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2024-06-26

Greg Dewe
Land Operations Manager
Fulton Hogan Ltd

Via email: Gregory.Dewe@fultonhogan.com

Dear Greg,

Rosemerryn Subdivision – Stage 21A
Geotechnical Completion Letter

This geotechnical completion letter report is submitted to fulfil the geotechnical requirements of Condition 21 of the Selwyn District Council Resource Consent RC185574 which requires confirmation that the original Technical Classification remains applicable after final earthworks have been completed.

1 Introduction

Fulton Hogan Land Development Limited (FHLD) are developing the Rosemerryn Subdivision located in Lincoln, Christchurch. Aurecon New Zealand Limited (Aurecon) has provided Geotechnical Engineering services for the subdivision development, including a geotechnical investigation and subsequent assessment of Stages 19 to 24 for the purposes of subdivision consent. The investigation and assessment are detailed in the Aurecon geotechnical report *"Rosemerryn Subdivision, Lincoln, Stages 19 to 24 Geotechnical Investigation Report"*, dated 22 June 2018.

FHLD has engaged Aurecon to provide a geotechnical review of the construction completed in Stage 21A of the Rosemerryn Subdivision and to confirm the Technical Category Classification of the proposed allotments. The extent of Stage 21A is shown on the attached Earth-fill As-built plan for Stage 21A provided by Davie Lovell Smith and attached as Appendix A of this letter. Aurecon's review is summarised in the letter below.

2 Earthworks

Cut and fill earthworks have been carried out across Stage 21A to ensure adequate drainage towards the street in accordance with the Christchurch City Council CSS and NZS 4431:1989. Earthworks were undertaken using site won engineered fill between October 2022 and March 2023. Cut and fill earthworks have been undertaken to a maximum 0.6m of cut and 1.3m of fill respectively.

Bulk earthworks and compaction signoff have been observed and signed-off separately by the project Civil Engineers Davie Lovell-Smith Ltd. An Earth-fill As-built plan for Stage 21A provided by Davie Lovell Smith is attached as Appendix A of this letter.

3 Liquefaction Hazard and Technical Category Assessment

3.1 Seismically Induced Liquefaction

Aurecon's Geotechnical Report for Stages 19 to 24 was issued following the publication of the Ministry of Business Innovation & Employment (MBIE), guidelines in December 2012 and subsequent updates

in 2018, which define the Technical Category zoning and the liquefaction induced deformation limits for each Technical Category.

The categories and corresponding criteria are as follows:

- **Technical Category 1 (TC1)** – Future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances.
- **Technical Category 2 (TC2)** – Minor to moderate land damage from liquefaction is possible in future large earthquakes.
- **Technical Category 3 (TC3)** – Moderate to significant land damage from liquefaction is possible in future large earthquakes.

The indicative vertical and horizontal displacements associated with each Technical Category classification, together with the impact of liquefaction on house foundations, are presented in Table 1 below.

Table 1 Liquefaction Deformation Limits and House Foundation Implications

Technical Category	Index Liquefaction Deformation Limits				Likely Implication for House Foundations (subject to individual assessment)
	Vertical		Lateral Spread		
	SLS	ULS	SLS	ULS	
TC1	15mm	25mm	Nil	Nil	Standard NZS 3604 type foundations with tied slabs are acceptable subject to shallow geotechnical investigation.
TC2	50mm	100mm	50mm	100mm	MBIE enhanced foundation solutions.
TC3	>50mm	>100mm	>50mm	>100mm	Site specific foundation solution.

A liquefaction hazard assessment was undertaken as part of Aurecon's 2018 Geotechnical Report using the prescribed Ministry of Business, Innovation, and Employment (MBIE, 2018) guidelines for residential development in Canterbury following the Canterbury earthquake sequence.

The liquefaction analysis for Stage 21A was based on the boreholes and CPT testing carried out as part of the geotechnical investigations for the larger subdivision. The geotechnical investigation information used to assess Stage 21A is part of a large group of geotechnical information and only the tests that are relevant for this stage have been assessed. Consideration was given to information and data from outside the stage boundary when assessing geotechnical hazards and issues.

3.2 Technical Category Classification

Given that the subdivision development has comprised relatively minor cut and fill earthworks, Aurecon considers that there has been no change in Technical Category Classification from our original assessment. Therefore, we consider that:

- **All Lots (Lots 832 to 853) fulfil the requirements of a TC2 Classification.**

4 Silty Soils

Investigations undertaken by Aurecon prior to earthworks indicate soft to firm silty soils underlain by loose to medium dense sand may be encountered at shallow depths across the entirety of Stage 21A of the Rosemerryn Subdivision. Stage 21A is expected to have a performance equivalent to MBIE TC2, we therefore believe that standard NZS 3604 type footings would not be appropriate.

Lot specific shallow geotechnical investigations will be required for all lots as part of the detailed building design process. The anticipated bearing capacities from the near surface soils are likely to be readily accommodated by a TC2 type foundation system, pending detailed foundation investigation and design at building consent stage.

5 Recommendations

Due to the identified underlying ground conditions (TC2 and with the potential for softer silty soils) lot and building specific shallow geotechnical investigations shall be undertaken for all lots in Stage 21A in accordance with the requirements of NZS3604.

This report is not intended to be used for detailed design of site-specific shallow foundations and is not suitable to support individual building consent applications. Site specific investigations are required at building consent stage.

6 Reference

Aurecon, 2018. *Rosemerryn Subdivision, Lincoln, Stages 19 to 24 Geotechnical Investigation Report, Rev0* - dated 22 June 2018. Aurecon New Zealand Limited, Christchurch, New Zealand.

Davie Lovell-Smith, 2024. *Earthfill Report, Fulton Hogan Land Development Ltd, Rosemerryn Stage 21A* – dated 12 June 2024.

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

MBIE, 2018. *Repairing and rebuilding houses affected by the Canterbury earthquakes.* Ministry of Business, Innovation and Employment, Wellington, New Zealand – May 2018.

7 Explanatory Statement

The contents of this letter are for the sole use of the Client and no responsibility or liability will be accepted to any third party. Information or opinions contained within this letter may not be used in other contexts or for any other purposes without our prior agreement.

The comments in this letter are based on our investigations of the site for the sole purposes of the geotechnical aspects only, as requested by the Client. Only a finite amount of information has been collected and this letter does not purport to completely describe all the site characteristics and properties.

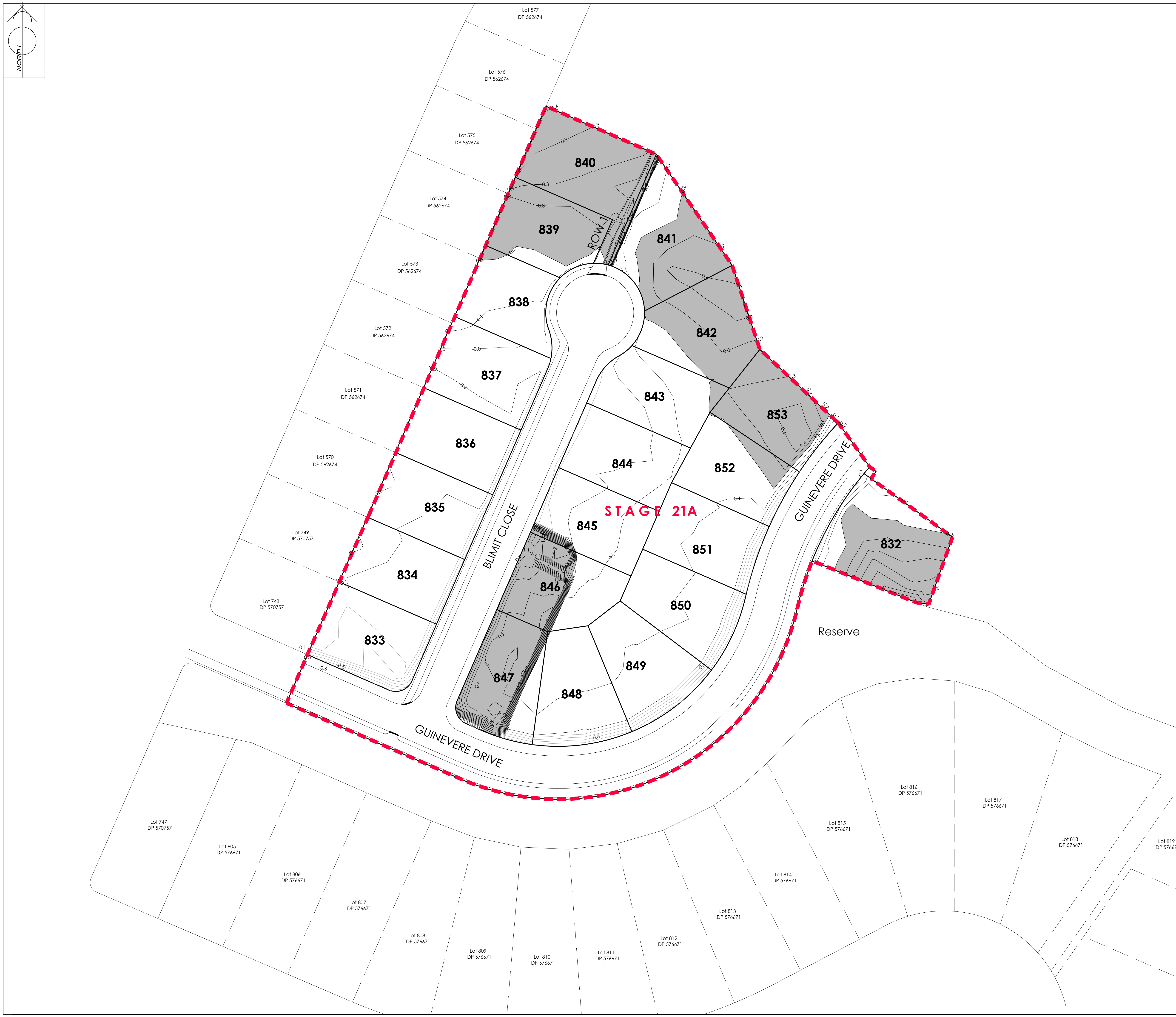
The extent of our investigations and the results of all the tests carried out are as presented in the geotechnical report for Stages 19 to 24 *"Rosemerryn Subdivision, Lincoln, Stages 19 to 24 Geotechnical Investigation Report"*, dated 22 June 2018.

We trust this meets your requirements and if there are any further questions, please do not hesitate to contact us.

Yours faithfully,

Ian McPherson
BE (Civil) Hons, M.A.Sc., DBS, CMEngNZ, CPEng
Technical Director – Geotechnical Engineering

Enc: DLS Earth-fill As-built Plan for Rosemerryn Subdivision Stage 21A



1. This plan has been prepared for earth fill asbuilt purposes only. No liability is accepted if the plan is used for any other purpose.
2. Any measurements taken from information which is not dimensioned on the electronic copy are at the risk of the recipient.

LEGEND

CONTOURS SHOWN ARE APPROXIMATELY CUT (-ve) AND FILL (+ve) AT 0.1m INTERVALS.

CUT

ASBUILT FILL ≥ 0.2m

ASBUILT KERB

ASBUILT FOOTPATH

DAVIE LOVELL-SMITH

PLANNING SURVEYING ENGINEERING

Rosemerryn - Stage 21A

Earthfill Asbuilt

Asbuilt

1:500@A1
1:1000@A3

June 2024

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