proposed extraction area.

While needing further detailed planning, conservation activities to make-up for the above losses would, at a minimum, need to consider:

- Total loss of ca. 6.39 ha of predominantly indigenous vegetation cover;

- Loss of ca. 1.10 ha (in two patches) of mature tawa forest—which is significant under the Representativeness criterion of local significance assessment criteria;
- Loss of pre-European forest relicts, most evident in the form of three mature pukatea;
- Loss of specimens of mature black beech which are located at (or near) their south-western most extent of the regional range;
- The spatial arrangement of any replacement activities (compensation/offset areas) with regard to their future performance at the landscape scale—especially for birds moving across the landscape;
- The replacement of the lowland forest bird habitat lost;
- Management of lizard populations (including wildlife permit and relocation) prior to and following site clearance—especially southern North Island forest gecko and Wellington green gecko (if found).

The proposed extension to the northern-most Special Amenity Area would legally protect an area which includes important ecological values. Those values include mature tawa forest, an area of podocarp regeneration, bird values similar to that of the proposed extraction area, and also habitat supporting southern North Island forest gecko. Those areas which are to be quarried are proposed to be re-vegetated, with the intention being to return the vegetation cover to indigenous forest, over time. Both of these restoration proposals would contribute, in part, towards making up for the loss of ecological values from the proposed extraction area.

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APPENDIX A: SITE PHOTOGRAPHS

1

2

Photograph 1: View inside mature tawa forest (Unit 16); Photograph 2: View from Firth Yard turn around area of black beech and pukatea crowns.

3

4

Photograph 3: View across Firth Block of uppermost black beech and pukatea crowns festooned with New Zealand passionfruit vines. Photograph 4: View across slope of two the of three large diameter pukatea trees.

5

6

Photograph 5: Black beech and pukatea on north facing slope. Photograph 6: Mixed broadleaved forest with stands of tree fern (Unit 10).

7

8

Photograph 7: Low forest with predominant tree fern component. Photograph 8: view to the east across Units 25, 21, and 31.

9

Photograph 9: View to the northeast from the northern corner of the Firth Block across Belmont Regional Park and the upper Hutt Valley. Keith George Memorial Park is visible to the left of the view.

APPENDIX B: NOTABLE ECOLOGICAL FEATURES

Belmont Quarry: Firth Block
Notable Ecological Features (point data only)

Scale: 1:3700 (A3)

APPENDIX C: BOTANY REPORT

REPORT ON BOTANICAL SIGNIFICANCE OF FIRTH BLOCK, HEBDEN CRESCENT, LOWER HUTT.
March 2013

EXECUTIVE SUMMARY

The purpose of the report is to document the results of botanical surveys of the Firth Block, including whether any indigenous vascular plant taxa with a Department of Conservation (DOC) Conservation Threat Status are present.

The survey of the Firth Block was undertaken within two areas defined as Survey Area A and Survey Area B. Survey A area lies within the area of the block which Winstone Aggregates propose to use for quarrying. Survey Area B encompasses part of the block which the company is not proposing to quarry. Both areas were botanised, and the resultant plant lists are appended to this report.

The uppermost parts of Survey Area A and Survey Area B are on Hāwera Series terrace formations. These are Pleistocene-era deposits of moderately-weathered gravels, in terrace systems which are slightly dissected.

The authors also inspected five other Hutt Valley sites on Hāwera Series terrace formations which are also immediately west of the scarp of the Wellington Fault, for plant communities similar to those in Survey Area A and Survey Area B. These five sites are collectively referred to as Survey Site C and were viewed from strategic viewpoints using binoculars.

The key observations in Survey Area A were:
In the gully: the occurrence and obvious antiquity of the following species: the three biogeographically-significant black beech trees; the three pukatea trees on an atypically-dry site, and the size of the coils of NZ passionfruit.

Spur from end of 4WD road to terrace: massed growth of kiekie.
On the terrace: the cohort of mature, even-aged, closed-canopy, tawa forest, with hīnau and rewarewa emergents.

In his study of peri-urban, primary forest remnants, *"An Inventory of the Surviving Traces of the Primary Forest of Wellington City*,

February 1999, the late Dr. Geoff Park concluded that " … *the great majority of primary forest remnants survive in steep-sloped gully heads out of sight of most roads and access points … where last century's fires could not reach … The liane kiekie is also a sound indicator of the survival of a primary forest element* …" .

The above site description, together with the observed stature and antiquity of the species mentioned above in the main gully, accurately fit Dr. Park's description of a primary forest remnant.

The key observations in Survey Area B were: the presence of the podocarps kahikatea, tōtara and rimu, and the cohort of mature, even-aged, closed-canopy, tawa forest.

No indigenous vascular plant taxa with a DOC Conservation Threat Status were found in the Firth Block.

The assessment of the significance of the forest vegetation and flora recorded in the survey areas is covered in the report prepared by Adam Forbes.

INTRODUCTION

On 24 January 2013 Barbara Mitcalfe was contacted by Simon Beale, MWH NZ Ltd (MWH), on behalf of Winstone Aggregates. MWH was seeking the services of a local botanist to identify indigenous plant species including threatened plants, as part of a terrestrial ecological assessment of the Firth Block, an area of land owned by Winstone Aggregates, adjacent to Belmont Quarry. The location of the Firth Block is indicated on Figure 1 on the following page.

Barbara Mitcalfe and Chris Horne work as a team of two, and came to an agreement with MWH, to provide independent botanical data about the site.

FIELD SURVEY METHODOLOGY

- Searched all landforms: terraces, spurs, gullies, watercourses, rock faces, former road alignments
- Searched all vegetation habitat categories, including:
  - mature forest: tree trunks, canopies, epiphyte nests
  - regenerating forest
  - mixed indigenous and adventive shrublands
  - lianoid communities
  - fernlands
  - grasslands
  - rushlands
  - sedgelands
  - groundcover
- Searched for plant species with a known Department of Conservation (DOC) Conservation Threat Status
- In Survey Area C, field-checked for tawa-dominant plant communities growing on other sites immediately west of the Wellington Fault scarp in the Hutt Valley, which are capped with Pleistocene-era, Hāwera Series terrace formations.

For this report, Mitcalfe and Horne surveyed three areas: defined as Survey Areas A, B and C.

Survey Areas A and B are outlined on Figure 2 on page 5.

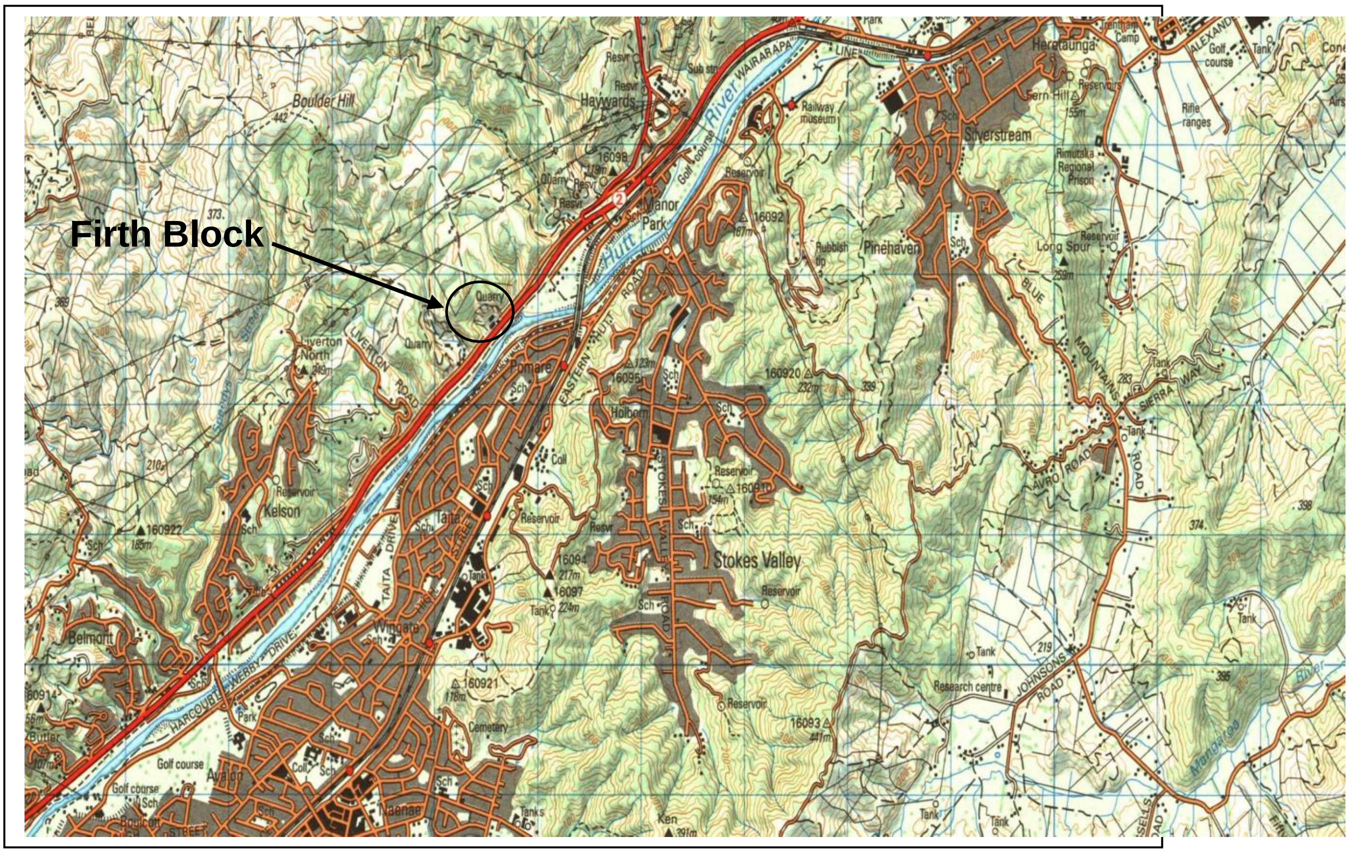

Figure 1: Location of Firth Block

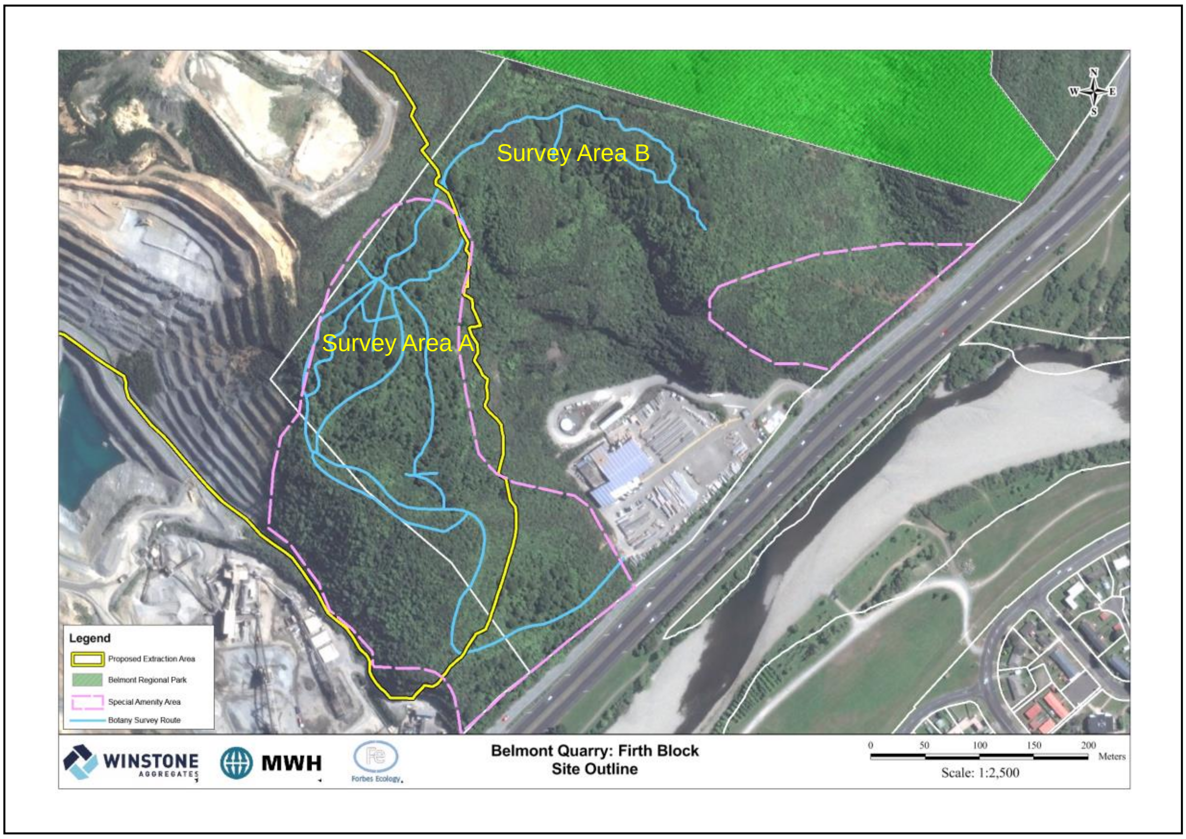

Figure 2: Location of Survey Areas A and B within the Firth Block

Notes:

- The yellow line represents the boundary of the area proposed for quarrying.
- The dotted pink line represents the boundary of the special amenity areas.
- The blue line represents the route of the foot surveys as recorded by GPS.
- Survey Area A is contained within the proposed quarry zone.
- Survey Area A includes part of Special Amenity Area 2
- Survey Area B lies outside the proposed quarry zone.

SURVEY RESULTS

SURVEY AREA A

Principal observations

This area is that part of the Firth Block which Winstone Aggregates proposes to quarry. The aerial cadastral photograph, "Belmont Quarry – Key Areas", indicates that Special Amenity Area 2, in Hutt City Council's District Plan, covers Survey Area A.
Dates botanised: 22.2.13, 5.3.13, 6.3.13, 8.3.13.

Main gully:

- two emergent, adjacent, *Nothofagus solandri* var. *solandri* tawhai rauriki, black beech trees, at E1764341 N5440851, both to estimated height of over 20 m, with d.b.h. c. 60 cm and c. 40 cm respectively, immediately below the true left side of the upper section of the 4WD road above the Firth yard
- one black beech further downslope to the northeast, (A. Forbes pers. comm.)
- three emergent *Laurelia novae-zelandiae* pukatea trees, two of them adjacent, both to estimated height of over 20 m, with d.b.h. c.1 m, and c. 70 cm, at E1764335 N5440869; the third pukatea, to estimated height of over 20 m, with d.b.h. c. 1 m, E1764328 N5440890
- occasional pukatea seedlings in the vicinity
- *Griselina littoralis* papāuma, broadleaf, a tree species
- *Melicytus ramiflorus* māhoe: c. 8 trunks from c. 20 cm d.b.h. to c. 50 cm
- one *Streblus heterophyllus* tūrepo, small-leaved milk tree, c. 4 m high
- several mature *Rhopalostylis sapida* nīkau, in fruit, with prolific seedlings
- epiphytes: *Griselinia lucida* puka, *Astelia solandri* kōwharawhara, perching astelia, and *Earina mucronata* peka a waka, Spring orchid, on pukatea trees
- two fern species not seen elsewhere in the survey, on a rock outcrop on the true left of the gully: *Arthropteris tenella* and *Trichomanes endlicherianum*
- lianes: large *Passiflora tetrandra* kohia, NZ passionfruit, to 11 cm d.b.h., prolific *Ripogonum scandens* supplejack, and *Freycinetia banksii* kiekie.

Spur on true left of main gully:

- one *Streblus heterophyllus* small-leaved milk tree, c. 7 m high
- abundant *Geniostoma ligustrifolium* var. *ligustrifolium* hangehange, in shrub tier

- twin-trunked, 8-m-high *Myrsine australis* māpou, with trunks to c. 25 cm and 28 cm d.b.h., E1764328 N5440972
- one *Prumnopitys ferruginea* miro, 6 m high, 8 cm d.b.h., in canopy, with *Knightia excelsa* rewarewa, and māpou. (A. Forbes pers. comm.)
- canopy c. 3 - 6 m
- one emergent *Weinmannia racemosa* kāmahi, c. 20 cm d.b.h.

Upper section of 4WD road:
- *one Cyathea cunninghamii* pūnui, gully tree fern, on true right side of 4WD road.

Track from end of 4WD road to Hāwera Series terrace formation:
- *Pseudopanax crassifolius* horoeka, lancewood, present in all tiers
- regenerating broad-leaved forest with tree-fern species
- *Metrosideros fulgens* akakura, scarlet rātā
- extensive kiekie.

Hāwera Series terrace formation:
- canopy of *Beilschmiedia tawa,* tawa-dominant forest ranging from c. 12 - 20 m high; tawa seedlings abundant
- emergent *Knightia excelsa* rewarewa, and occasional *Elaeocarpus dentatus,* hīnau, also seedlings and saplings of both taxa
- one 20 + m tall adventive, *Pinus radiata* radiata pine (E1764341 N544035), on southeastern edge of terrace
- numerous nīkau seedlings and saplings to 2 m
- areas of intact groundcover of fern species in many areas, e.g. *Blechnum filiforme* thread fern, *Hymenophyllum demissum* drooping filmy fern
- abundant regeneration of tree ferns, *Cyathea dealbata* silver fern, and *Cyathea medullaris* mamaku, and broadleaved tree species e.g. *Hedycarya arborea* porokaiwhiri, pigeonwood; kawakawa and māhoe
- one small-leaved milk tree
- one *Prumnopitys ferruginea* miro seedling, E1764237 N5441016 (A. Forbes pers. comm.), and lancewood seedlings
- in shallow gully, intersecting the terrace, with open water: several emergent nīkau, also present in all other tiers; *Aristotelia serrata* makomako wineberry; *Piper excelsum* kawakawa; supplejack; kiekie, and NZ passionfruit.

Old road alignment:
- abundant, emergent mamaku; silver fern
- māhoe; *Brachyglottis repanda* rangiora; kāmahi; supplejack.

1. DISCUSSION ON SURVEY AREA A

We note that Survey Area A is within the area designated as Special Amenity Area 2 in Hutt City Council's District Plan.

The most significant botanical values in Survey Area A are described in 1.1, 1.3 and 1.5.

1.1 *Main gully*

Using Dr. Geoff Park's list of criteria in, *"An Inventory of the Surviving Traces of the Primary Forest of Wellington City*, February 1999, we believe that elements of the forest in the main gully constitute a primary forest remnant. The three following paragraphs, and paragraph 1.4, illustrate this:

1.1.1 The three large black beech trees, each well over 20 m high, below the 4WD road above the true right side of the south end of the main gully, are regionally significant because they are among the few, southernmost-known, naturally-occurring, mature black beech trees on the west side of the Wellington Fault, in the Hutt Valley. Previously it was thought that the black beeches 1 km to the northeast, in Dry Creek, Belmont Regional Park, had this biogeographical distinction.

1.1.2 The three emergent, pukatea trees, with d.b.h. of 1 m, 1 m, and 0.7 m, with average height exceeding 20 m, are significant in being among the few, very large pukatea specimens in the Hutt Valley, on the west side of the Wellington Fault, where pukatea of this stature are uncommon. These specimens are all the more remarkable because this is a steep, well-drained site, which is an uncharacteristic habitat for this species

1.1.3 From our many years' experience of botanical work in primary forest remnants, we believe the massed coils of the liane, NZ passionfruit, up to 11 cm d.b.h., are evidence of its considerable age, possibly up to 100 years. (See *Forest Vines to Snow Tussocks. The Story of New Zealand Plants*. John Dawson. Victoria University Press. 1993 reprint. Page 62: "The woody stems can be up to 12 cm in diameter and in their lower parts often form tortuous coils on the forest floor").
Dawson is former Associate Professor of Botany at Victoria University of Wellington.

1.2 *Spur on true left of main gully*:

The largest kāmahi seen on the Firth Block occurs here, also hangehange, a species favoured by nectar-seeking birds.

1.3 *Upper section of 4WD road*
This gully tree fern was the only example of this taxon seen on the Firth Block. It is uncommon in the Hutt Valley, and common nowhere else in the region.

1.4 *Track from end of 4WD road to Hāwera Series terrace formation*
Kiekie, a terrestrial liane listed by Park 1999, as "a sound indicator of the survival of a primary forest element … ", is abundant and vigorous beside the track, in contrast to its condition in some other areas in the southern North Island. The fruit is of particular interest to Māori, as a special, ceremonial food, and the leaves are highly valued for whiri toi, the craft of fine weaving.

1.5 *Hāwera Series terrace formation*
This cohort of even-aged tawa, to c. 20 m high, is the largest, and therefore the most ecologically-significant example, of tawa-dominant forest type on the Firth Block. Tawa seedlings are common.

This cohort is larger than:

- the tawa-dominant area of Survey Area B,
- the tawa forest remnant on the Cottle Block immediately southwest of Belmont Quarry, (as seen from Liverton Road), and also larger than
- the tawa forest remnant on the terrace between Kelson and SH2, (Survey Area C).

The principal emergents here are scattered old hīnau trees, to more than 1 m d.b.h., and rewarewa, marker species of a much earlier, i.e. primary forest, on this site. (ibid. G. Park, 1999.) These emergents, and the tawa-dominant forest in which they grow, are supported by Judgeford soils. "*The soils on the Hāwera Series terraces tend to be Judgeford soils which are friable and have a loess component. They can be up to 1 m deep, are of moderate fertility, and are among the best in the Wellington region*". (Jan Heine, formerly Soil Bureau, D.S.I.R., pers. comm.).

The presence of pigeonwood trees to 2 m high, which are common in the shrub tier and small-tree tier, and the abundance of tawa seedlings, are evidence of the successful distribution of seed by gravity, and by birds flying from elsewhere in the ecological corridor in the vicinity of the Wellington Fault along the west side of the Hutt Valley.

Kunzea ericoides kānuka trees occupy a small area towards the northeast end of this part of the terrace. This species is also playing an important role here in forest succession.

Extensive areas of intact ground cover include thread fern and drooping filmy fern. The Hooker's spleenwort was the only example of this taxon seen on the Firth Block.

1.6 *Old road alignment*
Numerous mamaku and silver fern have colonised this site, as well as a wide range of broad-leaved tree species, e.g. pigeonwood.

SURVEY AREA B

Principal observations

Dates botanised: 22.2.13, 6.3.13.
This area is that part of the Firth Block which Winstone Aggregates do not propose to quarry.

Shrublands on northwest section of Hāwera Series terrace formation:
- kānuka to 4 m
- *Leptospermum scoparium* mānuka to 3m
- silver fern and mamaku.

Regenerating forest on central section of Hāwera Series terrace formation:
- early colonising species, e.g. māhoe and mamaku are common.

Tawa-dominant forest on southeast section of Hāwera Series terrace formation:
- tawa, from 15 – c. 22 m high
- adult nīkau and abundant nīkau saplings
- two *Dacrycarpus dacrydioides* kahikatea, each c. 15 – 18 m tall, with d.b.h. c. 20 cm and c. 40 cm respectively
- areas of dense groundcover of drooping filmy fern, and thread fern, with abundant seedlings of tawa, and nīkau.

Southeast of tawa-dominant forest on Hāwera Series terrace formation:
- regenerating podocarp - broadleaved forest. *Dacrydium cupressinum* rimu, 20 cm d.b.h. with no fruit or cones; one *Podocarpus totara* tōtara, 1 m tall; at least five miro, the largest, at E5441084 N1764553, c. 11 m high, and 33 cm d.b.h.; several black beech 4 – 5 m tall; māhoe; silver fern and mamaku.

DISCUSSION ON SURVEY AREA B

The most significant botanical values in Survey Area B are described below in 2.3 and 2.4.

2.1 *Shrublands on the northwest section of Hāwera Series terrace formation*:
This kānuka / mānuka shrubland immediately west of the tawa-dominant forest on the terrace is a good example of early-mid forest succession in the Wellington Ecological District 39.01.

2.2 *Regenerating forest on the central section of Hāwera Series terrace formation*:
This is a good example of mid-stage, southern-North Island, regenerating

forest of broad-leaved tree, shrub and tree-fern species.

2.3 *Tawa-dominant forest on the southeast section of Hāwera Series terrace formation*:

This plant community is dominated by tall tawa, with plentiful nīkau in every tier, and a well-developed groundcover of ferns and seedling broad-leaved species. The presence of the two emergent kahikatea is evidence of successful podocarp distribution by pollen carried by wind, and seed carried by birds, in the ecological corridor linking Survey Areas A and B with Belmont Regional Park and reserves elsewhere in the Hutt Valley.

2.4 *Southeast of the tawa-dominant forest on Hāwera Series terrace formation*:

Regenerating broad-leaved forest with māhoe, several young black beech trees, silver fern and mamaku, the presence of a 6-m tall rimu, several miro, one c. 11 m high, and a tōtara seedling, are, as noted above in 2.3, further evidence that the natural processes of succession toward eventual podocarp - broadleaved forest are taking place.

SURVEY AREA C

Principal observations

Date viewed from a car and through binoculars: 20.3.13.

This area comprises other sites capped with Hāwera Series terrace formations, which lie immediately west of the scarp of the Wellington Fault in the Hutt Valley. These are:

- Harbour View / Tirohanga / Belmont: no tawa forest remnants seen from Harbour View Road, Tirohanga Road, Pomare Road, Wairere Road, Corrondella Grove, Park Road, Palm Grove, Belmont Terrace.
- Kelson: small tawa-forest remnant seen from private drive off the end of Invercargill Drive. No tawa-forest remnant seen from sports ground off Kelso Grove.
- Cottle Block: small tawa-forest remnant seen from Liverton Road, on spur to northeast, i.e. southwest of Belmont Quarry.

The location of the tawa forest remnants are shown on Figure 3 on page 13.

The location of the Hawera Series terrace formations immediately west of the Wellington Fault is indicated on Figure 4 on page 14.

3. DISCUSSION ON SURVEY AREA C

This survey found no tawa forest remnants in Harbour View, Tirohanga or Belmont.

This survey indicates that the tawa forest remnants near Kelson and in the Cottle Block appear to cover smaller areas than the tawa-dominant forest in either Survey Area A or Survey Area B.

LIMITATIONS OF THE SURVEY

The four days allocated for field work on Survey Areas A and B were sufficient for a botanical reconnaissance but did not permit a more detailed survey.

The timing of the field work, i.e. early autumn, during a prolonged drought, restricted the likelihood of finding any terrestrial orchid species which are usually visible above ground in March.

The survey was designed to exclude non-vascular plant taxa, e.g., lichens, liverworts and mosses.

Figure 3: Location of tawa-forest remnants – Survey Area C

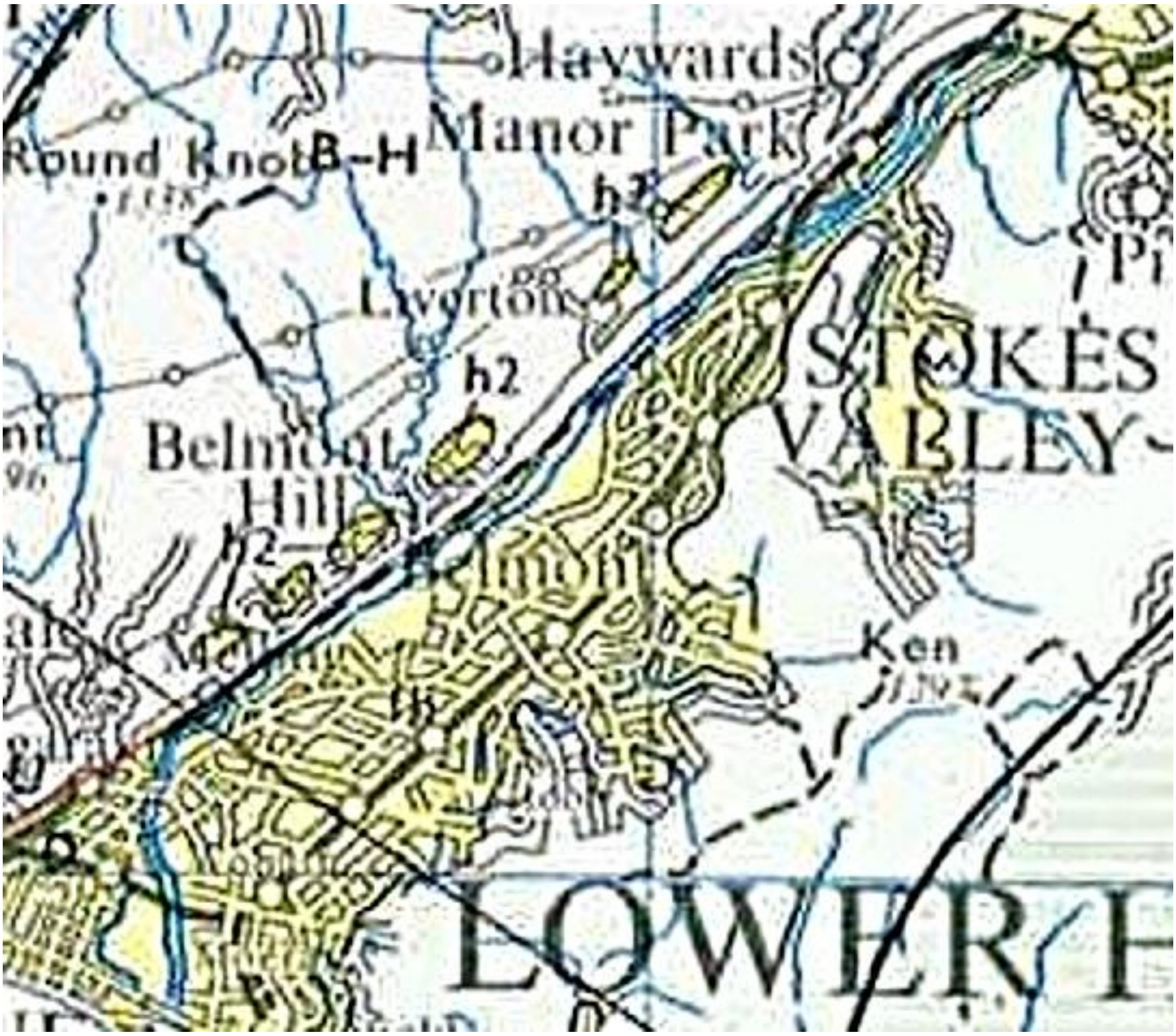

Figure 4: Geological map of Lower Hutt

Source: Part NZ Geological Map 1 : 250,000, Sheet 12, Wellington. NZ Geological Survey. 1st edition, reprinted 1975. Legend: Hāwera Series terraces - “h2”.

APPENDIX

SPECIES LISTS

SURVEY AREA A

FIRTH BLOCK, WINSTONE AGGREGATES, HEBDEN CRESCENT, LOWER HUTT

Survey Area A is that part of the area in the Firth Block which Winstone Aggregates proposes to use for quarrying purposes. This area was referred to as part of Site 15 in B. Mitcalfe's 1997 reconnaissance paper and plant species list. The aerial cadastral photograph “Belmont Quarry – Key Areas” appears to indicate that Special Amenity Area 2 in the Hutt City Council's District Plan covers Survey Area A.

Map: NZTopo50-BQ32 Lower Hutt, centred on grid reference c. 643409.
Altitude range: c. 100 m – 170 m above sea level.
Aspect: head of a basin facing northeast – east – southeast
Catchment: Hutt River, true right side.
Landforms: Escarpment of Wellington Fault, capped by terraces.
Geology: NZ Geological Survey map, 1:250,000, Wellington: alternating, dark-grey argillite and greywacke sandstone; intensely-sheared and semi-schistose; Balfour Series, Triassic. These Wellington Greywackes are capped by deposits of moderately weathered gravels in terrace systems; slightly dissected; Hāwera Series formation, Pleistocene.
Rainfall: **T**he 1985-2010 mean annual rainfall was 1338 mm. (Trevor McGavin’s private weather station, Maungaraki). No update available.
Ecological District: Wellington Ecological District 39.01.
Forest classification:
Terraces: a mosaic of mature, tawa-dominant, broad-leaved forest, with emergent hīnau and rewarewa.Tawa seedlings are prolific. In one of the two shallow gullies between the two terraces, nīkau is prolific in the seedling tier, common in the sapling and mature tiers, and occasionally emergent
Escarpment: second-growth, broad-leaved and tree-fern forest, with emergent pukatea, black beech, rewarewa, māhoe and nīkau.
Territorial Local Authority: Hutt City Council.
Tenure: Winstone Aggregates.

Lists

B .Mitcalfe's 1997 reconnaissance plant list was updated during the following four days by:

- B. Mitcalfe, J. C. Horne, S. Beale: two hours, familiarisation with site; preliminary plant listing, 22.2.2013.
- B. Mitcalfe and J.C. Horne: six hours, plant listing 5.3.2013.
- B. Mitcalfe and J.C. Horne:plant listing and assisting A. Forbes with Point Centre Transect; then one hour, plant listing, 6.3.2013.
- B. Mitcalfe and J.C. Horne: six hours plant listing, 8.3.2013.

Abbreviations
agg. = aggregate
* = not naturally occurring in Wellington Ecological District 39.01
sp. = species
subsp. = subspecies
(unc) = only one plant seen
var. = variety

BOTANICAL NAME	MĀORI NAME	COMMON NAME
LIST 1: SOME INDIGENOUS VASCULAR PLANTS		
GYMNOSPERM TREES		
Prumnopitys ferruginea (unc) (1)	miro	miro
MONOCOTYLEDONOUS TREES		
Rhopalostylis sapida	nīkau	nīkau
DICOTYLEDONOUS TREES AND SHRUBS		
Alectryon excelsus	tītoki	tītoki
Aristotelia serrata	makomako	wineberry
Beilschmiedia tawa	tawa	tawa
Brachyglottis repanda	rangiora	rangiora
Carpodetus serratus	putaputawētā	marbleleaf
Coprosma areolata		thin-leaved coprosma
Coprosma grandifolia	kānono	kānono
Coprosma lucida	karamu	shining karamu
Coprosma robusta	karamu	karamu
Coprosma rhamnoides		a coprosma sp.
* Corynocarpus laevigatus	karaka	karaka
Elaeocarpus dentatus	hīnau	hīnau
Geniostoma ligustrifolium var. ligustrifolium	hangehange	hangehange
Griselinia littoralis	pāpāuma	broadleaf
Griselinia lucida	puka	puka
Hebe stricta var. atkinsonii	koromiko	koromiko
Hedycarya arborea	porokaiwhiri	pigeonwood
Knightia excelsa	rewarewa	rewarewa
Kunzea ericoides	kānuka	kānuka
Laurelia novae-zelandiae (2)	pukatea	pukatea
Leptospermum scoparium	mānuka	mānuka
Lophomyrtus bullata	ramarama	ramarama
Melicytus ramiflorus	māhoe	māhoe
Nothofagus solandri var. solandri	tawhai rauriki	black beech
Olearia rani	heketara	heketara

Pennantia corymbosa	kaikōmako	kaikōmako
Piper excelsum	kawakawa	kawakawa
* Pittosporum ralphii		a pittosporum sp.
Pittosporum eugenioides	tarata	lemonwood
Pittosporum tenuifolium	kohuhu	kohuhu
Pseudopanax arboreus	whauwhaupaku	five-finger
Pseudopanax crassifolius	horoeka	lancewood
Schefflera digitata	patē	seven-finger
Solanum sp.	poroporo	a poroporo sp.
Streblus heterophyllus	tūrepo	small-leaved milk tree
Weinmannia racemosa	kāmahi	kāmahi

MONOCOTYLEDONOUS LIANES

Freycinetia banksii	kiekie	kiekie
Ripogonum scandens	kareao	supplejack

DICOTYLEDONOUS LIANES

Clematis foetida		a clematis sp.
Clematis paniculata	puawānanga	white clematis
Metrosideros diffusa	rātā	white rātā
Metrosideros fulgens	akakura	scarlet rātā
Metrosideros perforata	akatea	clinging rātā
Muehlenbeckia australis	pōhuehue	pōhuehue
Parsonsia heterophylla	kaihua	NZ jasmine
Passiflor**a** tetrandra	kōhia	NZ passionfruit
Rubus cissoides	tātarāmoa	bush lawyer

LYCOPODSAND PSILOPSIDS

Lycopodium scariosum (unc)		a clubmoss sp.
Tmesipteris elongata (unc)		a fork fern sp.

FERNS

Arthropteris tenella		jointed fern
Asplenium bulbiferum	manamana	hen & chicken fern
Asplenium flaccidum	makawe o Raukatauri	hanging spleenwort
Asplenium gracillimum		an asplenium sp.
Asplenium hookerianum (unc)		Hooker's spleenwort
Asplenium oblongifolium	huruhuruwhenua	shining

spleenwort

Asplenium polyodon	petako	sickle spleenwort
Blechnum chambersii	nini	lance fern
Blechnum discolor	piupiu	crown fern
Blechnum filiforme	pānako	thread fern
Blechnum fluviatile	kiwakiwa	ray water fern
Blechnum novaezelandiae	kiokio	kiokio
Cyathea cunninghamii (unc)	pūnui	gully tree fern
Cyathea dealbata	ponga	silver fern
Cyathea smithii	kātote	soft tree fern
Cyathea medullaris	mamaku	mamaku
Dicksonia squarrosa	whekī	whekī
Hymenophyllum demissum	irirangi	drooping filmy fern
Lastreopsis glabella		smooth shield fern
Lastreopsis hispida	pongaweka	hairy fern
Microsorum pustulatum	kōwaowao	hound's tongue fern
Microsorum scandens	mokimoki	fragrant fern
Paesia scaberula	mātā	ring fern
Pneumatopteris pennigera	pākau	gully fern
Polystichum neozelandicum subsp. xerophyllum	pikopiko	common shield fern
Pteridium esculentum	rārahu	bracken
Pyrrosia eleagnifolia	ota	leatherleaf fern
Rumohra adiantiformis	karawhiu	leathery shield fern
Trichomanes endlicherianum		a bristle-fern sp.

ORCHIDS

Earina mucronata	peka a waka	Spring orchid

GRASSES

Austroderia fulvida	toetoe	toetoe
Microlaena stipoides	pātītī	meadow rice grass
Rytidosperma gracile		a rytidosperma sp.

SEDGES

Carex sp.		a carex sp.
Uncinia scabra		a hooked sedge sp.

Uncinia uncinata	matau a Māui	a hooked sedge sp.

RUSHES

Luzula picta		a wood rush sp.

MONOCOTYLEDONOUS HERBACEOUS PLANTS, other than orchids, grasses, sedges, rushes

Astelia solandri	kōwharawhara	perching astelia
Dianella nigra	tūrutu	blueberry

COMPOSITE HERBACEOUS PLANTS

Senecio minimus		a fireweed sp.

DICOTYLEDONOUS HERBACEOUS PLANTS, other than composites

Centella uniflora		centella
Haloragis erecta	toatoa	shrubby haloragis
Stellaria parviflora	kohukohu	NZ chickweed

(1) A. Forbes pers. comm.
(2) Probably incorrectly listed as northern rātā in 1997 paper and plant list for Site 15.

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LIST 2: SOME ADVENTIVE VASCULAR PLANTS

GYMNOSPERM TREES

Cupressus macrocarpa	macrocarpa
Pinus radiata	radiata pine

DICOTYLEDONOUSTREES AND SHRUBS

Buddleja davidii	buddleia
Berberris glaucocarpa	barberry
Cytisus scoparius	English broom
Hypericum androsaemum	tutsan
Leycesteria formosa	Himalaya honeysuckle
Rubus fruticosus agg.	blackberry
Ulex europaeus	gorse

GRASSES

Anthoxanthum odoratum	sweet vernal
Cortaderia sp.	apampas sp.

Dactylis glomerata		cocksfoot
Ehrharta erecta		veld grass
Holcus lanatus		Yorkshire fog

SEDGES

Cyperus eragrostis		umbrella sedge

RUSHES

Juncus effusus		soft rush

MONOCOTYLEDONOUS HERBACEOUS PLANTS, other than orchids, grasses, sedges and rushes

None recorded

COMPOSITE HERBACEOUS PLANTS

Cirsium vulgare	kotimana	Scotch thistle
Conyza sumatrensis		fleabane
Gamochaeta purpurea		purple cudweed
Helminthotheca echioides		ox-tongue
Jacobaea vulgaris		ragwort
Sonchus asper		prickly sow thistle
Sonchus oleraceus	pūhā	sow thistle

DICOTYLEDONOUS HERBACEOUS PLANTS, other then composites

Digitalis purpurea		foxglove
Prunella vulgaris		self-heal
Solanum chenopodioides		velvety nightshade
Solanum nigrum		black nightshade

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LIST 3: SOME INDIGENOUS BIRDS

Anthornis melanura	korimako	bellbird
Gerygone igata	riroriro	grey warbler
Hemiphaga novaeseelandiae	kererū	kererū
Larus dominicanus	kāroro	black-backed gull
Prosthemadera novaeseelandiae	tūī	tūī
Rhipidura fuliginosa placabilis	pīwakawaka	North Island fantail
Vanellus miles novaehollandiae		spur-winged plover
Zosterops lateralis	tauhou	waxeye

++

LIST 4: SOME INTRODUCED BIRDS

Callipepla californica	California quail
Carduelis chloris	greenfinch
Fringilla coelebs	chaffinch
Platycercus eximius	eastern rosella
Turdus merula	blackbird

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SURVEY AREA B

FIRTH BLOCK, WINSTONE AGGREGATES, HEBDEN CRESCENT, LOWER HUTT

Survey Area B is that part of the area in the Firth Block which Winstone Aggregates does not propose to use for quarrying purposes. This area was referred to as part of Site 15 in B. Mitcalfe's 1997 reconnaissance report and plant species list.

Map: NZTopo50-BQ32 Lower Hutt, centred on grid reference c. 644412
Altitude range: c. 100 m – 160 m above sea level.
Aspect: southeast – south – southwest
Catchment: Hutt River, true right side.
Landforms: Escarpment of Wellington Fault, capped by terraces.
Geology: NZ Geological Survey map, 1:250,000, Wellington: alternating, dark-grey argillite and greywacke sandstone; intensely-sheared and semi-schistose; Balfour Series, Triassic. These Wellington Greywackes are capped by deposits of moderately weathered gravels in terrace systems; slightly dissected; Hawera Series formation, Pleistocene.
Rainfall: The 1985-2010 mean annual rainfall was 1338 mm. (Trevor McGavin's private weather station, Maungaraki).
Ecological District: Wellington Ecological District 39.01.
Forest classification:
Terrace: a mosaic of mature, tawa-dominant, broad-leaved forest, with emergent rewarewa.
Territorial Local Authority: Hutt City Council.
Tenure: Winstone Aggregates.

Lists

B .Mitcalfe's 1997 reconnaissance plant list was updated during the following two days:

- B. Mitcalfe, J. C. Horne, S. Beale: two hours, familiarisation with site; preliminary botanical listing 22.2.2013.
- B. Mitcalfe and J.C. Horne: two hours botanising 6.3.2013.

Abbreviations

agg. = aggregate
* = not naturally occurring in Wellington Ecological District 39.01
sp. = species
subsp. = subspecies
(unc) = only one plant seen
var. = variety

BOTANICAL NAME	MĀORI NAME	COMMON NAME
LIST 1: SOME INDIGENOUS VASCULAR PLANTS		
GYMNOSPERM TREES		
Dacrycarpus dacrydioides	kahikatea	kahikatea
Dacrydium cupressinum	rimu	rimu
Podocarpus totara (1)	tōtara	tōtara
MONOCOTYLEDONOUS TREES		
Cordyline australis (unc)	tī kōuka	cabbage tree
Rhopalostylis sapida	nīkau	nīkau
DICOTYLEDONOUS TREES AND SHRUBS		
Alectryon excelsus	tītoki	tītoki
Beilschmiedia tawa	tawa	tawa
Brachyglottis repanda	rangiora	rangiora
Carpodetus serratus	putaputawētā	marbleleaf
Coprosma areolata		thin-leaved coprosma
Coprosma grandifolia	kānono	kānono
Coprosma lucida	karamu	shining karamu
Coprosma rhamnoides		a coprosma sp.
* Corynocarpus laevigatus	karaka	karaka
Elaeocarpus dentatus	hīnau	hīnau
Geniostoma ligustrifolium var. ligustrifolium	hangehange	hangehange
Griselinia lucida	puka	puka
Hedycarya arborea	porokaiwhiri	pigeonwood
Knightia excelsa	rewarewa	rewarewa
Kunzea ericoides	kānuka	kānuka
Leptospermum scoparium	mānuka	mānuka
Melicytus ramiflorus	māhoe	māhoe
Myrsine australis	māpou	māpou
Nothofagus solandri var. solandri (1)	tawhai rauriki	black beech
Piper excelsum	kawakawa	kawakawa
Pittosporum tenuifolium	kohuhu	kohuhu
Pseudopanax crassifolius	horoeka	lancewood
Schefflera digitata	patē	seven-finger
MONOCOTYLEDONOUS LIANES		
Freycinetia banksii (unc)	kiekie	kiekie
Ripogonum scandens	kareao	supplejack
DICOTYLEDONOUS LIANES		
Metrosideros diffusa	rātā	white rātā

Metrosideros fulgens	akakura	scarlet rātā
Rubus cissoides	tātarāmoa	bush lawyer

LYCOPODS AND PSILOPSIDS

None recorded

FERNS

Asplenium bulbiferum	manamana	hen & chicken fern
Asplenium oblongifolium	huruhuruwhenua	shining spleenwort
Asplenium polyodon	petako	sickle spleenwort
Blechnum chambersii	nini	lance fern
Blechnum discolor	piupiu	crown fern
Blechnum filiforme	pānako	thread fern
Blechnum fluviatile	kiwakiwa	ray water fern
Blechnum novaezelandiae	kiokio	kiokio
Cyathea dealbata	ponga	silver fern
Cyathea medullaris	mamaku	mamaku
Dicksonia squarrosa	whekī	whekī
Hypolepis ambigua	rarauhi nehenehe	a hypolepis sp.
Lastreopsis glabella		smooth shield fern
Microsorum pustulatum	kōwaowao	hound's tongue fern
Microsorum scandens	mokimoki	fragrant fern
Paesia scaberula	mātā	ring fern
Pneumatopteris pennigera	pākau	gully fern
Polystichum neozelandicum subsp. xerophyllum	pikopiko	common shield fern

ORCHIDS

None recorded

GRASSES

Austroderia fulvida	toetoe	toetoe

SEDGES

Uncinia uncinata	matau a Māui	a hooked sedge sp.

RUSHES

None recorded

MONOCOTYLEDONOUS HERBACEOUS PLANTS, other than orchids, grasses, sedges, rushes
None recorded

COMPOSITE HERBACEOUS PLANTS
Senecio minimus a fireweed
sp.

DICOTYLEDONOUS HERBACEOUS PLANTS, other than composites
Centella uniflora centella
Haloragis erecta toatoa shrubby
haloragis
Stellaria parviflora kohukohu NZ
chickweed

(1) B. Stephenson pers. comm.

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LIST 2: SOME ADVENTIVE VASCULAR PLANTS

GYMNOSPERM TREES
Pinus radiata radiata pine

DICOTYLEDONOUS TREES AND SHRUBS
Buddleja davidii buddleia
Euonymus japonicus (1) Japanese
spindle tree
Leycesteria formosa Himalaya
honeysuckle
Ulex europaeus gorse

LIANES
None recorded

FERNS
None recorded

ORCHIDS
None recorded

GRASSES
None recorded

SEDGES
None recorded

RUSHES
Juncus effusus soft rush

MONOCOTYLEDONOUS HERBACEOUS PLANTS, other than orchids, grasses, sedges and rushes
None recorded

COMPOSITE HERBACEOUS PLANTS

Cirsium vulgare	kotimana	Scotch thistle

DICOTYLEDONOUS HERBACEOUS PLANTS, other then composites

Digitalis purpurea		foxglove
Lotus pedunculatus		birdsfoot trefoil
Ranunculus repens		creeping buttercup

(1) A.Forbes pers. comm.

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LIST 3: SOME INDIGENOUS BIRDS

Gerygone igata	riroriro	grey warbler
Hemiphaga novaeseelandiae	kererū	kererū
Larus dominicanus	kāroro	black-backed gull
Zosterops lateralis	tauhou	waxeye

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LIST 4: SOME INTRODUCED BIRDS

Anas platyrinchos		mallard

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APPENDIX D (a): AVIFAUNA REPORT

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FINAL REPORT:

BIRD MONITORING: FIRTH BLOCK ASSESSMENT

Brent Stephenson PhD
Eco-Vista: Photography & Research Ltd
Submitted: 11 March 2013

Overview of investigation carried out

As per the methodology outlined in the methodology document supplied at the start of this project, the following work was conducted on site at the Firth Block:

- Five-minute bird counts at 9 count sites, conducted one in the morning and once in the afternoon
- Investigation of the site to determine species not recorded during the five-minute bird counts and to determine likely species not present at the time of the counts
- A short desktop investigation into species recorded in the area previously (ie. Mainly using the OSNZ Atlas project)

Site visits

An induction with Geoff Cooke was attended midday on 6 Mar 2013. This took approximately one hour. An overview of the Health and Safety Issues and the site was carried out. I then spent the rest of the afternoon onsite and much of the next two days (7 & 8 Mar 013) onsite conducting the five-minute bird counts and assessment. It should be noted that as the surveys were conducted during a three day period, they will not take into account seasonal variation of species presence and abundance at the site. Below Ii discuss possible seasonal affects and species that may be present in low numbers or at other times of the year.

Five-minute bird counts

During the afternoon of 6 Mar 2013, I walked through much of the site, accessing it using the recently reformed road, and then through some of the tracks created by other workers at the site, and pest control access tracks. This allowed a good look at the site, and a preliminary placement of the count sites to be reassessed.

It had initially been thought that 10-12 count sites might have been possible within the Firth Block, but the very steep terrain and shape of the site allowed only 9 count sites to be placed, with the closest distance between sites being just over 130m (between FB6 and both FB4 and FB5) (see Figure One). Generally count sites were at least 150m or more apart. Even though FB6 was only around 130m from two other count sites, this was not a problem due to the steep nature of the site, which meant that this count site faced into a different area than the other two. Count site locations have been provided to Adam Forbes in the form of a GPX file.

Figure One. Placement of the nine count sites within the Firth Block.

During the afternoon of 6 Mar 2013 I took advantage of the good weather to conduct several counts, with the remainder of the counts being conducted on 7 & 8 Mar 2013. I conducted five-minute bird counts once during the morning and once during the afternoon at each count site. Weather during all of these counts was warm with light winds, and no rain. At no stage during these counts did the ambient noise or weather negatively affect the counts.

Site investigation

In between counts at the count sites, I kept records of significant sightings and general species records. Table One shows a list of bird species that were recorded at the site (during five-minute counts or otherwise), and other species that may be present in very low numbers and therefore were not detected during the surveys, or may be present at other times of the year.

Bird species present at the Firth Block

As would be expected at any native forest site in the lower North Island, the common native species were NZ pigeon, fantail, silvereye, grey warbler, tui, and bellbird. All of these species were recorded during the five-minute bird counts conducted at the site. It should be noted here that time of year may have had an impact on the relative abundance of these species recorded during these five-minute bird counts. The fact that tawa trees were fruiting at the time of the counts means that pigeon numbers at the site were probably higher than at other times of the year when this seasonal food resource is not available. Up to six pigeon were seen at one time from the carpark at the bottom of the Firth Block, and it is likely that 10+ pigeon could have been in the area during the time that this work was conducted. Likewise, tui and bellbird numbers are likely to fluctuate depending on the time of year, with the fluctuations in food availability. The flowering period of rewarewa would be of particular importance to these honeyeaters.

Black-backed gulls were another native species encountered during the counts, and apparently breed in the neighbouring upper part of the Winstone Quarry (G. Cooke pers comm.). They were often seen and heard flying over the Firth Block singly or in small flocks.

Native species not recorded in the five-minute bird counts but observed to be present during time spent at the site were little pied cormorant and morepork. A single juvenile little pied cormorant was observed at the freshwater pond in the north-western corner of the site, and two morepork roosts with fresh droppings and feathers below them were found at the site. Little pied cormorant is likely to be an occasional visitor to the site, whilst morepork are likely to be relatively common throughout the site (perhaps 2-3 pairs based on available habitat and home range size).

Desktop investigation

Both species of cuckoo are only found in New Zealand seasonally, and this work was conducted when both are unlikely to be detected or not present. Shining bronze-cuckoo are almost certainly found at the site during the spring and summer, and their distinctive call would be easy to detect. As good numbers of their host species (grey warbler) were detected at the site, they are also likely to breed here. Long-tailed cuckoo may occasionally pass through the site, but as their usual host species (whitehead) was not detected at the site, they probably do not breed at this site.

Other native species that were not detected during time spent at the site, but which may possibly occur in the neighbouring Belmont Regional Park or ecological corridor as shown in Figure Two (and therefore may occur in the Firth Block in low numbers) are indicated in Table One.

Harrier were reported as present by staff working at the Firth Masonry, whilst falcon may pass through the site infrequently. New Zealand kaka, parakeets (*Cyanoramphus* sp.), sacred kingfisher, rifleman, whitehead, North Island robin and North Island tomtit are all native species that were not recorded on site, but which may be found in low numbers in the Belmont Regional Park and adjacent ecological corridor. Bird counts conducted at Keith George Memorial Park and other Upper Hutt reserves in 2011 showed that some of these species are present in the vicinity (McArthur et al 2012). Whitehead and tomtit were both detected at Keith George Memorial Park, which is situated approximately 3km as the crow flies to the north-east of the Firth Block. Keith George Memorial Park is connected with the Firth Block by the adjacent ecological corridor. Tomtit were also suggested to be present in Belmont Regional Park by Barbara Mitcalfe and Chris, during discussions with them. Slightly more distant and not connected by a corridor is Wi Tako Reserve, situated approximately 4.5km to the north-east across the other side of the Hutt River. However, during 2011 both parakeets (*Cyanoramphus* sp.) and rifleman were detected at the site (McArthur et al 2012).

Figure Two. Taken from Ecological Corridors Lower Hutt F&B website. This figure shows the ecological corridor that extends from Upper Hutt, through to Lower Hutt, including Belmont Regional Park and the adjacent Firth Block.

Not recorded in adjacent parks or reserves were kaka and robin, but the OSNZ atlas suggests that both species are found in more continuous forests in the lower Tararuas and Rimatakas.

Table One. List of bird species recorded at the Firth Block during this survey (either present in the five-minute bird counts or during time spent at the site), plus potential species based on habitat (H) and local records (LR) or the OSNZ Atlas (OSNZ). National status key is as follows – Int = Introduced, NT = Not threatened, NUn = Nationally uncommon, AR-rt = At Risk, Relict, AR-dc = At Risk, Declining, NV = Nationally vulnerable, NE = Nationally endangered, NC = Nationally critical

Species	Scientific name	Nat. status	Present in counts	Present but not recorded in counts	Possible, historic records
Great cormorant (black shag)	*Phalacrocorax carbo*	NUn			X
Little black cormorant	*Phalacrocorax sulcirostris*	NUn			X
Little pied cormorant	*Phalacrocorax melanoleucos*	NUn		X	
Paradise shelduck	*Tadorna variegata*	NT			X
Mallard	*Anas platyrhynchos*	Int		X	
Pacific black (grey) duck	*Anas superciliosa*	NC			X
Swamp (Australasian) harrier	*Circus approximans*	NT			X
New Zealand falcon	*Falco novaeseelandiae*	NV			X
California quail	*Callipepla californica*	Int		X	
Masked lapwing (spur-winged plover)	*Vanellus miles*	NT		X	
Black-backed (kelp) gull	*Larus dominicanus*	NT	X		
Red-billed gull	*Larus scopulinus*	NV			X
Black-billed gull	*Larus bulleri*	NE			X
New Zealand pigeon	*Hemiphaga novaeseelandiae*	NT	X		
Rock (feral) pigeon	*Columba livia*	Int			X
New Zealand kaka	*Nestor meridionalis*	NV			?
Eastern rosella	*Platycercus eximius*	Int		X	
Red-crowned parakeet	*Cyanoramphus novaezelandiae*	AR-rt			?
Yellow-crowned parakeet	*Cyanoramphus auriceps*	NT			?
Shining bronze-cuckoo	*Chrysococcyx lucidus*	NT			X
Long-tailed cuckoo	*Eudynamys taitensis*	NUn			X
Morepork	*Ninox novaeseelandiae*	NT		X	
Sacred kingfisher	*Todiramphus sanctus*	NT			X
Rifleman	*Acanthisitta chloris*	AR-dc			?
Welcome swallow	*Hirundo neoxena*	NT			X
Dunnock	*Prunella modularis*	Int	X		
Common blackbird	*Turdus merula*	Int	X		
Song thrush	*Turdus philomelos*	Int		X	
Whitehead	*Mohoua albicilla*	NT			?
Grey fantail	*Rhipidura fuliginosa*	NT	X		
North Island robin	*Petroica longipes*	NT			?
North Island tomtit	*Petroica toitoi*	NT			?
Grey gerygone (warbler)	*Gerygone igata*	NT	X		
Silvereye (waxeye)	*Zosterops lateralis*	NT	X		
New Zealand bellbird	*Anthornis melanura*	NT	X		

Tui	*Prosthemadera novaeseelandiae*	NT	X		
Australian magpie	*Gymnorhina tibicen*	Int			X
Common starling	*Sturnus vulgaris*	Int		X	
House sparrow	*Passer domesticus*	Int			
Chaffinch	*Fringilla coelebs*	Int			
European greenfinch	*Carduelis chloris*	Int			
European goldfinch	*Carduelis carduelis*	Int			
Common redpoll	*Carduelis flammea*	Int			
Yellowhammer	*Emberiza citrinella*	Int			

References cited:

McArthur, N., Moylan, S. and Crisp, P. 2012. State and trends in the diversity, abundance and distribution of birds in Upper Hutt reserves, June 2012. Greater Wellington Regional Council, Publication No. GW/EMI-T-12/200, Upper Hutt.

APPENDIX D (b): AVIFAUNA SURVEY DATA

Date	Location	Site	Time	Temp	Sun	Wind/ noise	Precip.	Silvereye heard	Silvereye seen	Silvereye total	Bellbird heard	Bellbird seen	Bellbird total	Tui heard	Tui seen	Tui total	warbler heard	warbler seen	warbler total	Fantail heard	Fantail seen	Fantail total	pigeon heard	pigeon seen	pigeon total
08/03/13	Firth Block	FB8	10:09	5	5	1	0	2	0	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
08/03/13	Firth Block	FB9	10:38	5	5	2	0	2	1	3	1	0	1	0	1	1	1	0	1	0	0	0	0	0	0
08/03/13	Firth Block	FB7	9:25	5	5	1	0	1	2	3	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
08/03/13	Firth Block	FB5	9:42	5	5	0	0	4	0	4	0	0	0	0	0	0	0	0	0	1	0	1	2	0	2
07/03/13	Firth Block	FB1	10:34	5	5	1	0	3	0	3	2	0	2	0	0	0	1	0	1	0	0	0	0	0	0
07/03/13	Firth Block	FB5	13:01	5	5	1	0	2	1	3	0	0	0	1	0	1	0	0	0	0	0	0	3	0	3
07/03/13	Firth Block	FB2	9:46	5	5	1	0	0	0	0	2	0	2	0	0	0	1	0	1	1	0	1	0	1	1
07/03/13	Firth Block	FB1	10:04	5	5	2	0	2	0	2	1	0	1	0	0	0	1	0	1	0	0	0	0	0	0
07/03/13	Firth Block	FB6	9:00	5	5	2	0	5	0	5	2	0	2	0	0	0	0	0	0	1	0	1	0	0	0
07/03/13	Firth Block	FB4	9:25	5	5	1	0	1	1	2	3	0	3	1	0	1	0	0	0	0	0	0	0	0	0
07/03/13	Firth Block	FB8	13:21	5	5	2	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07/03/13	Firth Block	FB9	13:39	5	5	2	0	0	0	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0
06/03/13	Firth Block	FB3	16:00	5	4	2	0	2	0	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
06/03/13	Firth Block	FB7	16:36	5	4	2	0	1	0	1	1	0	1	0	0	0	2	0	2	0	0	0	0	0	0
06/03/13	Firth Block	FB6	14:10	5	2	2	0	2	1	3	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1
06/03/13	Firth Block	FB4	14:45	5	2	2	0	1	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
06/03/13	Firth Block	FB2	15:11	5	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
06/03/13	Firth Block	FB1	15:35	5	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0

Date	Location	Site	Time	Temp	Sun	Wind/ noise	Precip.	Blk-bck gull heard	Blk-bck gull seen	Blk-bck gull total	Chaffinch heard	Chaffinch seen	Chaffinch total	Greenfinch heard	Greenfinch seen	Greenfinch total	Goldfinch heard	Goldfinch seen	Goldfinch total	Blackbird heard	Blackbird seen	Blackbird total	Dunnock heard	Dunnock seen	Dunnock total	House sparrow heard	House sparrow seen	House sparrow total
08/03/13	Firth Block	FB8	10:09	5	5	1	0																					
08/03/13	Firth Block	FB9	10:38	5	5	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08/03/13	Firth Block	FB7	9:25	5	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1
08/03/13	Firth Block	FB5	9:42	5	5	0	0	0	4	4	0	2	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
07/03/13	Firth Block	FB1	10:34	5	5	1	0	3	0	3	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
07/03/13	Firth Block	FB5	13:01	5	5	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1
07/03/13	Firth Block	FB2	9:46	5	5	1	0	1	0	1	1	0	1	1	0	1	0	0	0	0	0	0	1	0	1	0	0	0
07/03/13	Firth Block	FB1	10:04	5	5	2	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07/03/13	Firth Block	FB6	9:00	5	5	2	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07/03/13	Firth Block	FB4	9:25	5	5	1	0	1	0	1	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0
07/03/13	Firth Block	FB8	13:21	5	5	2	0	1	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07/03/13	Firth Block	FB9	13:39	5	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06/03/13	Firth Block	FB3	16:00	5	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06/03/13	Firth Block	FB7	16:36	5	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
06/03/13	Firth Block	FB6	14:10	5	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
06/03/13	Firth Block	FB4	14:45	5	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
06/03/13	Firth Block	FB2	15:11	5	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06/03/13	Firth Block	FB1	15:35	5	2	2	0	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX E: HERPETOLOGY REPORT

An assessment of the lizard fauna — Belmont Quarry Extension

Report prepared for Winstone Aggregates

August 2013

Trent Bell, Sarah Herbert & Sabine Melzer

EcoGecko Consultants Limited

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An assessment of the lizard fauna — Belmont Quarry Extension

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Contents

Executive Summary

In order to extend the lifespan of the Belmont Quarry, Winstone Aggregates is proposing to extend the quarry area to include part of the Firth Block to the north-east of the existing quarry (the Belmont Quarry Extension Area).

There appear to be no records of lizards on the Department of Conservation's BioWeb *Herpetofauna* records database from within the proposed development envelope (development area).

Survey effort during an initial lizard survey consisted of minnow traps (46 'trap days') and pitfall traps (50 'trap days') during May 2012. A total of 15.42 person hours were also spent during the day searching a minimum area of 11,601.4 m^2 of vegetation and microhabitats for lizards. A subsequent comprehensive lizard survey during March-May 2013 comprised of 1,890 'checks' of closed-cell foam covers, 1,890 'checks' of Onduline™ Artificial Refugia, and 1,350 pitfall 'trap days'. Twenty (20) person hours were also spent undertaking night spotlighting surveys over 3.049 hectares.

One skink—a common skink (*Oligosoma* aff. *polychroma* Clade 1a, 'Not Threatened' Threat Classification)—was captured at a location adjacent to the Belmont Quarry Extension Area during an initial lizard survey on the 20th to 23rd May 2012. The comprehensive lizard survey during March-May 2013 recorded thirteen (13) *Mokopirirakau* sp. 'Southern North Island forest gecko' ('At Risk - Declining'). Eight (8) of the 13 animals were found within the Special Amenity Area / development area. Four of the female geckos were heavily gravid, and are likely to be carrying a further 8 young, indicative of a significant breeding gecko population present in the Belmont Quarry Extension area and the Firth Block.

Other species identified as potentially present using desktop assessment methods were not detected during either the initial or comprehensive surveys. The potentially present species were *Naultinus punctatus* ('At Risk - Declining'), *Woodworthia maculata* ('Not Threatened'), and possibly *Dactylocnemis pacificus* ('At Risk - Relict'); and the skinks *Oligosoma aeneum* ('Not Threatened'), *Oligosoma ornatum* ('At Risk - Declining'), and *Oligosoma zelandicum* ('Not Threatened'). These species are now considered to be absent from the Belmont Quarry Extension area, or are at densities so low that the species are rendered largely undetectable, even when using comprehensive survey methods.

There are other lizards that occur within the Tararua and Wellington Ecological Districts but these species are unlikely to be present within the proposed development area. They include the gecko *Woodworthia* sp. 'Marlborough mini' ('Not Threatened'), and the skink *Oligosoma lineoocellatum* ('At Risk - Relict'). The introduced species, *Lampropholis delicata* ('Introduced and Naturalised', and also classified as an 'Unwanted Organism' by Biosecurity NZ and DOC) has been recorded in the Greater Wellington region, but is assumed not to have established.

The overall impact from the extension of the quarry to the Extension Area has been assessed to have 'more than minor adverse effects' for the Southern North Island forest gecko using Resource Management Act terminology. These effects are best described as a combination of

deaths and injuries to individual lizards, and habitat losses, and loss of future conservation opportunities.

We consider that the green gecko may also be potentially present in the Belmont Quarry Extension Area, even though no animals were detected. This is because all species of green gecko are notoriously difficult to find, and especially with the habitat types present at the Firth Block. Hence, utilizing a habitat assessment, we suggest that the environmental effects for the green gecko to be similar for the Southern North Island forest gecko.

The adverse effects for the common skink are regarded as less than minor.

Because of the presence of Southern North Island forest gecko, a Wildlife Act Authority from the Department of Conservation is required to undertake lizard mitigation activity as a result of the Belmont Quarry Extension development. Mitigation activity is recommended, in order to mitigate, offset or compensate the adverse effects of any potential development activity on lizards at the Belmont Quarry Extension Area. This should include methods for rescue and relocation of lizards from the Belmont Quarry Extension Area, release site preparation, and measures to assist post release survival of lizards post release.

It is stressed that if any aspect of the development departs significantly from that proposed at the time of this assessment, the interpretation of ecological effects on lizards may no longer be valid.

Introduction

The New Zealand lizard fauna currently has c. 100+ recognised species, of which around half are formally described (Hitchmough et al. 2013, Nielsen et al. 2011). All lizards, apart from one, are endemic to New Zealand, and our lizard species richness is greater than that of terrestrial birds, making them a significant component of our extant fauna. All lizards, except for an introduced skink species, are legally protected under an amendment to the Wildlife Act 1953, and their habitats by the Resource Management Act 1991 (Anderson et al. 2012). A significant component of our lizard fauna (~85%) are recognised as 'Threatened' or 'At Risk' in the latest Threat Ranking Lists (Hitchmough et al. 2013).

Overview of project

In order to accommodate increased quarrying demands, and extend the lifespan of the Belmont Quarry, Winstone Aggregates is proposing to extend the extraction area to include a portion of the Firth Block to the north east of the quarry. Belmont Quarry is located west of State Highway 2, approximately 5 kilometres from Lower Hutt City. This proposed extension is termed the 'Belmont Quarry Extension Area' and would cover approximately 6.8 hectares of land in the Firth Block.

Ecology of the 38.01 Tararua and 39.01 Wellington Ecological Districts

The Belmont Quarry Extraction[1] Area is within the Tararua and Sounds-Wellington Ecological Regions (McEwen 1987) and is at 60-160 m above sea level. The Tararua Ecological District (38.01) consists of steep greywacke and argilite hills and mountains up to 1571m, with an annual rainfall of c. 1,270 mm). Westerly winds predominate and snowfalls are common at higher altitudes. The Wellington Ecological District (39.01) also features strongly faulted greywacke and argilite hills. This district is very windy with frequent NW gales, while warm summers and mild winters dominate.

The Wellington Ecological District has undergone extensive urban development and includes a major city, Wellington. The originally forested district now contains largely modified farms, gorse and forest remnants. Native vegetation includes salt marsh communities, podocarp forests on the hills, rimu-rata/tawa forests closer to the coast and miro-rimu/tawa forest at higher altitudes. The Tararua district features altitudinal zonation, from alpine herbfields, tussockland to leatherwood scrub and extensive forests. Native vegetation interspersed with small exotic forest patches and large burnt areas now dominated by gorse after land clearing. The current vegetation pattern within the Firth Block is diverse, due to both the diversity of landforms, and the differing levels of disturbance and subsequent redevelopment of vegetation cover. Vegetation cover within the Firth Block is predominantly of indigenous composition, but is of varying stages of successional development. Vegetation

[1] For purposes of clarification, the Belmont Quarry Extraction Area refers to the entire quarry operation, including the Proposed Extension Area in the Firth Block.

cover within the area of the Firth Block proposed for aggregate extraction currently comprises c. 40% cover by pioneering exotic plant pests (some areas including a minor indigenous shrub component), and c. 60% cover by indigenous shrub and forest communities. Indigenous vegetation communities range from early successional communities characterised by manuka and kanuka, common broadleaved species and tree ferns through to mature tawa forest. Other features such as emergent rewarewa, podocarp regeneration, and the presence of black beech and a small number of old aged hinau are notable.

Winstone Aggregates has employed the services of Forbes Ecology and MWH NZ Ltd to undertake an assessment of ecological effects of the proposed quarry extension on the ecosystems, flora and fauna within the Belmont Quarry Extension Area. Correspondingly, EcoGecko Consultants Limited were commissioned by Winstone Aggregates to undertake an assessment of the potential lizard and habitat values in this development envelope. This report is our assessment of these values.

Survey effort

We undertook the following lizard survey efforts:

- A desktop assessment of potential lizard values within the Firth Block.
- An initial survey during May 2012, consisting of day searching, pitfall trapping and minnow trapping. This was the initial survey effort for the assessment of environmental effects on lizards as a result of the Belmont Quarry Extension project.
- A comprehensive survey, consisting of night spotlighting, gecko covers, pitfall trapping and Onduline artificial retreats. A comprehensive survey effort was undertaken during March 2013 when the initial survey was inconclusive, and appeared to be affected by cooler weather conditions during the May survey of the previous year.

Materials and Methods

Desktop assessments

A desktop assessment was undertaken to assess the potential lizard values of the Tararua and Wellington Ecological Districts, their threat status, abundance and significance of their presence at the Firth Block locations (if present). This assessment was conducted using a search in the Department of Conservation's BioWeb *Herpetofauna* database, along with our expert knowledge of lizard species distribution patterns. This assessment, which is no substitute for a thorough survey effort, attempts to predict species occurrence based on historical records within the vicinity, along with our expert knowledge of habitat requirements relative to the habitat types available within the Tararua and Wellington Ecological Districts (Tables 1—3). Similarly, we also rated the significance of occurrence of each species in the Tararua and Wellington region, which is an arbitrary indicator of the potential and relative significance of populations of each species in the region, if any are confirmed present at Firth Block (Table 2 & 3). These rankings are based on our knowledge of the species' currently known range and extent of ranges, local and regional abundances, and threat categories. These rankings are subject to revision, as new information becomes available. Finally, we also rated the significance of impacts on the lizard species potentially present within the development footprint (Table 2 & 3).

Through the desktop exercise, we verified the potential presence of eleven lizard species within the combined Tararua and Wellington Ecological Districts. We also determined that there is a reasonable likelihood of the presence of up to six lizard species which may be present within the Firth Block, based on a combination of records from DOC's BioWeb *Herpetofauna* database, our knowledge of lizard ranges and ecology, and the known habitat available at the locality. These verified and potential lizard species are described in Tables 2 & 3.

There appear to be no records of lizards on the Department of Conservation's BioWeb *Herpetofauna* records database from within the proposed development envelope (project area).

TABLE 1: Extant lizard taxa known from the Tararua and Wellington Ecological Districts. Taxonomy used follows that of Nielsen et al. 2011 and Hitchmough et al. 2013.

Ecological District Code	Ecological District Name	Species
38.01	Tararua	*Dactylocenmis pacificus, Mokopirirakau* sp. 'Southern North Island', *Naultinus punctatus, Woodworthia maculata, Oligosoma aeneum, Oligosoma lineoocellatum, Oligosoma polychroma, Oligosoma ornatum.*
39.01	Wellington	*Dactylocenmis pacificus, Mokopirirakau* sp. 'Southern North Island', *Naultinus punctatus, Woodworthia maculata, Woodworthia* sp. 'Marlborough mini', *Lampropholis delicata* (recorded, not established), *Oligosoma aeneum, Oligosoma lineoocellatum, Oligosoma polychroma, Oligosoma ornatum, Oligosoma zelandicum.*

Species potentially present within the development footprint include the geckos *Dactylocenmis pacificus* ('At Risk - Relict'), *Mokopirirakau* sp. 'Southern North Island' ('At Risk - Declining)*, Naultinus punctatus* ('At Risk - Declining'), *Woodworthia maculata* ('Not Threatened'), and the skinks *Oligosoma aeneum* ('Not Threatened'), *Oligosoma ornatum* ('At Risk - Declining') and *Oligosoma zelandicum* ('Not Threatened').

Other lizards that occur within the Ecological Districts but are unlikely to be present within the proposed development envelope include the gecko *Woodworthia* sp. 'Marlborough mini' ('Not Threatened'), and the skinks *Oligosoma lineoocellatum* ('At Risk - Relict') and *Oligosoma zelandicum* (Not Threatened). The introduced species, *Lampropholis delicata* ('Introduced and Naturalised', also classified as an 'Unwanted Organism' by Biosecurity NZ and DOC) has been recorded, but assumed to not have established in the Wellington region. These species are subsequently not assessed for impacts, because of their likely absence from the development footprint.

In Tables 2 & 3, we rated the likelihood of occurrence for the seven species within the Firth Block. Of these seven species, four are classified as 'Not Threatened' by the Department of Conservation's national threat ranking (Hitchmough et al. 2013). These species were given a moderate to high likelihood of occurrence in our assessment for the lower Hutt Valley, apart from the common gecko, which was considered to have a low likelihood of occurrence.

Two species are currently ranked as 'At Risk - Declining', and one is considered 'At Risk Relict'. Populations of any of these at the locality would be of moderate to high significance and are considered likely to have a higher severity of impact. Occurrence of Pacific geckos at this site would be highly significant, as Lower Hutt represents the southernmost edge of their range and this species is not well-known from this area. Both the Southern North Island forest gecko and Wellington green geckos are known from the area immediate to the Firth Block, and from the Belmont Regional Park in particular. Their potential occurrence would not be as significant as that for the Pacific gecko, but the severity of impact would be high due to these species being considered as 'At Risk - Declining', especially if any populations are considered potentially sustainable.

TABLE 2: Extant gecko taxa known from the Tararua and Wellington Ecological Districts, listed with their likelihood and significance of occurrence within Firth Block, along with their current Department of Conservation national threat rankings (Hitchmough et al. 2013). Taxonomy used follows that of Nielsen et al. 2011 and Hitchmough et al. 2013.

Species name	Threat Category	Habitat	Likelihood of Occurrence	Significance of Occurrence[2]	Significance of Impact
Pacific gecko, *Dactylocnemis pacificus*	**At Risk – Relict.** Have undergone a documented decline within the last 1000 years, and now occupy < 10% of their former range. Criterion B — > 20,000 mature individuals; population stable or increasing at > 10%. Qualifiers: Conservation Dependent, Partial Decline.	Forest, shrubland, creviced clay banks and rock bluffs, rock outcrops and associated scrubby vegetation including flax	Moderate	High	High
Southern North Island forest gecko, *Mokopirirakau* sp. 'Southern North Island'	**At Risk - Declining.** Criterion C— very large population and low to high ongoing or predicted decline. C (2/1): Total area of occupancy > 10,000 ha (100 km^2), predicted decline 10–70%. Qualifiers: Data Poor, Partial Decline.	Forest, shrubland, in ferns, and creviced limestone or clay banks	High	Moderate	High
Wellington green gecko, *Naultinus punctatus*	**At Risk – Declining.** Criterion C— very large population and low to high ongoing or predicted decline. C (2/1): Total area of occupancy > 10, 000 ha (100 km^2), predicted decline 10–70%, Qualifiers: Data Poor, Sparse.	Forest and scrub, including manuka and kanuka shrubland	High	Moderate	High
Common gecko, *Woodworthia maculata*	**Not Threatened.** Have large, stable populations. Qualifiers: Conservation Dependent, Partial Decline.	A very wide range of habitats from boulders and bluffs in the littoral zone to inland broadleaf and beech forests; isolated populations sometimes occur on highly modified farm or urban habitats, especially those once forested; often in rocky or scree habitats	Low	Moderate	Moderate

[2] The term 'significance of occurrence' used in this table is not used with the same intent, meaning or purposes as 'significance' under the Resource Management Act 1991. The current viewpoint in assessments of significance for lizard fauna and lizard habitats is to prove the *insignificance* of the adverse effects of development, rather than the significance of populations or their habitats (Anderson et al. 2012).

TABLE 3: Extant skink taxa known from the Tararua and Wellington Ecological Districts, listed with their likelihood and significance of occurrence within Firth Block, along with their current Department of Conservation national threat rankings (Hitchmough et al. 2013). Taxonomy used follows that of Hitchmough et al. 2013. Both the brown skink and rainbow skink are not included as it is unlikely that either species are present.

Species name	Threat Category	Habitat	Likelihood of Occurrence	Significance of Occurrence[3]	Significance of Impact
Copper skink, *Oligosoma aeneum*	**Not Threatened.** Have large, stable populations. Qualifiers	Forest and open or shaded areas with adequate ground cover such as logs, rocks or long grass. Also encountered in urban areas such as compost heaps, rock gardens etc. Occurs close to the high-tide line in coastal situations	Moderate	Low	Moderate
Ornate skink, *Oligosoma ornatum*	**At Risk – Declining.** Criterion C—very large population and low to high ongoing or predicted decline. C(2/1): Total area of occupancy > 10,000 ha (100 km^2), predicted decline 10–70%, Qualifier: Conservation Dependent.	Forest and shrubland, in leaf litter or amongst rocks and logs under canopy cover	Moderate	High	High
¥Common skink, *Oligosoma* aff. *polychroma* Clade 1a	**Not Threatened.** Have large, stable populations. Qualifiers: Conservation Dependent, Partial Decline.	The species occupies a very wide range of generally open habitats up to 1800m including small rocky islets, littoral and supralittoral zones, driftwood on sandy beaches, grasslands, shrublands, rocky sites, and subalpine grasslands and herbfields	High	Low	Low

¥The taxon currently known as *O. polychroma* may consist of five genetically distinct clades, suggesting specific-level taxonomic treatment is likely (Liggins et al. 2008). The taxon likely to be recognised in the Tararua and Wellington EDs would be Clade 1a, which has a very extensive distribution from Gisborne, Taupo, Hawke's Bay and Wellington.

[3] The term 'significance of occurrence' used in this table is not used with the same intent, meaning or purposes as 'significance' under the Resource Management Act 1991. The current viewpoint in assessments of significance for lizard fauna and lizard habitats is to prove the *insignificance* of the adverse effects of development, rather than the significance of populations or their habitats (Anderson et al. 2012).

The Firth Block immediately abuts the Belmont Regional Park administered by the Greater Wellington Regional Council. The following lizard species are known to be present in Belmont Regional Park (source Department of Conservation BioWeb *Herpetofauna* database records, accessed 1 July 2013):

- Southern North Island forest gecko (*Mokopirirakau* sp. 'Southern North Island')
- Wellington green gecko (*Naultinus punctatus*)
- common gecko (*Woodworthia maculata*)
- common skink (*Oligosoma* aff. *polychroma* Clade 1a)

Habitat assessment

The area cited for quarry extension within the Firth Block was assessed as consisting of potentially moderate to high value habitats for lizards. Vegetation maps have been prepared by MWH Ltd / Forbes Ecology and they should be used when discussing vegetation and habitat values, however we make some comments based on our own survey work.

The areas adjacent to the quarry have been highly modified and now consist of a mixture of butterfly bush (*Buddleja davidii*), gorse (*Ulex europaeus*), broom (*Cytisus scoparius*) and Himalayan honeysuckle (*Leycesteria formosa*), with an understorey of regenerating native trees and shrubs (mostly mahoe and ferns). However, the *Buddleja*-dominated canopy is fairly low and open, and in many places covers loose scree of small to medium-sized rocks. Such habitat structure provides the understorey with sufficient sunlight and refugia for skinks to be potentially present.

Both the native scrub habitat and the ridgeline forested habitats were highly suitable for ornate and copper skinks, as well as for forest, Pacific and green geckos. It is of note that remarkably few exotic plant species were found inside these forest types, given that the edges are mostly comprised of invasive plants. The native scrub habitat in particular was of very high quality for all the lizard species present (except, perhaps common skinks which prefer a more open habitat) given its structural complexity, apparent dryness (indicated by patches of the club moss *Lycopodium volubile*, kanuka *Kunzea ericoides* and the fern *Paesia scaberula*) aspect, and patches of open canopy providing plenty of warm refugia and basking spots.

Likewise the ridgeline forested habitats would provide suitable habitat for all lizard species possibly present, with the exception of common skinks and possibly common geckos. While the forest floor and canopy appear to receive a lot of sun, we noted that the understorey of these habitats is open and there are less rocks and dead logs than downslope, therefore copper and ornate skinks may prefer the native scrub sites, as these have a denser understorey. The low regenerating native forest habitat is likely to be too shaded to provide quality habitat, although there were a lot of moderately-sized loose rocks that could provide good ground-level refuge for lizards. We noted the presence of several plant species within the native vegetation that provide important microhabitats and/or food sources. These are listed in Table 4. Therefore, we consider the native scrub habitat on the north-eastern side of the proposed quarry extension to be the highest quality habitat for lizards, followed by the ridgeline forest, exotic scrub, and the regenerating forest at the base of the proposed extension site.

TABLE 4: Plant species within the proposed quarry extension site that are important habitat and/or food species for lizards.

Type	Common name	Species name	Use
Monocot trees / shrubs	Nikau	*Rhopalostylus sapida*	Nectar for geckos?
Dicot trees / shrubs	Mahoe	*Melicytus ramiflorus*	Habitat and berries (?) for geckos
	Kanuka	*Kunzea ericoides*	Habitat and nectar for geckos
	Hangehange	*Geniostoma ligustrifolium*	Habitat for forest geckos
	Kawakawa	*Macropiper excelsium*	Berries are a food source for common geckos
	Kanono	*Coprosma grandifolia*	Berries a potential food source
	Twiggy coprosma	*Coprosma rhamnoides*	Berries, divaricating habitat
	Shining karamu	*Coprosma lucida*	Berries, habitat for geckos
	Karamu	*Coprosma robusta*	Habitat for common geckos and possibly other geckos, berries a potential food source
	Thin-leaved coprosma	*Coprosma areolata*	Complex habitat for geckos, berries
	Red mapou	*Myrsine australis*	Complex habitat for forest geckos
	Kohukuhu / black matipo	*Pittosporum tenuifolium*	Complex basking habitat or refuge for geckos
Ferns	Silver fern / ponga	*Cyathea dealbata*	Habitat for forest and green geckos, dead fronds used as refuge
	Mamaku	*Cyathea medullaris*	Habitat for forest and green geckos, dead fronds and hollow trunks used as refuge
	Wheki	*Dicksonia squarrosa*	Habitat for forest and green geckos, dead fronds and hollow trunks used as refuge. Thick skirt of dead fronds particularly good refuge for geckos.
	Crown fern	*Blechnum discolor*	Thought to be a refuge for forest geckos
Vines	Climbing rata	*Metrosideros fulgens*	Potential nectar for geckos
	Climbing rata	*Metrosideros perforata*	Potential nectar for geckos

Initial lizard survey

A site assessment was undertaken to evaluate the potential for the presence of lizards, their threat status, abundance and significance at the Firth Block (Figure 1 in Appendix). This initial survey was conducted over three days (21^{st} – 23^{rd} May 2012) and included the use of traps, manual searches of day-refugia and a habitat type assessment. For a description of the various survey techniques used here, see Anderson et al. (2012). Habitat sampled included established native forest, native scrub and disturbed exotic scrub habitat (exotic *Buddleja*, *Ulex* and *Cytisus*) close to the quarry extraction boundaries. The site assessment was completed during favourable weather conditions with no rainfall, low cloud cover and winds. However, the temperatures were cool during this time (8.6°C – 11.9°C), which was not ideal for lizard activity.

We used transects consisting of pitfall traps (10.5 cm diameter x 9.5 cm depth) and minnow traps along one transect within each of three habitat types to detect skinks (and to a lesser degree, geckos). Pitfall traps were covered with a 50 x 50 cm Onduline™ cover, which acted as both a lid as well as an artificial refuge for lizards. Traps were placed alternately along each transect, spaced 5-10 m apart and were baited with either pieces of banana or pear and banana baby food to attract lizards. Once set, traps were checked each day and re-baited if required. Traps in the native scrub (transect length: 152 m) and exotic grey scrub (transect length: 159 m) habitats were set for two days (10 pitfalls, 10 minnow traps each, thus 40 trap nights each), and traps in the forested habitat were set for one day (10 pitfalls, 6 minnow traps, thus 16 trap nights, transect length: 107 m). The total trapping effort was 96 trap nights.

In addition to trapping, we visually surveyed a distance of 1,160.14 m (an estimated minimum area of 11,601.4 m^2) within three different habitat types for geckos and skinks. This search included searching microhabitat and refugia likely to be used by the species we expected to find within the area. These included searching on trunks and branches of trees, in the dense foliage of shrubs and tree ferns, overhanging vegetation, within decaying tree trunks, as well as under rocks and logs. We spent a total of 15.42 person hours on direct searching.

The habitat types searched and trapped during the initial survey were as follows:

1. Established native forest – the area trapped was predominantly tawa-rewarewa forest, with some hinau and titoki, however we also searched through early- and mid-sucessional forest with gorse lower down the escarpment;
2. Native scrub – mixed scrub of silver fern, kanuka, mahoe, rangiora, hangehange, kanono, kohukohu and red mapou; and
3. Disturbed habitat and grey scrub (next to quarry access road to old settlement ponds) – this was mostly *Buddleja davidii* / broom scrub, with some native seedlings (mostly mahoe), gorse and Himalayan honeysuckle. Piles of rock tailings were also present.

During the direct searching we noted down plant species that are known to provide habitat and/or food for lizards to help our assessment of habitat quality.

Comprehensive lizard survey

After the initial survey, we followed up with a comprehensive lizard survey using multiple lizard detection methods during more optimum seasonal conditions (Figure 2 in Appendix). The decision was made to do this, as it was considered that weather conditions may have affected outcomes during the initial survey in May 2012. Lizards are less active when prevailing weather conditions are cool, and the conditions of the survey during May 2012 were fine, but quite cool.

As part of this comprehensive effort, eight 150 m-long transects of lizard survey hardware were set up across the Firth Block during mid-December 2012. These transects consists of 30 'units' of each survey method at a 'station' (a closed-cell foam cover, a pitfall trap, and an Onduline™ Artificial Retreat). Again, a description of the various survey techniques is provided by Anderson et al. (2012). These stations were separated by 5 m intervals. There were a total of 270 closed-cell foam covers, 270 pitfall traps and 270 Onduline™ Artificial Retreats in total. The closed-cell foam covers and Onduline™ Artificial Retreats were each checked seven times, while the pitfall traps were checked five times. This provided a total of 1,890 checks each of closed-cell foam covers and Onduline™ Artificial Retreats, and 1,350 'trap days' of pitfall traps. An extra transect was placed in the Belmont Regional Park during January 2013 to see if any results could be compared with those within the Firth Block.

The arboreal, nocturnal or diurno-nocturnal geckos (*Dactylocnemis*, *Mokopirirakau* and *Woodworthia* spp.) are more easily detected using closed-cell foam covers than in day searches or night spotlighting. Onduline™ Artificial Retreats also detect the above gecko species, albeit less frequently for *Dactylocnemis* and *Mokopirirakau* spp., and also detect copper skink, ornate skink and common skink. Pitfall traps similarly detect copper skinks, ornate skinks, common skinks, and have been known to 'trap' *Woodworthia* geckos. However, geckos are capable of exiting traps.

Additionally, 20 person hours of spotlighting effort was conducted by experienced herpetologists in optimal weather conditions. Night survey methods consisted of two night spotlighting techniques. The first is the use of hand-held Led-Lenser P7 torches, which are extremely powerful and long-lasting. These are effective at revealing lizards in foliage, especially in the canopy of manuka and kanuka. This is a method that requires close-up examination of habitat. The second consisted of the use of spotlight-mounted binoculars. These are particularly effective in detecting gecko eye-reflections from tree canopies, branches and trunks. Using binoculars, animal eye reflections can be detected from up to 30 metres away from the observer. We utilized vantage points and the access road to search taller canopies when searching by binocular spotlight methods. Hand-held torch spotlighting methods were conducted inside the forest along tracks and lizard sampling transects. The arboreal diurnal (*Naultinus* spp.) and nocturnal (*Dactylocnemis*, *Mokopirirakau* and *Woodworthia* spp.) geckos can be detected at night using spotlighting methods. For safety of the surveyors, the inner forest survey routes were marked with reflector and flagging tape during the day for the researchers to follow at night.

The intensive use of multiple methods was designed to detect as many lizard species and individuals as possible (Table 5). The fixed apparatus were also established at least 3 months before the first check, and the closed-cell foam covers and Onduline™ Artificial Retreats were checked for the last time after a placement of 5 months.

TABLE 5: Potential lizard species in the Firth Block; with survey methods used for the comprehensive survey. A 'tick' (✓) indicates that this method has usually detected the species in question in past lizard surveys either carried out by ourselves or by other herpetologists at other study sites. Note that for the common gecko and copper skink, pitfall traps and night spotlighting may not be a particularly effective method respectively for these species. However, the other survey methods utilized during the comprehensive survey do compensate for their inefficacy. The least detectable species appears to be the Wellington green gecko—no known survey method is reliable for this species, apart from night spotlighting and day searches, both of which are significantly affected by habitat structure and complexity. The taller forest of the Belmont Extension Area is not conductive to ease of detection of this species using either method. Although it seems apparent in the Table that day searches (visual scanning in vegetation, turning over ground cover objects) detects the widest range of lizard species, this can actually be the most ineffective technique, and prone to not detecting species (or the full suite of species). This is because lizards can be extremely cryptic in the environment. It is usually more efficient to use the other methods that were employed during the comprehensive survey.

Common name	**Scientific name**	**Day searches (May 2012)**	**Minnow traps (May 2012)**	**Closed-cell foam cover**	**Onduline™ artificial refugia**	**Pitfall traps (both surveys)**	**Night spotlighting**
Pacific gecko	*Dactylocnemis pacificus*	✓		✓	✓		✓
Southern North Island forest gecko	*Mokopirirakau* sp. 'Southern North Island'	✓		✓	✓		✓
Wellington green gecko	*Naultinus punctatus*	✓					✓
Common gecko	*Woodworthia maculata*	✓	✓	✓	✓	✓	✓
Copper skink	*Oligosoma aeneum*	✓	✓		✓	✓	✓
Ornate skink	*Oligosoma ornatum*	✓	✓		✓	✓	✓
¥Common skink	*Oligosoma polychroma*	✓	✓		✓	✓	
Survey Effort		**15.42 person hours**	**46 'trap days'**	**1,890 'checks'**	**1,890 'checks'**	**50 + 1,350 'trap days'**	**20 person hours**

TABLE 6: Placement of transects & predominant vegetation type during the comprehensive survey.

Transect	Location	Habitat type
QUAA	See Figure 2	Transect A runs through mixed broadleaf secondary forest, including sections of silver ferns
QUAB	See Figure 2	Transect B runs through mature mahoe forest with open understory
QUAC	See Figure 2	Transect C runs through short to medium stature secondary mixed forest, including red mapau
QUAD	See Figure 2	Transect D runs along track from mixed mahoe forest and into tawa forest
QUAE	See Figure 2	Transect E runs in mature tawa forest into secondary mixed fores, including red mapau
QUAF	See Figure 2	Transect F runs almost entirely throughout secondary kanuka, manuka and gorse habitat
QUAG	See Figure 2	Transect G runs through short stature mixed secondary broadleaf forest
QUAH	See Figure 2	Transect H runs through mature tawa forest
QUAI	See Figure 2	Transect I runs through mahoe forest in Belmont Regional Park

Results

Initial lizard survey

One common skink (*Oligosoma* aff. *polychroma* Clade 1a) was found on the 21st of May 2012 (12:28 pm) during day searching, underneath a rock (10 x 20 cm) in a pile of tailings on the disturbed north-eastern edge of the road leading to the silt ponds. Although the day was sunny, the skink was quite cold and inactive when captured. The location of the lizard is within the disturbed and quarried area, and not part of the Belmont Quarry Extension Area. Because of this, it is not mapped in this report, although its presence is informative of potential presence of common skinks in the development footprint.

No other lizards were detected during this survey, although we noted some white uric acid residuals from faeces on vegetation and rocks during our search that could have been from lizards.

Comprehensive lizard survey

Seven consecutive checks each of 270 closed-cell foam covers (total number of checks = 1,890) detected 12 Southern North Island forest geckos (*Mokopirirakau* sp. 'Southern North Island forest gecko'), plus one gecko skin (Tables 8-10)). Abundance of these geckos was low, with a naive[4] occupancy of 4.8%. The probability of finding a gecko under a cover was only 0.63% over the entire survey. No individual gecko was recaptured during the seven checks, but some geckos were under the same cover where other individual geckos had been recorded previously (QUAE18 and QUAF3). One cover (QUAD8) recorded a single gecko skin, but the animal was not captured in any of the seven checks.

[4] A naïve occupancy index of geckos under covers is simply an accumulated count of presence of geckos in covers. Naïve occupancy is in the sense that this is uncorrected for detection probability (i.e. not using statistical modeling methods to account for this). Occupancy of a gecko cover becomes conditional upon the first presence of a gecko, regardless which sampling day the gecko was recorded in. Clearly, the more checks undertaken over a longer time period, the higher the naïve occupancy will be for the site, because animals have more opportunity to move around and find covers. The search effort here is relatively comparable to other monitoring programmes using gecko covers elsewhere (T. Bell, unpub. data).

Six individual geckos were captured on the very first check (18/03/2013) while a further four were recorded on the fifth check. Single animals were found on the fourth and final check. This is a pattern sometimes seen when using gecko covers (Bell et al. 2011, T. Bell & S. Herbert, unpub. data), where 'loading' of gecko covers over time occasionally results in inflated numbers upon the first check, with additional animals throughout the remainder of the checks. The four animals from the fifth check may have been a result of certain weather conditions immediately preceding the check, in particular wind, cold or rain (Bell et al 2011). In this case, it seems apparent that overcast days, as denoted by the low sunshine hours for both the first check and fifth check (27/03/2013, see Table 10), results in more geckos under covers. This is informative for management planning for mitigation effort.

Eight (8) of the 13 animals were found within the southern Special Amenity Area (SAA). Geckos not in the SAA were either in the QUAF or QUAG transects. In reference to the non-development area, the remaining five animals were found under a single cover QUAF03 (two) on the Firth Block, and one each under QUAF24, QUAF29 and QUAG01. No geckos were recorded on the single Belmont Regional Park transect, possibly due to the low number of replicates (a total of 90 checks from only 30 covers). Eight (8) of the 13 animals were also within the proposed development area, and all 13 were on the Firth Block. The single gecko skin was within both the SAA and development area. Four of the female geckos were heavily gravid, indicating that they were likely carrying a total of 8 young (New Zealand geckos typically have twins per annum). This indicated that the Southern North Island forest gecko population in the Firth Block is well established and relatively significant.

Only one gecko was spotlighted out of 20 person hours of effort (0.05 geckos per person hour) over 3.049 hectares of search area. This was despite ideal weather conditions for spotlighting across two nights, using expert surveyors (Table 9, Figure 2). The evenings were calm (no wind), warm and dry (no recent rainfall). No geckos were spotlighted in areas where gecko cover transects existed (11 geckos were detected by covers within spotlight areas). The single gecko spotlighted was not situated on an existing transect, but between two adjacent transects (QUAB and QUAC, Figure 2). It was located in the SAA within the Extension Area.

Seven consecutive checks each of 270 Onduline™ Artificial Retreats (total = 1,890 checks) did not result in any lizard records. Five consecutive checks of 270 pitfall traps (total pitfall trap days = 1,350) did not result in detection of any lizards either.

TABLE 7: Results of comprehensive survey, detecting Southern North Island forest geckos (*Mokopirirakau* spp.) under gecko covers & by night spotlighting methods. Individual geckos are numbered 1-13. Sex / Stage: M = male; F = female, FG = gravid female (generally 2 young/female); J = immature gecko. Tail regeneration is the length of the regenerated portion of the tail from the break point to the tail tip. Tail length includes both the original tail from vent to break and the regenerating portion. Habitat type is a general description of the immediate forest type where the geckos were recorded.

Forest gecko number	Transect	Cover Number	Date	Sex / Stage	Snout-vent length	Tail length	Tail reg.[n]	Habitat type
1	QUAC	16	18/03/2013	FG	82	74	64	Mixed secondary forest, incl. red mapou
2	QUAC	26	18/03/2013	M	86	82	-	Mixed secondary forest, , incl. red mapou
3	QUAE	18	18/03/2013	M	80	90	81	Secondary forest, adj to tawa
4	QUAE	18	18/03/2013	FG	76	61	51	Secondary forest, adj. to tawa
5	QUAF	3	18/03/2013	M	75	96	-	Kanuka, manuka & gorse
6	QUAG	1	18/03/2013	FG	76	104	-	Mixed secondary forest, incl. red mapou
7	QUAF	29	25/03/2013	M	79	N/A	-	Kanuka, manuka & gorse
8	QUAC	16	27/03/2013	M	78	75	63	Mixed secondary forest, incl. red mapou
9	QUAE	18	27/03/2013	M	76	96	-	Secondary forest, adj. to tawa
10	QUAF	3	27/03/2013	J	48	92	-	Kanuka, manuka & gorse
11	QUAF	24	27/03/2013	FG	78	87	-	Kanuka, manuka & gorse
12	QUAD	24	08/05/2013	F	70	78	-	Mahoe, adj. tawa
13	N/A – Spotlighted 41° 9'59.88"S 174°57'27.17"E		26/03/2013	F	N/A	N/A	N/A	Mahoe in broadleaf forest
Skin	QUAD	8	18/03/2013	N/A	N/A	N/A	N/A	Mahoe, adj. tawa

TABLE 8: Locations of geckos in relation to the Special Amenity Area, areas within proposed development, and areas external to development, and Belmont Regional Park. Effort = number of transects or gecko covers within identified areas; naive cumulative index (%): index of gecko occupancy of covers within identified areas.

Forest gecko number	Transect	Cover Number	Special Amenity Area within Development	Development Area	Non-Development Area	Belmont Regional Park
1	QUAC	16	✓	✓	-	-
2	QUAC	26	✓	✓	-	-
3	QUAE	18	✓	✓	-	
4	QUAE	18	✓	✓	-	
5	QUAF	3	-	-	✓	-
6	QUAG	1	-	-	✓	-
7	QUAF	29	-	-	✓	-
8	QUAC	16	✓	✓	-	-
9	QUAE	18	✓	✓	-	-
10	QUAF	3	-	-	✓	-
11	QUAF	24	-	-	✓	-
12	QUAD	24	✓	✓	-	-
13	N/A – Spotlighted	41° 9'59.88"S 174°57'27.17"E	✓	✓	-	-
Skin	QUAD	8	✓	✓	-	-
Effort (covers)	9 transects	270 covers (1,890 checks)	145 (1,015 checks)	150 (1,050 checks)	90 (630 checks)	30 (90 checks)
Naive cumulative occupancy index (%)	270 covers	4.8% from all 270 covers	6.2%	6.0%	5.5%	0%
Overall probability of finding a gecko	1,890 checks	All covers: 0.63%	0.88%	0.85%	0.79%	0%
Totals	-	-	9	9	5	0

TABLE 9: Weather conditions during time of checks of gecko covers, Onduline Artifical Retreats and pitfall traps. Note, no lizards were found using Onduline or pitfall traps, therefore the we compare results of gecko covers with weather data only. Weather data sourced from NIWA (station number 3925, Kelburn, Wellington). Conditions on site were very similar to the weather data from NIWA.

Variable	Check 1 18/03/2013	Check 2 20/03/2013	Check 3 22/03/2013	Check 4 25/03/2013	Check 5 27/03/2013	Check 6 29/03/2013	Check 7 08/05/2013
Temp (Max)	19.5	16.4	19.1	20.4	24.7	25.3	16.6
Temp (Min)	14.3	5.4	9.3	10.0	11.4	9.1	5.7
Sunshine Hours	0.3	8.6	4.0	4.5	7.0	2.2	7.9
Precipitation 24 hr prior	7.2	0.6	0.0	0.0	0.2	0.0	0.0
Precipitation	28.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind 9am [Direction, Speed m/s]	301, 44	114, 16	108, 11	95, 1	101, 0	114, 12	110, 0
Number of geckos	6	0	0	1	4	0	1

TABLE 10: Weather conditions & results during night spotlighting. Wind is assessed using the Beaufort scale, where 0 = calm, 1 = light air and 2 = light breeze.

Variable	Observers	Date	Time Start	Time Finish	Temperature (Start)	Temperature (Finish)	Rain	Wind	No. of geckos
Night 1	Trent Bell, Sarah Herbert	26/03/2013	21:36	02:40	19.7	16.5	0	0 -2	1
Night 2	Trent Bell, Sarah Herbert	28/03/2013	21:00	02:24	19.9	20.7	0	0	0

It was of considerable surprise to us not to capture any terrestrial skink species. The number of artificial refugia and traps set for skinks was considerable, as was the number of checks. This outcome may be related to the history of the former quarry and land clearing in the past in the Firth Block. With the exception for the tawa-dominant forest tracts, the vegetation is largely successional in nature. It is possible that skinks were present when the original land cover was present, but subsequent clearing and working over may have made it untenable for terrestrial skinks to re-establish detectable populations.

Discussion and Assessment

Survey limitations

The original survey limitations in our initial lizard survey, caused by cool weather conditions during May 2012, were recognised both by Winstone Aggregates and ourselves. Detection probability of ectothermic animals increases dramatically when temperatures are higher during the summer months. The restriction of having to survey the area in May during the initial survey, close to winter when mornings and evenings are colder, is likely to have decreased the probability of detecting any lizards using any survey method over the limited survey duration. While we feel we looked under enough refugia during this initial survey to suggest that copper and ornate skinks are not abundant at the site, rare populations of lizards such as Pacific geckos and Southern North Island forest geckos can be incredibly difficult to detect due to their cryptic nature.

Winstone Aggregates responded to this survey limitation by asking for a more comprehensive survey effort, the results of which are presented in this assessment. Coincidentally, the clearing of a former access road after May 2012 enabled night spotlighting methods to be utilized safely and also enabled the use of heavy lizard survey equipment (in the form of 540 Onduline™ squares). These techniques could then be added to the comprehensive lizard survey.

Green geckos are one of the more difficult gecko species to detect in complex and tall forest. Despite the use of two methods known to be the most reliable for the detection of this gecko — day surveys and night spotlighting — no green geckos were found at the search site. This is not due to a failure to use an appropriate survey method for the species. The issue lies in the fact that green geckos are a difficult species to survey, particularly in habitat such as that found in the Firth Block. There is potential for Wellington green geckos to be either not present or present in very low numbers.

We strongly recommend that a precautionary assumption is made that the Wellington green gecko may be present in the Firth Block despite the inability to detect the species in our two surveys. This allows for this species to be included in the environmental management plan for the Belmont Quarry Extension project, and especially the lizard mitigation programme.

The steep terrain of the former quarry cutting into the hillside (now undergoing native vegetation succession) created safety hazards for surveying. This prevented our intensive lizard sampling methods from extending into these areas as well. However, we believe that our survey methods in the later comprehensive survey were robust enough to detect any lizard species—apart from the green gecko—that would also have been present in the more hazardous areas.

Species context

Southern North Island forest geckos have a very widespread range from Hawke's Bay in the North Island down to Wellington. They are habitat generalists, being found in manuka/kanuka scrubland, secondary broadleaved forest, mature podocarp-broadleaf forest and also beech forest across their national range. The Wellington green gecko is similarly widespread in the lower North Island where suitable habitat is available, and their macro-habitat requirements are similar. The habitat for the two gecko species in the proposed Belmont Quarry Extension Area is therefore not nationally significant, in terms of the Resource Management Act 1991 (Section 6(c)).

A recent conservation status re-evaluation has seen Southern North Island forest geckos elevated from Not Threatened, to At Risk – Declining (Hitchmough et al. 2013). The species was classified under this ranking using Criterion C (where there is a very large population, but with low to high ongoing or predicted decline. Sub-criterion (C: 2/1) indicated the total area of occupancy > 10,000 ha (100 km^2), predicted decline 10–70%. Two qualifiers were included in this assessment: Data Poor, Partial Decline. A recent paper by Tingley et al. (2013) looking at New Zealand lizard life history traits in relation to extrinsic threat factors found that arboreal geckos that are diurnal were currently at an enhanced risk of extinction. Both the Southern North Island forest gecko and green geckos have these traits (the Southern North Island forest gecko being diurno-nocturnal).

The common skink was found in a location adjacent to the Firth Block, in developed land within the 'Extraction Activity Area'. No other common skinks were recorded during the comprehensive survey, and the species is likely to be very sparse and in margin habitat largely unaffected by the proposed quarry extension.

However, the presence of lizards as absolutely protected wildlife within the Firth Block has triggered the requirement for a Wildlife Act Authority to be in place prior to undertaking development activities at the Belmont Quarry Extension Area. This is because all native lizards are legally protected by the Wildlife Act 1953, and destruction of lizards is not permitted by law under the Act without a Wildlife Act Authority (also commonly referred to as a Wildlife Act Permit) from the Department of Conservation.

Assessment of Environmental Effects

The overall effect from the construction of the Belmont Quarry Extension, without mitigation, has been assessed to be 'more than minor' on the Southern North Island forest gecko (Table 11). Although we were unable to detect the presence of the green gecko due to the lack of effective survey techniques for this species in structurally complex and tall habitat, we include this species on a precautionary basis, and assign it with the same assessed effects as for the Southern North Island forest gecko. This assessment is on the basis that the green gecko occupies habitat types that are very similar to the Southern North Island forest gecko, although spatial orientation and use of this habitat is distinct in the two gecko species.

These effects are best described as a combination of deaths and injuries to individual lizards, and habitat losses and fragmentation, including edge effects. Lizards are best described as 'sedentary' when considering movement and dispersal abilities, and destruction of lizard habitat will lead to mortalities and injuries. Further, New Zealand lizards have a very slow life history, characterised by low annual reproductive output and great longevity. This indicates that population recoveries from losses are unlikely, and may take decades even under optimum conditions for animal survival.

The existing site provides good quality habitat for lizards and can potentially act as a source for lizards when the existing quarry is eventually rehabilitated in time. Lizards are important for ecosystem processes as they can play roles in site pollination and seed dispersal. Further, the habitat destruction may lead to a future potential loss of conservation opportunities for the species involved, given that advances in pest management on mainland New Zealand has seen considerable conservation outcomes.

The common skink found during the initial survey was within an area adjacent to — but not in — the Belmont Quarry Extension Area, and no further common skinks were found during the comprehensive lizard survey. The adverse effects on this species therefore have been accorded with an assessment of 'less than minor'.

In a recent publication, Anderson et al. (2012) provided a viewpoint that can be described in two simple ways: all remaining lizard populations and their habitats are significant, and that the onus is on development proposals to demonstrate the *insignificance* of the adverse environmental effects of the project on lizards. This insignificance can be reached 'on balance' as part of a mitigation proposal avoiding, remedying, mitigating and/or offsetting the adverse effects of the project. It was also recommended by Anderson et al. (2012) that where possible, 'a net gain' is preferable over 'no net loss' thus improving the conservation status of the affected species overall. It is recommended to reduce adverse effects of the project to 'no more than minor' by implementing an environmental management plan that includes lizards.

Wildlife Act obligations

A Wildlife Act Authority (also known as a Wildlife Act permit) is a legislative obligation in order to rescue and relocate affected lizards from the development site prior to works. Wildlife Act Authorities involving affected lizards usually require a reasonable effort to 'rescue and relocate' native lizards to adjacent sites, or identified receptor sites located elsewhere, under the supervision of a suitably qualified expert, and to ensure their post-release establishment in new locations (such as via habitat manipulation and/or pest control plus monitoring to identify outcomes). The Wildlife Act Authority also requires the reporting of all lizard records to the Department of Conservation.

If a relocation of lizards is required, and the receptor site is more than 500 m away from the capture location, a Translocation Permit from the Department of Conservation will also be required.

The Wildlife Act Authority application should include a proposed specialised management plan for the lizard component of the project. This plan can be part of the wider environmental management plan. The Lizard Management Plan cannot be final until the outcome of the application for the Wildlife Act Authority and its conditions are known. This is because the Authority sets out conditions for wildlife, which then need to be incorporated into the final Plan.

Mitigation recommendations

For the Belmont Quarry Extension project, the following general mitigation recommendations are:

1) A specialist lizard management plan (LMP) be prepared to guide lizard management for the Belmont Quarry Extension. This may form part of the wider Environmental Management Plan for the site. The LMP should only be finalised prior to issuing of a Wildlife Act Authority, and the inclusions of any subsequent conditions into the LMP.

2) A Wildlife Act Authority application for lizard capture and relocation is prepared by a suitably qualified person or company, submitted and approved prior to any vegetation removal activities occurring on the Firth Block. This Wildlife Act Authority should be prepared by the people or company that will be engaged to undertake the lizard mitigation or offset activities on the Firth Block.

3) The Lizard Management Plan includes a lizard capture and relocation programme. For Southern North Island forest geckos, this lizard capture programme should utilize closed-cell foam covers arranged in a grid covering each 'stage' of the vegetative clearance of the Firth Block. It is anticipated that development of each stage will be staggered over years so foam covers will be moved from stage to stage as required over the lifetime of the vegetation clearing phase of the Belmont Quarry Extension. A regular 'checking' programme over the course of the warmer months of the year should be developed to

maximise opportunities for gecko capture and relocation. For green geckos, night spotlighting and scanning cut vegetation for geckos may be the best method for recovering animals.

4) Investigations with the Department of Conservation and the Greater Wellington Regional Council should be made with the following potential receptor sites in mind:

   a) **Mana Island (DOC).** No Southern North Island forest geckos are currently present on pest-free Mana Island. However, the island would once have had these geckos, and there is now suitable habitat. Establishing geckos on Mana Island would significantly extend the range of the species, help secure the species' security in the Greater Wellington region, and contribute towards the ecological restoration programme of Mana Island. Post-release monitoring would be required at intervals until the gecko can be confirmed as having successfully established on the island.

   b) **Matiu/Somes Island (DOC).** Southern North Island forest geckos were translocated to Matiu/Somes Island by DOC. However, the outcome of this translocation remains unknown. Relocated geckos from the Belmont Quarry Extension Area could supplement this population, and lizard management planning may allow for the opportunity to undertake scientific research on outcomes both of the translocation and supplementation together. Matiu/Somes Island is pest-free. Post-release monitoring would be required at intervals until the gecko can be confirmed as having successfully established on the island.

   c) **Adjacent forest in Belmont Regional Park (GWRC) or Firth Block.** In typical resource management activity, this would be the usual option, due to the close proximity of the BRP. No translocation plan would be required. However, utilization of the BRP/Firth Block as a receptor site for geckos would require a contribution to the pest management activities at an identified local site where geckos are to be released into. Such a contribution should have the objective of ensuring the success of the relocation and subsequent establishment of a new population of geckos. Releasing geckos in a particularly large area may mean post-release follow-up is not feasible due to dispersal, unless there was some form of 'soft-release' design utilized in the release—which would be largely experimental in nature. However, a long-term gecko monitoring programme could be established in the wider BRP/Firth Block to follow the general gecko population instead, and assess population responses to pest-management both by GWRC and Winstone Aggregates. This is a component requiring some further consideration.

   d) If the distance is greater than 500 m from the original capture location, a Translocation Permit from the Department of Conservation is also needed.

   e) Lizards should be released into habitats which provide for their requirements as a species.

f) A ‘soft-release’ experiment may potentially be undertaken to try to ‘anchor’ a translocated population and assist in population establishment.

g) A pest control programme should be developed for any potential release site, to assist relocated lizards establishment at the new site. Intensive pest control programmes over large landscapes may be used to offset adverse effects on lizards that will result from undertaking a project, especially if it is difficult to rescue a significant number of individuals from affected sites. Uncertainty surrounding the required scope, scale, duration and intensity of pest control in order to trigger positive responses in lizard populations must be considered during the development of any such pest control programme. A pest control programme would not be required if lizards were released into a pest-free environment, such as an offshore island.

5) A lizard monitoring programme should be implemented to determine establishment of the population at the new location over time. There are a variety of available analytical methods, ranging from simple indexes, to occupancy and mark-recapture modelling, and any monitoring programme should be developed after consideration of current best practice for lizard monitoring at the time of development, by a suitably qualified person or company. It is important to obtain expert advice in study design and techniques for monitoring lizards.

6) Producing reports is critical for reporting on mitigation efforts and in order to pass on knowledge. The requirement for reports should be included in the Lizard Management Plan.

Table 11: Lizard species likely to be present within the proposed Belmont Quarry Extension development area, with assessment of severity of adverse effects (low, moderate, high) from the proposed development for these species.

Common name	**Scientific name**	**Mortality & injuries via clearing forest for quarry**	**Habitat loss**[5]	**Barrier effect in dispersal via habitat fragmentation**[6]	**Loss of future conservation opportunity**[7]	**Edge effects**[8]	**Effect on local population without mitigation**
Pacific gecko	*Dactylocnemis pacificus*	N/A	N/A	N/A	N/A	N/A	No effect
Southern North Island forest gecko	*Mokopirirakau* sp. 'Southern North Island'	**High**	**High**	**Low**	**High**	**Low**	**More than Minor Adverse Effects.** Apparently sizable population present, and considering current threat status
Wellington green gecko	*Naultinus punctatus*	**High**	**High**	**Low**	**High**	**Low**	**More than Minor Adverse Effects. (Probable)—**species was not detected during surveys but is likely present)
Common gecko	*Woodworthia maculata*	N/A	N/A	N/A	N/A	N/A	No effect
Copper skink	*Oligosoma aeneum*	N/A	N/A	N/A	N/A	N/A	No effect
Ornate skink	*Oligosoma ornatum*	N/A	N/A	N/A	N/A	N/A	No effect
¥Common skink	*Oligosoma* aff. *polychroma* Clade 1a	**High**[9]	**Low**	**Low**	**Low**	**Low**	**Less Than Minor Adverse Effects.** Local population low in number and in limited habitat.

5 Habitat destruction refers to lizard habitat along the development corridor which will be permanently destroyed during the construction of the quarry extension.

6 The barrier effect refers to a species' inability to cross non-optimal habitat, such as roads, to reach other newly fragmented habitat patches what was once a continuous habitat area. This may be an issue of concern for particularly sedentary lizard species, given their tiny home ranges and low rate of dispersal.

7 This refers to the future potential of the site for intensive conservation management of the flora and fauna herewithin. New and improved pest control technologies are seeing effective possum and, in some cases, rodent control in unfenced areas. Improved pest control may see significant future opportunities for some lizard species on the New Zealand mainland.

8 Edge effects are defined as the effect of further fragmentation of the species' ideal habitat, and is based on whether the species is able to live on habitat edges, or requires interior habitat

9 Losses will be in the order of greater magnitude of any individuals killed, given the initial depauperate abundance of the species, however, the low density likely indicates fewer animals will actually be directly impacted during construction.

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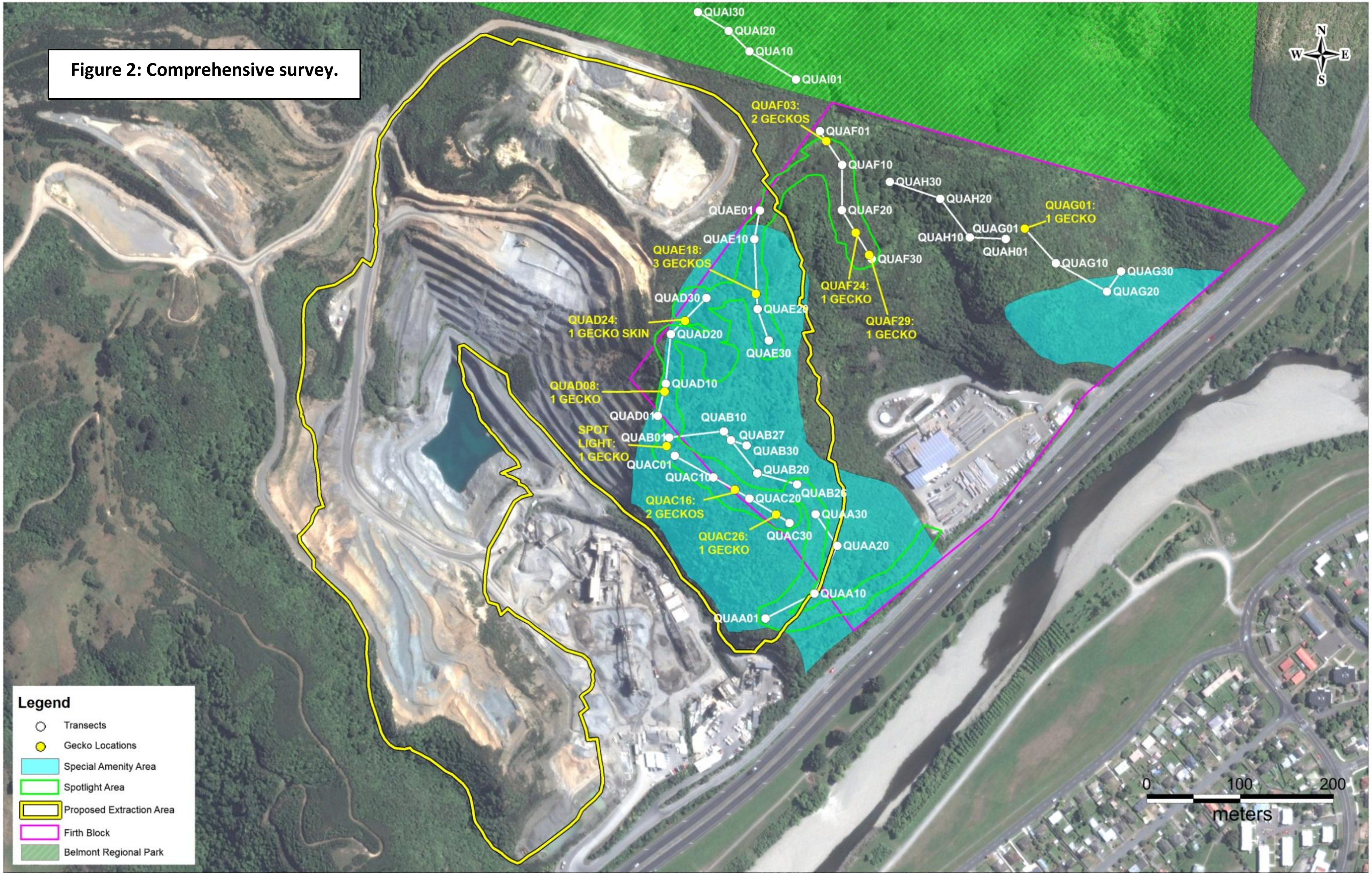
Appendixes

WINSTONE AGGREGATES | MWH | Forbes Ecology | ecogecko CONSULTANTS

Belmont Quarry: Firth Block
Initial Survey

Scale: 1:3700 (A3)



WINSTONE AGGREGATES MWH Forbes Ecology ecogecko CONSULTANTS

Belmont Quarry: Firth Block Comprehensive Survey

Scale: 1:3700 (A3)

APPENDIX 8 – EXAMPLES OF CONSULTATION MATERIALS

3rd July 2013

Dear Sir / Madam,

PROPOSED EXTENSION OF THE BELMONT

I am writing to you on behalf of Winstone Aggregates to advise you about the future development of the Belmont Quarry.

Based on present aggregate demand in the Wellington region, the current permitted quarry operation at Winstone's Belmont Quarry has approximately 5 - 10 years of resource remaining (depending on future demand). Winstones is therefore seeking approval for a new aggregate resource to ensure consistency of supply for the Wellington region and business as usual at the Belmont Quarry.

If you feel that you are directly affected by the proposal and/or would like to express any concerns you may have, please feel free to attend one of the public consultation events detailed below. Alternatively please don't hesitate in contacting me via email to request further information, ian.wallace@winstoneaggregates.co.nz .

Three public display stands will be setup, where Winstones personnel will be present to discuss any concerns or comments you may have.

Location	**Date & Time**
Tui Glen School Hall	2.00 – 3.50 pm Friday 26th July
Pomare School Hall	4.10 – 6.00 pm Friday 26th July
Walter Nash Stadium, main entrance	10.00am – 12.00pm Saturday 27th July

Kind Regards,

Ian Wallace
Environmental Projects Leader

MEETING AGENDA

The next Belmont Quarry Liaison Meeting will be held on:

Thursday 18th July 2013

The meeting will commence at 6:00 pm and conclude at 7:30 pm

To be held at:

Belmont Quarry
Hebden Crescent
Belmont

****

1. Welcome
2. General update on Belmont Quarry
3. Proposed Quarry Development
   - Presentation - quarry extension & private plan change
   - Questions and Answers
4. Complaints
5. General Business

   To have items of General Business placed on the Agenda, please advise:

   Email: ian.wallace@winstoneaggregates.co.nz

   Phone: 09 – 525 9309

6. Next meeting – potential dates

RSVP – Belmont Liaison Group Meeting

Name(s) ______________________________

Postal Address ______________________________

Email Address ______________________________

Phone number ______________________________

Number of People Attending ______________________________

Please return **completed form** via one of the following methods:

Postal address: PO Box 17 195, Greenlane, Auckland

Facsimile: 09 525 9004

Email: ian.wallace@winstoneaggregates.co.nz

Feedback Form – Proposed Belmont Quarry Extension

Please complete this feedback form if you have any concerns specific to the proposed extension of the Belmont Quarry.

Contact Details

Name:

Address:

Telephone Number:

Completed Feedback Forms

It would be much appreciated if all completed feedback forms could be returned to:

- Ian Wallace
  Winstone Aggregates
  PO BOX 17 195
  Greenlane
  Auckland 1546

Belmont Quarry Extension

Consultation Document

INTRODUCTION

Winstone Aggregates (Winstones) will shortly be submitting a Private Plan change application to the Hutt City Council to allow the future extension of the Belmont Quarry.

Belmont Quarry is located to the immediate West of State Highway 2, approximately 5 kilometres northeast of the Lower Hutt City. Access to the quarry is obtained from State Highway 2 via Hebden Crescent (refer to Figure 1 on page 6).

The plan change process will include all relevant technical and environmental investigations and potentially affected parties will be contacted and consulted throughout.

Winstones will be consulting with potentially affected parties with a focus on immediate landowners surrounding the quarry and those within the wider visual area. Consultation will also be undertaken with Greater Wellington Regional Council, Hutt City Council, Tangata Whenua and the Department of Conservation.

PLAN CHANGE – HUTT CITY COUNCIL

The Belmont Quarry is zoned as an 'Extraction Activity Area' in the Hutt City Council District Plan (yellow area shown in Figures 2 & 3). Vegetation removal and quarry activities are permitted activities within this zone (resource consents are not required) except for where additional protection mechanisms exist.

A Special Amenity Area protection overlay sits over the top of the Extraction Activity Area in two places at the Belmont Quarry (shown in pink in Figure 3), preventing quarry activities and vegetation clearance in defined areas.

The District Plan objectives and policies require areas of 'Special Amenity' to retain their indigenous vegetation on the face of the escarpment.

Winstones is seeking to remove part of the Special Amenity Area protection overlay which extends into the proposed quarry extension area (shown in Figure 3) from the Hutt City Council District Plan.

It is important to note that the Special Amenity Area is in conflict with a permitted Extraction Activity Area detailed in the same plan (shown in yellow on Figures 2 & 3).

Our target lodgement date for the Private Plan change application is August 2013.

BACKGROUND

Based on present aggregate demand in the Wellington region, the current permitted quarry operation at Winstone's Belmont Quarry has approximately 5 - 10 years of resource remaining (depending on future demand). Winstones is therefore seeking approval for a new aggregate resource to ensure consistency of supply for the Wellington region and business as usual at the Belmont Quarry.

A number of options have been considered. The Cottle Block to the southwest of the existing operation was initially preferred (even though it was outside the quarry zone), however drill tests have shown this resource is of relatively poor grade (high in argillite). The only remaining viable option is the Firth Block located to the northeast of the existing Belmont Quarry, on the hill country between the Belmont Quarry and the Firth Concrete yard, within the quarry zone (refer to Figure 2 on page 7).

Whilst the Firth Block land is identified in the District Plan as an 'Extraction Activity Area' (i.e. quarrying is a permitted activity) a sizable area has an additional protection overlay, in the form of a Special Amenity Area. Quarrying is not a permitted activity within the Special Amenity Area, even though the same area is also zoned as an 'Extraction Activity Area' in the Hutt City District Plan (refer to Figure 3 on page 8).

To allow the continued operation of the Belmont Quarry for the next 30+ years, Winstones is seeking to amend the District Plan to remove or relocate part of the Special Amenity Area overlay via a Private Plan change application.

It is important to understand that this proposal will not substantially expand the scale or nature of the existing operation, but rather secure future resource to allow the on-going operation of the quarry without interruption. Changes at the site will continue very gradually, as they have done for the last 100+ years.

AGGREGATES IN NEW ZEALAND

Rock is a fundamental input into the infrastructure on which the economy runs. There are no cost effective substitutes for the input of quarried rock.

Over half of the aggregate produced in NZ is used on roads, and 21% goes into commercial and residential building.

Quarries in and/or near urban areas are an economic necessity if we are to have the infrastructure that we require in our cities; because of the weight, transporting aggregate even short distances by road is costly , so our quarry resources need to be relatively near the places they are used.

With 75% of our aggregate being used by local councils the cost of carrying aggregate long distances falls on rate payers.

Infrastructure is critical to New Zealand's economic future. We need roads, rail, housing and commercial buildings to ensure the country's economic performance.

BELMONT QUARRY

1. History of Winstone Aggregates

Winstone Aggregates was founded by William Winstone almost 150 years ago in 1864. In New Zealand terms this is a long history in the aggregate and transport industries.

Winstones became part of Fletcher Building in 1988 and now operates within the Fletcher Infrastructure Products division.

Winstones is now New Zealand's largest supplier of aggregates with 26 locations nationwide. Annually we extract 4.5 million m³ of aggregate.

2. History of Belmont Quarry

The history of the Belmont Quarry stretches back to the early 1900's, where it had a colourful beginning as a gold prospecting site. In the 1920s, it was utilised as source of rock to produce ballast for New Zealand railways and from 1935 until 1977 the site was owned and operated by River Sand and Shingle Ltd.

The site was acquired by Firth Industries together with a river plant at Melling in 1977, the two plants complementing each other in the supply of building and roading aggregates.

In 1988, Belmont Quarry was amalgamated into Winstone Aggregates Limited (as it was then) under the ownership of Fletchers, and with local alluvial materials becoming scarce, a major production plant redevelopment was implemented to enable the production of a full range of high quality aggregate products from the quarry.

Today Belmont Quarry is one of three major aggregate suppliers in Wellington Region and the only quarry in the Hutt City Region. It supplies about one third of the Wellington region's aggregate and more than half of the regional demand for aggregate used in concrete. Belmont Quarry manufactures a full range of aggregates and sand for the use in roading, civil construction, concrete, drainage and building markets. Belmont also supplies clay and fill material for such projects as flood protection stop banks along the Hutt River.

3. *Future*

Based on the number of large roading and proposed construction projects and population growth in the Wellington region, long term demand is expected to grow.

Belmont Quarry is well placed to continue to meet the region's need for high quality aggregates. The site is a key to the supply of seal chip into the local market and also supplies concrete and asphalt aggregates to a number of Wellington asphalt plants.

Winstones has demonstrated a long standing commitment to Wellington and the Hutt Valley. Belmont Quarry has been here since the early 1900's and our reputation in the community as a good neighbour is important to us. This extension is our future commitment to the area, its community and its economic future.

4. *Environmental Record*

We have a very strong environmental compliance record for the 26 sites we operate and we work hard to achieve and go beyond our resource consent obligations.

Belmont Quarry was recently awarded the prestigious Encore Award – Excellence in Compliance, presented to the company by the Minister of Conservation. The company was nominated for this award by the Greater Wellington Regional Council compliance officer for the site. This award highlights just how seriously Winstones takes its consent and environmental obligations.

POTENTIAL EFFECTS AND MITIGATION

Generally future effects will be similar to those currently occurring at the existing Belmont Quarry. Preliminary assessments of potential effects and methods of control have been undertaken and are summarised as follows:

1. *Erosion and Sediment*

An Erosion and Sediment Control Plan (ESCP) is currently been developed, and will form part of the overall Quarry Management Plan. Under the ESCP erosion and sediment control measures will be undertaken and implemented with a hierarchy and priority order as follows:

- Erosion control will be a priority in all circumstances by preventing sediment generation through a range of structural (physical measures) and non-structural (methodologies and construction sequencing) means.

- Existing Sediment Retention Ponds (SRPs) will be retained and additional SRPs will be constructed.

As part of the erosion and sediment control methodology, on-going site monitoring will occur to ensure that the proposed erosion and sediment control measures have been installed correctly, methodologies are being followed and are functioning effectively throughout the duration of the works. Any measures requiring attention will be identified and amendments made as necessary.

2. *Landscape and Visual*

Quarry activities by their nature are large in scale and occur over long time frames (30+ years in this case). The design of the final landform and other rehabilitation measures included in the proposal endeavours to avoid, remedy and mitigate the potential adverse landscape and visual effects.

The proposed key landscape and visual mitigation measures identified are as follows:

- Through design, ensure that the new landform will physically and visually integrate with the existing landforms and landscape character of the locality following each stage of the proposal.

- The implementation of a rehabilitation plan to establish native vegetation along completed quarry faces. This will soften the form of these visible faces and reduce visual impact across the lifetime of the proposal.

In the long-term, the potential adverse visual and landscape effects of the changed landscape will be reduced as the modified landform is rehabilitated in native vegetation in a manner which will integrate into the surrounding landscape.

In the short term as the Firth Block escarpment is reduced in height, there may be some adverse landscape and visual effects. These effects may be more than minor during parts of the project and will be discussed with affected parties.

3. Terrestrial ecology

We have previously commissioned preliminary investigations into Terrestrial Ecology values associated with the Firth Block and proposed extension area.

Winstones recognise that although many parts of the proposed development area feature young, weedy, or otherwise poorly developed vegetation communities which are regenerating from past disturbance, there are also areas of more mature indigenous forest communities present.

We have commissioned further, comprehensive, ecological assessments of the site so as to delineate and better quantify the Terrestrial Ecology values present. These current investigations are covering not just assessment of vegetation cover, but also investigations into the types of birds present, whether lizards inhabit the area, and also to determine the potential for uncommon or threatened plants to be present within the Firth Block, and in the wider area also.

While it is too early to say just now what the outcomes of those investigations are, we expect to soon be able to say with confidence what the Terrestrial Ecology Values are at the Firth Block proposal site, and how any such values can be reflected in our development proposal.

4. Noise

Any adverse effects from noise are not expected to be more than minor and will be very similar (if not the same) to current noise emissions from the site.

5. Site Access

Road access to Belmont Quarry will remain the same as it is currently. The quarry has good access to the state highway network and is close to demand (cost of aggregate doubles for every additional 30 km it is transported).

A new quarry further away may have similar local environmental effects, but would come with increased cost because of the extra transport distances required to supply aggregate to where it is required.

It is important to note that there are currently no nearby commercially viable alternatives for a new quarry. Any potential quarry would involve significant land disturbance and increased transport distances.

WHERE TO FROM HERE?

Winstones will continue to consult with potentially affected parties with a view to lodging a Private Plan Change application with the Hutt City Council by August 2013.

Your comments and suggestions will be helpful in enabling us to better identify and understand potential adverse effects of the proposal, and thus enable us to formulate the most sensitive project design.

We are keen to discuss any concerns or queries you may have, which can be provided by post, email or phone (details below). If you feel it is beneficial, we will organise a meeting and/or site tour with you.

CONTACT INFORMATION

For further information please contact:

Ian Wallace
Environmental Projects Leader – Winstone Aggregates
DDI 09 525 9309
Mob 021 673 430
PO Box 17 195, Greenlane, Auckland 1546
ian.wallace@winstoneaggregates.co.nz

Figure 1 – Location of Belmont Quarry

Figure 2 – Alternative options considered

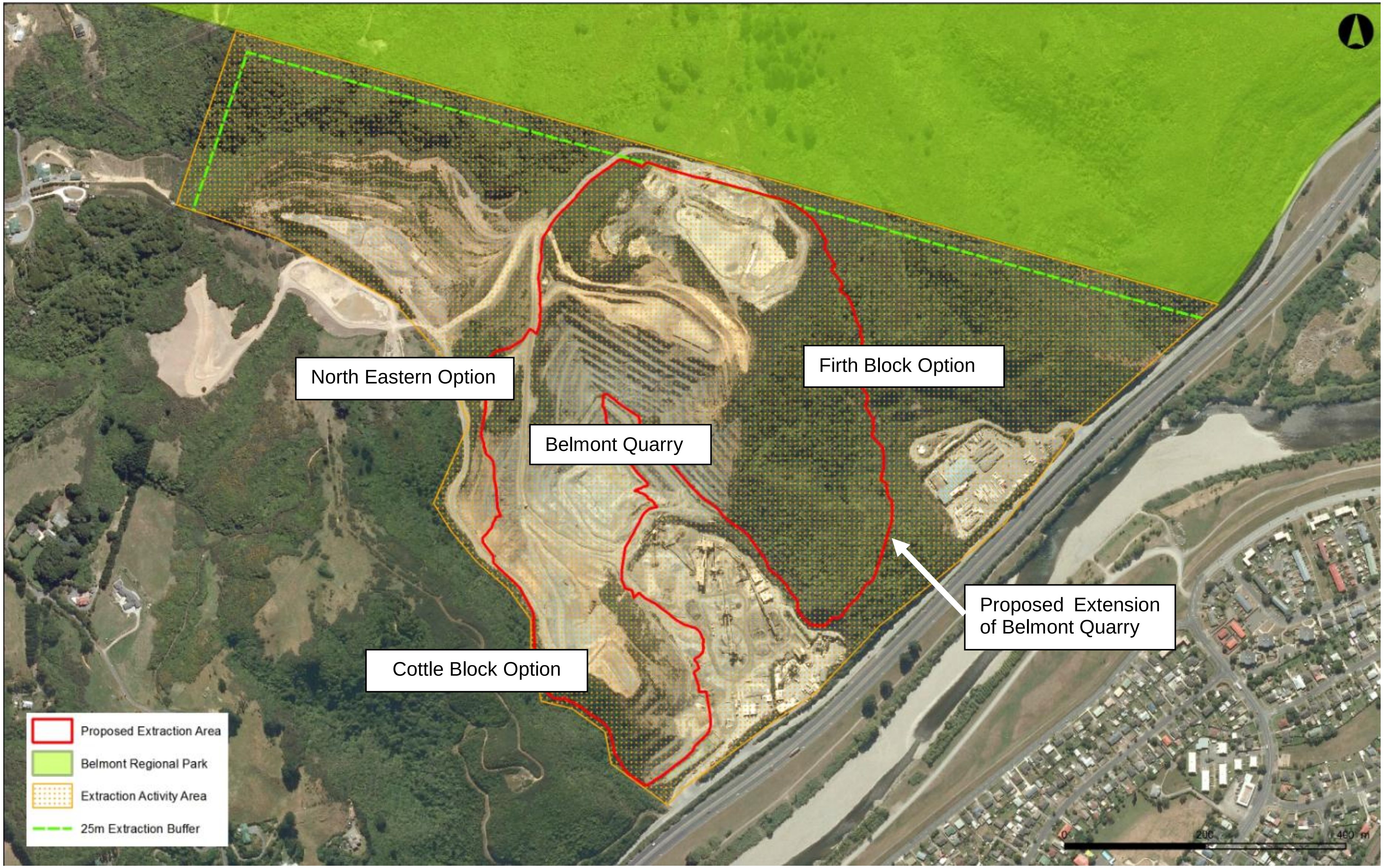
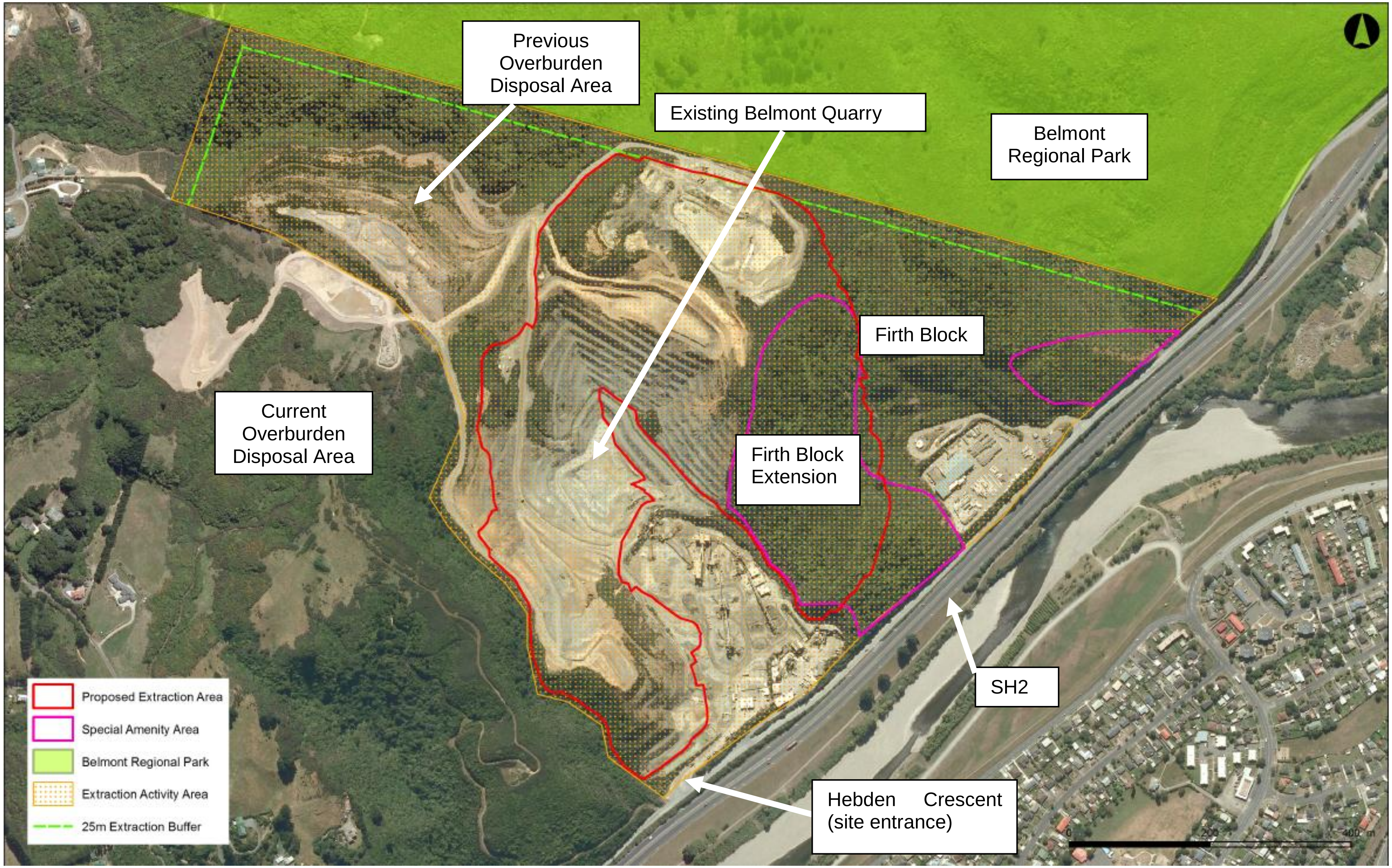


Figure 3 – District Plan zoning



Belmont Quarry Extension

Winstone Aggregates will shortly be submitting a Private Plan change application to the Hutt City Council to allow the future extension of the existing Belmont Quarry.

Three public display stands outlining the project along with visual simulations will be set-up at the locations below. Key personnel will be available to explain and discuss the project, as required.

Location	**Date & Time**
Tui Glen School Hall	2.00 – 3.50 pm Friday 26th July
Pomare School Hall	4.10 – 6.00 pm Friday 26th July
Walter Nash Stadium, main entrance	10.00am – 12.00pm Saturday 27th July

If you would like to receive information about the project in advance, please contact Ian Wallace via email to request a consultation pack. Ian.wallace@winstoneaggregates.co.nz

WELCOME TO THE EXHIBITION

Existing view from elevated northern edge of Belmont Quarry looking towards the Hutt Valley

PURPOSE

The purpose of these exhibition boards is to inform the development of our proposal to ensure the continued operation of Belmont Quarry.

Belmont Quarry has approximately 5 - 10 years of resource remaining (depending on future demand).

Please read through these exhibition boards and tell us what you think of our plans.

WHERE TO FROM HERE?

Our target lodgement date for the Private Plan change application is August 2013.

Your comments and suggestions will be helpful in enabling us to better identify and understand potential effects of the proposal, and thus enable us to formulate the most sensitive project design.

Boffa Miskell Tonkin & Taylor MWH Forbes Ecology Allan Planning & Research Ltd

WHAT YOU WILL FIND ON THESE EXHIBITION BOARDS

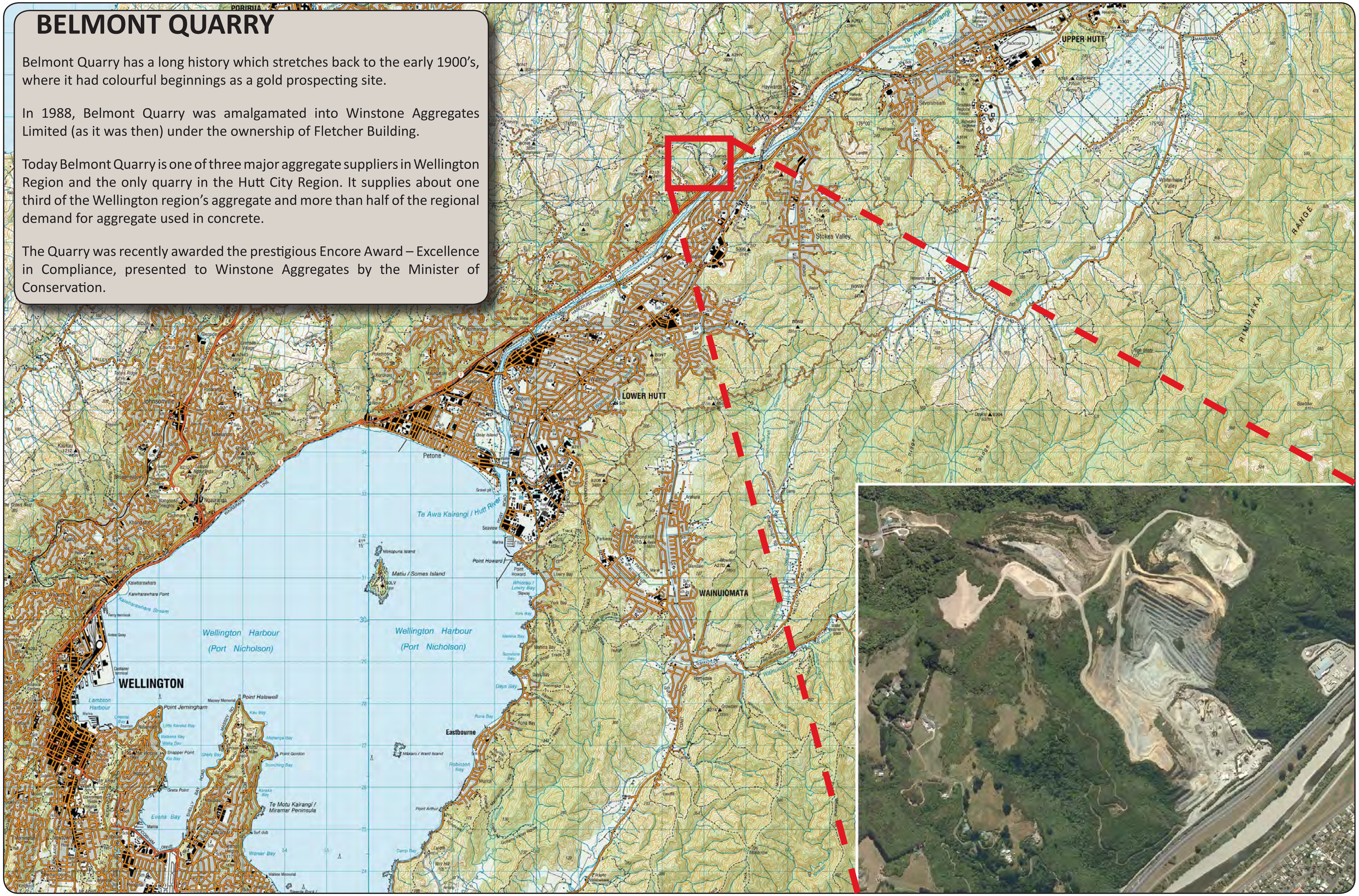
BELMONT QUARRY

Belmont Quarry has a long history which stretches back to the early 1900's, where it had colourful beginnings as a gold prospecting site.

In 1988, Belmont Quarry was amalgamated into Winstone Aggregates Limited (as it was then) under the ownership of Fletcher Building.

Today Belmont Quarry is one of three major aggregate suppliers in Wellington Region and the only quarry in the Hutt City Region. It supplies about one third of the Wellington region's aggregate and more than half of the regional demand for aggregate used in concrete.

The Quarry was recently awarded the prestigious Encore Award – Excellence in Compliance, presented to Winstone Aggregates by the Minister of Conservation.



WHAT ARE WE SEEKING?

PROPOSAL

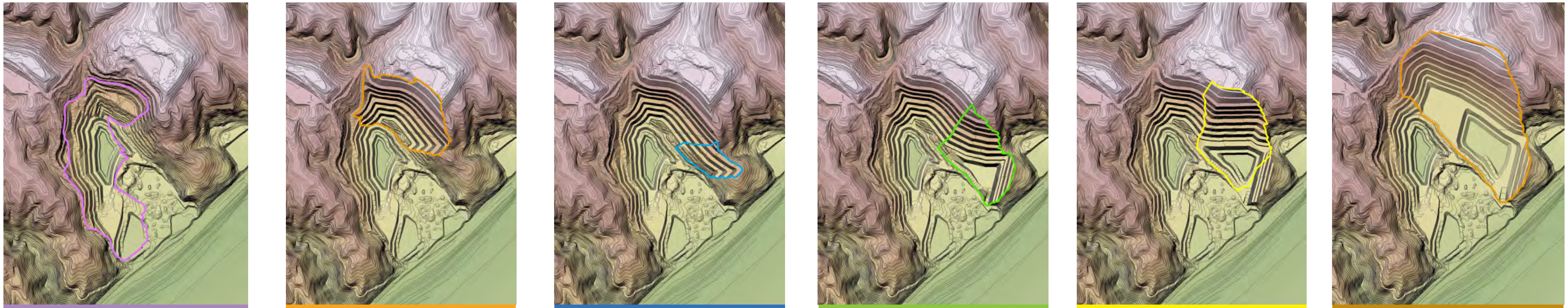
Winstone Aggregates is seeking to remove part of the Special Amenity Area protection overlay.

It is important to understand that this proposal will not substantially expand the scale or nature of the existing operation, but rather secure future resource to allow the on-going operation of the quarry without interruption. Changes at the site will continue very gradually, as they have done for the last 100+ years.

Existing Landform

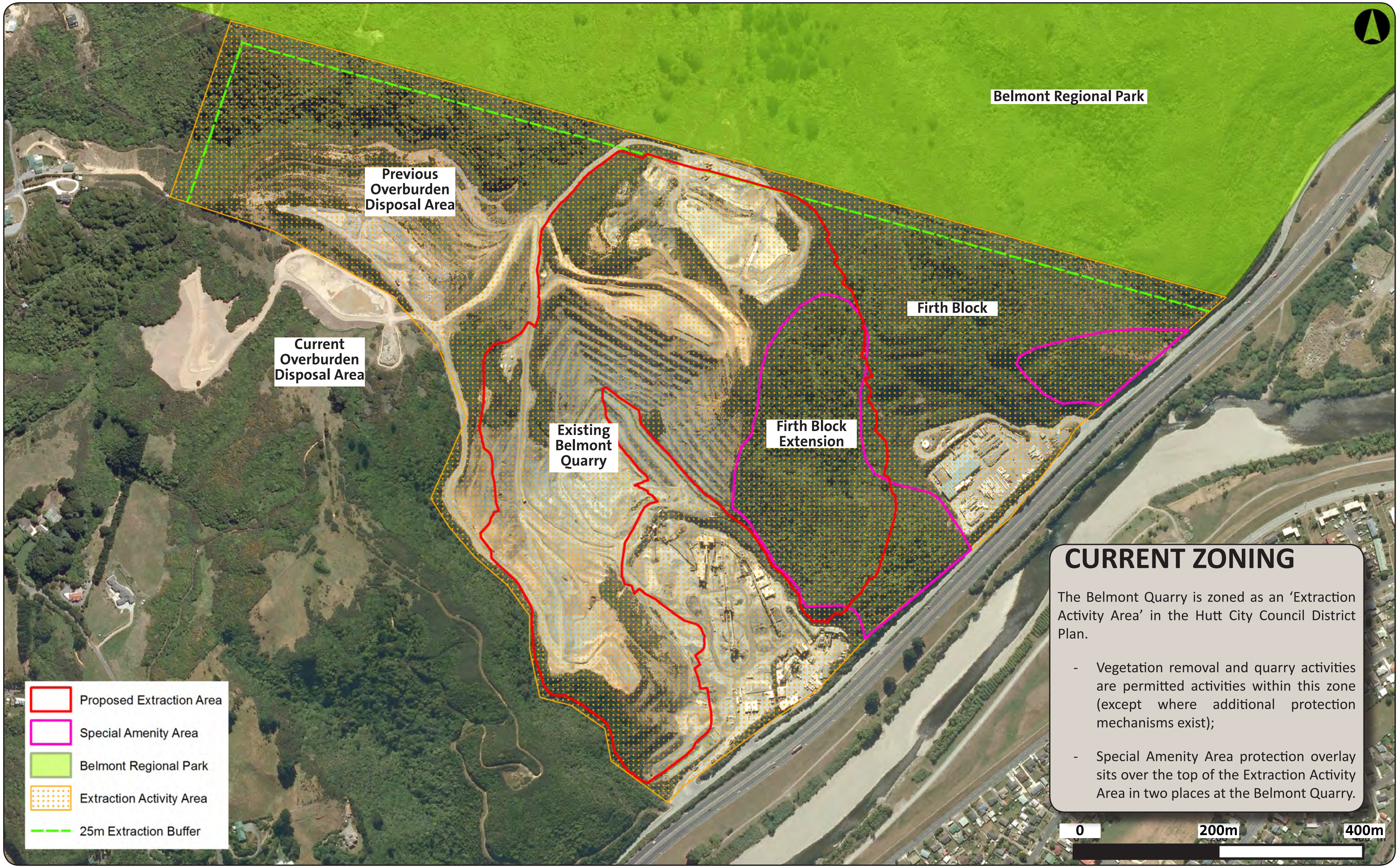
"The cost of a truckload of gravel can double every 30 kilometres travelled."
- Aggregates & Quarry Association of New Zealand.

New Zealanders used an average of 5.84 tonnes of aggregate per person in 2011.
- Aggregates & Quarry Association of New Zealand.



South Design (Completed) *Stage 1* *Stage 2* *Stage 3* *Stage 4* *Stage 5*

Approximately 30 years



CURRENT ZONING

The Belmont Quarry is zoned as an 'Extraction Activity Area' in the Hutt City Council District Plan.

- Vegetation removal and quarry activities are permitted activities within this zone (except where additional protection mechanisms exist);
- Special Amenity Area protection overlay sits over the top of the Extraction Activity Area in two places at the Belmont Quarry.

WHAT OPTIONS WERE CONSIDERED?

OPTIONS

A number of options have been considered:

Cottle Block Option

- The Cottle Block to the southwest of the existing operation was initially preferred, however drill tests have shown this resource is of relatively poor grade (high in argillite);

North Western Option

- A northwestern extension of the quarry area is limited by overburden and resource quality;

Firth Block Option

- The Firth Block located to the northeast of the existing Belmont Quarry is the preferred option.

REHABILITATION

REHABILITATION

In association with extraction works, a key element of the proposal is to facilitate the rehabilitation of extracted faces so that Belmont Quarry becomes re assimilated into the green backdrop of the Hutt Valley as development continues.

Key elements of the rehabilitation strategy will consider:

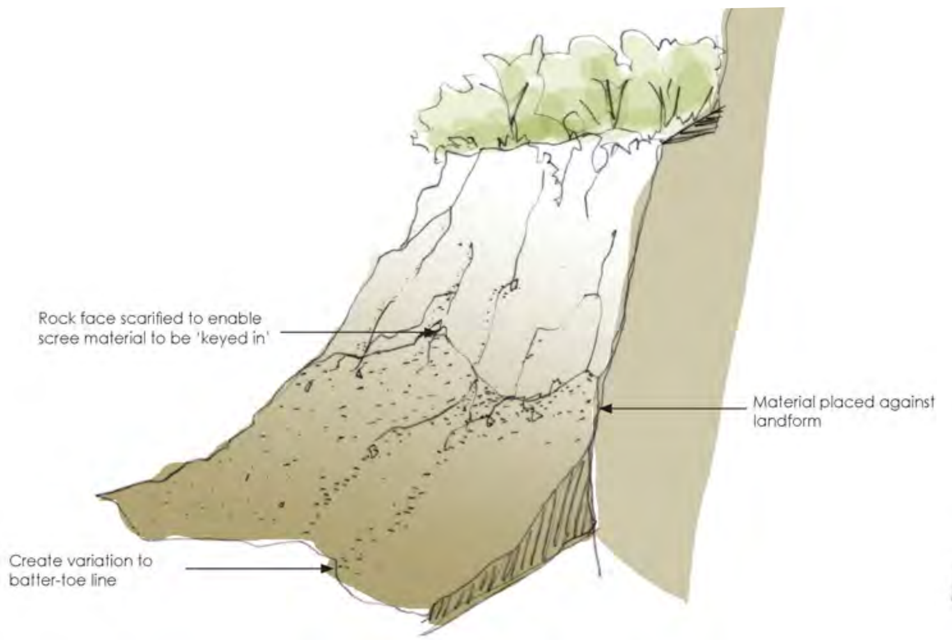
- Creation of final landform that integrates with the adjacent topography
- Creation of drainage pattern which prevents ponding and erosion
- Creation of soil conditions capable of supporting plant life equal to that of the local landscape

Recently extracted face

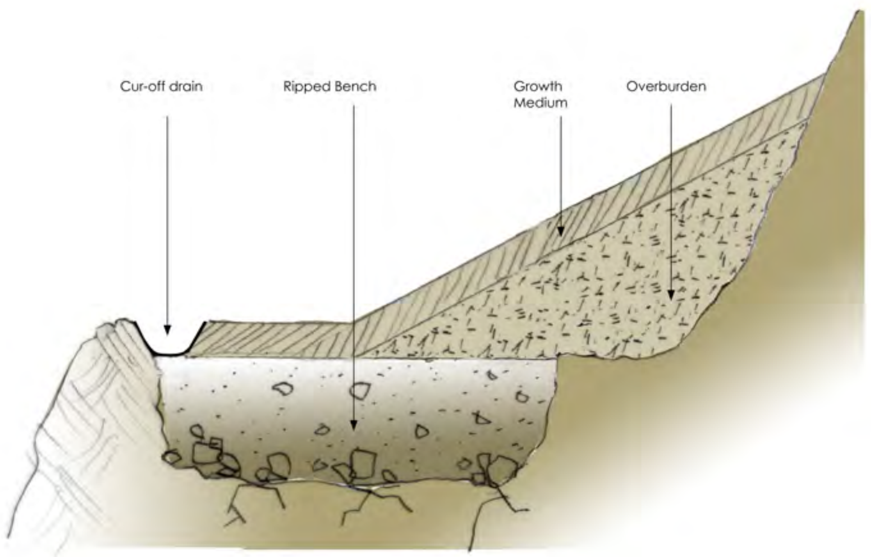
Regeneration after 5 to 10 years

Faces within Firth Block previously extracted in the 1980's

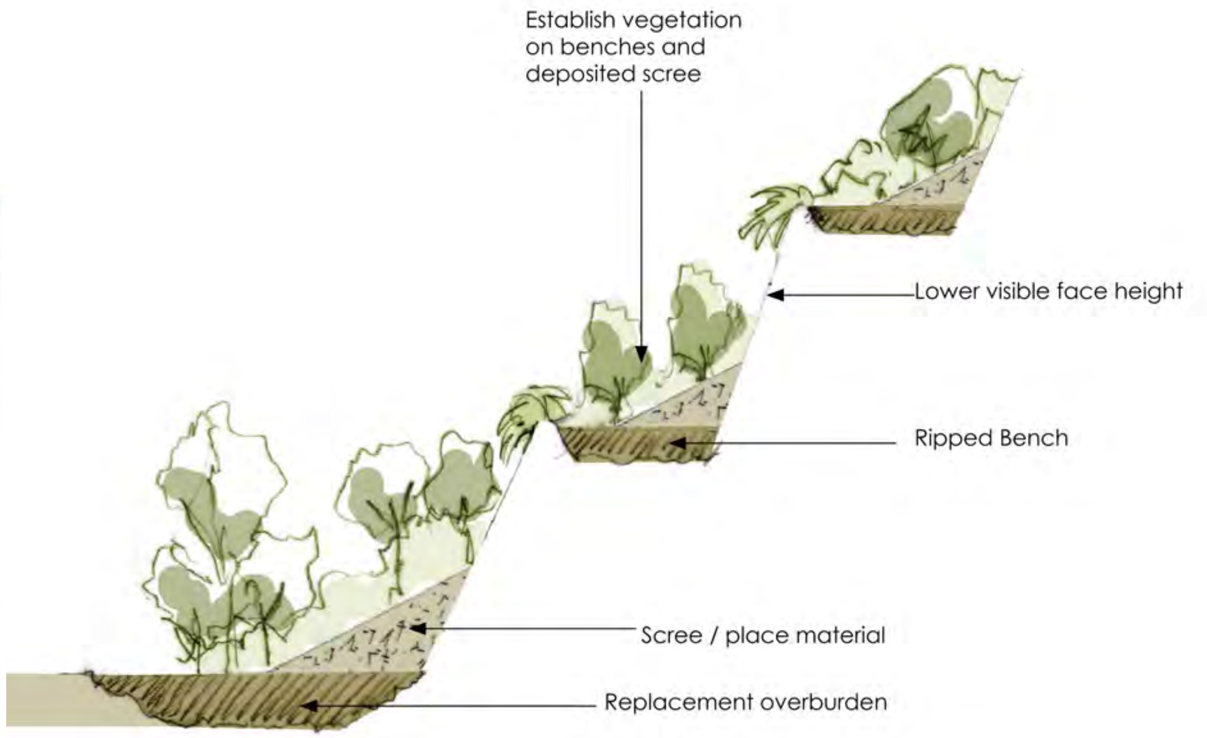
Approximately 30 years



Landform modification



Indicative drainage and soil rehabilitation



Facilitate vegetation growth

WHAT ARE THE LIKELY EFFECTS?

POTENTIAL EFFECTS AND MITIGATION

Generally future effects will be similar to those currently occurring at the existing Belmont Quarry. Four key potential effects will be considered:

1. *Landscape and Visual*

Quarry activities by their nature are large in scale and occur over long time frames (30+ years in this case). The design of the final landform and other rehabilitation measures included in the proposal endeavours to avoid, remedy and mitigate the potential adverse landscape and visual effects.

The implementation of a rehabilitation plan to establish native vegetation along completed quarry faces provides a key measure which will be used to mitigate potenial landscape and visual effects. This will help soften the form of visible faces and reduce visual impacts.

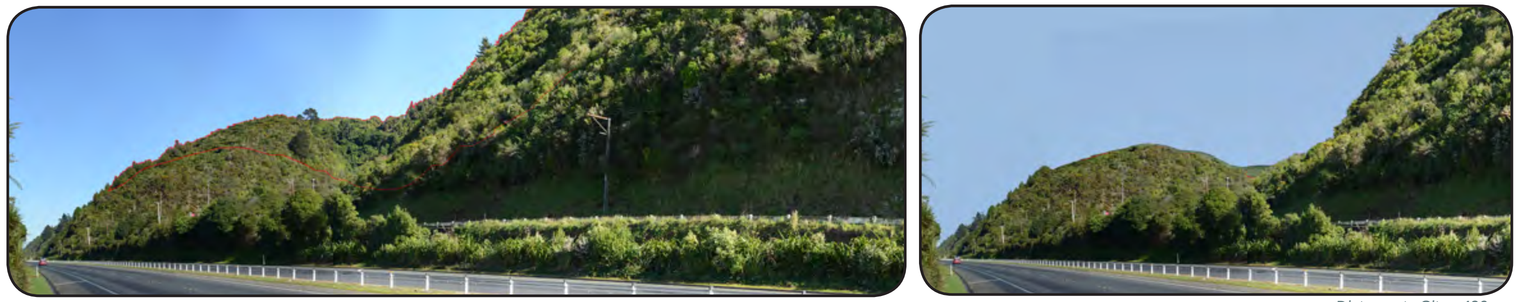
In the long-term, the potential adverse visual and landscape effects of the changed landscape will be reduced as the modified landform is rehabilitated in native vegetation in a manner which will integrate into the surrounding landscape.

In the short term as the Firth Block escarpment is reduced in height, there may be some adverse landscape and visual effects. These effects may be more than minor during parts of the project and will be discussed with affected parties.

Viewpoint Locations


Viewpoint 1 taken from State Highway 2 looking north — *Distance to Site : 500m*


Viewpoint 2 taken from Pomare School looking west — *Distance to Site : 570m*


Viewpoint 3 taken from State Highway 2 looking south — *Distance to Site : 420m*


Viewpoint 4 taken from Aldersgate Grove looking west — *Distance to Site : 1100m*


Viewpoint 5 taken from Hutt River Stop Bank adjoining Harcourt Werry Drive looking north — *Distance to Site : 1,400m*


Viewpoint 6 taken from Kaitangata Crescent looking north-east — *Distance to Site : 900m*

2. Erosion and Sediment

An Erosion and Sediment Control Plan (ESCP) has been developed, and will form part of a new, overall Quarry Management Plan.

- Erosion control will be a priority in all circumstances by preventing sediment generation through a range of structural (physical measures) and non-structural (methodologies and construction sequencing) means.
- Existing Sediment Retention Ponds (SRPs) will be retained and additional SRPs will be constructed.

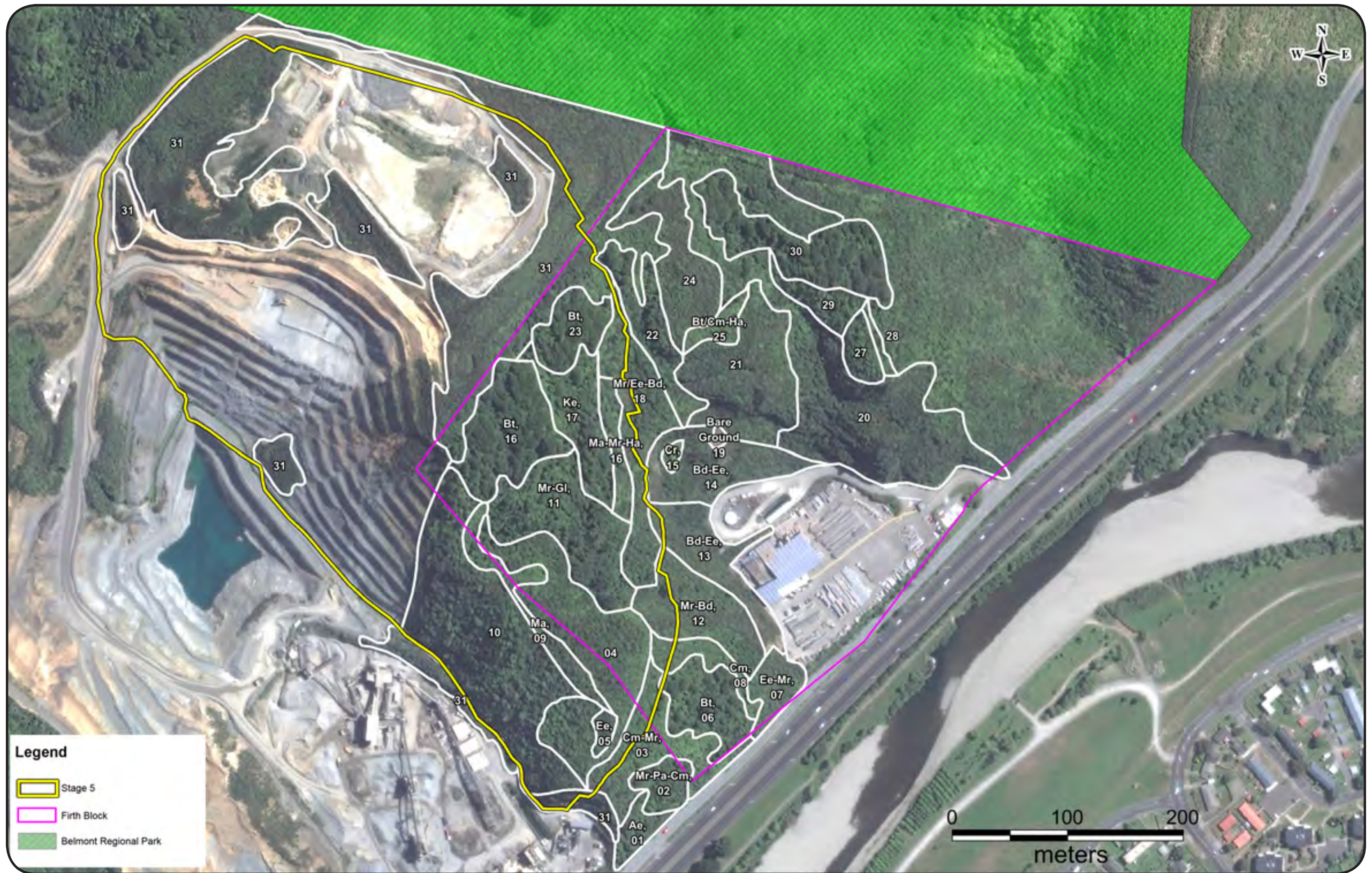
Sediment Retention Pond

3. Terrestrial ecology

We have previously commissioned preliminary investigations into Terrestrial Ecology values associated with the Firth Block and proposed extension area.

Winstones recognise that although many parts of the proposed development area feature young, weedy, or otherwise poorly developed vegetation communities which are regenerating from past disturbance, there are also areas of more mature indigenous forest communities present.

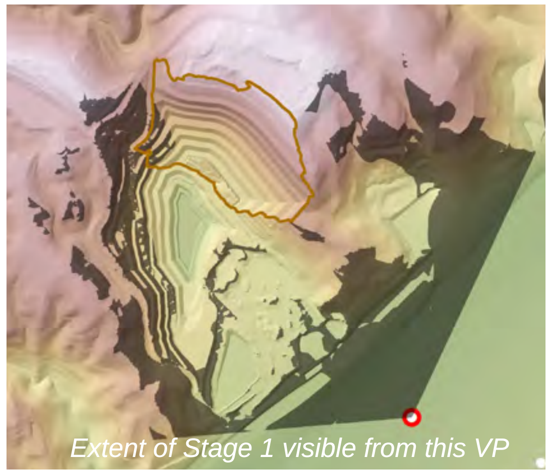
We have commissioned further, comprehensive, ecological assessments of the site so as to delineate and better quantify the Terrestrial Ecology values present. These current investigations are covering not just assessment of vegetation cover, but also investigations into the types of birds present, whether lizards inhabit the area, and also to determine the potential for uncommon or threatened plants to be present within the Firth Block, and in the wider area also.

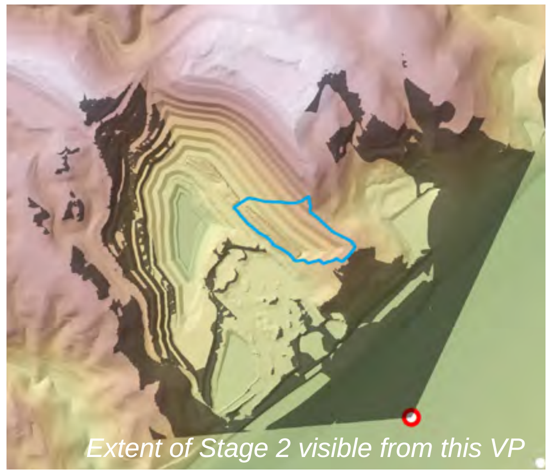


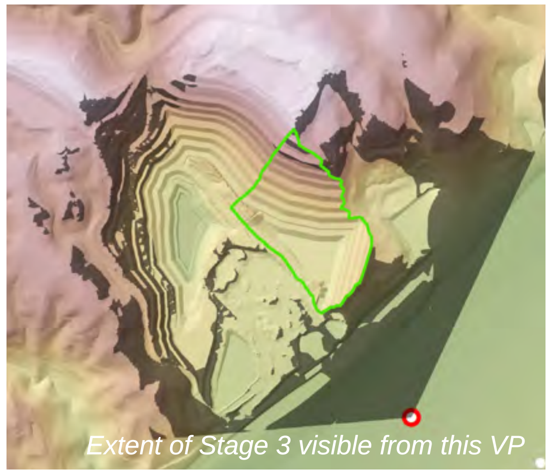
Vegetation Survey of Firth Block

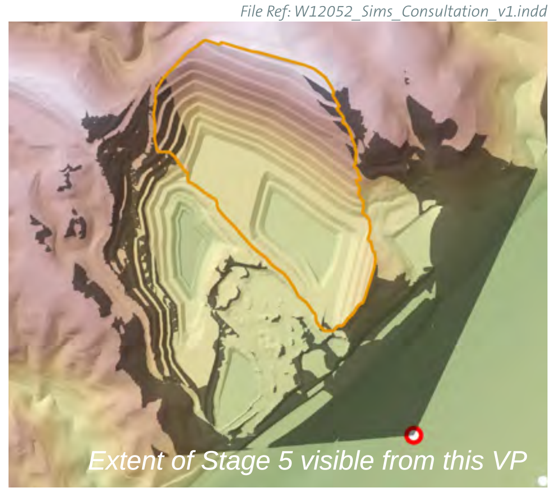
4. Noise

Noise emissions from the site are expected to be very similar to what they are now.



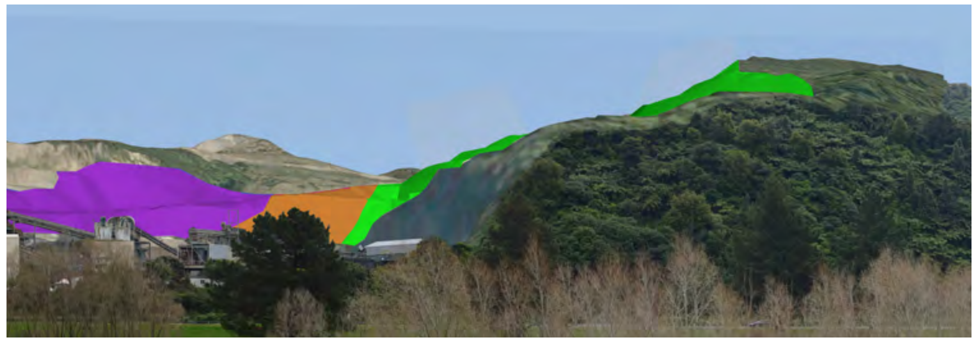






Stage 1

Stage 2



Stage 3

Purple	Southern Design
Orange	Stage 1
Blue	Stage 2
Green	Stage 3
Yellow	Stage 4
Brown	Stage 5

Stage 4

Stage 5

WINSTONE AGGREGATES

Viewpoint Details

NZTM Easting : 1 764500 mE
NZTM Northing : 5 440 439 mN
Elevation : 25m Approx
Date of Photography : March 2013
Field of View of Viewshed Analysis: 120°

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Views from Hutt River Stopbank looking Northwest

| **Date: July 2013** | **Revision: 0** |

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Author: **rhys.girvan@boffamiskell.co.nz** | *Checked:* XX

Stage 1 (approx 5 years)

Stage 3 (approx 15 years)

Stage 5 (approx 30 years)

Optimum Reading Distances : A3 = 18 cm / A1 = 36 cm

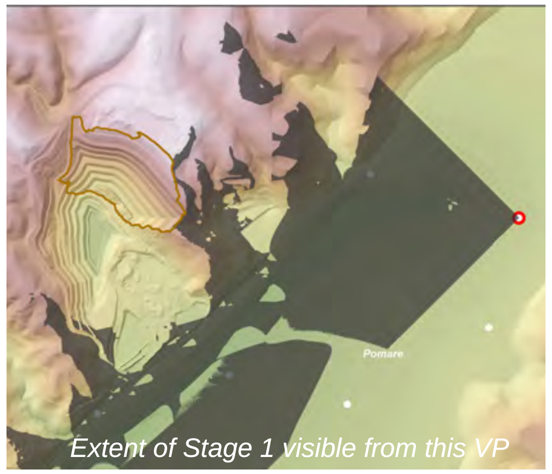
WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

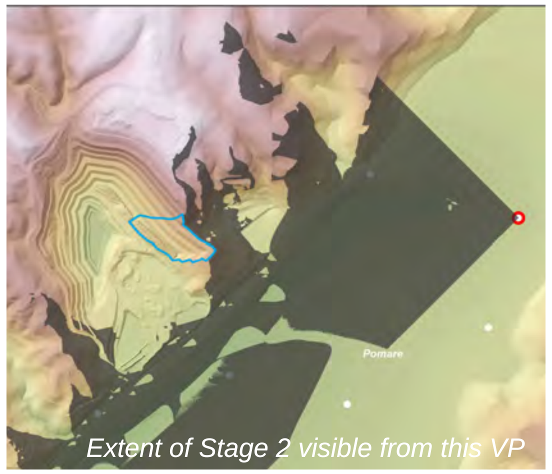
Indicative Simulations - Hutt River Stopbank

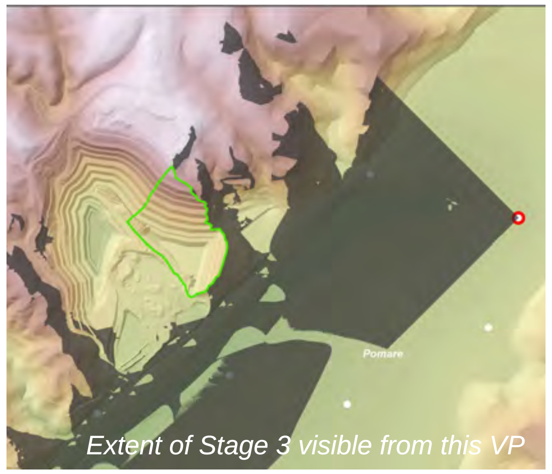
| **Date: July 2013** | **Revision: 0** |

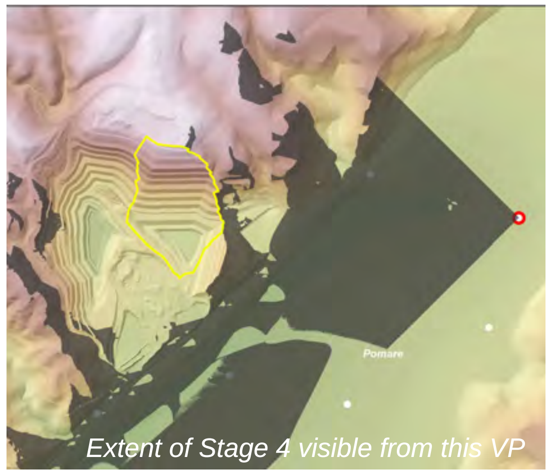
Plan prepared for Winstone Aggregates by Boffa Miskell Limited

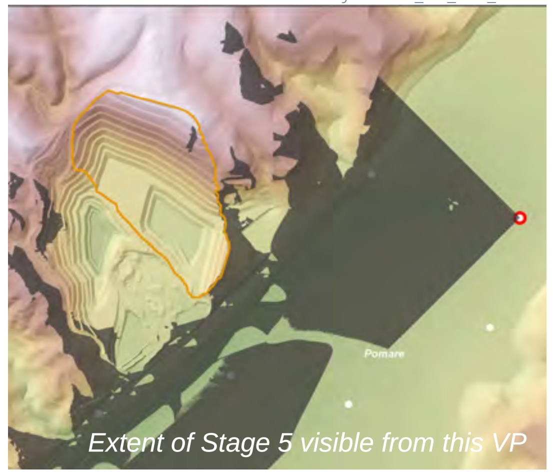
Author: **rhys.girvan@boffamiskell.co.nz** | *Checked:* XX

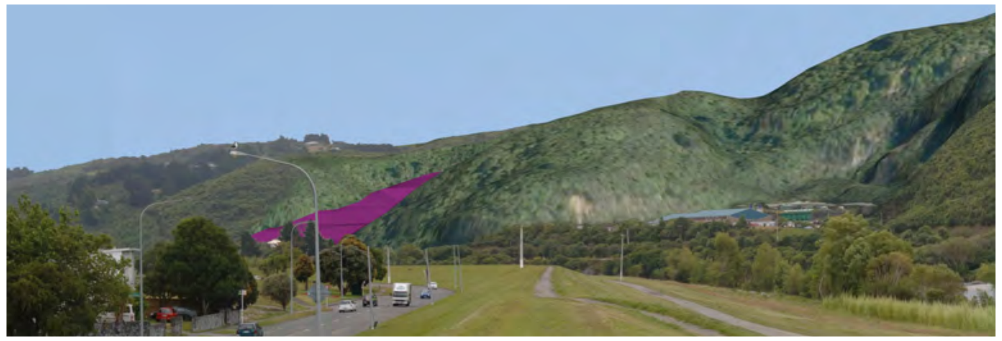


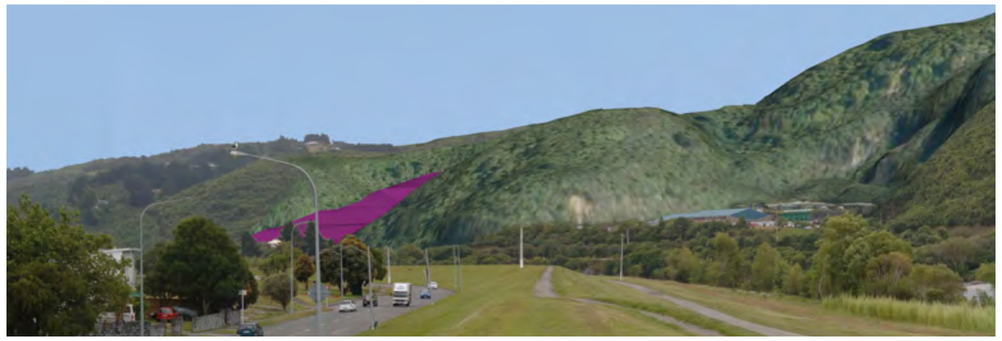









Stage 1


Stage 2


Stage 3

- Southern Design
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5


Stage 4


Stage 5

WINSTONE AGGREGATES

Viewpoint Details

NZTM Easting	:	1 765 330 mE
NZTM Northing	:	5 440 927 mN
Elevation	:	35m Approx
Date of Photography	:	March 2013
Field of View of Viewshed Analysis	:	90°

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Views from Stopbank (North) looking West

| **Date: July 2013** | **Revision: 0** |

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Author: **rhys.girvan@boffamiskell.co.nz** | Checked: XX

Optimum Reading Distances : A3 = 27.5 cm / A1 = 55 cm

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

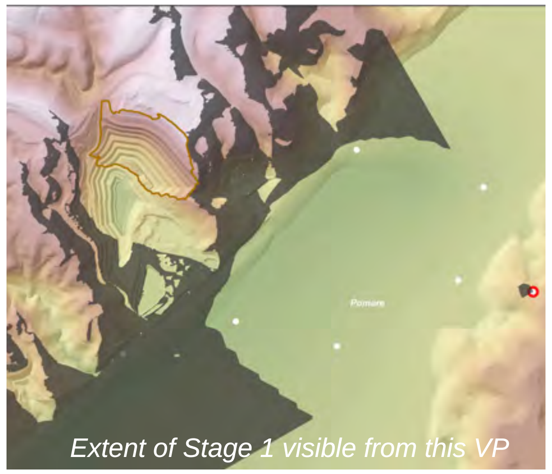
Indicative Simulations - Stopbank (North)

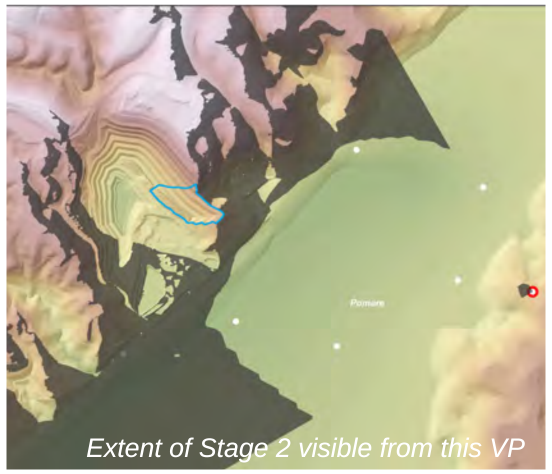
| **Date: July 2013** | **Revision: 0** |

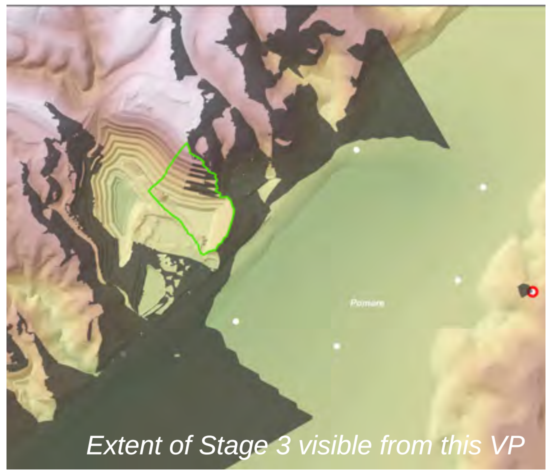
Plan prepared for Winstone Aggregates by Boffa Miskell Limited

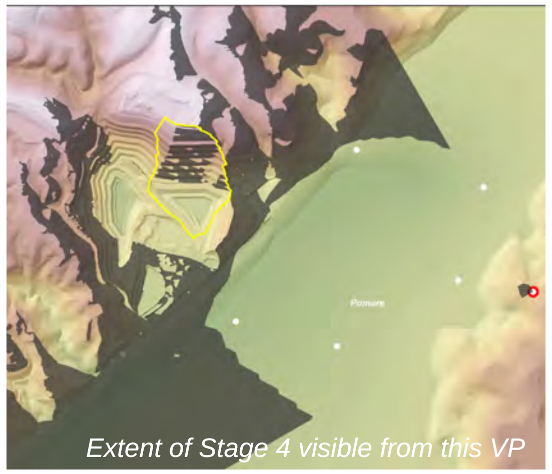
Author: **rhys.girvan@boffamiskell.co.nz** | *Checked:* XX

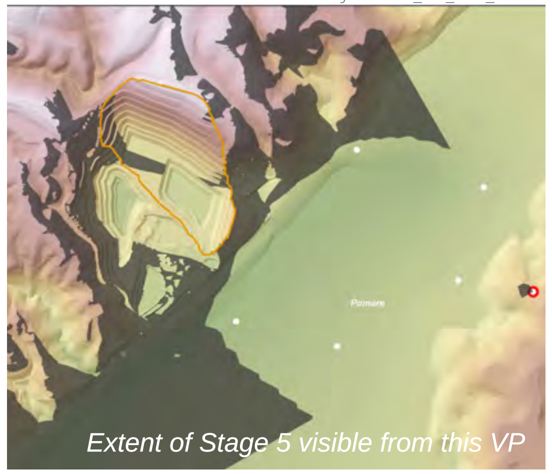
File Ref: W12052_LVA_Sims_v1.indd


Extent of Stage 1 visible from this VP


Extent of Stage 2 visible from this VP


Extent of Stage 3 visible from this VP


Extent of Stage 4 visible from this VP


Extent of Stage 5 visible from this VP


Distance to Site : 1100m
Extent of Proposed Extraction Area indicated


Stage 1


Stage 2


Stage 3

- Southern Design
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5


Stage 4


Stage 5

WINSTONE AGGREGATES

Viewpoint Details

NZTM Easting	:	1 765 528 mE
NZTM Northing	:	5 440 539 mN
Elevation	:	110m Approx
Date of Photography	:	March 2013
Field of View of Viewshed Analysis:		90°

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Views from Aldersgate Grove looking West

| **Date: July 2013** | **Revision: 0** |

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Author: **rhys.girvan@boffamiskell.co.nz** | *Checked:* XX

File Ref: W12052_LVA_Sims_v1.indd

Stage 1 (approx 5 years)

Stage 3 (approx 15 years)

Stage 5 (approx 30 years)

Optimum Reading Distances : A3 = 27.5 cm / A1 = 55 cm

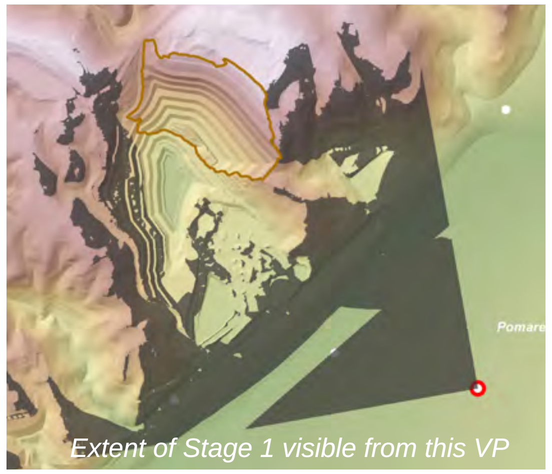
WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Indicative Simulations - Aldersgate Grove

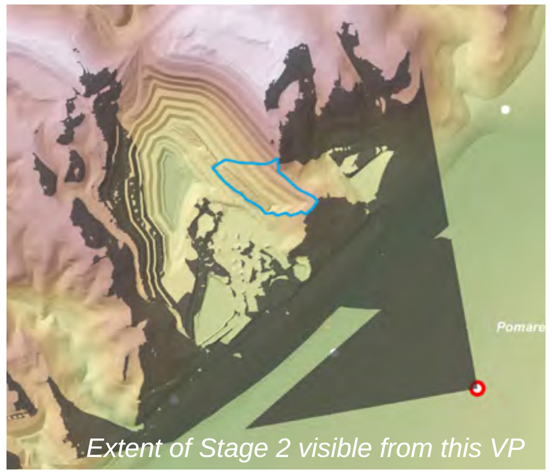
| **Date: July 2013** | **Revision: 0** |

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

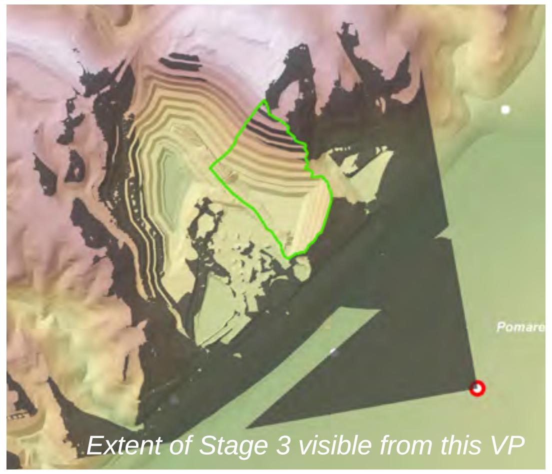
Author: rhys.girvan@boffamiskell.co.nz | *Checked:* XX



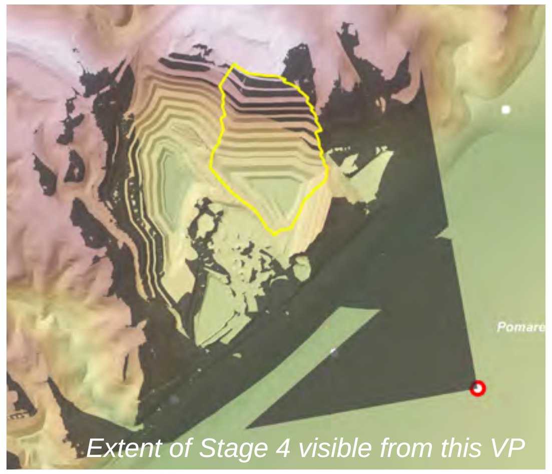
Extent of Stage 1 visible from this VP



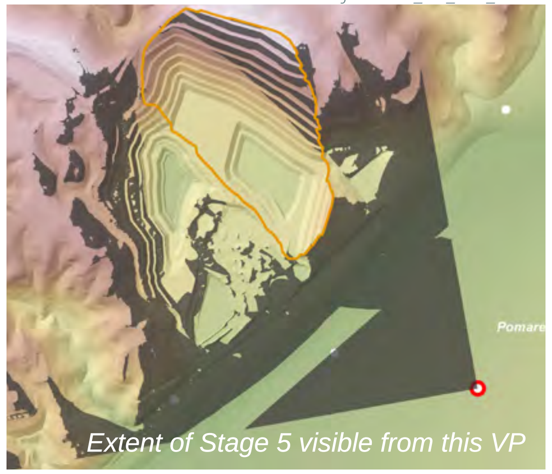
Extent of Stage 2 visible from this VP



Extent of Stage 3 visible from this VP



Extent of Stage 4 visible from this VP



Extent of Stage 5 visible from this VP


Stage 1


Stage 2


Stage 3

- Southern Design
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5


Stage 4


Stage 5

WINSTONE AGGREGATES

Viewpoint Details

NZTM Easting	:	1 764 785 mE
NZTM Northing	:	5 440 333 mN
Elevation	:	30m Approx
Date of Photography	:	March 2013
Field of View of Viewshed Analysis	:	90°

WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Views from Pomare School looking West

| **Date: July 2013** | **Revision: 0** |

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Author: **rhys.girvan@boffamiskell.co.nz** | Checked: XX

File Ref: W12052_LVA_Sims_v1.indd

Stage 1 (approx 5 years)

Stage 3 (approx 15 years)

Stage 5 (approx 30 years)

Optimum Reading Distances : A3 = 27.5 cm / A1 = 55 cm

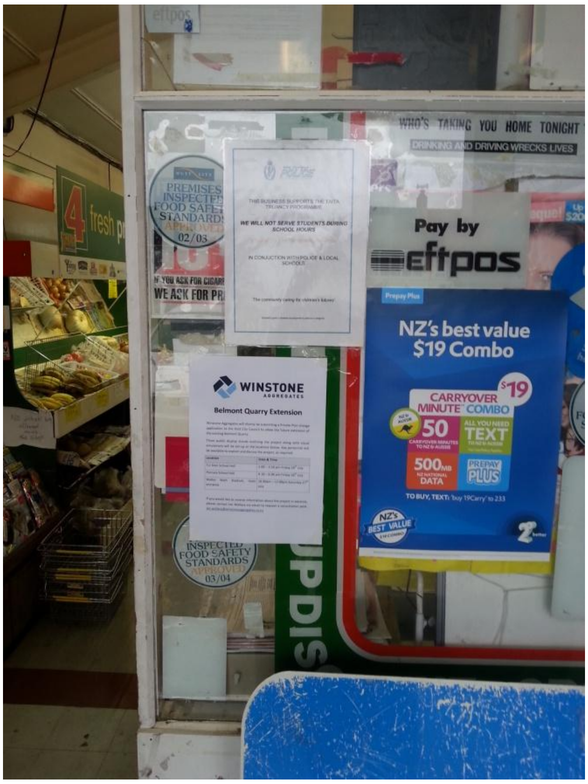
WINSTONE AGGREGATES FIRTH BLOCK EXTENSION

Indicative Simulations - Pomare School

| **Date: July 2013** | **Revision: 0** |

Plan prepared for Winstone Aggregates by Boffa Miskell Limited
Author: rhys.girvan@boffamiskell.co.nz | *Checked:* XX


WHAT OPTIONS
REHABILITATION


WHO'S TAKING YOU HOME TONIGHT
DRINKING AND DRIVING WRECKS LIVES
WE WILL NOT SERVE STUDENTS DURING SCHOOL HOURS
Pay by
eftpos
WINSTONE
Belmont Quarry Extension
NZ's best value
$19 Combo
CARRYOVER MINUTE COMBO
50
TEXT
500MB
DATA
PREPAY PLUS

APPENDIX 9 – CORRESPONDENCE FROM TĀNGATA WHENUA ORGANISATIONS

te Runanganui
o Taranaki Whanui

"Tamaiti Whangai"

18 July 2013

Ian Wallace
Environmental Projects Leader
P.O Box 17195
Green Lane
AUCKLAND 1546

BELMONT QUARRY EXTENSION

Tena Koe Ian

My recent conducted tour of the quarry with you gave me a greater insight and appreciation in what should be considered an impressive operation, undertaken with considerable environmental care.

As a Mana Whenua (Local Tribal Occupation Organisation) in the Hutt Valley and Wellington cities, our Runanganui has no objections to make in relation to resource consents your company may seek, in order to extend the quarry operations for the next 30 years.

Should you need any further clarification of our Runanganui support please don't hesitate to make contact.

Naku Noa Na

Teri Puketapu
Environmental Executive

Te Runanganui o Taranaki Whanui ki te Upoko o Te Ika a Maui
61 A Guthrie Street, P.O Box 36 111, Te Puni Mail Centre
Ph: 04 566 8214 Fax: 04 560 3278
www.atiawa.com

PORT NICHOLSON BLOCK
SETTLEMENT TRUST

19th July 2013

Ian Wallace
Winstone Aggregates
Environmental Projects Leader
Po Box 17-195
Greenlane Auckland 1546

Tena koe Ian,

RE: Belmont Quarry Extension, Lower Hutt

Thank you for meeting with me to discuss the proposed extension to the Belmont Quarry. The Port Nicholson Block Settlement Trust is the iwi Authority established in 2008 to receive the settlement on behalf of Taranaki Whanui. Taranaki Whanui is made up of peoples from Te Atiawa, Ngati Tama, Ngati Ruanui and Taranaki descent who lived around the harbour and throughout the Hutt Valley when the New Zealand Company representatives arrived in 1839. The membership of the trust derives from the descendants of those peoples. The takiwa includes Wellington, Lower Hutt and Upper Hutt cities. The Settlement Trust has its own legislation.

Wellington Tenths Trust and Palmerston North Maori Reserve Trusts are sister trusts who are managed under the Te Ture Whenua Maori Act. These Trusts have operated in different forms since 1839. Members of these two trusts are the same peoples who are included in the Settlement Trust. The three Trusts work collectively to manage the land and other iwi assets for their people. The Settlement Trust has formal statutory responsibilities under its Act and is the lead organisation for the collective.

Previously Winstones have worked with Wellington Tenths and Palmerston North Maori Reserve Trust.

This report addresses the extension now under consideration and the seven resource consents sought by Winstones at the Belmont Quarry site in Lower Hutt. It is also seeking a District Plan Change in the Lower Hutt City Council District Plan.

Railway Station Social Hall
55 Waterloo Quay
PO Box 12164
Wellington 6144

Telephone: (04) 472 3872
Fax: (04) 472 3874
www.portnicholson.org.nz

The consents Winstones are seeking are comprehensive and the time period Winstones are seeking is for 30 years.

Extensive environmental research has been undertaken by botanists who are known to us Viz: Chris Horne and Barbara Mitcalfe. Therefore we are comfortable the issues raised previously by Iwi have been examined. The issue related to an oral story of a spring which had Northern Rata trees or a tree which was used for Iwi travellers who journeyed through this pass from Pauatahanui and the Hutt Valley. This has given us much assurance in the proposed site and enabled to support the proposed District Plan Change over the land designated as Special Amenity Area.

The stream which borders the site on the northern side runs continuously and is currently un-named therefore we would seek to name the stream so the mana of the stream is enhanced. In naming a stream it ensures that care will be taken to protect and monitor it for water quality as it flows and enters Te Awa Kairangi, Hutt River.

The Trusts therefore would seek from the consent authorities a condition of the consent that the naming of the stream is undertaken by the Trust. An annual walk over of the site of Iwi representatives be scheduled and reported on. Monitoring reports be prepared showing regular tests for water quality and provided to the Iwi. This regular walkover would be funded by the applicant at a mutually agreed rate.

The Trusts would also seek from the consent authorities an accidental discovery protocol which included updated details for contacts from Port Nicholson Block Settlement Trust.

The trust understands the need for the length of the consent which will provide the applicant with security of investment. The condition sought by the Trust will enable the Trusts to support the applicant in the term sought as the annual visit will provide a kanohi ki te kanohi experience that ensures the physical practise Kaitiakitanga is undertaken.

Naaku Noa Na

Liz Mellish

Liz Mellish
Natural Resources Advisor
Taranaki Whanui Ki Te Upoko O Te Ika

Railway Station Social Hall
55 Waterloo Quay
PO Box 12164
Wellington 6144

Telephone: (04) 472 3872
Fax: (04) 472 3874
www.portnicholson.org.nz

Subject:RE: Belmont Quarry - consultation pack
Date: Tue, 23 Jul 2013 15:46:29 +1200
From: Reina Solomon <reina.solomon@ngatitoa.iwi.nz>
To: Ian Wallace (Winstone Aggregates) <Ian.Wallace@winaggs.co.nz>
CC:'Jennie Smeaton' <jennie.smeaton@ngatitoa.iwi.nz>

Kia ora Ian

Thanks for taking the time to discuss your proposal and show me around the site recently. Based on the initial information provided to us about this proposal we have no objections at this stage, however please continue to keep us informed of progress and consent applications. Also, can you please send through the reports that we discussed when you have a chance?

Following from our discussions at the site we are very interested in pursuing either a scholarship, internship, or development initiative in the Wellington region to acknowledge the long history of the quarry in this area. It may also be desirable to assess the suitability of entering into a Memorandum of Understanding to better reflect a sense of partnership.

Please feel free to contact me to discuss.

Ngā mihi
Reina

From: Ian Wallace (Winstone Aggregates) [mailto:Ian.Wallace@winaggs.co.nz]
Sent: Friday, 21 June 2013 10:47 a.m.
To: Reina Solomon
Subject: RE: Belmont Quarry - consultation pack

Thank you for the update Reina, I look forward to hearing back from you next week.

I am more than happy to meet with you and/or take you on a tour around the site if you feel it necessary. I'm in Wellington most weeks.

Many thanks,

Description: C:\Users\aleshr logo.jpg

IAN WALLACE Environmental Projects Leader
DDI +64 9 525 9309 **Mob** +64 21 673 430 **Fax** +64 9 525 9301
PO Box 17 195, Greenlane, Auckland 1546.
Ian.Wallace@winstoneaggregates.co.nz www.winstoneaggregates.co.nz
A Division of Fletcher Concrete and Infrastructure Limited

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From: Reina Solomon [mailto:reina.solomon@ngatitoa.iwi.nz]
Sent: Friday, 21 June 2013 10:37
To: Ian Wallace (Winstone Aggregates)
Subject: FW: Belmont Quarry - consultation pack

Kia ora Ian

Thanks for providing this information. We are reviewing the documents and will provide a response on to you on Monday.

Ngā mihi

Reina Solomon I Te Runanga o Toa Rangatira Inc
P.O Box 503 55 Porirua
T: 04 237 6763
F: 04 238 4701
M: 027 547 2047
E: reina.solomon@ngatitoa.iwi.nz
W: ngatitoa.iwi.nz

Begin forwarded message:

From: "Ian Wallace (Winstone Aggregates)" <Ian.Wallace@winaggs.co.nz>
Date: 17 June 2013 11:42:02 AM NZST
To: "jennie.smeaton@ngatitoa.iwi.nz" <jennie.smeaton@ngatitoa.iwi.nz>
Subject: Belmont Quarry - consultation pack

Good morning Jennie,

Further to our brief phone conversation before, please see attached our consultation pack regarding a private plan change (Hutt City Council District Plan) and application for resource consents from Greater Wellington Regional Council.

I'll follow up with you in a few days to discuss any concerns / comments you may have. If you would like to meet, I'll be in Wellington Monday and Tuesday next week (24th and 25th June). Alternatively I'll be in Wellington once a week throughout July.

Many thanks,

Description: C:\Users\aleshr logo.jpg

IAN WALLACE Environmental Projects Leader
DDI +64 9 525 9309 **Mob** +64 21 673 430 **Fax** +64 9 525 9301
PO Box 17 195, Greenlane, Auckland 1546.
Ian.Wallace@winstoneaggregates.co.nz www.winstoneaggregates.co.nz
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