

Project Reference: BGL000052

09 October 2019

Waikato Regional Council
Private Bag 3038,
Waikato Mail Centre,
Hamilton, 3240.

Attention: Emma Cowan

Preliminary Geotechnical Review – Huntly Quarry Pre-Application Review

1 Introduction

Waikato Regional Council (WRC) are in pre-application discussions with Gleeson Civil Limited (The Applicant), who is proposing a series of overburden disposal areas (Fill Sites) to support ongoing operations at their Huntly Quarry. The pre-application information provided to date indicates that the consent application will incorporate three (Fill Site 5 has been excluded) separate but adjacent Fill Sites to the west and north of the quarry, which will receive both overburden and a smaller quantity of imported clean fill and managed fill.

The Applicant has provided a geotechnical assessment prepared by Gaia Engineers Limited (Gaia) and are seeking an initial review during the pre-application process. WRC has requested the Baseline Geotechnical Limited complete the required review. Our scope of works was set out in our offer of service dated 20 September 2019 and is summarized below:

2 Scope of work

1. Read and critically assess the information provided in the geotechnical report¹.
2. Prepare a short summary addressing whether the report is sufficient to address geotechnical related effects on the environment in relation to a resource consent application.

¹ Gaia Engineers Report: Huntly Quarry Disposal Sites – Geotechnical Assessment, dated September 2019, ref: 2325-12-GQ-01 Rev:B.

3 Proposed development

Four OBDA sites are described in the geotechnical report. At the request of the Applicant, Fill Site 5 has been excluded from this review, as it will form part of a future, separate resource consent application.

The general conditions of the proposed footprint areas of Fill Sites 2 to 4 and the geometry of the proposed fills area are set out in Sections 2 & 6 of the geotechnical report respectively.

The information provided in those sections is at an appropriate level of detail to support a resource consent application. It provides a reasonable overview of each site and the concept geometric design that is being followed.

4 Background geology and data review

A review of background geology and supporting information is provided in Sections 3 & 4 of the geotechnical report.

4.1 Geology/Ground model

Section 3 describes the geology of the Fill Sites. The lithological descriptions are based on both published information [GNS Science New Zealand Geology Web Map] as well as descriptions sourced from site investigations [mapping and trial pit excavations]. The mix of both published and field investigation information means that this section of the report better describes the ground model for the Fill Sites.

The format is slightly unusual, in that factual field observations would typically be described earlier in the reporting [these are not provided until Section 5] prior to summarizing a ground model. However, this does not detract from the overall summary of ground conditions, which is a reasonable reflection of the trial pit investigation data. The exception to this is that there is limited information on the underlying bedding orientation in the Waikato Coal Measures.

For a preliminary geotechnical assessment of this nature, we would normally expect this section of the reporting to include reference to the key geotechnical risks typically associated with each lithological unit. This would provide a context or framework for the assessment that follows and is a significant omission.

4.2 Data review

Section 4 describes the information provided by the Applicant that Gaia has reviewed and relied on as part of the geotechnical report.

Section 4.2 describes a report by Terra Mining Ltd [2006], that includes a geological model and borehole drilling.

Boreholes HQ006 and HQ007 are described as providing “*some information regarding the boundary between the Waikato Coal Measures and the Newcastle Group Greywacke.*” However, the locations of the boreholes are not provided on drawing 2325-12-01. If the boreholes are relevant, then the locations should be illustrated on the field investigation plan and the logs provided in an Appendix.

In the same paragraph, the geotechnical report describes the contact between the Waikato Coal Measures and the Newcastle Group Greywacke as “*...not expected to be a governing factor regarding the stability and*

design of the proposed fill sites”. The basis for this statement is not clear and potentially disregards a geotechnical risk very early in the document, prior to any assessment being undertaken. This is discussed further below.

5 Ground investigations

A series of trial pit excavations have been undertaken across the proposed footprint of Fill Sites 2-4.

We note that there is an inconsistency in trial pit naming convention between the logs in Appendix B and the locations illustrated in Drawing 2325-12-01. This appears to only be for those pits in Fill Site 3.

The trial pit logs provided in Appendix B reasonably describe the encountered materials and the summary of shear strengths from hand held shear vanes provided in Table 1 in the text is useful.

However, apart from the table of shear vane strengths, there is no further discussion of the materials encountered in the ground investigation and the influence these may have on the likely geotechnical performance of the proposed Fill Sites.

In particular several issues arise from a review of the trial pit logs, that may influence geotechnical performance. These include:

- Description of sheared or fissured fabric in TP203, 204 and 206;
- Fast seepage described in historical mining fill in TP305 and 308;
- Trial pit excavations failing to intercept the contact between the mining fill and the underlying in-situ soil/rock.

These items are discussed further below.

6 Geotechnical risks

The document provided does not include a section that describes potential geotechnical risks and how these may be mitigated.

Typically, the key geotechnical consideration for an OBDA site is long term slope stability as this presents the largest risk in terms of off-site effects i.e. failure run out beyond the boundary or smaller failures that influence surface water quality.

The geotechnical report describes the anticipated level of stability as “suitable” in Paragraph 4 of Section 8, Paragraph 1 of Section 7 and Paragraph 6 of the Executive Summary. However, this has not been demonstrated by analysis, so the basis for those statements cannot be critically assessed.

We consider that there are some specific geotechnical risks related to ground conditions that need to be better understood and incorporated in the geotechnical report for the potential effects to be adequately addressed. In our opinion these include:

- Low strength, bedding parallel shears within the Waikato Coal Measures including a leached seatearth typically present below the lowermost coal seam, in proximity to the contact with the underlying greywacke. These are typically of low enough strength that historical slope failures in nearby opencast coal mines have occurred up dip.

-
- The orientation [dip and dip direction] of bedding will be critical in slope stability performance and will need to be defined prior to analysis of OBDA stability.
 - The historic mining fill provides a foundation for Fill Site 4. The full depth of the mining fill, and importantly, the condition of the contact between the mining fill and the underlying in-situ soils or rock has not been proven. This may be a significant geotechnical constraint on OBDA design and performance.
 - Underlying groundwater conditions in the foundation soils [both in in-situ soils and previous mining fill].
 - Expected slope stability performance which should be demonstrated by analysis.

7 Construction considerations

Construction considerations are described in Section 7. The items described are typically adopted methods which are expected to reduce the risk of instability developing within the fill material itself [as opposed to the foundation materials].

Development of excess pore water pressure within the fill material both during placement and in the long term will be an important parameter when considering stability performance. The proposed drainage blanket layers can be expected to appropriately manage the risk of pore pressure development within the fills, but consideration should be given to installation of in ground pore pressure monitoring [vibrating wire piezometers or similar] to verify pore pressure performance against design assumptions and support surface survey monitoring, which may be influenced by settlement. This could be managed as a condition of consent.

8 Consenting context

The geotechnical report sets out in Section 7.4 that there is provision to potentially steepen the design slope angles. Elsewhere the document [example Paragraph 5 in Section 6] indicates that the footprint may change in future design iterations, and that commencement of filling should be subject to detailed design.

While we understand that the proposal is in pre-application at the present time, the footprint and design envelope will need be confirmed as part of the application for Resource Consent, as the location and geometry of the fills will form the basis of the assessment of [geotechnical] effects on the environment.

Additionally, the proposal to complete the larger part of the stability design work [detailed design] after Resource Consent is granted is not appropriate in this instance, as once resource consent is granted, the proposal included in the application may be legally constructed. While the construction that follows may be subject to conditions, sufficient design work should be undertaken at the time of consenting to allow the potential effects to be understood. In our opinion the geotechnical report reporting does not currently provide this.

9 Summary and conclusions

We have completed our review of the geotechnical report provided by the applicant and authored by Gaia.

Our review of the document has identified areas where we consider additional detail should be sought prior to submission of the Resource Consent application so that the potential effects on the environment can be adequately assessed.

Matters that should be addressed in a revised preliminary design report include:

1. Confirmation of foundation ground conditions, including;
 - a. Bedding orientation and presence [or absence] of low strength bedding parallel shearing in the foundation of all Fill Sites;
 - b. Depth of historic mining fill at Fill Site 3;
 - c. Orientation and condition of contact between historic mining fill at Fill Site 3 and underlying in-situ soil/rock.;
2. Data on foundation groundwater conditions;
3. Demonstration of expected slope stability performance, by analysis, allowing for the conditions described in items 1 & 2 above.

10 Applicability

This report has been prepared for the exclusive use of our client Waikato Regional Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We have not independently verified the information contained in the Gaia report.

We trust that this letter report meets your present requirements. If you have any queries or wish to discuss any aspect, please contact the undersigned.

For and on behalf of Baseline Geotechnical Limited



Cameron Lines

Director

