14 February 2025

Irvine & Jo Cooper
C:/ Evolve Planning
irvinecooper64@gmail.com
kylie@evolveplng.co.nz

RE: Geotechnical Investigation for Proposed Subdivision at 96 Robert Hastie Drive, Mangawhai (Lot 50 DP 404128).

Wiley Geotechnical Limited (WGL) was requested by Evolve Planning on behalf of Irvine and Jo Cooper to provide a geotechnical investigation to support an application for a 2 Lot subdivision. We understand Lot 1 contains an existing dwelling. We have received and reviewed a proposed subdivision scheme plan produced by Pacific Coast Surveys (Ref: 4152, dated: November 2024). We have also reviewed a Geotechnical Suitability of Building Sites report produced by Hawthorn Geddes (Ref: 4819, dated: 07/07/2008).

WGL visited the site on 5th February 2025 and made the following observations:

- The site is located on a broad north-west to south-east trending ridge.
- A potentially suitable building site was identified towards the south of Lot 2 which is located on a gentle east facing slope.
- Slopes fall to the north of the proposed building platform with a gradient of approximately 15°, then rise from the bottom of the slope towards the Brynderwyn Hills.
- Slopes also fall to the south from the proposed building platform towards Robert Hastie Drive.
- Fill material was encountered to a depth of 0.4 m during our investigations.
- No obvious signs of instability were noted.
- One hand auger with shear vane testing was undertaken within a potentially suitable building site to a maximum depth of 3 m below ground level.

Geology

The GNS map for the site indicates that it is underlain by sedimentary rocks of the Pakiri Formation (Waitemata Group) (PF) comprising “alternating thick-bedded, volcanic rich, graded sandstone and siltstone with volcaniclastic grit beds.”

The GNS map also shows a geological boundary towards the northern side of the site and indicates that this area is underlain by sedimentary rocks of the Waipapa Composite Terrane comprising of “Massive to thin bedded, lithic volcaniclastic metasandstone and argillite, with tectonically enclosed basalt, chert and siliceous argillite.”

NRC GIS Hazards Map

We have reviewed the Northland Regional Council (NRC) GIS maps in relation to the subject site. There were no hazards indicated by the maps in the vicinity to the subject site.

Seismic Hazards

Since there are no known active faults crossing the property, it is our opinion that ground rupture is unlikely at the subject property. Granular soils, such as sand, are susceptible to liquefaction in the event of future earthquakes. This may result in settlement or lateral deformation. Based on the regional earthquake risk (discussed further below) and depth to groundwater, it is our opinion that there is a relatively low risk of liquefaction induced settlement or lateral movement such that specific liquefaction design is not required.

We recommend that the future structures and improvements are designed to account for seismic shaking and ground motions. For seismic design at the site and in line with NZS 1170.5:2004 the corresponding design peak ground accelerations (PGA) for the site have been calculated from NZS 1170.5:2004 using the recommendations of the New Zealand Geotechnical Society as follows:

$a_h = Z\ R\ C$

In which:

Z = base PGA called “Hazard factor” and is given by Table 3.3 and Figures 3.3 and 3.4 of NZS 1170.5:2004. Z = 0.13 for areas north of Auckland.

R = “Return period factor” and is given by Table 3.5 of NZS 1170.5:2004 (R = 1.0 for 500-year return period and R = 0.25 for a 25-year return period)

C = Site response factor called “Spectral shape factor” in NZS 1170.5:2004 and is based on the seismic site classification. We consider this site to be **Class C**, based on soil depth and therefore C = 1.33.

The design PGA at the site is given as:

ULS: $a_h = 0.13 \times 1.00 \times 1.33 = 0.17$ (i.e. PGA = 0.17 g)

SLS: $a_h = 0.13 \times 0.25 \times 1.33 = 0.04$ (i.e. PGA = 0.04 g)

Field Exploration and Subsurface Conditions

WGL carried out a shallow subsurface investigation consisting of one hand augers with shear vane testing within the approximate areas shown on the site plan below. A suitable wastewater disposal field is also illustrated in blue.



Figure 1: Approximate Subsurface Exploration Location & Wastewater Disposal Field

The hand auger was carried out to a depth 3.0 m. The subsurface material encountered in our hand auger investigation generally consisted of topsoil underlain by a thin layer of fill material before grading into moderately clayey silt with varying amounts of sand and plasticity. The measured undrained shear strengths all exceeded 100 kPa.

Groundwater was not encountered during our testing.

Based on this, it is our opinion that the material encountered in our subsurface investigation is broadly consistent with published geologic mapping. The bore log is presented as an appendix to this report and is written in general accordance with the New Zealand Geotechnical Society field classification guidelines (NZGS, 2005).

Expansive Soils

Expansive clay and silt soils are common in the wider Northland region and have the tendency to shrink and swell, particularly with seasonal fluctuations of soil water content. This behavior has implications for foundation design and surface structures and should be incorporated during foundation design.

Based on our visual and field assessment of the soils encountered onsite, and our experience in the area, we consider that the Expansive Site Class for this site is “M - moderate” - in accordance with AS 2870. Accordingly, the minimum footing depth is 600 mm below cleared ground level.

Conclusions and Recommendations

It is our opinion that the proposed development is feasible from a geotechnical point of view, provided the recommendations presented in this report and standard development practices are incorporated in the design and construction of the project.

The results of the geotechnical investigation indicate a suitable bearing capacity is available for future residential development, with readings generally greater than 100 kPa.

We consider the site to be suitable for the proposed subdivision in accordance with the provision of Section 106 of the Resource Management Act 1991, and that standard earthwork and construction practises will not result significant increase or risk of erosion, subsidence, falling debris, slippage or inundation by soil or rock.

Foundations

We anticipate that wooden piles designed in accordance with NZS3604 (2011) would likely provide a suitable foundation for future dwellings with anchor piles embedded to a minimum depth of 0.9 m, and all other piles are embedded to a minimum depth of 0.6 m. Piles on a sloping building pad should be embedded to have a toe level extending at least 600 mm below the lowest ground surface within 2 m. Additional evaluation may be required if the building site is sloped at greater than 3:1 (H:V).

A concrete foundation may also be feasible. We would expect that a minimum 300 mm layer of compacted hard fill is placed prior to applying blinding sand for any reinforced concrete slab and foundation elements having a minimum embedment depth of 0.6 m.

We expect that a geotechnical ultimate bearing capacity of 300 kPa would be available; however, further geotechnical investigations and design **must** be carried out at the building consent stage.

This report is not to be used for the purposes of any building consent applications regarding the foundations of future structures.

Onsite Wastewater Disposal

We consider the site would be suitable for a Secondary wastewater system and depending on your requirement for the land that will be used as a disposal field the effluent field to be fenced if the land intends to be grazed.

The final onsite wastewater disposal system must meet all the relevant requirements from the Proposed Regional Plan for Northland, section C.6.1 (PRPN), Kaipara District Council as outlined in AS/NZS

1547:2012 and G13 of the NZ building code. There are a number of proprietary systems available to suit the requirements of future residential development, which are a function of the building footprint and total number of occupants.

Any treated material must be dispersed in a controlled manner across a relatively level discharge area in order to maximise the efficient infiltration of material without compromising the stability of any slopes. To this end, we recommend that the effluent disposal fields be located clear of the building locations.

In terms of AS/NZS: 1547-2012) a Soil Category of 5 (i.e. “Light Clays – poorly drained”) should be adopted. This is based on the findings of the geotechnical investigation and the assessment of the soil regarding its relevant soil category, as per the guidance document.

Considering the results of the geotechnical investigation we consider Category 5 with a DIR of 3.5/3.0/2.5 mm/day. Based on a standard 4-bedroom house with an occupancy of 6 persons with roof supply water and standard water fixtures this would require 6 x 180L = 1080L/day/3.0 = 360m2 effluent field.

We have illustrated above suitable areas for a standard wastewater disposal field with sufficient area included for 30% reserve. There are other locations the Lot which may also be suitable to utilise as a wastewater disposal field. The final size and location of the wastewater disposal field shall be determined at subdivision stage once development plans have been made available.

The Northland Regional Council rules refer to a winter ground water level and require the following;

- Secondary systems – The lowest point of the disposal system is not less than 0.6 metres (600 millilitres) above the winter (June, July or August) groundwater table.

WGL have assessed the summer ground water levels at greater than 2.0 m, and do not consider groundwater to exceed a depth of 0.6 m for a secondary system.

Stormwater

We recommend that stormwater overflow from newly developed dwelling water tanks is directed downslope via closed conduit towards the existing overland flow path. The outlet of the stormwater pipe should not be positioned above sloping ground where the risk of slope instability would be increased. We recommend the outlet pipe directs water in to rip rap erosion protection. This should consist of geotextile cloth placed upon insitu soil with clean rock of 150-300 mm in diameter. This area should be a minimum of 1 m wide and 3 m in length.

If a suitable overland flow path is not available, we recommend implementing suitable subsoil level spreader to disperse stormwater runoff from future water tank overflow pipe(s). This should consist of a 0.5 m wide by a 0.5 m deep excavation with a perforated 110 mm novacoil pipe backfilled with clean drainage rock. The base and side should be wrapped with a geotextile cloth (Bidim A29, Cirtex AS410 or similar approved product) and fold over the top of the drainage metal enclosing it. The subsoil level spreader should be designed relative to the proposed impervious area.

If the total impervious area being developed on any lot (roofs, driveways, paving etc.) is greater than 10% of the entire lot area (15% if not in any Overlay), then specific stormwater design shall have to be

carried out with regards to attenuation in order to offset the increase in stormwater runoff up to the 100-year storm event.

Specific design must reach Kaipara District Council standards. This shall be determined at the building consent stage once final impervious areas are known.

Earthworks

For the development scheme provided we anticipate the majority of the earthworks will be limited to site clearing and construction for the building platform and driveway access. We recommend that any site concept plans be discussed with WGL or suitably qualified Geotechnical Engineer familiar with the site and the contents of this report.

In addition, we suggest the following:

- All cut surfaces should be inspected by WGL (or suitably qualified Geotechnical Engineer) prior to placing any fill to ensure founding conditions are as anticipated;
- All excavated soil to be removed from site or placed in an engineered stockpile that is strategically placed such that it would not trigger slope instability. If there is any soil to be placed permanently on site, we suggest contacting WGL for further guidance:
- Any proposed earthworks and drainage plans should be approved by a suitably qualified Geotechnical Engineer familiar with both the site and the recommendations within this report for review and comment;
- Fill placement, should be placed in accordance NZS 4431 – Code of practice for Earth Fills for Residential development. Fill should be placed on a suitably stripped and prepared subgrade including the removal of any non-engineered fill;
- Additional design-level earthwork recommendations are required if cut and fills are greater than 600mm; and
- All proposed batter slopes should be restricted to gradients no steeper than 1v:3h.

LIMITATIONS

(i) This report has been prepared for the use of our client, Irvine and Jo Cooper and their professional advisers and the relevant Regional Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

(ii) Assessments made in this report are based on the ground conditions indicated from published sources, site inspections and subsurface investigations described in this report based on accepted normal methods of site investigations. Variations in ground conditions may exist between test locations and therefore have not been taken into account in the report. If variations are found during excavation or at foundation preparation stage WGL should be notified immediately so we can amend our recommendations.

(iii) This Limitation should be read in conjunction with the ENZ/ACENZ Standard Terms of Engagement.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned at matt@wileygeotechnical.co.nz if you require any further information.

Prepared By:



Michael Davis – NZDE(Civil), MEngNZ

Engineering Technician

Reviewed By:



Matt Wiley - MSc(Hons), CMEngNZ

Principal Engineer



Raymond Su - BE(Hon), MEngSc(Geotechnical), CMEngNZ, CPEng

Principal Engineer

Attachments:

- Scheme plan Produced by Pacific Coast Surveys (Ref: 4152, dated: November 2024)

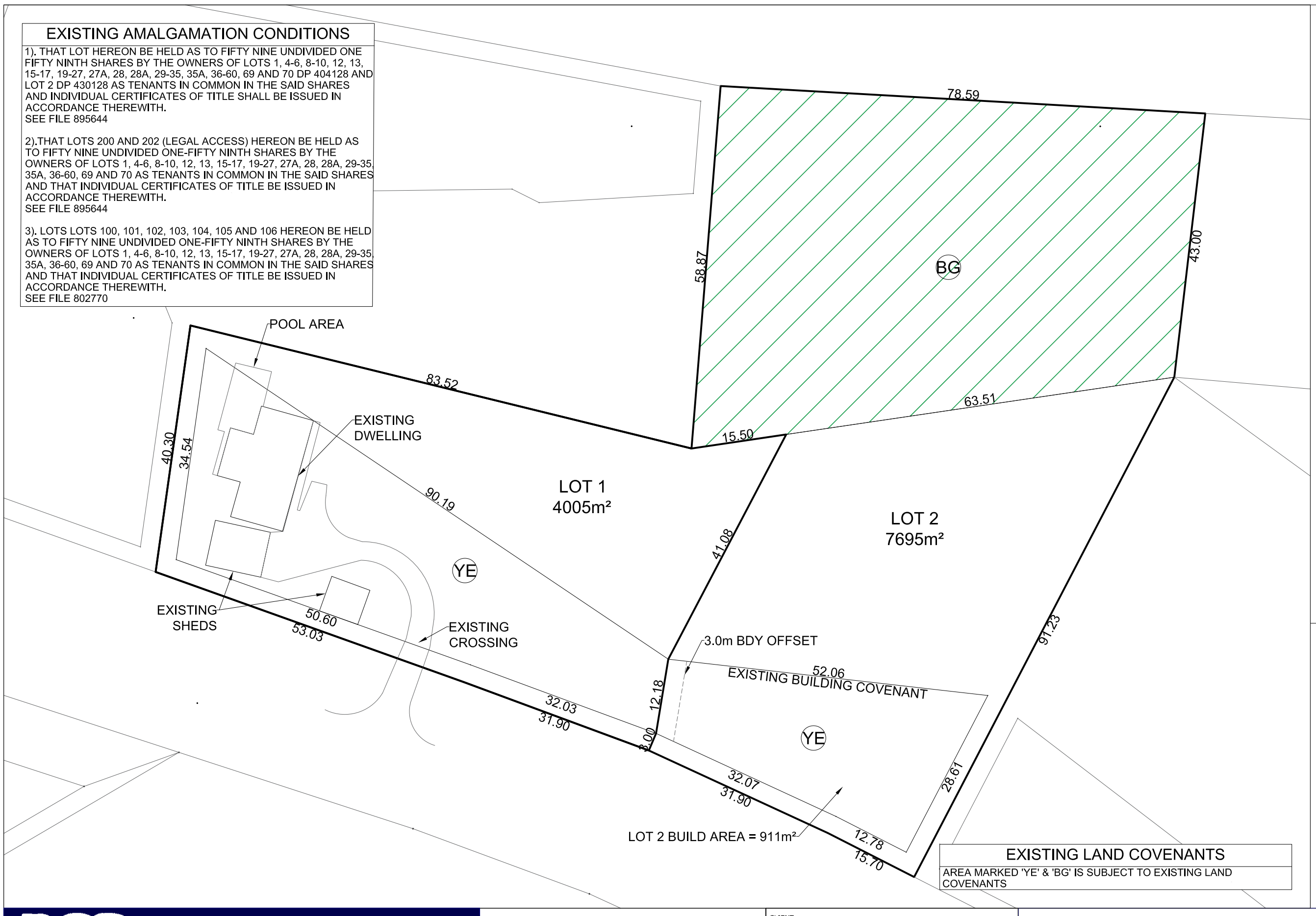
- Bore Logs

EXISTING AMALGAMATION CONDITIONS

1). THAT LOT HEREON BE HELD AS TO FIFTY NINE UNDIVIDED ONE FIFTY NINTH SHARES BY THE OWNERS OF LOTS 1, 4-6, 8-10, 12, 13, 15-17, 19-27, 27A, 28, 28A, 29-35, 35A, 36-60, 69 AND 70 DP 404128 AND LOT 2 DP 430128 AS TENANTS IN COMMON IN THE SAID SHARES AND INDIVIDUAL CERTIFICATES OF TITLE SHALL BE ISSUED IN ACCORDANCE THEREWITH.
SEE FILE 895644

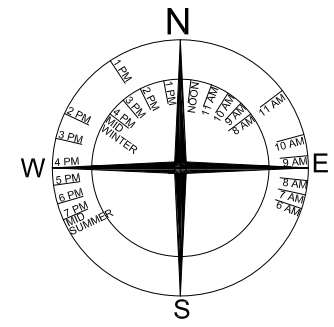
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SEE FILE 895644

3). LOTS LOTS 100, 101, 102, 103, 104, 105 AND 106 HEREON BE HELD AS TO FIFTY NINE UNDIVIDED ONE-FIFTY NINTH SHARES BY THE OWNERS OF LOTS 1, 4-6, 8-10, 12, 13, 15-17, 19-27, 27A, 28, 28A, 29-35, 35A, 36-60, 69 AND 70 AS TENANTS IN COMMON IN THE SAID SHARES AND THAT INDIVIDUAL CERTIFICATES OF TITLE BE ISSUED IN ACCORDANCE THEREWITH.
SEE FILE 802770



EXISTING LAND COVENANTS

AREA MARKED 'YE' & 'BG' IS SUBJECT TO EXISTING LAND COVENANTS



LEGEND

- MAJ CONTOUR
- MIN CONTOUR
- PROPERTY BDY
- FENCE
- RETAINING WALL
- TOP OF BANK
- BOTTOM OF BANK
- SANITARY SEWER
- STORMWATER
- FLOWLINES
- DRAIN
- GRAVEL
- CONCRETE/SEAL
- PLANTINGS
- NOMINAL BUILDING SITE
- EXISTING LAND COVENANTS
- TREES / GARDEN

NOTE:

- ANY QUERIES SHOULD BE DIRECTED TO PACIFIC COAST SURVEYS LTD.
- COORDINATES ARE IN TERMS OF MOUNT EDEN CIRCUIT 2000.
- VERTICAL DATUM ASSUMED.
- MAJOR CONTOUR LINES ARE AT 1m INTERVALS.
- ALL AREAS AND MEASUREMENTS ARE SUBJECT TO FINAL LT SURVEY.

PACIFIC COAST SURVEYS
09 431 5353 | 0800 PACIFIC | 0800 722 4342
info@pacificcoastsurvey.co.nz
www.pacificcoastsurvey.co.nz

SCHEME PLAN

96 ROBERT HASTIE DRIVE, MANGAWHAI

CLIENT IRVINE COOPER
FILE 4152
REVISION REV 1
DATE NOVEMBER 2024
SCALE 1:600 @ A3
COUNCIL FILE RM
PAGE 1 OF 3

PROPOSED SUBDIVISION OF LOT 50 DP 404128

EXISTING AMALGAMATION CONDITIONS

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PAGE	2 OF 3

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LOT 1 IMPERVIOUS AREA	SQM	%
GROSS SITE AREA	4005	100%
BUILDING COVERAGE (ROOF COVER)	194	4.84%
2X SHEDS (ROOF COVER)	110	2.74%
SEALED DRIVEWAYS	242	6.04%
POOL AREA	70	1.74%
TOTAL IMPERMEABLE SURFACES	616	15.38%
LANDSCAPED/PERMEABLE	3389	84.62%

EXISTING LAND COVENANTS

AREA MARKED 'YE' & 'BG' IS SUBJECT TO EXISTING LAND COVENANTS

N
W
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LEGEND

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PAGE	3 OF 3

PROPOSED SUBDIVISION OF LOT 50 DP 404128

WILEY GEOTECHNICAL LTD

BOREHOLE No. 1

SITE: 96 Robert Hastie Drive, Mangawhai

REF: 24163

Sheet 1 of 1

REDUCED LEVEL (RL) / INFERRED GEOLOGY	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa) ● Peak Field Vane ○ Remoulded Field vane 50 100 150	SCALA PENETROMETER BLOWS / 100 mm 5 10 15
FILL	TOPSOIL dark brown to 100mm SILT/FILL dark brown, friable, slightly clayey							
Pakiri Formation of the Waitemata Group	SILT pink with light grey staining, slightly to moderately clayey, slightly to moderately plastic at 0.4m red brown, slightly clayey, slightly plastic, trace sand at 0.8m moist with occasional light grey streaks at 1.2m pink with light grey streaks, slightly to moderately clayey, slightly to moderately plastic at 1.5m red brown, slightly clayey, slightly plastic, trace sand at 2.0m pink with light grey streaks, slightly to moderately clayey, slightly to moderately plastic at 2.5m		1 2 3				200 60 147 54 144 66 132 54 120 54 111 60 120 66 135 78 141 81 132	
	E.O.B at 3.0m		4 5					

NOTES Groundwater was not encountered.
Hand auger reached target depth of 3.0m

LOGGED BY: MD & WC
DATE DRILLED: 5-Feb-25
DRILL METHOD 50 mm Hand Auger