



STAFF REPORT

TO: Environment & Planning Subcommittee

FROM: Wayne Horner, Consent Planner – Subdivision

REFERENCES: RM080103 (Subdivision and Land Use – Road Formation);
RM080182 (Land Use – Dwelling Setback);

SUBJECT: **ST LEGER GROUP LIMITED - REPORT EP08/12/02** - Report prepared for hearing of 8 December 2008

1. DESCRIPTION OF THE PROPOSED ACTIVITY

St Leger Group Limited has lodged a number of resource consent applications relating to a subdivision, road formation, residential development, earthworks and stormwater discharge in the Rural Residential Zone.

The following report assesses applications **RM080103** and **RM080182** relating to the subdivision and land use aspects of the development. The remainder of the consents addressing stormwater discharge, **RM080191** and earthworks, **RM080193** are assessed in two complementary reports (EP08/12/03 and EP08/12/04) authored by Mr Leif Pigott, Council's Consent Planner – Discharges. This report should be read in conjunction with the aforementioned staff reports.

1.1 Subdivision Consent and Land Use Consent: RM080103

To subdivide one existing title containing 12.20 hectares to create:

- Lots 1 – 12 and Lots 14-31, being rural-residential allotments of between 2,001 and 2,659 square meters;
- Lot 32 containing 1.1362 hectares;
- Lot 33 containing 1.8552 hectares;
- A Walkway Reserve of 1,720 square meters to vest in Council; and
- Lot 13 containing 8,374 square meters as road to vest

A land use consent is also sought to construct an access road with a gradient of up to 1:6, which is proposed to vest in Council as road reserve.

Consent is also sought to form the proposed subdivision over a 10 year period in five stages.

Land Use Consent: RM080182

To construct buildings with setbacks of 5.0m from the proposed road (Lot 13) on Lot 2, Lots 9 – 11, and Lots 22-27 within the subdivision application RM080103.

1.2 Proposal and Background

The Certificate of Title for this site (CT 382080) contains an area of 12.20 hectares. However the northern part of this title, to the east of Highland Drive, has been granted consent under RM030497 to be subdivided into six lots which leaves an area of 11.10 hectares that is the subject of this application.

The proposed lot sizes are all in excess of 2,000 square meters which is in excess of the minimum area required to meet the controlled activity criteria for this Rural Residential Zone.

This area is within an area known as Richmond East with the subdivision being undertaken on the lower foothills above the already developed Park Drive area.

There are geotechnical risks associated with development on this site with two known fault lines crossing this site as well as some areas of potential instability. Tonkin & Taylor have been involved in the geotechnical investigation of this site, including the area subject to RM030497 and have prepared a report that concluded this proposal is feasible subject to a number of conditions. The Tonkin & Taylor report was subsequently peer reviewed by Dr Mike Johnston for Council.

Lots 14 – 18 cannot drain to the Council stormwater system in Park Drive and are proposed to drain via a piped system and diffuser into Saxton Creek across a short section of land owned by the J C and K E Heslop Family Trust. The effects of the discharge into Saxton Creek have been considered under EP08/12/03, **RM080191**.

All of the proposed lots can be provided with wastewater servicing draining to the Council system. However Lots 14-18 will require a privately owned and maintained wastewater pump system that drains into the gravity fed Council wastewater system.

A Council water supply can be provided for all proposed dwellings up to RL65. The applicant has proposed a number of options for water supply for the proposed dwellings including providing an auxiliary pump to provide potable water to all lots. Council's Development Engineer has recommended a number of conditions to allow for a potable water supply and fire fighting water supply to each lot.

A proposed road gradient of up to 1:6 in places will allow for smaller cuts than those required for a fully complying gradient of 1:7. The applicant has provided a report from Urbis TPD Limited in support of a steeper gradient and Council has sought a report from MWH regarding the effects of the proposed steeper gradient.

Landscaping has been volunteered by the applicant where new plantings will be established to augment the existing plantings. A number of other measures have also been volunteered that will reduce the visual impact of the buildings to be below the permitted activity standards of the Tasman Resource Management Plan (TRMP).

It is proposed to construct buildings with reduced setbacks of 5.0m from the proposed road boundary (Lot 13) on Lot 2, Lots 9 – 11, and Lots 22-27 due to geotechnical constraints.

The applicant is proposing to provide a public access walkway within this subdivision that links an existing unformed walkway reserve to the proposed road.

1.3 Legal and Site Description

The area of Lot 1 DP 395563 (CT 382080) that is not covered by the approved subdivision consent RM030497, containing an area of approximately 11.10 hectares.

2. SUBMISSIONS

The application was notified on 30 August 2008 and 17 submissions were received. Four submissions oppose the application, 11 submissions support the application with two neutral or did not indicate support or opposition submissions. See Appendix 2 for the location of submitters (OP = oppose, SU = support, NE = neutral, DNI = did not indicate).

2.1 Summary of Submissions

Submitter	Reasons	Decision
1. Public Health Service	Seeks a potable water supply, with reserve capacity, for all dwellings on the proposed Lots.	Conditions Required Does not wish to be heard
2. Sandra Hunter	Supports the proposal as the land has a suitable zoning and the stability issues can be resolved. Also supports the increased road gradient and reduced setbacks.	Grant Does not wish to be heard
3. Michael Montgomery	Supports the proposal as the land has a suitable zoning and the stability issues can be resolved. Also supports the proposed landscaping and layout.	Grant Does not wish to be heard
4. J C and K E Heslop Family Trust	Supports the proposal in regard to the use of the land and the increased road gradient. Mentions connectivity and servicing for their land and seeks no earthworks or substantial stormwater runoff from Lots 14, 15, 16 & 17.	Grant Wishes to be Heard.
5. C W Hart	Supports the proposal including the design and landscaping.	Grant Does not wish to be heard
6. K Brydon	Supports the proposal as there will be strong demand for the proposed lots.	Grant Does not state if they wish to be heard
7. New Zealand Fire Service Commission	Seeks conditions requiring a fire fighting water supply in accordance with SNZ PAS 4509:2008 to be provided for each dwelling.	If granted seeks Condition Wishes to be heard

Submitter	Reasons	Decision
8. C Hansen	Supports the proposal due to large lot sizes and landscaping provided, with good northerly facing views.	Grant Does not wish to be heard
9. I Kearney	Supports the proposal.	Grant Does not wish to be heard
10. J and D Byrom	Expressed concerns about the stability of the site, restricted building platforms location, future risk to rate payers, construction effects, inadequate stormwater capacity in Riding Grove and traffic effects.	Decline Does not wish to be heard
11. A and L Robinson	Seeks to delay this application until the Richmond East Draft Structure Plan is completed. Expressed concerns over land stability and pedestrian access to the existing play area in Highland Drive. Suggested the upgrading of the Hill Street/Champion Road intersection prior to any construction works.	Decline Does not state if they wish to be heard
12. The Lau Family Trust	Seeks a delay to this application until the tree removal issues with RM030497 have been resolved.	Decline Wishes to be heard
13. J A Cotton	Supports this proposal as a good use of the land considering the minimal productive values with an appropriate (steeper) road gradient. The application meets Section 106 of the RMA and the subdivision is geotechnically feasible.	Grant Wishes to be heard
14. Duke and Cooke Ltd	Supports the proposal as this site is zoned for this development and that the geotechnical, servicing and landscaping is appropriate.	Grant Does not wish to be heard
15. P A and E M Williams	Concerned about construction effects (traffic, noise & dust) and the traffic effects as a result of the steeper 1:6 gradient. Also concerned about the road construction standards for Highland Drive.	Decline Wishes to be heard
16. D Waive	Supports this proposal as it is a good use of the land and that the geotechnical issues can be overcome.	Grant Does not wish to be heard
17. M Gilbert	Supports this proposal as it is a good use of the land and that the geotechnical issues can be overcome.	Grant Does not wish to be heard

2.2 Comments on Submissions

For those submitters who support this application there is a common theme where this proposal was considered to be an appropriate use of the land considering the Rural Residential zoning, the proposed landscaping was supported, that the geotechnical issues can be resolved and the steeper road gradient is acceptable.

For those submitters who do not support this application concerns were expressed about a range of issues including site stability, noise, dust, traffic effects and stormwater issues.

The Public Health service sought a condition that a potable water supply with appropriate reserve as a condition should consent be granted.

The New Zealand Fire service sought a fire fighting water supply in accordance with the New Zealand Standard for each dwelling be required by a condition should consent be granted.

3. STATUTORY PROVISIONS

The application is considered to be a discretionary activity overall within this Rural Residential Zone. The Council must consider the application pursuant to Section 104 of the Resource Management Act 1991.

The matters for the Council to address in Section 104 are:

- Part II matters;
- the actual and potential effects on the environment of allowing the activity (Section 104 (1)(a));
- relevant objectives and policies in the Tasman Regional Policy Statement, and the Tasman Resource Management Plan (Section 104 (1) (b));
- any other matter the Council considers relevant and reasonably necessary to determine the application (Section 104 (1)(c)).

Section 104B of the Resource Management Act 1991 (as amended) provides:

After considering an application for a resource consent for a discretionary activity or non complying activity, a consent authority –

(a) may grant or refuse the application; and

(b) if it grants the application may impose conditions under section 108.

3.1 Resource Management Act Part II Matters

In considering an application for resource consent, Council must ensure that if granted, the proposal is consistent with the purpose and principles set out in Part II of the Act.

If consent is granted, the proposed activity must be deemed to represent the sustainable use and development of a physical resource and any adverse effects of the activity on the environment are avoided, remedied or mitigated.

The critical issues of this consent are whether the proposal represents sustainable use of the land for rural residential development as proposed under this application taking into account the underlying geotechnical risks, that adequate water, stormwater and wastewater servicing can be provided, that adequate provision for walkways has been made, and that the adverse effects on road users due to an increased gradient are acceptable.

3.2 Tasman Regional Policy Statement

The Regional Policy Statement seeks to achieve the sustainable management of land and coastal environment resources. Objectives and policies of the Policy Statement clearly articulate the importance of protecting land resources from inappropriate land use and development.

Because the Tasman Resource Management Plan was developed to be consistent with the Regional Policy Statement, it is considered that an assessment under the Proposed Plan will satisfy an assessment against Policy Statement principles.

3.3 Tasman Resource Management Plan

The most relevant Objectives and Policies to this application are contained in:

- Chapter 7 “Rural Environment Effects”;
- Chapter 11 “Land Transport Effects”;
- Chapter 13 “Natural Hazards”
- Chapter 14 “Reserves and Open Space”;

These chapters articulate Council’s key objectives: To provide opportunities for a rural residential lifestyle; to ensure that the proposed lots are stable and suitable for residential development in the long term taking into account the stability of the underlying ground; to ensure suitable services are provided to each lot; to provide adequate public access to reserves, walkways and open space and to ensure the adverse effects on the health and safety of road users in particular pedestrians and cyclists are avoided remedied or mitigated.

The most relevant Rules which follow from these imperatives are contained in:

- Chapter 16.3 ‘Rural Residential and Closed Zones’,
- Chapter 17.8.3 ‘Building Construction or Alteration’
- Chapter 18.8 ‘Road Area’,
- Chapter 18.12.3 ‘Slope Instability Risk Area – Subdivision’

The subject land is zoned Rural Residential (Champion Road and Hill Street North) and is within the Slope Instability Risk Area according to the Tasman Resource Management Plan and an active faultline being shown on the planning maps crossing the site. Highland Drive is shown as an Access Road on the planning maps.

4. ASSESSMENT

In accordance with Section 104 of the Resource Management Act, Council must consider the actual and potential effects on the environment of allowing the activity, have regard for any relevant objectives, policies, rules, and consider any other matters relevant and reasonably necessary to determine the application.

4.1 Matters of Discretion and Control in the Plan

The Activity overall has fully discretionary status, due to non compliance with the road gradient and dwelling setback from the road boundary and therefore the assessment is not restricted to specific matters. The following is a guide to status under each area of non compliance:

- Chapter 16.3 'Rural Residential and Closed Zones', meets Controlled Activity criteria for lots size. However is considered a Discretionary Activity due to non compliance with 'Road Area';
- Chapter 17.8.3 'Building Construction or Alteration', Discretionary Activity;
- Chapter 18.8 'Road Area', Discretionary Activity;
- Chapter 18.12.3 'Slope Instability Risk Area – Subdivision' Discretionary Activity, restricted to the risk of slope instability.

4.2 Geotechnical Assessment

The relevant rule is 18.12.3 Subdivision and this part of my assessment is limited to the risk of slope instability as it relates to the proposed subdivision and suitability of the proposed lots for rural residential development. The earthworks required to form this subdivision have been considered under RM080193 and are the subject of a separate report prepared by Mr Leif Pigott, Council's Consent Planner - Discharges.

This site is covered in part by the Slope Instability Risk Area within the Tasman Resource Management Plan and applicant has provided a report prepared by Tonkin & Taylor Limited, titled *Building Site and Road Alignment Feasibility Assessment Report*, dated February 2008, (T&T reference 870037.004).

There are three areas identified on the associated Tonkin & Taylor plan titled *Developmental Risk Zones* and attached as **Plan C**, that have been identified as high risk "No Build Areas" that correlate with the three active landslides identified within the report. There are also two fault lines identified, with the Waimea East Fault being shown as active.

A significant amount of investigation has been carried out by Tonkin & Taylor over a number of years that has provided background information for their report. This includes the detailed logging of 32 test pits and a review of ground movement monitoring data dating back to 2001. Movement of up to 105mm has been observed over this period for Monitoring Point 6.

The Tonkin & Taylor report has identified large areas of this site that are generally suitable for development amongst higher risk areas that will require some mitigation to improve stability and allow development. It is anticipated that building sites on land within Zone 1 can be provided without mitigation and within Zone 2 some mitigation will be required. However the specific details of the mitigation required for each lot have not been detailed as yet. Zone 3A, 3B and 3C (as shown on **Plan C**) contain the areas of higher risk land, and under this proposal residential development has been limited to Zones 1, 2 and 3A only.

Large scale earthworks will be required for the road construction and also in conjunction with the stabilisation works for some of the lots.

No onsite stormwater or wastewater disposal is proposed and all secondary stormwater flows are proposed to be contained within the formed road.

The applicant has confirmed that there should be no specific restrictions on the maintenance of council services within the road reserve or the installation of future services within the road, once the road has been constructed. Also some mitigation will be needed to ensure that there will be a low risk to services, laid within the higher risk areas that are not within the proposed road reserve.

Section 106(1) of the RMA is relevant to this application and states:

Despite section 77B, a consent authority may refuse to grant a subdivision consent, or may grant a subdivision consent subject to conditions, if it considers that –

(a) the land in respect of which consent is sought, or any structure on that land, is or is likely to be subject to material damage by erosion, falling debris, subsidence, slippage, or inundation from any source; or.....

The Tonkin & Taylor report has concluded that, subject to a number of recommendations including the requirement for specific geotechnical review, design and supervision, the proposed subdivision is feasible and that the requirements of Section 106 of the Resource Management Act can be satisfied.

Due to the geotechnical complexity of this site the Tonkin & Taylor report was peer reviewed for Council by Dr Mike Johnston, consulting geologist, and his report is attached as **Appendix 2**.

Following are extracts from Dr Johnston's report that are considered relevant to the proposed subdivision and site certification.

The following are extracts from the Discussion, Conclusions and Recommendations of Dr Johnston's report that relate to this subdivision:

1. DISCUSSION

Reducing the risk of movement to an acceptable level will be challenging but must be achieved if building sites, services to those sites and the access road are to be satisfactorily constructed within the coal measures formation.....Consequently,

Council will need to be satisfied that the road and the services within it are at low risk from slope movement.

Unless evidence is obtained to allow one of the branches to be disregarded, then both should be treated as active and setbacks implemented accordingly. Any setback would assist in minimising disruption to dwellings should either branch rupture during earthquake movement on the Waimea Fault.

....mitigation measures are likely to require ongoing maintenance and perhaps monitoring. Should this be the situation, then Council will need to know how this is to be achieved and it should make provision for the situation that either it and/or the owners of some or all of the lots will need to ensure that maintenance and perhaps also monitoring are undertaken. Matters that may need to be considered include ensuring that an adequate vegetation cover is maintained, surface and subsoil drains remain effective and bunds are kept clear of debris.

2. CONCLUSIONS

A number of mitigation measures are proposed and Tonkin & Taylor concludes that the subdivision is geotechnically feasible. The mitigation measures will require further investigation and design.

Council will need to be assured that any road, and the services within it, will be at low risk from slope movement. It also needs to be resolved as to who will take responsibility should any ongoing monitoring and/or maintenance of the mitigation measures implemented as part of the subdivision be required.

Construction of the road will result in extensive earthworks, which are likely to increase as the gradient of the road decreases. Cut faces are likely to need retention, even where relatively competent in situ coal measures are encountered.

To reduce the amount of earthworks, including cuts and their retention, and thereby reducing the risk of slope movement during construction and in the future, then the adoption of a 1:6 gradient for the road is both prudent and sensible.

The Tonkin & Taylor investigation has demonstrated that subdivision of the property is generally feasible and that most of the lots are in areas that are at low risk of slope instability. These lots are mostly confined to the ridge crest.

The lots on the slopes of the ridge, and also the adjacent road, are subject to greater risk although mitigation measures will likely reduce the risk to an acceptable level. Nevertheless, the Tonkin & Taylor report is cautious about the subdivision stating that, provided mitigation measures are implemented, then that firm "should be in a position to certify that a building site exists on lots created throughout the subdivision that is unlikely to be adversely affected by instability arising from high intensity rainfall or seismic events".

It also behoves Council to be equally cautious should it grant subdivision consent.

It can achieve this by ensuring that the whole subdivision, including earthworks, design and implementation of mitigation measures, drainage and building site certifications are the sole responsibility of an experienced and recognised

geotechnical consultant with provision for review of all documentation submitted to Council as part of any application for 224 Certification.

3. RECOMMENDATIONS

It is recommended that resource consent for the subdivision is granted with the following geotechnical conditions:

GEOTECHNICAL CERTIFICATIONS

1. Building Sites

- a. *Certification that each residential lot has an accessible site suitable for the erection of a residential building shall be submitted from a chartered professional engineer practising in geotechnical engineering and recognised as such by the Tasman District Council.*
- b. *The certification shall define on each lot the area suitable for building on and shall list development conditions pertaining to the site and the lot generally.*
- c. *The certifier of the building site shall be responsible for the design, implementation and supervision of all mitigation measures undertaken as part of the building site certification and also for the subdivision as a whole, including construction of the access road and right of ways.*
- d. *Any residential lots on which a certified building site has not been defined shall prior to any application for 224 Certification be amalgamated with an adjacent lot containing a site.*
- e. *If any mitigation works undertaken as part of the subdivision require on going monitoring and/or maintenance above that normally undertaken by Council for its roading network and drainage systems then this shall be the responsibility of the owners of all the lots that benefit from the mitigation works. Council will require a consent notice to be entered on the titles of the lots involved. If a consent notice cannot be implemented then Council will not grant 224 certification for the subdivision.....*

5. Geotechnical Review

- a. *Council may at the time of application by the consent holder for 224 Certification for the subdivision obtain a geotechnical peer review of the following:*
 - i. *Certifications of the building sites.*
 - ii. *Mitigation measures that have been implemented.*
 - iii. *Earthworks, including for the access road and the right of ways.*

If the review concludes that there is more than a low risk to the building sites and other structures, including the access road and right of ways, from slope instability and/or that further mitigation measures are required then Council will not grant 224 Certification until such mitigation measures have been implemented to the satisfaction of the Council. The cost of the review shall be met by the consent holder.

Conclusions

A significant amount of geotechnical investigation has occurred over a number of years and Tonkin & Taylor have also been involved with subdivision development near this site since 2003.

There are real geotechnical risks associated with the development of this site for rural residential development. It is clear that the design of the subdivision and road access has taken these underlying geotechnical risks into account.

The applicant has provided a report from Tonkin & Taylor that confirms that, in their professional opinion, the subdivision is feasible and meets the provisions of s106 of the RMA.

The exact extent of mitigation works required to allow each proposed lot to be certified is not known. However the extent of the mitigation works required will become clear as further design and monitoring is undertaken, should consent be granted.

It is unclear at this stage if any maintenance or monitoring of any future subsoil drainage is required as part of the s224 site certification. Also the site certification will come with conditions attached which will be attached to the title via a consent notice. There is a risk that some owners may ignore or be ignorant of their obligations under the consent notice and carry out earthworks that pose a risk to the stability of their land and or neighbouring land. Due to the underlying ground conditions these risks may be higher with this application than on other more stable sites.

The peer review carried out by Dr Mike Johnston concluded that a cautious approach should be taken by Council and has recommended that consent be granted subject to a number of conditions requiring geotechnical design, monitoring and supervision. Dr Johnston also recommends that Council retain the right to seek a peer review of the site certifications, mitigation measures and earthworks at the time s224 approval is sought.

4.3 Transport Effects

The proposal does not meet the:

- Permitted criteria 18.8.3.1(d) where all roads constructed and vested in Council in accordance with Figure 18.8A are required to have a maximum gradient of 1:7.

The proposed road will have a gradient steeper than 1:7, and up to 1:6, for a length 150 meters between chainage 140 and chainage 290, and also for another section with a length of 180 meters, between chainage 370 and chainage 540. Refer to **Plan D** and **Plan E**.

Geotechnical Issues Relating to Road Design

Tonkin & Taylor are proposing to carry out works to stabilise the proposed road access from the end of the existing road formation up to Lot 8 using a combination of large diameter shear piles, subsoil drainage and shear keys. Mr Mark Foley of Tonkin & Taylor has advised on 30 October 2008 that there may be some scope to allow for a lower road gradient. However he advised that there are significant geotechnical constraints that have the effect of restricting the location of the road as the stabilisation costs for more extensive cuts and fills can rise exponentially to a point where the subdivision is no longer viable.

Dr Johnston was also asked to specifically consider the proposed steeper access from a geotechnical point of view and his response is as follows:

In order to reduce the amount of earthworks, Tonkin & Taylor propose a road gradient of 1:6 (Option 2), which tends to follow the grade of the land, but is steeper than the 1:7 that the Tasman District Council usually requires (Option 1). From a geotechnical perspective a steeper gradient has the advantage of reducing the extent of earthworks on the northwest face of the ridge, particularly in the generally weak rocks of the coal measures formation. Tonkin & Taylor calculates that in Option 2 retained cuts of up to 2.7 m in height would result whereas in the Option 1 the cuts would be up to 5.25 m in height and in the coal measures formation they would not be feasible to retain due to the geotechnical complexity.

Mr Mark Foley and Dr Mike Johnston agree that the smaller cuts associated with a steeper road gradient are necessary from a geotechnical point of view.

Traffic Issues

The applicant has provided a report prepared by Mr Wayne Gallot, Transportation Planner, from Urbis TPD Limited, dated 29 May 2008. This report is attached as **Appendix 3**.

The key points of the Urbis report are that there are various road gradient standards applied around New Zealand, with some Council's requiring more stringent standards than the TRMP, and others such as in Christchurch City allowing a steeper 1:6 gradient, as a permitted activity. When accessing existing roads in the Christchurch area with a similar gradient to what is proposed under this application no real adverse effects to road users were observed and it was concluded that the steeper gradient proposed (Option 2) would provide a suitable level of service for road users.

MWH provided some brief comments for Council on the effects of the proposed road gradient in a memo to Council prepared by James Tomkinson. These comments were forwarded by email to the applicant on 30 June 2008.

A report specifically assessing the traffic effects of this application has been prepared for Council by Ms Melanie Muirson, Senior Traffic Engineer for MWH New Zealand Limited and her report is attached as **Appendix 4**. An extract from this report, *Section 5, Summary of the Traffic Impacts* follows;

- 5.1 *The New Zealand Transport Strategy and Government Policy Statement documents promote mode changes to sustainable transport which includes walking and cycling. These documents provide specific targets that the Road Controlling Authorities including TDC are required to work towards. Therefore any new transport infrastructure built shall provide access for all modes of transport and not be solely focussed on motor vehicles. With the potential for further development in the land adjacent to the St Leger subdivision, it is important that the national strategies are considered with respect to the design of the road for all road users, now and in the future.*
- 5.5 *The extension of Highland Drive as part of the St Leger subdivision is recommended to be constructed with a maximum grade of 1 in 7 based on providing ease of access for all road users including motor vehicles, pedestrians, cyclists, mobility scooters, towing vehicles and heavy commercial vehicles such as the weekly rubbish and recycling vehicles, furniture removal trucks, and construction traffic as the subdivision is being developed.*
- 5.7 *There are geotechnical and geometric solutions to reduce the grade of the proposed road alignment. An identified solution that could assist with achieving the 1 in 7 grade includes moving the road alignment by 25 metres into Lots 3, 4 and 33 and reconfiguring the lots which will lengthen the road by 40 metres. This would provide an ideal solution of reduced cut where the road traverses the fault line on the centreline of the road and require a 2.0 metre fill rather than the proposed cut at the toe of the central slip on the centreline of the road in the vicinity of Lots 7 and 11. An added advantage is that less cut is required around the curve in the vicinity of Lots 11, 12 and 14.*
- 5.9 *This proposed option would reduce the number of curves required to four when compared to the Applicant's proposed alignment for the Highland Road extension which consists of six curves interspaced with short sections of straights.*
- 5.10 *This proposed alignment would meet with TDC's standards and provide a safe environment for all road users and it is recommended that this possible solution is investigated further.*
- 5.11 *There is potential for future land development beyond the St Leger subdivision with the only practical access identified as being via a further extension to Highland Drive due to the difficult topography of the area. Therefore the road alignment for the St Leger subdivision should be designed to a standard that future proofs the proposed extension to Highland Drive to provide access to this potential development in the future.*

Mr Dugald Ley, in his staff report attached as **Appendix 6**, agrees with Ms Muirson and provides additional reasoning as to how the road design could be altered to allow a fully complying 1:7 gradient.

From the applicant's plan and their proposed alignment and grades will create:

1. *An approximate 0.96 – 1.64 “cut” at the “toe” of the central slip on the centreline of the road.*
2. *An approximate 2.2 “cut” at the crossover of the fault line at the centreline of the road.*
3. *The applicant proposes a right of way serving Lots 4, 5, 6 and 7 which is also anticipated to “cut” into the toe support.*

Cutting the “toe” support of an old slip will not be in the best interest of assets downhill. However it is acknowledged that the applicant is proposing substantial buttress design at the edge of the road reserve, i.e. combination of large diameter shear piles, subsoil drainage and a shear key.

It is my view that a complying graded road could be constructed as per the details below.

- 1 *.Drift some 25 m into Lots 3, 4 and 33, to allow a flatter gradient to occur.*
- 2 *.This will mean an approximate 2.0m fill on the road centreline where it traverses the toe of the slip, i.e. buttress effect to the slip.*
- 3 *.A 2.0 cut where the road traverses the fault line on the centreline of the road (similar to the applicant's proposal).*
- 4 *.Increase overall length of the road by approximately 40 m.*
- 5 *.Reduce size of shear piles etc resulting in less future maintenance and risk to Council if they are located within the road reserve. Note if the piles are required to protect lots then they should be located on private property and protected by easements.*
- 6 *.The ability of all users, i.e. walking, biking, mobility scooter, cars and trucks to use the asset with ease and not deny access.*
- 7 *.The cross-section plan 7081 produced by the applicant shows that with a 1-in-6 grade they would end up with a 2.2 m cut on the road centreline. However a longer road and “drifting” the road would result in a 2.0m cut situation.*
- 8 *The applicant's proposed concept alignment from the end of the formed road to the top turning cul-de-sac head is made up of six curves interspaced with short sections of straights. With the Council's proposed alignment, this is reduced to four curves, all complying with the Council standards and resulting in a safe environment for all road users.*

- 9 .Council's proposed grades would be as follows (from using applicant's plans):

Running distance	Grade
40 – 120	1-in-7
120 – 175	1-in-10
175 – 355	1-in-7
355 – 400	1-in-10.6
400 – 640	1-in-7

It is my view that a combination of the 1-in-7 grade and lengthening the road by drifting it some 25 m into Lots 3 and 4 will enhance stability to the road and lower overall risk to Council in the future. Council will have an expert roading witness available at the hearing and will table a report and speak to it.

Summary

The applicant has sought consent to construct a road with a gradient of up to 1:6 along two sections of the proposed road to vest. The TRMP requires a road gradient of no steeper than 1:7 to comply with Figure 18.8A.

From a geotechnical point of view the road design must take into account the underlying ground conditions and the proposed 1:6 road design is considered feasible due to the smaller cuts and fills required. The applicant has provided **Plan D** and **Plan E** showing the approximate height of the cuts for a road constructed along the proposed alignment and Mr Foley has confirmed that there may be some scope to alter the road alignment but this was limited for geotechnical reasons.

Mr Ley and Ms Muirson (Section 4.6) have suggested that it may be possible to achieve the desired 1:7 road gradient by realigning the position of the road and Mr Foley has indicated that some small reduction in grade may be possible.

From a road user point of view a complying gradient is preferred as it would present less of a barrier to pedestrians, cyclists, heavy vehicles such as for weekly refuse collections and towing vehicles. Ms Muirson states that mobility scooters would be effectively barred from the steeper sections of this road (refer to Section 4.11).

There is no point of difference between the traffic reports prepared by Mr Gallot and Ms Muirson regarding the ability of motor vehicles to be able to safely negotiate the steeper 1:6 sections.

This site is on the fringe of the Richmond township and is zoned Rural Residential where some development of this area is anticipated. There is no close shopping available, with the Richmond township centre being some 3.5 km from this development. The proposed lots will have a minimum area of 2,001 square meters and be located on moderately sloping ground and therefore would not be easy sections to develop or maintain, when compared to smaller sections on flat ground. Any future owners or occupiers of these lots who are physically impaired to the extent that they require a mobility scooter would also find the maintenance of these large sloping lots difficult. Mr Shane Overend, Subdivision Engineer, Nelson City Council advised that a more suitable gradient for mobility scooters was 1:8.

Conclusion

The proposed steeper gradient will be accessible by motor vehicles but present greater difficulty for, but not exclude, larger vehicles, pedestrians and cyclists. There is also uncertainty regarding the geotechnical feasibility of redesigning the road to a complying gradient and consequently the feasibility of the application as a whole. Due to the location of this development, the physical capability required for future owners to maintain their sections, the existing Rural Residential zoning and the relatively short length of the non complying gradient I consider that the effects of the proposed gradient are no more than minor.

4.4 Building Construction –Setback from proposed road (RM080102)

The applicant has also applied to construct buildings with setbacks of 5.0m from the proposed road (Lot 13) on Lot 2, Lots 9 – 11, and Lots 22-27 within the subdivision application RM080103.

The relevant rule is 17.8.3.1 (h)(i) where buildings are required to be setback 10.0m from the road boundary.

The proposed setback at 5.0m is similar to that applied within the Residential Zone. With this application a reduced setback is sought for nine lots to allow building to be constructed on the more stable parts of the lots. This would reduce the extent of the mitigation works required prior to certification or allow a larger area to be certified for residential development.

While there are adverse effects on the rural character of this subdivision in relation to this subdivision these effects are considered to be no more than minor taking into account the proposed landscaping, the limited number of lots with reduced setbacks, that Lots 14, 19, 20 and 31 will be setback 10m from the road boundary and that Lots 14, 19, 20 and 31 will be below the formed road. The lower volunteered development restrictions of single level dwellings with recessive color schemes will also reduce the effects of the reduced setbacks.

4.5 Public Access

The applicant has proposed a 5.0m wide public access walkway across this site linking a proposed walkway on Lot 3 DP 375320 to the proposed road to vest.

Rosalind Squire, Council's Reserves Planner has assessed this application and submitted a report attached as **Appendix 5**. The following extract from this report outlines the proposal and justification for the alterations sought;

“When the application was lodged Community Services staff undertook a site visit to assess the feasibility of constructing a walkway (with associated cuts, batters and amenity plantings) within the proposed 5 metre wide reserve on such a steep site. Staff requested that the width of the reserve be increased from 5 to 7 metres. The rationale for this was to provide a 3 metre wide walkway to accommodate the walkway formation and future maintenance access, a 1 metre batter slope on the uphill and downhill side of the walkway and a 1 metre wide strip to provide plantings and/or a fence.”.....

“Community Services also indicated that a walkway connection to the adjoining property to the east would provide a strategic link for a future walkway connection linking Highland Drive to any future development to the east and ultimately to Dellside Reserve or Easby Park (See Figure 1). This link would provide easier and more direct pedestrian access than alternative options for future residents to the Richmond CBD, nearby reserves, Waimea Intermediate, Waimea College, the Aquatic centre and ultimately the walk/cycleway adjoining the Waimea Estuary. To date this has not been agreed to by the applicant”.

Conclusions

While the proposed walkway provides an important walkway linkage concerns have been expressed in Ms Squire’s report regarding the proposed width of walkway considering the future development of the walkway and steepness of the land that it will cross. Also the walkway follows the Waimea Fault (East) and crosses two areas identified as Zone 3C (High Risk) on the Tonkin & Taylor plan attached as **Plan C** and any specific restrictions on earthworks and drainage within the walkway have not yet been formulated.

Increasing the minimum width of the proposed walkway by an additional 2.0m will allow for improved development of the walkway with less steep batters.

Also providing a short 6.0m wide public access easement from the proposed road to vest would allow a strategic link to Lot 1 DP 6202 that could form part of a wider walkway network along the Richmond foothills.

4.6 Servicing Effects

Geotechnical

This site contains two fault lines as well as other areas of known instability. It is proposed to form a road to vest that will cross these two fault lines. Services that will be vested in Council will be installed within the road to vest and also cross other areas identified as high risk as shown on **Plan C**. The long term security of these services is important as leaking drainage pipes may reduce the stability of the lots.

The Tonkin & Taylor report recognises that some mitigation will be required to ensure that the risk of damage to Council services is low from slope instability. Confirmation that there is a low risk to Council services is required from a geotechnical engineer prior to s224 certification as recommended by Dr Johnston.

With regard to services crossing the fault lines Dr Johnston has verbally confirmed that there is no evidence that the fault lines are creeping and should they move they are likely to up-thrust by up to 1.0m and this amount of movement would sever all services crossing these faults. Should this happen there will be significant damage to infrastructure, services, buildings and structures in this location and across Richmond generally.

Water supply

There are a number of options available to provide a potable water supply and to provide a water supply for fire fighting. The applicant has proposed a boosted supply to provide a restricted supply above RL90 with a concept reticulation plan shown on **Plan B**. Council's Development Engineer Mr Dugald Ley considered this application and prepared a report with recommendations for a water supply system to provide for this subdivision while allowing for future water supply infrastructure. Extract from Mr Ley's report are included below:

'The reticulation to which the proposed subdivision will connect is fed by the Richmond High Level Reservoir. Recent work by Council has indicated the water pressure at the point of connection to the proposed subdivision is likely to vary between 122 and 82m RL in the peak demand season. Council considers that the maximum lot elevation able to be serviced by the current reticulation network is 65m RL.

The 65m contour line traverses an approximate running distance of 160 (Verrall plan) on about Lot 8. Any lots proposed above that contour cannot presently be serviced from a Council supply (or will have substandard service).

As part of Council's water supply modelling for Richmond, a number of potential new reservoir sites have been identified in the Richmond East area. Reservoirs at these locations would provide security of supply and meet Council's level of service in the future.

As outlined in the proposed Richmond East rezoning, it is proposed to install two reservoirs (and associated infrastructure) with top water levels of 122.3 and 205 m RL respectively. This reticulation will meet all levels of service for the applicant's property; however it would not likely be in place until 2012/13 (subject to LTCCP approval). The lower reservoir base level (approximately 120 m) traverses the applicant's site, and a potential reservoir site exists on the applicant's property (Lot 30).

A number of options are available to service land above the 65m contour and are outlined below:

- 1. Each lot could be self sufficient with their own supply and rely on roof water or tankered water, with tanks on each site for storage and fire fighting supply. (Note: once owners install these low pressure systems it is likely connection to Council high pressure systems will be very expensive).*
- 2. At or about the 65m contour an inline water pump station could be installed to pump up to one (or a number of) storage tanks and supply the properties via a private system. The tank elevation would have to be at an elevation that would meet a minimum level of service (for example 30 to 90m pressure) and meet fire fighting requirements (including fire hydrant discharge rates). The applicant has not verified if fire fighting requirements can be met.*

The design will require agreement with Council regarding ownership of the pump station, water main and tanks, as parts of the infrastructure will be within the road reserve. The applicant has declined to discuss this aspect with Council.

There may be scope for the applicant to install reticulation and reservoirs compatible with that proposed by Council in the future and vest the assets in Council ownership. A reservoir could be installed on Lot 30, with a top water level of 122.3m. This would service lots up to the 90 m contour. Lots above this level could be serviced by additional rider mains supplied from an on-line booster pump or by a reservoir located at a higher level.

The applicant has proposed a “cost share” arrangement with Council in regard to installing infrastructure that will ultimately benefit the wider community and land above the 65 m contour line. Council cannot enter into this arrangement as we presently have no mandate for this work and, if approved by the LTCCP, would not get it until the early part of 2009. At present Council has not fully designed the system and confirmed alignments for pumping mains which will start at the Champion Road reservoir (although they are unlikely to come up Highland Drive).”

The applicant has confirmed that they are willing to provide fire fighting water storage on their sites in accordance with NZS PAS 4509:2008.

The proposed water supply conditions would provide a potable water supply, a fire fighting water supply and allow for an adequate water supply for all stages of this subdivision.

Wastewater and stormwater servicing can be adequately provided for subject to conditions.

4.7 Summary of Assessment of Effects

The potential adverse effects from the proposed subdivision have been assessed in detail above. In summary there are effects relating to;

- i) the long term stability of the sites, services and roads;
- ii) effects from the proposed increase in road gradient where some road users including pedestrians and cyclists will find accessing this steeper road more difficult and mobility scooters are barred from access;
- iii) the long term effects from limited walkway widths and linkages;
- iv) the visual effects from ten dwellings being 5.0m closer to the road reserve boundary than what is permitted.

Overall my assessment is that the adverse effects on the environment from the proposed subdivision and increased road gradient are no more than minor.

5. RELEVANT OBJECTIVES AND POLICIES OF THE PTRMP

The following Policies and Objectives have been considered relevant for this proposal:

- Chapter 7 “Rural Environment Effects”;
- Chapter 11 “Land Transport Effects”;
- Chapter 13 “Natural Hazards”
- Chapter 14 “Reserves and Open Space”;

5.1 Chapter 7: Rural Environment Effects

The relevant policy is 7.2.3.2 where this site has been identified as being suitable for rural residential development having regard to natural hazards and servicing availability.

The Rural Residential Zone is generally placed over areas of less productive land and is intended to relieve pressure for the fragmentation of the rural land resource. This site is located within the south west corner of the Rural Residential Zone between the existing residential development on Highland Drive and the Rural 2 Zone.

The establishment of rural residential development on this site at the proposed minimum lot size of greater than 2,000 square meters is anticipated within the TRMP by the Rural Residential zoning of this site.

5.2 Chapter 11: Land Transport Effects

Relevant Issues

The following Policies from Chapter 11 are considered relevant to this application:

11.2.3.3 *“To promote transport routes, and approaches and methods of design, construction and operation which avoid, remedy or mitigate adverse effects on:*

- (a) *the health and safety of people and communities; in particular, cyclists and pedestrians;...”* and,

11.2.3.6 *“To promote choice between using roads, walkways or cycleways for walking or biking”*

Conclusions

It is proposed to provide vehicle access including two rights of way to the proposed lots created by this subdivision where two sections of the proposed road are steeper than the design standard of 1:7 for a public road. This steeper access will be more difficult to access for pedestrians, cyclists and heavy vehicles and mobility scooters will be excluded from access. A public access walkway is provided to link existing walkway reserves. While this proposal does not meet these Policies in every respect, I do not consider that this proposal is contrary to these Policies in that access is in

fact provided but at a lesser standard, with limited adverse effects on the health and safety of cyclists and pedestrians.

5.3 Chapter 13, Natural Hazards

The following Policies from Chapter 13 are considered relevant to this application:

13.1.3.1 *“To avoid the effects of natural hazards on land use activities in areas or on sites that have a significant risk of instability, earthquake shaking, flooding, erosion, or inundation, or in areas with high groundwater levels”*

13.1.3.4 *“To avoid or mitigate the adverse effects of the interactions between natural hazards and the subdivision, use and development of land.”*

This application is considered to meet these Policies as the design and layout of the subdivision has specifically taken into account underlying geotechnical hazards as identified in the Tonkin and Taylor report. Also the Tonkin and Taylor report considered that the requirements of s106 could be met with regard to instability.

5.4 Chapter 14, Reserves and Open Space

The following Policy from Chapter 14 is considered relevant to this application:

14.1.3.4 *“To provide for new open space areas that are convenient and accessible for users, including the provision of walking and cycling linkages in and around townships, between townships and between reserves”*

The proposed walkway within this subdivision will provide a linkage, from an existing title owned by Tasman District Council that will be formed as a walkway, across this site to an area of road to vest. This application is considered to meet the requirements of this Policy.

5.5 Other Matters

The Richmond East area has been identified as an area of potential growth for residential development within The Richmond Development Study. In April 2008 the Nelson South – Richmond East Draft Structure Plan was sent out to all residents in the Richmond East area seeking public feedback to help with the preparation of a plan change for the Richmond East area.

The land adjacent to the southern boundary of this site owned by the J C and K E Heslop has been identified in the Draft Structure Plan as a Low Density Residential area. This area identified on the Heslop Trust land appears to have less geotechnical constraints than the St Leger land.

The Tasman District Council Engineering Standards 2008 also requires that the road design take into account access to adjoining land as described in the report prepared by Dugald Ley and attached as Appendix 6. However under the TRMP indicative roads, roading designations and zoning are primary drivers for connectivity.

The Manager Policy has confirmed the earliest possible notification date is April 2009. As the Richmond East plan change has not yet been notified it cannot be given significant weight when considering this application.

6. SUMMARY AND CONCLUSIONS

6.1 Geotechnical Issues

A significant amount of geotechnical investigation has occurred over a number of years and Tonkin & Taylor have been involved with subdivision development near this site since 2003.

It is unclear at this stage what if any maintenance or monitoring of any subsoil drainage is required as part of the s224 site certification. Also the site certification will come with conditions attached which will be attached to the title via a consent notice. There is a risk that some owners may ignore or be ignorant of their obligations under the consent notice and carry out earthworks that pose a risk to the stability of their land and or neighbouring land. Due to the underlying ground conditions these risks may be higher with this application than on other more stable sites.

The peer review carried out by Dr Mike Johnston concluded that from a geotechnical point of view consent can be granted subject to a number of conditions requiring geotechnical design, monitoring and supervision and he has also recommended that Council retain the right to seek a peer review of the site certifications, mitigation measures and earthworks at the time s224 approval is sought.

6.2 Road Gradient

From a geotechnical point of view the road design must take into account the underlying ground conditions and the proposed 1:6 gradient will have lower cuts and fills. Dr Johnston agreed that smaller cuts and fills are geotechnically desirable.

Mr Ley and Ms Muirson (Section 4.6) have suggested that it may be possible to achieve Council's desired 1:7 road gradient by realigning the position of the road. Mr Foley has indicated that some small reduction in grade may be possible. However there is doubt that the revised road location, and consequent 1:7 gradient is feasible from a geotechnical point of view.

Ordinary motor vehicles would be able to safely negotiate the steeper 1:6 sections. However mobility scooters would be effectively barred from this road and larger vehicles, pedestrians and cyclists will still have access, but with increased difficulty.

The proposed lots will have a minimum area of 2,001 square meters and be located on moderately sloping ground and therefore they would not be easy sections to develop or maintain, when compared to smaller sections on flat ground, with the likely ownership being a younger age group.

6.3 Setback

While there are adverse effects on the rural character of this subdivision in relation to this subdivision these effects are considered to be no more than minor taking into account the proposed landscaping, the limited number of lots with reduced setbacks,

that Lots 14, 19, 20 and 31 will be setback 10m from the road boundary and be below the formed road.

6.4 Public Access

The proposed walkway provides an important walkway linkage. However considering the future development of the walkway and steepness of the land that it will cross and taking a strategic view an increased width to 7.0m with splays, and an extension from the road reserve to Lot 1 DP 6202 are sought.

6.5 Planning

This proposal is considered to meet the Objectives and Policies of the TRMP for this Rural Residential Zone and the adverse effects of this proposal are no more than minor.

7. RECOMMENDATION

7.1 Subdivision and Land Use Consent (RM080103 and RM080182) be GRANTED subject to the following Conditions.

8. CONDITIONS (RM080103)

8.1 Should consent be granted I recommend the following conditions be imposed:

Subdivision Consent and Land Use Consent RM080103

1. Subdivision Plan

The subdivision and development shall be carried out generally in accordance with the application plan prepared by Verrall and Partners Limited, titled *Proposed Subdivision for St Leger Group Ltd, Highland Drive, Richmond*, and attached to this consent as **Plan A - RM080103**

2. Staging

a) The subdivision shall be completed in five stages as follows:

STAGE 1:

Lots 1 - 6 and Lots 32 – 33;

STAGE 2:

Lots 7 – 12, including the Walkway Reserve shown on **Plan A - RM080103;**

STAGE 3:

Lots 14 – 18;

STAGE 4:

Lots 19 – 25, and

STAGE 5:

Lots 26 – 31.

- b) The formation of the road to vest and or rights of way and including the installation of all services required by the Conditions of this consent shall extend along the full frontage of all lots contained within each stage.

3. Expiry of Consent:

This consent shall expire in 10 years from the date of issue, if not given effect to.

4. Landscape Plantings

- a) Prior to any application for s224(c) approval written confirmation shall be provided to the Tasman District Council Environment and Planning Manager from a qualified Landscape Architect that the landscaping has been established for that stage in accordance with *Planting Scheme Plan – The Highlands, Richmond Plan F, RM080103* attached to this consent.
- b) Any plantings on the road to vest (Lot 13) shall be approved by the Tasman District Council's Engineering Manager.

5. Consent Notices

The following consent notices shall be registered on the certificate of title for the relevant allotments pursuant to Section 221 of the Resource Management Act.

The consent notices shall be prepared by the applicant's solicitor and submitted to Council for approval and signing. All costs associated with approval and registration of the consent notices shall be paid by the consent holder.

Consent notices in accordance with conditions of this consent shall be placed on the allotments as they are created.

A. Building Setbacks

The construction of buildings on Lot 2, Lots 9 – 11 and Lots 22 - 27 shall be a minimum of 5.0m from the road reserve boundary, except that this does not apply to any buildings solely associated with utilities within the subdivision.

B. Building Site Stability

Any recommended conditions resulting from the engineering certification required under Condition 21(d) of this consent.

C. Wastewater

A private pumped wastewater system that discharges to Council's gravity drained wastewater system in Highland Drive is required to be installed, repaired, replaced and maintained by the owners of Lots 14 – 18 DP....., entirely at their cost. Specific design of this system will be required.

D. Stormwater

The management of stormwater for Lots 14 – 21 and Lot 31 shall be carried out in accordance with the conditions of the associated stormwater discharge permit, RM080191.

Lots 14 – 19 and Lot 21 are required to maintain the stormwater drainage system across their respective lots and also maintain the stormwater system within the right of way. This will include the maintenance of the sumps within the right of way.

E. Road Gradient

The public road access has been formed at a steeper gradient of up to 1:6 which will prevent the safe use of mobility scooters on this road.

6. Easements

- a) Easements are to be created over any services located outside the boundaries of the lots that they serve as easements-in-gross to the Tasman District Council for Council reticulated services or appurtenant to the appropriate allotment.
- b) Easements shall be shown on the Land Transfer title plan and any documents shall be prepared by a Solicitor at the consent holder's expense.
- c) Reference to easements is to be included in the Council resolution on the title plan at the section 223 stage.
- d) An easement in gross for Council services and public access on foot and bicycles shall be provided from the Road to Vest (Lot 13) to Lot 1 DP6202 at a minimum width of 6.0m.

7. Power and Telephone

- a) Full servicing for power and telephone cables shall be provided underground to the boundary of Lots 1 – 12 and 14 - 31 inclusive. The consent holder shall provide written confirmation from the relevant utility provider(s) to the Tasman District Council Engineering Manager that power and telephone cabling has been installed from the existing network to the boundaries of the abovementioned allotments.
- b) Confirmation that these requirements have been met shall be provided in a written statement from the supply authority. A copy of the supplier's

certificate of compliance shall be provided to the Tasman District Council Engineering Manager prior to a completion certificate being issued pursuant to Section 224(c) of the Resource Management Act 1991.

- c) All servicing shall be accordance with Tasman District Engineering Standards and Policies 2008.
- d) Electricity sub-stations, where required, shall be shown as road to vest on the land transfer survey plan if they are located adjacent to a road or road to vest. These shall be shown on the survey plan prior to a plan being submitted for Section 223 approval.

8. Stormwater

- a) A full stormwater reticulation discharging to Council's reticulated system shall be installed complete with all necessary manholes, sumps, inlets and a connection for Lots 1 – 12 and Lots 19 - 31. This may include work outside the subdivision.
- b) The design and construction of the stormwater discharge system for Lots 14 - 18 shall be in accordance with the Conditions of the associated stormwater discharge permit, RM080191.
- c) No systems or structures to protect private properties shall be installed on road reserve.
- d) Stormwater secondary flow paths (both public and private) shall be protected by suitable easements where required and constructed to comply with the Tasman District Council Engineering Standards 2008.

9. Street Numbers

The street numbers will be supplied at the time of submission of a s223 application plan.

10. Right-of-Ways

- a) The right-of-ways shown on **Plan A - RM080103** shall be formed, and permanently surfaced to minimum widths as below together with kerb, channel and sumps and a maximum gradient as per the table below.

Note: The minimum requirement for a permanent surface is a Grade 4 chip first coat, followed by a Grade 6 void fill second coat.

- b) The seal formation shall extend to the back of the footpath/edge of road seal/kerb crossing.

ROW serving lots	Carriageway width	Maximum Grade
4 – 7	3.5 m	1-in-5
14 – 18 and 21	5.0 m	1-in-6

11. Roding

- a) The road to vest and out to the sealed formation, shall have a minimum legal width of 21.8 metres, with a sealed carriageway of 10.0 metres.
- b) A 2 x 1.4 metre footpath shall be constructed on both sides of the road and remote from the kerb and channel.
- c) Kerb, channels and sumps shall be installed in accordance with Tasman District Council's Engineering Standards and amendments.

Advice Note: The carriageway can be reduced in width to 8.0m ie, "no parking on the inside edge" from the northern boundary of Lot 4 to the north eastern boundary of Lot 11.

Advice Note: The plan presented shows a number of compound and reverse curves. The curve alignment of the road to vest shall meet Council's engineering standards and may require realignment of existing curves on existing road reserve.

12. Access

- a) Practical access shall be constructed to each lot at a minimum grade of 1 in 6 and complying with the Tasman District Council Engineering Standards 2008.
- b) A kerb crossing shall be formed for each lot in the subdivision.

13. Water Supply

Full water reticulation, complete with all mains, valves, fire hydrants and other necessary fittings shall be installed and a water meter and approved housing box shall be provided for each lot. The system shall consist of at least the following:

- a) Continuation of the principal 150mm water main to a future reservoir site in the vicinity of Lot 30 shall be provided.
- b) An inline booster pump, valving, telemetry etc is to be constructed at the 65m contour (subject to design and not located in the sealed road carriageway) to supply the reservoir required by e).
- c) Appropriate fire hydrants are to be located on the principal main that meet fire code requirements and service all lots.
- d) A rider main to service the sites between 65m RL and 90m RL contours, meeting the requirements of Council's Engineering Standards 2008.
- e) A water storage reservoir with a top water level of 122.3m RL and with at least one day's minimum reserve supply shall be constructed in the vicinity of Lot 30 and water supply lot shall vest with Council.

- f) A boosted pump supply to lots above 90m RL, supplied via appropriately sized rider mains and supplied from the from the reservoir above.
- g) The reticulated system shall be constructed to meet Council's Engineering Standards 2008 or to the satisfaction of the Tasman District Council Engineering Manager, and shall provide:
 - i) Standard firefighting water flows;
 - ii) Standard pressure head for all lots, i.e. minimum 30m maximum 90m;
 - iii) Appropriate physical access to the site required by e) above for normal maintenance vehicles;
 - iv) An additional supply to service properties above the 90m contour;
 - v) A telemetry system to detect pressure loss within the system and automatic shutdown flow facility.

14. Sewer

- a) Full sewer reticulation discharging to Council's approved reticulation system shall be installed complete with any necessary manholes and a connection to each lot. This may include work outside the subdivision to connect to or upgrade existing systems.

Advice Note: Council will not accept any new wastewater pumpstations to vest with Council.

- b) Any private pumpstations/pressure mains, i.e. Lots 14-18 shall discharge to a manhole on private property before being discharged via gravity to Council's system.

15. Street Lighting

The consent holder shall provide street lighting in accordance with the Tasman District Council's Engineering Standards 2008 and amendments. This work will include installation of cabling, poles, outreach arms and lanterns.

16. Road Gradient

- a) The maximum road gradients where they are steeper than 1:7 shall be as shown on **Plan E – RM080103.**
- b) The maximum lengths of those sections of road steeper than 1:7 shall be as shown on **Plan E – RM080103.**
- c) Written confirmation from the geotechnical engineer required by Condition 21(a) shall be provided to Council's Engineering Manager stating that taking into account the underlying ground conditions of the site that it is not feasible to construct the road at a lower gradient.

17. Maintenance Performance Bond

The consent holder shall provide Council with a bond to cover maintenance of any roads or services that will vest in Council. The amount of the bond shall be \$1,100 per lot to a maximum of \$25,000 or a figure agreed by the Engineering Manager and shall run for a period of six years from the date of issue of 224C certification for each stage of the subdivision.

18. Engineering Plans

- a) Engineering plans detailing all services are required to be submitted to the Tasman District Council Engineering Manager for approval prior to the commencement of any works. All engineering details are to be in accordance with the Tasman District Council Engineering Standards and Policies 2008. All necessary fees for engineering plan approval shall be payable.
- b) "As built" plans of services will be required at the completion of the works and approved by the Engineering Manager prior to the issue of a 223 Certificate.

19. Commencement of Works and Inspection

- a) The Tasman District Council Engineering Department shall be contacted five working days prior to the commencement of any engineering works.
- b) No works shall commence on-site until the engineering plans have been approved by the Tasman District Council Engineering Manager.

20. Engineering Works

All works shall be constructed in strict accordance with the Tasman District Council Engineering Standards and Policies 2008, or to the Tasman District Council Engineering Manager's satisfaction.

21. Engineering Certification

Certification that each residential lot has an accessible site suitable for the erection of a residential building shall be submitted from a chartered professional engineer practising in geotechnical engineering and recognised as such by the Tasman District Council Environment and Planning Manager.

The certification shall define on each lot the area suitable for building on and shall list development conditions pertaining to the site and the lot generally.

- a) The certifier of the building site shall be responsible for the design, implementation and supervision of all mitigation measures undertaken as part of the building site certification and also for the subdivision as a whole, including construction of the access road and right of ways.

- b) Any of Lots 1 – 12 and Lots 14 – 31 which a certified building site has not been defined shall prior to any application for s224(c) Certification be amalgamated with an adjacent lot.
- c) At the completion of works, for each stage, a suitably experienced chartered professional engineer shall provide the Tasman District Council Engineering Manager with written certification that the works have been constructed in accordance with the approved engineering plans, drawings and specifications and any Council approved amendments.
- d) Certification that the nominated building sites on Lots 1 – 12 and 14 - 31 as shown on **Plan A – RM080103** are suitable for the construction of a residential buildings shall be submitted from a chartered professional engineer practicing in geotechnical engineering. This certificate shall define on Lots 1 – 12 and 14 - 31 the area suitable for the construction of residential buildings and shall be in accordance with NZS 4404:2004 Schedule 2A. Any limitations identified in Schedule 2A shall be noted on a consent notice pursuant to Section 221 of the Resource Management Act 1991 prior to the issue of the Section 224(c) certificate.
- e) Where fill material has been placed on any part of a lot, a suitably experienced chartered professional engineer practicing in geotechnical engineering shall provide Certification that the filling has been placed and compacted in accordance with NZS 4431:1989 Code of Practice for Earth Fill for Residential Development and shall be provided to the Tasman District Council Engineering Manager.
- f) Prior to any application for Section 224(c) certification the Consent Holder shall forward to the Tasman District Council Environment and Planning Manager as built plans of the earthworks for the subdivision. The plans shall be certified by the chartered professional engineer practising in geotechnical engineering referred to in Condition 20(a) above, that the earthworks have been:
 - i. satisfactorily completed
 - ii. are appropriate for the prevailing ground conditions and
 - iii. that there is a low risk of damage or disruption from slope instability to the access road, right of ways, stormwater, wastewater, water supply reticulation works and other services installed as part of the subdivision.

22. Geotechnical Review

The Tasman District Council Environment and Planning Manager may at the time of application by the Consent Holder for s224(c) approval certification for any stage of the subdivision, obtain a geotechnical peer review of the following:

- a) Certifications of the building sites;
- b) Mitigation measures that have been implemented;
- c) Earthworks, including for the access road and the right of ways.

If the review concludes that there is more than a low risk to the building sites and other structures, including the access road and right of ways, from slope instability and/or that further mitigation measures are required then s224 Certification will not be granted until such mitigation measures have been implemented to the satisfaction of the Tasman District Council Environment and Planning Manager. The cost of this review shall be met by the Consent Holder.

23. Public Access

The walkway reserve shown on **Plan A - RM080103** shall be a minimum of 7.0m in width and splayed to connect to the full width of Lot 3 DP375320.

24. Financial Contributions (based on 30 new sites)

Payment of financial contributions assessed as follows:

Reserves and Community Services

The contribution shall be 5.5% of the assessed market value of Lots 1-12 and 14-31.

The valuation will be undertaken by Council's valuation provider within one calendar month of Council receiving a request for valuation from the Consent Holder. The request for valuation should be directed to the Consents Administration Officer at Council's Richmond office. The cost of the valuation will be paid by Council.

If payment of the financial contribution is not made within two years of the date of this consent, a revised valuation will be required and the cost of the revised valuation shall be paid by the Consent Holder.

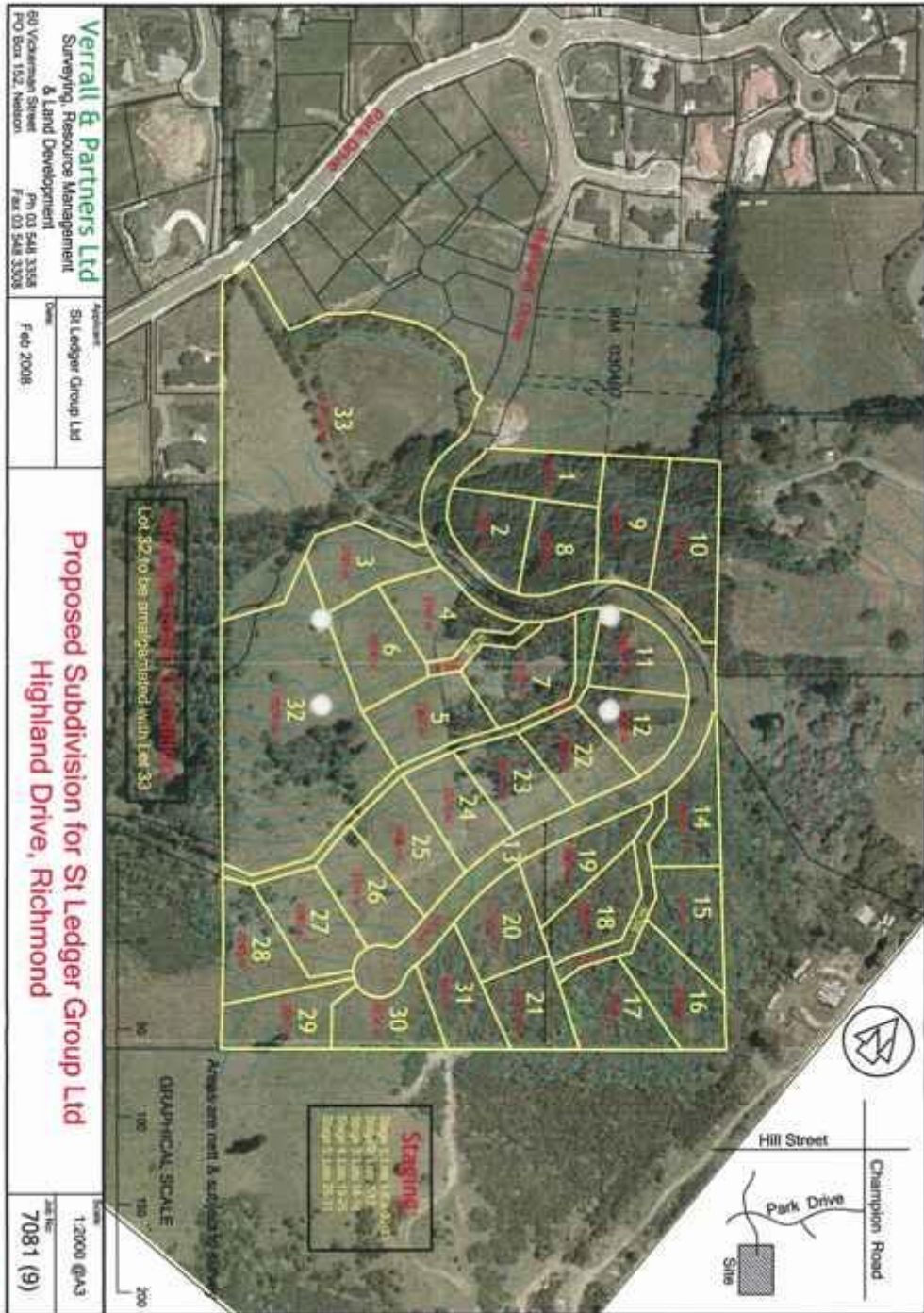
Advice Note – Development Contributions

Council will not issue the Section 224(c) certificate in relation to this subdivision until all development contributions have been paid in accordance with Council's Development Contributions Policy under the Local Government Act 2002.

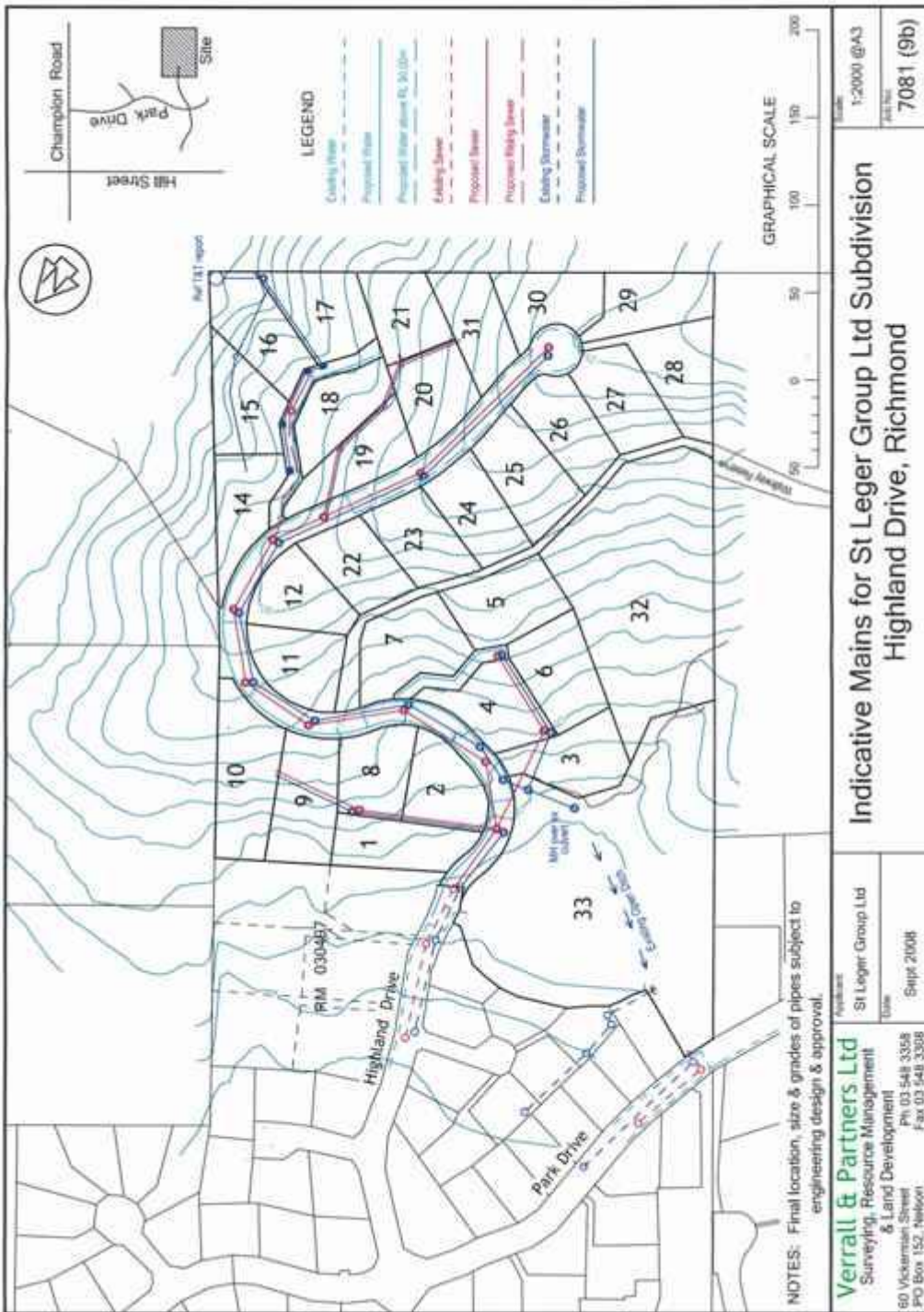
The Development Contributions Policy is found in the Long Term Council Community Plan (LTCCP) and the amount to be paid will be in accordance with the requirements which are the amount to be paid and will be in accordance with the requirements that are current at the time the relevant development contribution is paid in full.

This consent will attract development contributions on Lots 1-12 and 14-31 in respect of **roading, sewer, water and stormwater.**

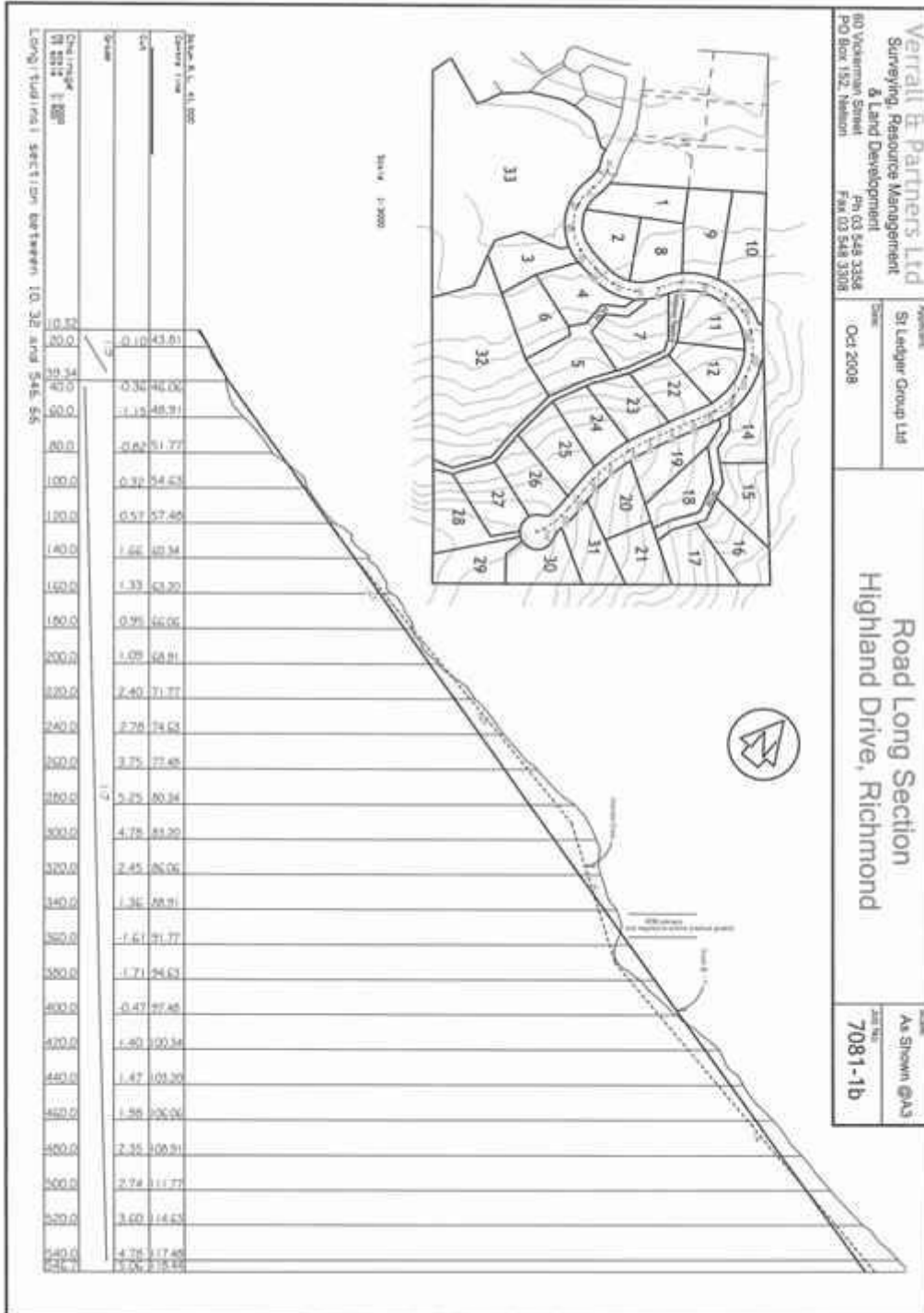
PLAN A
RM080103
Subdivision Scheme Plan



PLAN B
RM080103
Services Plan



PLAN D
RM080103
Road Gradients 1:7



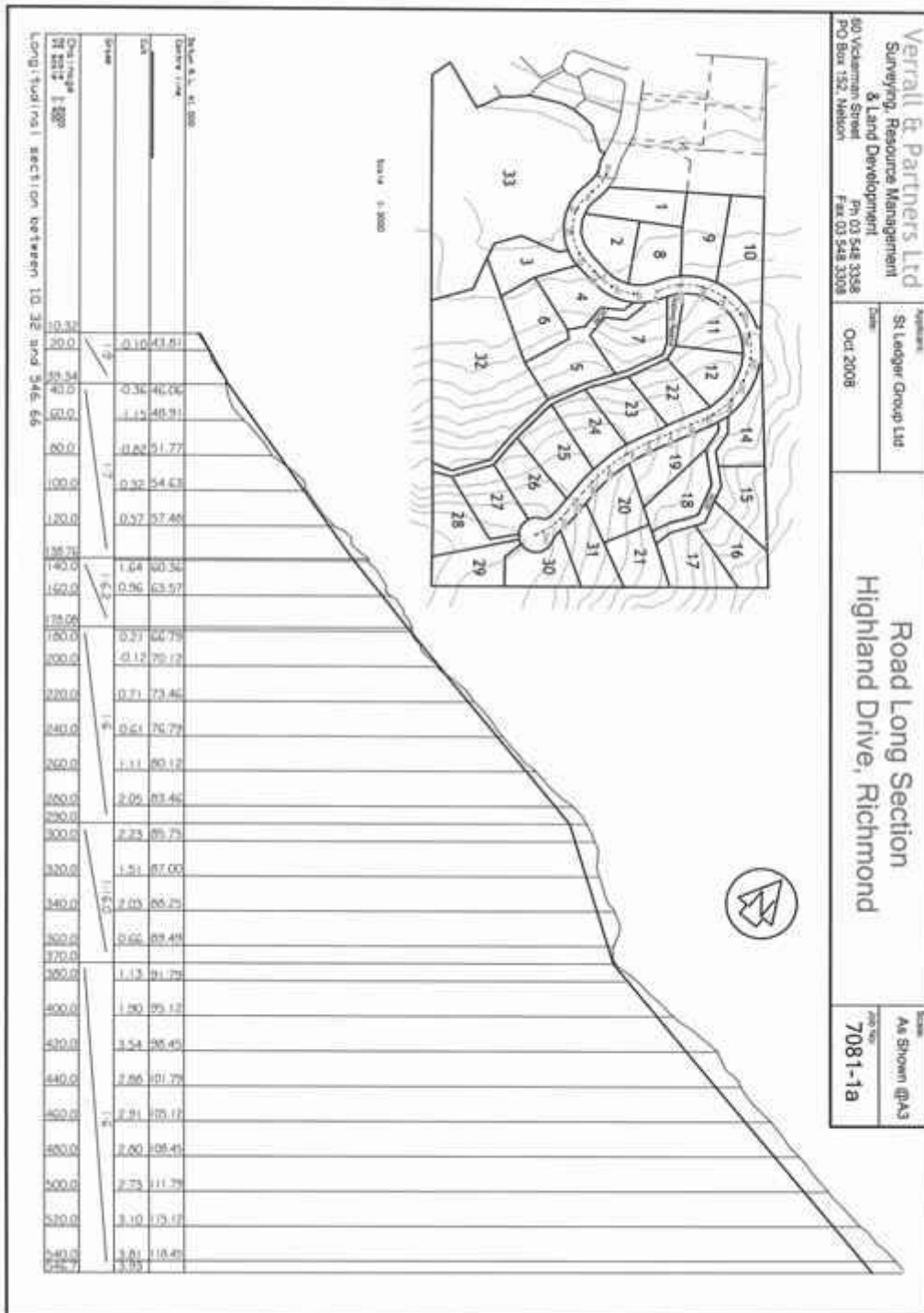
Verrill & Partners Ltd
 Surveying, Resource Management
 & Land Development
 60 Vokerman Street
 PO Box 152, Nelson
 Ph: 03 548 3356
 Fax: 03 548 3308

Client: **St Leger Group Ltd**
 Date: **Oct 2008**

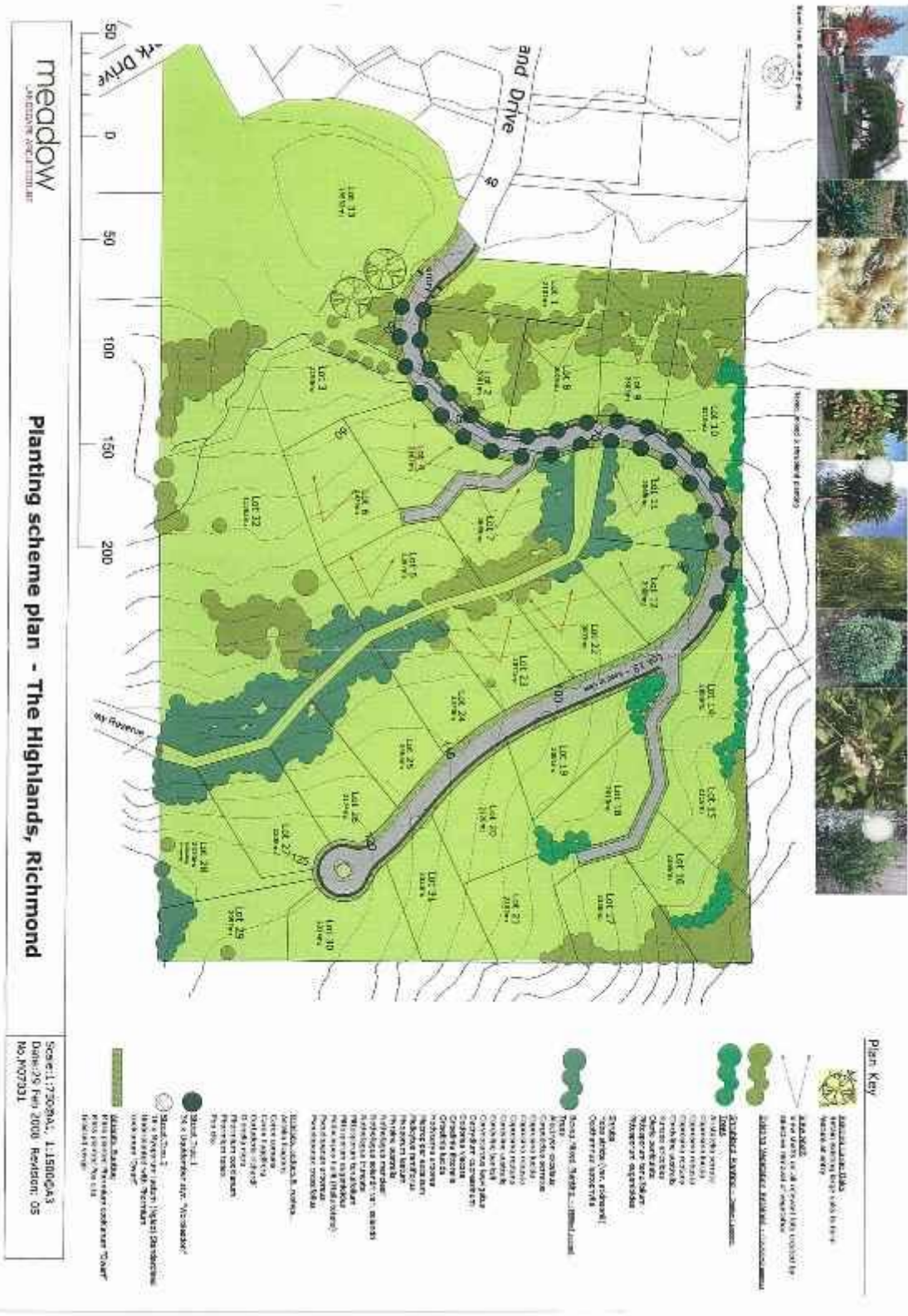
Road Long Section
Highland Drive, Richmond

Scale: **As Shown @A3**
 Job No: **7081-1b**

PLAN E
RM080103
Road Gradients 1:6



PLAN F
RM080103
Landscape Planting



9. CONDITIONS: LAND USE CONSENT (APPLICATION RM080182)

Should subdivision consent RM080103 be granted construction of buildings on Lot 2, Lots 9-11 and Lots 22-27 with reduced setbacks of 5.0m from the road to vest is GRANTED, subject to the following conditions:

1. General condition

The location of the proposed buildings shall be within the areas identified on the application plan prepared by Verrall and Partners Limited, titled *Proposed Subdivision for St Leger Group Ltd, Highland Drive, Richmond*, and attached to this consent as **Plan A - RM080182**

2. Commencement Date and Lapsing of Consent

- a) The commencement date for the land use consent shall be the issue date of the certificate of title for the respective allotments.
- b) This consent will lapse five years after the issue of the certificate of title for the respective allotments, unless given effect to.

3. Setback from Road Boundary

The construction of buildings shall be a minimum of 5.0m from the road reserve boundary, except that this condition does not apply to any buildings solely associated with utilities within the subdivision.

ADVICE NOTES

Council Regulations

1. The applicant shall meet the requirements of Council with respect to all Building Bylaws, Regulations and Acts.

Other Proposed Tasman Resource Management Plan Provisions

2. This resource consent only authorises the reduced setback of buildings from the road boundary described above. Any matters or activities not referred to in this consent or covered by the conditions must either: 1) comply with all the criteria of a relevant permitted activity rule in the Proposed Tasman Resource Management Plan (PTRMP); 2) be allowed by the Resource Management Act; or 3) be authorised by a separate resource consent.

Consent Holder

3. This consent is granted to the abovementioned consent holder but Section 134 of the Act states that such land use consents "attach to the land" and accordingly may be enjoyed by any subsequent owners and occupiers of the land. Therefore, any reference to "consent holder" in the conditions shall mean the current owners and occupiers of the subject land. Any new owners or occupiers should therefore familiarise themselves with the conditions of this

consent as there may be conditions which are required to be complied with on an ongoing basis.

Development Contributions

4. The Consent Holder is liable to pay a development contribution in accordance with the Development Contributions Policy found in the Long Term Council Community Plan (LTCCP). The amount to be paid will be in accordance with the requirements that are current at the time the relevant development contribution is paid.

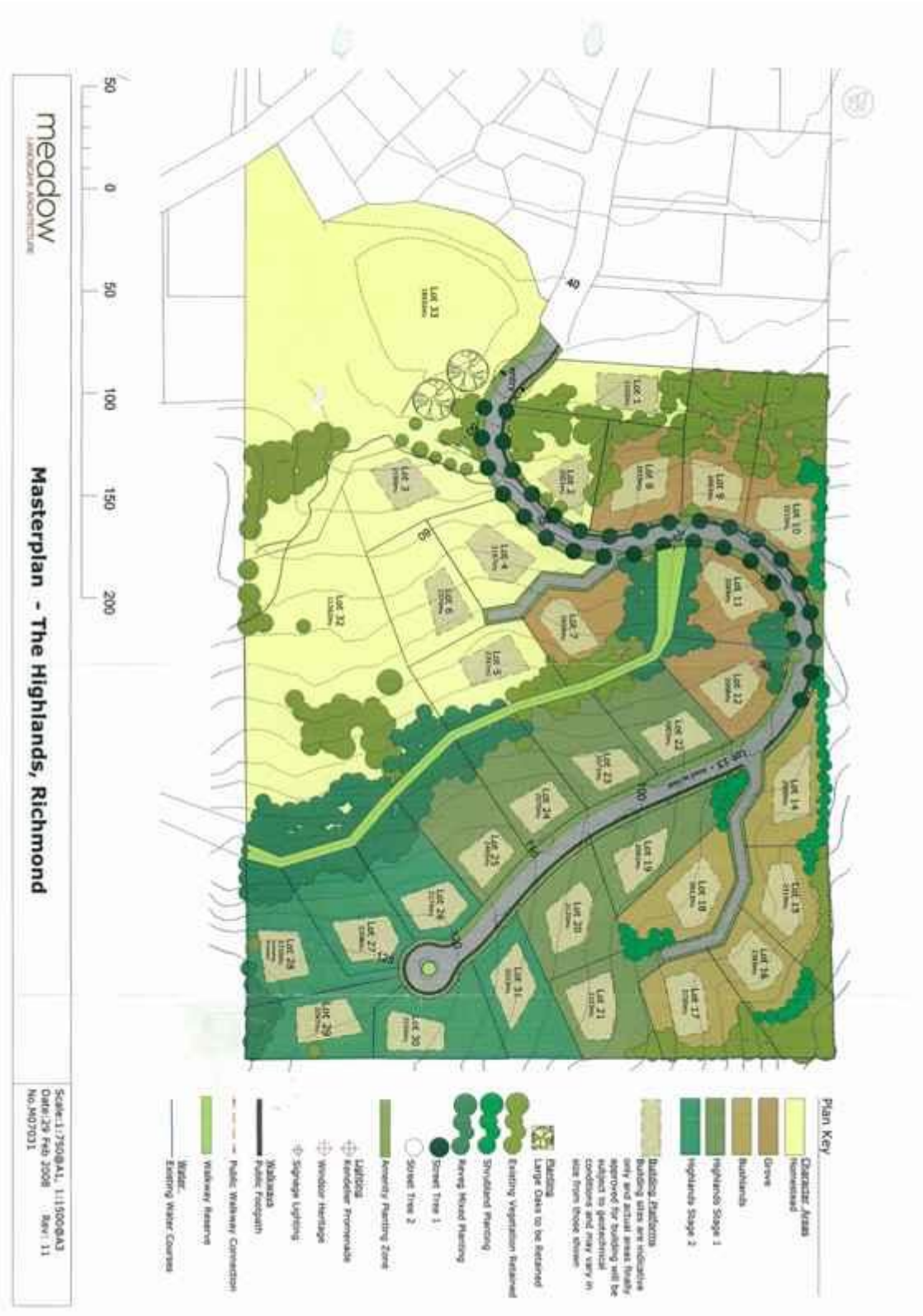
Council will not issue a Code Compliance Certificate until all development contributions have been paid in accordance with Council's Development Contributions Policy under the Local Government Act 2002.

Cultural heritage

5. Council draws your attention to the provisions of the Historic Places Act 1993. In the event of discovering an archaeological find during the earthworks (e.g. shell, midden, hangi or ovens, garden soils, pit depressions, occupation evidence, burials, taonga, etc) you are required under the Historic Places Act, 1993 to cease the works immediately until, or unless, authority is obtained from the New Zealand Historic Places Trust under Section 14 of the Historic Places Act 1993.

Wayne Horner
Consent Planner - Subdivision

PLAN A
Building Location Plan
RM080182

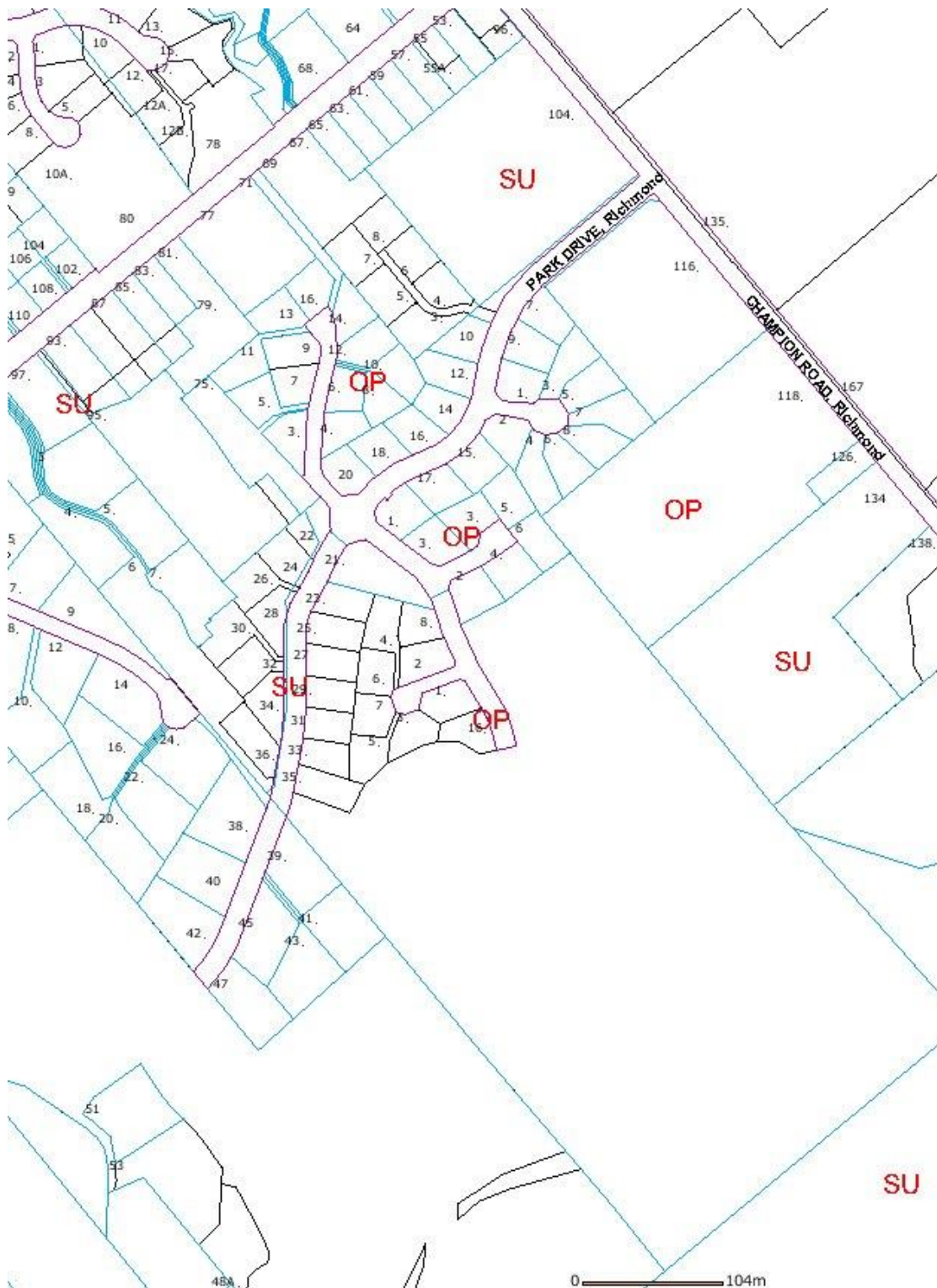


**APPENDIX 1
Location of Submitters**

OP = oppose

SU = support

DNI = did not indicate



Plus submissions from:
Nelson = SU, SU, SU, SU, SU, SU, SU
Public Health = DNI
NZ Fire Service = DNI

Dr M R JOHNSTON

Consulting Geologist

395 Trafalgar Street
NELSON 7001

Phone: 03 546 7575
Fax: 03 546 7574
Email mike.johnston@xtra.co.nz

12 May 2008

Mr. Wayne Horner
Consent Planner - Subdivisions
Tasman District Council
Private Bag 4
RICHMOND 7050

Dear Sir

Re: Geotechnical Review of Tonkin & Taylor Report – The Highlands Subdivision

4. INTRODUCTION

The Tasman District Council has forwarded for review Tonkin & Taylor report titled *St Ledger Group The Highlands Subdivision Building Site and Road Alignment Feasibility Assessment Report* (ref.870037.004), dated February 2008. The *Proposed Tasman Resource Management Plan* requires that in subdivisions the risk of slope instability, and the damage that may arise from any instability, is avoided or mitigated as well as buildings being setback from active faults.

The proposed subdivision encompasses a northeast trending ridge to the east of Highland Drive and which terminates at the head of Champion Road. To the northwest the ridge is bounded by low gently sloping land that has already been largely subdivided into residential lots. A sharp topographic change separates this land from the moderately steep to steep northwest slope of the ridge which has been extensively planted in exotic trees to reduce the risk of slope movement. Evidence of slope movement ranges from widespread superficial instability to several moderately large failures. A farm track across the slope provides access to the relatively broad crest of the ridge. The southeast side of the ridge slopes steeply towards Trowers Creek.

Concept plans for the subdivision accompany the Tonkin & Taylor report as well as showing development risk zones, locations of exploration test pits and broad geological features, including the Waimea Fault. The report refers to earlier Tonkin & Taylor reports 870037.001, dated 23 May 2003, and 870037.003, dated October 2007. The first of these reports, titled *St. Leger Trust Subdivision – Champion Road, Richmond Preliminary Geotechnical Assessment of Lots 1-6 of Stage III*, was reviewed for Council on 30 June 2003 (Johnston 2003) but the second report has not been sighted. Also received from Council is Tonkin & Taylor *Geotechnical Assessment of proposed construction of Highland Drive, The Highlands Subdivision, Richmond* (ref.870037.004), and dated 28 April 2008. This letter discusses the geotechnical implications of road grades of 1:7, which Council favours, or 1:6 which, although steeper, poses less geotechnical impediments. Aspects of the report and letter were discussed on 9 May 2008 with Messrs Mark Foley and Mark Dawson of Tonkin & Taylor.

5. DISCLOSURE

The reviewer in 2007 accompanied staff of Tonkin & Taylor on a site visit during which information on the position of the Waimea Fault within the subdivision was discussed. This was part of an exchange of information with the wider geotechnical community with respect to a reassessment of the Waimea-Flaxmore Fault System, of which the reviewer is co-author, undertaken for the Tasman District and Nelson City councils. A draft report has been prepared and is currently with the two Councils. An opinion on the current stability of the slopes and potential mitigation measures to reduce the risk of slope movement, within the proposed subdivision, were not part of the information provided to Tonkin & Taylor.

6. GEOLOGICAL SETTING OF THE SUBDIVISION

3a. Rock Types

The area is bisected by a northeast-southwest trending strip of Marsden Coal Measures formation, of Tertiary (Eocene) age (Johnston 1979, 1982). Bounding the strip is the Waimea Fault comprising what Tonkin & Taylor have identified as the West and East branches. To the northwest of the West Branch, and forming the northern part of the ridge, is Port Hills Gravel formation, of Late Miocene-Early Pliocene age (Rattenbury *et al.* 1998). The gravel, which is transitional to a rock, contains clasts derived largely from east Nelson with probable layers of siltstone and mudstone. Beyond the proposed subdivision and underlying the gentle low lying ground is greywacke-derived Moutere Gravel formation, of Late Pliocene age, although it is partially buried beneath superficial deposits derived from the ridge, including those arising from slope movement. The relationship between the Port hills Gravel and Moutere Gravel formations is not known. The West Branch of the Waimea Fault, between the Moutere Gravel and the Marsden Coal Measures, is approximately delineated by the major break in slope.

To the southeast of the East Branch, and comprising the crest of the ridge, are sedimentary rocks, dominantly siltstone with minor sandstone and conglomerate horizons, of the Late Triassic Richmond Group. Although the Richmond Group rocks are hard and indurated, they have numerous planes of weakness including bedding, joints and fractures. In the subdivision area all of the above units are poorly exposed but by extensive subsurface investigations, involving 32 test pits, Tonkin & Taylor has

obtained considerable information of the rock types present, including slope failure deposits, which in turn has allowed the position of both branches of the Waimea Fault to be more tightly constrained.

3b. Susceptibility to Slope Failure

With the exception of the Marsden Coal Measures formation, all of the rock units are generally competent with little evidence of other than minor slope instability. In contrast it has long been recognised that the coal measures formation along the Waimea Fault from the Brook Valley to the Aniseed Hill Road is prone to failure. From numerous geological and geotechnical investigations of the coal measures between the Brook Valley and the Wairoa Gorge, a number of factors contributing to slope instability within the formation have been identified including:

- The coal measures formation contains soft and crushed lithologies with little internal strength although more competent sandstone horizons are present.
- The coal measures formation is poorly permeable and is commonly water saturated. In contrast, the Richmond Group rocks, because of the numerous planes of weakness, have a relatively high degree of permeability. As a consequence rain percolates into the group and migrates as groundwater towards the toe of slopes. In the northwest this migration may be impeded by the very poorly permeable coal measures and/or Moutere Gravel formations.
- The weak and saturated coal measures formation is in many places unsupported on moderately steep to steep slopes resulting in widespread movement. Some of the failures have extended up slope to involve Richmond Group rocks.

3b Earthquake Hazard

The Waimea Fault encompassing the coal measures is part of the active northeast trending Waimea-Flaxmore Fault System, which separates the eastern Nelson Ranges from the lowlands of the Moutere Depression. While sections of the various component faults in the fault system have surface traces, the result of rupture along them, no traces are known within or adjacent to the proposed subdivision. Although this could be because any surface traces have been destroyed by erosion or burial, particularly by slope failures, it appears that the Waimea Fault has not moved in the vicinity of proposed subdivision for many thousands of years. Nevertheless, there is an active trace on a short length of the Eighty-eight Fault, a component of the fault system, to the east of Hart Road and south of the Wairoa River trenching across the West Branch of the Waimea Fault has confirmed that there has been three movements on it over the past 20,000 years (Fraser 2005; Fraser *et al.* 2006).

Movement on the Waimea-Flaxmore Fault System would produce intense levels of ground shaking, MMVIII or greater, which could initiate major slope failures. In addition movement could result in ground displacement if rupture along the fault occurred (Coote & Downes 1995) and as a consequence the *Proposed Tasman Regional Management Plan* requires a set back of 10 m from active faults, such as the Waimea Fault, where they can be recognised and the likely plane of future movement can be determined.

7. THE PROPOSED SUBDIVISION

The proposed subdivision largely envisages residential lots on the crest of the ridge which will be accessed by a new road that curves from the end of Highland Drive across the face of the ridge and which thereby will largely be in Marsden Coal Measures formation. Several residential lots are proposed on either side of the road, including within the coal measures, and several of them will be served by right of ways. To assist in planning for the subdivision Tonkin & Taylor has divided the area into five risk zones:

- *Zone 1 Low Risk* – mostly comprising gently sloping land underlain by Richmond Group rocks. Depending on slope this zone is further divided into *NZS 3604 Zone* (slope <15°) or *Specific Investigation and Design (SID) Zone* where slopes are >15°).
- *Zone 2 SID* – low to moderate risk.
- *Zone 3A SID/No Build Area* – moderate risk but probably economically feasible to develop.
- *Zone 3B SID/No Build Area* – moderate to high risk, development possible but would require extensive earthworks
- *Zone 3C No Build Area* – high risk area and probably not suitable for building.

On the plans accompanying the 2008 report an area in the southeast of the proposed subdivision was identified as “Area Not Investigated”. This area comprises the slope between the ridge crest and Trowers Creek and includes proposed lots 14 to 17 inclusive. However, Tonkin & Taylor on 9 May 2008 advised that the area has been investigated and lies within *Zone 2*.

Tonkin & Taylor has recognised that areas of ground improvement will be required within the Marsden Coal Measures formation, or immediately down slope of it, so as to allow construction of the road and to enable houses to be built on the sections between the two branches of the Waimea Fault. To reduce earthworks a 1:6 gradient for the road is proposed.

8. PROPOSED MITIGATION MEASURES

Tonkin & Taylor have proposed a number of mitigation measures which can be broadly grouped as:

- Avoiding the high risk areas (Zone 3C).
- Ground improvements.

7a. Road

In order to reduce the amount of earthworks, Tonkin & Taylor propose a road gradient of 1:6 (Option 2), which tends to follow the grade of the land, but is steeper than the 1:7 that the Tasman District Council usually requires (Option 1). From a geotechnical perspective a steeper gradient has the advantage of reducing the extent of earthworks on the northwest face of the ridge, particularly in the generally weak rocks of the coal measures formation. Tonkin & Taylor calculates that in Option 2 retained cuts of up to 2.7 m in height would result whereas in the Option 1 the cuts

would be up to 5.25 m in height and in the coal measures formation they would not be feasible to retain due to the geotechnical complexity.

Irrespective of the grade, the road from the end of Highland Drive will for approximately 180 m cross an area at high risk of slope movement (Zones 3B and 3C). To reduce this risk to an acceptable level Tonkin & Taylor proposes to stabilise the slope by using a combination of large diameter shear piles followed by the installation of sub soil drainage and shear keys with the work being done in two sections. A schematic layout of the ground improvements is depicted in Tonkin & Taylor Drawing 870037.004. Other lesser works will likely be required further up slope.

7b. Building Sites on Residential Lots

The building sites that are subject to an elevated risk of slope movement are on the northwest facing slopes of the ridge and are underlain by coal measures formation. Depending on location and the type of risk, Tonkin & Taylor proposes a variety of mitigation measures, including subsoil drainage, retention structures, piled walls and shear keys, and buttressing of the slope. This would allow the sites to be geotechnically certified as suitable for residential dwellings.

7c. Services

Tonkin & Taylor recognises that on the northwest face of the ridge services, such as stormwater, sewer and water, are potentially at risk and the firm has identified mitigation measures that may need to be implemented. These are potentially:

- Specific ground improvements, such as installation of subsoil drainage.
- Ensuring that pipes are buried below zones of creeping soil.
- Utilising routes that avoid high risk areas.
- Flexible couplings and/or high strength pipes.
- Ensure that all stormwater flows are piped or channelled off the hillside and to reduce the risk of water infiltration open channels will need to be lined.
- Secondary flow paths to be within the road formation.

A letter from Landmark Lile Ltd, dated 2 May 2008, to Council makes reference to a letter from Natural Systems Design Ltd (John McCartin), dated 9 April 2008, with respect to stormwater management for Lots 14-21 on the southeast side of the ridge. This includes the proposed lots in the southeast of the subdivision previously designated as *Area Not Investigated* but now within Zone 2. The Landmark Lile letter does not state what may be envisaged for the southeast side of the ridge, but it likely involves some form of stormwater disposal to ground.

7d Development Recommendations

Tonkin & Taylor list 12 development recommendations for the subdivision but these can be simply summarised in that all design and construction works should be under the supervision of chartered professional engineer practising in geotechnical engineering. Provided these works are implemented then Tonkin & Taylor conclude that the proposed subdivision is geotechnically feasible.

The report infers that the East Branch of the Waimea Fault is active and, although only approximately located at this stage, a 20 m wide building exclusion zone is proposed along it.

9. IMPLICATIONS OF GROUND CONDITIONS ON THE SUBDIVISION

Tonkin & Taylor recognises that the Marsden Coal Measures formation is the critical unit when assessing the proposed subdivision as it contains weak ground that is prone to slope movement. Arising from its investigations, Tonkin & Taylor has shown that the northwest face of the ridge is not one single complex slope failure but three moderate sized failures, identified from south to north as A, B and C on the site plan, with more competent *in situ* ground at shallow depth between them. Landslide C is a young feature or, probably more correctly, a reactivated failure (c. late 1980s), that has extended onto the gently sloping ground to the northwest of the West Branch of the Waimea Fault. Landslide A and also marginally Landslide B have extended up slope into the Richmond Group. As well as the major landslides much of the face shows ill-defined evidence of movement and clay-rich deposits along the toe of the slope are probably remnants of much older failures.

Observations of water levels in the test pits, and in limited number of piezometers, has revealed elevated groundwater levels in the coal measures formation, in some instances above identified slide planes. To obtain some indication of the stability of the coal measures formation, survey monitoring has been undertaken by Cotton and Light Ltd, registered surveyors, involving 15 points. The monitoring commenced in June 2001 (points 1 to 12) and was expanded in September 2005 (points 13 to 15) with results available up to August 2007. From the results, Tonkin & Taylor concludes that, depending on location, movement can be attributed to surface creep/shallow failure or deeper seated instability.

10. DISCUSSION

Reducing the risk of movement to an acceptable level will be challenging but must be achieved if building sites, services to those sites and the access road are to be satisfactorily constructed within the coal measures formation. Perhaps the most critical is the road as should it be subject to movement then the building sites further up slope, including within the *Zone 1* area on the ridge crest, will not be accessible. If the ground conditions prove unfavourable and/or the cost of mitigation is too high then lots within the coal measures can be either deleted or incorporated into adjacent lots. However, this is not an option that is available for the road. Consequently, Council will need to be satisfied that the road and the services within it are at low risk from slope movement.

There appears to be a proposal to dispose of stormwater to ground on the southeast side of the ridge although exactly what may have been proposed by Landmark Lile and/or Natural Systems Design has apparently not been geotechnically assessed. While stormwater disposal to ground has a large number of environmental benefits, it can be detrimental with respect to slope instability. As the slopes above Trowers Creek are developed on more competent Richmond Group rocks any instability is likely to be superficial and localised compared to the more extensive and deeper seated movement on the other side of the ridge where the coal measures formation predominates. Also, except for the four lots within the former "Area Not Investigated" the residential lots on southeast side of the ridge are above the proposed road where it crosses the ridge and consequently they can be connected by gravity to the

Council stormwater system. While stormwater disposal to ground from the four lots may be shown to be geotechnically achievable, the same will not be an option for waste water disposal which will have to be pumped upslope before gravity feeding to the Council system.

The coal measures formation is bounded by the active Waimea Fault although the degree of activity in the subdivision and its immediate environs is not known. Nevertheless, in compliance with the *Proposed Tasman Resource Management Plan*, a setback of 10 m from the fault where it has been recognised is required. Where the fault has not been identified then, except where there are thick superficial or landslide deposits (and where no building sites are in any case contemplated), it is possible to comply with the setback in that the fault separates different rock type. Consequently provided the bedrock unit is identified, it follows that a setback of 10 m from the rock identified must ensure that the fault is at least that distance away. Although no evidence is provided, only the East Branch is inferred by Tonkin & Taylor to be active and a building exclusion zone is proposed along it. However, the West Branch of the fault is aligned along a major change in slope and this suggests that it may be the more active of the two branches, which would be consistent with the West Branch south of the Wairoa Gorge (Fraser 2005). Unless evidence is obtained to allow one of the branches to be disregarded, then both should be treated as active and setbacks implemented accordingly. Any setback would assist in minimising disruption to dwellings should either branch rupture during earthquake movement on the Waimea Fault.

Severe earthquake ground shaking arising from movement on the Waimea Fault or an adjacent fault would probably measure MM VIII or greater on the Modified Mercalli Scale and is likely to result in slope failures, particularly if the ground is water saturated. The failures could arise from the reactivation of existing landslides and/or the initiation of new ones. This risk is, however, very difficult to quantify and, although this has not, except indirectly, been discussed in the report, it can best be addressed by ensuring that the proposed mitigation measures are implemented to minimise the risk of slope movement.

The proposed subdivision will also intercept a significant amount of rain that falls on the ridge, including much that currently percolates into the coal measures formation. In addition, the road, right of ways and driveways to the lots will act as cut off drains to overland flows. This, coupled with subsoil drainage and tree planting, will assist in dewatering the coal measures. These mitigation measures are likely to require ongoing maintenance and perhaps monitoring. Should this be the situation, then Council will need to know how this is to be achieved and it should make provision for the situation that either it and/or the owners of some or all of the lots will need to ensure that maintenance and perhaps also monitoring are undertaken. Matters that may need to be considered include ensuring that an adequate vegetation cover is maintained, surface and subsoil drains remain effective and bunds are kept clear of debris.

11. CONCLUSIONS

Tonkin & Taylor has completed sufficient investigation to identify the major rock types and the nature of the instability that is occurring on the ridge. There is thus a considerable expansion in knowledge of the ground conditions since the Tonkin & Taylor 2003 report was prepared. The instability is largely within, and mostly directly

related to, the weak and water saturated Marsden Coal Measures formation. It appears that only parts of the coal measures formation are involved in large scale failures, recognised by Tonkin & Taylor as A, B and C on the site plans, However, older failures may be present as suggested by clay-rich deposits at the toe of the face, and superficial movement is probably widespread. Nevertheless, *in situ* coal measures formation has been identified at a number of locations on the face. A number of mitigation measures are proposed and Tonkin & Taylor concludes that the subdivision is geotechnically feasible. The mitigation measures will require further investigation and design.

Of potentially greatest concern to Council will be the road which will traverse the Marsden Coal Measures. Council will need to be assured that any road, and the services within it, will be at low risk from slope movement. It also needs to be resolved as to who will take responsibility should any ongoing monitoring and/or maintenance of the mitigation measures implemented as part of the subdivision be required. For example, in a subdivision in Nelson City ongoing monitoring is required and it is the responsibility of all the owners of lots in that subdivision to ensure that this is carried out, irrespective of whether or not they have on their properties mitigation measures, such as drains. In this particular subdivision, the Council has no responsibility for the monitoring and maintenance. However, in that subdivision the lots are served by a right of way whereas The Highlands Subdivision will be accessed by the extension of Highland Drive and for which Council will assume responsibility for. While such levels of monitoring and maintenance as is required in the Nelson City subdivision are not likely to be necessary, Council should be aware that it is a possibility and should therefore be clear what its position will be should this prove to be the case.

Construction of the road will result in extensive earthworks, which are likely to increase as the gradient of the road decreases. Cut faces are likely to need retention, even where relatively competent *in situ* coal measures are encountered. Other than in perhaps sandstones, even only slightly weathered coal measures lithologies will deteriorate with time and ultimately requiring retention. Consequently, retention of all cut faces at the time of road construction may be prudent unless it is conclusively shown to be not necessary. To reduce the amount of earthworks, including cuts and their retention, and thereby reducing the risk of slope movement during construction and in the future, then the adoption of a 1:6 gradient for the road is both prudent and sensible. It would appear that the proposed road layout, with its gentle curves, could accommodate the steeper gradient without any significant adverse effects for road users.

The Tonkin & Taylor investigation has demonstrated that subdivision of the property is generally feasible and that most of the lots are in areas that are at low risk of slope instability. These lots are mostly confined to the ridge crest. The lots on the slopes of the ridge, and also the adjacent road, are subject to greater risk although mitigation measures will likely reduce the risk to an acceptable level. Nevertheless, the Tonkin & Taylor report is cautious about the subdivision stating that, provided mitigation measures are implemented, then that firm “should be in a position to certify that a building site exists on lots created throughout the subdivision that is unlikely to be adversely affected by instability arising from high intensity rainfall or seismic events”. It also behoves Council to be equally cautious should it grant subdivision consent. It can achieve this by ensuring that the whole subdivision, including earthworks, design and implementation of mitigation measures, drainage and building site certifications

are the sole responsibility of an experienced and recognised geotechnical consultant with provision for review of all documentation submitted to Council as part of any application for 224 Certification.

Finally clarification is required as to whether it is proposed to discharge stormwater to ground for some of the lots on the southeast side of the ridge, more particularly proposed lots 14 to 17. Until Council receives confirmation that disposal to ground can be satisfactorily achieved, then it should not consider granting subdivision consent for those lots. A number of alternatives to ground disposal exist, including pumping to a point where stormwater can be gravity fed into the Council Stormwater System. It is assumed that waste water will have to be pumped from the lots. An alternative for stormwater disposal is for the applicant to seek an easement over neighbouring land so as to allow discharge to Trowers Creek. Other options are holding tanks with a slow release of water to ground but this will require geotechnical assessment. Thus the question of how storm and waste water are to be conveyed from the lots and who has responsibility for such matters as pumping and possibly ensuring that disposal to ground is adequately achieved and maintained needs to be resolved prior to considering granting any resource consent for subdivision.

12. RECOMMENDATIONS

It is recommended that resource consent for the subdivision is granted with the following geotechnical conditions:

GEOTECHNICAL CERTIFICATIONS

2. Building Sites

- a. Certification that each residential lot has an accessible site suitable for the erection of a residential building shall be submitted from a chartered professional engineer practising in geotechnical engineering and recognised as such by the Tasman District Council.
- b. The certification shall define on each lot the area suitable for building on and shall list development conditions pertaining to the site and the lot generally.
- c. The certifier of the building site shall be responsible for the design, implementation and supervision of all mitigation measures undertaken as part of the building site certification and also for the subdivision as a whole, including construction of the access road and right of ways.
- d. Any residential lots on which a certified building site has not been defined shall prior to any application for 224 Certification be amalgamated with an adjacent lot containing a site.

3. Earthworks

- a. The earthworks to form the subdivision, including the access road, right of ways and all mitigation measures implemented as part of the subdivision shall be designed and constructed under the supervision of

the chartered professional engineer practising in geotechnical engineering referred to in Condition 1.

Advisory Note to Consent Holder: The above does not preclude work, such as kerbing, sealing, installation of services, and other finishing touches being supervised by a chartered professional engineer practising in civil engineering provided the work has been specifically assessed by the chartered professional engineer practising in geotechnical engineering referred to in Condition 1.

- b. No earthworks authorised by this consent shall commence unless specifically approved by the chartered professional engineer practising in geotechnical engineering referred to in Condition 1.
- c. Any cut and fill faces within the lots constructed as part of the subdivision shall be retained unless in the professional opinion of the chartered professional engineer practising in geotechnical engineering referred to in Condition 1 that this is not necessary to ensure the stability of the faces and slopes generally.
- d. Any cut and fill faces within or bounding the access road and the right of ways shall be retained unless considered unnecessary by the Tasman District Council after consultation with a chartered professional engineer practising in geotechnical engineering or an experienced engineering geologist.
- e. Retaining walls shall be designed and constructed under the supervision of the chartered professional engineer practising in geotechnical engineering referred to in Condition 1.
- f. At 224 Certification the consent holder shall forward to Council as built plans of the earthworks for the subdivision. The plans shall be certified by the chartered professional engineer practising in geotechnical engineering referred to in Condition 1 that the earthworks have been:
 - i. satisfactorily completed
 - ii. are appropriate for the prevailing ground conditions and
 - iii. that there is a low risk of damage or disruption from slope instability to the access road, right of ways, drainage, stormwater works and other services installed as part of the subdivision.
- g. If any mitigation works undertaken as part of the subdivision require on going monitoring and/or maintenance above that normally undertaken by Council for its roading network and drainage systems then this shall be the responsibility of the owners of all the lots that benefit from the mitigation works. Council will require a consent notice to be entered on the titles of the lots involved. If a consent

notice cannot be implemented then Council will not grant 224 certification for the subdivision.

4. Erosion and Sediment Control

- a. Prior to earthworks commencing on site the consent holder shall forward to the Tasman District Council for review and adoption a management plan for the control of soil erosion during earthworks for the subdivision. The plan shall show the limits of areas to be disturbed and the measures to avoid, remedy or mitigate the effects of erosion and sedimentation to the satisfaction of the Council.

5. Services

- a. Stormwater and waste water shall be connected to the Tasman District Council Stormwater and Waste water systems.

Note to Council: Before granting of consent Council should seek clarification from the applicant as to how storm and waste water are to be disposed of from the lots on the southeast side of the ridge, particularly proposed lots 14 to 17. Waste water will have to be pumped to a point where it can be gravity fed to the Council Waste Water System and a similar method could be implemented for stormwater. The question as to who takes responsibility for the pumping and the maintenance of the infrastructure to ensure this takes place also needs to be resolved prior to granting resource consent. Alternatives to the pumping of the stormwater may exist, such as discharge to Trowers Creek or disposal to land. On the very limited information available, the disposal to land would geotechnically be the least preferred alternative.

6. Geotechnical Review

- b. Council may at the time of application by the consent holder for 224 Certification for the subdivision obtain a geotechnical peer review of the following:
 - iv. Certifications of the building sites.
 - v. Mitigation measures that have been implemented.
 - vi. Earthworks, including for the access road and the right of ways.

If the review concludes that there is more than a low risk to the building sites and other structures, including the access road and right of ways, from slope instability and/or that further mitigation measures are required then Council will not grant 224 Certification until such mitigation measures have been implemented to the satisfaction of the Council. The cost of the review shall be met by the consent holder.

13. REFERENCES

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Limitations

This review is based on an assessment of Tonkin & Taylor report titled *St Ledger Group The Highlands Subdivision Building Site and Road Alignment Feasibility Assessment Report* (ref.870037.004), dated February 2008, a review of published and unpublished geological reports and maps of the area containing the ridge that it is proposed to subdivide, an examination of paired stereo aerial photographs and a walkover of the proposed subdivision. No on site investigations or detailed assessment of any proposed mitigation measures to improve slope stability have been undertaken.

Yours faithfully
Mike Johnston



Urbis (NZ) Limited
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Landmark Life Ltd,
PO Box 343,
Nelson

Attention: Mark Life

29 May 2008

Dear Mark,

RE: HIGHLAND DRIVE SUBDIVISION, RICHMOND

I write in regard to your request for a traffic assessment to be undertaken with regard to the proposed 33 lot subdivision (30 residential allotments) and extension to Highland Drive in Richmond.

I note that the site is zoned *Rural Residential Serviced* in the Tasman Resource Management Plan (the District Plan).

I understand that two design options are being considered with similar horizontal alignments, but different gradients. The first 40m of both options has a gradient of 1:9. Beyond the first 40m:

- Option 1 provides a uniform gradient of 1:7. This uniform grade requires significant cuts up to 5.25m high along two sections of the road with associated geotechnical issues.
- Option 2 proposes grades of 1:6 to 1:7 for the first 250m followed by a flatter 80m section at 1:16 and then the top 180m at 1:6. This option requires significantly less earthworks with the maximum cut noted as being 2.23m.

The vertical alignment proposed in Option 2 is therefore noted as being the preferred option by Mr Foley of Tonkin & Taylor Engineering Consultants on the grounds that it will provide better geotechnical stability. I add that the flatter 1:16 mid section proposed in Option 2 will also provide better access to the proposed ROW serving Lots 15-18 and Lot 21.

However, Option 2 does not comply with the maximum 1:7 gradient specified in Figure 18.10A (Road Construction Standards) of the District Plan for access roads serving 30-50 household lots. It is also noted that both options exceed the maximum gradient of 12.5% (1:8) specified in Table 3.1 (Road Design Standards) of NZS 4404:2004.

A review of other District Plans around the country revealed various standards with regard to maximum road gradients. Many District Plans have adopted the NZS 4404:2004 standards, whereas others specify different gradients as in the case of the Tasman District Plan. The Christchurch City Plan for example specifies a maximum gradient of 1:6, the Palmerston North District Plan notes that gradients steeper than 1:10 are subject to specific design and require approval of the Roading Manager, while the Marlborough District Plan states that the vertical alignment of all roads should be such that inclines can be negotiated during all weather conditions and sight distances are adequate for road safety.

In order to assess the appropriateness of the proposed Option 2 gradients, a selection of existing Christchurch roads were measured. The roads selected for measurement were on the basis that they provide access to a similar number of allotments as the Highland Drive proposal. The typical gradient of these roads was measured and the recorded measurements are detailed in Table 1 below:

Location	Gradient			Notes
	1:x	x"	x%	
Maffey's Road o/s 42	4.4	12.7	22.5%	5.5m carriageway, 1.3m path on east side. Dish channel on west side. Approx 450m long. Connections at each end. Approx 45 dwellings (incl La Costa Lane)
Egnot Heights	5.5	10.4	18.3%	7.5-8.5m carriageway, 1.5m path on east side. Approx 300m long (excl 570m Challenger Lane at top). No exit. Approx 40 dwellings (incl Challenger Lane)
Longhurst Terrace o/s 56	6.0	9.5	16.7%	7.5m carriageway, 1.3m path on west side. Approx 750m long total (excl side roads), approx 400m north/downhill of #41. No exit. Approx 40 dwellings (incl side roads north/downhill of #41)
Longhurst Terrace o/s 41	6.3	9.0	15.8%	7.5m carriageway, 1.3m path on west side. Approx 750m long total (excl side roads), approx 170m north/downhill of #56. No exit. Approx 15 dwellings (north/downhill of #56)
Clifton Terrace o/s 38	7.1	8.1	14.2%	7m carriageway, 1.2m path east side. Collector, 2600 vpd
Maffey's Road o/s 75	8.3	8.9	12.1%	6m carriageway, 1.0m path on northeast side. Approx 450m long. Connections at each end. Approx 45 dwellings (incl La Costa Lane)
Dyers Pass Road o/s 27	8.6	6.7	11.7%	10.5m carriageway, 1.5 path both sides. Minor Arterial, 7700 vpd
Scarborough Road	12.0	4.8	8.3%	7.5m carriageway, 1.3m path west side. Collector, 2700 vpd

Table 1: Christchurch Road Gradients

Of particular relevance to the proposed Highland Drive subdivision are Egnot Heights and Longhurst Terrace in that they are both no exit cul-de-sacs serving similar (or slightly more) residential lots as the proposal. These roads are illustrated in Figure 1 and Figure 4 below.



Figure 1: Aerial View of Egnot Heights



Figure 2: Egnot Heights (gradient = 1:5.5)



Figure 3: Aerial View of Longhurst Terrace



Figure 4: Longhurst Terrace (gradient = 1:6)

With maximum gradients of 1:5.5 to 1:6.3, carriageway widths of around 7.5m and asphaltic or chip seal surface, these roads were still able to be easily and safely negotiated.

It follows that the proposed road layout, with gentler curves than Egnot Heights, could accommodate the 1:6 maximum gradient without any significant adverse effects for road users. It is also noted that the proposed road has a generally northerly aspect and, subject to the provision of adequate drainage, is unlikely to experience ice build-up during the winter months. The maximum proposed gradient of 1:6 is also less than the 1:5 gradient specified by the LTNZ WoF Inspection Manual as the maximum at which a park brake is required to hold a vehicle at rest.

For the above reasons, it is my opinion that subject to adequate surfacing and drainage the proposed gradients of Option 2 are entirely satisfactory to provide a suitable level of service for road users.

Please contact me if you have any questions.

Yours faithfully,



Wayne Gallot
Transportation Planner

Reviewed for release by



Ray Edwards
Traffic Engineering Director

IN THE MATTER OF the Resource Management Act
1991

AND

IN THE MATTER of an application by
St Leger Group Limited

FOR Residential Subdivision at
Highland Drive, Richmond East

STATEMENT OF EVIDENCE

**MELANIE MUIRSON
SENIOR TRAFFIC ENGINEER
MWH NEW ZEALAND LIMITED**

November 2008



1 Introduction

- 1.1 My full name is Melanie Jane Muirson. I am a Senior Traffic Engineer in the Christchurch Office of MWH New Zealand Ltd (MWH) and I have been engaged by Tasman District Council to prepare and present transportation evidence for the resource consent to cover the proposed residential subdivision on Highland Drive in Richmond East. I have visited the site and I am familiar with the surrounding road network.
- 1.2 I hold a Bachelor of Engineering (Civil) and a Masters of Engineering in Transportation, both from the University of Canterbury. I am a Professional Member of IPENZ and a Chartered Professional Engineer (CPEng).
- 1.3 I have had 12 years experience in traffic and road safety engineering, working in New Zealand. My experience covers a wide range of areas including detailed investigation of transportation projects, corridor studies, traffic engineering design, safety auditing, transport impact assessments and project management. Within MWH, I have undertaken extensive work areas around New Zealand on behalf of Transit New Zealand (Transit) and other Road Controlling Authorities.

2 Description of Proposal

- 2.1 St Leger Group Limited has applied for a resource consent for a proposed subdivision development located at the end of Highland Drive on the eastern side of Richmond with 30 residential lots and a road to vest in a rural residential zone.
- 2.2 I have reviewed previous documentation and have read the Landmark Life Ltd Assessment of Environmental Effects dated 7 March 2008, the Urbis letter dated 29 May 2008 regarding the traffic assessment and the Tasman District Council (TDC) Development Engineer's Report dated 14 October 2008. Based on this, my evidence is divided into:
 - A brief summary of the existing traffic environment;
 - Assessment of implications for the proposed grade of 1 in 8 for the road through the subdivision.
- 2.3 This assessment excludes the following:
 - Review of the likely generation of traffic from the subdivision; and
 - Assessment of implications for the wider transport network, including the safety and capacity implications of this proposal on the intersections of Champion Road and Hill Street, Champion Road and Park Drive and Park Drive and Highland Drive.
- 2.4 I have read the Environment Court Practice Note on Expert Witnesses which took effect from 31 March 2005 and I agree to comply with it. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief are within my area of expertise.

3 Description of Site and Traffic Network

Current Traffic Environment

- 3.1 The site is proposed to be accessed via Highland Drive, Park Drive and Champion Road.
- 3.2 Park Drive is a Collector Road in the TDC road hierarchy while Highland Drive is an Access Road.
- 3.3 Highland Drive currently serves 20 lots with some of these still to obtain title.
- 3.4 The TDC Development Engineer's report states that Highland Drive has a 7.0 metre carriageway with two 2.5 metre wide traffic lanes and one 2.0 metre wide parking lane. While Park Drive has an 8.0 metre wide carriageway consisting of two 3.0 metre wide lanes and one 2.0 metre wide parking lane which does not meet TDC's Collector road standards. With the potential additional traffic generated from the St Leger subdivision and other future developments, these roads will be substandard in carriageway width. The TDC Development Engineer's report states that this will be an issue that TDC will have to deal with in its LTCCP and service levels from roading infrastructure in the future.

Proposed Subdivision Traffic Environment

- 3.5 The proposed Highlands subdivision would be accessed by constructing an extension to Highland Drive.
- 3.6 There are 30 residential lots proposed for this subdivision which would equate to an additional 312 vehicles per day using Highland Drive using the trip generation rates given in New Zealand Transport Agency's Planning Policy Manual (10.4 vehicle trips per day per dwelling).
- 3.7 The extension to Highland Drive will generally follow the existing farm track alignment and is proposed to have grade greater than 1 in 7 (maximum grade of 1 in 6) for a length of 326 metres of the 546 metre extension. There are locations where the road deviates from the farm track alignment to minimise the grade of the road and to avoid significant earthworks. The applicant has proposed to vary the grade over the length of the new road and as shown in the table below:

Running Distance	Length	Grade
0 - 40	40 m	1 in 9
40 - 140	100 m	1 in 7
140 - 180	40 m	1 in 8.2
180 - 290	110 m	1 in 6.0
290 - 370	80 m	1 in 16.0
370 - 546	176 m	1 in 6

- 3.8 As part of the development, a walkway will be developed through the site which will link up the Council owned reserve on the southern side of the site to the extension of Highland Drive. This walkway is proposed to follow the contour across the slope and provide an easy gradient through a wide corridor of existing and proposed amenity plantings.

- 3.9 Two right of ways are proposed, one servicing Lots 4, 5, 6 and 7 and the other servicing Lots 14, 15, 16, 17 and 18.
- 3.10 A footpath is proposed to be provided on the northern side of the extension of Highland Drive and it will link in the existing pedestrian facilities on the current section of Highland Drive.
- 3.11 No cycle lanes are provided on the current road network (Highland Drive and Park Drive) and the proposed Highland Drive extension.
- 3.12 There is potential for future land development beyond the St Leger subdivision with the only practical access identified as being via a further extension to Highland Drive due to the difficult topography of the area. Therefore the road alignment for the St Leger subdivision should be designed to a standard that future proofs the proposed extension to Highland Drive to provide access to this potential development in the future.
- 3.13 Discussion on the wider transportation network and the impacts from the development of this subdivision is excluded from this evidence.

4 Site Specific Issues

Road Gradient

- 4.1 The Applicant proposes to extend Highland Drive and construct sections of the new road with a steeper grade of 1 in 6 which does not meet TDC's maximum standard of 1 in 7 (Appendix 6-2 of the TDC – Engineering Standards & Policies 2008).
- 4.2 The land development and subdivision engineering standards (NZS 4404: 2004) state that a road serving between 21 and 150 dwelling units shall have a minimum grade of 1 in 8. The Nelson City Council standards state that for this level of development, the required minimum grade is 1 in 7. TDC's standards allow as a permitted activity the grade for a right of way with six users have a grade of 1 in 6. The grade of the proposed road in this subdivision exceeds these requirements for a subdivision that has 30 lots.
- 4.3 As discussed in Paragraph 3.9, Park Drive and Highland Drive will not meet the TDC standards for Collector and Access Roads, particularly carriageway widths, once the St Leger subdivision and any other future residential areas are developed. According to Appendix 6-2 of the TDC – Engineering Standards & Policies 2008, once the St Leger subdivision has been developed, Highland Drive will be carrying in excess of 500 vehicles per day which results in this road moving up to a Collector Road in the Tasman District road hierarchy. Therefore if TDC required the developer to construct a road that meets the future demand on Highland Drive, then the carriageway width should be 13 metres with a maximum grade of 1 in 8 for the Highland Drive extension.

- 4.4 The New Zealand Transport Strategy and Government Policy Statement documents promote mode changes to sustainable transport which includes walking and cycling. These documents provide specific targets that the Road Controlling Authorities including TDC are required to work towards. Therefore any new transport infrastructure built shall provide access for all modes of transport and not be solely focussed on motor vehicles. With the potential for further development in the area beyond the St Leger subdivision, it is important that the national strategies are considered with respect to the design of the road for all road users.
- 4.5 The Applicant's reasoning for proposing a grade of 1 in 6 steeper than TDC's standards is to reduce the earthworks required, particularly the cuts, and to follow the existing topography to reduce the potential land instability risk. The area where the subdivision is proposed has areas where there is a moderate to high risk of land instability while the proposed road alignment traverses a fault line at approximately Station 290. Details on the geotechnical aspects are covered elsewhere.
- 4.6 Based on a brief assessment and review of the previous reports by Paul Wopereis (Senior Geologist from MWH), the road could be constructed at a maximum grade of 1 in 7. It is understood that the Applicant's decision on the grade is essentially based on minimising construction cost rather than minimising geotechnical risk. An identified solution that could assist with achieving the 1 in 7 grade includes moving the road alignment by 25 metres into Lots 3, 4 and 33 and reconfiguring the lots which will lengthen the road by 40 metres. This would provide an ideal solution of reduced cut where the road traverses the fault line on the centreline of the road and require a 2.0 metre fill rather than the proposed cut at the toe of the central slip on the centreline of the road in the vicinity of Lots 7 and 11. An added advantage is that less cut is required around the curve in the vicinity of Lots 11, 12 and 14.
- 4.7 The Applicant's proposed alignment for the Highland Road extension consists of six curves interspaced with short sections of straights. If the proposed option (detailed in Paragraph 4.6) was implemented, this would reduce the number of curves required to four while complying with TDC's standards and providing a safe environment for all road users.
- 4.8 The grades based TDC's brief assessment of the proposed option would be as follows:

Running Distance	Length	Grade
0 - 40	40 m	1 in 7
40 - 120	80 m	1 in 7
120 - 175	55 m	1 in 10
175 - 355	180 m	1 in 7
355 - 400	45 m	1 in 10.6
400 - 640	240 m	1 in 7

- 4.9 I cannot comment on the cost difference between the proposed option detailed in Paragraph 4.6 and the Applicant's proposed alignment however it is recommended that this possible solution is investigated further.
- 4.10 It is agreed that motor vehicles, particularly cars, can safely negotiate a grade of 1 in 6 providing the individual accesses are carefully designed. However the traffic assessment has not considered the impacts of the grade on other road users such as pedestrians, cyclists, mobility scooters, heavy vehicles and towing vehicles.

- 4.11 Mobility scooters will not be able to traverse the 1 in 6 grade safely and it is unlikely that an elderly person operating a mobility scooter would attempt to travel up a road at such a grade. Essentially the people who rely on mobility scooters for transport would experience severance from the transportation network if a grade steeper than 1 in 7 was adopted.
- 4.12 Heavy vehicles such as rubbish, recycling and furniture removal trucks, and construction traffic as the subdivision is developed will struggle with the steeper grade. This would damage the pavement and increase the vehicle operating costs and vehicle emissions for these vehicles.
- 4.13 The minimum standard for pedestrians is given in Austroads Part 13: Pedestrians which is used as a standard within New Zealand and in Australia. The ideal gradient is for the footpath or walkway to be as flat as possible. Where the gradient is between 1 in 33 and 1 in 20, level rest areas should be provided not greater than 18 metre intervals in length.
- 4.14 The standards for cyclists with respect to gradients recommend that on road and off road paths be as flat as possible where this can be achieved. However Austroads Path 14: Bicycles states that the desirable maximum gradient be 3% or 1 in 33. If the grade of 1 in 33 cannot be achieved then it is recommended that the gradient be limited to 5% (1 in 20) over short lengths of the road.
- 4.15 It is agreed that it would be difficult to provide such grades for both pedestrians and cyclists in this subdivision to meet the Austroads standards. However it is recommended that the grades are minimised where possible in the geometric design of the road alignment to provide easier access for pedestrians, cyclists and mobility scooters. This will also improve access for heavy vehicles such as the weekly rubbish and recycling vehicles, furniture removal trucks, and construction traffic as the subdivision is being developed. Therefore the maximum grade should be 1 in 7 as per the TDC standards.
- 4.16 The Applicant proposes to seal the road with asphaltic concrete (AC) instead of sealing with chip seal to counteract the steeper grade. However once the road is vested to Tasman District Council, the additional cost of maintaining the AC seal on this road will have to be covered by TDC and hence their ratepayers. Chip seal has an average life of 10 years in the Tasman District and costs \$4.50 per m² while AC has an average life of 20 years while costing \$15 per m². If the road is constructed with a maximum grade of 1 in 7, then chip seal would meet the TDC standards and the subsequent maintenance of the road will cost less over the life of the road for TDC and their ratepayers.

5 Summary of the Traffic Impacts

- 5.1 The New Zealand Transport Strategy and Government Policy Statement documents promote mode changes to sustainable transport which includes walking and cycling. These documents provide specific targets that the Road Controlling Authorities including TDC are required to work towards. Therefore any new transport infrastructure built shall provide access for all modes of transport and not be solely focussed on motor vehicles. With the potential for further development in the land adjacent to the St Leger subdivision, it is important that the national strategies are considered with respect to the design of the road for all road users, now and in the future.
- 5.2 The Applicant proposes to extend Highland Drive and construct the new road with a steeper grade of 1 in 6 which does not meet TDC's maximum standard of 1 in 7 (Appendix 6-2 of the TDC – Engineering Standards & Policies 2008).
- 5.3 The land development and subdivision engineering standards (NZS 4404: 2004) state that a road serving between 21 and 150 dwelling units shall have a minimum grade of 1 in 8. The Nelson City Council standards state that for this level of development, the required minimum grade is 1 in 7. TDC's standards allow as a permitted activity the grade for a right of way with six users have a grade of 1 in 6. The grade of the proposed road in this subdivision exceeds these requirements for a subdivision that has 30 lots.
- 5.4 Park Drive and Highland Drive will not meet the TDC standards for Collector and Access Roads, particularly carriageway widths, once the St Leger subdivision and any other future residential areas are developed. According to Appendix 6-2 of the TDC – Engineering Standards & Policies 2008, once the St Leger subdivision has been developed, Highland Drive will be carrying in excess of 500 vehicles per day which results in this road moving up to a Collector Road in the Tasman District road hierarchy. Therefore if TDC required the developer to construct a road that meets the future demand on Highland Drive, then the carriageway width should be constructed to 13 metres with a maximum grade of 1 in 8 for the Highland Drive extension.
- 5.5 The extension of Highland Drive as part of the St Leger subdivision is recommended to be constructed with a maximum grade of 1 in 7 based on providing ease of access for all road users including motor vehicles, pedestrians, cyclists, mobility scooters, towing vehicles and heavy commercial vehicles such as the weekly rubbish and recycling vehicles, furniture removal trucks, and construction traffic as the subdivision is being developed.
- 5.6 If the road is constructed with a maximum grade of 1 in 7, then chip seal would meet the TDC standards and the future maintenance of the road will cost less over the life of the road for TDC and their ratepayers.

- 5.7 There are geotechnical and geometric solutions to reduce the grade of the proposed road alignment. An identified solution that could assist with achieving the 1 in 7 grade includes moving the road alignment by 25 metres into Lots 3, 4 and 33 and reconfiguring the lots which will lengthen the road by 40 metres. This would provide an ideal solution of reduced cut where the road traverses the fault line on the centreline of the road and require a 2.0 metre fill rather than the proposed cut at the toe of the central slip on the centreline of the road in the vicinity of Lots 7 and 11. An added advantage is that less cut is required around the curve in the vicinity of Lots 11, 12 and 14.
- 5.8 The grades based TDC's brief assessment of the proposed option would be as follows:

Running Distance	Length	Grade
0 - 40	40 m	1 in 7
40 - 120	80 m	1 in 7
120 - 175	55 m	1 in 10
175 - 355	180 m	1 in 7
355 - 400	45 m	1 in 10.6
400 - 640	240 m	1 in 7

- 5.9 This proposed option would reduce the number of curves required to four when compared to the Applicant's proposed alignment for the Highland Road extension which consists of six curves interspaced with short sections of straights.
- 5.10 This proposed alignment would meet with TDC's standards and provide a safe environment for all road users and it is recommended that this possible solution is investigated further.
- 5.11 There is potential for future land development beyond the St Leger subdivision with the only practical access identified as being via a further extension to Highland Drive due to the difficult topography of the area. Therefore the road alignment for the St Leger subdivision should be designed to a standard that future proofs the proposed extension to Highland Drive to provide access to this potential development in the future.



Memorandum

Environment & Planning Department

To: Environment & Planning Subcommittee

From: Rosalind Squire –Community Services

Date: 20 November 2008

Subject: RM080103 – St Ledger Group Limited, Highland Drive, Richmond East

The report by the principal planner outlines the proposed subdivision. This memorandum provides comments from the Community Services Department of Council with respect to the provision of walkways and open space reserves within the subdivision. Community Services staff visited the site and have considered the application in the wider context of existing formed and unformed legal roads, reserves and walkways in the vicinity.

Application and Context

The application as lodged includes a 5 metre wide walkway reserve connecting an existing walkway reserve on the adjoining property to the south to the Highland Drive Extension. This walkway connection is supported and will help complete the future walkway link from Selbourne Avenue to Highland Drive.

Walkway Considerations

When the application was lodged Community Services staff undertook a site visit to assess the feasibility of constructing a walkway (with associated cuts, batters and amenity plantings) within the proposed 5 metre wide reserve on such a steep site. Staff requested that the width of the reserve be increased from 5 to 7 metres. The rationale for this was to provide a 3 metre wide walkway to accommodate the walkway formation and future maintenance access, a 1 metre batter slope on the uphill and downhill side of the walkway and a 1 metre wide strip to provide plantings and/or a fence. It would also be sensible to have a splay in the walkway where it adjoins the property to the south as the width of this reserve at that boundary is 15 metres. To date this increase in width from 5 to 7 metres has not been agreed to by the applicant.

Community Services also indicated that a walkway connection to the adjoining property to the east would provide a strategic link for a future walkway connection linking Highland Drive to any future development to the east and ultimately to Dellside Reserve or Easby Park (See Figure 1). This link would provide easier and more direct pedestrian access than alternative options for future residents to the Richmond CBD, nearby reserves, Waimea Intermediate, Waimea College, the Aquatic centre and ultimately the walk/cycleway adjoining the Waimea Estuary. To date this has not been agreed to by the applicant.



Figure 1 – Location of subdivision site with respect to existing reserves network

Provision of an Additional Open Space Reserve

The nearest reserve to the application site is the recreation reserve at the corner of Highland and Park Drive which has an area of 2,900 m² and is approximately 480 metres away from the eastern boundary of the application site. The reserve contains a large open space area for informal recreation, amenity plantings and children's playground equipment. Access north to Champion Road is provided via footpaths adjoining Park Drive. Access west to Hill Street is provided off Ridings Grove down the Hill Street North Walkway. The level of service aim in the LTCCP and annual plan is to provide a reserve within 500m or a 10 minute walk from all residences in an urban area. The distance from the proposed allotments to the existing reserve at the corner of Park and Highland Drive is well within these minimums. Additional open space reserves are therefore not sought as part of this subdivision.

Recommendations

1. That the width of the proposed walkway reserve shown on the application be increased from 5 to 7 metres in order to provide for walkway construction works and amenity planting within the legal boundaries of the reserve and that the reserve also includes a splay adjoining the southern boundary.

2. That the subdivision be subject to the provision of a walkway link from the end of the cul de sac head at the termination of Highland Drive to the boundary of the adjoining property to the east.

Rosalind Squire
Planner, Community Services

STAFF REPORT

TO: Environment & Planning Subcommittee
FROM: Dugald Ley, Development Engineer
DATE: 21 November 2008
SUBJECT: **RESIDENTIAL SUBDIVISION – HIGHLAND DRIVE EXTENSION**

INTRODUCTION

This application is to create 30 residential lots plus a road to vest in a rural residential zone area. The site is traversed by fault lines and historic earth flows and is proposed to be fully serviced by Council infrastructure.

BACKGROUND

Details of the application are fully covered by the applicant and extensive geological investigations have been undertaken by specialist engineers. Those findings verify that residential building sites are available and services could be designed such that any adverse effects can be mitigated should a slip or fault rupture occur where services cross these vulnerable areas.

The road alignment generally follows a farm track which leads to a north trending spur. The spur extends into other land not owned by the applicant to the south east, and is zoned both rural residential serviced and Rural 2 land.

Councillors, as well as the applicant, are aware of the pending zone changes which are to be notified in the near future from Richmond East and Nelson South. These plans show how other land (east and south) in the vicinity has the potential for development and this future road has the facility to service this land. Due to topography restraints, no other access is available to this other land.

I understand this aspect will be covered by the applicant and also in the planner's report and via submissions from affected parties.

The following infrastructure will be discussed to service the subdivision.

ROADING

The site is accessed via Highland Drive, Park Drive and thence to Champion Road.

Champion Road from Hill Street to Park Drive is programmed to be upgraded in the next 12 months and will have adequate capacity to service the subdivision. With previous subdivisions in the Nelson City Council area, concern has been raised regarding the adequacy of both the Champion/Hill Street and Champion/Park Drive intersections. In previous consents traffic design professionals have summarised that these two

intersections can take additional traffic but in the long term there will be a need for roundabouts at both locations.

Park Drive is classed as a collector road and will ultimately form a link (through public consultation) from Champion Road to Hill Street via Angelus Avenue. Park Drive is not constructed to a collector road status in that it only has an 8.0 metre carriageway (2 x 3.0m lanes and 1 x 2.0m parking lane) and no cycle lanes, i.e. a collector road requires a 13.0 metre carriageway.

Highland Drive is an access road with a 7.0 metre carriageway (2 x 2.5 m lanes and 1 x 2.0 m parking lane) and presently serves some 20 lots (some still to obtain title). I concur that with the additional lots to be created by this application, plus potential future lots, Highland Drive and Park Drive will be substandard as to carriageway width. (This will be an issue Council will have to deal with in its LTCCP and service levels for roading infrastructure in the future).

The applicant wishes to construct a similar standard of road (7.0m carriageway) and to have a steeper grade of up to 1-in-6 compared with Council's standard of 1-in-7.

NZS 4404: 2004 (NZS land development and subdivision engineering standard) states a road serving 21-150 dwelling units have a maximum grade of 1-in-8 and a carriageway of 11m. In addition, the current Nelson City standards require a minimum grade of 1-in-7 for a road of this carrying capacity (the same as Tasman District Council).

Finally as to grades, Council standards allows as a permitted activity, six users on a "right of way" with a max steepness grade of 1-in-6.

Some vehicle users find steep grades formidable in regard to downhill hard braking, speeding, loss of control and side crossfall when doing "U" turns. Grades steeper than 1-in-7 tend to cause difficulties for users such as trucks and public transport as climbing these grades and turning on these crossfalls can cause instability. Grades steeper than 1-in-7 also restrict use of cycling and mobility scooters and, to a limited extent, walking and create increased maintenance due to surface or chip loss.

The applicant has proposed to vary the grade over the length of the new road and as shown in the table below:

Running distance	Length	Grade
0-40	40 m	1-in-9
40-140	100 m	1-in-7
140-180	40 m	1-in-6.2
180-290	110 m	1-in-6.0
290-370	80 m	1-in-16.0
370-546	176 m	1-in-6

As mentioned by the applicant, this is solely to reduce "cuts".

However the applicant's plans 7081-1a shows:

- a) cuts on the centreline of 1-1.6m under the slip zone, i.e. running distance 140-190;
- b) cuts of 2.2m through the fault zone.

Both Tonkin & Taylor Ltd (geotechnical engineering specialists) and Council's peer review specialist (Dr Mike Johnston) have confirmed the potential unstable nature of the terrain.

Viz T&T report 4.3.1

4.3.1 Road

The roading layout has been assessed and following recommendations by T&T an alignment and grade of up to 1-in-6 places has been adopted that reduces the geotechnical risks and minimises earthworks. However it is acknowledged that even with this alignment careful design consideration will need to be given to achieve an acceptable low level of geotechnical risk to the road.

The access road through the proposed subdivision will traverse a significant section of land at moderate to high risk, approximately 180 m from the end of Highland Drive and up to Lot 8.

To mitigate the risk of slope instability on this section of road we consider that it is feasible to stabilise the slope using a combination of large diameter shear piles, sub soil drainage and shear keys. It is currently envisaged that the piles will be constructed first and will be used to stabilise the hillside while the shear keys and subsoil drainage are constructed. These stabilisation measures will then combine to produce an effective method of ground improvement.

We consider that to provide a stable road platform two main sections of ground improvement works are required. One section will run from the end of Highland Drive to the point where the road meets the existing farm access track, eastern corner of Lot 2. The second section will run along the road in front of proposed Lots 2 and 8. A schematic layout of the proposed sections of ground improvement is shown on Drawing 870037.004-F3.

Viz Dr Mike Johnston report

Construction of the road will result in extensive earthworks, which are likely to need retention even where relatively competent in situ coal measures are encountered. Other than in perhaps sandstones, even only slightly weathered coal measures lithologies will deteriorate with time and ultimately require retention. Consequently, retention of all cut faces at the time of road construction may be prudent unless it is conclusively shown to not be necessary. To reduce the amount of earthworks, including cuts and their retention, and thereby reducing the risk of slope movement during construction and in the future, then the adoption of a 1-in-6 gradient for the road is both prudent and sensible. It would appear that the proposed road layout, with its gentle curves, could accommodate the steeper gradient without any significant adverse effects for road users.

With respect to Dr Johnston's last sentence, I assume this is "his opinion" rather than as an expert on roading matters. As part of the peer review of roading issues, Council's consultant overviewed the applicant's design and after reviewing both the Tonkin & Taylor Johnston reports, Paul Wopereis (a senior geologist from MWH) said "that the road could be constructed at the more appropriate grade of 1-in-7". This can be achieved by moving the bottom curve to the south into 3 and 4 plan 7081(9b) i.e. creating a longer road and getting to the high grade elevation with the potential for less cuts. This may have the

added advantage of additional “toe” support to the central slip area within Lots 7 and 11 and less cut around the curve in the vicinity of Lots 11, 12 and 14.

This was conveyed to the applicant on 30 June 2008. However I understand this option was dismissed by the applicant due to “increased cost”.

From the applicant’s plan and their proposed alignment and grades will create:

1. An approximate 0.96 – 1.64 “cut” at the “toe” of the central slip on the centreline of the road.
2. An approximate 2.2 “cut” at the crossover of the fault line at the centreline of the road.
3. The applicant proposes a right of way serving Lots 4, 5, 6 and 7 which is also anticipated to “cut” into the toe support.

Cutting the “toe” support of an old slip will not be in the best interest of assets downhill. However it is acknowledged that the applicant is proposing substantial buttress design at the edge of the road reserve, i.e. combination of large diameter shear piles, subsoil drainage and a shear key.

It is my view that a complying graded road could be constructed as per the details below.

1. Drift some 25 m into Lots 3, 4 and 33, to allow a flatter gradient to occur.
2. This will mean an approximate 2.0m fill on the road centreline where it traverses the toe of the slip, i.e. buttress effect to the slip.
3. A 2.0 cut where the road traverses the fault line on the centreline of the road (similar to the applicant’s proposal).
4. Increase overall length of the road by approximately 40 m.
5. Reduce size of shear piles etc resulting in less future maintenance and risk to Council if they are located within the road reserve. Note if the piles are required to protect lots then they should be located on private property and protected by easements.
6. The ability of all users, i.e. walking, biking, mobility scooter, cars and trucks to use the asset with ease and not deny access.
7. The cross-section plan 7081 produced by the applicant shows that with a 1-in-6 grade they would end up with a 2.2 m cut on the road centreline. However a longer road and “drifting” the road would result in a 2.0m cut situation.
8. The applicant’s proposed concept alignment from the end of the formed road to the top turning cul-de-sac head is made up of six curves interspaced with short sections of straights. With the Council’s proposed alignment, this is reduced to four curves, all complying with the Council standards and resulting in a safe environment for all road users.

9. Council's proposed grades would be as follows (from using applicant's plans):

Running distance	Grade
40 – 120	1-in-7
120 – 175	1-in-10
175 – 355	1-in-7
355 – 400	1-in-10.6
400 – 640	1-in-7

It is my view that a combination of the 1-in-7 grade and lengthening the road by drifting it some 25 m into Lots 3 and 4 will enhance stability to the road and lower overall risk to Council in the future. Council will have an expert roading witness available at the hearing and will table a report and speak to it.

EXTENSION OF PROPOSED ROAD – HIGHLAND DRIVE

Councillors will be aware of the proposed rezoning envisaged by Council for this area of Richmond East and Nelson South. Although not publicly notified, all parties are aware of the potential land development beyond this site owned by other parties. A walk over the applicant's land together with that of other land to the east reveals that if this "other" land is to be developed the only practical access is via Highland Drive extension. The steep terrain in other locations relies on 4-wheel drive access and access for future roads is not practicable.

The yet to be notified "rezoning" will show that a future indicative road is proposed into this "other" land and this was made clear to the applicant by Council officers at the earliest pre-development meeting.

Indeed Council's Engineering Standards since 2004 have alluded to this requirement on future roading layout for many years viz:

Shall be extended to the boundaries of the owner's land where the street will require to be ultimately extended into the adjoining land, and a temporary turnaround shall be constructed if it is part of a staged development of the same owner.

Road design alignments shall not be designed in isolation but will require an overall appraisal of the surrounding area, even if adjoining areas are zoned differently. Final roading layouts will require the approval of Council's Engineering Manager via the vetting of subdivision consent plans at the time of consent approval. Roading layouts shall be planned to maximise convenient access to all forms of public transport or potential public transport.

Subdividers are required to take roads to the adjoining boundary and they shall vest with Council without isolation strips and to the Council's satisfaction.

Again in the 2008 standards:

(a) *Roading layouts shall be planned to maximise convenient access to all users (traffic, cyclists, walkers etc).*

- (b) *Road design alignments shall not be designed in isolation but will require an overall appraisal of the surrounding area, even if adjoining areas are zoned differently.*
- (c) *New roads being added to the network must be guided by what is optimal for the area as a whole, rather than allowing individual developments to be created with minimal roading.*
- (d) *New roads shall be extended to the boundaries of the owner's land where the road will require to be ultimately extended into the adjoining land. A temporary turnaround shall be constructed if it is part of a staged development by the same owner.*
- (e) *The road design and layout must be approved as part of a subdivision and/or road area land-use consents, and be consistent with any resource consent conditions that may apply in accordance with the TRMP.*
- (f) *Final roading layouts will require the approval the Engineering Manager which will be carried out through the vetting of subdivision consent plans at the time of consent approval.*
- (g) *Where a road is developed in stages, a temporary turning area shall be provided at the end of the construction and outside the road-to-vest areas.*
- (h) *Where a road abuts an adjoining property and is not part of the consent, the road shall be formed up to the boundary and vested with Council without isolation strips. The turning requirement may be modified to provide some form of turning facility.*

The applicant has chosen to ignore the officer's request to show this future road access to the adjoining property at the most practical location point as shown by the attached plan which was submitted to the applicant.

Indeed the applicant has advised it is "premature to address these matters until such time as the principal engineering issues have been settled and the consent process defined". This even included a suggested 5.0 m wide public walkway from the end of the proposed road reserve to the adjacent land owned by J and K Heslop. (I understand that the submitter will discuss access to their block at today's hearing).

It is my view that pursuant to Section 406(a)(ii) the subdivision may not be in the public interest if it closes off potential developable land close to the town and has minimal (with respect) soil quality. In my view, the proposed road should be extended to the adjoining property in the most practical location and as an example this was achieved in the subdivision on the corner of Hart and Wensley Road which is under construction at present.

WATER SUPPLY

As set out in Council's Engineering Standards, Council has determined a level of service which requires a minimum of 30 m and maximum of 90 m head of water to a residential lot. Individual house plumbing systems are therefore designed for this pressure supplied by Council.

The reticulation to which the proposed subdivision will connect is fed by the Richmond High Level Reservoir. Recent work by Council has indicated the water pressure at the point of connection to the proposed subdivision is likely to vary between 122 and 82m RL in the peak demand season. Council considers that the maximum lot elevation able to be serviced by the current reticulation network is 65m RL.

The 65m contour line traverses an approximate running distance of 160 (Verrall plan) on about Lot 8. Any lots proposed above that contour cannot presently be serviced from a Council supply (or will have substandard service).

As part of Council's water supply modelling for Richmond, a number of potential new reservoir sites have been identified in the Richmond East area. Reservoirs at these locations would provide security of supply and meet Council's level of service in the future.

As outlined in the proposed Richmond East rezoning, it is proposed to install two reservoirs (and associated infrastructure) with top water levels of 122.3 and 205 m RL respectively. This reticulation will meet all levels of service for the applicant's property; however it would not likely be in place until 2012/13 (subject to LTCCP approval). The lower reservoir base level (approximately 120 m) traverses the applicant's site, and a potential reservoir site exists on the applicant's property (Lot 30).

A number of options are available to service land above the 65m contour and are outlined below:

1. Each lot could be self sufficient with their own supply and rely on roof water or tankered water, with tanks on each site for storage and fire fighting supply. (Note: once owners install these low pressure systems it is likely connection to Council high pressure systems will be very expensive).
2. At or about the 65m contour an inline water pump station could be installed to pump up to one (or a number of) storage tanks and supply the properties via a private system. The tank elevation would have to be at an elevation that would meet a minimum level of service (for example 30 to 90m pressure) and meet fire fighting requirements (including fire hydrant discharge rates). The applicant has not verified if fire fighting requirements can be met.

The design will require agreement with Council regarding ownership of the pump station, water main and tanks, as parts of the infrastructure will be within the road reserve. The applicant has declined to discuss this aspect with Council.

3. There may be scope for the applicant to install reticulation and reservoirs compatible with that proposed by Council in the future and vest the assets in Council ownership. A reservoir could be installed on Lot 30, with a top water level of 122.3m. This would service lots up to the 90 m contour. Lots above this level could be serviced by additional rider mains supplied from an on-line booster pump or by a reservoir located at a higher level.

The applicant has proposed a "cost share" arrangement with Council in regard to installing infrastructure that will ultimately benefit the wider community and land above the 65 m contour line. Council cannot enter into this arrangement as we presently have no mandate for this work and, if approved by the LTCCP, would not get it until the early part of 2009. At present Council has not fully designed the system and confirmed alignments for pumping

mains which will start at the Champion Road reservoir (although they are unlikely to come up Highland Drive).

As an interim measure, Council is willing to accept the following substandard system and accept future maintenance costs subject to the applicant funding the following infrastructure:

- (a) A normal 150 mm water main, installed in the new road from Council's existing supply at the end of Highland Drive. This main shall terminate at the tanks on Lot 30, as set out below, and would service properties up to the 90 m contour.
- (b) A booster pump, valving, telemetry etc shall be constructed at the approximate 65m contour (subject to design) and located on road reserve between the footpath and adjoining boundary.
- (c) Normal fire hydrants at approved spacings that meet fire fighting requirements would be installed between the booster pump and the reservoir tanks.
- (d) The reservoir tanks and valving would meet a minimum one full day's reserve supply and fire code requirements.
- (e) A suitably designed rider main that feeds the residential sections below the tank between the 65m and 90m contours, and meeting minimum 30 m pressure head requirements.
- (f) An additional pumped supply for those properties above the 90m contour. This supply would be most sensibly pumped from the new reservoir on Lot 30, and could be supplied via two appropriately sized rider mains on each side of the road reserve.
- (g) Land area to be vested with Council as a utility lot for the tank and the ability for an extended area to be available for a 1500 m³ tank, together with protected and legal access for maintenance, construction and vehicles. Note: to this end a concept plan was submitted previously to the applicant and is attached showing a location for a future reservoir and that of a future road extension, as previously set out in the roading section of this report.
- (h) Each lot will be supplied with a normal water lateral service plus standard water meter.
- (i) An appropriate design shall be submitted where the water main traverses the fault line. This shall be designed and constructed so that it will accommodate a ground displacement in any direction of up to 100 mm without pipe rupture. A sensor system connected to telemetry shall be designed and provided that will detect and close down the system within 10 seconds when pressure loss is detected.

WASTEWATER

Highland Drive has an existing 150 mm diameter pipe terminating at the end of the existing road to vest. This line is proposed to be extended in the new road to vest and all lots connected to that system. The downstream system is deemed to have enough capacity to

service this development. The applicants have provided a concept plan to show that all lots can connect.

Of concern are two issues:

- (a) Providing services through a fault line (alluded to in the above water section) requires for the design to allow for a lateral movement in any direction of up to 100 mm without pipe rupture. This can be provided via sealed sliding joints and flex couplings housed in an open conduit.
- (b) The design to service Lots 14 to 17 which cannot “gravitate” to the proposed pipeline in Highland Drive extension is proposed as a “pump” system. This shall be an entirely “private” system whereby each property has individual pumps and lines installed and a “body corporate or similar” is set up to run a centralised system. Any option will most likely require consent notices on the titles to highlight this disposal system to future owners.

The system will need to discharge to a manhole located most likely and within the start of the right-of-way such that a gravity system from private property can enter the gravity system.

STORMWATER

Due to the unstable nature of the area, stormwater and its control is critical to maintain stability and protect assets. (The hearings panel will be well aware of recent slip failures around the country involving housing and Council meeting some of the repair costs.) A fundamental component of slip failure is the ingress of water to lubricate soil surfaces and instigate soil movement.

The applicant is proposing three different discharge areas for stormwater, two being towards the Park Drive system and one to the east over other parties land, i.e. Lots 14 to 21.

The existing system downstream within the Park Drive catchment is deemed to have adequate capacity, subject to a stormwater pipe in Ridings Grove/Hill Street being increased in size in the next few months. The discharge for Lots 14 to 21, as above is subject to a stormwater discharge consent and is dealt with separately.

The stability report submitted by Tonkin & Taylor acknowledges susceptible areas and they have proposed that:

- *Deepen pipes to get below the zone of likely soil creep.*
- *Provide additional subsoil drainage.*
- *Relocate services routes to avoid high risk zones.*
- *Provide for flexible couplings and on high strength pipes i.e. HDPE.*
- *Stormwater flows found and ensured that all flows are pipe or channelled off the hillside.*
- *Secondary flow paths to be within road formation.*

Subsoil pipes and cut off drains are an integral part of the design to “drain” the land and when installed on “private” property will require the new owners to be aware of them and maintain them and possibly renew them when their life expectancy ceases. They will also

require ongoing monitoring of these “private” systems and I am aware in the past that “body corporates” are sometimes set up and monitoring data is submitted to Council on a regular basis much like a centralised wastewater disposal system and that it is continually in compliance. This will require legal advice on how this can be set up. It is assumed the applicant will table this information at today’s hearing.

As to the previous comments above on services crossing the fault line, it is imperative that movement in services can occur without rupture of that service. To this end the stormwater pipe that will vest with Council shall be designed to:

- (a) Withstand lateral movement in any direction of at least 100 mm without pipe rupture.
- (b) Not be installed within any existing known earth flows.
- (c) No systems that are solely to protect private lots are to be located on road reserve.

SUMMARY

Land within easy access to Richmond central is becoming harder to develop and developers are moving into more unstable areas that have previously been retired from development.

Council has to be certain that by allowing development in these areas that risks to Council and the ratepayers is mitigated against future infrastructure failure or private system failures.

Designs need to be robust and have increased factors of safety built in. These developments should be designed by professionals in their respective fields and certified to meet their design lives with the Council not carrying the risk for future generations.

Protection of its infrastructure and the ongoing risk of potential failure due to elements outside its control is of concern to engineering, i.e. we have previously dealt with past failures in other areas of Richmond where remedial action was required. Engineering would be extending the timeframe for maintenance from the normal two years to at least six years for infrastructural works due to the development in this high risk area.

It is my opinion that the site can be serviced subject to approved designs and certifications and that risk to Council can be mitigated.

Dugald Ley
Development Engineer

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