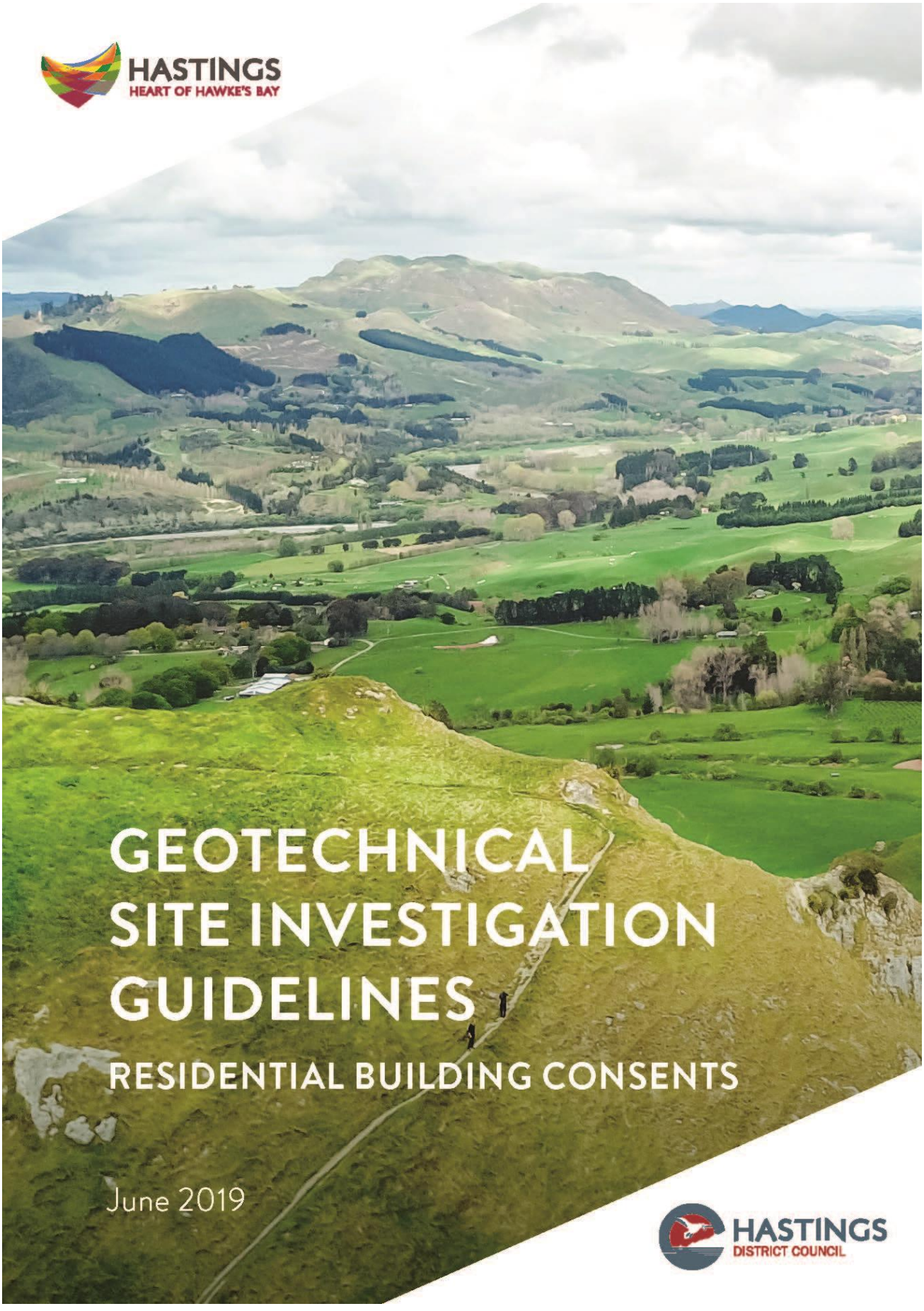
HASTINGS
HEART OF HAWKE'S BAY



GEOTECHNICAL SITE INVESTIGATION GUIDELINES

RESIDENTIAL BUILDING CONSENTS

June 2019

HASTINGS
DISTRICT COUNCIL

REG-2-9-18-3227

Acknowledgements

These guidelines have been prepared with assistance from Tonkin & Taylor, Initia Limited, RDCL, Wentz-Pacific, and Babbage consultants.

Consultation

The Council has undertaken consultation on the content and extent of these guidelines, and the Council's Geotechnical Engineering Panel has heard and considered submissions received.

Approval and Commencement

These guidelines have been finalised and were approved for release in June 2019.

These guidelines supersede all previous draft geotechnical engineering guidelines published by Hastings District Council.

Guideline Review

These guidelines will be reviewed following release of the MBIE guidelines *Planning and engineering guidance for potentially liquefaction-prone land (September 2017) ISBN 978-1-98-851770-4,* or when further technical information is received supporting a need for a review of these guidelines.

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GLOSSARY

CPEng - A Chartered Professional Engineer as assessed and administered by Engineering New Zealand.

Geotechnical professional - a suitably qualified and experienced geotechnical engineer and/or engineering geologist who is a registered Chartered Professional Engineer with Engineering New Zealand and awarded a geotechnical practice endorsement, and /or a Professional Engineering Geologist (PEngGeol) registered with Engineering New Zealand with a minimum of 10 years demonstrable experience in the investigation, assessment and mitigation of earthquake geotechnical hazards (refer NZ Geotechnical Society Inc. and MBIE (2016) Earthquake geotechnical engineering - Module 2).

Note: Reliance on these professional bodies to determine appropriate levels of qualification and experience in this field is acknowledged as appropriate in the Environment Court decision *Mulholland v Wanganui District Council (ENV-2017-WLG-000097)*.

Executive Summary

These proposed guidelines have been prepared by Hastings District Council to provide guidance regarding the **minimum** geotechnical site investigation requirements that Council will apply when assessing light and heavy weight residential building consent applications for liquefaction vulnerability and geotechnical investigations.

These guidelines provide local, site specific context to national planning and engineering guidance for potentially liquefaction-prone land and regional liquefaction assessment. The guidelines provide that the Council may seek independent peer review of any geotechnical report submitted with a building consent application.

Residential buildings that are masonry structures and/ or of tilt slab type construction will require site specific geotechnical investigation in all instances. Ground conditions intending to support hybrid building types will need to be considered by Chartered Geotechnical Professional and Structural engineers on a case by case basis.

The purpose of the guidelines is to enable Building Officers to assess compliance with the structural requirements of the New Zealand Building Code in relation to liquefaction vulnerability for residential buildings.

These guidelines are a non-statutory document and may be subject to change as new information becomes available.

Included in these guidelines are exclusions for some specific types of proposed building projects. It is however recommended that you always obtain advice in regard to geotechnical site assessments and ground conditions from a Chartered Professional Engineer holding a geotechnical practice field endorsement from Engineering New Zealand or a suitably qualified and experienced Chartered Professional Engineering Geologist registered by Engineering New Zealand.

The table on page 15 summarises the minimum geotechnical site investigation requirements for residential buildings.

For Orange and Brown liquefaction susceptibility areas, subsurface deep boring investigations to at least 10-15m using either machine drilled bore holes and SPT testing, or CPT testing supported as necessary by test pit investigations, and/or hand auger recovery of samples and the evaluation of geotechnical properties as appropriate by laboratory testing, are required to determine site specific foundation designs - refer section 7.3.3. Geotechnical Professional Engineers holding a current geotechnical practice field endorsement must confirm site suitability including foundation design recommendations.

For Yellow liquefaction susceptibility areas, minimum investigations need to include Scala Penetrometer and hand auger investigations to confirm ground bearing and determine if a more detailed geotechnical investigation is required - for details refer section 7.3.1.

Note: Commercial building applications require site specific geotechnical investigation in all instances.

1 Introduction

These guidelines are provided to assist applicants for building consent to ensure sufficient information is provided in the form of geotechnical investigations.

Hawke's Bay is situated in an area with complex geology. Hazards associated with the geology include, but are not limited to:

- **Susceptibility to liquefaction**;
- Expansive soils;
- Consolidation settlement;
- Slope stability/land slippage; and
- Bearing capacity.

The purpose of these guidelines is to provide clear guidance to help designers, builders, developers and engineers fulfil the Council's information requirements for building consent purposes, by explaining how those requirements can be met.

These guidelines set out the **minimum** requirements for geotechnical investigation, reporting and documentation of liquefaction hazard that should be provided in support of a building consent application. A building consent application needs to provide sufficient information for Council to be able to be satisfied on 'reasonable grounds' that structural requirements adequately address site specific geotechnical conditions.

Application of these guidelines will provide consistent practice across building sector within Hastings district. The information included in these guidelines is for members of the public and "professionals", being developers, architects, architectural designers, planners and engineers.

Geotechnical investigation requirements under the District Plan and for resource consent for land development proposals are identified in the companion document Guidelines for Geotechnical Subdivision and Land Development. The Hastings District Council supports the use of the New Zealand Geotechnical Database and the supply of site specific investigation data on soil and groundwater conditions from work in the Hawke's Bay and encourages geotechnical professionals and property developers to use the NZDG and add data to the database from their investigations. Over time this will assist the community to better understand and quantify the potential for liquefaction and enable the current zones to be refined.

Note:

Hastings District Council may seek an independent peer review of any geotechnical report submitted with a building consent application. The cost of the review would be at the applicant's expense. The Council will inform building consent applicants and/or their agents as soon as is practicable when an applicant's geotechnical report will be peer reviewed.

2 Scope of Guidelines

These guidelines are applicable to building consent applications for light and heavy residential buildings. Residential buildings that are masonry structures and/ or of tilt slab type construction will require site specific geotechnical investigation in all instances.

These guidelines do not apply to Commercial building consent applications as these buildings require site specific geotechnical investigation in all instances.

These guidelines do not limit the right of Hastings District Council to obtain independent peer review of any building consent application, and report in support of a building consent application, at the owner/agent's expense.

3 Background

The New Zealand Standard for timber-framed buildings (NZS3604:2011) sets out geotechnical investigation, testing and reporting requirements to determine the suitability and bearing capacity of near surface soils for timber framed buildings on a site specific basis .

The NZS 3604:2011 procedure has an emphasis on establishing "good ground" (soil with an Ultimate Bearing Capacity (UBC) of 300kPa or greater or allowable bearing capacity of 100kpa). However, it is possible to build foundations on soil with a lower bearing capacity, subject to an appropriate site investigation and specific engineering design. It should be noted that ground that can experience more than 25mm of movement is not considered to be *good ground* and requires Specific Engineering Design which is outside the scope of NZS3604:2011.

NZS 3604:2011 (outside of Canterbury) does not consider liquefaction and its associated effects. These guidelines specifically address the liquefaction vulnerability hazard as a means of supporting Specific Engineering Design, and identify the minimum site investigation, testing and reporting requirements for residential development in Hastings District Council using region specific information.

Following the Canterbury earthquakes, there is a greater awareness of the damaging effects that liquefaction and associated hazards phenomena can have on buildings. The Ministry of Business, Innovation and Employment (MBIE) has issued guidance for the repair and rebuild of houses damaged by the Canterbury earthquakes.

Currently, the MBIE guidance applies to the Canterbury earthquake region only. Further guidance is being developed for other New Zealand regions and it is expected that this will inform the wider building and construction sector in due course. In the meantime, for properties outside the Canterbury earthquake region that have the potential for liquefaction, MBIE recommends that further engineering advice is sought. For these properties a foundation solution following those provided for TC2 in the MBIE Guidelines may be appropriate. These guidelines on site investigations prepared by Hastings District Council set out how it is expected that liquefaction effects are to be addressed for foundation design in building consent applications.

Two published documents have a direct impact on the understanding of liquefaction vulnerability within the Hastings District. These documents are:

- Planning and Engineering Guidance for Potentially Liquefaction-prone Land (September, 2017)

  This document was developed jointly by the *Ministry for the Environment* and the *Ministry of Business, Innovation and Employment* in response to the Canterbury Earthquake Royal Commission recommendations. The guidance document can be viewed and downloaded from:

  https://www.building.govt.nz/building-code-compliance/b-stability/b1-structure/planning-engineering-liquefaction-land

  The guidance sets out a consistent planning approach to guide councils to prepare Resource Management Act policies and plans, and to process resource and building consent applications that appropriately address liquefaction risk. This guidance will assist all parties associated with the use and development of land in potentially liquefaction-prone areas.

- Assessment of Liquefaction Risk in the Hawkes Bay (October, 2017)

  This study prepared by the Institute of Geological and Nuclear Sciences Limited (GNS Science), was commissioned by the Hawke's Bay Regional Council and the Natural Hazards Research

Platform, to re-evaluate the liquefaction hazard across the region as originally described in Dellow et al (1999) and to update the consequential risk posed by liquefaction.

In conjunction with the MfE and MBIE document above the GNS study provides a basis for assessing liquefaction hazards for residential development. The report includes a liquefaction vulnerability map for the Heretunga Plains (refer to Figure 1) which can be used to determine the appropriate means to identify, investigate, and mitigate or avoid the liquefaction hazard that may be present.

The maps are based on the data available at the time of the report. As additional subsurface and groundwater data becomes available, and the science of liquefaction prediction improves, the maps may be revised.

This document and appendices can be accessed and downloaded from the Hawkes Bay Emergency Management Hazard Portal at:

(http://www.hbemergency.govt.nz/assets/Hazard-Information-Portal/CR-2015-186.pdf

http://www.hbemergency.govt.nz/assets/Hazard-Information-Portal/CR-2015-186-Appendices.pdf)

These documents prepared by GNS are based on data available as at July 2016 (ref p86 of Vol 1) which over wide areas is limited to geological mapping and limited location specific groundwater data.

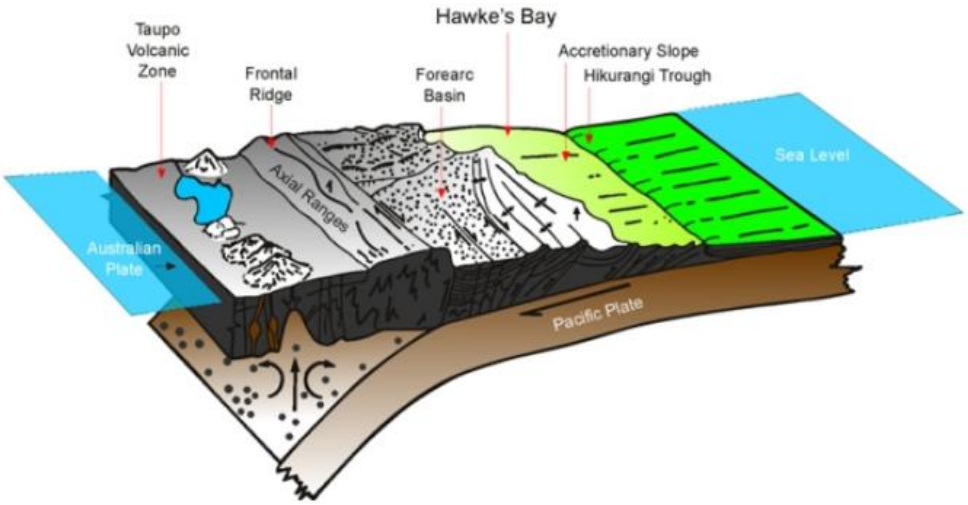
4 Hawke's Bay Seismic Hazard

4.1 Seismicity and Geology

New Zealand lies along the boundary between the Australian and Pacific tectonic plates. In the North Island the relative displacement between these plates is taken up along the Hikurangi subduction zone where the Pacific plate is moving under the Australian plate at an estimated rate of about 40mm per year (Figure 1). The interface passes approximately 20km beneath Hastings. Recent studies suggest that the subduction interface is capable of producing megathrust earthquakes as large as moment magnitude (M_w) 9.0.

Hastings is located above this subduction zone and within the forearc region which is crossed by numerous active faults that propagate upwards from the subduction zone to the ground surface. The main nearby zones of active faulting are the Axial Ranges to the west dominated by strike-slip faulting (e.g. the Mohaka Fault which is the northern segment of the Wellington Fault), the Poukawa-Heretaunga Trough (e.g. source of the M_w 7.8 1931 Napier earthquake) and the Coastal Ranges to the south-east. These make Hawke's Bay (and Hastings) one of the most seismically active regions in the country.

Figure 1 - Illustration of plate tectonics



The geology of the Hawke's Bay Region typically comprises:

Interbedded sand, silts and gravels deposited by of the Tutaekuri and Ngaruroro Rivers that cover most of the Heretaunga Plains;
Interbedded sand, silts and gravels of the estuary plain of the old Ahuriri Lagoon west of Napier; and
Pliocene aged rock which makes up the hills around the plains.

4.2 What is Liquefaction

Liquefaction is the process that results in temporary loss of soil strength, which can cause significant land and building damage. In loosely packed soils strong earthquake shaking can cause rearrangement of soil particles, and if the voids are filled with water, then high water pressures can develop resulting in ground water appearing at the ground surface, and consequential loss of soil strength.

Key elements required for liquefaction are:

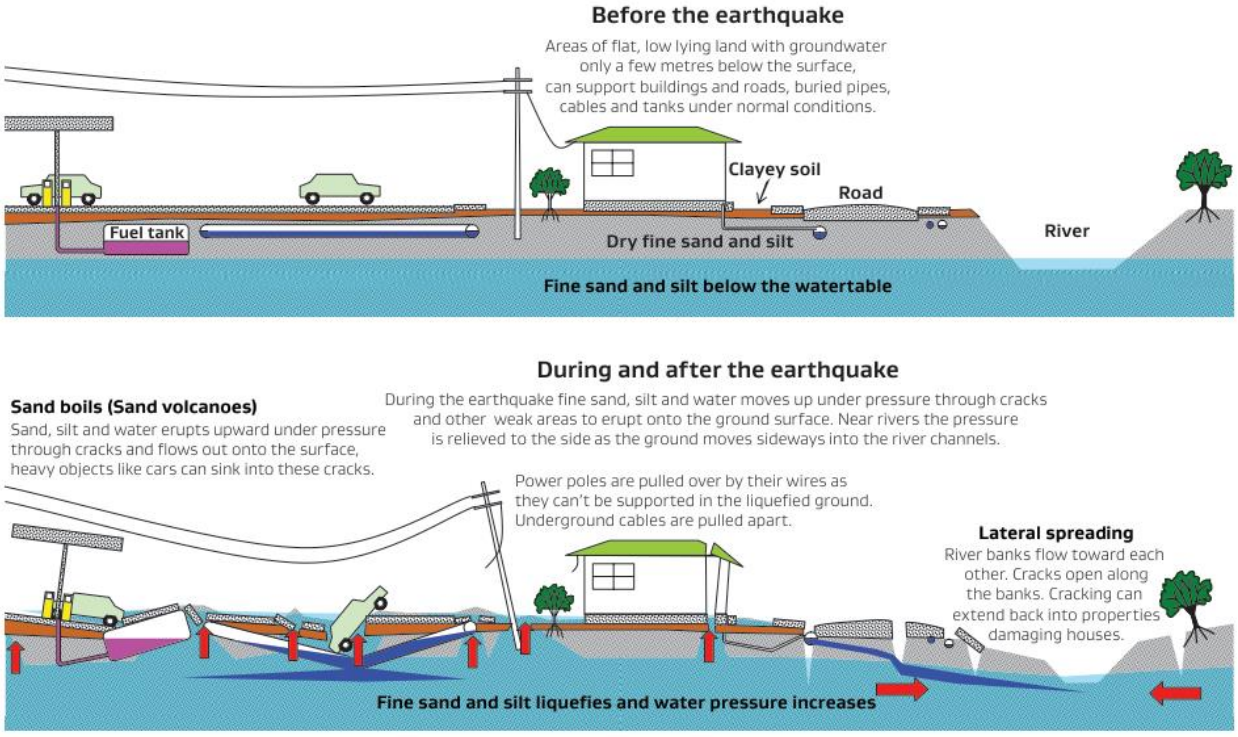
1. Loose non-plastic soil
2. Saturated soils
3. Sufficient ground shaking.

Consequences of Liquefaction

There general effects of liquefaction are summarised as follows and illustrated in Figure 2 below:

Loss of foundation bearing capacity resulting in settlement, cracking and tilting;
Sand boils, ground settlement and undulation;
Ground cracking;
Lateral spreading (where the ground moves downslope or towards an unsupported face);
Uplift of buoyant buried structures.

Figure 2 - Liquefaction and its effects



5 Building Consent Approval Process

5.1 Building Consent Applications

The Building Act 2004 requires the Council to grant building consent where it is satisfied on reasonable grounds that the provisions of the building code would be met if the building work was properly completed in accordance with the plans and specifications accompanying the application.

Site specific geotechnical investigations are required where any liquefaction or geotechnical hazards are or may be present on a site.

5.2 Associated Planning Documents and Resource Consent Conditions

5.2.1 District Plan and Subdivision Consents

The District Plan provides policy direction for managing natural hazards which includes liquefaction hazards, and paying particular attention to the identification and the avoidance or mitigation of risks associated with natural hazards.

The criteria under the District Plan rules for assessing subdivision consents requires consideration to be given to potential hazards, and particularly natural hazards. In addition, an amendment to the Resource Management Act in 2017 (s106) explicitly requires specified risks to be assessed. Therefore, any subdivision consent should address natural hazards, and in areas identified as being on land of medium or high liquefaction vulnerability or other geotechnical issues, a geotechnical investigation report undertaken by a suitably qualified geotechnical professional must be included. This is to address subsequent building development which may be subject to conditions with specific foundation requirements.

Reference should also be made to Council geotechnical guidelines on for subdivision and land development resource consent applications.

The resource consent application process may also require a consent notice to be placed on the record of title to require on-going compliance with a consent condition. A consent notice may outline what is to be achieved by way of detailed subsurface investigations and instability remedial measures required for the site at building consent stage. Copies of the consent notice can be obtained from Land Information New Zealand.

5.2.2 Earthworks / Geotechnical Completion Report

Any subdivision earthworks or geotechnical completion report should be checked for specific foundation recommendations. A completion report provides a statement on the suitability of land for building development. The report will provide information and recommendations that could be relevant to the foundation design – refer to the Table 1.

Table 1: Key recommendations from a geotechnical completion report typically include:

• An assessment of the natural hazards affecting a site; • Presence, extent and competency of any fill, whether engineered or non-engineered; • Presence and extent of unsuitable materials, e.g. organics, peat, soft compressible soils, with recommendations for how these should be dealt with; • Estimated settlements (short term and long term from site filling if required); • Minimum set back requirements from slopes;	• Seismic hazards including the liquefaction vulnerability and lateral spread potential; • Suitable foundation types; • Ultimate Bearing Capacity (UBC) for foundations under static and dynamic conditions; • Flood levels and minimum building platform levels; and • Effects of stormwater runoff, soakage and on-site effluent. • Requirements for maintenance and or monitoring by lot owners

Please note that in some cases an earthworks / geotechnical completion report for a subdivision consent may *not* provide sufficient site specific information on liquefaction hazards to support a building consent application. Therefore, geotechnical investigations may be required on a site specific basis to obtain building consent.

6 Liquefaction Hazard Mapping in Hawke's Bay - 2017

An assessment of liquefaction susceptibility considers the surface geology and groundwater conditions of an area. The boundaries are not exact, as they based on data points of varying quality and spacing, and need to be tested on a site specific basis.

Liquefaction hazard severity for the Hawke's Bay region has been reported and mapped by Geological & Nuclear Science (Rosser and Dellow 2017) - refer **Figure 3: *Liquefaction Land Vulnerability Map for the Heretaunga Plains***. The full and final GNS Science report is available on the Hawkes Bay Regional Council (HBRC) Hazard Information Portal http://www.hbemergency.govt.nz/hazards/portal.

As outlined in Section 4, the Hastings district geology is dominated by the distribution of our river systems and the estuaries where they discharge to the sea. Simply, the:

- Liquefaction is possible in areas of the plains which are underlain by generally cohesion-less, saturated sediments. In those parts of the plains (coloured orange or brown in Figure 3) there are two possible methods of managing the liquefaction hazard in the context of a building consent application, either:
  - Undertaking ground investigation to assess liquefaction risk and developing specific mitigation foundation measures; or
  - Using specified mitigation (similar to MBIE guidance for the Christchurch rebuild) provided it is accompanied by a statement by a geotechnical professional engineer. It is likely that over time as more data becomes available, guidance similar to that developed for Christchurch may be developed by MBIE.
- No liquefaction is expected in the hills surrounding the plains and accordingly, liquefaction mitigation is not stipulated.
- The geotechnical constraints in such areas are expected to include earthquake induced land movement.

Figure 3: Map showing liquefaction hazard vulnerability for the Heretaunga Plains

7 Guidelines for the Investigations for Residential Buildings

7.1 Establishing Compliance with the NZ Building Code

Compliance with the NZ Building Code for residential buildings has generally been based on either:

1. NZ Standard NZS3604 for ground with a Ultimate Bearing Capacity (UBC) greater than 300 kPa, outside any building setbacks or specific foundation design zones **AND** no liquefaction potential i.e. 'good' ground in terms of NZS 3604:2011; or

2. A geotechnical investigation by a Chartered Professional engineer where site specific engineered design (SED) or Site Specific Design is required because the ground does not meet the requirements of NZS 3604.

7.2 Geotechnical Investigations

Appropriate geotechnical investigations undertaken by a suitably qualified and experienced chartered geotechnical professional are required to confirm the suitability of the ground for either of the following:

- Residential Buildings - new or relocated
- Major additions to existing residential buildings when the proposed addition comprises a floor area greater than 30% of the ground floor area of the original building.
- All buildings in close proximity to potential or recognised geological hazards, evident from the site or from either known or recorded hazards (available on the Hawkes Bay Regional Council (HBRC) Hazard Information Portal), public records including but not limited to GNS data and maps available at the time of site assessment, or through Preliminary Geotechnical Appraisal of new subdivisions and requirements of consent notices. In general, areas of hazard include:
    - On or at the base of sloping land or on ridge tops;
    - Fill material;
    - Coastal environments particularly within identified erosion zones;
    - Areas at risk of inundation by flooding, adjacent to watercourses;
    - Known or interpreted fault traces; and
    - Areas identified as potentially prone to liquefaction/lateral spread.

7.3 Minimum Geotechnical Investigations for Assessing Liquefaction Hazard

The nature and extent of geotechnical investigation required for residential buildings depends on the potential liquefaction hazard associated with the area in which the site is located, the data that supported the zoning presented in Figure 3, and the data available at the time of the investigation. For Residential Buildings in areas where:

7.3.1 Liquefaction is unlikely (Yellow Areas)

Liquefaction is considered unlikely in the area coloured yellow in Figure 3 above due to an identified Low to Very Low Liquefaction Vulnerability. Site investigations can focus on the following:

- Shallow investigations completed in accordance with NZS 3604:2011 to confirm ground with an Ultimate Bearing Capacity greater than 300 kPa (or 100kpa Allowable Bearing Capacity).

This also applies to ground outside any building setbacks or specific foundation design zones imposed by a geotechnical assessment.

- Consideration should be given to the potential severity of ground shaking and the ease with which repairs to the foundations can be effected following a single large event which may be followed by increased seismic activity for a period of months to years.

- Measurement of groundwater following the investigations, noting that testing methodology and groundwater levels are subject to seasonal fluctuations.

- Investigations should take in to account the presence or absence of publicly available existing subsurface data, and the quality of that data (e.g. well driller's logs or CPT data).

- If 'standard testing' confirms the ground is not 'good ground' for the purposes of NZS 3604:2011, or if there is evidence to suggest that the site may be liquefaction prone i.e. shallow water table, loose sands / non-plastic silts found in shallow investigations, a suitably qualified and experienced geotechnical professional will be required to carry out a geotechnical site investigation sufficient to support the foundation design option selected and the design parameters adopted.

7.3.2 Liquefaction Possible – Medium and High Liquefaction Vulnerability (Orange or Brown)

In Medium and High Liquefaction Vulnerability areas, (orange and brown areas in Figure 3 above), the scope of geotechnical investigations for Residential Buildings must be confirmed by a suitably qualified and experienced Geotechnical Professional engineer. At a minimum investigations should comprise:

- "Deep" investigations comprising either machine drilled boreholes with Standard Penetration Testing (SPT) at 1.5 m (maximum) intervals, or Cone Penetration Tests (CPTs) to a depth of at least 10-15 m. Investigations terminating at a shallower depth must be supported by robust geotechnical-based reasoning. For example, termination of a CPT in shallow, dense materials may not be accepted as sufficient justification, unless it can be reasonably demonstrated that these materials are unlikely to be underlain by potentially liquefiable soils that may still affect foundation support during an earthquake.

- SPT and CPT test requirements carried out in accordance with accepted testing standards (ref: ASTM D5778 for CPT and ASTM D6066 for SPT, and NZGS Module 2).*

- The continuous stratigraphic profile and variation in soil strength with depth should be determined across the proposed building footprint. For a single structure on a site, this will require a minimum of 2 investigations* within, or in very close proximity to, the proposed building footprint (when an existing structure on site may prevent testing being undertaken across the building footprint). The key requirement is to adequately characterise the ground conditions at the location of the proposed building. For larger sites with multiple proposed building locations, the arrangement and proximity of investigations within and surrounding the building footprints may allow the minimum investigation density to be reduced.

A request to obtain a building consent based on a revised minimum investigation density may require a technical peer review prior to approval.

- Additional test pits and Dynamic Cone Penetrometer tests are beneficial to confirm near surface conditions and shallow bearing.

- Measurement of groundwater following the investigations, and clear identification of the groundwater depth to be used for design, noting that testing methodology and groundwater levels are subject to seasonal fluctuations;

- Testing of recovered soil samples to support the assessment of liquefaction susceptibility where plasticity is inferred to limit or may prevent liquefaction.

- Investigations should take in to account the presence or absence of publicly available existing subsurface data, historic records and aerial photographs, and should include assessment of typical geotechnical considerations such as settlement, bearing pressure etc. If these investigations do not or cannot extend to a depth sufficient to support the proposed design option or do not clarify liquefaction susceptibility further investigation may be required to determine liquefaction risk.

- The triggering of liquefaction should be assessed using the simplified procedures recommended in NZGS Module 3.

- **Note**: in the event that site-specific investigations cannot reach the minimum target depth of 10m (CPT refusal on dense gravel layer for example) nearby (i.e., ≤ 300 m) off-site deep investigation data may be considered if it is demonstrated that the off-site data can be considered to be generally representative of on-site soils.

It is likely that the minimum level of investigations for the area coloured orange in Figure 3 above will be amended as more data is included in the hazard mapping and foundation design guidance is developed by MBIE (similar to the MBIE guidance for Christchurch).

7.3.3 Geotechnical Investigations Required for Liquefaction Hazard and Foundation Design

Table 1 summarises the requirements for geotechnical investigation and foundation design in Hastings district. Note: refer to section 8 which sets out specific building work that is excluded from these requirements.

Table 2: Summary of Minimum Testing Required for Liquefaction Assessment

Level of Geotechnical Investigation for Residential Buildings		
Area and Liquefaction Susceptibility	**Minimum testing required**	**Notes**
Yellow Areas **Very Low to Low**	Hand held investigation using a Dynamic Cone Penetrometer (Scala Penetrometer) and hand auger to confirm the bearing pressure and in-situ strength to confirm 'good' ground. Not less than 2m depth (ref: NZS 3604:2011 and NZGS Module 2). Refer section 7.3.1	If "good" ground can be proven taking in to account likely seasonal fluctuations in soil moisture content and ground water levels (i.e. allowable bearing ≥ 100kPa) "normal" foundation design to NZS 3604:2011 may be acceptable. Note: If there is reason to suspect that the site may be prone to liquefaction or there are other geotechnical issues, a geotechnical site investigation is likely to be required to confirm the appropriate foundation design.
Orange Areas Medium **Brown Areas High**	"Deep" investigations comprising either machine drilled boreholes/CPT testing to a depth of at least 10-15 m or a depth that is demonstrated to be suitable by a suitably qualified and experienced Geotechnical Professional. Assessment of liquefaction potential to be made by suitably qualified and experienced Geotechnical Professional. Refer section 7.3.2	Liquefaction potential is to be assessed in accordance with New Zealand Geotechnical Society Earthquake Engineering Guidelines. Specific Engineering design of foundations to reflect outcomes and recommendations from the geotechnical investigation. Establishing the stratigraphic profile, variation of soil strength or density with depth to at least 3m, and preferably 5m, and the depth to groundwater is considered necessary. The "design" groundwater level should be reported that is based on measured groundwater level.

7.3.4 Fault Avoidance Zones

The Ministry for the Environment has published Guidelines on development of land on or close to active faults (MfE 2003). The aim of the MfE Guidelines is to assist building consent application processors and resource management planners tasked with developing land use policy and making decisions about development of land on, or near, active faults. This information is represented as fault avoidance zones.

GNS Science (GNS 2016) has published a report mapping active faults in the Hawke's Bay; the report identifies complexity and uncertainty of the fault features identified. The fault mapping and recurrence interval estimates have been combined to develop a relationship with Building Code importance category limitations for allowable buildings (GNS 2016, Table 5.1, p.31).

Fault avoidance zones in Hastings can be viewed on the Hawke's Bay Hazard Information Portal: http://www.hbemergency.govt.nz/hazards/portal The Council also publishes a copy on its GIS Hazard layer via its web site.

7.3.5 Geotechnical Report for Building Consent Applications

All building consent applications for Residential and Commercial Buildings should be accompanied by a geotechnical report addressing the site specific liquefaction hazard and including:

- Description and locations of the geotechnical testing undertaken;
- Description of the proposed project/structure(s);
- Site subsurface conditions;
- Depth of groundwater assumed for geotechnical design and taking in to account anticipated or predicted seasonal fluctuations;
- Assessment of the liquefaction hazard associated with the ground conditions, including commentary on the method(s) used and variables applied in the analysis which shall include the paired average magnitudes and PGA values from Tables 5.1 and 5.2 respectively in Volume 1, GNS Report 2015-186 Assessment of Liquefaction Risk In Hawke's Bay, and identification of assumptions;
- The potential implications of the liquefaction hazard on the proposed building;
- Details of liquefaction hazard mitigation measures if required; and
- Geotechnical foundation design recommendations.

Logs of all site investigations which include field descriptions in accordance with New Zealand Geotechnical Society (NZGS) guideline[1], the position relative to site boundaries and above and below ground structures, and surface elevations at investigation positions, will also be required to accompany the application.

Applications for building consent will not be accepted without sufficient information.

These guidelines do not limit the right of Hastings District Council to seek independent peer review of the liquefaction hazard and its ramifications for any building consent application at the owner/agent's expense.

[1] The guideline for the field classification and description of soil and rock engineering purposes published by the New Zealand Geotechnical Society Inc. December 2005. (Note that the Society publishes single page field notes to assist those working in the field to describe soil and rock in accordance with the guidelines available via htpp://www.nzgs.org).

8 Guideline Exclusions

8.1 Site specific geotechnical investigation is not required for:

- Out-buildings less than 150m^2 e.g. pole sheds without concrete floor or with concrete floors but not attached to foundations; portal frame metal clad sheds (these guidelines do *not* apply to any tilt panel buildings);
- Stand-alone garages and carports;
- Repiling of Residential Buildings;
- Sleep-outs with a maximum floor area of 20m^2, in association with an existing Residential Building and may include a toilet and shower.
- Small Residential Building additions with proposed increased floor area ≤ 30% of the existing Residential Building ground floor area, providing the existing foundations can be adequately assessed. In this case the new foundations can be constructed to the same design as the existing foundations, or to the equivalent required by the New Zealand Standard – NZS 3604:2011 Timber Framed Buildings (providing adequate structural connection can be made between the existing and the proposed additions).

8.2 Limitations for Exclusions

Despite the exclusions from site specific geotechnical investigation listed in 8.1, proposed building work related to a residential building may require further liquefaction hazard investigation in the following circumstances:

1. If there is an existing geotechnical report or other information relating to liquefaction hazard for the property or on an adjoining property, then the report and any recommendations must be considered by the engineer for the proposed building work.

2. When the value of the proposed building work, or additions, or the residential building to which additions are attached is significant, then it is recommended that building owners consider appropriate geotechnical investigation is undertaken.

9 References

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