

Addendum Report

Stage 2 - Setback Assessment

Addendum Report

Stage 2 - Setback Assessment

Client: Hamilton City Council

Co No.: N/A

Prepared by

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Quality Information

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Reviewed by Russell Allison

Revision History


Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	30-Jul-2019	Working draft for client	Chris Hardy Project Manager	
B	01-Nov-2019	Revised as per peer review	Chris Hardy Project Manager	
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1.0 Introduction

Hamilton City Council (HCC) engaged AECOM New Zealand Limited (AECOM) to undertake a detailed gully hazard setback assessment of the Mangakotukutuku and Peacocke Catchment as part of the Mangakotukutuku Integrated Catchment Management Plan (ICMP). This detailed assessment focuses on the Peacocke Structure Plan Area.

The scope of this assessment includes:

- Preliminary stability assessment of gully and riverbanks within the project area using the ground model developed in the previous assessment and slope geometry obtained from the HCC LiDAR terrain model. Stability assessment was undertaken to obtain setback distances
- Development of two setback lines as follows:
 - Primary setback line (static - identified as a red line)
 - Secondary setback line (seismic - identified as a green line)
- Undertake a Section 32 assessment for the proposed changes.

AECOM understands that the results of this assessment and the previous report will be considered in a future District Plan Change process for the Peacocke Structure Plan Area.

2.0 Background

This package of work was undertaken because of the outcomes determined in the previous report by AECOM titled '*Mangakotukutuku ICMP Gully Hazard Setback Assessment*' to which this report is an addendum.

Assessment carried out for the previous report consisted of a high-level assessment of the stability of gully and riverbanks within the area under multiple cases including static, seismic, and elevated groundwater.

3.0 Setback definition

The two setback lines have been developed with the intention that they would be used as a guide to trigger additional investigations and analysis, and not as a strict no-build zone.

The setback lines are intended to guide development to be undertaken in a manner that would consider the potential risks surrounding slope stability.

Final definitions and District Plan rules will be developed by HCC with assistance from AECOM in a technical capacity. This section outlines a broad technical definition of the two lines as they relate to the assessment methodology.

3.1 Primary Setback Line

The Primary Setback Line is proposed to be the minimum development setback distance to prevent the gully system being damaged from land development activities.

The Primary Setback Line may also prevent property and assets being located within a potential (non-earthquake) slip hazard areas without further geotechnical consideration. Though development being undertaken within this area would not be desirable, if a developer can prove that the dwelling is able to withstand the predicted slope movement and that the stability of the gully slope is not lowered because of the development, then the objective of the primary setback line has been fulfilled.

3.2 Secondary Setback Line

The Secondary Setback line is proposed to indicate where a development is required to be designed to accommodate potential lateral land movement because of an ultimate limit state (ULS) seismic event.

Development inside the Secondary Setback Line would require analysis to be undertaken based on specific and up to date site investigation data. The secondary setback requirement may be able to be by-passed if the analysis can prove that the site is not at risk of damaging lateral movements.

If the developer is unable to provide specific assessment for the site, then NZS 3604 type foundations cannot be approved within the secondary setback line.

In defining rules, and undertaking consultation, consideration will need to be made as to whether specific building foundation design can mitigate building risk with associated land instability being an accepted risk. AECOM have not provided an opinion in this regard because wide ranging non-technical related aspects need to be considered (e.g. loss of developable land, insurance implications etc.).

AECOM also understands that HCC wish to retain the existing Gully Hazard Zone (GHZ) of 6 m from the crest of the gully slope for purposes outside of the scope of this report. Therefore, the setback lines defined within this report will remain separate entities from the GHZ.

4.0 Assessment methodology

4.1 General

The methodology for this assessment has been agreed upon by AECOM and HCC to cover a large area with a comparatively limited amount of site investigation data. Therefore, the setback lines are presented as guidance and do not preclude detailed site investigation.

Site investigation information was obtained through the New Zealand Geological Database, reports provided by HCC, and previous site investigation information held on file at AECOM.

Inferences between ground investigation locations were made in areas where site investigation had not been undertaken or information was not available.

4.2 Ground Model

Because of the inherent variability observed within the Hinuera Formation (interbedded sand and silt) and the underlying Puketoka Formation, a conservative set of soil parameters was required. This has resulted in setback distances that are larger than what may be produced from a detailed analysis undertaken with site specific soil data. It is intended that the setback lines will trigger the need for such a detailed site assessment which should include site specific investigations and analysis.

Table 1 lists the soil properties that were used in the assessments.

Table 1 Soil Properties used for the slope stability analysis

Geological Unit	S_u (kPa)	γ (kN/m ³)	c' (kN/m ²)	ϕ' (degrees)
Hinuera Formation	50	17	2	30
Taupo Pumice Alluvium/ Melville Pumice Member	-	16	0	30
Case Hardened TPA	-	16	5	35
Hamilton Ash Formation	100	16	5	28
Puketoka Formation Alluvium	-	17	0	30
Puketoka Formation Completely Weathered Ignimbrite	50	16	4	30
Case Hardened Puketoka WI	50	60	10	50
Fill (placed in old sand quarry)	-	15	0	28

The cross sections used within the assessment were chosen at regular points along the stream chainage of each branch of the gully system. The cross sections attempt to capture the changes in the bank morphology throughout the gully system.

The ground model for each cross section was developed by studying all nearby ground investigation data. Because this data is not uniformly spread across the catchment, there will be numerous cross sections that have had the ground model inferred from other cross sections nearby where ground investigation data was available.

The seismic case was modelled under ULS (ultimate limit state) conditions using the parameters listed in Section 8.4.4 in the '*Mangakotukutuku ICMP Hydrogeology and Geotechnical Stage 2 - Gully Hazard Assessment*' report dated 10 May 2019.

4.2.1 Groundwater

Groundwater levels used within the analysis were taken from the nearby site investigation data. There is not enough investigation data to give a comprehensive and full understanding of groundwater levels over the catchment.

Due to the variability of geological materials and topography we feel that estimating groundwater levels should be kept to a minimum and site-specific investigations should be used to obtain groundwater data.

4.3 Mapping of setback lines

Ground surface topography was obtained from HCC. The 2008 Digital Elevation Model (DEM) generated from LIDAR data was used for this assessment. LIDAR data used was at a 1 m resolution and corrected for vegetation.

Sections were cut through the DEM to obtain the geographic information needed to draw a section in Slide (v2018; 8.010). The calculation method used for each section is GLE / Morgenstern-Price.

Static and seismic (ULS) cases were modelled and the distances of the farthest slip circle was measured from both the gully shoulder and end of the section. These were plotted in ArcMap and setback lines created from joining the space between each section. The Factor of Safety at each setback line is:

- Primary (static) case – 1.5 FoS
- Secondary (seismic) case – 1.2 FoS

Setback lines were reverted to the existing HCC 6 m gully hazard setback line in areas where slope stability results from this assessment was deemed to pose no risk.

Mapping outputs detailing the project extent, setback lines, cross section locations, ground investigation locations, and local geological maps are presented in Appendix A. The existing HCC 6 m gully setback line is presented for comparison with the proposed setback lines.

4.4 Stormwater soakage considerations

The slope stability scenarios have been assessed based on anticipated normal groundwater conditions. Stormwater disposal by soakage could result in an increased risk of instability. Soakage stability scenarios were considered in Stage 1 but have not been considered in this assessment due to the practicality of assessing multiple scenarios at each cross-section location.

Based on existing available information and the assessment carried out to date the following is noted regarding stormwater soakage:

- Stormwater disposal by soakage can be reasonably excluded from within the Primary Setback.
HCC could elect to make soakage acceptable with detailed site-specific investigation and design. However, precluding soakage does not represent a large area given the relative scale of the Primary Setback compared to the original 6 m setback.

- Stormwater disposal by soakage within the Secondary Setback could worsen the risk of instability but is of negligible additional risk in comparison to the design seismic event. Soakage does not need to be excluded from this area but if it is proposed it should be incorporated into any specific seismic assessment and design that is undertaken.

5.0 Section 32 information

This section presents information to inform the Section 32 process.

1 – Does the Primary setback Line being pushed farther out than the existing 6 m line mean a higher cost for development?

No - a property adjacent to a gully or riverbank would normally have an assessment undertaken anyway. The proposed setback line provides a better indication of the potential risk.

2 – Does the Secondary setback line trigger more cost?

The Secondary (seismic) Setback Line has the potential to incur more cost. In some areas the distance of the secondary stability line from the gully crest will mean additional stability assessment would be triggered for development. Assessment is likely to include the following additional works and associated costs:

Table 2 Potential additional items required

Item	Estimated Cost*
Bank survey	\$2,500
Deep soil investigations i.e. CPT testing or borehole	\$1,500 per CPT or \$7,000 per 25 m borehole
Stability analysis and reporting	\$2,000 to >\$5,000

*Estimated costs will vary depending on investigation quantities and depths. Contractor availability and travel from other cities will have a direct effect on estimated prices. Costs associated to consenting are likely to be involved which have not been taken into consideration.

3 – Do the proposed setback lines result in a change in the developable land area?

No - if the analysis can prove that slope stability is not an issue or can be mitigated through specific engineering then there would no loss in developable land. Development can therefore still proceed within the bounds of the setback lines as long as it is backed up by evidence it will not be impacted by or negatively impact slope stability of the gully.

Conversely, loss of land would only be the result of slope stability being too expensive to mitigate through engineering design and solutions. This assessment does not consider the cost of seismic engineered solutions on the basis that they would have been identified and undertaken anyway.

Note that the amount of developable area should remain the same. It is the intention of this report that development being undertaken within the areas that may pose an increased risk to property and assets is backed up by site specific engineering.

4 – What is the chief benefit?

- Increased hazard awareness regarding the potential risk of slope stability around the gully and river banks. Better protection of both public land areas with natural value (e.g. the gully system amenity) and private property.
- Additional foresight to design houses to be able to accommodate lateral land movements associated with large seismic events.

Changes to insurance, property value, and LIMs because of the outcomes of this report have not been included within the Section 32 assessment and are specifically excluded from the scope of this report as advice is being sought from the legal team at HCC.

Refer to Appendix B for tables that present further information regarding Section 32 requirements of the Resource Management Act. The Appendix tables have been populated in association with HCC using information from this report and HCC planning input.

6.0 Limitations

6.1 General limitations

- a. AECOM has prepared this report and/or the setback lines in accordance with the usual care and thoroughness of the consulting profession for the use of Hamilton City Council and only those third parties who have been authorised in writing by AECOM to rely on the report.
- b. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the variation dated 5 June 2019.
- c. This report was prepared between 5 June 2019 and 25 July 2019 and is based on the information available and reviewed at the time of preparation. The methodology adopted, and sources of information used by AECOM are outlined in this report.
- d. Where this report indicates that information has been provided to AECOM by HCC and/or third parties (including any model topography or data), AECOM has made no independent verification of this information unless required as part of the agreed scope of work. AECOM assumes no liability for any inaccuracies in or omissions to that information.
- e. To the extent permitted by law, AECOM expressly disclaims and excludes liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this report and/or the setback lines. AECOM does not admit that any action, liability or claim may exist or be available to any third party.
- f. Except as specifically stated in this section, AECOM does not authorise the use of this report and/or the setback lines by any third party. The report was commissioned by HCC solely for its own purposes and is in a form intended for use only by HCC for its own purposes and is not intended to be used or relied on by third parties.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice.

6.2 Qualifications

The assessment undertaken to define the setback lines is interpretative based on a desktop assessment and preliminary assessment using readily available information. The following shall be noted:

- a. The required setback extent may differ from the setback line presented in this report. Setback requirements could be closer or further away from the gully top of bank where actual ground conditions differ from those used in this assessment.
- b. This assessment provides a reasonable estimate of the required setback for the two design scenarios in the context of the input data and the concept design undertaken. The modelled setback does not necessarily reflect the greatest extent of setback required to protect against slope instability or earthquake effects that may be suffered in the future.
- c. The assessment outlined in this report is for general information purposes only and is intended to provide Hamilton City Council with information that may be used to assist with HCC in deciding how to communicate and present this information to the public, and how to present district plan rules regarding implementation and assessment for development. The acceptance or use of these categories and boundaries for any purpose is the decision of the HCC, not AECOM.
- d. It is recommended that public consultation is undertaken prior to deciding how to utilise this information. The level of risk that both HCC and landowners are prepared to accept may affect the way in which the setback data is used.

Appendix A

Mapping



PROJECT
 Mangakotukutuku ICMP -
 Detailed Setback
 Assessment

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 Te kaunihera o Kirikiriroa

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References
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 DigitalGlobe, GeoEye, Earthstar
 Geographics, CNES/Airbus DS, USDA,
 USGS, AeroGRID, IGN, and the GIS
 User Community

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NL	RA	CH
DESIGNER	CHECKED	APPROVED

ISSUE/REVISION

I	30/07/19	Client Draft
R	07/10/19	Peer Review
I/R	DATE	DESCRIPTION

KEY PLAN

-  Project Area
-  Waikato River Bank and Gully Hazard Area

PROJECT NUMBER
 60563022

SHEET TITLE
 Project Area

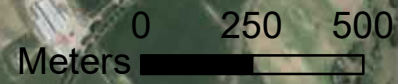
SHEET NUMBER
 Sheet 1

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Legend

- Primary (static) Setback
- Secondary (seismic) Setback
- 6 m Buffer
- Project Area



PROJECT
 Mangakootukutuku ICMP -
 Detailed Setback
 Assessment

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References
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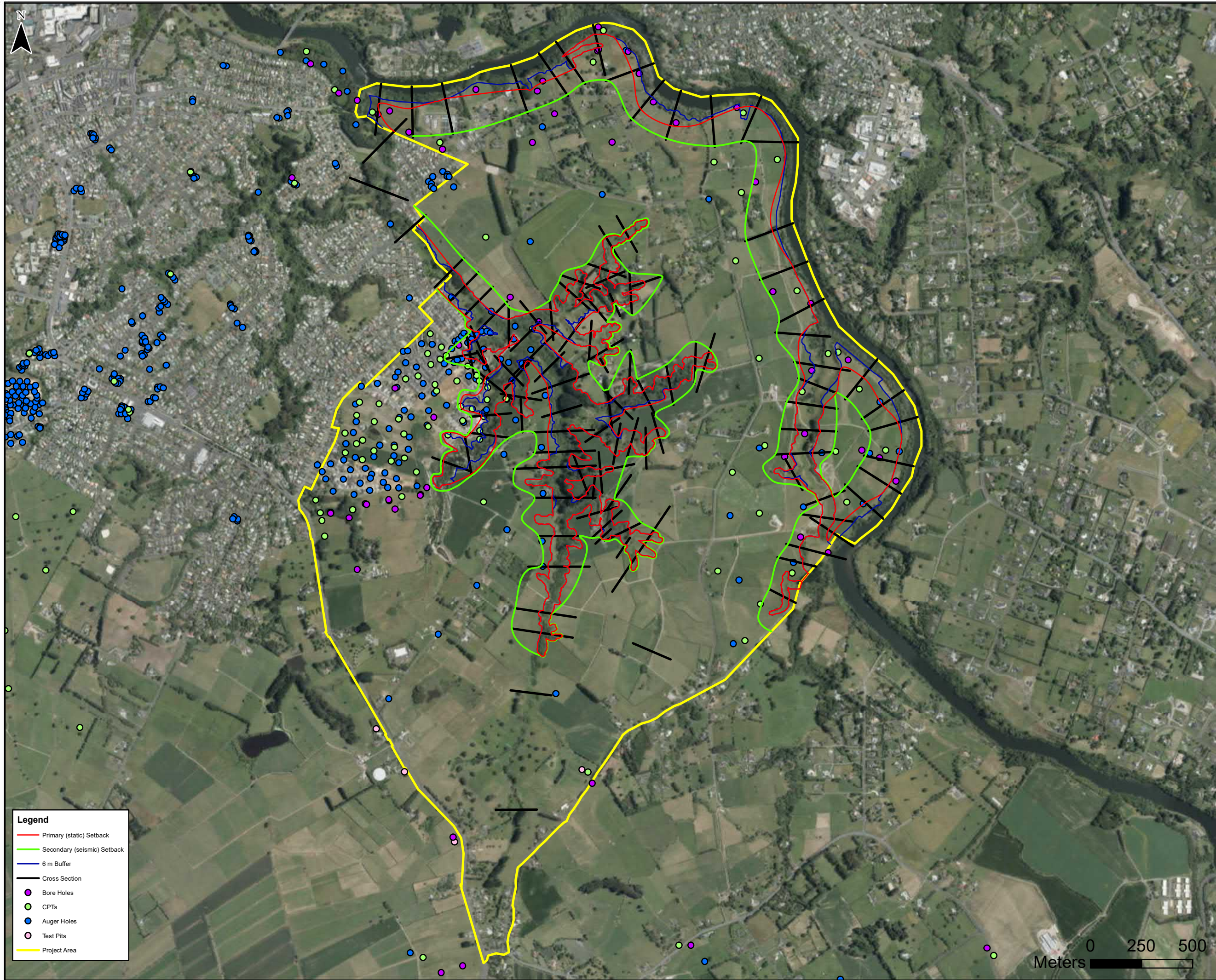
ISSUE/REVISION

I	30/07/19	Client Draft
R	07/10/19	Peer review
R	28/11/19	Final
I/R	DATE	DESCRIPTION

KEY PLAN

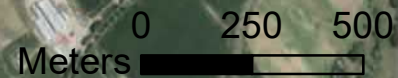
PROJECT NUMBER
 60563022
SHEET TITLE
 Project Area
SHEET NUMBER
 Sheet 2

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Legend

- Primary (static) Setback
- Secondary (seismic) Setback
- 6 m Buffer
- Cross Section
- Bore Holes
- CPTs
- Auger Holes
- Test Pits
- Project Area



PROJECT
 Mangakootukutuku ICMP -
 Detailed Setback
 Assessment

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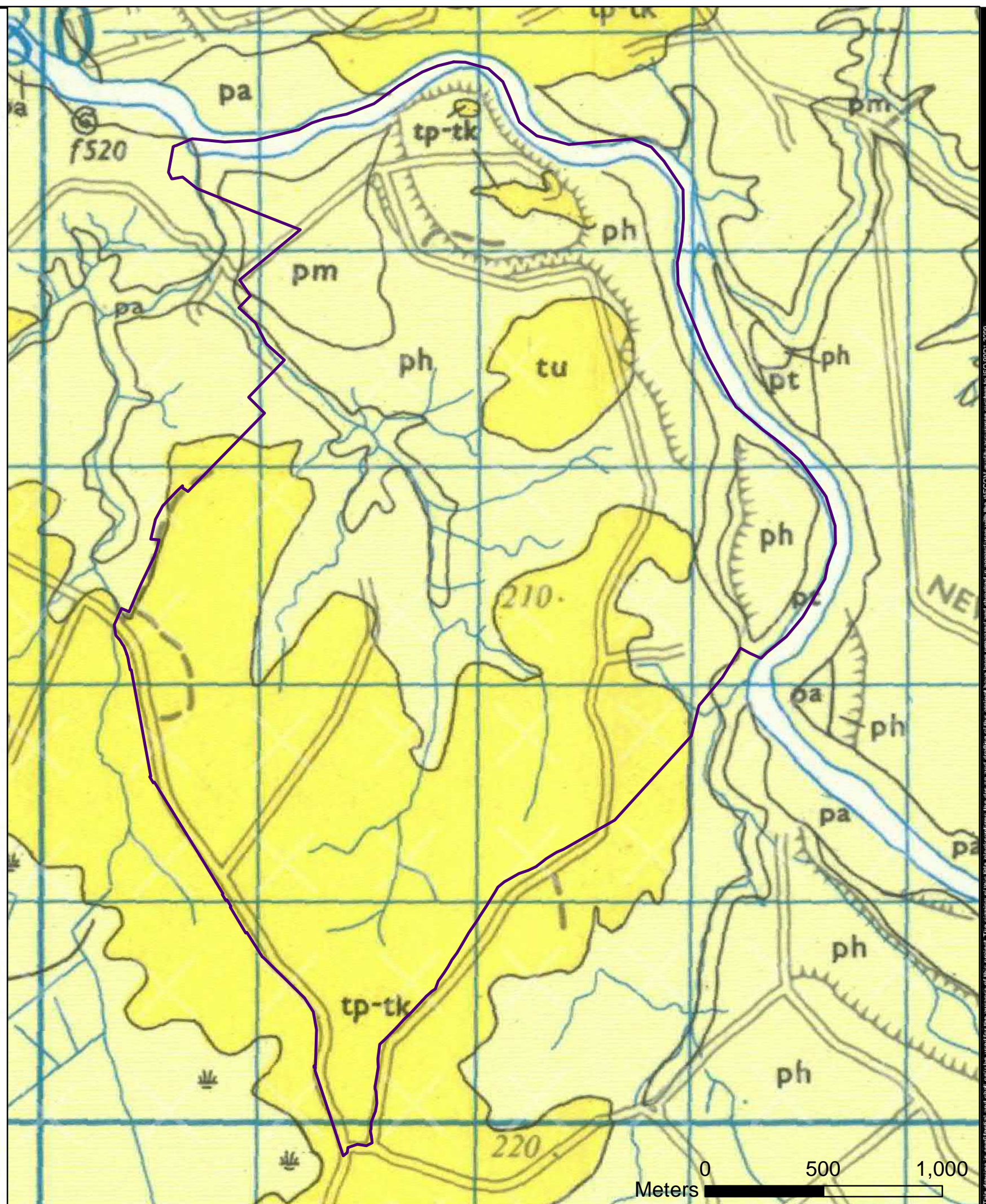
SHEET TITLE
 Combined Outputs

SHEET NUMBER
 Sheet 3

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GEOLOGICAL LEGEND

STAGE	SERIES	DESCRIPTION
HOLOCENE	TAURANGA GROUP PIAKO SUB-GROUP	Un-named Holocene Sediments
		Aluvium (pa)
	Fan Deposits (pf)	
	Taupo Pumice Alluvium	Melville Pumice Member (pm)
		Pumice sands silts and gravels.
		Hopuhopu Sand Member (ps)
		Current bedded sands (cf. Hinuera sands)
	Undifferentiated (pt)	
	Hauraki Formation	Estuarine muds
	Sediments associated with deposition of Hinuera Formation	alluvial (pn), aeolian (pe)
Hinuera Formation		Current bedded pumiceous sands, silts and gravels interbedded with peats
PLEISTOCENE	Undifferentiated Late Pleistocene	
	WALTON SUB-GROUP	
WANGANUI	Undifferentiated (tu)	Includes undifferentiated named Formations of Walton Sub-Group, plus younger sediments
	Karapiro Formation (tk)	Hinuera, but usually highly weathered
	Waerenga Gravels (tw)	Weathered gravels derived from Hokonui rocks
	Puketoka Formation (tp)	Predominantly highly pumiceous silts and sands interbedded with peats.
	Whangamarino Formation (wf)	Mainly clay, lignite and some gravels and pumice sands
PILCENE	FRANKTON SUB-GROUP	(Possibly, in part, correlative of Whangamarino Formation)
	Koromatua Blak sand	Blak sands interbedded with minor clays
Aberfoyle Siltstone	Moderately consolidated terrestrial siltstones and sandstones	
PAREORA	WAITEMATA GROUP	
	Amokura Formation	Well bedded normally uncalcareous marine siltstones and sandstones
	Mercer Sandstone	Massive thick sandstone with minor siltstone
	Koheroa Siltstone	Calcareous siltstone with minor sandstone
Waikawau Sandstone	Calcareous sandstone	
OLIGOCENE	TE KUITI GROUP	
	Te Akatea Siltstone	Very calcareous siltstone with thin siliceous layers. Basal greensand
	Whaingaroa Siltstone	Light grey moderately calcareous siltstone
	Glen Massey Formation	Glen Massey Sandstone Member at top, Dunphail Siltstone Member Elgood Limestone Member
	Mangakotuku Siltstone (km)	Dark grey, predominantly uncalcareous siltstone
	Pukemiro Sandstone (kp)	Uncalcareous estuarine sandstone with Kemps coal seam
	Whatawhata Sandstone (kf)	Member of Waikato Coal Measures with Kemps coal seam on top
	Glen Afton Claystone	Noncalcareous estuarine claystone
	Upper Waikato Coal Measures	Predominantly mudstones. Includes Renown and Kupatoua coal seams
	Lower Waikato Coal Measures	Predominantly mudstones. Includes Taupiri coal seams
Eocene	ARNOLD	
	Runungan	Bortonian to Kaistan



PROJECT
Mangakotukutuku ICMP - Detailed Setback Assessment

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References
Schofield, K.D., 1965
Sheet N65 Hamilton (1st Ed.)
Geological Map of New Zealand

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PROJECT MANAGEMENT INITIALS

NL	RA	CH
DESIGNER	CHECKED	APPROVED

ISSUE/REVISION

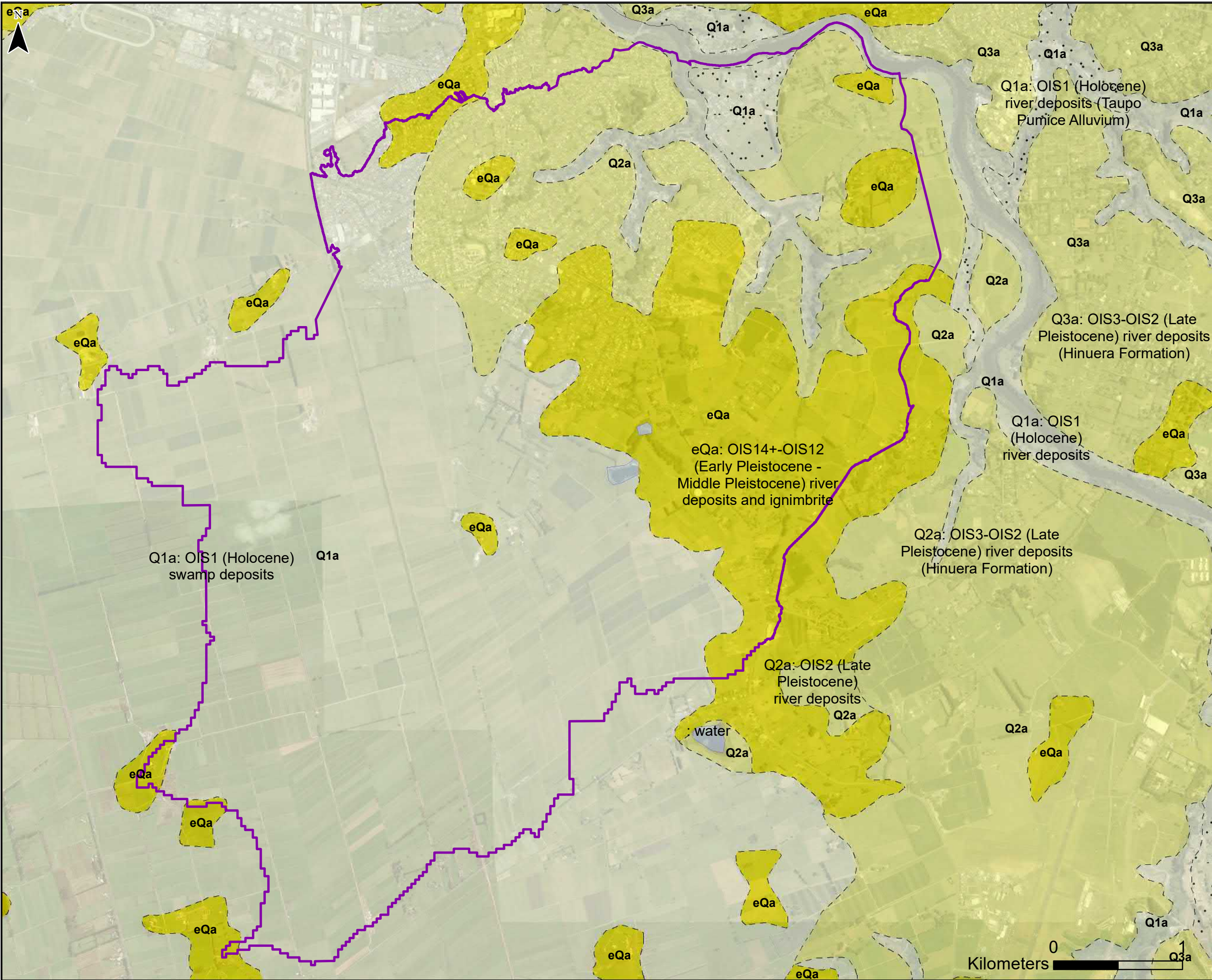
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Project

PROJECT NUMBER
60563022

SHEET TITLE
1:63360 Geological Map

SHEET NUMBER
Sheet 4



PROJECT

Mangakootukutuku ICMP - Detailed Setback Assessment

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References

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R	11/03/20	Peer Review

KEY PLAN

 Mangakootukutuku ICMP Catchment Boundary

PROJECT NUMBER

60563022

SHEET TITLE

1:250 000
Geological Map

SHEET NUMBER

Figure 5

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Appendix B

Section 32 tables

Mangakotukutuku Geotech Report in Support of Plan Change

Issue	Assessment of options in relation to the following issues: <ul style="list-style-type: none"> - The current 6 m building and swimming pool setback from the Waikato Riverbank and Gully Hazard Area (Rule 16.4.4 of the Operative District Plan) is limited and does not consider differing topography and geology. - The setback does not include consideration of potential erosion or land movement due to seismic events. 				
Objectives	<p>Objective 4.2.2 – Efficient use of land and infrastructure.</p> <p>Objective 4.2.3 – Residential development produces good on-site amenity.</p> <p>Objective 4.2.4 – The development contributes to good neighbourhood amenity as the area matures.</p> <p>Objective 4.2.9 – Buildings and activities at the interface of Residential Zones with other zones will be compatible with the form and type of development anticipated in the adjacent zone.</p> <p>Objective 21.2.1 – The ecological, amenity, landscape and cultural values of the river corridor and gully system are restored and protected.</p> <p>Objective 21.2.4 – The health and wellbeing of the Waikato River and gully systems shall be restored and protected.</p> <p>Objective 22.2.1 – Managing activities to avoid or mitigate adverse effects on, and minimise risk to: people, property, and the environment from natural hazards, in order to increase community resilience, reduce the risks from natural hazards, and support effective and efficient response and recovery from natural hazard events.</p> <p>Objective 23.2.1 – To ensure that risk to people, the environment and property is not exacerbated by subdivision.</p> <p>Objective 23.2.5 – Subdivision occurs in a manner that recognises historic heritage and natural environments.</p> <p>Objective 25.1.2.2 – Any development of land is carried out in a manner which reflects the physical constraints on its use and development and minimises any adverse effects on the environment.</p>				
Options Approach to achieve objectives	Description (brief) Describe the option and acknowledge the source of this option (if there is one e.g. feedback from consultation, suggestions from	Relevance How effective provisions are in achieving the objective(s)	Feasibility Within council’s powers, responsibilities and resources, degree of risk and uncertainty of achieving objectives, ability to implement, monitor and enforce	Acceptability Level of equity and fair distribution of impacts, level of community acceptance Where possible identify at a broad level social,	Recommendation Discard or evaluate further (with brief explanation) [REJECT/SUPPORT]

	workshops with elected members etc)			economic, environmental, cultural effects	
Option 1 – Do Nothing	Retain the existing 6 m building setback from the gully hazard zone.	The existing regulation covers the entirety of the gully and river bank area although differing geological conditions and seismic cases are not considered.	The existing setback does not require any additional resources to monitor, implement or enforce.	There may be a low level of political acceptance to this option as it will miss the opportunity to improve the effectiveness and efficiency of the Plan and lower development risk.	Discard Leaving the option for residential development to occur within an area of an increased hazard risk is not best practice.
Option 2 – Amend the ODP to include an increased development setback from the gully hazard zone.	Revised slope stability setback line (Primary Hazard Line) based on a broad assessment of slope and soil types in the Peacocke Structure Plan area. AECOM NZ Ltd. Geotechnical Investigation and Detailed Setback Assessment, July 2019	This option would address the risk of slope instability associated with development in the greenfield area with more certainty than the current 6m setback line.	It will not require any additional resources to monitor, implement or enforce the provision. Building consent assessments would rely on engineering assessment and advice as per usual practise.	There will be a degree of acceptance to this change at a political level as it will improve the awareness of the potential risk to stability within the catchment and minimise the risk of development adversely affecting the gully landform. There may be a low level of acceptance from developers and current land owners regarding the potential loss of developable land if the new line is adopted as a hard restriction. There could be uncertainty over	Support This option encourages development to account for the potential risks present with building in proximity to gully and river banks and maintains a reasonable separation in line with non-building objectives.

				potential increases of insurance costs if the setback is subject to assessment but may otherwise be developed.	
<p>Option 3 - Amend the ODP to include an increased area of setback from the existing gully hazard area including a new seismic hazard setback.</p>	<p>Revised slope stability setback line (Primary Hazard Line) and Seismic stability setback line (Secondary hazard Line) based on a broad assessment of slope and soil types in the Peacocke Structure Plan area.</p> <p>AECOM NZ Ltd. Geotechnical Investigation and Detailed Setback Assessment, July 2019</p>	<p>This option would address the risk of slope instability associated with development in the greenfield area with more certainty than the current 6 m setback line. It would also identify potential seismic stability risk areas for further evaluation.</p>	<p>It will not require any additional resources to monitor, implement or enforce the provision.</p> <p>Building consent assessments would rely on engineering assessment and advice as per usual practise.</p>	<p>There will be a degree of acceptance to this change at a political level as it will improve the awareness of the potential risk of land instability.</p> <p>There may be a low level of acceptance from developers and current land owners regarding the potential loss of developable land if the new line is adopted as a hard restriction.</p> <p>Additionally, there could be a potential increase in the cost of assessment and land development to mitigate seismic risk.</p> <p>Also, uncertainty over potential increases of insurance costs.</p>	<p>Evaluate Further/ Support</p> <p>In addition to the Primary Setback Line (Option 2) this option encourages development to account for the potential risks present with building in proximity to gully and river banks and provides greater certainty that development will be undertaken with adequate resilience.</p>

Evaluation of Rules

Appendix 5.3 Evaluation of Rules (section 32(2))

Chapter 4 – Residential Zones

This section assists to identify the provisions (i.e. policies, rules and methods) that are the most appropriate to achieve the objectives related to the Residential Zones.

The specific provisions subject to this Plan Change which are most appropriate to provide clear direction to achieving the Residential Zone are as follows:	Effectiveness and Efficiency	
<ul style="list-style-type: none"> Rule 16.4.4 – Building Setbacks 	<p>Relevant objectives:</p> <p>Objective 4.2.2 – Efficient use of land and infrastructure.</p> <p>Objective 4.2.3 – Residential development produces good on-site amenity.</p> <p>Objective 4.2.4 – The development contributes to good neighbourhood amenity as the area matures.</p> <p>Objective 4.2.9 – Buildings and activities at the interface of Residential Zones with other zones will be compatible with the form and type of development anticipated in the adjacent zone.</p> <p>Objective 21.2.1 – The ecological, amenity, landscape and cultural values of the river corridor and gully system are restored and protected.</p> <p>Objective 21.2.4 – The health and wellbeing of the Waikato River and gully systems shall be restored and protected.</p> <p>Objective 22.2.1 – Managing activities to avoid or mitigate adverse effects on, and minimise risk to: people, property, and the environment from natural hazards, in order to increase community resilience, reduce the risks from natural hazards, and support effective and efficient response and recovery from natural hazard events.</p> <p>Objective 23.2.1 – To ensure that risk to people, the environment and property is not exacerbated by subdivision.</p> <p>Objective 23.2.5 – Subdivision occurs in a manner that recognises historic heritage and natural environments.</p> <p>Objective 25.1.2.2(a) – Any development of land is carried out in a manner which reflects the physical constraints on its use and development and minimises any adverse effects on the environment.</p>	<p>Benefits</p> <p>Environmental: More scrutiny regarding the allowable proximity of development to gullies and river banks will protect these natural assets from potential adverse effects of residential development.</p>
		<p>Costs</p> <p>Environmental: None identified.</p>

	<p>Increased development setback including limiting stormwater disposal by soakage will lower the likelihood of erosion and instability of gully and river banks.</p> <p>The unmodified gully zone will be extended which has other consequential benefits (e.g. visual, public access, ecological)</p>	
	<p>Economic: Lower repair costs due to increased foundation resilience to slope instability.</p> <p>Potentially less EQC claims and lower insurance costs where risks have been demonstrably reduced (CONFIRM BY INSURANCE ADVICE).</p>	<p>Economic: Increased time and costs associated with preparing and processing resource consents.</p> <p>Increased costs for assessing the site's suitability for development (seismic). Increased design and construction costs for dwellings within seismic setback zone.</p> <p>Potential increased insurance costs due to an identified risk not previously differentiated (CONFIRM BY INSURANCE ADVICE).</p> <p>Possible adverse effects on existing homes that are located within the proposed setback zones.</p>
	<p>Social: Increased access to gully amenity, larger open areas.</p>	<p>Social: Variability in setback distance could create confusion with District Plan interpretation.</p>
	<p>Cultural: None identified.</p>	<p>Cultural: None identified.</p>
<p>Opportunities for economic growth and employment</p>		
<p>These provisions will not compromise economic growth and employment opportunities.</p>		
<p>Options less or not as appropriate to achieve the objective</p>		

Refer to options assessment. Doing nothing or retaining the existing provisions will potentially leave future developments exposed to increased risk.

Risk of acting or not acting

There is some risk involved with not acting. The existing provisions are adequately meeting the objectives of the Plan but do not address the potential for regression of gully and river banks and instability due to seismic events.

The risks of acting are:

- There may be increased costs incurred on developers from potentially more detailed site investigations and assessment (seismic).
- There may be increased costs incurred on developers and/or private landowners for foundation design and construction costs for properties further back from the gully and river banks but within the seismic setback zone (more-so than the current 6 m setback).
- Inconsistencies of setback distance may create confusion with ODP interpretation.

Effectiveness and Efficiency

Effectiveness

- The assessment used to determine the setback lines was undertaken using conservative soil parameters; this is conservative regarding potential risks. At risk areas can be more confidently considered to be included within the setback zones.
- The proposed setback lines provide more confidence that dwellings within the seismic setback zone will have foundations that are designed to be able to accommodate some lateral spreading and are otherwise not located within areas at risk of general slope instability in the near term.
- The proposed static setback takes the differing geological units into account so does not place restrictions where they are not necessary, as far as is practical without undertaking detailed site-specific investigations.
- Provisions will be put into place to protect gully and river bank slopes from oversaturation caused by ground soakage devices installed near slope crests. This has been shown to increase the likelihood of bank erosion and loss of property.
- The proposed solution provides a two-line system so that development is restricted near slopes where the potential frequency of instability is higher. Less frequent seismic risk areas are identified but may be mitigated through assessment and design so that developable land is not reduced by HCC and the assessment of economic viability remains with developers (**provided that potential landowners are made aware of potential development costs prior to land purchase**).

The proposed provisions will be efficient in achieving the relevant objectives as it identifies potential risks to development, and results in a greater assessment and design standard for areas at risk from erosion within the catchment.

There could be an impact on efficiency for developers who will need to prove that they have adequately assessed the site conditions including topography, soil profile, and post development stability (along with the existing provisions in place protecting the gully and river corridor as a natural resource) as part of the resource and building consent processes.

The development of new district plan rules will need to carefully consider the responsibilities of developers so that land within the seismic zone (Secondary Setback Line) cannot be approved for development without either;

- Broad scale mitigations having been carried out by the developer prior to sale of the land (at subdivision consent), and/or

- Adequate disclosure of information, prior to purchase, for private persons who will be responsible for building on the site and any further mitigations required (at building consent).

Draft Provisions

What we're proposing to put into the plan.

General slope stability (Primary Setback Line)

- Restricted development area (i.e. no development permitted)
- Stormwater soakage devices not permitted

Seismic stability (Secondary Setback Line)

- Identified risk area, no defined restriction
- Development subject to site specific investigation, assessment and design
- Defined responsibilities for land developers (subdivision consent) and individual owners (building consent) *TO BE CONSIDERED AND DISCUSSED*