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29 May 2015

Greg Dewe  
Land Development Manager  
Fulton Hogan Land Development Limited  
15 Sir William Pickering Drive  
PO Box 39185  
Christchurch 8545

Dear Greg

**Geotechnical Completion Report – Longhurst Stage 8A and 8B Development (Lots 581 to 644, 970 to 972, 978 and 979)**

This geotechnical completion report is submitted in accordance with Section 12.4.1 of the Christchurch City Council Infrastructure Design Standard.

**Introduction**

Fulton Hogan Land Development Limited (FHLD) is in the process of developing the Longhurst Residential development in Halswell in southwest Christchurch, with Stages 8A and 8B of the development nearing completion. During the geotechnical investigation Stage 8A and 8B was identified as being susceptible, to a limited degree, to the effects of seismically induced liquefaction.

The liquefaction risk at the site was assessed as being with acceptable levels that a Technical Category 2 (TC2) classification of the site was applicable. As such no site specific liquefaction mitigation measures were required for the site development.

The conditions of Aurecon's engagement are as per our original agreement relating to initial geotechnical investigation carried in October 2010, and are set out in our letter of engagement dated 29 September 2010.

**Previous Investigation**

Aurecon undertook a geotechnical site investigation across the wider 117ha FHLD Halswell West residential development site in October 2010 to support a plan change application. This investigation is described in the Aurecon Report *Geotechnical Site Investigation and Liquefaction Assessment, Halswell West Rezoning, Rev1* dated 29 November 2010 prepared for Fulton Hogan Land Development Limited (Aurecon, 2010).

Aurecon undertook further geotechnical investigations to support a subdivision application for, what was then known as, Stages 6 and 7 of the Longhurst development between October 2011 and September 2012. This included testing in areas that are now included in Stage 8A and 8B. This investigation is described in the Aurecon Report *Halswell West Residential Development, Longhurst Stages 6 and 7 Geotechnical Assessment, Rev1* dated 4 October 2012 (Aurecon, 2012).

**Liquefaction Hazard Assessment**

In the days immediately following the 4 September 2010 Darfield Earthquake and the 22 February 2011 Christchurch Earthquake Aurecon undertook a site walk over and mapping of surface manifestation of liquefaction across the entire Halswell West development (including Longhurst Stages

8A and 8B). No surface manifestation of liquefaction was observed in the area that is now Stages 8A and 8B following either the Darfield or Christchurch Earthquakes.

A liquefaction hazard assessment was carried out as part of the site assessments using the method prescribed in the Department of Building and Housing (DBH) now the Ministry of Business, Innovation, and Employment (MBIE) guidelines for residential development in Canterbury following the Canterbury earthquake sequence (DBH, 2011 and DBH, 2012). This assessment was in accordance with the prescribed methodology in the MBIE (2012) Guidelines.

### Technical Category Classification

We have assessed the liquefaction hazard at the site using the method recently prescribed by MBIE guidelines, observed site performance during the major seismic events in the Canterbury earthquake sequence. Based upon this assessment and observed site performance we believe **Lots Longhurst Stages 8A and 8B Development (Lots 581 to 644, 970 to 972, 978 and 979) fulfil the requirements of TC2 Classification**, i.e. this effectively means that the MBIE believe that '*Minor to moderate land damage from liquefaction is possible in future significant earthquakes*'. House foundations and site specific geotechnical investigations are required in accordance with the MBIE (2012) guideline documents '*Repairing and rebuilding houses affected by the Canterbury earthquakes*' released in December 2012.

### References

Aurecon, 2010. *Geotechnical Site Investigation and Liquefaction Assessment, Halswell West Rezoning, Fulton Hogan Land Development Limited, Revision 1* - dated 29 November 2011. Aurecon New Zealand Limited, Christchurch, New Zealand.

Aurecon, 2012. *Halswell West Residential Development, Longhurst Stages 6 and 7 Geotechnical Assessment, Rev1* dated 4 October 2012. Aurecon New Zealand Limited, Christchurch, New Zealand.

DBH, 2011. *Revised guidance on repairing and rebuilding houses affected by the Canterbury earthquake sequence*. Department of Building and Housing, Wellington, New Zealand.

DBH, 2012. *Interim guidance for repairing and rebuilding foundations in Technical Category 3. Appendix C to the Guidance on house repairs and reconstruction following the Canterbury earthquake sequence (November 2011)* 27 April 2012. Department of building and Housing, Wellington, New Zealand.

MBIE, 2012. *Repairing and rebuilding houses affected by the Canterbury earthquakes*. Ministry of Business, Innovation and Employment, Wellington, New Zealand.

### Limitations

We have prepared this report in accordance with the brief as provided. The contents of the report are for the sole use of the Client and no responsibility or liability will be accepted to any third party. Data or opinions contained within the report may not be used in other contexts or for any other purposes without our prior review and agreement.

The recommendations in this report are based on data collected at specific locations and by using suitable investigation techniques. Only a finite amount of information has been collected to meet the specific financial and technical requirements of the Client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground

between test locations has been inferred using experience and judgement and it must be appreciated that actual conditions could vary from the assumed model.

Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

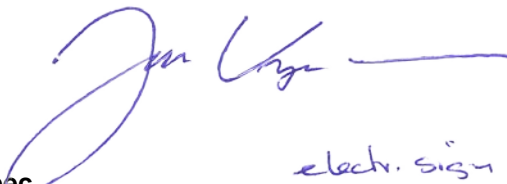
Subsurface conditions, such as groundwater levels, can change over time. This should be borne in mind, particularly if the report is used after a protracted delay.

This report is not to be reproduced either wholly or in part without our prior written permission.

This conclusions in this report draws on investigations, analysis and conclusions from various investigations stages and numerous reports. For specific details please refer to the above mentioned references or contact the writers.

If you have any queries regarding the content of this letter, please do not hesitate to contact the undersigned.

Yours sincerely



**Dr Jan Kupec**

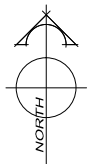
*PhD MSc candling MIPENZ CPEng IntPE MRSNZ | NZGS IGS ISSMGE NZSEE*

*Chartered Professional Geotechnical Engineer – Technical Director*

Inc: Longhurst Stage 8A and 8B Site Layout Plan

Cc: Andy Hall, Davie Lovell-Smith Ltd, PO Box 679, Christchurch





- NOTES:
- 1) Areas and dimensions subject to final survey and deposit of plans.
  - 2) Service easements to be created as required.
  - 3) This plan has been prepared for subdivision consent purposes only. No liability is accepted if the plan is used for any other purpose.

**Christchurch City Council**  
**Approved Consent Plan**  
**(Amended) 1a**  
**RMA92021819**  
**Paul Lowe**  
**17/01/2014**

**Balance Lot Diagram**

SCALE: 1:2500@A1  
1:5000@A3

**SCHEDULE OF AREAS**

Description	Area
Residential Lots ( Lots 390 - 684 )	12.3926ha
Road to Vest in Christchurch City Council ( Lots 973 - 979 )	4.6420ha
Local Purpose (Drainage) Reserve to Vest in Christchurch City Council ( Lots 960, 961 & 964 - 972 )	8924m <sup>2</sup>
Recreation Reserve to Vest in Christchurch City Council ( Lots 962 & 963 )	4469m <sup>2</sup>
Right of Ways	3453m <sup>2</sup>
Kiosk Sites ( Lots 986 - 991 )	30m <sup>2</sup>
Balance Lot ( Lot 983 )	5.5596m <sup>2</sup>

Total Area: 24.2818ha



**DAVIE LOVELL • SMITH**

PLANNING SURVEYING ENGINEERING

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**JOB TITLE:**  
**Fulton Hogan Ltd**  
**Longhurst - Stage's 6, 7 & 8**  
**Halswell Junction Road**

**SHEET TITLE:**  
**Proposed Subdivision of**  
**Lot 941 RMA.92022216**  
**& Lot 934 D.P.458806**

**DRAWING STATUS:**  
**Subdivision Consent**

SCALE: 1:1000@A1  
1:2000@A3  
DATE: November 2013

CAD FILE: J:\18228\SUBCON\E18228 Subcon Stg 6-8 R6.dwg

DRAWING No: E.18228 SHEET No: 1 of 1

REVISION: R6

**LEGEND**

Density A  
Minimum of 9 Lots

Density B  
Total Lots: 194  
Min Lot Size: 200m<sup>2</sup>  
Max Lot Size: 477m<sup>2</sup>  
Average Lot Size: 336m<sup>2</sup>

Density C  
Total Lots: 99  
Min Lot Size: 452m<sup>2</sup>  
Max Lot Size: 594m<sup>2</sup>  
Average Lot Size: 510m<sup>2</sup>

