Broadcrest Consulting Pty Ltd

78-80a Benaroon Road, Lakemba, NSW

Geotechnical Investigation

December 2022

Project 2465-GEO

1300 554 945 | contact@broadcrest.com.au | broadcrest.com.au

Wastewater | Stormwater | Flood | Environmental | Geotechnical | Acoustic | Structural

BLANK PAGE

Document controls

Approval and Authorisation

Title	78-80a Benaroon Road, Lakemba, NSW Geotechnical Investigation
Authored on behalf of Broadcrest Consulting Pty Ltd by:	Kurtis Ferry Geotechnical Engineer
Signed:	
Dated:	13/12/2022

Document Status

Date	Internal Reference	Document Status	Prepared by	Reviewed by
13/12/2022	2465-GEO-01-A	For release	K. Ferry	C. Hudson

Contents

1 EXECUTIVE SUMMARY 1

2 INTRODUCTION 2

2.1 Background 2

2.2 Objectives 2

2.3 Scope of works 2

3 SITE DESCRIPTION 3

4 DESKTOP INVESTIGATION 4

4.1 Anticipated Geotechnical Investigation Limitations 5

5 SITE INVESTIGATION 6

5.1 Methodology 6

5.2 Site Observations 7

5.3 Existing fill 7

5.4 Trees 7

5.5 Existing Building 7

5.6 Subsurface Conditions / Excavation 7

5.7 Subsurface flow 8

6 DESIGN CRITERIA 9

6.1 Earth Pressure Coefficients 9

6.2 Site classification – AS 2870 9

7 COMMENTS AND RECOMMENDATIONS 10

7.1 Site Preparation 10

7.2 Groundwater 10

7.3 Excavation 10

7.4 Vibration 11

7.5 Retaining Structures 12

7.6 Footings 14

7.7 Civil Engineering Plans 14

8 LIMITATIONS OF THIS REPORT 15

9 REFERENCES 16

Appendix A: Bore logs
Appendix B: Spatial Data Report
Appendix C: Site Survey and Proposed Layout
Appendix D: Soil landscapes

1 EXECUTIVE SUMMARY

Broadcrest Consulting Pty. Ltd. were engaged by Ali Taleb to conduct a preliminary geotechnical investigation at 78-80a Benaroon Road, Lakemba, NSW ('the site'). The proposed development includes:

- Demolition of the existing dwellings
- Construction of a two story childcare centre with basement

A desktop study was conducted on the 06/12/2022 to identify site features and constraints for the site inspection.

A site inspection was carried out on the 08/12/2022 which involved a visual assessment of the site and borehole drilling. The borehole drilling used thin wall tube samples to ~1.2m or refusal, with DCP testing for soil density profiling (refusal or ~2.0m).

The objective of a geotechnical report is to collate data on the surface and subsurface conditions of the site, specifically:

- Soil classification
- Depth to rock (based on DCP refusal)
- Ground water level (if encountered)
- General geotechnical constraints
- Design parameters for retaining walls and foundations
- General comments and recommendations.

The investigation confirms the overall suitability of the site for proposed development, subject to the design criteria and recommendations in Sections 6 and 7 (respectively) of this report being followed.

2 INTRODUCTION

2.1 Background

Broadcrest Consulting Pty. Ltd. were engaged by Ali Taleb to conduct a preliminary geotechnical investigation at 78-80a Benaroon Road, Lakemba, NSW ('the site'). The proposed development includes:

- Demolition of the existing dwellings
- Construction of a two-story childcare centre with basement

A desktop study was conducted on the 06/12/2022 to identify site features and constraints for the site inspection.

A site inspection was carried out on the 08/12/2022 which involved a visual assessment of the site and borehole drilling. The borehole drilling used thin wall tube samples to ~1.2m or refusal, with DCP testing for soil density profiling (refusal or ~2.0m).

2.2 Objectives

The objective of a geotechnical report is to collate data on the surface and subsurface conditions of the site, specifically:

- Soil classification
- Depth to rock
- General geotechnical constraints
- General comments and recommendations.

2.3 Scope of works

- A desktop review of the site utilising a Spatial Data report
- An on-site inspection to verify the desktop review
- 4 boreholes extending 1.2m below existing surface
- DCP testing to 2.0m or refusal
- Soil classification and logging
- Comments and recommendations relating to the proposed development.

3 SITE DESCRIPTION

The proposed development is located at 78-80a Benaroon Road, Lakemba, NSW. The site is currently occupied by residential dwellings, retaining walls, a carport, and lawned areas. The site is located on in R3 zoning: Medium Residential. The site consists of a gently inclined slope (~5%) sloping the front (south east) to the rear (north west).

The site is surrounded by residential dwellings on the southern and western boundaries, and road ways on the northern and eastern boundaries (see figure 3.1 and Appendix A).

Figure 3.1: Site aerial photo with boreholes

4 DESKTOP INVESTIGATION

The desktop investigation utilises a combination of public and private data sources to identify features on a site. These features can individually or collectively add geotechnical constraints during a development. Appendix B contains the full set of maps obtained for the review. Analysis of Lidar data from 2018 is performed to obtain raw 1m contour lines, slope heat maps, slope landforms and rainfall flow paths. References are provided for all other data sources.

The primary constraining features were assessed to determine the likely impact they will have on the geotechnical investigation and proposed development (rated minor, moderate or high). The impact rating of a feature is based on pre-existing criteria or through professional judgement and is assessed in context with all other features. The impact ratings are defined in Table 4.0.2 below.

Table 4.0.1: A summary of the general factors assessed during the desktop investigation.

Factor Assessed	Description	Limitation
Slope	~ 5	Minor
Rainfall	Monthly evaporation exceeds rainfall for majority of year	Minor
Temperature	Annual mean day-time maximum > 15°C.	Minor
Geology	Rh: Ashfield Shale	Moderate
Soil Landscape	Blacktown	Moderate
Soil Formation	Residual	Minor
Soil Fertility	Low – Moderate	Minor
Salinity	Not mapped	Minor
Acid Sulphate	None mapped	Minor
Run-on	Overland flow paths potentially identified	Moderate
Site-drainage	The soil permeability in the lower clay strata is anticipated to be low. Ponding of water during heavy rainfall events is possible during construction.	Minor
Land use	Previous: low density residential Proposed: commercial	Minor
Fill	No large-scale fill identifiable within building envelopes	Minor
Vegetation	Dense grass cover, isolated trees.	Minor
Structures	Neighbouring houses, roads and utilities	Moderate

Table 4.0.2: Legend for Geotechnical Constraints

Impact	Description
Minor	This feature has been assessed and deemed to have little geotechnical impact
Moderate	This feature requires consideration. It may require detailed investigation or planning
Major	This feature requires careful consideration and evaluation prior to further work

4.1 Anticipated Geotechnical Investigation Limitations

The desktop investigation allows for the anticipation of the ground conditions and limitations prior to beginning drilling and logging. This allows the correct equipment to be selected, aids in the identification of foreign material and reduces the probability of floating rocks giving a false soil depth.

The primary geotechnical limitations identified during the desktop investigation are:

Subsurface

- Clays – potentially deep (>2.0m)
- Shale
- Utilities and services

Surface

- Existing buildings
- Limited access

5 SITE INVESTIGATION

5.1 Methodology

A site investigation was conducted on the 08/12/2022 by Broadcrest Consulting Engineer Kurtis Ferry. Photographs were taken of the site features for future reference. The general methodology was as follows:

1. Initial site walk-over
   a. Identification of the development area
   b. Observations of the site landform
   c. Observations of the ground surface conditions
   d. Observations of vegetation, including type, density and spacing
   e. Observations of potential geotechnical limitations
2. Soil sampling
   a. Thin wall tube sampling of the soil to verify consistency with the desktop information
   b. Field classification of soil, including texture, density and plasticity (if applicable)
   c. Logging of recovered soil samples
   d. Dynamic Cone Penetrometer (DCP) testing

Table 5.1: A summary of the factors assessed during the site investigation

Factor Assessed	Description	Limitation
Existing Fill	>800mm of sand OR > 400mm all other soil types	Moderate
Fill contents	Fill containing wood, organic material or building waste	Moderate
Planned fill	Depth of soil / compatibility	Minor
Soil strength	Low strength soils	Moderate
Trees	Trees (current or removed) in or within 20m of building envelope	Moderate
Existing buildings	Any buildings (current or demolished) within the building envelope – existing dwelling to be modified	Major
Floating rocks	Floating boulders, soil containing gravel, colluvial soils leading to false bedrock depth measurements	Minor
Excavatability	Conditions limiting excavation on the surface or subsurface	Moderate
Subsurface flow	Subsurface flow or water seepage potential	Minor
Existing bore logs	Existing bore logs showing information of concern	Nil
Corrosion	Marine environment or corrosion risk from sea spray	Nil
Erosion	Soil susceptibility to erosion	Minor
Existing Movement	Trees, roads, kerbs, pavements, masonry walls, fences, and/or ground Surfaces	Minor

5.2 Site Observations

The site was primarily occupied by the existing dwellings, driveways and associated infrastructure. The yards consisted of grass and garden beds. No significant cracking in external masonry façade of existing dwelling, which would indicate ground movement. The driveways showed normal cracking, with little displacement.

5.3 Existing fill

Potential fill was identified in boreholes 3 and 4 (see figure 5.1 through 5.4 below).

- **Borehole 3** contained a silty soil not consistent with the remaining 3 boreholes. Organic soil was identified at the base of the borehole (black and high plasticity), likely the existing top soil.
- **Borehole 4** shows a what appears to be layering of clays (appears to be from the Blacktown landscape) over top soil.

These soils should not be directly founded upon without careful design (see section 7.6). The extent of fill is not known and should be assumed to cover the entire site.

5.4 Trees

The removal of trees can lead to reduced soil strength due to rotting roots and moisture level changes in the soil. The structural engineer should consider the potential for such effects during the design stage.

5.5 Existing Building

The demolition of the existing residence will likely leave service pipes and conduits beneath the service. These should be removed and backfilled prior to construction of the childcare centre.

In order to facilitate the basement construction, hammering is likely to be employed to excavate the underlying rock. If vibration levels become unsuitable for the neighbouring dwellings, rock sawing should be considered (see section 7.4.1). Care should be taken when removing rock within 1.0m of the existing footings services to ensure the stability of the supporting material isn't compromised.

5.6 Subsurface Conditions / Excavation

- See bore logs for location specific subsurface conditions (variable)
- Proposed development to be founded within the Shale layer (estimated to be between 1.3 and 2.0m BEGL)

5.7 Subsurface flow

No standing ground water or saturated soil cores were identified during the investigation. The soil strata was moist across the site. Given the heavily built nature surrounding the site and low permeability of the soils, subsurface flow through the soil strata is expected to be low. See section 7.2 for recommendations.

Figure 5.1: Borehole 1

Figure 5.2: Borehole 2

Figure 5.3: Borehole 3

Figure 5.4: Borehole 4

6 DESIGN CRITERIA

The following sections provide data which may be used by engineers for the design phase of the project.

6.1 Earth Pressure Coefficients

We recommend the following geotechnical parameters for the design of retaining walls:

Table 6.3.1: Earth pressure coefficients

Material	Ka		Kp	K_0
	Temporary	Long term		
Silt	0.35	0.39	2.88	0.52
Silt CLAY	0.28	0.33	3.54	0.44
Shale	0.20	0.25	4.0	0.80

Notes:

1. Flat ground behind the retaining wall has been assumed
2. No wall friction has been assumed
3. A geotechnical engineer should be consulted in the design of retaining walls using the above parameters
4. Parameters should be adjusted to account for groundwater where appropriate
5. Section 7.5 should be read for generalised comments and further design considerations.

For natural clay soils, an undrained shear strength (Cu) of 50kPA may be used.
For fill material (boreholes 3 and 4) an undrained shear strength (Cu) of 30kPA may be used.

6.2 Site classification – AS 2870

AS 2870 applies to residential dwellings only, however it may be useful for the structural engineer when interpreting the site.

The site is Class M (moderately reactive) in accordance with Table D2 of Australian Standard 2870 (2011). This applies to shallow footings founded at least 0.5m below the existing surface.

Founding on fill material will result in a P classification.

Basement
When founding on rock a class A classification applies.

7 COMMENTS AND RECOMMENDATIONS

7.1 Site Preparation

Material removed from the site will need to be managed in accordance with current legislation and may require material type classification in accordance with NSW EPA (2014) Waste Classification prior to removal. Soil should be disposed at appropriately licenced facilities. Natural soil and bedrock may be classified as excavated natural material and re-used on other sites rather than disposed at a landfill, although it must be proven to be free of contamination.

Removal of soil overburden should be performed in a manner that reduces the risk of sedimentation occurring in nearby waterways and on neighbouring land. All spoil on site should be properly controlled by soil erosion control methods in accordance with Landcom (2004) to prevent transportation of sediments off-site.

7.2 Groundwater

Given the soil structure, the infiltration rates into any excavations are expected to be slow and manageable with a sump pump.

All subsurface walls shall be designed for full hydrostatic pressure and made watertight. Appropriate drainage should be placed behind the wall to allow ground water seepage to move around the dwelling. It is best practice to implement upslope diversion bunds and/or trenches where practical.

7.3 Excavation

- Top-soil can be readily excavated using conventional earthmoving equipment.
- Extremely-low to low strength rock should be excavatable by light to medium ripping using a Caterpillar D6 dozer or equivalent and a hydraulic excavator fitted with rock hammer attachment.
- Medium strength rock should be excavatable by heavy ripping using a Caterpillar D9 dozer or equivalent and a hydraulic excavator fitted with rock hammer attachment. A rock saw attachment may be required if vibration levels are too high (see section 7.4).
- All excavation work should be completed with reference to the Code of Practice 'Excavation Work' (Oct 2013) by Safe Work Australia. Excavation method statements will need to be prepared by the excavation contractor prior to the issue of a CC.

7.4 Vibration

7.4.1 Structural

During excavation it will be necessary to use appropriate methods and equipment to keep ground vibration within acceptable limits. A typical provisional allowed vibration limit of 8.0 mm/sec Vector Sum Peak Particle Velocity (VSPPV) is considered standard industry practice for earthworks.

The German Standard DIN 4150-3 (Structural Vibration: Effects of Vibration on Structures) provides guideline values for short term vibration velocity at foundations. Short term vibration is classified as vibrations which do not occur often enough to cause structural fatigue.

Table 7.4.1 - Structural Damage – Short Term Vibration (mm/s) – German DIN 4150-3

Type of Structure	Velocity values in mm/s at the foundation at a frequency of			Plane of floor of uppermost storey
	Less than 10Hz	10-50Hz	50-100Hz	All frequencies
Building use for commercial purposes, industrial buildings and buildings of similar design	20	20-40	40-50	40
Dwelling and buildings of similar design and/or occupancy	**5**	**5-15**	**15-20**	**15**
Structures that because of their particular sensitivity to vibration and are of great intrinsic value (e.g. heritage listed structures)	3	3-8	8-10	8

It is recommended that building condition (dilapidation) surveys of adjacent structures (within 40m) be undertaken prior to commencement of excavation. The building foundation types and conditions should be determined where possible, so as to assess the maximum acceptable vibration level to reduce the likelihood of damage and to provide evidence in the event of any damage claims.

7.4.2 Human comfort criteria

The human annoyance vibration assessment should be undertaken using the EPA's publication 'Assessing Vibration: A Technical Guideline', based on the BS 6472 Standard. This Guideline covers the appropriate methods and criteria for the assessment of the intrusive vibration on living and working space. The guideline describes the following:

- The characteristics of vibration and associated effects that can cause community disturbance and concern to people, in particular the occupants of buildings.
- Criteria defining values of vibration to protect amenity.

- Procedures for the measurement and evaluation of vibration values and other associated emissions.

A summary of the VDV criteria for human comfort limits are adopted from the EPA's publication 'Assessing Vibration: A Technical Guideline and are presented in Table 7.4.2 below.

Table 7.4.2 - Acceptable vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Daytime[1]		Night Time[1]	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Critical Areas[2]	0.10	0.20	0.10	0.20
Residents	**0.20**	**0.40**	**0.13**	**0.26**
Offices, Schools, Educational, institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

1) Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am.
2) Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas. Source: BS 6472–1992

7.5 Retaining Structures

Any excavation greater than 1.5m will require an appropriately designed retaining structure or battering.

7.5.1 Batter Slopes

Recommended maximum temporary batter slopes for the sub-surface materials present are given in Table 7.5

Table 7.5: Allowable batter slopes (H : V ratio)

Material	Short term[2]	Long term[2]
Silt	2 : 1	3.5 : 1
Clay and XL strength shale	1.5 : 1	2 : 1
Low strength shale	0.75 : 1	1 : 1
Medium strength shale[1]	Vertical	Vertical

1) Subject to inspection by an experienced geotechnical engineer or engineering geologist
2) For cut heights no greater than 1.5m
3) Batters are not appropriate below ground water level

Suitable erosion and sediment prevention plans should be designed and implemented for all unsupported slopes. For long term batters, the slope is stabilised through the use of engineered design and/or appropriate vegetation. An environmental and risk analysis must be performed to ensure the risks from erosion, run-off and slope failure are managed and within acceptable limits.

7.5.2 Temporary shoring

Any temporary excavations into soil exceeding 1.5m depth should be supported by suitably designed and installed shoring system (in accordance with AS4678 Earth Retaining Structures). The soil pressure can be calculated either by:

a) A qualified and suitably experienced engineer using the Rankine formula for sand and Terzaghi formula for clay. The Engineer must include the ground water pressure in their capacity calculations unless a suitable external dewatering system is used and maintained.
b) Using 8H, where 'H' is the effective vertical height of the wall in meters. I.e. an excavation with an effective vertical height of 4.0m would require a shoring system with a capacity rated to 8*4.0 = 32KPa.

For temporary shoring, it is typically adequate to select a shoring system which won't retain water and monitor the ground water in and beside the excavation to ensure compliance. Dewatering near existing structures can cause settlement. If dewatering near a structure an assessment by an experienced engineer should be sought prior to commencing works.

7.5.3 Permanent shoring / basement walls

All permanent retaining structures must be designed by a qualified and suitably experienced Engineer in accordance with AS4678 and/or all applicable standards, legislation and guidelines. Full hydrostatic pressure from surface level should be assumed to account for events such as heavy rain and flooding.

7.5.4 General

The wall designer should consider the additional surcharge loading from existing structures, construction equipment, backfill compaction and ground water.

Backfill should comprise of engineered fill, free of organic material, contaminants and deleterious substances and having a maximum particle size of 30 mm. Backfill should be placed in maximum 300 mm thick layers compacted using a hand-held compactor. Care should be taken to ensure excessive compaction stresses are not transferred to retaining walls. Appropriate drainage should be provided between backfill/soil exposure and retaining walls (e.g. strip drains and ag-line in free draining gravel).

Use of heavy machinery should be avoided, where possible, within 2 m of the crest of any open soil excavation greater than 1.0m to prevent excessive local surcharge loads, vibrations and undue settlement within exposed soils. Careful consideration of nearby structures (e.g. footings, services, utilities, etc.) must be given when they are within the excavation zone of influence. The excavation zone of influence extends as a triangle from the base of the excavation to ground level at 2H : 1V. If any structure, utilities, etc, fall within this zone a qualified and suitably experienced engineer shall design a shoring system and develop an installation methodology which limits the settlement and horizontal movement so the structure will not be affected.

7.6 Footings

The basement will be founded on rock. It is anticipated that a raft slab will be utilised with piers beneath the walls and columns.

All piers should be socketed into bedrock or soil with suitable strength (not fill). If socketing into the rock, 'spoon' testing should be conducted to ensure no significant weak seems or floating rocks exist below the foundation level. The depth of the spoon test should be 1.5 times the least footing dimension.

All footings should be inspected by a geotechnical engineer prior to pouring.

7.7 Civil Engineering Plans

All civil works plans and detailed information shall be developed in accordance with the above recommendations. Once preliminary / proposed plans are completed, they should be assessed by a geotechnical engineer to ensure the recommendations within this report are sufficient. All documentation should include construction notes with the relevant recommendations from this report included (e.g, maximum batter slopes). A reference for the full geotechnical report and how to obtain it should be made within the construction notes.

All future drawings, geotechnical specifications, methodologies and design documentation shall be reviewed by a suitably qualified and experienced geotechnical engineer who is familiar with the site to ensure compliance with the report prior to issuing "for construction" drawings. Any items which require review and sign off on site shall be indicated by the geotechnical engineer for implementation within the construction schedule.

8 LIMITATIONS OF THIS REPORT

This report has been prepared subject to a number of limitations. These include:

The application of conditions of approval or impacts of unanticipated future events could modify the outcomes described in this document. In particular, the occurrence of earthquakes of any magnitude, extreme rainfall events or the effects of climate change have not been considered but should they occur, may have a significant impact on the site. The client agrees that such events are possible but nevertheless accepts the risk that they pose;

The findings contained in this report are the result of discrete/specific methodologies used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site in question. Under no circumstances, however, can it be considered that these findings represent the actual state of the site/sites at all points;

In preparing this report, Broadcrest Consulting Pty Ltd has relied upon certain verbal information and documentation provided by the client and/or third parties. Broadcrest Consulting Pty Ltd did not attempt to independently verify the accuracy or completeness of that information. To the extent that the conclusions and recommendations in this report are based in whole or in part on such information, they are contingent on its validity. Broadcrest Consulting Pty Ltd assume no responsibility for any consequences arising from any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to Broadcrest Consulting Pty Ltd; and

This report is not to be relied upon for any purpose other than that defined in this report.

9 REFERENCES

- Australian Standard 1726 (2017) Geotechnical site investigations.
- Australian Standard 2159 (2009) Piling – Design and installation.
- Australian Standard 2870 (2011) Residential slabs and footings.
- Australian Standard 3600 (2009) Concrete structures.
- Australian Standard 4678 (2002) Earth-retaining structures.
- Australian Standard 3798 (2007) Guidelines on earthworks for commercial and residential developments.
- Bertuzzi, R. & Pells, P.J.N. (2002) Geotechnical parameters of Sydney sandstone and shale, Australian Geomechanics, Vol. 37, No 5, pp 41-54.
- P.J.N Pells (1989 et al) Engineering Geology of the Sydney Region.
- Safe Work Australia (July, 2014) Code of Practice 'Excavation Work.

Appendix A: Bore log

BROADCREST
MAPPING AND GLOBAL INFORMATION SYSTEMS
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

Client Ali Taleb	**Project** 2465-GEO
Location 78-80a Benaroon Road, Lakemba	**Drawing ID / Revision** 2465-GEO-01 / 01-A

Drawing Name
Site Overview with borehole locations

Base map
Spatial Services | Obtained on 2022-12-13
Creative Commons 3.0 - Commonwealth of Australia

Scale
1:200

Broadcrest **BOREHOLE ID** 01

PROJECT NUMBER 2465	**DRILLING DATE** 08/12/2022	**COORDINATES**
PROJECT NAME	**DRILLING COMPANY** Broadcrest Consulting Pty	**COORD SYS** WGS 84
CLIENT Ali Taleb	**DRILLER** KF	**SURFACE ELEVATION**
ADDRESS 78-80a Benaroon Road, Lakemba	**DRILLING METHOD** Thin Wall Tube Sample	**LOGGED BY** KF
	TOTAL DEPTH 1.2	**CHECKED BY**

COMMENTS

Depth (m)	SPT B/100mm	Samples	Graphic Log	Moisture	Consistency	Material Description
				M	L	TOPSOIL: PT Dark brown, moist. High Organic content.
						Silty CLAY: Light Brown with Red Mottles, Low Plasticity
				S.M	F	
0.5						Clayey SILT: Light Brown with Red Mottles, Low Plasticity
1						
						Termination Depth at: 1.2m. Refusal

Contact: email: contact@broadcrest.com.au phone: 1300 554 945

Broadcrest **BOREHOLE ID** 02

PROJECT NUMBER 2465	**DRILLING DATE** 08/12/2022	**COORDINATES**
PROJECT NAME	**DRILLING COMPANY** Broadcrest Consulting Pty	**COORD SYS** WGS 84
CLIENT Ali Taleb	**DRILLER** KF	**SURFACE ELEVATION**
ADDRESS 78-80a Benaroon Road, Lakemba	**DRILLING METHOD** Thin Wall Tube Sample	**LOGGED BY** KF
	TOTAL DEPTH 1.4	**CHECKED BY**

COMMENTS

Depth (m)	SPT B/100mm	Samples	Graphic Log	Moisture	Consistency	Material Description
				M	F	TOPSOIL: PT Dark brown, moist. High Organic content.
				S.M		
0.5						Silty CLAY: Red Brown with Red Mottles, Low Plasticity
1						CLAY: Becoming bleached with Red Mottles, Int Plasticity
					ST	
						Termination Depth at: 1.4m. Refusal

Contact: email: contact@broadcrest.com.au phone: 1300 554 945

Broadcrest **BOREHOLE ID** 03

PROJECT NUMBER 2465	**DRILLING DATE** 08/12/2022	**COORDINATES**
PROJECT NAME	**DRILLING COMPANY** Broadcrest Consulting Pty	**COORD SYS** WGS 84
CLIENT Ali Taleb	**DRILLER** KF	**SURFACE ELEVATION**
ADDRESS 78-80a Benaroon Road, Lakemba	**DRILLING METHOD** Thin Wall Tube Sample	**LOGGED BY** KF
	TOTAL DEPTH 1.3	**CHECKED BY**

COMMENTS

Depth (m)	SPT B/100mm	Samples	Graphic Log	Moisture	Consistency	Material Description
				M	F	FILL: Silty Sand, Coarse Frags (<30mm)
0.5					S	SILT: Brown with dark brown bands,
					F	
				W		SILT: Dark Brown, Organic Material (anticipated existing top soil)
1						
						Termination Depth at: 1.3m. Refusal

Contact: email: contact@broadcrest.com.au phone: 1300 554 945

Broadcrest **BOREHOLE ID** 04

PROJECT NUMBER 2465	**DRILLING DATE** 08/12/2022	**COORDINATES**
PROJECT NAME	**DRILLING COMPANY** Broadcrest Consulting Pty	**COORD SYS** WGS 84
CLIENT Ali Taleb	**DRILLER** KF	**SURFACE ELEVATION**
ADDRESS 78-80a Benaroon Road, Lakemba	**DRILLING METHOD** Thin Wall Tube Sample	**LOGGED BY** KF
	TOTAL DEPTH 1.2	**CHECKED BY**

COMMENTS

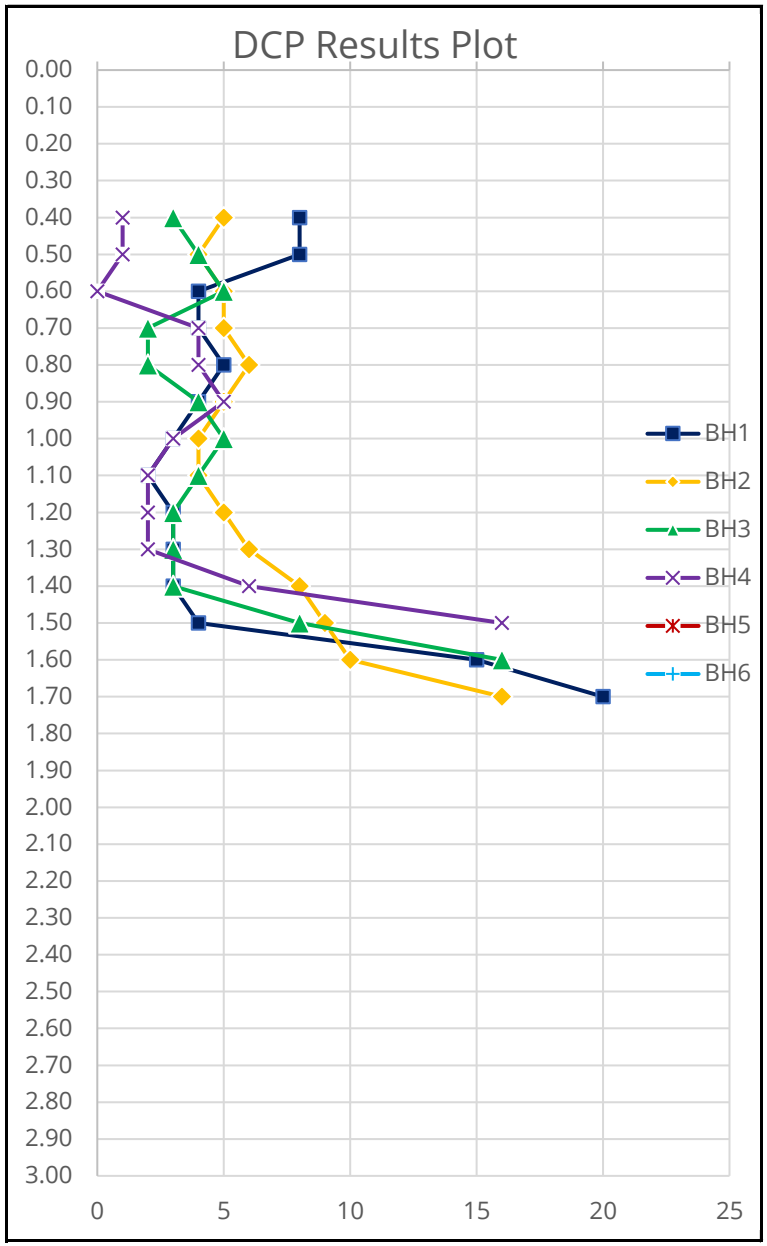
Depth (m)	SPT B/100mm	Samples	Graphic Log	Moisture	Consistency	Material Description
				M	VS	Top Soil, DB
						Silty CLAY, Brown with Red Mottles, LP, Minor Frags
0.5				W	F	SILT: Dark Brown, Organic material (anticipated existing top soil), HP
						Silty CLAY, Brown with Red Mottles, LP
1					S	
						Termination Depth at: 1.2m. Refusal

Contact: email: contact@broadcrest.com.au phone: 1300 554 945

Broadcrest Consulting Pty Ltd - DCP Results

Depth	Blows / 100mm					
	BH1	BH2	BH3	BH4	BH5	BH6
0.00 - 0.10						
0.10 - 0.20						
0.20 - 0.30						
0.30 - 0.40	8	5	3	1		
0.40 - 0.50	8	4	4	1		
0.50 - 0.60	4	5	5	0		
0.60 - 0.70	4	5	2	4		
0.70 - 0.80	5	6	2	4		
0.80 - 0.90	4	5	4	5		
0.90 - 1.00	3	4	5	3		
1.00 - 1.10	2	4	4	2		
1.10 - 1.20	3	5	3	2		
1.20 - 1.30	3	6	3	2		
1.30 - 1.40	3	8	3	6		
1.40 - 1.50	4	9	8	16		
1.50 - 1.60	15	10	16			
1.60 - 1.70	20	16				
1.70 - 1.80						
1.80 - 1.90						
1.90 - 2.00						
2.00 - 2.10						
2.10 - 2.20						
2.20 - 2.30						
2.30 - 2.40						
2.40 - 2.50						
2.50 - 2.60						
2.60 - 2.70						
2.70 - 2.80						
2.80 - 2.90						
2.90 - 3.00						
20th Percentile	**3**	**4.6**	**3**	**1.2**		

Soil Classification					
BH1	BH2	BH3	BH4	BH5	BH6
O	O	FILL	O		
CL			CL		
		M			
M	CL				
			O		
		O	M		



S = Sand, C = Clay, O = Organic, M = Silt, G = Gravel, L = Low Plasticity, H = High Plasticity, x,X Sub-type,PRIMARY-TYPE

Appendix B: Spatial Data Report

Broadcrest Consulting
MAPPING & SPATIAL SERVICES

LOCATION: 78-80a Benaroon Road, Lakemba

REPORT 2465

DATE 6.12.2022

SITE AREA 0.0964 ha (approx)

Disclaimer
Broadcrest Consulting has taken all reasonable care in collating and providing the data within this report on the basis that any person given access to this report are responsible for assessing the relevance of the content. The purpose of this report is to provide an overview of the site based on some data collated from various government, public and private sources. You should obtain independent advice before you make any decision based on the information in this report.

Broadcrest Consulting do not make any claim that the data is free from errors, omission, or that it is exhaustive. Furthermore, there is no claim that the data is accurate, authentic, current, complete, reliable, or suitable.

This report has been generated on the understanding that Broadcrest Consulting, to the extent permitted by law, accept no responsibility or liability (including, without any limitation, liability for negligence) for any damage, cost, loss or expense incurred by you or any other person (whether directly or indirectly) as a result of any error, omission or misrepresentation.

You and any person with access to this report are bound by Broadcrest Consulting's terms and conditions which are available at 'www.broadcrest.com.au/tandc.html' or will be supplied on request. By viewing the content of this report you agree to these terms and conditions.

BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

Client Ali Taleb	**Map** Site Aerial Photograph
Location 78-80a Benaroon Road, Lakemba LOT: 1-2 DP 12508	**LGA** CANTERBURY-BANKSTOWN COUNCIL

Data Source

Base map
DFSI Spatial Services Imagery | © Department of Finance, Services & Innovation 2017
Open Street Maps | Creative Commons 3.0 - OpenStreetMap Contributors

Scale 1:2,250

Project 2465

BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

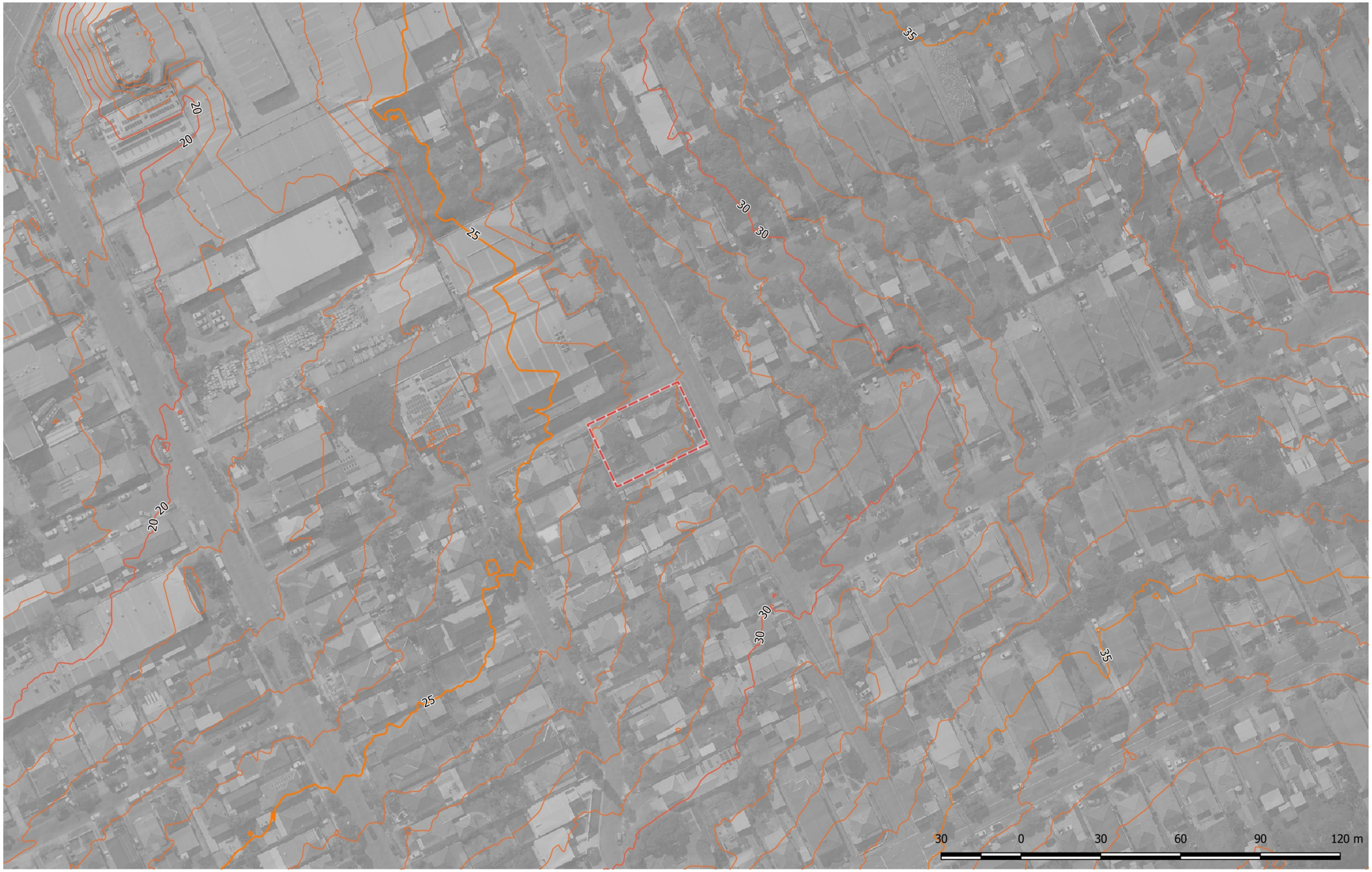
Client Ali Taleb	**Map** Site Location with Terrain
Location 78-80a Benaroon Road, Lakemba	**LGA** CANTERBURY-BANKSTOWN COUNCIL

Data Source
Geoscience Australia | Obtained on 18.07.2018
Creative Commons 3.0 - Commonwealth of Australia

Base map
DFSI Spatial Services Imagery | © Department of Finance, Services & Innovation 2017
Open Street Maps | Creative Commons 3.0 - OpenStreetMap Contributors

Scale
1:1,000

Project
2465



BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

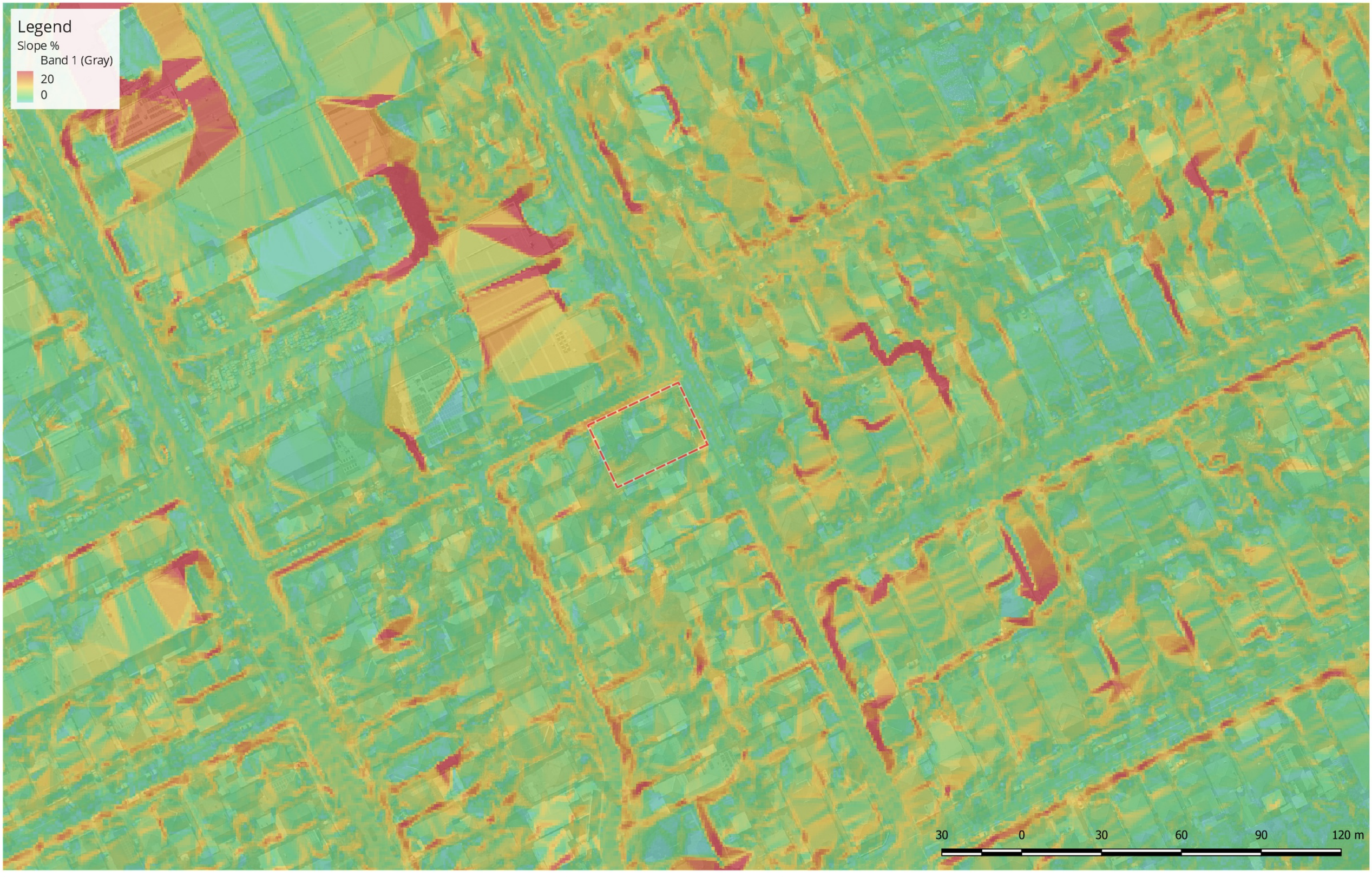
Client Ali Taleb	**Map** Topography
Location 78-80a Benaroon Road, Lakemba	**LGA** CANTERBURY-BANKSTOWN COUNCIL

Data Source
Derived from LiDAR Data | Geoscience Australia | Obtained on 18.07.2018
Creative Commons 3.0 - Commonwealth of Australia

Base map
Open Street Maps | Obtained on 6.12.2022
Creative Commons 3.0 - OpenStreetMap Contributors

Scale
1:1,500

Project
2465



BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

Client Ali Taleb	**Map** Slope Heat Map
Location 78-80a Benaroon Road, Lakemba	**LGA** CANTERBURY-BANKSTOWN COUNCIL

Data Source
Derived from LiDAR Data | Geoscience Australia | Obtained on 18.07.2018
Creative Commons 3.0 - Commonwealth of Australia

Base map
DFSI Spatial Services Imagery | Obtained on 6.12.2022
© Department of Finance, Services & Innovation 2017

Scale
1:1,500

Project
2465

BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

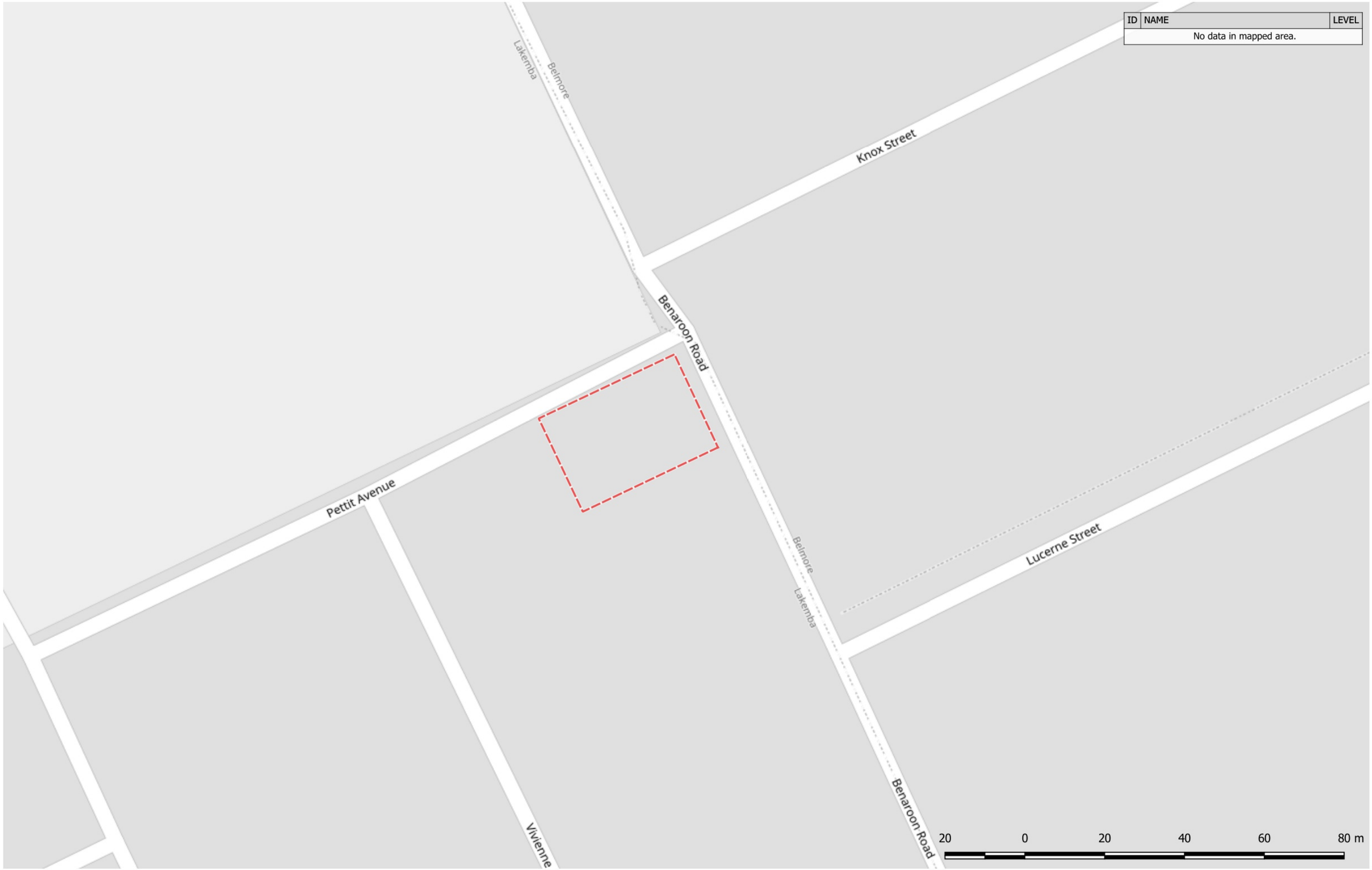
Client Ali Taleb	**Map** Land Zone Map
Location 78-80a Benaroon Road, Lakemba	**LGA** CANTERBURY-BANKSTOWN COUNCIL

Data Source
NSW Planning and the Environment | Obtained on 18.07.2018
Creative Commons 3.0 - Commonwealth of Australia

Base map
Open Street Maps | Obtained on 6.12.2022
Creative Commons 3.0 - OpenStreetMap Contributors

Scale
1:1,500

Project
2465



BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

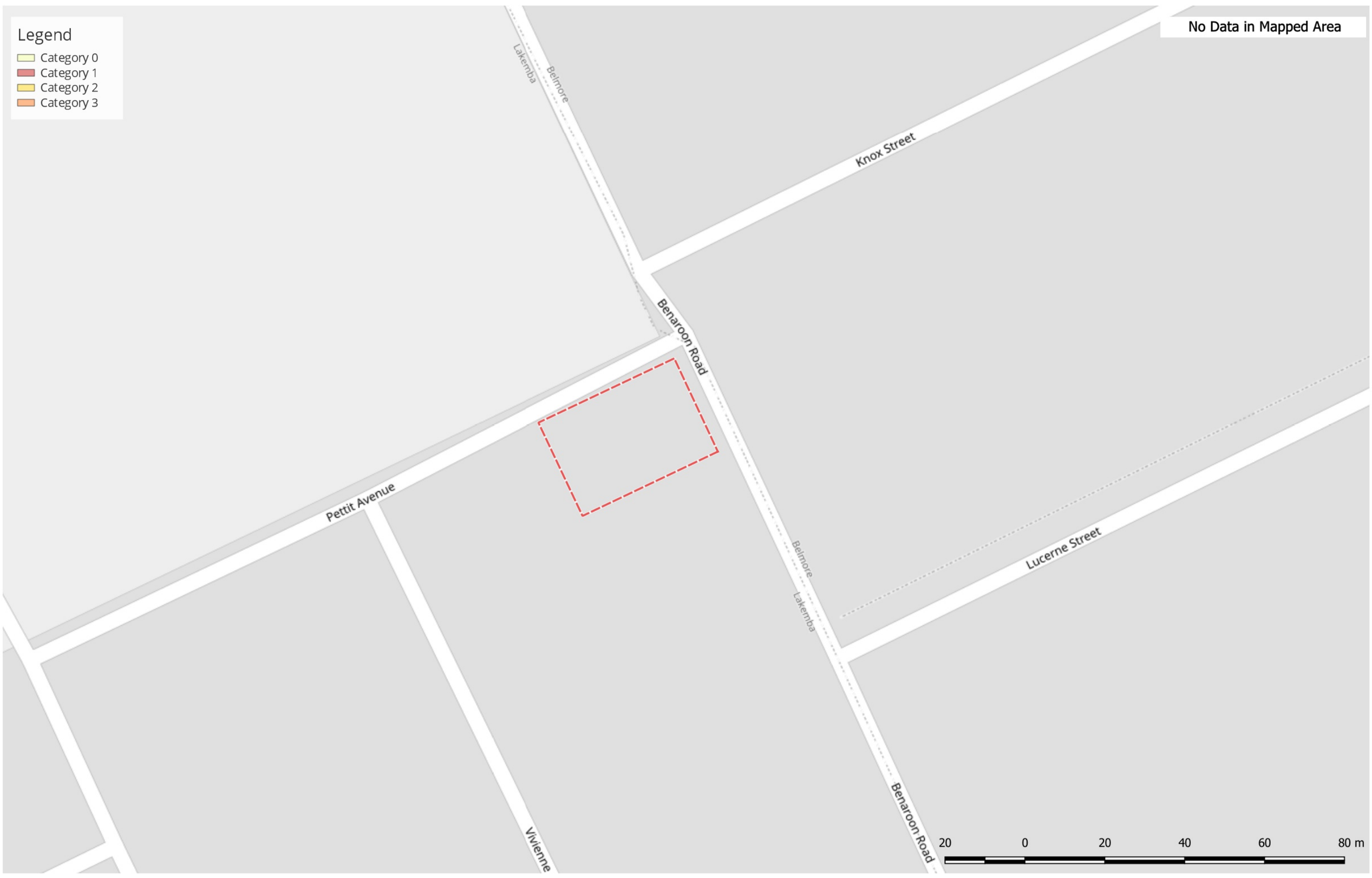
Client Ali Taleb	**Map** Heritage Listed Sites
Location 78-80a Benaroon Road, Lakemba	**LGA** CANTERBURY-BANKSTOWN COUNCIL

Data Source
NSW Planning and the Environment | Obtained on 18.07.2018
Creative Commons 3.0 - Commonwealth of Australia

Base map
Open Street Maps | Obtained on 6.12.2022
Creative Commons 3.0 - OpenStreetMap Contributors

Scale
1:1,000

Project
2465



BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au | 1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

Client Ali Taleb	**Map** Bushfire Prone Land
Location 78-80a Benaroon Road, Lakemba	**LGA** CANTERBURY-BANKSTOWN COUNCIL

Data Source
NSW Planning and the Environment | Obtained on 18.07.2018
Creative Commons 3.0 - Commonwealth of Australia

Base map
Open Street Maps | Obtained on 6.12.2022
Creative Commons 3.0 - OpenStreetMap Contributors

Scale
1:1,000

Project
2465

BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

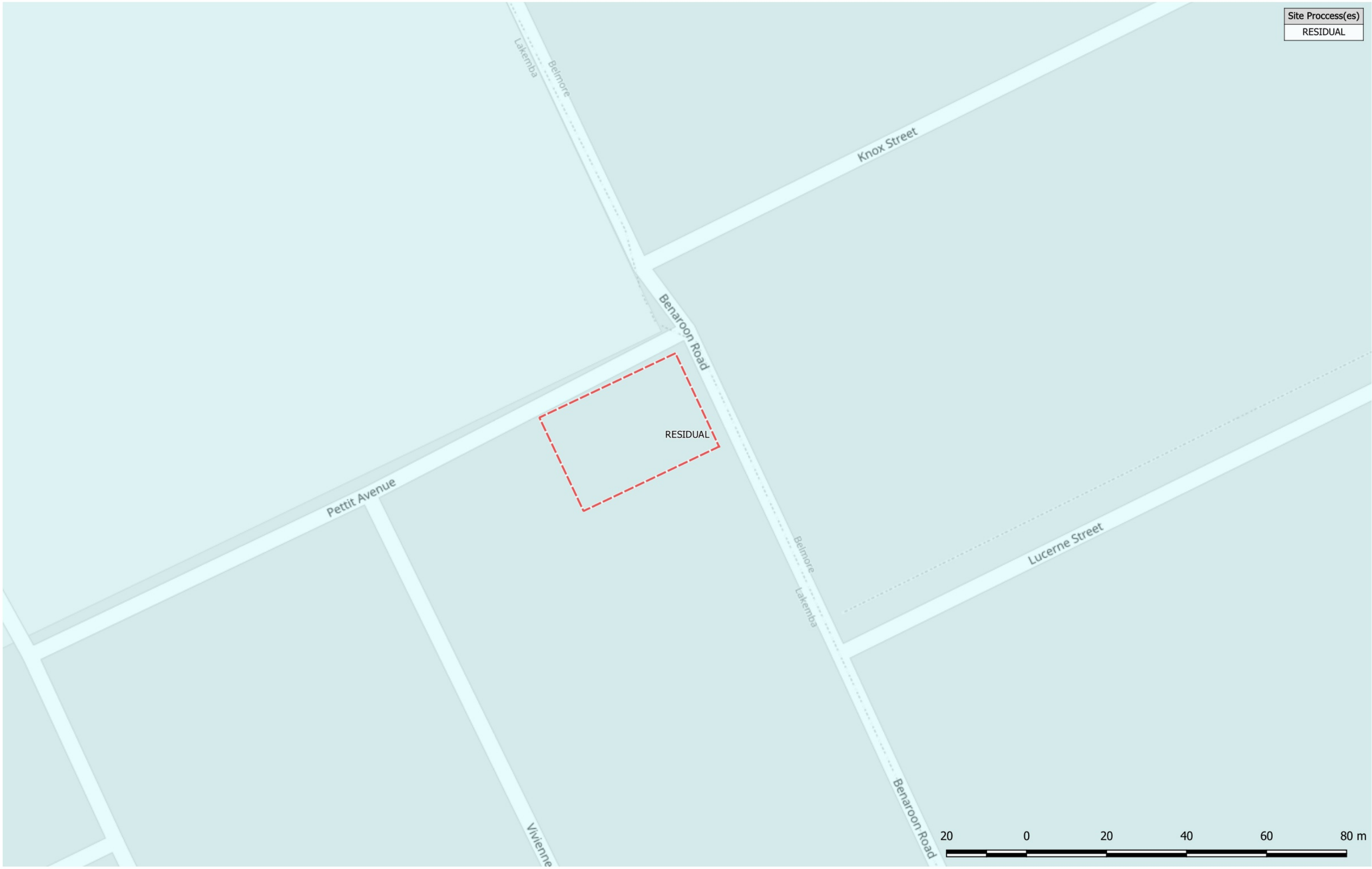
Client Ali Taleb	**Map** Soil Landscapes
Location 78-80a Benaroon Road, Lakemba	**LGA** CANTERBURY-BANKSTOWN COUNCIL

Data Source
Office of Environment and Heritage | Obtained on 18.07.2018
Creative Commons 3.0 - State of NSW and Office of Environment and Heritage

Base map
Open Street Maps | Obtained on 6.12.2022
Creative Commons 3.0 - OpenStreetMap Contributors

Scale
1:1,000

Project
2465



BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au | 1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

Client Ali Taleb	**Map** Soil Formation
Location 78-80a Benaroon Road, Lakemba	**LGA** CANTERBURY-BANKSTOWN COUNCIL

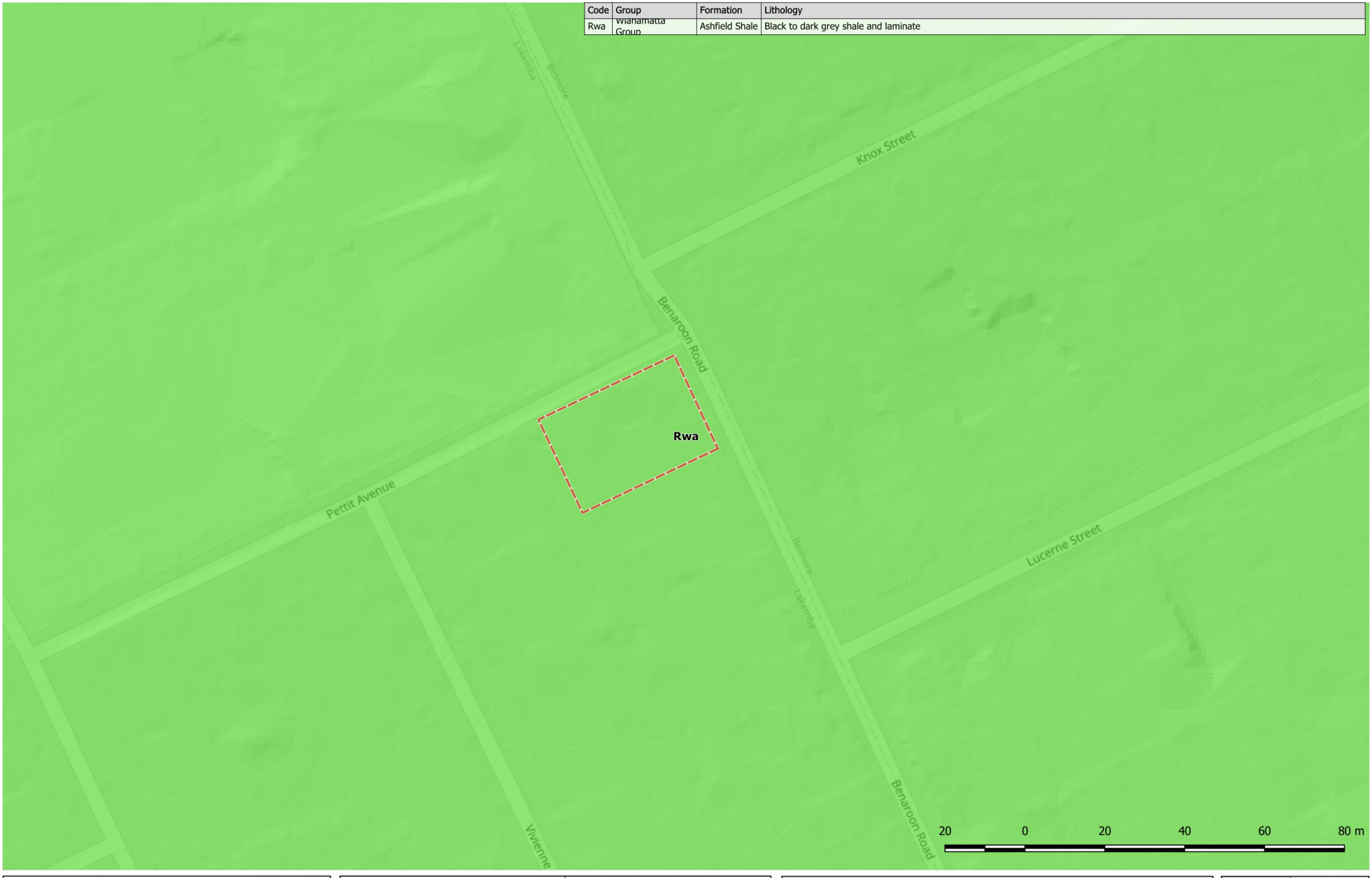
Data Source
Office of Environment and Heritage | Obtained on 18.07.2018
Creative Commons 3.0 - State of NSW and Office of Environment and Heritage

Base map
Open Street Maps | Obtained on 6.12.2022
Creative Commons 3.0 - OpenStreetMap Contributors

Scale
1:1,000

Project
2465

Code	Group	Formation	Lithology
Rwa	Wianamatta Group	Ashfield Shale	Black to dark grey shale and laminate



BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

Client
Ali Taleb

Map
Geology (1:100,000 Mapping)

Location
78-80a Benaroon Road, Lakemba

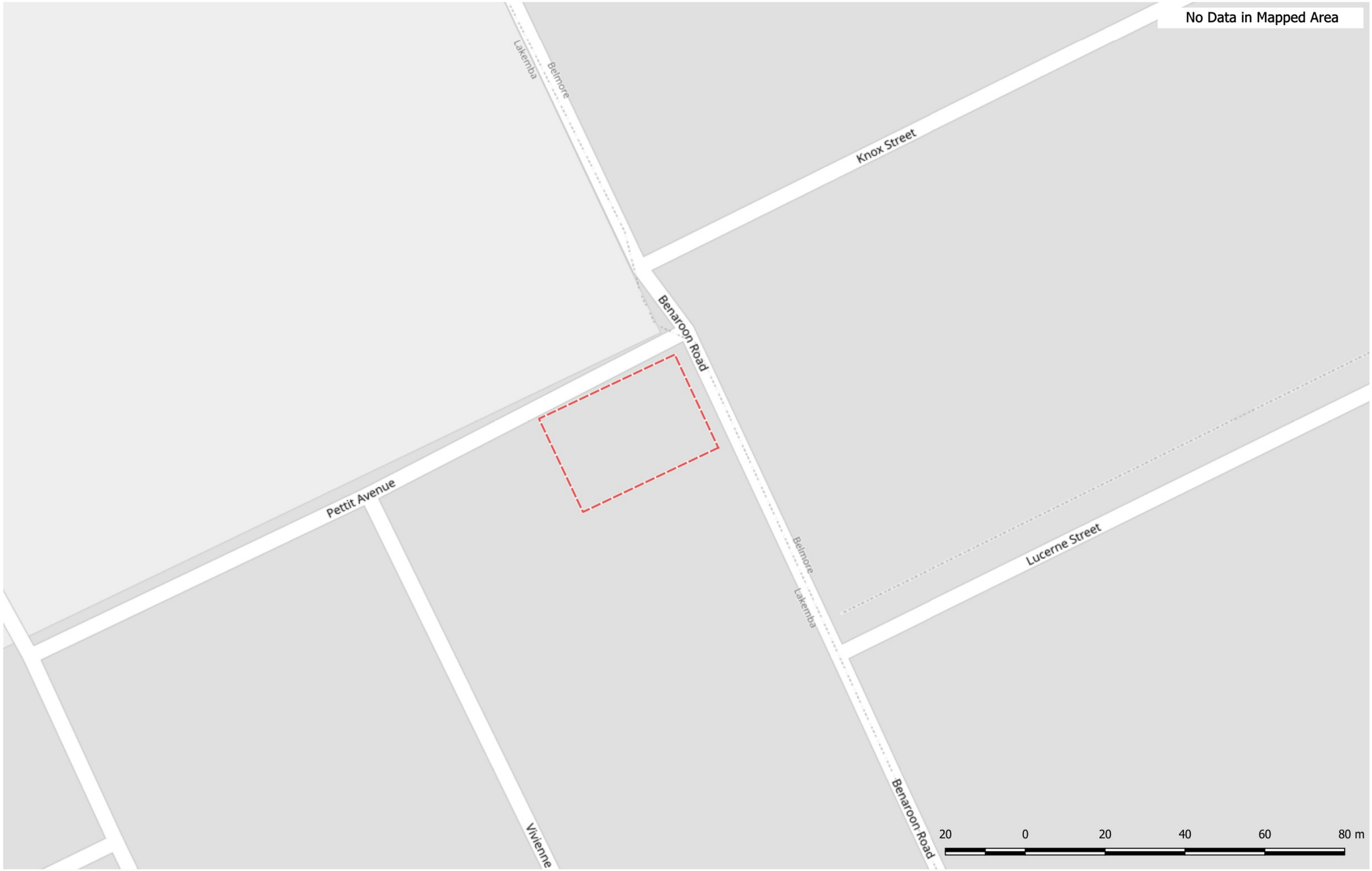
LGA
CANTERBURY-BANKSTOWN COUNCIL

Data Source
NSW Planning and the Environment | Obtained on 18.07.2018

Base map
Open Street Maps | Obtained on 6.12.2022

Scale
1:1,000

Project
2465



BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

Client Ali Taleb	**Map** Hydrogeological Landscapes
Location 78-80a Benaroon Road, Lakemba	**LGA** CANTERBURY-BANKSTOWN COUNCIL

Data Source
Office of Environment and Heritage | Obtained on 18.07.2018
Creative Commons 3.0 - State of NSW and Office of Environment and Heritage

Base map
Open Street Maps | Obtained on 6.12.2022
Creative Commons 3.0 - OpenStreetMap Contributors

Scale 1:1,000	
Project 2465	

BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

Client Ali Taleb	**Map** Acid Sulfate Risk map
Location 78-80a Benaroon Road, Lakemba	**LGA** CANTERBURY-BANKSTOWN COUNCIL

Data Source
NSW Planning and the Environment | Obtained on 18.07.2018
Creative Commons 3.0 - Commonwealth of Australia

Base map
Open Street Maps | Obtained on 6.12.2022
Creative Commons 3.0 - OpenStreetMap Contributors

Scale
1:1,000

Project
2465

BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

Client Ali Taleb	**Map** Watercourses and Hydrology
Location 78-80a Benaroon Road, Lakemba	**LGA** CANTERBURY-BANKSTOWN COUNCIL

Data Source
Department of Finance, Services & Innovation| Obtained on 6.12.2022

Base map
Open Street Maps | Obtained on 6.12.2022

Scale
1:1,000

Project
2465

BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

Client Ali Taleb	**Map** Rainfall Overland Flow Paths
Location 78-80a Benaroon Road, Lakemba	**LGA** CANTERBURY-BANKSTOWN COUNCIL

Data Source
Derived from LiDAR Data | Geoscience Australia | Obtained on 18.07.2018
Creative Commons 3.0 - Commonwealth of Australia

Base map
Open Street Maps | Obtained on 6.12.2022
Creative Commons 3.0 - OpenStreetMap Contributors

Scale
1:1,500

Project
2465

HydroCode	Depth	Strata Description	Bore Data
No data in mapped area.			

BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

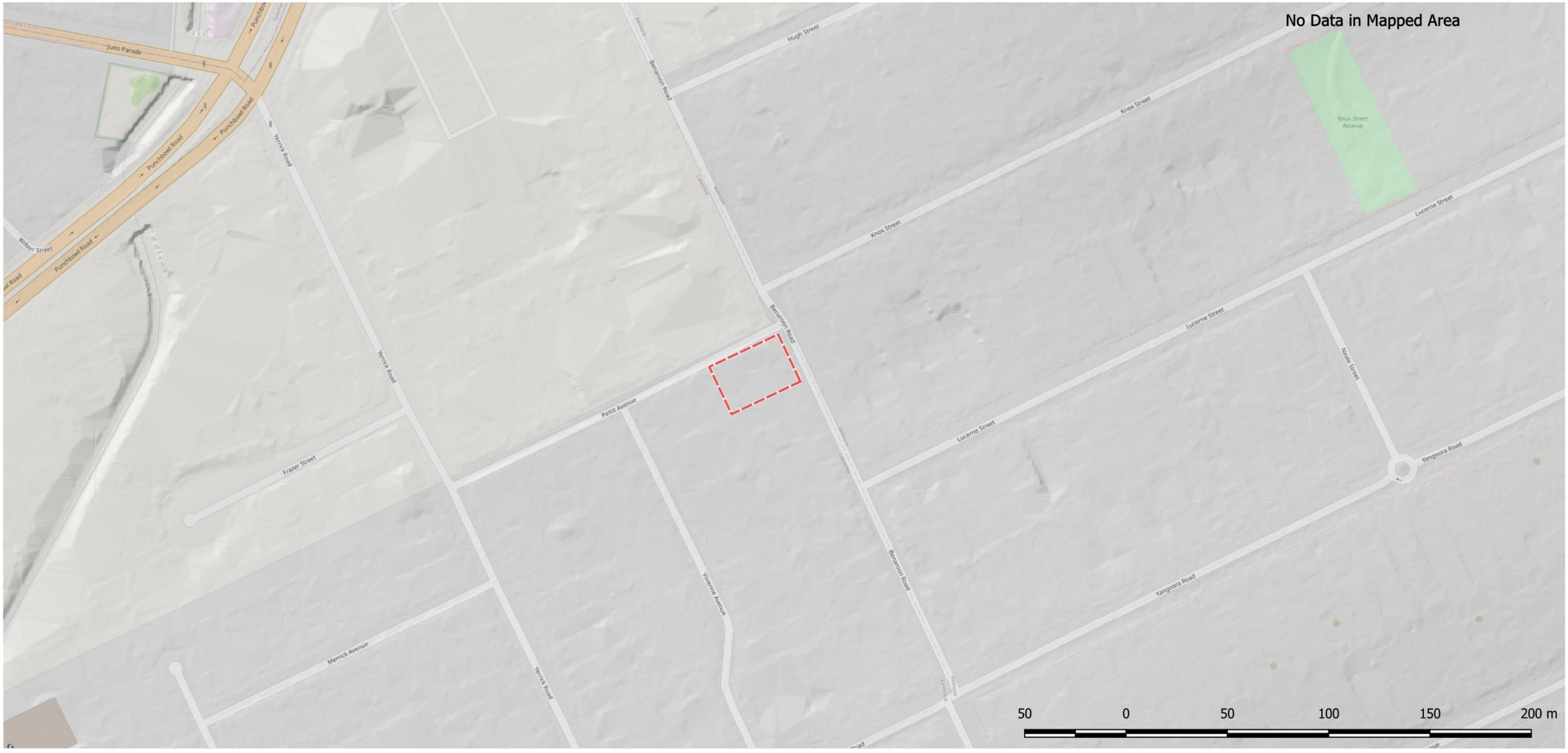
Client Ali Taleb	**Map** Groundwater Bores
Location 78-80a Benaroon Road, Lakemba	**LGA** CANTERBURY-BANKSTOWN COUNCIL

Data Source
NSW Planning and the Environment | Obtained on 18.07.2018
Creative Commons 3.0 - Commonwealth of Australia

Base map
Open Street Maps | Obtained on 6.12.2022
Creative Commons 3.0 - OpenStreetMap Contributors

Scale
1:3,000

Project
2465



ID	Date	Hazard	Synopsis	Impact Comments
No data in mapped area.				

BROADCREST
MAPPING & SPATIAL SERVICES
broadcrest.com.au | contact@broadcrest.com.au |1300 554 945
Broadcrest Consulting Pty Ltd | ABN: 622 508 187

Client
Ali Taleb

Location
78-80a Benaroon Road, Lakemba

Map
Recorded Landslides

LGA
CANTERBURY-BANKSTOWN COUNCIL

Data Source
NSW Planning and the Environment | Obtained on 18.07.2018

Base map
Open Street Maps | Obtained on 6.12.2022

Scale
1:2,250

Project
2465

Appendix C: Site Survey and Proposed Layout

ARTISTS IMPRESSION

78-80A BENAROON ROAD
LAKEMBA, NSW 2195

CHILDCARE CENTRE
DEVELOPMENT APPLICATION

ARCHITECTURAL DRAWING LIST - DA			
Sheet Number	Sheet Name	Current Revision	Current Revision Date
DA00.00	COVER PAGE	A	14/12/22
DA02.01	SITE PLAN / DEMOLITION	A	14/12/22
DA03.01	BASEMENT FLOOR PLAN	A	14/12/22
DA03.02	GROUND FLOOR PLAN	A	14/12/22
DA03.03	FIRST FLOOR PLAN	A	14/12/22
DA03.04	AREA CALCULATIONS	A	14/12/22
DA04.01	EXTERNAL ELEVATIONS	A	14/12/22
DA05.01	SECTIONS & EXTERNAL FINISHES	A	14/12/22
DA06.01	SHADOW DIAGRAMS	A	14/12/22
DA06.02	VIEWS FROM SUN	A	14/12/22
DA06.03	OUTDOOR PLAY AREA SOLAR CALCS	A	14/12/22

ISSUE	DATE	DESCRIPTION
A	14/12/22	ISSUED FOR DEVELOPMENT APPLICATION

ASSOCIATED CONSULTANTS

PLANNER	AVENUE TOWN PLANNING
ACCESS	ERGON CONSULTING
ACOUSTIC	DAY DESIGN
WASTE	DICKENS SOLUTIONS
LANDSCAPE	GREENSCAPE
QS	QPC&C
TRAFFIC	STANBURY TRAFFIC
SURVEY	MASRI SURVEY GROUP
STORMWATER	HORIZON ENGINEERS

NOTES
- Any Discrepancies MUST be reported to the Architect.
- All work to Conform to relevant Australian Standards & Codes as applicable.
- This drawing is copyrighted© and must NOT be copied or reused without authority from ArtMade Architects
- Contractors to check all dimensions on site prior to commencing Construction.
- Do not scale from this drawing, use given written dimensions
- Drawing not for construction purposes

CLIENT

MR. MUHAMMAD & ALI TALEB

ARCHITECT

ArtMade Architects

|516/50 Holt St, Surry Hills NSW 2010
|P: 02 8760 9300 |hello@artmade.com.au | www.artmade.com.au

PROJECT

CHILDCARE CENTRE

PROJECT ADDRESS

78-80A BENAROON ROAD, LAKEMBA

SHEET NAME

COVER PAGE

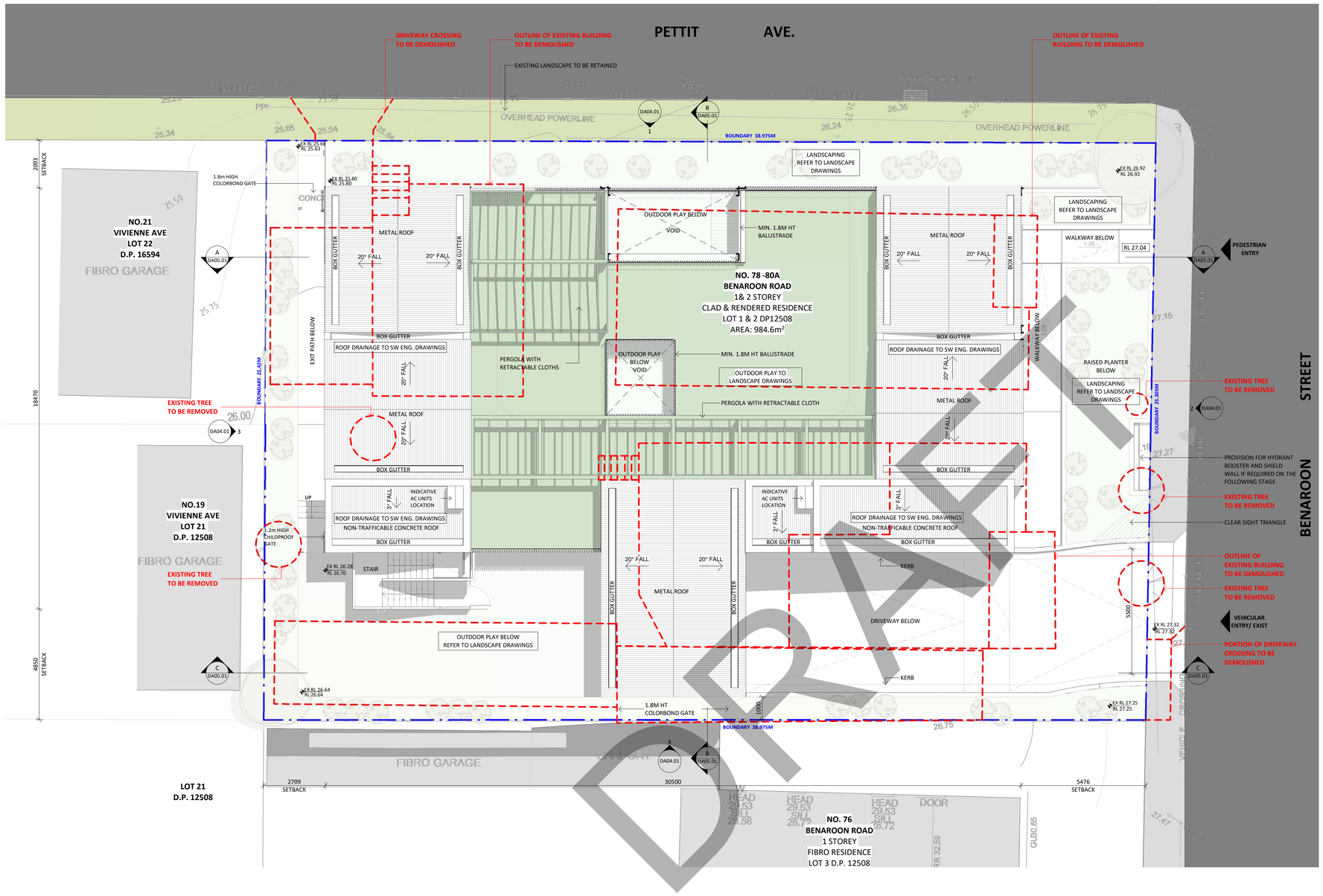
ISSUED FOR DEVELOPMENT APPLICATION

Project number	Sheet No.	Issue	Phase
23695	DA00.00	A	DA

Sheet Size	Scale	L.G.A.
A1		CANTERBURY

Drawn By	Checked By	Date
KZ/MS	AS/SS	14/12/22

NOT FOR CONSTRUCTION



1 SITE PLAN / DEMOLITION
1 : 100

0 1 2 3 4 5
1 : 100

ABBREVIATIONS

ENG.	- ENGINEER
ESL	- EXISTING SLAB LEVEL
EXT	- EXTERIOR
FFL	- FINISH FLOOR LEVEL
F.	- FIXED
FSL	- FINISH SURFACE LEVEL
GL	- GROUND LINE
GLZ	- GLAZING
EX.GL	- EXISTING GROUND LINE
REQ.	- REQUIREMENTS
XX.XX	- PROPOSED LEVEL
XX.XX	- EXISTING LEVEL
XX.XX	- SPOT LEVEL (PLAN)
XX.XX	- SPOT LEVEL (ELEVATION)

LANDSCAPE LEGEND

- EXISTING TREE / TREE TO BE RETAINED
- TREE TO BE REMOVED
- NEW TREE
- LANDSCAPING / BUFFER
- TURF
- EXTERNAL FLOOR FINISH
- LINE OF STRUCTURAL ROOT ZONE (SRZ)
- LINE OF TREE EXCLUSION ZONE (TEZ)
- LINE OF TREE PROTECTION ZONE (TPZ)

NOTE: REFER TO ARBORIST REPORT FOR FURTHER DETAILS

GENERAL NOTES

- ALL EXISTING BUILDING ELEMENTS TO BE CHECKED ON SITE U.N.O
- DEMOLITION TO BE IN ACCORDANCE WITH AUSTRALIAN STANDARDS AND TO BE CARRIED OUT BY A LICENCED CONTRACTOR U. N.O
- REFER TO SW DRAWINGS FOR DRAINAGE DESIGN.
- REFER TO LANDSCAPE DRAWINGS FOR LANDSCAPE DESIGN.
- KITCHEN AREA TO BE ACCORDANCE WITH NSW AS4674, FOOD ACT 2003, FOOD REGULATION 2015 AND FOOD STANDARD CODES 3.2.2 AND 3.2.3.

ISSUE	DATE	DESCRIPTION
A	14/12/22	ISSUED FOR DEVELOPMENT APPLICATION

ASSOCIATED CONSULTANTS

PLANNER	AVENUE TOWN PLANNING
ACCESS	ERGON CONSULTING
ACOUSTIC	DAY DESIGN
WASTE	DICKENS SOLUTIONS
LANDSCAPE	GREENSCAPE
QS	QPC&C
TRAFFIC	STANBURY TRAFFIC
SURVEY	MASRI SURVEY GROUP
STORMWATER	HORIZON ENGINEERS

NOTES
- Any Discrepancies MUST be reported to the Architect.
- All work to Conform to relevant Australian Standards & Codes as applicable.
- This drawing is copyrighted© and must NOT be copied or reused without authority from ArtMade Architects
- Contractors to check all dimensions on site prior to commencing Construction.
- Do not scale from this drawing, use given written dimensions
- Drawing not for construction purposes

INTERNAL STORAGE SCHEDULE			
NAME	NO. CHLDRN	REQ.VOL	VOL
INT ST 1	12	2.40 m³	5.40 m³
INT ST 2	20	4.00 m³	8.90 m³
INT ST 3	20	4.00 m³	14.90 m³
INT ST 4	10	2.00 m³	3.00 m³
INT ST 5	10	2.00 m³	10.55 m³
TOTAL	72	14.40 m³	42.75 m³

EXTERNAL STORAGE SCHEDULE			
NAME	NO. CHLDRN	REQ.VOL	VOL
EXT ST 1	42	12.60 m³	15.25 m³
EXT ST 2	30	9.00 m³	11.35 m³
TOTAL	72	21.60 m³	26.60 m³

INDOOR PLAYROOM SCHEDULE					
ROOM	AGE	NO. CHLDRN	NO. STAFF	UNENCUMBERED REQ.AREA	UNENCUMBERED AREA
PLAYROOM 1	AGE - 0-2	12	3	39 m²	47.30 m²
PLAYROOM 2	AGE 2-3	20	4	65 m²	71.45 m²
PLAYROOM 3	AGE 3-5	20	2	65 m²	71.60 m²
PLAYROOM 4	AGE 3-5	10	1	32.5 m²	37.05 m²
PLAYROOM 5	AGE 3-5	10	1	32.5 m²	33.30 m²
TOTAL		72	11	234 m²	260.65 m²

OUTDOOR PLAY AREA SCHEDULE				
AREA	AGE	NO. CHLDRN	UNENCUMBERED REQ.AREA	UNENCUMBERED AREA
OUTDOOR PLAY AREA 1	AGE - 2-5	30	210 m²	210.35 m²
OUTDOOR PLAY AREA 2	AGE 0-2	12	84 m²	85.60 m²
OUTDOOR PLAY AREA 3	AGE 3-5	30	210 m²	215.70 m²
TOTAL		72	504 m²	511.65 m²

PARKING SCHEDULE (1 SPACE PER 4 STAFF)	
PARKING	NO. SPACES
ACCESSIBLE	1
STAFF	7
VISITOR	5
TOTAL	13

NOT FOR CONSTRUCTION

ARCHITECT
ArtMade Architects
|516/50 Holt St, Surry Hills NSW 2010
|P: 02 8760 9300 |hello@artmade.com.au | www.artmade.com.au

CLIENT
MR. MUHAMMAD & ALI TALEB

PROJECT
CHILDCARE CENTRE

PROJECT ADDRESS
78-80A BENAROON ROAD, LAKEMBA

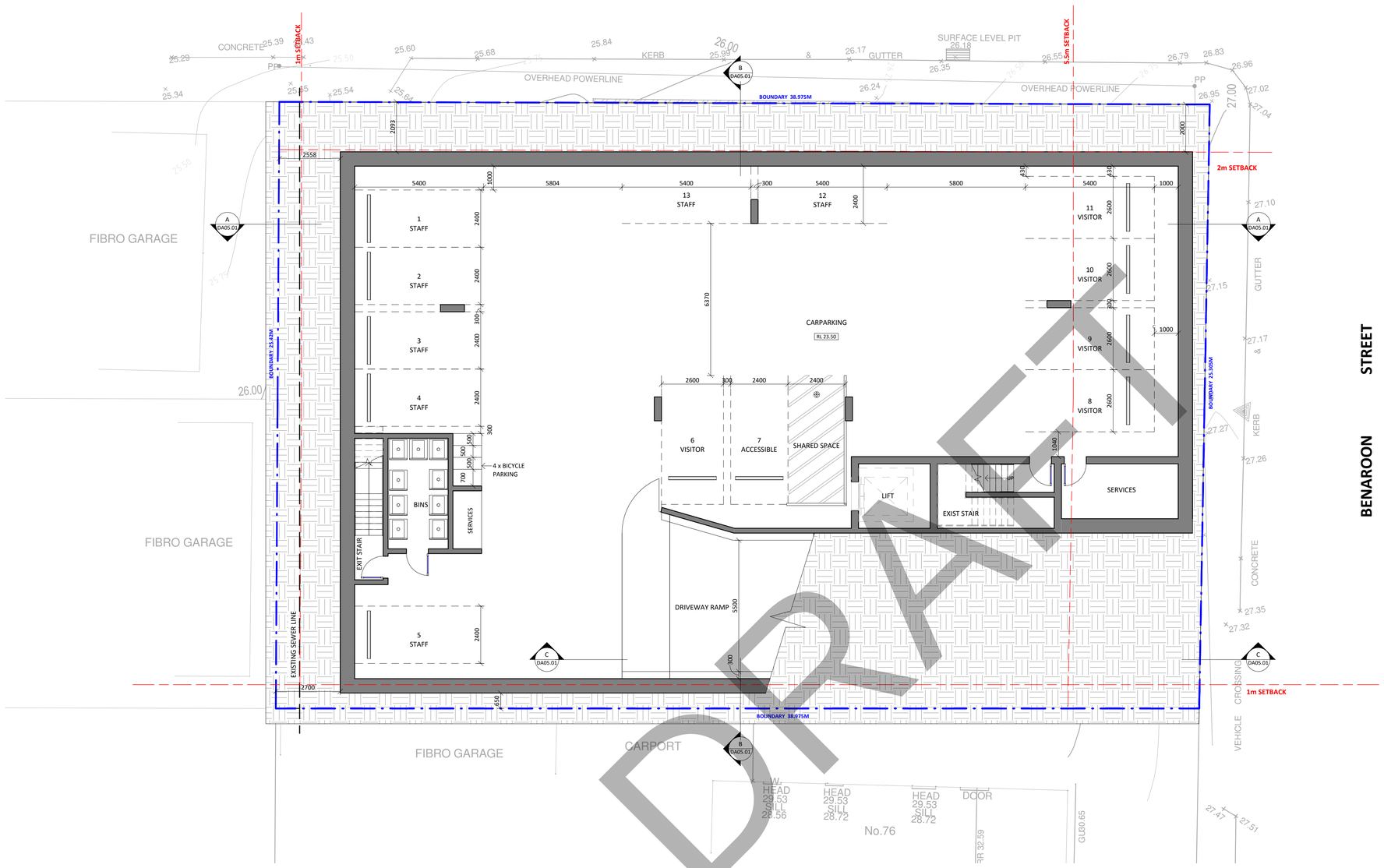
SHEET NAME
SITE PLAN / DEMOLITION

ISSUED FOR DEVELOPMENT APPLICATION

Project number	Sheet No.	Issue	Phase
23695	DA02.01	A	DA

Sheet Size	Scale	L.G.A.
A1	As indicated	CANTERBURY

Drawn By	Checked By	Date
KZ/MS	AS/SS	14/12/22



1 BASEMENT FLOOR PLAN
1 : 100

0 1 2 3 4 5
1 : 100

ABBREVIATIONS

ENG.	- ENGINEER
ESL	- EXISTING SLAB LEVEL
EXT	- EXTERIOR
FFL	- FINISH FLOOR LEVEL
F.	- FIXED
FSL	- FINISH SURFACE LEVEL
GL	- GROUND LINE
GLZ	- GLAZING
EX.GL	- EXISTING GROUND LINE
REQ.	- REQUIREMENTS
XX.XX	- PROPOSED LEVEL
XX.XX	- EXISTING LEVEL
XX.XX	- SPOT LEVEL (PLAN)
XX.XX	- SPOT LEVEL (ELEVATION)

LANDSCAPE LEGEND

- EXISTING TREE / TREE TO BE RETAINED
- TREE TO BE REMOVED
- NEW TREE
- LANDSCAPING / BUFFER
- TURF
- EXTERNAL FLOOR FINISH
- LINE OF STRUCTURAL ROOT ZONE (SRZ)
- LINE OF TREE EXCLUSION ZONE (TEZ)
- LINE OF TREE PROTECTION ZONE (TPZ)

NOTE: REFER TO ARBORIST REPORT FOR FURTHER DETAILS

GENERAL NOTES

- ALL EXISTING BUILDING ELEMENTS TO BE CHECKED ON SITE U.N.O
- DEMOLITION TO BE IN ACCORDANCE WITH AUSTRALIAN STANDARDS AND TO BE CARRIED OUT BY A LICENCED CONTRACTOR U. N.O
- REFER TO SW DRAWINGS FOR DRAINAGE DESIGN.
- REFER TO LANDSCAPE DRAWINGS FOR LANDSCAPE DESIGN.
- KITCHEN AREA TO BE ACCORDANCE WITH NSW AS4674, FOOD ACT 2003, FOOD REGULATION 2015 AND FOOD STANDARD CODES 3.2.2 AND 3.2.3.

ISSUE	DATE	DESCRIPTION
A	14/12/22	ISSUED FOR DEVELOPMENT APPLICATION

ASSOCIATED CONSULTANTS

PLANNER	AVENUE TOWN PLANNING
ACCESS	ERGON CONSULTING
ACOUSTIC	DAY DESIGN
WASTE	DICKENS SOLUTIONS
LANDSCAPE	GREENSCAPE
QS	QPC&C
TRAFFIC	STANBURY TRAFFIC
SURVEY	MASRI SURVEY GROUP
STORMWATER	HORIZON ENGINEERS

INTERNAL STORAGE SCHEDULE

NAME	NO. CHLDRN	REQ VOL	VOL
INT ST 1	12	2.40 m³	5.40 m³
INT ST 2	20	4.00 m³	8.90 m³
INT ST 3	20	4.00 m³	14.90 m³
INT ST 4	10	2.00 m³	3.00 m³
INT ST 5	10	2.00 m³	10.55 m³
TOTAL	72	14.40 m³	42.75 m³

EXTERNAL STORAGE SCHEDULE

NAME	NO. CHLDRN	REQ VOL	VOL
EXT ST 1	42	12.60 m³	15.25 m³
EXT ST 2	30	9.00 m³	11.35 m³
TOTAL	72	21.60 m³	26.60 m³

INDOOR PLAYROOM SCHEDULE

ROOM	AGE	NO. CHLDRN	NO. STAFF	UNENCUMBERED REQ AREA	UNENCUMBERED AREA
PLAYROOM 1	AGE - 0-2	12	3	39 m²	47.30 m²
PLAYROOM 2	AGE 2-3	20	4	65 m²	71.45 m²
PLAYROOM 3	AGE 3-5	20	2	65 m²	71.60 m²
PLAYROOM 4	AGE 3-5	10	1	32.5 m²	37.05 m²
PLAYROOM 5	AGE 3-5	10	1	32.5 m²	33.30 m²
TOTAL		72	11	234 m²	260.65 m²

OUTDOOR PLAY AREA SCHEDULE

AREA	AGE	NO. CHLDRN	UNENCUMBERED REQ AREA	UNENCUMBERED AREA
OUTDOOR PLAY AREA 1	AGE - 2-5	30	210 m²	210.35 m²
OUTDOOR PLAY AREA 2	AGE 0-2	12	84 m²	85.60 m²
OUTDOOR PLAY AREA 3	AGE 3-5	30	210 m²	215.70 m²
TOTAL		72	504 m²	511.65 m²

PARKING SCHEDULE (1 SPACE PER 4 STAFF)

PARKING	NO. SPACES
ACCESSIBLE	1
STAFF	7
VISITOR	5
TOTAL	13

NOTES

- Any Discrepancies MUST be reported to the Architect.
- All work to Conform to relevant Australian Standards & Codes as applicable.
- This drawing is copyrighted© and must NOT be copied or reused without authority from ArtMade Architects
- Contractors to check all dimensions on site prior to commencing Construction.
- Do not scale from this drawing, use given written dimensions
- Drawing not for construction purposes

CLIENT

MR. MUHAMMAD & ALI TALEB

ARCHITECT

ArtMade Architects
|516/50 Holt St, Surry Hills NSW 2010
|P: 02 8760 9300 | hello@artmade.com.au | www.artmade.com.au

© COPYRIGHT

PROJECT

CHILDCARE CENTRE

PROJECT ADDRESS

78-80A BENAROON ROAD, LAKEMBA

SHEET NAME

BASEMENT FLOOR PLAN

ISSUED FOR DEVELOPMENT APPLICATION

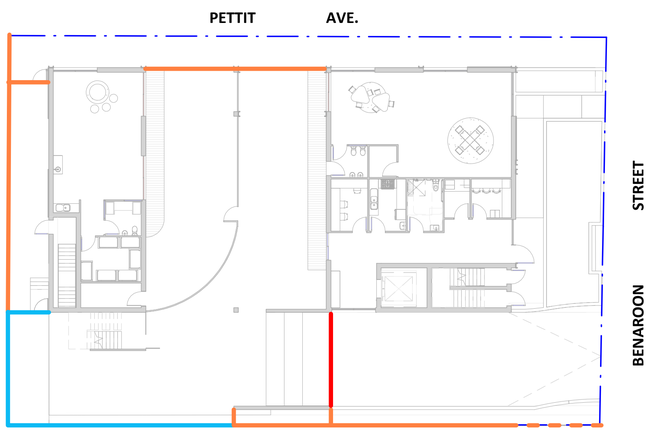
Project number	Sheet No.	Issue	Phase
23695	DA03.01	A	DA

Sheet Size	Scale	L.G.A.
A1	As indicated	CANTERBURY

Drawn By	Checked By	Date
KZ/MS	AS/SS	14/12/22

NOT FOR CONSTRUCTION

1 GROUND FLOOR PLAN
1 : 100



2 GROUND FLOOR FENCE / BARRIER DIAGRAM
1 : 200

FENCE / BALUSTRADE LEGEND

- 1.8M HT COLORBOND BOUNDARY FENCE
  REFER TO FENCE DETAILS- TYPE 3 (SHEET NO. A05.01)
- 1.2M HT COLORBOND FENCE
- 2.4M HT BOUNDARY FENCE / ACOUSTIC BARRIER
  REFER TO FENCE DETAILS- TYPE 2 (SHEET NO. A05.01)
- 1.8M HT BALUSTRADE / ACOUSTIC BARRIER
  REFER TO FENCE DETAILS- TYPE 1 (SHEET NO.)

NOTE:
- ALL ACOUSTIC BARRIERS IN ACCORDANCE WITH ACOUSTIC REPORT.
- REFER TO SHEET A05.01 FOR FENCE DETAILS.

0 1 2 3 4 5
1 : 100

ABBREVIATIONS

ENG.	- ENGINEER
ESL	- EXISTING SLAB LEVEL
EXT	- EXTERIOR
FFL	- FINISH FLOOR LEVEL
F.	- FIXED
FSL	- FINISH SURFACE LEVEL
GL	- GROUND LINE
GLZ	- GLAZING
EX.GL	- EXISTING GROUND LINE
REQ.	- REQUIREMENTS
XX.XX	- PROPOSED LEVEL
XX.XX	- EXISTING LEVEL
XX.XX	- SPOT LEVEL (PLAN)
XX.XX	- SPOT LEVEL (ELEVATION)

LANDSCAPE LEGEND

- EXISTING TREE / TREE TO BE RETAINED
- TREE TO BE REMOVED
- NEW TREE
- LANDSCAPING / BUFFER
- TURF
- EXTERNAL FLOOR FINISH
- LINE OF STRUCTURAL ROOT ZONE (SRZ)
- LINE OF TREE EXCLUSION ZONE (TEZ)
- LINE OF TREE PROTECTION ZONE (TPZ)

NOTE : REFER TO ARBORIST REPORT FOR FURTHER DETAILS

GENERAL NOTES

- ALL EXISTING BUILDING ELEMENTS TO BE CHECKED ON SITE U.N.O
- DEMOLITION TO BE IN ACCORDANCE WITH AUSTRALIAN STANDARDS AND TO BE CARRIED OUT BY A LICENCED CONTRACTOR U. N.O
- REFER TO SW DRAWINGS FOR DRAINAGE DESIGN.
- REFER TO LANDSCAPE DRAWINGS FOR LANDSCAPE DESIGN.
- KITCHEN AREA TO BE ACCORDANCE WITH NSW AS4674, FOOD ACT 2003, FOOD REGULATION 2015 AND FOOD STANDARD CODES 3.2.2 AND 3.2.3.

ISSUE	DATE	DESCRIPTION
A	14/12/22	ISSUED FOR DEVELOPMENT APPLICATION

ASSOCIATED CONSULTANTS

PLANNER	AVENUE TOWN PLANNING
ACCESS	ERGON CONSULTING
ACOUSTIC	DAY DESIGN
WASTE	DICKENS SOLUTIONS
LANDSCAPE	GREENSCAPE
QS	QPC&C
TRAFFIC	STANBURY TRAFFIC
SURVEY	MASRI SURVEY GROUP
STORMWATER	HORIZON ENGINEERS

NOTES
- Any Discrepancies MUST be reported to the Architect.
- All work to Conform to relevant Australian Standards & Codes as applicable.
- This drawing is copyrighted© and must NOT be copied or reused without authority from ArtMade Architects
- Contractors to check all dimensions on site prior to commencing Construction.
- Do not scale from this drawing, use given written dimensions
- Drawing not for construction purposes

INTERNAL STORAGE SCHEDULE			
NAME	NO. CHLDRN	REQ VOL	VOL
INT ST 1	12	2.40 m³	5.40 m³
INT ST 2	20	4.00 m³	8.90 m³
INT ST 3	20	4.00 m³	14.90 m³
INT ST 4	10	2.00 m³	3.00 m³
INT ST 5	10	2.00 m³	10.55 m³
TOTAL	72	14.40 m³	42.75 m³

EXTERNAL STORAGE SCHEDULE			
NAME	NO. CHLDRN	REQ VOL	VOL
EXT ST 1	42	12.60 m³	15.25 m³
EXT ST 2	30	9.00 m³	11.35 m³
TOTAL	72	21.60 m³	26.60 m³

INDOOR PLAYROOM SCHEDULE					
ROOM	AGE	NO. CHLDRN	NO. STAFF	UNENCUMBERED REQ AREA	UNENCUMBERED AREA
PLAYROOM 1	AGE - 0-2	12	3	39 m²	47.30 m²
PLAYROOM 2	AGE 2-3	20	4	65 m²	71.45 m²
PLAYROOM 3	AGE 3-5	20	2	65 m²	71.60 m²
PLAYROOM 4	AGE 3-5	10	1	32.5 m²	37.05 m²
PLAYROOM 5	AGE 3-5	10	1	32.5 m²	33.30 m²
TOTAL		72	11	234 m²	260.65 m²

OUTDOOR PLAY AREA SCHEDULE				
AREA	AGE	NO. CHLDRN	UNENCUMBERED REQ AREA	UNENCUMBERED AREA
OUTDOOR PLAY AREA 1	AGE - 2-5	30	210 m²	210.35 m²
OUTDOOR PLAY AREA 2	AGE 0-2	12	84 m²	85.60 m²
OUTDOOR PLAY AREA 3	AGE 3-5	30	210 m²	215.70 m²
TOTAL		72	504 m²	511.65 m²

PARKING SCHEDULE (1 SPACE PER 4 STAFF)	
PARKING	NO. SPACES
ACCESSIBLE	1
STAFF	7
VISITOR	5
TOTAL	13

NOT FOR CONSTRUCTION

CLIENT
MR. MUHAMMAD & ALI TALEB

ARCHITECT
ArtMade Architects
| 516/50 Holt St, Surry Hills NSW 2010
| P: 02 8760 9300 | hello@artmade.com.au | www.artmade.com.au

PROJECT
CHILDCARE CENTRE

PROJECT ADDRESS
78-80A BENAROON ROAD, LAKEMBA

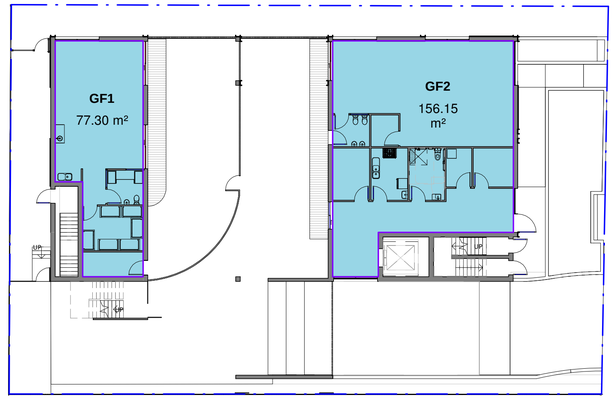
SHEET NAME
GROUND FLOOR PLAN

ISSUED FOR DEVELOPMENT APPLICATION

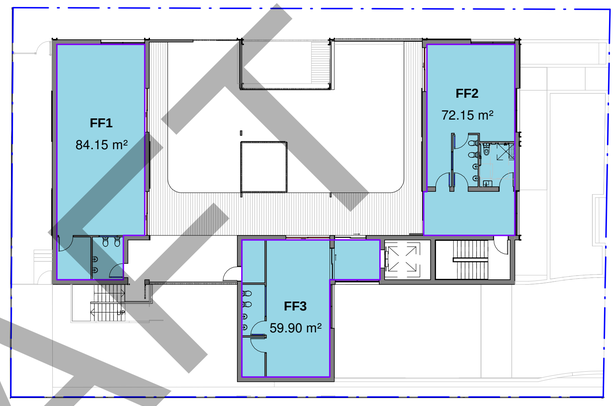
Project number	Sheet No.	Issue	Phase
23695	DA03.02	A	DA

Sheet Size	Scale	L.G.A.
A1	As indicated	CANTERBURY

Drawn By	Checked By	Date
KZ/MS	AS/SS	14/12/22



1 GROUND FLOOR LEVEL
1 : 200



2 FIRST FLOOR LEVEL
1 : 200

DCP - GFA (SITE AREA 984.6M²)	
PERMITTED AREA	MIN FSR
492.30 m²	0.5

PROPOSED - GFA			
Name	Level	Area	FSR
FF1	FIRST FLOOR LEVEL	84.15 m²	0.08548
FF2	FIRST FLOOR LEVEL	72.15 m²	0.073304
FF3	FIRST FLOOR LEVEL	59.90 m²	0.060838
GF1	GROUND FLOOR LEVEL	77.30 m²	0.078504
GF2	GROUND FLOOR LEVEL	156.15 m²	0.158584
TOTAL		449.70 m²	0.45671

NOT FOR CONSTRUCTION

0 1 2 4 6 8 10
1 : 200

ISSUE	DATE	DESCRIPTION
A	14/12/22	ISSUED FOR DEVELOPMENT APPLICATION

ASSOCIATED CONSULTANTS

PLANNER	AVENUE TOWN PLANNING
ACCESS	ERGON CONSULTING
ACOUSTIC	DAY DESIGN
WASTE	DICKENS SOLUTIONS
LANDSCAPE	GREENSCAPE
QS	QPC&C
TRAFFIC	STANBURY TRAFFIC
SURVEY	MASRI SURVEY GROUP
STORMWATER	HORIZON ENGINEERS

NOTES
- Any Discrepancies MUST be reported to the Architect.
- All work to Conform to relevant Australian Standards & Codes as applicable.
- This drawing is copyrighted© and must NOT be copied or reused without authority from ArtMade Architects
- Contractors to check all dimensions on site prior to commencing Construction.
- Do not scale from this drawing, use given written dimensions
- Drawing not for construction purposes

CLIENT

MR. MUHAMMAD & ALI TALEB

ARCHITECT

ArtMade Architects
|516/50 Holt St, Surry Hills NSW 2010
|P: 02 8760 9300 |hello@artmade.com.au | www.artmade.com.au

© COPYRIGHT

PROJECT

CHILDCARE CENTRE

PROJECT ADDRESS

78-80A BENAROON ROAD, LAKEMBA

SHEET NAME

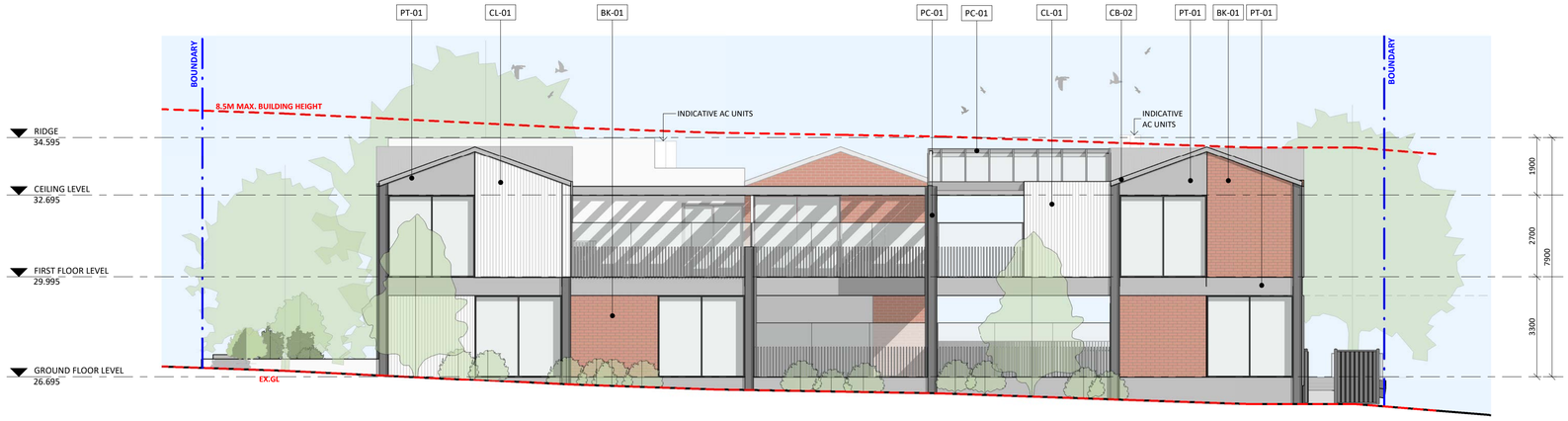
AREA CALCULATIONS

ISSUED FOR DEVELOPMENT APPLICATION

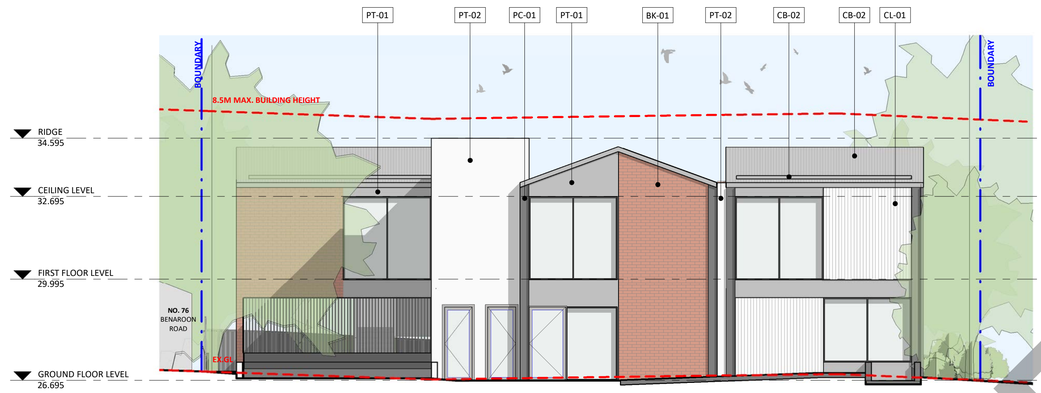
Project number	Sheet No.	Issue	Phase
23695	DA03.04	A	DA

Sheet Size	Scale	L.G.A.
A1	1 : 200	CANTERBURY

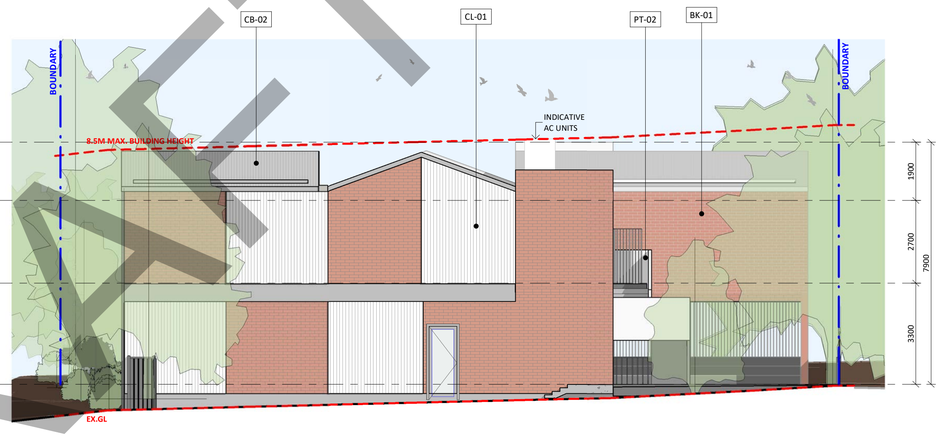
Drawn By	Checked By	Date
KZ/MS	AS/SS	14/12/22



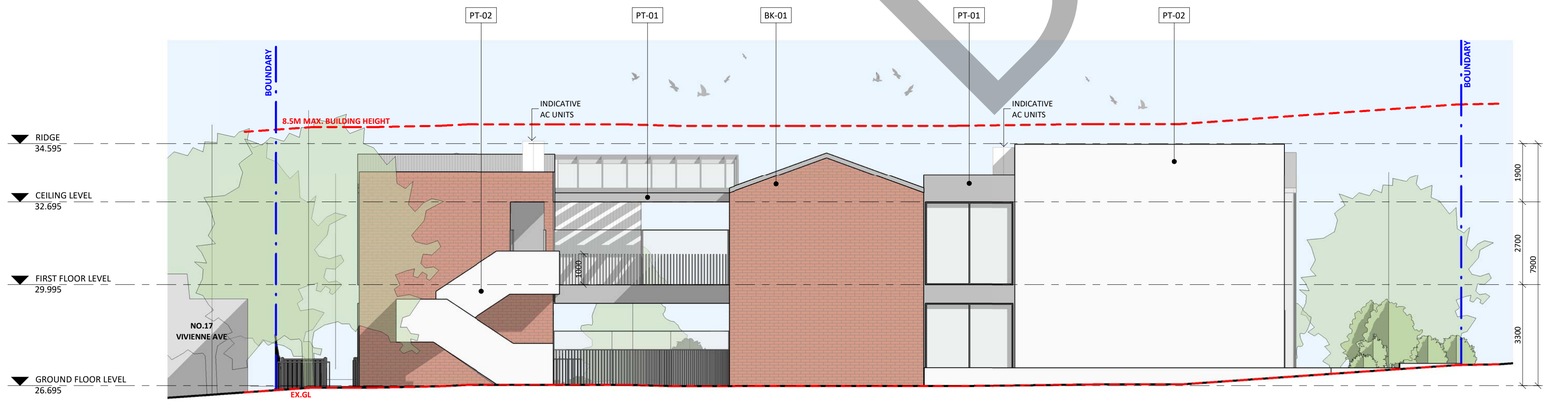
1 NORTH ELEVATION
1 : 100



2 EAST ELEVATION
1 : 100



3 WEST ELEVATION
1 : 100



4 SOUTH ELEVATION
1 : 100

ARTISTS IMPRESSION

0 1 2 3 4 5
1 : 100

EXTERNAL FINISHES

BK-01	BRICK AUSTRAL BRICK COLOUR: GIPPS OR SIMILAR
CB-01	GARAGE DOOR COLORBOND COLOUR: WOODLAND GREY OR SIMILAR
CB-02	ROOF,GUTTER, DOWNPIPES COLORBOND COLOUR: WOODLAND GREY OR SIMILAR
CL-01	CLADDING COLOUR: PALE EUCALYPT OR SIMILAR
PT-01	RENDER & PAINT DULUX COLOUR: WOODLAND GREY OR SIMILAR
PT-02	CEMENT RENDER DULUX COLOUR: SHALE GREY OR SIMILAR
PC-01	ALUMINIUM WINDOW, DOOR FRAMES & COLUMNS DURALLOY POWDERCOAT COLOUR: WOODLAND GREY OR SIMILAR
TB-01	TIMBER DECKING INNOWOOD COLOUR: WESTERN RED CEDAR OR SIMILAR

ISSUE	DATE	DESCRIPTION
A	14/12/22	ISSUED FOR DEVELOPMENT APPLICATION

ASSOCIATED CONSULTANTS

PLANNER	AVENUE TOWN PLANNING
ACCESS	ERGON CONSULTING
ACOUSTIC	DAY DESIGN
WASTE	DICKENS SOLUTIONS
LANDSCAPE	GREENSCAPE
QS	OPC&C
TRAFFIC	STANBURY TRAFFIC
SURVEY	MASRI SURVEY GROUP
STORMWATER	HORIZON ENGINEERS

NOTES

- Any Discrepancies MUST be reported to the Architect.
- All work to Conform to relevant Australian Standards & Codes as applicable.
- This drawing is copyrighted© and must NOT be copied or reused without authority from ArtMade Architects
- Contractors to check all dimensions on site prior to commencing Construction.
- Do not scale from this drawing, use given written dimensions
- Drawing not for construction purposes

CLIENT

MR. MUHAMMAD & ALI TALEB

ARCHITECT

ArtMade Architects
|516/50 Holt St, Surry Hills NSW 2010
|P: 02 8760 9300 |hello@artmade.com.au | www.artmade.com.au

PROJECT

CHILDCARE CENTRE

PROJECT ADDRESS

78-80A BENAROON ROAD, LAKEMBA

SHEET NAME

EXTERNAL ELEVATIONS

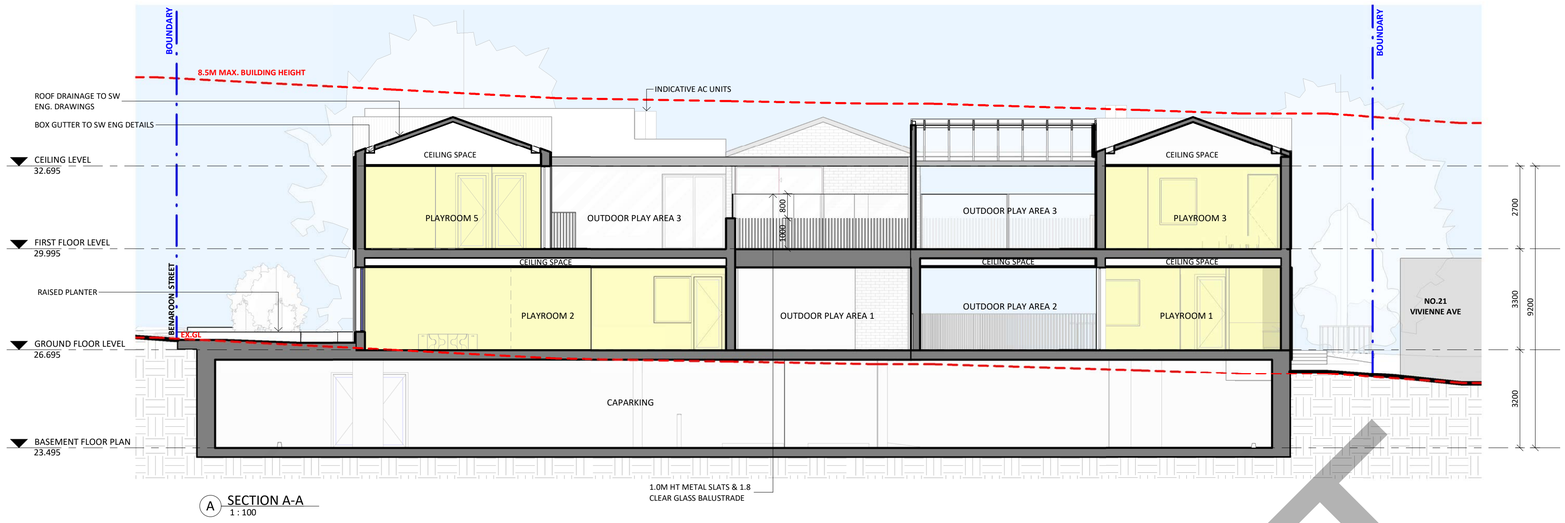
ISSUED FOR DEVELOPMENT APPLICATION

Project number	Sheet No.	Issue	Phase
23695	DA04.01	A	DA

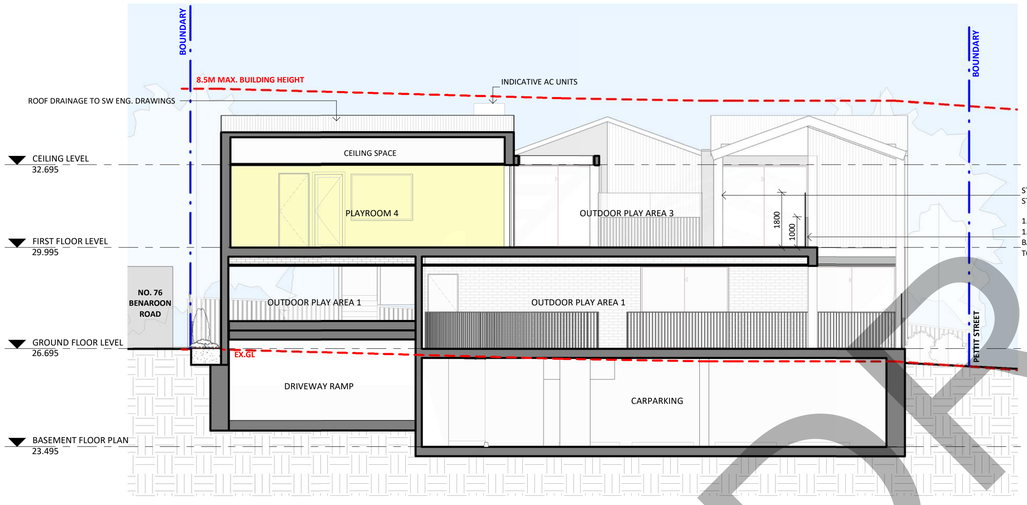
Sheet Size	Scale	L.G.A.
A1	1 : 100	CANTERBURY

Drawn By	Checked By	Date
KZ/MS	AS/SS	14/12/22

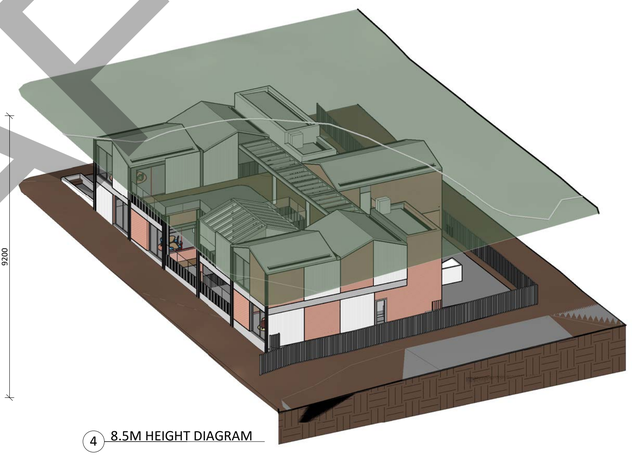
NOT FOR CONSTRUCTION



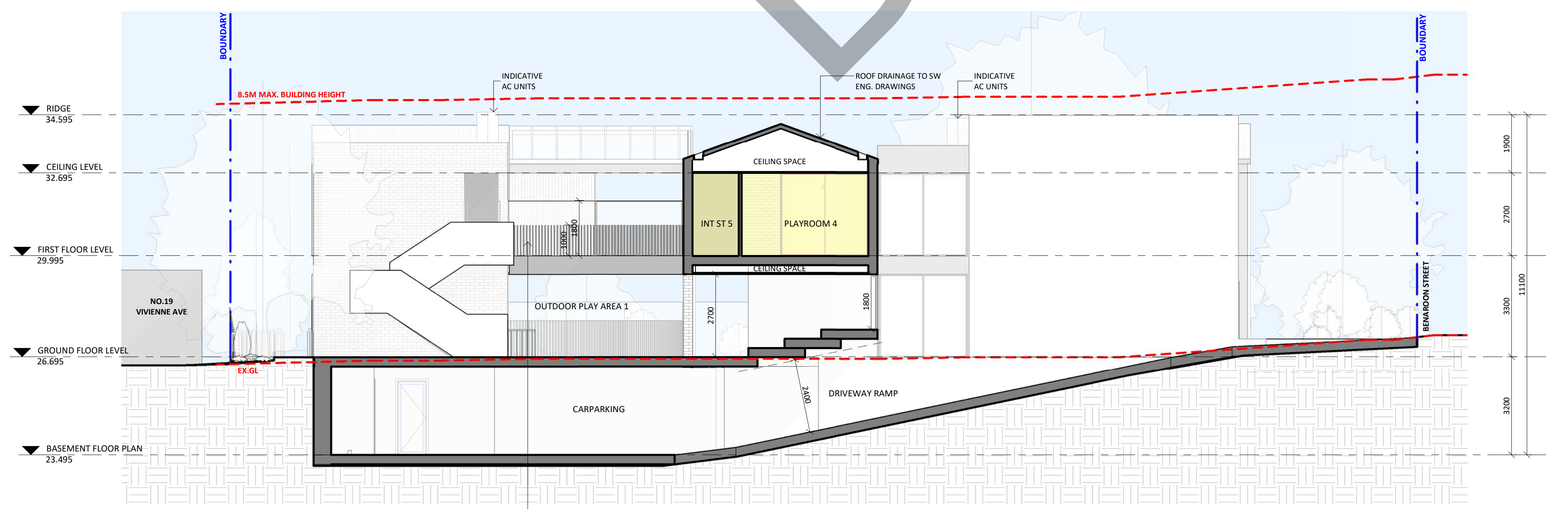
A SECTION A-A
1 : 100



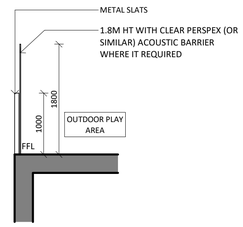
B SECTION B-B
1 : 100



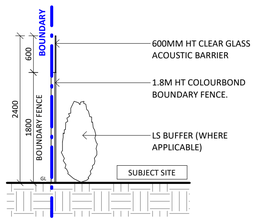
4 8.5M HEIGHT DIAGRAM



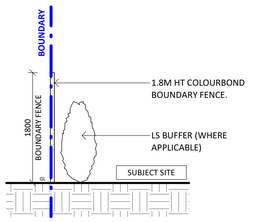
C SECTION C-C - DRIVEWAY SECTION
1 : 100



1 TYP. FENCE DETAILS - TYPE 1
1 : 50



2 TYP. FENCE DETAILS - TYPE 2
1 : 50



3 TYP. FENCE DETAILS - TYPE 3
1 : 50

NOT FOR CONSTRUCTION

0 1 2 3 4 5
1 : 100

EXTERNAL FINISHES

BK-01	BRICK AUSTRAL BRICK COLOUR: GIPPS OR SIMILAR
CB-01	GARAGE DOOR COLORBOND COLOUR: WOODLAND GREY OR SIMILAR
CB-02	ROOF,GUTTER, DOWNPIPES COLORBOND COLOUR: WOODLAND GREY OR SIMILAR
CL-01	CLADDING COLOUR: PALE EUCALYPT OR SIMILAR
PT-01	RENDER & PAINT DULUX COLOUR: WOODLAND GREY OR SIMILAR
PT-02	CEMENT RENDER DULUX COLOUR: SHALE GREY OR SIMILAR
PC-01	ALUMINIUM WINDOW, DOOR FRAMES & COLUMNS DURALLOY POWDERCOAT COLOUR: WOODLAND GREY OR SIMILAR
TB-01	TIMBER DECKING INNOWOOD COLOUR: WESTERN RED CEDAR OR SIMILAR

ISSUE	DATE	DESCRIPTION
A	14/12/22	ISSUED FOR DEVELOPMENT APPLICATION

ASSOCIATED CONSULTANTS

PLANNER	AVENUE TOWN PLANNING
ACCESS	ERGON CONSULTING
ACOUSTIC	DAY DESIGN
WASTE	DICKENS SOLUTIONS
LANDSCAPE	GREENSCAPE
QS	QPC&C
TRAFFIC	STANBURY TRAFFIC
SURVEY	MASRI SURVEY GROUP
STORMWATER	HORIZON ENGINEERS

NOTES
- Any Discrepancies MUST be reported to the Architect.
- All work to Conform to relevant Australian Standards & Codes as applicable.
- This drawing is copyrighted© and must NOT be copied or reused without authority from ArtMade Architects
- Contractors to check all dimensions on site prior to commencing Construction.
- Do not scale from this drawing, use given written dimensions
- Drawing not for construction purposes

CLIENT

MR. MUHAMMAD & ALI TALEB

ARCHITECT

ArtMade Architects
|S16/50 Holt St, Surry Hills NSW 2010
|P: 02 8760 9300 |hello@artmade.com.au | www.artmade.com.au

PROJECT

CHILDCARE CENTRE

PROJECT ADDRESS

78-80A BENAROON ROAD, LAKEMBA

SHEET NAME

SECTIONS & EXTERNAL FINISHES

ISSUED FOR DEVELOPMENT APPLICATION

Project number	Sheet No.	Issue	Phase
23695	DA05.01	A	DA

Sheet Size	Scale	L.G.A.
A1	As indicated	CANTERBURY

Drawn By	Checked By	Date
KZ/MS	AS/SS	14/12/22

Appendix D: Soil Landscapes

bt	BLACKTOWN	Residual

Landscape—gently undulating rises on Wianamatta Group shales. Local relief to 30 m, slopes usually >5%. Broad rounded crests and ridges with gently inclined slopes. Cleared Eucalypt woodland and tall open-forest (dry schlerophyll forest).

Soils—shallow to moderately deep (>100 cm) hardsetting mottled texture contrast soils, red and brown podzolic soils (Dr3.21, Dr3.31, Db2.11, Db2.21) on crests grading to yellow podzolic soils (Dy2.11, Dy3.11) on lower slopes and in drainage lines.

Limitations—localised seasonal waterlogging, localised water erosion hazard, moderately reactive highly plastic subsoil, localised surface movement potential.

LOCATION

Occurs extensively on the Cumberland Lowlands. Examples include Blacktown, Mount Druitt, Glossodia and Leppington.

Isolated examples are found at Bilpin on the Blue Mountains plateau surface and along the Silverdale Road south of Wallacia.

LANDSCAPE

Geology

Wianamatta Group—Ashfield Shale consisting of laminite and dark grey siltstone, Bringelly Shale which consists of shale with occasional calcareous claystone, laminite and infrequent coal, and Minchinbury Sandstone consisting of fine to medium-grained quartz lithic sandstone.

Topography

Gently undulating rises on Wianamatta Shale with local relief 10–30 m and slopes generally >5% but occasionally up to 10%. Crests and ridges are broad (200–600 m) and rounded with convex upper slopes grading into concave lower slopes. Outcrops of shale do not occur naturally on the surface. They may occur, however, where soils have been removed.

Vegetation

Almost completely cleared open-forest and open-woodland (dry sclerophyll forest). The original woodland and open-forest were dominated by *Eucalyptus tereticornis* (forest red gum), *E. crebra* (narrow-leaved ironbark), *E. moluccana* (grey box) and *E. maculata* (spotted gum) (Benson, 1981).

Further west near Penrith remnant stands of *E. punctata* (grey gum) occur. Between Liverpool and St Marys the dominant species are *E. globoidea* (white stringybark) and *E. fibrosa* (broad-leaved ironbark), with *E. longifolia* (woollybutt) as an understorey species. Individual trees or small stands of *E. sideroxylon* (mugga ironbark) are occasionally found on crests.

Landuse

The dominant landuses are intensive residential (Fairfield, Blacktown and Mt Druitt), horticulture and animal husbandry (Vineyard, Scheyville and Leppington) and light and heavy industry (Yennora and Moorebank).

Existing Erosion

No appreciable erosion occurs on this unit. Minor sheet and gully erosion may be found where surface vegetation is not maintained.

Associated Soil Landscapes

South Creek (**sc**) soil landscape occurs along drainage depressions. Picton (**pn**) soil landscape occurs on steeper south and southeast facing slopes. Small areas of Luddenham (**lu**) soil landscape may also occur.

SOILS

Dominant Soil Materials

bt1—Friable brownish black loam.

This is a friable brownish black loam to clay loam with moderately pedal subangular blocky structure and rough-faced porous ped fabric. This material occurs as topsoil (A horizon).

Peds are well defined subangular blocky and range in size from 2 mm to 20 mm. Surface condition is friable. Colour is brownish black (10YR 2/2) but can range from dark reddish brown (5YR 3/2) to dark yellowish brown (10YR 3/4). The pH varies from moderately acid (pH 5.5) to neutral (pH 7.0). Rounded iron indurated fine gravel-sized shale fragments and charcoal fragments are sometimes present. Roots are common.

bt2—Hardsetting brown clay loam.

This is a brown clay loam to silty clay loam which is hardsetting on exposure or when completely dried out. It has apedal massive to weakly pedal structure and slowly porous earthy fabric. It occurs as an A2 horizon.

Peds when present are weakly developed, subangular blocky and are rough faced and porous. They range in size between 20–50 mm. This material is water repellent when extremely dry.

Colour is dark brown (7.5YR 4/3) but can range from dark reddish brown (2.5YR 3/3) to dark brown (10YR 3/3). The pH varies from moderately acid (pH 5.0) to slightly acid (pH 6.5). Platy, iron indurated gravel-sized shale fragments are common. Charcoal fragments and roots are rarely present.

bt3—Strongly pedal, mottled brown light clay.

This is a brown light to medium clay with strongly pedal polyhedral or sub-angular to blocky structure and smooth-faced dense ped fabric. This material usually occurs as subsoil (B horizon).

Texture often increases with depth. Peds range in size from 5–20 mm. Colour is brown (7.5YR 4/6) but may range from reddish brown (2.5YR 4/6) to brown (10YR 4/6). Frequent red, yellow or grey mottles occur

often becoming more numerous with depth. The pH varies from strongly acid (pH 4.5) to slightly acid (pH 6.5). Fine to coarse gravel-sized shale fragments are common and often occur in stratified bands. Both roots and charcoal fragments are rare.

bt4—Light grey plastic mottled clay.

This is a plastic light grey silty clay to heavy clay with moderately pedal polyhedral to subangular blocky structure and smoothfaced dense ped fabric. This material usually occurs as deep subsoil above shale bedrock (B3 or C horizon).

Peds range in size from 2–20 mm. Colour is usually light grey (10YR 7/1) or, less commonly, greyish yellow (2.5YR 6/2). Red, yellow or grey mottles are common. The pH varies from strongly acid (pH 4.0) to moderately acid (pH 5.5). Strongly weathered ironstone concretions and rock fragments are common. Gravel-sized shale fragments and roots are occasionally present. Charcoal fragments are rare.

Occurrence and Relationships

Crests. On crests and ridges up to 30 cm of friable brownish black loam (**bt1**) overlies 10–20 cm of hardsetting brown clay loam (**bt2**) and up to 90 cm of strongly pedal, brown mottled light clay (**bt3**) [red podzolic soils (Dr 3.21, 3.11) and brown podzolic soils (Db 2.11)]. **bt1** is occasionally absent. Boundaries between the soil materials are usually clear. Total soil depth is <100 cm.

Upper slopes and Midslopes. Up to 30 cm of **bt1** overlies 10–20 cm of **bt2** and 20–50 cm of **bt5**. This in turn overlies up to 100 cm of a light grey plastic mottled clay (**bt4**) [red podzolic soils (Dr 3.21), brown podzolic soils (Db 2.21). Occasionally **bt1** is absent. The boundaries between the soil materials are usually clear. Total soil depth is<200 cm.

Lower sideslopes. Up to 30 cm of **bt1** overlies 10–30 cm of **bt2** and 40–100 cm of **bt3**. Below **bt3** there is usually >100 cm of **bt4** [yellow podzolic soils Dy 2.11, Dy 3.11)]. The boundaries between the soil materials are clear. Total soil depth is >200 cm.

LIMITATIONS TO DEVELOPMENT

Soil Limitations

btl Strongly acid

bt2 Hardsetting
Low fertility
Strongly acid
High aluminium toxicity

bt3 High shrink-swell (localised)
Low wet strength
Low permeability
Low available water capacity
Salinity (localised)
Sodicity (localised)
Very low fertility
Very strongly acid
Very high aluminium toxicity

bt4 High shrink-swell (localised)
Low wet strength
Stoniness
Low available water capacity
Low permeability
Salinity (localised)
Sodicity (localised)
Low fertility
Strongly acid
Very high aluminium toxicity
High erodibility (localised)

Fertility

General fertility is low to moderate. Soil materials have low to moderate available water capacity, low CEC values, hardsetting surfaces (**bt2**), very low phosphorus and low to very low nitrogen levels. The subsoils (**bt3**, **bt4**) may be locally sodic with low permeability. When **bt1** is present its higher organic matter content and moderate nitrogen levels result in higher general fertility.

Erodibility

Blacktown soil materials have moderate erodibility. The topsoils (**bt1**, **bt2**) are often hardsetting and they have high fine sand and silt content but they also have high to moderate organic matter content. The subsoils (**bt3**, **bt4**) are very low in organic matter. Where they are also highly dispersible and occasionally sodic the erodibility is high.

Erosion Hazard

The erosion hazard for non-concentrated flows is slight to moderate but ranges from low to very high. Calculated soil loss during the first twelve months of urban development for topsoil and exposed subsoil tends to be low (7–11 t/ha). Soil erosion hazard for concentrated flows is moderate to high.

Surface Movement Potential

The deep clay soils are moderately reactive. These are generally found on side-slopes and footslopes. Shallower soils on forests are slightly reactive.

Landscape Limitations

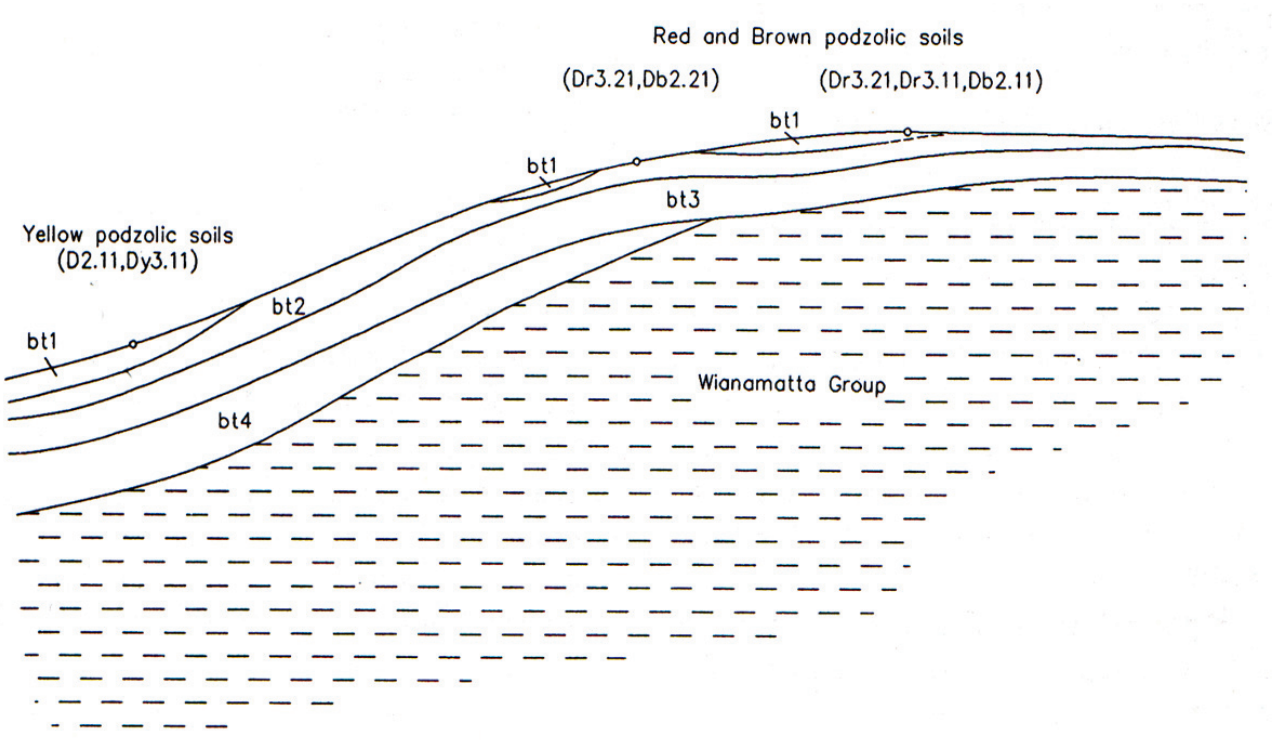
Seasonal waterlogging (localised), water erosion hazard (localised), surface movement potential (localised).

Urban Capability

High capability for urban development with appropriate foundation design.

Rural Capability

Small portions of this soil landscape which have not been urbanised are capable of sustaining regular cultivation and grazing.



Distribution diagram of the Blacktown soil landscape showing the occurrence and relationship of dominant soil materials.