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GEOTECHNICAL SUMMARY MEMO TO SUPPORT FAST TRACK APPLICATION
PROPOSED RESIDENTIAL DEVELOPMENT AT
43A & 45 WAIMARIE STREET & 819 RIDDELL ROAD, ST HELIERS

Introduction

Soil & Rock Consultants (S&RC) was requested by Civix Ltd to provide a geotechnical summary for the proposed development at 43a & 45 Waimarie Street & 819 Riddell Road, St Heliers (the site) to support a fast-track application.

S&RC have been engaged to undertake geotechnical investigations at the site and to provide geotechnical consulting services to support the proposed development. We completed investigations and reporting for 45 Waimarie Street & 819 Riddell Road in August 2021, that the results of which were provided in a report titled *'Geotechnical Investigation for Proposed Residential Development at 45 Waimarie Street & 819 Riddell Road, St Heliers'* Rev A, Job No. 21706. Since that report the development area has been expanded to include 43a Waimarie Road, for which S&RC are undertaking geotechnical fieldwork and subsequent reporting in late November 2021.

Proposed Development

The proposed development comprises fifty-eight new residential units (see Figure 1) between two and three stories high. The earthworks plan provided by Civix Ltd indicates approximately 75% proposed cuts will be 2.0m

or less, however cuts up to 5.6m are proposed in northern portions of the site. The remainder of the site will comprise fill generally up to 1.0m depth, with small, isolated areas requiring up to 3.2m of fill.

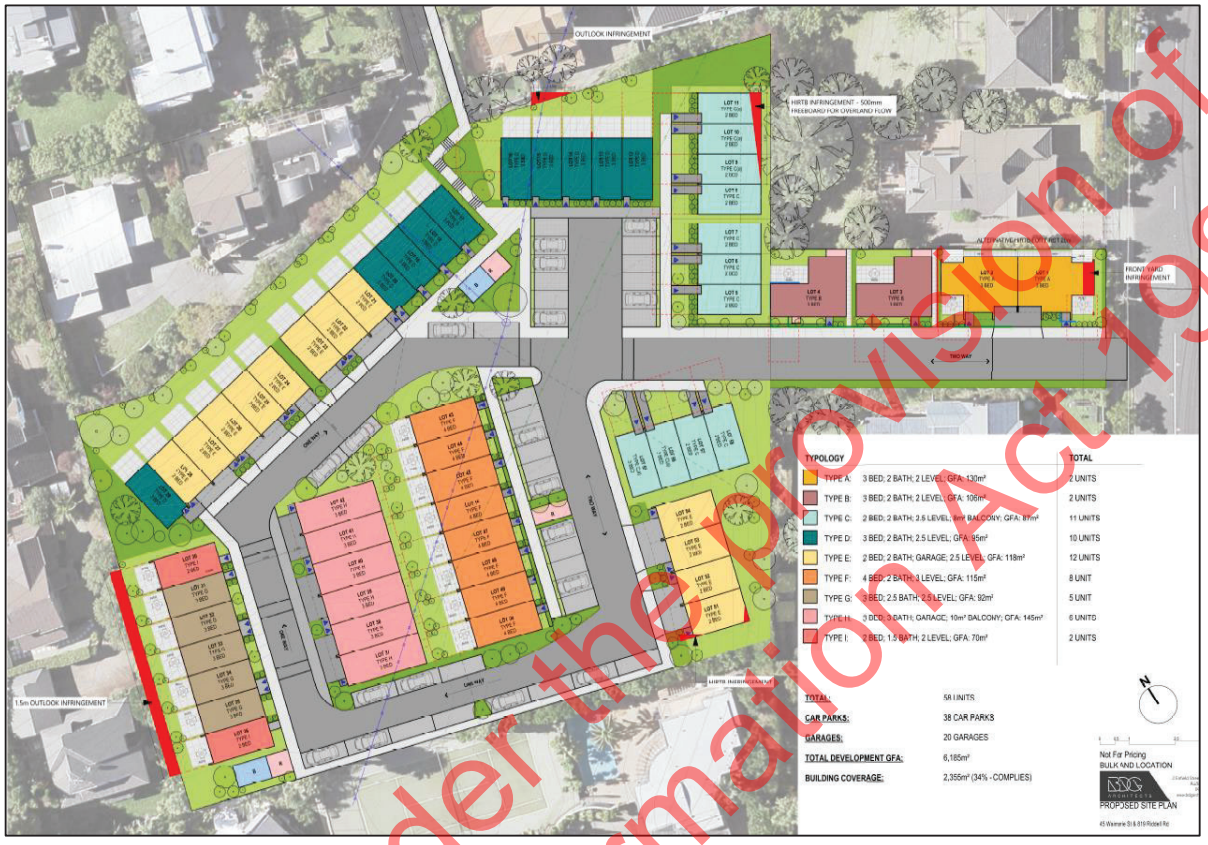

Figure 1: Proposed Site Plan - September 2021 (*Source: Civix Ltd*)

Site Description

The subject site encompasses three adjacent properties, legally described as Lot 2 DP 69975 (43a Waimarie St), Lots 1 & 2 DP 46758 (45 Waimarie St) and Lot 15 DP 18184 (819 Riddell Rd), henceforth referred to as 'the site'. The 'majority' of the site area is made up by 43a and 45 Waimarie Street which cover areas of 2,716m² and 3,376m² respectively, while 819 Riddell Road makes up 809m² of the site area to the east, combining to form a total site area of 6,901m².

Each property is occupied by a dwelling, 43a and 45 Waimarie St both have tennis courts and 45 Waimarie St also has a detached garage and above ground pool. The remainder of the site cover comprises medium to large size trees, bush/shrubs, and grass.

The ground surface across the site is dominated by a wide (approximately 25m) and low-lying overland flow path (gully) feature which enters the site at the southern end between 43a Waimarie St and 45 Waimarie St (common boundary), then it transects 45 Waimarie St from to the northeast. The low-lying area is near level, and the moderate to steep (26° to 33°) slopes are present to the east and west.

During the walkover in August 2021, we observed several timber pole retaining walls between 0.5m and 2.0m height near the eastern and western boundaries of 45 Waimarie St. We anticipate similar retaining will be present within 43a Waimarie St.

Several underground public services (stormwater and wastewater) are located within the site, the most significant of these services being a 375mmØ stormwater service aligning with the gully orientation (see Figure 2). In August it was proposed to relocate the public wastewater manhole located within 45 Waimarie St, however we have not been informed if this is still the intention.

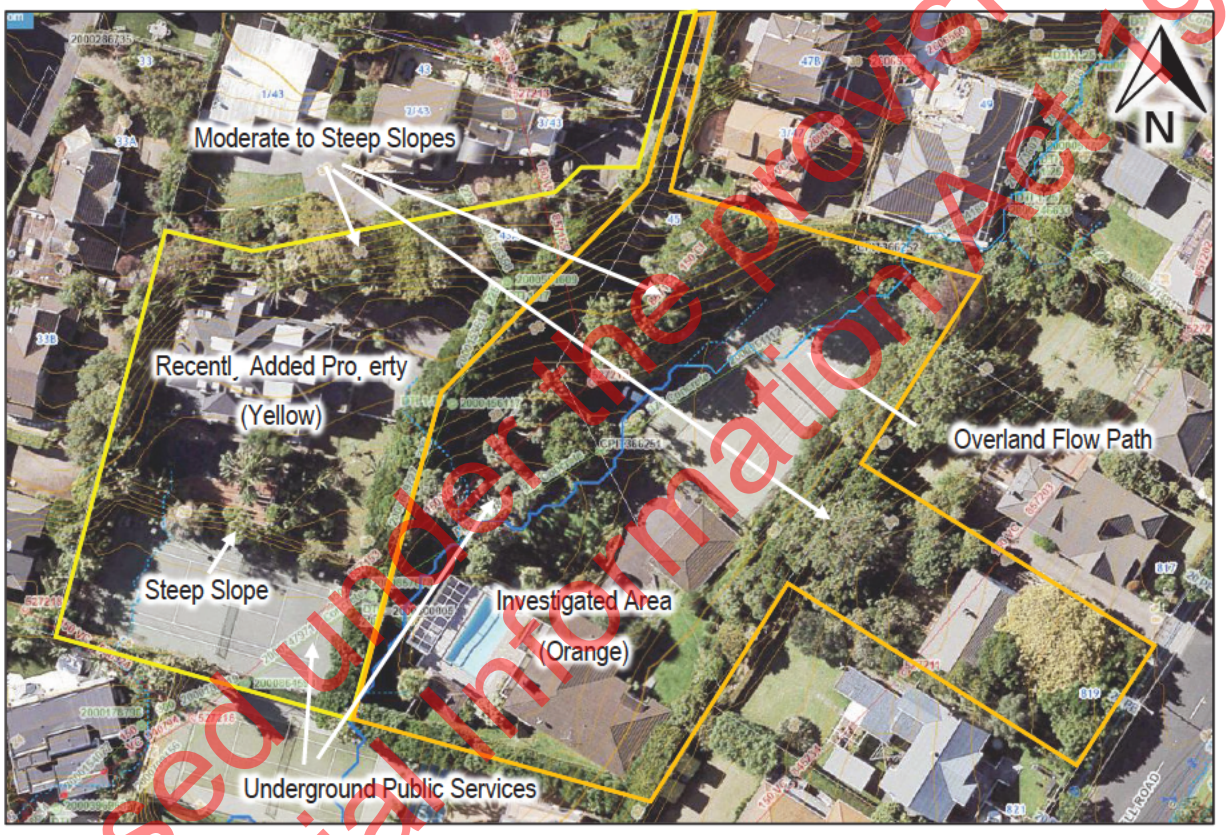

Figure 2: Aerial Image (*Source: [Category] Council GIS Website*)

Geotechnical Investigations

S&RC undertook geotechnical investigations at 45 Waimarie St & 819 Riddell Rd in August 2021, comprising eight hand augerholes (3.0m – 5.0m depth), three surface soil expansivity samples, and two cross sections for preliminary stability analysis.

The forthcoming November investigation will comprise a further six hand augerholes between 3.0m and 5.0m deep within 43a Waimarie St, along with two Machine Boreholes (MB's) to 10.0m depth and two further cross sections. Piezometers will also be installed at six locations across the 'whole site' to inform a Groundwater Compliance Assessment (GCA).

Geotechnical Conditions

Based on the findings from the initial S&RC investigation, ground conditions at the site generally comprise:

- A surficial layer of topsoil to a maximum depth of 0.3m below present ground level (bpgl) and/or non-engineered fill to depths ranging between 0.2m and 1.5m bpgl.
- Auckland Volcanic Field Tuff deposits were encountered below the topsoil/non-engineered fill, extending to depths between 1.8m and 4.7m bpgl within augerholes undertaken outside of the gully area. The Tuff generally comprised very stiff to hard silt with some clay and fine to medium sand, and vane shear strengths ranged from 103kPa to greater than 200kPa.
- Puketoka Formation Alluvial deposits were encountered below the Tuff material in augerholes outside of the gully area, and below the topsoil/non-engineered fill within the gully. The alluvial soils generally comprised stiff to very stiff clays and silts with lesser amounts of fine sand, though local firm soils were occasionally encountered below 4.0m bpgl. It is noted that no organic soils were encountered. Vane shear strengths recorded within the Puketoka Formation material ranged between 54kPa and 183kPa.
- Scala Penetrometer testing was carried out from the base of each augerhole, and refusal was encountered at depths ranging between 4.7m and 6.7m bpgl (shallower refusal depths were encountered in the 'low-lying' portions of the site). The upper surface of a constantly dense stratum (such as sandstone/siltstone) was not inferred from Scala Penetrometer testing.
- Groundwater was encountered between 1.0m and 3.7m bpgl, with higher groundwater readings within or near the gully.

Geotechnical Constraints

As no geotechnical investigations have been undertaken in the within 43a Waimarie St, there is a risk that ground conditions in this area vary from the conditions encountered in the other areas of the site, however this is considered relatively unlikely. Geotechnical investigations in this area are planned to be undertaken in November 2021, which will mitigate this risk.

The primary geotechnical risk is considered to be the proposed earthworks which includes cut depths up to 5.6m and fills up to 3.2m depth. The Geotechnical Investigation will verify soil conditions in areas of significant proposed earthworks, and the Groundwater Compliance Assessment will determine if dewatering will take place. If dewatering is found to be a risk, then subsequent deflection and settlement (neighbouring properties) analyses will be undertaken to mitigate these effects.

We anticipate subdivision bulk earthworks will remove all non-engineered fill which was encountered to a maximum depth of 1.5m.

The August 2021 'preliminary' stability analysis indicated global instability to not be an issue with respect to future development of the site, and potential localised stability risks will be mitigated during bulk earthworks (i.e. lessening of slope batters, appropriate retaining and removal of non-engineered fill).

There is potential risk of uplift pressures on foundations if groundwater is found to near or above the final ground levels, though this can be addressed through suitable design if necessary. Outside of the potential for uplift pressures, we anticipate shallow foundations comprising a 'waffle' or 'rib-raft' slab and/or traditional strip/pad footings, founded on either Tuff or Alluvial materials will be suitable for the majority of the proposed units following bulk earthworks. Pile foundations are unlikely to be required in regard to bearing capacity (light-weight units are anticipated), though pile foundations will be required for the bridging of underground public services.

Limitations

This report has been prepared by Soil & Rock Consultants for the sole benefit of Sanctum Projects Ltd (the client) with respect to the proposed development of 43a & 45 Waimarie Street & 819 Riddell Road, St Heliers and the brief given to us. The data and/or opinions contained in this report may not be used in other contexts, for any other purpose or by any other party without our prior review and agreement. This report may only be read or transmitted in its entirety, including the appendices.

The recommendations given in this report are based on data obtained from discrete locations and soil conditions between locations are inferred only. 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 should be appreciated that actual conditions could vary from the assumed model.

Yours faithfully
SOIL & ROCK CONSULTANTS

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End of Report