TE KAUNIHERA Ā ROHE O WHAKAAHURANGI
STRATFORD DISTRICT COUNCIL

Geotechnical Site Investigation Guidelines for Building Consents

Version 2 issued October 2021

Contents

Definitions

Chartered Profession Engineer (CPEng)	A Chartered Professional Engineer as assessed and administered by Engineering New Zealand[1]
Geotechnical professional	A CPEng with geotechnical practice area endorsement or a Professional Engineering Geologist (PEngGeol) registered with Engineering New Zealand1
Definition of Good Ground • NZS3604:2011; and • B1 Structure	Any soil or rock capable of permanently withstanding an ultimate bearing capacity of 300kPa (i.e. an allowable bearing pressure of 100 kPa using a factor of safety of 3.0) but excludes: a) Potentially compressible ground such as top soil, soft soils such as clay which can be moulded easily in the fingers, and un-compacted loose gravel which contains obvious voids b) Expansive soils being those that have a liquid limit of more than 50% when tested in accordance with NZS4402 Test 2.2 and a linear shrinkage of more than 15% when tested from the liquid limit in accordance with NZS4402 Test 2.6; and c) Any ground which could foreseeably experience movement of 25mm or greater for any reason including one or a combination of the following:- • land instability, • ground creep, • subsidence, • seasonal swelling and shrinking, • frost heave, • changing ground water level, • erosion, • dissolution of soil in water; and • effects of tree roots

[1] Reliance on 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).*

Introduction

These guidelines are provided to ensure sufficient information is provided in the form of geotechnical investigations at the time a building consent application is lodged. The purpose of these guidelines is to provide clear guidance to help designers, builders, developers and engineers fulfil Stratford District Council's (SDC) information requirements for building consent purposes.

A building consent application needs to provide sufficient information for SDC 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 the building sector within the district.

Review of these Guidelines

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

These guidelines build on the original version released in July 2021 following feedback from the local building industry. They have also been updated to reflect changes to B1 Structure of the NZ Building Code, which comes into effect in November 2021.

Geotechnical reports received since the guidelines came into effect have reaffirmed the decision to implement these guidelines and in some cases provided recommendations for more cost-effective foundation solutions.

Reference to Standards

Where New Zealand Standards are referred to, reference is to the current version (year) cited in the Building Code.

Geography

Stratford is located at the junction of State Highway 43 (The Forgotten World Highway) and State Highway 3. Stratford District makes up about a quarter of the land area of the Taranaki region. The four main geological features it contains are the Taranaki volcanic cone, the Taranaki volcanic ring plain, the Pātea River, and the eastern hill country.

SDC is one of three territorial authorities in the Taranaki region, overlying which is the administrative area of the Taranaki Regional Council.

The far eastern portion of Stratford District is also overlain by the administrative area of the Manawatu / Wanganui Regional Council. The political division between the two regional councils lies along the Whangamomona Saddle.

The major landforms of the district comprise the volcanic landforms centred on Taranaki Maunga, including the “ring plain”, and the dissected eastern Taranaki “hill country”. Between these two lies the more gentle rolling “frontal hill country”.

The natural resources of the Stratford district are the basis for the existing and potential nature, scale and intensity of rural development. The natural resource base comprises elements of geology, soils, topography, drainage, climate and vegetation which are all closely inter-related and which in combination define both the physical basis of the local economy and the intrinsic landscape qualities of the area.

Taranaki Maunga, and Te Papakura o Taranaki /Egmont National Park, dominate the landscape of the District. In the past successive eruptions of ash and natural erosion has created an "apron" or a "ring plain" around the base of the mountain. The fertile and generally free draining soils of this ring plain support intensive pastoral farming, especially dairying.

East of the ring plain lies the rolling topography of the frontal hill country and further east, the deeply dissected hill country. These hills are not volcanic but consist of sedimentary rocks (mudstone, sandstone and siltstone). Soil properties in the eastern hill country are closely linked to the differences in rock hardness and composition. Most are steep land soils, i.e., are shallow soils which have developed on steep, relatively unstable slopes.

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

Natural hazards

Taranaki and Stratford District is subject to a range of natural hazards, the most significant of which are considered to be:-

- volcanic activity;
- earthquake;
- flooding;
- windstorm;
- tornado; and
- land instability and erosion

Natural hazards are a natural event and cannot be totally prevented or controlled; however, the Council (amongst other agencies) has an obligation to try and reduce the actual or potential impact on life, property and the environment.

The District Plan provides policy direction for managing natural 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 require consideration to be given to natural hazards. In addition, an amendment to the Resource Management Act in 2017 (s.106) explicitly requires specified risks to be assessed. Therefore, any subdivision consent should address natural hazards, and in areas identified as being on land with 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.

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.

Applications for Building Consent

The Building Act 2004 requires SDC 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.

In order to do this, SDC require a geotechnical assessment of ground conditions in the following circumstances:

- Any new or relocated residential dwelling
- Any major addition[2] to a residential dwelling
- Re-piling more than 30% of the foundations originally consented
- Re-piling in all cases, where the foundations are being replaced due to failure
- All un-lined outbuildings (e.g. pole sheds, hay barns, etc) with a Building Importance Level 1 where the floor area exceeds 150m^2
- All outbuildings with a Building Importance Level of 2, 3, 4 or 5
- All commercial buildings (new builds and additions)
- All masonry or tilt slab type construction
- All retaining walls greater than 2.5m in height (with or without a surcharge)
- All tiered retaining walls where the wall is within 1.5 times the height of the largest wall in a tiered situation
- Top of any cutting that is closer than 1m to a boundary or an existing or proposed structure
- Any un-retained soil cut in Taranaki Brown Ash exceeding 1.5m where the base of the cut is within a 1V:1H projection from the boundary or an existing or proposed structure.
- Any un-retained cut in any soil other than Taranaki Brown Ash exceeding 1.5m height where the base of the cutting is within a 1V:2H projection from the boundary or an existing or proposed structure.
- Any un-retained fill steeper than 1V:3H or higher than 2m within 2m of a boundary or a 1V:2H projection from the toe of any existing retaining wall down slope.
- Any fill >600mm (consideration must be given to loads imposed and depth of influence of the loads)
- Any structure, soakage or effluent fields on land steeper than 15 degrees or a 1V:3H projection from the toe of the slope
- Any dry-stacked boulder walls[3]
- Any land with liquefiable soils
- All buildings in close proximity to potential or recognised geological hazards evident from the site or from either known or recorded hazards, 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.

Potential or recognised geological hazards include:

- Any building platform on or at the base of sloping land or on ridge tops;
- Any building platform containing fill material;
- Any areas at risk of inundation by flooding or adjacent to watercourses;
- Any known or interpreted fault traces; and

[2] Where the addition comprises a floor area >30% of the ground floor area of the originally consented building

[3] An initial risk assessment shall be undertaken for dry stack boulder walls that assess the location and the potential hazard from the wall to other property, and the potential current and future uses. Where the risk is greater than low then dry stack boulder walls shall be specifically assessed for seismic stability. Guidance on the seismic assessment of dry stack boulders can be found in international standards, along with construction monitoring requirements.

- Any areas identified as potentially prone to lateral spread

Hybrid building types will need to be considered by Chartered Geotechnical Professional and structural engineers on a case by case basis

Good Ground

Although we know soil conditions in the District are poor, it is possible that good ground conditions exist.

Soil conditions can be checked and tested by a structural or civil engineer holding CPEng status; however, the engineer must:

- Ensure the building proposed is within the scope of NZS3604:2011; and
- Soil conditions have an ultimate bearing capacity of 300kPa in original condition (i.e. at time of testing and not after remedial work has been undertaken or proposed); and
- Provide a Soil Suitability Report

If good ground cannot be demonstrated, a geotechnical investigation must be undertaken by a CPEng (GEOL).

Refer page 3 for definitions of Good Ground and CPEng (GEOL) qualifications and page 11 for Geotechnical Reporting Expectations. The reporting expectations for Good Ground are outlined in the section below, Soil Suitability Reporting Requirements

Soil Suitability Reporting Requirements

Acknowledging that a soil suitability report does not need to be as extensive as a geotechnical investigation / report when good ground is found, it does however need to contain the following information as a minimum:

- Description of the proposed work
- Description of soil conditions and confirmation of bearing capacity
- Testing methodology and calibration certificates for equipment used, if applicable
- Site plan showing location of building platform, test sites, any contours, existing water courses, drains, etc and be accompanied with appropriate photos
- Recommendations for foundation design based on findings
- Conclusions

Liquefaction

On 29 November 2021, changes come into effect in respect to foundation design. These changes require a liquefaction hazard assessment be undertaken to determine liquefaction vulnerability.

Therefore in addition to any other reporting requirements, all soil assessments (i.e. Soil Suitability Reports and Geotechnical Reports) will need to comment on liquefaction.

Compliance with Geotechnical Report

Where a geotechnical report has been undertaken, SDC expect a statement to be provided from the structural engineer confirming that they have read, understood, correctly interpreted and incorporated the recommendations of the geotechnical report into their foundation design. The statement shall include reference to the particular geotechnical report (name / date / version number).

Peer / Regulatory Review

Council may at its discretion seek an independent peer review of any geotechnical report submitted with a building consent application. In this case, the reviewer will be engaged by the applicant. The review must be undertaken by CPEng geotechnical professional. The peer reviewer must complete the functions of a regulatory review and independently check the calculations and provide a PS2. The peer review record must accompany the PS2.

The Council may also require a regulatory review; in this case, the reviewer will be engaged by the Council. The reviewer will assess the adequacy of the information in the consent application against these guidelines and whether assumptions and conclusions are reasonable.

The cost of a Regulatory Review will be charged to the applicant at cost.

Types of Reports

During the land development / subdivision process, several geotechnical reports maybe provided to councils.

Geotechnical preliminary assessment / investigation report

The initial report is to demonstrate the suitability of the land for the proposed development. The purpose of this report is to address natural hazards and demonstrate to councils that the land can be developed to meet the requirements of the Resource Management Act and District Plan. These reports are generally not suitable for building consent as they are usually not site-specific.

Geotechnical design report

If the site is to be modified during subdivision then a geotechnical design report is needed. The purpose of this report should be to confirm the suitability of the proposed landform and provide any specific assessments needed to support the detailed design of the subdivision and landform.

Geotechnical Completion Report (GCR)

The final report for each stage of a development should be a Geotechnical Completion Report (GCR). This report summarises the works undertaken and provide recommendations for the foundation design. GCR's must include all fill testing records and settlement monitoring records.

Some GCRs provide recommendations for additional investigation and assessment. Other GCRs state that buildings can be built in accordance with NZS3604, provide an ultimate bearing capacity or recommend liquefaction resistant foundation design.

If required, the Geotechnical Engineer must provide construction monitoring and confirm in writing to Council that the site is suitable for construction purposes.

Geotechnical Assessment Reporting Expectations

Regardless of the purpose of the geotechnical report, it must include an assessment of the natural hazards affecting the site, including but not limited to:

- A description of the proposed project / structure(s)
- A desk study:
    - Review NZGD for relevant nearby investigations (these are not a substitute for site specific investigations that will be required for building consent).
    - Retrolens
    - Geological map
    - SMaps
    - Council GIS maps
    - Active fault database
    - Any other relevant information
- Reference to any previous geotechnical reports for the site and the recommendations.
- A scale contour plan either surveyed or lidar at a scale suitable to show relevant geomorphic features and the proposed development.
- Geomorphic description of the site with any key features such as soil, creep, overland flow, existing slumps or erosion, shown on plans.
- Give adequate consideration to land features or structures beyond the boundary that may affect or be affected by the works.
- Address the presence of any services within or adjacent to the site and demonstrate that they do impact the proposal and will not be impacted by the proposal.
- Subsurface investigations, number and depth appropriate to scale of development and proposed changes to site conditions
- Describe the underlying geology of the area and any mantling soils.
- At least one geotechnical cross section showing the current and future site levels
- 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, expansive soils, with recommendations for how these should be dealt with
- Estimated settlements (short term and long term from site filling and building loads if required)
- Minimum set back requirements from slopes and how they have been established.
- Slope stability must address static, seismic, post-seismic strength loss and elevated water pressures due to prolonged rainfall.
- State proximity to active faults
- State the site subsoil class in accordance with NZS1170. Where the presence of bedrock is possible but has not been established in accordance with NZS1170 the conservative structural and geotechnical actions shall be adopted.

- Seismic hazards including the liquefaction vulnerability and lateral spread potential, in accordance with current NZ practice
- Ultimate bearing capacity (UBC) for foundations under static and dynamic conditions
- Suitable foundation types
- Reference to flood levels and minimum building platform levels, and how they were established (regional flood hazard, model, specific flood hazard model by others)
- Effects of storm water runoff, soakage and on-site effluent
- Description and locations of the geotechnical testing undertaken
- Depth of groundwater assumed for geotechnical design and taking in to account anticipated or predicted seasonal fluctuations;
- Site works and earthworks specifications
- Any requirements for maintenance and / or monitoring by lot owners

In accordance with The New Zealand Geotechnical Society (NZGS) and Engineering New Zealand's policies, all geotechnical investigations for a building consent must be uploaded to the NZGS prior to applying for consent.

Logs of all site investigations which include field descriptions in accordance with New Zealand Geotechnical Society (NZGS) guideline[4] including 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.

SDC will not accept any foundation designs where ground conditions have been assumed. In all cases, ground conditions must be verified.

Site Inspections post Consent Issue

The geotechnical engineer must identify and list any construction monitoring that they require too undertake.

If the geotechnical engineer does not require any construction monitoring and the design calls up 600mm or more of hard-fill, these inspections can be undertaken by a CPEng structural.

[4] 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).