300530

21 November 2011

Beca Carter Hollings & Ferner Ltd
P O Box 13960
CHRISTCHURCH

Attention: Paul Whyte

Dear Paul

Plan Change 60 - Maxwell Hills Zone – Reply to Request for Further Information

Thank you for your letter received on 07 July 2011 in which you requested further information in respect of the request for the above private plan change. We respond as follows (adopting the numbered headings set out in your letter), but note that some matters raised, particularly in relation to infrastructure, will be dealt with in detail in the resource consent applications which will follow the rezoning of the land.

We now consider that the Plan Change Request ought to be publicly notified without further delay.

1. Water Supply

You have requested information regarding the potable water supply, and fire fighting supply, particularly the quantity and quality of the water available. Please find attached in Appendix I details of the water quality and quantity supplied by the developer. In terms of fire fighting, it is proposed that each section will be required to install a 20,000 litre concrete water tank, with a pump capable of operating two fire sprinklers. Each house will be required to install a sprinkler system.

2. Traffic Assessment

You have asked us to comment on whether the sealed carriageway width of Taylors Pass Road will be of sufficient width for safety purposes in terms of AustRoads when the site is developed, particularly given the popularity of the road for cyclists. A letter from Gary Clarke, the project's traffic engineer is attached in Appendix II. In summary Mr Clarke advises:

- The sight distance along the route is excellent with slow moving cyclists easily identified by motorists;
- There is sufficient forward sight distance and opportunities for all road users to pass safely;
- The width of the road is sufficient for other road users to pass safely; and
- This is an open road environment and it is expected that cyclists will ride with appropriate care.

3. Geotechnical Assessment

A number of questions were raised in respect to the Geotechnical Assessment provided in Appendix E of the Plan Change documents. These questions except question 3 have been

CPG New Zealand Ltd
55 Shands Rd PO Box 13-875 Christchurch 8141 New Zealand **T** 64 3 374 6515 **F** 64 3 374 6516
christchurch@nz.cpg-global.com

responded to by Riley Consultants Limited and are contained in Appendix III. A response to question 3 is provided below.

These works will form part of the detailed design issues at the subdivision consent stage and we expect them to become conditions of consent for subdivision (via consent notices, covenants and legal mechanisms), consents for discharges and some land use components that will require consent. This is explained in more detail in the response to Section 5 question 11 and in Section 5 question 7.

4. Flood Assessment

Additional information was requested in respect to the effects of climate change and sediment deposition, and in respect to the contribution from soil creep and bank erosion to sediment entering the stormwater system and causing loss of efficiencies and blockages. These first two questions have been answered by Riley Consultants in their response in Appendix III.

Question 3 requests a discussion on the likely management implications for the Council in respect to the Maxwell Creek and Taylor River corridors in terms of such matters as maintenance of the capacity of waterways.

Please refer to Section 4 of the revised stormwater report (Appendix IV) which discusses stormwater mitigation measures and erosion control, and also the response to Question 4 (1) in respect to sediment deposition in the Riley response (Appendix III). Management of this area in terms of maintenance of the capacity of the two waterways is unlikely to change significantly as a result of the density of development proposed by the Plan Change. It is noted that there is a 10 m esplanade strip on the true right bank of the Taylor River which is already under the administration of the Council.

Maxwell Creek is very steep sided and is unlikely to silt up. The Riley response (Appendix III at page 6) considers that sediment deposition of the Maxwell Creek within the proposed development is expected to be minor due to the relatively steep narrow channel, small catchment size and generally small sediment size. The discussion further states that scouring out of the existing channel and lowering of the bed level is the primary process expected over time, and that the greatest sediment deposition will be at the confluence with the Taylor River where the creek bed is seen to widen. It is considered that any sediment that did deposit (thus potentially affecting the capacity of the water way would be expected to be scoured out during flood events maintaining the capacity of the channel (page 6 Riley Response Appendix III). The report concludes that sediment deposition within Maxwell Creek is expected to have little impact on its flood capacity within the next 50 years. Overall, it is considered that the management implications for the Council in respect to Maxwell Creek and its flood carrying capacity will be minimal.

Question 4 requests better definition of the flood boundary level and confirmation that the bund will provide protection for the lots fronting Maxwell Creek. This can be found in the explanation and plans provided by the Riley response in Appendix III.

5. Schedule of Changes – Appendix G

The Schedule of Changes has been devised to fit in as much as possible with the format, structure and sense of the existing Plan, and the way it is being administered; as this was the preferred approach stated during our discussions with MDC Officers in respect to the proposal. To do this we have carried many rules subject to the questions below, over from other "similar" zones already existing in the Plan to deal with specific issues. Discussions with the Policy Planners also indicated that they preferred the new zone to standalone rather than result in changes throughout the existing Plan. In taking this approach it is recognised that the existing Plan is not perfect, and it is acknowledged that a review is underway.

1. *Rule 2.2.2.6* – the phrase "stable land areas" has been adopted directly from existing rules in the Plan. Refer for example Rule 33.1.2.1.5. CPG have discussed this with the Council's Planning Administration staff who advised that "stable land areas" are generally interpreted to mean planted land away from areas of recent fill, excavations, cut faces or other areas of loose soils.

2. *Rule 2.2.8.1* – this rule, including reference to "public system", is an existing rule found elsewhere in the Plan (for example, see Rule 31.1.3.1 and Rule 32.1.7.1). It is considered important that connection to a public system still be provided for as a permitted activity within the proposed zone in the event that the Council and the developer decide that it is viable to connect to the Blenheim public sewerage system. It is intended to provide a communal wastewater system. This will require resource consents for the treatment plant and for discharges and potentially other miscellaneous matters.

3. *Rule 2.2.6.1.1* – the Flood Assessment Report prepared by Riley Consultants Limited and contained in Appendix F of the plan change request recommends a building setback of 8m from all streams on the site (see Section 8.1 and 9.0 of that report) and is consistent with the proposed rule. It is noted that the wording of the rule has been carried over from the other "residential" zones in the Plan. Please see Rule 33.1.5.1 (Township Residential Zone), Rule 32.1.5.1 (Urban Residential 1 and 2 Zones), and Rule 31.1.6.1 (Rural Residential Zone).

4. *Rule 2.2.6.1.3* – A revised Outline Development Plan is attached (Appendix V) which more clearly shows the flood hazard overlay.

5. *Hazards Register* – the Hazards Register is referred to elsewhere in the Plan (see for example Rules 31.1.6.2 and 32.1.5.2). However, if the Council no longer maintains a hazards register we see no reason to refer to one. Please find attached the revised Schedule of Changes (Appendix V). We have deleted the note referring to a hazards register.

6. *Rule 2.2.7.1.1* – The flood avoidance/protection bund included in the Outline Development Plan is technically a stopbank (see definitions section of the Plan) and it will be important that it is not undermined in the future once the site is developed. The wording of the rule has been carried over from the other "residential" zones in the Plan (see Rule 33.1.6.1.1 (Township Residential Zone) and Rule 32.1.6.1.1 (Urban Residential 1 and 2 Zones)).

7. *Rule 2.2.8* – Stormwater discharges are proposed to generally be a permitted activity, in accordance with proposed Rule 2.1 Permitted Activities, last bullet point. We have taken a similar view to the provisions provided in the Plan for the Township Residential Zone. If discharges were not listed as permitted activities in the Maxwell Hills Zone generally then they would be caught by the general catch all of proposed Rule 2.5 and would be non-complying activities. However, please note that any subdivision and development will be required to comply with Chapter 29 provisions that apply throughout the District and discharges to natural water are subject to the provisions of Chapter 27 that also apply throughout the District (see Proposed Rule 2). For example Rule 29.2.12), requires the developer to:

   " *provide a satisfactory system for the collection and disposal of stormwater, from all allotments, roads, accessways, and private roads connecting to a stormwater drainage system. The stormwater drainage system shall provide for the collection and control of all stormwater within the land being developed or subdivided together with potential drainage from the entire catchment upstream of the proposed subdivision or development.*'

This rule also states "The developer shall obtain resource consents necessary to discharge into the receiving river or drainage channel."
Rule 27.1.10 of the Plan deals with discharges to water, Rule 27.1.10.1.2 deals specifically with stormwater and Rule 27.1.10.1.3 deals specifically with stormwater from earthworks; Rule 27.1.10.1.4 deals with stormwater from vegetation clearance sites.

A minor change to Proposed Rule 2 has been made to make it even clearer than the rules that apply throughout the District do apply to Maxwell Hills Zone (See Appendix V).

Overall, from our assessment of the stormwater system described in Appendix H in the Plan Change document and revised as Appendix IV attached, by Riley Consultants, it is our view that the stormwater discharges associated with the development (construction and on-going) are likely to be a discretionary activity.

8. *Rule 2.2.8.2.1(d)* this condition is taken directly from similar rules elsewhere in the Plan, for example see Rules 30.1.8.7.4, 31.1.3.5.4 and 32.1.7.4.4. For the Proposed Maxwell Hills Zone we would be happy to delete it, if it was considered it serves no useful purpose.

9. *Rule 2.2.8.3* – this rule is taken directly from another section of the Plan (see Rule 32.1.7.7, (Urban Residential 1 and 2 Zones), and Rule 33.1.7.4 (Township Residential Zone)). The rule also only applies to "discharge of contaminants associated with any permitted activity" as per the list of permitted activities for the zone. In the Maxwell Hills Zone there is a narrow list of permitted activities and we consider that noxious particulates from them are unlikely and that conditions (a) and (b) will apply. Other non-permitted activities would require separate resource consents and any noxious elements could be assessed at that time. We acknowledge that potentially a domestic wood burner could become noxious but it could still be caught under (a) and (b). We further note that the Plan is being reviewed and that more robust air quality provisions are being prepared. Any plan change or review would cover this proposed new zone.

10. *Rule 2.3.1.2.3* This rule has been proposed to enable the Council and the applicant to work through the relevant issues associated with a discharge from the proposed community wastewater treatment plant if the discharge occurs within the Maxwell Hills Zone, such as within the utilities area and/or for irrigation of grassed berms etc. It is considered that the matters for discretion have been broadly set for both the treatment plant and the discharge to enable all potential matters to be part of the resource consent determination process. The two rules have been linked to ensure that the effluent being discharged is the high quality effluent anticipated from the proposed wastewater treatment plant. If the criteria set for restricted discretionary activity status for the community wastewater treatment plant cannot be met the discharge proposal will fall to be considered as a full discretionary activity with opportunity for full notification and/or service. It is further noted that many of the discharge areas will be located outside the Maxwell Hills Zone and will therefore be subject to the Rural 4 Zone provisions (see note provided after Rule 2.3.1.2.3). It is not intended to alter the Rural 4 Zone provisions to better accommodate the discharge to land from the Community Wastewater Treatment Plant (note it is the preference of the Council Officers that existing zones in the Plan do not get altered by this plan change).

11. Rule 2.4.1 – The items outside the Maxwell Hills Zone are not subject to the Maxwell Hill zone provisions but are subject to the zone provisions that they fall within. The proposed reserve, for instance, is zoned Rural 4 and development of the reserve will be subject to the provisions of the already established Rural 4 Zone. Stormwater Pond E is the only pond that is not within the Proposed Maxwell Hills Zone.

The main question to resolve is ensuring that the reserve area, esplanade strip and pedestrian and cycle links are implemented. Normally, this would be dealt with in a specific plan for resource consent for subdivision and would become conditions of consent (some implemented through consent notices). However, in this case, it is a Plan Change for rezoning and the rules for subdivision have been included in the Maxwell Hills Zone because the Council requested a standalone zone with minimal interference with the rest of the Plan. It is anticipated that subdivision and other resource consents for the development will follow. Reference to the Outline Development Plan has been included in both the zone provisions and the subdivision provisions (see Proposed Rule 2.7.2.1 (b)). In addition, the rules in the Maxwell Hills Zone for subdivision do contain a reference back to the general matters that the Council retains control over see (see proposed Rule 2.7.2.2.1 which refers to clause 28.2.5). These matters include:

(e) stormwater control requirements.
(h) financial and land contributions in accordance with the requirements of the Plan.
(i) provision of esplanade reserves and esplanade strips around the coastline and margins of lakes and rivers.

The Council will be able to bring these controls into the decision making process and require the items referred to in the Outline Development Plan to be implemented as part of the subdivision consent. The land surrounding the proposed Maxwell Hills Zone is owned by the Plan Change requester, including the area proposed as reserve and pond E. The esplanade strip has already been taken by MDC (a 10 metre wide esplanade strip is already recorded on the titles for Lots 1-3 DP357141).

Land owned by the Plan Change requester will need to be kept available for the development of the Maxwell Hill Zone and will form the reserve contribution and will vest in the Council. If this land was for some reason, not made available to accompany the development of the Maxwell Hill Zone, then valuable Maxwell Hills Zoned land would need to be used, or a considerable cash amount paid. The requester has had discussions with MDC on the reserve area and we understand that the Council is open to the use of this land for reserve to connect to the recreational area at the Taylor Dam and for cycle linkages. It is considered that these matters can be tied into the subdivision consent application.

Overall, if the Outline Development Plan is not being implemented by appropriate measures including delineation on the subdivision plan and conditions (including reserve areas) in the proposed subdivision application for the development of the Maxwell Hills Zone then the subdivision will fall to be considered as a full Discretionary Activity (see Proposed Rule 2.7.3). This is similar to how other Districts treat non-compliance with an Outline Development Plan. It is noted that some councils take the stronger measure and require the subdivision to be assessed as a Non-Complying Activity when it does not implement the outline development plan. Experience with similar developments have indicated that non-complying is too onerous, and inflexible.

If there is concern related to when the reserve is to be vested, should the subdivision be completed in stages, it could be added as a requirement that the reserve vest in the Council during the first stage. It is further noted that the development of walking and cycling tracks are secured by the Outline Development Plan and are expected to be translated into a condition of consent and could similarly be imposed at the earliest stage considered practicable.

12. A decision was made to not include the conceptual layout of lots as shown on the Riley Stormwater Report. The stormwater layout was primarily to show what was feasible and how a potential development could be serviced. During subdivision consenting, specific easements for stormwater will be required to be included as per clause 29.2.12 and clause 28.2.5. Given the nature of the topography, these easements will affect the location of the final lot boundaries. However, it is noted that the stormwater ponds have been included in the revised Outline Development Plan (Appendix V).

6. Stormwater Assessment

A number of questions were raised in respect to the Stormwater Report provided in Appendix H of the Plan Change documents. Questions 1-7 have been answered in the response from Riley Consultants Limited in Appendix III. A revised stormwater report has also been provided (see Appendix VI). The response to question 8 requesting information on the proposed ownership of the stormwater ponds is provided below.

If the stormwater ponds are not to be vested in the Council it is anticipated that the ownership and management of the stormwater ponds will be part of the management company to be set up for other aspects of the the development and is most likely to be a body corporate arrangement. This is explained in more detail below in response to question 7/7.

7. Wastewater Disposal

Questions 1-4 have been answered by Riley Consultants in their response document contained in Appendix III. Question 4 a-e in respect to nutrient modelling has been responded to by Rob Potts of CPG and is in an attachment to the Riley Response in Appendix III.

Responses to Questions 5-8 are provided below.

5. Please see the response in Section 5, question 2 of this letter where the reference to a public system is explained.

6. We confirm that the the majority (but not necessarily all; note the potential for combined utility area to be used and potential for use to irrigate grass berms etc.) of the proposed wastewater disposal areas are proposed to occur outside the plan change area (Proposed Maxwell Hills Zone) and will be subject to the Rural 4 and General Zone rules. It is noted that the Maxwell Hills Zone is also subject to the General rules of the Plan.

7. A body corporate type management structure is anticipated for the management of the wastewater treatment plant and associated components. All landowners will be required to be shareholders in the management company established for the sole purpose of maintaining utilities, vegetation areas and infrastructure, including all wastewater infrastructure. A private contractor (and possibly sub-contractors, such as a local plumbing company) are likely to be engaged on behalf of the body corporate members to undertake the required work and on-going maintenance. The details of the management structure are matters for the subdivision consenting stage, however, we note that there are many examples of this type of management structure in New Zealand and utility management companies servicing these types of management structures have increased in number in recent years. Jacks Point in the Queenstown area is one such development with this type of arrangement which continues to work well and for which the district council is unlikely to take over. In this example Innoflow hold the contract to manage and monitor the wastewater treatment facilities and a local company is subcontracted to maintain the infrastructure in good order, with overall ownership through a body corporate. We note that Councils themselves often engage utility management companies to manage and maintain public wastewater treatment and disposal systems. We attach an example of a utility

management company who specialises in these type of management arrangements under a variety of management structures, including body corporates (Appendix VI).

In respect to whether proposed clauses 2.3.1.1.2 (h) and 2.3.1.2.2 (k) are matters the Council can exercise discretion in relation to ownership structures, we agree that the ownership structure is not strictly a resource management matter. There are likely to be circumstances where the Council may want to influence the governing rules of a body corporate or owning entity to ensure obligations contained in conditions of consent are complied with, however, we consider that the proposed matters listed a to g in clause 2.3.1.1.2, and a to j in clause 2.3.1.2.2 will be sufficient if such need arises. We have amended the Schedule of Changes accordingly (Appendix V).

8. The disposal areas are contained in the one Certificate of Title 232445 being Lot 1-3 DP 357141 and Lot 1 DP 9518 and being 322 hectares, and all in the ownership of the Plan Change requester. This same single site also contains the plan change rezone area. When the site is subdivided to give effect to the plan change it will need to include utility lots and easements associated with the wastewater disposal areas.

Additional questions from Brin Williman have been included as part of the RFI and have been responded to in the Riley Consultants response in Appendix III. The question relating to the inclusion of additional mitigation measures as rules in the Plan Change documents has been assessed. It is considered that many of the mitigation measures proposed in the Riley reports are better drafted as site specific conditions of consent during the resource consent stage of the project.

Yours sincerely
CPG

Janice Carter
Principal

Enclosures: **Appendices**
Appendix I - Water Quality and Quantity
Appendix II - Letter from Traffic Concepts Limited
Appendix III – Riley Consultants Limited - Response
Appendix IV – Revised Stormwater Report
Appendix V – Revised Schedule of Changes
Appendix VI – Utility Management Company Brochure

APPENDIX I

Water Quality and Quantity

Julie Clark

From: John Marris <jandamarris@xtra.co.nz>
Sent: Friday, 8 July 2011 11:51 a.m.
To: Janice Carter
Subject: Plan Change 60 Maxwell Hills Zone.
Attachments: sc0113b572.jpg

Further to the request from Paul Whyte from Beca Carter Hollings & Ferner Ltd regarding the water supply please find attached a sample analysis taken at the beginning of a 5 day continuous 24 hours/day pump test on the source well on my property at New Renwick Road.
The pump rate for the duration of that long term pump test was 120 m3/hour.

At the time of construction the source well was drilled to a finished depth of 16 metres. The initial 2 hour pump test was at 138 m3/hour and the draw down was 5.30 metres below static water level.

In the 5 day continuous pump test mentioned above the pump rate was 120 m3/hour and the maximum draw down reached was 3.79 metres below static water level.
Detailed information including the original well construction log and the 5 day pump test are available if required.

It is proposed that each section will install a 20,000 litre concrete water tank and that they will pressurise their own system with a pump that has the capability to operate two fire sprinklers.
Each house will be required to install a sprinkler system.
Each house will have a domestic/ home irrigation allocation of 5 m3/day. A Maric restrictor valve is used to control the inflow into each section storage tank.
By my experience using both my Morven Road (20 sections) and my Fairbourne
(24 sections) experience over the last 10 years or so, they would only use their full allocation on some summer days. Generally the average daily usage would be less than 3 m3/day

In any future fire design, elevated water storage would be part of that design. I have been working with John Bealing from Ag first Consultants in Motueka.John has done initial water design work, accordingly, for this project

Please get back to me if you need further information on the proposed water supply.

Regards,
John Marris

Laboratory Report

CAWTHRON

Certificate of Analysis: Final

Cawthron Contract Number: 11377

Project Number: P87791

Waimea Drilling Company
Aniseed Valley Road
Hope
RD1
RICHMOND

Attention: Woody -

Customer Order No: Woody
Customer Ref: Kapiti Views
Copy Report to (1): J Marris, 114 New Renwick Road, BLENHEIM
Email Recipients: Woody -,John Marris
Date Project Started: 11/07/2007 09:55

Sample Details

Laboratory ID: P87791-1 **Sample Type:** Water **Date Sampled:** 11/07/2007 09:30
Date Received: 11/07/2007 09:50

Customer ID: Kapiti Views

Analysis	Result	Units	Guideline Value	Maximum Allowable Value	Method
pH	**6.6**	-	**7.0 - 8.5**	-	APHA 21st Edn 4500 H B
Free Carbon Dioxide	32	g/m³	-	-	APHA 21st Edn 4500 CO2 C
Acidity	37	g/m³ as $CaCO_3$	-	-	APHA 21st Edn 2310 B
Alkalinity	71	g/m³ as $CaCO_3$	-	-	APHA 21st Edn 2320 B
Chloride	5.4	g/m³	250	-	APHA 21st Edn 4110 B
Nitrate-N	0.45	g/m³	-	11.3	APHA 21st Edn 4110 B
Conductivity 25°C	27	mSm^{-1}			APHA 21st Edn 2510 B
Calcium	25	g/m³	-	-	APHA 21st Edn 3120B Acid Preserved. ICP-OES
Copper	<0.001	g/m³	1.0	2.0	APHA 21st Edn 3120B Acid Preserved. ICP-OES
Iron	0.008	g/m³	0.2	-	APHA 21st Edn 3120B Acid Preserved. ICP-OES
Magnesium	7.3	g/m³	-	-	APHA 21st Edn 3120B Acid Preserved. ICP-OES
Manganese	0.002	g/m³	0.04	0.4	APHA 21st Edn 3120B Acid Preserved. ICP-OES
Arsenic	<0.001	g/m³	-	0.01	APHA 21st Edn 3114 B & C
Hardness	93	g/m³ as $CaCO_3$	200	-	APHA 20th Edn 2340B Calculation.
Total coliforms	1	MPN/100mL			MIMMS 4th Edn 11A1. D.W. Stds for NZ 2005
Faecal coliforms	<1	MPN/100mL			MIMMS 4th Edn 11A1. D.W. Stds for NZ 2005
E.coli	<1	MPN/100mL	-	<1/100ml	MIMMS 4th Edn 11A1. D.W. Stds for NZ 2005

Results apply to samples as received

This laboratory is accredited by IANZ Unless specified all tests reported herein have been performed in accordance with the laboratory's scope of registration.

Report Number: 194824
Project Number: P87791
V13.12

Julie Clark

From: John Marris <jandamarris@xtra.co.nz>
Sent: Friday, 8 July 2011 2:35 p.m.
To: Janice Carter
Subject: RE Maxwell Pass proposed water supply
Attachments: sc011defc8.jpg

Hi Janice,
Please find a second Cawthron water Lab test.
The 5 day pump test was started on the 07/07/07 this lab test was from a sample taken on the 09/07/07, 2 days into the long term pump test.
The previous lab test in my previous email to you was from a sample taken on the 11/07/07 i.e.4 days into the long term pump test.
The main area of interest is that the Nitrate levels started off quite high at 7.5 g/m3 (maximum allowable value is 11.5 so the levels were well under).
The next sample 48 hours pumping later showed these Nitrate levels were down to 0.45 g/m3 Both these sample are deemed potable.

Regards,
John Marris

CAWTHRON

Laboratory Report

Certificate of Analysis: Final

Cawthron Contract Number: 11377

Project Number: P87671

Waimea Drilling Company
Aniseed Valley Road
Hope
RD1
RICHMOND

Attention: Woody -

Customer Order No: Woody
Customer Ref: Kapiti Views
Email Recipients: Woody -,John Marris
Date Project Started: 09/07/2007 11:05

Sample Details

Laboratory ID: P87671-1 **Sample Type:** Water **Date Sampled:** 09/07/2007 10:20
Description: Kapiti Views **Date Received:** 09/07/2007 10:45

Analysis	Result	Units	Method
pH	6.9	-	APHA 21st Edn 4500 H B
Free Carbon Dioxide	23	g/m^3	APHA 21st Edn 4500 CO2 C
Acidity	26	g/m^3 as $CaCO_3$	APHA 21st Edn 2310 B
Alkalinity	69	g/m^3 as $CaCO_3$	APHA 21st Edn 2320 B
Chloride	19	g/m^3	APHA 21st Edn 4110 B
Nitrate-N	7.5	g/m^3	APHA 21st Edn 4110 B
Conductivity 25°C	27	mSm^{-1}	APHA 21st Edn 2510 B
Calcium	25	g/m^3	APHA 21st Edn 3120B Acid Preserved. ICP-OES
Copper	<0.001	g/m^3	APHA 21st Edn 3120B Acid Preserved. ICP-OES
Iron	0.018	g/m^3	APHA 21st Edn 3120B Acid Preserved. ICP-OES
Magnesium	7.2	g/m^3	APHA 21st Edn 3120B Acid Preserved. ICP-OES
Manganese	0.001	g/m^3	APHA 21st Edn 3120B Acid Preserved. ICP-OES
Hardness	92	g/m^3 as $CaCO_3$	APHA 20th Edn 2340B Calculation.
Total coliforms	<1	MPN/100mL	MIMMS 4th Edn 11A1. D.W. Stds for NZ 2005
Faecal coliforms	<1	MPN/100mL	MIMMS 4th Edn 11A1. D.W. Stds for NZ 2005
E.coli	<1	MPN/100mL	MIMMS 4th Edn 11A1. D.W. Stds for NZ 2005

Results apply to samples as received

Our routine detection limits for chemical testing relate to samples with a clean matrix.
Reported detection limits may be higher for individual samples if there is insufficient sample or the matrix is complex.

< means less than, > means greater than

Date Generated: 20/7/07

Report Number: 194073
Project Number: P87671
V13.11

Appendix II

Letter from Traffic Concepts Limited

Trafficconcepts LTD

2 August 2011

File Ref: 0491

Janice Carter
CPG New Zealand Ltd
PO Box 13-875
Christchurch

Dear Janice

PLAN CHANGE – FURTHER INFORMATION REQUEST - MAXWELL HILLS - BLENHEIM

Following on from our discussions, I am please to provide my assessment of the further information request from Marlborough District Council's request relating to traffic matters. Their information request is noted below:

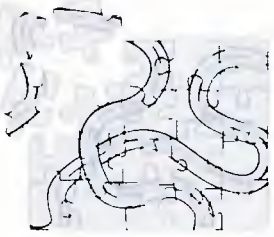
> *1. In terms of the Traffic Concepts Report (Appendix C) please comment as to whether the sealed carriageway width of Taylors Pass Road will be of sufficient width for safety purposes in terms of AustRoads when the site is developed, particularly given the popularity of the road for cyclists.*

My comments to this matter are provided below and some information is contained within my original assessment.

As noted in my original assessment the capacity of the existing roadway to the proposed development has been assessed by using the Austroads guidelines. In particular Part 2 "Road Capacity" was used to assess the safe and efficient operating capacity of the existing road following the completion of the development.

This assessment showed that the current roadway width was able to accommodate the additional flows generated from the development in a safe and convenient manner. While not explicitly identified in the assessment, cyclists form part of that road environment and there are no adverse effects on these road users in terms of safety and convenience.

It should however be noted that there will be more traffic on the road which will have some impact in terms of cyclists expectations to ride on a low volume road. However it will still be safe for cyclists following completion of the subdivision.



Austroads also has a guideline dedicated to Bicycles (Part 14) which can be used for the design of cycle facilities if the route is identified as a strategic route. There is also other guidance if it was appropriate to provide for these users in this case.

In reviewing Part 14, the guideline provides the following advice relating to the provision for cyclists on Taylor Pass Road.

> *Ensure satisfactory local conditions including safety, connectivity, route to schools and bicycle trip generators are considered.*

In considering this guidance and the further information request, the key point is safety of these road users. As noted above, this is considered to some degree in the Road Capacity calculations for Taylor Pass Road. Nevertheless a safety review of the route was carried out with safety in mind in case there is a certain aspect that needed to be considered as part of the increase in vehicle movements.

This review identified the following matters when specifically reviewing the route for the safety of cyclists.

- The sight distance along the route is excellent with slow moving cyclists easily identified by motorists,
- There is sufficient forward sight distance and opportunities for all road users to pass safely,
- The width of the road is sufficient for other road users to pass safely; and
- This is an open road environment and it is expected that cyclists will ride with appropriate care.

Cyclists that use this route are typically road cyclists which often ride in groups. This in itself provides a safer environment because of the numbers and presence they have in the road environment.

Due to the number of cyclists, it is recommended that appropriate warning signs be erected at the fringe of the urban area into the rural area and every 5 kms along Taylor Pass Road as a reminder. These signs should be erected to recognise the current situation.

We welcome the opportunity to discuss the above further if required and if you have any questions please contact me on (021) 243 1233.

Regards,

Gary Clark
NZCE (Civil), REA, MIPENZ, CPEng

Appendix III

Riley Consultants Limited - Response

RILEY CONSULTANTS

RESPONSE TO REQUEST FOR FURTHER INFORMATION RESOURCE CONSENT APPLICATION PLAN CHANGE 60 - MAXWELL HILLS ZONE

Engineers and Geologists

RESPONSE TO REQUEST FOR FURTHER INFORMATION
RESOURCE CONSENT APPLICATION
PLAN CHANGE 60 - MAXWELL HILLS ZONE

Report prepared for: Kapiti Views Trust

Report prepared by: Grant Fleming, Environmental Engineer

Steven Price, Geotechnical Engineer

Jason Budd, Senior Civil Engineer

Report reviewed by: Brett Black, Director, CPEng

Report reference: 04819/6-B

Date: 14 March 2012

Copies to:

Kapiti Views Trust	1 copy
CPG New Zealand Ltd	1 copy 1 electronic copy
Riley Consultants Ltd	1 copy

Issue:	Details:	Date:
1	Response to Request for Further Information	7 October 2011
2	Response to Request for Further Information	4 November 2011
3	Response to Request for Further Information	14 March 2012

Contents

Question 3 - Geotechnical Assessment 1
Question 3.1 - Chemical Stabilisation of Fill Material 1
Question 3.2 - Local Re-contouring 3
Question 4 - Flood Assessment 4
Question 4.1 - Climate Change and Sediment Deposition 4
Question 4.2 - Stormwater System Sedimentation 6
Question 4.4 - Flood Inundation and Protection 7
Question 6 - Stormwater Assessment 8
Question 6.1 - Soakpit Construction 8
Question 6.2 - Locating of Soakpits 8
Question 6.3 - Secondary Flowpath Protection 8
Question 6.4 - Flowpath Easements 9
Question 6.5 - Future Stormwater Catchments 9
Question 6.6 - Stormwater Quality 9
Question 6.7 - Impervious Area Determination 10
Reply to Additional Comments from Mr Brin Williman 10
Flood Map 10
Coordination of Recommendations 10
Stormwater Report 11
Phase 1 – Construction Mitigation Measures 12
Phase 2 - Permanent Stormwater Treatment and Erosion Protection Measures 12
Question 7 - Wastewater Disposal 13
Question 7.1 and 7.2 - Treatment Plant Construction 13
Question 7.3 - Soil Classification and Discharge Loading Rate 13
Question 7.4 - Nutrient Assessment 15

Appendices

Appendix A RILEY Drawings 04819/6FL-1 to 3
Appendix B MDC Email Correspondence
Appendix C Nitrogen Modelling Letter, prepared by Rob Potts, CPG NZ Ltd

RESPONSE TO REQUEST FOR FURTHER INFORMATION
RESOURCE CONSENT APPLICATION
PLAN CHANGE 60 - MAXWELL HILLS ZONE

The following responses, prepared by Riley Consultants Ltd (RILEY), relate to questions raised by Mr Paul Whyte of Beca Carter Hollings & Ferner Ltd (Beca) on behalf of the Marlborough District Council (MDC), in their letter dated 10 June 2011, requesting further information.

The responses presented below address the questions raised by MDC on design work undertaken by RILEY. In addressing these questions, RILEY has undertaken further design and review to satisfy MDC that the proposed plan change meets the rules and regulations of its regional and district plans. The responses are referenced as they are numbered in the council's letter.

Question 3 - Geotechnical Assessment

Question 3.1 - Chemical Stabilisation of Fill Material

On-Site Erosion Characteristics

The erosion observed on the Wither Hills is similar to that observed in other areas of New Zealand, such as the loess covered Port Hills. In many instances the erosion at the Wither Hills is more severe and has been considered by past authors, such as Gibbs[1] (1945). However the mechanisms of its occurrence and formation are believed to be similar to the processes that exist on the Port Hills.

As outlined in our geotechnical report of 11 February 2011, tunnel gully type erosion is observed on some of the sloping land within the subject site. Relatively small portions of the proposed development extend on the base of the slopes affected by this erosion.

The origin of the erosion features observed is inferred from on-site observations to be consistent with the mechanisms as outlined in Bell & Trangmar[2] (1987) for both shallow and deeper-seated tunnel formation above and below the fragipan. These are summarised in Figure 1 below, from Bell & Trangmar. There are no concentrated sources of stormwater runoff above the erosion features; as such, these features are likely caused by surface water runoff from the paddocks in association with shallow subsurface seepage.

[1] Gibbs, H.S. 1945. Tunnel Gully Erosion on the Whithers Hills, Marlborough. NZ Journal of Science and Technology Vol 27 pp 135-146.

[2] Bell, D.H. & Trangmar, B.B. 1987. Regolith Materials and Erosion Processes for the Port Hills, Christchurch, NZ.

As outlined in Bell, Glassey and Yetton[3] (1986) there is a need for a "sound engineering geological site model as the basis for any successful loess stabilisation programme". As part of the original geotechnical assessment, an engineering geological plan has been created plotting the location of the erosion features. It is envisaged in areas potentially affected by tunnel gully erosion (or adjacent) investigation, as outlined below, will be undertaken at subdivision detailed design stage.

Investigation of Erosion Features

Prior to undertaking any remedial measures on or immediately adjacent to the proposed development, an investigation will be undertaken to assess the depth and extent of any identified features, along with whether these features are old or active.

There are a number of potential investigation techniques as outlined in Yetton[4] (1990), including hand augering, cavity inspection, and geophysics. The preferred investigation method is machine dug trenches, which will create excellent exposures and allow assessment of depths, extent, and recent activity of internal erosion.

Testing will be undertaken on materials recovered from the trenching to establish erodibility and categorise the encountered soil layers.

Remedial Treatment

Chemical stabilisation is a technique that has been successfully used within erodible loess soils in both the Port Hills and Marlborough. Several different methods of chemical stabilisation are available, including the addition of hydrated lime, quick lime, Portland cement and orthophosphoric acid. Such materials reduce the deflocculating characteristics of any clays, although slaking and disaggregation are likely greater contributors to erosion than dispersivity. The addition of lime will bond silt particles together increasing resistance to erosion.

Hydrated lime is the current preferred stabilising option as it has a demonstrated past performance and is relatively easy to handle and use. Where active tunnel gully erosion is identified, the following is proposed:

- Excavation of the tunnel gully down to a non-erodible material below the active tunnel base level, extending a minimum of 10m upslope and beyond the proposed development boundary.
- Placement of a perforated 'Novaflo' pipe in the base, surrounded by a sandy gravel filter.
- Over this will be placed approximately 1m (less if the gully is a depth of <1m) of lime stabilised compacted loess in 250mm thick layers.
- Near surface will be compacted non-treated loess and a topsoil surface.
- The Novaflo will be connected to a suitable discharge point.
- A wingwall will be formed at the inlet surrounded by stabilised fill with a silt trap forebay.

[3] Bell, D.H., Glassey, P.J. & Yetton, M.D. 1986. Chemical Stabilisation of Dispersive Loessical Soils, Banks Peninsular, Canterbury, New Zealand. Proceedings of the Fifth International Congress. IAEG.
[4] Yetton, M.D. 1990. Subsurface Erosion and Seepage in Banks Peninsular Loess. Proceedings of Groundwater and Seepage Symposium Vol 16 pp 85-95.

Laboratory testing by others (e.g. Yetton, 1990) indicate 1% to 2% by weight hydrated lime is enough to create essentially a non-erodible backfill under ideal circumstances. However, for field operations, a 2% to 3% mix of hydrated lime is recommended to accommodate for any poor mixing.

For non-active tunnels a slurry (such as acid stabilised loess and sand, or lime cement stabilised sands) backfilling technique may be appropriate forming a low strength 'grout'. This is likely significantly cheaper than the above compacted lime stabilised option.

It is appreciated a significant quantity of the tunnel gully erosion will likely extend below the fragipan and significant volumes may be required to backfill this. However, the limited extent of the development proposed over slopes with internal erosion and the use of slurry in non-active tunnels will limit the quantities of backfill required and cost.

Question 3.2 - Local Re-contouring

No detailed earthworks plans have been developed at this stage. The term "local re-contouring" refers to localised in-filling of small gullies and depressions to form a somewhat smoother surface for residential development and disposal of any excess cut to create a better earthworks balance.

All fill sites will be subject to specific engineering review and will consider, but not be limited to, stormwater flows in the upper catchment and the affects of raised groundwater level on slope stability. Soft, compressible, and organic material should not be placed in the fills sites; if present, this will be removed prior to filling.

Any earthworks will be undertaken following standard industry practices and standards under the observation and verification of a suitably experienced geotechnical engineer.

Caution will be undertaken, particularly with respect to reworking of loess deposits and potential issues of promoting internal erosion. To this end a focus of earthworks design and construction will be minimising disturbance to the loess/colluvium and the fragipan at depth. Any disturbed fragipan would be appropriately reinstated, as soon as possible during construction, with a permanent low permeability material. During construction, all means would be taken to intercept, and appropriately dispose of, surface water above the exposed fragipan. Earthworks are envisaged to extend only to a shallow depth; as such, exposure of the fragipan is expected to be only over short areas.

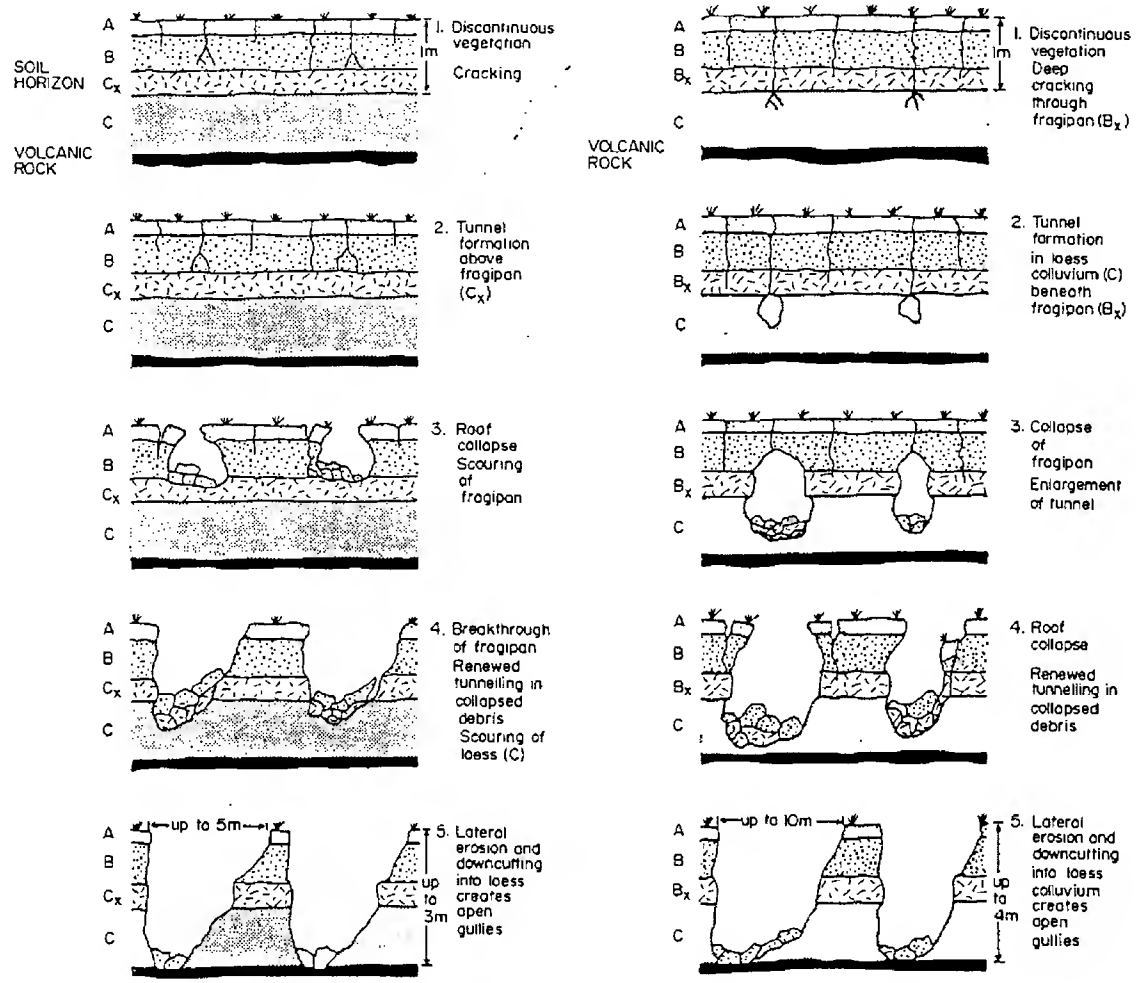


Figure 1: Schematic of formation of shallow and deep tunnel gullies (from Bell and Trangmar 1987)

Question 4 - Flood Assessment

Question 4.1 - Climate Change and Sediment Deposition

Climate Change

Climate change is expected to lead to increases in the frequency and intensity of extreme rainfall events in New Zealand and, therefore, will generally lead to an increase in flooding. Generally river flows are likely on average to increase in the west but decrease in the east of New Zealand. From correspondence with Mr Brin Williman (MDC Rivers and Drainage Engineer) and climate change information available to date, it may be possible that climate change in areas of Marlborough will actually reduce design flood events by up to 15% in the future. However, MDC do not give weight to this information and using a reduction in the design flood event is not an accepted practice to use. What this information does suggest is that there may not be any noticeable increase in design flood events at Maxwell Hills due to climate change in the future.

Currently NZS 4404 Land Development and Subdivision Engineering gives reference to Ministry for the Environment (MOE) publications for guidance on climate change. The MOE publication 'Preparing for climate change: A guide for local government in New Zealand' (2008) provides guidance for increase in intensity of design rainfall events based on an estimate of seasonal temperature increase from 1990 to 2040 and 2090 (Table 2). For the Marlborough region the maximum seasonal temperature increase is expected to be 1 °C to 2040 and 2.1 °C to 2090 (Spring and Autumn).

The MOE publication 'Tools for estimating the effects of climate change on flood flow: A Guidance Manual for Local Government in New Zealand (2010)' suggests that an adjustment factor of 8% should be used to adjust 1% AEP extreme rainfall events for every 1°C increase in temperature expected. Using a simplistic relationship (e.g. Rational method) where an increase in rainfall will produce the same proportional increase in flow an additional 8% increase in flow could be expected over the next 50 years. It is considered a more conservative design approach to base future climate change effects on MOE guidance as per NZS 4404 guidance rather than MDC climate change information. The effects of increases in flood flows due to climate change are discussed below.

The flood level assessment for the Maxwell Creek is based on increased rainfall due to climate change, which indicates that flood levels would increase by approximately 100mm to 200mm during the 1% AEP flood event. This will produce a minor increase to the design flood levels but no noticeable change in the flood plain mapping shown on RILEY Dwgs: 04816/6-FL1 and FL2. Similarly modelling results for Streams 1 and 2 indicate that only negligible increases in flood depth would be expected (up to 50mm). This is not expected to result in a significant increase in flooding.

MOE guidance also suggests that any increase in rainfall due to climate change should be incorporated into design flood levels. Currently a 1m freeboard has been allowed for above the 1% AEP. The minimum freeboard for habitable buildings required within NZS 4404 is 0.5m, although it is recommended that this should be increased for steeper catchments. As discussed within RILEY Flood Assessment Report (February 2011), a conservative additional 0.5m above the minimum freeboard has been recommended to account for the steepness of the catchment. It is considered that a possible increase of flood levels due to climate change within Maxwell Creek can also be provided within this increased freeboard height (i.e. within 1m freeboard).

A 1% AEP flood level of RL68.4m for the Taylor River upstream of the Taylor Dam has been used within the flood assessment. This level is equal to the emergency spillway level of the dam and was obtained from MDC. From further correspondence with Mr Brin Williman this 1% AEP flood level also accounts for expected climate change in the future (Appendix B). As mentioned above, a freeboard of 1m has been provided above the 1% AEP flood level within the flood assessment report.

Dwgs: 04819/6-FL1 to FL3 have been revised and attached within Appendix A. These have been updated with better contour information and clearly define the 1% AEP flood levels including 1m freeboard from the assessment. Minimum finished floor levels (FFL) for lots adjacent to the rivers have also been added to assist clarity.

Sediment Deposition

Sediment deposition within channels may lead to changes in channel morphology reducing the flood capacity of the channel. Within a river system, patterns of aggradation and degradation vary with both time and space, which makes changes to both channel morphology and flood-plain inundation hard to predict.

The smaller ephemeral streams within the development are expected to experience only minor sediment deposition within the next 50 years due to their limited time of flow. It would be expected that the majority of any sediment deposition in these streams would be located at their lower extents near their confluence with the Maxwell Creek and Taylor River channels where the bed slope flattens.

From correspondence with Mr Brin Williman there are currently no issues with sedimentation behind the Taylor Dam effecting storage capacities (Appendix B). Sediment is currently transported downstream through the operation culvert at the base of the dam. This would suggest that sediment deposition is only a minor issue within the Taylor River catchment, and that volumes of annual sediment yield are relatively small. Following from this, no significant loss of storage volume behind the dam would be expected within the next 50 years, particularly with regard to the proposed development, which would include devices to minimise sediment generation, such as water quality ponds, erosion protection, and re-vegetation in accordance with the Auckland Regional Council's technical publication No.10, 'Stormwater Treatment Devices Design Guidelines Manual' (ARC TP10). No significant impact on flood levels would be expected in the immediate future due to loss of dam reservoir storage from sediment deposition.

Sediment deposition of the Maxwell Creek within the proposed development is expected to be minor due to the relatively steep narrow channel, small catchment size, and generally small sediment size. Further scouring out of the existing channel and lowering of the bed level would be the primary process expected within this section of the creek channel over time. It is likely that the greatest area of sediment deposition will be at the confluence with the Taylor River where the creek bed is seen to widen. Any sediment that did deposit within the channel would be expected to be scoured out during flood events maintaining the capacity of the channel. Sediment deposition within the Maxwell Creek is expected to have little impact on its flood capacity within the next 50 years.

Question 4.2 - Stormwater System Sedimentation

Soil creep is considered to be a minor hazard for the development, which can be mitigated by using various techniques, such as installation of surface drains and subsoil drains to minimize infiltration and groundwater levels (where appropriate). Planting of appropriate vegetation will also help stabilize and dewater slopes. Similarly planting of vegetation along stream banks within the development will also reduce erosion and downstream sediment transport.

The stormwater system will be designed in accordance with current MDC engineering standards and the building code. To protect against blockage of the stormwater system from sediment entering the stormwater network, it is recommended the following measures be incorporated into the stormwater design:

- Catchpits incorporating appropriate sumps installed at collection points for runoff from the road and private accessways.
- The stormwater pipe network should be designed to ensure all pipes are able to pass flow at a minimum velocity to enable self-cleansing. This would be achieved by ensuring pipes are laid at suitable grades, e.g. a minimum gradient of at least 0.75%.
- Swales (if incorporated) should be designed and graded adequately to restrict sediment entry and protect against erosion.
- Lining of channels with competent rock for erosion protection and energy dissipation.
- Use of rock at culvert outlets for erosion protection and energy dissipation.

- Regular inspection and maintenance of the stormwater system.

These measures should ensure that loss of efficiency and blockages of the stormwater system will be minimised.

Question 4.4 - Flood Inundation and Protection

The extent of the estimated 1% AEP Floodplain (including 1 metre freeboard) is shown on RILEY Dwgs: 04819/6FL-1 to 3 (Appendix A). As mentioned earlier, minimum FFLs have also been added to show flood levels along the creek/river.

Within the Maxwell Creek area, the 1% AEP flood plain line is based on hydraulic modelling described within sections 6 and 7 of the RILEY Flood Assessment Report (February 2011). A 1m freeboard has been added above the 1% AEP flood level as discussed in section 3.2 of this report and Question 4.1 above. This has been proposed as the minimum FFL for habitable dwellings.

The lots situated to the north of Maxwell Creek along the right bank will be at risk from shallow overland flood flows due to overtopping of the constricted channel at the Maxwell Pass Road Bridge. The land along the right bank downstream of the bridge slopes in a downstream direction that is relatively flat in a north to south direction. Flow is likely to sheetflow across the north bank area before returning to the channel further downstream. Modelling results indicate that sufficient capacity is available within the channel immediately downstream of the bridge constriction to cater for the 1% AEP plus 1m freeboard flood level. It is proposed that a 150m long bund is provided to divert water that overtops the bridge along the right bank back into the channel immediately downstream as shown on Dwgs: 04819/6FL-1 to 3. Additional to the bund, raising of the road level should also be included to ensure flood flows do not outflank the bund. The bund and raising of the road will ensure that those properties along the right bank are not affected by overland flow due to overtopping of the Maxwell Pass Road Bridge.

The 1% AEP ponded flood level in the Taylor River adjacent to the site is RL 68.4m, which coincides with the Taylor Dam emergency spillway (from information supplied by MDC). The section of Taylor River adjacent to the site is controlled by the Taylor Dam. The dam crest level of RL 70.7m is 2.3m above the 1% AEP flood level of the dam. As per our response to Question 4.1 above, a 1m freeboard should be provided for habitable dwellings. Therefore, the design flood level within the Taylor River is RL 69.4m.

The 1% AEP flood level has also been modelled within the proposed development for Streams 1 and 2 (RILEY Dwg: 04819/6FL-1). The flood plain for these streams including 1% AEP plus 1m freeboard is also shown on the drawings.

RILEY Dwgs: 04819/6FL-1 and 2 have been updated and Dwg: 04819/6FL-3 added to better clarify the design flood plain for the Maxwell Creek, Taylor River, Stream 1, and Stream 2. Additional contours have also been provided for clarification.

Question 6 - Stormwater Assessment

Question 6.1 - Soakpit Construction

As discussed in our stormwater report, it is proposed that soak pits are used as a means of stormwater drainage for the lower lots adjacent to the Taylor River and Maxwell Creek. A limited number of test pits cover the proposed plan change area. The lower lots range from generally flat land through to land with slopes of up to 1 in 4 (14°). As discussed in our geotechnical report, groundwater was not encountered within the test pits and is generally expected to be at depths greater than 3m. For soakage pits to work adequately, soakage should be achieved into free draining gravels underlying the soil. The subsurface ground profile is described as predominantly silt material (loess) over Hillersden Gravel or Colluvium material. The silt layer varies in depth over the proposed development, from 0.1m to over 3m in depth below the ground surface. Review of the test pit logs indicates soakage potential will be variable, with some areas having potentially good soakage, with other areas marginal performance. Specific investigation will be required to confirm for individual lots whether soakage is practical and to determine the location and size of soak pits. This work should be completed during detailed engineering design of the proposed subdivision to confirm whether an alternative such as a reticulated network is necessary. As mentioned above, based on the limited number of test pits within the plan change boundary, we consider that soakage is possible in some locations; however, further specific investigation is required. Generally it is expected that where adequate soakage cannot be achieved, a reticulated stormwater system will be provided.

For those lots adjacent to watercourses they will discharge directly to the watercourse. Outlets to watercourses should be designed in accordance with the MDC engineering standards and Auckland Regional Council Technical Publication No. 10, "Stormwater treatment devices: Design guidelines manual", 2nd Edition, May 2003. The design should ensure a suitable outfall and dissipating structure is incorporated so to not impede flow or erode the waterway channel. No stormwater attenuation will be required due to the Taylor Dam being immediately downstream of the site.

Question 6.2 - Locating of Soakpits

As mentioned above, it is envisaged that soak pits will be used for stormwater disposal on the lower lots adjacent to the river and creek. These sites are generally on lots with gradients of less than 14° (1 in 4). Geotechnical investigation will be undertaken to ensure slope stability will not be affected from prospective soak pits. Should issues be identified, stormwater reticulation will be designed and installed. In concept, any soak pits will extend through the surficial silts and discharge to permeable gravels at depth and, therefore, not affect stability within the loess soils.

Question 6.3 - Secondary Flowpath Protection

It is anticipated that some secondary flowpaths within the site will require minor earthworks to assist flow. This is expected to be achieved through localised re-contouring of the site. Depending on the gradient of the secondary flowpaths, energy dissipation structures (check dams) or channel lining may be required to minimise effects from scour.

Question 6.4 - Flowpath Easements

Overland flowpaths to cater for the 1% AEP flood event will ideally use roads and designated corridors. The use of roads as secondary flowpaths is an accepted practice by MDC. Overland flowpaths along property boundaries will require designated easements to protect these areas. These easements will be sized to accommodate the overland flow width for a 1% AEP flood event. RILEY Dwgs: 04819/6SW-1 to 4 have been updated to show indicative legal easements where secondary flowpaths are located through private lots.

Question 6.5 - Future Stormwater Catchments

This note has been removed from the revised RILEY Stormwater Report (Issue 3) as there is currently no plan to increase the development area above that of the proposed plan change area.

The layout of individual lots for the proposed development has not been finalized including total impermeable areas within each catchment. The design is preliminary with ponds sized as listed within table 2 of the RILEY Stormwater Report (Ref: 04819/6SW-A, Issue 3 dated 4 November 2011) for the preliminary development scenario shown within RILEY Dwgs: 04819/6SW-1 to 4.

Question 6.6 - Stormwater Quality

Stormwater will predominately drain to water quality ponds via a piped stormwater system apart from those lots that do not connect into the pipe system. The sites with no pipe connection will either discharge stormwater to on-site soakage or directly to a watercourse. Water quality issues from runoff are primarily related to water off public roads, due to contaminants from vehicles, such as metals, hydrocarbons, and sediment. As previously mentioned this water will pass through stormwater treatment ponds designed in accordance with ARC TP10 to mitigate effects on water quality in the downstream environment.

Stormwater runoff from private residential property is considered to be less of an issue and can be broken into two components, runoff from roofs and runoff from driveways. Certain roofing materials can create a source of zinc and copper contaminants which can have residual toxic effects within aquatic receiving environments. It is recommended that only inert (non-toxic) roofing materials be permitted to address this issue and uncoated galvanised roofing material not be allowed.

For impervious driveway and parking areas, contaminants similar to public roads are generated, but in less quantities. To mitigate the effects of runoff from these areas it is recommended that provision be made for use of grass swales, grass filter strips, or filtration devices such as Enviropods. Contaminant potential is not high; however, mitigation devices such as these will reduce the cumulative effects generated from the proposed development.

It is recommended that runoff that is to be drained to soakage include the above devices, plus sediment traps such as catchpits with sumps to collect potential contaminated sediment runoff. These will protect the soak pits from premature blockage due to sedimentation and also the possible discharge of contaminates to groundwater. Provided the above treatment and mitigating measures are utilised, it is considered that there will be minimal impacts on the downstream water quality.

Question 6.7 - Impervious Area Determination

Within Table 4 of the RILEY Stormwater Report (Ref: 04819/6SW-A, Issue 3 dated 4 November 2011) roofed areas of dwellings have been included for within the land type: sealed roads, roof and hardstand areas (600m^2/lot).

Reply to Additional Comments from Mr Brin Williman

Flood Map

The flood assessment map RILEY Dwg: 04819/6FL-1 has been amended to include the Taylor Dam, with reference to its crest level (RL 70.7m) and the emergency spillway (RL 68.4m). The 1% AEP flood plain level as provided by MDC (Mr Brin Williman) is shown as a blue line extending alongside the Taylor River and into the proposed plan change area (i.e. it crosses Taylor Pass Road onto the lower parts of the proposed plan change area). The flood plain also extends up into the Maxwell Creek tributary, merging with the modelled 1% AEP flood plain of the creek. A direct analysis of the Taylor River flood levels was not undertaken as the section of river near the site is controlled by the Taylor Dam. As previously mentioned, all flood plain levels include an additional 1m freeboard. Two further drawings have been amended and included to show proposed minimum FFLs adjacent to the Taylor River and Maxwell Creek, RILEY Dwgs: 04819/6FL-2 and 3. Note the FFLs are the same as the adjacent 1% AEP flood level line (including 1m freeboard).

The basis of the 1% AEP modelled flood plain, including 1m freeboard, has been explained in Question 4.1. As discussed in our flood assessment report, RILEY Ref: 04819/6FL-A, the assessment was estimated using three methods, the Rational Method, Regional Method (McKercher & Pearson 1989) and TM61. The hydraulic assessment was undertaken using HEC-RAS modelling software.

As previously discussed the philosophy of stormwater management has been discussed with MDC (Mr Brin Williman in 2006) prior to RILEY commencing assessment of flood flows in the Taylor River and Maxwell Creek. The agreed management of stormwater runoff from the site was that no storage or attenuation was required due to the Taylor Dam being able to cope with any increase in flow from the proposed development site. Note at the time (2006), this included potential development of 286ha of the site. This has since been reduced to the current proposed plan change area of 49.9ha. As such, the basis of stormwater management for the site has been developed so that the main focus of the preliminary design has been to provide techniques to mitigate the effects of the proposed development on downstream water quality. A summary of the proposed mitigation techniques is provided below in the section titled, 'Stormwater Report, Phase 2 – Permanent Stormwater Treatment and Erosion Protection Measures'.

Coordination of Recommendations

Stormwater

As discussed in the geotechnical report the loess soils found in this area are susceptible to erosion and slumping. Design of overland flowpaths, culverts, and pipe outlets within the development will include consideration of erosion and scour potential. Measures such as those discussed in Question 6.3 will be employed. Other measures may include use of reno mattresses, gabion baskets, geotextile fabrics, and energy dissipation devices. Consideration of flow velocities and gradients will be important to minimise the effects of concentrated stormwater flows.

Provision for runoff from the catchment above the plan change area, should be made to allow existing overland flow to continue through the developed area as shown on RILEY Dwgs: 04819/6SW-1 to 4. A number of overland flowpaths have been identified with water passing along roads or easements created along residential boundaries. All stormwater runoff from the catchment above the proposed plan change area will bypass the piped network and treatment ponds. Stormwater from the upper catchment will cross the road network either through a culvert for up to the 1% AEP event or as overland flow via localised depressions in the road network. Overland flow from the upper catchment will ultimately discharge directly to the Maxwell Creek or Taylor River.

Geotechnical

Soil creep is generally considered to occur periodically due to elevated ground moisture, and may be associated with seasonal changes in ground moisture. Soil creep is considered a minor hazard, which can be effectively mitigated by using the following techniques:

- Retaining walls to stabilise cuts.
- Installing foundations into underlying competent material.
- Installing surface drains and subsoil drains to control groundwater levels.
- Planting dense shrub vegetation in soil creep areas to help dewater the slope and increase stability through root-binding effects.

Tunnel gully erosion at the site is prevalent; however, is not considered to preclude residential development in affected areas. Foundation undermining is considered the most affected feature of development. However, environmentally sensitive developments have been successfully completed in erosion prone (loess) soils in other areas (e.g. Christchurch Port Hills) and it is considered that residential development, along with associated surface and groundwater control, rehabilitation planting, and retention measures, would substantially reduce the erosion and improve the long-term stability of tunnel gully affected areas.

All filling in loess/colluvial soils should utilise chemically stabilised fill, and underfill drainage with suitable backfill to maximise internal erosion. The risk of new gully erosion structures forming can be significantly reduced through the planting of low-lying shrubs or woody vegetation in selected areas to reduce the seasonal moisture variations in erodible soils on north aspect slopes. Vegetation helps prevent seasonal desiccation cracks and thereby stops a principle infiltration route for surface water to the dispersive subsoil layers.

Specific recommendations are made in our geotechnical report for the maximum gradients of cut and fill slopes for each soil type. In all cases re-vegetation of exposed soil faces is recommended as soon as possible after the cut and fill slopes have been completed. As part of any significant earthworks, it is recommended that erosion and sediment control measures in accordance with the ARC 'Guidelines for Land Disturbing Activities' Technical Publication 90 are implemented.

Stormwater Report

Mitigation measures to prevent degradation of downstream water quality should be broken into two phases; Phase 1 being the temporary erosion and sediment control for the land disturbing activities that will take place during construction of the development, and Phase 2 being the permanent stormwater treatment and erosion protection measures to be in place once the development has been constructed. The following recommendations and measures are listed below for each phase –

Phase 1 – Construction Mitigation Measures

The general principles adopted during the earthworks activities, which should be incorporated into the Erosion & Sediment Control Plan (E&SCP), are as follows:

- Minimise the disturbed area due to earthwork activities as practically possible, while satisfying all requirements for development of the site.
- Where possible, stage earthworks and progressively stabilise exposed areas following completion.
- Where possible, divert all clean water runoff away from the site, thus reducing the contributing catchment to the exposed earthwork areas only and eliminating any clean water catchment.
- Intercept and divert sediment-laden runoff from exposed areas to vegetated verges where the courser sediments can settle out.
- Implement measures to prevent construction traffic exiting the construction area onto public roads with sediment and other materials attached to the undercarriage and tyres.
- Regularly inspect the erosion and sediment control measures, and undertake any maintenance necessary to maximise the potential retention of sediment on the site.
- In the event of forecast heavy rain, stabilise the site as far as practically possible and close works down.
- Ongoing assessment of the efficiency and adequacy of the erosion and sediment control measures and, if required, adjustment of these measures to improve efficiency as the work progresses.
- Ensure the site staff is aware of the requirements of the E&SCP and the relevant resource consent conditions prior to the works commencing.

These principles are generally in accordance with ARC TP90.

Phase 2 - Permanent Stormwater Treatment and Erosion Protection Measures

The measures proposed below are in accordance with MDC engineering standards and ARC TP10. The following recommendations and measures are proposed:

- Separation and diversion of all stormwater runoff from the catchment above from the infrastructure proposed for the plan change area.
- Separation of runoff should be achieved through the creation of diversion bunds above the plan change boundary and diversion of water to overland flowpaths using easements or public roads.
- Where required, based on velocities and gradients of diversion bunds and flowpaths, erosion protection and energy dissipation measures should be provided. These could include the use of, but not limited to, measures such as reno mattresses, gabion baskets, geotextile fabrics, check dams, and rock lining.
- Where possible within the proposed plan change area, stormwater runoff up to the 10% AEP event will be collected into a reticulated pipe network and drained to a treatment pond.
- Water quality ponds will be provided for treatment of run-off from impervious areas of the proposed development.

- The areas of the development that are unable to be drained by the reticulated network (residential lots) will utilise soak pits or discharge directly to a watercourse. Note these areas are the lower lots close to the Taylor River or Maxwell Creek.
- On-site residential specific stormwater mitigation measures could include use of inert roofing materials, grass swales, grass filter strips, or filtration devices such as Enviropods.
- As mentioned above, overland flowpaths for the 1% AEP event within the plan change area should include measures for erosion protection and energy dissipation. These could include the use of, but not limited to, measures such as reno mattresses, gabion baskets, geotextile fabrics, check dams, and rock lining.
- Designated routes for overland flowpaths should remain clear of obstructions.
- Additional planting of trees and vegetation both within the proposed development and upslope will help reduce stormwater runoff and help prevent soil erosion.

Time of Concentration

The rational method has been used to calculate stormwater runoff from the site which is considered to be both conservative and the most appropriate method for a rural development of this size. In line with this method, normal practice is to use a minimum time of concentration of 10 minutes. A minimum time of concentration of 10 minutes has been used for both pre and post-development situations due to the relatively short flowpaths. This also coincides with the minimum duration of rainfall depth provided by HIRDS software. It is considered that using a minimum time of concentration of less than 10 minutes will be overly conservative for this development. Though development of roads will create clear flowpaths that will further channelize flow, it is expected that these will also lead to an increase in the length of flowpaths over the site above that of the existing situation.

Question 7 - Wastewater Disposal

Question 7.1 and 7.2 - Treatment Plant Construction

Discussions with regard to grinder pumps within the report were only included to offer a potential alternative to the STEP/STEG system proposed. If a grinder pump solution was to be installed, which has now been excluded from the design, it would be a wholly grinder pump system. It was never anticipated to provide a mixed system of these technologies.

In conclusion, the proposed system will be STEP/STEG based only (i.e. no grinder systems). These interceptor tanks on the residential lots will discharge into an effluent sewer that will ultimately discharge to a blend tank located at the central treatment plant.

Question 7.3 - Soil Classification and Discharge Loading Rate

The information requested with regards to the soil assessment was prepared within the geotechnical assessment prepared by RILEY and summarised within the wastewater report. The irrigation/areal loading rates are based on a conservative soil inspection and morphological classification (as per ARC TP58[5] methodology) rather than AS:NZS 2000[6] recommendations or permeability testing. The information presented in the report has been expanded below.

[5] Auckland Council (formerly Auckland Regional Council) Technical Publication No. 58 "On-site Wastewater Systems: Design and Management Manual", Third Edition, August 2004

[6] Australian/New Zealand Standard (AS/NZS), "On-Site Domestic-Wastewater Management", Ref 1547:2000.

The soil types on the site can be broadly classified into two categories based on the subsurface soil type and slopes; these are the highland slopes and Taylor River lowlands.

Highland Slopes

The subsurface soils (alluvial and colluvial silts) in these upper irrigation areas are steep (20° 30°) and are categorised as moderate to slow draining and, therefore, require low areal loading rates.

Soil testing in these areas is covered by TP45a-c, TP116, TP117, TP123 and TP124.

From the geotechnical report and plans the geology of this area is described as:

> Colluvium: variable composition but predominantly a firm to stiff, brown, dry to moist, sandy clayey silt, locally with some gravel to boulders. Locally becomes a sandy clay. Fine grained component typically re-worked loess. Lithology includes limited undifferentiated insitu loess deposits. Colluvium thickness generally increases toward the base of slopes; it is generally absent near ridgelines, <1.5m thick on mid-slope areas, and locally over4m thick in gully heads and bases.

The near surface soils would be classified as Category 4 (clay loams) to 5 (light clays) in accordance with AS:NZS 1547:2000 with an indicative permeability of between 0.06m/d and 1.5m/d. In accordance with this standard, a suitable Design Irrigation Rate (DIR) of 20mm/week to 25mm/week (this is equivalent of an average of 2.9mm/day to 3.6mm/day) would be considered suitable for the proposed advanced secondary treated effluent to be discharged.

As outlined in the report, the proposed discharge area does not provide perfect drainage conditions due to:

- The discharge slopes are moderate sloping to steep, therefore, required additional lateral spacing and setbacks to watercourses (i.e. minimum of a 20m horizontal setback from any adjacent watercourse) to mitigate against surface runoff.
- During the winter months some of the south facing slopes are exposed to low levels of sunlight and, therefore, experience reduced evapotranspiration.

This creates a requirement for a reduced DIR and, therefore, a more extensive land application area than that required by free-draining soils on lower slopes or on the north facing sites. Any area developed for the discharge of treated wastewater will be suitably planted to improve nutrient uptake and evapotranspiration of the discharge effluent.

Based on the above discharge rates, a minimum area (excluding reserve areas) of 4.4ha to 5.5ha would be required in this Highland Slopes area. The plan included within the wastewater application shows a total of 19ha that is considered suitable for the establishment as wastewater land application areas.

Lowlands

Soil types on the lower irrigation area, adjacent to the Taylor River are similar geological origins, but tend to include a greater fraction of gravels which increases their permeability and have slope 0 to 5°.

From the geotechnical report and plans the geology of this area is described as:

> Alluvium: variable composition, typically of compact silty sandy gravel, with local cobbles and boulders of sub-rounded slightly weathered, strong greywacke. Underlies terrace surfaces, which are commonly capped with <1.5m interbedded with colluvium adjacent at slope bases.

The near surface soils would be classified as Category 2 (sandy loams) to 3 (loams) in accordance with AS:NZS 1547:2000 with an indicative permeability of between 0.5 and 3m/d. In accordance with this standard, a suitable DIR of 28mm/week to 35mm/week (4mm/d to 5mm/d) would be considered suitable for the proposed advanced secondary treated effluent to be discharged.

As outlined in the design report, these soil types tend to include a greater fraction of gravels which increases their permeability and, therefore, the soil DIR has potential to be limited by nutrient treatment capacity, rather the hydraulic capacity. Any area developed for the discharge of treated wastewater will be suitably planted to improve nutrient uptake and storage within these more porous soils.

Based on hydraulic considerations only, a DIR of 4mm to 5mm/day is recommended based on the soils present on the site and the site topology. However, following the preliminary nutrient analysis undertaken by Rob Potts (refer response to question 7.4, below) the need to mitigate against nutrient leaching through the soils and maximise nutrient uptake from the proposed plantings, and these also require a loading rate of between 4mm to 5mm/day.

This rate will require a lowland designated discharge area of between 3.2ha to 4ha, which is roughly equivalent to the existing designated area of 3.36ha (greater area is available in the lowland region). The final discharge area location and size will be determined during the Discharge Consent application.

Question 7.4 - Nutrient Assessment

It is ultimately proposed to construct a full nutrient balance as part of a detailed discharge consent application that will be prepared by an environmental scientist. This balance will show how nutrient discharge levels will be managed to ensure the net effect on the catchment that contains the site will not be adversely effected by the proposed discharge.

At this stage, a preliminary assessment of the nitrogen balance has been prepared by Mr Rob Potts of CPG NZ Limited and has been appended (appendix C) to provide a response to this request.

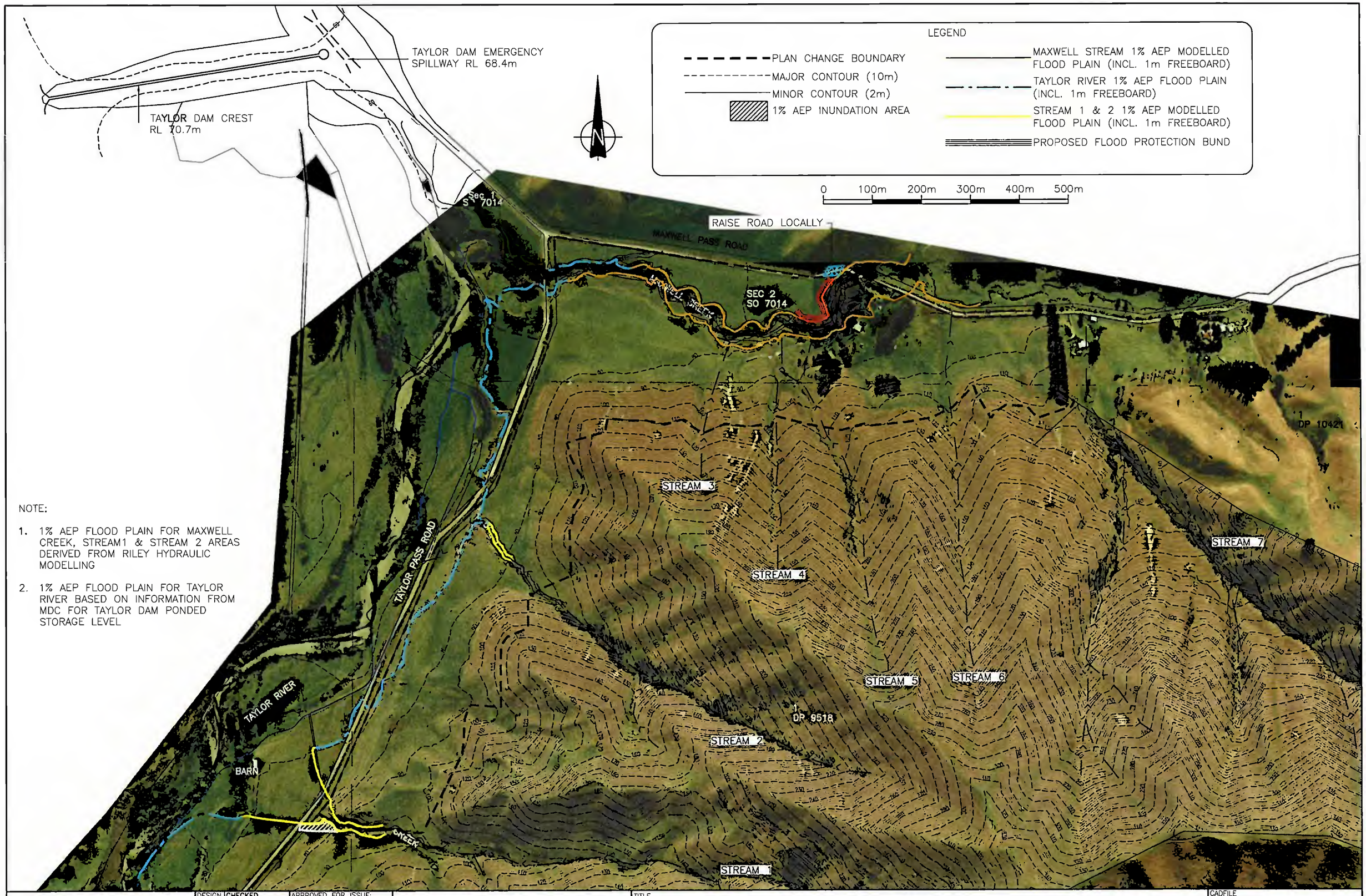
Limitation

This report has been prepared solely for the benefit of Kapiti Views Trust as our client with respect to the brief and Marlborough District Council in processing the consents. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such parties' sole risk.

Recommendations and opinions in this report are based on data from limited test positions. The nature and continuity of subsoil conditions away from the test positions are inferred, and it must be appreciated that actual conditions could vary considerably from the assumed model.

APPENDIX A

Drawings



NOTE:

1. 1% AEP FLOOD PLAIN FOR MAXWELL CREEK, STREAM1 & STREAM 2 AREAS DERIVED FROM RILEY HYDRAULIC MODELLING
2. 1% AEP FLOOD PLAIN FOR TAYLOR RIVER BASED ON INFORMATION FROM MDC FOR TAYLOR DAM PONDED STORAGE LEVEL

REV	DESCRIPTION	BY	DATE
0	FIRST ISSUE		

DESIGN WS | CHECKED WJ
DRAWN MP | CHECKED
DATE DRAWN AUG. 2011

APPROVED FOR ISSUE:
DATE: 6/10/11

RILEY CONSULTANTS
P.O.BOX 100 253
N.S.M.C.
AUCKLAND
TEL. 09-4897872
FAX. 09-4897873

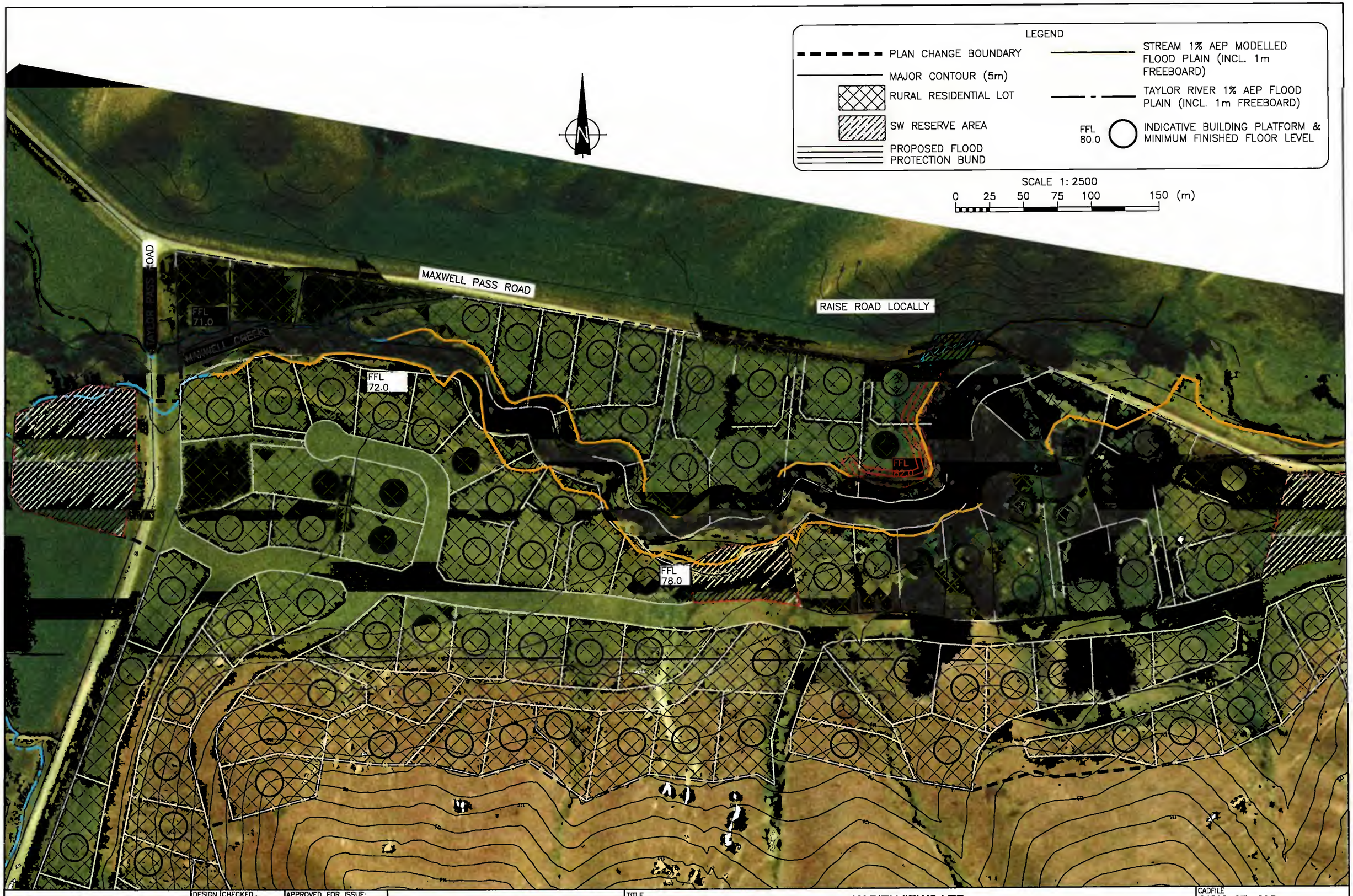
TITLE

KAPITI VIEWS LTD.

RURAL RESIDENTIAL DEVELOPMENT - PRIVATE PLAN CHANGE

FLOOD ASSESSMENT

CADFILE 04819_6FL-1
SCALES (A3) AS SHOWN
ACENZ
DRAWING No. 04819/6FL-1
REV. 0



REV	DESCRIPTION	BY	DATE
1	8m Easement deleted	MP	28.10.11
D	FIRST ISSUE		

DESIGN: WS | CHECKED
DRAWN: MP | CHECKED
DATE DRAWN: AUG. 2011

APPROVED FOR ISSUE:
DATE: 28/10/11

RILEY CONSULTANTS
P.O.BOX 100 253
N.S.M.C.
AUCKLAND
TEL. 09-4897872
FAX. 09-4897873

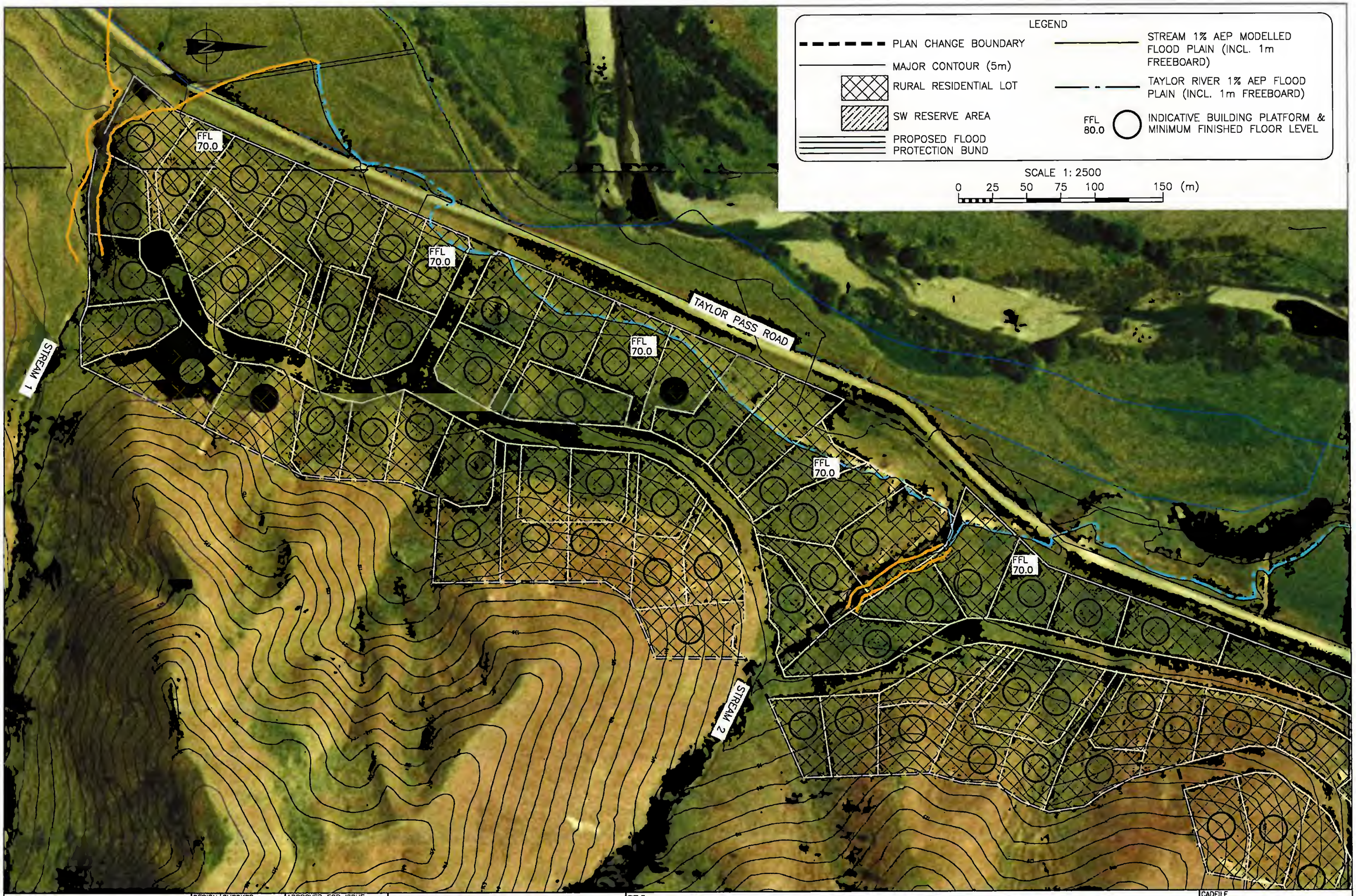
TITLE

KAPITI VIEWS LTD.

RURAL RESIDENTIAL DEVELOPMENT - PRIVATE PLAN CHANGE

MITIGATED FLOOD PLAN - SHEET 1 OF 2

CADFILE: 04819_6FL-2&3
SCALES (A3): 1:2500
DRAWING No.: 04819/6FL-2
REV.: 1
ACENZ



REV	DESCRIPTION	BY	DATE
1	8m Easement deleted	MP	28.10.11
0	FIRST ISSUE		

DESIGN WS | CHECKED
DRAWN MP | CHECKED
DATE DRAWN AUG. 2011

APPROVED FOR ISSUE:

DATE: 22/10/11

RILEY CONSULTANTS
P.O.BOX 100 253
N.S.M.C.
AUCKLAND
TEL. 09-4897872
FAX. 09-4897873

TITLE

KAPITI VIEWS LTD.

RURAL RESIDENTIAL DEVELOPMENT - PRIVATE PLAN CHANGE

MITIGATED FLOOD PLAN - SHEET 2 OF 2

CADFILE 04819_6FL-2&3
SCALES (A3) 1:2500
ACENZ
DRAWING No. 04819/6FL-3
REV. 1

APPENDIX B

MDC Email Correspondence

William Stringer

From: Brin Williman-8467 [Brin.Williman@marlborough.govt.nz]
Sent: Wednesday, 24 August 2011 4:57 p.m.
To: William Stringer
Subject: RE: Taylor Dam query
Follow Up Flag: Follow up
Flag Status: Completed

Will

Answers attahced.

If you want to clarify issues give me a phone call. I have given consisderable study to the hydrology and hydraulics of the Taylor dam.

Brin Williman FIPENZ CPEng
Rivers & Drainage Engineer
Marlborough District Council
03 520 7442
021 917 947

From: William Stringer [mailto:]
Sent: Wednesday, 24 August 2011 9:42 a.m.
To: Roger Fitzgerald-8459
Subject: Taylor Dam query

Roger,

Was passed your email from call centre as you may be able to help with a couple of queries on Taylor Dam. Currently I'm looking into providing further information to MDC for a flood assessment report for proposed private plan change for Maxwell Hills 1km upstream of the Taylor Dam alongside the Taylor River and Maxwell Creek. If possible I would like to gain some more information from council regarding the following:

- Sedimentation issues with the river channel/reservoir upstream of the Taylor Dam which would be expected to reduce reservoir capacity in the future. Are there any existing issues or ongoing maintenance currently required? There are no issues with sedimentation affecting the storage volume of the Taylor dam. the small smount of sediment gets carried through the operational culvert which takes an annual flood size beofre any backing up and detentin storage coming into play.
- As we understand it the 1% AEP flood level is equal to the emergency spillway weir level of 68.4mRL for a flow of approximately 320 m3/s. The calculated 1% flood is a little below emergency spilllway crest at the moment. Does this flow and level account for expected increases in climate change in the future? Yes. Considerable studies have been done on the dam hydrology and hydraulics. If not is any information available from council of what expected increase in reservoir level behind the dam may be for increases due to climate change in the future or smaller % AEP flood events. Our best information at the moment is that climate change may reduce design flood sizes by 15%, and not increase it. But we are giving no weight to this information.

Cheers,

Will

William Stringer
Civil Engineer
Riley Consultants Ltd

RILEY CONSULTANTS

PO Box 100253, NSMC 0745
Level 2, 4 Fred Thomas Drive, Takapuna 0622
Tel: +649 489 7872
Fax: +64 9 489 7873
Email: wstringer@riley.co.nz
Web: www.riley.co.nz

No of attachments: 0

Riley Consultants Limited (RILEY)

Have you visited our website? - http://www.riley.co.nz/

William Stringer

From: Janice Carter [Janice.Carter@nz.cpg-global.com]
Sent: Friday, 12 August 2011 4:12 p.m.
To: Grant Fleming; John Marris (jandamarris@xtra.co.nz)
Subject: FW: Maxwell Hills Plan Change-RFI flooding

Hi Grant

See below the response from MDC in relation to the question on the depth of information required on the flooding issue, note they confirm that more modelling is not required. There are further questions here, however, that Paul Whyte from Beca is suggesting we treat as part of the RFI and address in our response. If you consider answering these questions will add to your costing please discuss this with John. There is the question at the end from Brin Williams on whether the mitigation methods should be added as rules in the Schedule of changes which I will discuss further with John.

Regards

Janice

Janice Carter
CPG New Zealand Ltd
T +64 3 374 6515 | **M** +64 21 032 9746
Level 1, 55 Shands Road, Hornby, PO Box 13-875, Christchurch 8042, New Zealand

cpg-global.com

From: Paul Whyte [mailto:paul.whyte@beca.com]
Sent: Friday, 12 August 2011 3:55 p.m.
To: Janice Carter
Cc: Mark Caldwell-8225 (Mark.Caldwell@marlborough.govt.nz); Pere Hawes (Pere.Hawes@marlborough.govt.nz)
Subject: Maxwell Hills Plan Change-RFI flooding

Janice
Further to our previous discussions I attach comments from Brin Williman, MDC Rivers Planning Engineer, in respect of flooding which is addressed in the first bullet point.

Brin has also commented on other aspects of the development in terms of stormwater and geotechnical issues. I believe it is useful to address these matters in your response to the request for further information.

Please do not hesitate to contact me if you wish to discuss

Regards

Paul Whyte
Associate (Planning)
Beca
Phone +64-3-366 3521 Fax =64-3-366 3188
DDI: +64-3- 374 3180 Mobile 0274 723675
paul.whyte@beca.com
www.beca.com

COMMENTS OF BRIN WILLIMAN

- **Flood map.** Plan 04819/6FL-1 is a key plan. It needs to be referred specifically to in Appendix G zone proposed rules - it has not been so far. This plan is also deficient. It needs to depict the Taylor dam crest for the whole plan map area - it currently does not. The basis for the "1 % AEP Modeled Floodplain Line (including 1 metre freeboard)" needs to be explained in the text. The basis for the line in the Maxwell creek area has been modeled, so as to provide the basis for the postioning of the line. No explanation has been provided for the basis of the drawing of the line in the Taylor river area. Almost certainly it is following the boundary of the flood detention dam top ponded water level. A plan showing the contours for the area and the depicting the dam crest level contour should be adequate information.

- **Coordination of recommendations of Geotechnical Assessment (Appendix E); Flood Assessment (Appendix A); and Stormwater Report (Appendix H).** The Geotechnical report identifies that stormwater control is critical to control of tunnel gully erosion and other soil erosion or slumping problems. The Geotechnical report also alludes to the potential of significant excavation to achieve house founding levels - thus producing an increase of steep cut faces and also disposal of surplus earth which will also increase the possibility of soil erosion and deposition in rain events. The Geotechical report indicates that these problems are addressed by the Stormwater report. These issues are **not** addressed in the stormwater report.

Similarly the Flood Assessment identifies that overland flow from upstream slopes needs to be coped with, mentins the need for cutoff drains, and states that the issue is discussed in more detail in the Stormwater Report. It is **not** covered in detail in the Stormwater report.

- **Stormwater Report (Appendix H).** It is unclear as to what mitigation measures are being recommended, especially with regard to the crucial issue of erosion and sedimentation. I also do not agree with the assessment of pre and post development stormwater flow situations. I consider that the development will create roads and driveways as stormwater channels that will shorten the time of concentration to less than the existing situation, and this will be another factor in the development increasing the stormwater runoff.

- **Inclusion of mitigation methods into Schedule of Changes (Appendix G).** This is a crucial requirement to ensure that recommended mitigation methods of the Flood Assessment, Stormwater Report and Geotechnical Reports are effectively encapsulated into plan rules. In my viewpoint this has **not** been done adequately. It has been made more difficult by unclear nature of the recommendations of the Stormwater report.

Brin Williman FIPENZ CPEng
Rivers Planning Engineer
Marlborough District Council
03 520 7442
021 917 947

. ----------

Jason Budd

From: Paul Rivett
Sent: Wednesday, 7 September 2011 9:22 a.m.
To: Jason Budd
Subject: FW: Taylor River R780-02 Maxwell Hills Subdivision

From: Paul Rivett
Sent: Friday, 1 December 2006 8:58 a.m.
To: Ed Ladley; Paul Morgan
Subject: FW: Taylor River R780-02 Maxwell Hills Subdivision

Confirmation of no attenuation/storage. Although as he says the public process may be different, but at least it has the backing from the Council.

From: Brin Williman-8467 [mailto:Brin.Williman@marlborough.govt.nz]
Sent: Friday, 1 December 2006 8:52 a.m.
To: Paul Rivett
Cc: zFile - Records
Subject: RE: Taylor River R780-02 Maxwell Hills Subdivision

Paul

The flood flows in the Taylor are up to 300 m3/sec. I have no probllems with the small increase in discharge resulting from the Maxwell Hills subdivision development and that attenuation/storage of such stormwater is irrelevant.

The resource consent application for such discharge is however a public process so my viewpoint is not the final say.

Brin Williman CPEng
Rivers & Drainage Engineer
Marlborough District Council
03 577 2522
021 917 947

From: Paul Rivett [mailto:privett@riley.co.nz]
Sent: Thursday, 30 November 2006 4:59 p.m.
To: Brin Williman-8467
Subject: 04819/3SW Maxwell Hills Subdivision

Brin

Thank you for discussing the Taylor Dam earlier today.

It sounded like you were familiar with the subdivision in the Maxwell Hills that we are working on. During our conversation you mentioned that stormwater from the subdivision could be discharged into the Taylor River, and that no storage or attenuation of flows would be necessary as the river/dam could cope with whatever comes out of the subdivision. Can you please confirm that post-development flows can discharge to the Taylor River without storage or attenuation, but with suitable erosion protection at the outlets.

Regards,

Paul Rivett
Civil Engineer
Riley Consultants Ltd

PO Box 4355
1st floor, 56 Cashel Street
Christchurch 8140

Ph: 03 379-4402
Fax: 03 379-4403
e-mail: privett@riley.co.nz
web: www.riley.co.nz

RILEY
CONSULTANTS

APPENDIX C

Nitrogen Modelling Letter, prepared by Rob Potts, CPG NZ Ltd

31 October 2011

CPG NZ Limited
PO Box 13875
CHRISTCHURCH

Attention: Janice Carter

Dear Janice

Kapiti Views Trust, Maxwell Pass Plan Change – Response re Nitrogen Modelling

As requested by the client, we have been requested to assist Riley's with the nitrogen balance for the proposed development. We see this as being a two phased assessment: Phase 1 with sufficient details for a Plan Change, i.e. to give comfort that effects are likely to be minor; and Phase 2 with sufficient detail to satisfy an assessment of effects for a discharge consent.

This response is for Phase 1. It is response to the Paul Whyte request for information (received 13 July 2011) and deals specifically with Section 7 (Wastewater Disposal), Subsection 4 on the nutrient balance. The comments made in the P. Whyte letter (a) – (e) all revolve around the lack of a nutrient model/balance for the land application areas. This is addressed under the various headings below.

Design Irrigation Rates

In order to meet likely long-term nitrogen (N) loading requirements, the DIR on the flatter areas will also be in the order of 2 – 5 mm/d, i.e. similar to the hill areas. This gives an annual N loading to the land treatment area (LTA) of about 150 – 365 kg N/ha/yr which is in the acceptable range of loading depending on the final land use.

This means the area requirements are in the order of 3.2 - 8 ha plus buffer areas. Reserve areas are not required for community systems as these are managed and monitored systems; reserve areas are a requirement for individual on-site systems as per AS/NZS1547 that have minimal management and monitoring.

The final selection of DIR will be a function of the LTA selected (hill or lowlands) and land use (cut and carry, grazed, etc).

Land Use

The final land use of the LTA is important in the N budget.

The lowland areas are able to accommodate a number of land use scenarios, such as pasture/grazed (about 200 kg N/ha/yr loading generally acceptable), pasture/cut and carry (350+ kg N/ha/yr loading generally acceptable), pasture/cut and leave (about 100 kg N/ha/yr generally acceptable), coppicing eucalypts or willows (about 250 kg N/ha/yr generally acceptable).

The land use on the hill areas is constrained due to the topography. Coppicing trees being the most likely option.

In discussion with John Marris, the following land uses are acceptable to the development:

1. Hill areas – coppicing eucalyptus plantation;
2. Lowlands – grazed pasture.

N Budget

Predevelopment

The farmed area is currently running about 10 – 12 SU/ha of beef cattle, which equates to about 2.2 – 2.7 beef cattle/ha (based on 400 kg animals). From modelling work we have done in Canterbury and Otago, leaching of N (using the AgResearch Overseer Model and Developed Soils rather than Highly Developed as Overseer is not calibrated for Highly Developed) for 10 - 12 SU dryland beef is 7 - 8 kg N/ha/yr being leached.

Therefore, for 50 ha of land, there is approximately 350 – 400 kg N/yr currently being leached.

Post-development

As the N balance is based on annual figures, the annual average N concentration and the annual average effluent flow should be used. The average annual dry weather flow is likely to be in the order of 100 m^3/d, based on 3 people/dwelling, 200 L/d/person and 160 dwellings. Also, the rtPBR effluent quality of 20 mg/L is a maximum rather than an average. In periods of lower utilisation and also warmer temperatures, the N concentration of the effluent could be in the order of 15 mg/L or lower.

These average values will be further developed in Phase 2. Phase 1 takes the conservative approach in assuming the maximum effluent N concentration and the peak flow are annual averages, i.e. 20 mg/L N in the effluent and 160 m^3/day flow for 365 days/year.

Therefore, the loading from the treatment plant (assuming an annual mean daily flow of 160 m^3/d and an average N concentration of 20 mg/L), gives an annual load of 1,168 kg N/yr. Note this is loading not leaching. From simple soil N modelling (taking into account plant uptake, volatilisation, denitrification and microbe use) and the loading figures given above for the proposed land uses, the likely N leaching from the soil is:

HILL AREA

i. Loading of 1,168 over 4 ha (4 mm/d) is 292 kg N/ha/yr. With biomass harvesting of 10,000 kg DM of eucalypts at 3% N, the model gives 89 kg N/ha/yr leached, or a total leached mass of 356 kg N. This is in the same order of the predevelopment mass leached;

ii. Loading of 1,168 kg N over 5 ha is 234 kg N/ha/yr. With biomass harvesting of 10,000 kg DM of eucalypts at 3% N, the model gives 73 kg N/ha/yr leached, or a total leached mass of 365 kg N. This is in the same order of the predevelopment mass leached;

iii. Loading of 1,168 kg N over 6 ha is 195 kg N/ha/yr. With biomass harvesting of 10,000 kg DM of eucalypts at 3% N, the model gives 62 kg N/ha/yr leached, or a total leached mass of 372 kg N. This is in the same order of the predevelopment mass leached; and

iv. Loading of 1,168 over 8 ha (2 mm/d) is 146 kg N/ha/yr. With biomass harvesting of 10,000 kg DM of eucalypts at 3% N, the model gives 48 kg N/ha/yr leached, or a total

leached mass of 384 kg N. This is in the same order of the predevelopment mass leached.

Therefore, if the total land treatment area was based in the hills, then post development N leaching is likely to be very similar to predevelopment N leaching. Further model refinements, with less conservative assumptions, during the discharge consent application is likely to see the post development N leaching less than the predevelopment leaching. For the meantime, an allowance of approximately 4 - 5 ha should be made.

LOWLAND AREA

i. Loading of 1,168 over 3.2 ha (5 mm/d) is 365 kg N/ha/yr. With biomass production of 16,000 kg DM at 2.5% N and 85% of this utilised by grazing sheep, the model gives 90 kg N/ha/yr leached, or a total leached mass of 288 kg N. This is significantly less than the predevelopment mass leached;

ii. Loading of 1,168 over 5 ha (3.2 mm/d) is 234 kg N/ha/yr. With biomass production of 16,000 kg DM at 2.5% N and 85% of this utilised by grazing sheep, the model gives 58 kg N/ha/yr leached, or a total leached mass of 290 kg N. This is less than the predevelopment mass leached;

iii. Loading of 1,168 over 6 ha (2.7 mm/d) is 195 kg N/ha/yr. With biomass production of 16,000 kg DM at 2.5% N and 85% of this utilised by grazing sheep, the model gives 47 kg N/ha/yr leached, or a total leached mass of 282 kg N. This is less than the predevelopment mass leached; and

iv. Loading of 1,168 over 8 ha (2 mm/d) is 146 kg N/ha/yr. With biomass production of 16,000 kg DM at 2.5% N and 85% of this utilised by grazing sheep, the model gives 38 kg N/ha/yr leached, or a total leached mass of 304 kg N. This is less than the predevelopment mass leached.

Regional Councils generally accept N loading for grazed pasture of 150 – 200 kg N/ha/yr. As can be seen by the preliminary modelling above, these loading rates result in annual N leached of between 38 and 47 kg N/ha/yr. As the cost of drip irrigation is approximately $50,000/ha and the lesser area results in an overall less mass leached, it is likely the LTA will be optimised towards the smaller area. Thus the LTA area for a grazed pasture scenario on the lowland soils is likely to require in the order of 5 - 6 ha.

Other N Inputs Post-development

Stormwater runoff from hardstand areas equates to about 3 kg/ha/yr per hectare of hardstand area. For 50 ha of development, 5.7 ha of roading is estimated and impervious site coverage is estimated on average to be 26% (600 m^2 per 2,300 m^2 lot), of which 50% is likely to be hardstanding (5.8 ha)[1], giving a total hardstand of 11.5 ha, with N leaching of 34.5 kg N/yr.

Reserve areas within the development, as with on-site lawns/gardens are likely to leach in the order of 0.22 kg N/ha/yr. Therefore, for 32.8 ha[2] of reserve/lawns equates to 7.2 kg N/yr.

[1] Based on 50 ha, less 5.7 ha of road to give 44.3 ha of lots, of which 26% impervious (11.5 ha), of which 50% is on-site hardstand (5.8 ha).

[2] Based on 50 ha, less 5.7 ha of road and 11.5 ha of on-lot roof and hardstand, i.e. 50 – 5.7 – 11.5 = 32.8 ha

Summary of Inputs

Total inputs from the development are therefore:

Scenario	Leached Mass (kg N/yr)
Predevelopment	**350 – 400**
Dryland Beef Grazing	350 – 400
Post Development (Hill)	**398 – 407**
LTA	356 – 365
Stormwater	35
Lawns/reserves	7
Post Development (Lowland)	**324 – 332**
LTA	282 – 290
Stormwater	35
Lawns/reserves	7

Wider Area Effects

It is highly likely that the final annual N balance will show that post development N leaching will be less than predevelopment leaching. Thus effects on downstream surface waters will be less than occurs at present. Therefore, assessment of effects on downstream surface waters, such as the Taylor River and Taylor Dam storage will not be required.

We trust this is of sufficient detail to answer the questions raised.

Yours sincerely
CPG Limited

Rob Potts
Senior Principal

Appendix IV

Revised Stormwater Report

RILEY CONSULTANTS

MAXWELL HILLS RURAL RESIDENTIAL ZONE PROPOSED PRIVATE PLAN CHANGE STORMWATER REPORT

Engineers and Geologists

MAXWELL HILLS RURAL RESIDENTIAL ZONE
PROPOSED PRIVATE PLAN CHANGE
STORMWATER REPORT

Report prepared for: Kapiti Views Trust

Report prepared by: Jason Budd, Senior Civil Engineer, CPEng

William Stringer, Civil Engineer

Report reviewed by: Brett Black, Director, CPEng

Report reference: 04819/6SW-A

Date: 4 November 2011

Copies to:

Kapiti Views Trust	1 copy
CPG Global	1 copy 1 electronic copy
Riley Consultants Ltd	1 copy

Issue:	Details:	Date:
1	Stormwater Report	15 February 2011
2	Stormwater Report	7 October 2011
3	Stormwater Report	4 November 2011

Riley Consultants Limited, 4 Fred Thomas Drive, Takapuna
PO Box 100 253, NSMC, Auckland, New Zealand
Telephone 64 9 489 7872, Facsimile 64 9 489 7873
riley@riley.co.nz www.riley.co.nz

Contents

1.0 Introduction 1
2.0 Site Location and Characteristics 1
3.0 Background 2
3.1 Discussions with MDC 2
3.2 Geotechnical Considerations 2
3.3 Design Standards 3
4.0 Stormwater Mitigation Measures 3
4.1 Individual House Lots 3
4.2 Stormwater Conveyance 5
4.3 Culverts, Discharge Points and Water Quality Ponds 5
5.0 Hydrological Assessment 7
5.1 Site Description 7
5.2 Stormwater Run-off 8
5.3 Stormwater Quality 10
6.0 Effects of Stormwater Disposal and Recommendations 11
6.1 Phase 1 – Construction Mitigation Measures 11
6.2 Phase 2 - Permanent Stormwater Treatment and Erosion Protection Measures 12
7.0 Conclusions 13
8.0 Limitation 13

Appendices

Appendix A Stormwater Calculations
Appendix B RILEY Drawings 04819/6SW-1 to 4

MAXWELL HILLS RURAL RESIDENTIAL ZONE
PROPOSED PRIVATE PLAN CHANGE
STORMWATER REPORT

1.0 Introduction

Riley Consultants Ltd (RILEY) has prepared the following revised stormwater report at the request of Kapiti Views Trust following questions raised by Mr Paul Whyte of Beca Carter Hollings & Ferner Ltd (Beca) on behalf of the Marlborough District Council (MDC), in their letter dated 10 June 2011. This letter requested further information to enable a better understanding of the stormwater mitigation for the proposed private plan change.

This report supersedes the Issue 1 dated February 2011 and Issue 2 dated October 2011 and includes further information to address the questions raised by MDC. It provides a preliminary stormwater assessment to establish the effects of a proposed residential development and to identify the potential constraints for developing the site. This report also provides methods to manage stormwater run-off from the development area in order to mitigate the effects on the downstream environment. It is intended to support a plan change application to MDC.

The plan change region covers the lower terraced area of the larger lots (Lot 1, DP 9518, Section 2, SO 7014 Lots 1-3, DP357141) held by Kapiti Views Trust. To ensure that development is sustainable and suitable, an assessment of the engineering aspects has been provided by RILEY. This report should be read in conjunction with the following RILEY documents.

Table 1:

RILEY Document	RILEY Ref:
Flooding Assessment	04819/6FL-A
Geotechnical Assessment	04819/6GT-A
Wastewater Servicing	04819/6WW-A
Response to Request for Further Information	04819/6-B

2.0 Site Location and Characteristics

The site is located approximately 2.5km south of the existing urban boundary of Blenheim, Marlborough, and is bounded by Maxwell Pass Road and Taylor Pass Road. The Taylor River runs along the western boundary, with the Taylor Dam (a flood detention structure protecting the Blenheim Township) located a few hundred metres from the site's north-western corner. The entire site has an area of approximately 286ha, with the proposed development described as the "rural residential development area" of 49.9ha. It is proposed to develop rural residential lots with an area of typically 0.2ha, which will be configured in a conventional type subdivisional layout pattern.

The rural residential development area is located on the lower portion of the site. The topography of the lower areas is relatively gentle with slopes of 0 to 20°. The stormwater management network in this area is based around a pipe network that will collect flows from the roads and individual lots where possible. Where this is not possible, runoff will be discharged directly to watercourses or soakage pits for individual lots where feasible (further specific investigation will be required for each lot). Water quality ponds will be constructed for each drainage catchment, to treat run-off collected from the piped network for the proposed development. Catchment characteristics are described in greater detail in Section 5.1.

3.0 Background

3.1 Discussions with MDC

Stormwater from the site will continue as it does presently and discharge into the Taylor River and Maxwell Creek immediately upstream of the Taylor Dam. Under normal flow conditions, water passes through a culvert underneath the dam, with the dam filling only when the flow in the Taylor River exceeds the capacity of the culvert. According to MDC, this dam attenuates flood flows of up to approximately 320m^3/s from the Taylor River, and is designed to spill at a 1% Annual Exceedence Probability (AEP) event with the crest level set for the Probable Maximum Flood (PMF).

RILEY has previously discussed the issue of stormwater discharge with a MDC Rivers and Drainage Engineer (Brin Williman) who accepted, in principle, that no stormwater storage or attenuation is necessary within the proposed development due to the Taylor Dam being able to cope with an increase in post-development flow. The following assessment of the development is undertaken on the assumption that stormwater attenuation is not required from the downstream flooding perspective.

In accordance with the proposed Wairau/Awatere Resource Management Plan, measures will be provided prior to construction earthworks commencing, to restrict the transport of sediment laden run-off entering the river from construction activities. Erosion and sediment control devices will be commissioned that are capable of mitigating sediment laden run-off for up to a 1 in 10 year storm event.

The design should ensure that the natural clarity of the receiving waters shall not be "conspicuously changed" by sediment. "Conspicuously changed" means: greater than 33% reduction in the visual clarity of the receiving water as measured by the horizontal sighting on a black disk; and/or greater than 15% increase in the turbidity of the receiving water as measured in NTU. The measurements are to be taken immediately upstream and below the discharge after reasonable mixing.

3.2 Geotechnical Considerations

A detailed geotechnical description of the site is presented in the previous geotechnical report (RILEY Ref: 04819/6GT-A) with further geotechnical information provided in the RILEY Response to Request for Further Information accompanying this report (RILEY Ref: 04819/6-B). The upper part of the site is steep, with the loess soils susceptible to erosion, shallow landslides, and small slumps. Such hazards may be exacerbated by the uncontrolled discharge of stormwater. Therefore, a primary focus of stormwater management is on minimising erosion and instability throughout the site. Downstream flooding attenuation from the site is not a specific requirement as the Taylor River Dam is immediately downstream. However, it is noted that the mitigation measures proposed for minimising erosion and instability will, by their nature, result in some attenuation of run-off.

3.3 Design Standards

RILEY has referred to the MDC Code of Practice for Subdivision and Development and the New Zealand Standard NZS 4404 Land Development and Subdivision Engineering to determine the most appropriate design storms for the present development. The MDC Code of Practice for Subdivision and Land Development indicates that the 2% AEP (1 in 50 years) rainfall event should be used for design of stormwater systems to protect residential property. However, NZS 4404 recommends using a 1% AEP (1 in 100 years) rainfall. A 1% AEP is the minimum standard used for flood protection in most other regions and is recognised as providing an acceptable level of safety for residential developments.

Inundation from the upper catchment is a primary concern for this site as the topography is steep with limited natural vegetation except for grazing pasture. The extended dry periods experienced in this area mean that the natural ground initially behaves similar to an impervious pavement with a high percentage of rainfall transferred as run-off. Run-off will initially be as sheet flow before collecting in the hillside gullies and flowing down to the lower catchments via ephemeral streams. Once the upper catchment has softened (typically in winter) peak run-off rates will be lower. However, as a measure of protection from sudden summer rainfall and the first of the autumn rain, we recommend that the 1% AEP event is used to size overland flowpaths and to design building platforms with an appropriate level of free board protection. As mentioned in our flood assessment report, there should be a minimum of 1m free board protection above the 1% AEP event.

As mentioned earlier, water quality ponds will be provided for each drainage catchment. In the latest MDC Code of Practice, these ponds should be designed in accordance with the Auckland Regional Council technical publication TP10, "Stormwater Management Devices: Design guidelines manual", 2nd Edition, May 2003. The ponds will be designed to provide only stormwater treatment for run-off from the developed catchment. No attenuation is necessary due to the Taylor Dam immediately downstream of the site.

4.0 Stormwater Mitigation Measures

A preliminary lot layout has been developed for feasibility purposes. A full concept design for this area has not been undertaken; however, this preliminary layout has been used to develop stormwater management measures to mitigate the effects of stormwater run-off generated from new impervious surfaces. This conceptual plan will highlight the stormwater mitigation measures that will be required to develop the site.

The predominant concern for the rural residential lots is to identify overland flow from the catchment above. The mitigation options discussed below will ensure that overland flow is clearly identified and does not cause potential inundation of rural residential building platforms.

4.1 Individual House Lots

The individual house lots in the proposed plan change area can be separated into the following two categories: house sites which connect into a reticulated stormwater pipe network, and those houses which do not. Those sites which do not connect into a pipe network will discharge directly to an adjacent watercourse or to soakage.

Connection to Pipe Network

A preliminary drainage network is shown on RILEY Dwgs 04819/SW-1 to 4. For most of the proposed plan change area the residential lots will drain to the reticulated pipe network.

Discharge to a Watercourse

Those lots adjacent to a watercourse which cannot connect into a reticulated stormwater pipe network or to soakage shall discharge directly to the watercourse. Outlets should be designed according to MDC engineering standards and TP10 so to not impede flow or erode the waterway channel.

Soakage Pits

Soakage shall be used where house sites cannot feasibly connect into the reticulated pipe network and is preferred to discharging directly to a watercourse. For these sites, stormwater should be discharged into a specifically designed soakage pit. Soakage tests (during Building Consent stage) will be required on individual lots to determine the feasibility of using soakage for each site. It is important that soakage be achieved within the underlying gravels and not within surficial founding soils. From test pits undertaken within the plan change area, a silt layer with variable depth of 0.1m to over 3m below the ground surface exists over the proposed development. Groundwater is expected to be at depths greater than 3m. From this information it is expected that soakage will be possible in some locations. Where adequate soakage cannot be achieved, it is generally expected that a reticulated stormwater system will be provided or the site will discharge directly to a watercourse. Further discussion on locating and constructing soakage pits is discussed within the RILEY Response to Request for Further Information accompanying this report (RILEY Ref: 04819/6-B).

Stormwater Runoff from Roof Areas

Stormwater runoff from private residential property can be considered to be broken into two components, runoff from roofs and runoff from driveways or paved areas. Runoff from roof areas will drain to the piped stormwater system or to a soakage pit or watercourse.

Stormwater Runoff from Driveways and Paved Areas

It is recommended that runoff from private driveways and paved areas be collected in grass swales or catch-pits with filter bags (e.g. Enviropods), to provide treatment of stormwater runoff. This water will then drain to the piped stormwater system or to a soakage pit or watercourse.

Overland Flow

Stormwater from the upper catchment that is not drained into specific gullies at the proposed plan change boundary can be intercepted with sheet flow diversion bunds. These bunds will divert sheet flow into gully features upslope of the development. Concentrated overland flow has been identified for each catchment within the Dwgs 04819/6SW-1 to 4 with a preliminary lot arrangement created to ensure these flows bypass building platforms. Overland flow where located on individual lots should typically occur along lot boundaries along a legal easement. The easements should be sized to accommodate a 1% AEP flood event and may require localised re-contouring of the site to confine flow. The overland flow paths are also intended to divert flow from the upper catchments around the stormwater ponds provided for the plan change area. As mentioned in Section 3.3 the ponds have only been designed to provide stormwater treatment for the plan change area.

4.2 Stormwater Conveyance

Primary Flows

As previously mentioned, for most of the plan change area, stormwater will drain via a pipe network, which should be designed for a 10% AEP rain event. The pipe network will collect stormwater run-off from the roads, impervious areas of individual house lots where possible, and sheet flow run-off from areas above the road. The stormwater pipe network should be designed to ensure all pipes are able to pass flow at a minimum velocity to enable self-cleansing. This would be achieved by ensuring pipes are laid at suitable grades. All aspects of the MDC Code of Practice and the New Zealand Building Code should be adhered to in the design of the pipe network.

Secondary Overland Flowpaths

As discussed earlier, the desirable method for conveying stormwater flows within the rural residential area is by a pipe network where possible. This network would be used to convey the primary stormwater flows (up to a 10% AEP event) to water quality ponds as indicated on RILEY Dwgs: 04819/6SW-1 to 4. Where stormwater run-off exceeds the capacity of the primary pipe network, the roads and designated corridors will become secondary overland flowpaths to convey stormwater run-off flows for up to a 1% AEP event. The use of roads as a secondary overland flowpath has previously been discussed with MDC and is an accepted practice. For all overland flowpaths, it is important to ensure that the designated route remain clear of obstructions that may affect the flow capacity (e.g. fences) and, therefore, it would be preferable that overland flowpaths are not located within individual lots unless a legal easement is specifically provided.

4.3 Culverts, Discharge Points and Water Quality Ponds

There are three main types of discharge currently within the site: culverts draining the site to the Taylor River; pipes that drain directly to a gully or stream; and pipes that drain directly to Maxwell Creek or the Taylor River.

Culverts

Run-off from the existing gullies that drain to Taylor Pass Road tend to flow across the lower lots and into the roadside drain. There are existing culverts at several points that convey the water to the Taylor River underneath the road. These culverts appear to be undersized from current flooding concerns in the area. The gullies that drain to the north have a slightly different pattern, with many draining directly into Maxwell Creek. Where flow is intercepted by Maxwell Pass Road, these culverts also appear to be undersized. With proposed development of the site, the flooding concerns from these undersized culverts will be alleviated.

A major concern with the culverts that drain directly to a gully or stream is the potential for erosion at the outlet. Culverts will be required at numerous points throughout the development to convey water beneath roads and into gullies. The code of practice does not specify a design event for culverts in the district. During detailed design of the secondary flowpaths it is recommended that each culvert is designed based on specific site constraints, e.g. risk of flooding due to back water effects, acceptability of the roading authority to possible over topping etc. Erosion protection at the culvert outlet should also be incorporated into the design.

Discharge Points

The discharge points is a critical aspect of stormwater management as the energy in the water discharging from these points needs to be properly dissipated to reduce the energy of the stormwater flows. An example of the application of energy dissipation structures on steep terrain in loess soils can be seen on the Port Hills in Christchurch, where a combination of structural methods (i.e. concrete channels, riprap, bubble-up chambers) and vegetative methods (i.e. planting with vegetation and grasses) has been used successfully for several decades. Similar methods of protection are suitable for this development.

Water Quality Ponds

Previous stormwater assessments for the development did not require stormwater quality or quantity considerations. From recent discussions with MDC representatives, the council now requires stormwater treatment within the development in accordance with proposed council standards.

As a result of the new standards, stormwater treatment measures have been incorporated to mitigate the effects of the development on the environment. This assessment has designated areas of land for mitigation measures and stormwater management within the development.

Due to the site constraints, stormwater quality ponds at discharge points are considered to be the most efficient method to provide the necessary treatment and erosion control. Other treatment options were also considered (swales, structural filtration devices, etc), however, in order to maintain a 'traditional' subdivision development and with allowance for site constraints such as the erosion potential of the underlying soils, water quality ponds were considered the best management practice for stormwater treatment. This will enable conventional construction of roads and stormwater reticulation within the development. As mentioned in Section 4.1 the use of swales and filtration devices is recommended on private residential lots as part of the stormwater treatment train for the plan change area.

As shown on the RILEY Dwgs: 04819/6SW-1 to 4, five water quality ponds (labelled A to E) have been included in the stormwater network. The ponds have been designed in accordance with Auckland Regional Council Technical Publication No.10, 'Stormwater Treatment Devices Design Guidelines Manual', Second Edition, May 2003 (TP10), as prescribed in the MDC Code of Practice. The preliminary pond sizing has been calculated based on the preliminary development scenario for the proposed plan change area as shown on RILEY Dwgs: 04819/6SW-1 to 4. The pond sizing includes for impervious areas (i.e. roads, roof, and private hardstand areas) and are summarised below in Table 2.

A total impervious area of 600m²/lot has been allowed for when determining pond size. The design of the ponds caters for the impervious area from the entire road network and 600m²/lot (driveways, roof, and hardstand areas).

Table 2: Preliminary Stormwater Water Quality Ponds

Development Catchment Reference	Catchment Area[(1)] (ha)	Approximate Pond Dimensions	
		Surface Area (m^2)	Live Storage Volume (m^3)
A	6.8	1,800	500
B	5.7	1,500	300
C	14.7	2,700	1000
D	8.0	1,800	500
E	5.5	1,400	300
Totals	**40.7**	**9,200**	**2,600**

[(1)] Note the catchments for the ponds exclude lots which drain directly to a watercourse as indicated on Dwgs: 04819/6SW-1 to 4.

As mentioned in Section 2.0, the total rural residential development area is 49.9ha. The remaining development areas that do not drain to the ponds located in Catchments A to E either drain directly to on-site soakage pits or watercourses. Further detailed design will optimise the pond sizes and locations.

5.0 Hydrological Assessment

5.1 Site Description

A detailed description of the site is presented in our geotechnical report (RILEY Ref: 04819/6GT-A). The description includes the catchments above the development area to highlight the major features from a stormwater perspective. The catchments are made up of a series of ridges with steep slopes down to distinct and well-defined gullies. The ground elevation varies between approximately RL 70m and RL 400m, with slopes in the upper catchments typically less than 30°, but up to 40°. The site has two main drainage patterns: ridges and gullies orientated west-east with stormwater draining directly into the Taylor River in the west; and ridges and gullies orientated north to south, with stormwater draining directly into the Maxwell Creek in the north. These gullies are ephemeral watercourses that only flow in times of heavy rainfall. For the purposes of stormwater assessment, the site can effectively be divided into seven catchments consisting of distinct gullies, plus one catchment making up the area between Maxwell Creek and Maxwell Pass Road. For the design of the water quality ponds and impact of overland flow into the rural residential development areas, these seven catchments have been amalgamated into five catchments to direct water to the five main discharge points from the proposed development. The catchments are defined as follows.

Catchment A (27.4ha) is a narrow catchment consisting of a well-defined gully draining two steep ridges and flows north to an existing culvert under Maxwell Pass Road into Maxwell Creek. A sub-catchment to the east drains the slope between Catchments A and the neighbouring catchment. Run-off will be directed back towards Pond A at the base of Catchment A; however, only the impervious areas from the rural residential development area will drain to the pond. Overland flow from the catchment above the development will bypass the pond as shown on RILEY Dwg: 04819/6SW-1.

Catchment B (23.5ha) is a combination of two narrow catchments that drain to the north, flowing into Maxwell Creek. At this location Maxwell Creek is within the boundary of the development. As for Catchment A, overland flow from the catchment above will bypass the pond.

Catchment C (22.1ha) drains into Taylor Pass Road to the west and Maxwell Creek to the North. This catchment includes the largest number of rural residential lots for the development. Again, overland flow from the catchment above will bypass the pond.

Catchment D (44.8ha) is one of two major catchments draining to the Taylor River in the west. This catchment is drained by a substantial gully with steep sided slopes both north and south. As the stream nears Taylor Pass Road it drops down to a terrace of the Taylor River floodplain, where it becomes a deeply incised gully through an existing culvert, into the Taylor River. A smaller catchment to the south drains the slope between catchments D and E, with half of this catchment included as part of D. The management regime for overland flow is the same as above.

Catchment E (80.1ha) is the largest catchment, and the second major catchment that drains the site to the Taylor River in the west. This catchment consists of two major gullies that drain the high slopes and join together before discharging into the Taylor River. The management regime for overland flow is the same as above.

5.2 Stormwater Run-off

There is no gauged data of flows within the catchment and, therefore, the analysis of flows is for an ungauged catchment. Assessment of the pre and unmitigated post-development flows was undertaken using the Rational Method for determining peak flows. This method was considered the most suitable and conservative given that the catchment is rural and less than 3km². Catchments draining the site were assessed using topographic data and aerial photographs of the site. HIRDS v2 was used to develop a design storm for a 2 year (50% AEP), 10 year (10% AEP) and 100 year (1% AEP) event.

The pre and post-development flows were estimated by assessment of topographical information and aerial photographs. HIRDS v2 was used to develop a design storm for each of the following return periods:

- 2 year (50% AEP)
- 10 year (10% AEP)
- 100 year (1% AEP)

The design depths and durations used for the modelling presented in this report are given in Table 3.

Table 3: Design Storms and Depths

Storm Frequency	Depth for Given Duration (mm)							
	10 minute	20 minute	30 minute	1 hour	2 hour	6 hour	12 hour	24 hour
50% AEP	4.1	6.6	8.7	14	20.3	36.4	52.6	76.1
10% AEP	6.4	10.2	13.4	21.3	30	51.4	72.3	101.6
1% AEP	14.5	22.7	29.5	46.3	61.7	97.3	129.6	172.8

As discussed above, the development was assessed for 50% AEP, 10% AEP, and 1% AEP events, which have been used to compare pre and unmitigated post-development flows. HIRDS v2 rainfall data has also been used to size the water quality ponds. HIRDS v2 rainfall data has been used as per Issue 1 of this report which is more conservative than HIRDS v3 data which provides lower rainfall depths.

The pre-development flows have been assessed using the following parameters:

- Time of concentration (Tc) 10 minutes
- Run-off coefficient (C) 0.40
- Rainfall intensity (50% AEP) 24.6 mm/hour
- Rainfall intensity (10% AEP) 38.4 mm/hour
- Rainfall intensity (1% AEP) 87 mm/hour

The value for the run-off coefficient (C) is taken from Tables 1 and 2 of the New Zealand Building Code Clause E1 Surface Water[1] document assuming a medium soakage soil type (C = 0.30) and a slope correction due to the steepness of the site (C + 0.1).

The proposed development has a lot and roading layout that has been developed for feasibility purposes and preliminary design. This layout will become more refined as the design process continues; however, we consider that any changes to the layout will not significantly alter the flows assessed herein.

Based on this preliminary layout, the unmitigated post-development flows have been assessed using the following parameters:

- Time of concentration (Tc) 10 minutes
- Averaged run-off coefficient (C) 0.44
- Rainfall intensity (50% AEP) 24.6 mm/hour
- Rainfall intensity (10% AEP) 38.4 mm/hour
- Rainfall intensity (1% AEP) 87 mm/hour

The averaged run-off coefficient (C) for the unmitigated post-development condition was calculated using the sub-catchment areas detailed in Section 5.1 and Table 4 below. This increase in the run-off coefficient is due to the increase in impervious area within the catchments.

Table 4: Determination of the Average Run-off Coefficient (C)

Land Type	Area (ha)	Run-off coefficient (C)
Sealed roads, roof and hardstand areas (600m²/lot)	14.3	0.90
Undeveloped subdivision area	184	0.40

Table 5 presents the catchment characteristics and approximate areas for the pre-development and post-development scenarios. These preliminary figures are included to provide a comparison of pre and post-development flows. As mentioned earlier, the water quality ponds are not intended to provide any attenuation. The full extent of road corridors shown within RILEY Dwgs: 04819/6SW-1 to 4 have been taken as fully impervious areas within the calculations which is considered to be conservative. The potential for some of the residential lots to be mitigated by soakage has been ignored within Table 5 as determination of the feasibility of using soakage will require site specific testing (during Building Consent stage).

[1] Building Industry Authority, 2001. New Zealand Building Code Clause E1 Surface Water.

Table 5: Catchment Characteristics and Approximate Areas

Cover Description	Area (ha)			
	Pre-development		Post-development	
	Impervious	Pervious	Impervious	Pervious
Sealed roads	-	-	5.7	-
Hardstand areas (600 m^2/lot)	-	-	8.6	-
Trees (planted)	-	-	-	55+
Undeveloped subdivision area	-	198	-	128.7
Total area (ha)	198		198	

+ Additional planting will reduce run-off.

If run-off quantities from the total site could be concentrated at one location, the peak flow rates presented in Table 6 would be generated for the pre-development and post-development scenarios.

Table 6: Catchment Flow Rates

	Pre-development		Post-development	
	Storm 1	Storm 2	Storm 1	Storm 2
AEP (%)	10%	1%	10%	1%
Peak Flow Rate (m^3/s)	8.7	19.0	9.5	20.7

The figures presented above show an increase in run-off quantities from the catchment. The increase in peak flows is a result of the increase in impervious area in the post-development scenario. Calculations have been provided within Appendix A. The use of soakage within some lots (as discussed within Section 4.1) will help reduce the post-development scenario peak flows shown within Table 6. A more detailed assessment of individual catchments and stages of development should be undertaken during detailed design.

5.3 Stormwater Quality

Stormwater will predominately drain to water quality ponds via a piped stormwater system apart from those lots that do not connect into the pipe system. The sites with no pipe connection will either discharge stormwater to on-site soakage or directly to a watercourse. Water quality issues from runoff are primarily related to water off public roads, due to contaminants from vehicles, such as metals, hydrocarbons, and sediment. As previously mentioned, this water will pass through stormwater treatment ponds designed in accordance with ARC TP10 to mitigate effects on water quality in the downstream environment.

Stormwater runoff from private residential property is considered to be less of an issue and can be broken into two components, runoff from roofs and runoff from driveways. Certain roofing materials can create a source of zinc and copper contaminants, which can have residual toxic effects within aquatic receiving environments. It is recommended that only inert (non-toxic) roofing materials be permitted to address this issue and uncoated galvanised roofing material not be allowed.

For impervious driveway and parking areas, contaminants similar to public roads are generated, but in less quantities. To mitigate the effects of runoff from these areas, it is recommended that provision be made for use of grass swales, grass filter strips, or filtration devices such as Enviropods. Contaminant potential is not high; however, mitigation devices such as these will reduce the cumulative effects generated from the proposed development.

Runoff that is to be drained to soakage should include the above devices, plus sediment traps such as catch-pits with sumps to collect potential contaminated sediment runoff. These will protect the soakage pits from premature blockage due to sedimentation and also the possible discharge of contaminates to groundwater. Provided the above treatment and mitigating measures are utilised, it is considered that there will be minimal impacts on the downstream water quality.

6.0 Effects of Stormwater Disposal and Recommendations

The main effect that normally arises from construction of roads and developments such as this is the concentration of run-off from the site. For this particular development the presence of the Taylor Dam immediately downstream, which is able to cope with any increase in flows, has shifted the primary focus from limiting post-development flows to minimising erosion and instability throughout the site. However, a consequence of these mitigation measures has seen only a slight increase in stormwater run-off.

The stormwater run-off from the proposed development will drain via a reticulated network into water quality ponds provided for development within each catchment, before discharging to the Taylor River or Maxwell Creek. The run-off flows from the rural residential areas will be collected in a pipe network, disposed of into soakage pits or discharged directly to a watercourse, which effectively stops run-off draining over the erosion prone loess soils. As a result of the proposed development and the associated stormwater mitigation measures, run-off generated from impervious surfaces will be collected and discharged via the ponds to minimise erosion and maintain water quality in the receiving environment.

Mitigation measures to prevent degradation of downstream water quality should be broken into two phases. Phase 1 being the temporary erosion and sediment control for the land disturbing activities that will take place during construction of the development, and Phase 2 being the permanent stormwater treatment and erosion protection measures to be in place once the development has been constructed. The following recommendations and measures are listed below for each phase:

6.1 Phase 1 – Construction Mitigation Measures

The general principles adopted during the earthworks activities, which should be incorporated into the Erosion and Sediment Control Plan (E&SCP), are as follows:

- Minimise the disturbed area due to earthwork activities as practically possible, while satisfying all requirements for development of the site.
- Where possible, stage earthworks and progressively stabilise exposed areas following completion.
- Where possible, divert all clean water runoff away from the site, thus reducing the contributing catchment to the exposed earthwork areas only and eliminating any clean water catchment.
- Intercept and divert sediment-laden runoff from exposed areas to vegetated verges where the coarser sediments can settle out.

- Implement measures to prevent construction traffic exiting the construction area onto public roads with sediment and other materials attached to the undercarriage and tyres.
- Regularly inspect the erosion and sediment control measures, and undertake any maintenance necessary to maximise the potential retention of sediment on the site.
- In the event of forecast heavy rain, stabilise the site as far as practically possible and close works down.
- Ongoing assessment of the efficiency and adequacy of the erosion and sediment control measures and, if required, adjustment of these measures to improve efficiency as the work progresses.
- Ensure the site staff is aware of the requirements of the E&SCP and the relevant resource consent conditions prior to the works commencing.

These principles are generally in accordance with ARC TP90.

6.2 Phase 2 - Permanent Stormwater Treatment and Erosion Protection Measures

The measures proposed below are in accordance with MDC engineering standards and ARC TP10. The following recommendations and measures are proposed:

- Separation and diversion of all stormwater runoff from the catchment above from the infrastructure proposed for the plan change area.
- Separation of runoff should be achieved through the creation of diversion bunds above the plan change boundary and diversion of water to overland flowpaths using easements or public roads.
- Where required, based on velocities and gradients of diversion bunds and flowpaths, erosion protection and energy dissipation measures should be provided. These could include the use of, but not limited to, measures such as reno mattresses, gabion baskets, geotextile fabrics, check dams, and rock lining.
- Where possible within the proposed plan change area, stormwater runoff up to the 10% AEP event will be collected into a reticulated pipe network and drained to a treatment pond.
- Water quality ponds will be provided for treatment of run-off from impervious areas of the proposed development.
- The areas of the development that are unable to be drained by the reticulated network (residential lots) will utilise soakage pits or discharge directly to a watercourse. Note these areas are the lower lots close to the Taylor River or Maxwell Creek.
- On-site residential specific stormwater mitigation measures could include use of inert roofing materials, grass swales, grass filter strips, or filtration devices such as Enviropods.
- As mentioned above, overland flowpaths for the 1% AEP event within the plan change area should include measures for erosion protection and energy dissipation. These could include the use of, but not limited to, measures such as reno mattresses, gabion baskets, geotextile fabrics, check dams, and rock lining.
- Designated routes for overland flowpaths should remain clear of obstructions.

- Additional planting of trees and vegetation both within the proposed development and upslope will help reduce stormwater runoff and help prevent soil erosion.

7.0 Conclusions

A stormwater assessment to accompany a plan change application for a rural residential development has been completed for the site. In our opinion the proposed development is considered feasible from a stormwater perspective. The mitigation measures discussed above will adequately deal with the design storm conditions. This assessment has recognised that the main focus for the mitigation measures is on minimising erosion of the loess soils and maintaining downstream water quality. A consequence of these measures is that attenuation of peak flows will reduce post-development flows close to pre-development levels.

8.0 Limitation

This report has been prepared solely for the benefit of Kapiti Views Trust as our client with respect to the brief and Marlborough District Council in processing the plan change. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such parties' sole risk.

The hydraulic and hydrological analyses and recommendations contained in this report are based on our understanding and interpretation of the available information. The recommendations are, therefore, subject to the accuracy and completeness of the information available at the time of the study. Should any further information become available, the analyses and findings of this report should be reviewed accordingly.

APPENDIX A

Calculations

MAXWELL HILLS RURAL RESIDENTIAL ZONE
PROPOSED PRIVATE PLAN CHANGE
STORMWATER REPORT

DESIGN CALCULATIONS

Calculations prepared for: Kapiti Views Trust

Calculations prepared by: William Stringer, Civil Engineer

Calculations reviewed by: Jason Budd, Senior Civil Engineer CPEng

Project reference: 04819/6SW-A

Date: 1 November 2011

Riley Consultants Limited, 4 Fred Thomas Drive, Takapuna
PO Box 100 253, NSMC, Auckland, New Zealand
Telephone 64 9 489 7872, Facsimile 64 9 489 7873
riley@riley.co.nz www.riley.co.nz

RILEY CONSULTANTS

Job No: 04819/6	Page: 0	of	Pages
Project: Maxwell Hills Plan Change			
Calc: WS	Date: 30/9/14		
Check: JEB	Date: 6/10/14		

Description: MAXWELL HILLS STORMWATER RUNOFF CALCULATIONS

CALCULATIONS COMPLETED FOR:

(1) • PRE-DEVELOPMENT 10% & 1% AEP RAINFALL EVENT.

• POST-DEVELOPMENT (UNMITIGATED) 10% & 1% AEP RAINFALL EVENT

(NO ATTENUATION REQUIRED AS PER DISCUSSION WITH MDC)

FOR MAXWELL HILLS DEVELOPMENT USING RATIONAL FORMULA $Q = CIA$ TO FIND PEAK RUNOFF FLOWS FROM SITE.

CATCHMENTS A* - E* REPRESENT FULL CATCHMENT AREAS INCLUDING THAT AREA UPSCOPE OF PROPOSED PLAN CHANGE AREA.

CATCHMENTS A - E REPRESENT CATCHMENT AREAS WITHIN PROPOSED PLAN CHANGE AREA.

(2) SIZING OF WATER QUALITY PONDS FOR RUNOFF FROM POST-DEVELOPMENT PROPOSED PLAN CHANGE AREA.

CALC'S UNDERTAKEN FOLLOWING ARC TP10.

RILEY CONSULTANTS

Job No: 04819/6	Page: 1	of	Pages
Project: Maxwell Hills Plan Change			
Calc: WS	Date: 27/9/11		
Check: JEB	Date: 6/10/11		

Description

MAXWELL HILLS PRE-DEVELOPMENT RUNOFF FLOWS.

PRE-DEVELOPMENT - 10% AEP RAINFALL EVENT.

CATCHMENT A*.

$A = 27.4\ ha = 274,000\ m^2$
$C = 0.4$ (undeveloped)
$i = 38\ mm/hr = 1.1 \times 10^{-5}\ m/s$ 10% AEP 10min Duration.

$Q = CiA$
$= 0.4 \times 1.1 \times 10^{-5} \times 274,000\ m^2$
$= 1.2\ m^3/s$

CATCHMENT B*

$A = 23.5\ ha = 235,000\ m^2$

$Q = 0.4 \times 1.1 \times 10^{-5} \times 235,000$
$= 1.0\ m^3/s.$

CATCHMENT C*.

$A = 22.1\ ha = 221,000\ m^2$

$Q = 0.4 \times 1.1 \times 10^{-5} \times 221,000$
$= 0.97\ m^3/s.$

CATCHMENT D*

$A = 44.8\ ha = 448,000\ m^2$

$Q = 0.4 \times 1.1 \times 10^{-5} \times 448,000$
$= 2.0\ m^3/s$

CATCHMENT E*

$A = 80.1\ ha = 801,000\ m^2$

$Q = 0.4 \times 1.1 \times 10^{-5} \times 801,000$
$= 3.5\ m^3/s$

TOTAL

$Q = 8.7\ m^3/s$ for 10% AEP RAINFALL EVENT.

This is the total runoff if flow was concentrated at one location. $T_c = 10$mins assumed for total catchment.

RILEY CONSULTANTS

Job No: 04819/6	Page: 2	of	Pages
Project: Maxwell Hills Plan Change.			
Calc: WS	Date: 27/9/11		
Check: JEB	Date: 6/10/11		

Description

MAXWILL HILLS PRE-DEVELOPMENT RUNOFF FLOWS.

PRE-DEVELOPMENT – 1% AEP RAINFALL EVENT.

$C = 0.4$

$i = 87\ mm/hr = 2.4 \times 10^{-5}\ m/s$

CATCHMENT A*.

$Q = CiA$

$= 0.4 \times 2.4 \times 10^{-5} \times 274,000\ m^2$

$= 2.6\ m^3/s.$

CATCHMENT B*.

$Q = 0.4 \times 2.4 \times 10^{-5} \times 235,000\ m^2$

$= 2.3\ m^3/s$

CATCHMENT C*

$Q = 0.4 \times 2.4 \times 10^{-5} \times 221,000$

$= 2.1\ m^3/s$

CATCHMENT D*

$Q = 0.4 \times 2.4 \times 10^{-5} \times 448,000$

$= 4.3\ m^3/s$

CATCHMENT E*

$Q = 0.4 \times 2.4 \times 10^{-5} \times 801,000$

$= 7.7\ m^3/s.$

TOTAL

$Q = 19.0\ m^3/s$ for 1% AEP RAINFALL EVENT.

This is the total runoff if flow was concentrated at one location. T_c = 10 mins assumed for total catchment.

NOTE: CATCHMENTS A* – E* INCLUDE AREA'S UPSLOPE OF THE PROPOSED PLANNING CHANGE AREA.

CATCHMENTS A–E ARE PROPOSED DEVELOPMENT AREAS AS PART OF PLAN CHANGE.

RILEY CONSULTANTS

Job No: 04819 16	Page: 3	of	Pages
Project: Maxwell Hills Plan Change.			
Calc: WS	Date: 27/9/11		
Check: JEB	Date: 6/10/11		

Description

MAXWELL HILLS POST-DEVELOPMENT AREAS

- Impermeable Area / Lot = 600m². (Rural Residential).
  → made up of 300m² roof area & 300m² hardstanding areas.
- Road corridor generally ranges 14m - 20m in width, assume all road corridor is impermeable (conservative).

CATCHMENT A. - DEVELOPED

Total Area = 6.97 ha
Lots = 22
Impermeable Lot Area = 1.32 ha.
Impermeable sealed Road Area = 815m x 20m = 1.63 ha.
Total Impermeable Area = 2.95 ha.
Total Permeable Area = 4.02 ha.

CATCHMENT B. - DEVELOPED

Total A = 6.12 ha.
Lots = 21½
Imperm. Lot A = 1.29 ha.
Imperm. Sealed Road A = 110m x 20m + 100m x 13m = 0.35 ha.
Total Imperm A = 1.64 ha
Total Permeable A = 4.48 ha

CATCHMENT C. - DEVELOPED

TOTAL A = 14.94 ha.
Lots = 53
Imperm Lot A = 3.18 ha
Imperm Sealed Road A = 1,040m x 18m + 210m x 16m = 2.21 ha.
Total Imperm A = 5.39 ha
Total Permeable A = 9.55 ha.

CATCHMENT D - DEVELOPED

TOTAL A = 8.76 ha
Lots = 28½
Imperm. Lot A = 1.71 ha
Imperm. Sealed Road A = 470m x 18m + ½ x 100m x 18m = 0.94 ha
Total Impermeable A = 2.65 ha, Total Permeable A = 6.11 ha

Catchment E. - DEVELOPED

Total A = 5.52 ha
Lots = 19
Imperm. Lot A = 1.14 ha
Imperm. Sealed Road A = 250m x 18m + ½ 100m x 18m = 0.54 ha
Total Imperm A = 1.68 ha, Total Permeable A = 3.84 ha

RILEY CONSULTANTS

Job No: 04819/6	Page: 4	of	Pages
Project: Maxwell Hills Plan Change			
Calc: WS	Date: 28/9/11		
Check: JEB	Date: 6/10/11		

Description: MAXWELL HILLS POST-DEVELOPMENT (UNMITIGATED)

DEVELOPMENT OF SITE-PLANNING CHANGE TO RURAL RESIDENTIAL

POST-DEVELOPMENT (UNMITIGATED) – 10% AEP RAINFALL EVENT.

$C = 0.4$ (UNDEVELOPED) PER.
$= 0.9$ (ROOFS, PAVING, HARDSTAND AREAS, ROADS) IMP.
$i = 38\ mm/hr = 1.1 \times 10^{-5}\ m/s.$

CATCHMENT A*

- RURAL RESIDENTIAL (CATCHMENT A)
IMP. $A = 2.95\ ha = 29,500\ m^2$
PER. $A = 4.02\ ha = 40,200\ m^2$

$Q_{10\%} = 1.1 \times 10^{-5} (29,500 \times 0.9 + 40,200 \times 0.4)$
$= 0.47\ m^3/s$

- UNDEVELOPED CATCHMENT AREA
PER. $A = 274,000 - 69,700 = 204,300\ m^2$

$Q_{10\%} = 0.4 \times 1.1 \times 10^{-5} \times 204,300$
$= 0.90\ m^3/s$

$\Rightarrow Q_{A*} = 1.4\ m^3/s$

CATCHMENT B*

- RURAL RESIDENTIAL (CATCHMENT B)
IMP. $A = 16,400\ m^2$
PER. $A = 44,800\ m^2$

$Q_{10\%} = 1.1 \times 10^{-5} (16,400 \times 0.9 + 44,800 \times 0.4)$
$= 0.36\ m^3/s.$

- UNDEVELOPED CATCHMENT AREA.
PER $A = 235,000 - 61,200 = 173,800$

$Q_{10\%} = 0.4 \times 1.1 \times 10^{-5} \times 173,800$
$= 0.76$

$\Rightarrow Q_{B*} = 1.1\ m^3/s$

RILEY CONSULTANTS

Job No: 04819/6	Page: 5	of	Pages
Project: Maxwell Hills Plan Change			
Calc: WS	Date: 28/9/11		
Check: JEB	Date: 6/10/11		

Description

MAXWELL HILLS POST-DEVELOPMENT (UNMITIGATED)

CATCHMENT C*

- RURAL RESIDENTIAL (CATCHMENT C).
  IMP. A = 5.39 ha = 53,900 m²
  PER. A = 9.55 ha = 95,500 m²

$Q_{10\%} = 1.1 \times 10^{-5} (53,900 \times 0.9 + 95,500 \times 0.4)$
$= 0.95 \text{ m}^3/\text{s}$

- UNDEVELOPED CATCHMENT AREA
  PER. A = 221,000 − 149,400 = 71,600 m²
  $Q_{10\%} = 0.4 \times 1.1 \times 10^{-5} \times 71,600$
  $= 0.32 \text{ m}^3/\text{s}.$

$\Rightarrow Q_{C^*} = 1.3 \text{ m}^3/\text{s}.$

CATCHMENT D*

- RURAL RESIDENTIAL (CATCHMENT D)
  IMP. A = 26,500 m²
  PER. A = 61,100 m²
  $Q_{10\%} = 1.1 \times 10^{-5} (26,500 \times 0.9 + 61,100 \times 0.4)$
  $= 0.53 \text{ m}^3/\text{s}$

- UNDEVELOPED CATCHMENT AREA
  PER. A = 448,000 − 87,600 = 360,400 m²
  $Q_{10\%} = 0.4 \times 1.1 \times 10^{-5} \times 360,400$
  $= 1.58 \text{ m}^3/\text{s}$

$\Rightarrow Q_{D^*} = 2.1 \text{ m}^3/\text{s}.$

CATCHMENT E*

- RURAL RESIDENTIAL (CATCHMENT E)
  IMP. A = 16,800 m²
  PER. A = 38,400 m²

$Q_{10\%} = 1.1 \times 10^{-5} (16,800 \times 0.9 + 38,400 \times 0.4)$
$= 0.34 \text{ m}^3/\text{s}$

- UNDEVELOPED CATCHMENT AREA.
  PER. A = 801,000 − 55,200 = 745,800

$Q_{10\%} = 0.4 \times 1.1 \times 10^{-5} \times 745,800$
$= 3.28 \text{ m}^3/\text{s}$

$\Rightarrow Q_{E^*} = 3.6 \text{ m}^3/\text{s}.$

TOTAL $Q_{10\%}$ For Catchment A* - E* = 9.5 m³/s.

RILEY CONSULTANTS

Job No: 048 19/6	Page: 6	of	Pages
Project: Maxwell Hills Plan Change			
Calc: WS	Date: 28/9/11		
Check: JEB	Date: 6/10/11		

Description: MAXWELL HILLS POST-DEVELOPMENT (UNMITIGATED)

POST-DEVELOPMENT (UNMITIGATED) - 1% ACP RAINFALL EVENT

C = 0.4 (UNDEVELOPED) PER
= 0.9 (ROOFS, PAVING, HARDSTAND AREAS, ROADS) IMP
i = 87 mm/hr = 2.4×10^{-5} m/s

CATCHMENT A*

- RURAL RESIDENTIAL (CATCHMENT A)
  $Q_{1\%} = 2.4 \times 10^{-5} (29,500 \times 0.9 + 40,200 \times 0.4)$
  $= 1.02 \ m^3/s$
- UNDEVELOPED CATCHMENT AREA
  $Q_{1\%} = 0.4 \times 2.4 \times 10^{-5} \times 204,300$
  $= 1.96 \ m^3/s$

$\Rightarrow Q_{A^*} = 3.0 \ m^3/s.$

CATCHMENT B*

- RURAL RESIDENTIAL (CATCHMENT B)
  $Q_{1\%} = 2.4 \times 10^{-5} (16,400 \times 0.9 + 44,800 \times 0.4)$
  $= 0.78 \ m^3/s$
- UNDEVELOPED CATCHMENT AREA
  $Q_{1\%} = 0.4 \times 2.4 \times 10^{-5} \times 173,800$
  $= 1.67 \ m^3/s$

$\Rightarrow Q_{B^*} = 2.4 \ m^3/s.$

CATCHMENT C*

- RURAL RESIDENTIAL (CATCHMENT C)
  $Q_{1\%} = 2.4 \times 10^{-5} (53,900 \times 0.9 + 95,500 \times 0.4)$
  $= 2.08 \ m^3/s$
- UNDEVELOPED CATCHMENT AREA
  $Q_{1\%} = 0.4 \times 2.4 \times 10^{-5} \times 71,600$
  $= 0.69 \ m^3/s$

$\Rightarrow Q_{C^*} = 2.8 \ m^3/s$

RILEY CONSULTANTS

Job No: 04819/6	Page: 7	of	Pages
Project: Maxwell Hills Plan Change			
Calc: WS	Date: 28/9/11		
Check: JCB	Date: 6/10/11		

Description

MAXWELL HILLS POST-DEVELOPMENT (UNMITIGATED)

CATCHMENT D*

- RURAL RESIDENTIAL (CATCHMENT D)

$Q_{1\%} = 2.4 \times 10^{-5} (26,500 \times 0.9 + 61,100 \times 0.4)$
$= 1.16 \ m^3/s.$

- UNDEVELOPED CATCHMENT AREA

$Q_{1\%} = 0.4 \times 2.4 \times 10^{-5} \times 360,400$
$= 3.46 \ m^3/s$

$\Rightarrow Q_{D^*} = 4.6 \ m^3/s.$

CATCHMENT E*

- RURAL RESIDENTIAL (CATCHMENT D)

$Q_{1\%} = 2.4 \times 10^{-5} (16,800 \times 0.9 + 38,400 \times 0.4)$
$= 0.73 \ m^3/s.$

- UNDEVELOPED CATCHMENT AREA.

$Q_{1\%} = 0.4 \times 2.4 \times 10^{-5} \times 745,800$
$= 7.16 \ m^3/s$

$\Rightarrow Q_{E^*} = 7.9 \ m^3/s.$

TOTAL $Q_{1\%}$ for catchment $A^* - E^* = 20.7$

Averaged C for the total catchment POST-DEVELOPMENT.

$$C_{avg} = (0.4(24.45 + 21.86 + 16.71 + 42.15 + 78.42) + 0.9(2.95 + 1.64 + 5.39 + 2.65 + 1.68)) \times \frac{1}{197.9}$$
$$= 0.44$$

RILEY CONSULTANTS

Job No: 04819/6	Page: 8	of	Pages
Project: Maxwell Hills Plan Change.			
Calc: WS	Date: 4/11/11		
Check:	Date:		

Description: MAXWELL HILLS POST-DEVELOPMENT

POST-DEVELOPMENT 10% & 1% AEP RAINFALL EVENT

DISCHARGE OF STORMWATER TO SOAKAGE WILL BE USED (WHERE FEASIBLE) FOR THOSE SITES NOT CONNECTED TO THE PIPED STORMWATER NETWORK. THIS REQUIRES SPECIFIC SITE INVESTIGATION. FOR THESE CALCULATIONS SITES DRAINING TO SOAKAGE HAVE BEEN IGNORED AS THE NUMBER OF APPLICABLE SITES HAVE NOT YET BEEN FINALIZED. THIS IS CONSIDERED TO BE A CONSERVATIVE APPROACH.

STORMWATER QUALITY PONDS ARE NOT DESIGNED FOR ATTENUATION BUT FOR WATER QUALITY ONLY AS THE DOWNSTREAM TAYLOR DAM ATTENUATES DOWNSTREAM RIVER FLOWS (AS PER DISCUSSION WITH M.D.C.)

THE POST-DEVELOPMENT FLOWS FOR THE 10% & 1% AEP RAINFALL EVENTS ARE SUMMARISED BELOW:

CATCHMENT	AREA (ha)	POST-DEVELOPMENT FLOW $Q_{10\%\,AEP}$ (m^3/s)	$Q_{1\%\,AEP}$ (m^3/s)
A*	27.4	1.4	3.0
B*	23.5	1.1	2.4
C*	22.1	1.3	2.8
D*	44.8	2.1	4.6
E*	80.1	3.6	7.9
TOTAL	198	9.5	20.7

RILEY CONSULTANTS

Job No: 04819/6	Page: A	of	Pages
Project: Maxwell Hills Plan Change			
Calc: WS	Date: 1/11/11		
Check: JEB	Date: 2/11/11		

Description

WATER QUALITY PONDS - SIZING OF PONDS

WATER QUALITY PONDS FOR EACH OF THE CATCHMENT AREAS (A-E) IN THE PLAN CHANGE AREA ARE DESIGNED IN ACCORDANCE WITH ARC TP10 (2003) AS PRESCRIBED IN THE NDC CODE OF PRACTICE

AREAS DRAINING DIRECTLY TO MAXWELL CREEK OR TAYLOR RIVER ARE NOT INCLUDED WITHIN POND SIZING CALC'S. CURRENTLY THE NUMBER OF SITES GOING TO SOAKAGE (WHERE LOTS CANNOT BE DRAINED BY PIPED NETWORK) ARE NOT KNOWN SO THESE LOTS ARE INCLUDED IN THE CALCULATIONS

AREA OF CATCHMENT GOING TO PONDS

CATCHMENT	TOTAL AREA m^2	LOT AREA DRAINING TO RIVER/CREEK m^2 #	CATCHMENT AREA TO POND m^2
A	69,700	(0 LOTS) IMP. 0, PER. 0 } 0	69,700
B	61,200	(2 LOTS) IMP. 1,200, PER. 2,800 } 4,000	57,200
C	149,400	(1 LOT) IMP. 600, PER. 1,400 } 2,000	147,400
D	87,600	(4 LOTS) IMP. 2,400, PER. 5,600 } 8,000	79,600
E.	55,200	(0 LOTS) IMP. 0, PER. 0 } 0	55,200

TOTAL LOT AREA DRAINS TO RIVER/CREEK. MINIMUM RURAL RESIDENTIAL LOT SIZE 2000 m^2 USED IN CALCULATION.

Riley Consultants Limited

Runoff Parameters and Time of Concentration
(from ARC's TP108)

Project Title: Maxwell Hills - Pond Sizing **By:** WJS

Project Number: 04819/6 **Checked:** JEB

Catchment: A - Rural residential zone **Date:** 1-Nov-11

1. Runoff Curve Number (CN) and Initial Abstraction (Ia) - Post Development

Soil Name	Soil Classification	Cover Description	Pervious, Impervious	CN*	Area (Ha)	Product of CN x Area
Colluvium	Group C	Paving, Roads, Roofs	Im	98	2.95	289.1
Colluvium	Group C	Grass	P	74	4.02	297.48
* from Appendix B, TP108 (ARC, 1999)				**Totals =**	6.97	586.58

CN (Weighted) = 84.2

Ia (Weighted) = 2.9 mm

Riley Consultants Limited

Graphical Peak Flow Method
(from ARC's TP108)

Project Title:	Maxwell Hills - Pond Sizing	**By:**	WJS
Project Number:	04819/6	**Checked:**	JEB
Catchment:	A - Rural residential zone	**Date:**	1-Nov-11

1. Data

Catchment Area	A =	0.0697	km^2
Runoff curve number....	CN =	84.2	
Initial Abstraction....	Ia =	2.9	mm

2. Calculate Storage, S = (1000/CN - 10)25.4 = 47.8 mm

	Storm #1
3. Average Recurrence Interval, ARI (yr)	Wqevent
4. 24-hour Rainfall Depth, P_{24} (mm)	25.4
5. Compute c* = $(P_{24}-2Ia)/(P_{24}-2Ia+2S)$	0.17
6. Runoff Depth, $Q_{24} = (P_{24}-Ia)2/(P_{24}-2Ia)+S$ (mm)	7.2
7. Runoff Volume, $V_{24} = 1000Q_{24}A$ (m^3)	500

Riley Consultants Limited

Runoff Parameters and Time of Concentration
(from ARC's TP108)

Project Title: Maxwell Hills - Pond Sizing **By:** WJS

Project Number: 04819/6 **Checked:** JDB

Catchment: B - Rural residential zone **Date:** 1-Nov-11

1. Runoff Curve Number (CN) and Initial Abstraction (Ia) - Post Development

Soil Name	Soil Classification	Cover Description	Pervious, Impervious	CN*	Area (Ha)	Product of CN x Area
Colluvium	Group C	Paving, Roads, Roofs	Im	98	1.52	148.96
Colluvium	Group C	Grass	P	74	4.2	310.8
* from Appendix B, TP108 (ARC, 1999)				**Totals =**	5.72	459.8

CN (Weighted) = 80.4

Ia (Weighted) = 3.7 mm

Riley Consultants Limited

Graphical Peak Flow Method
(from ARC's TP108)

Project Title:	Maxwell Hills - Pond Sizing	**By:**	WJS
Project Number:	04819/6	**Checked:**	JEB
Catchment:	B - Rural residential zone	**Date:**	1-Nov-11

1. Data

Catchment Area	A =	0.0572	km^2
Runoff curve number....	CN =	80.4	
Initial Abstraction....	Ia =	3.7	mm

2. Calculate Storage, S = (1000/CN - 10)25.4 = 62.0 mm

	Storm #1
3. Average Recurrence Interval, ARI (yr)	Wqevent
4. 24-hour Rainfall Depth, P_{24} (mm)	25.4
5. Compute c* = $(P_{24}-2Ia)/(P_{24}-2Ia+2S)$	0.13
6. Runoff Depth, $Q_{24} = (P_{24}-Ia)2/(P_{24}-2Ia)+S$ (mm)	5.6
7. Runoff Volume, $V_{24} = 1000Q_{24}A$ (m^3)	300

Riley Consultants Limited

Runoff Parameters and Time of Concentration
(from ARC's TP108)

Project Title: Maxwell Hills - Pond Sizing **By:** WJS

Project Number: 04819/6 **Checked:** JEB

Catchment: C - Rural residential zone **Date:** 1-Nov-11

1. Runoff Curve Number (CN) and Initial Abstraction (Ia) - Post Development

Soil Name	Soil Classification	Cover Description	Pervious, Impervious	CN*	Area (Ha)	Product of CN x Area
Colluvium / Loess	Group C	Paving, Roads, Roofs	Im	98	5.33	522.34
Colluvium / Loess	Group C	Grass	P	74	9.41	696.34
* from Appendix B, TP108 (ARC, 1999)				**Totals =**	14.74	1218.68

CN (Weighted) = 82.7

Ia (Weighted) = 3.2 mm

Riley Consultants Limited

Graphical Peak Flow Method
(from ARC's TP108)

Project Title:	Maxwell Hills - Pond Sizing	**By:**	WJS
Project Number:	04819/6	**Checked:**	JEB
Catchment:	C - Rural residential zone	**Date:**	1-Nov-11

1. Data

Catchment Area	A =	0.1474	km^2
Runoff curve number....	CN =	82.7	
Initial Abstraction....	Ia =	3.2	mm

2. Calculate Storage, S = (1000/CN - 10)25.4 = 53.2 mm

	Storm #1
3. Average Recurrence Interval, ARI (yr)	Wqevent
4. 24-hour Rainfall Depth, P_{24} (mm)	25.4
5. Compute c* = $(P_{24}-2Ia)/(P_{24}-2Ia+2S)$	0.15
6. Runoff Depth, $Q_{24} = (P_{24}-Ia)2/(P_{24}-2Ia)+S$ (mm)	6.5
7. Runoff Volume, $V_{24} = 1000Q_{24}A$ (m^3)	1000

Riley Consultants Limited

Runoff Parameters and Time of Concentration
(from ARC's TP108)

Project Title: Maxwell Hills - Pond Sizing **By:** WJS

Project Number: 04819/6 **Checked:** JEB

Catchment: D - Rural residential zone **Date:** 1-Nov-11

1. Runoff Curve Number (CN) and Initial Abstraction (Ia) - Post Development

Soil Name	Soil Classification	Cover Description	Pervious, Impervious	CN*	Area (Ha)	Product of CN x Area
Colluvium	Group C	Paving, Roads, Roofs	Im	98	2.41	236.18
Colluvium	Group C	Grass	P	74	5.55	410.7
* from Appendix B, TP108 (ARC, 1999)				**Totals =**	7.96	646.9

CN (Weighted) = 81.3

Ia (Weighted) = 3.5 mm

Riley Consultants Limited

Graphical Peak Flow Method
(from ARC's TP108)

Project Title:	Maxwell Hills - Pond Sizing	**By:**	WJS
Project Number:	04819/6	**Checked:**	JEB
Catchment:	D - Rural residential zone	**Date:**	1-Nov-11

1. Data

Catchment Area	A =	0.0796	km^2
Runoff curve number....	CN =	81.3	
Initial Abstraction....	Ia =	3.5	mm

2. Calculate Storage, S = (1000/CN - 10)25.4 = 58.6 mm

	Storm #1
3. Average Recurrence Interval, ARI (yr)	Wqevent
4. 24-hour Rainfall Depth, P_{24} (mm)	25.4
5. Compute c* = $(P_{24}-2Ia)/(P_{24}-2Ia+2S)$	0.14
6. Runoff Depth, $Q_{24} = (P_{24}-Ia)2/(P_{24}-2Ia)+S$ (mm)	6.0
7. Runoff Volume, $V_{24} = 1000Q_{24}A$ (m^3)	500

Riley Consultants Limited

Runoff Parameters and Time of Concentration
(from ARC's TP108)

Project Title: Maxwell Hills - Pond Sizing **By:** WJS

Project Number: 04819/6 **Checked:** JEB

Catchment: E - Rural residential zone **Date:** 1-Nov-11

1. Runoff Curve Number (CN) and Initial Abstraction (Ia) - Post Development

Soil Name	Soil Classification	Cover Description	Pervious, Impervious	CN*	Area (Ha)	Product of CN x Area
Colluvium	Group C	Paving, Roads, Roofs	Im	98	1.68	164.64
Colluvium	Group C	Grass	P	74	3.84	284.16
* from Appendix B, TP108 (ARC, 1999)				**Totals =**	5.52	448.8

CN (Weighted) = 81.3

Ia (Weighted) = 3.5 mm

Riley Consultants Limited

Graphical Peak Flow Method
(from ARC's TP108)

Project Title:	Maxwell Hills - Pond Sizing	**By:**	WJS
Project Number:	04819/6	**Checked:**	JEB
Catchment:	E - Rural residential zone	**Date:**	1-Nov-11

1. Data

Catchment Area	A =	0.0552	km^2
Runoff curve number....	CN =	81.3	
Initial Abstraction....	Ia =	3.5	mm

2. Calculate Storage, S = (1000/CN - 10)25.4 = 58.4 mm

	Storm #1
3. Average Recurrence Interval, ARI (yr)	Wqevent
4. 24-hour Rainfall Depth, P_{24} (mm)	25.4
5. Compute c* = $(P_{24}-2Ia)/(P_{24}-2Ia+2S)$	0.14
6. Runoff Depth, $Q_{24} = (P_{24}-Ia)2/(P_{24}-2Ia)+S$ (mm)	6.0
7. Runoff Volume, $V_{24} = 1000Q_{24}A$ (m^3)	300

Riley Consultants Limited

Runoff Parameters and Time of Concentration
(from ARC's TP108)

Project Title:	Maxwell Hills - Pond Sizing	**By:**	WJS
Project Number:	04819/6	**Checked:**	JEB
Catchment:	Summary	**Date:**	1-Nov-11

Pond Volume Summary

24-hour Rainfall Depth, P24 (mm)		25.4
		Total Volume (m^3)
Catchment	**Size (ha)**	**WQ**
A	6.8	500
B	5.7	300
C	14.7	1000
D	8.0	500
E	5.5	300
TOTAL	40.7	2,600

Riley Consultants Limited

Runoff Parameters and Time of Concentration
(from ARC's TP108)

Project Title:	Maxwell Hills	**By:**	WJS
Project Number:	04819/6	**Checked:**	JEB
Catchment:	Summary - Rural residential zone	**Date:**	1-Nov-11

Pond Area Summary

		Areas				
		Pond		Forebay		Total (m^2)
Catchment	Size (ha)	Length	Width	Length	Width	
A	6.8	34	24	14	11	1,755
B	5.7	28	22	13	10	1,437
C	14.7	49	27	21	13	2,657
D	8.0	34	24	14	11	1,755
E	5.5	27	21	13	10	1,364
TOTAL	40.7					8,967

APPENDIX B

Drawings

MAXWELL PASS ROAD

RAISE ROAD LOCALLY

MAXWELL CREEK

NOTE:
SOME LOCALISED RECONTOURING WILL BE REQUIRED TO DIVERT OVERLAND FLOWPATHS

MAXWELL PASS ROAD

Pond A
0.18Ha

Pond B
0.15Ha

CATCHMENT B
6.12Ha.

CATCHMENT A
6.97Ha.

LEGEND

- MAJOR CONTOUR (5m)
- RURAL RESIDENTIAL LOT
- SW RESERVE AREA
- SW TREATMENT POND
- LEGAL EASEMENT
- LOT DRAINS TO RIVER/CREEK
- CULVERT (1% AEP)
- OVERLAND FLOWPATH
- WATERCOURSE (PERENNIAL)
- PIPED NETWORK
- CATCHMENT BOUNDARY
- BOUNDARY
- MITIGATED 1% AEP FLOOD PLAIN (INCL. 1m FREEBOARD)
- PROPOSED OVERLAND FLOW BARRIER
- SHEET FLOW DIVERSION BUND (1% AEP)

SCALE 1: 2500

0 25 50 75 100 150 (m)

REV	DESCRIPTION	BY	DATE
1	REVISED ISSSUE		

DESIGN WS | CHECKED
DRAWN MP | CHECKED
DATE DRAWN AUG. 2011

APPROVED FOR ISSUE:

DATE: 6/12/11

RILEY CONSULTANTS
P.O.BOX 100 253
N.S.M.C.
AUCKLAND
TEL. 09-4897872
FAX. 09-4897873

TITLE

KAPITI VIEWS LTD.

RURAL RESIDENTIAL DEVELOPMENT - PRIVATE PLAN CHANGE

STORMWATER NETWORK PLAN - SHEET 1

CADFILE 04819_6SW1to4
SCALES (A3) 1:2500
ACENZ
DRAWING No. 04819/6SW-1
REV. 1

NOTE:
SOME LOCALISED RECONTOURING WILL BE REQUIRED TO DIVERT OVERLAND FLOWPATHS

MAXWELL PASS ROAD

RAISE ROAD LOCALLY

MAXWELL CREEK

TAYLOR PASS ROAD

TAYLOR RIVER

Pond C
0.25Ha

CATCHMENT C
14.94Ha.

Pond B
0.15Ha

CATCH
6.12Ha.

CATCHMENT C
14.94Ha.

LEGEND

- MAJOR CONTOUR (5m)
- RURAL RESIDENTIAL LOT
- SW RESERVE AREA
- SW TREATMENT POND
- LEGAL EASEMENT
- LOT DRAINS TO RIVER/CREEK
- CULVERT (1% AEP)
- OVERLAND FLOWPATH
- WATERCOURSE (PERENNIAL)
- PIPED NETWORK
- CATCHMENT BOUNDARY
- BOUNDARY
- MITIGATED 1% AEP FLOOD PLAIN (INCL. 1m FREEBOARD)
- PROPOSED OVERLAND FLOW BARRIER
- SHEET FLOW DIVERSION BUND (1% AEP)

SCALE 1: 2500

0 25 50 75 100 150 (m)

REV	DESCRIPTION	BY	DATE
1	REVISED ISSSUE		

DESIGN: WS | CHECKED
DRAWN: MP | CHECKED
DATE DRAWN: AUG. 2011

APPROVED FOR ISSUE:
DATE: 6/12/11

RILEY CONSULTANTS
P.O.BOX 100 253
N.S.M.C.
AUCKLAND
TEL. 09-4897872
FAX. 09-4897873

TITLE

KAPITI VIEWS LTD.

RURAL RESIDENTIAL DEVELOPMENT - PRIVATE PLAN CHANGE

STORMWATER NETWORK PLAN - SHEET 2

CADFILE: 04819_6SW1to4
SCALES (A3): 1:2500
DRAWING No.: 04819/6SW-2
REV.: 1
ACENZ

NOTE:
SOME LOCALISED RECONTOURING WILL BE REQUIRED TO DIVERT OVERLAND FLOWPATHS

CATCHMENT C
14.94Ha.

CATCHMENT D
8.76Ha.

CATCHMENT E
5.52Ha.

Pond D
0.16Ha

TAYLOR RIVER

TAYLOR PASS ROAD

LEGEND

- MAJOR CONTOUR (5m)
- RURAL RESIDENTIAL LOT
- SW RESERVE AREA
- SW TREATMENT POND
- LEGAL EASEMENT
- LOT DRAINS TO RIVER/CREEK
- CULVERT (1% AEP)
- OVERLAND FLOWPATH
- WATERCOURSE (PERENNIAL)
- SW — SW PIPED NETWORK
- CATCHMENT BOUNDARY
- BOUNDARY
- MITIGATED 1% AEP FLOOD PLAIN (INCL. 1m FREEBOARD)
- PROPOSED OVERLAND FLOW BARRIER
- SHEET FLOW DIVERSION BUND (1% AEP)

SCALE 1: 2500

0 25 50 75 100 150 (m)

REV	DESCRIPTION	BY	DATE
1	REVISED ISSSUE		

DESIGN WS | CHECKED
DRAWN MP | CHECKED
DATE DRAWN AUG. 2011

APPROVED FOR ISSUE:
DATE: 6/12/11

RILEY CONSULTANTS
P.O.BOX 100 253
N.S.M.C.
AUCKLAND
TEL. 09-4897872
FAX. 09-4897873

TITLE

KAPITI VIEWS LTD.

RURAL RESIDENTIAL DEVELOPMENT - PRIVATE PLAN CHANGE

STORMWATER NETWORK PLAN - SHEET 3

CADFILE 04819_6SW1to4
SCALES (A3) 1:2500
ACENZ
DRAWING No. 04819/6SW-3
REV. 1

CATCHMENT D
8.76Ha.

CATCHMENT E
5.52Ha.

Pond E
0.14Ha

TAYLOR RIVER

TAYLOR PASS ROAD

NOTE:
SOME LOCALISED RECONTOURING WILL BE REQUIRED TO DIVERT OVERLAND FLOWPATHS

LEGEND

- MAJOR CONTOUR (5m)
- RURAL RESIDENTIAL LOT
- SW RESERVE AREA
- SW TREATMENT POND
- LEGAL EASEMENT
- LOT DRAINS TO RIVER/CREEK
- CULVERT (1% AEP)
- OVERLAND FLOWPATH
- WATERCOURSE (PERENNIAL)
- SW — SW — PIPED NETWORK
- CATCHMENT BOUNDARY
- BOUNDARY
- MITIGATED 1% AEP FLOOD PLAIN (INCL. 1m FREEBOARD)
- PROPOSED OVERLAND FLOW BARRIER
- SHEET FLOW DIVERSION BUND (1% AEP)

SCALE 1: 2500
0 25 50 75 100 150 (m)

REV	DESCRIPTION	BY	DATE
1	REVISED ISSSUE		

DESIGN WS CHECKED
DRAWN MP CHECKED
DATE DRAWN AUG. 2011

APPROVED FOR ISSUE:
DATE: 6/10/11

RILEY CONSULTANTS
P.O.BOX 100 253
N.S.M.C.
AUCKLAND
TEL. 09-4897872
FAX. 09-4897873

TITLE

KAPITI VIEWS LTD.

RURAL RESIDENTIAL DEVELOPMENT - PRIVATE PLAN CHANGE

STORMWATER NETWORK PLAN - SHEET 4

CADFILE 04819_6SW1to4
SCALES (A3) 1:2500
DRAWING No. 04819/6SW-4
REV. 1
ACENZ

Appendix V

Revised Schedule of Changes

Schedule of Changes to the Wairau/Awatere Resource Management Plan

SCHEDULE OF CHANGES TO THE WAIRAU AWATERE RESOURCE MANAGEMENT PLAN

It is proposed to change the Wairau Awatere Resource Management Plan (the Plan) as follows:

Note: Where text is proposed to be added to the Plan it is shown as <u>underlined</u>.

Volume 2 Rules

1 Add a new Appendix R Maxwell Hills Zone, including an Outline Development Plan, as attached.

2 Add "**Appendix R Maxwell Hills Zone**" to the Table of Contents after "Appendix Q Schedule of Water Bodies for Riparian Management Purpose"

Volume 3 Planning Maps

3 Amend Planning Map 185 to include the new Maxwell Hills Zone with reference to Appendix R, as attached.

4 Amend the Legend to the Planning Maps to show a key for the Maxwell Hills Zone with specific reference to Appendix R, as attached.

Appendix R Maxwell Hills Zone

1. Zone Statement

The Maxwell Hills Zone is intended to provide a very low density residential living environment in a rural hills setting. This zone adds to the choice of high amenity living environments available to the Wairau/Awatere community. The zone is located 2.5 kilometres from the existing Blenheim urban boundary and about 1 kilometre from the Taylor Dam recreational area. The density of development provided is much lower than the nearby Blenheim urban area but is higher than the density of the existing rural residential zones which are generally around 1 hectare and is intended to provide for the growing demand for lots between 2000- 4000 square metres in area. The zone is intended to take some pressure off the demand for rural residential development in the Wairau Plain and from a visual amenity point of view will enable the development of a hill residential environment that is not visible from Blenheim.

An Outline Development Plan is included for this zone to ensure integrated development of the site with appropriate roading, servicing, recreation and reserve networks.

While several options exist, provision of an adequate water supply will be fundamental to the development of this rural residential area.

1.1 Objective and Policies

Objective 1: An environment that provides a sustainable and alternative choice for residential living for the community while avoiding or mitigating any adverse effects on the amenity values and characteristics of the surrounding rural environment.

Policy 1.1 Provide for the establishment of a residential hills environment through zoning land at Maxwell Hills for very low density residential activity.

Policy 1.2 Ensure that all building development within the Maxwell Hills Zone avoids areas subject to hazards, unless those hazards can be sufficiently mitigated.

Policy 1.3 Provide for the maintenance and enhancement of the amenity and visual character of the locality through sensitive landscape planting, building densities and building design.

Policy 1.4 Provide for a range of small scale non residential activities in conjunction with residential activity to facilitate the social, economic and cultural well being of the community while avoiding and mitigating adverse effects on the environment.

Policy 1.5 Encourage opportunities that will create a more sustainably focused residential environment to that found in traditional residential environments within the District, including but not limited to enabling increased use of solar energy, cycling and pedestrian activity.

2. Rules

Unless specifically excluded by a rule below the definitions of Chapter 26.0, the Rules of Chapter 27.0 (General Rules Having Application in All Zones, Rivers, Riverbeds and Lakes) and Chapter 29.0 (Standard Requirements for Subdivision and Development) apply.

2.1 Permitted Activities

The following activities are permitted activities provided that they comply with the Outline Development Plan and the permitted activity conditions specified:

- Residential activity, limited to one dwelling house per lot.
- Homestay, limited to not more than five visitors.
- Professional offices, veterinary clinics and home occupations, provided these are ancillary to the principal residential activity.
- retail sales of:
  farm and garden produce grown, reared or produced on the site.
  handicrafts produced on the site.
- Parks, reserves (owned and administered by a public authority).
- Grazing for maintenance of open space.
- Temporary buildings.
- Discharges

2.2 Conditions for Permitted Activities

2.2.1 Outline Development Plan

2.2.1.1 All development shall be undertaken in accordance with the Outline Development Plan in Clause 2.8.

2.2.2 Vehicle Access

2.2.2.1 For any proposed activity the owner, occupier or developer shall make provision for on-site all-weather vehicle parking. Any driveway formed on a lot for a permitted activity shall not exceed a gradient of 1 in 6.

2.2.2.2 With respect to Maxwell Hills Zone all vehicle access, including driveways and intersections, shall comply with Austroads Guide to Traffic Engineering Practice Part 5 “Intersections at Grade” and the following general rules in Chapter 27.2 (Rules Relating to Transportation) shall not apply:

Rules 27.2.4.4, 27.2.4.5, 27.2.4.6, 27.2.4.7 and 27.2.5

2.2.2.3 Gradients - Excavation

The gradient of any side cut excavation must not exceed an average of 9.5° (1:6) and must not exceed 11.3° (1:5) along any length of more than 20 metres.

2.2.2.4 Water Control and Culverts

Stormwater controls, watertable cut-offs, and culverts are to be installed to ensure that erosion does not occur on the inside edge of the cut. No culvert size less than 300 mm may be used to drain any side-cut excavation.

2.2.2.5 Stabilisation

Batters and side castings are to be stabilised by appropriate measures such as retaining, seeding, compacting, drainage and/or other methods of revegetation.

2.2.2.6 Run-off

Run-off from watertables or surfaces of side cut excavations is to be directed to stable land areas.

2.2.2.7 Access to Taylor Pass Road

Residential lots which adjoin Taylor Pass Rd shall not have vehicle access directly to or from Taylor Pass Road.

2.2.3 Parking Space Requirements

Refer to Chapter 27, Rule 27.2.3.

2.2.4 Amenities

2.2.4.1 Residential Site Density - Residential Activity

The minimum net site area for each residential unit shall be:

(i) A minimum of 2,000m^2;
(ii) Of such shape that it will contain a circle of 15 metres diameter; and
(iii) Dedicated for the exclusive use and occupation of the unit and contiguous with it.

2.2.4.2 Open Space - Residential Activity, Home Occupations, Homestays

The maximum percentage of net site area which may be covered by buildings shall be: 30% or 600m^2, whichever is the least.

2.2.4.3 Maximum Building Height - All Activities

The maximum permitted height of any building or structure shall be 8 metres.

2.2.4.4 Sunlight and Privacy for Neighbours - All Activities

2.2.4.4.1 No part of any building shall exceed a height equal to the recession plane angle determined by the application of Figures 2 and 3 of the Definition Chapter. To determine the maximum permitted height in relation to boundaries on the site the diagram in Figure 2 (Recession Plane Indicator) must be viewed within the site, and

orientated north. The angle of inclination relative to a particular boundary is determined by the angle on the diagram in Figure 3 adjacent at that boundary.

2.2.4.4.2 Within the Maxwell Hills Zone the angle shall be measured from a starting point 2.3 metres above ground level (x = 2.3 m).

2.2.4.4.3 Except where a site boundary abuts the street or road, no part of any building should exceed a height limit imposed by a line drawn at an angle of 55° from the horizontal and originating and drawn at right angles from a point 2 metres above the boundary of the site where it abuts the street or road.

2.2.4.4.4 Exception for a garage
Any part of the garage building may intrude into a recession plane, until the recession plane reaches 3 metres in height with reference to the boundary level, to enable the garage building to be sited up against or nearer to a side or rear boundary provided that:

(a) The continuous or aggregate length of a building or buildings sited on or near to the boundary and intruding into the recession plane may not exceed 9.0 metres.
(b) The exemption can be applied to only one side boundary and one rear boundary.
(c) Any such building shall be sited at least 5.5 metres from the front boundary. This does not apply to side entry garages, where a 90-percentile vehicle can park between the front boundary and the garage entrance.
(d) The maximum height of the building within 1 metre of the boundary does not exceed 3 metres.

2.2.4.5 Siting Requirements for Garages

A front yard of 5.5 metres depth shall be provided for a garage having vehicular access directly from the road or street.

2.2.4.6 Noise

All activities shall be conducted so as to ensure that noise arising from such activities does not exceed the following noise limits at or within the boundary of any other site zoned Maxwell Hills:

55 dBA L_{10}	0700 hrs - 2200 hrs Monday to Friday and 0700 hrs - 1200 hrs Saturday
45 dBA L_{10} , and 70 dBA L_{max}	At all other times including any public holiday

Provided on any day between 0700 hrs - 2200 hrs the L_{max} limit shall not apply

2.2.5 Heritage

Note:
Notwithstanding any permitted activity status herein, an authorisation from the New Zealand Historic Places Trust is required before any person may destroy, damage or modify the whole or part of any historical, cultural or archaeological site.

2.2.6 Hazards

2.2.6.1 Flood Protection / Riparian Management

2.2.6.1.1 All buildings, structures and trees shall be set back a minimum of 8 metres from the top of any natural river or stream bank, or wetland, or any stopbank.

2.2.6.1.2 No dwelling house(s) shall be sited on the river/stream side of the flood line shown on the Maxwell Hills Zone Outline Development Plan (see Clause 2.8).

2.2.6.1.3 No dwelling house(s) shall be sited within the Flood Hazard overlay area shown on the Outline Development Plan (see Clause 2.8).

2.2.6.1.4 The earth bund shown on the Outline Development Plan in Clause 2.8 must be constructed before any dwellings can be constructed on the north side of Maxwell Creek.

2.2.7 Earthworks

2.2.7.1 Excavation

2.2.7.1.1 No excavation shall take place within 8 metres of the landward toe of a stopbank and the depth of any excavation may not exceed 20% of the distance from the stopbank.

Exemptions

Filling or excavation associated with the construction or maintenance of flood protection works. This includes stopbanks or retention basins constructed by or on behalf of the Council.

2.2.7.2 Content

2.2.7.2.1 Material other than rubble, ballast, stones, soil material and demolition material shall not be used as fill or for the filling of land or depressions.

2.2.7.2.2 Fill material shall not contain any putrecible, inflammable or hazardous components.

2.2.7.2.3 Fill material shall contain no more than 5% vegetative material which is not incidental to the cleaning of sites.

2.2.7.3 General

2.2.7.3.1 No woody material of greater than 100 mm diameter shall be left in any permanently flowing river, lake, or wetland as a result of any earthworks.

2.2.7.3.2 All sites subject to excavation or fill are to be stable when subject to a storm event of return frequency of 1 in 10 years or less.

2.2.8 Discharges

2.2.8.1 Domestic Effluent Disposal

2.2.8.1.1 Provision must be made for the satisfactory disposal of all effluent and greywater in accordance with the requirements of this Plan. The requirements of this

Plan are deemed to have been met where all domestic effluent and greywater is connected to a public system expressly designed for this purpose.

2.2.8.2 Incineration

2.2.8.2.1 The discharge of contaminants to air from incineration of untreated wood, vegetation newspapers, magazines and cardboard shall be a Permitted Activity provided that:

(a) The waste is generated on the property where incineration occurs.
(b) Any vegetative matter is dry.
(c) The waste being incinerated shall not include:
(i) Car tyres;
(ii) Plastic agrichemical containers;
(iii) Hazardous substances or containers of hazardous substances;
(iv) Oil based products;
(v) Food scraps;
(vi) Aerosol cans;
(vii) Foam products;
(viii) Paper, unless there is a fly ash guard;
(ix) All tyres and rubber, and all plastics.

(d) Weather conditions are such that any nuisance effects from smoke are minimised.

2.2.8.3 Other Discharges to Air

Any discharge of contaminants to air associated with any Permitted Activity is also a Permitted Activity provided:

(a) There shall be no objectionable or offensive odour to the extent that it causes an adverse effect beyond the boundary of the site of the discharge.
(b) The discharger at all times, adopts the best practicable option to avoid, remedy or mitigate any adverse effects on the environment.

2.2.8.4 Discharge of Electro Magnetic Radiation (EMR)

The discharge of EMR (Electric Magnetic Radiation) is a Permitted Activity, provided the level of discharge meets the requirement/limitations of NZS 6609.

2.2.8.5 Application of Agrichemicals

The discharge of a contaminant or contaminants onto land or into air in connection with the spray application of agrichemicals on domestic or residential properties or in domestic quantities on industrial and trade premises is permitted provided that the person responsible for the activity shall:

(a) Apply sprays strictly in accordance with the manufacturers instructions.

(b) Notify the Council immediately in the case of accidental discharge into a water body.

(c) Take all reasonable steps to ensure that no spray drift occurs beyond the boundary of the property.

(d) Apply sprays in a manner which does not cause or is not likely to cause deposition into surface waters.

(e) Apply sprays with hand held equipment only.

2.2.9 Rules Applicable to Temporary Buildings

The following temporary buildings shall be a Permitted Activity:

(a) Temporary buildings ancillary to a building or construction project, provided that any such building does not exceed 40 m^2 in area, or remain on the site for longer than the duration of the project or twelve months, whichever is the lesser.

(b) Temporary buildings or other structures including tents, ancillary to carnivals, bazaars, and public meetings, provided that such activities or buildings shall not remain on site longer than one month.

(c) Where a building is intended for the care of a nominated dependent relative and the maximum site coverage requirement for buildings has already been reached then a building of not more than 80 m^2 will be permitted subject to the building being relocatable. The landowner shall enter into a bond with the Council to ensure that the building is removed when no longer required for the housing of the nominated dependent relative (the bond shall be registered under the Land Transfer Act 1952 against the Certificate of Title to the land and shall be of a covenant running with the land which binds all subsequent owners of the land).

2.3 Limited Discretionary Activities

2.3.1 Application must be made for a resource consent for a limited discretionary activity for the following:

- Wastewater infrastructure that does not meet rule 2.1 and/or 2.2. but meets rule 2.3.1.1.
- Wastewater discharges that do not meet rule 2.1 and/or 2.2. but meet rule rule 2.3.1.2.
- Minor non-compliance with the standards for Permitted Activities to the extent specified in rule 2.3.1.3 below.

2.3.1.1 Reticulated Community Wastewater Treatment Plant and Associated Infrastructure

2.3.1.1.1 A Reticulated Community Wastewater Treatment Plant and associated on-site infrastructure including primary treatment tanks is a Limited Discretionary Activity provided that the activity conforms to the following Standards and Terms.

(a) All allotments with dwellings have an on-site interceptor tank with a minimum storage capacity of 24 hours.
(b) Secondary treatment shall be by a recirculating textile packed bed reactor treatment plant or similar technology;
(c) The Treatment Plant shall be:
    (i) Located in the utilities area in general accordance with the Outline Development Plan.
    (ii) Monitored by a remote telemetry unit.
    (iii) Of sufficient capacity for emergency storage volume of at least 24 hours at peak flow following any Treatment Plant malfunction.
    (iv) Planted along boundaries to provide screening of the site from the road.

2.3.1.1.2 Matters to which the Council has restricted the exercise of its Discretion:

For a reticulated community wastewater treatment plant that conforms with the standards and terms in rule 2.3.1.1, the Council limits its discretion to, and may impose conditions with respect to:

(a) The location, siting, bulk and design of the plant and associated infrastructure;
(b) Staging of installation of the Treatment Plant and associated infrastructure;
(c) The quality of the effluent to be created;
(d) Screening of the Treatment Plant from the road, including proposed height of plants at time of planting;
(e) Maintenance contracts and management plans;
(f) Monitoring systems, alarms and emergency response;
(g) Systems of reporting to the Council;

2.3.1.1.3 All applications under rule 2.3.1.1 will not require the written approval of other persons and shall be non-notified. However, the Council may consult with iwi.

2.3.1.2 Discharge of Treated Wastewater

2.3.1.2.1 Discharge of treated wastewater is a Limited Discretionary Activity provided that the discharge is from a wastewater treatment plant that complies with the standards and terms in rule 2.3.1.1.

2.3.1.2.2 Matters to which the Council has restricted the exercise of its Discretion:

For discharge of treated wastewater that complies with rule 2.3.1.2, the Council restricts its discretion to and may impose conditions with respect to:

(a) The location and siting of the discharge areas;
(b) Fencing and barrier planting, and amenity planting;
(c) Vegetation within the land application area/s;
(d) The quality of the effluent to be discharged
(e) The rate of discharge sufficient to avoid slope instability or erosion, and avoid contamination of water;
(f) The design of the land irrigation system;
(g) Systems for monitoring and maintenance;
(h) Emergency and malfunction management systems;

(i) Management Plans;
(j) Systems of reporting to Council;

2.3.1.2.3 All applications under rule 2.3.1.2 will not require the written approval of other persons and shall be non-notified, however, the Council may consult with iwi.

Note:
Discharge of treated wastewater to land within the Maxwell Hills Zone is likely to be limited, but could include discharge in the utilities area specified in the Outline Development Plan at Clause 2.9 and/or recycling of high quality effluent to irrigate road berms, landscaped areas and private lawns.

2.3.1.3 Minor Non-compliance with Some Standards for Permitted Activities

2.3.1.3.1 Minor non-compliance with the standards for Permitted Activities to the extent specified below:

- Buildings exceeding the maximum permitted site coverage up to a maximum of 20% of the specified standard.
- Buildings or structures exceeding the maximum permitted height up to a maximum of 20% of the specified standard.
- Buildings encroaching the height envelope created by the recession plane angles by a maximum of 1 metre in any direction.
- Buildings, structures and trees within 8 metres of any drainage channel or landward toe of any stopbank - up to 100% dispensation.
- Parking requirements.
- Access gradients - up to 5%.

2.3.1.3.2 All applications for minor non-compliance shall be non-notified, however, the Council may require the written approval of every person who may in the Council's judgment be adversely affected by the granting of the consent for non-compliance unless it is considered unreasonable in the circumstances to require such approval.

2.3.1.3.3 Matters to which the Council has Restricted the Exercise of its Discretion

In considering any application for minor non-compliance the Council will in the exercise of its discretion have regard to the following matters:

(a) The non-compliance should not diminish the overall residential character of the locality.
(b) The non-compliance should not significantly and adversely obstruct views from nearby residential properties to the surrounding hills and valley
(c) The non-compliance should not adversely affect privacy enjoyed on adjoining residential properties.
(d) The non-compliance should not significantly diminish the daylight available to adjoining properties or cause shading of outdoor living areas, service courts, open space or habitable rooms on adjoining properties.
(e) The non-compliance should not significantly reduce the usability or enjoyment of open space, living courts, or service courts on the applicant's site.
(f) The non-compliance should not put at risk any private property from foreseeable flood hazard.

(g) The non-compliance should not interfere with the protection of any natural or any other floodway. The non-compliance should not adversely affect the hydraulic integrity of any watercourse or stream. The non-compliance should not adversely affect on-site vehicle manoeuvring or car parking areas or affect the safe flow of traffic on adjoining roads.

2.4 Discretionary Activities

2.4.1 Application must be made for a resource consent for a Discretionary Activity for the following:

- Activities listed as Permitted which do not comply with standards and/or conditions or with the provisions for minor non-compliance dealt with as Limited Discretionary Activities. Except that this provision shall not apply to activities listed as Non-Complying or Prohibited Activities.
- Activities provided for under Rules 2.3.1.1 and 2.3.1.2 that do not comply with the standards and terms of those rules.
- Relocated buildings of greater than $36m^2$ in area.
- Visitor accommodation, including camping grounds.
- Community facilities and activities, places of assembly, religious institutions.
- Recreational facilities (other than parks and reserves).
- Retail facilities not provided for as a permitted activity.
- Educational facilities.
- Marae and marae-based activities.
- Hazardous facilities having an effects ratio no greater than 1.0.
- Emergency service activities.
- Development that is not in general accordance with the Outline Development Plan.

2.5 Non-Complying Activities

2.5.1 Application must be made for a resource consent for a Non-Complying Activity for the following:

- Any activity not provided for as a Permitted, Controlled, Limited Discretionary, Discretionary or Prohibited Activity shall be deemed to be a Non-Complying Activity.

- Any non-compliance with Rule 2.2.4.1 (Residential Site Density).

- Within any area identified as a Flood Hazard on the Planning Maps the following are Non-Complying Activities:
  Any building.
  Construction of stopbanks, modification of existing stopbanks or deposition of material in ephemeral channels.
  Construction of impermeable walls, fences or similar structures which would divert water.
  Any excavation.

2.6 Prohibited Activities

2.6.1 The following are Prohibited Activities for which no resource consent shall be granted:

- The disposal of hazardous waste substances to land or water.

- The combustion of:
  Materials associated with the recovery of metals from insulated electrical cables in the open; or
  Materials and metals used in motor vehicles in the open; or
  Any other PVC plastic, or rubber tyres, waste oils, treated timber, or agricultural chemical wastes in the open.

Note:
In the open means other than in an enclosed incineration device with a chimney.

2.7 Subdivision

2.7.1 Permitted Subdivision Activities

The provisions of Chapter 28, Rule 28.1.1 and Rule 28.1.2 shall apply.

2.7.2 Controlled Subdivision Activities

2.7.2.1 Subdivision which complies with the following standards shall be a controlled activity:

(a) Allotment Standards

Zone	Allotment Type	Environmental Assessment Threshold Lot Area m^2	Environmental Assessment Threshold Building Platform Shape Factor	Environmental Assessment Threshold Frontage metres	Qualification
Maxwell Hills Zone	**Front and rear with sewerage**	**2,000 m^2 minimum; and 2,400m^2 average (see note 1**	**15 metre diameter circle (see note 2**	N/A	Access requirements apply, refer Chapter 28,

Zone	Allotment Type	Environmental Assessment Threshold Lot Area m^2	Environmental Assessment Threshold Building Platform Shape Factor	Environmental Assessment Threshold Frontage metres	Qualification
	reticulation	below)	below)[2]		Rule 28.2.3 as for all residential zones.

Notes:

1 Lot areas prescribed are net areas, exclusive of access

2 The minimum building platform shape factor may be applied anywhere within the proposed allotment.

(b) Subdivision in the Maxwell Hills Zone shall be in general accordance with the Outline Development Plan at Clause 2.8.

(c) The General Standards for controlled subdivision activities contained in Chapter 28, Rule 28.2.4 shall apply.

2.7.2.2 Matters over Which the Council will Exercise Control

2.7.2.2.1 The matters for control identified in Chapter 28, Rule 28.2.5 shall apply.

2.7.2.2.2 In addition to the matters identified in Rule 28.2.5, the Council will also exercise control over landscape treatment.

2.7.3 Discretionary and Non-Complying Subdivision Activities

Subdivision is a Discretionary Activity where the subdivision does not comply with one or more of the Permitted or Controlled Activity requirements for the Maxwell Hills Zone; except that where the environmental assessment threshold lot area is not met the subdivision activity shall be a non-complying activity.

In assessing a discretionary or non-complying subdivision activity, the Council may take into consideration the matters contained in Chapter 28, Clause 28.3.5 and may impose conditions indicated in Chapter 28, Clause 28.3.6.

2.7.4 Information to be Supplied with All Applications for Subdivision Consent

2.7.4.1 The relevant provisions of Chapter 29.0, Clause 29.1 shall apply to all applications for subdivision consent. In addition the specific information requested below shall be required:

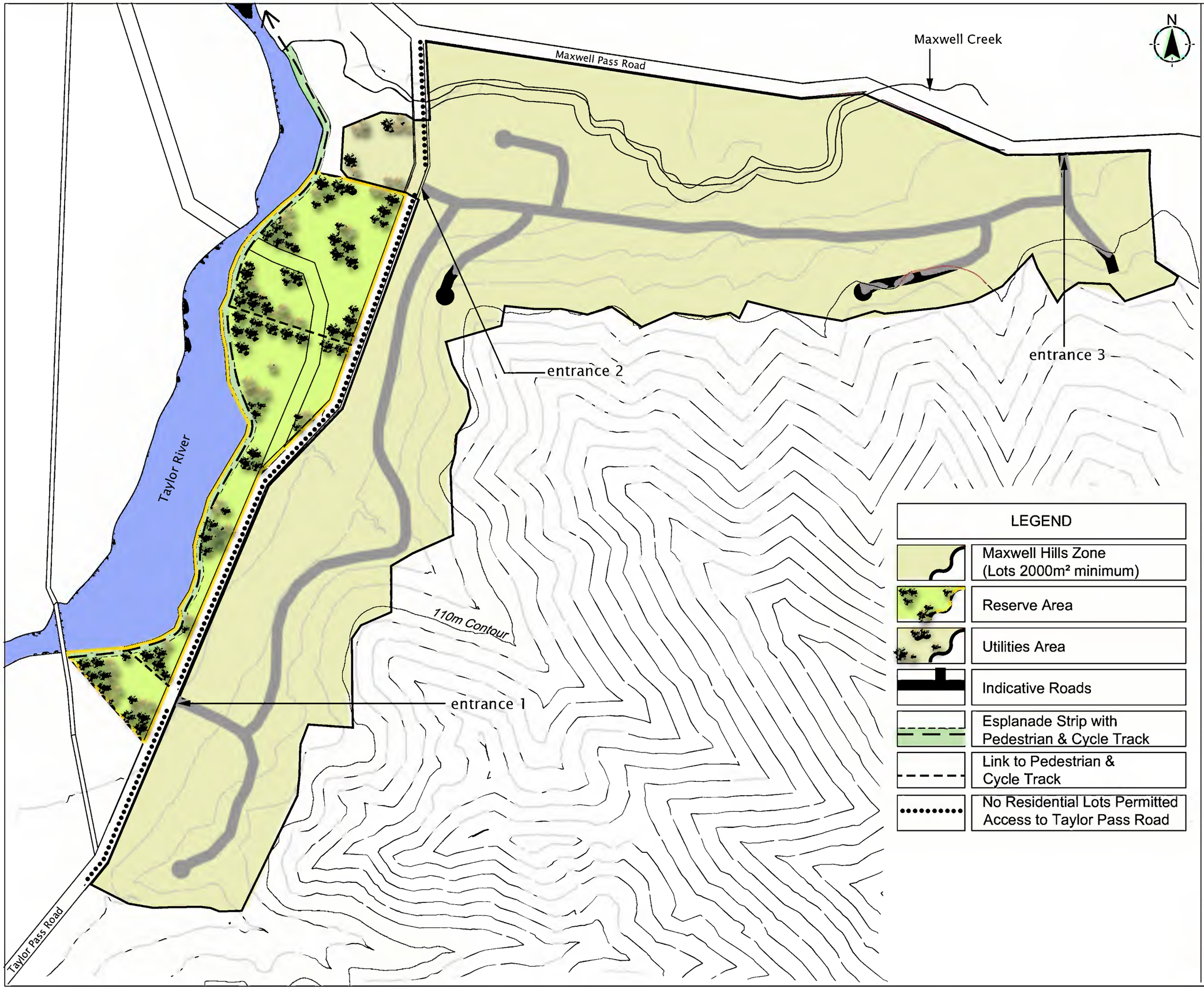
(a) A landscape plan detailing the species, density, planting programme as well as maintenance regime.

2.7.5 Requirements for Subdivision and Development

2.7.5.1 The provisions of Chapter 29.0, Clause 29.2 shall apply. In respect to Clause 29.2.19.4 the amount required for reserve fund contribution shall be as for the Rural Residential Zone.

2.8 Outline Development Plan for Maxwell Hills Zone

[next page]



LEGEND

- Maxwell Hills Zone (Lots 2000m² minimum)
- Reserve Area
- Utilities Area
- Indicative Roads
- Esplanade Strip with Pedestrian & Cycle Track
- Link to Pedestrian & Cycle Track
- No Residential Lots Permitted Access to Taylor Pass Road

GENERAL NOTES

1. Flood Hazard Overlay boundaries to be confirmed.
2. Lot boundaries, Vegetation, Road & Track positions shown are indicative only.
3. All subdivision lots accommodated within proposed Maxwell Hills Zone.

B	AMEND LAYOUT	JC	11.11.10
A	INITIAL ISSUE	JC	03.11.10

Revision		App	Date
Surveyed	~		~
Designed	JC		11.11.10
Drawn	NC	MGC (CGLA) 21.02.11 MGC (CGLA) 19.09.11 MGC (CGLA) 28.04.11 MGC (CGLA) 21.11.11 MGC (CGLA) 22.07.11	11.11.10
Reviewed	JC		11.11.10
Approved	JANICE CARTER		11.11.10

CPG New Zealand Ltd
236 Armagh Street
Christchurch 8141
Phone 03 374 6515
Fax 03 374 6516
christchurch@nz.cpg-global.com

Client
KAPITI VIEWS TRUST

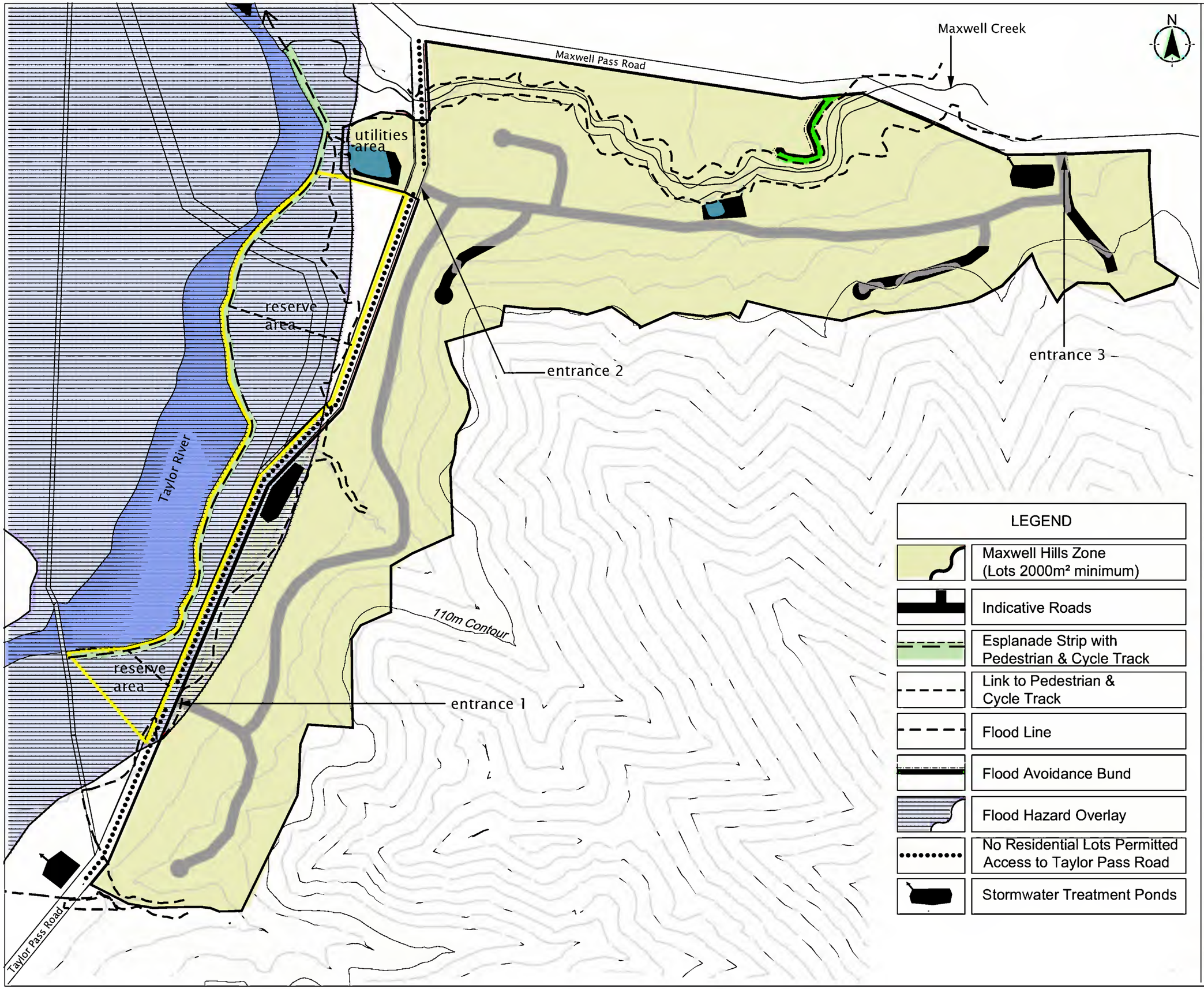
Project Title
MAXWELL HILLS PLAN CHANGE

Sheet Title
OUTLINE DEVELOPMENT PLAN A

Scale (A3 Original) 1: 5000

50 25 0 50 100 150 m

Project No	Sheet	Revision
009025	130	B



GENERAL NOTES

1. Flood Hazard Overlay boundaries to be confirmed.
2. Lot boundaries, Vegetation, Road & Track positions shown are indicative only.
3. All subdivision lots accommodated within proposed Maxwell Hills Zone.

LEGEND

- Maxwell Hills Zone (Lots 2000m² minimum)
- Indicative Roads
- Esplanade Strip with Pedestrian & Cycle Track
- Link to Pedestrian & Cycle Track
- Flood Line
- Flood Avoidance Bund
- Flood Hazard Overlay
- No Residential Lots Permitted Access to Taylor Pass Road
- Stormwater Treatment Ponds

B	AMEND LAYOUT	JC	11.11.10
A	INITIAL ISSUE	JC	03.11.10

Revision		App	Date
Surveyed	~		~
Designed	JC		11.11.10
Drawn	NC MGC (CGLA) 19.09.11 MGC (CGLA) 21.11.11		11.11.10
Reviewed	JC		11.11.10
Approved	JANICE CARTER		11.11.10

Verify all dimensions on site before commencing work. Prioritise figured dimensions over scaling. Refer all discrepancies to the drawing office.

CPG New Zealand Ltd
236 Armagh Street
Christchurch 8141
Phone 03 374 6515
Fax 03 374 6516
christchurch@nz.cpg-global.com

Client
KAPITI VIEWS TRUST

Project Title
MAXWELL HILLS PLAN CHANGE

Sheet Title
OUTLINE DEVELOPMENT PLAN B (Flood and Stormwater)

Scale (A3 Original) 1: 5000

50 25 0 50 100 150 m

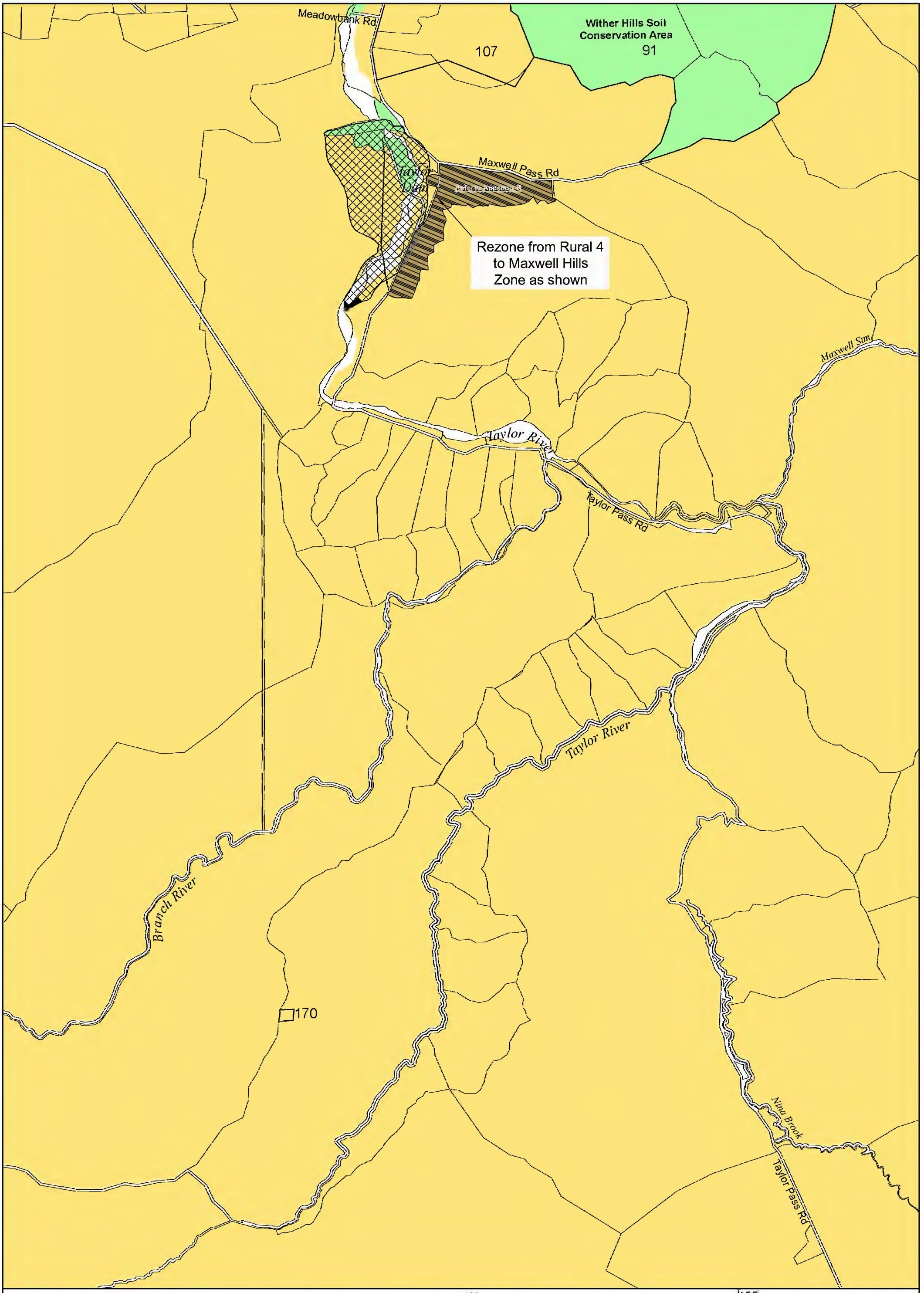
Project No	Sheet	Revision
009025	130	B

Table of Contents

Volume Two - Rules

26.0	Definitions	
27.0	General Rules	
	1.	Rules Relating to Fresh Water, River and Riverbeds
	2.	Rules Relating to Transportation
	3.	Rules Relating to Heritage
	4.	Rules Relating to Outdoor Advertising
	5.	Rules Relating to Utilities and Designations
28.0	Subdivision	
29.0	Standard Requirements for Subdivision and Development	
30.0	Rural 3 and 4 Zones	
31.0	Rural Residential Zone	
32.0	Urban Residential 1 and 2 Zones	
33.0	Township Residential Zone	
34.0	Deferred Township Residential Zone	
35.0	Central Business Zone	
36.0	Neighbourhood Business Zone	
37.0	Industrial 1 and 2 Zones	
38.0	Rural Township Zone	
39.0	Coastal Marine Zone	
40.0	Port Zone	
41.0	Conservation Zone	
42.0	District Recreation Zone	
43.0	Local Recreation Zone	
44.0	Airport Zone	
45.0	Lake Grassmere Salt Works Zone	
46.0	Skifield Zone	

Appendix A	Register of Significant Heritage Resources
Appendix B	Schedule of Designated Land
Appendix C	Hazardous Facility Screening Procedure
Appendix D	Areas of Significant Conservation Value
Appendix E	Requirements for Chimney Height
Appendix F	River Control and Drainage Works Programme
Appendix G	Register of Specifically Identified Activities
Appendix H1	Schedule of 3,000m^2 Sites in Urban Residential 2 Zone
Appendix H2	Schedule of 1,200m^2 Sites in Urban Residential 2 Zone
Appendix I	North West Blenheim – Zone Development Levy Areas
Appendix J	Water Quality Classifications
Appendix K	Marlborough Quality Classifications
Appendix M	Airport Noise Sensitive Activities
Appendix N	Definition of Potable Water
Appendix O	Quality of Effluent Suitable for Application to Surface Irrigation
Appendix P	Irrigation Water Quality Guidelines
Appendix Q	Schedule of Water Bodies for Riparian Management Purpose
Appendix R	Maxwell Hills Zone



198

Scale: 1: 30000

Original drawn scale for printing at A3

Taylor Pass to Awatere Valley

155
184 186
198

Map 185

PROPOSED PLAN CHANGE: REZONING FROM RURAL 4 TO MAXWELL HILLS ZONE

Wairau / Awatere Resource Management Plan Legend

- Airport Zone
- Airport Noise Exposure Overlay
- Areas of Significant Conservation Value
- Central Business Zone
- Central Business Zone/Primary Shopping Area
- Conservation Zone
- Coastal Marine Zone
  Mean High Water Springs to 12 Mile Limit (CMZ)
- Deferred Township Residential Zone
- District Recreation Zone
- Industrial One Zone
- Industrial Two Zone
- Lake Grassmere Height Limitation Boundary
- Lake Grassmere Special Noise Boundary
- Lake Grassmere Pipeline Extension Corridor
- Lake Grassmere Salt Works Administration & Processing Area
- Lake Grassmere Salt Works Zone
- Local Recreation Zone
- Marlborough Ridge Zone
- Marlborough Ridge Inner Zones
- **Maxwell Hills Zone (refer to Appendix R)**
- Neighbourhood Business Zone
- Port Zone
- Rural Four Zone
- Rural Residential Zone
- Rural Three Zone
- Rural Township Zone
- Skifield Zone
- Township Residential Zone
- Urban Residential One Zone
- Urban Residential Two Zone
- Cadastral Boundary
- Water features
- Designated Area

Clifford Bay - Alternative Rail Routes

1 2 3

- Flood Hazard Overlay
- 7 Heritage Tree
- 9 Heritage Site
- River Mouth
- Resource Management Plan boundaries
- Specific Identified Activity Sites (Appendix G)
- Transmission centreline
- Wairau Lagoons

- Inset Maps
- 172 / 180 / 192 / 8 Adjacent Map Key
- N North applicable to all Maps

NOTE: Legend does not apply to the following maps:
Map 213 : Airport Protection and Designation 2
Maps 214 - 215 : Riparian Setback Maps
Map 216 : Aquifers of the Wairau Plain
Map 217 : Landscape Types and Special Places
Maps 218 - 227 : Outstanding Natural Features and Landscapes Series

Appendix VI

Utility Management Company Brochure

UTILITIES MANAGEMENT NZ LTD

The Ultimate Solution for Management of Decentralised Services

Utilities Management NZ Ltd is an independent company that will own and operate self-contained utility services throughout New Zealand. This provides strong benefits to property developers, local authorities, suppliers, consultants and residents.

This solution reduces the complexity of consenting and developing projects that rely on decentralized services. Proven as a successful model in the United States, specialised utility company ownership and management provides an effective way forward and a long-term solution for development.

Local Authorities:

- Strengthen Resource Consent processes.
- Include a Responsible Management Entity in the chain of accountability.
- Independent ownership of utility services guarantees professional management and operation.
- Bypass Residents Association control of utility services and avoid unqualified management of critical services.
- Create efficiencies in monitoring and contact with utility operators.

Consultants:

- Developers chosen consultants will implement development.
- Enjoy a mutually beneficial and constructive approach to services implementation.
- Focus on excellent long-term outcomes.

Utility system suppliers:

- Enjoy the benefits of more direct competition.
- Provide operational and maintenance services.
- Protect the reputation of installed systems.
- Compete only with suppliers of quality systems.

Property Developers:

- Avoid Securities Act risks, buyer resistance and the complications caused by Resident Association requirements.
- Save time in dealings with Local and Regional Authorities.
- Maximise the benefits and profitability of installed services.
- Reduce risk and uncertainty as Utilities Management will remain responsible for the operation and maintenance of utilities.

Residents:

- Rest assured that essential services are being professionally owned and managed.
- Reduce financial risk because of reliable services and an assurance of fair dealing.
- Benefit from living and owning in a development with a high reputation.
- Avoid having to be part of Residents Association and still enjoy all the benefits of a self contained community.

Find out more

Call Utilities Management on 0800 654 765 www.umnz.co.nz

INDEPENDENTLY OWNED UTILITIES