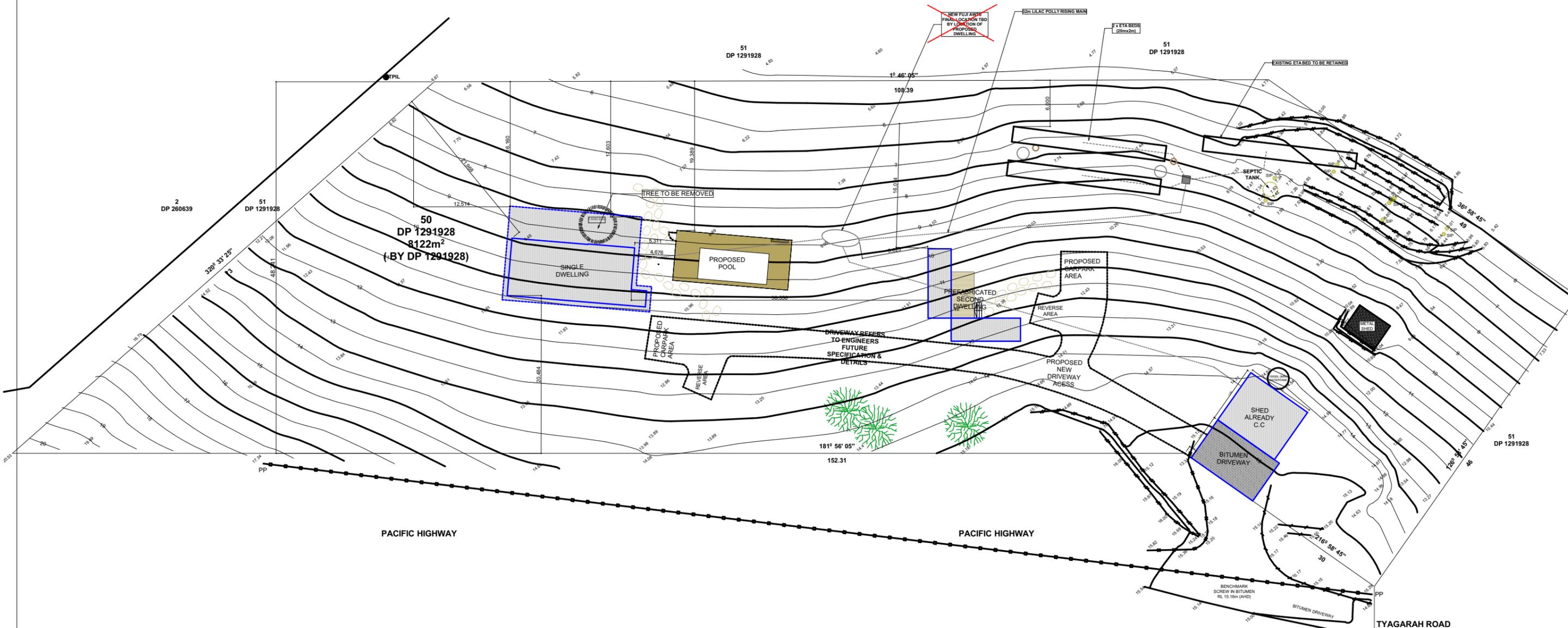


final AWTS location not approved under DA 10.2023.404.1, location is subject to further approval under section 68 of the Local Government Act.



0. Proposed Site Plan
Scale 1:500

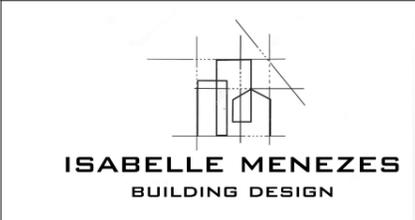
LEGEND

| | |
|------|----------------------------------|
| PP | POWER POLE |
| SIP | SEWER INSPECTION POINT |
| TPIL | TELECOMMUNICATION PILLAR |
| ET | OVERHEAD COMMS/ELECTRICITY WIRES |
| | TOP/BOTTOM OF BANK |

BYRON SHIRE COUNCIL
Development Application
APPROVED PLAN
DA No. 10.2023.404.1
Date: 16 April 2024

Revision History

| RevID | ChID | Change Name | Date |
|-------|------|---|------------|
| A | DH | Section 68 lodged for upgrade of the greywater treatment system to black water | 27/04/2023 |
| B | IM | Proposed prefabricated dwelling, new location for single dwelling with pool new driveway and demolition of one tree | 20/10/2023 |
| | | | |
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LEGEND/NOTES

| | | | | | | | |
|-----|----------------------------|------|----------------------------------|-----|----------------------------------|-----|------------------------------------|
| CT | CERAMIC FLOOR TILES | FG | FIXED GLASS | MB | MAIN POWER BOARD | SHR | SHOWER |
| CPT | CARPET | FW | FLOOR WASTE | MDR | METAL DECK ROOF | STC | STEEL TROWELLED CONCRETE |
| CS | CORRUGATED STEEL COLORBOND | G1 | 90mm HALF ROUND GUTTER | NGL | NATURAL GROUND LINE | STN | STONE CLADDING |
| CFT | CONCRETE FLOOR TILE | G2 | COLORBOND BOX GUTTER 300mm | PBK | PAINTED AND RENDERED BRICK | SP | OVERFLOW SPITTER |
| DP | DOWNPIPE 90 Ø ROUND | GS | GUTTER WATER SPITTER | PBW | PAINTED BLOCKWORK | SL | SKYLIGHT TO BASIX SPECIFICATIONS |
| EX | EXISTING | GD | GARAGE DOOR VERTICAL TIMBER CLAD | PB | PAINTED PLASTER BOARD | SW | STONE FEATURE WALL |
| EF | EXHAUST FAN | GHRL | GLASS HAND RAIL | PCS | POLISHED CONCRETE SLAB | ST | STORAGE |
| F | FRIDGE | GT | EXTERNAL GARDEN TAP | PS | PRIVACY SCREEN | TD | TIMBER DECKING HARDWOOD |
| FFL | FINISHED FLOOR LEVEL | HT | HOT WATER UNIT TO BASIX | R | ROBE | TF | TIMBER FLOORING HARDWOOD |
| FCL | FINISHED CEILING LEVEL | HTSL | HORIZONTAL TIMBER SLATS | RC | REINFORCED CONCRETE | TS | TIMBER SCREEN |
| FC | FIBRE CEMENT SHEETING | LB | LINING BOARDS | RB | RENDERED BLOCK WALL PAINT FINISH | WB | TIMBER WEATHERBOARD CLADDING PAINT |
| FP | FIREPLACE | LC | LAUNDRY CHUTE | RH | RANGEHOOD | WL | WASHING LINE |
| FS | TIMBER FASCIA PAINT FINISH | LP | LINEN CUPBOARD | RWT | RAINFALL TANK TO BASIX | WM | WASHING MACHINE |
| | | LV | LOUVRES | SC | STEEL COLUMN TO ENG DETAILS | WIP | WASTE PIPE |
| | | | | SM | SMOKE DETECTOR TO BCA | ZC | ZINC CLADDING |

Client Name
Sarah Vial
Project Name
Tyagarah Rd Residence
27 Tyagarah Rd NSW 2481

Drawing Title:
Proposed Site Plan

Status: PROPOSAL
RESIDENCE

Date: 17/11/2023
Scale: 1:500 @ A3

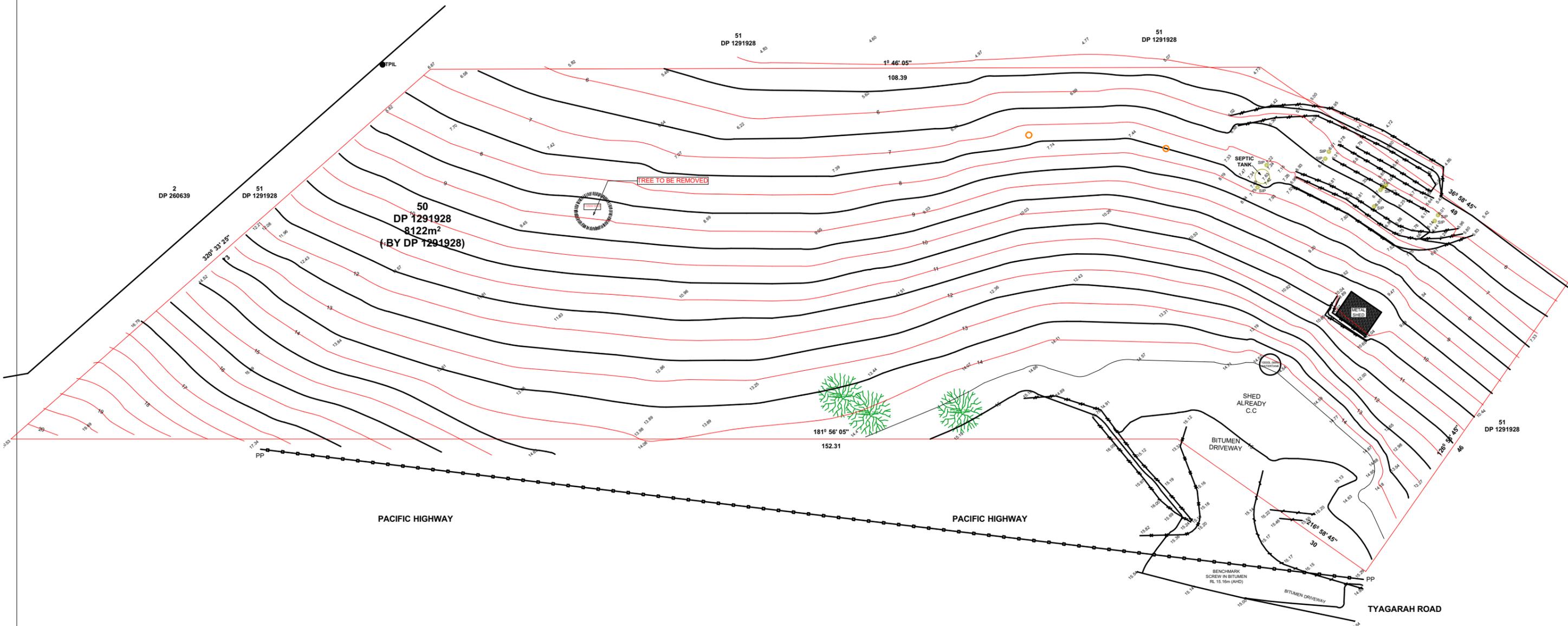
Project No:
12

Drawing No.:
A.01.3

REVISION:
B

Plot Date:

BYRON SHIRE COUNCIL
 Development Application
 APPROVED PLAN
 DA No. 10.2023.404.1
 Date: 16 April 2024



0. Demolition Plan
 Scale 1:500

| RevID | ChID | Change Name | Date |
|-------|------|---|------------|
| A | DH | Section 88 lodged for upgrade of the greywater treatment system to black water | 27/04/2023 |
| B | IM | Proposed prefabricated dwelling, new location for single dwelling with pool new driveway and demolition of one tree | 20/10/2023 |
| | | | |
| | | | |
| | | | |
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LEGEND/NOTES

| | | | | | | | |
|-----|----------------------------|------|----------------------------------|-----|----------------------------------|-----|------------------------------------|
| CT | CERAMIC FLOOR TILES | FG | FIXED GLASS | MB | MAIN POWER BOARD | SHR | SHOWER |
| CPT | CARPET | FW | FLOOR WASTE | MDR | METAL DECK ROOF | STC | STEEL TROWELLED CONCRETE |
| CS | CORRUGATED STEEL COLORBOND | G1 | 90mm HALF ROUND GUTTER | NGL | NATURAL GROUND LINE | STN | STONE CLADDING |
| CFT | CONCRETE FLOOR TILE | G2 | COLORBOND BOX GUTTER 300mm | PBK | PAINTED AND RENDERED BRICK | SP | OVERFLOW SPITTER |
| DP | DOWNPIPE 90 Ø ROUND | GS | GUTTER WATER SPITTER | PBW | PAINTED BLOCKWORK | SL | SKYLIGHT TO BASIX SPECIFICATIONS |
| EX | EXISTING | GD | GARAGE DOOR VERTICAL TIMBER CLAD | PB | PAINTED PLASTER BOARD | ST | STONE FEATURE WALL |
| EF | EXHAUST FAN | GHRL | GLASS HAND RAIL | PCS | POLISHED CONCRETE SLAB | ST | STORAGE |
| F | FRIDGE | GT | EXTERNAL GARDEN TAP | PS | PRIVACY SCREEN | TD | TIMBER DECKING HARDWOOD |
| FFL | FINISHED FLOOR LEVEL | HTSL | HORIZONTAL TIMBER SLATS | R | ROBE | TP | TIMBER POST |
| FCL | FINISHED CEILING LEVEL | LB | LINING BOARDS | RC | REINFORCED CONCRETE | TF | TIMBER FLOORING HARDWOOD |
| FC | FIBRE CEMENT SHEETING | LC | LAUNDRY CHUTE | RB | RENDERED BLOCK WALL PAINT FINISH | TS | TIMBER SCREEN |
| FP | FIREPLACE | LN | LINEN CUPBOARD | RH | RANGEHOOD | WB | TIMBER WEATHERBOARD CLADDING PAINT |
| FS | TIMBER FASCIA PAINT FINISH | LV | LOUVRES | RWT | RAINFALL TANK TO BASIX | WL | WASHING LINE |
| | | | | SC | STEEL COLUMN TO ENG DETAILS | WM | WASHING MACHINE |
| | | | | SM | SMOKE DETECTOR TO BCA | WIP | WASTE PIPE |
| | | | | | | ZC | ZINC CLADDING |

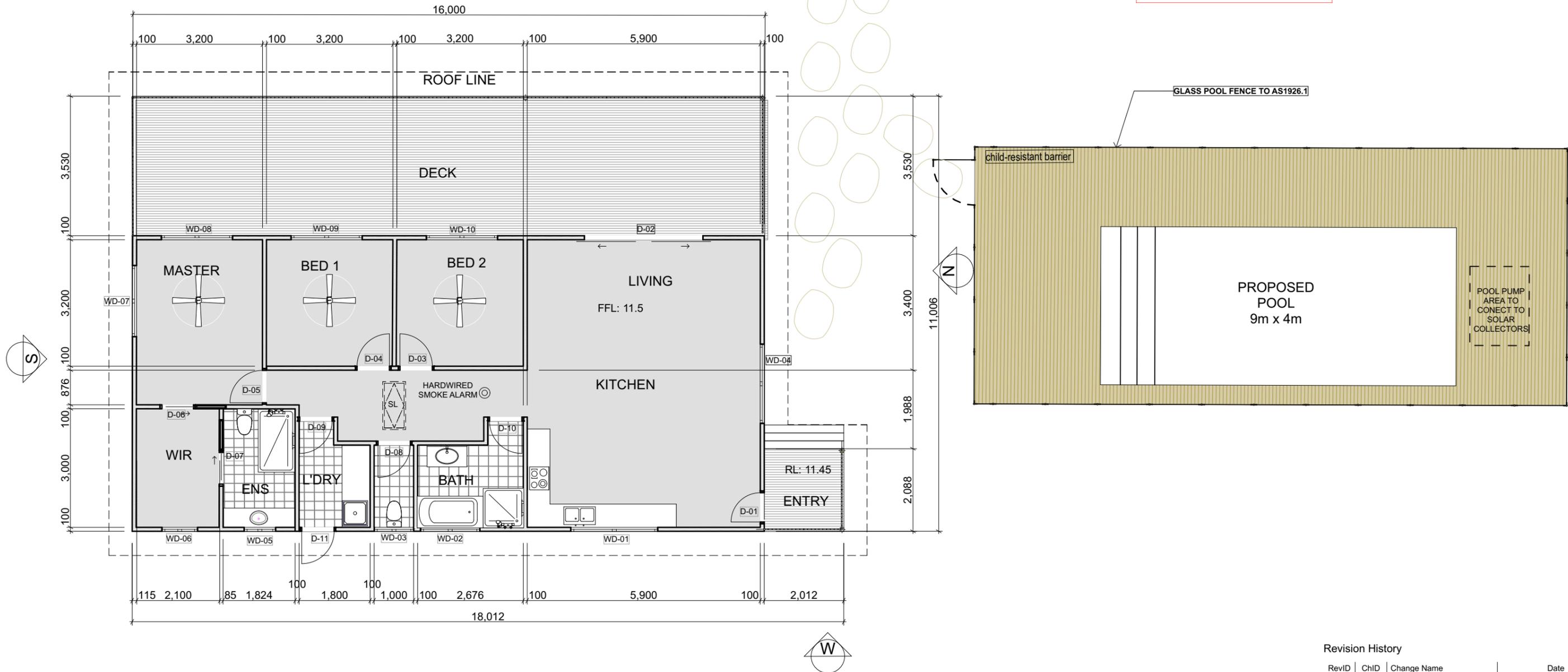
Client Name
Sarah Vial
 Project Name
Tyagarah Rd Residence
 27 Tyagarah Rd NSW 2481

Drawing Title:
Demolition Plan

Status: PROPOSAL
RESIDENCE
 Date: 17/11/2023
 Scale: 1:500 @ A3
 Project No:
12
 Drawing No.: **A.01.4** REVISION: **B**
 Plot Date:

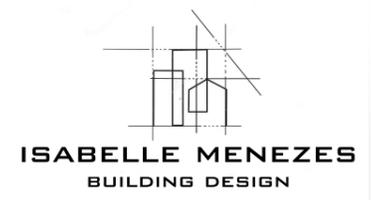


BYRON SHIRE COUNCIL
 Development Application
APPROVED PLAN
 DA No. 10.2023.404.1
 Date: 16 April 2024



1. Proposal Ground Floor
 Scale 1:100

| Revision History | | | |
|------------------|------|---|------------|
| RevID | ChID | Change Name | Date |
| A | DH | Proposed single dwelling | |
| B | DH | Proposed single dwelling | 04/06/2017 |
| C | IM | Proposed new location of single dwelling, extension of the deck and proposed pool | 20/10/2023 |
| | | | |
| | | | |
| | | | |
| | | | |



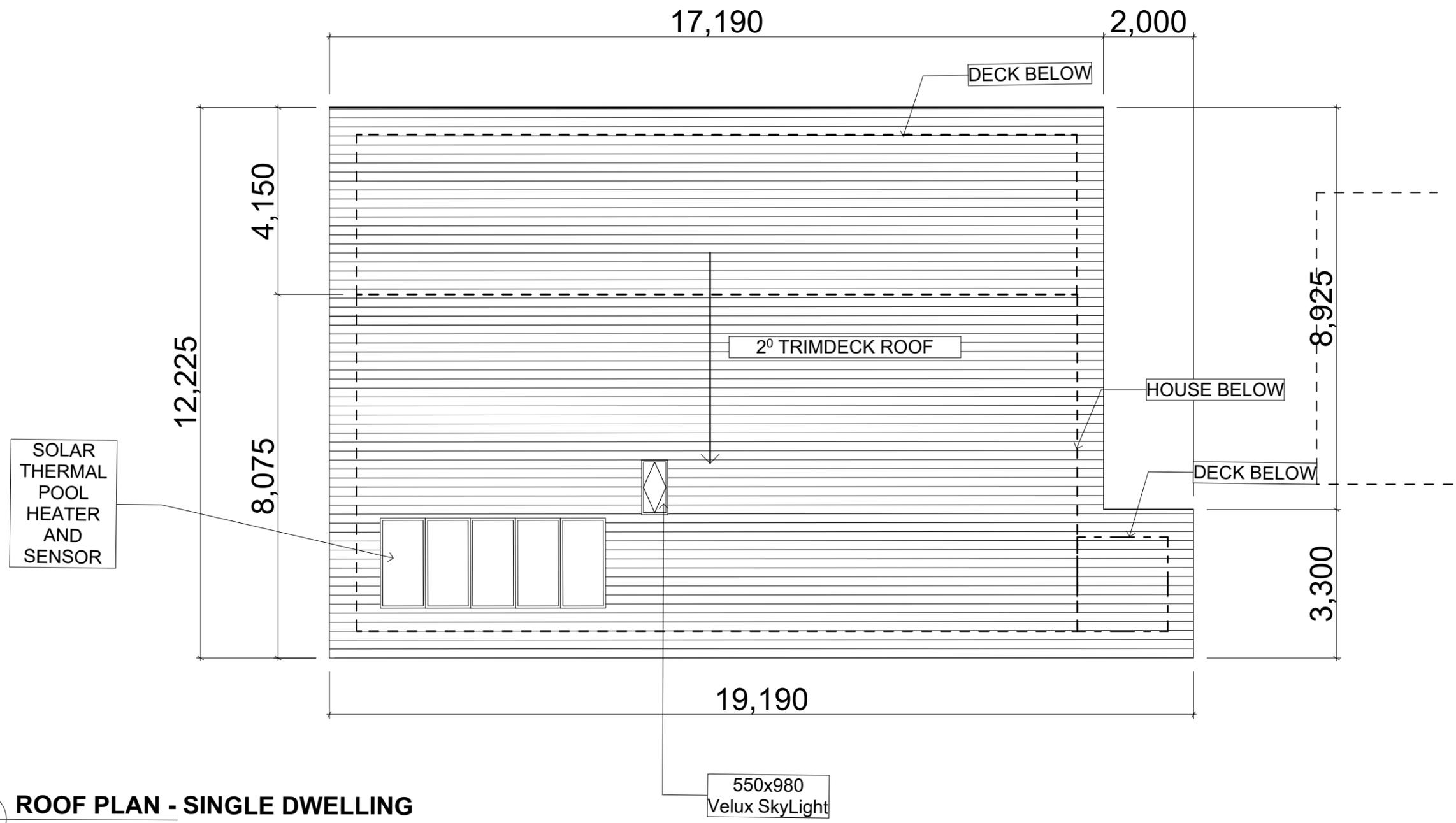
LEGEND/NOTES

| | | | | | | | |
|-----|----------------------------|------|----------------------------------|-----|----------------------------------|-----|------------------------------------|
| CT | CERAMIC FLOOR TILES | FG | FIXED GLASS | MB | MAIN POWER BOARD | SHR | SHOWER |
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| | | | LINEN CUPBOARD | SC | STEEL COLUMN TO ENG DETAILS | WP | WASTE PIPE |
| | | | LOUVRES | SM | SMOKE DETECTOR TO BCA | ZC | ZINC CLADDING |

Client Name
Sarah Vial
 Project Name
Tyagarah Rd Residence
 27 Tyagarah Rd NSW 2481

Drawing Title:
 Proposed Floor Plan

Status: PROPOSAL
 RESIDENCE
 Date: 17/11/2023
 Scale: 1:100 @ A3
 Project No:
12
 Plot Date:
 Drawing No.:
A.01.5
 REVISION:
B



2. ROOF PLAN - SINGLE DWELLING
Scale 1:100

BYRON SHIRE COUNCIL
 Development Application
APPROVED PLAN
 DA No. 10.2023.404.1
 Date: 16 April 2024

| RevID | ChID | Change Name | Date |
|-------|------|---|------------|
| A | DH | Proposed single dwelling | |
| B | DH | Proposed single dwelling | 04/06/2017 |
| C | IM | Proposed new location of single dwelling, extension of the deck and proposed pool | 20/10/2023 |
| | | | |
| | | | |
| | | | |
| | | | |

LEGEND/NOTES

| | | | | | | | |
|-----|----------------------------|------|----------------------------------|-----|----------------------------------|-----|------------------------------------|
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| DP | DOWNPIPE 90 Ø ROUND | GS | GUTTER WATER SPITTER | PBW | PAINTED BLOCKWORK | SL | SKYLIGHT TO BASIX SPECIFICATIONS |
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| EF | EXHAUST FAN | GHRL | GLASS HAND RAIL | PCS | POLISHED CONCRETE SLAB | ST | STORAGE |
| F | FRIDGE | GT | EXTERNAL GARDEN TAP | PS | PRIVACY SCREEN | TD | TIMBER DECKING HARDWOOD |
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| FCL | FINISHED CEILING LEVEL | HTSL | HORIZONTAL TIMBER SLATS | RC | REINFORCED CONCRETE | TF | TIMBER FLOORING HARDWOOD |
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| FP | FIREPLACE | LC | LAUNDRY CHUTE | RH | RANGEHOOD | WB | TIMBER WEATHERBOARD CLADDING PAINT |
| FS | TIMBER FASCIA PAINT FINISH | LN | LINEN CUPBOARD | RWT | RAINWATER TANK TO BASIX | WL | WASHING LINE |
| | | LV | LOUVRES | SC | STEEL COLUMN TO ENG DETAILS | WM | WASHING MACHINE |
| | | | | SM | SMOKE DETECTOR TO BCA | WP | WASTE PIPE |
| | | | | | | ZC | ZINC CLADDING |

Client Name
Sarah Vial
Project Name
Tyagarah Rd Residence
27 Tyagarah Rd NSW 2481

Drawing Title:
Roof Plan - Single Dwelling

Status: PROPOSAL
RESIDENCE

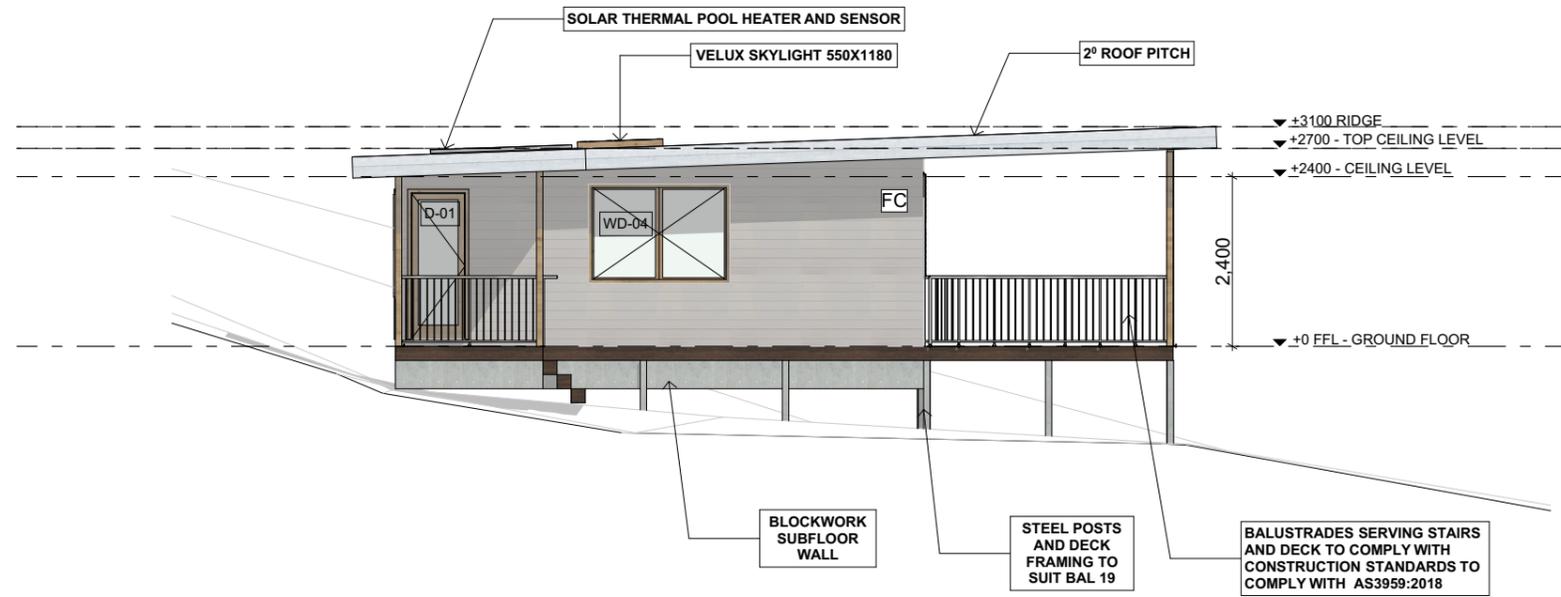
Date: 17/11/2023
Scale: 1:100 @ A3

Project No:
12

Drawing No.:
A.01.6

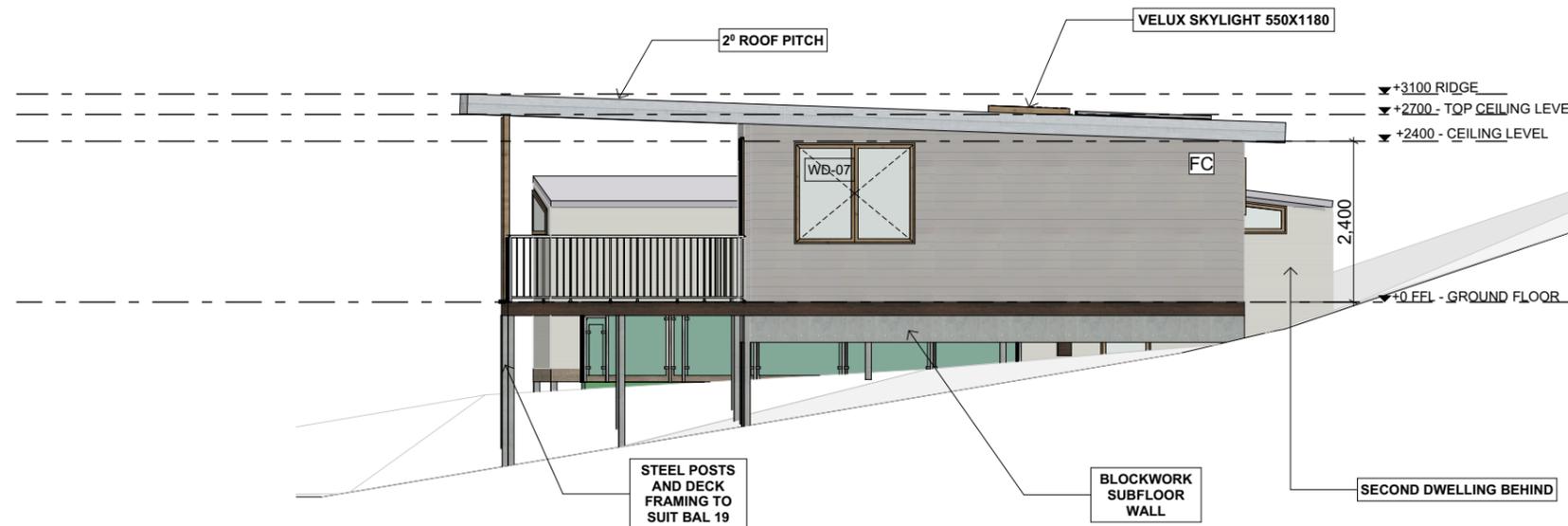
REVISION:
B





BYRON SHIRE COUNCIL
 Development Application
APPROVED PLAN
 DA No. 10.2023.404.1
 Date: 16 April 2024

N Elevation
 Scale 1:100



FINISHES

- ROOF: TRIMDEK 'SURFMIST' AT 2° PITCH
 EXTERNAL WALL CLADDING: FC SHEET 'BASALT' COLORBOND
 MAIN FLOOR: TIMBER WITH BLOCK SUBFLOOR PERIMETER WALL
 DECK: HARDIDECK FIBRE CEMENT
 DOORS AND WINDOWS: ALUMINIUM 'CLEAR ANODIZED'
- ** ALL CONSTRUCTION TO COMPLY WITH BAL 19
 - *** EG: STEEL SCREENED WINDOWS AND DOORS, 2MM MAX APERTURE
 - *** NO EXTERNAL TIMBER
 - *** MASONRY SUBFLOOR PERIMETER WALL WITH SCREENED VENTS
 - *** REFER DESIGN MANUAL FOR DETAILS FOR WALLS AND ROOFS

ALL TAPS, TOILETS, INSULATION AND WINDOW GLASS AS PER COMMITMENTS IN BASIX CERTIFICATE

ALL LIGHTING LED

LOWER CEILING LEVEL 2400mm AFFL
 TOP CEILING LEVEL 2700mm AFFL

Revision History

| RevID | ChID | Change Name | Date |
|-------|------|---|------------|
| A | DH | Proposed single dwelling | |
| B | DH | Proposed single dwelling | 04/06/2017 |
| C | IM | Proposed new location of single dwelling, extension of the deck and proposed pool | 20/10/2023 |
| | | | |
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| | | | |
| | | | |

S Elevation
 Scale 1:100

LEGEND/NOTES

CT CERAMIC FLOOR TILES
 CPT CARPET
 CS CORRUGATED STEEL COLORBOND
 CFT CONCRETE FLOOR TILE
 DP DOWNPIPE 90 Ø ROUND
 EX EXISTING
 EF EXHAUST FAN
 F FRIDGE
 FFL FINISHED FLOOR LEVEL
 FCL FINISHED CEILING LEVEL
 FC FIBRE CEMENT SHEETING
 FP FIREPLACE
 FS TIMBER FASCIA PAINT FINISH

FG FIXED GLASS
 FW FLOOR WASTE
 G1 90mm HALF ROUND GUTTER
 G2 COLOURBOND BOX GUTTER 300mm
 GS GUTTER WATER SPITTER
 GD GARAGE DOOR VERTICAL TIMBER CLAD
 GHRL GLASS HAND RAIL
 GT EXTERNAL GARDEN TAP
 HTSL HOT WATER UNIT TO BASIX
 HWU HORIZONTAL TIMBER SLATS
 LB LINING BOARDS
 LC LAUNDRY CHUTE
 LN LINEN CUPBOARD
 LV LOUVRES

MB MAIN POWER BOARD
 MDR METAL DECK ROOF
 NGL NATURAL GROUND LINE
 PBK PAINTED AND RENDERED BRICK
 PBW PAINTED BLOCKWORK
 PB PAINTED PLASTER BOARD
 PCS POLISHED CONCRETE SLAB
 PS PRIVACY SCREEN
 R ROBE
 RC REINFORCED CONCRETE
 RB RENDERED BLOCK WALL PAINT FINISH
 RH RANGEHOOD
 RWT RAINWATER TANK TO BASIX
 SC STEEL COLUMN TO ENG DETAILS
 SM SMOKE DETECTOR TO BCA

SHR SHOWER
 STC STEEL TROWELLED CONCRETE
 STN STONE CLADDING
 SP OVERFLOW SPITTER
 SL SKYLIGHT TO BASIX SPECIFICATIONS
 SW STONE FEATURE WALL
 ST STORAGE
 TD TIMBER DECKING HARDWOOD
 TP TIMBER POST
 TF TIMBER FLOORING HARDWOOD
 TS TIMBER SCREEN
 WB TIMBER WEATHERBOARD CLADDING PAINT
 WL WASHING LINE
 WM WASHING MACHINE
 WP WASTE PIPE
 ZC ZINC CLADDING

Client Name
Sarah Vial
 Project Name
Tyagarah Rd Residence
 27 Tyagarah Rd NSW 2481

Drawing Title:
 Proposed Elevation - Single Dwelling



Status: PROPOSAL RESIDENCE

Date: 17/11/2023

Scale: 1:100 @ A3

Project No:

12

Drawing No.:

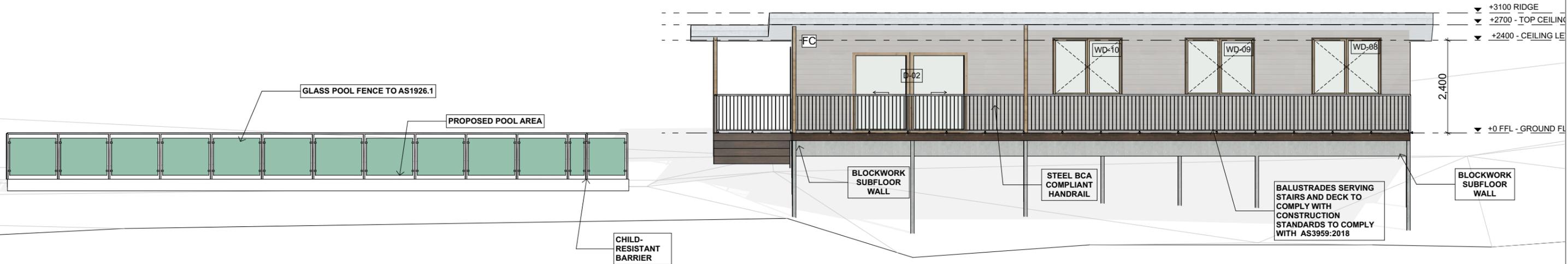
A.01.7

REVISION:

B

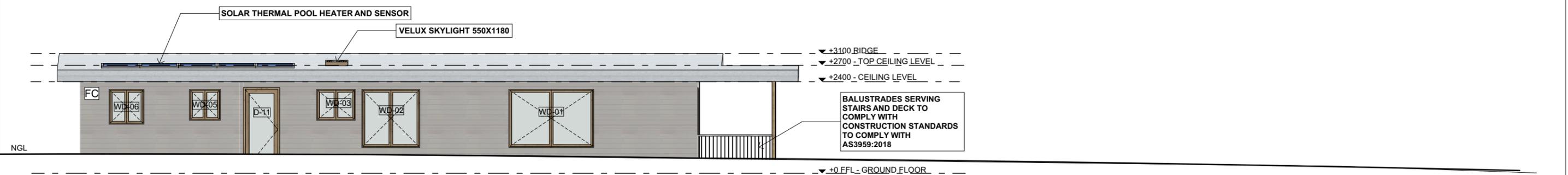
Plot Date:



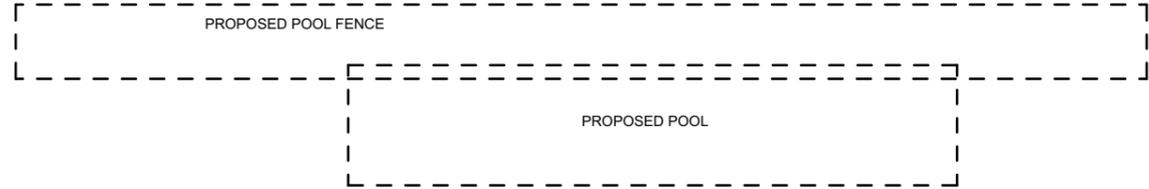


E Elevation
Scale 1:100

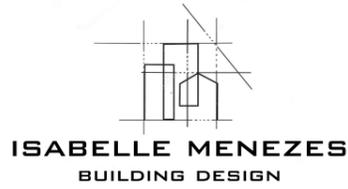
BYRON SHIRE COUNCIL
Development Application
APPROVED PLAN
DA No. 10.2023.404.1
Date: 16 April 2024



W Elevation
Scale 1:100



| RevID | ChID | Change Name | Date |
|-------|------|---|------------|
| A | DH | Proposed single dwelling | |
| B | DH | Proposed single dwelling | 04/06/2017 |
| C | IM | Proposed new location of single dwelling, extension of the deck and proposed pool | 20/10/2023 |
| | | | |
| | | | |
| | | | |
| | | | |



LEGEND/NOTES

CT CERAMIC FLOOR TILES
CPT CARPET
CS CORRUGATED STEEL COLORBOND
CFT CONCRETE FLOOR TILE
DP DOWNPIPE 90 Ø ROUND
EX EXISTING
EF EXHAUST FAN
F FRIDGE
FFL FINISHED FLOOR LEVEL
FCL FINISHED CEILING LEVEL
FC FIBRE CEMENT SHEETING
FP FIREPLACE
FS TIMBER FASCIA PAINT FINISH

FG FIXED GLASS
FW FLOOR WASTE
G1 90mm HALF ROUND GUTTER
G2 COLOURBOND BOX GUTTER 300mm
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HTS HOT WATER UNIT TO BASIX
HTSL HORIZONTAL TIMBER SLATS
LB LINING BOARDS
LC LAUNDRY CHUTE
LN LINEN CUPBOARD
LV LOUVRES

MB MAIN POWER BOARD
MDR METAL DECK ROOF
NGL NATURAL GROUND LINE
PBK PAINTED AND RENDERED BRICK
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PB PAINTED PLASTER BOARD
PCS POLISHED CONCRETE SLAB
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RB RENDERED BLOCK WALL PAINT FINISH
RH RANGEROOD
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SC STEEL COLUMN TO ENG DETAILS
SM SMOKE DETECTOR TO BCA

SHR SHOWER
STC STEEL TROWELLED CONCRETE
STN STONE CLADDING
SP OVERFLOW SPITTER
SL SKYLIGHT TO BASIX SPECIFICATIONS
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TS TIMBER SCREEN
WB TIMBER WEATHERBOARD CLADDING PAINT
WL WASHING LINE
WM WASHING MACHINE
WP WASTE PIPE
ZC ZINC CLADDING

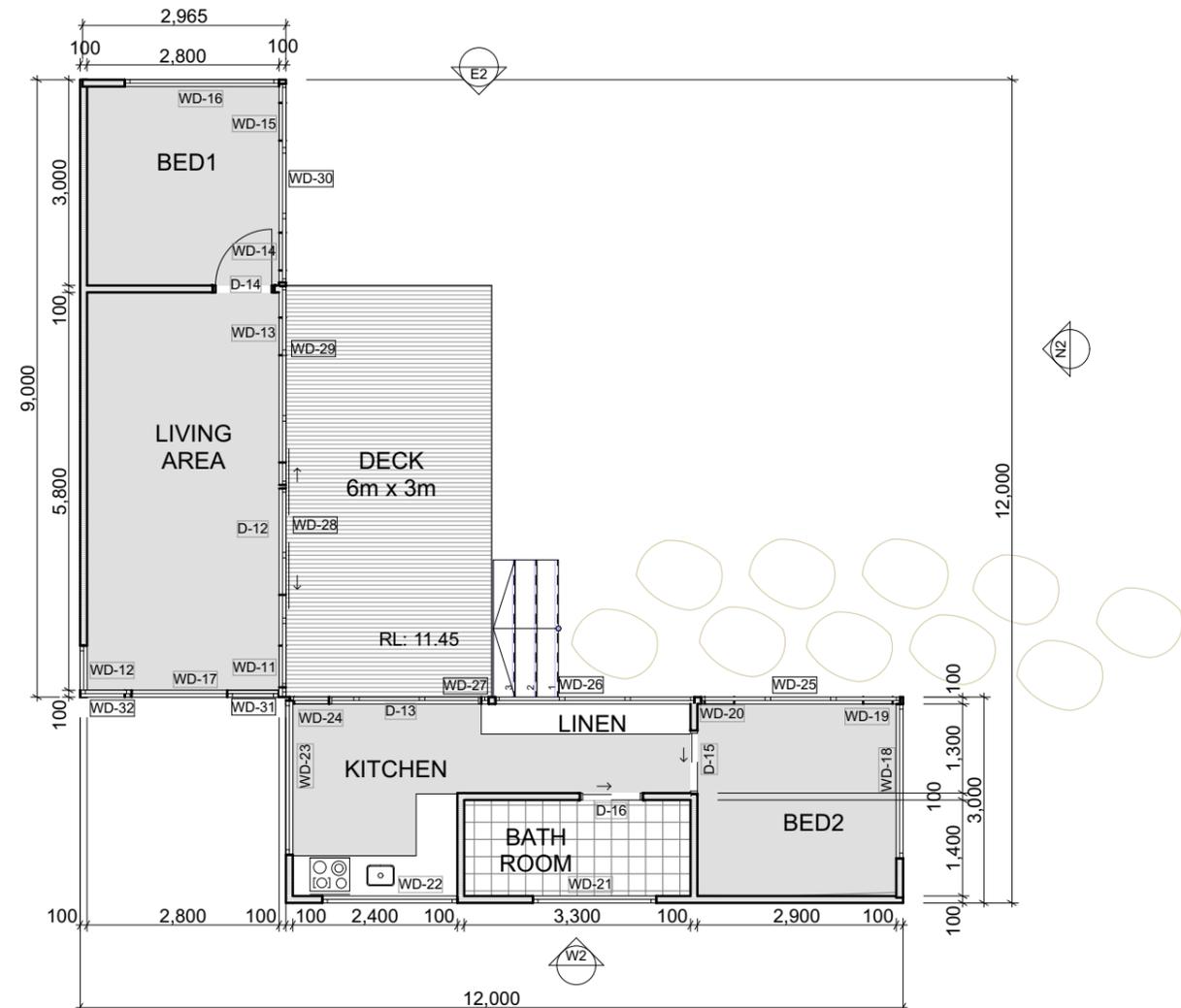
Client Name
Sarah Vial
Project Name
Tyagarah Rd Residence
27 Tyagarah Rd NSW 2481

Drawing Title:
Proposed Elevation - Single Dwelling

Status: PROPOSAL RESIDENCE
Project No:
12
Plot Date:

Date: 17/11/2023
Scale: 1:100 @ A3
Drawing No.: **A.01.8**
REVISION: **B**

BYRON SHIRE COUNCIL
 Development Application
APPROVED PLAN
 DA No. 10.2023.404.1
 Date: 16 April 2024



1. Proposal Ground Floor
 Scale 1:100

| Revision History | | | |
|------------------|------|---|------------|
| RevID | ChID | Change Name | Date |
| A | IM | Proposed pre fabricated second dwelling | 20/10/2023 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
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LEGEND/NOTES

| | | | | | | | |
|-----|----------------------------|------|----------------------------------|-----|----------------------------------|-----|------------------------------------|
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| | | LV | LOUVRES | SC | STEEL COLUMN TO ENG DETAILS | WP | WASTE PIPE |
| | | | | SM | SMOKE DETECTOR TO BCA | ZC | ZINC CLADDING |

Client Name
Sarah Vial
 Project Name
Tyagarah Rd Residence
 27 Tyagarah Rd NSW 2481

Drawing Title:
 Proposed Second Dwelling

Status: PROPOSAL
 RESIDENCE

Date: 17/11/2023
 Scale: 1:100 @ A3

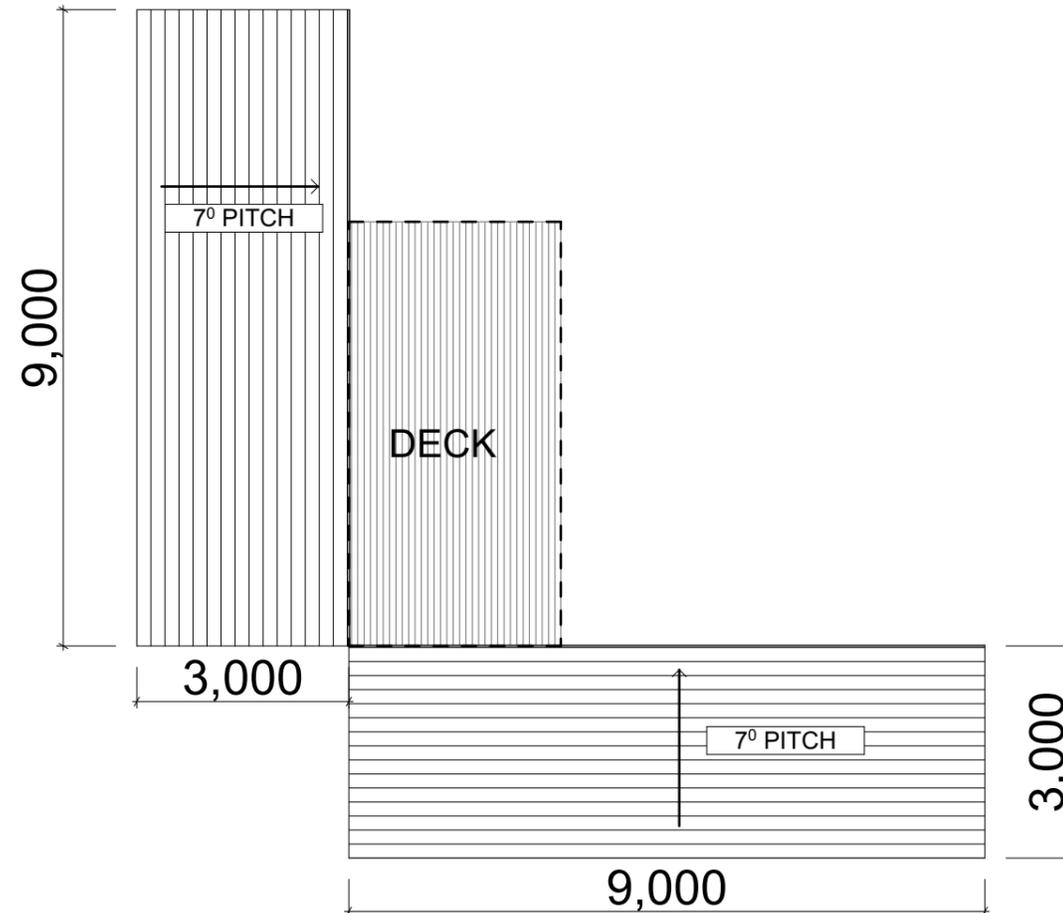


Project No:
12

Drawing No.:
A.01.9 REVISION:
B

Plot Date:

BYRON SHIRE COUNCIL
 Development Application
APPROVED PLAN
 DA No. 10.2023.404.1
 Date: 16 April 2024



2. ROOF PLAN - SECOND DWELLING

Scale 1:100

Revision History

| RevID | ChID | Change Name | Date |
|-------|------|---|------------|
| A | IM | Proposed pre fabricated second dwelling | 20/10/2023 |
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LEGEND/NOTES

CT CERAMIC FLOOR TILES
 CPT CARPET
 CS CORRUGATED STEEL COLORBOND
 CFT CONCRETE FLOOR TILE
 DP DOWNPIPE 90 Ø ROUND
 EX EXISTING
 EF EXHAUST FAN
 F FRIDGE
 FFL FINISHED FLOOR LEVEL
 FCL FINISHED CEILING LEVEL
 FC FIBRE CEMENT SHEETING
 FP FIREPLACE
 FS TIMBER FASCIA PAINT FINISH

FG FIXED GLASS
 FW FLOOR WASTE
 G1 90mm HALF ROUND GUTTER
 G2 COLOURBOND BOX GUTTER 300mm
 GS GUTTER WATER SPITTER
 GD GARAGE DOOR VERTICAL TIMBER CLAD
 GHRL GLASS HAND RAIL
 GT EXTERNAL GARDEN TAP
 HWU HOT WATER UNIT TO BASIX
 HTSL HORIZONTAL TIMBER SLATS
 LB LINING BOARDS
 LC LAUNDRY CHUTE
 LN LINEN CUPBOARD
 LV LOUVRES

MB MAIN POWER BOARD
 MDR METAL DECK ROOF
 NGL NATURAL GROUND LINE
 PBK PAINTED AND RENDERED BRICK
 PBW PAINTED BLOCKWORK
 PB PAINTED PLASTER BOARD
 PCS POLISHED CONCRETE SLAB
 PS PRIVACY SCREEN
 R ROBE
 RC REINFORCED CONCRETE
 RB RENDERED BLOCK WALL PAINT FINISH
 RH RANGEROOD
 RWT RAINWATER TANK TO BASIX
 SC STEEL COLUMN TO ENG DETAILS
 SM SMOKE DETECTOR TO BCA

SHR SHOWER
 STC STEEL TROWELLED CONCRETE
 STN STONE CLADDING
 SP OVERFLOW SPITTER
 SL SKYLIGHT TO BASIX SPECIFICATIONS
 SW STONE FEATURE WALL
 ST STORAGE
 TD TIMBER DECKING HARDWOOD
 TP TIMBER POST
 TF TIMBER FLOORING HARDWOOD
 TS TIMBER SCREEN
 WB TIMBER WEATHERBOARD CLADDING PAINT
 WL WASHING LINE
 WM WASHING MACHINE
 WP WASTE PIPE
 ZC ZINC CLADDING

Client Name
Sarah Vial
 Project Name
Tyagarah Rd Residence
 27 Tyagarah Rd NSW 2481

Drawing Title:
 Roof Plan - Second Dwelling



Status: PROPOSAL
 RESIDENCE

Date: 17/11/2023

Scale: 1:100 @ A3

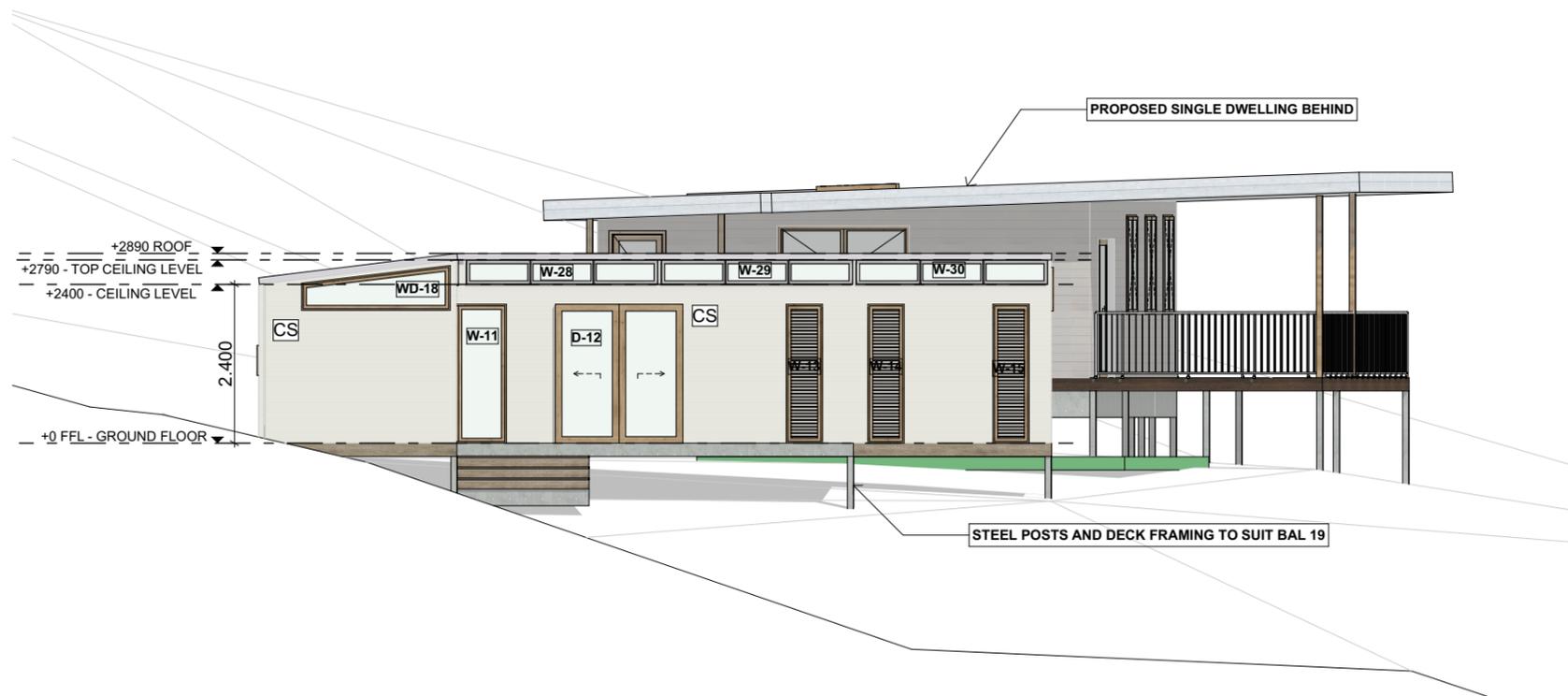
Project No:

12

Drawing No.: REVISION:

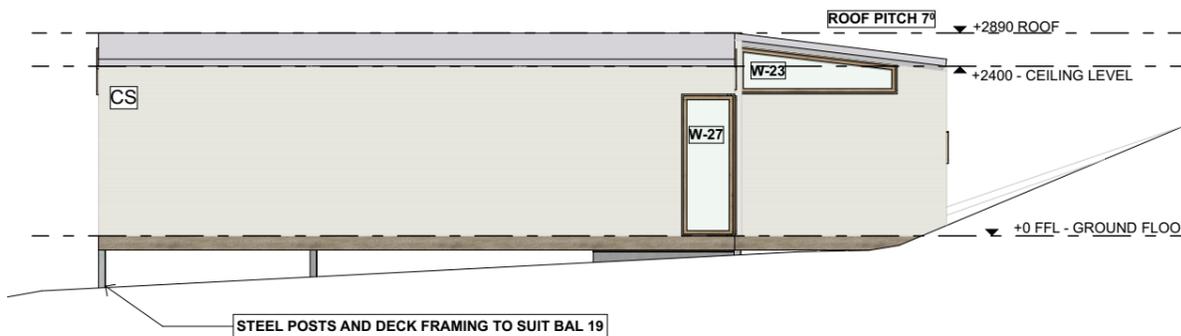
A.01.10 B

Plot Date:



BYRON SHIRE COUNCIL
 Development Application
APPROVED PLAN
 DA No. 10.2023.404.1
 Date: 16 April 2024

N2 Elevation
 - Scale 1:100



S2 Elevation
 - Scale 1:100

FINISHES

ROOF: TRIMDEK 'SURFMIST' AT 7° PITCH
 EXTERNAL WALL CLADDING: WHITE CORRUGATED WALL CLADDING
 MAIN FLOOR: TIMBER
 DECK: HARDIDECK FIBRE CEMENT
 DOORS AND WINDOWS: ALUMINIUM 'CLEAR ANODIZED'

** ALL CONSTRUCTION TO COMPLY WITH BAL 19
 *** EG: STEEL SCREENED WINDOWS AND DOORS, 2MM MAX APERTURE

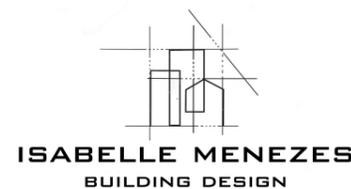
ALL TAPS, TOILETS, INSULATION AND WINDOW GLASS AS PER COMMITMENTS IN BASIX CERTIFICATE

ALL LIGHTING LED

LOWER CEILING LEVEL 2400mm AFFL
TOP CEILING LEVEL 2790mm AFFL

Revision History

| RevID | ChID | Change Name | Date |
|-------|------|---|------------|
| A | IM | Proposed pre fabricated second dwelling | 20/10/2023 |
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LEGEND/NOTES

CT CERAMIC FLOOR TILES
 CPT CARPET
 CS CORRUGATED STEEL COLORBOND
 CFT CONCRETE FLOOR TILE
 DP DOWNPIPE 90 Ø ROUND
 EX EXISTING
 EF EXHAUST FAN
 F FRIDGE
 FFL FINISHED FLOOR LEVEL
 FCL FINISHED CEILING LEVEL
 FC FIBRE CEMENT SHEETING
 FP FIREPLACE
 FS TIMBER FASCIA PAINT FINISH

FG FIXED GLASS
 FW FLOOR WASTE
 G1 90mm HALF ROUND GUTTER
 G2 COLOURBOND BOX GUTTER 300mm
 GS GUTTER WATER SPITTER
 GD GARAGE DOOR VERTICAL TIMBER CLAD
 GHRL GLASS HAND RAIL
 GT EXTERNAL GARDEN TAP
 HTSL HOT WATER UNIT TO BASIX
 HWL HORIZONTAL TIMBER SLATS
 LB LINING BOARDS
 LC LAUNDRY CHUTE
 LN LINEN CUPBOARD
 LV LOUVRES

MB MAIN POWER BOARD
 MDR METAL DECK ROOF
 NGL NATURAL GROUND LINE
 PBK PAINTED AND RENDERED BRICK
 PBW PAINTED BLOCKWORK
 PB POLISHED PLASTER BOARD
 PCS POLISHED CONCRETE SLAB
 PS PRIVACY SCREEN
 R ROBE
 RC REINFORCED CONCRETE
 RB RENDERED BLOCK WALL PAINT FINISH
 RH RANGEHOOD
 RWT RAINWATER TANK TO BASIX
 SC STEEL COLUMN TO ENG DETAILS
 SM SMOKE DETECTOR TO BCA

SHR SHOWER
 STC STEEL TROWELLED CONCRETE
 STN STONE CLADDING
 SP OVERFLOW SPITTER
 SL SKYLIGHT TO BASIX SPECIFICATIONS
 SW STONE FEATURE WALL
 ST STORAGE
 TD TIMBER DECKING HARDWOOD
 TP TIMBER POST
 TF TIMBER FLOORING HARDWOOD
 TS TIMBER SCREEN
 WB TIMBER WEATHERBOARD CLADDING PAINT
 WL WASHING LINE
 WM WASHING MACHINE
 WP WASTE PIPE
 ZC ZINC CLADDING

Client Name
Sarah Vial
 Project Name
Tyagarah Rd Residence
 27 Tyagarah Rd NSW 2481

Drawing Title:
 Proposed Second Dwelling
 Elevations



Status: PROPOSAL
RESIDENCE

Date: 17/11/2023

Scale: 1:100 @ A3

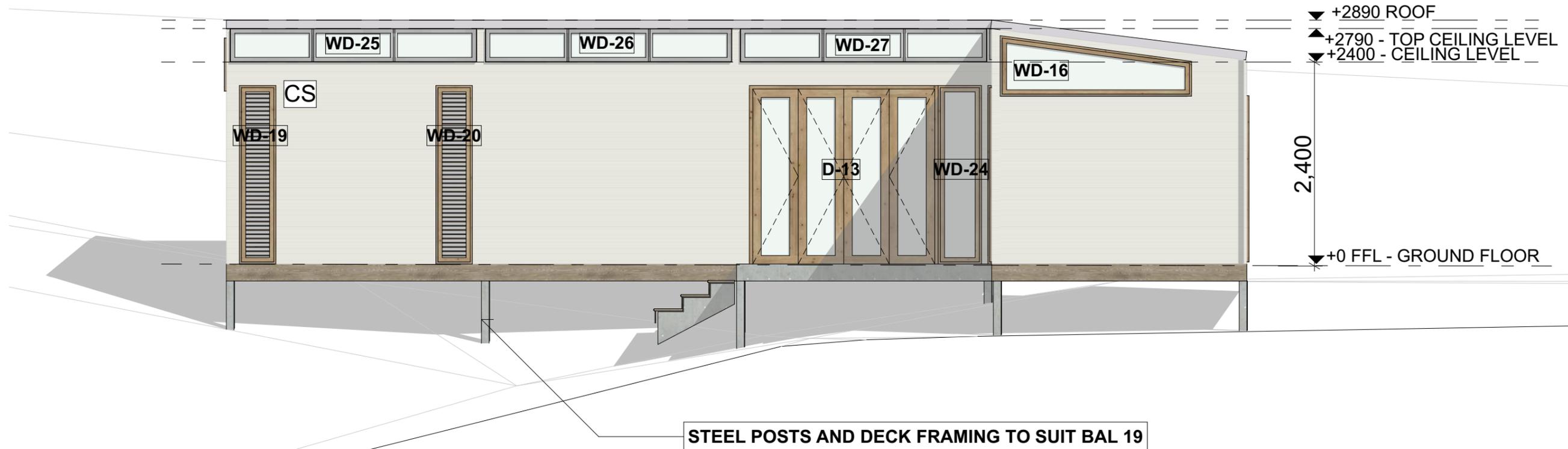
Project No:

12

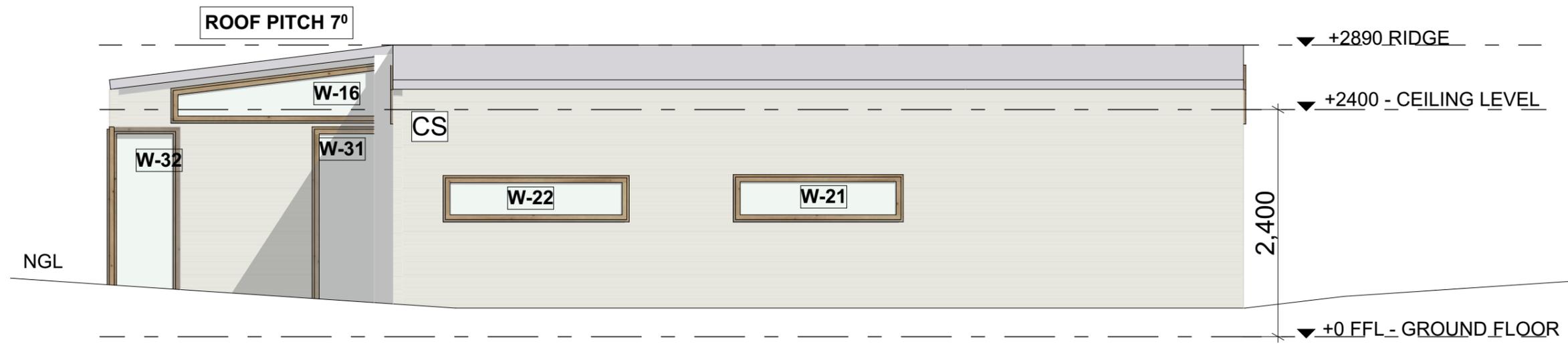
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A.01.11 B

Plot Date:



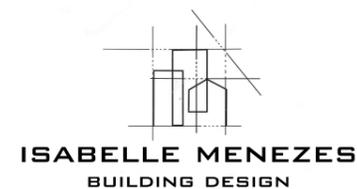
E2 Elevation
Scale 1:50



W2 Elevation
Scale 1:50

BYRON SHIRE COUNCIL
 Development Application
APPROVED PLAN
 DA No. 10.2023.404.1
 Date: 16 April 2024

| REVISION HISTORY | | | |
|------------------|------|---|------------|
| RevID | ChID | Change Name | Date |
| A | IM | Proposed pre fabricated second dwelling | 20/10/2023 |
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LEGEND/NOTES

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|-----|----------------------------|------|----------------------------------|-----|----------------------------------|-----|------------------------------------|
| CT | CERAMIC FLOOR TILES | FG | FIXED GLASS | MB | MAIN POWER BOARD | SHR | SHOWER |
| CPT | CARPET | FW | FLOOR WASTE | MDR | METAL DECK ROOF | STC | STEEL TROWELLED CONCRETE |
| CS | CORRUGATED STEEL COLORBOND | G1 | 90mm HALF ROUND GUTTER | NGL | NATURAL GROUND LINE | STN | STONE CLADDING |
| CFT | CONCRETE FLOOR TILE | G2 | COLORBOND BOX GUTTER 300mm | PBK | PAINTED AND RENDERED BRICK | SP | OVERFLOW SPITTER |
| DP | DOWNPIPE 90 Ø ROUND | GS | GUTTER WATER SPITTER | PBW | PAINTED BLOCKWORK | SL | SKYLIGHT TO BASIX SPECIFICATIONS |
| EX | EXISTING | GD | GARAGE DOOR VERTICAL TIMBER CLAD | PB | PAINTED PLASTER BOARD | ST | STONE FEATURE WALL |
| EF | EXHAUST FAN | GHRL | GLASS HAND RAIL | PCS | POLISHED CONCRETE SLAB | ST | STORAGE |
| F | FRIDGE | GT | EXTERNAL GARDEN TAP | PS | PRIVACY SCREEN | TD | TIMBER DECKING HARDWOOD |
| FFL | FINISHED FLOOR LEVEL | HT | HOT WATER UNIT TO BASIX | R | ROBE | TP | TIMBER POST |
| FCL | FINISHED CEILING LEVEL | HTSL | HORIZONTAL TIMBER SLATS | RC | REINFORCED CONCRETE | TF | TIMBER FLOORING HARDWOOD |
| FC | FIBRE CEMENT SHEETING | LB | LINING BOARDS | RB | RENDERED BLOCK WALL PAINT FINISH | TS | TIMBER SCREEN |
| FP | FIREPLACE | LC | LAUNDRY CHUTE | RH | RANGEHOOD | WB | TIMBER WEATHERBOARD CLADDING PAINT |
| FS | TIMBER FASCIA PAINT FINISH | LN | LINEN CUPBOARD | RWT | RAINFALL TANK TO BASIX | WL | WASHING LINE |
| | | LV | LOUVRES | SC | STEEL COLUMN TO ENG DETAILS | WM | WASHING MACHINE |
| | | | | SM | SMOKE DETECTOR TO BCA | WP | WASTE PIPE |
| | | | | | | ZC | ZINC CLADDING |

Client Name
Sarah Vial
Project Name
Tyagarah Rd Residence
27 Tyagarah Rd NSW 2481

Drawing Title:
Proposed Second Dwelling
Elevations



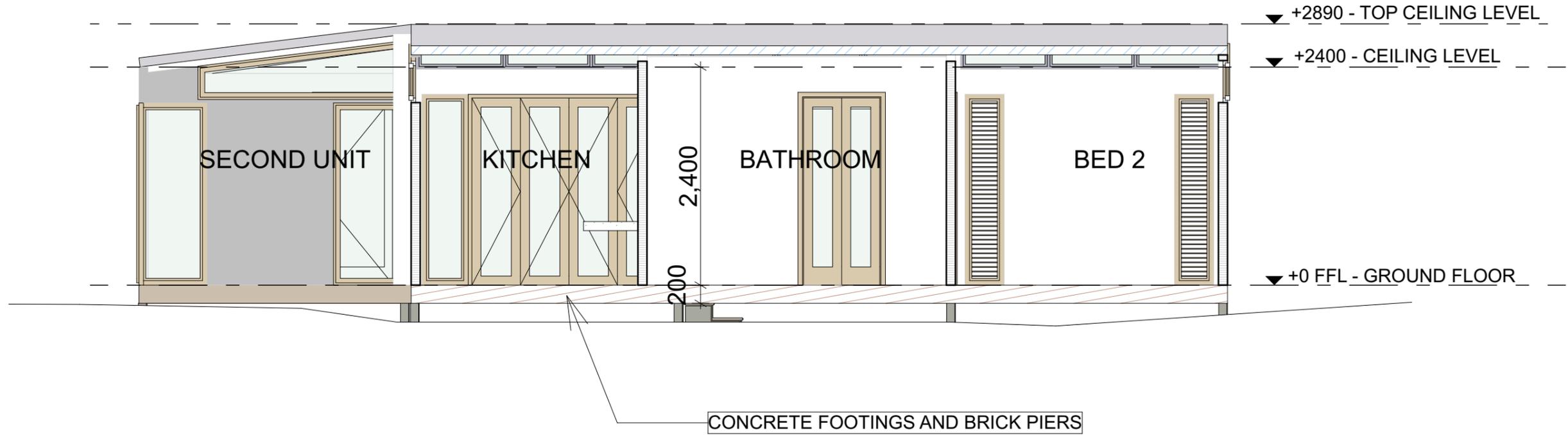
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RESIDENCE

Date: 17/11/2023
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Project No:
12

Drawing No.: **A.01.12**
REVISION: **B**

Plot Date:



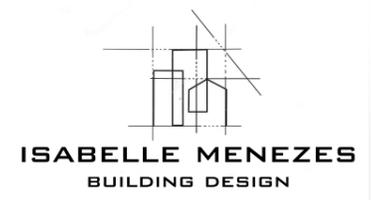
S-01 SECOND DWELLING SECTION 1
Scale 1:50



S-02 SECOND DWELLING SECTION 2
Scale 1:50

BYRON SHIRE COUNCIL
 Development Application
APPROVED PLAN
 DA No. 10.2023.404.1
 Date: 16 April 2024

| Revision History | | | |
|------------------|------|---|------------|
| RevID | ChID | Change Name | Date |
| A | IM | Proposed pre fabricated second dwelling | 20/10/2023 |
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LEGEND/NOTES

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|-----|----------------------------|------|----------------------------------|-----|----------------------------------|-----|------------------------------------|
| CT | CERAMIC FLOOR TILES | FG | FIXED GLASS | MB | MAIN POWER BOARD | SHR | SHOWER |
| CPT | CARPET | FW | FLOOR WASTE | MDR | METAL DECK ROOF | STC | STEEL TROWELLED CONCRETE |
| CS | CORRUGATED STEEL COLORBOND | G1 | 90mm HALF ROUND GUTTER | NCL | NATURAL GROUND LINE | STN | STONE CLADDING |
| CFT | CONCRETE FLOOR TILE | G2 | COLORBOND BOX GUTTER 300mm | PBK | PAINTED AND RENDERED BRICK | SP | OVERFLOW SPITTER |
| DP | DOWNPIPE 90 Ø ROUND | GS | GUTTER WATER SPITTER | PBW | PAINTED BLOCKWORK | SL | SKYLIGHT TO BASIX SPECIFICATIONS |
| EX | EXISTING | GD | GARAGE DOOR VERTICAL TIMBER CLAD | PB | PAINTED PLASTER BOARD | ST | STONE FEATURE WALL |
| EF | EXHAUST FAN | GHRL | GLASS HAND RAIL | PCS | POLISHED CONCRETE SLAB | ST | STORAGE |
| F | FRIDGE | GT | EXTERNAL GARDEN TAP | PS | PRIVACY SCREEN | TD | TIMBER DECKING HARDWOOD |
| FFL | FINISHED FLOOR LEVEL | HTSL | HORIZONTAL TIMBER SLATS | R | ROBE | TP | TIMBER POST |
| FCL | FINISHED CEILING LEVEL | LB | LINING BOARDS | RC | REINFORCED CONCRETE | TF | TIMBER FLOORING HARDWOOD |
| FC | FIBRE CEMENT SHEETING | LC | LAUNDRY CHUTE | RB | RENDERED BLOCK WALL PAINT FINISH | TS | TIMBER SCREEN |
| FP | FIREPLACE | LN | LINEN CUPBOARD | RH | RANGEHOOD | WB | TIMBER WEATHERBOARD CLADDING PAINT |
| FS | TIMBER FASCIA PAINT FINISH | LV | LOUVRES | RWT | RAINWATER TANK TO BASIX | WL | WASHING LINE |
| | | | | SC | STEEL COLUMN TO ENG DETAILS | WM | WASHING MACHINE |
| | | | | SM | SMOKE DETECTOR TO BCA | WP | WASTE PIPE |
| | | | | | | ZC | ZINC CLADDING |

Client Name
Sarah Vial
 Project Name
Tyagarah Rd Residence
 27 Tyagarah Rd NSW 2481

Drawing Title:
 Second Dwelling Sections

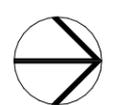
Status: PROPOSAL
 RESIDENCE

Date: 17/11/2023
 Scale: 1:50 @ A3

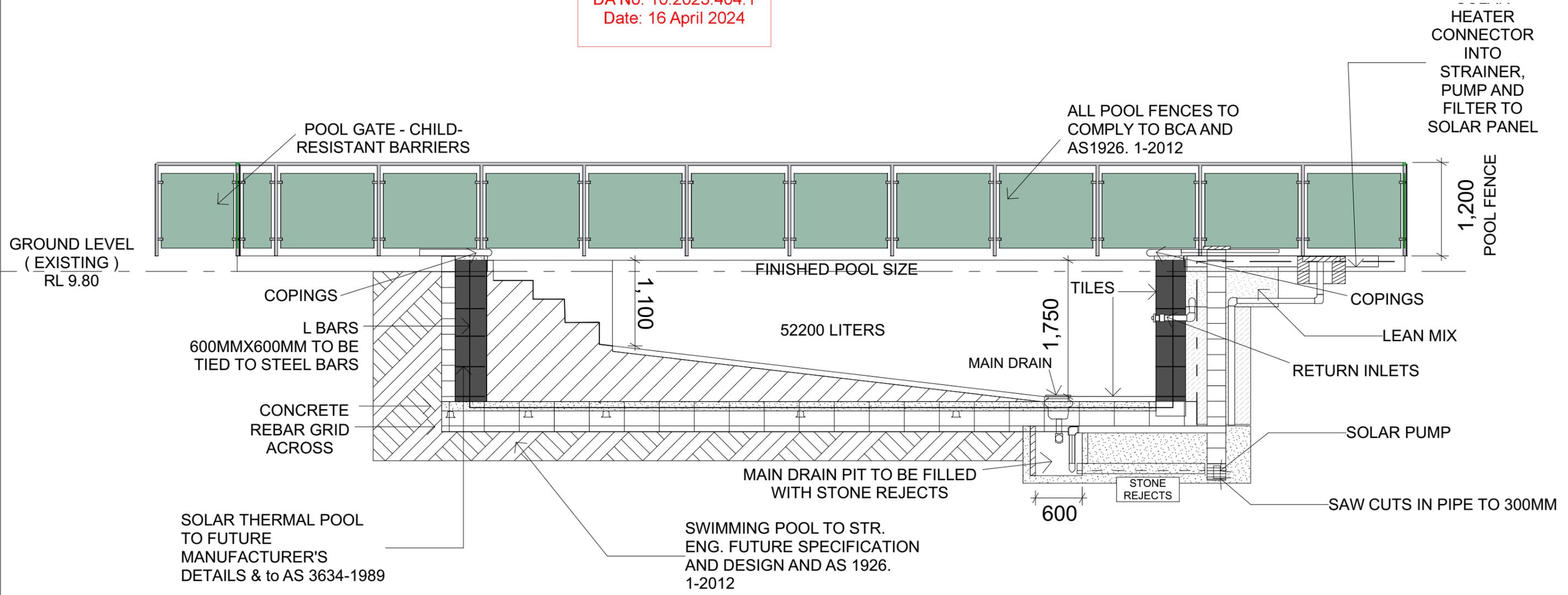
Project No:
12

Drawing No.: **A.01.13** REVISION: **B**

Plot Date:



BYRON SHIRE COUNCIL
 Development Application
APPROVED PLAN
 DA No. 10.2023.404.1
 Date: 16 April 2024



S-03 Pool Section

Scale 1:50

Revision History

| RevID | ChID | Change Name | Date |
|-------|------|--------------------|------------|
| A | IM | Proposed Pool Area | 20/10/2023 |
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LEGEND/NOTES

CT CERAMIC FLOOR TILES
 CPT CARPET
 CS CORRUGATED STEEL COLORBOND
 CFT CONCRETE FLOOR TILE
 DP DOWNPIPE 90 Ø ROUND
 EX EXISTING
 EF EXHAUST FAN
 F FRIDGE
 FFL FINISHED FLOOR LEVEL
 FCL FINISHED CEILING LEVEL
 FC FIBRE CEMENT SHEETING
 FP FIREPLACE
 FS TIMBER FASCIA PAINT FINISH

FG FIXED GLASS
 FW FLOOR WASTE
 G1 90mm HALF ROUND GUTTER
 G2 COLOURBOND BOX GUTTER 300mm
 GS GUTTER WATER SPITTER
 GD GARAGE DOOR VERTICAL TIMBER CLAD
 GHRL GLASS HAND RAIL
 GT EXTERNAL GARDEN TAP
 HTSL HOT WATER UNIT TO BASIX
 HTSL HORIZONTAL TIMBER SLATS
 LB LINING BOARDS
 LC LAUNDRY CHUTE
 LN LINEN CUPBOARD
 LV LOUVRES

MB MAIN POWER BOARD
 MDR METAL DECK ROOF
 NGL NATURAL GROUND LINE
 PBK PAINTED AND RENDERED BRICK
 PBW PAINTED BLOCKWORK
 PB POLISHED PLASTER BOARD
 PCS POLISHED CONCRETE SLAB
 PS PRIVACY SCREEN
 R ROBE
 RC REINFORCED CONCRETE
 RB RENDERED BLOCK WALL PAINT FINISH
 RH RANGEHOOD
 RWT RAINWATER TANK TO BASIX
 SC STEEL COLUMN TO ENG DETAILS
 SM SMOKE DETECTOR TO BCA

SHR SHOWER
 STC STEEL TROWELLED CONCRETE
 STN STONE CLADDING
 SP OVERFLOW SPITTER
 SL SKYLIGHT TO BASIX SPECIFICATIONS
 SW STONE FEATURE WALL
 ST STORAGE
 TD TIMBER DECKING HARDWOOD
 TP TIMBER POST
 TF TIMBER FLOORING HARDWOOD
 TS TIMBER SCREEN
 WB TIMBER WEATHERBOARD CLADDING PAINT
 WL WASHING LINE
 WM WASHING MACHINE
 WP WASTE PIPE
 ZC ZINC CLADDING

Client Name
Sarah Vial
 Project Name
Tyagarah Rd Residence
 27 Tyagarah Rd NSW 2481

Drawing Title:
 Longitudinal Pool Section



Status: PROPOSAL
 RESIDENCE

Date: 17/11/2023

Scale: 1:50 @ A3

Project No:

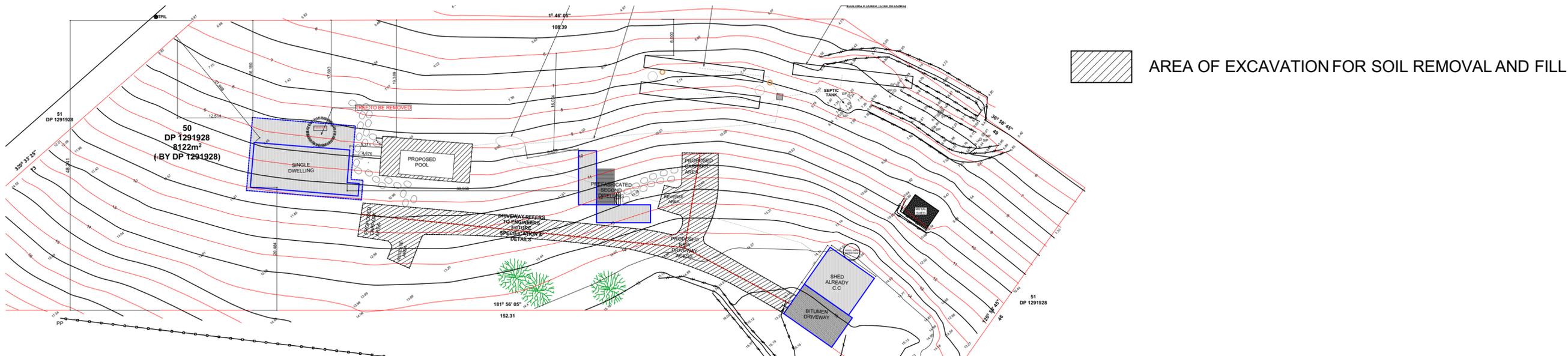
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Plot Date:

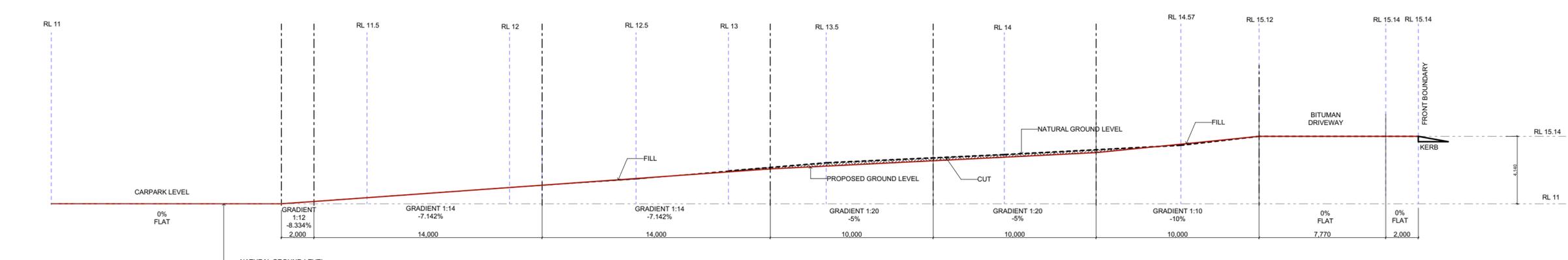
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A.01.14 B

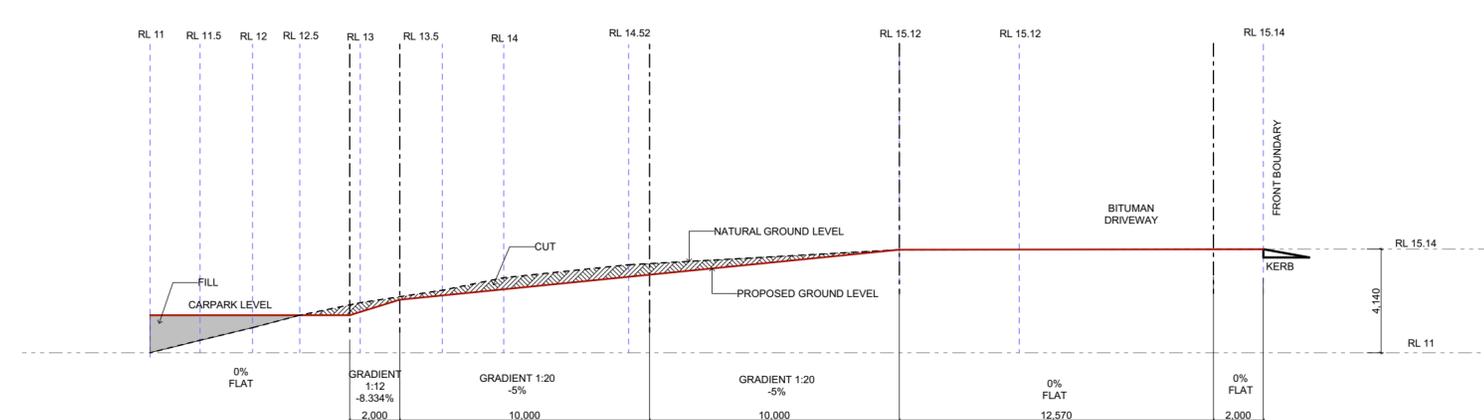
REVISION:



Proposed Excavation Work Plan
Scale 1:500



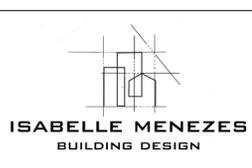
Proposed Excavation Work for Driveway to Single Dwelling
Scale 1:200



Proposed Excavation Work for Driveway to Pre Fabricated Second Dwelling
Scale 1:200

BYRON SHIRE COUNCIL
Development Application
APPROVED PLAN
DA No. 10.2023.404.1
Date: 16 April 2024

| RevID | ChID | Change Name | Date |
|-------|------|-------------------------------|------------|
| A | IM | Proposed Excavation Work Plan | 20/10/2023 |
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| LEGEND/NOTES | |
|---------------------------------------|-------------------------------------|
| CT CERAMIC FLOOR TILES | FG FIXED GLASS |
| CPT CARPET | FW FLOOR WASTE |
| CS CORRUGATED STEEL COLORBOND | G1 90mm HALF ROUND GUTTER |
| CFT CONCRETE FLOOR TILE | G2 COLOURBOND BOX GUTTER 300mm |
| CP DOWNPIPE 90° ROUND | GW GUTTER WATER SPITTER |
| EX EXISTING | GS GARAGE DOOR VERTICAL TIMBER CLAD |
| EF EXHAUST FAN | GHRL GLASS HAND RAIL |
| F FRIDGE | GT EXTERNAL GARDEN TAP |
| FFL FINISHED FLOOR LEVEL | HWU HOT WATER UNIT TO BASIX |
| FCL FINISHED CEILING LEVEL | HTSL HORIZONTAL TIMBER SLATS |
| FC FIBRE CEMENT SHEETING | LB LINING BOARDS |
| FP FIREPLACE | LC LAUNDRY CHUTE |
| FS TIMBER FASCIA PAINT FINISH | LN LINEN CUPBOARD |
| | LV LOUVRES |
| MB MAIN POWER BOARD | MS SMOKE DETECTOR TO BCA |
| MDR METAL DECK ROOF | |
| NGL NATURAL GROUND LINE | |
| NBL PAINTED AND RENDERED BRICK | |
| PBW PAINTED BLOCKWORK | |
| PB PAINTED PLASTER BOARD | |
| PCS POLISHED CONCRETE SLAB | |
| PS PRIVACY SCREEN | |
| R ROBE | |
| RC REINFORCED CONCRETE | |
| RB RENDERED BLOCK WALL PAINT FINISH | |
| RH RANGHOOD | |
| RWT RAINWATER TANK TO BASIX | |
| SC STEEL COLUMN TO END DETAILS | |
| SM SMOKE DETECTOR TO BCA | |
| SHR SHOWER | |
| STC STEEL TROWELLED CONCRETE | |
| STN STONE CLADDING | |
| SP OVERFLOW SPITTER | |
| SL SKYLIGHT TO BASIX SPECIFICATIONS | |
| SW STONE FEATURE WALL | |
| ST STORAGE | |
| TD TIMBER DECKING HARDWOOD | |
| TP TIMBER POST | |
| TF TIMBER FLOORING HARDWOOD | |
| TS TIMBER SCREEN | |
| TW TIMBER WEATHERBOARD CLADDING PAINT | |
| WL WASHING LINE | |
| WM WASHING MACHINE | |
| WP WASTE PIPE | |
| ZC ZINC CLADDING | |

Client Name
Sarah Vial
Project Name
Tyagarah Rd Residence
27 Tyagarah Rd NSW 2481

Drawing Title:
Proposed Excavation Works
- Driveways

Status: **PROPOSAL**
RESIDENCE

Project No:
#PIn

Plot Date:

Date: 17/11/2023
Scale: 1:200, 1:500 @ A3

Drawing No.: **A.01.15**
REVISION: **####**



Sarah Vial
05 March 2024

27 Tyagarah Road, Tyagarah

Acoustic Assessment

www.octaveacoustics.com.au

BYRON SHIRE COUNCIL
Development Application
APPROVED PLAN
DA No. 10.2023.404.1
Date: 16 April 2024

Octave Acoustics
ABN 60 615 372 873
Ph +61 2 8027 0100
Level 11, 1 O'Connell Street
Sydney, NSW 2000



Project 27 Tyagarah Road, Tyagarah
Client Sarah Vial
Document Number AC539SE-01E02 Acoustic Modelling Assessment (r0)

| Revision | Date | Comment | Author | Reviewer |
|----------|------------|------------------|--------|----------|
| 0 | 05.03.2024 | Issued to Client | NH | LE |

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1. Introduction

Octave Acoustics was engaged by Sarah Vial (Client) to prepare an acoustic assessment with respect to traffic noise intrusion for the proposed single dwelling and a prefabricated second dwelling located at 27 Tyagarah Road, Tyagarah (Subject Site).

2. Site Context

The Subject Site and its neighbouring properties (Figure 1) are zoned RUI: Primary Production. Approximately 38m East of the property boundary is the SP2 Pacific Highway (M1) motorway. Infrastructure Australia (infrastructureaustralia.gov.au) states that in 2019, an average of over 22,500 vehicles used the corridor per day (west of Byron Bay) and since 1999 traffic volumes have shown sustained growth by approximately 3% per year.



Figure 1 - Site Context

3. Criteria

3.1. State Environmental Planning Policy (Transport and Infrastructure) 2021

Division 17 *Roads and Traffic* of the NSW Transport and Infrastructure SEPP (TISEPP) Clause 2.120 *Impact of road noise or vibration on non-road development* sets out noise requirements for developments adjacent busy roads as follows:

- (1) *This section applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 20,000 vehicles (based on the traffic volume data published on the website of TfNSW) and that the consent authority considers is likely to be adversely affected by road noise or vibration:*
 - (a) *residential accommodation,*
 - (b) *a place of public worship,*
 - (c) *a hospital,*
 - (d) *an educational establishment or centre-based childcare facility.*
- (2) *Before determining a development application for development to which this section applies, the consent authority must take into consideration any guidelines that are issued by the Planning Secretary for the purposes of this section and published in the Gazette.*
- (3) *If the development is for the purposes of residential accommodation, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:*
 - (a) *in any bedroom in the residential accommodation—35 dB(A) at any time between 10 pm and 7 am,*
 - (b) *anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.*
- (4) *In this section **freeway, tollway** and **Transitway** have the same meanings as they have in the Roads Act 1993.*

3.2. Development near Rail Corridors and Busy Roads – Interim Guidelines (2008)

The relevant extracts from the Department of Planning's Development near Rail Corridors and Busy Roads – Interim Guidelines (2008) (Guideline) are presented below.

3.5.2 Busy Roads

Screen tests have been developed for single dwelling developments and for residential flat buildings and other sensitive developments.

These screen tests apply ONLY to areas of a development (or facades of buildings) which are exposed to traffic noise and which have a direct line-of-sight.

The noise-affected facades can be on the noisy side of the building (with a direct exposure or line of sight) or on the flanks of a building (with an angled or indirect exposure to the road or rail line). The screen tests apply within a range of direct line-of-sight distances from 10 metres to 300 metres from the road kerb due to practical prediction limitations. Where a development is closer than 10 metres to the road it is likely to require special noise controls.

Standard noise control treatments are grouped into six categories. Category 1 areas are those likely to have low road traffic noise and Category 6 areas are likely to have the highest road traffic noise. Each category refers to a set of standard construction methods and building materials for each key element of a building with the aim of achieving the internal performance criteria for noise identified in clause 102(3) of the Infrastructure SEPP.

Figure 1 below shows screen tests for habitable areas of single/dual occupancy dwellings (if any exposed façade is direct line-of-sight).

Screen Test 1(b) – Habitable Areas 100/110 km/h

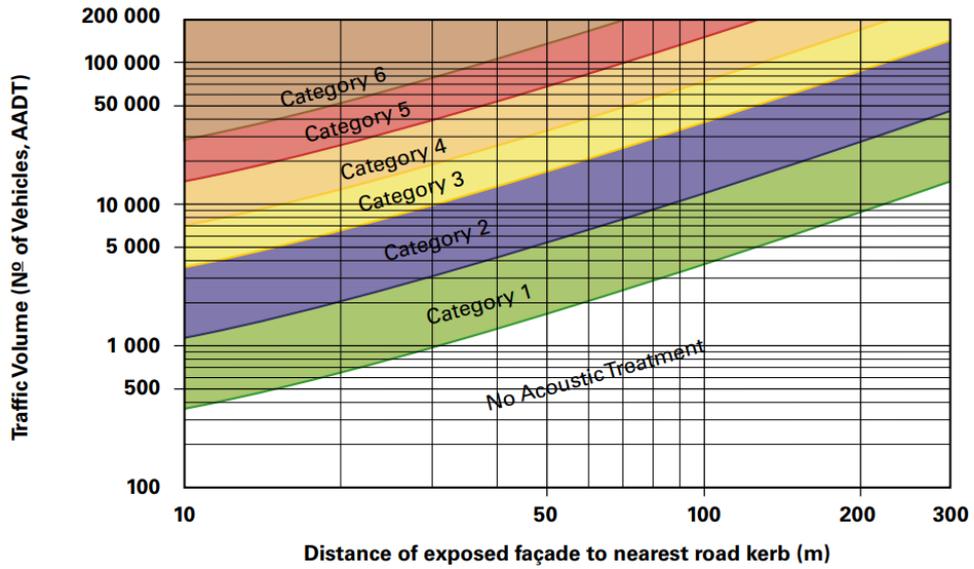


Figure 2 - Screen Test for Single/Dual Occupancy Dwellings Adjacent 100-110 km/h Roads

4. Assessment

Octave Acoustics has assessed traffic noise intrusion of the M1 Pacific Highway to the proposed single dwelling and prefabricated second dwelling located at the Subject Site. Data processing was carried out by reviewing noise measurement results conducted by Dedicated Acoustics within their 2017 *Road Traffic Noise Assessment*.

To validate this data, the measurements were incorporated into a 3-D computer model of the measurement location of Dedicated Acoustics (ML1), Subject Development and surrounds created in CadnaA software implementing the ISO9613 environmental noise prediction and CoRTN road traffic noise algorithm. The model incorporates the following inputs:

- Road traffic flows (Veitch Lister Consulting)
- Pacific Highway – 26,000 Vehicles, 20% Heavy Vehicles
- 100km/hr speed
- Geographical Data – WGS84/Spherical Mercator
- -2.5dB Road Surface correction
- Receptor points located 1.5m above ground level.

It should be noted that a correction of -3dB¹ (widely accepted method of conversion from L_{Aeq} to L_{L10} 18 hour) has been added to the resulting calculation within Table 1 below.

Table 1 – Measured and Calculated SPL Results

| Location | Measured Results of Dedicated Acoustics L _{A10} 18 hour (2017) | Calculated Results Octave Acoustics L _{Aeq} 18 hour (2022) |
|-----------------------------------|--|--|
| ML1 (On-Site Validation Point) | 60.9 dB | 61 dB ¹ |

4.1. Proposed Dwelling

To assess the proposed dwelling, the model was run to calculate L_{Aeq} sound pressure levels across the façades, which shown below in Table 2. Resulting noise levels within the dwelling were then calculated using standard noise intrusion calculations.

Table 2 – Criteria and Calculated Results of Worst-Case Road Noise Intrusion

| Assessment Criterion | Exterior Noise at Facade L _{Aeq} dB(A) |
|--------------------------|--|
| Living Spaces (any time) | 62 |
| Bedrooms (10pm-7am) | 52 |

The outcome of the Screening Test for the proposed dwelling was Category 4. The Subject Site's required R_w value of building elements for noise control treatment to meet Category 4 requirements are stated below in Table 3 and Standard Constructions and Building Elements can be found in Appendix B.

Table 3 – Altered Category 4 Treatment Recommendations

| Construction Items | Building Element Description | Calculated R_w value |
|--------------------|--|------------------------|
| Walls | 1 x 13 mm Fire rated plasterboard + Double timber stud (70 mm x 35 mm) Or Resilient rail design, Cavity Width 165 mm + 14kg ² /75 mm wall insulation | 48 |
| Windows | Double Glaze system - 6mm Glass/12mm Air Gap/6mm Glass | 35 |
| Ceilings | 1 x 0.5 mm Roof Cladding with a Solid Joist w/ resilient rail (382 mm x 45 mm), Cavity Width 400 mm with 250 mm R4.0 Ceiling Insulation + 1 x 13 mm Fire Rated plasterboard | 50 |
| Floors | 40mm thick concrete on ground, density 1300 kg/m ³ | 40 |
| Entry Door | 40mm solid core timber door fitted with full perimeter acoustic seals | 33 |

The resulting interior noise levels for each criterion were calculated as the logarithmic sum of noise entering via each transmission path. Using the recommended Building elements of Category 4 in Appendix B: the results were then checked against the assessment criteria for each space, as shown below in Table 4.

Table 4 – Calculated Results of Worst-Case Road Noise Intrusion

| Assessment Criterion | Exterior Noise at Facade L_{Aeq} dB(A) | TISEPP Noise Criteria L_{Aeq} dB(A) | Resulting Interior Noise Levels L_{Aeq} dB(A) | Complies? |
|--------------------------|---|--|--|-----------|
| Living Spaces (any time) | 62 | 40 | 39 | Yes |
| Bedrooms (10pm-7am) | 52 | 35 | 29 | Yes |

4.2. Prefabricated Dwelling

Assessing the as-built prefabricated dwelling, the computer model was run to calculate L_{Aeq} sound pressure levels across the worst affected façades of the living spaces and bedrooms, which are shown below in Table 5. Resulting noise levels within the dwellings were then calculated using standard noise intrusion calculations.

Table 5 - Criteria and Calculated Results of Worst-Case Road Noise Intrusion

| Assessment Criterion | Exterior Noise at Facade L_{Aeq} dB(A) |
|--------------------------|---|
| Living Spaces (7am-10pm) | 62 |
| Bedrooms (10pm-7am) | 52 |

A conservative approach to assessing the 'as-built' construction forms has been taken, as architectural plans were not able to be obtained. However, an engineering report 170608.1 by Lucena Civil & Structural Engineers and on-site photos were provided by Client, which were used to identify typical building elements below in Table 6.

Table 6 - Likely 'As-Built' System Ratings

| Construction Items | Building Element Description | Calculated Rw value |
|--------------------|--|---------------------|
| Walls | 1 x 13 mm Fire rated plasterboard + Double timber stud (70 mm x 35 mm), Cavity Width 165 mm + 14kg ² /75 mm wall insulation | 48 |
| Windows | Aluminium Single Sliding Window with a 3mm Float Glass on each side of a 13mm air gap | 30 |
| Ceilings | 1 x 0.5 mm Roof Cladding with a Solid Joist w/ resilient rail (382 mm x 45 mm), Cavity Width 400 mm with 250 mm R4.0 Ceiling Insulation + 1 x 13 mm Fire Rated plasterboard | 50 |

The resulting interior noise levels for each criterion were calculated as the logarithmic sum of noise entering via each transmission path. . The results were then checked against the assessment criteria for each space, as shown below in Table 7.

Table 7 - Calculated Results of Worst-Case Road Noise Intrusion

| Assessment Criterion | Exterior Noise at Facade L_{Aeq} dB(A) | TISEPP Noise Criteria L_{Aeq} dB(A) | Resulting Interior Noise Levels L_{Aeq} dB(A) | Complies? |
|--------------------------|---|--|--|-----------|
| Living Spaces (any time) | 62 | 40 | 39 | Yes |
| Bedrooms (10pm-7am) | 52 | 35 | 30 | Yes |

5. Conclusion

Octave Acoustics prepared an acoustic assessment with respect to traffic noise intrusion to support the development application for the proposed single dwelling and a prefabricated second dwelling located at 27 Tyagarah Road, Tyagarah New South Wales.

The property neighbours the (M1) Pacific Highway, which is located at approximately 38m from the proposed developments façades, according to the project plans by Isabelle Menzes Building Design, Drawing Number A.01.1, revision B. Octave Acoustics reviewed the plans and carried out acoustic assessments addressing noise related requirements of:

- TISEPP Division 17 – 2.120 Impact of road noise or vibration on non-road development.
- Development near Rail Corridors and Busy Roads – Interim Guideline (2008)

The results of the assessments show that both the proposed single dwelling and the prefabricated second dwelling will satisfy the acoustic requirements set out in the TISEPP. In summary, the Pacific Highway's noise impacts on the developments can be mitigated using standard building methods; the proposed dwelling will comply with minor changes and the prefabricated dwelling will comply with the pre-existing mandatory acoustic requirements.

Appendix A: Glossary of Terms

'A' Frequency Weighting

The 'A' frequency weighting roughly approximates to the Fletcher–Munson 40 phon equal loudness contour. The human loudness perception at various frequencies and sound pressure levels is equated to the level of 40 dB at 1 kHz. The human ear is less sensitive to low frequency sound and very high frequency sound than midrange frequency sound (i.e. 500 Hz to 6 kHz). Humans are most sensitive to midrange frequency sounds, such as a child's scream. Sound level meters have inbuilt frequency weighting networks that very roughly approximates the human loudness response at low sound levels. It should be noted that the human loudness response is not the same as the human annoyance response to sound. Here low frequency sounds can be more annoying than midrange frequency sounds even at very low loudness levels. The 'A' weighting is the most commonly used frequency weighting for occupational and environmental noise assessments. However, for environmental noise assessments, adjustments for the character of the sound will often be required.

AMBIENT NOISE

The ambient noise level at a particular location is the overall environmental noise level caused by all noise sources in the area, both near and far, including all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc. Usually assessed as an energy average over a set time period 'T' (LAeq,T).

AUDIBLE

Audible refers to a sound that can be heard. There are a range of audibility grades, varying from "barely audible", "just audible" to "clearly audible" and "prominent".

BACKGROUND NOISE LEVEL

Total silence does not exist in the natural or built-environments, only varying degrees of noise. The Background Noise Level is the minimum repeatable level of noise measured in the absence of the noise under investigation and any other short-term noises such as those caused by all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc. It is quantified by the noise level that is exceeded for 90 % of the measurement period 'T' (LA90,T). Background Noise Levels are often determined for the day, evening and night time periods where relevant. This is done by statistically analysing the range of time period (typically 15 minute) measurements over multiple days (often 7

days). For a 15-minute measurement period the Background Noise Level is set at the quietest level that occurs at 1.5 minutes.

'C' FREQUENCY WEIGHTING

The 'C' frequency weighting approximates the 100 phon equal loudness contour. The human ear frequency response is more linear at high sound levels and the 100 phon equal loudness contour attempts to represent this at various frequencies at sound levels of approximately 100 dB.

DECIBEL

The decibel (dB) is a logarithmic scale that allows a wide range of values to be compressed into a more comprehensible range, typically 0 dB to 120 dB. The decibel is ten times the logarithm of the ratio of any two quantities that relate to the flow of energy (i.e. power). When used in acoustics it is the ratio of the square of the sound pressure level to a reference sound pressure level, the ratio of the sound power level to a reference sound power level, or the ratio of the sound intensity level to a reference sound intensity level. See also Sound Pressure Level and Sound Power Level. Noise levels in decibels cannot be added arithmetically since they are logarithmic numbers. If one machine is generating a noise level of 50 dB, and another similar machine is placed beside it, the level will increase to 53 dB (from $10 \log_{10}(10^{(50/10)} + 10^{(50/10)})$) and not 100 dB. In theory, ten similar machines placed side by side will increase the sound level by 10 dB, and one hundred machines increase the sound level by 20 dB. The human ear has a vast sound-sensitivity range of over a thousand billion to one, so the logarithmic decibel scale is useful for acoustical assessments.

dB(A) – See 'A' frequency weighting

dB(C) – See 'C' frequency weighting

EQUIVALENT CONTINUOUS SOUND LEVEL, LAeq

Many sounds, such as road traffic noise or construction noise, vary repeatedly in level over a period of time. More sophisticated sound level meters have an integrating/averaging electronic device inbuilt, which will display the energy time-average (equivalent continuous sound level - LAeq) of the 'A' frequency weighted sound pressure level. Because the decibel scale is a logarithmic ratio, the higher noise levels have far more sound energy, and therefore the LAeq level tends to indicate an average which is strongly influenced by short-term, high level noise events. Many studies show that

human reaction to level-varying sounds tends to relate closer to the LAeq noise level than any other descriptor.

'F' (FAST) TIME WEIGHTING

Sound level meter design-goal time constant which is 0.125 seconds.

FREE FIELD

In acoustics a free field is a measurement area not subject to significant reflection of acoustical energy. A free field measurement is typically not closer than 3.5 metres to any large flat object (other than the ground) such as a fence or wall or inside an anechoic chamber.

FREQUENCY

The number of oscillations or cycles of a wave motion per unit time, the SI unit is the hertz (Hz). 1 Hz is equivalent to one cycle per second. 1000 Hz is 1 kHz.

LOUDNESS

The volume to which a sound is audible to a listener is a subjective term referred to as loudness. Humans generally perceive an approximate doubling of loudness when the sound level increases by about 10 dB and an approximate halving of loudness when the sound level decreases by about 10 dB.

MAXIMUM NOISE LEVEL, LAFmax

The root-mean-square (rms) maximum sound pressure level measured with sound level meter using the 'A' frequency weighting and the 'F' (Fast) time weighting. Often used for noise assessments other than aircraft.

MAXIMUM NOISE LEVEL, LASmax

The root-mean-square (rms) maximum sound pressure level measured with sound level meter using the 'A' frequency weighting and the 'S' (Slow) time weighting. Often used for aircraft noise assessments.

NOISE

Noise is unwanted, harmful or inharmonious (discordant) sound. Sound is wave motion within matter, be it gaseous, liquid or solid. Noise usually includes vibration as well as sound.

OFFENSIVE NOISE

Reference: Dictionary of the NSW Protection of the Environment Operations Act 1997).

"Offensive Noise means noise:

(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:

(i) is harmful to (or likely to be harmful to) a person who is outside the premise from which it is emitted, or

(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or

(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances prescribed by the regulations."

'S' (SLOW) TIME WEIGHTING

Sound level meter design-goal time constant which is 1 second.

SOUND ATTENUATION

A reduction of sound due to distance, enclosure or some other device. If an enclosure is placed around a machine, or an attenuator (muffler or silencer) is fitted to a duct, the noise emission is reduced or attenuated. An enclosure that attenuates the noise level by 20 dB reduces the sound energy by one hundred times.

SOUND EXPOSURE LEVEL (LAE)

Integration (summation) rather than an average of the sound energy over a set time period. Use to assess single noise events such as truck or train pass by or aircraft flyovers. The sound exposure level is related to the energy average (LAeq,T) by the formula $LA_{eq,T} = LAE - 10 \log_{10} T$. The abbreviation (SEL) is sometimes inconsistently used in place of the symbol (LAE).

SOUND PRESSURE

The rms sound pressure measured in pascals (Pa). A pascal is a unit equivalent to a newton per square metre (N/m²).

SOUND PRESSURE LEVEL, Lp

The level of sound measured on a sound level meter and expressed in decibels (dB). Where $L_p = 10 \log_{10} (Pa/Po)^2$ dB (or $20 \log_{10} (Pa/Po)$ dB) where Pa is the rms sound pressure in Pascal and Po is a reference sound pressure conventionally chosen is 20 μ Pa (20×10^{-6} Pa) for airborne sound. Lp varies with distance from a noise source.

SOUND POWER

The rms sound power measured in watts (W). The watt is a unit defined as one joule per second. A

measures the rate of energy flow, conversion or transfer.

SOUND POWER LEVEL, L_w

The sound power level of a noise source is the inherent noise of the device. Therefore, sound power level does not vary with distance from the noise source or with a different acoustic environment. $L_w = L_p + 10 \log_{10} 'a'$ dB,

re: $1 \mu W$, (10^{-12} watts) where 'a' is the measurement noise-emission area (m^2) in a free field.

SOUND TRANSMISSION LOSS

The amount in decibels by which a random sound is reduced as it passes through a sound barrier. A method for the measurement of airborne Sound Transmission Loss of a building partition is given in Australian Standard AS1191 - 2002.

STATISTICAL NOISE LEVELS, L_n

Noise which varies in level over a specific period of time 'T' (standard measurement times are often 15-minute periods) may be quantified in terms of various statistical descriptors with some common examples:

The noise level, in decibels, exceeded for 1% of the measurement time period, when 'A' frequency weighted and 'F' time weighted is reference to as $L_{AF1,T}$. This may be used for describing short-term noise levels such as could cause sleep arousal during the night.

The noise level, in decibels, exceeded for 10% of the measurement time period, when 'A' frequency

weighted and 'F' time weighted is reference to as $L_{AF10,T}$. In most countries the $L_{AF10,T}$ is measured over periods of 15 minutes, and is used to describe the average maximum noise level.

The noise level, in decibels, exceeded for 90% of the measurement time period, when 'A' frequency weighted and 'F' time weighted is reference to as $L_{AF90,T}$. In most countries the $L_{AF90,T}$ is measured over periods of 15 minutes, and is used to describe the average minimum or background noise level.

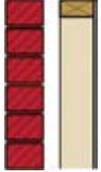
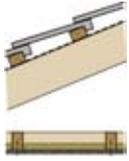
WEIGHTED SOUND REDUCTION INDEX, R_w

This is a single number rating of the airborne sound insulation of a wall, partition or ceiling. The sound reduction is normally measured over a frequency range of 100 Hz to 3.150 kHz and averaged in accordance with ISO standard weighting curves (Refer AS/NZS 1276.1:1999). Internal partition wall R_w+C ratings are frequency weighted to simulate insulation from human voice noise. The R_w+C is similar in value to the STC rating value. External walls, doors and windows may be R_w+C_{tr} rated to simulate insulation from road traffic noise. The spectrum adaptation term C_{tr} adjustment factor takes account of low frequency noise. The weighted sound reduction index is normally similar or slightly lower number than the STC rating value.

'Z' FREQUENCY WEIGHTING

The 'Z' (Zero) frequency weighting is 0 dB within the nominal 1/3 octave band frequency range centred on 10 Hz to 20 kHz. This is within the tolerance limits given in AS IEC 61672.1-2004: 'Electroacoustics - Sound level meters - Specifications'.

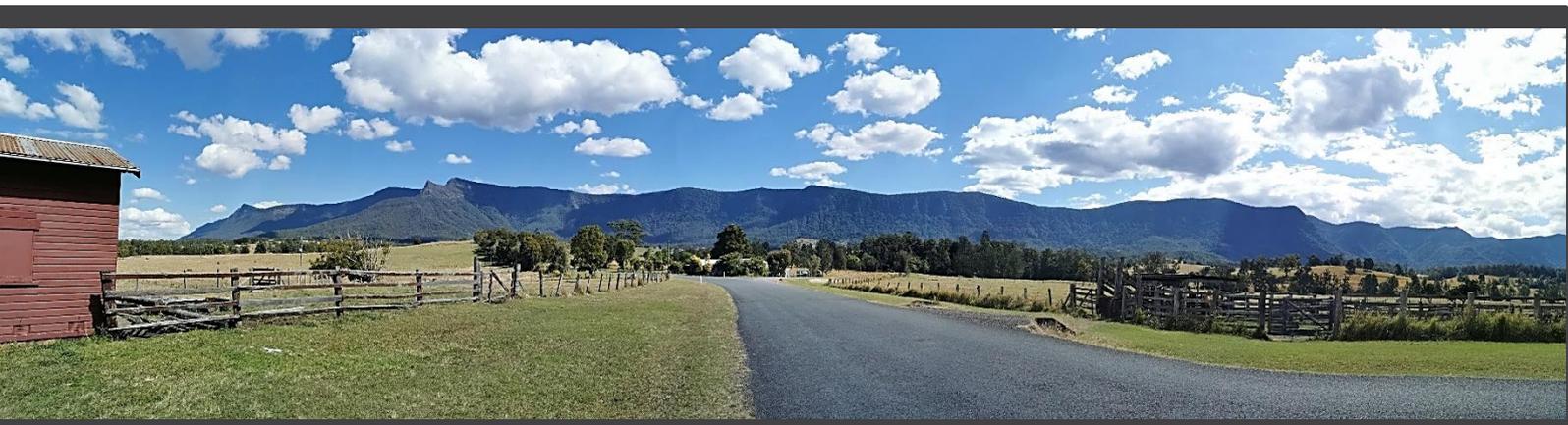
Appendix B: Standard Constructions and Building Elements

| Category No. | Building Element | Standard Constructions | sample |
|--------------|-----------------------|--|---|
| 4 | Windows/Sliding Doors | Openable with minimum 10.38mm laminated glass and full perimeter acoustic seals |  |
| | Frontage Facade | Brick Veneer Construction: 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, R2 insulation batts in wall cavity, 10mm standard plasterboard internally. |  |
| | | Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap |  |
| | Roof | Pitched concrete or terracotta tile or sheet metal roof with sarking, 2 layers of 10mm sound-rated plasterboard fixed to ceiling joists, R2 insulation batts in roof cavity. |  |
| | Entry Door | 45mm solid core timber door fitted with full perimeter acoustic seals |  |
| | Floor | Concrete slab floor on ground |  |



Bushfire Risk Assessment

Infill Development



| | |
|------------------------------|--|
| Proposed Development: | Two (2) 'Class 1a' dwellings – main residence & second dwelling. |
| Location: | Lot 50 DP1291928 of 27 Tyagarah Road Tyagarah NSW 2481 |
| Client: | Sarah Vial |
| Our Ref: | 2307VIA2166 [2207VIA1898] |

BYRON SHIRE COUNCIL
Development Application
APPROVED PLAN
DA No. 10.2023.404.1
Date: 16 April 2024

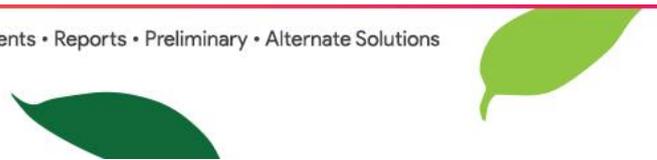


Date of Issue: 20 September 2023

Report prepared by **Melanie Jackson**

Grad Dip (Bushfire Protection); B.A.Sc. (EnvResMgt)

BPAD-Level 3 Accredited Practitioner & Member of the FPA Australia



‘Prepare—Act—Survive’

In the Event of an Emergency Call:

‘000’



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EXPIRY

The bushfire risk assessment and resulting BAL rating contained in this report should not be relied upon for a period extending 12 months from date of issue. If this report was issued more than 12 months ago, it is recommended that the validity of the determination be confirmed with the Accredited Practitioner and where required an updated report should be issued.

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EXECUTIVE SUMMARY

| | |
|--|--|
| This Bushfire Risk Assessment relates to a proposed development located at: | Lot 50 DP1291928 27 Tyagarah Road Tyagarah NSW 2481 |
| Client/s: | Sarah Vial |
| Site inspection date: | 22 September 2022 |
| Proposed development: | Two (2) 'Class 1a' dwellings – main residence & second dwelling |
| Plans: | Plans by Isabelle Menezes, date: 19/09/2023 A full set of plans shall be provided by the applicant to accompany the DA. All design and site plans must ensure compliance with the minimum building setbacks in relation to this development as proposed and the recommendations contained herein. |
| What is the Bushfire Attack Level (BAL) as per AS3959–2018? | BE1 – Main residence: BAL-19 (entire residence, swimming pool & deck). BE2 – Second dwelling: BAL-19 (entire structure). |
| Are performance solutions presented herein? | NO |
| Does this development require referral to the NSW Rural Fire Service? | NO – The consent authority must be satisfied the development conforms to the relevant specifications and requirements prior to granting of consent. If not satisfied, the consent authority should consult with the Commissioner of the NSW Rural Fire Service under s.4.14 EP&A Act. |
| Does this development satisfy the Aims and Objectives of Planning for Bushfire Protection (PBP 2019)? | YES – The proposed development shall confirm with the relevant specifications and requirements against PBP (2019) subject to compliance with the recommendations and conditions set out herein. |
| This Bushfire Risk Assessment Report acts as a 'Certificate' under s.4.14(b) Environmental Planning and Assessment Act 1979. | This 'Certificate' has been issued by Melanie Jackson who is recognised by the NSW Rural Fire Service as a qualified consultant in bushfire risk assessment.  Melanie Jackson – BPAD-Level 3 Certified Practitioner FPAA Cert. No: 21977 |



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ABBREVIATIONS

| Abbreviation | Description |
|-------------------|---|
| APZ | Asset protection zone |
| AS3959 | Australian Standard – Construction of Buildings in Bushfire Prone Areas |
| BAL | Bush fire attack level |
| BCA | Building Code of Australia |
| BE | Building envelope |
| BFPL | Bush fire prone land |
| BFPL Map | Bush fire prone land map |
| BFSA | Bush fire safety authority |
| BPM | Bush fire protection measure |
| DA | Development application |
| DCP | Development control plan |
| EP&A Act | <i>Environmental Planning & Assessment Act 1979</i> |
| FFDI | Forest fire danger index |
| GFDI | Grass fire danger index |
| IPA | Inner protection area |
| kW/m ² | Kilowatts per metre squared |
| LEP | Local environmental protection plan |
| NSW RFS | NSW Rural Fire Service |
| OPA | Outer protection area |
| PBDB | Performance based design brief |
| PBP | Planning for Bushfire Protection |
| RF Act | <i>Rural Fires Act 1997</i> |
| RF Reg | <i>Rural Fires Regulation 2022</i> |
| SEPP | <i>State Environmental Planning Policy</i> |
| SFPP | Special fire protection purpose |
| SFR | Short fire run |



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1 INTRODUCTION

Bushfire Risk Pty Ltd was engaged by the client/s to conduct a Bushfire Risk Assessment in support of a Development Application (DA). The purpose of the assessment is to determine category of bushfire attack and construction level for the proposed development on behalf of the client/s.

The development shall be carried out on the lot/s referred to as the 'Subject Site' (Figure 1) and dwelling sites shall be sited within a Building Envelope which shall be referred to as a 'BE' throughout this document.

1.1 Subject Site

Address: Lot 50 DP1291928

27 Tyagarah Road Tyagarah NSW 2481.

1.2 Proposed Development

Two (2) 'Class 1a' dwellings – main residence & second dwelling, swimming pool and deck.



Figure 1: Aerial image of the subject site (Source: NSW Government; 2023)

1.3 Legislation

1.3.1 Bushfire Prone Land

The subject site is mapped as 'Bush Fire Prone Land' (BFPL) under s.10.3 Environmental Planning and Assessment Act 1979 (EPA Act), triggering the legislative requirements for building on bushfire prone land is applicable (Ref. Figure 2).

1.3.2 Building on Bushfire Prone Land

The National Construction Code (NCC) contains Performance Requirements and Deemed-to-Satisfy provisions relating building on Bushfire Prone Land (BFPL). Construction on BFPL must comply with AS3959-2018 – Construction of buildings in bushfire prone areas (AS3959) or the National Association of Steel Framed Housing (2014) Steel Framed Construction in Bush Fire Areas (NASH Standard) as varied in NSW. These requirements are considered Deemed-to-Satisfy solutions, however, do not extend to BAL-FZ or where modified by specific conditions of the relevant development consent.



Figure 2: BFPL Map (Source: NSW Government; 2023)

1.3.3 Infill Development

The proposed development is classified as 'infill' development, which refers to the development of land by the erection of, or alteration or addition to, a dwelling which does not require the spatial extension of services including public roads, electricity, water and sewerage and is within an existing lot. Infill development requires an assessment under s.4.14 EPA Act 1979, requiring an assessment of the bushfire risk to be carried pursuant to section 7 – Residential Infill Development PBP (2019).

1.3.4 Planning for Bushfire Protection

All development on BFPL must satisfy the aim and objectives of Planning for Bush Fire Protection (PBP 2019). This report demonstrates how the requirements can be met by ensuring suitable Bushfire Protection Measures (BPM) are put in place commensurate with the level of risk and characteristics of the occupants.

The aim of PBP is to provide for the protection of human life and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment.

1.4 Aim and Objectives

All development on BFPL must satisfy the aim and objectives of Planning for Bush Fire Protection (PBP 2019). This report demonstrates how the requirements can be met by ensuring suitable Bushfire Protection Measures (BPM) are put in place commensurate with the level of risk and characteristics of the occupants.

The aim of PBP is to provide for the protection of human life and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment.

2 BUSHFIRE RISK ASSESSMENT

This Bushfire Risk Assessment includes an analysis of the hazard, threat and subsequent risk to the development as proposed and provides recommendations that the proposal satisfies the aim and objectives of PBP, Specific Objectives for Infill Development and Intent of Measures. by demonstrating compliance against the performance criteria or acceptable solutions, thereby providing adequate bushfire protection measures (BPM) to the proposed development commensurate with the level of risk and characteristics of the occupants.

The assessment shall incorporate provisions including appropriate separation distances between the BE and hazard, namely asset protection zone (APZ) and defendable spaces around a building and appropriate BAL rating nominated pursuant to the requirements set out in PBP (2019). The results may incorporate deviations from the acceptable solutions, where performance solutions may be used to demonstrate compliance against the performance criteria.

The recommendations aim to satisfy the requirements of PBP (2019) by addressing the suite of BPM in combination, commensurate with the level of bushfire risk and site and occupant characteristics appropriate to the proposed development.

2.1 Methodology

2.1.1 PBP 2019

The bushfire risk assessment was carried out pursuant to the requirements set out in s.7 – *Residential Infill Development* (PBP 2019). The bushfire risk assessment was carried out pursuant to the site assessment methodology described in Appendix 1 PBP (2019).

2.1.2 Acceptable Methodology – Asset Protection Zones

The APZ was determined pursuant to the requirements set out in PBP (2019), namely *Appendix 1 – Site Assessment Methodology* including the following tables:

- A1.12.3 - Minimum distances for APZs – residential development, FFDDI 80 areas (29kW/m², 1090K).
- A1.12.6 – Determination of BAL, FFDI 80 – residential development.
- A1.2 – Vegetation formation. A split assessment of two vegetation types shall be used to determine the worst-case scenario.

2.2 Site Inspection

An assessment of the subject site was undertaken by Melanie Jackson (BPAD-Level 3 Accredited Practitioner No. 21977) on 22 September 2022.

2.3 Site Assessment

The following sections include an assessment of the subject site, vegetation, slope, setbacks, environmental considerations for the subject site and bushfire protection measures in combination.

2.3.1 Fire Danger District

The fire danger for the Local Council area is set at FFDI-80

2.3.2 Vegetation & Environmental Features

The assessment and classification of the predominant vegetation types on and surrounding the subject site (out to a minimum distance of 140m from the boundaries of the property) was undertaken, using Keith (2006) vegetation classification system as described in PBP (2019) (Table 1).

2.3.3 Slope & Aspect

An assessment of the aspect and effective slope, being the land under the classified vegetation most likely to have the greatest effect on bushfire behaviour within 100m of the site was undertaken and the results presented in the assessment table/s herein (Table 2 and Table 3).

Slope analysis was undertaken using the following assessment methodology:

- A desktop assessment of 2, 5, 10m contours available via the Fire Protection Association (FPAA) *FireMaps NSW* platform (FPAA 2023).
- On-site ground truthing was undertaken, assessing the slope using a Leopold Laser Range Finder and comparison with the desktop assessment to determine the effective slope of the hazard; tabulated in the results table/s herein (Ref. Figure 3).

Table 1: Vegetation Analysis

| Vegetation Classification, Direction, Plot, Description & Photos |
|---|
| <p>South – Managed land & low threat vegetation (exclusions)</p> <p>Both onsite and south of the subject site, the vegetation is consistently managed in a low fuel state, south being managed around the curtilage of the dwellings on these properties. Patches of rainforest are considered '<i>low threat vegetation – exclusions</i>' and are excluded from this assessment (PBP 2019).</p> |
| <p>East – Managed land & low threat vegetation (exclusions)</p> <p>The pacific motorway traverses adjacent to the subject site, strips of roadside vegetation, rainforest patches and managed land occurs to the east. These areas are considered '<i>low threat vegetation – exclusions</i>' and are excluded from this assessment (PBP 2019).</p> |
| <p>North – Grassland</p> <p>North of the subject site the vegetation is classified as 'Grassland' 'Category 2' vegetation.</p> |
| <p>West (a) – Grassland</p> <p>West (b) – Forest</p> <p>The land west has two distinct vegetation types within the assessment area. Firstly grassland formation and Coastal Swamp Forest which is consistent with the 'Forest' formation under PBP (2019). The grassland is at least 40m deep between the boundary and forest. Therefore an assessment of the two vegetation types was carried out to determine the worst case scenario relating to the proposed development.</p> |

Vegetation Classification, Direction, Plot, Description & Photos



Photo 1: South managed land



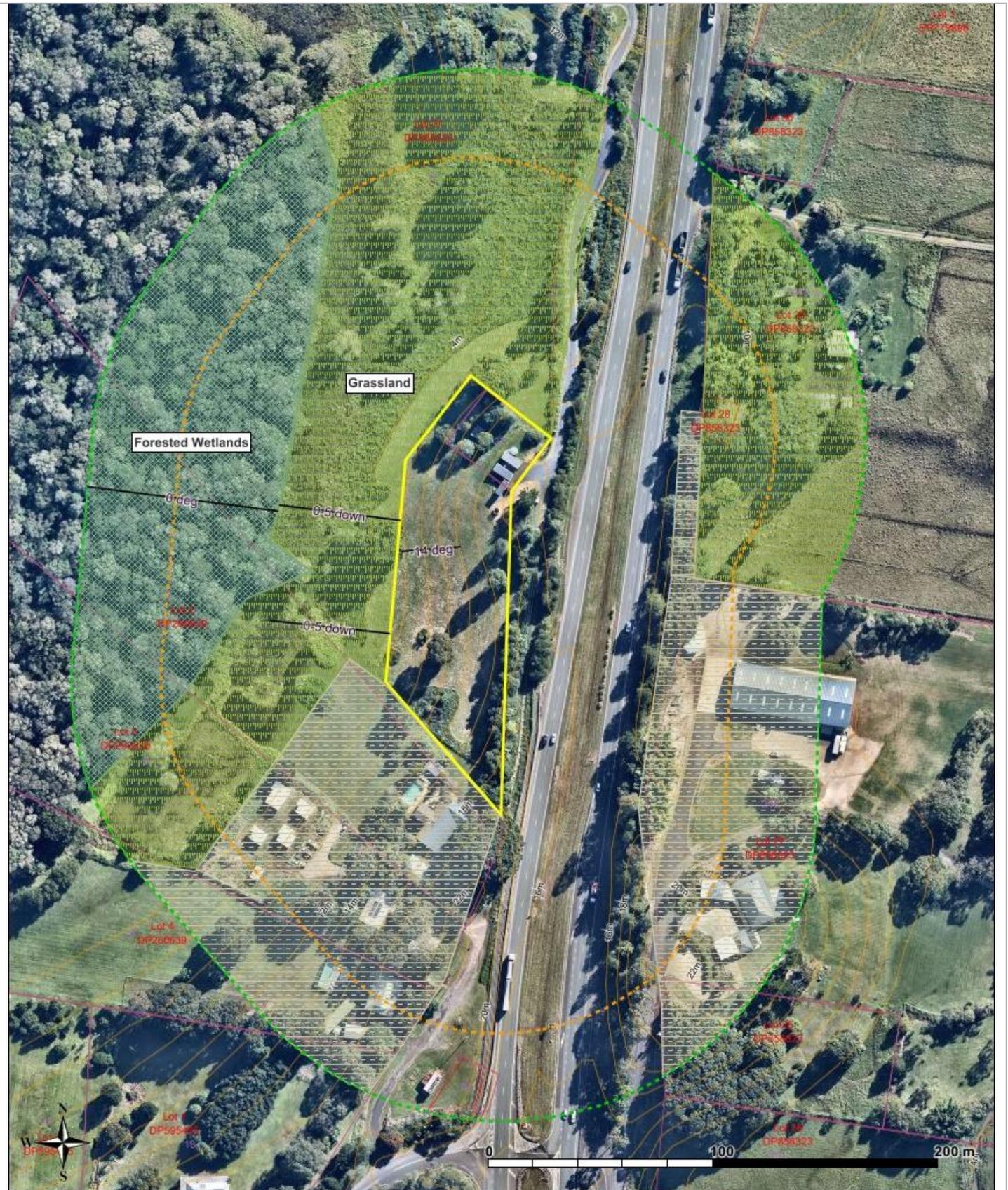
Photo 2: North managed land



Photo 3: West grassland (foreground)



Photo 4: Forest in the distance



Legend

| | | | | | | | | |
|-----------------------|--------------------------|--------------------|--------------------|------------|---------------|--------------------------|---------------------|----------------------|
| Slope profiles | Property boundary | 140m survey | 100m survey | VEG | Forest | Property Boundary | Lot Boundary | Contours (2m) |
| — Slopes | ▭ Subject Site | ▭ Veg analysis | ▭ Slope Analysis | ▭ Excluded | ▭ Grassland | ▭ | ▭ | ▭ |

Map Printed from FireMaps on Mon Sep 04 22:03:50 AEST 2023

Figure 3: Vegetation analysis (Source: FireMaps 2023; Nearmap 2023)

2.4 Bushfire Protection Measures (BPM)

The BPMs are a set of measures to be satisfied which aim to reduce risk from bushfires and enhance occupant survival, property protection and community resilience to bushfire attack. Analysis of the BPMs shall be undertaken commensurate to the level of risk to occupants and the subject site. Recommendations provided are based on the results. BPMs to be satisfied include the following:

- APZ
- Access
- Construction
- Siting and design
- Landscaping
- Services
- Emergency and evacuation planning

The following section/s describe the vegetation type, slope, access, availability of water supplies and environmental considerations for the subject site and surrounds.

2.4.1 Intent of measures:

'To minimise the risk of bushfire attack and provide protection for emergency services personnel, residents and others assisting firefighting activities' (PBP 2019).

2.4.2 Asset Protection Zones

Setbacks from the hazard are presented in Table 2 and Table 3 below. The setbacks relate to the separation distance between the proposed development site (BE) and the hazard.

The APZ is to be managed within the bounds of the subject site in perpetuity pursuant to *Appendix 4 – Asset Protection Zone Requirements* (PBP 2019). Refer to Figure 4.

Table 2: Main Residence (BE1) APZ & BAL Rating Results

| Vegetation & Hazard Analysis & Results Summary | | | APZ Requirements | |
|---|---|---------------|----------------------------|--|
| Direction | Vegetation Class / Formation | Veg Slope (°) | Table A1.12.3 Min. APZ (m) | Recommended Min. APZ (m) |
| North | Grassland | 0 level | 10 | 20 (onsite) |
| East | Low threat vegetation (exclusions) | - | - | 20 (onsite) |
| South | Managed land & low threat vegetation (exclusions) | - | - | 20m (or boundary whichever is closest) |
| West (a) | Grassland (from boundary) | 0-5 downslope | 11 | 16m (to boundary) ^ |
| West (b) | Forest (>40m from boundary) | 0 level | 20 | To boundary |
| Notes: | | | | |
| ^ The proposed BE shall be sited with setbacks as per the site plans provided herein (Ref. Appendix A), i.e. the extent of the dwelling, swimming pool and deck must be at least 16m from the west boundary to comply with BAL-19 construction level. | | | | |

Table 3: Second Dwelling (BE2) APZ & BAL Rating Results

| Vegetation & Hazard Analysis & Results Summary | | | APZ Requirements | |
|--|---|---------------|----------------------------|--|
| Direction | Vegetation Class / Formation | Veg Slope (°) | Table A1.12.3 Min. APZ (m) | Recommended Min. APZ (m) |
| North | Grassland | 0 level | 10 | 20 (onsite) |
| East | Low threat vegetation (exclusions) | - | - | 20 (onsite) |
| South | Managed land & low threat vegetation (exclusions) | - | - | 20m (or boundary whichever is closest) |
| West (a) | Grassland (from boundary) | 0-5 downslope | 11 | 20m (onsite) * |
| West (b) | Forest (>40m from boundary) | 0 level | 20 | To boundary |

Notes:
* The proposed BE shall be sited with setbacks as per the site plans provided herein (Ref. Appendix A), i.e. the extent of the dwelling & dwelling deck must be at least 20m from the west boundary to comply with BAL-19 construction level.

2.4.3 Construction Standard – BAL Rating

Bushfire Attack Levels (BAL) provide increased protection designed to improve a buildings performance and negate the effects of bushfire attack to a building. Albeit there is no guarantee a building will survive a bushfire event however the six BAL ratings set out in *Australian Standard 3959-2018 – Construction of Buildings in Bushfire Prone Areas (AS3959-2018)* aim to reduce the effects of potential exposure of a building to embers, radiant heat flame contact and potential ignition.

The recommended BAL rating/s for the proposed development is as follows:

BE1 – Main residence: BAL-19 (entire residence, swimming pool & deck).

BE2 – Second dwelling: BAL-19 (entire structure).

In addition to the BAL rating, construction shall include the NSW variations to AS3959. Refer to BPM Compliance Table presented herein.

2.4.4 Water Supplies for Fire Fighting Purposes

Water supplies shall comply with the acceptable solutions. A minimum 20,000 litre static water supply shall be installed. The swimming pool may be nominated as a suitable supply provided access to the swimming pool is provided as discussed above (Ref. Figure 4).

2.4.5 Access

An access road to the dwelling is proposed. The property access road shall be constructed as per the acceptable solutions of PBP, namely allow for a 4m wide carriageway, provide a turning area or loop road i.e. multi-head turning area as depicted in Appendix 3 PBP (2019).

Should the swimming pool be nominated as a firefighting water supply, access and a hardstand area suitable for fire fighting vehicles shall be installed within 4m of the pool (Ref. Figure 5).

2.4.6 Electricity & Gas Services

Any modifications to the existing services shall be conducted in accordance with the acceptable solutions.

2.4.7 Landscaping

Comply with the acceptable solutions by undertaking landscaping and APZ management as per the NSW Appendix 4 (PBP) and the RFS document '*Standards for Asset Protection Zones*' (RFS 2005).

2.4.8 Emergency Planning

It is recommended occupants of the site prepare a bushfire survival plan and practice it annually. A guide to preparing a 'Bushfire Survival Plan' is available for download on the NSW RFS website: www.rfs.nsw.gov.au.

2.4.9 Likely Environmental Impacts

The scope of this report does not include an environmental assessment and should be read in conjunction with the Statement of Environmental Effects (SEE) and any supporting assessments and reports submitted in support of the DA.

The following was considered during the assessment process:

- There is a single tree within the proposed BE that is proposed for removal. The APZ does not require removal and/or modification of any significant vegetation to create the APZ.
- The client must seek further advice from Council prior to undertaking tree removal.
- The APZ shall be managed in perpetuity as an Inner Protection Area (IPA).

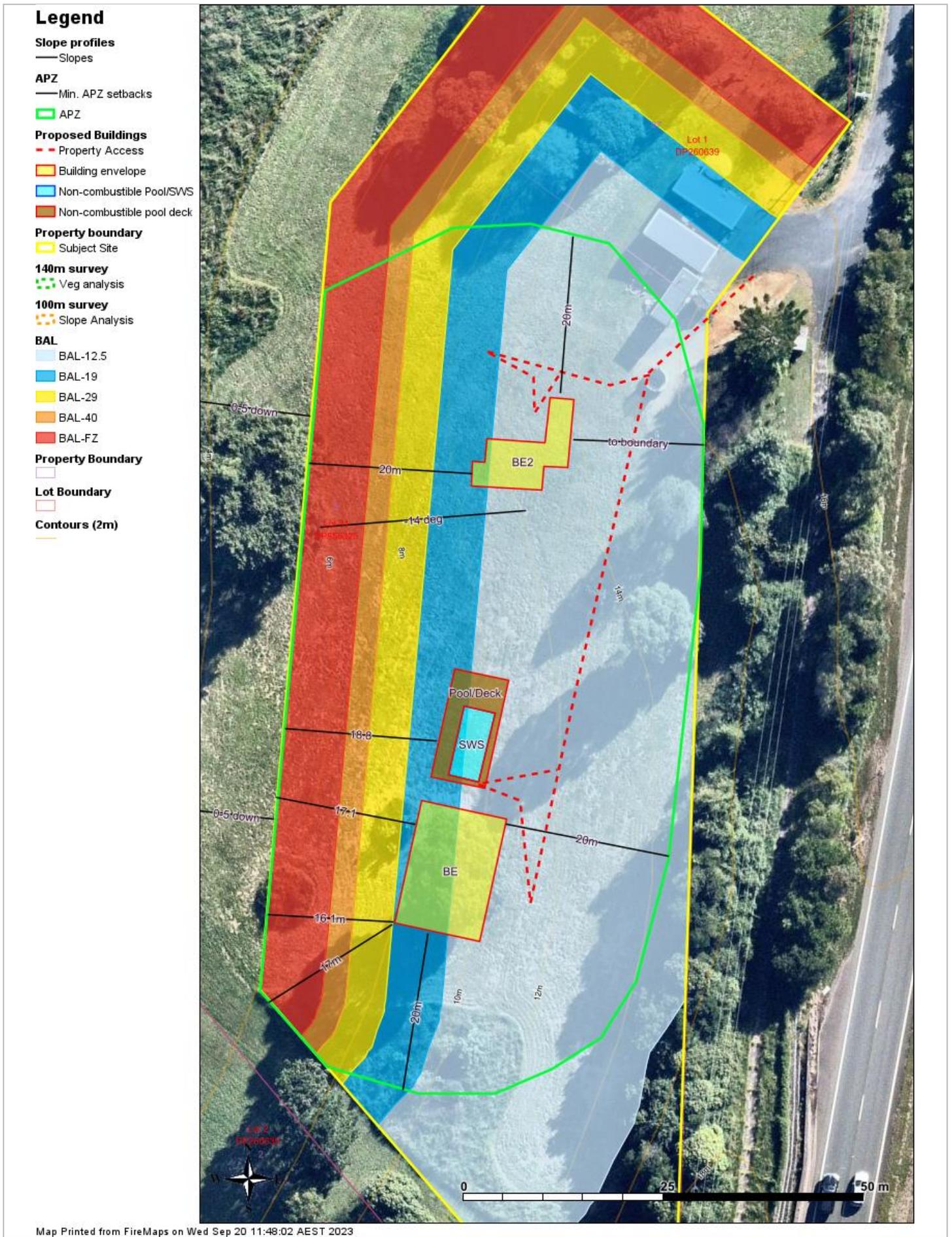


Figure 4: BAL analysis (Source: FireMaps 2023; Nearmap 2023)

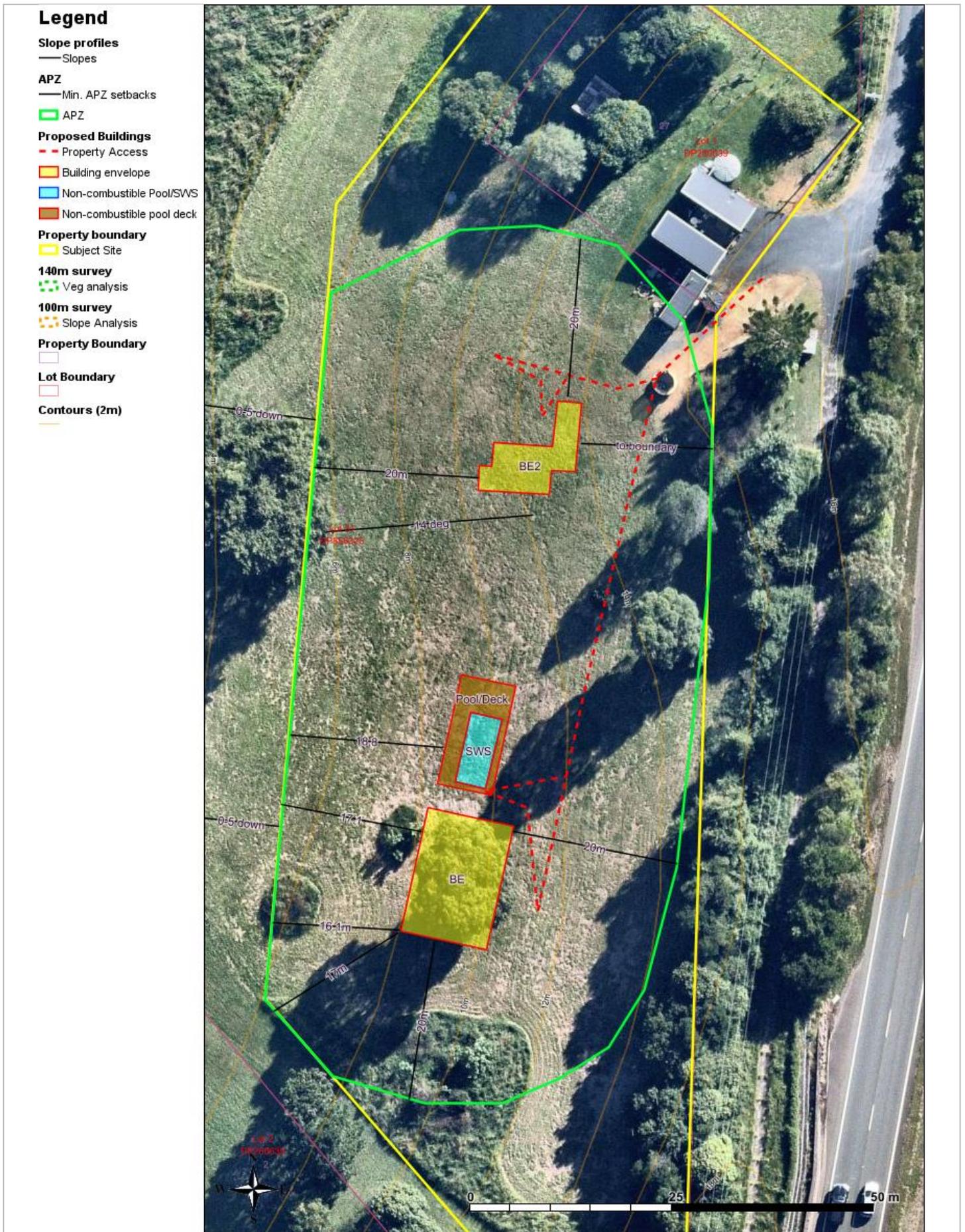


Figure 5: APZ & access (Source: FireMaps 2023; Nearmap 2023)

3 RECOMMENDATIONS & COMPLIANCE

The following table/s indicate the extent to which the proposed development conforms with or deviates from the standards, specific objectives, performance criteria and acceptable solutions set out in s.7 – *Residential Infill Development* (PBP).

The results and recommendations herein are commensurate with the level of bushfire risk and characteristics of the occupants for the proposed development, by applying the suite of BPM in combination, being the site-specific requirements that must be satisfied to comply.

The table below specifies the level of compliance and any deviations from the acceptable solution against the BPMs, providing recommendations ensuring the intent of each BPM shall be met (Table 4).

NB: the following terms indicate the level of compliance referred to in Table 4 below.

Acceptable Solution – complies with the Acceptable Solution/s; some work may be required to meet the requirements.

Performance Criteria – performance solution/s used to demonstrate compliance against the Performance Criteria; some additional work may be required to meet the requirements.

Assumed (previous approval/s) – it is assumed this requirement has been met under existing approval/s i.e., existing infrastructure/DA approval/s.

N/A – not applicable; this solution is not relevant to this proposal.

Table 4: BPM compliance against the performance criteria & acceptable solutions – s.7 Residential Infill Development (PBP)

| BPM | Performance Criteria | Acceptable Solutions | Compliance & Recommendations |
|--|--|---|---|
| <p>s.7.4 Intent of measures: To minimise the risk of bushfire attack and provide protection for emergency services personnel, residents and others assisting firefighting activities.</p> | | | |
| <p>The intent may be achieved where:</p> | | | |
| APZ | <ul style="list-style-type: none"> • APZs are provided commensurate with the construction of the building; and • A defensible space is provided. | <ul style="list-style-type: none"> • An APZ is provided in accordance with Table A1.12.2 or A1.12.3 in Appendix 1.6 | <p>Complies with the Acceptable Solutions</p> <ul style="list-style-type: none"> • The APZ satisfies the minimum distances for APZs as per Table A1.12.3. |
| APZ | <ul style="list-style-type: none"> • APZs are managed and maintained to prevent the spread of a fire to the building. | <ul style="list-style-type: none"> • APZs are managed in accordance with the requirements of Appendix 4 of PBP. | <p>Comply with the Acceptable Solutions</p> <p>The APZ shall be:</p> <ul style="list-style-type: none"> • Managed in perpetuity as an IPA. |
| APZ | <ul style="list-style-type: none"> • The APZ is provided in perpetuity. APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised. | <ul style="list-style-type: none"> • APZs are wholly within the boundaries of the development site. • APZ are located on lands with a slope less than 18 degrees. | <p>Complies with the Acceptable Solutions</p> |
| Access | <ul style="list-style-type: none"> • Firefighting vehicles are provided with safe, all-weather access to structures | <ul style="list-style-type: none"> • Property access roads are two-wheel drive, all-weather roads. | <p>Comply with the Acceptable Solutions</p> |

| BPM | Performance Criteria | Acceptable Solutions | Compliance & Recommendations |
|--------|---|---|---|
| | and hazard vegetation. | | |
| Access | <ul style="list-style-type: none"> The capacity of access roads is adequate for firefighting vehicles. | <ul style="list-style-type: none"> The capacity of road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes), bridges and causeways are to clearly indicate load rating. | <p>Comply with the Acceptable Solutions</p> |
| Access | <ul style="list-style-type: none"> There is appropriate access to water supply. | <ul style="list-style-type: none"> Hydrants are provided in accordance with the relevant clauses of AS 2419.1:2005. There is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available. | <p>Comply with the Acceptable Solutions</p> <ul style="list-style-type: none"> The swimming pool may be nominated as the firefighting water supply, therefore ensure suitable access for a Category 1 fire appliance to within 4m of the static water supply is provided. |
| Access | <ul style="list-style-type: none"> Firefighting vehicles can access the dwelling and exit the property safely. | <ul style="list-style-type: none"> At least one alternative property access road is provided for individual dwellings or groups of dwellings that are located more than 200 metres from a public through road. <p>Note: There are no specific access requirements in an urban area where an unobstructed path (no greater than 70m) is provided between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles.</p> <p>In circumstances where this cannot occur, the following requirements apply:</p> <ul style="list-style-type: none"> Minimum 4m carriageway width. | <p>Comply with the Acceptable Solutions</p> |

| BPM | Performance Criteria | Acceptable Solutions | Compliance & Recommendations |
|-----|----------------------|--|------------------------------|
| | | <ul style="list-style-type: none"> • In forest, woodland and heath situations, rural property roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m, at the passing bay. • A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches. • Property access must provide a suitable turning area in accordance with Appendix 3. • Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress. • The minimum distance between inner and outer curves is 6m. • The crossfall is not more than 10 degrees. • Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads; and • A development comprising more than three dwellings has formalised access by dedication of a road and not by right of way. <p>Note: Some short constrictions in the access may be accepted where they are not less than 3.5m wide, extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above.</p> | |

| BPM | Performance Criteria | Acceptable Solutions | Compliance & Recommendations |
|----------------|--|--|--|
| Water Supplies | <ul style="list-style-type: none"> An adequate water supply is provided for firefighting purposes. | <ul style="list-style-type: none"> Reticulated water is to be provided to the development where available. A static water supply is provided where no reticulated water supply is available. | <p>Comply with the Acceptable Solutions</p> |
| Water Supplies | <ul style="list-style-type: none"> The integrity of the water supply is maintained. | <ul style="list-style-type: none"> All above-ground water service pipes external to the building are metal, including and up to any taps. | <p>Comply with the Acceptable Solutions</p> |
| Water Supplies | <ul style="list-style-type: none"> A static water supply is provided for firefighting purposes in areas where reticulated water is not available. | <ul style="list-style-type: none"> Where no reticulated water supply is available, water for firefighting purposes is provided in accordance with Table 5.3d. A connection for firefighting purposes is located within the IPA or non-hazard side and away from the structure; 65mm Storz outlet with a ball valve is fitted to the outlet. Ball valve and pipes are adequate for water flow and are metal. Supply pipes from tank to ball valve have the same bore size to ensure flow volume. Underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank. A hardened ground surface for truck access is supplied within 4m. Above-ground tanks are manufactured from concrete or metal. | <p>Acceptable Solutions</p> <ul style="list-style-type: none"> Ensure a min. 20,000 litre water supply is made available for firefighting purposes at all times. The water source shall be made available or located within the APZ and away from the structure (e.g. 20m of the dwelling). The swimming pool may be nominated provided suitable access up to the water source as per the acceptable solutions is installed. |

| BPM | Performance Criteria | Acceptable Solutions | Compliance & Recommendations |
|----------------------|--|---|--|
| | | <ul style="list-style-type: none"> • Raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F of AS 3959). • Unobstructed access can be provided at all times; underground tanks are clearly marked. • Tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters. • All exposed water pipes external to the building are metal, including any fittings. • Where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump and are shielded against bush fire attack. • Any hose and reel for firefighting connected to the pump shall be 19mm internal diameter; and • Fire hose reels are constructed in accordance with AS/NZS 1221:1997 and installed in accordance with the relevant clauses of AS 2441:2005. | |
| Electricity Services | <ul style="list-style-type: none"> • Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings. | <ul style="list-style-type: none"> • Where practicable, electrical transmission lines are underground; and • Where overhead, electrical transmission lines are proposed as follows: <ul style="list-style-type: none"> • Lines are installed with short pole spacing of 30m, unless crossing gullies, gorges, or riparian areas; and | <p>Comply with the Acceptable Solutions</p> <ul style="list-style-type: none"> • Where applicable, any new or upgrades to the electricity supply services shall be carried out in accordance with the acceptable solution. |

| BPM | Performance Criteria | Acceptable Solutions | Compliance & Recommendations |
|------------------------|---|---|---|
| | | <ul style="list-style-type: none"> No part of a tree is closer to a power line than the distance set out in ISSC3 <i>Guideline for Managing Vegetation Near Power Lines</i>. | |
| Gas Services | <ul style="list-style-type: none"> Location and design of gas services will not lead to ignition of surrounding Bushland or the fabric of buildings. | <ul style="list-style-type: none"> Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 - The storage and handling of LP Gas, and the requirements of relevant authorities, and metal piping is used. All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side. Connections to and from gas cylinders are metal. Polymer-sheathed flexible gas supply lines are not used; and Above-ground gas service pipes are metal, including and up to any outlets. | <p>Comply with the Acceptable Solutions</p> <ul style="list-style-type: none"> Where provided, gas supplies shall be installed in accordance with the acceptable solution. |
| Construction Standards | <ul style="list-style-type: none"> The proposed building can withstand bush fire attack in the form of embers, radiant heat, and flame contact. | <ul style="list-style-type: none"> BAL is determined in accordance with Tables A1.12.5 to A1.12.7; and Construction provided in accordance with the NCC and as modified by section 7.5 (please see advice on construction in the flame zone). | <p>Comply with the Acceptable Solutions</p> <ul style="list-style-type: none"> The min. recommended BAL rating is: <ul style="list-style-type: none"> BE1 – Main residence: BAL-19 (entire residence, swimming pool & deck). BE2 – Second dwelling: BAL-19 (entire structure). Construction shall be undertaken pursuant to the following sections of AS3959-2018: <ul style="list-style-type: none"> s.6 – Construction for BAL-19; and s.3 – Construction General; and <p>The following NSW variations for construction must be applied:</p> |

| BPM | Performance Criteria | Acceptable Solutions | Compliance & Recommendations |
|------------------------|--|---|--|
| | | | <ul style="list-style-type: none"> • Clause 3.10 of AS3959 is deleted and any sarking used for BAL-12.5, BAL-19, BAL-29 or BAL-40 shall: <ul style="list-style-type: none"> • Be non-combustible; or • Comply with AS/NZS 4200.1, be installed on the outside of the frame, and have a flammability index of not more than 5 as determined by AS1530.2; and • Clause 5.2 ad 6.2 of AS3959 is replaced by Clause 7.2 of AS3959, except that any wall enclosing the subfloor space need only comply with the wall requirements for the respective BAL; and • Clause 5.7 and 6.7 of AS3959 is replaced by clause 7.7 of AS3959, except that any wall enclosing the subfloor space need only comply with the wall requirements for the respective BAL. |
| Construction Standards | <ul style="list-style-type: none"> • Proposed fences and gates are designed to minimise the spread of bush fire. | <ul style="list-style-type: none"> • Fencing and gates are constructed in accordance with section 7.6. | <p>Comply with the Acceptable Solutions</p> <p>All fences in bushfire prone areas should be made of either hardwood or non-combustible material.</p> <ul style="list-style-type: none"> • In circumstances where the fence is within 6m of a building or in areas of BAL-29 or greater, they should be made of non-combustible material only. |
| Construction Standards | <ul style="list-style-type: none"> • Proposed Class 10a buildings are designed to minimise the spread of bush fire. | <ul style="list-style-type: none"> • Class 10a buildings are constructed in accordance with section 8.3.2. | <p>Comply with the Acceptable Solutions</p> <p>The NCC defines a class 10 building as a non-habitable building or structure such as a:</p> <ul style="list-style-type: none"> • Class 10a – a non-habitable building being a private garage, carport, shed or the like; or |

| BPM | Performance Criteria | Acceptable Solutions | Compliance & Recommendations |
|--------------------------------|--|---|---|
| | | | <ul style="list-style-type: none"> Class 10b – a structure being a fence, mast, antenna, retaining or free-standing wall, swimming pool, or the like; or Class 10c – a private bushfire shelter. <p>There are no bushfire protection requirements for Class 10a buildings located more than 6m from a dwelling in bushfire prone areas. Where a Class 10a building is located within 6m of a dwelling it must be constructed in accordance with the NCC.</p> |
| *Upgrades for Ember Protection | *The existing residence and associated buildings remain predominantly unchanged in relation to the bushfire threat. Refer to the attached NSW RFS document: 'Development Assessment and Planning Introduction – Upgrading of existing buildings' (RFS 2014; Appendix B). | | |
| Landscaping | <ul style="list-style-type: none"> Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions. | <ul style="list-style-type: none"> Compliance with the NSW RFS 'Asset protection zone standards' (see Appendix 4). A clear area of low-cut lawn or pavement is maintained adjacent to the house; fencing is constructed in accordance with section 7.6; and Trees and shrubs are located so that: <ul style="list-style-type: none"> The branches will not overhang the roof. The tree canopy is not continuous; and Any proposed windbreak is located on the elevation from which fires are likely to approach. | <p>Acceptable Solutions</p> <ul style="list-style-type: none"> Landscaping is to be managed in accordance with Appendix 4 (PBP) (Ref. Appendix B herein) and the NSW RFS document 'Guidelines for Asset Protection Zones'. <p>When creating and maintaining gardens within an APZ, key landscaping features may include the following (list not exhaustive):</p> <ul style="list-style-type: none"> Ensure that vegetation does not provide a continuous path to the house. Plant vegetation in clumps rather than continuous rows. Tree canopy cover should be less than 15% at maturity. Trees at maturity do not overhang or touch the building. Tree canopies should be separated by 2-5m. Prune low branches min. two metres above the ground. |

| BPM | Performance Criteria | Acceptable Solutions | Compliance & Recommendations |
|----------------------|--|----------------------|--|
| | | | <ul style="list-style-type: none"> • Shrubs should not be planted under trees. • Clumps of shrubs and other plants should be separated from the dwelling and plant away from windows and doors by a distance of at least twice the height of the vegetation. • Use low-flammability plant species i.e., rainforest species, succulents etc. • Use non-flammable ground cover/mulch such as pebbles or crush tile etc. |
| Emergency Management | <ul style="list-style-type: none"> • It is recommended the occupants formulate a bushfire survival plan and practice it on a regular basis. • A guide to preparing a 'Bushfire Survival Plan' is available for download on the NSW RFS website: www.rfs.nsw.gov.au (RFS 2019). | | |

4 CONCLUSION

This bushfire report provides the consent authority with a detailed bushfire risk assessment to enable the consent authority to make an informed decision in granting consent for the proposed development referred to herein.

As a BPAD Level 3 accredited practitioner, recognised by the NSW Rural Fire Service, all elements of bushfire attack and BPMs in combination have been considered commensurate with the level or risk in relation to the proposed development.

In conclusion, provided the proposed development is carried out in accordance with the recommendations contained herein, the proposed development, in my professional opinion, satisfies the aim, objectives and performance criteria set out in *s.7 Residential Infill Development* (PBP).

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APPENDIX A – SITE & BAL PLANS

Plans by: Isabelle Menezes, date: 19/09/2023.

The following figure indicates the proposed BLE referred to herein. Relocating the proposed BLE will render these results invalid and a reassessment and/or rewrite of this report may be required as a result.

A full set of plans shall be provided by the applicant to accompany the DA. All design and site plans must ensure compliance with the minimum building setbacks in relation to this development as proposed and the recommendations contained herein.

APPENDIX B – RFS GUIDELINES & FAST FACTS

APPENDIX 3

ACCESS

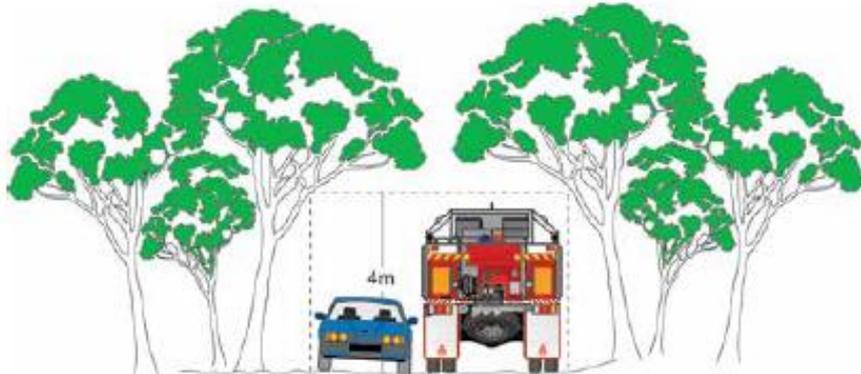
This appendix provides design principles for emergency service vehicle access.

A3.1 Vertical clearance

An unobstructed clearance height of 4 metres should be maintained above all access ways including clearance from building construction, archways, gateways and overhanging structures (e.g. ducts, pipes, sprinklers, walkways, signs and beams). This also applies to vegetation overhanging roads.

Figure A3.1

Vertical clearance.



A3.2 Vehicle turning requirements

Curved carriageways should be constructed using the minimum swept path as outlined in Table A3.2.

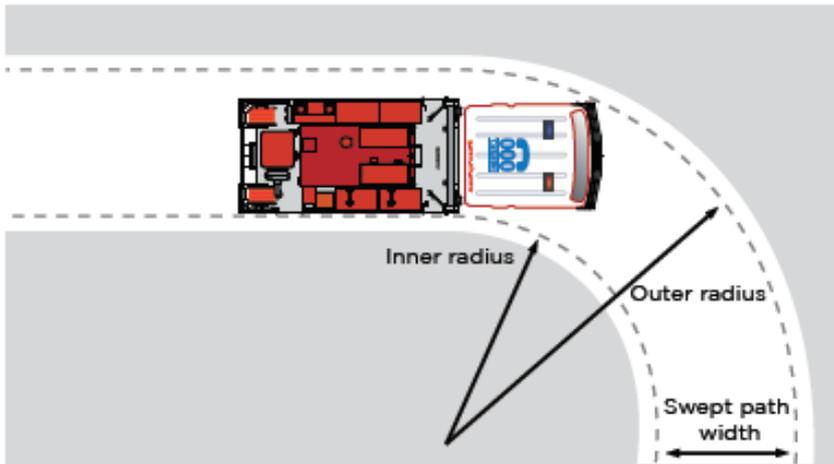
Table A3.2

Minimum curve radius for turning vehicles.

| Curve radius (inside edge in metres) | Swept path (metres width) |
|---|------------------------------|
| < 40 | 4.0 |
| 40 - 69 | 3.0 |
| 70 - 100 | 2.7 |
| > 100 | 2.5 |

Figure A3.2a

Swept path width for turning vehicles.



The radius dimensions given are for wall to wall clearance where body overhangs travel a wider arc than the wheel tracks (vehicle swept path). The swept path shall include an additional 500mm clearance either side of the vehicle.

Figure A3.2b

Roundabout swept path.



Example of a swept path as applied to a roundabout. The distance between inner and outer turning arcs allows for expected vehicle body swing of front and rear overhanging sections (the swept path).



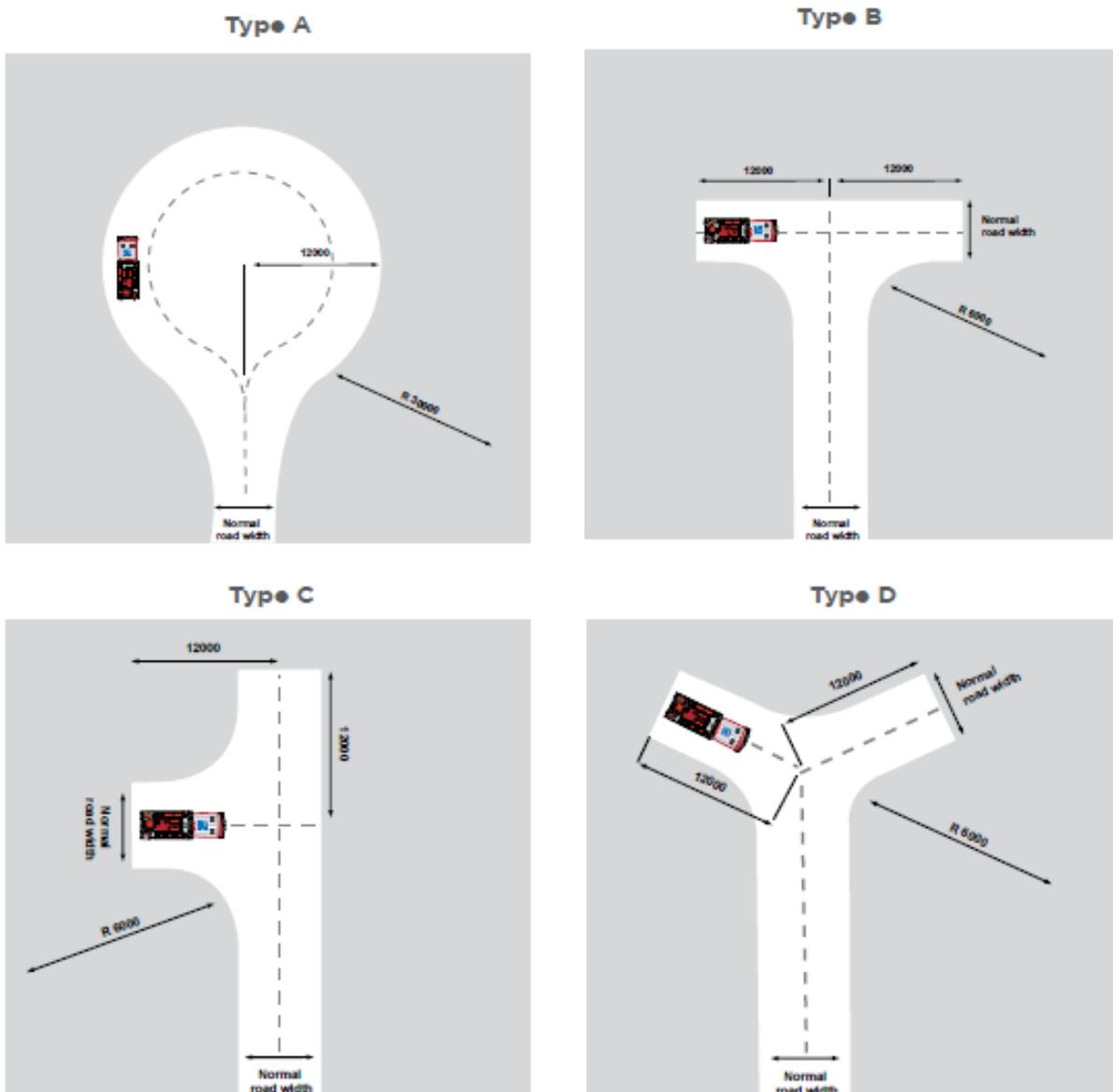
A3.3 Vehicle turning head requirements

Dead ends that are longer than 200m must be provided with a turning head area that avoids multipoint turns. "No parking" signs are to be erected within the turning head.

The minimum turning radius shall be in accordance with Table A3.2. Where multipoint turning is proposed the NSW RFS will consider the following options:

Figure A3.3

Multipoint turning options.



A3.4 Passing bays

The construction of passing bays, where required, shall be 20m in length and provide a minimum trafficable width at the passing point of 6m.

Figure A3.4

Passing bays can provide advantages when designed correctly. Poor design can and does severely impede access.



A3.5 Parking

Parking can create a pinch point in required access. The location of parking should be carefully considered to ensure fire appliance access is unimpeded. Hydrants shall be located outside of access ways and any parking areas to ensure that access is available at all times.

Figure A3.5

Hydrants and parking bays.

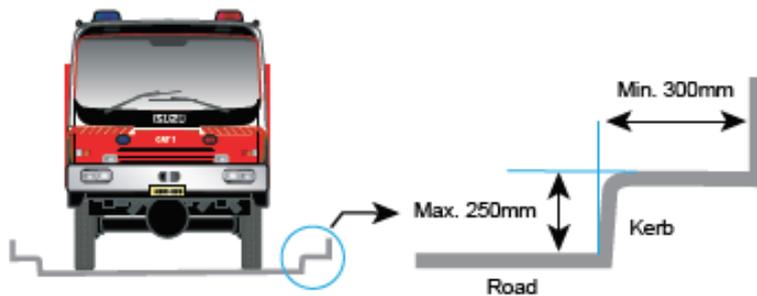


A3.6 Kerb dimensions

All kerbs constructed around access roads should be no higher than 250mm and free of vertical obstructions at least 300mm back from the kerb face to allow clearance for front and rear body overhang.

Figure A3.6

Carriageway kerb clearance dimensions.



A3.7 Services

Hydrant services should be located outside the carriageway and parking bays to permit traffic flow and access. Setup of standpipes within the carriageway may stop traffic flow. Hydrant services shall be located on the side of the road away from the bush fire threat where possible.

A3.8 Local Area Traffic Management (LATM)

The objective of LATM is to regulate traffic an acceptable level of speed and traffic volume within a local area.

Traffic engineers and planners should consider LATM devices when planning for local traffic control and their likely impact on emergency services. LATM devices by their nature are designed to restrict and impede the movement of traffic, especially large vehicles.

Where LATM devices are provided they are to be designed so that they do not impede fire vehicle access.

A3.9 Road types

A3.9.1 Perimeter Roads

Perimeter roads are to be provided with a minimum clear width of 8m. Parking and hydrants are to be provided outside of carriageways. Hydrants are to be located outside of carriageways and parking areas.

Figure A3.9a

Perimeter road widths.



A3.9.2 Non-perimeter Roads

Non-perimeter roads shall be provided with a minimum clear width of 5.5m. Parking is to be provided outside of the carriageway and hydrants are not to be located in carriageways or parking areas.

Figure A3.9b

Non-perimeter road widths.



A3.9.3 Property access

Property access roads are to be a minimum of 4m wide.

Figure A3.9c

Property access road widths.



APPENDIX 4

ASSET PROTECTION ZONE REQUIREMENTS

In combination with other BPMs, a bush fire hazard can be reduced by implementing simple steps to reduce vegetation levels. This can be done by designing and managing landscaping to implement an APZ around the property.

Careful attention should be paid to species selection, their location relative to their flammability, minimising continuity of vegetation (horizontally and vertically), and ongoing maintenance to remove flammable fuels (leaf litter, twigs and debris).

This Appendix sets the standards which need to be met within an APZ.

A4.1 Asset Protection Zones

An APZ is a fuel-reduced area surrounding a building or structure. It is located between the building or structure and the bush fire hazard.

For a complete guide to APZs and landscaping, download the NSW RFS document *Standards for Asset Protection Zones* at the NSW RFS Website www.rfs.nsw.gov.au.

An APZ provides:

- a buffer zone between a bush fire hazard and an asset;
- an area of reduced bush fire fuel that allows for suppression of fire;
- an area from which backburning or hazard reduction can be conducted; and
- an area which allows emergency services access and provides a relatively safe area for firefighters and home owners to defend their property.

Bush fire fuels should be minimised within an APZ. This is so that the vegetation within the zone does not provide a path for the spread of fire to the building, either from the ground level or through the tree canopy.

An APZ, if designed correctly and maintained regularly, will reduce the risk of:

- direct flame contact on the building;
- damage to the building asset from intense radiant heat; and
- ember attack.

The methodology for calculating the required APZ distance is contained within Appendix 1. The width of the APZ required will depend upon the development type and bush fire threat. APZs for new development are set out within Chapters 5, 6 and 7 of this document.

In forest vegetation, the APZ can be made up of an Inner Protection Area (IPA) and an Outer Protection Area (OPA).

A4.1.1 Inner Protection Areas (IPAs)

The IPA is the area closest to the building and creates a fuel-managed area which can minimise the impact of direct flame contact and radiant heat on the development and act as a defensible space. Vegetation within the IPA should be kept to a minimum level. Litter fuels within the IPA should be kept below 1cm in height and be discontinuous.

In practical terms the IPA is typically the curtilage around the building, consisting of a mown lawn and well maintained gardens.

When establishing and maintaining an IPA the following requirements apply:

Trees

- tree canopy cover should be less than 15% at maturity;
- trees at maturity should not touch or overhang the building;
- lower limbs should be removed up to a height of 2m above the ground;
- tree canopies should be separated by 2 to 5m; and
- preference should be given to smooth barked and evergreen trees.

Shrubs

- create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided;
- shrubs should not be located under trees;
- shrubs should not form more than 10% ground cover; and
- clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

Grass

- grass should be kept mown (as a guide grass should be kept to no more than 100mm in height); and
- leaves and vegetation debris should be removed.

A4.1.2 Outer Protection Areas (OPAs)

An OPA is located between the IPA and the unmanaged vegetation. It is an area where there is maintenance of the understorey and some separation in the canopy. The reduction of fuel in this area aims to decrease the intensity of an approaching fire and restricts the potential for fire spread from crowns; reducing the level of direct flame, radiant heat and ember attack on the IPA.

Because of the nature of an OPA, they are only applicable in forest vegetation.

When establishing and maintaining an OPA the following requirements apply:

Trees

- tree canopy cover should be less than 30%; and
- canopies should be separated by 2 to 5m.

Shrubs

- shrubs should not form a continuous canopy; and
- shrubs should form no more than 20% of ground cover.

Grass

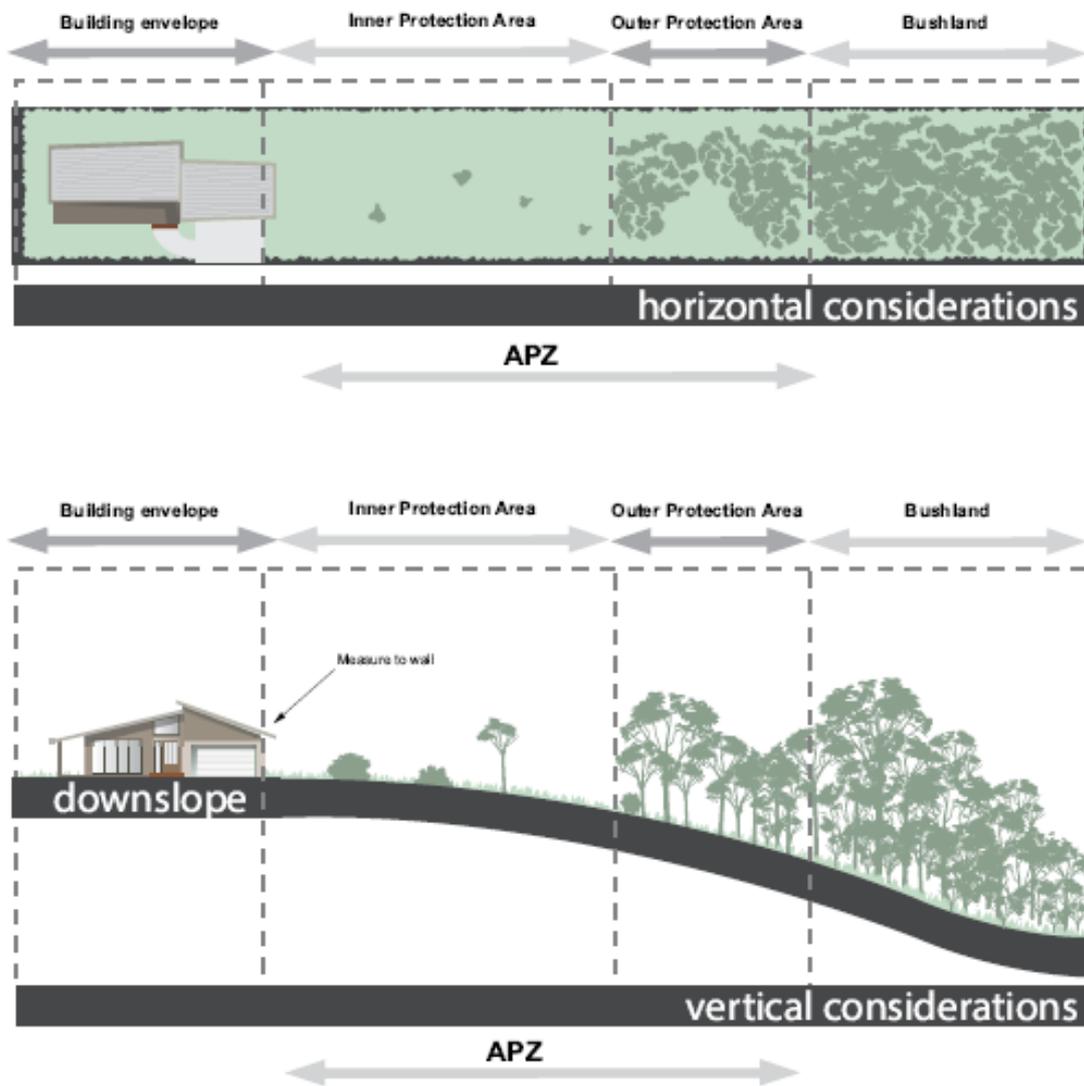
- grass should be kept mown to a height of less than 100mm; and
- leaf and other debris should be removed.

An APZ should be maintained in perpetuity to ensure ongoing protection from the impact of bush fires. Maintenance of the IPA and OPA as described above should be undertaken regularly, particularly in advance of the bush fire season.



Figure A4.1

Typical Inner and Outer Protection Areas.



Brisbane
Sunshine Coast
Gold Coast
Townsville
Cairns
Byron Bay
Toowoomba

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QDC MP 4.4 ROAD TRAFFIC NOISE ASSESSMENT

Pacific Highway Tyagarah NSW 2481 (Lot 1 on DP260639)

BYRON SHIRE COUNCIL
Development Application
APPROVED PLAN
DA No. 10.2023.404.1
Date: 16 April 2024

Document Control Page

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Date: 10 November 2017

Prepared by: Craig O’Sullivan, BEng (Mech) MAAS

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| Date | Revision | Description | Authorised | |
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| 7/11/2017 | 1 | Revised Issue | Craig O’Sullivan Director |  |
| 10/11/2017 | 2 | Revised Issue | Craig O’Sullivan Director |  |

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The client is authorised, upon payment to Dedicated Acoustics of the agreed report preparation fee, to provide this report in full to any third party. Recommendations made in this report are intended to resolve acoustical problems only. We make no claim of expertise in other areas and draw your attention to the possibility that our recommendations may not meet the structural, fire, thermal, or other aspects of building construction

We encourage clients to check with us before using materials or equipment that are alternative to those specified in our Acoustical Report.

The use of contractors that are experienced in acoustic construction and the use of materials and equipment that are supported by acoustic laboratory test data are encouraged.

Dedicated Acoustics: QDC MP 4.4 Road Traffic Noise Assessment

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EXECUTIVE SUMMARY

This report details a road traffic noise assessment undertaken for a proposed dwelling on Pacific Highway, Tyagarah NSW 2481 (Lot 1 on DP260639). The Byron Shire Council has requested this assessment due to the sites proximity to the Pacific Highway.

Future road traffic noise levels have been forecast to habitable facades of the proposed dwelling; along with acoustic treatment requirements determined in accordance with AS3671:1981 *Acoustics – Road traffic noise intrusion – Building siting and construction* (AS3671), to achieve the recommended internal noise levels within AS/NZS2107:2016 – *Acoustics – Recommended design sound levels and reverberation times for building interiors* (AS2107).

Noise emission from the Pacific Highway has been forecast onto habitable facades of the proposed dwelling, including future traffic growth, as shown in **Table 4.2**. Acoustic treatment requirements to achieve AS2107 internal levels have been calculated in accordance with AS3671 as shown in **Table 4.3**. These requirements are summarised in **Table 4.4** along with example constructions to achieve these requirements.

Achieving the nominated noise reductions will require doors and windows in the dwelling to be closed. We recommend that acoustically rated mechanical ventilation or air-conditioning is considered for the comfort of occupants.

Figure 1.2: Aerial photograph of the site in relation to the Pacific Highway (Google Earth)



Figure 1.3: Subject site as seen from the Pacific Highway



2. TRAFFIC NOISE SURVEY

Continuous noise measurements were conducted from 31 October 2017 to November 2017, at a measurement location referred to as ML1. The microphone was at a height of 1.5 m and is considered free-field. The location of ML1 is presented in **Figure 2.1** along with photographs in **Figure 2.2**.

Figure 2.1: Measurement location ML1



Figure 2.2: Photographs of ML1



All instrumentation used in this assessment holds a current calibration certificate from a certified NATA calibration laboratory. The following instruments were used to measure the ambient noise levels-

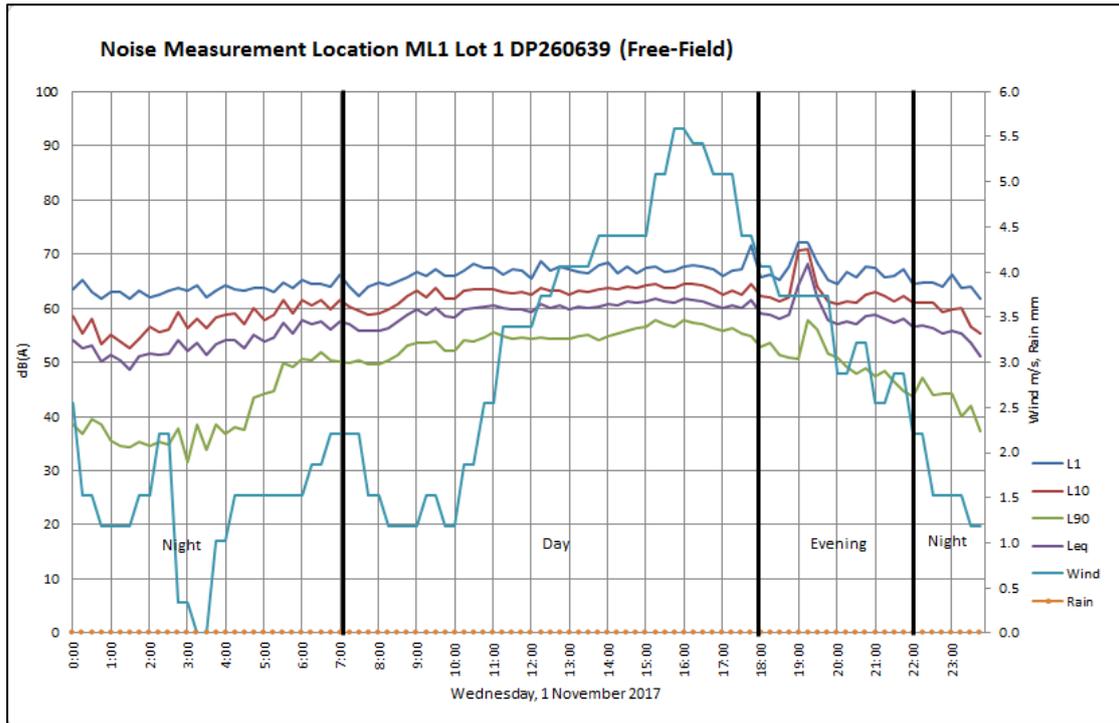
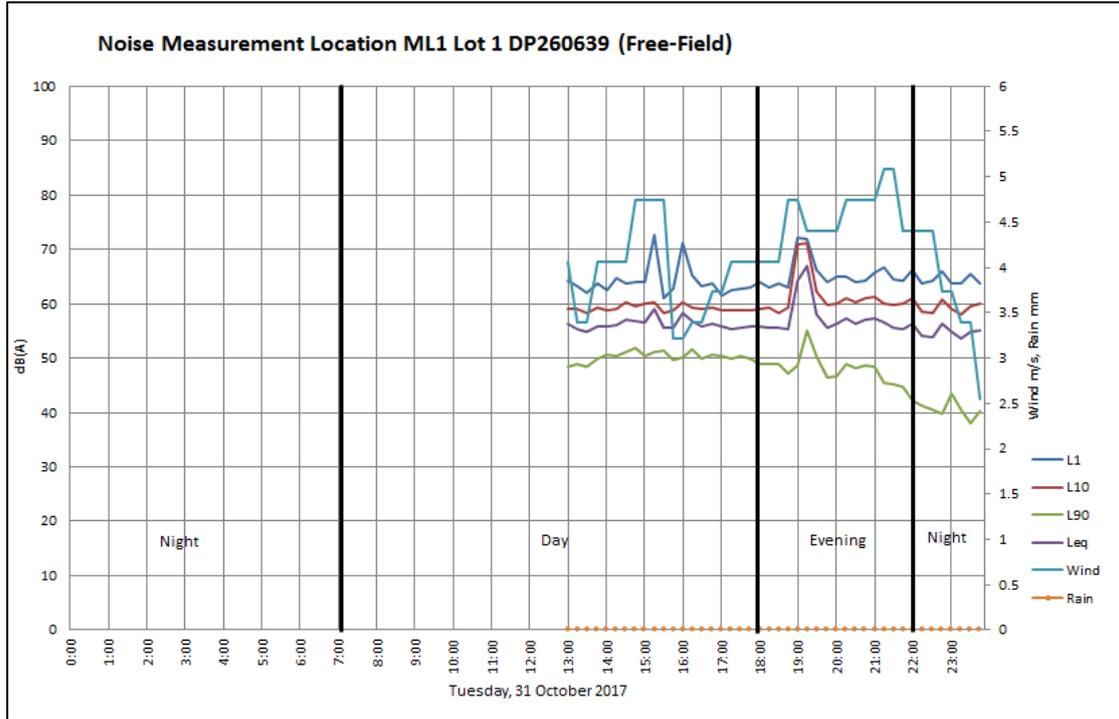
- Rion NL-32 sound level meter
- Castle GA07 Calibrator

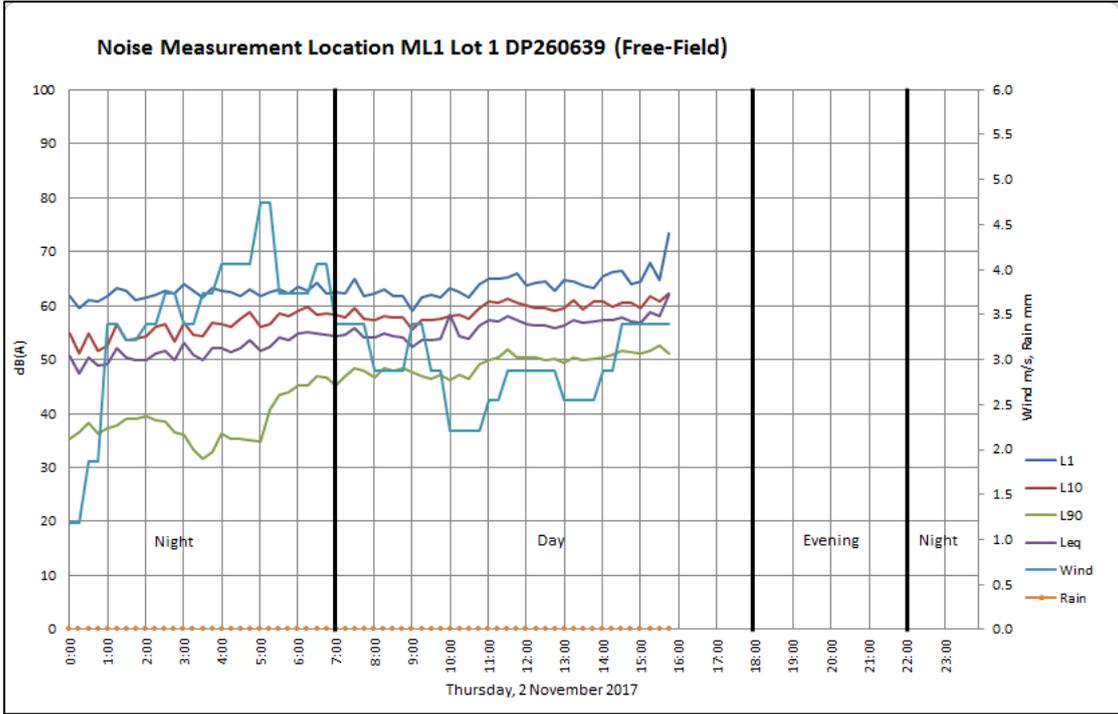
Ambient sound pressure levels were measured in accordance with Australian Standard AS1055.1:1997 - 'Acoustics-Description and measurement of environmental noise - Part 1: General procedures'. Ambient noise levels were recorded at continuous 15 minute intervals. Noise monitoring results are shown graphically in **Figure 2.3**, and summarised in **Table 2.1**.

Table 2.1: Average ambient noise levels recorded at ML1 (levels in dB(A), free field)

| Time | Measured Noise Level dB(A) | | | |
|----------------------------------|----------------------------|------------------|------------------|------------------|
| | L _{A01} | L _{A10} | L _{A90} | L _{Aeq} |
| Day 7:00am to 6:00pm | 65.1 | 60.8 | 51.8 | 57.9 |
| Evening 6:00pm to 10:00pm | 66.3 | 62.2 | 49.4 | 60.0 |
| Night 10:00pm to 7:00am | 63.2 | 57.3 | 39.9 | 53.7 |
| Day Max 1-hr 7:00am to 6:00pm | | | | 59.4 |
| Night max 1-hr 10:00pm to 7:00am | | | | 56.2 |
| CoRTN 6am – 12am | | 60.9 | 48.1 | |
| 24 hour | 64.6 | | | 57.4 |

Figure 2.3: External noise levels at Location ML1, levels free field





3. NOISE CRITERIA

3.1 AS/NZS 2107 – RECOMMENDED DESIGN SOUND LEVELS AND REVERBERATION TIMES FOR BUILDING INTERIORS

The Australian/New Zealand standards AS/NZS 2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors* (AS 2107) recommends design acoustic design criteria for dwellings near major roads as shown in **Table 3.1**.

Table 3.1: Internal noise level criteria from AS 2107

| Type of Occupancy/Activity | | Design Sound Level (L _{Aeq,T}) Range, dB(A) |
|--|-----------------------------|---|
| Houses and apartments in inner city areas or entertainment districts or near major roads | Living areas | 35 to 45 |
| | Sleeping areas (night time) | 35 to 40 |
| | Work areas | 35 to 45 |

4. NOISE IMPACT ASSESSMENT

4.1 ROAD TRAFFIC NOISE INTRUSION

A road traffic noise model has been generated with the CoRTN algorithm to forecast road traffic noise impacts on to the proposed dwelling. The model incorporates the following inputs:

- Road traffic flows (Veitch Lister Consulting)
 - Pacific Highway
 - AADT 2017 – 23,131 vehicles per day, 14.6% heavy vehicles
 - AADT 2027 – 26,725 vehicles per day, 14.3% heavy vehicles
- Gazetted speed 100km/hr (Observed on site)
- Terrain data (Geoscience Australia)
- -0.7 dB free field and -1.7 dB façade correction Australian conditions and 0 dB pavement surface correction for dense grade asphalt.
- Noise descriptor corrections based on measured levels
 - $L_{eq}(1\text{hour day max}) = L_{10}(18\text{hour}) - 1.5 \text{ dB}$
 - $L_{eq}(1\text{hour night max}) = L_{10}(18\text{hour}) - 4.7 \text{ dB}$
- Receptor points are located 1.5m above finished floor level.

The road traffic noise model has been generated and validated against noise levels measured at location ML1 (see **Section 2**) as shown in **Table 4.1** below.

Table 4.1: Predicted and measured $L_{A10, 18hr}$ (2017) noise levels (dB(A), free field)

| Location | Measured $L_{10}(18 \text{ hour})$ 2017 (free field) | Forecast $L_{10}(18 \text{ hour})$ 2017 (free field) |
|----------|--|--|
| ML 1 | 60.9 | 60.5 |

Forecast noise levels were found to be within ± 2 dB of measured values and are considered to be a good fit. A +0.4 dB validation factor has been added to future forecasts.

The calculated levels, including growth in road traffic, at the affected façades along with the resultant noise category are presented in **Table 4.2**.

Table 4.2: Predicted LA10, 18hr (2027) noise levels at habitable facades (levels in dB(A), façade adjusted).

| Room | Façade | Predicted level 2027 (façade affected) dB(A) | | |
|----------------|--------|--|---------------------|-----------------------|
| | | L10(18 hour) | Leq(1 hour day max) | Leq(1 hour night max) |
| Entry | NE | 58 | 56 | |
| Living/Kitchen | NW | 59 | 57 | |
| | NE | 64 | 62 | |
| | SE | 62 | 61 | |
| | Roof | 65 | 63 | |
| Master | SW | 58 | | 53 |
| | NW | 57 | | 52 |
| | Roof | 63 | | 59 |
| Bed 1 | NW | 57 | | 52 |
| | Roof | 64 | | 59 |
| Bed 2 | NW | 57 | | 52 |
| | Roof | 64 | | 59 |

Road traffic noise intrusion calculations have been undertaken in accordance with AS 3671 and are shown in **Table 4.3**. Calculations are based on achieving a noise intrusion level mid-range of those shown in **Table 3.1**. Acoustic performance requirements for façade elements are summarised in **Table 4.4**, along with example constructions to achieve these requirements. Alternate selections are acceptable, provided they can achieve the acoustic performance requirement.

Achieving the nominated noise reductions will require doors and windows in the dwelling to be closed. We recommend that acoustically rated mechanical ventilation or air-conditioning is considered for the comfort of occupants.

Table 4.3: AS3671 road traffic noise intrusion calculation

| Room | Façade | Element | Leq Ext dB(A) | Design Goal dB(A) | No. Elements | Reverberation Time (s) | Room Dimensions | | | | Element Dimensions | | | TNAc | Rw |
|----------------|--------|---------|---------------|-------------------|--------------|------------------------|-----------------|-------|-------|---------------------|--------------------|-------|---------------------|------|----|
| | | | | | | | H (m) | L (m) | W (m) | A (m ²) | H (m) | L (m) | A (m ²) | | |
| Living/Kitchen | NE | Glazing | 62 | 40 | 9 | 0.5 | 2.6 | 7.3 | 6 | 43.8 | 1.8 | 2.1 | 3.8 | 22 | 28 |
| | | Wall | 62 | | | | | | | | | | 14.8 | 28 | 34 |
| | NE | Door | 56 | | | | | | | | 2.1 | 1.8 | 3.8 | 16 | 22 |
| | NW | Door | 57 | | | | | | | | 2.1 | 3.6 | 7.6 | 20 | 26 |
| | | Wall | 57 | | | | | | | | | | 7.7 | 20 | 26 |
| | SE | Glazing | 61 | | | | | | | | 0.8 | 2.4 | 1.9 | 18 | 24 |
| | | Wall | 61 | | | | | | | | | | 13.4 | 26 | 32 |
| | Roof | | 63 | | | | | | | | 7.3 | 6 | 43.8 | 33 | 39 |
| | Floor | | 62 | | | | | | | | 7.3 | 6 | 43.8 | 32 | 38 |

| Room | Façade | Element | Leq Ext dB(A) | Design Goal dB(A) | No. Elements | Reverberation Time (s) | Room Dimensions | | | | Element Dimensions | | | TNAc | Rw |
|--------|--------|---------|---------------|-------------------|--------------|------------------------|-----------------|-------|-------|---------------------|--------------------|-------|---------------------|------|----|
| | | | | | | | H (m) | L (m) | W (m) | A (m ²) | H (m) | L (m) | A (m ²) | | |
| Master | SW | Glazing | 53 | 37 | 6 | 0.5 | 2.6 | 4.2 | 3.3 | 13.9 | 1.1 | 1.8 | 2.0 | 16 | 22 |
| | | Wall | 53 | | | | | | | | | | 8.7 | 22 | 28 |
| | NW | Glazing | 52 | | | | | | | | 1.1 | 1.8 | 2.0 | 15 | 21 |
| | | Wall | 52 | | | | | | | | | | 6.4 | 20 | 26 |
| | Roof | | 59 | | | | | | | | 4.2 | 3.3 | 13.9 | 30 | 36 |
| | Floor | | 53 | | | | | | | | 4.2 | 3.3 | 13.9 | 24 | 30 |
| Bed 1 | NW | Glazing | 52 | 37 | 4 | 0.5 | 2.6 | 3.3 | 3.3 | 10.9 | 1.1 | 1.8 | 2.0 | 14 | 20 |
| | | Wall | 52 | | | | | | | | | | 6.4 | 19 | 25 |
| | Roof | | 59 | | | | | | | | 3.3 | 3.3 | 10.9 | 29 | 35 |
| | Floor | | 52 | | | | | | | | 3.3 | 3.3 | 10.9 | 22 | 28 |
| Bed 2 | NW | Glazing | 52 | 37 | 4 | 0.5 | 2.6 | 3.3 | 3.3 | 10.9 | 1.1 | 1.8 | 2.0 | 14 | 20 |
| | | Wall | 52 | | | | | | | | | | 6.4 | 19 | 25 |
| | Roof | | 59 | | | | | | | | 3.3 | 3.3 | 10.9 | 29 | 35 |
| | Floor | | 52 | | | | | | | | 3.3 | 3.3 | 10.9 | 22 | 28 |

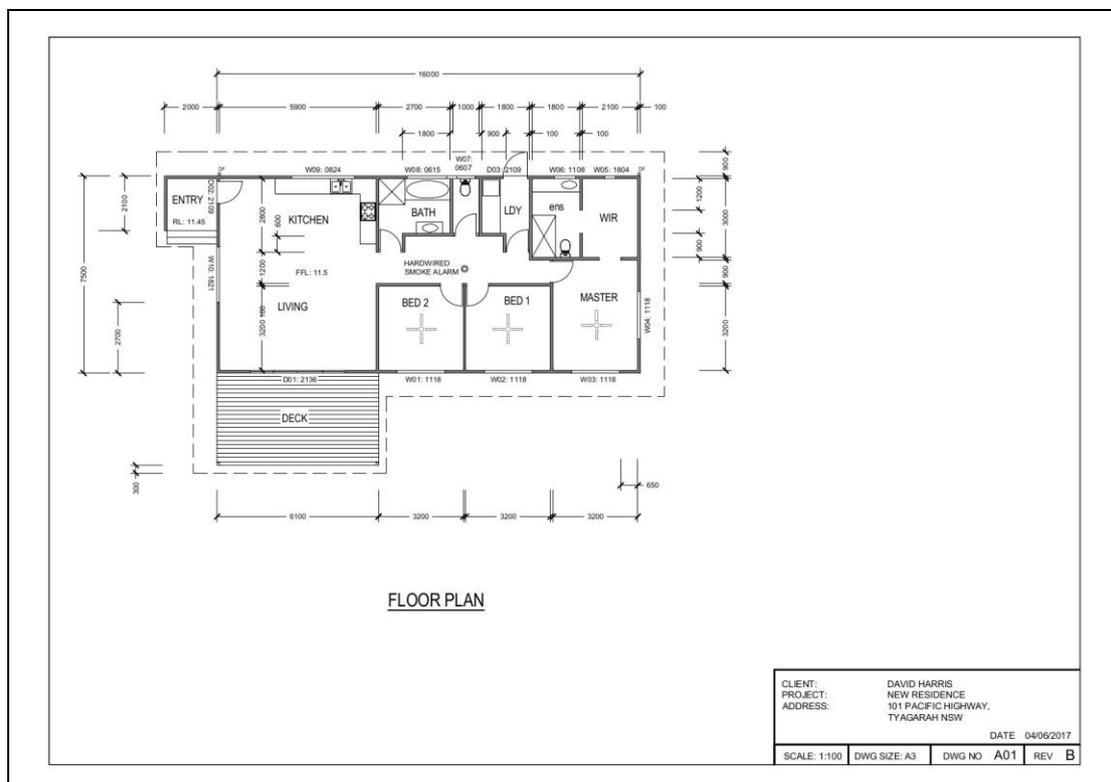
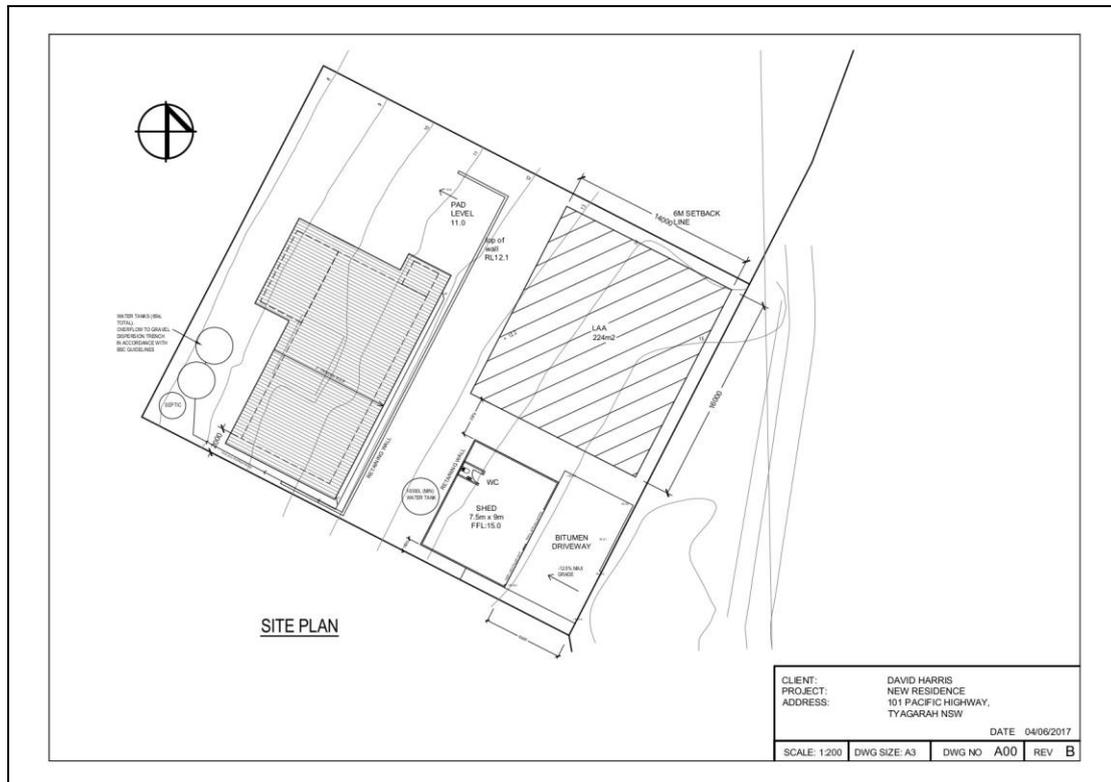
Table 4.4: Summary of required acoustic performance for architectural elements

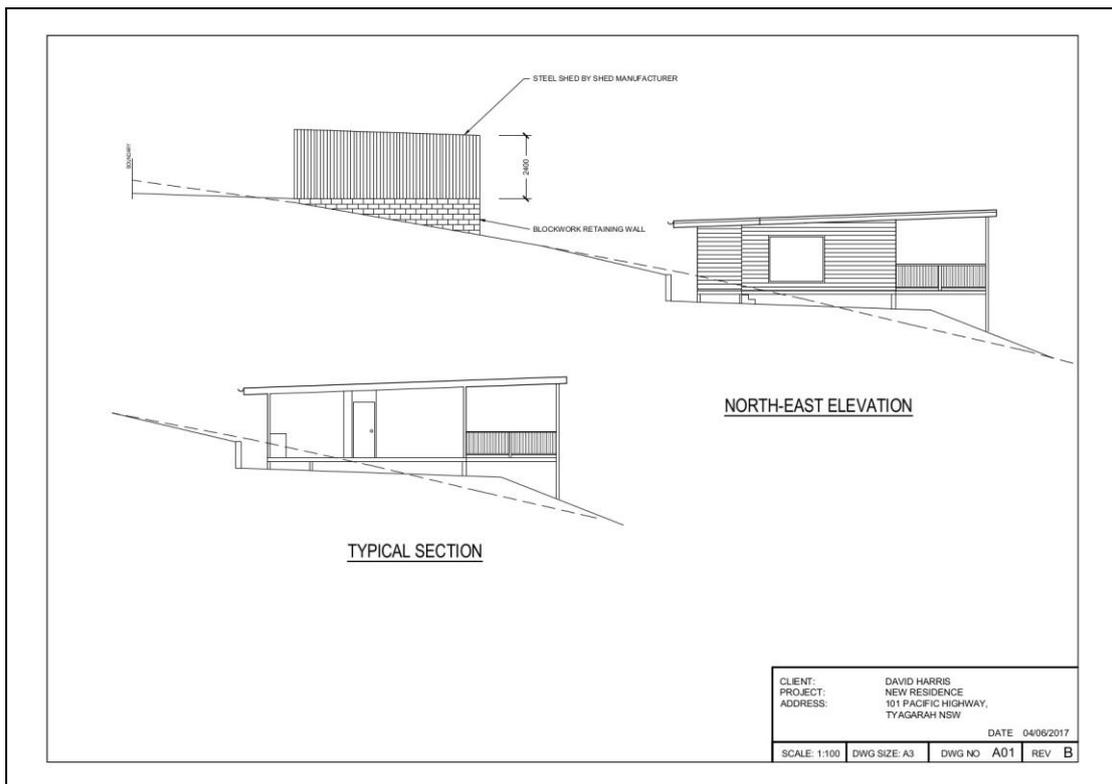
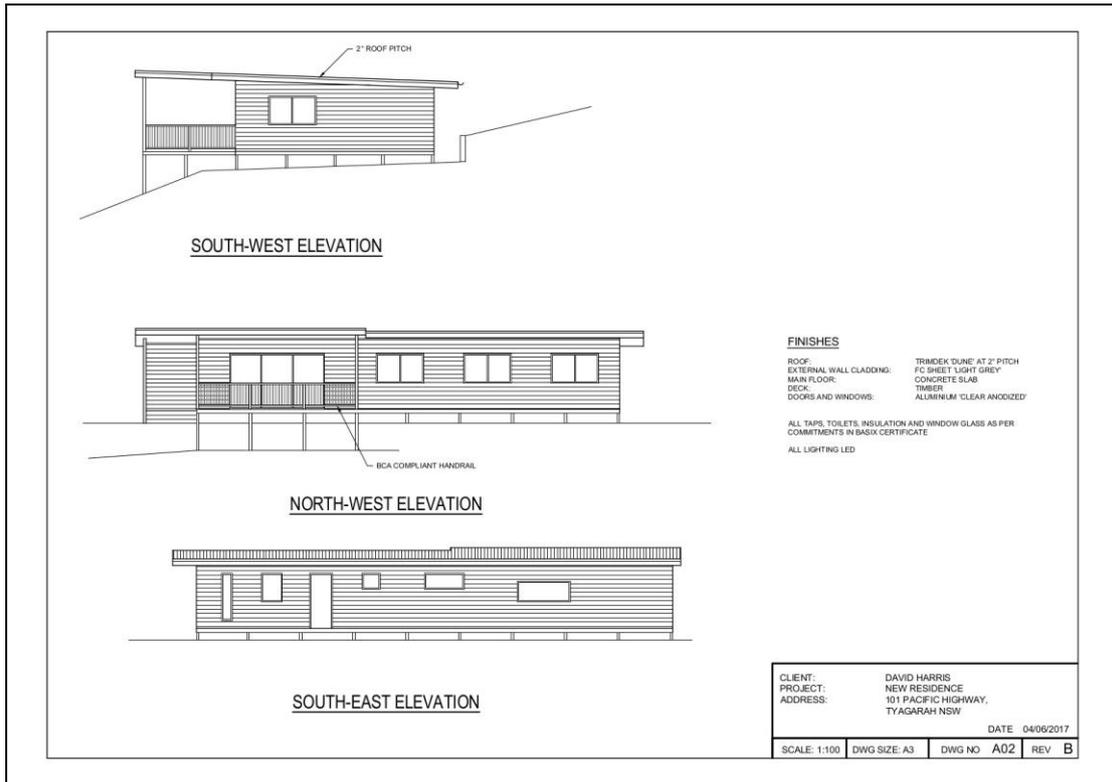
| Room | Façade | Element | Acoustic Performance Rw | Example Construction |
|----------------|--------|---------|-------------------------|--|
| Living/Kitchen | NE | Glazing | 28 | 6mm glazing |
| | | Wall | 34 | Minimum 6mm thick fibre cement sheeting or weatherboards or plank cladding externally, minimum 90mm deep timber stud or 92mm metal stud, standard plasterboard at least 13mm thick internally |
| | | Door | 22 | Fixed so as to overlap the frame or rebate of the frame, constructed of – (i) Wood, particleboard or blockboard not less than 33mm thick; or (ii) Compressed fibre reinforced sheeting not less than 9mm thick; or (iii) Other suitable material with a mass per unit area not less than 24.4 kg/m ² ; or (iv) Solid core timber door not less than 35mm thick fitted with full perimeter acoustically rated seals. |
| | NW | Door | 26 | 6mm glazing with acoustic seals |
| | | Wall | 26 | Minimum 6mm thick fibre cement sheeting or weatherboards or plank cladding externally, minimum 90mm deep timber stud or 92mm metal stud, standard plasterboard at least 13mm thick internally. |
| | SE | Glazing | 24 | 4mm glazing with weather seals |
| | | Wall | 32 | Minimum 6mm thick fibre cement sheeting or weatherboards or plank cladding externally, minimum 90mm deep timber stud or 92mm metal stud, standard plasterboard at least 13mm thick internally. |
| | Roof | | 39 | Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity, mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m ³ . |
| | Floor | | 38 | 40mm thick concrete, density 1300 kg/m ³ |
| | | | | 25mm tongue and groove timber flooring (minimum surface mass 12 kg/m ³) on 100mm |

| Room | Façade | Element | Acoustic Performance Rw | Example Construction |
|--|--------|---------|-------------------------|---|
| | | | | joist with 6mm fibre cement below. Flashing on sides to have minimum surface mass of 9 kg/m ² (e.g. 6mm fibre cement). |
| Master | SW | Glazing | 22 | 4mm glazing |
| | | Wall | 28 | Minimum 6mm thick fibre cement sheeting or weatherboards on minimum 60mm deep stud, standard plasterboard at least 10mm thick internally |
| | NW | Glazing | 21 | 4mm glazing |
| | | Wall | 26 | Minimum 6mm thick fibre cement sheeting or weatherboards on minimum 60mm deep timber stud, standard plasterboard at least 10mm thick internally |
| | Roof | | 36 | Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity, mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m ³ . |
| | Floor | | 30 | 10mm thick concrete, density 1300 kg/m ³ |
| Tongue and groove timber flooring minimum surface mass 19 kg/m ² . If lighter weight timber is used, the additional mass can be made up with a sub-floor element. | | | | |
| Bed 1 | NW | Glazing | 20 | 4mm glazing |
| | | Wall | 25 | Minimum 6mm thick fibre cement sheeting or weatherboards on minimum 60mm deep stud, standard plasterboard at least 10mm thick internally |
| | Roof | | 35 | Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity. |
| | Floor | | 28 | 8mm thick concrete, density 1300 kg/m ³ |
| Tongue and groove timber flooring minimum surface mass 15 kg/m ² . If lighter weight | | | | |

| Room | Façade | Element | Acoustic Performance Rw | Example Construction |
|--|--------|---------|-------------------------|--|
| | | | | timber is used, the additional mass can be made up with a sub-floor element. |
| Bed 2 | NW | Glazing | 20 | 4mm glazing |
| | | Wall | 25 | Minimum 6mm thick fibre cement sheeting or weatherboards on minimum 60mm deep stud, standard plasterboard at least 10mm thick internally |
| | Roof | | 35 | Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity. |
| | Floor | | 28 | 8mm thick concrete, density 1300 kg/m ³ |
| Tongue and groove timber flooring minimum surface mass 15 kg/m ² . If lighter weight timber is used, the additional mass can be made up with a sub-floor element. | | | | |

APPENDIX A – DEVELOPMENT PLANS





APPENDIX B – GLOSSARY OF ACOUSTIC TERMS

The following is a brief description of the technical terms used to describe traffic noise to assist in understanding the technical issues presented in this document.

Event maximum sound pressure level (LA%,adj,T), L01

The L01 level is calculated as the noise level equalled and exceeded for 1% of the measurement time, for example 9 seconds in any 15 minute interval. L01 is an appropriate level to characterise single events, such as from impulsive or distinctive pass-by noise. In this Report, the measured L01 levels for day/evening/night are not averaged but are arranged from low to high in the relevant day/evening/night interval and the value that is found at the 90th percentile (L10 of L01 sample) in the interval is recorded as its "L01" level. The level can be adjusted for tonality or impulsiveness.

Average maximum sound pressure level (LA%,adj, T), L10

The "L10" level is an indicator of "steady-state" noise or intrusive noise conditions from traffic, music and other relatively non-impulsive noise sources. The L10 level is calculated as the noise level equalled and exceeded for 10% the measurement time, for example 90 seconds in any 15 minute interval. The measured L10 time-intervals for day/evening/night are arithmetically averaged to present the "average maximum" levels of the environment for day/evening/night. The level can be adjusted for tonality or impulsiveness.

Background sound pressure level (LA90,T), L90

Commonly called the "L90" or "background" level and is an indicator of the quietest times of day, evening or night. The L90 level is calculated as the noise level equalled and exceeded for 90% the measurement time. The measured L90 time-intervals are arithmetically averaged to present the "average background" levels of the environment for day/evening/night. The level is recorded in the absence of any noise under investigation. The level is not adjusted for tonality or impulsiveness.

Equivalent Continuous or time average sound pressure level (LAeq,T), Leq

Commonly called the "Leq" level it is the logarithmic average noise level from all sources far and near. The maximum 1-hour levels within the day/evening/night time intervals are referenced for building design. The level can be adjusted for tonality.

Façade-adjusted level

A sound level that is measured at a distance of 1.0 metre from a wall or facade. The level is nominally 2.5 dB higher than the free-field level.

Free-field level

A sound level that is measured at a distance of more than 3.5 metres from a wall or facade.

Weighted Sound Reduction Index, Rw

A single number value used to compare the sound reduction index of building elements. Similar to the Sound Transmission Class (STC) rating that is still in common use. Rw and STC are not identical though may be considered, for most applications, as being interchangeable. A high Rw indicates high sound reduction.