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FLOOD STUDY REPORT

91-93 MCINTOSH ROAD NARRAWEENA

DEVELOPMENT APPLICATION

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Appendix B	Survey plan
Appendix C	Architectural plans prepared by Benson McCormack Architecture
Appendix D	Council Flood Information Request;
Appendix E	Upstream Catchment Plan
Appendix F	Stormwater Survey prepared by Robert Friend Surveys Pty Ltd
Appendix G	Pre-developed DRAINS model Data and Results
Appendix H	Post-developed DRAINS model Data and Results

1.0 Introduction

Dawes Consulting Engineers (DCE) has been commissioned by Dreambuild Pty Ltd to undertake the stormwater deign and flood analysis assessment for the proposed residential development at 91-93 McIntosh Road Narraweena to support the Development Application.

The development will comprise of nine (9) residential units, retail and commercial spaces and basement car parking.

This report is intended to provide information to Northern Beaches Council on the results of the flood analysis as the development comprises an existing stormwater drainage pipe through the site and to also provide an assessment on the proposed building and basement carparking with regards to overland flow. In particular the report addresses:

- the upstream catchment extent;
- the upstream catchment runoff affecting the development site;
- the pre and post developed pipe and overland flow affecting the site; and
- the comparison between the pre and post developed scenarios for the site.

2.0 Related Documents

This report is to be read in conjunction with the following documents:

1. Development Application documentation prepared by Dawes Consulting Engineers, presented in **Appendix A**:
    - 18010-DA-C1.01 Cover Sheet;
    - 18010-DA-C2.01 Concept Sediment and Erosion Control Plan;
    - 18010-DA-C2.02 Sediment and Erosion Control Details
    - 18010-DA-C3.01 Concept Stormwater Management Plan – Ground Floor;
    - 18010-DA-C3.02 Concept Stormwater Management Plan – Basement Level;
    - 18010-DA-C4.01 Driveway Longitudinal Sections;
    - 18010-DA-C4.02 Stormwater Longitudinal Section;
    - 18010-DA-C5.01 Details Sheet.
2. Northern Beaches Council Development Controls;
3. Northern Beaches Flood Mapping Tool;
4. Northern Beaches Flood Information Request;
5. Warringah Council Local Environmental Plan 2011;
6. Warringah Council Development Control Plan 2011;
7. Warringah Council Water Management Policy.

3.0 Existing Site Description

The site is located at 91-93 McIntosh Road Narraweena, also known as DP868560 and is within the Northern Beaches Council Local Government Area (LGA). The subject site is approximately 786m² in area and is bound by McIntosh Road to the north, Alfred Street to the west and existing residential dwellings to the South and East.

Currently there exists multiple commercial and retail facilities at the site which will all be demolished as part of the proposed development works. The site generally falls from the street frontage to the rear of the property with the low point being approximately RL72.22 in the south east corner of the site.

There is an existing DN750mm stormwater pipe that traverses the subject site in a west to east direction, before increasing to a DN825mm directly downstream. A CCTV investigation has also been undertaken to verify the existing stormwater infrastructure (refer *Figure 5* for results).

As part of the future development, the existing drainage pipe is proposed to be diverted along the southern boundary of the subject site including new stormwater pits and a designated drainage easement as shown on 18010-DA-C3.01 and 18010-DA-C3.02.

The subject site can be viewed on the survey plan which is presented in **Appendix B** and *Figure 1*.

Figure 1 – Site Locality

Source: Sixmaps 19/10/18

Utilising Council's online Flood Mapping tool, the subject site was determined to be within the *Low Risk Flood Planning Precinct* as shown in *Figure 2*.

Figure 2 – Low Risk Flood Planning Precinct

An initial assessment has determined that any overland flow from the upstream catchment does not travel through the subject site due to the following reasons:

- There is an existing kerb inlet pit (sag) fronting the development site in Alfred Street. The drainage pit forms the beginning of the stormwater network through the site;
- The reduced level of the sag stormwater pit is RL73.35;
- The reduced levels of the existing retail and commercial spaces and adjacent pathway are approximately RL73.86;
- Any overland flow resulting from upwelling of the sag pit cannot enter the site due to the building frontages;
- Any overland flow will top the kerb and travel down the existing overland flow path adjacent the subject site.

4.0 Proposed Development

The proposed development consists of nine (9) residential units, commercial and retail spaces and basement carparking. The proposed development plans prepared by Benson McCormack Architecture are presented in **Appendix C**.

The following summarise the proposed stormwater system:

- The existing DN750 diameter stormwater pipe that traverses the subject site is proposed to be diverted around the southern boundary of the site as shown on 18010-DA-C3.01 and 18010-DA-C3.02;
- The existing overland flow condition is proposed to be maintained and restrict overland flow from entering the site to ensure downstream flow conditions are not adversely affected;
- No On-site Stormwater Detention is required in accordance with Councils advise;
- No Rainwater Tank is provided in accordance with BASIX and Council requirements;

- The impervious areas within the site will remain the same in the pre and post developed conditions maintaining site runoff;
- Site discharge will connect into the proposed easement running through the site maintaining existing discharge conditions.

5.0 Methodology

To determine the pre and post developed flooding extent the following methodology was undertaken:

- Utilising Council's online Flood Mapping tool, the subject site was determined to be within the '*Low Risk Flood Planning Precinct*';
- Request flood information from Council;
- An upstream catchment plan for the subject site was generated using existing GIS contour survey information and aerial information;
- A computer based hydrological model of the catchment and existing drainage network was constructed using DRAINS. Design storms were applied to the model to provide estimates of the 100 year ARI pipe flow and overland flow discharges at the subject site in the pre-development condition;
- A second DRAINS model was constructed to assess the post-developed condition by amending the pre-developed model with the proposed drainage infrastructure;
- The proposed stormwater drainage system was designed and amendments made to the post-developed model to ensure no adverse impacts on the downstream properties; and
- Finished floor levels and protection to building openings were assessed, including freeboard, within the development to ensure no internal inundation from overland flow.

5.1 Council Requirements

Council's requirements and guidelines state that as part of the development application process a Flood Risk Management Plan must be submitted for assessment. The objectives of the policy are:

- To ensure a sustainable and holistic catchment wide approach is taken to development, of both private land uses and public facilities, on flood prone land;
- To increase public awareness of the hazard and extent of land affected by all potential floods, including floods greater than the 1% AEP flood;
- To ensure the flood risk associated with development is minimised;
- To manage the risk to life, damage to property and impacts on the natural environment caused by flooding and inundation by controlling development on flood prone land;
- To ensure the development is compatible with the flood risk through the application of risk-based controls that take into account social, economic, ecological and design considerations;
- To ensure that proposed development does not expose existing development to increased risks associated with flooding;
- To ensure that effective development controls apply so that development is carried out in accordance with these objectives;
- To ensure that the preparation of flood related information required to be lodged are carried out by suitably qualified professionals with appropriate expertise in the applicable areas of engineering.

5.2 Council Flood Information Request

A Flood Information Request was submitted to Council with the following information provided.

- 1% AEP Water Level (Alfred Street)– 74.27m AHD;
- 1% AEP Flood Hazard – Medium Flood Risk;
- Flood Planning Level (floor levels) – 74.77m AHD (500mm freeboard);
- PMP Maximum Water Level – 75.00m AHD;
- 1% AEP Water Level (McIntosh Road) – 73.90m AHD;
- Flood Planning Level (driveway) – 74.20m AHD (300mm freeboard);

The Flood Information Request is presented in **Appendix D**.

The stormwater design has been undertaken to maintain the existing stormwater and flooding conditions to maintain the existing Flood Information results. The flood planning levels provided have been used to determine flooring and driveway crest levels.

6.0 Hydrological Analysis and Modelling

To determine the amount of upstream runoff affecting the subject site and design the stormwater diversion an upstream catchment analysis was undertaken and modelled using DRAINS computer software. No overland flow assessment was undertaken through the site as overland flow will be restricted from travelling through the site to maintain existing overland flow conditions and protect downstream properties from increased flood risk and flood levels.

6.1 Catchment Analysis

The total upstream catchment has been determined to be approximately 10.95 hectares (ha) in area and extends in a south-west direction from the subject site. The upstream catchment is presented in **Appendix E** of the report.

The existing stormwater drainage infrastructure traversing the site can be viewed on the survey plan in **Appendix B** as well as Stormwater survey presented in **Appendix F**. For unknown pipe sizes, the smaller pipe size has been adopted.

6.2 Data Input

A DRAINS model was developed to determine the pipe and overland flow rates. The following data was input into the model:

- Rainfall Data - Rainfall data was determined using Australian Rainfall & Runoff 1987 parameters;
- Minor Storm Event (ARI) – 5 years;
- Major Storm Event (ARI) - 100 years;
- Design Storm - It is noted that the 5 year ARI storm was run with 100% blockage however the 100 year ARI storm with 50% blockage was the worst case;
- Inlet pit blockage – 50% was adopted as the design storm as it was the worst case;
- Soil Type - 3;
- Antecedent Moisture Condition - 3;
- Paved and grassed storage area depressions of 1mm and 5mm respectively;

- Pipe friction - The pipe roughness value used was 0.013 (Manning's formula);
- Pit pressure head coefficient (k) - The k values have been calculated using the QUDM method in DRAINS;
- Impervious percentages for the upstream catchment have been calculated for the upstream catchment and are represented in Table 1 below.

Table 1 – DRAINS Catchment Data

Catchment	Area (ha)	Impervious %	Flow Path Length (m)	Flow Path Slope (%)	Flow Path Roughness (n*)	
					Imp	Per
C1	0.09	100	35	1.0	0.013	0.035
C1A	5.41	80	485	2.6	0.013	0.035
C2	5.41	80	735	8.0	0.013	0.035
C3	0.04	100	12.5	0.2	0.013	0.035

Note: (IMP – Impervious)

An overview of the Pre-Developed Model and Data is presented in *Figure 3*.

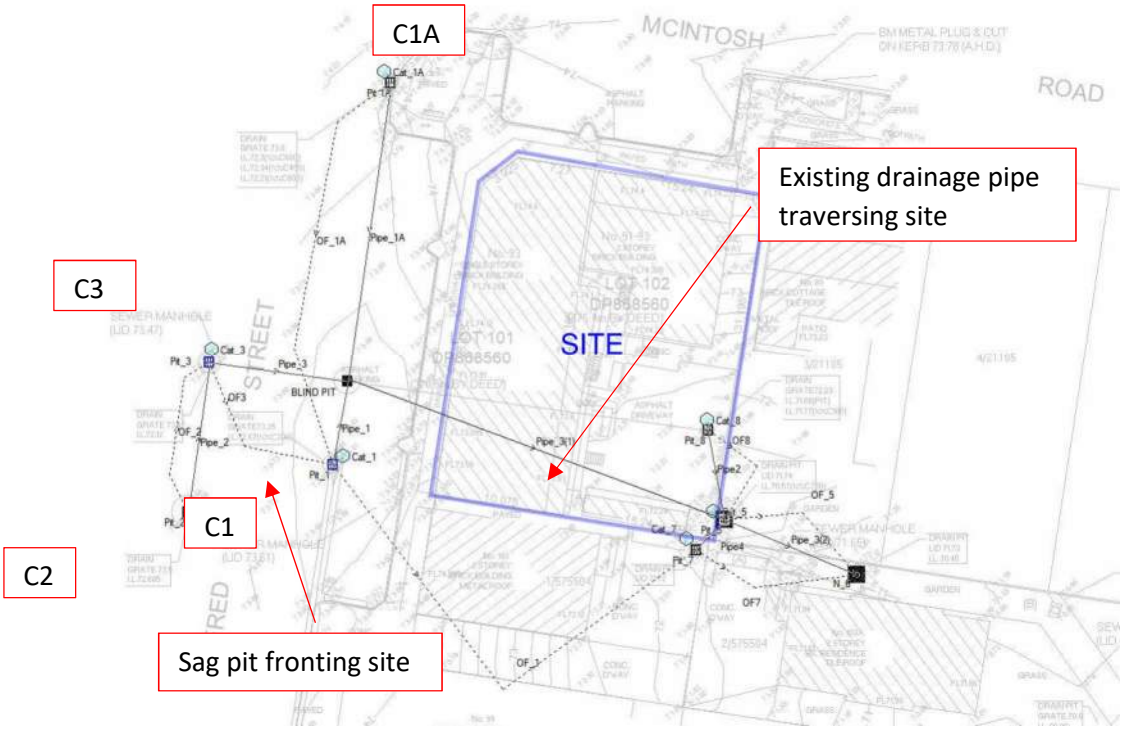

Figure 3 - Pre-Developed Model Data

6.3 Pre-Developed Model Results

The results of the pre-developed model are presented in *Figure 4*.

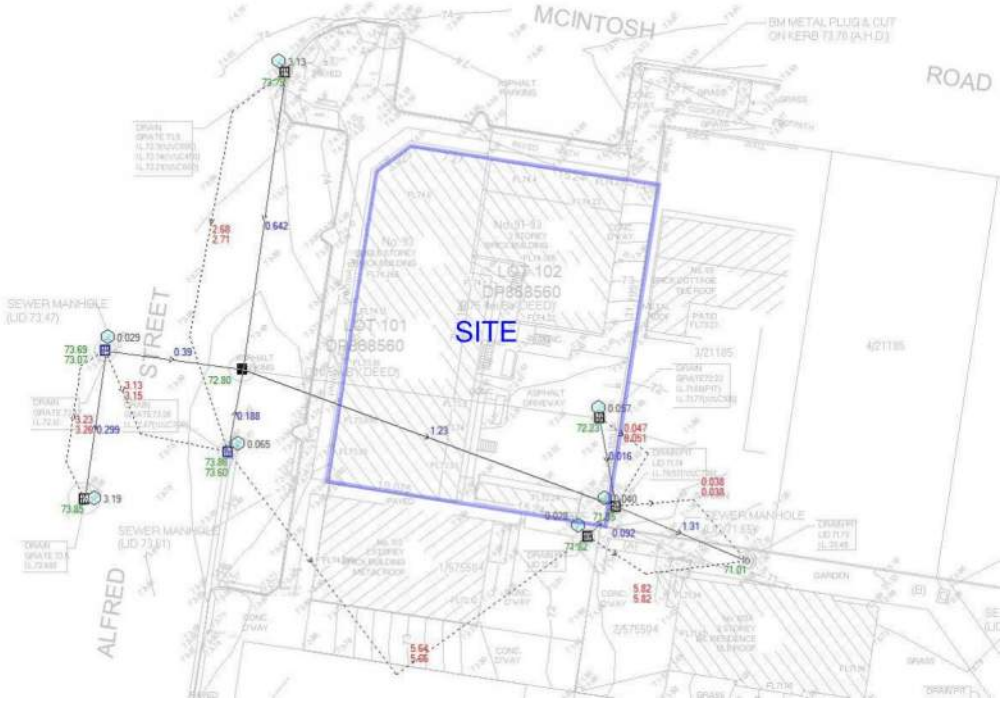

Figure 4 – Pre-Developed Model Results

The results in Table 2 below show the following pipe and overland flows affecting the site:

Table 2 – DRAINS Pre-developed Model Results

	Flow (m^3/s)
Pipe Flow	1.23
Overland Flow Directly Adjacent Site	5.66
Total Flow Downstream of Site	7.17

Due to the existing road levels in Alfred Street, it is likely that any overland flow in larger storm events will overtop the kerb and travel down the existing paved pathway adjacent the subject site. Due to the existing building footprint, the site is, at present, not affected by overland flow from the upstream catchment.

The existing stormwater drainage network in the predeveloped scenario is presented in *Figure 5*.

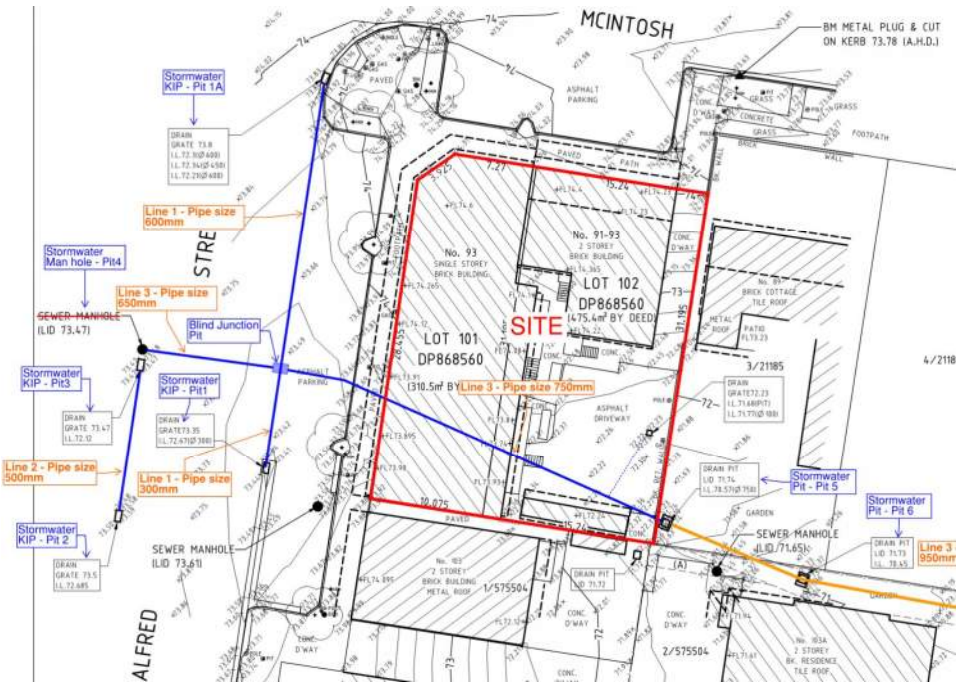

Figure 5 - Existing Stormwater Network (Pre-Developed)

The pre-developed data and results are presented in **Appendix G**.

6.4 Post-Developed Model Results

The results of the post-developed model are presented in *Figure 6* below.

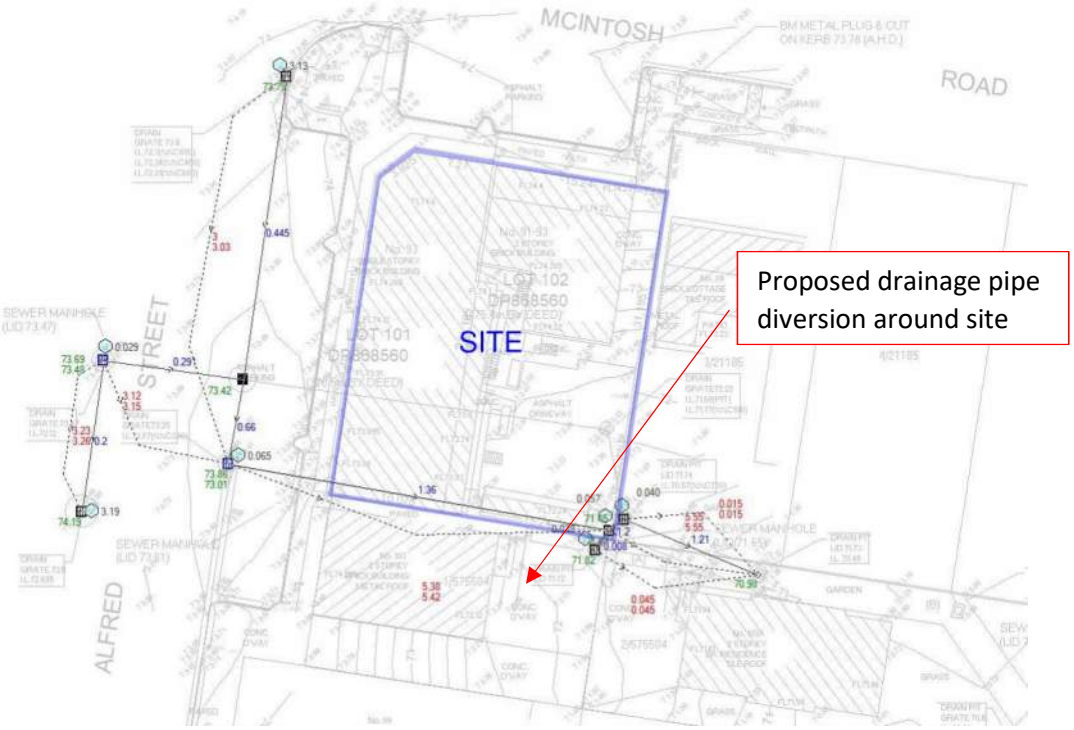

Figure 6 - Post-Developed Model Results

The results show the following pipe and overland flows affecting the site:

Table 3 – DRAINS Post-developed Model Results

	Flow (m^3/s)
Pipe Flow	1.36
Overland Flow Directly Adjacent Site	5.42
Total Flow Downstream of Site	6.82

The post-developed data and results are presented in **Appendix H**.

6.5 Model Comparison

Table 4 presents the comparison between the pre and post developed models. The results show a minor increase in the pipe capacity and reduction in overland flow. This is due to the improved hydraulic arrangement of the network. Overall, the drainage network is slightly improved in the post developed scenario. Refer to *Table 4* for a model comparison.

Table 4 – DRAINS Pre and Post Model Results

	Pre-developed	**Post-developed**
Pipe Flow	1.23	1.36
Overland Flow Directly Adjacent Site	5.66	5.42
Total Flow Downstream of Site	7.17	6.82

The results show an improvement in pre to post overland flow conditions and an increase in pipe capacity. This is a result of the upgrade to the pipe system.

6.6 Hydraulic Grade Line Analysis and Freeboard Assessment

DRAINS was used to assess the worst case HGL within the drainage network to check against the proposed Flood Planning level and Finished Floor Levels. The maximum HGL level in the system was determined to be RL73.79.

All Finished Floor levels are currently set at the Flood Planning Level of RL 74.77m which is above the HGL level plus freeboard. *Table 5* outlines the results.

Table 5 – DRAINS Water Level Results

Worst Case HGL	RL73.86m
Min Property RL	RL74.77m
Freeboard	0.91m

Due to the proposed driveway location and level, overland flow was considered to ensure water will not enter the new basement carparking. The flood level provided by Councils Flood Information indicates a flood level of RL 73.90m. The driveway ramp has been designed with a crest at RL74.20, providing 0.3m freeboard.

7.0 Flood Risk Management

The results presented above also indicate that, as part of the proposed development, there is no change to the existing overland flow path adjacent to the site. The driveway has been located outside of the critical overland flow path to omit any risk associated with flood waters entering the basement carpark. The minimum habitable floor level is to be set at RL77.47, also providing a sufficient freeboard to the top water level in the 100 year storm event.

7.1 Flood Mitigation Measures

With reference to the architectural drawings presented in **Appendix C**, the minimum floor level and driveway level is to be RL74.77 and RL74.20 respectively. These levels provide sufficient freeboard in accordance with Council's requirements.

To ensure overland flow does not enter the site along the proposed easement, a structurally designed flood protection gate is proposed at the easement boundary. The gate will be operable to provide access to the easement for Council maintenance. Refer to the civil drawings in **Appendix A**.

8.0 Conclusion

Dawes Consulting Engineers has prepared this stormwater assessment report to demonstrate the findings and results of the overland flow for 91-93 McIntosh Road Narraweena to assist Council in assessing the Development Application.

The findings of this report demonstrate the following:

- Overland flow from the upstream catchment does traverse the subject site in the pre and post developed conditions;
- The diversion results in a minor increase in pipe capacity and reduction in overland flow in the post-developed condition;
- A minimum 500mm freeboard is provided to the proposed adjacent floor levels in accordance with Council's Policy;
- A minimum 300mm freeboard is provided to the proposed basement parking in accordance with Council's Policy;

Based on the above results, there are no adverse effects on the proposed development or neighbouring properties as a result of the development or pipe realignment. The above findings have been undertaken in relation to the Development Application design and are subject to detailed evaluation in the construction certificate detailed design phase.

APPENDIX A

91-93 MCINTOSH ROAD, NARRAWEENA

CONCEPT STORMWATER MANAGEMENT PLAN

DEVELOPMENT APPLICATION

SOURCE : GOOGLE MAPS (©2016)

LOCALITY MAP

NOT TO SCALE

DRAWING SCHEDULE

18010-DA-C1.01	COVER SHEET
18010-DA-C2.01	CONCEPT SEDIMENT AND EROSION CONTROL PLAN
18010-DA-C2.02	SEDIMENT AND EROSION CONTROL DETAILS
18010-DA-C3.01	CONCEPT STORMWATER MANAGEMENT PLAN - GROUND FLOOR
18010-DA-C3.02	CONCEPT STORMWATER MANAGEMENT PLAN - BASEMENT LEVEL
18010-DA-C4.01	DRIVEWAY LONGITUDINAL SECTIONS
18010-DA-C4.02	STORMWATER LONGSECTION
18010-DA-C5.01	DETAILS SHEET

REV	DATE	ISSUE DESCRIPTION	DRN	DES	VER
3	19.10.18	ISSUED FOR DEVELOPMENT APPLICATION	AD	AD	AD
2	10.09.18	ISSUED FOR DEVELOPMENT APPLICATION	AD	AD	AD
1	23.05.18	ISSUED FOR INFORMATION	AD	AD	AD

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SCALE:

PROJECT: 91-93 MCINTOSH ROAD NARRAWEENA, NSW

DRAWING: COVER SHEET

NORTH

CLIENT: DREAM BUILD

ARCHITECT: BENSON McCORMACK ARCHITECTS

STATUS: ISSUED FOR APPROVAL

NOT TO BE USED FOR CONSTRUCTION

SIZE: A1 | DRAWING NUMBER: 18010-DA-C1.01 | REVISION: 03

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150mm ON A1 ORIGINAL

SEDIMENT & EROSION NOTES

1. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE ESTABLISHMENT AND MAINTENANCE OF EROSION AND SEDIMENTATION THROUGHOUT THE CONTRACT IN ACCORDANCE WITH:
   - A. LOCAL AUTHORITY REQUIREMENTS
   - B. EPA REQUIREMENTS
   - C. NSW DEPARTMENT OF HOUSING MANUAL "MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION", 4th EDITION, MARCH 2004 ("THE BLUE BOOK".)

2. THE EROSION AND SEDIMENTATION CONTROLS SHOWN ON THE DRAWINGS REPRESENT CONCEPTS ONLY TO DEMONSTRATE THE MINIMUM REQUIREMENTS.

3. MAINTAIN THE EROSION CONTROL DEVICES AT ALL TIMES TO THE SATISFACTION OF THE SUPERINTENDENT AND THE LOCAL AUTHORITY.

4. AS STORMWATER PITS ARE CONSTRUCTED, PREVENT SITE RUNOFF ENTERING UNLESS SEDIMENT FENCES ARE ERECTED AROUND PITS.

5. WATER WILL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS IT IS RELATIVELY SEDIMENT FREE, I.E. THE CATCHMENT AREA HAS BEEN PERMANENTLY LANDSCAPED AND/OR ANY LIKELY SEDIMENT HAS BEEN FILTERED THROUGH AN APPROVED STRUCTURE.

6. DURING WINDY WEATHER, LARGE, UNPROTECTED AREAS WILL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL. DUST CONTROL HESSIAN SHALL BE INSTALLED TO SITE FENCES AS REQUIRED.

7. FINAL SITE LANDSCAPING OR TEMPORARY STABILISATION WILL BE UNDERTAKEN AS SOON AS POSSIBLE FROM COMPLETION OF CONSTRUCTION ACTIVITIES.

8. THE **CONTRACTOR** IS TO INFORM ALL SUB-CONTRACTORS OF THEIR RESPONSIBILITIES IN MINIMISING THE POTENTIAL FOR SOIL EROSION AND POLLUTION TO DOWNSLOPE LANDS AND WATERWAYS.

9. WHERE PRACTICAL, THE SOIL EROSION HAZARD ON THE SITE SHALL BE KEPT AS LOW AS POSSIBLE. TO THIS END, WORKS SHOULD BE UNDERTAKEN IN THE FOLLOWING SEQUENCE:
   - A. INSTALL ALL TEMPORARY SEDIMENT FENCES AND BARRIER FENCES. WHERE FENCES ARE ADJACENT TO EACH OTHER THE SEDIMENT FENCE CAN BE INCORPORATED INTO THE BARRIER FENCE;
   - B. CONSTRUCT TEMPORARY STABILISED SITE ACCESS. INCLUDING SHAKE DOWN AND WASH PAD;
   - C. INSTALL SEDIMENT CONTROL MEASURES AS OUTLINED ON THE APPROVED PLANS;
   - D. UNDERTAKE SITE DEVELOPMENT WORKS IN ACCORDANCE WITH THE ENGINEERING PLANS. WHERE POSSIBLE, PHASE DEVELOPMENT SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF WORKABLE SIZE.

10. TOPSOIL STRIPPED FROM SITE SHALL BE STOCKPILED WITHIN THE SITE FOR REUSE

11. STOCKPILES WILL NOT BE LOCATED WITHIN 2 METRES OF HAZARD AREAS, INCLUDING LIKELY AREAS OF CONCENTRATED OR HIGH VELOCITY FLOWS SUCH AS WATERWAYS. WHERE THEY ARE BETWEEN 2 AND 5 METRES FROM SUCH AREAS, SPECIAL SEDIMENT CONTROL MEASURES SHOULD BE TAKEN TO MINIMISE POSSIBLE POLLUTION TO DOWNSLOPE WATERS, E.G. THROUGH INSTALLATION OF SEDIMENT FENCING. SEDIMENT RETENTION STRUCTURES TO BE PLACED DOWNSLOPE OF ANY STOCKPILES. STOCKPILES IN PLACE > 28 DAYS TO BE TEMPORARILY GRASSED.

12. ANY SAND USED IN THE CONCRETE CURING PROCESS (SPREAD OVER THE SURFACE) WILL BE REMOVED AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS FROM PLACEMENT.

13. TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES WILL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE REHABILITATED.

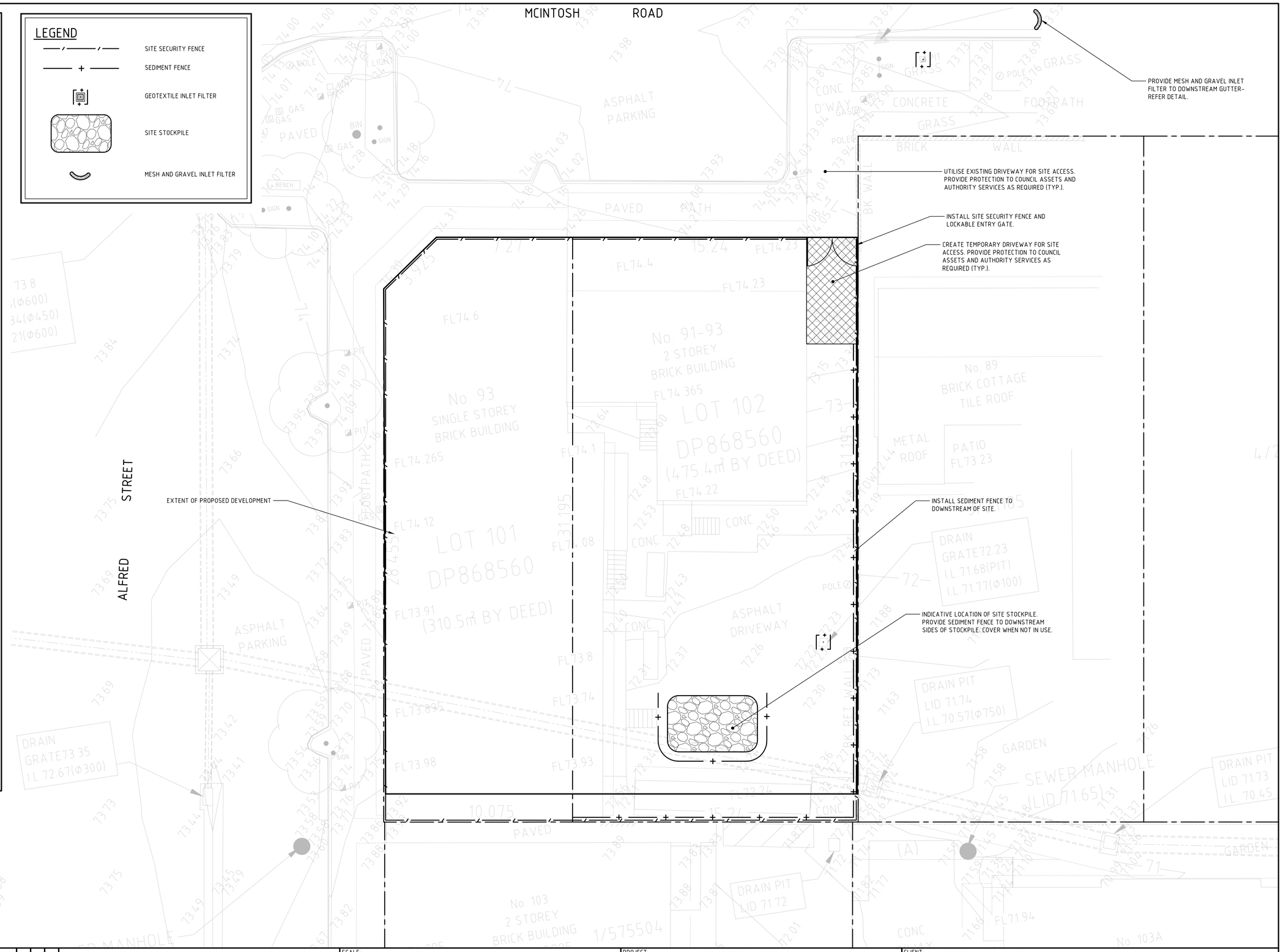
14. ACCEPTABLE RECEPTORS WILL BE PROVIDED FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER AND SHALL BE DISPOSED OF IN ACCORDANCE WITH REGULATORY AUTHORITY REQUIREMENTS, PAY ALL FEES AND PROVIDE EVIDENCE OF SAFE DISPOSAL.

15. STRIPPING WORKS ARE TO BE STAGED TO MINIMISE EXTENTS OF EXPOSED AREAS AT ONE TIME. WEATHER CONDITIONS TO BE ASSESSED PRIOR TO UNDERTAKING STRIPPING.

16. SITE ACCESS TO BE RESTRICTED TO ALLCOATED TRUCK ROUTES. EXTERNAL ROADS TO BE SWEPT REGULARLY FOR DURATION OR WORKS.

LEGEND

- SITE SECURITY FENCE
- SEDIMENT FENCE
- GEOTEXTILE INLET FILTER
- SITE STOCKPILE
- MESH AND GRAVEL INLET FILTER



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SCALE: 0 2 4 6 8 10m — SCALE 1:100 A1

PROJECT: 91-93 MCINTOSH ROAD NARRAWEENA, NSW

DRAWING: CONCEPT SEDIMENT AND EROSION CONTROL PLAN

NORTH

CLIENT: DREAM BUILD

ARCHITECT: BENSON McCORMACK ARCHITECTS

STATUS: ISSUED FOR APPROVAL

NOT TO BE USED FOR CONSTRUCTION

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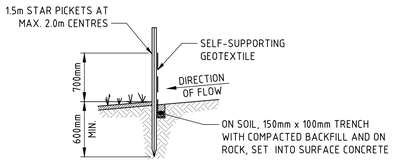

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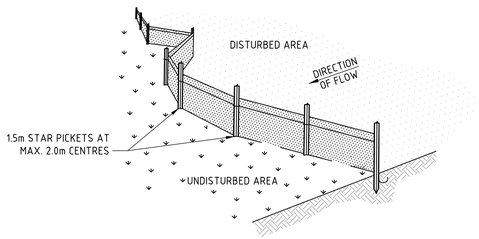
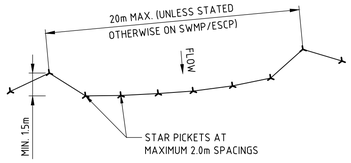




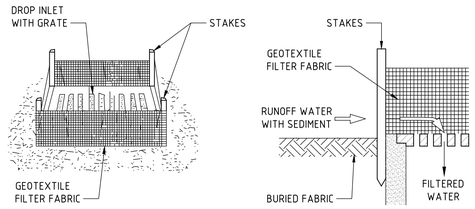
PLAN

NOTES:

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50L/s IN THE DESIGN STORM EVENT, USUALLY THE 10-YEAR EVENT.
2. CUT A 200mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1.5m LONG STAR PICKETS INTO GROUND AT 2.0m INTERVALS (MAX) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

SEDIMENT FENCE

NOT TO SCALE

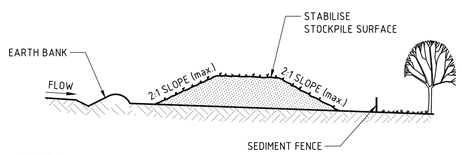


NOTES:

1. FABRICATE A SEDIMENT BARRIER MADE FROM GEOTEXTILE OR STRAW BALES.
2. CUT A 200mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1.0m LONG STAR PICKETS INTO GROUND AT THE FOUR CORNERS OF PIT WALLS. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

GEOTEXTILE INLET FILTER

NOT TO SCALE

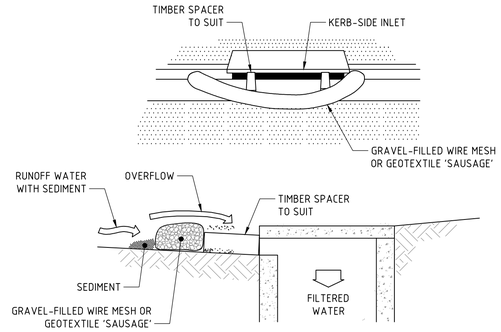


NOTES:

1. PLACE STOCKPILES MORE THAN 2 (PREFERABLY 5) METRES FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2 METRES IN HEIGHT. 4. WHERE THEY ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED ESCP OR SWMP TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES 1 TO 2 METRES DOWNSLOPE.

STOCKPILE

NOT TO SCALE

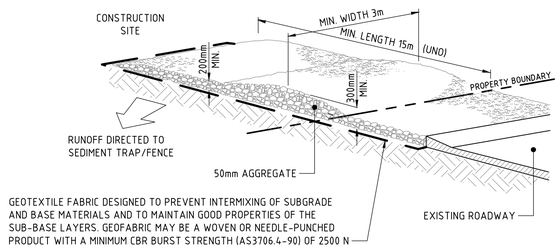


MESH AND GRAVEL INLET FILTER

NOT TO SCALE

NOTES:

1. THIS PRACTICE ONLY TO BE USED WHERE SPECIFIED IN AN APPROVED SWMP/ESCP.
2. INSTALL FILTERS TO KERB INLETS ONLY AT SAG POINTS.
3. FABRICATE A SLEEVE MADE FROM GEOTEXTILE OR WIRE MESH LONGER THAN THE LENGTH OF THE INLET PIT AND FILL IT WITH 25mm TO 50mm GRAVEL.
4. FORM AN ELLIPTICAL CROSS-SECTION ABOUT 150mm HIGH x 400mm WIDE.
5. PLACE THE FILTER AT THE OPENING LEAVING AT LEAST A 100-mm SPACE BETWEEN IT AND THE KERB INLET . MAINTAIN THE OPENING WITH SPACE BLOCKS.
6. FORM A SEAL WITH THE KERB TO PREVENT SEDIMENT BYPASSING THE FILTER.
7. SANDBAGS FILLED WITH GRAVEL CAN SUBSTITUTE FOR THE MESH OR GEOTEXTILE PROVIDING THEY ARE PLACED SO THAT THEY FIRMLY ABUT EACH OTHER AND SEDIMENT-LADEN WATERS CANNOT PASS BETWEEN.



NOTES:

1. STRIP THE TOPSOIL, LEVEL THE SITE AND COMPACT THE SUBGRADE.
2. COVER THE AREA WITH NEEDLE-PUNCHED GEOTEXTILE.
3. CONSTRUCT A 200mm THICK PAD OVER THE GEOTEXTILE USING ROAD BASE OR 30mm AGGREGATE.
4. ENSURE THE STRUCTURE IS AT LEAST 15m LONG OR TO BUILDING ALIGNMENT AND AT LEAST 3m WIDE.
5. WHERE A SEDIMENT FENCE JOINS ONTO THE STABILISED ACCESS, CONSTRUCT A HUMP IN THE STABILISED ACCESS TO DIVERT WATER TO THE SEDIMENT FENCE.

TEMPORARY CONSTRUCTION ENTRY/EXIT

NOT TO SCALE

REV	DATE	ISSUE DESCRIPTION	DRN	DES	VER
3	19.10.18	ISSUED FOR DEVELOPMENT APPLICATION	AD	AD	AD
2	10.09.18	ISSUED FOR DEVELOPMENT APPLICATION	AD	AD	AD
1	23.05.18	ISSUED FOR INFORMATION	AD	AD	AD

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SCALE: NOT TO SCALE

PROJECT: 91-93 MCINTOSH ROAD
NARRAWEENA, NSW

DRAWING: SEDIMENT AND EROSION CONTROL DETAILS

CLIENT: DREAM BUILD

ARCHITECT: BENSON McCORMACK ARCHITECTS

STATUS: ISSUED FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

SIZE: A1 | DRAWING NUMBER: 18010-DA-C2.02 | REVISION: 03

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150mm ON A1 ORIGINAL

LEGEND

	PROPOSED STORMWATER PIPE
	EXISTING STORMWATER PIPE
	CHARGED STORMWATER PIPE
	PROPOSED STORMWATER PIT
FFL 74.77	FINISHED FLOOR LEVEL
GTD	GRATED TRENCH DRAIN
DP	DOWNPIPE
ø150	PIPE SIZE AND FLOW DIRECTION
5.0%	SURFACE FALL
RL. 73.73	PROPOSED SURFACE LEVEL

NOTES

1. THESE PLANS HAVE BEEN DESIGN IN ACCORDANCE WITH RELEVANT LOCAL AUTHORITY GUIDELINES FOR DEVELOPMENT APPLICATION PURPOSES TO DEMONSTRATE FEASIBILITY AND ARE SUBJECT TO COUNCIL APPROVAL AND DETAIL DESIGN AT CONSTRUCTION CERTIFICATE STAGE.
2. DO NOT OBTAIN DIMENSIONS BY SCALING THE DRAWINGS. ALL DIMENSIONS ARE IN METRES (M) AND ALL LEVELS ARE IN METRES (m), UNO. ALL LEVEL ARE TO AUSTRALIAN HEIGHT DATUM (AHD).

DESIGN SUMMARY

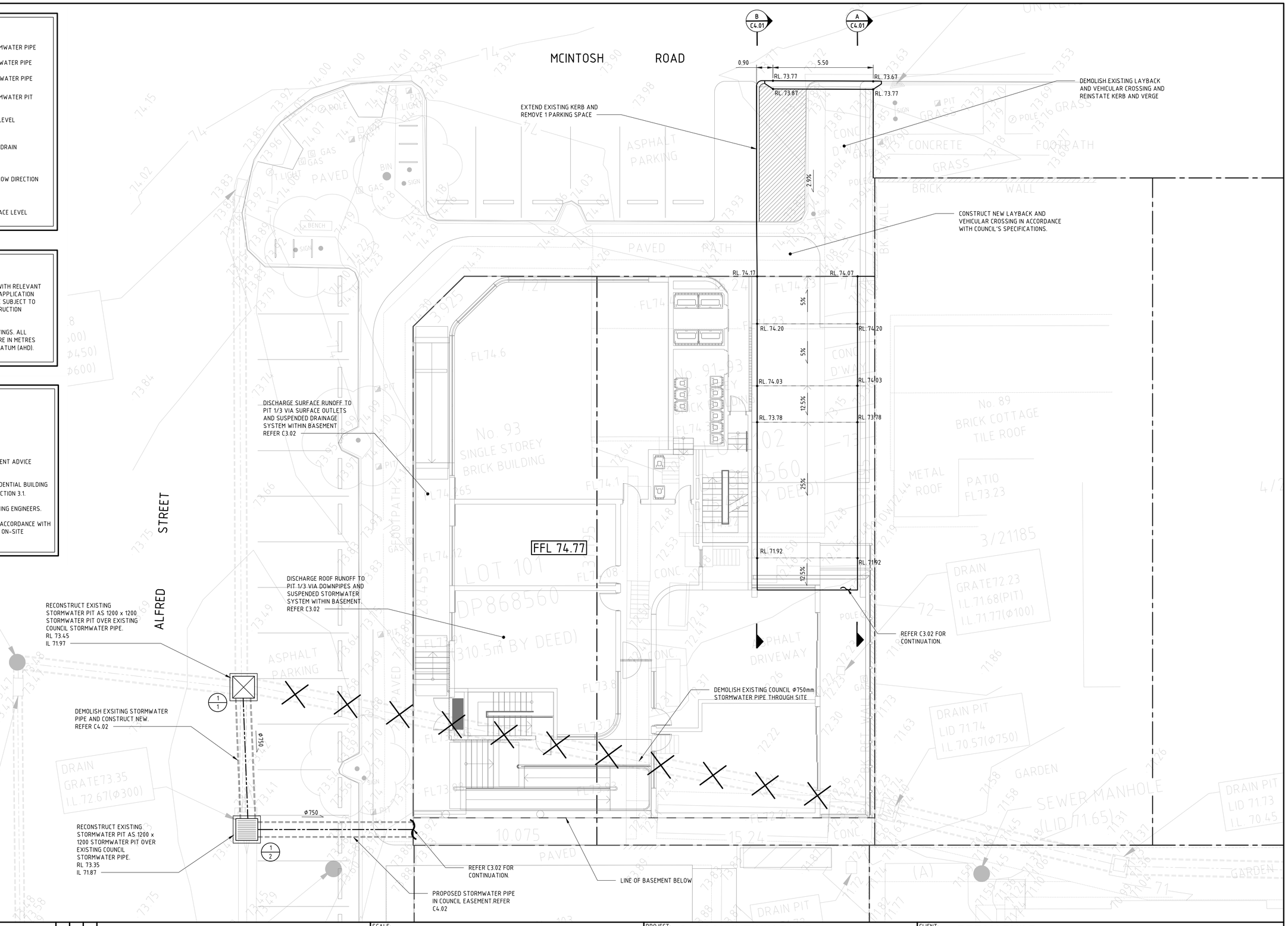
SITE ARE = 786m²
EXISTING IMPERVIOUS AREA = 786m², 100%
PROPOSED IMPERVIOUS AREA = 786m², 100%
INCREASED IMPERVIOUS AREA = 0m², 0%

OSD IS NOT REQUIRED IN LINE WITH COUNCIL PRE-LODGEMENT ADVICE DATED 02/06/18.

STORMWATER QUALITY IS NOT APPLICABLE DUE TO RESIDENTIAL BUILDING LESS THAN 2500m². SEE WATER MANAGEMENT POLICY SECTION 3.1.

REFER FLOODING REPORT PREPARED BY DAWES CONSULTING ENGINEERS.

THE STORMWATER MANAGEMENT HAS BEEN DESIGNED IN ACCORDANCE WITH WARRINGAH COUNCILS WATER MANAGEMENT POLICY AND ON-SITE STORMWATER DETENTION TECHNICAL SPECIFICATIONS.



REV	DATE	ISSUE DESCRIPTION	DRN	DES	VER
5	19.10.18	ISSUED FOR DEVELOPMENT APPLICATION	AD	AD	AD
4	10.09.18	ISSUED FOR DEVELOPMENT APPLICATION	AD	AD	AD
3	29.05.18	ISSUED FOR INFORMATION	AD	AD	AD
2	24.05.18	ISSUED FOR INFORMATION	AD	AD	AD
1	23.05.18	ISSUED FOR INFORMATION	AD	AD	AD

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SCALE: 0 2 4 6 8 10m — SCALE 1:100 A1

PROJECT: 91-93 MCINTOSH ROAD NARRAWEENA, NSW

DRAWING: CONCEPT STORMWATER MANAGEMENT PLAN - GROUND FLOOR

NORTH

CLIENT: DREAM BUILD

ARCHITECT: BENSON McCORMACK ARCHITECTS

STATUS: ISSUED FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

SIZE: A1 | DRAWING NUMBER: 18010-DA-C3.01 | REVISION: 05

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150mm ON A1 ORIGINAL

LEGEND

	PROPOSED STORMWATER PIPE
	EXISTING STORMWATER PIPE
SSW SSW	SUSPENDED STORMWATER PIPE
	PROPOSED STORMWATER PIT
FFL 71.67	FINISHED FLOOR LEVEL
GTD	GRATED TRENCH DRAIN
DP	DOWNPIPE
Φ300	PIPE SIZE AND FLOW DIRECTION
5.0%	SURFACE FALL
RL. 10.00	PROPOSED SURFACE LEVEL

NOTES

1. THESE PLANS HAVE BEEN DESIGN IN ACCORDANCE WITH RELEVANT LOCAL AUTHORITY GUIDELINES FOR DEVELOPMENT APPLICATION PURPOSES TO DEMONSTRATE FEASIBILITY AND ARE SUBJECT TO COUNCIL APPROVAL AND DETAIL DESIGN AT CONSTRUCTION CERTIFICATE STAGE.
2. DO NOT OBTAIN DIMENSIONS BY SCALING THE DRAWINGS. ALL DIMENSIONS ARE IN METRES (M) AND ALL LEVELS ARE IN METRES (m), UNO. ALL LEVEL ARE TO AUSTRALIAN HEIGHT DATUM (AHD).

PUMP-OUT TANK DESIGN SUMMARY

1. PUMP-OUT STORAGE DESIGNED IN ACCORDANCE WITH AS3500.3:2003, SECTION 9.3.6

DESIGN STORM = 10 YEAR ARI, 120 MIN DURATION

CATCHMENT AREA = $104m^2$

RAINFALL INTENSITY = 66.3mm/Hr

DESIGN RUNOFF = $\frac{C.I.A}{3600} = \frac{1x104x66.3}{3600} = 1.82L/s$

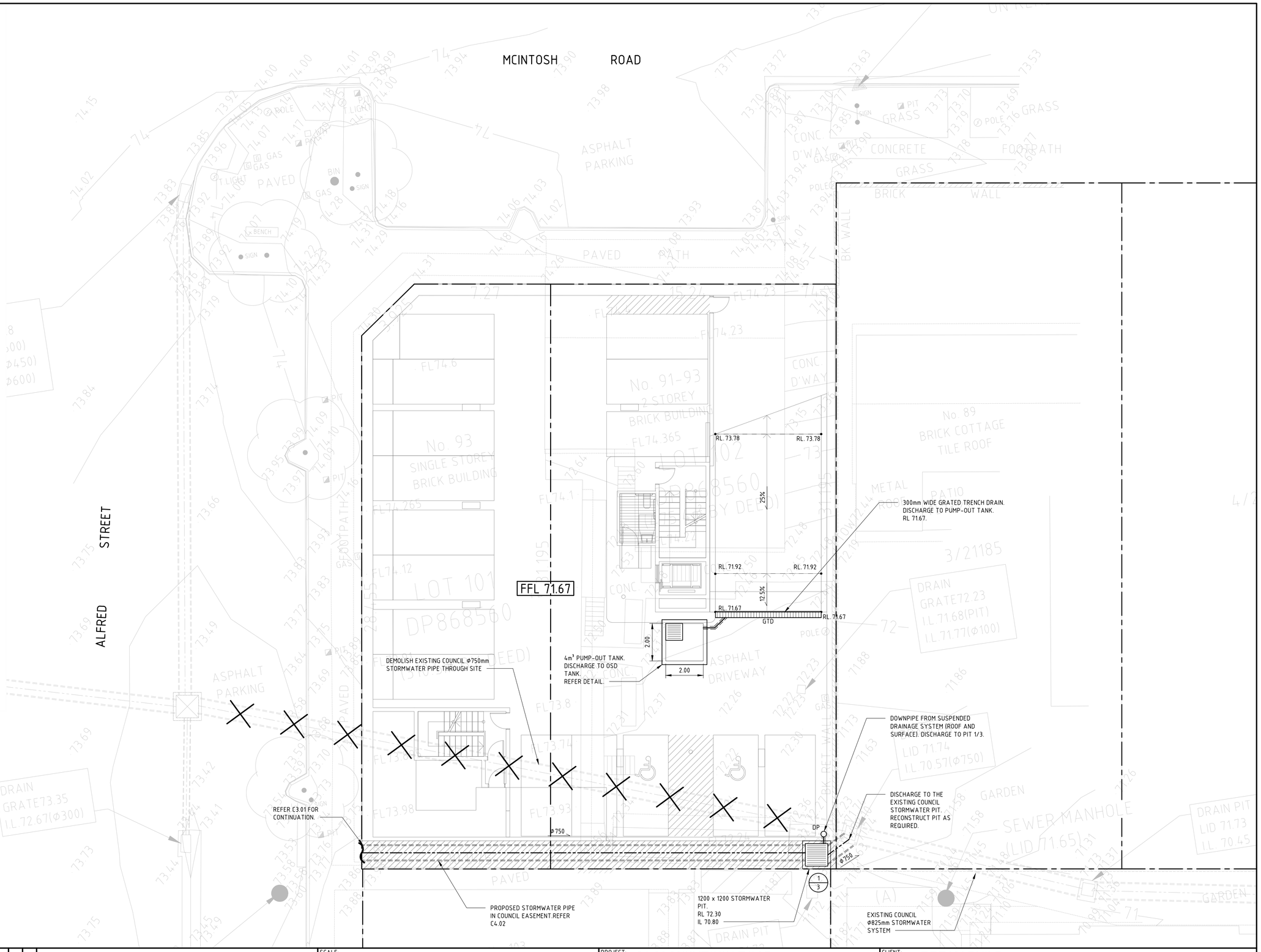
MINIMUM EFFECTIVE STORAGE VOLUME = 1.82 x 60 x 120
= 13104L
= $13.1m^3$

ALLOWANCE FOR PUMP CAPACITY

MINIMUM PUMP-OUT RATE = 10L/s
DESIGN PUMP-OUT RATE = 5L/s
PUMP CAPACITY (30MIN)
= 5 x 60 x 30
= 9000L

SO MINIMUM PUMP-OUT TANK STORAGE = $4.1m^3$

2. PUMP-OUT TANK INCLUDE:
- DUTY AND STANDBY PUMPS WITH ALTERNATING SWITCHES (MIN 10L/s)
- FUEL GENERATOR FOR BACK-UP POWER
- HIGH LEVEL ALARM
- CONTROL PANEL
- ASSOCIATED FLOAT VALVES



REV	DATE	ISSUE DESCRIPTION	DRN	DES	VER
5	19.10.18	ISSUED FOR DEVELOPMENT APPLICATION	AD	AD	AD
4	10.09.18	ISSUED FOR DEVELOPMENT APPLICATION	AD	AD	AD
3	24.05.18	ISSUED FOR INFORMATION	AD	AD	AD
2	24.05.18	ISSUED FOR INFORMATION	AD	AD	AD
1	23.05.18	ISSUED FOR INFORMATION	AD	AD	AD

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SCALE: 0 2 4 6 8 10m — SCALE 1:100 A1

PROJECT: 91-93 MCINTOSH ROAD NARRAWEENA, NSW

DRAWING: CONCEPT STORMWATER MANAGEMENT PLAN - BASEMENT LEVEL

CLIENT: DREAM BUILD

ARCHITECT: BENSON McCORMACK ARCHITECTS

STATUS: ISSUED FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

SIZE: A1 | DRAWING NUMBER: 18010-DA-C3.02 | REVISION: 05

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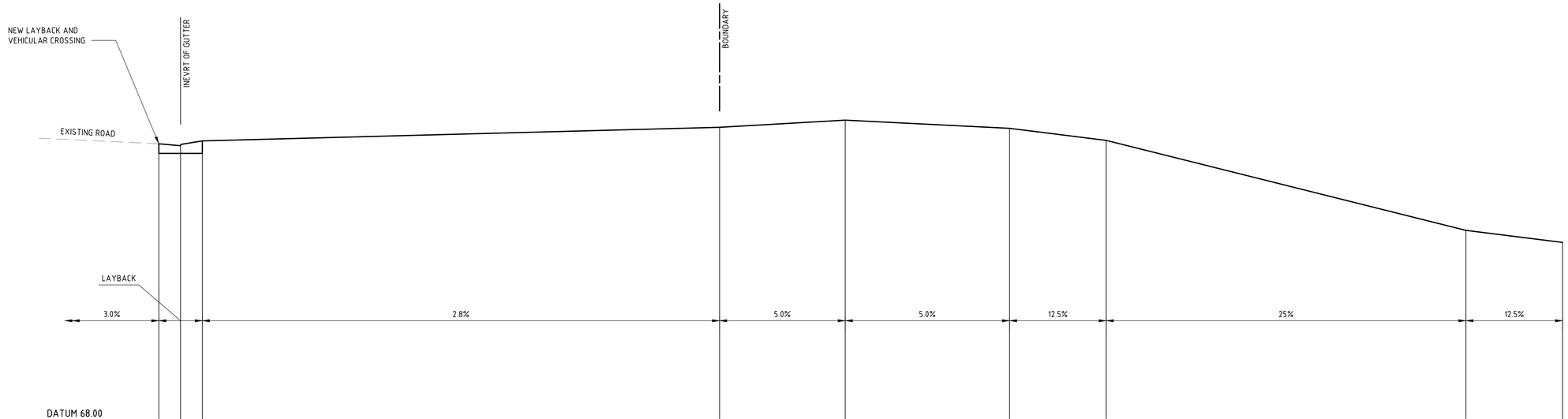
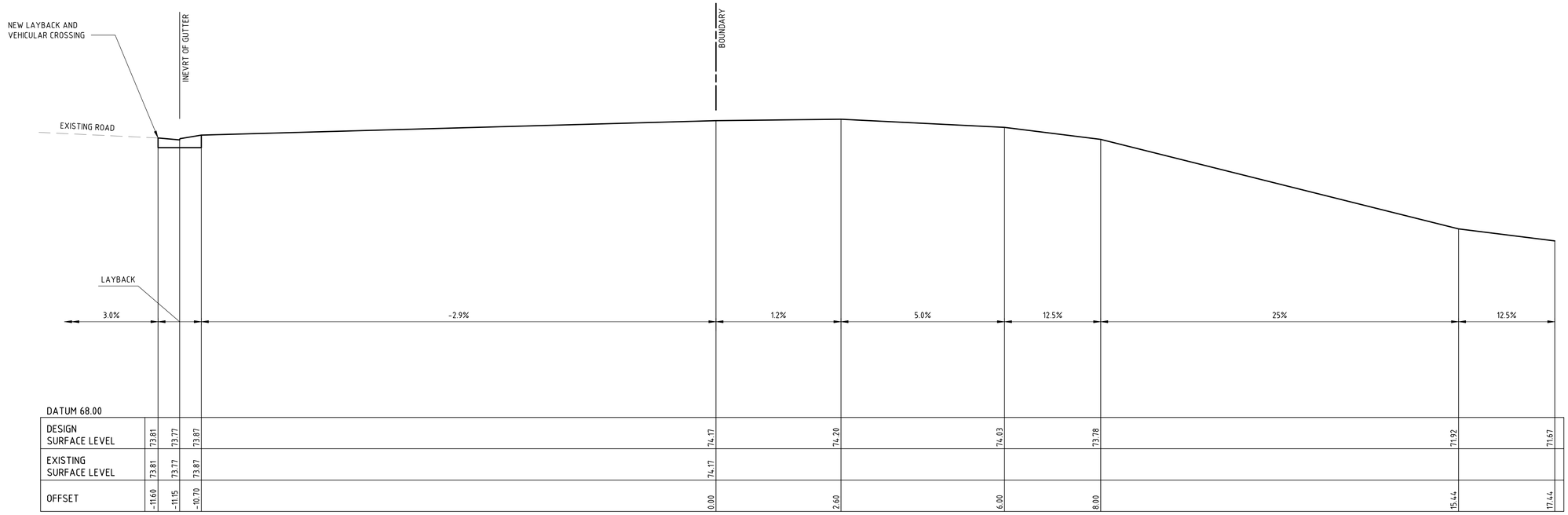


DATUM 68.00

DESIGN SURFACE LEVEL	73.71	73.67	73.77	74.07	74.20	74.03	73.78	71.92	71.67
EXISTING SURFACE LEVEL	73.71	73.67	73.77	74.05					
OFFSET	-11.60	-11.15	-10.70	0.00	2.60	6.00	8.00	15.44	17.44

DRIVEWAY LONGITUDINAL SECTION A C3.01



DATUM 68.00

DESIGN SURFACE LEVEL	73.81	73.77	73.87	74.17	74.20	74.03	73.78	71.92	71.67
EXISTING SURFACE LEVEL	73.81	73.77	73.87	74.17					
OFFSET	-11.60	-11.15	-10.70	0.00	2.60	6.00	8.00	15.44	17.44

DRIVEWAY LONGITUDINAL SECTION B C3.01

REV	DATE	ISSUE DESCRIPTION	DRN	DES	VER
3	19.10.18	ISSUED FOR DEVELOPMENT APPLICATION	AD	AD	AD
2	10.09.18	ISSUED FOR DEVELOPMENT APPLICATION	AD	AD	AD
1	23.05.18	ISSUED FOR INFORMATION	AD	AD	AD

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SCALE:

0 1 2 3 4 5m

SCALE 1:50 A1

PROJECT: 91-93 MCINTOSH ROAD NARRAWEENA, NSW

DRAWING: DRIVEWAY LONGITUDINAL SECTIONS - COPY

CLIENT: DREAM BUILD

ARCHITECT: BENSON McCORMACK ARCHITECTS

STATUS: ISSUED FOR APPROVAL

NOT TO BE USED FOR CONSTRUCTION

SIZE: A1

DRAWING NUMBER: 18010-DA-C4.01

REVISION: 03

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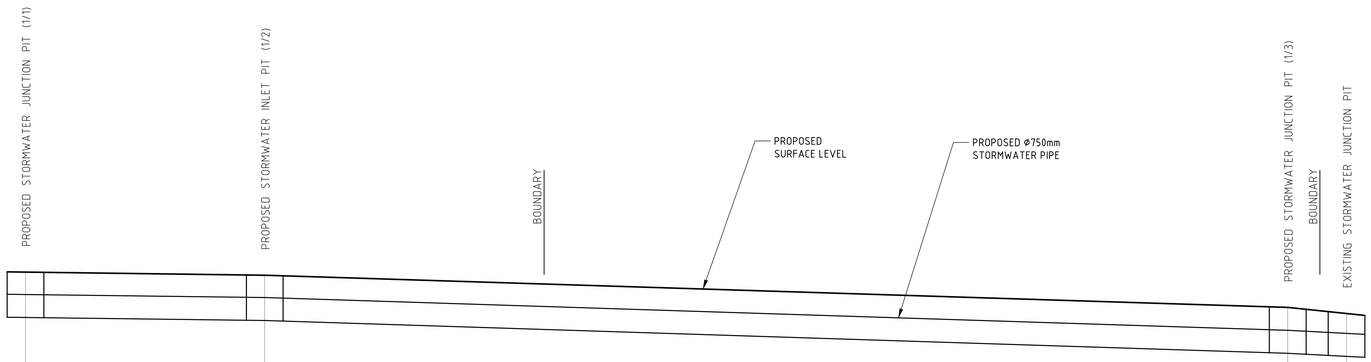

DATUM RL 68.0

FINISHED SURFACE	73.45	73.35	72.30	72.10
STORMWATER HGL				
STORMWATER INVERT	71.97	71.87	70.80	70.70
CHAINAGE	0	7.81	41.21	43.13

LONGITUDINAL SECTION ALONG PROPOSED DRAINAGE EASEMENT

HORIZONTAL SCALE 1:100@A1
VERTICAL SCALE 1:100@A1

REV	DATE	ISSUE DESCRIPTION	DRN	DES	VER
2	19.10.18	ISSUED FOR DEVELOPMENT APPLICATION	AD	AD	AD
1	10.09.18	ISSUED FOR DEVELOPMENT APPLICATION	AD	AD	AD

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SCALE: 0 1 2 3 4 5m
SCALE 1:50 A1

PROJECT: 91-93 MCINTOSH ROAD NARRAWEENA, NSW

DRAWING: STORMWATER LONGITUDINAL SECTION

CLIENT: DREAM BUILD

ARCHITECT: BENSON McCORMACK ARCHITECTS

STATUS: ISSUED FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

SIZE: A1 | DRAWING NUMBER: 18010-DA-C4.02 | REVISION: 02

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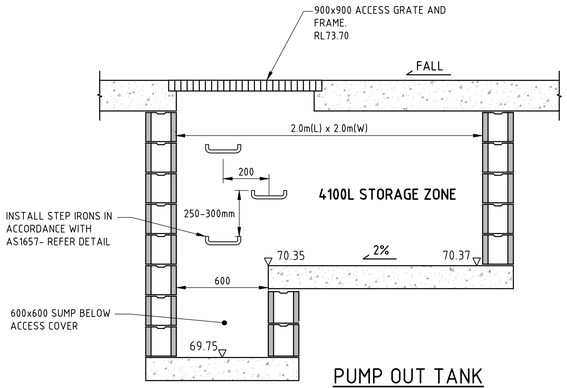

PUMP OUT TANK

NOT TO SCALE

NOTE :

1. REFER STRUCTURAL ENGINEERS DETAILS FOR TANK STRUCTURE.
2. A CONFINED SPACES WARNING SIGN IS TO BE INSTALLED IN THE TANK AT THE ACCESS LOCATION.
3. PUMP-OUT TANK TO INCLUDE:
   - 3.1.1 SUBMERSIBLE DUTY AND STANDBY PUMPS WITH (SPECIFIED BY OTHER TWO) ALTERNATING SWITCHES (MIN 10L/s)
   - 3.1.2 FUEL GENERATOR FOR BACK-UP POWER
   - 3.1.3 HIGH LEVEL ALARM
   - 3.1.4 CONTROL PANEL
   - 3.1.5 ASSOCIATIVE FLOAT VALVES
4. PROVIDE MOSQUITO AND VERMIN PROTECTION TO ALL INLETS AND OUTLETS.
5. PROVIDE WATERPROOFING TO ARCHITECTS SPECIFICATIONS.
6. DISCHARGE TO WATER QUALITY CHAMBER.

REV	DATE	ISSUE DESCRIPTION	DRN	DES	VER
3	19.10.18	ISSUED FOR DEVELOPMENT APPLICATION	AD	AD	AD
2	10.09.18	ISSUED FOR DEVELOPMENT APPLICATION	AD	AD	AD
1	23.05.18	ISSUED FOR INFORMATION	AD	AD	AD

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SCALE:

0 0.2 0.4 0.6 0.8 1m
SCALE 1:10 A1

0 0.5 1 1.5 2m
SCALE 1:20 A1

PROJECT: 91-93 MCINTOSH ROAD
NARRAWEENA, NSW

DRAWING: DETAILS SHEET

CLIENT: DREAM BUILD

ARCHITECT: BENSON McCORMACK ARCHITECTS

STATUS: ISSUED FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

SIZE: A1

DRAWING NUMBER: 18010-DA-C5.01

REVISION: 03

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150mm ON A1 ORIGINAL

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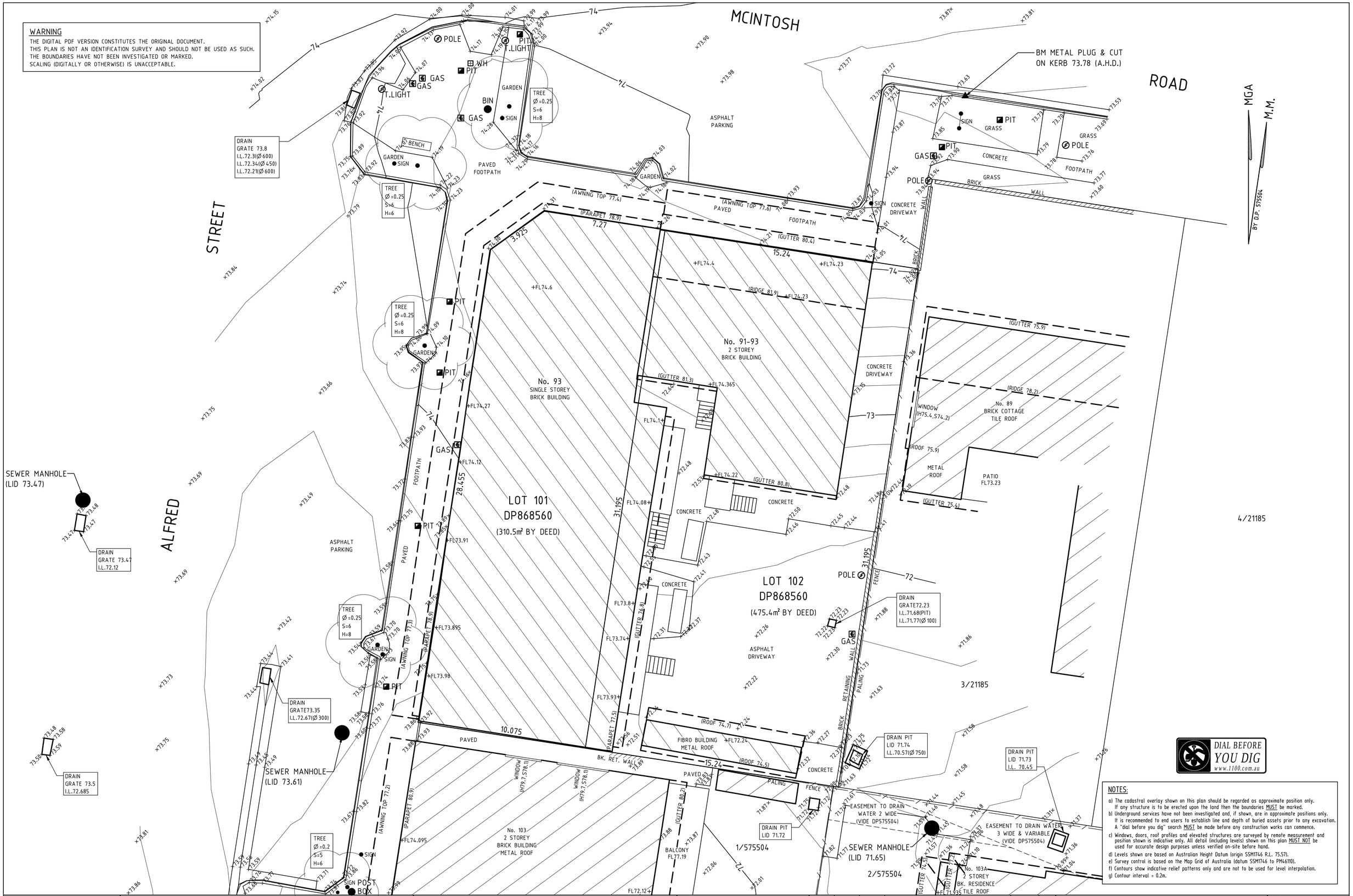
APPENDIX B



WARNING
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THE BOUNDARIES HAVE NOT BEEN INVESTIGATED OR MARKED.
SCALING (DIGITALLY OR OTHERWISE) IS UNACCEPTABLE.

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NOTES:

a) The cadastral overlay shown on this plan should be regarded as approximate position only. If any structure is to be erected upon the land then the boundaries MUST be marked.
b) Underground services have not been investigated and, if shown, are in approximate positions only. It is recommended to end users to establish line and depth of buried assets prior to any excavation. A "dial before you dig" search MUST be made before any construction works can commence.
c) Windows, doors, roof profiles and elevated structures are surveyed by remote measurement and position shown is indicative only. All detail (including levels) shown on this plan MUST NOT be used for accurate design purposes unless verified on-site before hand.
d) Levels shown are based on Australian Height Datum (origin SSM1746 R.L. 75.57).
e) Survey control is based on the Map Grid of Australia (datum SSM1746 to PM46110).
f) Contours show indicative relief patterns only and are not to be used for level interpolation.
g) Contour interval = 0.2m.

BOSSI ID 3841
Surveyor Registered under the Surveying and Spatial Information Act, 2002

NOTE: ALL DIMENSIONS ARE IN METRES UNLESS SPECIFIED OTHERWISE

ROBERT FRIEND SURVEYS PTY LTD
Consulting Land Surveyor
PO Box 4292, Denistone East, NSW, 2112 (02) 9807 4947
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SURVEY	DRAWN	CHKD	AMENDMENTS	DATE	No.
R.F.	R.F.	R.F.	ADDITIONAL INFORMATION	APR. 2018	B
R.F.	R.F.	R.F.	ISSUED FOR INFORMATION PURPOSES ONLY	MAR. 2018	A

CLIENT: DREAMBUILD

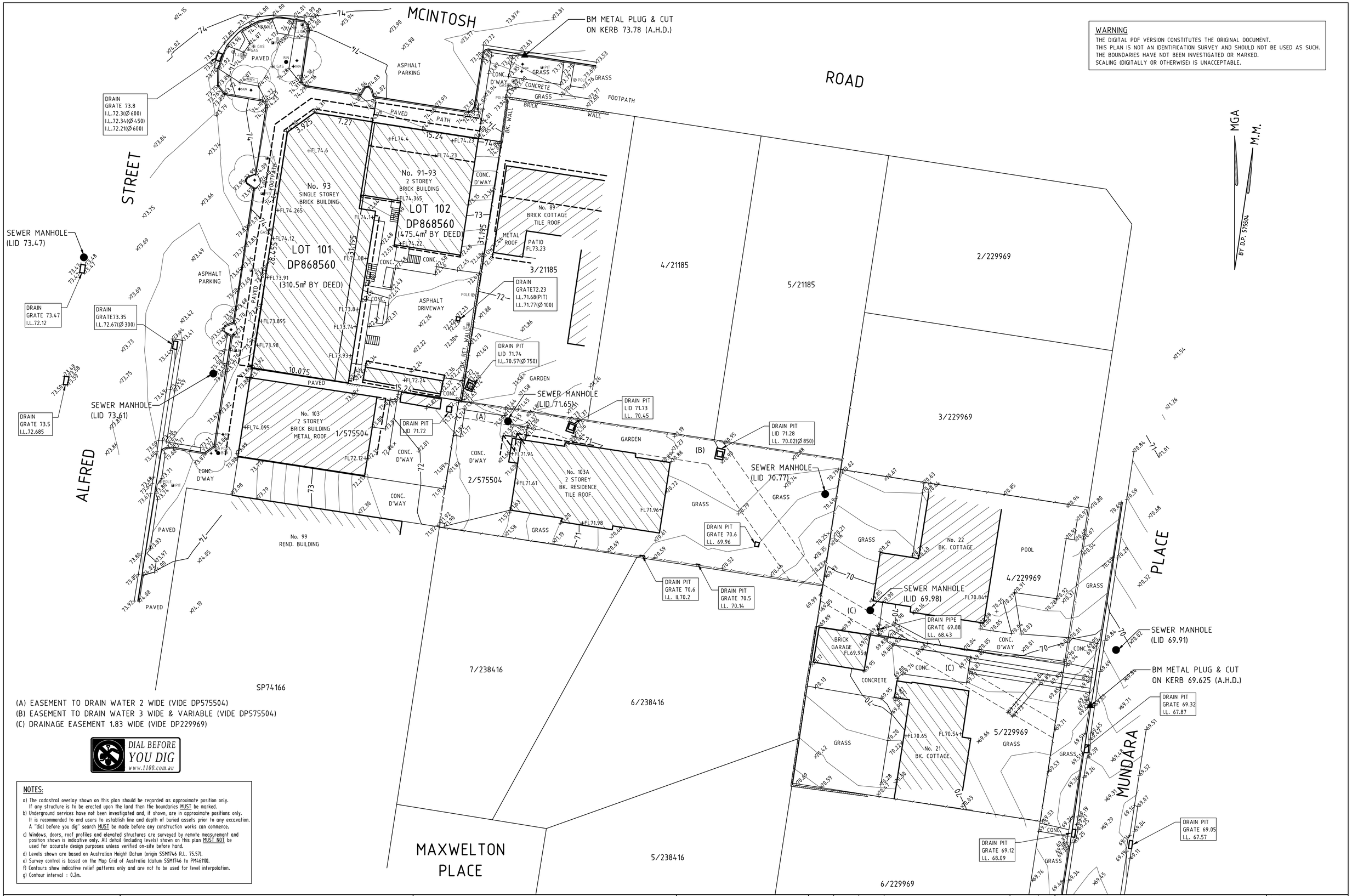
TITLE: DETAIL SURVEY OF LAND AT 91-93 McINTOSH ROAD NARRAWEENA NSW 2099

SCALE: 1 : 100

DRAWING No.: 1821-1-B

SHEET: 1 of 1

A1



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THE BOUNDARIES HAVE NOT BEEN INVESTIGATED OR MARKED.
SCALING (DIGITALLY OR OTHERWISE) IS UNACCEPTABLE.

(A) EASEMENT TO DRAIN WATER 2 WIDE (VIDE DP575504)
(B) EASEMENT TO DRAIN WATER 3 WIDE & VARIABLE (VIDE DP575504)
(C) DRAINAGE EASEMENT 1.83 WIDE (VIDE DP229969)

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a) The cadastral overlay shown on this plan should be regarded as approximate position only. If any structure is to be erected upon the land then the boundaries MUST be marked.
b) Underground services have not been investigated and, if shown, are in approximate positions only. It is recommended to end users to establish line and depth of buried assets prior to any excavation. A "dial before you dig" search MUST be made before any construction works can commence.
c) Windows, doors, roof profiles and elevated structures are surveyed by remote measurement and position shown is indicative only. All detail (including levels) shown on this plan MUST NOT be used for accurate design purposes unless verified on-site before hand.
d) Levels shown are based on Australian Height Datum (origin SSM1746 R.L. 75.57).
e) Survey control is based on the Map Grid of Australia (datum SSM1746 to PM46110).
f) Contours show indicative relief patterns only and are not to be used for level interpolation.
g) Contour interval = 0.2m.

BOSSI ID 3841
Surveyor Registered under the Surveying and Spatial Information Act, 2002

4 2 0 4 8 12 16 20
NOTE: ALL DIMENSIONS ARE IN METRES UNLESS SPECIFIED OTHERWISE

ROBERT FRIEND SURVEYS PTY LTD
Consulting Land Surveyor
PO Box 4292, Denistone East, NSW, 2112 (02) 9807 4947
Email: admin@rfsurveys.com.au

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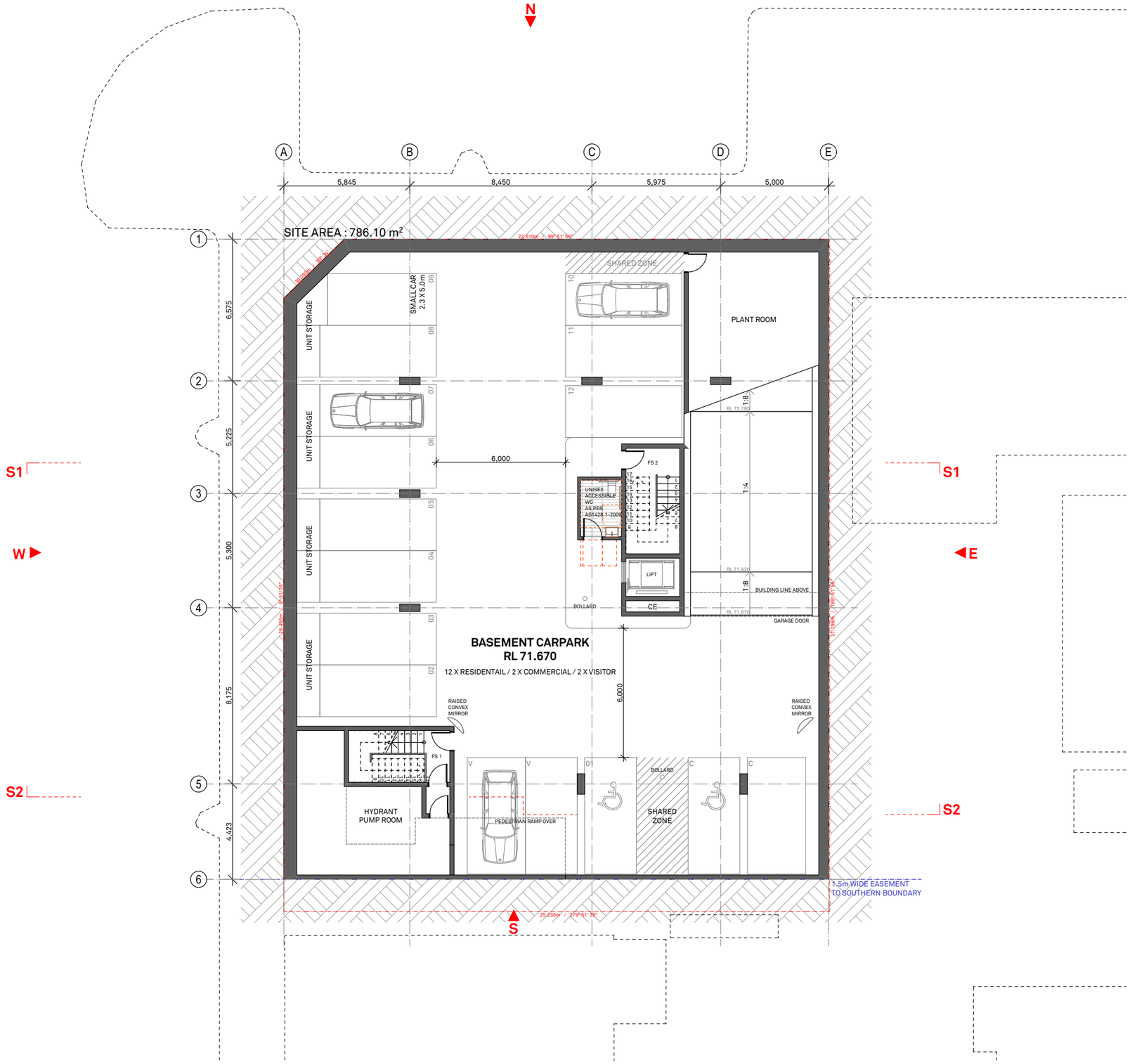
SURVEY	DRAWN	CHKD	AMENDMENTS	DATE	No.
R.F.	R.F.	R.F.	ISSUED FOR INFORMATION PURPOSES ONLY	APRIL 2018	A

CLIENT: DREAMBUILD

TITLE: LEVELS SURVEY AT LAND ADJOINING
91-93 McINTOSH ROAD
NARRAWEENA NSW 2099

SCALE 1 : 200
DRAWING No. 1821-2-A
SHEET 1 of 1
A1

APPENDIX C



91M

DEVELOPMENT APPLICATION

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DO NOT SCALE DRAWINGS.

REV	DATE	ISSUE
A	SEPT 18	DA ISSUE 01

CLIENT
DREAMBUILD
6/37A KING ROAD HORNSBY NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD NARRAWEENA NSW 2099

PROJECT NORTH

SCALE 1:200 @ A3

PROJECT NO. 1816A

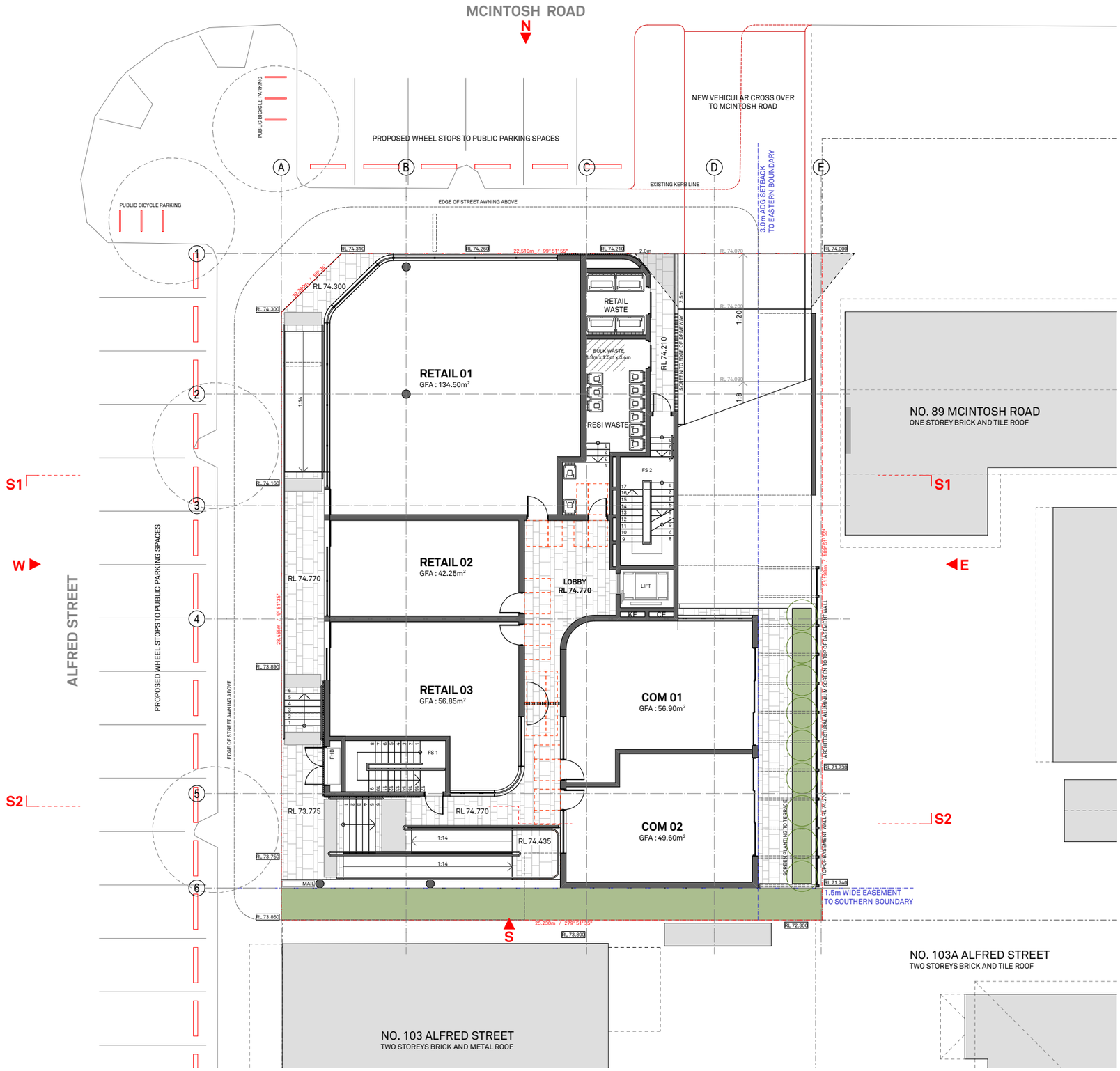
DRAWING NO. A-0101

DRAWING BASEMENT FLOOR PLAN

ISSUE A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7530

BENSON McCORMACK ARCHITECTURE



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REV	DATE	ISSUE
A	SEPT 18	DA ISSUE 01

CLIENT
DREAMBUILD
6/37A KING ROAD HORNSBY NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD NARRAWEENA NSW 2099

PROJECT NORTH

SCALE 1:200 @ A3

PROJECT NO. 1816A

DRAWING NO. A-0102

DRAWING GROUND FLOOR PLAN

ISSUE A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

BENSON McCORMACK ARCHITECTURE

91M

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REV	DATE	ISSUE
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CLIENT
DREAMBUILD
6/37A KING
ROAD HORNSBY
NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD
NARRAWEENA NSW 2099

PROJECT NORTH

SCALE
1:200 @ A3

PROJECT NO.
1816A

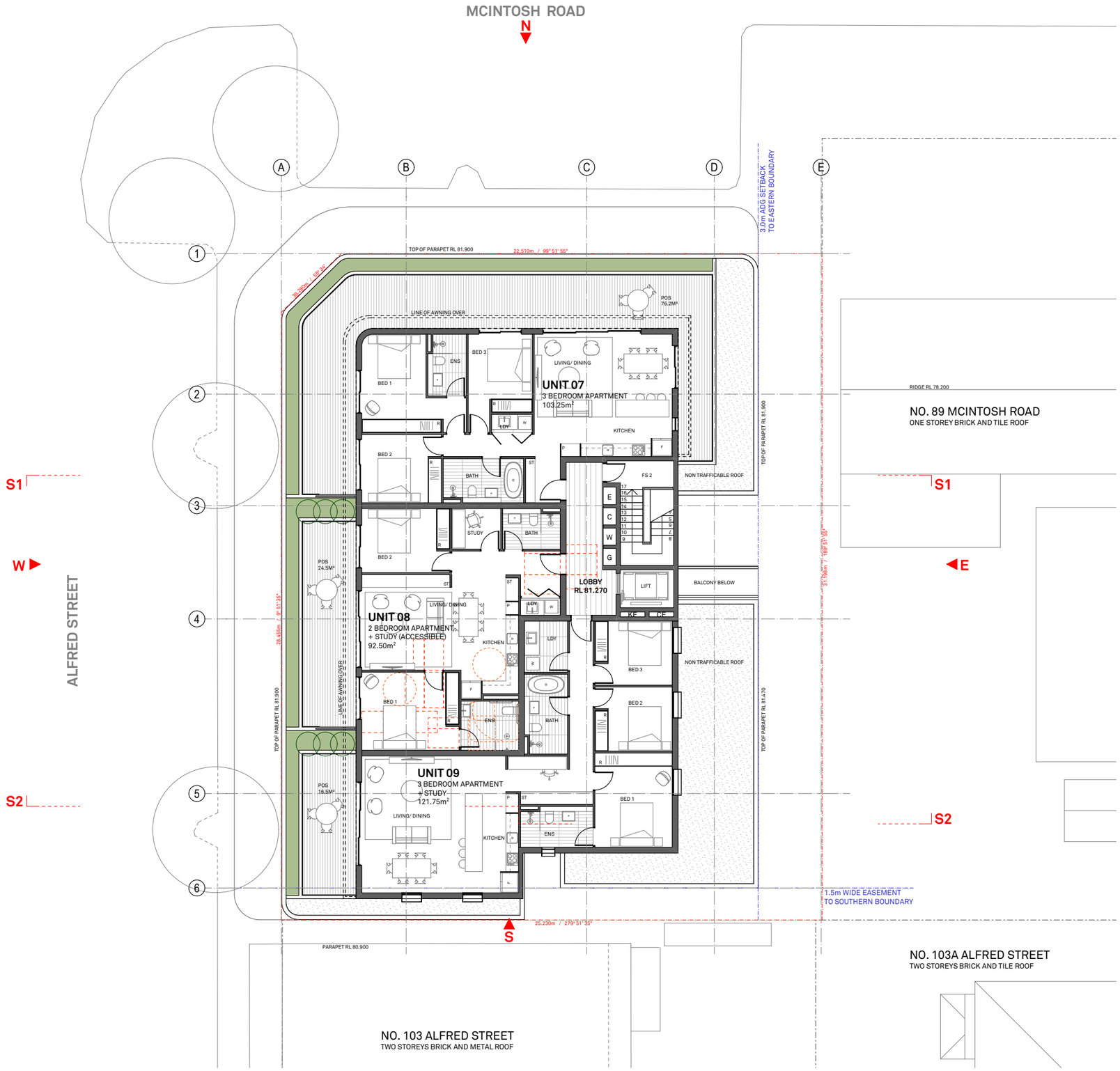
DRAWING NO.
A-0103

DRAWING
1ST FLOOR PLAN

ISSUE
A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

BENSON McCORMACK ARCHITECTURE



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REV	DATE	ISSUE
A	SEPT 18	DA ISSUE 01

CLIENT
DREAMBUILD
6/37A KING ROAD HORNSBY NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD NARRAWEENA NSW 2099

PROJECT NORTH

SCALE 1:200 @ A3

PROJECT NO. 1816A

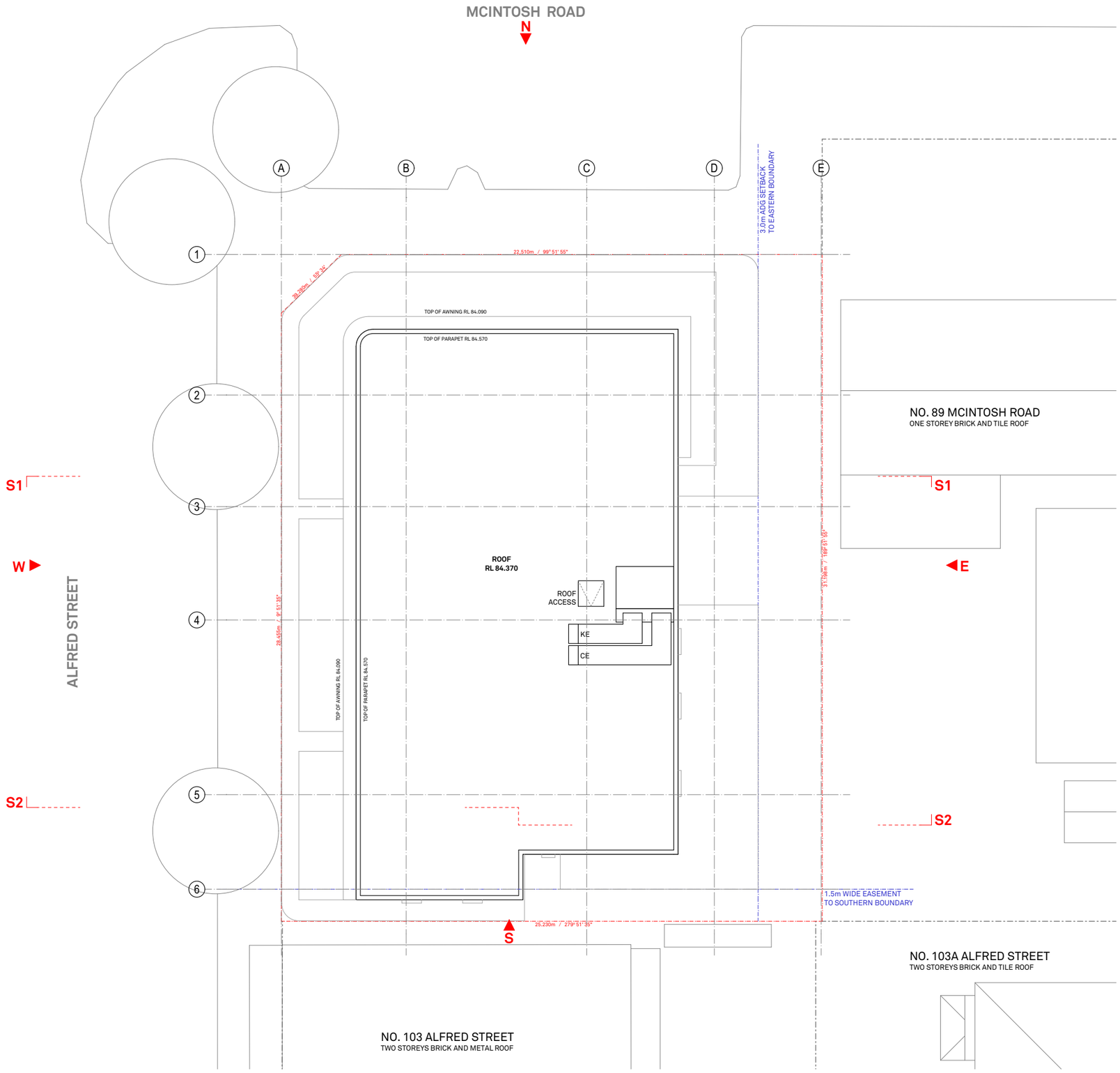
DRAWING NO. A-0104

DRAWING 2ND FLOOR PLAN

ISSUE A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

BENSON McCORMACK ARCHITECTURE



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A	SEPT 18	DA ISSUE 01

CLIENT
DREAMBUILD
6/37A KING
ROAD HORNSBY
NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD
NARRAWEENA NSW 2099

PROJECT NORTH

SCALE 1:200 @ A3

PROJECT NO. 1816A

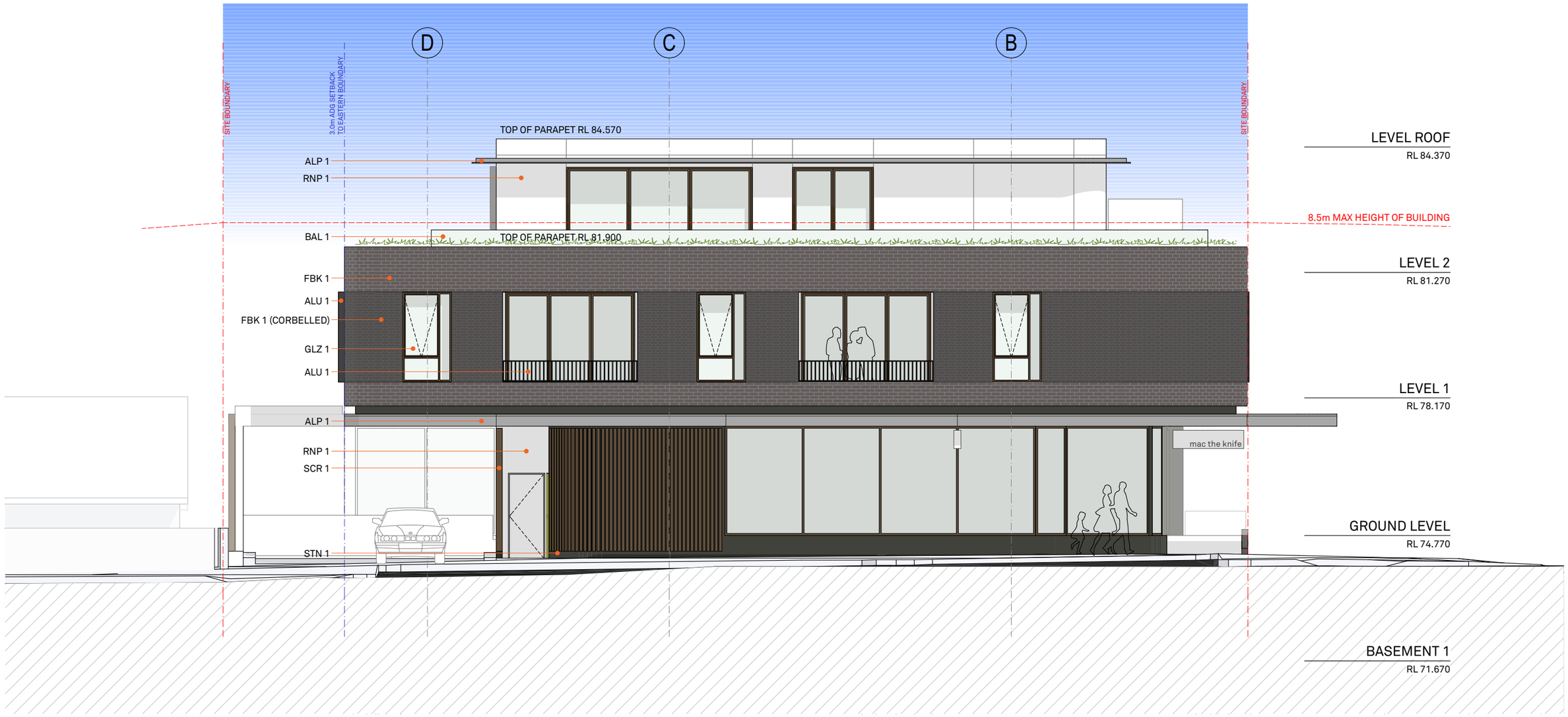
DRAWING NO. A-0105

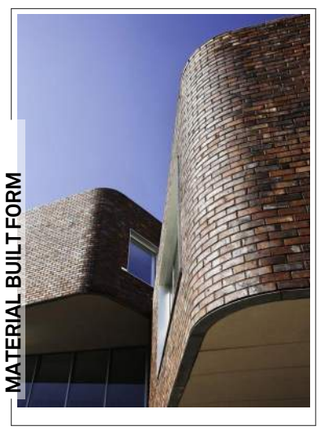
DRAWING ROOF PLAN

ISSUE A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

BENSON
McCORMACK
ARCHITECTURE





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REV	DATE	ISSUE
A	SEPT 18	DA ISSUE 01

CLIENT
DREAMBUILD
6/37A KING ROAD HORNSBY NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD NARRAWEENA NSW 2099

PROJECT NORTH

SCALE
1:100, 1:4.15 @ A3

PROJECT NO.
1816A

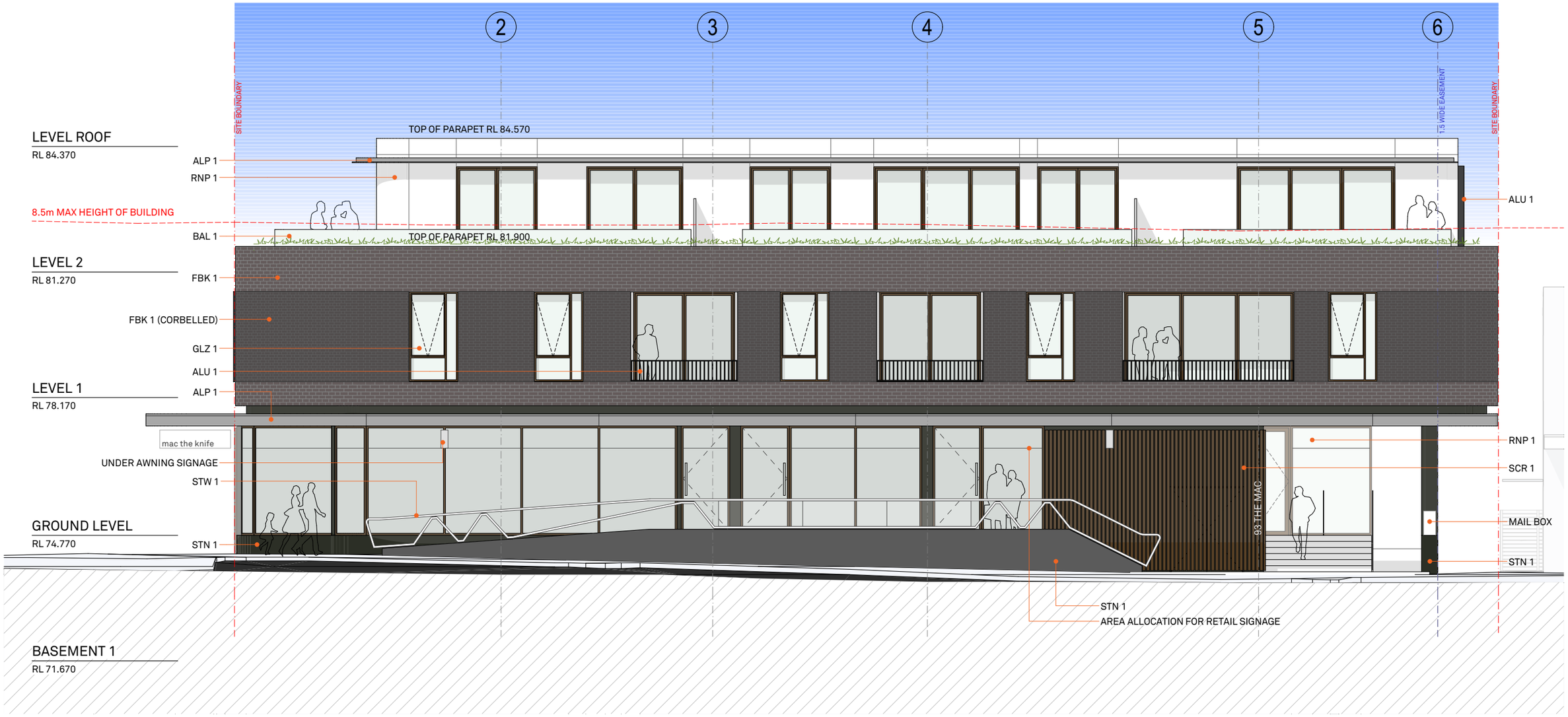
DRAWING NO.
A-0201

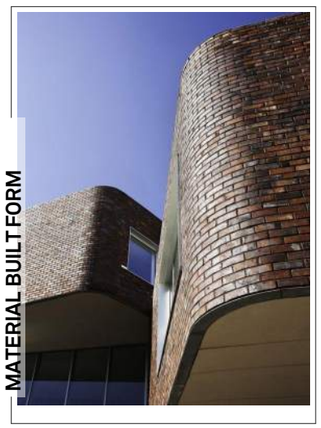
DRAWING
MCINTOSH RD ELEVATION

ISSUE
A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

BENSON McCORMACK ARCHITECTURE





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REV	DATE	ISSUE
A	SEPT 18	DA ISSUE 01

CLIENT
DREAMBUILD
6/37A KING ROAD HORNSBY NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD NARRAWEENA NSW 2099

PROJECT NORTH

SCALE
1:100, 1:4.15 @ A3

PROJECT NO.
1816A

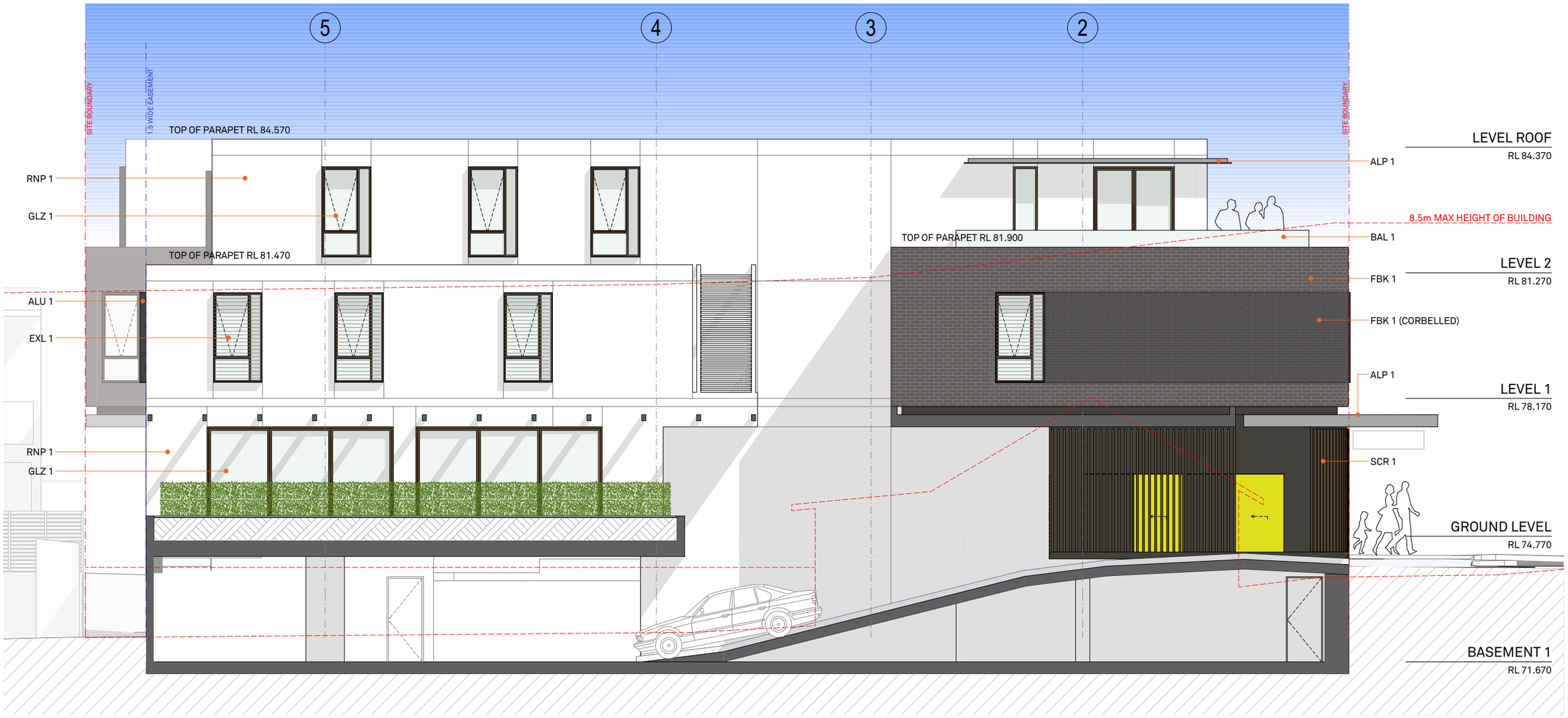
DRAWING NO.
A-0202

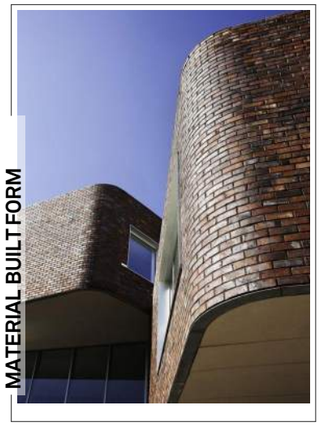
DRAWING
ALFRED ST ELEVATION

ISSUE
A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

BENSON McCORMACK ARCHITECTURE





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REV	DATE	ISSUE
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CLIENT
DREAMBUILD
6/37A KING ROAD HORNSBY NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD NARRAWEENA NSW 2099

PROJECT NORTH

SCALE
1:100, 1:4.15 @ A3

PROJECT NO.
1816A

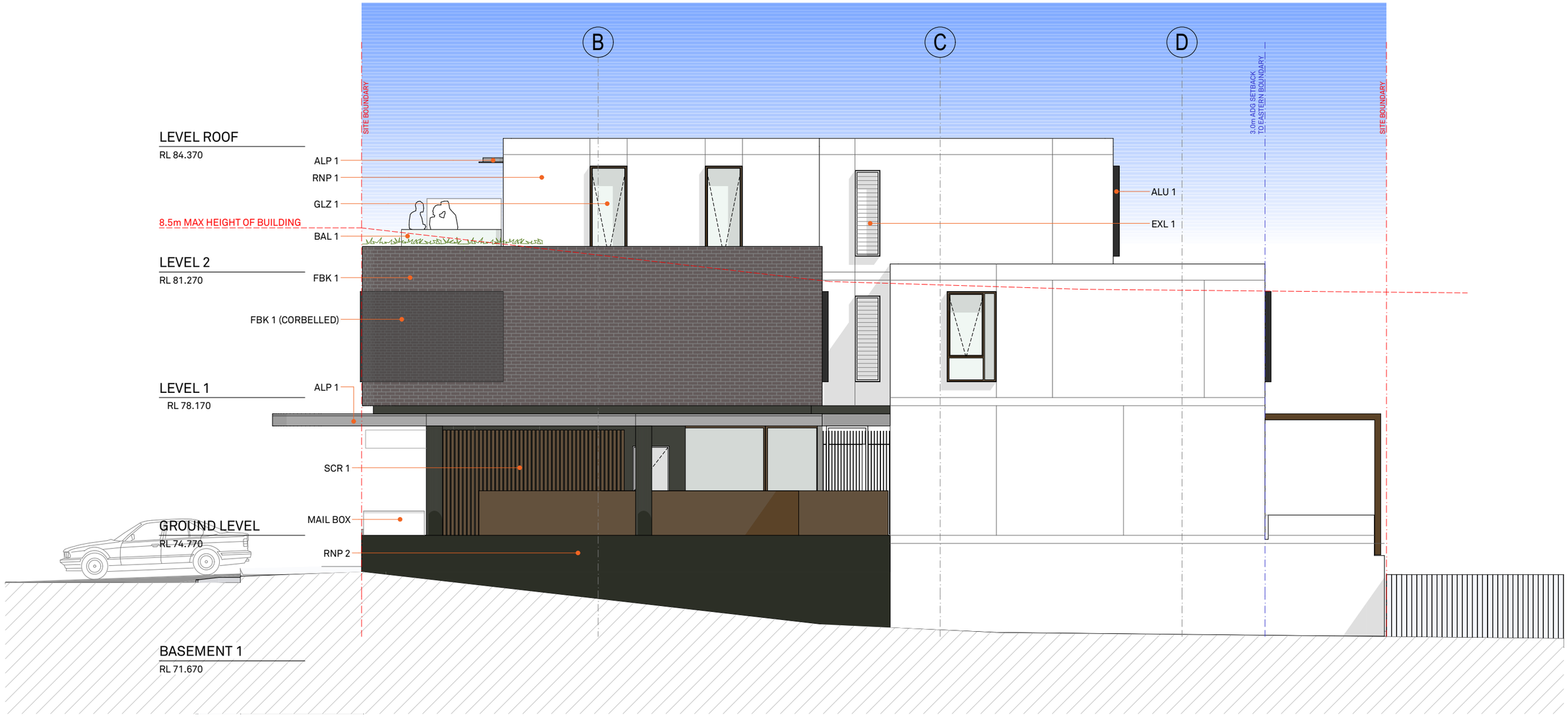
DRAWING NO.
A-0203

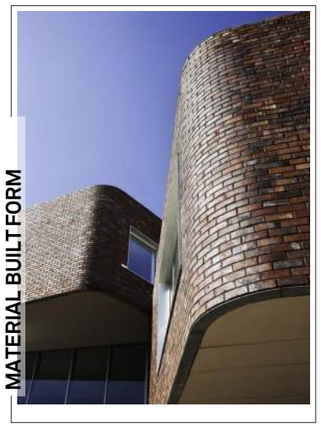
DRAWING
EAST ELEVATION

ISSUE
A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

BENSON McCORMACK ARCHITECTURE





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REV	DATE	ISSUE
A	SEPT 18	DA ISSUE 01

CLIENT
DREAMBUILD
6/37A KING ROAD HORNSBY NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD NARRAWEENA NSW 2099

PROJECT NORTH

SCALE
1:100, 1:4.15 @ A3

PROJECT NO.
1816A

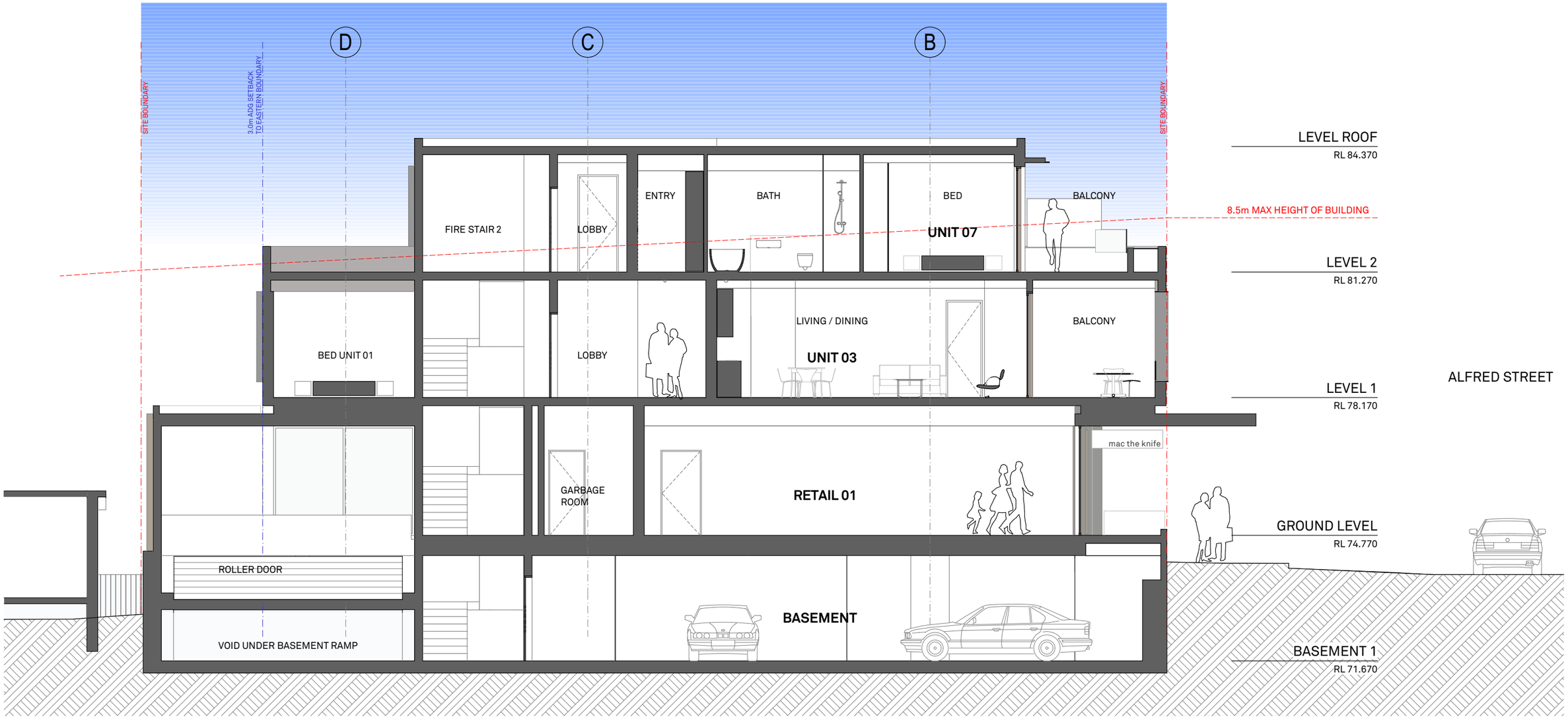
DRAWING NO.
A-0204

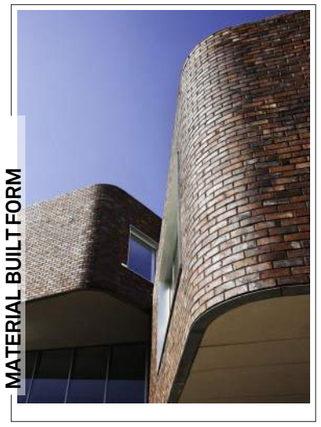
DRAWING
SOUTH ELEVATION

ISSUE
A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

BENSON McCORMACK ARCHITECTURE





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REV	DATE	ISSUE
A	SEPT 18	DA ISSUE 01

CLIENT
DREAMBUILD
6/37A KING ROAD HORNSBY NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD NARRAWEENA NSW 2099

PROJECT NORTH

SCALE
1:100, 1:4.15 @ A3

PROJECT NO.
1816A

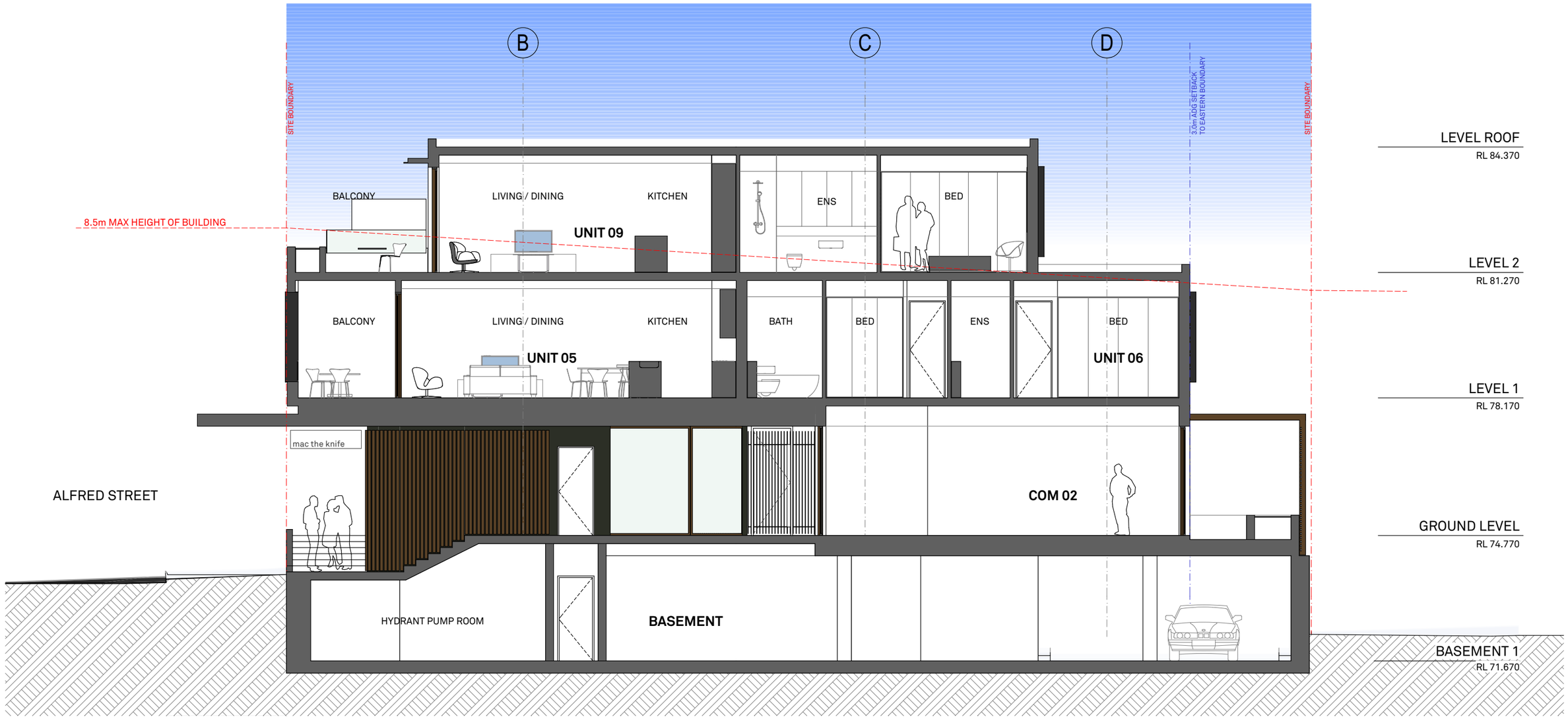
DRAWING NO.
A-2051

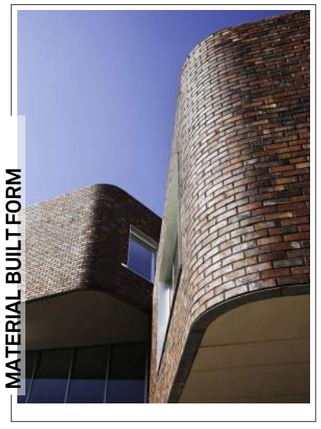
DRAWING
SECTION

ISSUE
A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

BENSON McCORMACK ARCHITECTURE





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CLIENT
DREAMBUILD
6/37A KING ROAD HORNSBY NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD NARRAWEENA NSW 2099

PROJECT NORTH

SCALE
1:100, 1:4.15 @ A3

PROJECT NO.
1816A

DRAWING NO.
A-2052

DRAWING
SECTION

ISSUE
A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

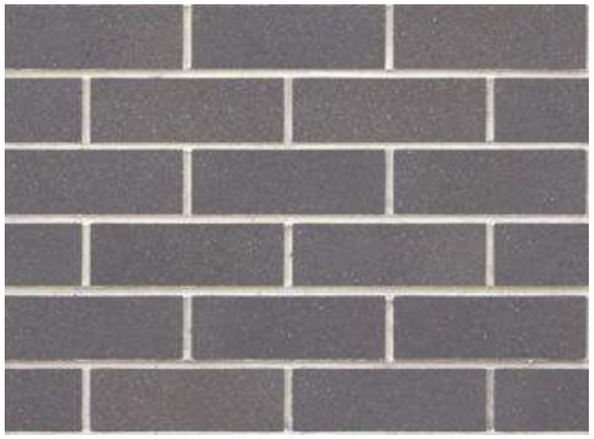
BENSON McCORMACK ARCHITECTURE

ALU 1 ALUMINIUM - WINDOW/BALCONY SURROUNDS, BALUSTRADE
FINISH SIM/EQ TO DULUX POWDERCOAT 'MONUMENT'

ALP 1 ALPOLIC - AWNING
FINISH SIM/EQ TO ALPOLIC SOLID COLORS 'ALUMINUM GRAY'

EXL 1 EXTERNAL LOUVERS FIXED ON WINDOW
LOUVERS FINISH SIM/EQ TO DULUX POWDERCOAT 'EARTHEN POT'

GLZ 1 CLEAR GLAZED ALUMINIUM FRAMED WINDOWS/DOORS
FRAME FINISH SIM/EQ TO DULUX POWDERCOAT 'EARTHEN POT'

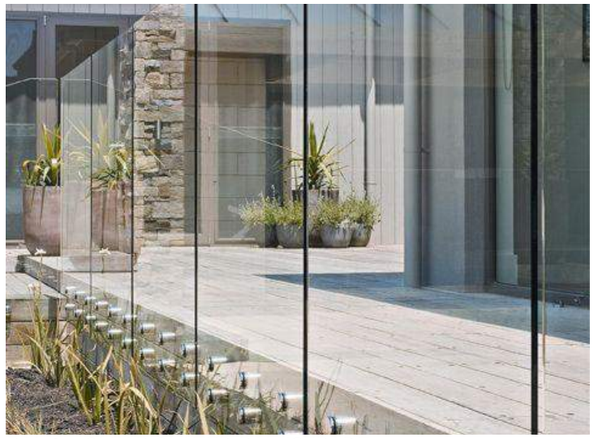


FBK 1 FACE BRICKWORK
FINISH SIM/EQ TO AUSTRAL BOWRAL BRICKS 'BRAHMAN GRANITE'

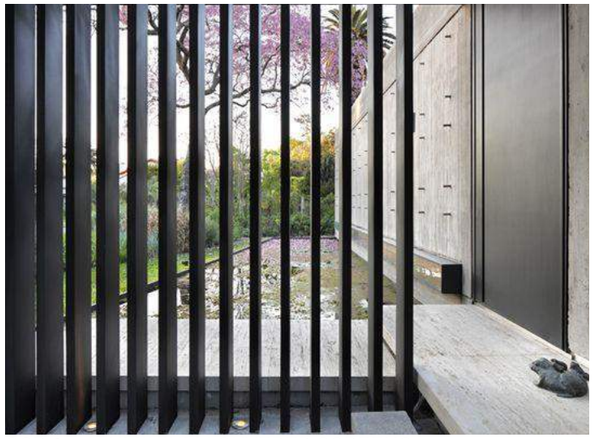
RNP 1 CEMENT RENDER & PAINT
PAINT FINISH SIM/EQ TO DULUX 'LEXICON'

RNP 2 CEMENT RENDER & PAINT
PAINT FINISH SIM/EQ TO DULUX 'GUILD GREY'

STN 1 STONEWORK



BAL 1 CLEAR GLAZED BALUSTRADE



SCR 1 ALUMINIUM LOUVERED SCREENS
FINISH SIM/EQ TO DULUX DESIGN 'EARTHEN POT'

STW 1 STEELWORK - HANDRAIL
FINISH SIM/EQ TO DULUX POWDERCOAT 'EARTHEN POT'

91M

DEVELOPMENT APPLICATION

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REV	DATE	ISSUE
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CLIENT
DREAMBUILD
6/37A KING ROAD HORNSBY NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD NARRAWEENA NSW 2099

PROJECT NORTH

SCALE

PROJECT NO. 1816A

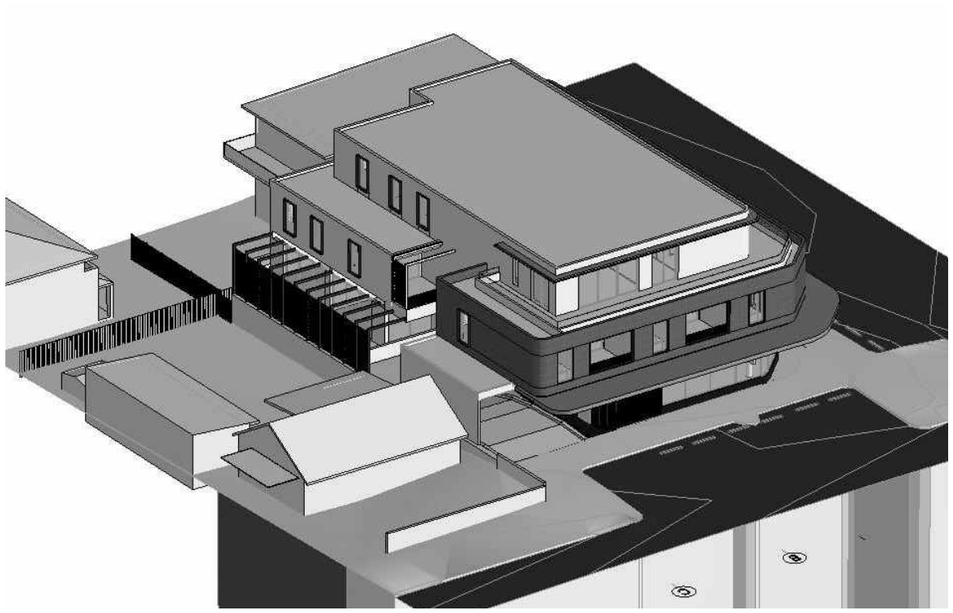
DRAWING NO. A-1301

DRAWING FINISHES & MATERIALS

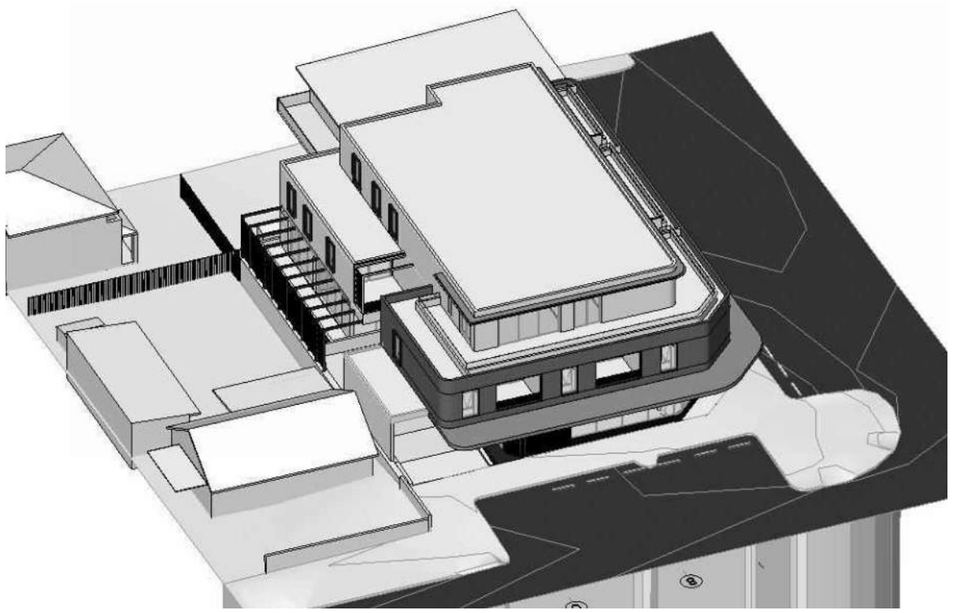
ISSUE A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

BENSON McCORMACK ARCHITECTURE

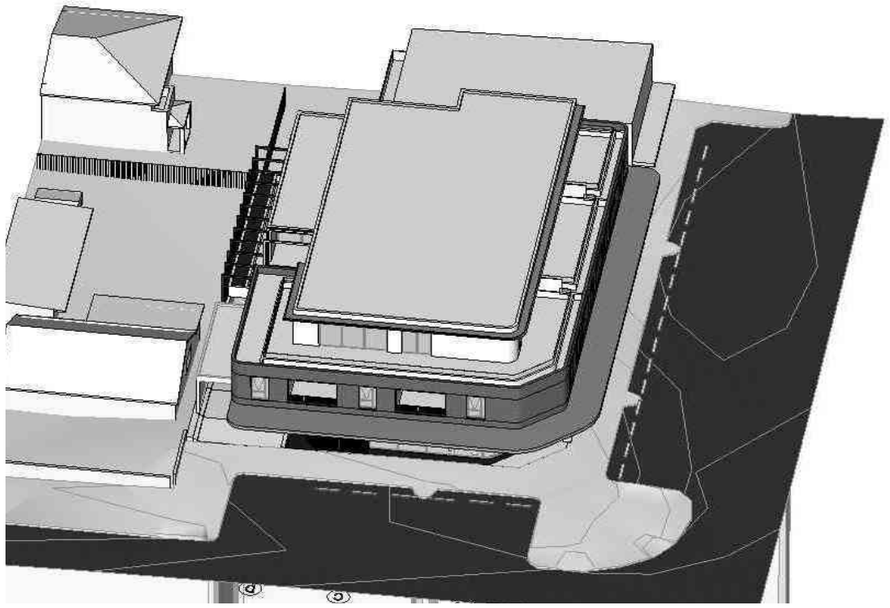


JUNE 21 **0900**



JUNE 21 **1000**

JUNE 21 **1100**



JUNE 21 **1200**

| JUNE 21

HOURLY SOLAR ANALYSIS

91M

THE VIEW FRAME (CAMERA POSITION) ASSUMES THE POSITION OF THE SUN. AT ANY HOURLY INTERVAL, EVERYTHING THAT CAN BE SEEN WILL RECEIVE SUN, AND INVERSELY ANYTHING THAT IS HIDDEN FROM VIEW IS IN SHADE.

DWELLING COMPLIANCE

LEVEL 1	01	02	03	04	05	06
	Yes	Yes	No	No	No	Yes
LEVEL 2	07	08	09			
	Yes	Yes	Yes			

TOTAL : **6 / 9 DWELLINGS (66.7%)**

DEVELOPMENT APPLICATION

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REV	DATE	ISSUE
A	SEPT 18	DA ISSUE 01

CLIENT
DREAMBUILD
6/37A KING ROAD HORNSBY NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD NARRAWEENA NSW 2099

PROJECT NORTH

SCALE

PROJECT NO. 1816A

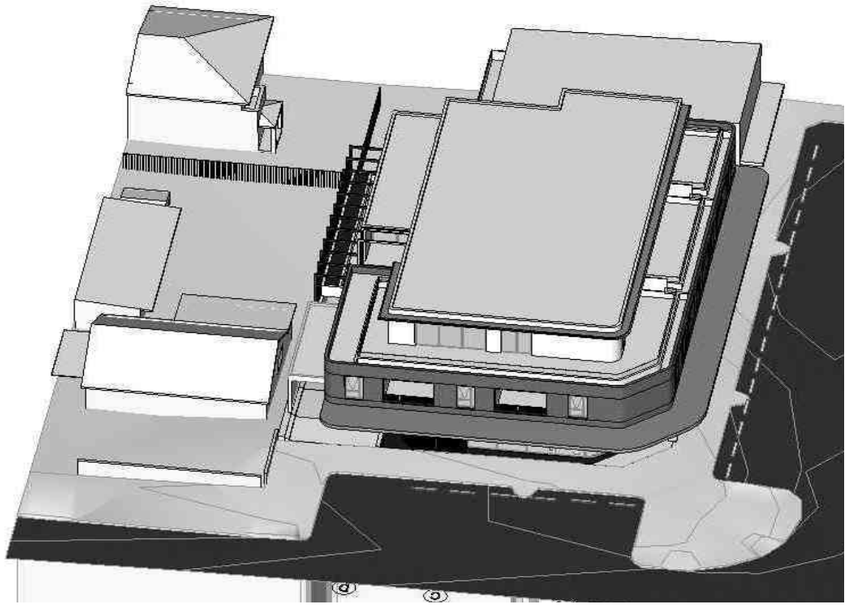
DRAWING NO. A-1302

DRAWING SOLAR ANALYSIS

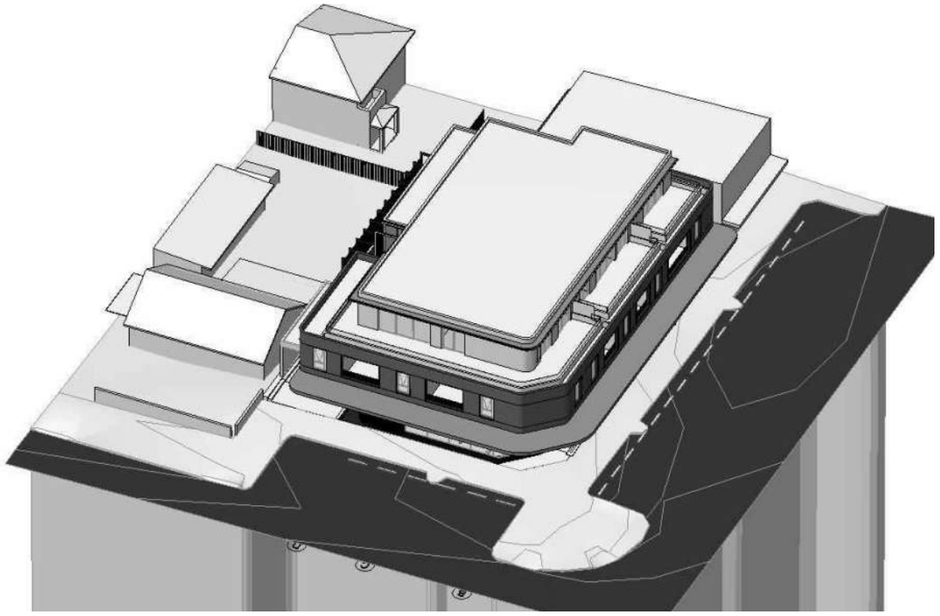
ISSUE A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

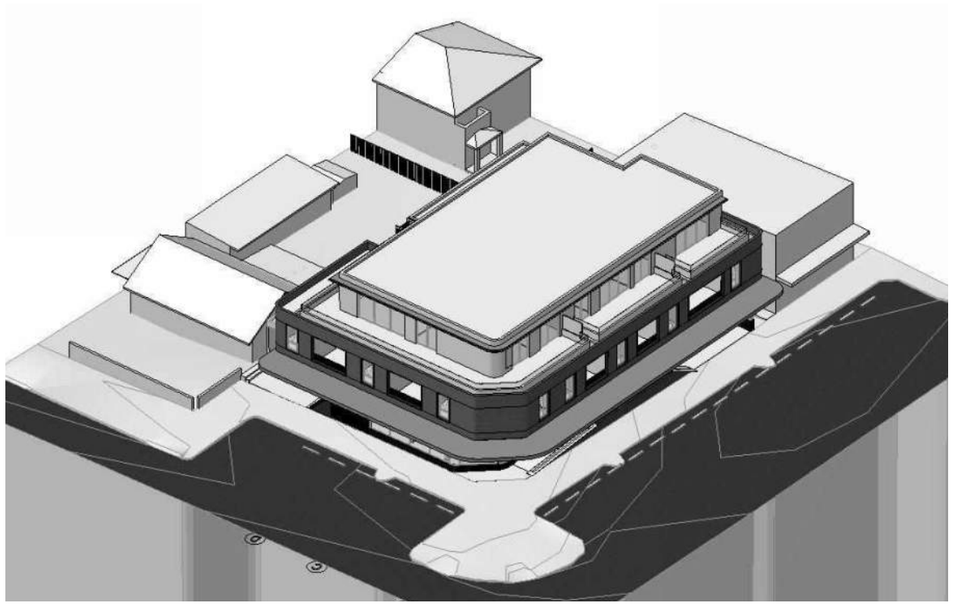
BENSON McCORMACK ARCHITECTURE



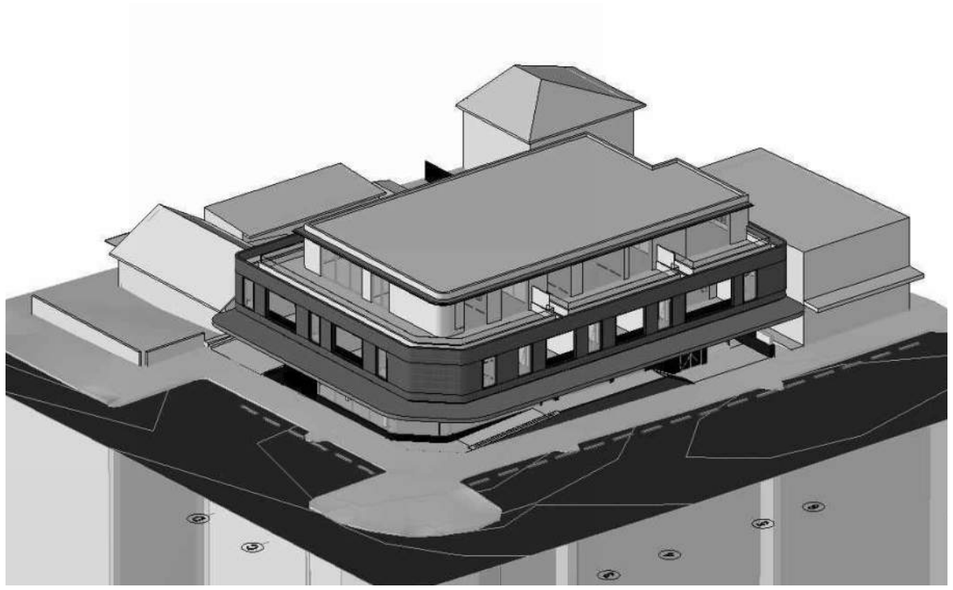
JUNE 21 **1200**



JUNE 21 **1300**



JUNE 21 **1400**



JUNE 21 **1500**

JUNE 21

HOURLY SOLAR ANALYSIS

THE VIEW FRAME (CAMERA POSITION) ASSUMES THE POSITION OF THE SUN. AT ANY HOURLY INTERVAL, EVERYTHING THAT CAN BE SEEN WILL RECEIVE SUN, AND INVERSELY ANYTHING THAT IS HIDDEN FROM VIEW IS IN SHADE.

DWELLING COMPLIANCE

LEVEL 1	01	02	03	04	05	06
	Yes	Yes	No	No	No	Yes
LEVEL 2	07	08	09			
	Yes	Yes	Yes			

TOTAL : **6 / 9 DWELLINGS (66.7%)**

91M

DEVELOPMENT APPLICATION

NOTES

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REV	DATE	ISSUE
A	SEPT 18	DA ISSUE 01

CLIENT
DREAMBUILD
6/37A KING ROAD HORNSBY NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD NARRAWEENA NSW 2099

PROJECT NORTH

SCALE @ A3

PROJECT NO. 1816A

DRAWING NO. A-1303

DRAWING SOLAR ANALYSIS

ISSUE A

ARCHITECT
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STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

BENSON McCORMACK ARCHITECTURE

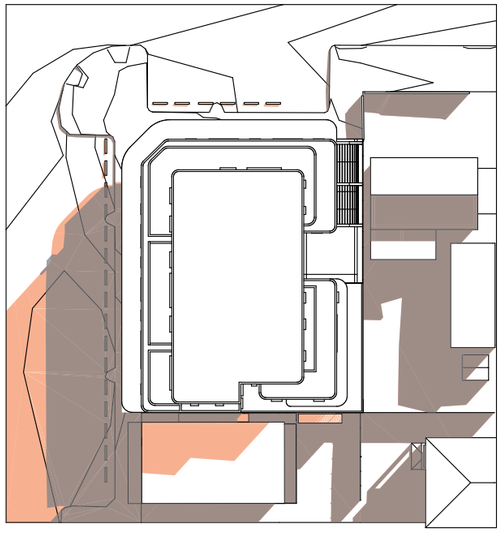
HOURLY SHADOW ANALYSIS

JUNE 21

EXISTING SHADOW

PROPOSED SHADOW

NOTE:
SHADOWS REMOVED FROM PROPOSED SITE FOR CLARITY



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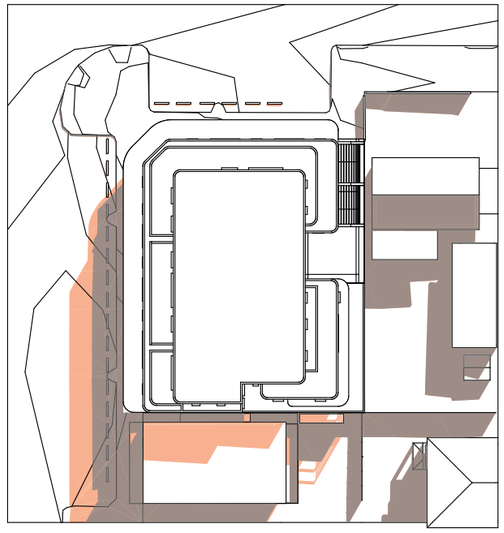

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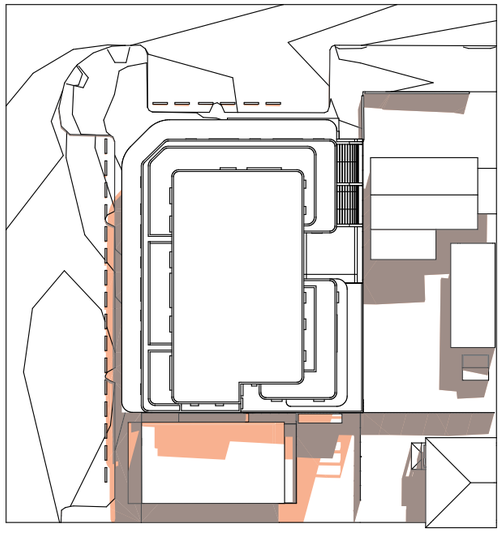

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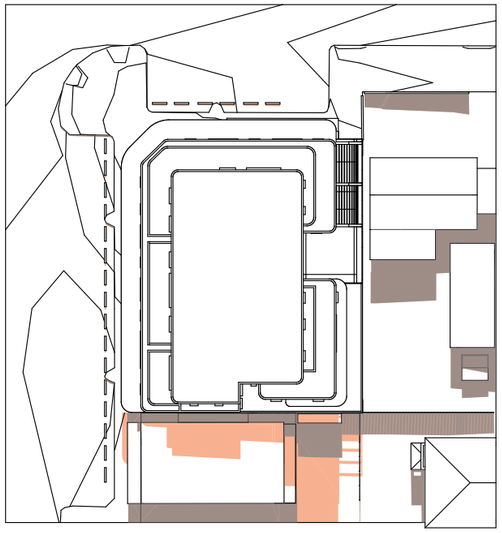

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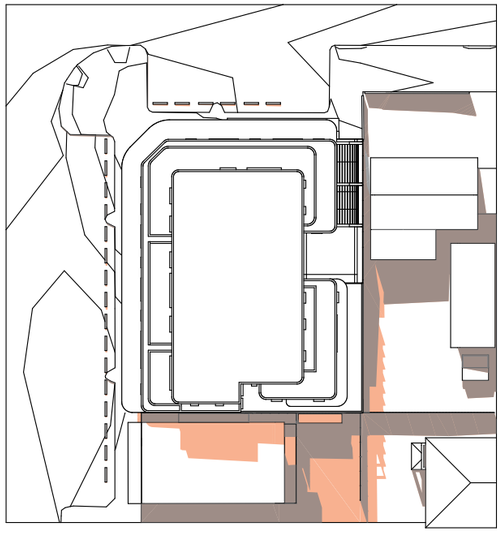

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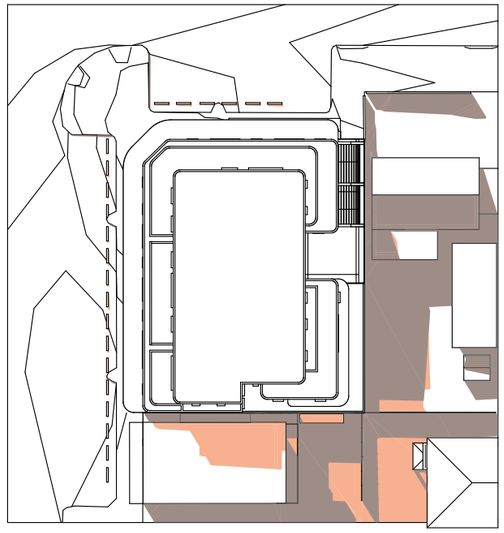

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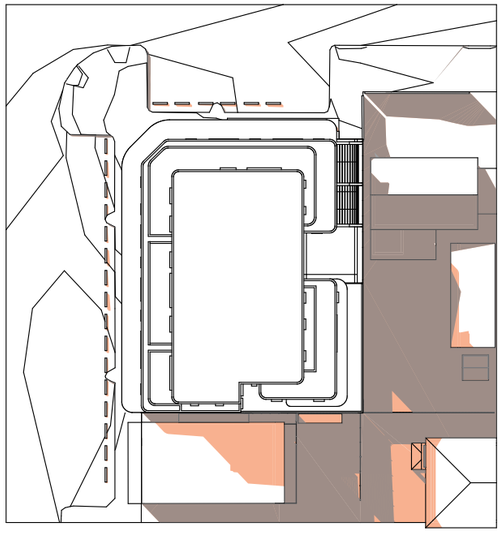

1500

91M

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REV	DATE	ISSUE
A	SEPT 18	DA ISSUE 01

CLIENT
DREAMBUILD
6/37A KING
ROAD HORNSBY
NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD
NARRAWEENA NSW 2099

PROJECT NORTH

SCALE

PROJECT NO.
1816A

DRAWING NO.
A-1304

DRAWING
SHADOW ANALYSIS

ISSUE
A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

BENSON
McCORMACK
ARCHITECTURE

CALCULATIONS

PARKING ALLOCATION

RESIDENTIAL CARPARKS

RESIDENTIAL CAR SPACES REQUIRED (WARRINGAH DCP) - 12 SPACES
VISITOR CAR SPACES REQUIRED (WARRINGAH DCP) - 2 SPACES

TOTAL RESIDENTIAL CAR SPACES ON SITE - 11+1 (ACCESSIBLE) SPACES **(PROVIDED)**
TOTAL VISITOR CAR SPACES ON SITE - 2 SPACES **(PROVIDED)**

COMMERCIAL/RETAIL CARPARKS

CAR SPACES DEDICATED (ON STREET) EXISTING - **21 SPACES**

CAR SPACES REQUIRED FOR RETAIL (WARRINGAH DCP) - 1 SPACE PER 16.4m²
TOTAL RETAIL GFA - 233.6m² = 15 SPACES
CAR SPACES REQUIRED FOR BUSINESS (WARRINGAH DCP) - 1 SPACE PER 40m²
TOTAL BUSINESS GFA - 106.5m² = 3 SPACES

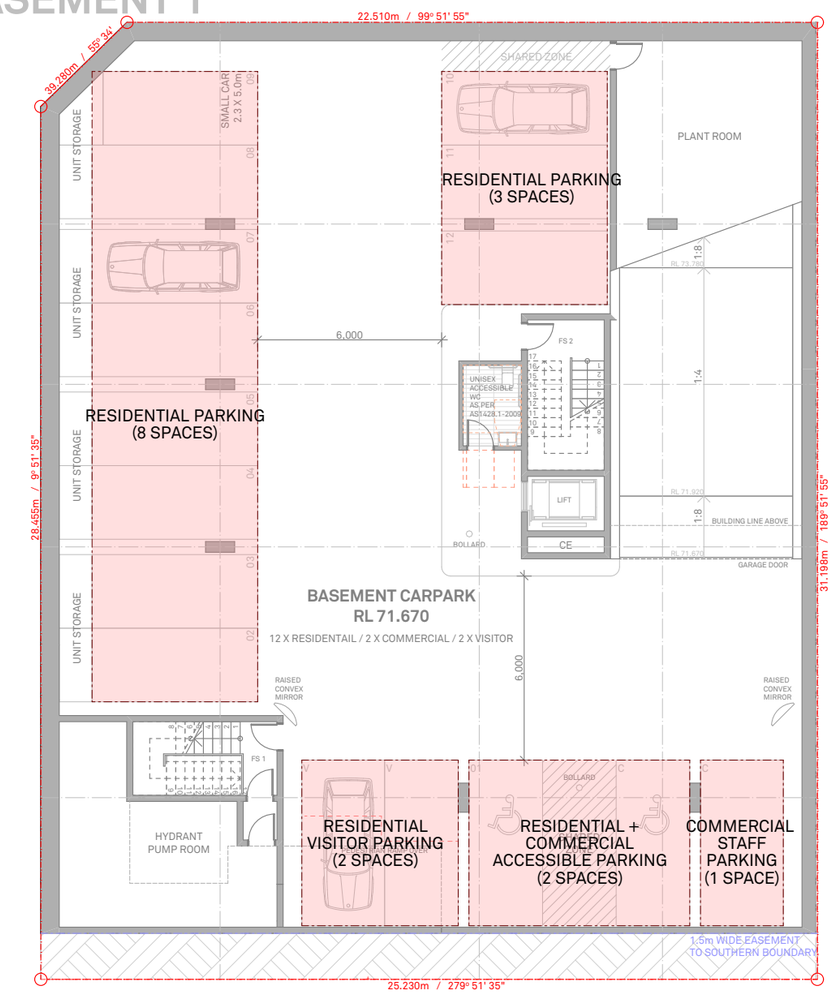
TOTAL CAR SPACES REQUIRED - **XX SPACES**
ADDITIONAL RETAIL/BUSINESS CAR SPACES PROVIDED ON SITE - **1+1 (ACCESSIBLE) SPACES**

BICYCLE PARKING

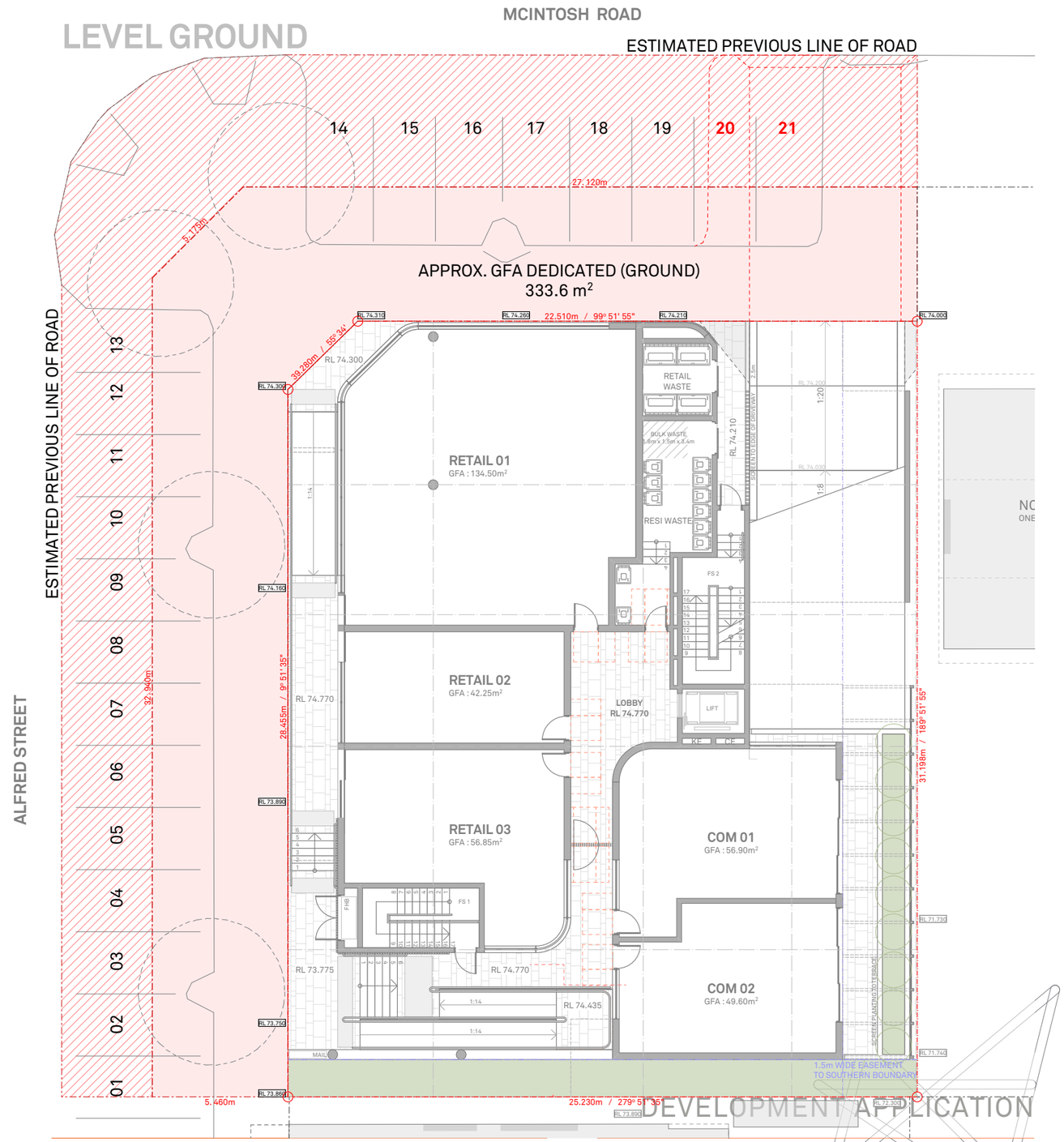
RESIDENTIAL BICYCLE PARKING REQUIRED (WARRINGAH DCP) - 9 + 1 (VISITOR) SPACES
RETAIL BICYCLE PARKING REQUIRED (WARRINGAH DCP) - 2 + 1 (VISITOR) SPACES
OFFICE BICYCLE PARKING REQUIRED (WARRINGAH DCP) - 1 SPACE

*ALL 9 RESPECTIVE UNITS STORAGES ARE ALSO USED AS BICYCLE STORAGE
*RESIDENTIAL VISITOR, RETAIL AND OFFICE BICYCLE PARKING ARE PROVIDED AT CORNER OF MCINTOSH ROAD AND ALFRED STREET

BASEMENT 1



LEVEL GROUND



91M

DEVELOPMENT APPLICATION

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REV	DATE	ISSUE
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CLIENT
DREAMBUILD
6/37A KING ROAD HORNSBY NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD NARRAWEENA NSW 2099

PROJECT NORTH

SCALE 1:200 @ A3
PROJECT NO. 1816A
DRAWING NO. A-1305
DRAWING CALCULATIONS - PARKING ALLOCATIONS
ISSUE A

ARCHITECT
P : + 61 2 9818 0777
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STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

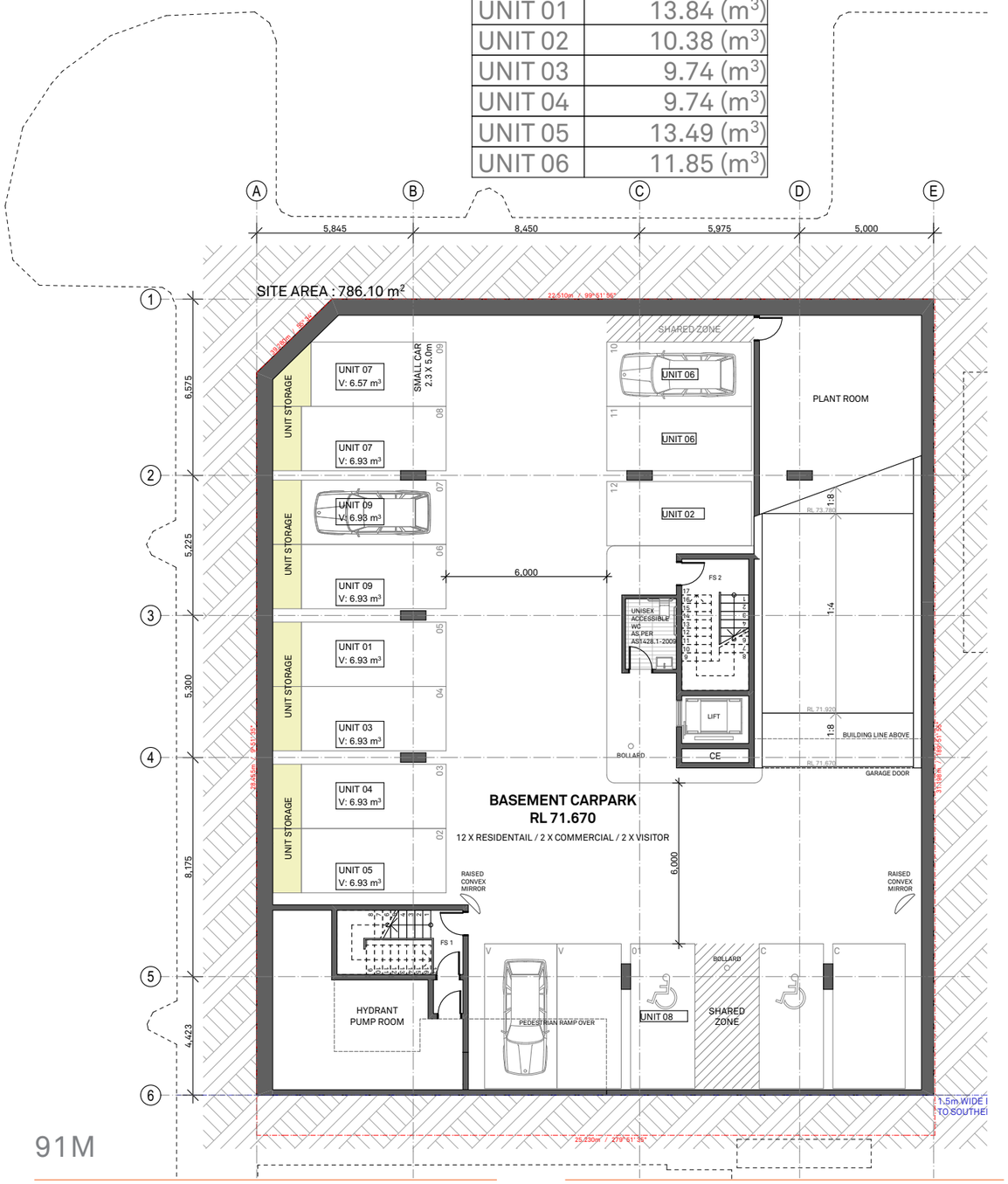
BENSON McCORMACK ARCHITECTURE

CALCULATIONS

UNIT STORAGE AREAS

UNIT NO.	STORAGE (m^3)
UNIT 01	13.84 (m^3)
UNIT 02	10.38 (m^3)
UNIT 03	9.74 (m^3)
UNIT 04	9.74 (m^3)
UNIT 05	13.49 (m^3)
UNIT 06	11.85 (m^3)

BASEMENT 1



1ST FLOOR

91M

DEVELOPMENT APPLICATION

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6/37A KING ROAD HORNSBY
NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD
NARRAWEENA NSW 2099

PROJECT NORTH

SCALE 1:200 @ A3

PROJECT NO. 1816A

DRAWING NO. A-1306

DRAWING CALCULATIONS - UNIT STORAGE AREAS 1 OF 2

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STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7530

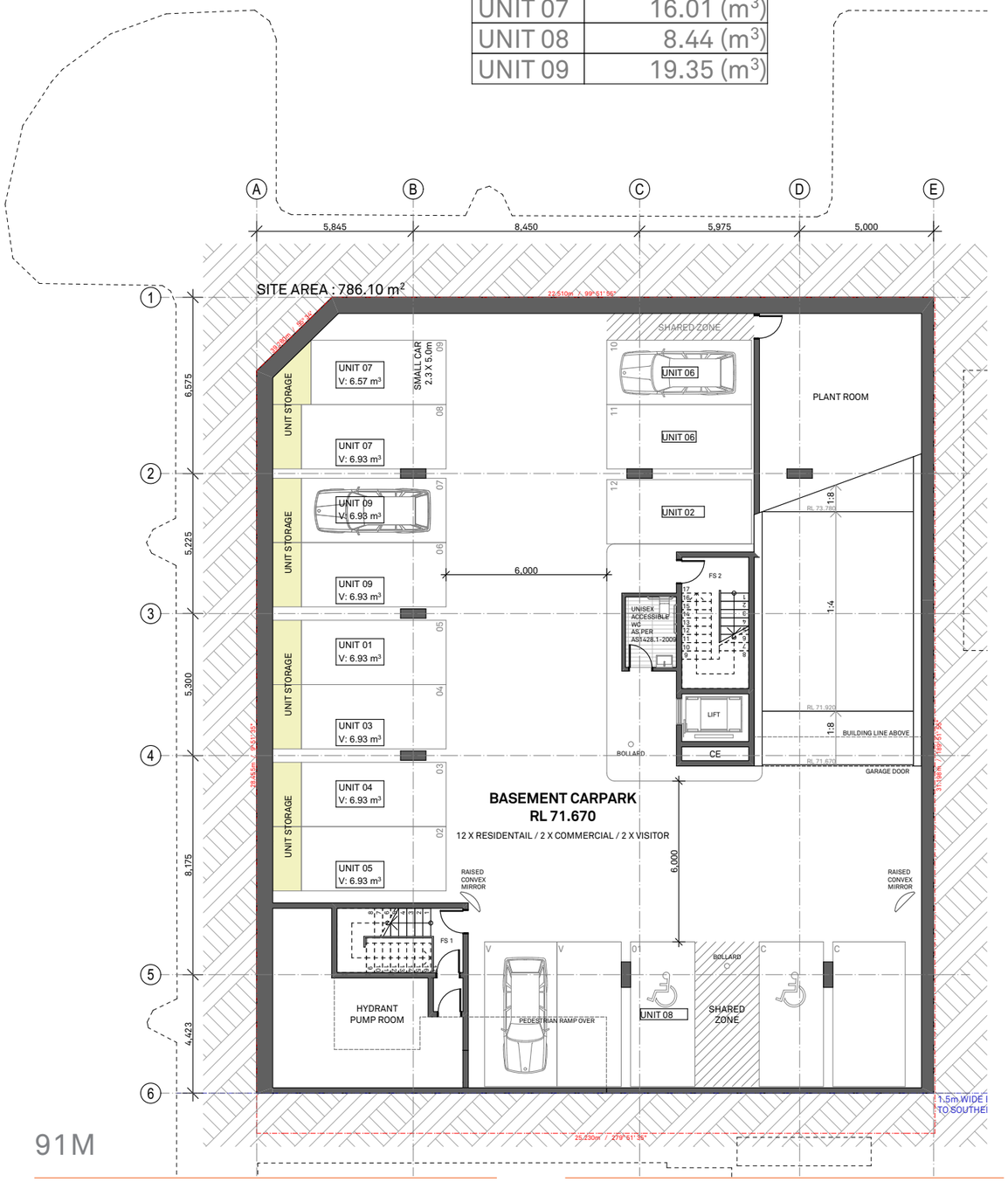
BENSON McCORMACK ARCHITECTURE

CALCULATIONS

UNIT STORAGE AREAS

UNIT NO.	STORAGE (m^3)
UNIT 07	16.01 (m^3)
UNIT 08	8.44 (m^3)
UNIT 09	19.35 (m^3)

BASEMENT 1



2ND FLOOR

91M

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REV	DATE	ISSUE
A	SEPT 18	DA ISSUE 01

CLIENT
DREAMBUILD
6/37A KING ROAD HORNSBY NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD NARRAWEENA NSW 2099

PROJECT NORTH

SCALE 1:200 @ A3

PROJECT NO. 1816A

DRAWING NO. A-1307

DRAWING CALCULATIONS - UNIT STORAGE AREAS 2 OF 2

ISSUE A

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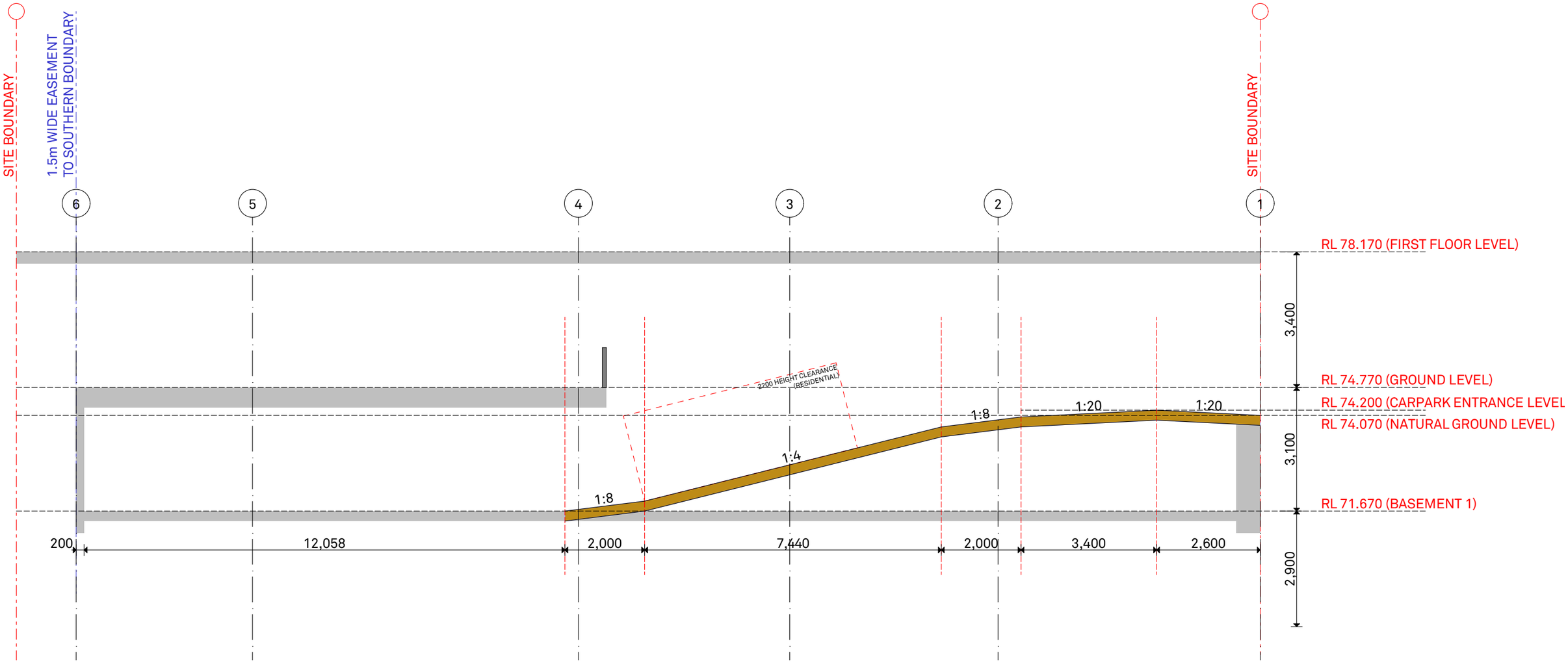
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

BENSON McCORMACK ARCHITECTURE



91M

DEVELOPMENT APPLICATION

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DREAMBUILD
6/37A KING
ROAD HORNSBY
NSW 2077

PROJECT DETAILS
91M
91-93 MCINTOSH ROAD
NARRAWEENA NSW 2099

PROJECT NORTH

SCALE	PROJECT NO.	DRAWING NO.	DRAWING
1:100 @ A3	1816A	A-1308	BASEMENT RAMP (WITH RAISED ENTRANCE LEVEL)

ISSUE
A

ARCHITECT
P : + 61 2 9818 0777
F : + 61 2 9818 0778
STUDIO 5, 505 BALMAIN RD
LILYFIELD NSW 2040
ABN: 76 129 130 285 RN: 7536

BENSON
McCORMACK
ARCHITECTURE

APPENDIX D

NORTHERN BEACHES
COUNCIL

FLOOD INFORMATION REQUEST – MULTI-PURPOSE

Property: 91-93 McIntosh Road, Narraweena
Lot DP:
Issue Date: 13/04/2018
Flood Study Reference: Dee Why South Catchment Flood Study, 2013

Flood Information for lot:

Flood Life Hazard Category – See Map A

1% AEP – See Flood Map B

1% AEP Maximum Water Level[3]: 74.27m AHD

1% AEP Maximum Peak Depth from natural ground level[3]: 0.75m

1% AEP Maximum Velocity: 0m/s

1% AEP Provisional Flood Hazard: Medium Flood Risk See Flood Map E

1% AEP Hydraulic Categorisation: Flood fringe See Flood Map F

Flood Planning Area – See Flood Map C

Flood Planning Level (FPL)[1,2, 3 &4]: 74.77m AHD

Probable Maximum Flood (PMF) – See Flood Map D

PMF Maximum Water Level[2]: 75.0 m AHD

PMF Maximum Depth from natural ground level: 1.45m

PMF Maximum Velocity: 0.0m/s

PMF Flood Hazard: N/A See Flood Map G

PMF Hydraulic Categorisation: Floodway See Flood Map H

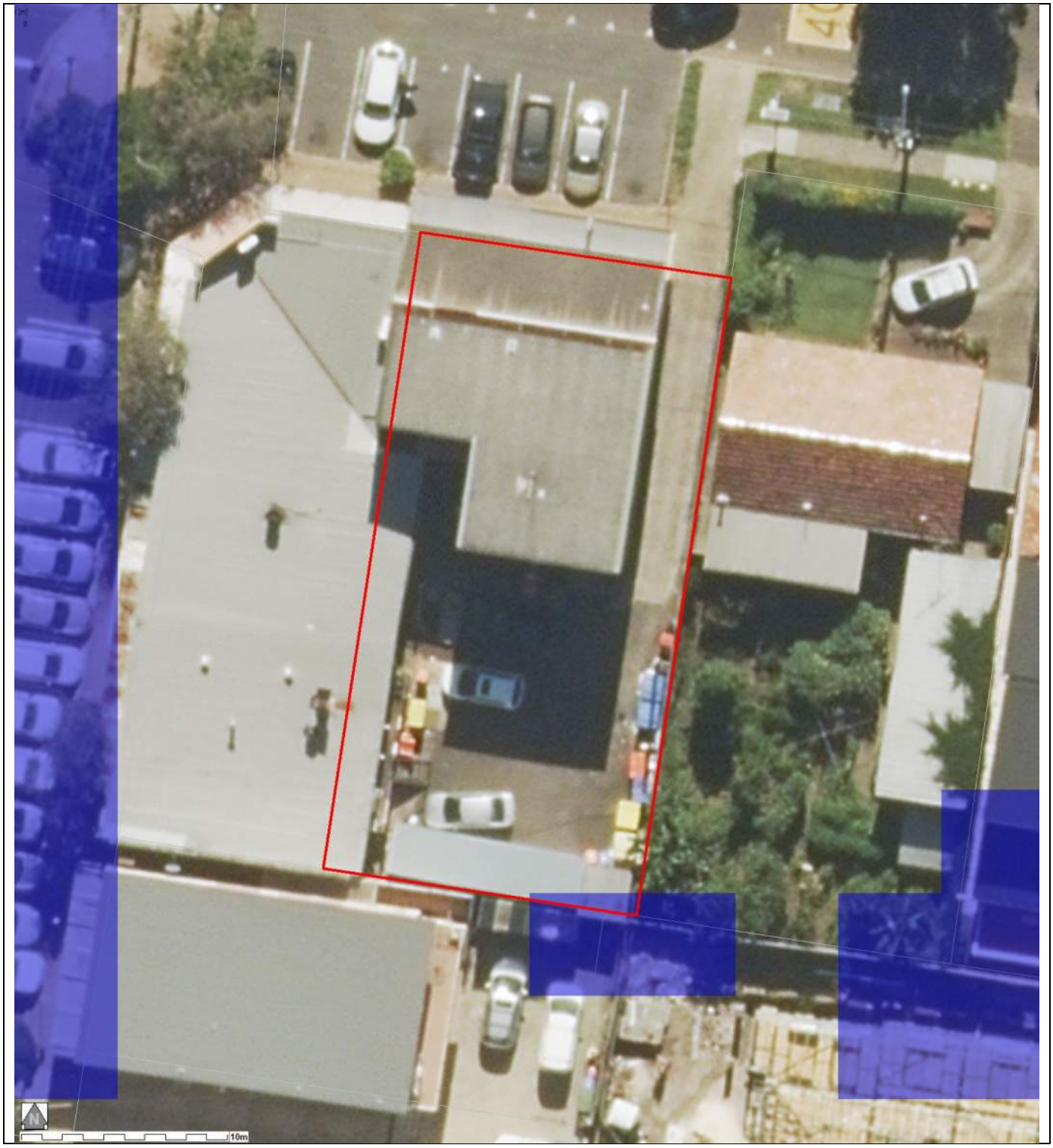
Flood Risk Precinct – See Map K

[1]The flood information does not take into account any local overland flow issues nor private stormwater drainage systems.
[2]Overland flow/mainstream water levels may vary across a sloping site, resulting in variable minimum floor/ flood planning levels across the site.
[3]Intensification of development in the former Pittwater LGA requires the consideration of climate change impacts which may result in higher minimum floor levels than those indicated on this flood advice.
[4]Vulnerable/critical developments require higher minimum floor levels using the higher of the PMF or Flood Planning Level

General Notes:

- All levels are based on Australian Height Datum (AHD) unless otherwise noted.
- This is currently the best available information on flooding; it may be subject to change in the future.
- Council recommends that you obtain a detailed survey of the above property and surrounds to AHD by a registered surveyor to determine any features that may influence the predicted extent or frequency of flooding. It is recommended you compare the flood level to the ground and floor levels to determine the level of risk the property may experience should flooding occur.
- Development approval is dependent on a range of issues, including compliance with all relevant provisions of Northern Beaches Council's Local Environmental Plans and Development Control Plans.
- Please note that the information contained within this letter is general advice only as a detail survey of the property as well as other information is not available. Council recommends that you engage a suitably experienced consultant to provide site specific flooding advice prior to making any decisions relating to the purchase or development of this property.
- The Flood Studies on which Council's flood information is based are available on Council's website.

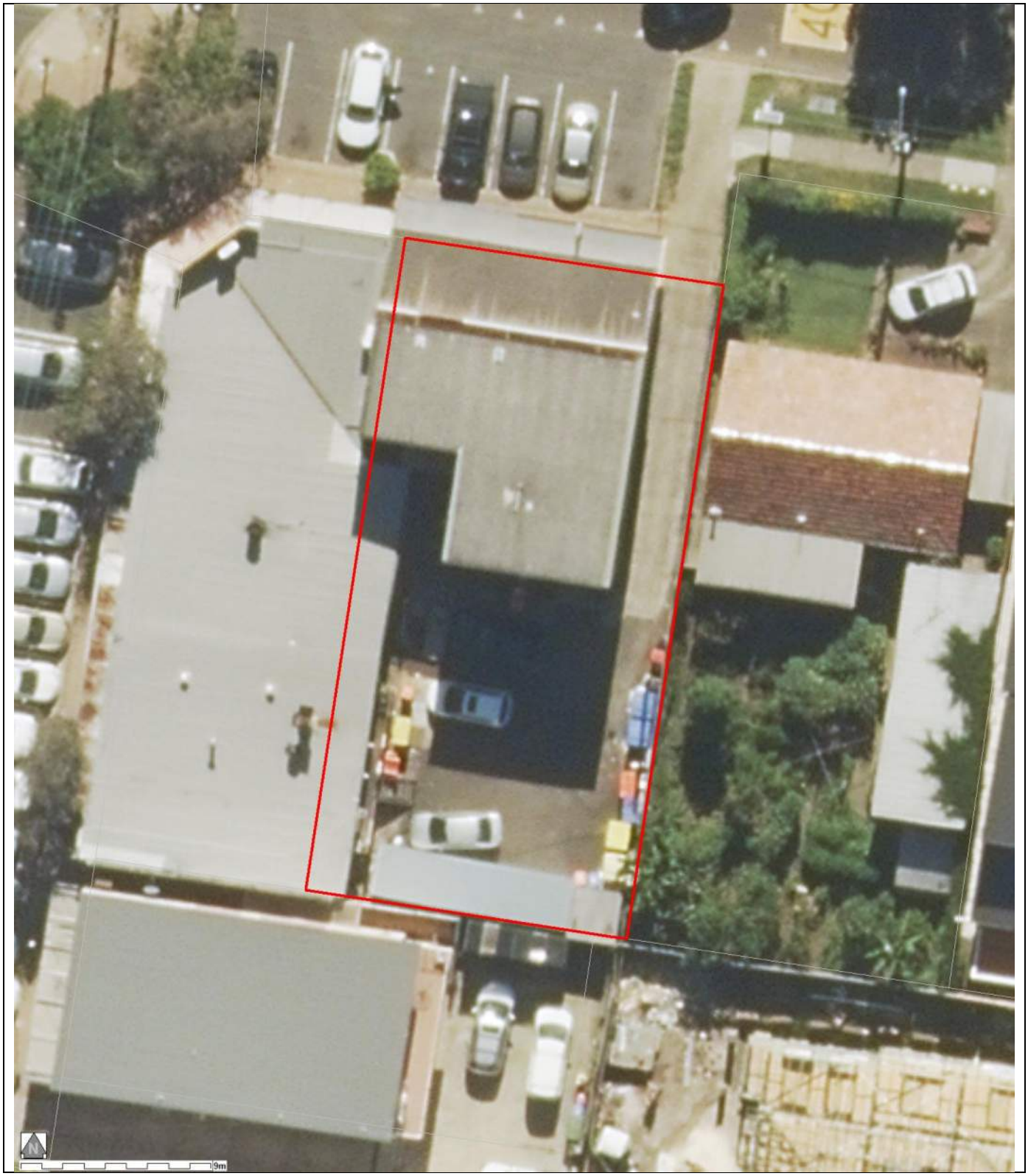
FLOOD MAP B: FLOODING - 1% AEP EXTENT



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event.
- Flood events exceeding the 1% AEP can occur on this site.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: N/A) and aerial photography (Source Near Map 2014) are indicative only.

FLOOD MAP C: FLOOD PLANNING AREA EXTENT



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: N/A) and aerial photography (Source Near Map 2014) are indicative only.

FLOOD MAP D - PMF EXTENT MAP

Notes:

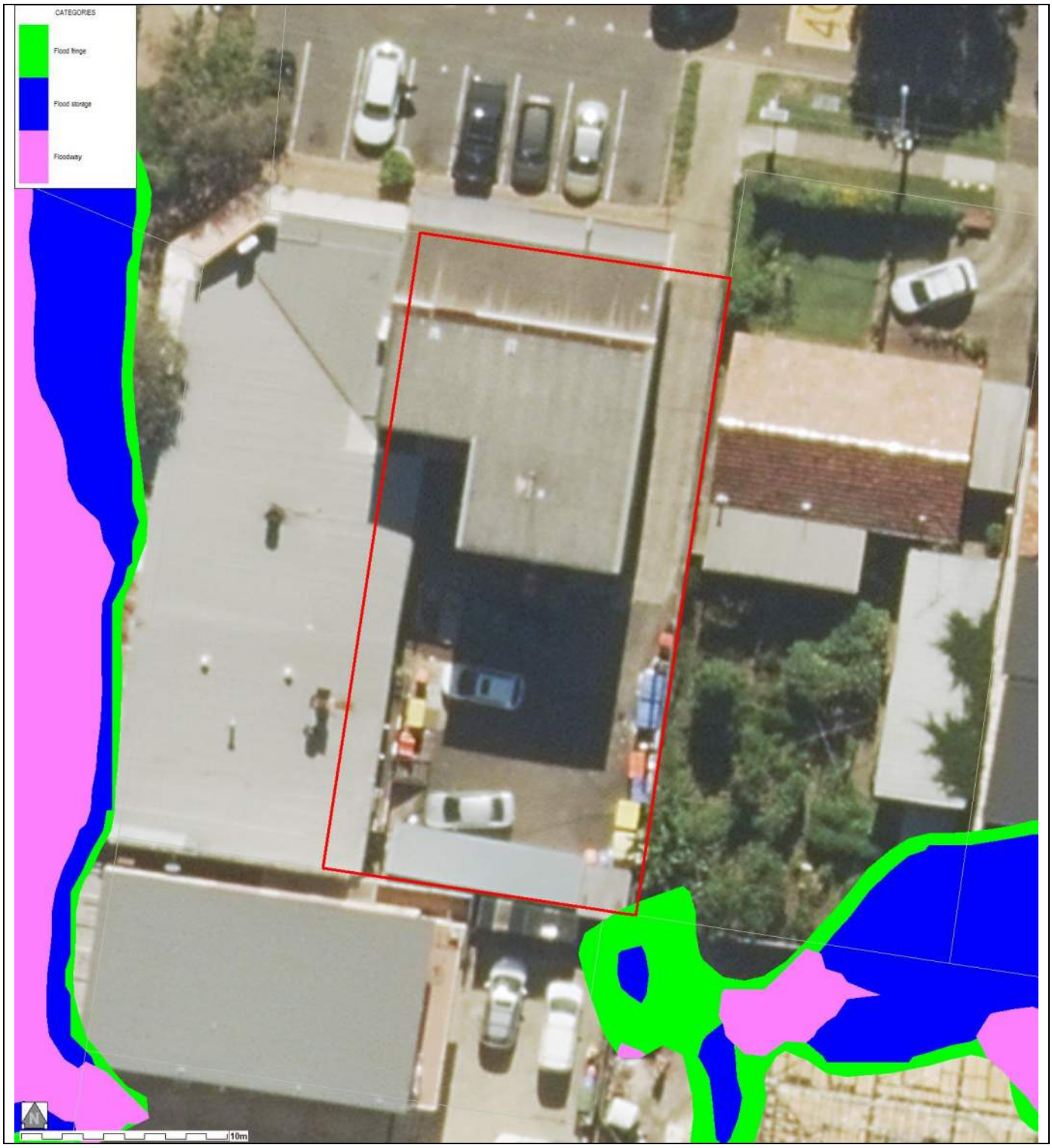
- extent represents the Probable Maximum Flood (PMF) flood event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: N/A) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP E – 1% AEP FLOOD HAZARD EXTENT MAP

Notes:

- extent represents the 1% annual Exceedance Probability (AEP) flood event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: N/A) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP F – 1% AEP FLOOD HYDRAULIC CATEGORY EXTENT MAP



Notes:

- extent represents the 1% annual Exceedance Probability (AEP) flood event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: N/A) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP G – PMF FLOOD HAZARD EXTENT MAP

Notes:

- extent represents the 1% annual Exceedance Probability (AEP) flood event
- extent represents the Probable Maximum Flood (PMF) event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: N/A) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP H – PMF FLOOD HYDRAULIC CATEGORY EXTENT MAP

Notes:

- extent represents the Probable Maximum Flood (PMF) event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: N/A) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP K – FLOOD RISK PRECINCT MAP

Notes:

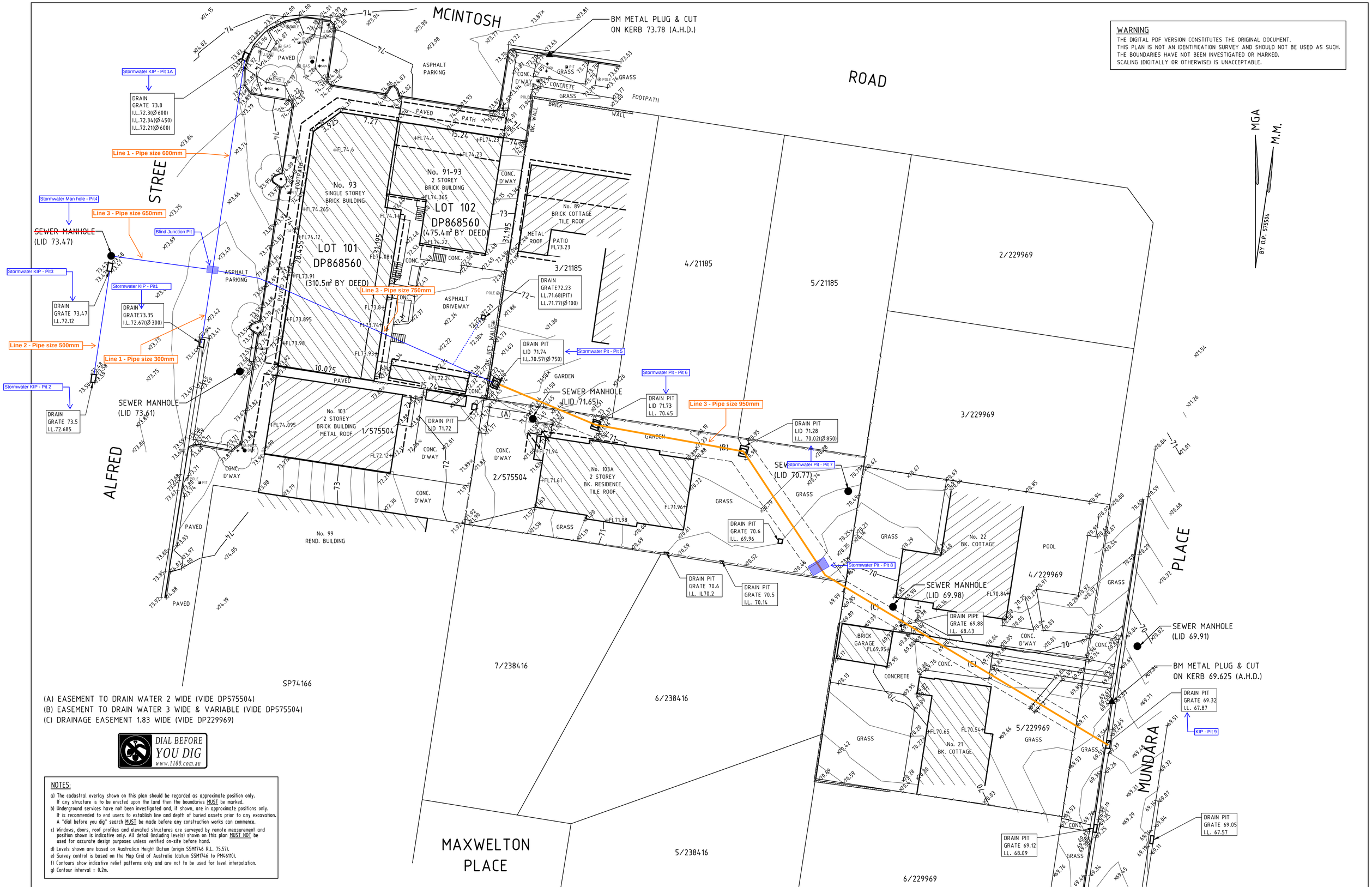
- **Low Flood Risk precinct** means all flood prone land not identified within the High or Medium flood risk precincts.
- **Medium Flood Risk precinct** means all flood prone land that is (a) within the 1% AEP Flood Planning Area; and (b) is not within the high flood risk precinct.
- **High Flood Risk precinct** means all flood prone land (a) within the 1% AEP Flood Planning Area; and (b) is either subject to a high hydraulic hazard, within the floodway or subject to significant evacuation difficulties (H5 and or H6 Life Hazard Classification).
- Does not include climate change

APPENDIX E

Parr Park
PARADE
NALYA ROAD
GREENWOOD AVENUE
GREENWOOD
+85·3
+82·8
+80·9
+79·8
+77·9
RONALD AVENUE
WARATAH PARADE
TARAKAN PL
RONALD AVENUE
GREER PLACE
McINTOSH ROAD
PALING PLACE
ELTHAM STREET
MONARO PLACE
NARRAWEENA
NARRAWEENA PUBLIC SCHOOL
LASCELLES ROAD
PLAYGROUND
COOPER CLOSE
AMARAL STREET
EDWARD STREET
CLOSE
STREET
MAXWELTON PLACE
MUNDARA PLACE
ALAMEIN
THE CIRCLE
ROAD
80
90
100
110
120
130

DAWES
CONSULTING ENGINEERS
e:info@dawesengineering.com.au
m:0413 723 171 ABN 54 165 695 250

APPENDIX F



WARNING
THE DIGITAL PDF VERSION CONSTITUTES THE ORIGINAL DOCUMENT.
THIS PLAN IS NOT AN IDENTIFICATION SURVEY AND SHOULD NOT BE USED AS SUCH.
THE BOUNDARIES HAVE NOT BEEN INVESTIGATED OR MARKED.
SCALING (DIGITALLY OR OTHERWISE) IS UNACCEPTABLE.

(A) EASEMENT TO DRAIN WATER 2 WIDE (VIDE DP575504)
(B) EASEMENT TO DRAIN WATER 3 WIDE & VARIABLE (VIDE DP575504)
(C) DRAINAGE EASEMENT 1.83 WIDE (VIDE DP229969)

DIAL BEFORE YOU DIG
www.1100.com.au

NOTES:

a) The cadastral overlay shown on this plan should be regarded as approximate position only. If any structure is to be erected upon the land then the boundaries MUST be marked.
b) Underground services have not been investigated and, if shown, are in approximate positions only. It is recommended to end users to establish line and depth of buried assets prior to any excavation. A "dial before you dig" search MUST be made before any construction works can commence.
c) Windows, doors, roof profiles and elevated structures are surveyed by remote measurement and position shown is indicative only. All detail (including levels) shown on this plan MUST NOT be used for accurate design purposes unless verified on-site before hand.
d) Levels shown are based on Australian Height Datum (origin SSM1746 R.L. 75.57).
e) Survey control is based on the Map Grid of Australia (datum SSM1746 to PM46110).
f) Contours show indicative relief patterns only and are not to be used for level interpolation.
g) Contour interval = 0.2m.

BOSSI ID 3841
Surveyor Registered under the Surveying and Spatial Information Act, 2002

4 2 0 4 8 12 16 20
NOTE: ALL DIMENSIONS ARE IN METRES UNLESS SPECIFIED OTHERWISE

ROBERT FRIEND SURVEYS PTY LTD
Consulting Land Surveyor
PO Box 4292, Denistone East, NSW, 2112 (02) 9807 4947
Email: admin@rfsurveys.com.au

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SURVEY	DRAWN	CHKD	AMENDMENTS	DATE	No.
R.F.	R.F.	R.F.	ISSUED FOR INFORMATION PURPOSES ONLY	APRIL 2018	A

CLIENT: DREAMBUILD

TITLE: LEVELS SURVEY AT LAND ADJOINING
91-93 McINTOSH ROAD
NARRAWEENA NSW 2099

SCALE 1 : 200
DRAWING No. 1821-2-A
SHEET 1 of 1
A1

APPENDIX G

DRAINS results prepared from Version 2018.08

PIT / NODE DETAILS Version 8

Name	Max HGL	Max Pond HGL	Max Surfac Flow Arrivi (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit 1A	73.79		3.125		0.01	2.677	Inlet Capacity
BLIND PIT	72.8		0		0.65		None
Pit_5	71.55		0.087		0.19	0.038	Inlet Capacity
N_6	71.01		5.851				
Pit_1	73.6	73.86	5.808	8.6	0	5.643	Outlet System
Pit_2	73.85		3.193		0	3.234	Outlet System
Pit_3	73.07	73.69	3.262	4.3	0.4	3.125	Inlet Capacity
Pit_7	71.82		5.667		0	5.82	Outlet System
Pit_8	72.23		0.057		0	0.047	Inlet Capacity

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat_1A	3.125	2.754	0.456	8.24	14.93	0	AR&R 100 year, 20 minutes storm, average 159 mm/h, Zone 1
Cat_5	0.04	0.04	0	5	0	0	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
Cat_1	0.065	0.065	0	5	0	0	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
Cat_2	3.193	2.746	0.475	7.86	14.23	0	AR&R 100 year, 25 minutes storm, average 144 mm/h, Zone 1
Cat_3	0.029	0.029	0	5	0	0	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
Cat_7	0.028	0.028	0	5	0	0	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
Cat_8	0.057	0.057	0	5	0	0	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1

Outflow Volumes for Total Catchment (8.96 impervious + 2.16 pervious = 11.1 total ha)

Storm	Total Rainf cu.m	Total Runo cu.m (Runc	Impervious cu.m (Runc	Pervious Runoff cu.m (Runoff %)
AR&R 100	2465.64	2159.91 (8	1896.36 (9	263.55 (54.9%)
AR&R 100	3893.12	3540.71 (9	3046.13 (9	494.58 (65.3%)
AR&R 100	4977.63	4587.88 (9	3919.65 (9	668.23 (69.0%)
AR&R 100	5895.3	5474.45 (9	4658.78 (9	815.67 (71.1%)
AR&R 100	6673.92	6218.10 (9	5285.92 (9	932.17 (71.8%)
AR&R 100	7341.31	6857.26 (9	5823.48 (9	1033.78 (72.4%)
AR&R 100	9093.31	8541.10 (9	7234.63 (9	1306.47 (73.8%)
AR&R 100	10455.81	9849.77 (9	8332.05 (9	1517.71 (74.6%)
AR&R 100	12346.75	11652.94 (	9855.07 (9	1797.87 (74.8%)
AR&R 100	13792.58	13023.90 (	11019.77 (	2004.13 (74.7%)
AR&R 100	15883.65	14985.97 (	12704.07 (	2281.90 (73.8%)
AR&R 100	18419.74	17346.89 (	14746.50 (	2600.39 (72.6%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Pipe_1A	0.642	2.97	73.157	72.803	AR&R 100 year, 30 minutes storm, average 132 mm/h, Zone 1
Pipe_3(1)	1.233	7.46	72.25	71.554	AR&R 100 year, 45 minutes storm, average 109 mm/h, Zone 1
Pipe_3(2)	1.314	3.4	71.25	71.01	AR&R 100 year, 25 minutes storm, average 144 mm/h, Zone 1
Pipe_1	0.188	2.67	73.073	72.889	AR&R 100 year, 5 minutes storm, average 266 mm/h, Zone 1
Pipe_2	0.299	2.71	73.225	73.069	AR&R 100 year, 5 minutes storm, average 266 mm/h, Zone 1
Pipe_3	0.39	1.8	72.866	72.803	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
Pipe4	0.092	2.31	71.676	71.554	AR&R 100 year, 20 minutes storm, average 159 mm/h, Zone 1
Pipe2	0.016	2.08	71.951	71.554	AR&R 100 year, 20 minutes storm, average 159 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF_1A	2.677	2.706	0	0.11	0.9	6.6	8.21	AR&R 100 year, 25 minutes storm, average 144 mm/h, Zone 1
OF_5	0.038	0.038	0	0.021	0.01	7.5	0.39	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
OF_1	5.643	5.664	0	0.271	1.5	4	5.54	AR&R 100 year, 25 minutes storm, average 144 mm/h, Zone 1
OF_2	3.234	3.26	0	0.11	1.09	6.6	9.89	AR&R 100 year, 25 minutes storm, average 144 mm/h, Zone 1
OF3	3.125	3.153	0	0.118	0.26	18.47	2.23	AR&R 100 year, 25 minutes storm, average 144 mm/h, Zone 1
OF7	5.82	5.82	0	0.199	0.37	23.93	1.85	AR&R 100 year, 25 minutes storm, average 144 mm/h, Zone 1
OF8	0.047	0.051	0	0.016	0.01	6.44	0.81	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level

CONTINUITY CHECK for AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Ch (cu.m)	Difference %
Pit 1A	5659.39	5731.65	0	-1.3
BLIND PIT	5202.32	5205.9	0	-0.1
Pit_5	5651.2	5649.91	0	0
N_6	11792.04	11792.04	0	0
Pit_1	7236.15	7238.42	0	0
Pit_2	5660.07	5617.64	0	0.7
Pit_3	5661.63	5661.79	0	0
Pit_7	6334.38	6438.07	0	-1.6
Pit_8	86.9	87.77	0	-1

Run Log for 18.10.17_DCE_Naraweena_US Catchment_MC.drn run at 08:40:26 on 19/10/2018
Upwelling occurred at: Pit_8, Pit_7, Pit_2, Pit 1A
Freeboard was less than 0.15m at Pit_1
The maximum flow in these overflow routes is unsafe: OF7, OF_1, OF_1A, OF3, OF_2

These overflow routes carried water uphill (adding energy): OF_1A, OF3, OF_2. These results may be invalid. You should check for water flowing round in circles (e.g. negative flow in adjacent pipes) at t

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APPENDIX H

DRAINS results prepared from Version 2018.06 Postdevelopment Results 100 YR ARI

PIT / NODE DETAILS Version 8

Name	Max HGL	Max Pond HGL	Max Surfac Flow Arrivi (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit_1A	73.79		3.125		0.01	3.001	Inlet Capacity
BLIND PIT	73.42		0		0.03		None
Pit_1	73.01	73.86	6.134	8.6	0.34	5.378	Inlet Capacity
Pit_1(2)	71.84		5.429		0	5.551	Outlet System
Pit5	71.45		0.04		0.29	0.015	Inlet Capacity
N_6	70.98		5.605				
Pit_2	74.19		3.193		0	3.231	Outlet System
Pit_3	73.48	73.69	3.259	4.3	0	3.123	Outlet System
Pit_7	71.82		0.028		0	0.045	Outlet System

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat_1A	3.125	2.754	0.456	8.24	14.93	0	AR&R 100 year, 20 minutes storm, average 159 mm/h, Zone 1
Cat_1	0.065	0.065	0	5	0	0	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
Cat_1(2)	0.057	0.057	0	5	0	0	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
Cat_5	0.04	0.04	0	5	0	0	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
Cat_2	3.193	2.746	0.475	7.86	14.23	0	AR&R 100 year, 25 minutes storm, average 144 mm/h, Zone 1
Cat_3	0.029	0.029	0	5	0	0	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
Cat_7	0.028	0.028	0	5	0	0	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1

Outflow Volumes for Total Catchment (8.96 impervious + 2.16 pervious = 11.1 total ha)

Storm	Total Rainf cu.m	Total Runo cu.m (Runc	Impervious cu.m (Runc	Pervious Runoff cu.m (Runoff %)
AR&R 100	2465.64	2159.91 (8	1896.36 (9	263.55 (54.9%)
AR&R 100	3893.12	3540.71 (9	3046.13 (9	494.58 (65.3%)
AR&R 100	4977.63	4587.88 (9	3919.65 (9	668.23 (69.0%)
AR&R 100	5895.3	5474.45 (9	4658.78 (9	815.67 (71.1%)
AR&R 100	6673.92	6218.10 (9	5285.92 (9	932.17 (71.8%)
AR&R 100	7341.31	6857.26 (9	5823.48 (9	1033.78 (72.4%)
AR&R 100	9093.31	8541.10 (9	7234.63 (9	1306.47 (73.8%)
AR&R 100	10455.81	9849.77 (9	8332.05 (9	1517.71 (74.6%)
AR&R 100	12346.75	11652.94 (	9855.07 (9	1797.87 (74.8%)
AR&R 100	13792.58	13023.90 (	11019.77 (	2004.13 (74.7%)
AR&R 100	15883.65	14985.97 (	12704.07 (	2281.90 (73.8%)
AR&R 100	18419.74	17346.89 (	14746.50 (	2600.39 (72.6%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Pipe_1A	0.445	2.06	73.553	73.422	AR&R 100 year, 5 minutes storm, average 266 mm/h, Zone 1
Pipe_BP	0.66	2.33	73.051	73.014	AR&R 100 year, 5 minutes storm, average 266 mm/h, Zone 1
Pipe_1	1.358	5.4	72.286	71.841	AR&R 100 year, 10 minutes storm, average 210 mm/h, Zone 1
Pipe_1(2)	1.203	2.63	71.459	71.446	AR&R 100 year, 10 minutes storm, average 210 mm/h, Zone 1
Pipe_5	1.215	3.37	71.101	70.977	AR&R 100 year, 25 minutes storm, average 144 mm/h, Zone 1
Pipe_2	0.2	2.83	73.699	73.477	AR&R 100 year, 5 minutes storm, average 266 mm/h, Zone 1
Pipe1	0.291	1.35	73.437	73.422	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
Pipe_7	0.008	0.19	71.82	71.841	AR&R 100 year, 10 minutes storm, average 210 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF_1A	3.001	3.027	0	0.11	1.01	6.6	9.18	AR&R 100 year, 20 minutes storm, average 159 mm/h, Zone 1
OF_1	5.378	5.423	0	0.483	3.66	1.48	7.58	AR&R 100 year, 25 minutes storm, average 144 mm/h, Zone 1
OF1(2)	5.551	5.551	0.043	0.195	0.35	23.69	1.82	AR&R 100 year, 25 minutes storm, average 144 mm/h, Zone 1
OF5	0.015	0.015	0	0.014	0	6.09	0.3	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1
OF2	3.231	3.257	0	0.11	1.09	6.6	9.88	AR&R 100 year, 25 minutes storm, average 144 mm/h, Zone 1
OF3	3.123	3.151	0	0.118	0.26	18.47	2.23	AR&R 100 year, 25 minutes storm, average 144 mm/h, Zone 1
OF7	0.045	0.045	4.58E+30	0.022	0.01	7.73	0.42	AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level

CONTINUITY CHECK for AR&R 100 year, 1.5 hours storm, average 74.0 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Ch (cu.m)	Difference %
Pit_1A	5659.39	5898.66	0	-4.2
BLIND PIT	2947.73	2948.92	0	0
Pit_1	11758.97	11760.78	0	0
Pit_1(2)	11799.5	11800.63	0	0
Pit5	5824.03	5825.37	0	0
N_6	11953.79	11953.79	0	0
Pit_2	5660.07	5715.43	0	-1
Pit_3	5759.42	5760.14	0	0
Pit_7	42.02	42.08	0	-0.1

Run Log for 18.10.17_DCE_Naraweena_US Catchment_Post Dev_MC.drn run at 19:50:21 on 18/10/2018
Upwelling occurred at: Pit_1(2), Pit_7, Pit_2, Pit_1A
Freeboard was less than 0.15m at Pit_3
The maximum flow in these overflow routes is unsafe: OF1(2), OF_1, OF_1A, OF3, OF2

These overflow routes carried water uphill (adding energy): OF_1A, OF3, OF2. These results may be invalid. You should check for water flowing round in circles (e.g. negative flow in adjacent pipes) at th

IGNORE THESE WARNINGS AT YOUR OWN PERIL.\cf1