BUSHFIRE PLANNING AND DESIGN CERTIFICATION

The following report titled and dated:

Bushfire Risk Assessment & Compliance Report for Proposed Residential Units and Townhouse Complex - Cnr Limestone Ave & Wolseley Drive (Block 38 Sections 4 & 5) Campbell, 20th September 2018

has been prepared by:

Matthew E. Jones (Principal Consultant),

BPAD Accredited Practitioner 14598 L3-NSW

BUSHFIRE PLANNING AND DESIGN ACCREDIATION SCHEME: In accordance with the FPA Australia Bushfire Planning and Design Accreditation Scheme, the identified practitioner is accredited to assess potential bushfire risk and provide advice to manage the risk for existing buildings and for future developments using the follow methods:

1. *The determination of Bushfire Attack Levels using simplified methods and the applicable Deemed-to-Satisfy construction requirements.*
2. *The development of planning and building applications and reports by applying the prescribed design requirements in accordance with local regulatory requirements.*
3. *The development of planning and building applications and reports by developing alternative design solutions in accordance with local regulatory requirements.*

TERM OF VALIDITY: Opinions and statements made within the following report will expire 2 years from the date of the report. Should the following report require re-examination with a view to the possible extension of its term of validity, please apply to Bushfire Protection Planning & Assessment Services before the date of expiry. Bushfire Protection Planning & Assessment Services reserves the right at any time to withdraw any opinions or statements in the light of new knowledge, revised standards or Agency policies.

DISCLAIMER: Bushfire mitigation or protection measures as recommended or purported by the following report may not guarantee that the proposed building development will survive a bushfire event on every occasion. This is substantially due to the unpredictable nature and behaviour of fire and extreme weather conditions, and the behaviour of building occupants or fire fighters defending the building when exposed to severe or greater bushfire attack conditions.

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1.0 GENERAL

The following report outlines a Bushfire Risk and Compliance Assessment for proposed infill building development within Block 38 Sections 4 & 5 Campbell (herein '***the subject property***'), Cnr Limestone Ave & Wolseley Drive. The mapped location of the subject property is as shown Figures 1.0 - 4.0.

The proposed development is for a complex of permanently occupied residential building structures and associated infrastructure, services and landscaping (herein '***the proposed development***').

This report has been prepared on behalf of Doma Group Canberra, (herein '***the proponent*** '). The report is provided for the information of the National Capitol Authority (NCA) and ACT Fire Rescue (ACTFR) in support of the proposed building and associated infrastructure development within the subject property.

Supporting publications and/or standards referred to for this assessment and stated compliance include;

- ACT Strategic Bushfire Management Plan 2014-2019 (herein '***SBMP***')
- ACT Bushfire Management Standards, Strategic Bushfire Management Plan 2014 (herein '***BMS***'),
- Australian Standard 2419 Fire hydrant installations 2005 (herein '***AS 2419***')
- Australian Standard 3959 Construction of buildings in bushfire prone areas 2009 (herein '***AS 3959***')
- Australian / New Zealand Standard (ISO) 31000 Risk management – Principles and guidelines 2009 (herein '***ISO 31000***')

Plans and development detail for the proposed development (as considered by this report) are as provided by the proponent. At the date of this report, this includes;

- Site Plan (Doma Group / Stewart Architecture), Revision B dated August 2018, &
- Hydraulic Services Fire Hydrant Protection Concept Design (Doma / Tenant Hydraulic Conslting Services, Project TH180036 Rev 2 – August 2018.

Plans and mapped / site information relating to the subject property and proposed development are as follows throughout this report, Figures 1.0 – 12.0 and Appendix 1.0.

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2.0 SUBJECT PROPERTY – GENERAL DESCRIPTION

The address of the subject property is Block 38 Sections 4 & 5 Campbell, Cnr Limestone Ave & Wolseley Drive, Campbell ACT 2612.

The subject property currently contains the old CSIRO Head Office building complex and associated car parking area which has now been closed and abandoned for re-development of the site.

The subject property is 40,077sqm (≈4.1ha) in total area.

Public roadway access / frontage to the subject property is via Limestone Ave from the western boundary, with a secondary / alternate access via Quick / Hayley Street from the eastern boundary. All public roadway sections servicing the proposed development site provide two way / through access.

The subject property is bounded by existing residential building development to the southwest to northwest (opposite side of Limestone Ave) & north-east (Ainslie Village), and Campbell High School to the south.

Adjoining the northern boundary of the subject property is undeveloped land primarily comprised of native grassland and minor areas of regenerated woodland. This includes Block 4 Section 63 Campbell, Blocks 2 & 3 Section 60 Ainslie & the unformed road reserve area (≥44m wide) of Wolseley Drive.

Adjoining the eastern most corner of the subject property is undeveloped land comprised of native woodland, which is also further contiguous with Mount Ainslie Nature Reserve. This also includes a continuation of Block 4 Section 63 Campbell.

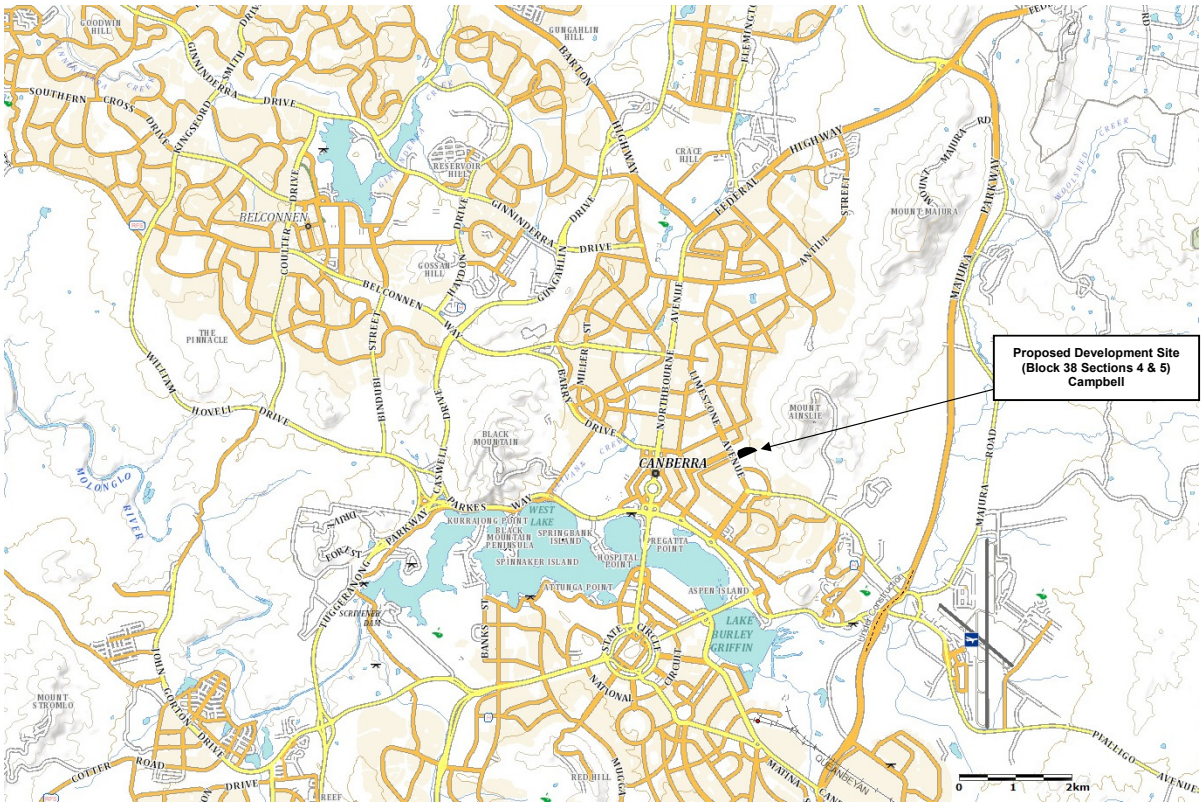
The subject property is zoned CF: COMMUNITY FACILITIES by the Territory and National Capitol Plan.

Apart from a few scattered woodland trees retained or planted for shade and/or site aesthetics, the subject property appears to have been maintained as cleared and managed landscape, i.e. mown / slashed open areas and car-parking, which appears to be regularly and historically maintained as such.

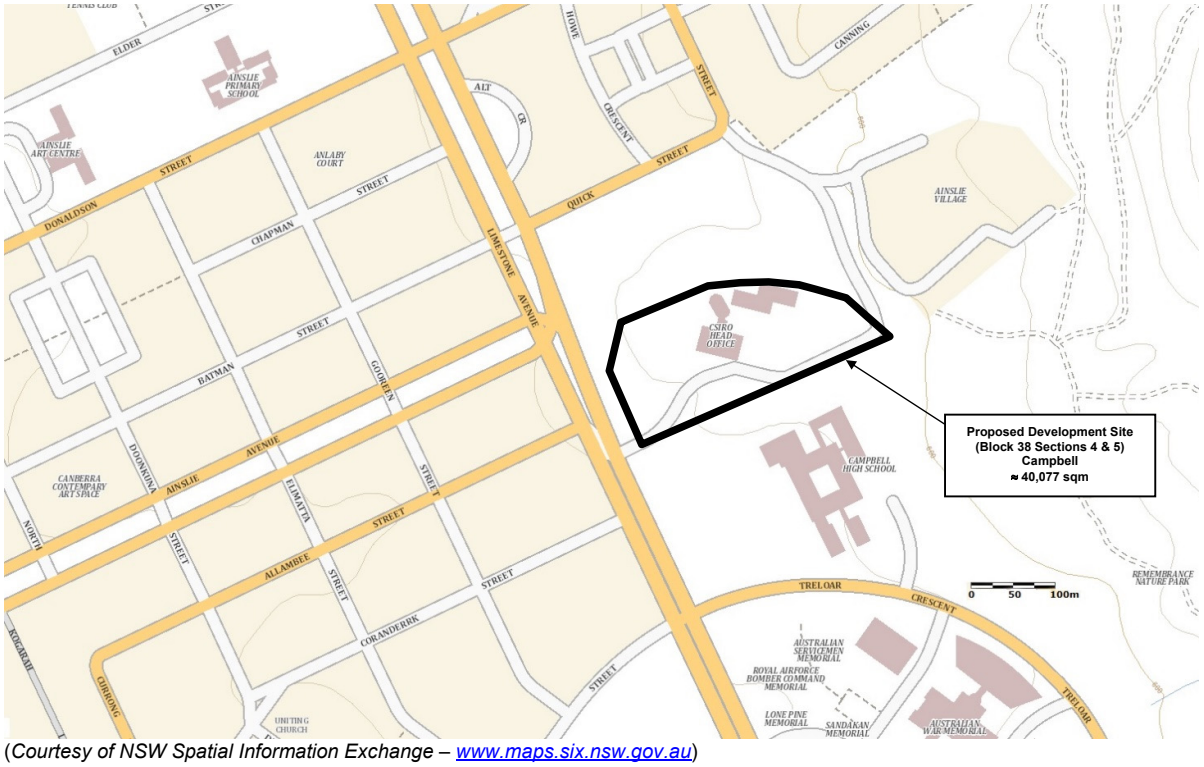
Water supply services (for firefighting purposes) are also currently connected to the existing CSIRO complex. This includes at least 5 existing hydrant outlets located directly adjacent to the primary entry point from Limestone Ave and a Fire Hydrant Booster assembly (within the subject property) located within 30m of the existing hydrant outlets.

Power supply cabling (underground supply) is currently connected to the existing CSIRO complex within subject property.

Figure 1.0 – Regional Location



(*Courtesy of NSW Spatial Information Exchange – www.maps.six.nsw.gov.au*)



(*Courtesy of NSW Spatial Information Exchange – www.maps.six.nsw.gov.au*)

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Figure 2.0 – Aerial Photo / Subject Property Overlay - Block 38 Sections 4 & 5 Campbell

(*Courtesy of ACT Government Maps - www.actmapi.act.gov.au*)

(*Courtesy of ACT Government Maps - www.actmapi.act.gov.au*)

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3.0 PROPOSED DEVELOPMENT

3.1 Type and use

The proposed development (as currently considered at the time of this report) will be a multi-storey complex of residential apartments and single storey townhouses, with associated infrastructure / services, vehicle and pedestrian access areas, and managed landscaping. The individual complex structures range in size between ≈290m^2 to 1,265m^2.

The use of each individual residential unit or townhouse will be for permanent residential occupation.

A small (≈ 4.8 x 6.6m ≈ 32m^2) single / detached electrical sub-station structure will also be incorporated as of the proposed development.

Communal facilities may also be incorporated as part of the proposed development, including concierge, health club, indoor and outdoor pools, tennis court, play grounds and general landscaped recreational areas.

The proposed development will replace the existing CSIRO Head Office complex which will be demolished and entirely removed from the subject property.

3.2 Building Classification

The proposed development will be a complex of Class 2 residential apartments / townhouses, being 2 or more sole-occupancy units each being a separate dwelling, as defined by the Building Code of Australia, to be designed / constructed in accordance with standard BCA / National Construction Code and associated Fire Safety requirements.

The detached electrical sub-station structure is considered a Class 10a building.

3.3 Siting and building area / description

The proposed development will be comprised of 21 separate building structures containing a complex of 236 individual residential apartments and town houses. The structures will be grouped into 4 distinct 'Blocks' or staged development identified Blocks 1 – 4 for the purpose of this report.

Apart from the two western building structures within Block 1, all other building structures (within Blocks 2-4) will be single storey townhouses of 4-14 units (total of 132), each with an individual parking space.

The two building structures within Block 1 will be 5-7 storey apartment blocks (total of 104 apartment units) which will also incorporate communal facilities and underground parking spaces for 196 cars.

The complex will be evenly distributed across the subject property and setback from the boundaries of the allotment by;

- Generally ≥10m from the northern and eastern boundaries (i.e. to identified hazards), occasionally to within 7m,
- ≥7m from the southern boundary (i.e. to Campbell High School), &

- ≥15m from the western boundary (i.e. to Limestone Ave).

For the purpose of this report and assessment, the 21 separate / detached building structures incorporated within the proposal are as identified Table 1 following.

Table 1.0

Mapped ID	Block No.	Building No.	No. Units	Storeys
B1-1(52)	1	1	52	≥5 over parking
B1-2(52)	1	2	52	≥5 over parking
B2-1(5)	2	1	5	Single
B2-2(8)	2	2	8	Single
B2-3(7)	2	3	7	Single
B2-4(7)	2	4	7	Single
B2-5(8)	2	5	8	Single
B2-6(6)	2	6	6	Single
B2-7(6)	2	7	6	Single
B3-1(6)	3	1	6	Single
B3-2(5)	3	2	5	Single
B3-3(4)	3	3	4	Single
B3-4(4)	3	4	4	Single
B3-5(10)	3	5	10	Single
B3-6(6)	3	6	6	Single
B3-7(4)	3	7	4	Single
B4-1(14)	4	1	14	Single
B4-2(8)	4	2	8	Single
B4-3(7)	4	3	7	Single
B4-4(8)	4	4	8	Single
B4-5(9)	4	5	9	Single
			236 (total)	

The proposed development will also incorporate a 1.8m high 'Ha Ha' stone wall around the majority of the subject property.

The proposed electrical sub-station structure will be located directly adjacent (<2m) to the west elevation of building complex B4-1.

The location and extent of the proposed development is as denoted figure 3.0 and attached appendices.

3.4 Vehicle access (Internal)

The current development (CSIRO) is formally accessed via Limestone Ave from the west boundary, with the additional benefit of an informal access route from the east via Hayley Street (or else the access to Ainslie Village).

The proposed development will continue to be formally accessed from Limestone Ave. Access to Hayley Street via the eastern boundary (for vehicle access) will be formally blocked and no longer available as result of the proposed development.

Vehicle access will be comprised of a dual lane access section (≈ 80m long, 10m wide - each lane 3m) from Limestone Ave to a first roundabout / turning area (≈ 14m radius with 7m carriageway), with the main internal access section being ≈150m long - 6m wide and terminating at a central roundabout / turning area (≈9m radius). The main internal access sections will also be connected to shared driveway access throughout the site that link to private parking spaces (132) to each individual townhouse.

36 general parking spaces will be located along the main internal access section, all of which will be at least 5m long from kerb to carriageway. The above internal roadway lengths and dimensions are as denoted Figures 5.0 & 6.0.

With some minor modifications / additions, it is reasonable to suggest the proposed internal roadway sections should reasonably facilitate the safe passage of normal fire fighting vehicles (or fire fighters) seeking to access or egress the proposed development site during a bushfire emergency event. Recommendations for additional access requirements / considerations are listed section 8.0 of this report.

3.5 Services / Utilities

As advised by the proponent, the proposed development will incorporate reticulated water and building service utilities (electricity and natural gas) as normally required for Class 2 building structures of the capacity and occupancy type.

Water supply to service the proposed development will be provided by the existing reticulated urban water lines servicing the Campbell residential precinct and as otherwise connected to the subject property (existing CSIRO complex).

Any required fire hydrants, associated boosted installation and general building fire safety measures are to be be incorporated in accordance with Building Code of Australia, AS2419 requirements and as further required by ACTFR Policy for the same.

For the purpose of this assessment, at least 6 attack hydrants, 7 feed hydrants and 2 booster connection points are proposed throughout the site and not located within any proposed parking bays. A further 4 existing hydrant connection points are also located near the entrance (Limestone Ave) to the proposed development site. In this regard, the proposed development should be reasonably accessible by a 'hose laid on ground' within ≈70m of either proposed or existing hydrant / outlet points (as denoted Figure 4.0 following).

Existing power supply lines to the subject property are currently located underground. It is reasonably assumed that any relocated or new power line connections to service the proposed development would also be located underground.

Recommendations for water supply and utilities protection for bushfire safety compliance are as further listed section 8.0 of this report.

Figure 3.0 – Aerial Photo / Subject Development Overlay

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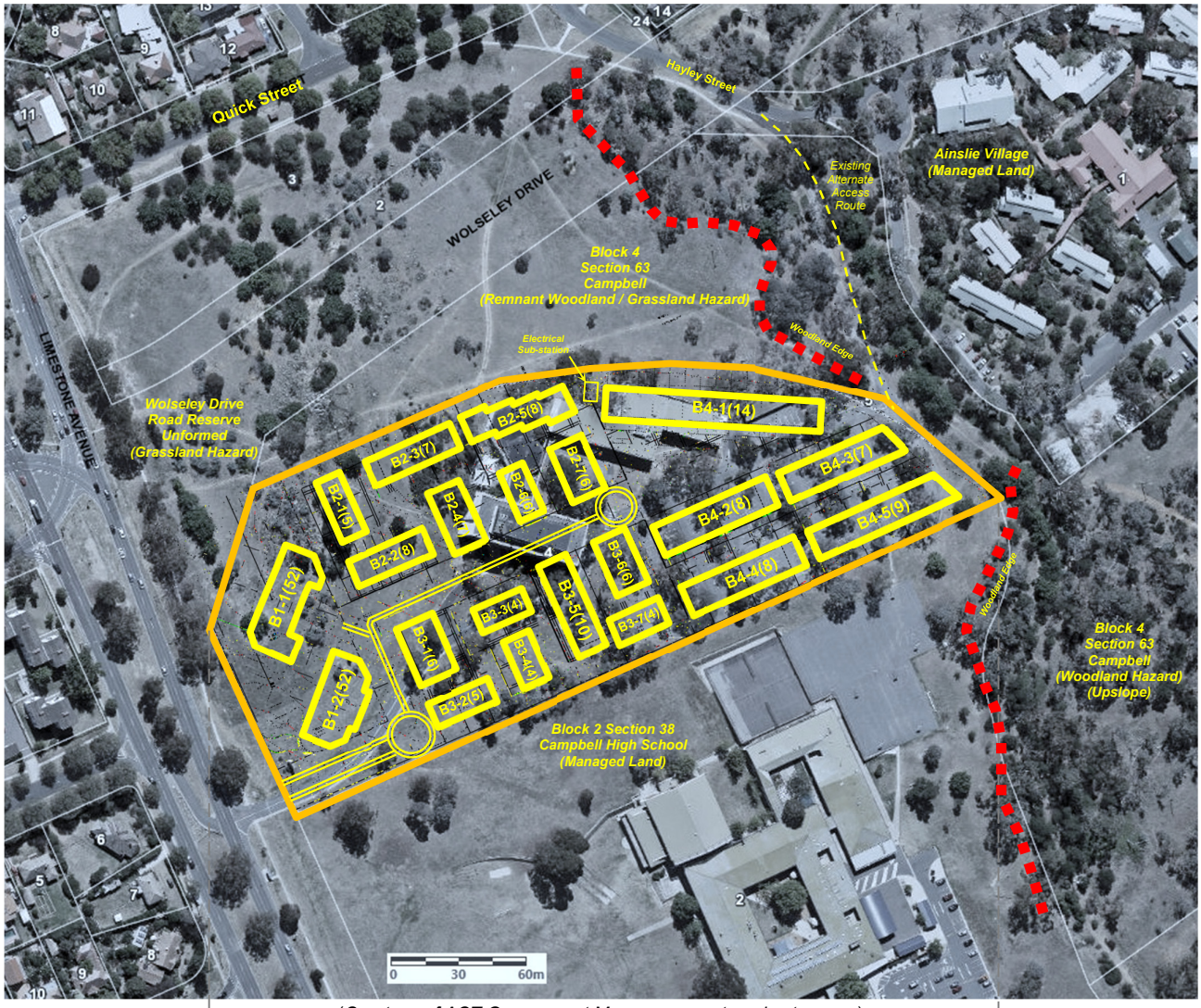
Figure 4.0 – Aerial Photo / Subject Development Overlay



(*Courtesy of ACT Government Maps - www.actmapi.act.gov.au*)

Notation Legend Example:

B1 – 1 (52)

Block No. *Building No.* *No. of Units*

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Figure 5.0 – Proposed Fire Services & Appliance Access

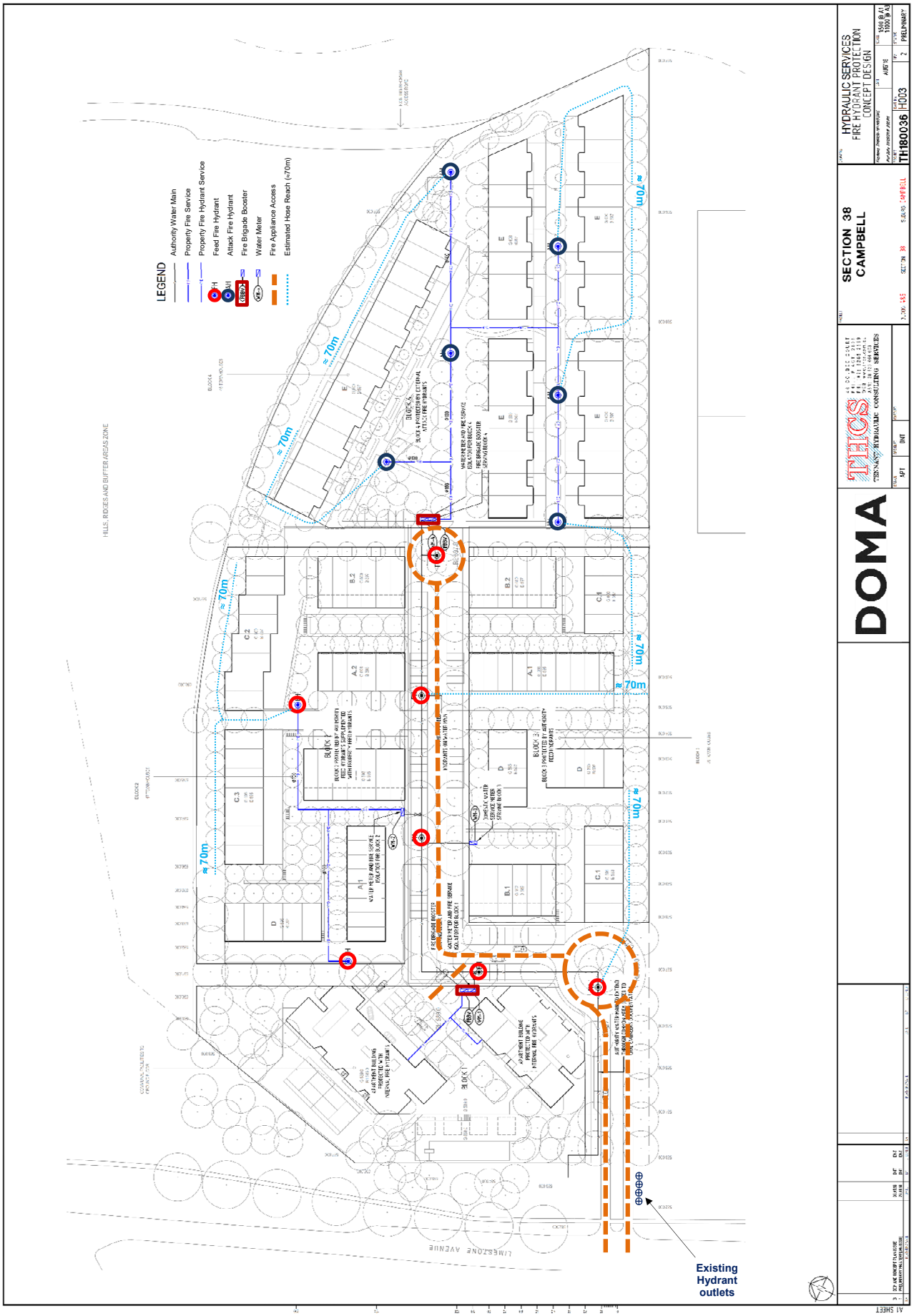

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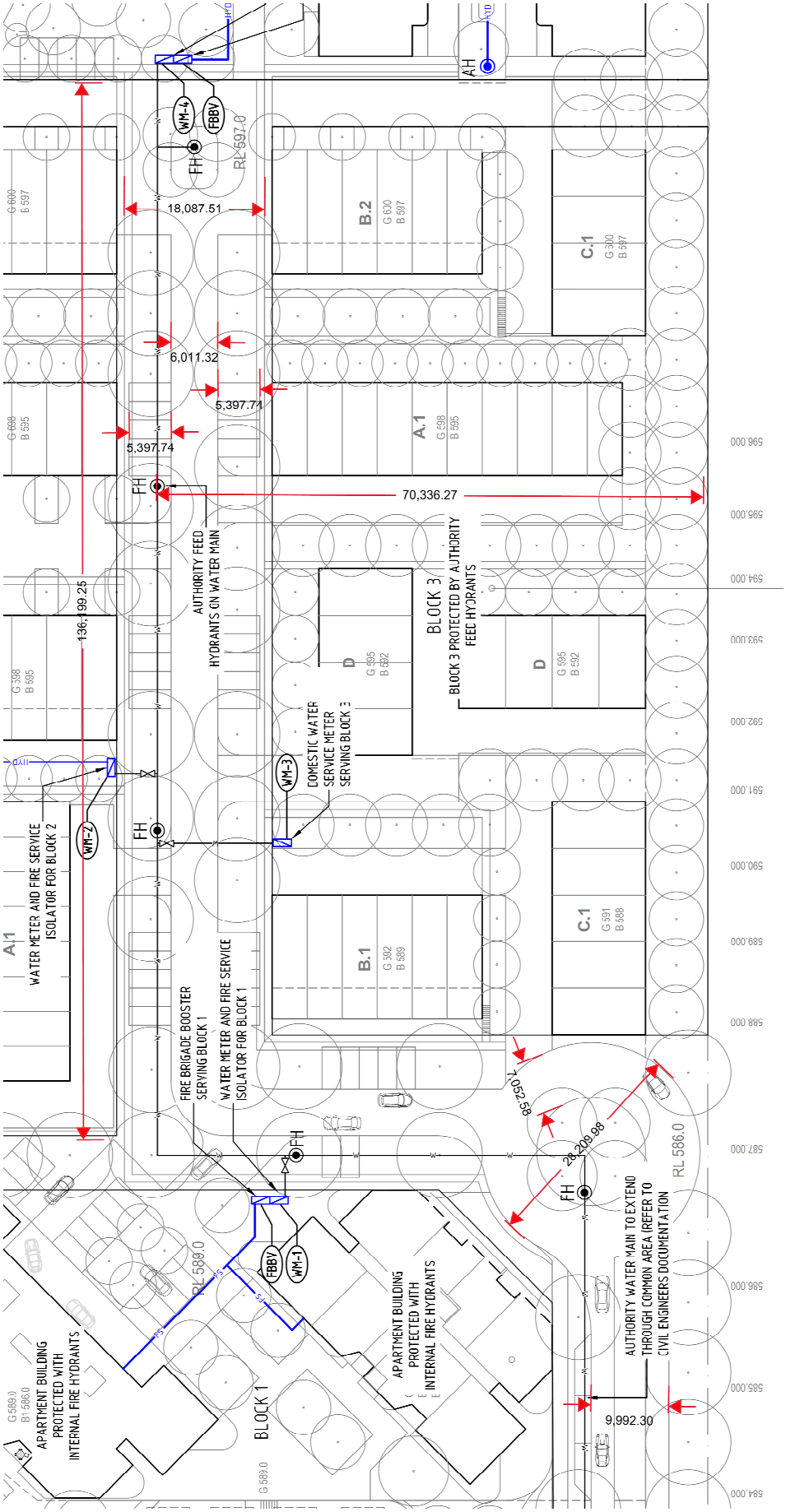
Figure 6.0 – Proposed Fire Services & Appliance Access (Detailed Measurement)



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4.0 SURROUNDING AREAS

4.1 Bushfire Vegetation / Hazard Classification

The primary bushfire vegetation / hazard to the proposed development site has been reasonably determined as combination of WOODLAND & GRASSLAND for the purposes of this assessment and associated Bushfire Attack Level (BAL) analysis in accordance with AS3959.

Remnant areas or isolated woodland vegetation is also acknowledged within vicinity of the proposed development site, but is otherwise reasonably excluded as a potential bushfire hazard in accordance with AS3959 Clause 2.2.3.2.

Potential hazardous lands to the subject property include;

- Block 4 Section 63 Campbell, which is also contiguous with Mount Ainslie Nature Reserve, containing both Woodland & Grassland hazard, &
- Block 2 & 3 Section 60 Ainslie and Wolseley Drive, also including an unformed road reserve, containing a primary Grassland hazard with some scattered woodland / shrubs.

Apart from the above woodland & grassland hazards identified above, all other land within vicinity (i.e. ≤ 100m) is generally non-vegetated, comprised of existing residential or educational building development (Campbell High School), public roadway, managed nature strips and maintained lawn or mown landscaped areas.

AS3959 Clause 2.2.3.2 (*Exclusions - Low threat vegetation and non-vegetated areas*) identifies;

- *Non-vegetated areas, including waterways, roads, footpaths, buildings and rocky outcrops.*
- *Low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks.*

In this regard, all other surrounding land within prescribed vicinity (≤ 100m) is technically considered a *non-vegetated area* or *low threat (excluded) vegetation* in accordance with AS3959.

4.2 Effective Slope

The effective slope to the woodland hazard is considered level to upslope (i.e. NE to SE of the proposed development site). The effective slope is the gradient within the hazard (vegetation) which will most significantly influence the fire behaviour of the site having regard to vegetation class found.

The effective slope to the grassland hazard is considered 0-5° downslope (i.e. N to NW of the proposed development site).

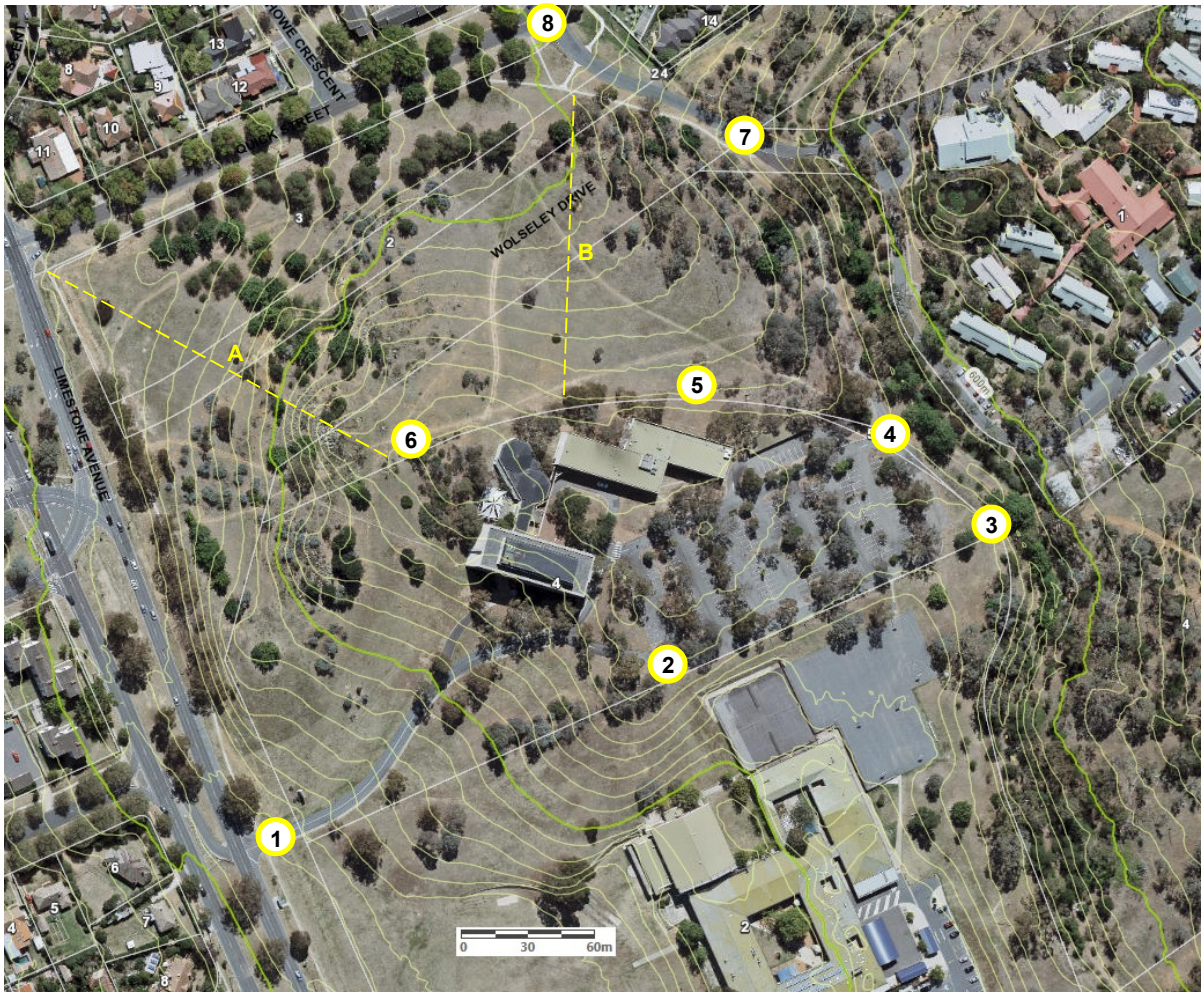
The proposed development site itself is located on gently sloping land, which does not reasonably exceed 5° (9%).

The gradient of the slope within the subject property will not affect the location of proposed vehicle access routes or designated / required Asset Protection Zone areas for the purpose of bushfire safety compliance.

Mapped contours over the subject property and surrounds, showing 1m contour intervals, are as denoted Figure 7.0 as follows.

Site photo theodolite angles are as shown Section 4.3 of this report.

Figure 7.0 –Contours of Subject Property and surrounds / Site Photo Reference Points



(*Courtesy of ACT Government Maps - www.actmapi.act.gov.au*)

Photo Reference Point – (#)

Effective slope; *A - 16/175* *≈ 5° or 9%*
B - 5/130 *≈ 2° or 4%*

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4.3 Site / Theodolite Photos (30/01/17)

Photo 1 – Reference Point 1

Photo 2 – Reference Point 1

Photo 3 – Reference Point 1

Photo 4 – Reference Point 1


Photo 5 – Reference Point 1


Photo 6 – Reference Point 1

Photo 7 – Reference Point 2

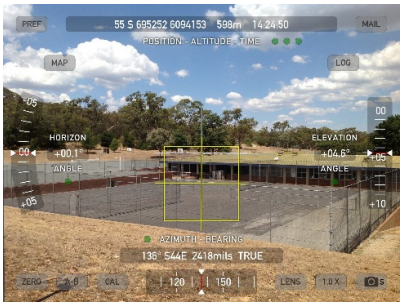

Photo 8 – Reference Point 2

Photo 9 – Reference Point 2

Photo 10 – Reference Point 2

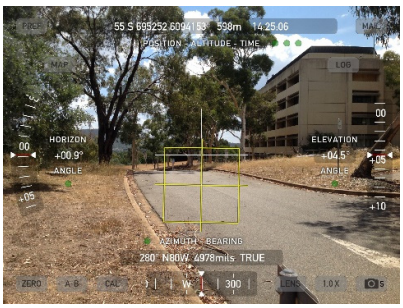

Photo 11 – Reference Point 2

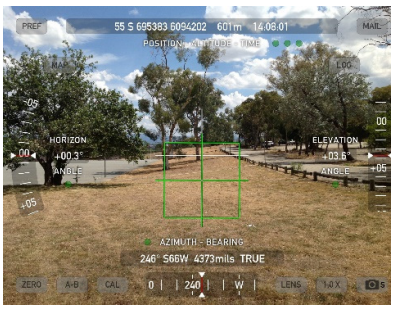

Photo 12 – Reference Point 3

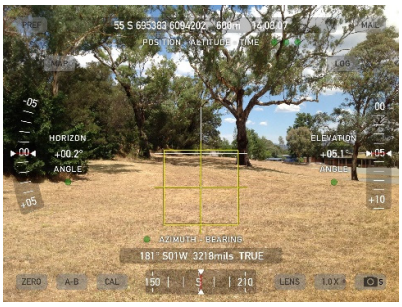

Photo 13 – Reference Point 3

Photo 14 – Reference Point 3

Photo 15 – Reference Point 3

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Photo 16 – Reference Point 3

Photo 17 – Reference Point 4

Photo 18 – Reference Point 4

Photo 19 – Reference Point 4

Photo 20 – Reference Point 5

Photo 21 – Reference Point 5

Photo 22 – Reference Point 5

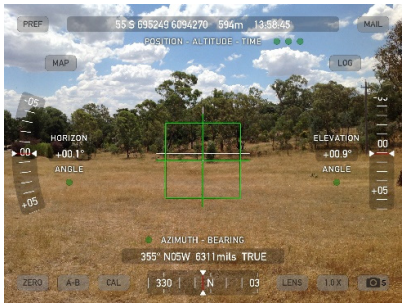

Photo 23 – Reference Point 5

Photo 24 – Reference Point 5

Photo 25 – Reference Point 5

Photo 26 – Reference Point 6

Photo 27 – Reference Point 6

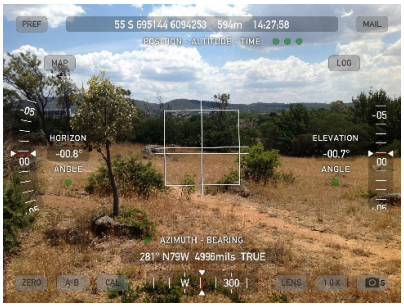

Photo 28 – Reference Point 6

Photo 29 – Reference Point 7

Photo 30 – Reference Point 7

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Photo 31 – Reference Point 7

Photo 32 – Reference Point 7

Photo 33 – Reference Point 8

Photo 34 – Reference Point 8

Photo 35 – Reference Point 8

Photo 36 – Reference Point 8

4.4 Asset Protection Zone (APZ) Areas

The subject property will have the benefit of identified inner and outer protection zones to the east of the site as currently identified by the SBMP (as denoted Figures 9.0 & 10.0). Whilst the identified IPZ & OPZ areas are targeted at protection for Ainslie Village, the proposed development would also be afforded additional protection by the bushfire mitigation measures undertaken within vicinity of the site. Similarly, identified vegetation maintenance works adjacent to Limestone Ave & Quick Street would also be to the benefit to the site and reduced risk / fire run.

The zoning for the subject property is identified as CF: COMMUNITY FACILITIES. The zoning permits the development of the land as facilities and services for residential occupation. The adjoining land to the south (Campbell High School) is also zoned the same.

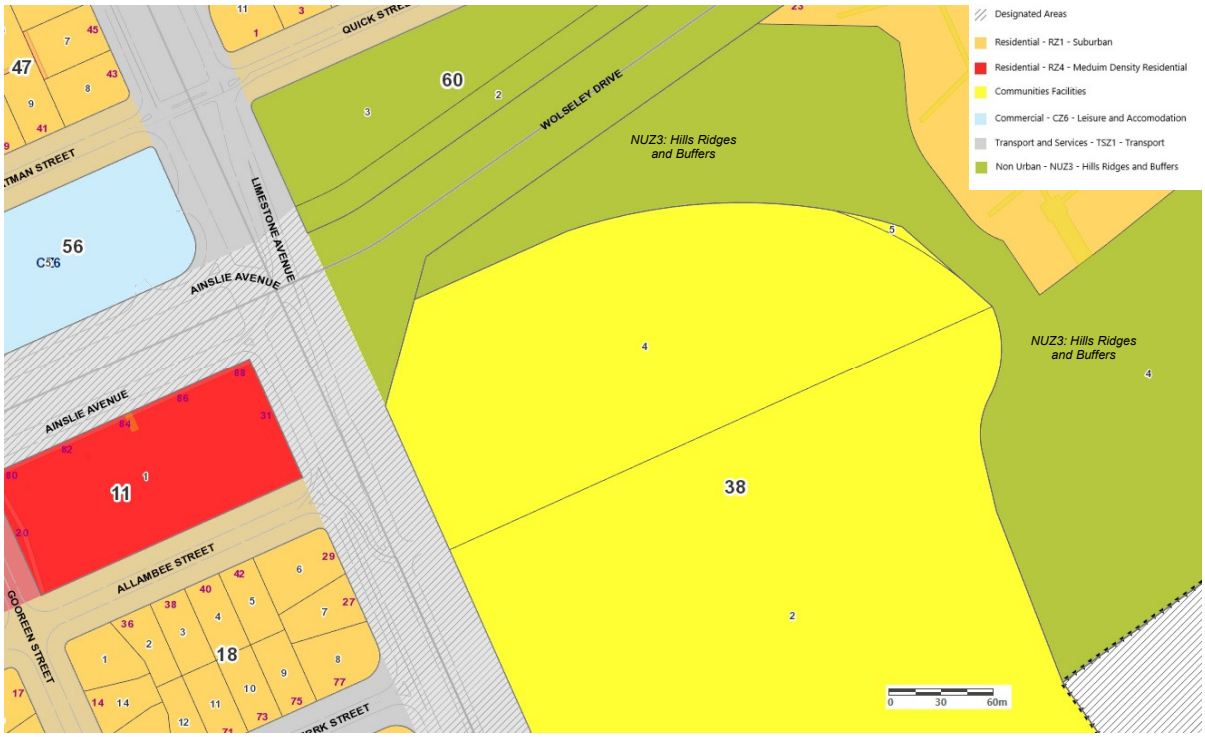
The major zoning for land adjacent to the north-east, north & west (i.e. Campbell & Ainslie urban / built residential precinct) is primarily identified as RZ1: SUBURBAN or RZ4 MEDIUM DENSITY RESIDENTIAL. A small area of land zoning adjoining Ainslie Ave (due northwest of the subject property) is identified as CZ6: LEISURE & ACCOMODATION.

Public lands directly adjoining the northern and eastern boundary of the subject property (i.e. Block 46 Section 63 Campbell, Blocks 2 & 3 Section 60 Ainslie and unformed road reserve for Wolseley Drive) are identified NUZ3: HILLS RIDGES & BUFFERS. Whilst parts of this land are identified by the SBMP for vegetation slashing / physical removal, this area would mostly likely remain vegetated as either remnant woodland or native grassland.

Apart from the adjoining land zoned NUZ3, all other adjoining / adjacent land is more or less entirely developed for residential building and urban occupation, educational purposes, public roadway areas, pedestrian access or managed (slashed) open spaces. Any potential grassland or woodland vegetation associated with these areas should reasonably be *maintained at an overall fuel hazard ≤ low, 3-5 m canopy separation or fuel gap to crown >3m maintained,* or *grassland maintained at ≤200 mm height when grassland curing ≥70%* in accordance with BMS APZ requirements. Likewise, all neighbouring residential, commercial and educational lands

within vicinity (i.e. ≤100m) would also be reasonably considered *low threat or non-vegetated* as defined under AS3959 (see section 4.1 of this report).

Figure 8.0 – Territory and National Capitol Plan



(*Courtesy of ACT Government Maps - www.actmapi.act.gov.au*)

It is acknowledged that potential areas of grassland vegetation may persist to the north through to northwest of the proposed development site (i.e. Block 46 Section 63 Campbell & Unformed Road Reserve for Wolseley Drive). The extent of the potential grassland vegetation would provide a fire run <100m, and hence would be considered a 'Secondary' Asset Interface in accordance with BMS requirements.

It is also acknowledged that potential areas of woodland vegetation may persist to the northeast and east of the proposed development site (i.e. again within Block 46 Section 63 Campbell).

The extent of the potential woodland vegetation to the northeast (i.e. towards Ainslie Village) would reasonably provide a fire run <350m, and hence would be considered a 'Lee' Asset Interface in accordance with BMS requirements.

The extent of the potential woodland vegetation to the east (i.e. towards Mount Ainslie Nature Reserve) would reasonably provide a fire run >350m, and hence would be considered a 'Secondary' Asset Interface in accordance with BMS requirements.

Considering the above, a 10-20m Inner APZ area is otherwise prescribed as a requirement by the BMS (Tables 2 & 3). In this regard, the Inner APZ would be easily facilitated to the east of the subject property as a 30m wide IPZ is currently identified by the SBMP in this direction. To the north of the subject property (directly adjoining the boundary), there is currently no identified IPZ.

Figure 9.0 – ACT SBMP – Regional Fire Management Plan

(*Courtesy of ACT Government Maps - www.actmapi.act.gov.au, Strategic Bushfire Management Plan*)

Figure 10.0 – ACT SBMP – Regional Fire Management Zones

(*Courtesy of ACT Government Maps - www.actmapi.act.gov.au, Strategic Bushfire Management Plan*)

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4.4 External Vehicle Access

Public roadway access (Limestone Avenue) to the proposed development site is well established and designed for heavy vehicle and traffic anticipated to access the Campbell precinct, which also includes the Australian War Memorial and Campbell High School.

Limestone Ave is of a dual carriageway, with each side approximately 8-9m wide with two designated lanes. The existing public roadway sections provide through access within direct vicinity of the subject property, and otherwise through access to the larger network of public roadway areas servicing the greater Campbell urban precinct.

Considering the above, the existing public roadway system servicing the subject property and proposed development would easily facilitate the safe passage of emergency services and associated vehicles seeking to access or egress the subject property under most circumstances.

5.0 PLANNING CONTEXT

The subject land is categorized as National Land, under the jurisdiction of the National Capital Authority (NCA), and as such falls outside of ACT authority and is therefore not subject to SBMP requirements.

At the request of the National Capital Authority (NCA), the proponent is required to submit an assessment for bushfire safety that only reports against AS/NZS 4360 and AS3959 rather than any particular legislation or the ACT SBMP.

However, to ensure no prescribed bushfire measures (within the ACT) are overlooked or understated for the proposed development, a full assessment against the SBMP has been undertaken – particularly considering the matter will likely be referred to ACTFR for comment. A full assessment in this regard incorporates an assessment against AS3959 (Simplified or Detailed Methodologies) and also *supports the Fire Services, land managers, developers as well as the general community in achieving effective results in reducing bushfire risk*[1].

Superseding AS/NZS 4360, AS/NZS ISO 31000:2009 (Risk management – Principles & guidelines) describes risk assessment as *the overall process of risk identification, risk analysis and risk evaluation.*

For the purpose of this report, this identified risk is a combination of the potential for an unplanned or uncontrolled bush/grassfire event emanating from adjoining lands and the impact upon building structures and occupants within the proposed development area at that time.

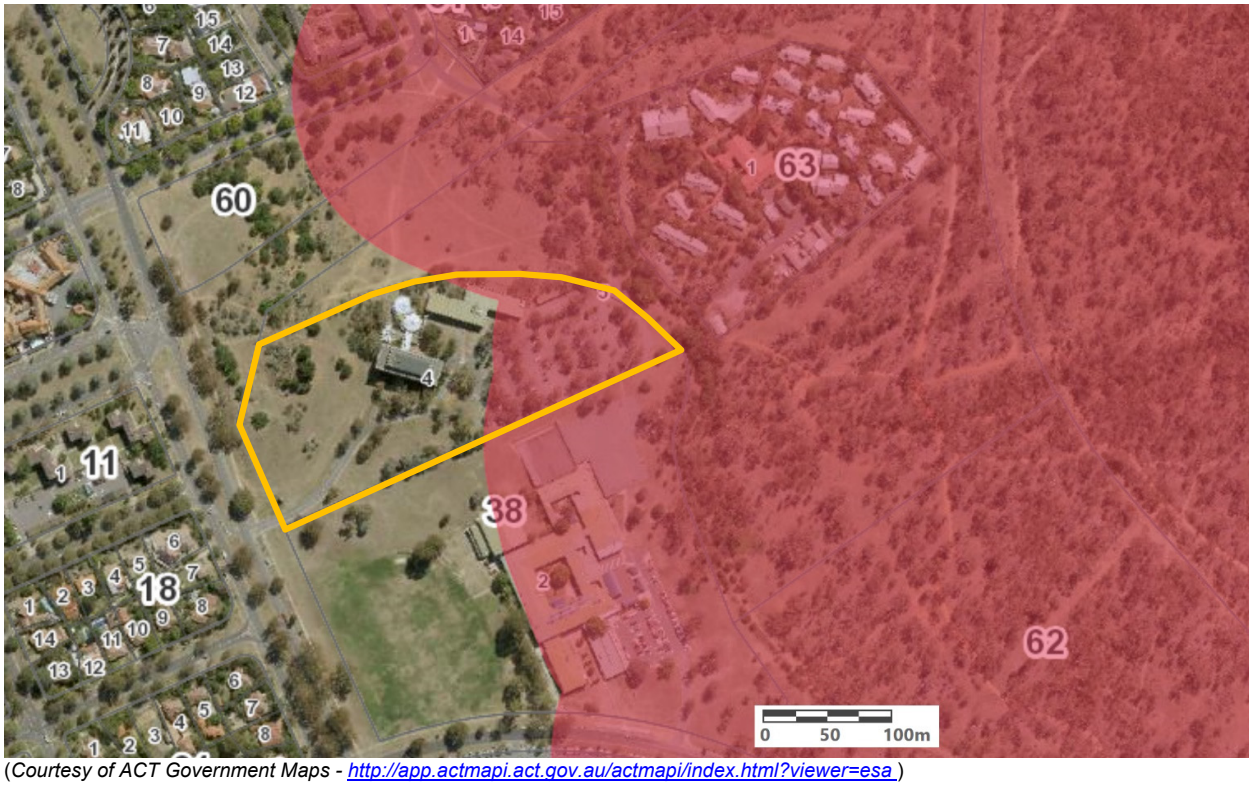
This report outlines an analysis and evaluation of the risk using the nationally accepted AS3959 and Bushfire Attack Level (BAL) assessment methodology to identify prescribed building standards. This reports also includes an assessment against the BMS Asset Interface Classification to identify APZ compliance in accordance with the SBMP requirements.

All of which should reasonably assists to appropriately manage the risk or *the effect of uncertainty* of a potential bush/grassfire event impacting upon the proposed development.

[1] *Bushfire Management Standards, Strategic Bushfire Management Plan, Version 3 (2014) – Territory and Municipal Services, ACT Government*

Subject property is designated as within a Bushfire Prone Area (BPA) in accordance with the SBMP. Figure 11.0 as follows denotes the current BPA affecting the subject property and surrounding land.

Figure 11.0 – ACT SBMP – Bushfire Prone Area Map



(*Courtesy of ACT Government Maps - http://app.actmapi.act.gov.au/actmapi/index.html?viewer=esa*)

The SBMP states that in a BPA, it is proposed:

> *That new residences or existing residences being significantly renovated or properties being knocked down and rebuilt will be required to be assessed under AS3959 to determine standards for bushfire construction. A minimum standard of construction under AS3959 will be required to be undertaken to the lowest level of BAL, BAL 12.5.*

BMS zoning and fuel management standards outlines an *Asset Interface Classification* matrix and associated widths for an Asset Protection Zone (APZ). For an interface potentially impacted upon by a fire run in excess 350m from the E, <350m from the northeast, & <100m from north to northwest (as for the proposed development site), the asset interface is considered to be 'Secondary to Lee'. A Secondary asset interface classification requires a 20m APZ (Inner APZ only) and a Lee asset interface classification requires a 20m APZ (Inner APZ only).

Section 6.0 of this report details a 'Simplified Assessment' (in accordance with AS3959) for the subject development site.

Apart from AS3959 requirements, all other determined measures and/or requirements for bushfire safety and compliance are derived from the SBMP - *Integrated measures for bushfire protection at the urban edge*. Considered relevant to the proposed development, this otherwise includes;

- Access (new estate developments)
- Water supply and other services (new estates and large infill developments)
- APZs in established areas
- Urban landscaping (all areas)

The listed measures and compliance comments are outlined section 7.0. Recommendations for bushfire safety compliance are as listed Section 8.0.

Figure 12.0 – APZ / BAL Assessment & Alternate Solution Compliance

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6.0 ESTIMATED BUSHFIRE ATTACK LEVEL (BAL) – AS3959 SIMPLIFIED METHODOLOGY

Relevant FDI: 100 (Australian Capital Territory), as per Table 2.1 of AS3959

Vegetation Classification: WOODLAND
GRASSLAND

The potential woodland hazard is considered persisting to the northeast to southeast of the subject property, towards Ainslie Village and Mount Ainslie Nature Reserve (i.e. within Block 4 Section 63 Campbell).

The potential grassland hazard is considered persisting to the north to northwest, between the subject property and Quick Street (i.e. within Block 4 Section 63 Campbell, Blocks 2 & 3 Section 60 Ainslie & the unformed road reserve area of Wolseley Drive).

Apart from the identified Woodland & Grassland vegetation, all other surrounding land within approximately 100m of the proposed development would reasonably qualify as excluded or low threat vegetation, as per Clause 2.2.3.2 of AS3959. This includes Campbell High School and associated open paddock areas, and the existing Campbell residential precinct opposite sides of Limestone Avenue & Quick Street.

Site Distance to Vegetation, Effective Slope & BAL:

Building	Distance (m)	Vegetation (*Location / Direction*)	Effective Slope	BAL
B1-1	> 15m	GRASSLAND *Wolseley Drive Road Reserve / NW*	0-5°	19
B1-2	> 50m	GRASSLAND *All directions*	N/A	LOW
B2-1	≥ 10m	GRASSLAND *Block 4 Section 63 Campbell / NW-NE*	0-5°	29
B2-2	≥ 45m	GRASSLAND *Block 4 Section 63 Campbell / NW-NE*	0-5°	12.5
B2-3	≥ 10m	GRASSLAND *Block 4 Section 63 Campbell / NW-NE*	0-5°	29
B2-4	≥ 30m	GRASSLAND *Block 4 Section 63 Campbell / NW-NE*	0-5°	12.5
B2-5	≥ 7m	GRASSLAND *Block 4 Section 63 Campbell / NW-NE*	0-5°	FZ (40*)

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B2-6	≥ 35m	GRASSLAND *Block 4 Section 63 Campbell / NW-NE*	0-5°	12.5
B2-7	≥ 30m	GRASSLAND *Block 4 Section 63 Campbell / NW-NE*	0-5°	12.5
B3-1	> 50m	GRASSLAND *All directions*	N/A	LOW
B3-2	> 50m	GRASSLAND *All directions*	N/A	LOW
B3-3	> 50m	GRASSLAND *All directions*	N/A	LOW
B3-4	> 50m	GRASSLAND *All directions*	N/A	LOW
B3-5	> 50m	GRASSLAND *All directions*	N/A	LOW
B3-6	> 50m	GRASSLAND *All directions*	N/A	LOW
B3-7	> 50m	GRASSLAND *All directions*	N/A	LOW
B4-1	≥ 7m	WOODLAND *Block 4 Section 63 Campbell / N-E*	Level / Upslope	FZ (40*)
B4-2	≥ 45m	WOODLAND *Block 4 Section 63 Campbell / N-E*	Level / Upslope	12.5
B4-3	> 15m	WOODLAND *Block 4 Section 63 Campbell / N-E*	Level / Upslope	29
B4-4	> 70m	WOODLAND *Block 4 Section 63 Campbell / N-E*	Level / Upslope	12.5
B4-5	> 15m	WOODLAND *Block 4 Section 63 Campbell / N-E*	Level / Upslope	29
Electrical Substation	≥ 7m	WOODLAND *Block 4 Section 63 Campbell / N-E*	Level / Upslope	FZ (40*)

* *BAL-40 determined based on alternate solution / engineered judgement acknowledging a reduced fire intensity / fuel load / fire front width as a result of powerlines & vehicle access restricting natural extent of the vegetation hazard. Reasonable judgement and view factor modelling (i.e. reduced flame width) should demonstrate radiant heat flux would not exceed 40kW/m^2. An alternate solution for a radiant heat shield is further identified as an additional margin of safety to further minimise the risk.*

Determined BAL: **BAL 40 to LOW** as per Clause 2.2.6 of AS3959.

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Recommended BAL:

BAL-12.5 minimum, in accordance with SBMP - *a minimum standard of construction under AS3959 will be required to be undertaken to the lowest level of BAL, BAL 12.5.* This includes; B1-2, B2-2, B2-4, B2-6, B2-7, B3 (1-7 all structures), B4-2 & B4-4.

BAL-19 to B1-1.
Elevations of the structures shielded or facing away from the identified hazard may be designed and constructed to BAL-12.5 in accordance with AS3959 Clause 3.5 (Reduction in construction requirements due to shielding).

BAL-29 to;
B2-1, B2-3, B4-3 & B4-5. Elevations of the structures shielded or facing away from the identified hazard may be designed and constructed to BAL-19 in accordance with AS3959 Clause 3.5 (Reduction in construction requirements due to shielding).

BAL-40 to B2-5, B4-1 & Electrical substation*.
Elevations of the structures shielded or facing away from the identified hazard may be designed and constructed to BAL-29 in accordance with AS3959 Clause 3.5 (Reduction in construction requirements due to shielding).

**Note: In accordance with AS3959 Clause 3.2.3 (Adjacent structures), should the electrical sub-station be adjusted >6m away from any residential building component, compliance with the construction requirements of AS3959 would NOT be required. Only standard BCA / NCC and associated Fire Safety requirements are applicable.*

7.0 BMS - LISTED BUSHFIRE COMPLIANCE MEASURES

Performance Criteria	***Acceptable Solution / Referred Standard***	***Compliance Comment***
Firefighters are provided with safe all-weather access to Bushfire Prone Areas and assets.	*Refer to ESDD Estate Development Code March 2012.*	*As per recommendations No. 9-16 of this report.*
	Public roads are two-wheel drive, all-weather roads.	**Complies** – *as per recommendation No. 10 of this report.* *Limestone Ave is a fully formed and maintained major arterial public roadway servicing the subject property and surrounding Campbell residential / Memorial precinct.*
Public road widths and design allow safe access and egress for firefighters while residents are evacuating an area. *Public road widths allow firefighting crews to work with firefighting equipment around the vehicle, and to allow other vehicles to pass with safety.*	*Edge road required for all new subdivisions and developments. Alternate solutions will be considered on merits of safety to public and emergency service personnel.*	*N/A*
	Urban edge roads are two-way – that is, at least two traffic lane widths (carriageway 7.5 m minimum kerb to kerb), allowing traffic to pass in opposite directions, with parking provided in designated parking bays clear of the carriageway.	*N/A*
	Hydrants are located clear of parking bays.	**Complies** – *as per recommendation No. 8 of this report*
	The edge road is linked to the internal road system at an interval of no greater than 500m in urban areas.	*N/A*
	Traffic management devices are constructed to facilitate access and egress by emergency services vehicles.	**Complies** – *as per recommendation No. 9 of this report.*
	Public roads have a cross-fall not exceeding 6%.	**Complies** – *all existing and proposed new vehicle access section directly servicing the subject property and proposed development site would not have cross-fall >6%.*
	All roads are through roads. Dead-end roads are not recommended but, if unavoidable, dead ends are not more than 200m in length, incorporate a minimum 24m diameter unobstructed turning circle, and are clearly signposted as a dead end and direct traffic away from the hazard.	**Complies** – *as per recommendations No. 10, 11 & 16 of this report.*
	Curves of roads (other than perimeter roads) are a minimum inner radius of 6m and minimal in number, to allow for rapid access and egress.	**Complies** – *as per recommendation No. 9 of this report.* *The existing public roadway sections to service the proposed development / subject property would reasonably facilitate rapid access and egress, with roadway curves (within vicinity) having an inner radius of >6m.*
	The minimum distance between inner and outer curves is 6m.	*As above.*
	Maximum grades for sealed roads do not exceed 28%, and an average grade of not more than 18% or other gradient specified by road design standards, whichever is the lesser gradient.	**Complies** – *All roadway sections directly servicing the subject property and development site do not reasonably exceed 5° or 9%.*
	There is a minimum vertical clearance to a height of 4.2m above the road at all times.	**Complies** – *As per recommendation No. 6 of this report.* *Limestone Ave is otherwise well separated away from overhanging or unmanaged vegetation.*

	Roads are clearly signposted (with easily distinguishable names), and buildings and properties are clearly numbered.	**Complies** – *As per recommendation No. 16 of this report.* *All existing public roadway areas servicing the subject property are currently and clearly signposted.*
	In designated Bushfire Prone Areas, cul-de-sac road design is generally not encouraged. Where they are used, however, they should not exceed 200m in length. In some instances, it may be possible to provide emergency access between cul-de-sac heads so that residents and firefighters have two-way access and egress. In this case, and provided it does not service more than 8 lots, the maximum length of a cul-de-sac can be increased to 600m. Turnaround areas should allow fire appliances to turn around safely and should be available at cul-de-sac heads, house sites and at 250m intervals along driveways and fire service accesses.	*As per recommendations No. 9-16 of this report.* *The proposed vehicle access arrangement is considered appropriate to achieve the performance criteria.*
	Emergency accesses may be used to link up with roads to allow alternative access and egress during emergencies where traffic flow designs do not allow for two-way access. The access should comply with minimum standards for roads and should be signposted. If gates are used to control traffic flow during non-emergency periods, they must not be locked.	*Vehicle access within the proposed development has previously been considered and agreed to in principle with ACTFR. An emergency / alternate access link was not considered a necessary requirement.* *The proposed vehicle access arrangement is considered appropriate to achieve the performance criteria.*
The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles	*The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles (approximately 30 tonnes for aerial appliances and 25 tonnes for tankers).* *Bridges shall be signposted to clearly indicate load rating.*	**Complies** – *as per recommendation No. 15 of this report.* *The internal roadway section should otherwise be designed and engineered to standard civil requirements.* *The external public roadway section (Limestone Ave) currently servicing the subject property is a fully formed and engineered roadway designed for heavy traffic and associated vehicle movements.*
Water supplies are easily accessible and located at regular intervals	*The Water and Sewerage Network (Design and Maintenance) Code of the Utilities Act 2000 requires the fire-fighting requirements are able to be met.* *A deed of agreement exists between ACTEW Corporation Limited and ACTF&R in relation to water supply in the built up area. This agreement details operative provisions which cover:* *Fire Hydrants – general provisions* *Flow rates* *Fire risk classification and fire hydrant spacing's* *Fire hydrant testing and maintenance* *Fire hydrant system shutdown / isolation* *Connection to domestic supplies* *Water usage by ACTF&R and ACTRFS* *Provision of plans showing location of fire hydrants* *Hydrants on the water network* *Amendments to water supply standards* *The deed of agreement is currently under review by both parties.*	*The proposed development will incorporate water supplies and firefighting connection points in accordance with standard BCA / NCC (AS2419) and specified ACTFR requirements.* *At least 7 feed & 6 attack hydrant connection and 2 hydrant booster points are proposed throughout the site. A further 4 existing hydrant connection points are also located at the entrance (Limestone Ave) to the proposed development site. In this regard, the proposed development would be reasonably accessible by a 'hose laid on ground' within 70m (or <90m) of the proposed or existing hydrant connection points.*
Parking does not obstruct the minimum paved width.	*Internal public roads 6.5m wide provide parking within parking bays, and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.*	**Complies** *All identified / existing hydrant connection points to service the proposed development are reasonably located clear of proposed parking bay areas.*
	Internal public roads between 6.5 m and 7.5m are signposted as 'No Parking' on one side, with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression.	*N/A*

	One-way only public access roads are no less than 3.5m wide and provide parking within parking bays, and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.	**Complies** – *As per recommendations No. 11 of this report.*
	Parking bays are a minimum of 2.6m wide from kerb edge to road pavement. No services or hydrants are located within the parking bays.	**Complies** *All proposed parking bays along the main internal roadway sections for fire fighting appliance access will be 5m wide from kerb to carriageway.*
	Public roads directly interfacing the bushfire hazard vegetation shall provide roll-top kerbing to the hazard side of the road.	*N/A - no sections of roadway access servicing the proposed development directly interface the bushfire hazard.*
location of electricity services will not lead to ignition of surrounding bush land or the fabric of buildings or risk to life from damaged electrical infrastructure	*Electrical transmission lines are underground.*	**Complies** – *as per recommendation No. 17 of this report.*
Location and installation of gas services will not lead to ignition of surrounding bushland or the fabric of buildings	*As detailed in AS3959 which notes water and gas pipes above ground, exposed water and gas supply pipes shall be metal.*	**Complies** – *as per recommendation No. 18 of this report.*
An emergency and evacuation management plan shall be prepared for Special Fire Protection Developments	*Compliance with AS 3745-2002 'Emergency control organisation and procedures for buildings, structures and workplaces' for residential accommodation'.* *Compliance with AS 4083-1997 'Planning for emergencies - for health care facilities'.*	**N/A** – *the proposed development is not classified as a SFPP development*

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8.0 RECOMMENDATIONS

1. The proposed development shall incorporate external materials and design in accordance with Sections 3 & 5-8 of AS3959 Construction of buildings in bushfire-prone areas (BAL-12.5 to 40 requirements).

   Table 2.0 as follows outlines the recommended BAL requirements for each individual building structure.

Table 2.0

B1-1	BAL 19 or 12.5 to elevations shielded away from the identified hazard
B1-2	BAL 12.5 for all elevations
B2-1	BAL 29 or 19 to elevations shielded away from the identified hazard
B2-2	BAL 12.5 for all elevations
B2-3	BAL 29 or 19 to elevations shielded away from the identified hazard
B2-4	BAL 12.5 for all elevations
B2-5	BAL 40 or 29 to elevations shielded away from the identified hazard
B2-6	BAL 12.5 for all elevations
B2-7	BAL 12.5 for all elevations
B3-1	BAL 12.5 for all elevations
B3-2	BAL 12.5 for all elevations
B3-3	BAL 12.5 for all elevations
B3-4	BAL 12.5 for all elevations
B3-5	BAL 12.5 for all elevations
B3-6	BAL 12.5 for all elevations
B3-7	BAL 12.5 for all elevations
B4-1	BAL 40 or 29 to elevations shielded away from the identified hazard
B4-2	BAL 12.5 for all elevations
B4-3	BAL 29 or 19 to elevations shielded away from the identified hazard
B4-4	BAL 12.5 for all elevations
B4-5	BAL 29 or 19 to elevations shielded away from the identified hazard
Electrical Substation	BAL 40 or 29 to elevations shielded away from the identified hazard

   The specific BAL estimates for each elevation as otherwise previously denoted figure 12.0.

2. The proposed 1.8m high 'Ha ha' wall shall be extended partly along the northern boundary of the subject property to ensure townhouse B2-5 & B4-1 are shielded from the identified grassland & remnant woodland hazard within Block 4 Section 63 Campbell.

   The Ha ha wall is to effectively provide a radiant heat shield for the purpose of an alternate solution to town hoses B2-5 & B4-1.

   The recommended location of the Ha ha wall / radiant heat shield is as otherwise previously denoted figure 12.0.

3. The entire area of the proposed development site shall be identified and maintained as an APZ in accordance with the ACT Bushfire Management Standards – ACT Strategic Bushfire Management Plan Version 3 (2014).

Vegetation and landscape management for APZ compliance should consider the principals of the document *Landscape and Building Design for Bushfire Areas, by Caird Ramsay and Lisle Rudolph published November 2003*.

4. Any vegetation landscaping to be retained or re-introduced as part of the proposed development shall ensure any readily combustible dry garden mulching and/or plantings are minimised within the proposed development site, or else should be entirely excluded.

5. Any internal landscaping shall ensure any readily combustible dry garden mulching and/or plantings are separated away from the proposed building lines by at least 2m.

6. Any internal landscaping shall ensure trees planted directly adjacent to the internal roadway area does not significantly overhang or obstruct the access of larger vehicle's entering the proposed development site. Any overhanging vegetation shall be maintained to ensure a minimum height of 4.2m above the road at all times.

7. Any internal landscaping shall ensure only fire retardant trees are reintroduced as part of the proposed development. Fire retardant plants for the ACT are as otherwise listed by the Yarralumla nursery-Garden Advice series[2].

8. Where applicable, proposed hydrant and associated booster / access arrangements to service the proposed development shall be designed and installed in accordance with AS2419 & the ACTFR Policy - *Access and Hydrant Requirements for Rear Lanes and Unit Complexes (Policy)*, particularly requiring;

   No hydrant outlets to be located within a parking bay,

9. All internal vehicle access roadway sections shall have a minimum carriageway width of 6m or else the proposed internal roadway and verge area shall facilitate an unobstructed and trafficable width of at least 6m at all times. The minimum inner radius of any roadway bend shall be ≥6m and any identified parking spaces.

10. The centrally located vehicle turn around area (between B2-7 & B3-6) shall be designed to facilitate a turning radius of at least 12m or else shall provide additional access sections to facilitate a 'hammer-head' or equivalent turning facility for heavy vehicle access / dimensions (≈2.5 x 12m).

11. The dual access section from Limestone Ave to the first round about shall be designed to facilitate laneway access or carriageway width of at least 3.5m for each lane.

12. Vehicle access for fire fighting purposes shall ensure a working footprint access (12m x 6.5m with a maximum gradient not exceeding 6°) to at least one corner of structures B1-1 & B1-2 (multi-storey apartments) to allow a Bronto Skylift fire fighting appliance access to two sides of the building structure.

13. The pavement loading for a Bronto Skylift working footprint (particularly where in proximity to any basement surface) shall ensure capacity to support point loads up to 21 tonnes (within surface area of 0.7 m²) as may be applied by the ground pads.

14. Any gating or obstacles for traffic or pedestrian management or calming shall be designed to ensure firefighting and emergency services vehicles can safely pass through, over or remove

[2] *http://www.tams.act.gov.au/__data/assets/pdf_file/0012/389937/Fire_retardant_plants_for_canberra.pdf*

/ open the traffic management obstacle at all times. Emergency access gating used to control traffic flow during non-emergency periods shall not be locked

15. The proposed internal vehicle access roadway surface shall have a carrying capacity of at least 30 tonnes in anticipation of a standard ACTFR aerial appliance seeking to access and operate within the proposed development site.

16. The proposed development and associated internal roadway access section shall be clearly signposted at entry point from Limestone Ave to identify the proposed development site and No Through access arrangement. All building structures shall also be clearly sign posted.

17. All new electrical lines and connections (including communication lines) to service the proposed development shall be located underground.

18. All external / exposed water and gas supply pipes supplying the proposed development shall be metal.

9.0 REFERENCED DOCUMENTS / LITERATURE

1. *Access and Hydrant Requirements for Rear Lanes and Unit Complexes (Policy)* – ACT Fire & Rescue

2. *Australian Standard 3959 Construction of buildings in bushfire prone areas (2009)* – Standards Australia.

3. *Australian / New Zealand ISO 31000 Risk management, principles and guidelines (2009)* - Standards Australia.

4. *Bushfire Management Standards, Strategic Bushfire Management Plan, Version 3 (2014)* – Territory and Municipal Services, ACT Government.

5. *ACTEW / ACTFR Deed-of-Agreement (Tables 2.2 & 2.3) (1999)*.

6. *Estate Development Code (2013)* – ACT Government.

7. *Fire Retardant Plants for Canberra,* Yarralumla Nursery – Garden Advice Series.

8. *Landscape and building design for bushfire areas (2003)* - Ramsay, G. C & Rudolph, L., CSIRO Publishing, Collingwood Victoria.

9. *The ACT Strategic Bushfire Management Plan (2014)* – Territory and Municipal Services, ACT Government.

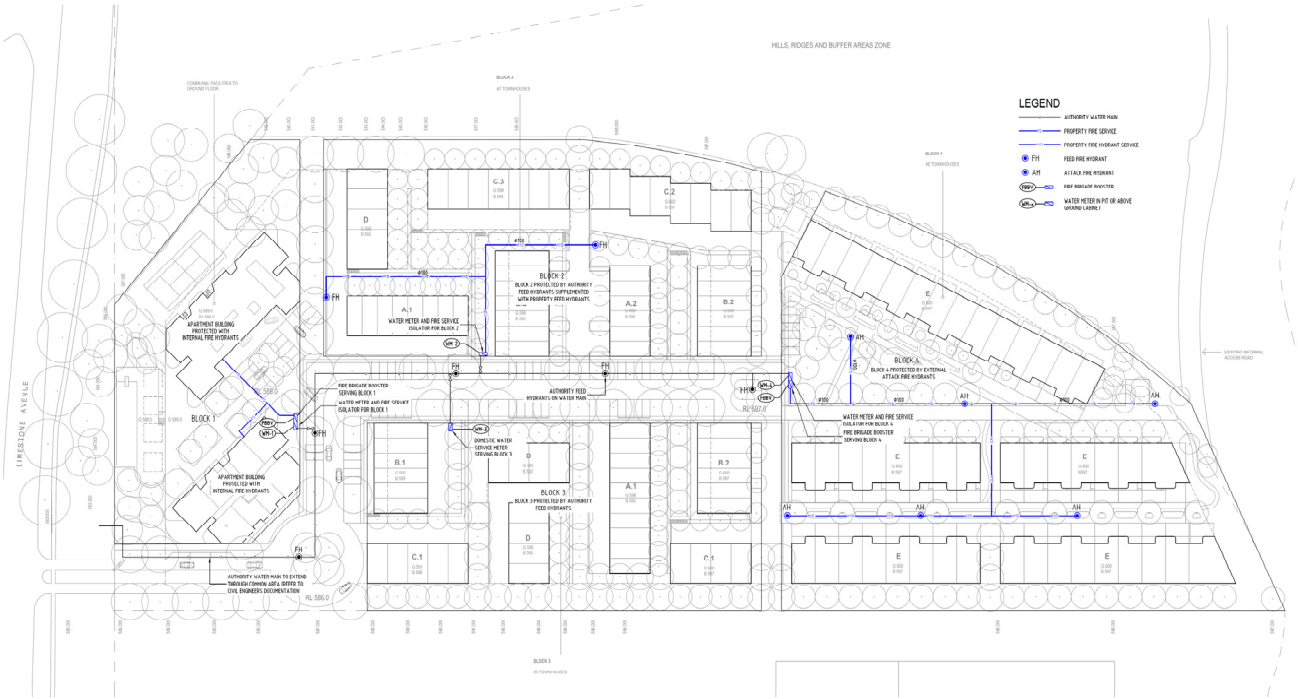
10.0 Personal Communication

- Mitch Brennan, ACT Fire Rescue – Risk and Planning Section, 3-6/02/17 (personal meeting, phone and email consultation)

11.0 APPENDICES

11.1 Appendix 1 – Proposed Development

11.2 Appendix 2 – Proposed Development – Hydraulic Services / Proposed Fire Hydrant Plan



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