27 August 2021 Document Ref: AKL2021-0210AB Rev 0

Unit A3/27 William Pickering Drive
Rosedale
Auckland 0632

Attention: Thomas Rutter

Dear Sir,

RE: GEOTECHNICAL EXPERT INPUT
201 – 203 BROWNS BAY ROAD, BROWNS BAY

1 INTRODUCTION

CMW has been engaged by Matvin G oup to provide expert input for the proposed apartment development at 201 – 203 Browns Bay Road Browns Bay.

CMW's experienced team currently comprises 65 staff across our NZ officers based in Auckland, Tauranga and Hamilton with a further 100 staff in Austr lia. Each of our New Zealand officers operates an in house IANZ accredited soils testing laboratory for earthworks quality and control testing. Our quality, health and safety and Environmen al systems are all accredited to the latest ISO standards.

CMW Auckland and CMW staff have been involved in many developments throughout Auckland. We have a wealth of experi nce working on similar projects in similar ground conditions to draw upon. Some examples of these pro ects include the following:

- Remuera Gardens project where CMW designed a perimeter wall (combi-wall) retaining up to 5.15m to support a basement excavation. The proposed perimeter utilised circular hollow sections filled with einforced concret and 150mm steel clutches welded on both sides of the pile to provide a impermeable barrier prevent the ground water table from being drawn down.
- 1 Ke marna Avenue project which involved the design and construction supervision of a 4.0m high bored pile wall to support a basement excavation. The wall was near an existing road and with critical services. CMW specified and helped implement a monitoring and contingency plan to assess deflections and settlement during construction to allow intervention if deemed necessary.

We understand that this letter will be used as part of a Fast-Track application for Resource Consent with Au kland Council. This letter has been prepared by Kostas Lontzetidis a Chartered Principal Geotechnical Engineer with over 25 years' experience. Kostas has worked in a wide range of civil engineering projects including infrastructure (highways, railways, bridges, tunnels, wastewater), buildings and oil & gas.

2 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The site is located on Browns Bay Road which runs along the southern boundary of the site with neighbouring residential properties on the north, south and west sides.

The site comprises two adjacent lots at 201 and 203 Browns Bay Road. The properties have the legal description Lot 1 DP 82026 and Lot 2 DP 52218 respectively. The combined area of the sites is approximately 3309m^2 , 2,423 m^2 at 201 and 886 m^2 at 203 .

Both properties are currently occupied by residential dwellings. The site is steeply sloping on the southe n side with gradients of up to 2H :1V with two level platforms present on the site where the residential dwel ngs are located. The site location is shown on the aerial on Figure 1 below.

Figure 1: Aerial photograph of s te with site boundary shown in red

The proposed development plans titled P1 Resource Consent updated and dated the 9th of July 2021 show the development as consisting of four new apartment buildings up to seven-storeys in height. In between the apartments building are roads and carparking areas with some landscape and public outdoor areas.

The proposed apartment buildings on the southern side will have up to four levels of structure as partial basem nt with the rear walls supporting the slope along the southern boundary. It is expected that the r quired height of retention will be up to 12.0m. Significant cuts will be required to form the building platforms or the new apartment structures.

3 DESKTOP STUDY

3.1 Site History and Geomorphology

Historic aerial photography viewed on the Auckland GIS viewer[1] indicates the site in 1959 having a gully running generally south to north along the site. This gully appears to be filled in by the time the next aerial photos records are available in 1996.

A review of the Auckland Council GIS shows overland flowpaths close to the site but outside the property footprint.

3.2 Geology

Published geological maps suggest that the site is underlain by East Coast Bays Formation alternating sandstone and siltstone (with variable volcanic content and interbedded pebble and boulder sized clasts). It is anticipated that the near surface material will be comprised of a residually weathered soil derived from the East Coast Bays Formation rock. Figure 2 below shows the geology in the area local to the site.

Figure 2 Geology map, Source: GNS Web Viewer

East Coast bays Formation (ECBF) deposits of Waitemata group are evident along much of the eastern coastline of the Auckland Area. Formed during the Early Miocene in the submarine fan and basin floor depositional environments and typically consists of thickly bedded sandstone and interbedded laminated mudstones/siltstones. Residual soils formed by weathering and alteration of the parent sedimentary formation typically form silts and clays or mixtures of the two depending on groundwater conditions, faulting and land gradients.

[1] https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html

3.3 Existing Geotechnical Information

A previous geotechnical investigation was undertaken by Kirk Roberts Consulting Engineers. The investigation comprised of four hand auger boreholes undertaken to depths of between 3.2m and 4.0m below existing ground level. Shear vanes readings were also taken at 0.3m intervals during the hand augers investigation. All boreholes reached target depths except for HA02 which terminated early due to difficult drilling conditions.

The report detailed that the ground conditions typically comprised firm clays and silty clays with moderate to high plasticity. These clays are typically ECBF residual soils with some pockets of engineered fill material and deeper topsoil which is most likely associated with landscaping around the existing dwellings.

No ground water was encountered during the investigation.

3.4 CMW Sitewalkover 17th August 2021

As part of the planning prior to undertaken an investigation CMW undertook a site walkover. The primary purpose of this walkover was to assess access for undertaking a geotechnical site investigation. However, during the investigation CMW staff also took note of any features which would indicate the presence of geotechnical risks on the site. CMW observed on the north-western boundary some tension cracks forming behind an old retaining wall. This retaining wall due to its age appeared to have deteriorated considerably. CMW staff also observed cracking along the footpath running along the southern boundary of the site however it was unclear whether this was due to expansive soils, slope movement or subsidence.

4 PRELIMINARY GROUND MODEL

From the information gathered in the desktop study it is likely that residual soils of the East Coast Bays Formation are present across the site. Underlying the residual soils is weathered rock of the easy coast bays formation. Due to the presence of an old gully, it is possible that there will be isolated alluvial deposits along the north and eastern boundaries of the site. Due to earthworks being undertaken on the site during its original development into residential properties we also anticipate some uncertified fill materials to be present across the site.

The depth to bedrock is likely to be variable. At this stage there is no data on the exact depth to rock.

5 GEOTECHNICAL HAZARD ASSESSMENT

5.1 Uncertified Fills

Based on the review of the aerial photography and the existing geotechnical investigation it is anticipated that uncertified fill materials will be present on the site. It is possible that these fills may be of poor quality and are suspectable to load induced settlements which may cause damage to foundations, pavements and services.

Any engineered fill sources from excess cut are likely to require conditioning to achieve appropriate moisture content. This process is typical for soils in this region.

5.2 Slope Instability

The current site has significant slopes and furthermore during CMWs site walkover tension cracking was observed along the northern border of the site and along the footpath which runs along the southern edge of the site. Based on these observations it is expected that there may be some slope stability issues already present on the site due to its inclined nature. The slope stability of the site will need to be carefully assessed during the design process.

Due to the inclined nature of the site, soil creep on slopes could be expected to occur. This can easily be mitigated through deepening of foundations or adopting a pile foundation solution.

The stability issues along the southern boundary will be resolved by the construction for the r tention structures associated with the development. If slope stability is identified as an issue and the required fa tors of safety as defined in the Auckland Council Code of Practise cannot be achieved, remedial measures will be required. Remedial measures may include the construction of soil nails, palisade walls or ground anchors to improve overall site stability.

5.3 Excavation and Deflections

Significant excavations are proposed which require both temporary retention during construction and a permanent retaining wall solution to be incorporated into the proposed structures. It is noted that the proposed retaining walls are currently up to 12.0m high. It is anticipated that the deflection of a retaining structure of that height if constructed in cantilever would generate large deflections which would result in a large amount of surface settlements. These surface settlements would affect Browns Bay Road and any services located in the road corridor.

Settlements induced by the excavation and deflections of any r tention structures are anticipated to be the largest geotechnical risk on the site. Retention solutions include the use of soil nail walls or reinforced concrete or UC cantilever/propped walls. A construction methodology and design solution will need to be carefully considered and designed at the Building Consent stage to mitigate and reduce the impacts of the deflections. A monitoring and contingency plan will be required to utline a regime of monitoring alert and alarm levels to continuously evaluate soil and structure movements during construction. If movements exceed acceptable values, the construction teams will need to undertake remedial actio to arrest and prevent further movement which can damage adjacent infrastructure. Remedial action will include the use of stability berms and propping to increase wall stiffness and reduce deflections.

5.4 Ground Water Drawdown

Groundwater levels are expected to be low due top the site being located on a ridgeline however due to the deep anticipated cuts to form the basement walls, it is anticipated ground water levels will be encountered during earthworks. Ground water can cause issues with seepage into excavations and excavation instability. The drawdown of gr und water ither temporarily during construction, or permanent due to basement construction, can result in settlements in adjacent properties and infrastructure. If this is not carefully managed then settlements can result in ground deformation, cracking and damage to existing buildings.

Basements may require tanking and might be required some additional resistance against uplift pressures, although t is considered highly unlikely due to the weight of the structures. Where basements are proposed whi h could intercept groundwater levels it is anticipated that the need for specific groundwater take and/or div rsion consents will be required. If predicted ground water drawdowns are outside acceptable levels potential r media measures include reinjection wells, cutting off groundwater flows or underpinning/remediated impacted infrastructure/services.

5.5 Expansive Soils

Seasonal shrinking and swelling results in vertical surface ground movement which can cause significant cracking of floor slabs and walls. There have been instances of concrete floors and/ or foundations that have been poured on dry, desiccated subgrades in summer months on expansive soils and have undergone heaving and cracking requiring extensive repairs or re-building once the soil moisture contents have returned to higher levels. This hazard is addressed by a combination of careful foundation design and site preparation.

Based on our experience in the Auckland region we anticipate that the AS2870 expansive site class for the soils present on the site typically ranged from moderate (M), and in some occasions, to high (H1/H2). Site specific laboratory testing is typically undertaken during the site investigation phase. The issue of expansive soils can easily be solved by adopting the appropriate foundation solution as defined in the NZ Building Code.

5.6 Proposed Buildings' Settlements

The presence of soft sols and existing fill materials presents a potential geotechnical risk to the project. It is noted that most of the structures are to be constructed on cut building platforms. In th se situations the change in earth pressure experienced by the soils is expected to be negligible and therefore settlement will be minor. However, there are some cases were structures up to four storeys high will be construc ed onto current existing ground levels. In these cases, it is anticipated that the high load of the structure will result in moderate settlements even in relatively stiff soils. In these situations, either a piled or a ground improvement solution may be required to reduce the magnitude of differential and total settlement values down to numbers in line with the requirements of the New Zealand Building Code.

5.7 Seismicity

The Auckland region is not known to be highly seismic however seismic events are known to occur. The materials present on site are typically too old and too highly plastic to undergo iquefaction and anticipated seismic loads are not significant to induce cyclic softening which will impa t the design significantly. As no liquefaction is anticipated to occur lateral spreading s considered unlik ly despite the sloping nature of the site. The previous report undertaken by Kirk Roberts Consulting Engineers indicated that the site subsoil class will be Class C (shallow Soil) site. The soil class could be change to B (rock), at least at some parts of the development, due to the anticipated excavations

6 CONCLUSION AND RECOMMENDATIONS

On the basis of our desktop study, we consider the subject site is generally suitable for future development subject to the risks outlined in Section 5 being mitigated. There are not expected to be any geotechnical limitations to the development of the land for the planned purpose that are unable to be remediated through specific geotechnical investigation, analyses and design or that would prevent a consent being granted.

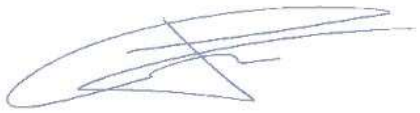
7 LIMITATION

This report has been prepared for use by our client Matvin Group and their consultants. Liability for its use is limited to these parties and to the scope of work for which it was prepared as it may not contain sufficient info mation for other parties for other purposes.

It should be noted that the factual data referenced in this report has been obtained from discrete locations within the property using normal geotechnical investigation techniques. As such investigation methods by their nature only p ovide information about a relatively small volume of subsoils, there may be special conditions pertaining to this site which have not been disclosed by the investigations which have not been considered in this report.

For and on behalf of CMW Geosciences

Prepared by:



Kostas Lontzetidis

Principal Geotechnical Engineer, CPEng

Distribution: 1 electronic copy to Matvin via email
Original held at CMW Geosciences