FPDplanning

6 October 2023

Brendon Roberts
Agile Planning
Department of Environment and Planning
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Re: Lourdes Retirement Village Planning Proposal – EHG Response

Dear Brendon,

I refer to your email dated 18 August 2023 requesting a response to the issues raised by the Department's Environment and Heritage Group (EHG) in its submission and seeking further review and consideration of the following aspects of the Planning Proposal.

- Direction 4.3 Planning for Bushfire Protection
- Traffic Generation
- Proposed R3 zone.

This letter and the attachments provide a detailed response to all issues raised.

The applicant has given extensive consideration to all matters raised by EHG and DPE, and in particular has made changes to the master plan to retain additional native vegetation including 100% of Sydney Turpentine Ironbark Forest threatened ecological community. This has resulted in changes to the proposed height of buildings and FSR maps to reflect the reduced building footprint and development yield as detailed in this letter.

Response to EHG letter

To respond to the issues raised by EHG the applicant has expanded the engagement of Ecological Australia (ELA) to continue to work intensively with ACS Environmental to provide further advice and undertake a detailed peer review and endorsement of the Biodiversity Development Assessment Report (BDAR).

This work has included:

- Review of EHG letter ref: DOC23/628482 (Aug 2023), recommended actions and preparation of a response to submissions letter
- Additional site inspection, investigations and workshops between ACS Environmental & ELA to aid in response to:
    - PCT assessment, justification and determination
    - Validation of the planted native vegetation within the site which had previously assessed via Streamlined assessment module
    - Visits to known nearby Blue Gum High Forest sites as reference sites
- Coordination and workshop with Project Arborist for defined identification of species and revision to the Arboricultural Impact Appraisal Report
- Advice on the potential construction and operational impacts of the future development
- Consultation with EHG and Department of Planning and Environment
- Review and BDAR amendments based on bushfire consultant advice.

To respond to the issues raised by EHG and to reduce impacts on native vegetation a number of changes have been made to the master plan as detailed in the Urban Design Addendum (Attachment 1) which is reflected in the updated arborist report (Attachment 4) and BDAR report (Attachment 2). As a result, the following changes have been made to the master plan to further avoid significant vegetation which has resulted in a reduction of the overall development yield:

- Reconfigured building envelope of the northern clubhouse / independent living unit (ILU) building, realignment of the eastern access road and central ILU buildings resulting in retention of additional important native vegetation including Sydney Turpentine Ironbark Forest
- Reconfiguration of the townhouses at the south west corner and realignment of the access road in this location resulting in retention of vegetation and reduction in yield of townhouses to 59.

The changes have resulted in a reduction of overall floor space from 39,650sqm to 38,600sqm. The estimated number of seniors living ILUs remains unchanged. The estimated number of townhouses has reduced from 63 to 59.

The amended BDAR notes that the changes to the Master Plan have resulted in:

- Avoidance of 100% of Sydney Turpentine Ironbark Forest (PCT 3262) threatened ecological community
- Avoidance of 71.9% of Sydney Coastal Enriched Sandstone Forest (PCT 3592)

A key issue raised by EHG was that the extent of clearing and vegetation management which may be required to establish the site as an Asset Protection Zone (APZ) has not been assessed, so direct and indirect biodiversity impacts cannot be confirmed.

To respond to this issue, advice has been provided by Blackash (Attachment 5) which confirms that:

- *The entire site has been historically managed as an APZ and those practices are considered appropriate*
- *Consistent with Planning for Bushfire 2019, the proposed tree / vegetation retention and landscaping can accommodate the required APZ which will provide a fuel reduced area surrounding the buildings and between the buildings and the bush fire hazard.*
- *Blackash advises that the APZs will comprise a combination of fuel free areas (i.e. roads, paths, etc), intensely managed areas (i.e. mown grass) and pockets of garden and retained vegetation (i.e. native gardens, native vegetation).*
- *The location of these different management areas, particularly the pockets of retained native vegetation has been carefully reviewed and do not present a compliance issue and satisfy the performance intent of an APZ*
- *The areas of retained native vegetation will only require minimal maintenance by way of the removal of leaf litter, twigs and debris, therefore satisfying the requirements of an APZ without the need for any additional tree removal.*
- *The design of the APZ in this manner is typical of larger sites like Lourdes Village.*

To ensure that any ecological impacts of this minor ongoing maintenance of APZ’s is appropriately assessed, and as a conservative approach, the BDAR has been amended to take these minor bushfire management impacts by way of a partial offset for these areas.

Further, to ensure that the BDAR considers all impacts of the future development, additional information has been prepared to determine the full extent of earthworks, servicing and construction impacts of the development including:

- Further civil engineering design for sediment control plans, bulk excavation plans and overall stormwater design
- Development construction management and operational plans to assess impacts from construction and operations.

These documents have been incorporated in the revised BDAR.

Response to issues raised by DPE – Direction 4.3 Planning for Bushfire Protection

The email from DPE dated 18 August 2023 has raised the following in relation to Direction 4.3 Planning for Bushfire Protection:

> *While the Rural Fire Service (RFS) have confirmed that the proposed performance-based approach satisfies this Direction, the Department will require justification that changes to any biodiversity assessments and the planning approval pathway (being SSD which switches off requirements for a s100B bushfire authority) would not change the position from RFS. In addition, the Department will require confirmation from the RFS that the proposed floor space can be achieved, having regard to the indicative masterplan.*

In this regard it is important to note that State Significant Development (SSD) provides for an integrated approval. The SSD Guideline (DPE 2022) states the following:

- *Some SSD projects require approvals under other legislation in addition to development consent under the EP&A Act.*
- *The assessment of all relevant matters relating to these approvals is fully integrated into the SSD assessment. Consequently, these projects only require a single assessment under the EP&A Act before these other approvals may be granted. This approach promotes consistent decision-making across all levels of government.*
- *SSD projects are exempt from several approvals normally required under NSW legislation* [including a bush fire safety authority under section 100B of the Rural Fires Act 1997]. *Instead, the relevant matters relating to these approvals are considered in the SSD assessment and regulated under the SSD development consent.*

Accordingly, we are of the view that the likely future SSD pathway is not relevant to the Planning Proposal.

This response, including the amended master plan and updated BDAR, do not make any changes to the proposed management of native vegetation which would change the position of the RFS that it has no objection to the Planning Proposal.

Further, in relation to confirmation from the RFS that the proposed floor space can be achieved RFS has already reviewed the Planning Proposal and master plan and confirmed that it has no objection to the Planning Proposal including the proposed yield, as follows:

- *The NSW Rural Fire Service (RFS) has no objection to the planning/ rezoning proposal for seniors housing and nominated residential uses as per the above, based on the additional work and documentation provided by Blackash Bushfire Consulting, as contained within the "Addendum Bushfire Report for Lourdes Retirement Village", dated the 22 December 2022 Version 1.0.*

- *The additional work referenced in the above Addendum was considered to address a maximum number of occupants that could be on-site, the adequacy/appropriateness of roadways for emergency egress and fire brigade access given reasonable worst case bush fire scenarios.*

To further support the respond to this issue advice has been provided by Blackash (Attachment 6).

Response to issues raised by DPE – Traffic Generation

The email from DPE dated 18 August 2023 has raised the following in relation to traffic generation:

> *Noting Council's submission and potential amendments to the master plan, please demonstrate that the trips generated by the proposed private dwellings can be adequately accommodated on the internal road lay and Stanhope Road without a significant impact on existing level of service and not adversely impacting the amenity of adjoining residential dwellings (to the west of the site).*

Additional advice and updated traffic modelling has been provided by ARUP (Attachment 7) which confirms the suitability of the trip generation rates applies which address this comment including as follows:

- *The amended master plan includes three access points to the site. Traffic generated by the site is expected to be distributed among these various access points and would be less than the environmental capacity of a local access way being a maximum of 100 vehicles per hour (RTA Guide to Traffic Generating Development)*
- *Furthermore, the speed limit of internal roads is expected to be low (such as 10 kilometres per hour in line with existing speed limits). Therefore, the amenity impact of traffic within the site and on adjoining residential properties is expected to be low.*
- *The number of town houses in the amended master plan has reduced from 63 to 59. Accordingly, impacts on the Werona Avenue / Stanhope Road intersection are expected to remain minimal, with trips expected to generally occur outside of the network peak hours.*

In addition, to respond to issues raised by the Sydney North Planning Panel pre-exhibition changes were made to the master plan which realigned the western entrance road to allow for an increased buffer to the existing dwelling to the west of the site. This was endorsed by the Panel for exhibition.

Response to issues raised by DPE – Proposed R3 zone

The email from DPE dated 18 August 2023 has raised the following in relation to the R3 residential zone:

> *The Agile Planning team is concerned that the proposed R3 Medium Density Residential zone, FSR and height across the entire site are too flexible, and not well linked to the delivery of seniors housing or the protection of areas which contain identified vegetation. The Agile Planning team are keen to explore what can be achieved under the existing zone or a different zone for part or all of the site.*

Levande is the owner and operator of a portfolio of 58 villages, across Australia, providing community living and support services to more than 10,000 older Australians. Lourdes Retirement Village has been delivering to the community for over 40 years and Levande wish to continue this legacy. Levande is committed to delivering a senior living retirement village to service current and future residents.

The suitability of the R2 zone has already been extensively considered and been the subject of discussion and assessment by the Sydney North Planning Panel and DPE as part of the Gateway endorsement of the Planning Proposal. The Gateway decision (issued on 10 May 2022) included a condition requiring: *consideration of an alternative option to maintain the site's zone as R2 Low Density Residential and include additional permitted uses for seniors housing and nominated residential uses.*

In response to the Gateway condition the updated Planning Proposal report noted (at DPEs request) the following:

> *Such an option would involve retaining the R2 Low Density Residential zone across the site and including Seniors Housing as permissible with consent on the northern portion of the site and multi-dwelling housing, attached dwellings and semi-detached dwellings as permissible with consent on the southern portion. Whilst this approach could achieve the same outcome and could be supported, we are of the view that the R3 zone is a more accurate representation of the proposed development and built form outcome.*

On 27 July 2022, the Sydney North Planning Panel endorsed the Planning Proposal for exhibition, including the proposed rezoning from R2 Low Density Residential to R3 Medium Density Residential, and confirmed that all gateway conditions had been met subject to minor changes.

We are concerned about the potential legal procedural risk of changing the zone across the entire site at this late stage in the process. It would also be contrary to the endorsement of strategic merit from the Planning Panel.

Further, we are of the view that permissible uses within the R3 zone would limit future development to uses proposed under the master plan being seniors housing and multi-dwelling housing, noting that residential flat buildings would continue to be prohibited.

Further, the draft DCP specifically references the delivery of seniors housing as a key development objective and the indictive layout plan in the draft DCP specifies the distribution of Seniors Housing and Multi Dwelling Housing across the site.

DPE has also raised concern about the suitability of the R3 zone in relation to the protection of areas which contain identified vegetation. A BDAR has been prepared which has informed areas of vegetation to be retained and a BDAR will be submitted to support a future SSD application and will be reviewed by EHG and assessed by DPE. This process provides a high a high level of assurance that proposed vegetation retention will be realised in the future development.

Further, the floor space ratio control limits the development yield to align with the master plan, and in combination with a site specific DCP can ensure building footprints are located outside areas identified for vegetation retention.

Accordingly, we are of the view that further changes to the Land Use Zoning map are not necessary. Further protection of these areas could be more appropriately achieved at DA stage through approved building footprints, vegetation management plans and potential restrictive covenants if required. As noted above the vegetation remains protected by existing legislation.

Changes to the Planning Proposal

This response proposes a number of changes to the exhibited mapping amendments to the Ku-ring-gai LEP as follows:

- Amendment of the maximum height of buildings map to align the proposed building heights with the amended master plan
- Amendment of the Floor Space Ratio Map to reduce the maximum FSR from 7.5:1 to 7.3:1 to align with the amended master plan and reflect the reduced yield.

Updated maps are included in the Urban Design Addendum (Appendix A).

Conclusion

To support this response the following updated documents are provided:

- Attachment 1: Addendum Urban Design document detailing the updated master plan, landscape plans and LEP diagrams (Plus Architecture and Arcadia dated 28 September 2023)
- Attachment 2: Updated BDAR to address all issues raised by EHG (dated 5 October 2023)
- Attachment 3: Letter from ELA to respond to all issued raised by EHG in relation to Ecological Australia's previous advice (dated 13 September 2023)
- Attachment 4: Updated Arboricultural Impact Assessment to reflect the amended master plan (Naturally Trees dated 25 September 2023)
- Attachment 5: Advice from Blackash regarding management of retained native vegetation as an APZ (dated 28 September 2023)
- Attachment 6: Advice from Blackash to respond to DPE's concerns regarding Direction 4.3 Planning for Bushfire Protection (dated 28 September 2023)
- Attachment 7: Advice from ARUP to respond to DPE's concerns regarding traffic generation (dated 5 October 2023).

We trust this information resolves all remaining issues raised by EHG and DPE.

We look forward to continuing to work with you in finalising the Planning Proposal. Please contact me if you require any clarification.

Yours sincerely,

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	EHG Comments (16/08/23) on ELA report	ELA Action response or recommendation for BDAR amendment	ACS/ Ecologique Response
	The ELA report provided a comparison of PCTs on the site. The discussion doesn't consider the site disturbance influences on the diagnosis of PCT to the extent that is warranted given the current land use.	ELA acknowledge that the majority of the site is highly disturbed. ELA recommend that additional sources of information be used to assist in PCT justification selection, such as a review of existing development plan (Dated 1981) and landscape plans (dated 1988), historical aerial imagery, or photographs where relevant and to be included within the revised BDAR.	N/A
	One of the CEECs discussed in the ELA report is Blue Gum High Forest (BGHF). The Final Determination for Blue Gum High Forest (BGHF) states that "Highly modified relics of the community also persist as small clumps of trees without a native understorey." If trees from this community are present on the site and the geographical location and the physical characteristics align with the Final Determination descriptions, then there is no reason to assume that the vegetation on site does not form part of this community or is a transitional intergrade of this community with another.	Full response provided in ELA letter 'Response to Department of Planning' dated 13 September 2023. ACS/ Ecologique to review letter and may use information within to provide a justification for the presence or absence of the Final Determination for the CEEC BGHF.	N/A
	The BGHF Final Determination states "BGHF is dominated by a tall canopy of eucalypts that may exceed 30 m in height. Its understorey is typically multi-layered with a midstorey of mesophyllous shrubs and small trees and a diverse ground layer of herbs, ferns, and some grasses. Most stands of the community are in a state of regrowth	ELA acknowledge the Lourdes site is highly disturbed and that the native vegetation present within the site is generally species poor. ELA therefore recommend that other characteristics appropriate for examining the presence of BGHF such as supplementary descriptors and descriptive attributes be examined in deciding the	N/A

	EHG Comments (16/08/23) on ELA report	ELA Action response or recommendation for BDAR amendment	ACS/ Ecologique Response
	after past clearing or logging activities, and consequently trees may be shorter, less dense or more dense than less disturbed stands." The ELA report states, "The vegetation within the north east of the site is tall, and approximately to 20 to 30 m (Naturally Trees 2023), however, would not be considered an extremely tall forest." However, the Final Determination for does not require that the trees be extremely tall. The wording of the Final Determination indicates that trees within BGHF may or may not exceed 30m in height, therefore the remnant trees of this community found on the site could have formed part of this community and aren't required to be excluded based on tree height.	presence or absence of BGHF from the site. Supplementary descriptors and descriptive attributes to consider may include but not limited to, underlying geology, tree height and other supplementary descriptors such as rainfall, the height of the vegetation position above sea level, and landscape position. It is recommended to compare site characterises to informative supplementary descriptors from relevant, published literature. The supplementary descriptors and descriptive attributes do not replace a floristic assessment but could be used to provide additional information and consideration as to the likelihood of the presence of Blue Gum High Forest occurring on or near the site, this justification should be documented within the revised BDAR.	
	The Final Determination states "it can also intergrade with Sydney Turpentine Ironbark Forest (STIF)…stands that contain intermediate characteristics are collectively covered by the Final Determinations of BGHF and STIF and may be diagnosed by detailed consideration of the assemblage of species present at the site." Given STIF has been confirmed as likely to be present on the site, it is also possible that stands of remnant trees could form BGHF given the intergrading often observed between the two communities.	Response provided in ELA letter Response to Department of Planning. Integrades between BGHF and STIF are likely to occur along the boundary of deeper soils and shallower clay soils. Deep clay soils are not present near or within the site. While the site is clearly disturbed the local remnant trees adjacent to Stanhope Road are more consistent with STIF and less consistent with BGHF. Paragraph six of the BGHF FD (Proposed Gazettal date 14/10/11) includes the following text:	N/A

	EHG Comments (16/08/23) on ELA report	ELA Action response or recommendation for BDAR amendment	ACS/ Ecologique Response
		'Blue Gum High Forest is typically associated with soils derived from Wianamatta Shale (Tozer 2003), though may occur in adjacent areas underlain by Hawkesbury Sandstone. The community also occurs on soils associated with localised volcanic intrusions, 'diatremes' (Benson and Howell 1994). Typically, Blue Gum High Forest occurs more than 100m above sea level, where rainfall exceeds 1050 mm per annum, although it may be present in sheltered locations with lower rainfall (Tozer 2003). In drier areas and approaching the shale/sandstone boundary, it intergrades with Sydney Turpentine Ironbark Forest, which is currently listed as an Endangered Ecological Community under the TSC Act. Stands that exhibit intermediate characteristics are collectively covered by the Determinations of these communities and may be diagnosed by detailed consideration of the assemblage of species present at the site.' In areas nearby where BGHF and STIF occur near to each other it is highly likely that both communities receive similar rainfall. The local distribution of BGHF and STIF is more likely to be correlated with soil factors. Blue Gum High Forest can occur on soils that are underlain by Hawkesbury sandstone. However, Benson and Howell (1990) state that BGHF is more common on deep soils. Therefore, it is likely that BGHF occurs above sandstone when soils are deep. As stated above STIF is more likely to occur near the shale/sandstone boundary. While it is not	

	EHG Comments (16/08/23) on ELA report	ELA Action response or recommendation for BDAR amendment	ACS/ Ecologique Response
		explicitly included in the BGHF FD, it can be assumed that clay soils derived from Wianamatta shale are likely to be shallower near the shale/sandstone boundary. ACS/ Ecologique to review the information above and may chose to include some of the justification provided into a revised BDAR.	
	If the upper stratum of BGHF was sparse or absent, then the final determination states that the relatively diverse stratum of small trees including Pittosporum undulatum, Elaeocarpus reticulatus and Allocasuarina torulosa is usually present, all of which are found on the site.	The Final Determinations for both BGHF and STIF provide similar information, that these species, Pittosporum undulatum, Elaeocarpus reticulatus and Allocasuarina torulosa is usually present. Thus the presence of these tree species cannot be easily used to decide whether BGHF or STIF is present. ELA suggest that additional information called supplementary descriptors by the NSW Scientific Committee and descriptive attributes by the NSW government be used to assist ACS / Ecologique in deciding the presence or absence of BGHF from the site.	N/A
	The ELA report states "Quantitative analysis was completed, using the Hager/Steenebeeke 2010 analysis excel spreadsheet for each vegetation integrity plot to determine the best fit PCT using standardised ratio comparison positive native to total native score. This analysis uses the diagnostic species as described by Tozer (2003) and Tozer (2010)." The ELA report has included many discussion points in regard to the analysis of plot	Full response provided in ELA letter 'Response to Department of Planning' dated 13 September 2023.	N/A

	EHG Comments (16/08/23) on ELA report	ELA Action response or recommendation for BDAR amendment	ACS/ Ecologique Response
	data in both the Hager/Steenebeeke excel spreadsheet and the PCT filter tool. The use of the Hager/Steenebeeke tool and the PCT filter tool can be limited on sites which have high levels of disturbance. The reliance on meeting the number of positive diagnostic species to identify the best-fit PCT (e.g. Appendix B of the ELA report for Plot 1), may not be justified given the level of disturbance. While the analysis of species presence and their dominance can assist in assigning the likely best-fit PCT, total numbers of positive diagnostic species aren't always the best indicator, especially when the numbers of positive diagnostic species are so close between PCTs.		
	EHGs advice dated 29 July 2023 has highlighted that the number of positive diagnostic species present on the site is only one component of the analysis for assigning the best-fit PCT. Section 4.2.3.2 of the revised BDAR notes this limitation in the use of positive diagnostic species saying "As can be seen in Table 21 and Table 25, the constituent species in both PCTs are very similar and in the absence of diverse and an abundance of shrub and ground layer species, the use of analytical tools such as the Vegetation classification database PCT filter tool (refer Section 2.2.5) and Hager and Steenbeeke tool used by ELA, are limited."	Full response provided in ELA letter 'Response to Department of Planning' dated 13 September 2023.	N/A

	EHG Comments (16/08/23) on ELA report	ELA Action response or recommendation for BDAR amendment	ACS/ Ecologique Response
	The ELA report compares the results of using both the Hager/Steenebeeke tool and the PCT filter tool. The differences in number of positive diagnostic species between the use of the two tools may indicate that the use of older tools such as the Hager/Steenebeeke tool is based on PCT analysis that is outdated.	All plots undertaken on or near the site have now utilised the Plot to PCT analysis, to use the most recent analysis tool. The Plot to PCT analysis input two plots collected on site and two plots collected in adjacent bushland to the site and two additional plots collected on 8 September. ELA have also used ACS/Ecologique's plot data including the recent one from 8 September which ACS and Ecologique assisted in the field survey work for the plot adjacent to Stanhope Road. The results of all Plot to PCT analysis are provided in Response provided in ELA letter Response to Department of Planning. In summary, the Plot to PCT Tool analysis provided variable results and the less reliability of the Plot to PCT Tool for the analysis of disturbed plots provides support for the use of descriptive attributes to assist in the decision about which PCT is present on a site.	N/A
	Even if PCT 3592 Sydney Coastal Enriched Sandstone Forest was present within Plot 2 in the ELA Report, the plot is outside of the subject site. The plot is located downslope of the site and could reasonably be argued to show a transition area between any TEC's on the site and adjoining area. EHG considers that the plot doesn't necessarily provide data that should be used to draw conclusions in regard to vegetation found on the site.	It is agreed that vegetation not on the same contour is more likely to differ from vegetation on the same contour. There was no opportunity to assess undisturbed vegetation on the same contour directly adjacent to the site. It is believed that while an assessment of vegetation on a different contour is of less value, it still generates information that may assist in understanding the vegetation on the site.	N/A

	Revised BDAR	ELA Action Recommendation	ACS/ Ecologique Action
	The revised BDAR has not provided adequate mapping of the construction and operational footprints to understand the extent of impacts on the site because key impacts have been left out of the assessment like those related to APZ requirements.	Provide mapping which shows the construction and operational footprint within the revised BDAR. The Operational footprint should consider those areas which are subject to ongoing management or maintenance of retained vegetation for the Asset Protection Zone (APZ). It is recommended that the BDAR include the operational footprint with the assumption that vegetation will be managed in accordance with the Bushfire Consultant advice pertaining to the existing retained vegetation. As per Bushfire Letter Re: Lourdes Retirement village – Asset Protection Zone Requirements Dated 28 Sept 2023) that no tree removal is required for APZ compliance, as such the operational footprint will include the understorey management of the area to be retained in the north-east of the site. The maps within the revised BDAR should clearly define the construction and operational footprint.	Construction and operational footprints provided in Appendices N and O of the BDAR
	Figure 3 shows that there are many locally native trees that have not been assigned to a PCT but aren't mapped as landscaping either. It is unclear why these locally native trees have not been included in PCT mapping. They mainly occur in areas where there was not complete removal of vegetation as can be seen in historical aerial imagery and	Recommend that all locally native trees within the site are assigned to a native Plant Community Type. Recommend that locally native trees mapped as landscaping be assigned to a PCT. Revised PCT mapping should be provided in consultation with the revised Arborist report Rev E dated 25 September 2023. Those native trees which	All local native trees were reviewed and Figure 3 reissued to show location of tree types overlying vegetation type they are located in.

	so may be remnant trees of the original vegetation community retained within the current land use.	are local to native PCTs in the area should be assigned to their best-fit PCT. Those trees identified on the Arborist report which are natives, however do not belong to local PCTs such as *Eucalyptus microcorys* (Tallowwood), *Eucalyptus melliodora* (Yellow Box), *Eucalyptus tereticornis* (Forest Red Gum) *Eucalyptus maidenii* (Maiden's Gum) could be described as non-local natives in text within the BDAR. These non-local natives may have been planted, or arisen as regrowthfrom disturbed, non-local soils. However, as the vegetation occurs in a mosaic of potentially remnant vegetation, it should be assigned to the best-fit PCT. As these trees do not typically occur in Sydney Turpentine Ironbark Forest, nor a sandstone community, these trees could be assigned to Sydney Turpentine Ironbark Forest on the basis that other local native Sydney Turpentine Ironbark Forest species occur in the surrounds, and has been assigned to Sydney Turpentine Ironbark Forest based on a conservative approach. Figures throughout report to be updated to reflect inclusion of local natives assigned to a PCT and this action to be included in text within revised BDAR.	Locally native trees have now been allocated to PCTs where appropriate.
	Section 4.3.2.3 of the revised BDAR has provided some discussion on the Justification of PCT selection in regard to the reduced extent of STIF in comparison to that identified in the ELA report. It does not include justification as to why the mosaic of locally native species found across the remainder of the site has not been assigned a best-fit PCT and instead treated as landscaping only despite the prevalence of locally native species per Figure 3.	Section 4.3.2.3 of the BDAR to be amended with text describing the outcomes of the revised vegetation mapping across the entire site and description of assigning local natives to the best-fit PCT.	BDAR Section 2.2 (Native vegetation, threatened ecological communities and vegetation integrity) and Section 4 (Native vegetation, threatened ecological communities and vegetation integrity) have included additional justification of PCT allocation and where appropriate use of the BAM streamlined assessment module for non-local natives.

	The BDAR has used the Streamlined assessment module – planted native vegetation for portions of the site. There are two PCTs (STIF 3262 and BGHF 3136) that could potentially occur on the site in the form of trees or clumps of trees based on their status of being highly cleared and given the descriptions included within the Final Determinations. In this regard, the locally native trees across the site do not comply with the use of the streamlined assessment module on the site.	Recommend that the Streamline assessment module is not used for planted, locally native trees, and instead those locally native trees be assigned to the best-fit PCT, and the full BAM assessment applies.	As above.
	The first question in the decision-making key asks, “Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?” If yes, the Biodiversity Assessment Method (BAM) must be applied and not the streamlined assessment module.	As above, recommend that any locally native trees be assigned to their best-fit PCT, and full BAM assessment applies.	As above.
	Figure 3 of the revised BDAR clearly shows the mosaic of trees on the site that are locally native. Hence, the BDAR must consider whether the trees form part of any likely PCT. It is noted that the ELA report was not commissioned to assess the mosaic of locally native trees and so falls silent on what PCT could be assigned to any mosaic of locally native trees.	As per the above, it is recommended that ACS/Ecologique assign any locally native trees to their best-fit PCT. ELA have since been commissioned to assess the mosaic of trees on the site that are locally native across the site. ELA have produced their own PCT mapping of the site which has assigned any locally native species to the best-fit Plant Community Type despite if they have been planted regrowth or are potential remnants. ELA’s PCT mapping may be appended to the Response to Submissions document, or as an Appendix within the	The planted vegetation that is not allocated to a PCT (and some areas that have been allocated to a PCT) are located in garden beds, courtyards and the like, are demonstrated to be of planted origin (in accordance with the guidelines) and would not naturally occur in this environment (including prior to its disturbance as a retirement village). ACS and Ecologique inspected planted native vegetation within the site (September 2023) and stand by our assessment that the vegetation is not required to be assigned to a PCT.

		BDAR. ELA's PCT mapping may be used to assist in updating Figure 3, and all figures within the BDAR to reflect assigning landscaping trees to a Plant Community Type.	Figure 3 and associated mapping has been updated to reflect the revised PCT mapping
	Given the intergrading between STIF and BGHF, either PCT could reasonably be assigned to a number of locally native trees within the site.	ACS/Ecologique to include all steps taken to assign PCT selection. This may include additional plots taken by both ELA and ACS/Ecologique within and adjacent to the site; The use of the Plot to PCT tool results and supplementary descriptors, and descriptive attributes outlined in ELA's letter- Response to Department of Planning.	The allocation of PCTs and the limitations in doing so have been described by ELA (Appendix F & H) and in the BDAR in Section 2.6 (Limitations). BGHF has been discounted in the BDAR based on the absence of appropriate soil landscape groups from recently available eSPADE data, which has been compared to sites visited by ELA that contain BGHF.
	The STIF Final Determination states "These disturbances have affected the structure and potentially the composition of remnants. For example, the density and average basal diameter of trees in remnants sampled by Benson and Howell (1994) suggested that the removal of large older trees has led to higher densities of smaller trees such that remnants typically have the structure of regrowth forest." And "Remnants of Sydney Turpentine-Ironbark Forest are typically small and fragmented and are susceptible to continuing attrition through clearing for routine land management practices due to the majority of remnants being located in close proximity to rural land or urban interfaces (Benson and Howell 1994; Tozer 2003).	As described, ACS/Ecologique to include any locally native trees into their best-fit PCT. Despite any historical disturbance which has occurred on the site, any regrowth trees should also be included into the Best-fit PCT, as regrowth, may be from potential remnant soils that have moved around the site.	An additional area of understorey regrowth beneath planted non-locally sourced trees has been allocated to STIF in this BDAR. The extent of allocated STIF in the subject land is already considered to represent application of the precautionary principle, i.e., in the absence of adequate and distinguishing data to allocate a PCT with confidence, allocation of PCT ensures the highest assessment possible given it has a much higher sensitivity to biodiversity loss than the local PCT 3592 (which has been allocated confidently elsewhere on the site).
	Applications to the NSW Land and Environment Court demonstrate that there is ongoing pressure to clear STIF in the course of developing private properties or for the	As above individual trees which are locally native should be assigned to their Best-fit PCT. Only those which are not	Not relevant as no vegetation is being cleared for the establishment of Asset Protection Zones.

	establishment of Asset Protection Zones (https://www.caselaw.nsw.gov.au accessed 19/11/2018). 'Clearing of native vegetation' is listed as a Key Threatening Process under the Act." These sections of the STIF Final Determination and the above discussion in relation to the BGHF Final Determination demonstrate that small clumps and even individual trees can be considered as Critically Endangered Ecological Communities.	locally native to the PCTs in the area, should be assigned to a non-local native category or landscaping.	
	This indicates further that it would be appropriate to consider individual locally native trees (Figure 3) in the context of a BDAR as opposed to using the streamlined module for these areas of the site.	Locally native trees should be mapped and assigned to best-fit PCT, which may include STIF and subject to full BAM assessment.	Responded to at questions 3-8
	Given the above comments in relation to the justification of the best-fit PCT, it is considered that the PCTs have not been adequately justified within the BDAR.	As above, PCT selections and justifications should be revised and documented within a revised BDAR.	Responded to at questions 3-8
	The Serious and Irreversible Impact (SAII) assessment for Swift Parrot has not included any discussion regarding trees across the site that are habitat trees for this species. Avoidance of these trees should be a priority for design of the proposal to ensure retention of habitat trees for this species, even outside of the important area habitat map. The information provided for the SAII assessment is incomplete in this regard and instead only focuses on the area mapped as important habitat which is used for generating species credit polygons.	A revised BDAR should provide a SAII assessment for Swift Parrot. The SAII assessment should consider all native vegetation to be removed within the site as potential foraging habitat for this species, and not be limited to the important area of habitat for this species. The SAII assessment should consider any areas which have been proposed by the proponent for retention, including any individual key feed trees proposed for retention.	The Swift Parrot was (and still is) maintained as an ecosystem credit species in the BAM C for clearing of PCT 3592.See section 9.3.1 and Figure 18. Due to the mapped area of important habitat for the species, it has been assessed as a species credit species and offsets calculated conservatively for foraging habitat outside of the mapped habitat (allowed for in ecosystem credits) and by default additional species credit species for areas within the mapped habitat area that will not be cleared (as the habitat area is required to be included in the species polygon).

	EHG's advice dated 29 May 2023 includes commentary that any habitat for the Swift Parrot within the site should be prioritised for avoidance of impacts.	Advice for Swift Parrot – would encourage the approach to be to identify those favoured Swift Parrot feed trees present on site and include any impacted favoured trees as the species polygon for offsetting species credits for Swift Parrot. As there is Important Habitat Mapped areas adjacent to the site and there are favoured trees present; I would think it prudent to include these favoured trees and offset any impacts to them accordingly. This could be included in on map as 'Impacted Favoured Swift Parrot Feed Trees currently outside the Important Mapped Area' Favoured feed trees include winter flowering species such as Swamp Mahogany Eucalyptus robusta, Spotted Gum Corymbia maculata, Red Bloodwood C. gummifera, Forest Red Gum E. tereticornis, Mugga Ironbark E. sideroxylon, and White Box E. Commonly used lerp infested trees include Inland Grey Box E. microcarpa, Grey Box E. moluccana, Blackbutt E. pilularis, and Yellow Box E. melliodora. ELA suggest ACS/Ecologique and the proponent identify those key feed trees for Swift Parrot and, where possible, seek to avoid impacts to foraging habitat across the site for this species.	Preferred foraging habitat trees for the species have been avoided further, noting that foraging habitat trees relating to lerp infestations have not been included as no lerp infestations have been observed in the subject land's vegetation by ACS, Ecologique and ELA. Further information is provided in BDAR Section 5.6.1 Swift Parrot important habitat and Section 9.3 Threatened species at risk of an SAII (Swift Parrot)
	It is unclear the extent and nature of vegetation removal that will be required for creation of APZs on the site as the revised BDAR has not taken these impacts into consideration in the impact assessment. The areas that	The BDAR should include commentary from the Bushfire Consultant regarding the fact that *"The compliance strategy utilises a performance-based approach which is designed as holistic package of bushfire measures but is*	No retained vegetation is being cleared for the establishment of Management Zones as this not required

	have been specified for retention may require the removal of groundcovers, shrubs and some canopy trees to be able to meet the IPA requirements. Management of the site as an IPA will mean the whole site will have a reduced Vegetation Integrity score which has not been taken into consideration in the revised BDAR. Changes such as this would impact on credit calculations and also potentially affect the assessment of SAII.	*not reliant/contingent on a specified APZ or separation from the bushland. The key elements are the building construction and emergency management arrangements."* .Regardless, the site is proposed to have an APZ and be managed as an IPA. Also to include commentary that Bushfire Consultant Provided that for the proposed APZ *"The areas of retained native vegetation will only require minimal maintenance by way of the removal of leaf litter, twigs and debris, therefore, satisfying the requirements of an APZ without the need for any additional tree removal"* The shrub layer is very limited and the groundcover and is generally highly reduced. Small twigs, and leaf litter will require removal to ensure fuel loads are reduced, and ongoing maintenance of the site will may see removal of regeneration. This needs to be considered in perpetuity as a direct impact. Further detail below. Direct Impacts- Asset protection Zone The revised BDAR is to include management zone for direct impacts to vegetation for the ongoing maintenance of the understorey advised by the Blackash Consultant letter dated .28 Sept 2023. Consider as direct and on-going impact how the management of these areas will impact on the vegetation in perpetuity. Further, need to account for loss of stem size class, which would eventually reflect loss of canopy cover or large sized	(Refer to Appendix J. Black Ash- Response to Department of Planning-Asset Protection Zone) The BDAR has included two management zones, which the Applicant will voluntarily offset to ensure the existing maintenance regime in the northern bushland area (adjacent to the electricity easement) may continue, and if necessary maintenance in the southern bushland area adjacent to the fire access road (Lourdes Road).

		trees in future all for these aspects should be considered and should be accounted for in the BAMC. i.e. reducing the future values for canopy cover, stem size classes, leaf litter, large woody debris.	
	In addition, retention of native vegetation on the site to avoid and mitigate impacts to threatened entities will conflict with future APZ requirements. Plans outlined in the revised BDAR for mitigating impacts to any Threatened Ecological Communities (TECs) by retaining and enhancing native vegetation on site are inconsistent with tree and fuel load management.	Tree regeneration /stem size class will be reduced to ensure fuel loads are managed, consider how trees might not be being replaced in the long term Trees could be planted at such a density and separation (in consultation with Bushfire Consultant) to ensure revegetation is not inconsistent with the IPA requirements.	Refer to updated BDAR section 2.2.6 which accounts for management zones.
	EHG considers that much of the site and possibly some adjoining areas will be affected by indirect impacts due to the increased intensity of use and thus asserts that biodiversity impacts of the PP have been underestimated. Trees within proximity of the built form are likely to be removed for construction, or their health will be compromised post-construction. It is unreasonable to expect that trees that form TECs on the site will be retained in the APZ.	Suggest that the TPZ's of trees to be retained within the APZ are avoided where possible . Where not possible consider mitigation measures in the revised BDAR. Construction fencing should be erected outside the TPZ of trees in consultation with Arborist to ensure no impact to the structural root zones of trees where possible.	Not all TPZs could be avoided, mitigation measures suggested including onsite presence of a qualified arborist during construction works. Refer to the mitigation measures section 8 of the BDAR. Trees that will be cleared for the proposal are not considered to be constituents of any TECs, this is evidenced in the historical analysis and records provided in Appendix C, D and E.
	Given the proposed seniors living use, indirect impacts will be amplified by active management of trees for safety and bushfire protection reasons. The understorey will also be limited, inhibiting recruitment of native plants across the site. The requirement to retain bushland may be unlikely given APZ requirements and in the context of the proposed intensification of use and ongoing management	Direct impacts incurred by the APZ addressed above. Consideration of indirect impacts from weed sources, fertilisers or herbicide used for landscaping be included into BDAR, and document any mitigation measures proposed to reduce any likely impacts which may result. Indirect impacts and mitigation measures, including	Direct impacts are addressed above Indirect impacts refer to Section of the BDAR

	of the site, including the use of fertilisers and weed sources resulting from the landscaping of the site.	identification of which stage the indirect impact may occur to be included as a table within the BDAR.	
	A number of mitigation measures in Table 38 of the revised BDAR are in the planning phase. It is questioned whether the full extent of the impacts are understood if the mitigation measures have not been identified. Prescribed impacts have not been adequately assessed given the proposal for extensive excavation on the site. Changes such as these are likely to have impacts on runoff, water quality and quantity, all of which have not been taken into consideration in the mitigation of such impacts.	The mitigation measures table will be reviewed by ELA. The review will focus on ensuring that all direct and indirect impacts expected by the proposal have been identified, assessed for the planning phase, construction, and operational phases and in perpetuity impacts of the project. ELA will review the mitigation measures proposed and provide additional input to mitigate residual impacts and or potential impacts.	Refer to Section 8 of the BDAR for updated table. Additional information has been provided in Appendices K, L and M, which demonstrate that prescribed and indirect impacts are understood and can be appropriately avoided, minimised, and mitigated.
	The removal of some Ecosystem Credit Species (ECS) has not been adequately justified. It should be noted that the lists of ECS generated by the BAM-C will be in error if the correct PCTs have not been identified on the site.	The BAMC to be updated to reflect the updated vegetation mapping and PCT selections on site. All ecosystem credit species require retention within the BAMC, unless they have a clear geographic limitation or habitat constraint which is not present or relevant to the site. Similarly, the species credit species which have clear geographic limitation or habitat constraint can be removed from the BAMC, or if the habitat is degraded to the extent that the species is unlikely to utilise the site. The reasons for any species credit species exclusion should be justified within text.	The BAM-C has been updated to reflect the updated vegetation mapping and PCT allocations and justifications provided. Three ECS have been excluded from the BAM-C. Two are wetland species and one is dependent on lerp infestations, all habitat requirements are absent from the subject land. Should these species have been maintained in the BAM-C it would have no effect on the BAM C calculations. The ECS list generated by the BAM-C has appropriately considered all ECS for PCT 3592 and PCT 3262.
	The removal of some Species Credit Species (SCS) has not been adequately justified. The number of trap nights for microchiropteran bats is not compliant with the requirements of ‘ Species credit’ threatened bats and their	ELA to review and provide comment on the species credit species retained/removed in the BDAR and to review the justifications provided.	The justification of SCS has been updated to include the BAM habitat constraints and the BAM geographic constraints, which compliantly exclude SCS.

	habitats: NSW survey guide for the Biodiversity Assessment Method (OEH 2018). The minimum number of acoustic detection trap nights is 16.	Only those species credit species which have a habitat constraint listed, geographic limitation listed which are not relevant to the site can be excluded from the assessment. Any species credit species which are determined unlikely by ACS/Ecologique to occur on site due to the habitat constraints or microhabitats are being degraded to the point that the species is unlikely to use the subject land as per Section 5.2.3 of the BAM should be adequately identified, documented, and justified within the BDAR. All surveys undertaken for species credit species should be included in the BDAR, if the correct number of trap nights were not compliant, species presence is to be assumed. In particular, there is likely to be habitat for one of the microchiropteran bats, *Chalinolobus dwyeri* (Large-eared pied bat) within proximity to the site. *Chalinolobus dwyeri* (Large-eared Pied Bat): The habitat constraint listed for this species in the Threatened Biodiversity Database Collection (TBDC) is 'Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.' .To determine the presence of potential cliffs, escarpments, rocky areas etc., ELA have provided a landscape analysis which utilises mapping of contour lines, slope and Hillshade. Using this information an escarpment in this analysis was determined	Additional information has been provided for SCS where habitat is absent or degraded to further justify the assessor(s) decision to discount SCS (see BDAR Table 29). The limited Yangochiropteran surveys has been acknowledge in the BDAR and it has also been noted that additional surveys are required to discount this species. In the interim, the large eared pied bat has been assumed present and an offset obligation determined in the BAM C. The eastern pygmy-possum has also been assumed present, due to the increased area of PCT 3592 (PCT mgm zone) entered into the BAM C, and this species tolerance of disturbed sites.

		by selecting slopes greater than 45 degrees. As escarpments are likely to be present within 2 km of the subject land, a 2 km buffer was applied to the escarpments, and found that the 2 km buffer from the defined escarpment does intersect with the subject site. Breeding habitat for this species is 'Potential breeding habitat is PCTs associated with the species within 100m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings'. There do not appear to be escarpments within 100m of the subject land. Whilst this species could be ruled out for breeding habitat, as the correct number of survey nights for this species are lacking, this species cannot be determined to be definitely present or absent. Therefore, to undertake a conservative approach, it may be appropriate to assume that this species is present for foraging habitat only for PCTs associated with this species, of which PCTs for Sydney Turpentine Ironbark Forest and Sydney Coastal Enriched sandstone Forest are both associated with Large-eared Pied Bat. Large-eared Pied Bat is also a candidate for SAII, however, only impacts to breeding habitat are SAII. This should be documented within the BDAR. It is suggested that any trap nights not met within the BDAR should be noted and the correct number of trap nights be completed for subsequent SSDA.	

	Similarly, the amount of survey effort for birds would not be adequate to be able to exclude any species from the list of SCS. Details on the time of day have not been included. It is also noted that the lists of SCS generated by the BAM-C will be in error if the correct PCTs have not been identified on the site.	In lieu of inadequate survey effort for species credit birds, these species must be assumed present and species polygons created and subsequent species credits generated. Approach to be confirmed between ACS/ Ecologique and proponent.	Refer to Section 5 of the BDAR for the revised assessment of SCS Details of the times that assessors were on the site and birds surveyed has been provided in table of the revised BDAR. Additional pre-dawn / dusk surveys would provide additional certainty, however the subject site does not provide habitat for species credit species birds as justified in the BDAR. As noted earlier, the SCS BAM C list has been generated correctly for PCTs 3592 and 3262.
	Given the above concerns with the identification of the full extent of PCTs on the site, the identification of direct, indirect and prescribed impacts may not be complete and hence the avoidance of impacts will need to be revised.	ACS/ Ecologique and proponent to provide additional avoidance of vegetation at the north of the site and selected avoidance of other additional key feed trees for Swift Parrot. This also requires all assessment of impacts, prescribed impacts, SAII assessments to be revised.	Direct impacts have been further avoided (refer BDAR Section 7). Indirect impacts have been further detailed in Section 8 of the BDAR.
	Any assessment of SAII entities cannot take place until the identification of PCTs, ECS and SCS on the site has been undertaken in accordance with the BAM.	Following the revision of vegetation mapping and PCT selection across site, the SAII section within the BDAR should be updated to include an assessment on SAII candidate species, such as Sydney Turpentine Ironbark Forest.	The SAII assessment has been amended to decrease the areas of impacts for STIF and the swift parrot, and have included an assessment of the large-eared pied bat due to the very marginal potential for the species to forage at the site (and the assumption of species presence).
	The revised BDAR has identified entities on the site which meet the principles and criteria for SAII. However, as the revised BDAR has not identified the full extent of PCTs on the site, the complete picture of indirect, direct and	The BDAR should be revised to include all candidate SAII entities which occur on site or have the potential to occur on site. ELA anticipate that an SAII assessment will be required for Sydney Turpentine Ironbark Forest which	As above

	prescribed impacts cannot yet be accounted for. In this regard the credit calculations are likely to be an underestimate and the assessment of SAII cannot be made nor any conclusions on the extent of SAII impacts.	includes any direct and on-going impacts (such as continued understorey management for APZs).	
	Given the lack of adequate information, it remains unclear what the impacts of the PP will be on local biodiversity values and if subsequent development applications (DAs) would be able to be supported pursuant to s.7.16 of the Biodiversity Conservation Act 2016 (BC Act).	The BDAR should be updated to include those local natives which were previously included in the streamlined planted native vegetation module and assign to their best-fit PCT. PCT selection should be updated to provide clear justification and steps taken to determine the PCT selection. This may include, the use of additional plots undertaken by both ACS/Ecologique and those plots undertaken by ELA. It may also include the use of historical aerial imagery, existing landscape plans, and also the use of supplementary and descriptive attributes. Following the vegetation mapping updates, suggest that the BAMC is subsequently updated to produce list of ecosystem credit species and species credit species associated with the selected PCTs. All ecosystem credit species require retention within the BAMC, unless they have a clear geographic limitation or habitat constraint which is not present or relevant to the site. Similarly, the species credit species which have clear geographic limitation or habitat constraint can be removed from the BAMC, or if the habitat is degraded to the extent that the species is unlikely to utilise the site. The reasons for any species credit species exclusion should be justified within text.	The BDAR has been substantially updated to provide additional information for assessment of the planning proposal in line with recommendations provided by ELA. This has been updated by using the information provided by ELA which utilised the Plot to PCT tool, and supplementary descriptors found in the final determination for Sydney Turpentine Ironbark Forest. This has been updated by using the information provided by ELA which utilised the Plot to PCT tool, and supplementary descriptors found in the final determination for Sydney Turpentine Ironbark Forest. The BDAR has also been updated following the revision of PCT mapping to capture ecosystem credit species associated with PCT 3592 and 3136. Species credit species have also been updated in line with these changes. A species polygon has bene included for Swift Parrot which includes foraging habitat for this species. A species polygon has also been included for Large-eared Pied Bat and credit requirements generated for impact to foraging habitat for this species. Prescribed impacts and indirect impacts from the PP have also been updated within the BDAR and mitigation

		Impact assessments should be updated to include impacts incurred for the removal of vegetation for the construction footprint, and direct impacts incurred from the on-going management of understorey vegetation. All direct impacts, ongoing impacts and indirect impacts are to be identified and change in vegetation integrity to apply to all direct impact categories. The biodiversity credit calculations should be updated to reflect the inclusion of credits generated from the maintenance of understorey. Prescribed impacts section of the BDAR should be updated to capture and consider any impact incurred from stormwater run-off into areas adjacent to the site. The impacts should be considered following ACS/ Ecologique's review of the concept stormwater management plan (SK-0140 Rev B and civil engineering plans (SK0120 Rev D, SK0130 Rev B, SK0131 Rev B, SK0132 Rev B and Civil Engineers letter Document refence S22172-LTR0003 dated 28 Sept 2023. The prescribed impact section should also review impact on geology, bushfire management, or any other direct or indirect impacts to threatened which may utilise the site, in particular, prescribed impacts should include focus on prescribed impact of habitat connectivity for Swift Parrot. ELA suggest that the BDAR footprint is updated across all maps and to reflect the retention of native PCTs to the north of the site and the retention of additional key feed trees which may provide potential foraging habitat for Swift Parrot.	measures have been provided which addresses impacts during construction and during the operational phase of the project. A BDAR will be prepared to support the future Development Application, at which time additional compliant targeted species surveys would be completed.

		The BDAR should demonstrate how the proponent has further avoided and mitigated impacts to native vegetation and prescribed impacts by further revising the impact footprint and nominating additional areas for retention. These changes within revised BDAR should provide a comprehensive assessment of all impacts to local biodiversity across the site.	

LOURDES RETIREMENT VILLAGE

95 STANHOPE ROAD, KILLARA

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Prepared by :

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Final Report October 2023

Angophora costata on sandstone outcropping | First Avenue, Lourdes Retirement Village

Lourdes Retirement Village - Biodiversity Development Assessment Report

prepared for

Levande Pty Ltd

Prepared for

Levande Pty Ltd

C/- Nathan Donn
Senior Development Manager

Revision Schedule

Rev No	Date	Details	Issued to
1	04.05.2023	BDAR for submission	Levande Pty Ltd
2	12.07.2023	BDAR amended in response to EHG submission	Levande Pty Ltd
3	05.10.2023	BDAR amended in response to EHG submission	Levande Pty Ltd

Summary

ACS was engaged by Levande to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed development at Lourdes Retirement Village in Killara. The subject land is the assessable area which includes Lot 21 and Lot 22 in Deposited Plan 634645, in the Ku-ring-gai Local Government Area (LGA).

The proposed development will redevelop the site, retaining its use as a retirement village with retirement aged care facilities, and introduce new town houses. The development is classified as a State Significant Development under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

This BDAR has followed the Biodiversity Assessment Method 2020 (BAM, established under Section 6.7 of the NSW *Biodiversity Conservation Act 2016* (BC Act) and has been completed using the *Biodiversity Development Assessment Report Template* (2022).

This BDAR describes the biodiversity values within the subject land and development site, describes the impacts and outlines the measures to be taken to avoid, minimise and mitigate impacts to the Plant Community Types and threatened species habitat present within the subject land, development footprint and development site.

The BDAR provides the number of biodiversity credits that would be required to be retired to offset the residual loss of biodiversity from the impacts of the development as described.

The proposed development involves direct impacts to the biodiversity values within the development footprint, and indirect impacts within the development site. Following avoidance and mitigation, the residual direct impacts were calculated in accordance with the BAM by utilising the BAM Credit Calculator.

Requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) have been addressed in this BDAR.

Consultation

Consultation with the Department of Planning and Environment (DPE) - Environment and Heritage Group (EHG) has included EHG's attendance at the village to assist in finalising the BDAR for submission with the planning proposal.

This BDAR has responded to preliminary and later feedback provided by EHG (August and September 2023 respectively). A detailed response matrix has been provided separately to this report. Key areas of additional information provided within this BDAR include the following:

- Plant Community Type (PCT) allocation
- The potential for threatened ecological communities (TECs) to occur within the subject land
- Serious and Irreversible Impacts (SAII) assessments
- Explanation, and offsetting, of asset protection management
- Further avoidance of impacts to biodiversity values

Ecologique and Eco Logical Australia (ELA) were both engaged to provide peer review and assist in finalising the BDAR.

Development Background

This BDAR has been prepared to support a Planning Proposal that will amend the current zoning to enable the proposed redevelopment of the Lourdes Retirement Village (the Village).

Redevelopment of the Village is necessary as the existing aging buildings (originally constructed in the early 1980s) do not provide services and facilities that are competitive with market demand nor compliant with current Building Codes, Senior Living or Bushfire standards.

The proposed development footprint will involve the following:

- Demolition of single and two storey residential buildings;
- Construction of multi-storey independent Living units and town houses buildings

- restoration of the existing single storey chapel;
- Construction of new access roadways and realignment of internal roadways;
- Associated services;
- Vegetation clearing; and
- Landscaping.

If the Planning Proposal is endorsed, the proposal will be assessed by the Department of Planning and Environment (DPE) as State significant development (SSD) under Part 4 of the EP&A Act.

SSDs are required to assess any biodiversity impacts associated with the development in accordance with the *Biodiversity Conservation Act 2016* and the Biodiversity Assessment Method (OEH 2020), including the preparation of a Biodiversity Development Assessment Report (BDAR), unless a waiver is granted, or the site is on biodiversity certified land.

Measures To Avoid And Minimise

Given the significant landholding and obligations to house existing residents during the development, alternate sites were not considered appropriate nor feasible for the proposal objectives.

The proposal has been located within the existing developed footprint and has avoided impacts on the site's biodiversity values. In accordance with Section 7.1.2 of the BAM the proposal's unavoidable impacts will occur in areas that have low or no biodiversity values and in vegetated areas that are in the poorest condition and have no or very limited habitat for threatened species.

During the design development, various possibilities were explored regarding the development layout of the site. This comprehensive evaluation took into account the potential opportunities and constraints presented by the location, aiming to develop a place-based master planned renewal of the village suitable for seniors living.

This has been achieved through the following strategies:

- Relocation and realignment of the western entrance, enabling the retention of the subject land's remaining *Syncarpia glomulifera* (Turpentine) trees and areas mapped as comprising the critically endangered ecological community Sydney Turpentine Ironbark Forest;
- Redesign and reduction of southern townhouses to retain more mature native vegetation along the southern boundary and thereby minimising impacts to Swift Parrot feed trees (adjacent mapped important habitat area for the species) and reduced clearing of PCT 3952;
- Modification of the Northeastern Independent Living Apartment Building to avoid and minimise impact on the adjacent vegetation to the north, include native vegetation allocated to the critically endangered ecological community Sydney Turpentine Ironbark Forest.

The outcome of design amendments more specifically includes the following:

Vegetation type	Total area (ha)	Avoided (ha)	% avoided	Impacted (ha)	% impacted
PCT 3262	0.17	0.17	100	0	0
PCT 3592	0.78	0.56	71.9	0.22	28.1
Landscaping (native)	0.63	0.32	50.8	0.31	49.2
Total native vegetation	**1.58**	**1.05**	**66.5**	**0.53**	**33.5**
Landscaping (exotic)	1.13	0.11	10.2	1.02	89.8

Plant Community Types And Threatened Ecological Communities

Two plant community types (PCTs) have been allocated to remnant and planted native vegetation with the subject land:

- Sydney Coastal Enriched Sandstone Forest - PCT 3592
- Sydney Turpentine Ironbark Forest - PCT 3262

PCT 3592 occurs as remnant native vegetation along the southern and southeastern peripheries of the subject land and as a smaller area of regrowth on sandstone outcropping within the centrally development site portion.

Additional areas of planted local native tree species throughout the subject land have been allocated to PCT 3592 due to the predominance of sandstone geologies and soils this PCT is known to occur on. PCT 3592 is not associated with any threatened ecological communities (TECs).

PCT 3262 has been mapped by OEH (2016) in two locations in the subject land, in the western areas of the site. Both areas are the only locations in the subject land that contain *Syncarpia glomulifera* (Turpentine).

Planted native vegetation and potentially remnant vegetation in a further two locations along the northern boundary of the subject land (adjacent Stanhope Road) has been allocated to PCT 3262.

PCT 3262 is listed as a TEC under both the BC Act and Commonwealth EPBC Act, although it does not meet the diagnostic and condition thresholds to be considered the EPBC listed TEC. PCT 3262 is also a listed serious and irreversible impact (SAII) entity.

PCTs 3262 and 3592 have very similar characteristics, which has proven difficult to discern between due to the highly modified environment in which they occur and lack of distinguishing data. Due to this lack of certainty, the use of PCT 3262 ensures the highest level of assessment (e.g., SAII assessment) and higher offset obligations as it has a much higher sensitivity to biodiversity loss and risk weighting than other potential PCTs (i.e., PCT 3592).

Threatened Species

The subject land contains approximately 0.22 ha of mapped important habitat for the threatened swift parrot, which is listed under both the BC and EPBC Acts. Through design revisions, this area has been avoided along with preferred foraging tree species that are located outside of the mapped habitat area.

The subject land is located marginally within a 2km radius of cliffs and rock escarpments, which may potentially contain caves and breeding habitat for the threatened large-eared pied bat (which is also listed under both the BC and EPBC Acts). The subject land’s timbered areas potentially provide foraging habitat for the species.

Relatively small areas containing foraging habitat for the swift parrot and large-eared pied bat will be cleared from within the developed areas central to the subject land. Until such a time that further targeted surveys to determine species presence of absence, these species have been assumed to be present and an offset obligation calculated in the BAM calculator.

The eastern pygmy-possum has also been assumed present. This species is listed as vulnerable under the BC Act and is known to tolerate disturbed sites. Subsequently an offset has also been generated for this species until further surveys can be confidently discount or confirm its presence.

Impact Assessment

Approximately 0.22 ha of native vegetation allocated to PCT 3592 and areas of assumed threatened species habitat will be directly impacted on by the proposal.

The proposal has been designed to avoid clearing in all areas allocated to PCT 3262 and in remnant PCT 3592. However, the Applicant is voluntarily offsetting areas of both PCTs (management zones) so that the Village’s existing maintenance and management of its peripheral bushland can continue and be extended along the southern boundary adjacent its residences if deemed necessary.

No clearing of vegetation from these ‘management zones’ is proposed, only the removal of leaf litter and smaller debris (<10cm diameter). The exception being where canopy cover is impacted by lopping and trimming of trees located beneath the electricity easement in the north of the site. This is not undertaken by the Applicant, instead is done routinely by the utility provider (or contractors of) and therefore is out of the control of the Applicant.

Direct impacts and offset obligations calculated by the BAM C are summarised below:

Direct impact	Extent (ha)	Credits required
Clearing of planted native vegetation allocated to PCT 3592	0.22	2
PCT 3592 Management zone	0.36	4
PCT 3262 Management zone	0.34	4
Total ecosystem credits		**10**
Clearing of swift parrot foraging habitat incl. PCT 3592 management zone	0.24	10
Clearing of large-eared pied bat foraging habitat incl. PCT 3592 management zone and PCT 3262 management zone	0.92	15
Clearing of eastern pygmy possum habitat incl. PCT 3592 management zone	0.92	9
Total species credits		34

PCT 3262, the swift parrot and the large-eared pied bat are identified Serious and Irreversible Impact (SAII) entities and an SAII assessment in accordance with Section 9.1.1 of the BAM is provided to assist the consent authority to evaluate the nature of an impact on a potential entity at risk of a SAII.

Prescribed impacts have been assessed in accordance with Section 8.3 of the BAM and the likelihood of the proposal to result in a prescribed impact is considered a low risk.

This assessment has determined that the proposed development is unlikely to have a significant impact on any of the MNES and a referral under the EPBC Act is not required.

Mitigation Measures

Mitigation of indirect impacts on biodiversity values during construction will be specified within a project Construction and Environmental Management Plan (CEMP), which at a minimum shall include the following:

- Erosion and sediment controls;
- Dust and noise suppression;
- Pre-clearance and clearance processes to achieve the following, but not limited to, objectives:
  - protection of retained native vegetation and habitat
  - prevention of injury/mortality to all fauna
  - prevention of the spread and/or introduction of weeds and pathogens
- Mitigation of operational indirect impacts on biodiversity values will be integrated into the detailed design of the proposal, which includes, but is not limited:
  - Stormwater management and protection of downstream aquatic ecosystems
  - Light spill into the adjacent bushland and native fauna habitat
  - Landscape management (including native landscaping establishment and ongoing weed control)

Future Development Assessment

Prior to commencement of the proposed development, development consent is required. As the proposed development including seniors living housing, the development application will be submitted as a State Significant Development (SSD).

An updated BDAR will be prepared for submission with the SSD application. At this time, further detail will be possible as targeted surveys for threatened species will have been completed and additional design detail will be available.

Contents

Tables

Figures

Shortened forms

BAM	Biodiversity Assessment Method (NSW)
BAM-C	BAM calculator
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BC Reg.	*Biodiversity Conservation Regulation 2017* (NSW)
BDAR	Biodiversity Development Assessment Report
Biosecurity Act	*Biosecurity Act 2015* (NSW)
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offsets Scheme
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DA	Development Application
DBH	Diameter at breast height
DCP	Development Control Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Cwlth)
DPE	Department of Planning and Environment (NSW)
EHG	Environment and Heritage Group of the DPE
EPBC Act	*Environment Protection Biodiversity and Conservation Act 1999* (Cwlth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
FM Act	*Fisheries Management Act 1994* (NSW)
HTW	High threat weed
IBRA	Interim Biogeographic Regionalisation of Australia
KTP	Key threatening process
LEP	Local Environment Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance
PCT	Plant community type
SAII	Serious and Irreversible Impact
SEARs	Secretary’s Environmental Assessment Requirements
SEPP	State Environment Protection Policy (NSW)
TEC	Threatened Ecological Community
TBDC	Threatened Biodiversity Data Collection

Declarations

i. Certification under clause 6.15 *Biodiversity Conservation Act 2016*

The following signatories certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the *Biodiversity Conservation Act 2016* (BC Act).

Name: **KATHRYN DUCHATEL**

Date: 5October 2023

BAM Assessor Accreditation no: **BAAS17054**

This BDAR has been prepared to meet the requirements of BAM 2020. **Appendix P** provides an assessment of compliance with the minimum information requirements outlined in BAM Appendix K.

ii. Details and experience of author/s and contributors

Authors and contributors

Name	Position/Role	Tasks performed	Relevant qualifications
Peter Stricker	Director, ACS Environmental Pty Ltd	BAM field surveys PCT analysis BAM-C analysis Report preparation Rev. 1 & Rev. 2	BSc. (Hons) (Syd) BAAS18125
Kathryn Duchatel	Director, écologique	BAM field surveys PCT analysis Report preparation Rev. 1 - Rev. 3	BSc. Env. (Macq) BAAS17054 EIANZ CEnvP #601
Amy Rowles	Director, Corymbia Ecology	Microbat survey	B. Sc. (Hons) Ecology PhD Candidate 'Seasonal Migration of Australian Tree Roosting Microbats'

iii. Conflict of Interest

I, KATHRYN DUCHATEL, declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest.

This declaration has been made in the interests of full disclosure to the decision-maker. Full disclosure has also been provided to the client.

Signature:

Date: 5 October 2023

BAM Assessor Accreditation no: **BAAS17054**

Stage 1: Biodiversity Assessment

1. Introduction

1.1 Proposed development

1.1.1 Development overview

Lourdes Retirement Village (the Village) is nestled beside bushland at the end of Stanhope Road, Killara. The site has been developed throughout various uses since the 1910's with construction of the current Village arrangement commenced in 1983 and continued throughout the 1980's.

The Village now requires significant renewal to provide modern seniors housing. The existing housing is dated, has limited accessibility with many of the dwellings not having lift access and the gradient of streets and pathways provide poor pedestrian connectivity.

From a bushfire perspective, the renewal of the site as envisaged by the Planning Proposal will deliver a significantly enhanced bushfire safety outcome for the existing and future residents through improved access/egress from the site, improved bushfire construction of new buildings, and the location of vulnerable seniors housing residents further from the bushfire risk. In particular, the additional access points to the site are required to support evacuation during a bushfire event (if necessary) and have been located to avoid Biodiversity values to the greatest extent possible.

Levande Pty Ltd (the proponent) proposes to redevelop the Village to bring the facility into the modern era and expand the current facility to meet the growing demand for seniors' accommodation.

This Biodiversity Development Assessment Report (BDAR) has been prepared to support the Planning Proposal that will amend the current zoning to enable the proposed redevelopment.

If the Planning Proposal is endorsed, the proposed redevelopment will be assessed by the Department of Planning and Environment (DPE) as State significant development (SSD) under Part 4 of the EP&A Act, for the proposed development.

1.1.2 Location

The Village is located approximately 12 kilometres north the Sydney Central Business District. Relevant site details are summarised below and are illustrated in Figure 1.

Street address	95 Stanhope Road, Killara
Legal identification	Lot 21 DP 634645 & Lot 22 DP 634645
Local Government Area (LGA)	Ku-ring-gai
Local Government	Ku-ring-gai Council
Environmental Planning Instrument	Ku-ring-gai Council Local Environment Plan 2015
Site area	Approximately 5.6 ha

Legend

Subject land

N

0 30 60 120

m

Lourdes Retirement Village

Figure 1. Subject land

Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 20 June 2023

Data drawn: 18 July 2023

1.1.3 Proposed development

The proposed development is shown in Figure 2 and will involve the following:

- Demolition of single and two storey residential buildings;
- Construction of multi-storey residential buildings and a single storey chapel;
- Construction of new access roadways and realignment of internal roadways;
- Associated services;
- Vegetation clearing; and
- Landscaping.

The proposal's construction footprint and staged construction plans are provided in **Appendix N** and operational footprint is provided in **Appendix O.**

Figure 2. Master Plan (September 2023)

1.1.4 The subject land

Historical landuse

Before its current use as the present-day Lourdes Retirement Village complex, the subject land was historically used as follows:

- Headfort School, which:
  - Opened in 1918 and by 1921 contained two connected two-storey buildings, surrounding gardens, a tennis court,
  - Contained two full playing fields, a smaller field, swimming pool and a mini rifle range by 1923, and
  - Operated until 1935 (under ownership of the Congregational Union 1927-1935)
- NSW Australian Women's Army Service (AWAS), who used the site as:
  - A training course for AWAS recruits, and
  - A training school for AWAS NCOs until 1944
- Hospital:
  - From 1946 to 1967 as a tuberculosis hospital, and
  - An acute after-care facility for patients from the Mater Hospital North Sydney

An assessment of historical and heritage imagery (as relevant to biodiversity) is provided in Section 2.2.4 and imagery provided in Appendix C.

Current setting

The subject land currently operates as a retirement village, consisting of numerous residential (independent living) dwellings, a nursing home and an amenities building including an administration centre, swimming pool and spa areas.

Natural vegetation structure and species composition have been extensively modified due to historical clearing and land use and both historical and contemporary landscaping (i.e., historical landscaping refers to non-locally occurring native species that are evident in historical imagery as far back as 1950).

More recent landscaping (i.e., that associated with the existing development) has been planted mainly along the surrounding boundaries of internal roadways and grassy garden areas and include local and non-local native species as well as exotic ornamental species.

Topography

Based on the supplied survey plans, the maximum elevation relief across the site, between the northern relatively level portion and the lower lying southernmost road is about 14m. Beyond the southern and eastern site boundaries, the steep bushland covered hillsides grade between 15° and 45° (JK Geotechnics 2023).

The site's elevation is described by prensa (2023) as: steep, falling between 104m AHD on the northern boundary and 95m AHD on the southern boundary; and between 105m AHD on the western boundary, rising to approximately 108m AHD, before declining to approximately 99m AHD on the eastern boundary.

JK Geotechnics (2022) describe the site further as follows:

- Along the northern and northeastern site boundaries, batter slopes grading between 26° and 35° and up to 3m high were present. Beyond the toes of the batter slopes, the ground surface gently graded between 2° and 3° towards Stanhope Road (the location of unmapped native vegetation).
- To the south and east of the northern relatively level portion of the site, surface levels typically fall at grades between 2° and 12°. This portion of the site is terraced by numerous retaining

walls, up to 3m high. Batter slopes generally between 10° and 25° and up to approximately 2.5m high were also present across the lower sloping portion of the site.

- The neighbouring property to the west of the site (91 Stanhope Road) contained a two-storey brick residence, which was set back approximately 1m from the common boundary. The neighbouring surface level was about 0.4m lower than the subject site.

Soils and geologies

The 1:100,000 geological map of Sydney (Geological Survey of NSW, Geological Series Sheet 9130) indicates the site to be underlain by Hawkesbury Sandstone. Generally, boreholes drilled by JK Geotechnics (2022) encountered pavements and/or fill, overlying residual clays, then sandstone bedrock at relatively shallow depths.

Soil landscape mapping indicates the north-western site portion as 'residual 'Lucas Heights' Soil landscape series that is characterised by gently undulating crests and ridges on plateau surfaces of the Mittagong Formation where rock outcropping is usually absent (Chapman & Murphy 1989).

The lower and eastern sections of the subject land appear to be more associated with Hawkesbury Sandstone sediments where the colluvial 'Hawkesbury' Soil Landscape Series is characterised by rolling hills on Hawkesbury Sandstone including rock outcropping with rocky benches, broken scarps and boulders (Chapman & Murphy 1989).

JK Geotechnics (2023) found sandstone rock outcrops and exposed sandstone cut faces between 1.2m and 1.6m high are exposed across the site.

1.2 Biodiversity Offsets Scheme entry

The Biodiversity Conservation Regulation 2017 (BC. Reg.) sets out threshold levels for when the Biodiversity Offsets Scheme will be triggered. The threshold has 2 elements:

- Whether the amount of native vegetation being cleared exceeds an area threshold
- Whether the impacts occur on an area mapped on the Biodiversity Values Map published by the Environment Agency Head.

If clearing and other impacts, including biodiversity impacts prescribed by clause 6.1 of the BC. Reg., exceed either trigger, the Biodiversity Offsets Scheme applies to the proposal.

1.2.1 Area threshold

The minimum lot size under the Ku-ring-gai LEP for both lots is 850m^2 (noting that the smallest lot size is used when determining the area threshold).

The area threshold for Lots smaller than 1 ha in size is 0.25 ha (i.e., clearing of native vegetation 0.25 ha or more exceeds the Scheme’s area threshold).

The total area of native vegetation that is identified as potentially remnant and is proposed to be cleared is marginally less than 0.25ha in extent (not including planted native vegetation to be cleared).

1.2.2 Biodiversity Values Map

The initial design footprint resulted in clearing of native vegetation from land mapped as containing Biodiversity Values (BV).

Design iterations (refer Section 7) have avoided clearing vegetation from BV mapped land and therefore this trigger no longer applies to the proposed development.

1.2.3 State significant development

Regardless of whether the proposed development triggers the Scheme’s threshold, as it will be assessed as SSD, Secretary Environmental Assessment Requirements (SEARs) will be issued. The SEARs will require that potential impacts on biodiversity values be assessed through application of the BAM and a BDAR be prepared.

1.3 Matters of national environmental significance

Four matters of national environmental significance have been identified as potentially occurring on or utilising the subject land (see Table 1).

Table 1. EPBC Act matters of national environmental significance

MNES	Description	Significant Impact upon a MNES likely? (Y/N)
PCT 3262 Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	Occurrences of the Turpentine–Ironbark Forest in the Sydney Basin Bioregion ecological community are considered to be part of the nationally listed TEC if patches are in good condition. Good condition is generally determined as: ▪ the vegetation has some characteristic components from all structural layers (tree canopy, small tree/shrub midstorey, and understorey); and ▪ the tree canopy cover is greater than 10%; and ▪ the patch size is greater than 1 ha.	No. The patch size is not >1 ha (refer Section 4.4).
PCT 3136 Blue Gum High Forest in the Sydney Basin Bioregion	Occurrences of the Blue Gum High Forest of the Sydney Basin Bioregion ecological community are considered to be part of the nationally listed TEC if they are greater than one hectare in size and: ▪ have a canopy cover greater than 10%; or ▪ have a canopy cover less than 10% and occur in areas of native vegetation in excess of 5 ha	No. Floristic survey did not find evidence of this TEC occurring within the subject land (refer Sections 4.1 and 4.3).
Chalinolobus dwyeri Large-eared pied bat	Vulnerable species	No. The subject land does not provide habitat for the species and no escarpments identified on or within 100 m of the subject land. (refer Section 5.6).
Lathamus discolor Swift Parrot	Critically endangered species	No. The subject land provides potential foraging habitat, which will not be significantly impacted (refer Section 5.6)

This assessment has determined that the proposed development is unlikely to have a significant impact on any of the MNES listed in Table 1 and a referral under the EPBC Act is not required. (Assessment of MNES is provided in Section 4.4).

1.4 Information sources

The following information sources were used in the preparation of this BDAR:

1.4.1 Data and Imagery

- Imagery:
  - Aerial imagery: NearMap 16 March 2023
  - NSW Spatial Services – Historical imagery viewer: 1943 to 1985
  - NSW Soil landscapes\ Sydney_SL100K_v1_GDA94.shp
- Australian Government Department of Climate Change, Energy, Environment and Water
  - Species Profiles and Threats Database (SPRAT) http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl
  - Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0
- NSW Department of Planning and Environment (DPE)
  - NSW (Mitchell) Landscapes – version 3.1
  - BVMap_BV152_Web.gdb
  - The Native Vegetation of the Sydney Metropolitan Area (SMA) - Version 3_1 (OEH, 2016) VIS_ID 4489 (SydneyMetroArea_v3_2016_E_4489)
  - NSW State Vegetation Type Mapping (SVTM) (OEH, 2022)
  - BioNet Vegetation Classification Database and Threatened Biodiversity Data Collection
  - Biodiversity Investment Opportunities Map: Mapping Priority Investment Areas for the Cumberland Subregion (2018)
  - eSPADE © State of NSW and Department of Planning, Industry and Environment 2023.

1.4.2 Reports

- Australian Government Department of Climate Change, Energy, Environment and Water
  - Approved Conservation Advice for Turpentine-Ironbark Forest in the Sydney Basin Bioregion (11 April 2014)
  - Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (Department of the Environment, Water, Heritage, and the Arts, 2013 EPBC Act Policy Statement)
  - SPRAT Profile for Turpentine–Ironbark Forest in the Sydney Basin Bioregion. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=38&status=Critically+Endangered
- NSW Threatened Species Scientific Committee
  - CEEC final determination for Sydney Turpentine Ironbark Forest in the Sydney Basin Bioregion (31 May 2019)
- NSW DPE Environment Heritage Group (EHG)
  - Advice PP-2022-658 95-97 Stanhope Road Killara_Ref-1539 (1) (27 September 2022)
  - Advice PP-2022-658 95-97 Stanhope Road Killara Amended Plans (28 March 2023)
  - EHG Advice PP-2022-658 95 Stanhope Road Killara Amended Information (6 June 2023)

  - EHG Advice PP-2022-658 95 Stanhope Road Killara Amended Information – August 2023

- FPD Planning (23 December 2022) Lourdes Retirement Village Planning Proposal - Response to Submissions
- FPD Planning (22 February 2023) Planning Proposal PP 2022-658
- GML Heritage (May 2017) Headford House 95 Stanhope Road Killara Heritage Significance Assessment. Report prepared for Stockland 11 May 2017
- JK Geotechnics (September 2022) Preliminary Geotechnical Investigation for the proposed redevelopment at Lourdes Retirement Village
- Naturally Trees (16 June 2023) Lourdes Retirement Village Arborist Report - Rev C
- Plus Architecture (02 August 2022) - Urban Design Report to support planning proposal
- Plus Architecture (29 June 2023) Lourdes Retirement Village – Urban Design Report, Response to Council.
- Plus Architecture (Sept 2023) Lourdes Retirement Village – Urban Design Report, Response to Submissions.
- BlackAsh letter – Asset Protection Zone Requirements dated 28th September 2023
- Eco Logical Australia Pty Ltd (July 2023) PCT Confirmation Letter V2 (dated 17 July 2023).
- Eco Logical Australia Pty Ltd (September 2023) Response to Department of Planning V2 (dated 2 October 2023).
- Prensa (June 2023) Preliminary Site Investigation, 95 Stanhope Road, Killara, NSW.

2. Methods

2.1 Site context

2.1.1 Landscape assessment

In accordance with Sections 3.1 and 3.2 of the BAM (2020), landscape features relevant to the proposal have been assessed from within a 1500m buffer zone around the subject land (the BDAR assessment area).

Assessment and mapping of the following landscape features was undertaken using ArcMap v10.8.2 and Nearmap imagery from March 2023 (EPSG7856_Date20230316 Lat-33.767336 Lon151.1766 Mpp1.194.jpg):

- IBRA bioregions and subregions;
- NSW (Mitchell) landscapes;
- Rivers and streams classified according to stream order;
- Wetlands within, adjacent to and downstream of the site;
- Connectivity of different areas of habitat;
- Geological features;
- Areas of outstanding biodiversity value occurring on the subject land and assessment area; and
- Percent native vegetation cover in the assessment area (see Section 2.1.2).

2.1.2 Native vegetation cover

Native vegetation cover on the subject land must be assessed in relation to native vegetation cover across a broader area. The cover of native vegetation in the BDAR assessment area, was assessed as follows:

- Clipping the extent of SydneyMetroArea_v3_2016_E_4489 (OEH, 2016) shapefile within the BDAR assessment area using ArcMap v10.8.2.

  Note the more recent NSW State Vegetation Type Map (DPE 2022) shapefile was also clipped and reviewed, but OEH (2016) mapping was found to better represent the extent of native vegetation cover.

- Editing the shapefiles to:
  - Remove areas of vegetation no longer evident due to clearing,
  - Increase polygon areas where vegetation has increased in extent, and
  - Create additional polygons identifying areas of vegetation not represented in mapping.
- Exporting the clipped shapefile data attribute table for analysis.

2.2 Native vegetation, threatened ecological communities and vegetation integrity

2.2.1 Existing information

Native vegetation within the subject land was assessed with reference to the following resources:

- Arboricultural assessment dated 25th Spetember 2023;
- Native vegetation mapping;
- Historical imagery;
- Site survey/floristic data collection;
- The BAM streamlined assessment module for planted native vegetation; and
- The BioNet Vegetation Classification database.

2.2.2 Arboricultural assessment

Naturally Trees (2023) assessed 394 individual tree specimens from seventy-three (73) different species in the subject land:

- 17 local native species
- 11 local native species not expected to occur at the site (i.e., habitat for the species absent);
- 15 non-local native species; and
- 30 exotic species.

Figure 3 shows the location of trees assessed by Naturally Trees (2023) and Table 2 lists all native species identified, whether they are local or non-local species and their habitat requirements. Distribution and habitat requirements have been sourced from the Flora of New South Wales (PlantNET).

The data collected by Naturally Trees (2023) aided in the categorisation of native vegetation within the subject land (refer Section 2.2.3).

Table 2. Subject land native tree species

Botanical name	Scientific name	Habitat or distribution
Local native		
Acacia implexa	Hickory wattle	Widespread, grows in a variety of communities
Allocasuarina littoralis	Black Sheoak	Understorey species in open forest, generally on moderate-nutrient soils and drier moisture situations
Allocasuarina torulosa	Forest oak	Understorey species in open forest to tall open forest, generally on higher-nutrient soils and moister situations
Angophora costata	Smooth-barked apple	Locally abundant, on deep sandy soils or sandy soils on sandstone; often coastal
Banksia integrifolia	Coastal banksia	Widespread, chiefly from coastal sites to the ranges on a broad range of habitats
Banksia serrata	Old-man banksia	Usually in dry sclerophyll forest or woodland on sandstone or consolidated sand dunes
Corymbia gummifera	Red bloodwood	Abundant, in dry sclerophyll forest or woodland on low fertility sand or sandstone
Corymbia maculata	Spotted gum	Community dominant, in open forest on somewhat infertile and drier sites on shales and slates
Elaeocarpus reticulatus	Blueberry ash	Mostly in gullies or along watercourses, often in tall eucalypt forest or in or near rainforest
Eucalyptus haemastoma	Scribbly gum	Locally frequent, in dry sclerophyll woodland on shallow infertile sandy soil on sandstone
Eucalyptus paniculata	Grey ironbark	Dry sclerophyllous woodland, locally found on shale capped ridges and plateaus, on heavy shale derived soil
Eucalyptus pilularis	Blackbutt	Widespread and often dominant, in wet sclerophyll or grassy coastal forest on lighter soils of medium fertility
Eucalyptus piperita	Sydney peppermint	Locally frequent, in dry sclerophyll forest or woodland on moderately fertile often alluvial sandy soil
Eucalyptus tereticornis	Forest red gum	Community dominant, widespread in grassy, wet or dry forest or woodland on soils of medium to high fertility
Melaleuca armillaris	Bracelet honey-myrtle	Widespread in heath communities, often on headlands or coastal ranges

Botanical name	Scientific name	Habitat or distribution
Pittosporum undulatum	Sweet pittosporum	Rainforest and wet sclerophyll forest and sheltered situations in dry sclerophyll forest or woodland
Syncarpia glomulifera	Turpentine	Often grows as an emergent near the margins of rainforest or in wet sclerophyll forest, often on heavier soils
Local native - habitat absent		
Acacia elata		Rainforest and wet sclerophyll forest
Angophora floribunda	Rough-barked apple	Widely scattered and locally abundant, usually on deep alluvial sandy soils
Casuarina cunninghamiana	River oak	Occurs along permanent freshwater streams
Eucalyptus melliodora	Yellow box	Grassy woodland on moderately fertile often sandy or alluvial soils
Eucalyptus robusta	Swamp mahogany	Locally abundant in heath on low swampy sites on sandy soils
Melaleuca linariifolia	Flax-leaved paperbark	Heath and dry sclerophyll forest in moist or swampy ground
Melaleuca quinquenervia	Broad leaved paperbark	Widespread in coastal swamps and around lake margins
Melaleuca styphelioides	Prickly leaved paperbark	Grows in moist situations, often along stream banks
Melia azedarach	White cedar	Grows in subtropical and dry rainforest, mostly on margins
Syzygium paniculatum	Magenta lilly pilly	Subtropical and littoral rainforest on sandy soils or stabilized dunes, often near the sea
Tristaniopsis laurina	Water gum	Rainforest and sclerophyll forest usually along banks of streams
Non-local native or local cultivar		
Acacia baileyana	Cootamundra wattle	Endemic to the Temora-Cootamundra district; widely cultivated
Araucaria heterophylla	Norfolk Island pine	Endemic on Norfolk Island, widely cultivated
Archontophoenix alexandrae	Alexandra palm	Native range of this species is north-east and central-east Queensland, widely cultivated
Callistemon viminalis	Weeping bottlebrush	Occurs north from the Gloucester area. Widely cultivated species
Corymbia citriodora	Lemon-scented gum	A tall tree from temperate and tropical eastern Australia
Cyathea cooperi	Straw/scaly/lacy treefern	Occurs in gullies in warm coastal rainforest; north from Durras Mtn
Eucalyptus maidenii	Maiden’s gum	Occurs south from the Shoalhaven River
Eucalyptus microcorys	Tallowood	North from about the Gosford area, to Hervey Bay in Qld and including Fraser Island.
Eucalyptus scoparia	Wallangarra white gum	Known from only three locations near Tenterfield, including Bald Rock National Park.
Ficus benjamina	Weeping fig	One of the most cultivated in the world, found in Northern Qld and NT

Botanical name	Scientific name	Habitat or distribution
Grevillea robusta	Silky oak	Grows on the coast and inland ranges north of Coffs Harbour district. Widely cultivated species
Grevillea spinosa	Tjiilka-tjiilka	Endemic to inland Western Australia
Leptospermum petersonii	Lemon-scented teatree	North from Port Macquarie. Naturalised in NSW, cultivated for landscaping
Lophostemon confertus	Brushbox	North from the Hunter Valley; sparingly naturalised around Sydney, commonly planted as a street tree
Macadamia sp.		Macadamia genus is indigenous to Australia, native to northeastern NSW and central and southeastern Qld

2.2.3 Mapping native vegetation extent

The native vegetation extent on the subject land was assessed via desktop aerial interpretation using Nearmap imagery from March 2023 (EPSG7856_Date20230316 Lat-33.767336 Lon151.1766 Mpp1.194.jpg) and vegetation mapping as described in Section 2.1.2.

Ground truthing was undertaken on several occasions (see Table 3) to verify available vegetation mapping (refer Section 2.1.2), arboricultural assessment findings (Naturally Trees 2022, 2023) and distinguish between planted and naturally occurring native vegetation.

Table 3. Vegetation surveys

Date	Surveyor	Areas surveyed
27 October 2022	Actinotus	All of subject land
23 March 2023	Actinotus	Northern site portion
10 April 2023	écologique	All of subject land
14 June 2023	Eco Logical Australia	Southwestern and northern site portions (refer Appendix F)
22 June 2023	Actinotus and écologique	Northern site portion and land northeast on opposite side of Stanhope Road
5 September 2023	Eco Logical Australia	South of subject land and northern site portions (refer Appendix G & H)
5 September 2023	Actinotus and écologique	Landscaping within central site portion

All areas of vegetation were able to be comprehensively assessed as located in managed curtilage and covering a relatively small extents. Vegetation community boundaries were measured using hand-held GPS, notated on printed aerial photographs, then transferred to ArcMap for interrogation and map production.

Additional site visits to nearby vegetated locations were also undertaken on 22 June 2023 and 5 September 2023 for comparison of similarly mapped vegetation areas. This was done given the difficulties in allocating ‘best fit’ plant community types (PCTs) to planted native vegetation in the subject land. Additional sites visited are shown on Figure 12 and included:

- Killara Park, Springdale Road, Killara (Actinotus and écologique 22 June 2023)
- Soldiers Memorial Park, Tryon Road Lindfield (Actinotus 22 June 2023)
- Wombin Reserve, Nelson Road, Killara (écologique 22 June 2023)
- Dalrymple-Hay Nature Reserve, St Ives (Eco Logical Australia 5 September 2023)
- Rofe Park - Sheldon Forest, Turramurra (Eco Logical Australia 5 September 2023)

Vegetation within the subject land was categorised into the broad vegetation types listed in Table 4. These broad vegetation types were assessed further against historical imagery (refer Section 2.2.4) and, where applicable, allocated to PCTs based on data collected from BAM floristic plots (refer Section 2.2.5). The status of the vegetation types aligns with the origins of the species they contain as was applied to tree species in Section 2.2.2 and Table 2.

Further discussion regarding the allocation of PCTs is provided in Section 2.2.8 (Vegetation classification database) and Section 4.3 (Plant community types).

Table 4. Vegetation types assessed in the subject land

Vegetation type	Status
Remnant	Remnant native vegetation
Planted native	Planted native vegetation able to be allocated to a PCT
Landscaping	Planted local native
	Planted local native/habitat absent
	Planted native/non-local native mixture
	Planted non-local native
	Planted non-local native/exotic mixture
	Exotic

2.2.4 Historical imagery

Historical imagery from the early 1900s to current day provides insight into land-use changes over time. This method of assessment is particularly useful when an area of interest (such as the subject land) contains numerous non-local native and exotic planted species.

Historical imagery indicates the potential for small pockets of existing vegetation to be of remnant origin, although the assessment of historical imagery is limited as the subject land was cleared prior to the earliest available imagery in 1929.

Imagery of the subject land during construction of the existing development, in combination with ground truthing, has guided the allocation of the 'landscaping' vegetation type identified in Table 4. Photographic plates have been marked up to indicate where vegetation cover within the subject land has remained constant over time and thereby indicating where vegetation has the most potential to be of remnant origins (see Appendix C).

Further historical information is provided in the Project's heritage assessment (GML Heritage 2017), which discusses land ownership and land use that pre-dates the available historical aerial imagery.

Site photographs show views into surrounding bushland and the habit of retained remnant trees. Albeit limited to the cleared and developed area of the subject land (associated the Headfort School), photography indicates a dry sclerophyll environment (see Appendix C).

Parish mapping from 1897 shows Stanhope Road located to the south of the existing northern most area of native vegetation. By 1934, the Congregational Union of NSW 1934 land holdings plan shows Stanhope Road in its current alignment.

Figure 4 illustrates the irregularly shaped land located between the boundary of Lots 217-219 in 1897 and that acquisitioned by 1934 into the land holdings of the Congregational Union of NSW. This irregularly shaped land encompasses the northern most area of vegetation in the contemporary subject land.

Archived site photographs from the construction activities in 1982 have also been analysed.

Figure 4 also shows:

- Current site imagery overlain by the indicative location of Stanhope Road before its relocation; and

- An indicative patch of previously uninterrupted vegetation that has been floristically investigated further (refer Section 2.2.5 below, Section 2.2.8 - Vegetation classification database and Section 4.3 - Plant community types).

2.2.5 Plot-based vegetation survey

Plot-based floristic vegetation surveys were undertaken in accordance with BAM Subsection 4.2.1.

Initially, data from four floristic plots was collected to verify the vegetation mapping and extent components of the BAM (see Table 5 below).

Table 5. Vegetation survey plots

Plot no	Location	Vegetation mapping	
		OEH (2016)	DPE (2022)
1	Northwestern corner of subject land	PCT 3262 (STIF) Urban Exotic/Native	Not native
2	Southwestern corner of subject land	PCT 3592 (SCESF) PCT 3136 (BGHF)	PCT 3592 (SCESF) PCT 3136 (BGHF)
3	Mid-site portion of subject land	Urban Exotic/Native	Not native
4	Mid-northern site portion of subject land	Urban Exotic/Native	Not native

The location of plots sought to validate the following:

- Planted native vegetation – for assessment under the BAM streamlined module for planted native vegetation;
- Planted native vegetation – that can be feasibly allocated to a PCT and assessed under the standard BAM; and
- Potential remnant vegetation – for allocation to a PCT and assessed under the standard BAM.

It should be noted that locating plots to avoid areas of disturbance was limited due to the managed nature of the subject land and limited areas of vegetation. This limitation was partially addressed through additional vegetation plots collected by Eco Logical Australia (ELA) on 14 June 2023 (Plot 5) and 5 September 2023 (Plots 8 and 9) and by Actinotus and écologique on 22 June 2023 (Plot 7) (see Table 6).

Table 6. Additional vegetation survey plots

Plot no	Location	Vegetation mapping	
		OEH (2016)	DPE (2022)
5#	Bushland south of subject land in Seven Little Australians Park	PCT 3592 (SCESF)	PCT 3136 (BGHF)
6#	Planted and potential remnant native vegetation in the northern site portion adjacent Stanhope Road	Urban Exotic/Native	Not native vegetation
7##	Bushland northeast of subject land on northern side of Stanhope Road	Urban Exotic/Native	PCT 3595 (CSGF)
8**	Planted and potential remnant native vegetation in the northern site portion adjacent Stanhope Road	Urban Exotic/Native	Not native vegetation
9**	Bushland south of subject land	PCT 3592 (SCESF)	PCT 3592 (SCESF)

surveys conducted by ELA (refer **Appendix F**)

survey conducted by Actinotus and écologique on undeveloped land that was continuous with the subject land pre 1934 when Stanhope Road was realigned (as shown in **Figure 4).**

** surveys conducted by ELA (refer **Appendix G & H**)

2.2.6 Vegetation Integrity Assessment

Vegetation integrity assessments were undertaken in the subject land in accordance with Section 4.2.4 of the BAM, which requires the quantitative measure of composition, structure and function attributes from each vegetation zone.

Survey plots were established around a central 50 m midline as follows:

- One 400 m^2 plot (20 m × 20 m), to assess:
  - Composition (number of native species in each growth form)
  - Structure (percent cover of native species in each growth form)
- One 1,000 m^2 (standard 20 m × 50 m) plot, to assess the function attributes (number of large trees, number of hollow bearing trees, stem size classes, tree regeneration, length of logs)
- Five 1 m^2 subplots, to assess average litter cover

Vegetation integrity plots coincided with the Plots 1-4 in Table 5.

To collect BAM data compliantly, plots and transects were variously shaped to avoid areas of hardstand as far as practical.

The location and approximate shape of plots is shown in Figure 12 and BAM data is provided in Appendix B.

Table 7 identifies the broad zones in which vegetation integrity plots[1]. were conducted and compliance with the minimum number of plots required (i.e., 1 plot per zone <2ha)

Table 7. Vegetation zones

Location	Area (ha)	Plots required	Plots completed
Remnant and planted native vegetation (3262)	0.17	1	2
Remnant and planted native vegetation (3592)	0.78	1	1
Landscaped native vegetation (not allocated to a PCT)	0.63	1	1
	1.58		

2.2.7 BAM Streamlined module – Planted Native Vegetation

BAM Appendix D: Streamlined assessment module – Planted native vegetation provides the framework for the assessment of planted native vegetation using the BAM.

Vegetation identified as Landscaping in Table 4 has been assessed using the streamlined module for planted native vegetation and the standard BAM used to assess vegetation identified as Remnant in Table 4.

2.2.8 Vegetation classification database

The PCT filter tool in the Bionet vegetation classification database was used to allocate the best fit plant community types (PCTs) to native vegetation that was not assessed in the streamlined module for planted native vegetation. Table 8 lists the database filters used.

[1] Only four (4) of the nine (9) floristic plots referenced in Section 2.2.5 included the collection of structure and function data

Table 8. PCT filters used

IBRA region	Sydney Basin
IBRA subregion	Cumberland Plain
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation) Dry Sclerophyll Forests (Grassy sub-formation) Wet Sclerophyll Forests (Shrubby sub-formation) Wet Sclerophyll Forests (Grassy sub-formation)
Keith vegetation form	Sydney Coastal Dry Sclerophyll Forests Sydney Hinterland Dry Sclerophyll Forests Northern Hinterland Wet Sclerophyll Forests North Coast Wet Sclerophyll Forests
Species (all strata and growth form groups)	Species observed in each plot / vegetation type mapped in the subject land

Further filtering of the results were undertaken to remove:

- PCTs that do not occur in the IBRA region and subregion[2];
- Vegetation types that do not occur in the subject land, such as rainforest, forested wetlands, wetlands, riparian communities and heath;
- PCTs that are specific to geographic regions, such as the Woronora Plateau and Blue Mountains;
- Species that are not local to the subject land, such as tallowwood; and
- Species that the subject land does not provide habitat for, such as swamp mahogany.

The resultant PCT list was then further investigated by comparing the characteristics found in the scientific description of each PCT in the vegetation classification database:

- Descriptive attributes; and
- Frequency in which species occur within plots (i.e., plot data that have informed the diagnostic species list for each PCT in the database and from where benchmark data has been established)

To a lesser degree landscape characteristics were considered, such as rainfall, elevation, dominant soils or geology (refer limitations below).

2.3 Threatened species methods

2.3.1 Review of existing information

The assessment of habitat suitability has been informed by the TBDC, threatened species profiles and the NSW Scientific Committee's conservation advice and final determinations. Threatened species are categorised in the BAM-C as ecosystem species or species credit species.

[2] The Vegetation Classification Database PCT filter tool returns database PCTs in descending order based on the total number of matches and in some cases will return PCTs with high numbers of all species present, but the PCT does not occur in the bioregion or subregion or is not of the correct vegetation formation and class.

Ecosystem credit species

Ecosystem credit species are those threatened species where the likelihood of occurrence of a species or elements of the species' habitat can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection.

A targeted survey is not required to identify or confirm the presence of ecosystem credit species.

Species credit species

Species credit species are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence or components of their habitat. A targeted survey or an expert report is required to confirm the presence of these species on the subject land.

Dual credit species have different habitat constraints for each credit class (e.g., habitat constraints for breeding habitat which is a species credit component). Most dual credit species will be listed as an ecosystem credit species – for foraging habitat.

Under Section 5.2.2 of the BAM:

Species credit species can be excluded from further assessment, and thereby targeted surveys, if it is determined that none of the species-specific habitat constraints are present within the subject land.

Under Section 5.2.3 of the BAM:

A candidate species credit species can be considered unlikely to occur on the subject land (or specific vegetation zones) if after carrying out a field assessment, the assessor determines that the habitat is substantially degraded such that the species is unlikely to utilise the subject land (or specific vegetation zones).

2.3.2 Habitat constraints

Desktop assessments and field surveys within the subject land included assessment of habitat constraints and microhabitats for predicted species credit flora species.

2.3.3 Targeted threatened flora species survey

Most of the subject land is managed curtilage and does not provide suitable habitat for many of the candidate threatened flora species. Table 10 lists threatened flora species for which the subject land's remnant peripheral native vegetation may contain marginal microhabitat for.

All areas of potential habitat within the development site were able to be searched comprehensively due to the relatively small and discontinuous patches of vegetation and lack of dense mid and understorey (i.e., without the need to allocate grid or parallel transect survey methods).

Table 9. Threatened flora species maintained in the BAM

Scientific name	Common name	Recommended survey times	Times surveyed	Survey Personnel/ Hours
Acacia pubescens[#]	Downy wattle	All year round	27 October 2022	6 hrs onsite x 1 person
Callistemon linearifolius[#]	Netted bottlebrush	Oct-Jan		
Darwinia biflora		All year round		
Eucalyptus camfieldii[#]	Camfield's stringybark	All year round		
Melaleuca deanei[#]	Deane's paperbark	All year round		
Darwinia peduncularis		All year round	27 October 2022	6 hrs onsite x 1 person
Dillwynia tenuifolia		Aug-Oct		
Epacris purpurascens var. *purpurascens*		Sept-Nov		
Grevillea parviflora subsp. *parviflora*		Aug-Nov		
Hibbertia puberula		Oct-Dec		

Scientific name	Common name	Recommended survey times	Times surveyed	Survey Personnel/ Hours
Hibbertia spanatha		Oct-Nov		
Hibbertia superans		Jul-Dec		
Lasiopetalum joyceae		Sept-Nov		
Persoonia hirsuta		All year round		
Persoonia mollis subsp. *maxima*		All year round		
Pimelea curviflora var. *curviflora*		Oct- Mar		
Tetratheca glandulosa		Aug-Nov		

also not detected in arborist surveys

No threatened flora species were found during surveys conducted on 27/10/2022.

Additional site surveys conducted on 23/03/2023, 10 April 2023 and 22 June 2023 also did not detect any native species of conservation significance and none area expected to occur.

2.4 Threatened fauna species survey

2.4.1 Habitat Constraints

Desktop assessments and field surveys within the subject land included assessment of habitat constraints and microhabitats for predicted species credit fauna species.

The subject land does not contain any drainage lines and was not found to contain any hollow-bearing trees or evidence of nesting or breeding habitat for threatened species.

Other identified habitat constraints include the network of access roads and associated car and pedestrian traffic, noise and light pollution.

The subject land is not expected to be used preferentially over the surrounding and more intact native bushland that is contiguous with Garigal National Park. This includes mapped important habitat area for the Swift Parrot (refer to Section 5).

2.4.2 Field surveys

No candidate threatened fauna species were maintained in the BAM-C for further investigation due to the absence of microhabitat for species credit species and breeding habitat for dual credit species.

Despite the lack of microhabitat and breeding habitat identified, diurnal bird counts (in line with DEC 2004 guidelines) were conducted during vegetation surveys and a Yangochiroptera (microbat) survey also undertaken (see Table 11).

The Yangochiropteran survey was only conducted for 8 survey nights. Additional surveys will be undertaken to comply with BAM survey requirements, which require a total of 16 nights.

Table 10. Fauna surveys conducted

Fauna group	Date	Time range	Survey technique(s)	Survey effort	Personnel
Diurnal birds	27/10/2022 23/03/2023 10/04/2023 22/06/2023	9am – 12pm 12pm– 4pm 7am – 11am 11am – 3pm	Bird census counts were conducted at each of the following survey locations: 1. Western corner (adjacent Stanhope Road): 2 x 1 person x 20min (40 mins) 2. Southwestern site portion (adjacent bushland): 2 x 1 person x 20min (40 mins) 3. Southeastern site portion (adjacent bushland): 2 x 1 person x 20min (40 mins) 4. Central development area: 2 x 1 person x 20min (40 mins) 5. Mid-eastern site portion (vacant buildings adjacent bushland): 1 x 2 people x 20min (40 mins) 6. Northern site portion: 3 x 1 person x 20min and 1 x 2 people x 20min (100 mins) Additional opportunistic observations were also recorded	300 min	Peter Stricker (150 mins) Kat Duchatel (150 mins)
Microbats	21/11/2022 – 24/11/2022	Recorders automated operation 1hr before dusk and after dawn	A dedicated mirochiropteran survey (4 evening sampling surveys) was undertaken from 21/11/2022 – 24/11/2022 to record the potential for presence of microbats across the subject area. **Methodology:** Two SongMeter Minibat ultrasonic recorders were set at 95 Stanhope Rd, Killara for four consecutive nights during fair, warm temperature conditions. Afternoon temperatures varied from 25.9^{0} – 26.3^{0}, with wind speeds varying from 17kmh (South on Wednesday 23rd) to 33kmh (West on Monday 21st). The detectors were placed at the northeast (NE) and southwest (SW) corners of the subject land within areas of open vegetation as indicated in see Figure 5.	8 nights	Amy Rowles

Fauna species detected in the subject land are listed in Table 11 and Yangochiropteran findings are summarised in Table 12. Figure 5 illustrates the locations of surveys undertaken.

Table 11. Fauna species observed in subject land

Class/Family	Common name	Scientific name	Record type
Aves			
Cacatuidae	Sulphur-crested Cockatoo	*Cacatua galerita*	OW
Campephagidae	Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	O
Charadriidae	Laughing Kookaburra	*Dacelo novaeguineae*	OW
Columbidae	Crested Pigeon	*Ocyphaps lophotes*	O
	Spotted Turtle Dove*	*Spilopelia chinensis*	O
Corvidae	Australian Raven	*Corvus coronoides*	OW
Cracticidae	Grey Butcherbird	*Cracticus torquatus*	OW
	Magpie	*Gymnorhina tibicen*	O
	Pied Currawong	*Streptera graculina*	O
Cuculidae	Channel-bill Cuckoo	*Scythrops novahollandiae*	W
	Eastern Koel	*Eudynamys orientalis*	W
Maluridae	Superb Fairy-wren	*Malurus cyaneus*	O
Megapodiidae	Australian Brushturkey	*Alectura lathami*	O
Meliphagidae	Eastern Spinebill	*Acanthorhynchus tenuirostris*	O
	Little Wattlebird	*Acanthochaera chrysoptera*	O
	Noisy Miner	*Manorina melanocephala*	O
	Red Wattlebird	*Acanthochaera caranculata*	O
Psittacidae	Crimson Rosella	*Platycercus elegans*	O
	Rainbow Lorikeet	*Trichoglossus moluccanus*	H
Rhipiduridae	Grey Fantail	*Rhipidura albiscapa*	O
Sternidae	Common Mynah	*Acridotheres tristis*	O
Mammalia			
Macropodidae	Swamp wallaby	*Wallabia bicolor*	P
Phalangeridae	Common Brushtail Possum	*Trichosurus vulpecula*	F
	Ringtail Possum	*Pseudocheirus peregrinus*	F
Reptilia			
Scincidae	Dark-flecked Garden Sunskink	*Lampropholis delicata*	O
	Eastern Water Skink	*Eulamprus quoyii*	O
F = tracks/scratchings		O = seen	
H = hair, feathers or skin		OW = Seen and heard	
P = scat		W = call heard	

Table 12. Results of bat surveys (A. Rowles 2022)

Species	Common name	Identification Confidence (no. of passes of individuals)	
		Detector 1 (SW)	Detector 2 (NE)
Austronomus australis	White-striped freetailed bat	D (7)	D (6)
Chalinolobus gouldii	Gould's wattle bat	Pr (2)	D (9); Pr (9)
Miniopterus australis	Little bent-winged bat		D (2)
Miniopterus orianae oceanensis	Large bent-winged bat	D (1)	D (1); Pr (1)

Legend: D – definite identification | Pr – Probable identification (high likelihood) SW – southwest | NE – northeast

Results summarised in Table 13 indicate that over the survey period, microbat activity was very low, recording only four species of Yangochiropterans despite suitable weather conditions.

Two common species, the white-striped freetailed bat and Gould's wattle bat appear to be foraging at both sites with several passes at each location. Some species, including the Gould's wattle bat, will travel several kilometres from roost sites to reach preferred foraging habitat (Lumsden, 2004).

Two threatened species were recorded, these being the large bent-winged bat and little bent-winged bat. However only a few passes of each were recorded and are considered to most likely be individuals passing through the subject land and not foraging (Rowles 2022).

Both these species have been maintained in the BAM-C as ecosystem credit species but discounted as species credit species due to the absence of breeding habitat (i.e., the absence of maternity caves and known nursery sites).

2.5 Weather conditions

Table 13. Weather conditions

Surveys conducted	Date	Weather conditions[a]	Preceding rainfall[b]
Floristics Threatened Flora Diurnal bird census	27/10/2022	Fine conditions, no rainfall, slight wind. 9am: Temp. 22.9^0; Wind NW 13km/hr 3pm: Temp. 22.9^0; Wind NNW 13km/hr	Preceding week: 37.6mm Preceding 2 weeks: 49.6mm Preceding 3 weeks: 144.4mm Preceding 4 weeks: 162.6mm
Microbat ultrasonic recording	21/11/2022	9am Temp. 22.8^0; Wind W 22km/hr 3pm Temp. 22.8^0; Wind W 33km/hr No Rainfall	Preceding week: 41.4mm Preceding 2 weeks: 42.8mm Preceding 3 weeks: 44.2mm Preceding 4 weeks: 78.2mm
Microbat ultrasonic recording	22/11/2022	9am Temp. 15.7^0; Wind W 17km/hr 3pm Temp. 26.3^0; Wind S 17km/hr No Rainfall	Preceding week: 2.8mm Preceding 2 weeks: 42.8mm Preceding 3 weeks: 44.2mm Preceding 4 weeks: 69.2mm
Microbat ultrasonic recording	23/11/2022	9am Temp. 19.5^0; Wind WSW 24km/hr 3pm Temp. 23.1^0; Wind WSW 17km/hr	Preceding week: 2.8mm Preceding 2 weeks: 42.4mm

Surveys conducted	Date	Weather conditions[a]	Preceding rainfall[b]
		No Rainfall	Preceding 3 weeks: 43.6mm Preceding 4 weeks: 45mm
Microbat ultrasonic recording	24/11/2022	9am Temp. 21.3^0; Wind SW 7km/hr 3pm Temp. 23.6^0; Wind ENE 20km/hr No Rainfall	Preceding week: 2.8mm Preceding 2 weeks: 42.4mm Preceding 3 weeks: 43.6mm Preceding 4 weeks: 44.6mm
Floristics Diurnal bird census	23/03/2023	Fine conditions, no rainfall, still. 9am: Temp 19.9^0; Wind WNW 6km/hr 3pm: Temp. 25.5^0; Wind SSW 13km/hr	Preceding week: 1.7mm Preceding 2 weeks: 38.5mm Preceding 3 weeks: 43.9mm Preceding 4 weeks: 47.5mm
Floristics Diurnal bird census	10/04/2023	Fine conditions, no rainfall, slight wind. 9am: Temp. 15.9^0; Wind WSW 13km/hr 3pm: Temp. 21.0^0; Wind WSW 15km/hr	Preceding week: 12.8mm Preceding 2 weeks: 78mm Preceding 3 weeks: 90.4mm Preceding 4 weeks: 127.3mm
Floristics Diurnal bird census	26/06/2023	Fine conditions, no rainfall, slight breeze. 9am: Temp. 9.2^0; Wind WNW 7km/hr 3pm: Temp. 13.8^0; Wind NW 2km/hr	Preceding week: 7mm Preceding 2 weeks: 7.2mm Preceding 3 weeks: 9.2mm Preceding 4 weeks: 11.4mm

[a] Daily Weather Observations for Sydney Olympic Park Station no: 066212 (10.1km from Killara)

[b] Daily Rainfall Data for Macquarie Park (Willandra Village) Station no: 66156 (3.6km from Killara)

2.6 Limitations

2.6.1 PCT allocation

As identified in Sections 2.25 and 2.28 the subject land is extensively modified such that validation of available vegetation mapping and allocation of native vegetation to PCTs with a high degree of confidence is not possible. The is due to the following limitations:

Similarities between mapped PCTs

PCTs mapped and predicted to occur within the locality contain similar diagnostic species, climate and elevation ranges.

Insufficient floristic data, especially the absence of shrub and ground layer species diversity, constraints distinction between the PCTs returned by the filter tool.

The median native species richness per plot for returned PCTs ranges between 44 and 40 (i.e., plot data that has informed PCT diagnostic species), whereas species richness gained from subject land plots were a minimum of 9 and maximum of 17.

An example of PCT filter tool results is provided in Table 14. PCT filter tool results, that used native species found from within the vegetated area shown in Figure 4 (i.e., existing vegetation immediately north and south of Stanhope Road and total of 30 species entered into the filter tool). The results demonstrate the closeness in PCTs generated from these searches.

Table 14. PCT filter tool results

PCT	Common_Name	Matches	IBRA	IBRA Sub	Angophora costata	Corymbia gummifera	Eucalyptus pilularis	Eucalyptus saligna	Eucalyptus paniculata	Allocasuarina torulosa	Allocasuarina littoralis	Pittosporum undulatum	Elaeocarpus reticulatus	Ozothamnus diosmifolius	Acacia implexa	Leucopogon juniperinus	Microlaena stipoides	Entolasia stricta	Lomandra longifolia	Imperata cylindrica	Themeda triandra	Aristida vagans	Oplismenus aemulus	Digitaria parviflora	Cyathochaeta diandra	Gahnia clarkei	Lobelia purpurascens	Dianella caerulea	Dichondra repens	Centella asiatica	Oxalis perennans	Commelina cyanea	Eucalyptus botryoides	Angophora hispida	Cynodon dactylon
Dry Sclerophyll Forests (Shrubby sub-formation)																																			
Sydney Coastal Dry Sclerophyll Forests																																			
3592	Sydney Coastal Enriched Sandstone Forest	33	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3594	Sydney Coastal Sandstone Foreshores Forest	30	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
3595	Sydney Coastal Sandstone Gully Forest	29	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1
Wet Sclerophyll Forests (Grassy sub-formation)																																			
Northern Hinterland Wet Sclerophyll Forests																																			
3262	Sydney Turpentine Ironbark Forest	32	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
3259	Sydney Coastal Shale-Sandstone Forest	31	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wet Sclerophyll Forests (Shrubby sub-formation)																																			
North Coast Wet Sclerophyll Forests																																			
3176	Sydney Enriched Sandstone Moist Forest	27	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	1	1	1	1	1	0	0	0
3136	Blue Gum High Forest	27	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	0	1

Species origins

Non-local native species are easily attributed to landscaping based on geographic limitations. Although a number of native species that are both not expected to occur at the locality (due to either geographic distribution or lack of habitat) are identified in the Bionet Vegetation Classification database as diagnostic to the PCTs returned.

Examples include: *Melia azerdarach* (white cedar), which grows in subtropical and dry rainforest, *Eucalyptus robusta*, which is locally abundant in heath on low swampy sites on sandy sites.

Vegetation formation

A key distinction between the mapped PCTs within and adjacent to the subject land is whether the vegetation formation is wet or dry sclerophyll forest (see Table 15).

Table 15. Vegetation (Keith) formations and classes

Formation name	Class	PCT_ID
Dry Sclerophyll Forests (Shrubby sub-formation)		
Sydney Coastal Enriched Sandstone Forest	Sydney Coastal Dry Sclerophyll Forests	3592
Sydney Coastal Sandstone Gully Forest	Sydney Coastal Dry Sclerophyll Forests	3595
Wet Sclerophyll Forests (Grassy sub-formation)		
Sydney Turpentine Ironbark Forest	Northern Hinterland Wet Sclerophyll Forests	3262
Sydney Coastal Shale-Sandstone Forest	Northern Hinterland Wet Sclerophyll Forests	3259
Wet Sclerophyll Forests (Shrubby sub-formation)		
Blue Gum High Forest	North Coast Wet Sclerophyll Forests	3136

Available vegetation formation and class mapping is based on Sydney Metropolitan vegetation mapping (OEH 2016), which shows most of the subject land as cleared and hence not allocated to a Keith formation and class (see Figure 10).

The existing condition of the subject land indicates a dry sclerophyll forest formation, although it is not known what occurred prior to historical clearing and what, if any, impact this had on the land to support either wet or dry sclerophyll forest formations.

Pre-development of the retirement village the history of the subject land does not suggest any surface disturbances other than clearing and construction of buildings within the western site portion (as shown in historical photography provided in **Appendix C** and construction photography from 1982 in **Appendix D**).

Geology and soil landscape mapping

Soil landscape profiles in NSW have been collected over the last 60 years by several hundred individuals of varying backgrounds and expertise for widely varying purposes.

Methods of locating profiles may not have been particularly accurate, especially in the case of data collected a long time ago before the introduction of precision digital locating technology using Global Positioning Systems (GPS).

Consequently, the quantity, quality and accuracy of data recorded at different points in NSW may vary substantially (DPE, eSPADE 2022).

Soil landscape mapping for the subject land was published in 1989 (in the absence of GPS) and therefore may not be particularly accurate.

2.6.2 Fauna survey

Under the guidelines for ‘Species credit’ threatened bats and their habitats (OEH, 2018) surveys should be undertaken over 16 nights (i.e., 4 units x 4 nights, or 2 units x 8 nights). The survey undertaken for this assessment was not compliant, consisting of 2 units x 4 nights).

Despite breeding habitat not found for threatened species, additional Yangochiroptera (insectivorous bats, hereafter referred to as ‘microbat’) surveys would be undertaken compliantly to support a future development application.

3. Site context

3.1 Assessment area

Landscape features relevant to the proposal have been assessed from within a 1500m buffer zone (the BDAR assessment area) around the proposed development site (subject land). The BDAR assessment area covers 851.6 ha.

3.2 Landscape features

In accordance with Sections 3.1 and 3.2 of the BAM (2020) assessment and mapping of the following landscape features are required:

- IBRA bioregions and subregions;
- NSW (Mitchell) landscapes;
- Rivers and streams classified according to stream order;
- Wetlands within, adjacent to and downstream of the site;
- Connectivity of different areas of habitat;
- Geological features such as karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features;
- Areas of outstanding biodiversity value occurring on the subject land and assessment area; and
- Percent native vegetation cover in the assessment area.

3.2.1 Topography and soil landscapes

The topography of the subject land slopes from a hillcrest gently to the south-east over gradients of from 2 – 5^0.

Elevation ranges from a minimum of approximately 90m ASL to 206m ASL.

The local underlying geology of the subject area occurs across the boundaries of the Ashfield Shale Series of the Wianamatta Group of Shales (Herbert 1983) and Hawkesbury Sandstone (Herbert 1983).

The subject land is mapped by Chapman and Murphy (1989) as containing the Lucas Heights and Hawkesbury soil landscape types (see Figure 6).

Lucas Heights soil landscape

The Lucas Heights soil landscape is described by Chapman & Murphy (1989) as follows:

- Gently undulating crests and ridges on plateau surfaces of the Mittagong formation with alternating bands of shale and fine-grained sandstones.
- Local relief to 30 m, slopes <10%. Rock outcrop is absent
- Mittagong Formation: interbedded shale, laminite and fine to medium grained quartz sandstone.
- The Mittagong Formation is located stratigraphically between the Ashfield Shale and Hawkesbury Sandstone. It is often relatively shallow.
- Minor areas of Hawkesbury Sandstone and minor areas of Ashfield Shale may occur.
- Extensively cleared to completely cleared low, eucalypt open-forest and low eucalypt woodland with a sclerophyll shrub understorey.
- Dominant tree species include turpentine *Syncarpia glomulifera*, smooth-barked apple *Angophora costata*, red bloodwood *Corymbia gummifera*, thinleaved stringybark *E. eugenioides* and scribbly gum *E. haemastoma*

Hawkesbury soil landscape

The Hawkesbury soil landscape is described aby Chapman and Murphy (1989) as follows:

- Medium to coarse-grained quartz sandstone with minor shale and laminite lenses. Sandstones are either massive or cross-bedded sheet facies with vertical or subvertical joint sets. The combination of bedding planes and widely spaced joints gives sandstone outcrops a distinctive blocky appearance.
- Rolling to very steep hills. Local relief varies from 40–200 m. Slope gradients range from 25–70%.
- Crests and ridges are convex and narrow, at >300 m wide. Slopes are moderately inclined to precipitous. Rock outcrop occurs as horizontal benches and broken scarps up to 10 m high.
- Boulders and cobbles cover up to 50% of the ground surface. Valleys are narrow and incised.
- Mostly uncleared open-woodland (dry sclerophyll) with pockets of tall open-forest (wet sclerophyll) and closed-forest (rainforest).
- On exposed crests and ridges there is usually a low open-woodland containing red bloodwood *Corymbia gummifera*, narrow-leafed stringybark E. oblonga, scribbly gum *E. haemostoma*, brown stringybark *E. capitellata* and old man banksia *Banksia serrata*.
- On the more sheltered side slopes, a dry sclerophyll open-forest containing black ash *E. sieberi*, sydney peppermint *E. piperita*, smooth-barked apple *Angophora costata* and black sheoak *Allocasuarina littoralis* predominate. The understorey is dominated by shrub species of the families Epacridaceae, Myrtaceae, Fabaceae and Proteaceae.
- Within sheltered gullies, wet sclerophyll closed-forests of blackbutt *Eucalyptus pilularis*, Sydney blue gum *E. saligna*, water gum *Tristania laurina* and occasionally coachwood *Ceratopetalum apetalum* occur. Black wattle *Callicoma serratifolia*, native myrtle *Backhousia myrtifolia* and bracken *Pteridium esculentum* form a closed scrubby understorey.

As identified in Section 2.6 (Limitations), the available soil landscape mapping may not be particularly accurate.

The most relevant data point for the subject land identified in eSPADE (DPE 2023), collected by JK Geotechnics (2022) from the subject land, which identified the following:

- Sandy loams (sandy loam and fine sandy loam) topsoils
- Loams (loam, silty loam, sandy clay loam) subsoils

3.2.2 IBRA bioregions and IBRA subregions

The subject land occurs wholly within the Sydney Basin IBRA region and the Cumberland IBRA Subregion. The Pittwater IBRA Subregion occurs within the BDAR assessment area, which is distanced approximately 370m to the northeast of the subject land (see Figure 7).

3.2.3 Rivers, streams, estuaries and wetlands

The subject land does not contain any drainage lines. As shown in Figure 7 there are several watercourses within the BDAR assessment area, which include Little Bluegum Creek, Stoney Creek, Rocky Creek and Gordons Creek.

The subject land is located upslope approximately 100m from a first order tributary of Gordons Creek, which rises in Swain Gardens. The confluence of this stream and another first order stream that flows from the south is located approximately 150m southeast of the subject land.

No wetlands of local, regional, national or international significance are located within the subject land or BDAR assessment area.

Gordon Creek is a tributary of Middle Harbour, which is located outside of the BDAR assessment area (see Figure 7).

3.2.4 Habitat connectivity

As shown in Figure 9, the subject land is juxtaposed at the edge of extensive existing developed land and remnant bushland. The latter contiguous within Garigal National Park, which extends to Middle Harbour and provides substantial connectivity.

The proposal does not require any clearing of vegetation from remnant bushland adjacent to the subject land and will not result in the isolation or fragmentation of native vegetation and/or connectivity. The subject land is partially isolated (at the shrub and ground levels) from the adjacent remnant vegetation by sealed roads.

3.2.5 Karst, caves, crevices, cliffs, rocks or other geological features of significance

No karsts, caves, crevices, cliffs or areas of geological significance have been identified within the BDAR assessment area.

3.2.6 Areas of outstanding biodiversity value

Areas of Outstanding Biodiversity Values (AOBV) are special areas that contain irreplaceable biodiversity values that are considered important to NSW, Australia or globally. No listed AOBVs occur within the subject land or BDAR assessment area.

3.2.7 NSW (Mitchell) landscape

Mitchell landscape mapping indicates that most of the subject land is located in the Pennant Hills Ridges landscape with a smaller eastern site portion located in the Belrose Coastal Slopes landscape (see Figure 7).

3.3 Native vegetation cover

Table 16 summarises the extent of native vegetation cover within the assessment area. Figure 8 shows native vegetation cover within the assessment area.

Table 16. Native vegetation cover in the assessment area

Assessment area (ha)	851.6
Total area of native vegetation cover (ha)	196.5
Percentage of native vegetation cover (%) **SVTM**	5.9
Percentage of native vegetation cover (%) **SMA**	23.1
Class (0-10, >10-30, >30-70 or >70%)	>10-30 adopted

4. Native vegetation, threatened ecological communities and vegetation integrity

4.1 Native vegetation extent

4.1.1 Changes to the mapped native vegetation extent

Available mapping by OEH (2016) and DPE (2022) indicate most of the subject site to either contain urban native/exotic or not-native vegetation.

Mapped vegetation by DPE (2022) identifies the following PCTs as occurring either immediately adjacent the subject land and/or within the periphery of the subject land:

- Blue Gum High Forest (PCT 3136);
- Sydney Coastal Sandstone Gully Forest (PCT 3595); and
- Sydney Coastal Enriched Sandstone Forest (PCT 3592).

OEH's SydneyMetroArea_v3_2016_E_4489 mapping similarly indicates the subject land to be dominated by "Urban Exotic/Native" vegetation, however it also has mapped small patches of the following PCTs:

- Sydney Coastal Shale-Sandstone Forest (PCT 3259); and
- Sydney Turpentine Ironbark Forest (PCT 3262).

Figure 10 and Figure 11 show OEH (2016) and DPE (2022) mapping (respectively).

Blue Gum High Forest (PCT 3136)

Mapping by OEH (2016) and DPE (2022) indicate Blue Gum High Forest (PCT 3136) as encroaching into the southwestern corner of the subject land as shown in Figure 10 and Figure 11.

PCT 3136 occurs on North Coast Wet Sclerophyll Forests vegetation formation, which is not mapped as occurring within or adjacent to the subject land.

Eco Logical Australia (ELA) collected data from a BAM floristic plot from within the area mapped as containing PCT 3136 (see Figure 12 for location of plot).

Analysis of the floristic data by ELA found the vegetation at this location to be representative of Sydney Coastal Enriched Sandstone Forest (refer to Section 4.3 for discussion on PCT allocation).

Additional BAM floristic plots undertaken by ELA on 5 September 2023 in surrounding bushland failed to detect any areas of PCT 3136.

Proximal sites where PCT 3136 is known to occur (see Figure 12) are identified as overlying West Pennant Hills soil landscapes by Chapman & Murphy (1989) with more recent soil data points identifying topsoil and subsoils as medium to heavy clays. Such soils do not occur within the subject land.

Further support that PCT 3136 is not present within the subject land was obtained through revision of tree species identification. In particular numerous trees initially identified as *Eucalyptus saligna* (Sydney blue gum) within the north of the site. As a result of the additional field work undertaken as part of the response to EHG feedback, it was identified that these trees had been incorrectly identified. The arboricultural assessment has since been updated and the species now identified as *Eucalyptus teretecornis* (Forest Red Gum), one large *Eucalyptus maidenii* (Maiden's Gum) and *Eucalyptus melliodora* (Yellow Box).

The absence of Sydney blue gums from the site in conjunction with the absence of related soil landscapes and other descriptive and supplementary factors provides further justification for why PCT 3136 is considered unlikely to occur within the subject land.

The proposed development does not require clearing of remnant native vegetation from areas mapped as PCT 3136. Clearing of native vegetation is from dry sclerophyll and sandstone dominated habitat on which PCT 3136 is not expected to occur.

On the basis of the above information, PCT 3136 does not require further consideration.

Sydney Coastal Shale-Sandstone Forest (PCT 3259)

The area mapped in the subject land by OEH (2016) as Sydney Coastal Shale-Sandstone Forest (PCT 3259) was cleared by 1985 and replaced by exotic vegetation and an ornamental garden (including hedging) at the village boundary. Historical imagery showing this area is provided in **Appendix C**.

Sydney Coastal Sandstone Gully Forest (PCT 3595)

OEH (2016) and DPE (2022) have mapped Sydney Coastal Sandstone Gully Forest (PCT 3595) as occurring as a large continuous patch along the southeastern and eastern boundary of the subject land.

This vegetation was not surveyed for during this assessment as it will not be directly impacted on by the proposed development. It is located on the outer periphery of the existing access road and predominantly originates downslope of the road embankment (and out of the subject land boundary). The potential for indirect impacts on remnant vegetation is detailed in Section 8.

Sydney Coastal Enriched Sandstone Forest (PCT 3592)

OEH (2016) and DPE (2022) have mapped Sydney Coastal Enriched Sandstone Forest (PCT 3592) within southern edge of the subject land, also occurring as a large continuous patch within the surround bushland. There is some variation between the two mapping projects as to the extent this patch extends into the subject land from the adjacent bushland, but this is inconsequential as the mapped PCT 3592 on the subject land comprises either:

- Aerial canopy extent of vegetation, which originates to the south of hardstand access road and in part beyond the subject land boundary (and will not be directly impacted by the proposal), or
- Planted native vegetation within constructed raingardens.

Notwithstanding, PCT 3592 was determined to best represent the mixture of native local and non-local planted species throughout the subject land, due to predominant sandstone geology and soil landscapes (as shown in Figure 12).

Sydney Turpentine Ironbark Forest (PCT 3262)

Mapping by OEH (2016) indicates Sydney Turpentine Ironbark Forest (PCT 3262) occurring in two locations along the western side of the subject land. DPE (2022) mapping does not indicate this community as occurring on the subject land (see Figure 10 and Figure 11 respectively).

The two mapped locations were previously discounted as containing PCT 3262 due to the highly modified environment, with only a small number of *Syncarpia glomulifera* (turpentine) occurring in each patch overlying a mown lawn and garden bed in carpark.

Following consultation with DPE's Environment and Heritage Group (EHG) and feedback on an earlier version of the proposal's BDAR (dated 4 May 2023), further consideration was paid to the significance of this vegetation, which included:

- Additional analysis of historical imagery that found the areas of mapped PCT 3262 coincide with areas consistently vegetated (albeit trees only and not bushland) in historical imagery as far back as 1929 (historical imagery is provided in **Appendix C**);
- Review of OEH (2016) showed that the confidence level of the mapping of these patches to be 'very high' with the site 'visited by others'; and

- Ultimately, the proposed development footprint was amended to avoid clearing of this vegetation (refer to Section 7).

PCTs allocated to planted native vegetation

In addition to the above mapped patches of PCT 3262, the area of native vegetation located along the northern boundary of the subject land has been investigated thoroughly to determine whether it may also contain PCT 3262 or other PCT.

Confidently allocating a PCT to this patch of vegetation has been difficult due to:

- The very high proportion of non-local native species (i.e., within the patch collectively approximately 30% of the tree specimens present are of local native origin);
- The lack of shrub and groundlayer species diversity which would assist in distinguishing between PCTs;
- Geotechnical investigations found this area to contain fill overlying sandstone; suggesting that historical and more contemporary disturbance has modified the soil profiles (nothing that this patch of vegetation is located within the irregular patch of land that was historically located north of Stanhope Road as discussed in Section 2.2.4 and shown in Figure 4);
- The closest 'best fit' PCTs differ significantly in vegetation formation and class, i.e., being either dry or wet sclerophyll formations.

The native vegetation extent adopted for this assessment is shown in Table 17 and Figure 12 and is based on the following:

- Assessment of historical aerial imagery (provided in **Appendix C**);
- Ground truthing of the subject land and floristic data collection;
- Review and consideration of geotechnical and detailed site analysis of the subject area;
- Additional field investigations completed by Eco Logical Australia (provided in **Appendices F, G and H**).
- Consultation between Actinotus, écologique and Eco Logical Australia, which included workshopping the allocation of PCTs to the native vegetation on the subject land; and
- Subsequent additional investigations (following workshops) that included:
    - Review of historical studies and associated imagery and mapping;
    - Collection of floristic data from bushland immediately northeast of Stanhope Road (adjacent to the subject land); and
    - Inspection of other sites in the locality mapped as containing Sydney Turpentine Ironbark Forest (PCT 3262) for comparison.

Table 17. Subject land vegetation

PCT	Area		Description
	(m^2)	(ha)	
PCT 3262#	1,055		Allocated potentially remnant and planted vegetation
PCT 3262#	377		Allocated remnant regenerating understory (beneath planted non-local species)
PCT 3262 (OEH, 2016)	167		Mapped – accepted (OEH 2016)
PCT 3262 (OEH, 2016)	100		Mapped – accepted (OEH 2016)
	1,699	**0.17**	
PCT 3592	3,643		Remnant
PCT 3592	890		Native regrowth & planted mixture
PCT 3592	361		Allocated planted local
PCT 3592	2319		Allocated native/non-local native mixture

PCT	Area		Description
	(m^2)	(ha)	
PCT 3592	557		Allocated native/exotic mixture
	7,770	**0.77**	

4.1.2 Areas that are not native vegetation

Approximately 1.13 ha of planted vegetation in the subject land is exotic (see Figure 12). Approximately 1.01 ha of exotic vegetation will be cleared and 0.12 ha retained.

4.2 Planted native vegetation

D.1 Decision-making key

The Planted Native Vegetation Module includes a decision-making key to identify whether a streamlined assessment can be applied to part or all of the subject land.

The first 3 questions of the decision-making key are used to evaluate if the proposed impacts to the vegetation require assessment under the standard BAM. A ‘yes’ to any of these questions requires the vegetation to be assigned to a plant community type (PCT) and assessed using the standard BAM.

If all responses are ‘no’, the remainder of the questions apply, with Questions 4–6 used to evaluate the reasons for application of D.2. Under D.2, the planted native vegetation is assessed for threatened species habitat only and biodiversity credits are not calculated.

Table 18 outlines how the decision-making key has been applied and photographic plates 4.1 to 4.12 show various areas of planted native vegetation. Figure 12 shows planted native vegetation collectively as ‘landscaping’.

Table 18. DI Decision making key

Key	Decision
1. Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?	Approximately 0.31 ha of the subject land's planted native vegetation does not occur within a mosaic of planted and remnant native vegetation (i.e., a mix of planted and non-planted native vegetation occurring in a patch where the planted native vegetation is likely to account for a minor component) and has not been reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal. This vegetation has also been justified as planted based on the following evidence: ▪ Historical aerial imagery (see **Appendix C**) ▪ Construction photographs (see **Appendix D**) ▪ Non-locally native single species stands or as dominant planted species in mixed planted areas (refer to Table 2) ▪ Occurrence in artificially constructed rain gardens, garden beds, yards and courtyards (see photographic plates 4.1 to 4.12)
i. Yes .... The planted native vegetation must be allocated to the best fit PCT and the BAM must be applied.	Approximately 0.14 ha of planted native vegetation has been allocated to PCT 3262 Sydney Turpentine Ironbark Forest (see Section 4.3.2) and 0.41 ha of planted native vegetation has been allocated to PCT 3592 – Sydney Coastal Enriched Sandstone Forest (refer to (Section 4.3.3)
ii. No...... Go to 2.	0.36 ha of planted native trees and landscaping is further assessed herein.
2. Is the planted native vegetation:	
a. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and	No
b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?	No
i. Yes .... The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.	Not applicable
ii. No...... Go to 3.	

Key	Decision
3. Is the planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat under one of the following:	
a. a species recovery project	No
b. *Saving our Species* project	No
c. other types of government funded restoration project	No
d. condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat	No
e. legal obligation as part of a condition or ruling of court. This includes regulatory directed or ordered remedial plantings (e.g., Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act)	No
f. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or	No
g. approved vegetation management plan (e.g., as required as part of a Controlled Activity Approval for works on waterfront land under the NSW *Water Management Act 2000*)?	No
i. Yes .... The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.	Not applicable
ii. No...... Go to 4.	
4. Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation?	No
i. Yes...... Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).	Not applicable
ii. No....... Go to 5.	
5. Is the native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such as: windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or tea-tree farms?	Yes
i. Yes .... Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).	

D.2 Assessment of planted native vegetation for threatened species habitat

An assessment of the potential for the planted native vegetation to provide habitat for threatened species is required. If there is evidence that threatened species are using the planted native vegetation as habitat, the assessor must apply Section 8.4 of the BAM to mitigate and manage impacts on these species. Species credits are not required to offset the proposed impacts.

Threatened flora and fauna species assessed under the BAM has considered the entire subject land, including planted native and exotic vegetation and human made structures, refer Section 5 (Threatened Species) and Section 6 (Prescribed impacts) and concluded that the planted native vegetation assessed in this section does not:

- Provide habitat for threatened species, and
- Application of BAM Section 8.4 is not required.

Photo plate 4.1: *Pittosporum undulatum, Allocasuarina torulosa* and exotics planted in garden bed (within western site portion)

Photo plate 4.2: *Leptospermum petersonsii* (non-local native) specimens planted with exotic understorey in roadside garden bed

Photo plate 4.3: *Araucaria heterophylla* and Grevillea robusta (non-local natives) and *Angophora costata* (local native) with exotic understorey in roadside garden bed (along south western boundary)

Photo plate 4.4: *Lophostemon confertus* and *Eucalyptus scoparia* (non-local natives) and *Corymbia gummifera* (local native) with exotic understorey in garden bed (eastern site boundary)

Photo plate 4.5: *Melaleuca quinquenervia* and *Casuarina cunninghamiana* (local natives – natural habitat absent) planted in rain garden

Photo plate 4.6: drainage pit and mixture of native and introduced groundlayer species in rain garden

Photo plate 4.7: *Banksia serrata* (local native) plantings in residential garden beds (on left) and road side garden bed (on right)

Photo plate 4.8: Example of residential area with planted local natives (Angophora floribunda in background) and non-local natives (Callistemon viminalis) in foreground

Photo plate 4.9: planted *Melaleuca quinquenervia, Araucaria heterophylla* and *Phoenix canariensis* either side of entrance road

Photo plate 4.10: stand of the non-local native *Eucalyptus microcorys* planted along northern boundary of subject land

Photo plate 4.11: *Acacia baileyana* (non-local native), native groundcovers planted along Stanhope Road. Semi-mature Casuarina cunninghamiana specimens in background on left (local native – habitat absent)

Photo plate 4.12: non-local native *Eucalyptus microcorys* planted along Stanhope Road – managed canopy and lower electricity easement. Note: upward canopy growth stunted and instead extending north over road.

4.3 Plant community types

4.3.1 Overview

Vegetation within the subject land has been assessed as aligning with, or has been allocated to, the BioNet Vegetation Classification PCTs identified within Table 19. Their extent is shown in Figure 12 and PCTs that will be impacted by the proposed development are summarised in Table 20.

Table 19. PCTs identified within the subject land

PCT	Area		Description
	(m^2)	(ha)	
PCT 3262	1,055		Allocated potentially remnant and planted vegetation
PCT 3262	377		Allocated remnant regenerating understory (beneath planted non-local species)
PCT 3262 (OEH, 2016)	167		Mapped – accepted (OEH 2016)
PCT 3262 (OEH, 2016)	100		Mapped – accepted (OEH 2016)
	1,699	**0.17**	
PCT 3592	3,643		Remnant (partially coincides with OEH 2016 & DPE 2022 mapping)
PCT 3592	890		Native regrowth & planted mixture
PCT 3592	3,237		Allocated planted local and non-local species
	7,770	**0.78**	

Table 20. Impacted PCT areas

PCT	Area		Description
	(m2)	(ha)	
PCT 3592	890		Native regrowth & planted mixture
	361		Allocated planted local shrub/small tree species in
	374		Allocated native/non-local native mixture
	557		Allocated native/exotic mixture
	2,182	**0.22**	

4.3.2 PCT 3262 Sydney Turpentine Ironbark Forest

PCT overview

PCT 3262 is described in the Bionet Vegetation Classification database as a tall to very tall sclerophyll open forest with mid-stratum of mixed sclerophyll and mesophyll shrubs and a ground layer of grasses and forbs, found on shale or sheltered shale-sandstone soils mainly in the northern suburbs of Sydney and lower Blue Mountains.

This PCT occurs as small remnants in mosaics of urban land use in the shale-dominated landscapes in higher rainfall zones of the Sydney Metropolitan area, with the northern suburbs between Baulkham Hills and Ku-ring-gai include the highest number of remnants.

This community grades into tall moist shrub forests PCT 3136 (Blue Gum High Forest) in higher rainfall shale-rich soils on the north shore, or into PCT 3620 (Sydney Hinterland Turpentine Sheltered Forest) in sandstone environments.

The tree canopy very frequently includes *Syncarpia glomulifera* either as a canopy dominant or as a smaller tree or both. Other species which are localised and occasionally dominant or co-dominant occasionally include *Eucalyptus pilularis, Angophora costata* and *Eucalyptus punctata*, rarely with one of several species from the ironbark, stringybark or mahogany eucalypt groups of which

Eucalyptus paniculata, Eucalyptus globoidea and *Eucalyptus resinifera* are the most frequent of each group.

The mid-stratum is layered, with a sparse cover of small trees that includes eucalypts, occasionally *Acacia parramattensis* and *Allocasuarina torulosa*, rarely with *Allocasuarina littoralis*. The lower shrub layer very frequently includes *Pittosporum undulatum* and *Leucopogon juniperinus*, commonly with *Breynia oblongifolia, Polyscias sambucifolia, Ozothamnus diosmifolius* and *Notelaea longifolia*. The ground layer includes a diverse cover of grasses that very frequently includes *Microlaena stipoides* and *Entolasia stricta*, commonly with *Imperata cylindrica, Entolasia marginata* and *Themeda triandra*. Small forbs including *Lobelia purpurascens* are also very frequent, together with *Lomandra longifolia*.

PCT 3262 occurs in two locations in the subject land, as follows:

- Approximately 167 m^2 located in a garden bed with street frontage to Stanhope Road, which consists of a cluster of *Syncarpia glomulifera* (see photo plate 4.13 and 4.14).
- Approximately 100 m^2 located in mown lawn adjacent the fenceline to neighbouring residential dwelling, which comprises three individual of *S.glomulifera* (see photo plate 4.15 and 4.16). This location has also been avoided.

These are the only locations within the subject land that contain S.glomulifera. The proposal has been designed to avoid impacts to these trees.

Two additional areas have been allocated to PCT 3262 as follows:

- Approximately 1,052 m^2 of mixed local and non-local planted and potentially remnant trees with a very sparse understorey. This area is located beneath and adjacent to an electricity easement and has been maintained to exclude a shrub and ground layer (see photo plate 4.17 and 4.18).

  Maintenance (undertaken by others) includes lopping of trees directly beneath power lines (see photo plate 4.18)
- Approximately 373 m^2 of planted native trees that overly regenerating native shrub and ground layer species.

PCT 3262 has been allocated to these areas as this community is critically endangered, is an SAII entity and has a much higher sensitivity to biodiversity loss and risk weighting than other potential PCTs (i.e., PCT 3592).

Due to the lack of certainty in allocating this vegetation to a PCT, the use of PCT 3262 ensures the highest level of assessment (e.g., SAII assessment) and offset obligations as calculated in the BAM-C.

Table 21. PCT 3262 Sydney Turpentine Ironbark Forest

PCT ID	PCT 3262
PCT name	Sydney Turpentine Ironbark Forest
Vegetation formation	Wet Sclerophyll Forests (Grassy sub-formation)
Vegetation class	Northern Hinterland Wet Sclerophyll Forest
Per cent cleared value (%)	95.91
Extent within subject land (ha)	0.17 ha

Condition states

All areas of vegetation allocated to PCT 3262 within the subject land are degraded and located in areas that are managed such that any capacity to regenerate naturally has not occurred.

Justification of PCT selection

PCT 3262 at locations 1 and 2 has been adopted based on:

- Previous mapping by OEH (2016), which indicated a very high confidence level in the assignment of this PCT due to the site being visited during the mapping project;
- Historical imagery which suggests that vegetation at these locations may have prevailed since the early 1900s; and
- The presence of Turpentine ironbark specimens, which is common to all sites mapped by OEH (2016) and DPE (2022) as containing this PCT within the locality.

PCT 3262 at locations 3 and 4 (as discussed above) were determined as the best fit PCT applying the precautionary principle.

The proposal has been designed to avoid clearing in all areas allocated to PCT 3262.

However, the applicant wishes to continue the current management regime of this area, which includes leaf litter removal and removal of fallen timber. As such the applicant has requested the BAM assessors to conservatively include these areas in the BAM C as a management zone that would incur an offset obligation.

As locations 3 and 4 are located at either end of a monoculture of planted tallowwood, the entire area (including tallowwoods) has conservatively been entered in the BAM C as a PCT 3262 management zone (i.e., an increase from 0.14 ha to 0.33 ha).

Alignment with TECs

PCT 3262 is aligned with the TEC Sydney Turpentine Ironbark Forest in the Sydney Basin Region, which is listed as a CEEC under the BC Act.

It should be noted that the entire area being assessed as a PCT 3262 management zone does not align with the CEEC under the BC Act.

Alignment with EPBC Act listed ECs

PCT 3262 is aligned with the Commonwealth Turpentine-Ironbark Forest of the Sydney Basin Region, which is listed as a CEEC under the EPBC Act. The mapped patches of PCT 3262 and vegetation allocated to PCT 3262 in the subject land are not considered to be part of the nationally listed ecological community (refer to Section 4.4 for further detail).

	
Photo plate 4.13: Location 1	**Photo plate 4.14:** Location 1
	
Photo plate 4.15: Location 2	**Photo plate 4.16:** Location 2
	
Photo plate 4.17: Location 3	**Photo plate 4.18:** Location 3

Photo plate 4.19: Wombin Reserve (photo approx. 600m west of subject land STIF patch)

Photo plate 4.20: Wombin Reserve (photo approx. 450m west of subject land STIF patch)

Photo plate 4.21: Wombin Reserve approx. 600m west of subject land STIF patch

Photo plate 4.22: STIF patch Stanhope Rd approx. 600m west of subject land STIF patch

4.3.3 PCT 3592 Sydney Coastal Enriched Sandstone Forest

PCT overview

PCT 3592 is described in the Bionet Vegetation Classification database as a tall to very tall shrubby sclerophyll open forest found on slightly enriched Hawkesbury sandstone soils on sheltered slopes and occasionally crests on the Sydney coastal sandstone plateaus. The tree canopy very frequently includes a high cover of *Angophora costata* commonly in combination with *Corymbia gummifera* and *Eucalyptus piperita*, with *Eucalyptus pilularis* occasionally locally abundant.

A taller mid-stratum is characterised by very frequent however sparse cover of *Pittosporum undulatum* and *Allocasuarina littoralis* or *Allocasuarina torulosa*. A mid-dense lower shrub layer is comprised of dry sclerophyll species that commonly include *Leptospermum trinervium, Persoonia levis, Lomatia silaifolia, Acacia ulicifolia* and *Dodonaea triquetra*, with *Banksia serrata* and *Banksia spinulosa* recorded occasionally.

The ground layer is typically a sparse cover of graminoids that almost always includes *Dianella caerulea* and *Lomandra longifolia* with the grass *Entolasia stricta* and fern *Pteridium esculentum*, with frequent occurrences of climbers such as *Smilax australis*. This PCT is primarily distributed at elevations of less than 200 metres asl downslope of shale soils on the north shore of Sydney and Sutherland and on the Narrabeen sandstone escarpment along the Pittwater Peninsular. It grades into a heathy forest PCT 3595 on rocky Hawkesbury sandstone gullies or moist shrub and fern forest PCT 3176 with increased shelter in deeper gullies.

PCT 3592 occurs as remnant native vegetation along the southern and southeastern peripheries of the subject land (see photo plates 4.19, 4.20 and 4.26). The proposal will not directly impact on this vegetation, however the applicant wishes to include management of this zone as is being done for the PCT 3262 management zone.

The 'voluntary' PCT 3592 management area is not required to be managed as an asset protection zone (refer **Appendix J**: BlackAsh – Asset Protection Zone Requirements), rather the applicant wishes to take a conservative approach to management of the site and have this area included.

Within the subject land PCT 3592 is also considered to be of remnant origin as follows:

- Approximately 890 m^2 of planted native vegetation comprising a smaller area of regrowth on top of sandstone outcropping, which deliberate planting would not have been possible (see photo plate no. 4.30); and
- Approximately 341 m^2 of landscaping that contains two individual trees (no's 244 and 245) that were evident in 1982 construction photographs which show these trees being retained.

  However, tree no. 244 (*Angophora floribunda*) is no longer evident in aerial photography from 1983 (post construction), where tree no. 245 (*Angophora costata*) is evident.

  The current tree no. 244 is most likely planted following the removal of the original tree shortly after the construction photographs were taken.

  Notwithstanding, both trees have been maintained as PCT 3592.

  PCT 245 cannot be avoided but the proposal has been designed to avoid PCT 244. Based on arborist advice there is a chance that PCT 244 may be impacted despite avoidance and protection measures.

  Therefore, the total 341 m^2 area of landscaping is being offset in the BAM C.

All other individual or small groups of planted native trees have been that can be justified as planted native vegetation (under the BAM streamlined module for planted native vegetation) but are local native species, have conservatively been allocated to PCT 3592.

Condition states

For the purpose of this BDAR, PCT 3592 has been entered into the BAM C as two condition states, these being:

(i) Low_condition, which includes all PCT 3592 within the development footprint that will be cleared for the proposal. This vegetation is considered in low condition due to the nature of its managed curtilage and lack of any capacity to regenerate naturally.

(ii) Moderate_condition, which includes all vegetation within the PCT 3592 management zone.

Justification of PCT selection

Selection of PCT 3592 has been discussed already in detail in Section 4.3.2.3 (justification for selection of PCT 3262). In summary PCT 3592 was selected based on the following information:

- Site geologies and soil assessments (which indicate shallow fill over sandstone in northern vegetated areas and sandstone outcropping throughout);
- Elevation requirements (minimum 6 m and maximum 203.6 m), which align with the subject land's elevation (maximum of 106 m);
- The presence of shallow fill over sandstone in northern vegetated areas and sandstone outcropping throughout the subject area;
- The location of this PCT mapped within and adjacent to the subject land by OEH (2016) and DPE (2022); and
- Additional floristic plot data collected by ELA (refer Appendices D and G), which support the presence of this PCT.

Table 22. Frequency of occurrence of PCT 3592 species on the subject land

Species name	Frequency	Location found
Trees		
Angophora costata	79	All areas
Allocasuarina littoralis	69	South and northern patches
Corymbia gummifera	64	All areas
Eucalyptus pilularis	45	All areas
Allocasuarina torulosa	23	Northern patch
Shrubs		
Pittosporum undulatum	77	All areas
Elaeocarpus reticulatus	64	South and northern patches
Ozothamnus diosmifolius	37	South and northern patches
Leucopogon juniperinus	30	Northern patch
Grasses		
Lomandra longifolia	96	All areas
Entolasia stricta	95	All areas
Microlaena stipoides	61	All areas
Themeda triandra	40	Northern patch
Imperata cylindrica	39	Northern patch
Cyathochaeta diandra	23	Northern patch
Forbs		
Dianella caerulea	96	Northern patch
Lobelia purpurascens	40	Northern patch

Alignment with TECs

PCT 3592 is not aligned with any TECs under the BC Act or EPBC Act.

Table 23. PCT 3592 Sydney Coastal Enriched Sandstone Forest

PCT ID	PCT 3592
PCT name	Sydney Coastal Enriched Sandstone Forest
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Sydney Coastal Dry Sclerophyll Forests
Per cent cleared value (%)	60.82
Extent within subject land (ha)	0.78 ha

Photographic plates 4.19 to 4.30 illustrate PCT 3592 within and adjacent to the subject land.

Photo plate 4.19: Remnant PCT 3592 on southern boundary of subject land (will not be disturbed)

Photo plate 4.20: Remnant PCT 3592 on southern boundary of subject land (will not be disturbed)

Photo plate 4.21: Plot 2 – individuals of *Eucalyptus piluaris* in planted assemblage within managed curtilage

Photo plate 4.22: rain garden included in Plot 2, containing *E.pilularis, Corymbia maculata, M.quinqenervia, Lomandra longifolia*

Photo plate 4.25: rain garden included in Plot 2, containing *E.pilularis, Corymbia maculata, M.quinqenervia, Lomandra longifolia*

Photo plate 4.26: adjacent PCT 3592 – southeast corner of site

Photo plate 4.27: Planted local and non-local natives allocated to PCT 3592 in between village and Stanhope Road.

Photo plate 4.28: Planted local and non-local natives allocated to PCT 3592 adjacent Stanhope Road.

Photo plate 4.29: Planted non-local natives on northern side of Stanhope Road.

Photo plate 4.30: Regenerated PCT 3592 and landscaping on sandstone outcrop in subject land

4.4 Threatened ecological communities

TECs are listed in Table 24 and their extent is shown on Figure 14.

Table 24. TECs within the subject land

TEC name	Profile ID (from TBDC)	BC Act status	EPBC Act status	Associated vegetation zones within the subject land	Area within subject land (ha)
Sydney Turpentine Ironbark Forest	10789	CEEC	CEEC	PCT 3262	0.17

Consideration has been paid to the NSW Scientific Committee Final Determination for Sydney Turpentine Ironbark Forest (refer Section 4.3.2.3).

4.4.1 Sydney Turpentine Ironbark Forest

The mapped PCT 3262 in the subject land would not be considered to be part of the nationally listed ecological community due to the size of each patch being less than one hectare (ha).

Occurrences of the Turpentine–Ironbark Forest in the Sydney Basin Bioregion ecological community are considered to be part of the nationally listed ecological community if patches are in good condition (EPBC Act Approved Conservation Listing, 2014). Good condition is generally determined as:

- The vegetation has some characteristic components from all structural layers (tree canopy, small tree/shrub midstorey, and understorey);
- The tree canopy cover is greater than 10%; and
- The patch size is greater than one hectare.

4.5 Vegetation integrity (vegetation condition)

4.5.1 Vegetation integrity survey plots

Table 25 identifies each zone and the minimum number of plots required and completed and the location of plot/transects is shown in Figure 12.

Table 25. Vegetation zones

Vegetation zone ID	Area (ha)	Plots required	Plots completed
3592_management zone	0.36	1	1
3592_low condition	0.22	1	1
3262_management zone	0.34	1	2

4.5.2 Scores

Table 26 summarises each zones composition, structure and function score and vegetation integrity score.

Table 26. Vegetation integrity scores

Vegetation zone ID	Composition condition score	Structure condition score	Function condition score	Vegetation integrity score	Hollow bearing trees present?#
PCT 3592 – Low	9	45	28.7	22.7	No
PCT 3592– Managed	70.9	42	83.8	62.9	Yes
PCT 3262– Managed	32.7	47.8	79.8	32.7	No

presence of hollow bearing trees (HBTs) does not impact on habitat assessment. PCT 3592 managed zone is located in remnant bushland that is not being cleared and therefore there will be no impact to HBTs.

However, only floristic data was collected from this zone and benchmark data was used for structural and functional scores in the BAM-C, which included HBTs being present.

4.6 Patch size

All PCTs within the subject land have been assigned a patch size of <100 ha due to the continuous bushland and contiguous Garigal National Park which extends onto Middle Harbour. Figure 15 shows the continuity of the subject land with the adjacent bushland to the south and east.

5. Habitat suitability for threatened species

5.1 Identification of threatened species for assessment

5.1.1 Ecosystem credit species

Table 27 identifies the ecosystem credit species likely to occur on or use the subject land returned by the BAM and whether they have been retained in the BAM-C.

Table 27. Predicted ecosystem credit species

Scientific name	Common name	Listing status		Dual credit species	Sources	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act					
Anthochaera phrygia	Regent honeyeater	V	V	Yes	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Artamus cyanopterus cyanopterus	Dusky woodswallow	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	Moderate
Callocephalon fimbriatum	Gang-gang cockatoo	V	E	Yes	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	Moderate
Calyptorhnchus lathami	Glossy black cockatoo	V	V	Yes	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Chthonicola sagittata	Speckled warbler	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Climacteris picumnus victoriae	Brown treecreeper	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Daphoenositta chrysoptera	Varied Sittella	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	Moderate
Dasyurus maculatus	Spotted-tailed Quoll	V	E	No	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Glossopsitta pusilla	Little lorikeet	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High

Scientific name	Common name	Listing status		Dual credit species	Sources	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act					
Haliaeetus leucogaster	White-bellied sea eagle	V	-	Yes	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Hieraaetus morphnoides	Little eagle	V	-	Yes	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	Moderate
Hirundapus caudacutus	White-throated needletail	-	V	No	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Ixobrychus flavicollis	Black Bittern	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3262	Moderate
Lathamus discolor	Swift parrot	E	CE	Yes	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	Moderate
Lophoictinia isura	Square-tailed kite	V	-	Yes	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	Moderate
Melanodryas cucullata cucullata	Hooded robin	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	Moderate
Melithreptus gularis gularis	Black-chinned honeyeater	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	Moderate
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3262	High
Neophema pulchella	Turquoise parrot	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3592	High
Ninox connivens	Barking owl	V	-	Yes	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Ninox strenua	Powerful owl	V	-	Yes	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Petroica boodang	Scarlet robin	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3592	Moderate

Scientific name	Common name	Listing status		Dual credit species	Sources	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act					
Petroica phoenicea	Flame robin	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	Moderate
Pandion cristatus	Eastern osprey	V	-	Yes	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	Moderate
Tyto novaehollandiae	Masked owl	V	-	Yes	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Miniopterus australis	Little bent-winged bat	V	-	Yes	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Miniopterus orianae oceanensis	Large bent-winged bat	V	-	Yes	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Saccolaimus flaviventris	Yellow-bellied sheathtail bat	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Scoteanax rueppellii	Greater Broad-nosed bat	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3592	High
Stagonopleura guttata	Diamond Firetail	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3262	Moderate
Pteropus poliocephalus	Grey-headed flying-fox	V	V	Yes	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Varanus rosenbergi	Rosenberg's goanna	V	-	No	☒ BAM-C	Retained in BAM-C	PCT 3592 PCT 3262	High
Botaurus poiciloptilus	Australasian bittern*	V	-	No	☒ BAM-C	**Habitat absent:** Requires freshwater wetland habitat with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleocharis spp.).	PCT 3592	High
Ephippiorhynchus asiaticus	Black-necked stork	E	-	No	☒ BAM-C	**BAM habitat constraint:** Absence of shallow, open freshwater or saline wetlands or shallow edges of deeper wetlands within 300m of these swamps/Waterbodies, or	PCT 3592 PCT 3262	Moderate

Scientific name	Common name	Listing status		Dual credit species	Sources	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act					
						Shallow lakes, lake margins and estuaries within 300m of these waterbodies		
Grantiella picta	Painted honeyeater	V	V	No	☒ BAM-C	**BAM habitat constraint:** Mistletoes are not present at a density of greater than five mistletoes per hectare	PCT 3592 PCT 3262	Moderate

5.1.2 Species credit species

Table 28 and Table 29 lists all predicted species credit species returned in the BAM C and justification as to whether the species has been retained for further assessments or not.

Table 28. Predicted flora species credit species

Scientific name	Common name	Listing status		Sources	Habitat constraint	Geographic constraint	Species retained for further assessment ?	Reason for exclusion from further assessment
		BC Act	EPBC Act					
Acacia prominens	Endangered population Gosford Wattle, Hurstville and Kogarah Local Government Areas	E		☒ BAM-C		LGAs listed in the Determination (inclusive of Georges River LGA)	No	**BAM Geographic limitation:** site does not occur in listed LGAs
Acacia pubescens	Downy wattle	V	V	☒ BAM-C			Yes	
Callistemon linearifolius	Netted bottlebrush	V	-	☒ BAM-C			Yes	
Darwinia biflora		V	V	☒ BAM-C			Yes	
Darwinia peduncularis		V	-	☒ BAM-C			Yes	
Deyeuxia appressa		E	E	☒ BAM-C			No	**Habitat degraded:** Given that *D. appressa* hasn't been seen in over 60 years, almost nothing is known

Scientific name	Common name	Listing status		Sources	Habitat constraint	Geographic constraint	Species retained for further assessment ?	Reason for exclusion from further assessment
		BC Act	EPBC Act					
								of the species' habitat and ecology except that the species flowers in spring to summer and is mesophytic (grows in moist conditions). The species is an erect perennial grass to 0.9 m high. Natural moist habitat is lacking from the subject land and rain gardens are only temporarily wet and lack tall native grasses.
Dillwynia tenuifolia		V	V	☒ BAM-C			Yes	
Epacris purpurascens var. purpurascens		V	-	☒ BAM-C			Yes	
Eucalyptus camfieldii	Camfield's stringybark	V	V	☒ BAM-C			Yes	
Genoplesium baueri	Bauer's midge orchid	E	E	☒ BAM-C			No	**Habitat degraded:** i.e., the species grows in dry sclerophyll forest and moss gardens over sandstone. The subject land's original landform has been substantially modified such that the species is unlikely to have subsisted in managed garden beds, rain gardens and turfed areas.
Grevillea parviflora subsp. *parviflora*		V	V	☒ BAM-C	North of the Great Western Highway		Yes	**BAM Geographic limitation:** site does not occur north of Great Western Highway
Haloragodendron lucasii		E	E	☒ BAM-C			No	**Habitat absent:** i.e., the species is reported to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Such habitat is absent from the subject land.
Hibbertia puberula		E	-	☒ BAM-C			Yes	
Hibbertia spanatha		CE	CE	☒ BAM-C			Yes	
Hibbertia superans		E	-	☒ BAM-C			Yes	
Lasiopetalum joyceae		V	V	☒ BAM-C			Yes	
Leucopogon fletcheri subsp. *fletcheri*		E	-	☒ BAM-C			Yes	

Scientific name	Common name	Listing status		Sources	Habitat constraint	Geographic constraint	Species retained for further assessment?	Reason for exclusion from further assessment
		BC Act	EPBC Act					
Marsdenia viridiflora	Marsdenia viridiflora - endangered population	E (pop)	-	☒ BAM-C		Blacktown, Camden, Campbelltown, Canterbury-Bankstown, Cumberland, Fairfield, Liverpool and Penrith LGAs	Yes	**BAM Geographic limitation:** site does not occur in listed LGAs
Melaleuca deanei	Deane's paperbark	V	V	☒ BAM-C			Yes	
Persoonia hirsuta		E	E	☒ BAM-C			Yes	
Persoonia mollis subsp. *maxima*		E	E	☒ BAM-C			Yes	
Pimelea curviflora var. *curviflora*		V	V	☒ BAM-C			Yes	
Pomaderris brunnea	Brown pomaderris	E	V	☒ BAM-C			Yes	
Pomaderris prunifolia – endangered population	Pomaderris prunifolia – endangered population	E (pop)	-	☒ BAM-C		Parramatta, Auburn, Strathfield and Bankstown LGAs	No	**BAM Geographic limitation:** site does not occur in listed LGAs
Rhizanthella slateri	Eastern Australian underground orchid	V	E	☒ BAM-C			No	**Habitat degraded:** the species' habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground.

Scientific name	Common name	Listing status		Sources	Habitat constraint	Geographic constraint	Species retained for further assessment ?	Reason for exclusion from further assessment
		BC Act	EPBC Act					
								Therefore, usually located only when the soil is disturbed. The subject land's original landform has been substantially modified such that the species is unlikely to have subsisted in managed garden beds, rain gardens and turfed areas.
Rhodamnia rubescens	Scrub Turpentine	CE	CE	☒ BAM-C			Yes	
Tetratheca glandulosa	Tetratheca glandulosa	V	-	☒ BAM-C			Yes	
Wahlenbergia multicaulis – endangered population	Wahlenbergia multicaulis – endangered population	E (pop)	-	☒ BAM-C		Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield LGAs	No	**BAM Geographic limitation:** site does not occur in listed LGAs

Table 29. Predicted fauna species credit species

Scientific name	Common name	Listing status		Sources	Habitat constraint	Geographic constraint	Species retained for further assessment?	Reason for exclusion from further assessment
		BC Act	EPBC Act					
Anthochaera phrygia	Regent honeyeater	V	V	☒ BAM-C	Mapped breeding area for the species		No	**BAM Habitat constraint:** Not within Important Habitat Map
Burhinus grallarius	Bush stone curlew	E	-	☒ BAM-C	Fallen/standing dead timber including logs		No	**BAM Habitat constraint:** Absence of fallen/standing dead timber including logs
Callocephalon fimbriatum	Gang-gang cockatoo	V	E	☒ BAM-C	Tree hollows		No	**BAM Habitat constraint:** Absence of hollow bearing trees

Scientific name	Common name	Listing status		Sources	Habitat constraint	Geographic constraint	Species retained for further assessment?	Reason for exclusion from further assessment
		BC Act	EPBC Act					
Calyptorhynchus lathami	Glossy black cockatoo	V	V	☒ BAM-C	Tree hollows		No	**BAM Habitat constraint:** Absence of hollow bearing trees
Cercartetus nanus	Eastern pygmy possum	V	-	☒ BAM-C			Yes	**Assumed presence**
Chalinolobus dwyeri	Large-eared pied bat	V	V	☒ BAM-C			Yes	**Assumed presence**
Haliaeetus leucogaster	White-bellied sea eagle	V	-	☒ BAM-C	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines		No	**BAM Habitat constraint:** Absence of living or dead mature trees
Heleioporus australiacus	Giant burrowing frog	V	V	☒ BAM-C			No	**Habitat degraded**: i.e., Usually live along clear, small slowly flowing water courses which traverse plateaus and broad upland gullies. They also live adjacent to stream headwaters where they prefer permanently moist soaks and pondages. Many breeding sites have been found to be associated with shallow temporary ponds receiving seepage and the ponded sections of slow flowing creeks that drain ridges and plateaus. Have not been recorded breeding in waters that are even mildly polluted and are adversely affected by small pH changes. Habitat associated with the Gordon Creek tributary (average 100m downslope from subject land). Stream health data collected by Council indicates the creek is historically subject to poor water quality and therefore is considered too degraded to support this species.
Hieraaetus morphnoides	Little eagle	V	-	☒ BAM-C	Nest trees - live (occasionally dead) large old		No	**BAM Habitat constraint:** Absence of nest trees

Scientific name	Common name	Listing status		Sources	Habitat constraint	Geographic constraint	Species retained for further assessment?	Reason for exclusion from further assessment
		BC Act	EPBC Act					
					trees within vegetation)			
Hoplocephalus bungaroides	Broad-headed Snake (Breeding)	E	V	☒ BAM-C		The southwest margins of the sub-region		**BAM Geographic limitation:** site does not occur in the southwest margins of the region
Lathamus discolor	Swift parrot	E	CE	☒ BAM-C			Yes	**Assumed present**
Litoria aurea	Green and golden bell frog	E	V	☒ BAM-C			No	**Habitat absent:** i.e., inhabits marshes, dams and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.). Optimum habitat includes waterbodies that are unshaded, free of predatory fish such as Plague Minnow (Gambusia holbrooki), have a grassy area nearby and diurnal sheltering sites available. Such habitat is absent from the subject land.
Lophoictinia isura	Square tailed kite	V	-	☒ BAM-C	Nest trees		No	**BAM Habitat constraint:** Absence of nest trees
Meridolum corneovirens	Cumberland Plain Land Snail	E	-	☒ BAM-C			No	**Habitat absent:** i.e., Primarily inhabits Cumberland Plain Woodland - a grassy, open woodland with occasional dense patches of shrubs. Also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest Lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish Such habitat is absent from the subject site.

Scientific name	Common name	Listing status		Sources	Habitat constraint	Geographic constraint	Species retained for further assessment?	Reason for exclusion from further assessment
		BC Act	EPBC Act					
Miniopterus australis	Little bent-winged bat	V	-	☒ BAM-C	Caves, tunnel, mine, culvert or other structure known/suspected to be used for breeding. Includes species records in BioNet with microhabitat code 'IC – in cave' observation type code 'E nest-roost' with numbers of individuals >500 or from the scientific literature		No	**BAM Habitat constraint:** absence of caves, tunnel, mine, culvert or other structure known or suspected to be used for breeding
Miniopterus orianae oceanensis	Large bent-winged bat	V	-	☒ BAM-C			No	
Myotis macropus	Southern myotis	V	-	☒ BAM-C	Waterbodies with permanent pools/stretches 3m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies, on or within 200m of the site		No	**BAM Habitat constraint:** suitable waterbodies are not present within 200m of the subject land
Ninnox connivens	Barking owl	V	-	☒ BAM-C	Tree hollows		No	**BAM Habitat constraint:** Absence of hollow bearing trees
Ninnox strenua	Powerful owl	V	-	☒ BAM-C	Tree hollows		No	**BAM Habitat constraint:** Absence of hollow bearing trees

Scientific name	Common name	Listing status		Sources	Habitat constraint	Geographic constraint	Species retained for further assessment?	Reason for exclusion from further assessment
		BC Act	EPBC Act					
Pandion cristatus	Eastern osprey	V	-	☒ BAM-C	Stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting)		No	**BAM Habitat constraint:** Absence of stick-nests
Perameles nasuta	Long-nosed Bandicoot population on Western Sydney	E (pop)	-	☒ BAM-C		Marrickville, Canada Bay, Canterbury, Ashfield and Leichhardt LGAs	No	**BAM Geographic limitation:** site does not occur in listed LGAs
Petaurus norfolcensis	Squirrel glider	V	-	☒ BAM-C			No	**Habitat degraded:** i.e., inhabits mature or old growth Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Require abundant tree hollows for refuge and nest sites, which are absent from the subject land.
Phascolarctos cinereus	Koala	E	E	☒ BAM-C			No	**Habitat degraded:** i.e., the subject land is highly modified and would not provide foraging habitat above that provided in the higher quality surrounding bushland. Due to retired nature of the village's residents, it is anticipated that the presence of a koala in any of the village's tree would not go unnoticed. Anecdotal wildlife observations provided by non-village Stanhope Road residents do not include seeing or hearing the koala.
Pommerhelix duralensis	Dural land snail	E	E	☒ BAM-C			No	**Habitat degraded:** i.e., the species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris.

Scientific name	Common name	Listing status		Sources	Habitat constraint	Geographic constraint	Species retained for further assessment?	Reason for exclusion from further assessment
		BC Act	EPBC Act					
								The subject land is located within this interface but has been substantially modified and good native cover and woody debris absent.
Pseudophryne australis	Red-crowned toadlet	V	-	☒ BAM-C			No	**Habitat degraded:** i.e., occur in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Red-crowned Toadlets have not been recorded breeding in waters that are even mildly polluted or with a pH outside the range 5.5 to 6.5. Habitat associated with the Gordon Creek tributary (average 100m downslope from subject land). Stream health data collected by Council indicates the creek is historically subject to poor water quality and therefore is considered too degraded to support this species.
Pteropus poliocephalus	Grey-headed flying fox	V	V	☒ BAM-C	Breeding camps		No	**BAM Habitat constraint:** Absence of breeding camp
Tyto novaehollandiae	Masked owl	V	-	☒ BAM-C	Tree hollows		No	**BAM Habitat constraint:** Absence of hollow bearing trees

5.2 Presence of candidate species credit species

Table 30. Determining the presence of candidate flora species credit species on the subject land

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required?
		BC Act	EPBC Act			
Acacia pubescens	Downy wattle	V	V	Targeted threatened species survey	No	No
Callistemon linearifolius	Netted bottlebrush	V	-	Targeted threatened species survey	No	No
Darwinia biflora	Darwinia biflora	V	V	Targeted threatened species survey	No	No
Darwinia peduncularis	Darwinia peduncularis	V	-	Targeted threatened species survey	No	No
Dillwynia tenuifolia	Dillwynia tenuifolia	V	V	Targeted threatened species survey	No	No
Epacris purpurascens var. purpurascens	Epacris purpurascens var. purpurascens	V	-	Targeted threatened species survey	No	No
Eucalyptus camfieldii	Camfield's stringybark	V	V	Targeted threatened species survey	No	No
Hibbertia puberula	Hibbertia puberula	E	-	Targeted threatened species survey	No	No
Hibbertia spanatha	Hibbertia spanatha	CE	CE	Targeted threatened species survey	No	No
Hibbertia superans	Hibbertia superans	E	-	Targeted threatened species survey	No	No
Lasiopetalum joyceae	Lasiopetalum joyceae	V	V	Targeted threatened species survey	No	No
Leucopogon fletcheri subsp. *fletcheri*		E	-	Targeted threatened species survey	No	No
Marsdenia viridiflora	Marsdenia viridiflora - endangered population	E (pop)	-	Targeted threatened species survey	No	No
Melaleuca deanei	Deane's paperbark	V	V	Targeted threatened species survey	No	No
Persoonia hirsuta	Persoonia hirsuta	E	E	Targeted threatened species survey	No	No
Persoonia mollis subsp. *maxima*	Persoonia mollis subsp. maxima	E	E	Targeted threatened species survey	No	No
Pimelea curviflora var. *curviflora*	Pimelea curviflora var. curviflora	V	V	Targeted threatened species survey	No	No

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required?
		BC Act	EPBC Act			
Pomaderris brunnea	Brown pomaderris	E	V	Targeted threatened species survey	No	No
Rhodamnia rubescens	Scrub Turpentine	CE	CE	Targeted threatened species survey	No	No
Tetratheca glandulosa	Tetratheca glandulosa	V	-	Targeted threatened species survey	No	No

Table 31. Determining the presence of candidate fauna species credit species on the subject land

Scientific name	Common name	Listing status		Method used to determine presence	Present?	Further assessment required?(
		BC Act	EPBC Act			
Lathamus dicolor	Swift Parrot	E	CE	Within important habitat mapped area	Assumed present	Yes
Cercartetus nanus	Eastern pygmy possum	V	-	Assumed present	Assumed presence	Yes
Chalinolobus dwyeri	Large-eared pied bat	V	V	Assumed present	Assumed presence	Yes

5.3 Threatened species surveys

As discussed in Section 2.3.3 (Threatened flora species survey methods), due to the managed curtilage and lack of dense mid and groundlayer species in areas of more dense vegetation, all areas of potential habitat were able to be searched comprehensively (i.e., without the need to allocate grid and parallel transect survey methods).

Table 32 lists the flora species surveyed and outlines survey details. Weather conditions at the time of surveys are provided in in Section 2.5.

Table 32. Threatened species surveys for candidate flora species credit species on the subject land

Scientific name	Common name	Threatened flora species surveys			Present	Further assessment req'd
		Timing of survey – within recommended period?		Effort (hours & no. people)		
Acacia pubescens	Downy wattle	☒ Yes All year round	27.10.22	6 hrs x 1 person	No	No
Callistemon linearifolius	Netted bottlebrush	☒ Yes All year round	27.10.22	6 hrs x 1 person	No	No
Darwinia biflora		☒ Yes October to January	27.10.22	6 hrs x 1 person	No	No
Darwinia peduncularis		☒ Yes All year round	27.10.22	6 hrs x 1 person	No	No
Dillwynia tenuifolia		☒ Yes All year round	27.10.22	6 hrs x 1 person	No	No
Epacris purpurascens var. *purpurascens*		☒ Yes August to October	27.10.22	6 hrs x 1 person	No	No
Eucalyptus camfieldii	Camfield's stringybark	☒ Yes September to October	27.10.22	6 hrs x 1 person	No	No
Grevillea parviflora subsp. *parviflora*		☒ Yes All year round	27.10.22	6 hrs x 1 person	No	No
Hibbertia puberula		☒ Yes August to November	27.10.22	6 hrs x 1 person	No	No

Scientific name	Common name	Threatened flora species surveys			Present	Further assessment req'd
		Timing of survey – within recommended period?		Effort (hours & no. people)		
Hibbertia spanatha		☒ Yes October to December	27.10.22	6 hrs x 1 person	No	No
Hibbertia superans		☒ Yes October to November	27.10.22	6 hrs x 1 person	No	No
Lasiopetalum joyceae		☒ Yes July to December	27.10.22	6 hrs x 1 person	No	No
Marsdenia viridiflora	Marsdenia viridiflora - endangered population	☒ Yes September to November	27.10.22	6 hrs x 1 person	No	No
Melaleuca deanei	Deane's paperbark	☒ Yes All year round	27.10.22	6 hrs x 1 person	No	No
Persoonia hirsuta		☒ Yes All year round	27.10.22	6 hrs x 1 person	No	No
Persoonia mollis subsp. *maxima*		☒ Yes All year round	27.10.22	6 hrs x 1 person	No	No
Pimelea curviflora var. *curviflora*		☒ Yes All year round	27.10.22	6 hrs x 1 person	No	No
Rhodamnia rubescens	Scrub Turpentine	☒ Yes October to March	27.10.22	6 hrs x 1 person	No	No
Tetratheca glandulosa		☒ Yes August to November	27.10.22	6 hrs x 1 person	No	No

Table 33. Threatened species surveys for candidate species credit species on the subject land

Species	Threatened fauna species surveys	Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
Lathamus discolor Swift Parrot	N/A	Assumed present	Yes
Chalinolobus dwyer (large-eared pied bat)	N/A	Assumed present	Yes

Species	Threatened fauna species surveys	Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
Cercartetus nanus (eastern pygmy possum)	N/A	Assumed present	Yes

5.4 Expert reports

Expert reporting has not been used in this assessment. However, should an approved expert become available for PCT 3262, it is recommended that they be engaged to assess the areas that have been allocated to this PCT within the subject land.

5.5 More appropriate local data (where relevant)

Local data has not been used to assess habitat suitability in this assessment but has used benchmark data for the structural and functional BAM-C components of the PCT 3952 management zone as only floristic plot data was collected by ELA (refer **Appendices F, G and H**).

5.6 Location of suitable habitat for a species credit species (a species polygon)

5.6.1 Swift Parrot important habitat

The subject land contains approximately 2,306 m^2 (or 0.23 ha) of mapped important habitat areas for *Lathamus discolor* (swift parrot), which includes approximately 0.17 ha of PCT 3592, small areas of exotic vegetation and encompasses parts of the road (see Table 34).

The proposal design has avoided impacts on native vegetation within the mapped important habitat areas. The Applicant's conservative inclusion of the PCT 3592 management zone within the BAM C encompasses approximately 0.17 ha of mapped important habitat for the swift parrot (see Table 34).

Potential management of this area would be limited to removal of leaf litter, bark and small woody debris (i.e., <10cm in diameter and below that considered as large woody debris in the BAM-C) and would not impact on foraging habitat for the swift parrot.

Several preferred foraging trees will be removed from the existing developed areas of the subject land (see Table 34).

Table 34. Areas of Swift Parrot habitat within the subject land

Vegetation type	Area		Impact
Swift Parrot mapped important habitat	**m^2**	**ha**	
PCT 3592 – management zone	1,727	0.17	YES
PCT 3592 – non management zone	189	0.02	NO
Exotic landscaping	78	0.01	YES
Road, other	312	0.03	N/A
Total mapped important habitat area	2,306	**0.23**	
Swift Parrot favoured foraging trees#	**m^2**	**ha**	
Corymbia gummifera x 4	461	0.05	YES
Eucalyptus tereticornis x 1	100	0.01	YES
Subtotal	**561**	**0.06**	

foraging trees within the subject land that are located outside of the mapped important habitat areas and do not include species known as preferred lerp infested trees as lerp infestations were not observed by Actinotus, écologique or ELA.

For the purpose of this BDAR, the applicant has chosen to conservatively assume the presence of the swift parrot.

Figure 18 shows the extent of mapped important habitat within the subject land, the PCT 3592 management zone, favoured foraging trees that will be removed for the proposal and species polygons used to calculate the area of habitat entered into the BAM-C.

5.6.2 Large-eared pied bat habitat

The subject land is located within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.

Chalinolobus dwyer (large-eared pied bat) is not a dual credit species, which means that despite the subject land only ever likely to provide foraging (and not breeding) habitat for the species, it must be assessed as a species credit species.

Figure 20 shows the subject land in the context of the escarpments, and the species polygons used to calculate the area of habitat entered into the BAM-C.

The offsetting required for this species may be discounted following compliant surveying in the months of November-December 2023 and January 2024 and where the species is not detected during compliant surveys.

5.6.3 Eastern pygmy possum habitat

Cercartetus nanus (eastern pygmy possum) cannot be discounted from potentially (albeit infrequently) visiting the subject land, due to its ability to tolerate small patches of vegetation in fragmented landscapes and although the species prefers habitat with a rich shrub understory, they are known to occur in grassy woodlands and the presence of Eucalypts alone is sufficient to support populations in low densities.

Figure 23 shows the species polygon used to calculate the area of habitat entered into the BAM-C for this species.

The offsetting required for this species may be discounted following compliant surveying in the months of October-December 2023 and January-March 2024 and where the species is not detected during compliant surveys.

6. Identifying prescribed impacts

Prescribed additional biodiversity impacts (prescribed impacts) must be assessed as per clause 6.1 of the BC Reg. Prescribed impacts include those impacts on the habitat of threatened species or ecological communities from development that is not directly caused as a result of vegetation clearing.

Table 35 lists the prescribed impacts, which are identified in Clause 6.1 of the BC Reg and the relevance of each prescribed impact in relation to the proposal.

Table 35. Prescribed and Uncertain Impacts

Feature	Present	Description of feature characteristics and location
Karst, caves, crevices, cliffs, rocks or other geological features of significance	☐Yes / ☒No	Not relevant. Mapping was undertaken to identify areas of geological significance for threatened species (e.g., the Large-eared Pied Bat) and no geological areas of significance were identified within the subject land.
Human-made structures	☒Yes / ☐No	Relevant. The project includes the staged demolition of a number of existing buildings within the subject land. Despite being aged in providing aged services, the buildings are in good condition and are actively managed and well maintained. There are no areas of roofing, eaves, piping or other building components that are in disrepair, and no obvious access points for microchiropteran bats. Human made structures will be demolished during the construction phase of the project (refer Section 8.3.1).
Non-native vegetation	☒Yes / ☐No	Relevant. Non-native vegetation occurring within the subject land comprises areas of managed lawns, landscaped gardens and exotic roadside plantings. This vegetation may provide some low-value habitat for native fauna species, including threatened birds and bats, on occasion. Impacts to non-native vegetation would occur during the construction phase of the project (refer Section 8.3.2).
Habitat connectivity	☒Yes / ☐No	Relevant. The subject land's peripheral vegetation along its southern and eastern boundaries is adjacent to the bushland that is contiguous with Garigal National Park (separated only be the Eastern Arterial Road to the east). Garigal National Park extends to Middle Harbour, thereby providing substantial connectivity. The vegetation within the subject land that is to be cleared may provide some habitat connectivity to the adjacent bushland and to the extensive connected corridor beyond Gadigal National Park and Middle Harbour (refer Section 8.3.3).
Waterbodies, water quality and hydrological processes	☒Yes / ☐No	Relevant. The subject land does not contain any watercourses or other surface drainage lines. However, stormwater runoff from the subject land discharges to creek systems in the adjacent bushland and downstream National Park. Impacts to downstream aquatic biota may occur during construction and operational phases of the project (refer Section 8.3.4).

Feature	Present	Description of feature characteristics and location
Wind turbine strikes (wind farm development only)	☐Yes / ☒No	Not relevant. The proposal does not involve wind farming.
Vehicle strikes	☒Yes / ☐No	Relevant. The potential for vehicle strike may increase above that which currently exists. The proposed development will result in the creation of additional access roads / private driveways and increased traffic (by way of increased dwellings), increasing the risk of potential vehicle strike (refer Section 8.3.5).

Stage 2: Impact Assessment

7. Avoid and minimise impacts

7.1 Avoid and minimise direct and indirect impacts

7.1.1 Project necessity

The redevelopment of the village is necessary as the existing aging buildings, which were original constructed in 1983, need renewal to provide modern seniors housing. The existing housing has limited accessibility with many of the dwellings without lift access and the gradient of streets and pathways providing poor pedestrian connectivity.

The dwellings are accessed via a network of narrow internal paths and stairways making pedestrian movement across the site difficult, with some streets too steep to walk. The building stock is aging and does not provide services and facilities that are competitive with market demand nor compliant with current Building Codes or Bushfire standards. Accordingly, major renewal of the housing and infrastructure is required which has resulted in the development of the Planning Proposal and master plan.

Building footprints have been located with the view to minimise impacts on biodiversity wherever possible. However, locations and building footprints have also been driven by the need to meet the requirements of the Apartment Design Guide for building separation and solar access and to provide generous communal space at the ground level as well as to achieve suitable building floorplates to accommodate modern seniors housing, necessitating some impacts on biodiversity.

The proposed changes to the internal road network seek to establish a separate access network for the private town house development to the south of the site and the seniors housing (independent living units and residential aged care) at the north of the site. This necessitates a new site access point to Stanhope Road at the west of the site and a new access road along the western boundary as well as a new site access connecting to the existing roundabout at Stanhope Road which will impact on small areas of native vegetation.

This ensures safe and efficient access to the proposed land uses and locates access to the basement and loading areas for the seniors housing as close as possible to Stanhope Road limiting the intrusion of vehicles into the site as much as feasible and also by extension serving to limit the effect of vehicle movements from a noise and pollution perspective within the local context. It also allows for a low traffic environment for the internal road serving the townhouses providing for a high level of pedestrian safety and amenity and minimal noise impacts in these areas.

7.1.2 Project location

Given the significant landholding and obligations to house existing residents during the development, alternate sites were not considered appropriate nor feasible for the proposal objectives.

The proposal is predominantly located within the existing developed footprint of the subject land and in accordance with Section 7.1.2 of the BAM, as far as practical, has sought to avoid the following:

- In areas that have negligible or no biodiversity values; and
- In vegetated areas that:
    - are in the poorest condition, and/or

- do not contain, or contain limited, habitat for threatened species.

This is demonstrated in Table 36, which identifies the areas of exotic vegetation to be the most impacted (at 1.02 ha); 1.05 ha out of 1.58 ha of native vegetation avoided, with most native vegetation being cleared comprising landscaping.

Table 36. Avoided and impacted native vegetation

Vegetation type	Total area (ha)	Avoided (ha)	% avoided	Impacted (ha)	% impacted
PCT 3262	0.17	0.17	100	0	0
PCT 3592	0.78	0.56	71.9	0.22	28.1
Landscaping (native)	0.63	0.32	50.8	0.31	49.2
Total native vegetation	**1.58**	**1.05**	**66.5**	**0.53**	**33.5**
Landscaping (exotic)	1.13	0.11	10.2	1.02	89.8
Total all vegetation	**2.71**	**1.16**	**42.8**	**1.55**	**57.2**

7.1.3 Project design

During the design development, various possibilities were explored regarding the development layout of the site. This comprehensive evaluation took into account the potential opportunities and constraints presented by the location, aiming to develop a place-based master planned renewal of the village suitable for seniors living.

Figure 16 shows the final development footprint and alternative footprints, which had greater impacts on biodiversity values, including impacts to the critically endangered ecological community Sydney Turpentine Ironbark Forest and mapped important habitat of the Swift Parrot.

This was achieved through the following design amendments:

- Relocation and realignment of the western entrance, enabling the retention of the subject land's remaining *Syncarpia glomulifera* (Turpentine) trees and areas mapped as comprising the critically endangered ecological community Sydney Turpentine Ironbark Forest (PCT 3262).
- Redesign of southern townhouses and avoided mapped important habitat for the Swift Parrot. The masterplan has also been further amended to minimise impact to foraging habitat outside of mapped important habitat.
- Modification of the Northeastern Independent Living Apartment Building by redesign of the footprint of the building and basement footprint. Since the prior design, this enabled the avoidance of 0.05 ha of PCT 3262 and minimisation by reduction of 0.10 ha of planted native vegetation previously allocated to PCT 3592.
- Modification of the eastern entrance from Stanhope Road to enable greater native vegetation retention of PCT (3262 & 3592) to the northeastern areas of the site. Therefore a greater retention of foraging habitat of mobile fauna.
- Redesign of the townhouse precinct and the reduction of townhouses yield from a 63 to 59

Design amendments made in July 2023 resulted in an overall reduction in clearing of PCT vegetation from 0.58 ha to 0.25 ha (i.e., a further avoidance of 0.33 ha of PCTs).

The outcome of the current proposed design (i.e., of September 2023) is a further reduction in PCT vegetation of 0.15 ha, which includes 0.05 ha of PCT 3262 and 0.10 ha of planted native vegetation previously allocated to PCT 3592)[3].

Table 37 provides a summary of avoidance and minimisation components that have been considered through design iterations.

Table 37. Avoidance and minimisation measures for direct, indirect and prescribed impacts

Avoidance and minimisation components	Action	Outcome	Timing	Responsibility
Alternative development site locations				
Avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	Given the significant landholding and obligations to house existing residents during the development, alternate sites were not considered appropriate or feasible for the proposal objectives.	The project: • is sited within existing areas of development that are proximal to existing infrastructure and urban amenities; and • impacts only on vegetation that is in a disturbed and/or managed condition.	During project planning and masterplan design	Proponent, Project Design Team and Ecologist
Efforts to avoid and minimise impacts through design must be documented and justified	Through the various iterations, the proponent has determined that the proposed impacts to 0.7 ha cannot be avoided because the footprint has been amended to accommodate: • Necessity of multiple access roadways to facilitate emergency evacuation • Location of the building footprints in accordance with Bushfire Constraints • Grading of portions of the site to meet requirements for Housing SEPP - Seniors Living design & civil engineering constraints	The outcome of design amendments made in July 2023 was an overall reduction in clearing of PCT vegetation from 0.58 ha to 0.25 ha (i.e., the additional avoidance of 0.33 ha of PCTs achieved). Additional amendments made in September 2023 further reduced clearing of 0.15 ha, which includes 0.05 ha of PCT 3262 and 0.10 ha of planted native vegetation previously allocated to PCT 3592. Most clearing is of exotic vegetation (1.0 ha of 1.14 ha). All areas of native vegetation being removed (including PCTs) contain a mixture of native and planted non-local species, which are located in managed curtilage and lack a fully structured	During Project Master planning, project design and construction documentation	Proponent, Project Design Team, Project Manager, and Ecologist

[3] Due to revision of tree species identification in areas previously assessed as potential remnant vegetation, this area was identified by ELA as meeting the definition of planted native vegetation (refer **Appendix I**). PCT 3592 clearing extent has remained relatively constant as planted native trees within the central site portion (and that can be justified through evidence of being planted in origin) have been conservatively allocated to PCT 3592 in the BAM-C and are being offset.

Avoidance and minimisation components	Action	Outcome	Timing	Responsibility
		community (i.e., absence of native shrub and ground layers).		
Clearing protocols that identify vegetation to be retained to prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chain-saw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	Boundaries of the impact area to be clearly delineated with heavy duty fencing, retained areas marked with “No Go” signage, in particular in the areas surrounding Sydney Turpentine Ironbark Forest to be retained	Protection of retained vegetation with heavy duty fencing.	Prior to and during construction	Contractor, Ecologist and project manager
Sediment barriers to control the quality of water released from the site into the receiving environment	Install permanent sediment barriers and erosion control during and post construction to prevent runoff into adjacent bushland/ waterways. Sediment barriers to be checked regularly during construction phase and following periods of heavy rainfall to mitigate potential indirect impacts	Control of erosion, sedimentation and Runoff of contaminated substances into adjacent waterways	Prior / during construction & throughout operations	Project Design Team, Project Manager and Contractor
Efforts to avoid and minimise impacts through design must be documented and justified	Through the various iterations, the proponent has determined that the proposed impacts to 0.53 ha of native vegetation cannot be avoided because the footprint has been amended to accommodate: • Necessity of multiple access roadways to facilitate emergency evacuation • Location of the building footprints in accordance with Bushfire Constraints • Grading of portions of the site to meet requirements for Housing SEPP - Seniors Living design & civil engineering constraints	The outcome of design amendments is an overall reduction in clearing of PCT vegetation from 0.58 ha to 0.22 ha (i.e., the additional avoidance of 0.35 ha of PCTs has been achieved through design iterations in July and September 2023). Most clearing is of exotic vegetation (1.0 ha of 1.14 ha). All areas of native vegetation being removed (including PCTs) contain a mixture of native and planted non-local species, which are located in managed curtilage and lack a fully structured community (i.e., absence of native shrub and ground layers)	During Project Master planning, prior authority approval and design / construction documentation	Proponent, Project Design Team, Project Manager, and Ecologist

Avoidance and minimisation components	Action	Outcome	Timing	Responsibility
Avoidance of impacts on biodiversity values through location of design				
Locating the project in areas where the native vegetation: • is in the poorest condition; • does not provide habitat for threatened species; • avoids vegetation in high threat categories (e.g., an EEC or CEEC); and • avoids areas mapped as important habitat for the swift parrot	The project footprint has been located within an already developed area and where vegetation is dominated by planted exotic and native landscaping. Most clearing is of exotic vegetation (1.0 ha of 1.14 ha existing exotic vegetation, including large areas of mown lawns). Unavoidable impacts are limited to areas that are: • dominated by planted native vegetation; • lack a fully structured community (i.e., absence of native shrub and ground layers); • Are not EEC or CEECs; and • Do not provide habitat of significance for any threatened species.	Impacts across the development footprint are mostly limited to areas containing planted exotic and native vegetation. The proposed application will affect 0.53 ha of a total 1.58 ha of native vegetation. All planted native vegetation allocated to PCT 3262 (a CEEC) has been avoided. Approximately 0.09 ha of regenerating PCT 3592 mixed with planted native vegetation (not threat listed) will be impacted. Approximately 0.56 ha of this PCT will be avoided. A further 0.31 ha of planted native vegetation not allocated to a PCT will be cleared and approximately 0.32 ha avoided. Potential impacts to threatened species habitat is limited to marginal foraging habitat only, which is unlikely to be preferred over the intact bushland adjacent to the subject land's east and southern boundaries. All areas of mapped important habitat for the swift parrot have been avoided. Wherever possible foraging trees preferred by the swift parrot have been avoided, including 6 x *Eucalyptus robusta*, 9 x *E.tereticornis*, 13 x *Corymbia gummifera*, 2 x *Corymbia maculata*) 4 x *Corymbia gummifera*, and 2 x *E.tereticornis* will be cleared	During Project Master planning and design and prior to authority approval	Project Design Team, Project Manager, and Ecologist

Avoidance and minimisation components	Action	Outcome	Timing	Responsibility
Avoidance of impacts on biodiversity values through proposal design				
Design amendment - northeastern Independent Living Apartment Building Amendments	In response to EHG RtS (6/06/23) & RtS (August 2023) the Northeastern Independent Living Building has been modified to further avoid and minimise the adjacent vegetation to the north. This included the relocation of the overall building footprint and basement footprint.	The proposed clearing of a small area of 0.05 ha (or 500m^2) of native vegetation allocated to PCT 3262 (a CEEC) and a further 0.1 ha of planted native vegetation in this area has been avoided. This has included avoiding foraging trees preferred by the swift parrot (i.e., 4 x E.robusta, 4 x E.tereticornis and 2 x C.gummifera.	During Project Master planning and design and prior to authority approval	Project Design Team, Project Manager, and Ecologist
Design amendment - western access road amendment	Avoidance of areas of intact vegetation through the relocation and realignment of the western entrance road to enabling the retention of the subject land's remnant *Syncarpia glomulifera* (Sydney turpentine) trees and areas mapped as comprising the critically endangered Sydney Turpentine Ironbark Forest (PCT 3262)	Retention of mature trees where possible which provide higher quality potential resources for highly mobile common fauna in the wider locality. Retention of remnant native vegetation relating to a critically endangered community under the BC Act.	During Project Master planning and design and prior to authority approval	Project Design Team, Project Manager, and Ecologist
Design amendment - southwestern townhouse design change and road re-alignment	Avoidance and minimisation of native vegetation clearing within the mapped boundary of mapped Swift Parrot important habitat area.	Amendment of townhouse design footprint and yield to avoid previously proposed clearing of planted native vegetation within the mapped Swift Parrot important habitat area	During Project Master planning and design and prior to authority approval	Project Design Team, Project Manager, and Ecologist
Minimisation of earthworks	Minimisation of cut and fill at the boundary of the sites to enable retention of the existing perimeter road.	Retention of mature and higher quality patches of remnant and planted native vegetation.	During Project Master planning and design, prior to and during felling, prior to demolition and excavation	Project Design Team, Project Manager, Contractor and Ecologist
Habitat connectivity	The subject land is juxtaposed at the edge of extensive existing developed land and	Approximately 140m^2 of native planted vegetation in the southwest and from within an area mapped as important habitat for the	During Project Master planning	Project Design Team, Project Manager, and Ecologist

Avoidance and minimisation components	Action	Outcome	Timing	Responsibility
	remnant bushland to its south and east. The latter is contiguous with Garigal National Park, which extends to Middle Harbour and provides substantial connectivity. The site's periphery vegetation along the southern and eastern boundaries supplements but does not provide a significant contribution to this connectivity. Notwithstanding impacts on this vegetation has been avoided and minimised.	swift parrot has been avoided. Clearing from the peripheral areas of the subject land has been limited to small patches of three small patches of planted native vegetation ($70m^2$, $174m^2$ and $180m^2$). Each of these areas are located on the inner side of Lourdes Road and the Stanhope Road cul de sac, thereby not impacted on external bushland and connectivity.		
Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal				
APZ design and management Requirements across the site	Limit the amount of required maintenance required to comply with the APZ management of native vegetation	The areas of retained native vegetation will only require minimal maintenance by way of the removal of leaf litter, twigs and debris to satisfy the requirements of an APZ without the need for any additional vegetation / tree removal.	During project planning and design, prior and during construction and operational	Proponent
Eastern access roadway	Impacts of the eastern access roadway to the senior's living component of the site has been reduced to avoid impacts on swift parrot preferred foraging trees	Preferred foraging trees not mapped in the important mapped area are further avoided. Swift Parrot preferred trees would be retained.	During Project Master planning and design and prior to authority approval	Project Design Team, Project Manager, and Ecologist
Identification of any other site constraints that the proponent has considered in determining ways to minimise loss of biodiversity				
Making provision for the demarcation, ecological maintenance of ecological function to areas of retained native vegetation habitat on the subject land	A Vegetation Management Plan for all vegetation within the retained area of vegetation to the north-east of the subject land.	An Adaptive Management Strategy Ecological Monitoring Plan to monitor for any loss of trees over time as the understorey will be managed. Over time, revegetation works will occur where necessary to facilitate the retention of function of local ecological communities	Following construction and during operational phase and VMP to be reviewed every 5 years	Proponent

8. Impact assessment

8.1 Direct impacts

8.1.1 Residual direct impacts on PCTs

Table 38 documents the impacts likely to occur on the subject land after steps taken to avoid and minimise impacts.

Table 38. Summary of residual direct impacts

Direct impact	BC Act status	EPBC Act status	SAII entity	Project phase/timing of impact	Extent (ha)
Clearing of native vegetation allocated to PCT 3592	n/a	n/a	No	Construction	0.22 ha
Management of PCT 3592	n/a	n/a	No	Operation	0.36 ha
Management of PCT 3262	CEEC (part)	CEEC (part)	Yes	Operation	0.34 ha

8.1.2 Change in vegetation integrity score

Table 39 documents the change in vegetation integrity for residual direct impacts on native vegetation.

Table 39. Impacts to vegetation integrity

		Before construction					After construction					
PCT ID	Vegetation zone	Area (ha)	VI score	Composition	Structure	Function	Area (ha)	VI score	Composition	Structure	Function	Change in VI score
PCT 3592	Low condition	0.22	22.7	9	45	28.7	0.00	0	0	0	0	-22.7
PCT 3592	Management zone	0.36	62.9	70.9	42	83.8	0.36	40.6	60.4	31.6	35	-22.4
PCT 3262	Management zone	0.34	50	32.7	47.8	79.8	0.34	30.6	32.7	24.9	35	-19.4

Management zone calculations have been based on the following assumptions:

- The areas for both zones and composition of PCT 3262 remain constant whereas composition of PCT 3262 is reduced to allow for potential loss in shrub and groundcovers (whereas PCT 3262 is already depauperate in these layers)
- Structure and function have been reduced proportionally on the existing structure and function in PCT 3262 and benchmark structure and function scores used in PCT 3592. In both PCTs regardless of existing or benchmark conditions, all leaf litter, regeneration cover of grasses and forbs have been reduced to zero.

8.1.3 Residual direct impacts on species

Table 40 documents the impacts likely to occur on species after steps taken to avoid and minimise impacts.

Table 40. Summary of residual direct impacts

Direct impact	BC Act status	EPBC Act status	SAII entity	Project phase/timing of impact	Extent (ha)
Swift parrot	E	CEEC	No	Construction	0.22 ha
Large-eared pied bat	V	V	No	Operation	0.36 ha
Eastern pygmy-possum	V	-	Yes	Operation	0.34 ha

8.1.4 Change in habitat condition

Table 41 documents the change in vegetation integrity for residual direct impacts on native vegetation, TECs, threatened species and their habitat that were identified on the subject land.

Table 41. Impacts to habitat (vegetation integrity) loss

Species	Vegetation zone	Area (ha)	VI score	Sensitivity to loss	Sensitivity to loss justification	Biodiversity risk weighting	Potential SAII	Species credits
Anthochaera phrygia / Regent Honeyeater (Fauna)	Low condition	0.01	22.7	Very high	BC Act listing	3	True	1
	Management zone	0.23	22.4	Very high	BC Act listing	3	True	4
Cercartetus nanus / Eastern Pygmy-possum (Fauna)	Low condition	0.34	19.4	High	BC Act listing	2	False	3
	Management zone	0.22	22.7	High	BC Act listing	2	False	2
	Management zone	0.36	22.4	High	BC Act listing	2	False	4
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)	Low condition	0.34	19.4	Very high	BC Act listing	3	True	5
	Management zone	0.22	22.7	Very high	BC Act listing	3	True	4
	Management zone	0.36	22.4	Very high	BC Act listing	3	True	6

8.2 Indirect impacts

Table 42 provides a summary of potential indirect impacts to biodiversity values within and/or proximal to the subject land.

Table 42. Summary of indirect impacts

Indirect impact	Project Phase	Nature	Extent	Frequency	Duration	Timing	Biodiversity values impacted	Consequence, risk, and Mitigation measure proposed
Inadvertent impacts on adjacent habitat or vegetation, such as:								
Increased sedimentation and contaminated or nutrient rich run-off	Construction and operation	Runoff during construction and operation resulting in pollution and degradation of off-subject land, downslope creeklines	Potential sedimentation and contaminated runoff into adjacent creeks	During rainfall events	During construction and operational phase of project	Potentially long-term impacts	Native vegetation and waterways downslope of subject land	Best practices erosion and sedimentation management are to be implemented in accordance with the project's Erosion and Sediment Control Plan (ESCP). With appropriate safeguards in place stop the spread of sedimentation outside of the subject land, the risk of this impact is low.
Dust generation	Construction and operation	Dust from machinery,	Adjacent vegetation	Daily, during construction works and operational phase	During construction and operational phase of project	Potentially long-term impacts	Retained vegetation within the subject land and vegetation off-subject land in the surrounds	Dust generation during construction activities will be managed through the following measures: ▪ Construction staging, ▪ Minimising material stockpiles, ▪ Cleaning (water suppression) of construction haul roads, ▪ Speed restrictions, and ▪ Implementation of the project's ESCP, and ▪ Implementation of mitigations measures prescribed within the Construction Environmental Management Plan (CEMP). The proposal is considered unlikely to reduce viability of retained native vegetation due to dust generation.
Inadvertent impacts on adjacent habitat or vegetation	Construction and operation	Damage to adjacent habitat and vegetation	Adjacent vegetation	Daily, during construction works and	During construction and operational	Potentially long-term impacts	Inadvertent impacts on retained vegetation	Retained vegetation will be protected with construction fencing to be set up around the outside of any TPZ of trees to be retained, around the retained area to the north.

Indirect impact	Project Phase	Nature	Extent	Frequency	Duration	Timing	Biodiversity values impacted	Consequence, risk, and Mitigation measure proposed
		including as a result of construction or operation.		operational phase	phase of project		within the subject land and vegetation off-subject land in the surrounds	
Transport of weeds and pathogens from the subject land to adjacent vegetation	Construction and operation	Spread of weed seed and pathogens from incoming machinery and equipment	Potential spread into nearby habitat	Daily, during construction and operational phases	During construction and operational phase of project	Potentially long-term impacts	Transport of weeds and pathogens from to the-subject land and to potential to spread into vegetation in the surrounds	Construction activities have the potential to both spread existing weed infestations, introduce new weed species, and introduce or spread soil borne pathogens on machinery and equipment. As a consequence, the condition (e.g., subject land integrity values) of retained and neighbouring vegetation could be decreased. Providing that the mitigation measures recommended in Section 8 are implemented the consequence of this impact is considered to be a low risk.
Rubbish dumping	Construction and operation	Unauthorised rubbish dumping by workers and public leading to degradation of adjacent vegetation	Potential for rubbish to spread into adjacent vegetation in the indirect impact areas and outside development subject land	Daily, during construction and operational phases	During construction and operational phase of project	Potentially long-term impacts	Retained vegetation within the subject land and vegetation off-subject land in the surrounds	The subject lands will not be accessible by the public (through security fencing). The risk of this impact is considered low.
Wood collection, removal and disturbance of rocks, including bush rock	Construction and operation	Removal of wood in vegetation adjacent to development subject land resulting in loss of habitat	Throughout adjacent vegetation	Potential to occur at any time during construction or operational phases	During construction and operational phase of project	Medium-term impacts	Local fauna potentially adjacent to the site	Noting that removal of leaves, sticks and twigs (woody debris) has been accounted for as a direct impact for the APZ and is to be offset accordingly. Outside of APZ management, the removal of woody debris has also been considered in the context of an indirect impact. The Lourdes subject land currently exists opposite to native vegetation where there is potential for residents to collect wood. It is considered unlikely that the

Indirect impact	Project Phase	Nature	Extent	Frequency	Duration	Timing	Biodiversity values impacted	Consequence, risk, and Mitigation measure proposed
		resources for fauna						project would contribute to an increased risk of woody debris removal.
Reduced viability of adjacent habitat due to:								
Light spill	Construction and operation	Light spill during operational phase disturbing fauna activity in adjacent vegetation.	Adjacent vegetation	Daily, during construction works and operational phase	During construction and operational phase of project	Potentially long-term impacts	Local fauna potentially adjacent to the site	The proposal will result in an increase in light levels above that which already exists. Light spill will be mitigated during the design phase in accordance with available standards and guidelines for mitigating impacts on fauna habitat, which include but may not be limited to the following: Commonwealth of Australia (2020) National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds; and AS/NZS 4282:2019 Control of the obtrusive effects of outdoor lighting recognises the impact of artificial light on biota. The above guidelines provide a range of measures to minimise light spill impacts on fauna and fauna habitat. Examples include: The use of recent advances in smart control technology options for better controlled and targeted artificial light management; Ensuring that lighting is shielded and directed only to the intended object or area; Ensuring that light intensity is appropriate for the target area using only the minimum number and intensity of lights needed to provide safe and secure illumination for the area at the time required to meet the lighting objectives; and Consideration of the following lighting aspects: high quality, low glare lighting, which enhances visibility for the user at night, reduces eye fatigue, improves night vision and delivers light where it is needed,

Indirect impact	Project Phase	Nature	Extent	Frequency	Duration	Timing	Biodiversity values impacted	Consequence, risk, and Mitigation measure proposed
								non-reflective, dark coloured surfaces, reduced or filtered out blue, violet and ultraviolet wavelengths, which wildlife are sensitive to. Providing the design of the village's lighting installations incorporates the above and current best practice measures, the likelihood of light spill impacts on fauna and fauna habitat will be minimised as far as practical.
Noise	Construction and operation	Noise/vibration from machinery, light spill during operational phase disturbing fauna activity in adjacent vegetation.	Adjacent vegetation	Daily, during construction works and operational phase	During construction and operational phase of project	Potentially long-term impacts	Local Fauna	All construction works are proposed to be undertaken during standard construction hours: ▪ Monday to Friday, 7am to 6pm; ▪ Saturday 8am to 1pm; and ▪ No work on Sundays or public holidays. The proposed construction will be temporary in nature and the risk of consequence is considered low. Long term operation: ▪ The proposal will not result in a significant increase in noise levels above that which already exists; ▪ Resident fauna within the vicinity of the proposed development would already be accustomed to ambient noise levels from existing development. The consequence of increased noise impacts is considered a low risk.
Increased risk of starvation, exposure, loss of shade or shelter	Construction and operation	The loss of trees and sheltering habitat may affect fauna species which	Vegetation within the subject land	Daily, during construction works and operational phase of the project	During construction and operational phase of project	Potentially long-term impacts	Loss of foraging/shelter habitat for fauna	The proposal would remove foraging food resources, shade and shelter, mostly for highly mobile aerial species, as much of the understorey consists of a modified landscape. Vegetation within be retained within the subject land which provides a foraging resource for highly mobile species such as birds and bats. Therefore, the

Indirect impact	Project Phase	Nature	Extent	Frequency	Duration	Timing	Biodiversity values impacted	Consequence, risk, and Mitigation measure proposed
		utilise the habitat						proposed development is considered a low risk in this respect.
Loss of specialist breeding habitat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Breeding habitat for threatened species is absent from subject land.
Habitat connectivity								
Habitat connectivity	Construction and operation	Removal of vegetation from the subject land	Contributing to the loss of habitat connectivity in the surrounding landscape	Daily, during construction works and operational phase of the project	During construction and operational phase of project	Potentially long-term impacts	Loss of habitat on the edge of a corridor.	The proposal would see the removal of native vegetation which contributes to habitat connectivity within the surrounding landscape. However, the proposal does not impact on the remnant bushland adjacent to the subject land and would not sever, fragment, or create large gaps in habitat. The proposal will not t result in the isolation or fragmentation of native vegetation and/or connectivity for any threatened or non-threatened fauna species. Further, native vegetation will be retained within the subject land, which will continue to provide connectivity to stepping-stone habitat outside of the subject land, particularly to the northwest of the subject land.
Edge effects	Construction and operation	Removal of vegetation from the subject land creating a large edge effect	Contributing to edge effects	Daily, during construction works and operational phase of the project	During construction and operational phase of project	Potentially long-term impacts	Exacerbation of edge effects due to removal of vegetation	The subject land has been historically highly modified and is currently subject to edge effects. Whilst some vegetation in the subject land will contribute further to edge effects, it will not introduce edge effects, and is unlikely to exacerbate any edge effects to vegetation outside of the subject land, as a road and mown areas already currently exist around the periphery of the subject land adjacent to remnant bushland. No new edge effects would be created.
Water bodies, water quality and hydrological processes								

Indirect impact	Project Phase	Nature	Extent	Frequency	Duration	Timing	Biodiversity values impacted	Consequence, risk, and Mitigation measure proposed
Water bodies, water quality and hydrological processes	Construction and operation	Escape of stormwater from outside of the subject land	Stormwater entering into environment and downslope waterways creating degraded water quality (Gordons Creek)	Daily, during construction works and operational phase of the project	During construction and operational phase of project	Potentially long-term impacts	Water quality, vegetation, and water quality for fauna	The proposal's civil engineering strategy will provide a best practice solution within the constraints of the existing landform and proposed development layout. Within this strategy a stormwater quantity and quality management strategy will be developed to consider peak flows and reduce pollutant loads in stormwater leaving this subject land. A hydrological assessment will be required to show that local post development flows from the subject land will be consistent with pre-development flows and demonstrate that the subject land discharge will not adversely affect any land, drainage systems or watercourse as a result of the development. During the construction phase, a Sediment and Erosion Control Plan will be in place to ensure the downstream drainage system and receiving waters are protected from sediment laden runoff.
Bush rock removal and disturbance	Construction and operation	Removal and disturbance of bush rock in indirect impact areas and vegetation adjacent to development site resulting in loss of habitat resources for fauna	Throughout adjacent vegetation	Potential to occur at any time during construction or operational phases	During construction and operational phase of project	Long-term impacts	Removal of habitat for faunal groups	There is limited bush rock within the subject land, therefore the collection of bush rock is considered a low risk. Further, during the operational phase of the development it is unlikely that bush rock collection from areas outside of the subject land are likely to occur anymore than compared to the current level of risk. It is considered very unlikely that the intensification of usage would exacerbate this risk.
Increase in predatory species populations	Construction and operation	Potential to increase if food scraps/rubbish is left on or	Within the development and throughout	Potential to occur gradually after	During construction and operational	Potentially long-term impacts	Native fauna	The level of usage is unlikely to intensify in comparison to current level of usage that would exacerbate this risk during the operational phase of the project. However, food scraps / rubbish

Indirect impact	Project Phase	Nature	Extent	Frequency	Duration	Timing	Biodiversity values impacted	Consequence, risk, and Mitigation measure proposed
		adjacent to site. Potential to increase -/+ decrease due to disturbance to existing vegetation resulting in increased predation on native fauna	indirect impact areas and adjacent vegetation	disturbance to habitat and vegetation takes place	phase of project			may be left behind by contractors during construction phase of the project. The mitigation measure for this would be to ensure contractors are inducted to risks that can be caused to native fauna by rubbish dumping and the impact to native fauna prior to commencement of work.
Increased risk of fire	Construction and operation	Potential for fire to spark during construction and operation from any machinery or electrical works	Throughout adjacent vegetation	Potential to occur at any time throughout the operational or construction phases	During operating/ construction hours	Potentially long-term impacts	Adjacent vegetation	Contractor will provide and work within their Safety Management Plans to mitigate fire risks during construction. Risk of fire escaping into adjacent vegetated areas. Consequence of loss of vegetation and fauna habitat. Through appropriate Contractor Safety Management Protocols, the risk of fire during construction is low. The overall land use remains the same (residential purpose).

8.3 Prescribed impacts

8.3.1 Human-made structures

Nature

As described in Table 37, all buildings that will be demolished during the construction phase of the project are in good condition, are actively managed and well maintained. There are no areas of roofing, eaves, piping or other building components that are in disrepair, and no obvious access points for microbats.

A yangochiropteran survey conducted to the east and southwest of existing vacant buildings found microbat activity to be very low, recording only four species of microbats despite suitable weather conditions (refer Section 2.4).

Extent

Due to the extent of redevelopment works required to make the village compatible with current standards, impacts to human-made structures are not able to be avoided as part of the project.

Duration

Should there be any roosting habitat in buildings being demolished, the redevelopment would thereby represent a permanent residual impact.

Threatened Entities Affected

Due to the existing ongoing use of the human-made structures, it is unlikely that threatened entities will be affected by the demolition of these structures. The habitat provided by human-made structures may provide roosting habitat for ecosystem species, such as microbats, but this is considered unlikely.

Consequences

Potential impacts from the demolition of the buildings will be minimised through the implementation of a suite of mitigation measures, including pre-demolition inspections that will coincide with ecologist pre-clearance surveys (see Section 8.4).

NOTE: Additional yangochiropteran surveys are required to comply with BAM microbat survey guidelines and adequately determine the presence and absence of foraging microbats. This may or may not be necessary given foraging habitat is being offset in ecosystem credits and most 'more' intact areas of vegetation have been avoided.

8.3.2 Non-native vegetation

Nature

The subject land contains 1.13 ha exotic vegetation, which is largely made up of mown lawn, garden beds and other landscaping areas. Exotic trees are dominated ornamental species (such as Chinese tallow, Angel's trumpets, Japanese maple, Wych elm and Evergreen elder, Camellia, Ornamental prune, Tibouchina and Jacaranda) with less widespread palm species and larger tree species (such as Camphor laurel, Liquidambar and Magnolia).

Extent

The redevelopment will result in the removal of up to 1.0 ha of 1.13 ha exotic vegetation, which is made up of 74 individual tree specimens, including 64 ornamental species (most with a dbh <100mm dbh), and 10 palm species.

Duration

Impacts to non-native vegetation would occur during the construction phase of the project. The removal of the non-native vegetation is a long-term impact.

Threatened Entities Affected

The habitat provided by non-native vegetation may provide some foraging habitat for ecosystem species, such as microbats, birds and the Grey-headed flying-fox, which may forage on palms when fruiting. The non-native vegetation is not considered suitable breeding habitat due to a lack of hollows for hollow-roosting species.

Consequences

The project will result in a reduction in non-native vegetation by 1.0 ha., which is not considered to significantly impact upon any potentially affected threatened entities. The non-native vegetation comprises marginal to sub-optimal habitat and other areas of suitable habitat, in the form of both native and non-native vegetation (within the subject land) and extensive intact bushland (adjacent to the subject land), will remain available.

8.3.3 Waterbodies, water quality and hydrological processes

Nature

Stormwater from the existing and proposed redeveloped village discharges into the existing stormwater system, part of which discharges to a first order tributary of Gordon Creek to the south of the subject land.

Extent

Sediment and erosion during earthworks and construction activities if unmitigated can impact on downstream aquatic biota.

Discharge of excess nutrients and pollutants in stormwater may also impact on downstream aquatic biota.

Duration

Discharge of sediment and pollutants in stormwater may occur sporadically (accidentally or in pulses), or over a longer term depending on the contaminants (i.e., hydrocarbon or chemical spills) and also frequency of polluted discharge (i.e., regular in puts of excessive nutrients, high or low pH, etc).

Threatened Entities Affected

No known threatened species are associated with the downstream Gordon Creek tributary. Aquatic species are more likely to be associated with Gordon Creek and the downstream Middle Harbour system.

Consequences

The proposed stormwater quantity will be managed through OSD, and the stormwater water quality will be managed through proprietary and natural devices in accordance with Ku-ring-gai Council's DCP specifications, which require the following water quality treatment parameters:

- Gross Pollutants (GP) = 70% reduction
- Total Suspended Solids = 85% reduction
- Total Phosphorus = 65% reduction
- Total Nitrogen = 45% reduction

During the construction the site excavation and site works will be managed through proposed sediment and erosion control devices in line with the BlueBook, which follow NSW best practices for managing sediment and erosion during construction. Through the use of these measures, the surrounding bushland and downstream drainage system and receiving waters are protected from sediment laden runoff.

Further detail is provided in **Appendices K, L and M**.

Through the use of these measures, the downstream drainage system and receiving waters are protected from sediment laden runoff protecting bushland and watercourses.

It should be noted that the proposal's construction will require vertical excavation of sandstone bedrock and minimal earthworks (i.e., cut and fill that create the biggest construction risk of sediment pollution).

Based on the above, the risks of impacts on biodiversity associated with stormwater discharge is considered to be low.

8.3.4 Habitat connectivity

Nature

The subject land's peripheral native vegetation in the south and eastern site portions is adjacent to continuous native bushland, which provides substantial connectivity to Garigal National Park and thereafter Middle Harbour.

Vegetation mapped by OEH (2016) and DPE (2022) coincides with a mapped important habitat area for the endangered Swift Parrot. This area encroaches into the subject land from the adjacent bushland and the boundary is relatively coarse. As can be seen in Figure 18 the mapping includes part of the sealed boundary road and also includes areas of exotic garden plantings.

Connectivity to the north, northwest and west is limited due to existing development (also shown in Figure 18).

Extent

The mapped important habitat area extends over 0.24 ha (2,377 m^2), which includes part of the sealed boundary road, areas of exotic and non-native planted gardens and landscaping and canopy cover from the adjacent bushland.

Areas that will be cleared include the following:

Approximately 174m^2 of planted native trees partially fragmented from adjacent bushland at the ground level by a sealed road. The trees to be removed are typically found along watercourses and wetlands and would not normally at this location (i.e., *Melaleuca quinquervia* x 3 and *Casuarina cunninghamia*na x 1). These species tolerance of wet conditions is why they are likely to have been planted within rainwater gardens of the southern site portion.

Duration

The loss of 140 m^2 of native vegetation will be a permanent impact. However, proposed landscaping with local native species will enhance habitat connectivity across the subject land.

Threatened Entities Affected

Threatened entities that would potentially be affected include highly mobile microbat and bird species, including the Swift Parrot.

Consequences

The proposal is considered to have a negligible if any impact on habitat connectivity due to the following:

- Most clearing will occur within the central areas of the subject land, which is predominantly landscaping;
- Only small areas of native planted vegetation will be cleared from, or proximal to, the periphery of the subject land;
- Cleared native planted vegetation is located adjacent to larger areas that are being retained;
- Areas of native planted vegetation being cleared are partially fragmented from adjacent bushland at the ground level by roads (Lourdes and Stanhope);

- It is unlikely that the trees to be removed from the subject land would be preferred habitat over the higher quality habitat provided in the extensive and more intact bushland to the south and east; and
- Connectivity to the north, northwest and west is limited due to existing development.

It is considered unlikely that any native fauna would be solely reliant on the habitat within the subject land for movement between different areas of habitat and the consequences are considered to be a very low risk.

8.3.5 Vehicle strike

Nature

The project will result in the creation of additional access roads and private driveways within the subject land along with an increased population of residents through the inclusion of multi-level buildings. As such, there is likely to be an increase in vehicle traffic within the subject land and thereby increasing the potential of vehicle strikes. The implementation of traffic control measures, primarily speed limits along access roads and driveways will reduce the potential for vehicle strikes on native fauna species.

Extent

The redevelopment will result in a permanent risk of vehicle strike, however there are no anecdotal occurrences of road kill from the retirement village.

Duration

The redevelopment will result in a permanent risk of vehicle strike

Threatened Entities Affected

The subject land does not provide suitable microhabitat for any threatened ground dwelling fauna species and none have been incidentally recorded on the subject land.

Consequences

The potential for vehicle strike is consider low given the subject land contains shared road and pedestrian pathways and speed limits are restricted to 10km/hr.

8.4 Mitigating residual impacts – management measures and implementation

Table 43 summarises the typical mitigation measures that would be implemented to avoid or minimise accidental direct impacts and indirect impacts.

Table 43. Summary of mitigation measures for impacts to biodiversity values

Mitigation measure	Risk before mitigation measure	Risk after mitigation measure	Threatened entity or biodiversity to which the mitigation measure applies	Proposed Action	Timing	Frequency	Outcome	Responsibility
Delineation of clearing limits	High	Low	Sydney Turpentine Ironbark Forest	Clearing limits are delineated with high visibility tape, temporary fencing, or other appropriate boundary markers. Materials and methods of marking trees to be removed or retained and protected will be agreed to prior to their employment.	Pre-construction	Once per relevant construction stage	Mitigate any direct impact to a TEC from unauthorised clearing and/or damage to vegetation to be retained.	Contractor
Instigating clearing protocols including pre-clearing surveys, prior to tree removal with a trained ecological or licensed wildlife handler during clearing events	High	Medium	Any fauna threatened or non-threatened which may utilise trees, Banksia shrubs within the subject land	Pre-clearing surveys will be undertaken by a suitably qualified ecologist ahead of clearing, to limit fauna injury and mortality and to identify habitat features to be relocated. Pre-clearance surveys will be conducted by suitably qualified ecologists and all fauna found during these surveys will be encouraged to move on or relocated by the ecologists in areas of similar habitat nearby that will not be impacted. Pre-clearing surveys will include: Demarcation of key habitat features as hollow-bearing trees, fallen logs and bush rock;	Pre-construction (maximum of 7 days pre-clearance)	Once per relevant construction stage	Mitigate direct and indirect impact to threatened species such as, Squirrel Glider, eastern Pygmy Possum, and non-threatened fauna	Project Ecologists, Project Manager

Mitigation measure	Risk before mitigation measure	Risk after mitigation measure	Threatened entity or biodiversity to which the mitigation measure applies	Proposed Action	Timing	Frequency	Outcome	Responsibility
				Checking trees for the presence of bird nests and arboreal mammals, such as possums, and bats; Animals found to be occupying trees and habitat will be safely removed and relocated into nearby wooded habitat. Identification and nomination of habitat trees to be salvaged and relocated to adjacent retained vegetation for reuse as fauna habitat (if applicable); and Provision of a report following the completion of a pre-clearing survey, detailing the location and type of each habitat feature, and a record of all fauna species encountered.				
Erosion and sediment controls	High	Moderate	Aquatic fauna in downstream environments to the subject land	Implementation of Erosion and Sediment Control Plan (ESCP) measures	Pre-construction and construction phase	Continual During Constriction and ongoing during operation	Sedimentation of native vegetation and downstream aquatic environment.	Project Manager / Contractor
Yangochiroptera survey	Moderate	Low	Threatened microbats	While it is considered unlikely that any of the village buildings provide roosting habitat for microbats, the following best practice daytime roost searches are to be undertaken as a precaution.	Pre-construction	Once	Harm / death of microbats	Project Manager / Contractor / Project Ecologist

Mitigation measure	Risk before mitigation measure	Risk after mitigation measure	Threatened entity or biodiversity to which the mitigation measure applies	Proposed Action	Timing	Frequency	Outcome	Responsibility
				Prior to demolition of buildings, daytime roost searches should be carried out. A search is to be undertaken by looking for bats or signs of bats in suitable roost habitat during the daytime. All roost searches should use a torch to shine in holes, cracks and crevices, and carry a handheld bat detector to locate bats that may call. If bats are detected, demolition of the building must be delayed until bats are able to be relocated.				
Clearance staging	Moderate	Low	Threatened and non-threatened mammals with potential to move from adjacent vegetation through the subject land	The clearing will be conducted using a two-stage clearing process as follows: Stage 1: Clearing will commence following the identification of potential habitat features by a qualified ecologist. Habitat trees marked during pre-clearing will not be cleared during the first stage; however, all vegetation around these trees will be cleared to enable isolation of the feature. Identified habitat trees will be left at a minimum overnight after Stage 1 clearing to allow resident fauna to voluntarily move from the area.	During clearance	Once per relevant construction stage	Harm / death of fauna	Contractor / Project Ecologist

Mitigation measure	Risk before mitigation measure	Risk after mitigation measure	Threatened entity or biodiversity to which the mitigation measure applies	Proposed Action	Timing	Frequency	Outcome	Responsibility
				Stage 2: After habitat trees have been left overnight, the trees will be cleared using the following protocols: Trees marked as containing habitat will be shaken by machinery prior to clearing to encourage any animals remaining to leave the hollows and move on; Use a bulldozer or excavator to start pushing the tree over. Move the bulldozer over the roots and continue gently pushing the tree over; and All habitat trees will be investigated by an ecologist for the presence of fauna following felling of the tree. The felled habitat tree will be left overnight to allow any remaining fauna time to leave the hollows and move on. The two-stage clearing process enables fauna a chance to self-relocate upon nightfall, when foraging typically occurs.				

Mitigation measure	Risk before mitigation measure	Risk after mitigation measure	Threatened entity or biodiversity to which the mitigation measure applies	Proposed Action	Timing	Frequency	Outcome	Responsibility
Habitat Salvage	N/A	N/A	Threatened and non-threatened mammals with potential to move from adjacent vegetation through the subject land	Any timber that would be suitable to create habitat within peripheral bushland areas should be salvaged during clearing. These should be identified by the ecologist during clearance supervision and should be separated from remaining material that could be mulched on site. Timber suitable for salvage should include larger logs and branches that are unlikely to decompose between clearing and revegetation. Salvaged features should be stockpiled away from areas impacted by earthworks to ensure the features do not become mixed with soil.	During clearance	Once per relevant construction stage	Providing habitat resource for native fauna	Contractor / Project Ecologist
Biosecurity management/ Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Moderate	Low	Introduction and/or spread of pest species, pathogens, disease, and in turn harm death of adjacent flora and fauna	Implementation of hygiene measures to prevent the introduction and / or spread of introduced flora and fauna species, pathogens and / or disease.	Ongoing	Once per relevant construction stage	Mitigate indirect impacts such as weed spread into downstream environments such as Gordons Creek and vegetation within retained vegetation	Contractor / Principal

Mitigation measure	Risk before mitigation measure	Risk after mitigation measure	Threatened entity or biodiversity to which the mitigation measure applies	Proposed Action	Timing	Frequency	Outcome	Responsibility
On site water management	High	Moderate	All water being used onsite (e.g. dust management, cleaning, processes) is to be managed appropriately on site in accordance with a water management plan or similar.	Control contaminated water on site and prevent from leaving the site.	Prior to and during Construction	During Construction stages	Mitigate indirect impact of dust to native vegetation within retained areas, and outside of the subject land.	Project Manager, Contractor
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Medium	Low	Threatened and non-threatened mammals with potential to move from adjacent vegetation through the subject land	All staff working on the project will undertake an environmental induction as part of their site familiarisation. Site briefings should be updated based on phase of the work. This induction will include items such as: Site environmental procedures (vegetation management, sediment and erosion control, exclusion fencing) What to do in case of environmental emergency (chemical spills, fire, injured fauna) Key contacts in case of environmental emergency What to do in the case of finding a threatened species	Prior to and during Construction	Once per relevant construction stage	Management of food scraps, rubbish dumping and leaving behind a clean work area so as to not affect any local fauna/introduce pest species into the area.	Project Manager, all staff

Mitigation measure	Risk before mitigation measure	Risk after mitigation measure	Threatened entity or biodiversity to which the mitigation measure applies	Proposed Action	Timing	Frequency	Outcome	Responsibility
				What to do in the case of finding fauna on the site All staff entering the site are fully aware of all environmental aspects relating to the development and know what to do in case of any environmental emergencies. Staff to be aware of threatened species, which may occur within the surrounding local area.				
Making provision for the ecological function and/or ongoing maintenance of retained native vegetation habitat on the subject land.	High	Medium	Sydney Turpentine Ironbark Forest	A Vegetation Management Plan should be prepared which covers the retained area. The aim of the VMP is to manage the area as an IPA, and supplement the loss of trees over time with revegetation of trees if required.	VMP to be implemented following construction and reviewed every 5 years	During operational phase	Ensuring ecological function is retained over time	Proponent
Design lighting to minimise impacts to nocturnal and diurnal fauna.	Moderate	Minor	Threatened mammals and non-threatened mammals, forest owls, Eastern Pygmy Possum, Grey-headed Flying Fox which may be in proximity to the subject land	Light pollution can be reduced by limiting the duration of spotlight illumination, reducing the brightness of lights where possible, installing shield fixtures to reduce light scattering, and using narrow-spectrum light sources to reduce the wavelengths likely to interfere with animal behaviour (Gaston et al 2012). High priority areas where the implementation of measures to	During clearing works and post construction (i.e. design).	During planning phase/ construction/ operation phase	Lighting impacts on nocturnal and diurnal fauna is minimised	Project Manager/Project Design Team/Ecologist

Mitigation measure	Risk before mitigation measure	Risk after mitigation measure	Threatened entity or biodiversity to which the mitigation measure applies	Proposed Action	Timing	Frequency	Outcome	Responsibility
				reduce light pollution should be considered would be located adjacent to important habitat.				
Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	Low	Very Low	Threatened mammals and non-threatened mammals, forest owls, Eastern Pygmy Possum, Grey-headed Flying Fox.	Conduct works during daylight hours.	During construction phase	Throughout life of project	Avoid light disturbance to native fauna during construction	Project Manager
Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	Low	Very Low	Threatened mammals and non-threatened mammals, forest owls, Eastern Pygmy Possum, Grey-headed Flying Fox	Daily timing of construction activities is recommended in accordance with Table 1 of Interim Noise Guidelines (2009).	During construction phase	Throughout life of project	Noise impacts associated with the development will be managed in accordance with guidelines.	Project Manager

8.5 Mitigation Measures for Prescribed Impacts

The following mitigation measures are relevant to the prescribed impacts of the project:

- Sedimentation control measures;
- Pre-demolition building surveys;
- Pre-clearance vegetation / habitat surveys;
- Clearing supervision and protocols;
- Weed control and hygiene protocols; and
- Stormwater management measures in accordance with SEARs and Council DCP requirements.

No additional mitigation measures are proposed for prescribed impacts.

8.6 Use of Biodiversity Credits to Mitigate or Offset Indirect or Prescribed Impacts

The project does not propose to use additional biodiversity credits to mitigate or offset indirect or prescribed impacts as the impacts are not considered to be significant when the proposed management strategies for these impacts are taken into consideration.

8.7 Adaptive management strategy for uncertain impacts (where relevant)

The project is considered unlikely to result in any uncertain impacts that require adaptive management.

A level of uncertainty has been identified regarding the longevity of tree no. 244 despite tree protection measures being implemented. However, this uncertainty has been mitigated by including this tree's extent in the BAM-C offset calculations for PCT 3592.

9. Serious and irreversible impacts

9.1 Assessment for serious and irreversible impacts on biodiversity values

Three entities identified to be at risk of serious and irreversible impacts (SAII entities) are assessed in this section (see Table 44).

The information in the following sections is provided to assist the consent authority to evaluate the nature of an impact on a potential entity at risk of a serious and irreversible impact (in accordance with BAM Sections 9.1.1 and 9.1.2).

Table 44. Entities at risk of an SAII

Common name	Scientific name	Reason for inclusion in assessment
Sydney Turpentine Ironbark Forest	Sydney Turpentine Ironbark Forest	Included in current list of entities at risk of an SAII and is likely to be impacted by the proposal
Swift Parrot	*Lathamus discolor*	Included in current list of entities at risk of an SAII and is likely to be impacted by the proposal
Large-eared pied bat	*Chalinolobus dwyeri*	Included in current list of entities at risk of an SAII and is likely to be impacted by the proposal

9.2 Threatened ecological communities at risk of an SAII

Sydney Turpentine Ironbark Forest (PCT 3262) is assessed in this section as it is a Serious and irreversible impact (SAII) threatened ecological community (TEC). In accordance with BAM Section 9.1.1 the following information is provided to assist the consent authority in determining whether or not the proposal represents a serious and irreversible impact on this TEC.

9.2.1 Measures taken to avoid the direct and indirect impacts on the TEC at risk of an SAII

The proposal's design revisions have relocated building footprints, the western and eastern access roadways and entrances to the development site to avoid all native vegetation that has been nominated as STIF.

Section 7 (Avoidance and Minimisation) describes in further detail the actions and measures that have been undertaken to avoid direct impacts on the TEC. Table 37 and Table 43 describe the actions and measures that will be undertaken to avoid indirect impacts on the TEC.

The outcome of the proposal's design revisions is an overall reduction in 0.06 ha (0.01 ha in July 2023 and a further 0.05 ha in September 2023).

Approximately 0.17 ha of native vegetation in the subject land allocated to STIF (herein referred to as PCT 3262) is located within a highly managed environment as summarised in Table 45.

Table 45. PCT 3262 locations and extent

Area	Extent (m^2)	Location	Direct impact	Indirect impact
OEH (2016) mapped	167	Garden bed constrained by a wall (boundary to Stanhope Road) and kerbs to a carparking area (as shown in photo plates 4.13 and 4.14)	Nil	Nil, no change in existing landuse or management of garden bed proposed
	100	Mown lawn located along the western boundary to residential development (as shown in photo plates 4.15 and 4.16)	Nil	Nil, no change in existing landuse or management of garden bed proposed
Planted and potentially remnant native vegetation	1,055	Land north of the village and south of Stanhope Road (as shown in photo plates 4.17 and 4.18)	Nil	Conservatively included in the BAM-C so that existing land use is ensured, which must consider the adjacent electricity easement requirements. This is proposed despite specialist bushfire consultant advice that none of the surrounding bushland does not require management as an APZ zone. A reduction in functional attributes will be offset due to the potential for ongoing removal of leaf litter and small woody debris (<10cm in diameter).
Planted non-local native with native understorey	377	Land northeast of the village and south of Stanhope Road (as shown in photo plate 4.19) This area is identified as 'PCT 3262 understorey' as the canopy species in this area are not local to the area (ie., *Eucalptus robusta, E.melliodora* and *Casuarina cunninghamiana*). Regenerating shrub and ground layers could indicate either PCT 3262	Nil	

Area	Extent (m^2)	Location	Direct impact	Indirect impact
		or PCT 3952[4] (e.g., *Elaeocarpus reticulatus, Allocasuarina torulosa, Ozothamnus diosmifolius, Pittosporum undulatum, Dianella caerulea, Lomandra longifolia, Aristida vagans, Eriostemon australasius* (present only in PCT 3592) PCT 3952 is of less conservation concern, thus applying the precautionary principle, PCT 3262 has been allocated.		
Total	**1,699**			

[4] Refer to discussion regarding PCT allocation limitations in Section 2.6

9.2.2 Current status of the TEC

Table 46. Current status – Sydney Turpentine Ironbark Forest (STIF)

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Current total geographic extent (ha) of the TEC in NSW	1,038	BIONET vegetation classification database	Calculated from State Vegetation Type Map (SVTM) extant PCT map C1.1.M1 and Inland Multinomial Modelling. Values rounded to nearest hectare.
	2,940	NSW Scientific Committee's final determination (2019) – Section 3.1.4	Tozer *et al*. (2010) estimated some 2,300 ha remains. Additional remnants have been mapped by BMCC (2003) (a total of 190 ha) and Smith and Smith (2008) (148 ha). Combining these maps with the maps of Tozer et al. (2010) and NSW OEH (2013ab) gives an estimated **2,940 ha** of STIF remaining.
Estimated reduction in geographic extent of the TEC since 1970	Not available	Not available	The estimated reduction in the geographic extent of STIF since 1970 is not available in the TBDC, BioNet, the final determination and was not identified from a search of available literature. Nonetheless, the pre-European extent of STIF is listed as approximately 25,348 ha in the TBDC.
Extent of reduction in ecological function, describing the degree of environmental degradation or disruption to biotic processes (Principle 2) indicated by factors listed in BAM Subsection 9.1.1(2.b.) Factors listed in BAM Subsection 9.1.1(2.b.) are: i. change in community structure ii. change in species composition iii. disruption of ecological processes iv. invasion and establishment of exotic species v. degradation of habitat, and vi. fragmentation of habitat The NSW Scientific Committee's final determination (2019) describes STIF as historically subjected to a range of anthropogenic disturbances including logging, grazing by domesticated livestock and burning at varying intensities (Benson and Howell 1994). These disturbances have affected the structure and potentially the composition of remnants. The removal of large older trees has been suggested to lead to higher densities of smaller trees such that remnants typically have the structure of regrowth forest. Increased fire frequencies associated with hazard reduction burning have led to declines in populations of slow-maturing, fire sensitive species and effected a structural simplification in some remnants of STIF.			

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Conversely, remnants with a long-term history of fire-exclusion, particularly when coupled with increases in nutrient and moisture availability, are characterised by higher densities and cover of mesic species (such as *Pittosporum undulatum, Glochidion ferdinandi* and *Homalanthus populifolius*), larger and more diverse populations of exotic species and lower diversity of understorey species (Rose and Fairweather 1997, McDonald et al. 2002, Howell 2003). Fragmentation and continued clearing for development are also attributed to the reduction in extent and ecological function of the community, with remnants typically small and fragmented and susceptible to continuing attrition through clearing for routine land management practices due to the majority of remnants being located in close proximity to rural land or urban interfaces (Benson and Howell 1994; Tozer 2003). Remnants of Sydney Turpentine-Ironbark Forest are also subject to ongoing invasion by an extensive range of naturalised plant species. Weed invasion is exacerbated by the proximity of remnants to areas of rural and urban development and the associated influx of both weed propagules from gardens and nutrients contained in stormwater runoff, dumped garden refuse and animal droppings.			
Evidence of restricted geographic distribution (Principle 3) based on the TEC's geographic range in NSW			
Extent of occurrence (ha)	The distribution of Sydney Turpentine-Ironbark Forest is highly restricted. The extent of occurrence (EOO) of STIF is 4,479 km^2	NSW Scientific Committee's final determination (2019) – Section 3.1.4	Based on a minimum convex polygon enclosing known occurrences of the community as interpreted in Sections 4.2 – 4.10 and using the method of assessment recommended by IUCN (Bland et al. 2017). The estimated area of occupancy (AOO) is 12 10 km x 10 km grid cells, the scale recommended for assessing AOO by IUCN and applying a minimum occupancy threshold of 1% (Bland et al. 2017).
Area of occupancy (ha)	An estimated 280 ha of STIF (less than 1% of the pre-European extent) is distributed among 15 reserves (with a minimum area of 0.5 ha) under the management of the NSW NPWS. A further 254 ha occurs in Crown Reserves and 36 ha is preserved in perpetuity under Biobanking or Conservation Agreements. The total area under reservation is estimated to be 570 ha, equivalent to less than 2% of the estimated pre-1750 distribution or 20% of the remaining extent.	NSW Scientific Committee's final determination (2019) – Section 3.1.5	
Number of threat-defined locations	Not available		No threat defined locations are listed in the TBDC.

9.2.3 Impact assessment

Table 47. Impact assessment – Sydney Turpentine Ironbark Forest

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information (e.g., TBDC indicates data is unknown or deficient)
Impact on the geographic extent of the TEC (Principles 1 and 3)			
Area of TEC to be impacted by the proposal (ha)	Nil	N/A	N/A
Area of TEC to be impacted by the proposal as a % of the current geographic extent in NSW (%)	Nil	N/A	N/A
Direct/indirect impacts likely as a result of the proposal to contribute to loss of flora/fauna species characteristic of the TEC (BAM Subsection 9.1.1(4.a.ii.))	No further direct or indirect impacts to this community is anticipated. This includes partial losses from changes to fire regime, species interactions, fragmentation, increased edge effects, which are likely to contribute to the loss of flora and/or fauna species characteristic of the TEC. The existing vegetation is predominantly planted native tree species located in a managed curtilage (i.e., absence of shrub and ground layers and canopy limited due to overhead powerlines).	N/A	N/A
Impacts likely to contribute to further environmental degradation or disruption of biotic processes (Principle 2)			
Remaining extent of isolated areas of TEC (ha)	Remaining areas of STIF from within a 500m of the development footprint is 4.53 ha of which approximately 50% is reserved and the remainder made of isolated small patches on private land.	SydneyMetroArea-v3E-4489 (OEH 2016)	Extent of mapped STIF in 500m buffer from development site calculated in ArcMap V10.8.2.
Average distance between remaining remnants – remnant is retained (m)	**Within subject land :** 115 **Within locality :** 432 Lengths measured x 8 minimum 101 maximum 722 median 463	SydneyMetroArea-v3E-4489 (OEH 2016)	Lineal distances measured in in ArcMap V10.8.2. Smaller patches of STIF in residential properties ignored in wider locality. (See Figure 19)
Average distance between remaining remnants – remnant is removed (m)	As above, remnant vegetation is not being removed		

<table>
<tr><th>Criteria</th><th>Data/ information</th><th>Data sources</th><th>Details of data deficiency, assumptions, reasons for low confidence in information
(e.g., TBDC indicates data is unknown or deficient)</th></tr>
<tr><td>Estimated maximum dispersal distance of species associated with the TEC (km)</td><td>Both plants and animals as well as other organisms e.g., fungi are associated with this TEC and it is anticipated that the dispersal range would vary very significantly. For example: the Grey-headed Flying-fox transport pollen from some eucalypt species over hundreds of kilometres. Similarly spores from ferns and fungi (puffballs) can be transported hundreds of kilometres by wind. In contrast, the dispersal distance of pollen for some insect pollinated species is likely to in the order of tens of metres. Similarly, the dispersal distances of some seeds in more likely to be in the order of tens of metres.</td><td>Not available</td><td>Not available</td></tr>
<tr><td>Area to perimeter ratio of remaining remnants (ratio)</td><td><table><tr><th>Perimeter (m)</th><th>Area (m^2)</th><th>Ratio</th></tr><tr><td>228</td><td>1565</td><td>0.15</td></tr><tr><td>47</td><td>154</td><td>0.31</td></tr><tr><td>90</td><td>400</td><td>0.23</td></tr></table></td><td>SydneyMetroArea-v3E-4489 (OEH 2016)</td><td>Extent of mapped STIF in (m^2) and perimeter (m) calculated in ArcMap V10.8.2.</td></tr>
<tr><td colspan="4">Vegetation integrity analysis</td></tr>
<tr><td>Vegetation Zone 1 (Composition score)</td><td>16.8</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Vegetation Zone 1 (Structure score)</td><td>30.7</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Vegetation Zone 1 (Function score)</td><td>16.2</td><td>N/A</td><td>N/A</td></tr>
</table>

9.3 Threatened species at risk of an SAII (Swift Parrot)

Lathamus discolor (swift parrot) is assessed in this section as it is a Serious and irreversible impact (SAII) threatened species. In accordance with BAM Section 9.1.2 the following information is provided to assist the consent authority in determining whether or not the proposal represents a serious and irreversible impact on this TEC.

9.3.1 Measures taken to avoid the direct and indirect impacts on the species at risk of an SAII

The subject land contains approximately 2,306 m^2 (or 0.23 ha) of mapped important habitat for *Lathamus discolor* (swift parrot). 1,727 m^2 (or 0.17 ha) of this area will potentially be managed to remove leaf litter and other debris, however this will not impact on foraging habitat for the species.

An earlier development footprint would have resulted in approximately 816m^2 for construction of a western access road and the proposed southern apartment building footprints.

The western access has been realigned and the southern apartment building footprints substantially reduced to avoid impacts on this area.

Additional amendments to the development's footprint have reduced the extent of vegetation clearing required and avoided foraging trees that are preferred by the swift parrot.

Section 7 (Avoidance and Minimisation) describes in further detail the actions and measures that have been undertaken to avoid direct impacts on the species. Table 37 and Table 43 describe the actions and measures that will be undertaken to avoid indirect impacts on the species.

9.3.2 Current status (excluding impacts of the proposal)

Table 48. Current status – *Lathamus discolor* / Swift Parrot

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Evidence of rapid decline (Principle 1)			
Change in population size in NSW in the past 10 years or 3 generations (indicate whether as a direct estimate of the population or if indicated by an index or surrogate)	The swift parrot population was estimated to be 2000 individuals in 2010 (Garnett et al. 2011). More recent estimates, predict the population of this species to be 750 with a maximum of 1000 (M Webb, D Stijanovic, R Heinsohn unpublished). Studies have predicted that population viability is likely to decrease by 79-95% over 12-18 years (Heinsohn et al., 2015). Other studies have predicted a further 6% (Heinshon et al., 2019). These projected declines are consistent with findings of annual assessments of over 1000 breeding sites across the breeding range. These assessments track variation and abundance across the range. Habitat loss and habitat degradation are significant threats impacting breeding (nesting and foraging) habitat.	TBDC	N/A
Evidence of small population size (Principle 2)			
Current population size in NSW	The Swift Parrot breeds in Tasmania, where the breeding population has declined from in excess of 10,000 pairs to less than 1,000 pairs (Forshaw 1993, Garnett 1993, Brereton 1998). Numbers in New South Wales are considerably less than this.	NSW Scientific Committee - final determination (Page last updated 9 June 2021	
Decline in species' population size in 3 years or one generation	Population reduction >80% in 10 years of 3 generations	TBDC	N/A
Number or percentage of mature individuals in each subpopulation or whether the species	2,000	Threatened Species Strategy – Year 3 Priority Species Scorecard (2018)	Information derived from the Conservation Advice

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
is likely to undergo extreme fluctuations			(Threatened Species Scientific Committee 2016), with some amendments made by contributing experts based on new information
Evidence of limited geographic range (Principle 3)			
Extent of occurrence (ha)	Area of occupancy appears to have declined significantly since European settlement, as can be inferred from the extent of habitat loss. For example, 70% percent of box-ironbark habitat (the principal wintering habitat of the swift parrot on the mainland) has been cleared in NSW. White box-yellow gum-Blakely's red gum woodland, another important habitat in NSW, has been reduced to less than 4 percent of its pre-European extent on the south-western slopes and southern tablelands of NSW.	Threatened Species Scientific Committee (2016). Conservation Advice Lathamus discolor swift parrot.	
Area of occupancy (ha)	The full extent of occurrence (EOO) for this species was estimated at 57,000km^2 in the Action Plan for Australian Birds 2010 (Garnett et al., 2011), which is not considered limited.	Threatened Species Scientific Committee (2016). Conservation Advice Lathamus discolor swift parrot.	
	Area of Occupancy: 1,400km^2	Threatened Species Strategy – Year 3 Priority Species Scorecard (2018)	
Number of threat-defined locations	The majority of Swift Parrot foraging sites in NSW, Queensland and South Australia occur outside conservation reserves and therefore continue to be vulnerable to loss, fragmentation or disturbance.		No threat defined locations are listed in the TBDC.
Whether the species' population is likely to undergo extreme fluctuations	Projected that Swift Parrots will undergo substantial declines within three generations	Threatened Species Strategy – Year 3 Priority Species Scorecard (2018)	Population Viability Analysis (Heinsohn et al. 2015) (based on modelled scenarios that considered impacts of sugar glider predation).

9.3.3 Impacts assessment

Table 49. Impacts assessment – *Lathamus discolor* / Swift Parrot

Impact	Data / information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number of individuals (mature and immature) present in the subpopulation on the subject land	The NSW Bionet Atlas was used to investigate records of the swift parrot since 1 Jan 1990 within or near the site. The site is centred within the 10 km x 10 km square (investigation area). There are 16 records of the swift parrot. All records were in the period 2002 - 2014. None of the records were within the site. The closest record is approximately 1100 m from the site.	NSW Bionet Atlas	
Number of individuals (mature and immature) present as a percentage of total NSW population (%)	Not applicable Only one population nationally		
Area of habitat to be impacted (ha) (for species measured by area only)	Approximately 0.014 ha comprising 5 x preferred foraging habitat trees. No areas of mapped important habitat will be cleared.	BAM Swift Parrot Important Habitat Map	Extent of mapped habitat impacted calculated in ArcMap V10.8.2.
Area of the species' geographic range to be impacted by the proposal (ha)			
Area of the species' geographic range to be impacted as a percentage of the total area or extent of occupancy (%)	0.00001% of occupancy		Extent of mapped habitat impacted calculated in ArcMap V10.8.2.
Individuals impacted	No individuals will be directly impacted, some habitat will be impacted		
Viability of a fragmented population	The species areas of mapped important habitat will not become fragmented.		The swift parrot is extremely mobile being migratory. The proposal will almost certainly not cause fragmentation for the species.

9.4 Threatened species at risk of an SAII (large-eared pied bat)

Chalinobus dwyeri (large-eared pied bat) is assessed in this section as it is a Serious and irreversible impact (SAII) threatened species. In accordance with BAM Section 9.1.2 the following information is provided to assist the consent authority in determining whether or not the proposal represents a serious and irreversible impact on this TEC.

The species is a full species credit because it cannot be reliably predicted to occur on a site based on vegetation and other landscape features (either foraging or breeding).

Any impacts on breeding habitat used by this species could **be considered potentially serious and irreversible**. Potential breeding habitat is PCTs associated with the species within 100m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings. Surveys must be undertaken as per the Threatened Bat Survey Guide to confirm breeding habitat.

9.4.1 Measures taken to avoid the direct and indirect impacts on the species at risk of an SAII

The proposal will not impact on breeding habitat for this species. Foraging habitat for this species, comprises:

- The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy.

Hence timbered areas within the subject land that are subject to clearing and management have been conservatively entered into the BAM-C and an offset obligation incurred. The offset obligation calculated by the BAM-C may not be required should the species not be detected in future compliant surveys.

9.4.2 Current status (excluding impacts of the proposal)

Table 50. Current status – Large-eared pied bat

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Species that is unlikely to respond to management and is therefore irreplaceable (Principle 4)			
Total abundance	It has been suggested that the species is unlikely to undergo extreme natural fluctuations in population numbers, extent of occurrence or area of occupancy (Hoye 2006 pers. comm.), although the justification for this is unknown.	DCCEEW SPRAT	There is insufficient data to estimate abundance or population trends of the Large-eared Pied Bat. Also, no site monitoring of known roosts has occurred. Some data were collected in the early 1960s, but this site was subsequently flooded by Copeton Dam (Hoye & Dwyer 1995).
Site population characteristics	The Large-eared Pied Bat appears to exist in a number of small populations throughout its range. The largest known populations of the Large-eared Pied Bat occur in those areas dominated by sandstone escarpments.	Department of Environment and Resource Management. 2011. National recovery plan for the large-eared pied bat *Chalinolobus dwyeri*. Report to the	Colonies seldom contain more than 50 individuals, but the level of interaction between adjacent colonies has not been ascertained.

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
	Important populations supporting higher numbers of individuals include those present in the sandstone escarpments of the Hunter Valley, Sydney Basin and Southern Tablelands of NSW, and the sandstone escarpments of Carnarvon, Expedition Ranges and Blackdown Tablelands Queensland. Additional smaller populations of importance occur in limestone caves and caves and mines with rocks of volcanic origin in the western and north-east parts of its range in NSW, south-eastern Queensland, as well as Shoalwater Bay north of Rockhampton (Hoye 2005).	Department of Sustainability, Environment, Water, Population and Communities, Canberra.	
Habitat modelling	Habitat modelling based on surveys in the southern Sydney region (NSW DECC 2007d) suggest that the Large-eared Pied Bat is largely restricted to the interface of sandstone escarpment (for roost habitat) and relatively fertile valleys (for foraging habitat) (Pennay 2008). Survey work in the Brigalow Belt South region of NSW supports this modelling (Pennay 2008). Some populations of the Large-eared Pied Bat would rely in part on the following threatened ecological communities: ▪ Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ▪ Brigalow (Acacia harpophylla dominant and co-dominant) ▪ White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and	DCCEEW SPRAT	

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
	Derived Native Grassland Weeping Myall - Coobah - Scrub Wilga Shrubland of the Hunter Valley ▪ Temperate Highland Peat Swamps on Sandstone ▪ Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia ▪ New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands. None of these PCTs occur on the subject land.		
Number of threat-defined locations	The main known cause of decline in the species is the destruction of, and interference with maternity and other roosts. Information presented in the recovery plan and in Schulz et al. (1999) identifies other probable threats as: ▪ mining of roosts; ▪ mine induced subsidence of clifflines; ▪ disturbance from human recreational activities; ▪ habitat disturbance by introduced animals, including livestock; ▪ predation by introduced pests; ▪ vegetation clearing in the proximity of roosts; and ▪ fire in the proximity of roosts.	Department of Environment and Resource Management. 2011.	No threat defined locations are listed in the TBDC. The lack of detailed information regarding the distribution, abundance and ecological requirements of the species makes an assessment of threats difficult.

9.4.3 Impacts assessment

Table 51. Impacts assessment – Large-eared pied bat

Impact	Data / information	Data sources	Details of data deficiency, assumptions or reasons for low confidence in information (e.g. TBDC indicates data is unknown or deficient)
Number of individuals (mature and immature) present in the subpopulation on the subject land	The NSW Bionet Atlas was used to investigate records of the species since 1 Jan 1990 within or near the site. The site is centred within the 10 km x 10 km square (investigation area). There are 4 records of the large-eared pied bat. Records were from 1992, 2018 and 2021. None of the records were within the subject land. The closest record is approximately 2,400 m from the site.	NSW Bionet Atlas	
Area of habitat to be impacted (ha) (for species measured by area only)	Approximately 0.9ha of foraging habitat may be impacted. This includes 0.2 ha of canopy trees that will be cleared and 0.7 ha of forested habitat that will be managed. Management includes removal of leaf litter and woody debris <10cm in diameter. This is not anticipated to impact on foraging habitat for the species.		
Individuals impacted	No individuals will be directly impacted, some habitat will be impacted		

10. Impact summary

10.1 Determine an offset requirement for impacts

10.1.1 Impacts on native vegetation and TECs or ECs (ecosystem credits)

Figure 21 and Table 52 identifies impacts on TECs and ECs that require an offset (as per BAM Subsection 9.2.1(1.)).

Table 52. Impacts that require an offset – ecosystem credit

Vegetation zone	TEC	Impact area (ha)	Current VI score	Future VI score	Change in VI score	Biodiversity risk weighting	Number of ecosystem credits required
3592_Low	NO	0.22	22.7	0	-22.7	1.75	2
3592_Management #	NO	0.36	62.9	40.6	-22.4	1.75	4
3262_Management ##	YES (PART)	0.34	50.0	30.6	-19.4	2.5	4
						Total ecosystem credits	**10**

10.1.2 Impacts on threatened species and their habitat (species credits)

Table 53 identifies impacts to the swift parrot, eastern pygmy-possum and large-eared pied bat that require an offset (as per BAM Subsection 9.2.2(2.). See also Figure 18, Figure 20 and Figure 23.

Table 53. Impacts that require an offset – species credits

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
Swift parrot	*Lathamus discolor*	E	CE	0.24	3	5
Eastern pygmy-possum	*Cercartetus nanus*	V		0.92	2	9
Large-eared pied bat	*Chalinolobus dwyeri*	V	V	0.92	3	15
					Total species credits	**29**

10.2 Impacts that do not need further assessment

Figure 22 and Table 54 identifies the impacts that do not need further assessment for ecosystem credits (as per BAM Section 9.3(1–2.)).

Table 54. Impacts that do not need further assessment for ecosystem credits

Impact	Location within subject land	Area (ha)	Justification why no further assessment is required
Clearing of planted native vegetation	Interspersed throughout		Refer to Section 4.2. Streamlined assessment module for planted native vegetation. Under D2 the planted native vegetation has been assessed for threatened species habitat only and biodiversity credits are not calculated.
Clearing of exotic vegetation	Interspersed throughout		Exotic vegetation has been assessed as not providing habitat for threatened species

11. Biodiversity credit report

11.1 Ecosystem credits

Ecosystem credits and matching credit profiles are provided in Table 55 and **Appendix A**.

Table 55. Ecosystem credit class and matching credit profile

Ecosystem credit	Attributes shared with matching credits						
	PCT name	**PCT vegetation class**	**PCT vegetation formation**	**Associated TEC or EC**	**Offset trading group** (BAM Section 10.2, Tables 4 & 5)	**Hollow bearing trees present?**	**IBRA subregion** (in which proposal is located)
4	3262- Sydney Turpentine-Ironbark Forest	Wet Sclerophyll Forests (Grassy sub-formation)	Northern Hinterland Wet Sclerophyll Forests	Sydney Turpentine Ironbark Forest in the Sydney Basin Bioregion	-	No	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo; or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
4	3592-Sydney Coastal Enriched Sandstone Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Coastal Dry Sclerophyll Forests	-	Sydney Coastal Dry Sclerophyll Forests >=50% and <70%	No	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
2	3592-Sydney Coastal Enriched Sandstone Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Coastal Dry Sclerophyll Forests	-	Sydney Coastal Dry Sclerophyll Forests >=50% and <70%	Yes	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

11.2 Species credits

Species credits and matching credit profiles are provided in Table 56 and **Appendix A**.

Table 56. Species credit class and matching credit profile

Species credit	Attributes shared with matching credits				
	Name of threatened species	Kingdom	BC Act status	EPBC Act status	IBRA region
5	*Lathamus discolor* / Swift Parrot	Fauna	Endangered	Critically Endangered	Any in NSW
9	*Cercartetus nanus* / Eastern Pygmy-possum	Fauna	V	-	Any in NSW
15	*Chalinolobus dwyeri* / Large-eared Pied Bat	Fauna	V	V	Any in NSW

12. References

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13. Figures

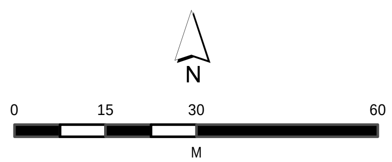
Figure 3. Location of trees in subject land

Lourdes Retirement Village
95 Stanhope Road, Killara

Figure 3.
Subject land trees

Legend

- Subject land
- Local native
- Local native - habitat absent
- Non-local native
- Exotic
- PCT 3262
- PCT 3262 understorey
- PCT 3592
- Landscaping
- Landscaping-shrubs



Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 20 June 2023

Data drawn: 29 September 2023

Above: Extract from 1897 parish map of Gordon showing the present-day location of Village in blue
Source: GML Heritage 2017

Above: 1934 plan of Congregational Union of NSW landholdings showing contemporary location of Stanhope Road
Source: GML Heritage 2017

Coordinate System: MGA Zone 56 (GDA 2020) | Image source: Nearmap 16 March 2023

Historical_Stanhope_Road_alignment

Area previously uninterrupted

Lourdes Retirement Village

Figure 4. Historical boundary change

Lourdes Retirement Village

Figure 5. Targeted surveys

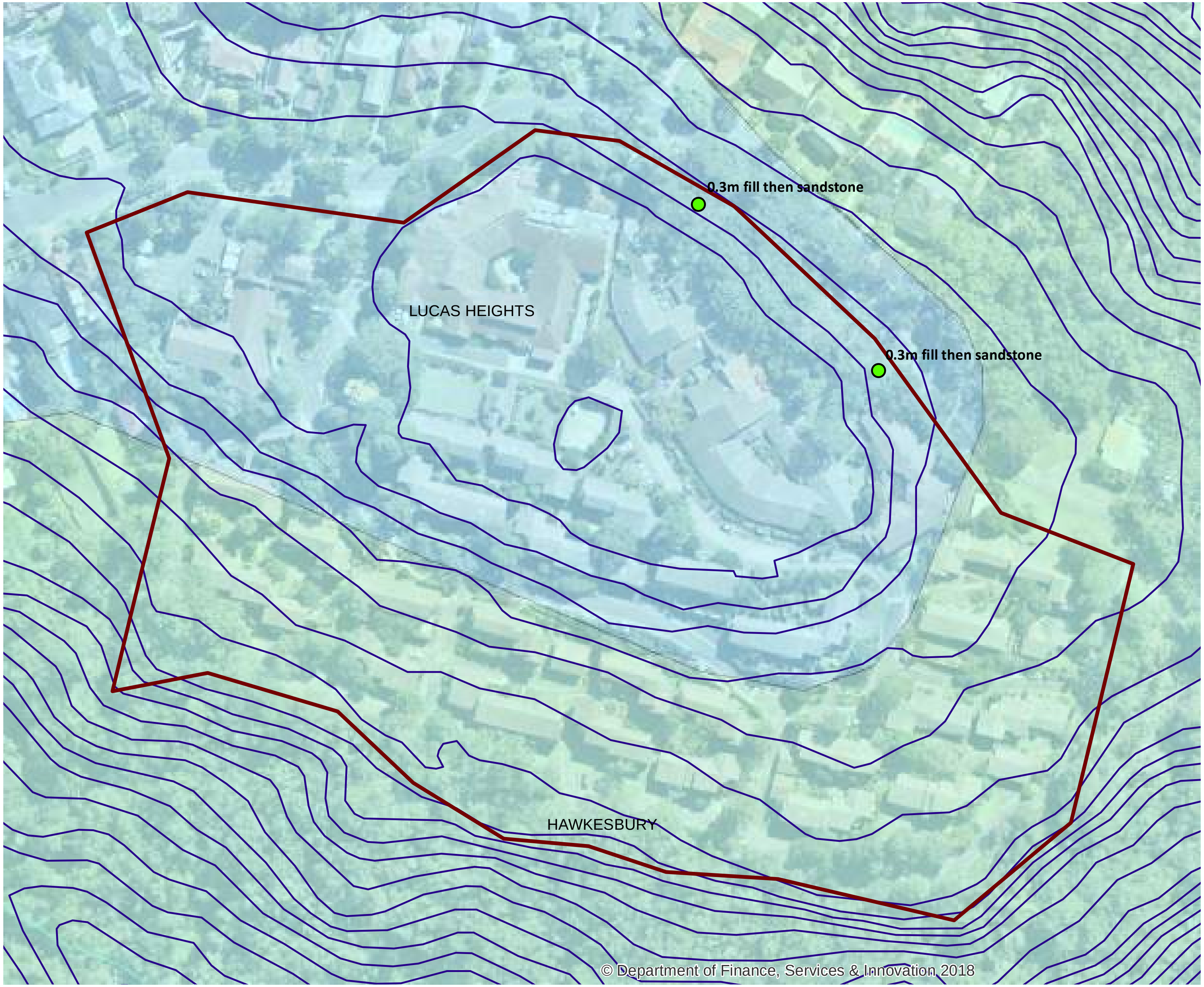
Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 16 March 2023

Data drawn: 1 May 2023

Lourdes Retirement Village

Figure 2-1. Subject land soil landscapes



Legend

Name

Subject land

Contours 2m

Soil landscape

GYMEA

HAWKESBURY

LUCAS HEIGHTS

N

0 15 30 60

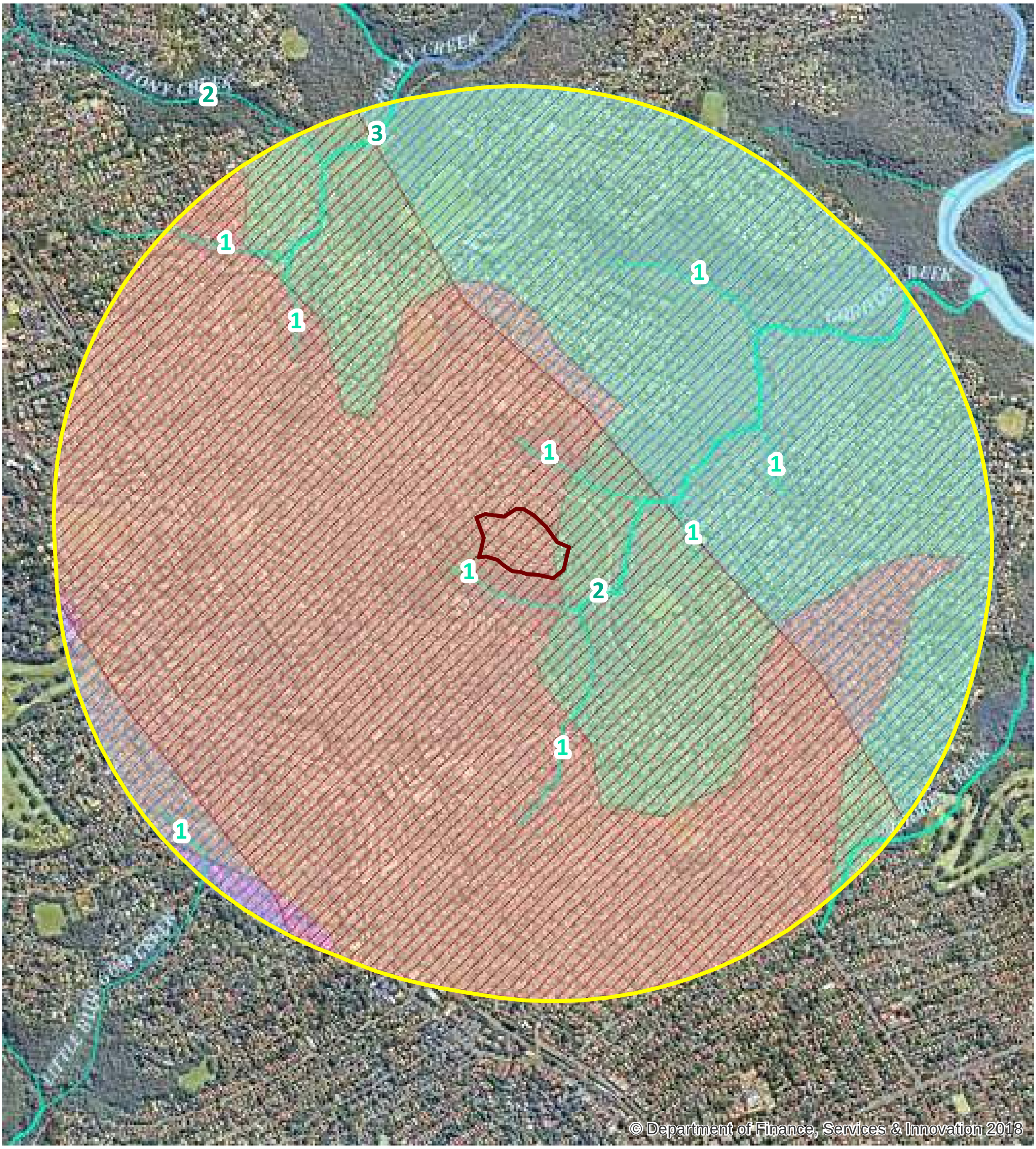
m

Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 16 March 2023

Data source: Sydney Soil Landscapes\ Sydney_GIS_data\Sydney_SL100K_v4_GDA94.shp

Data drawn: 20 April 2023



Legend

BDAR_assessment_area

Subject_site

IBRA subregion

Cumberland

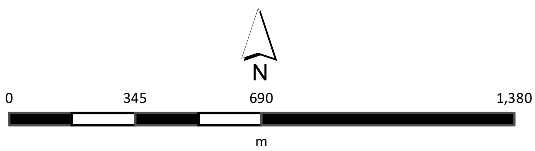
Pittwater

Mitchell landscape

Belrose Coastal Slopes

Pennant Hills Ridges

Port Jackson Basin



Lourdes Retirement Village

Figure 7. Landscape assessment

Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 16 March 2023

Data source: IBRA7 Subregions; Land_Mitchell_Landscapes_v3

Data drawn: 20 April 2023

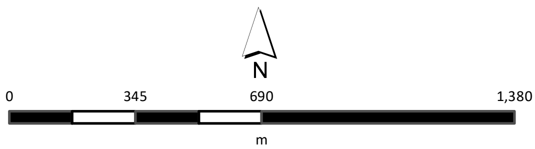
BDAR_assessment_area

Subject_site

<all other values>

NV cover (DPE, 2022)

NV cover (OEH, 2016)



Lourdes Retirement Village

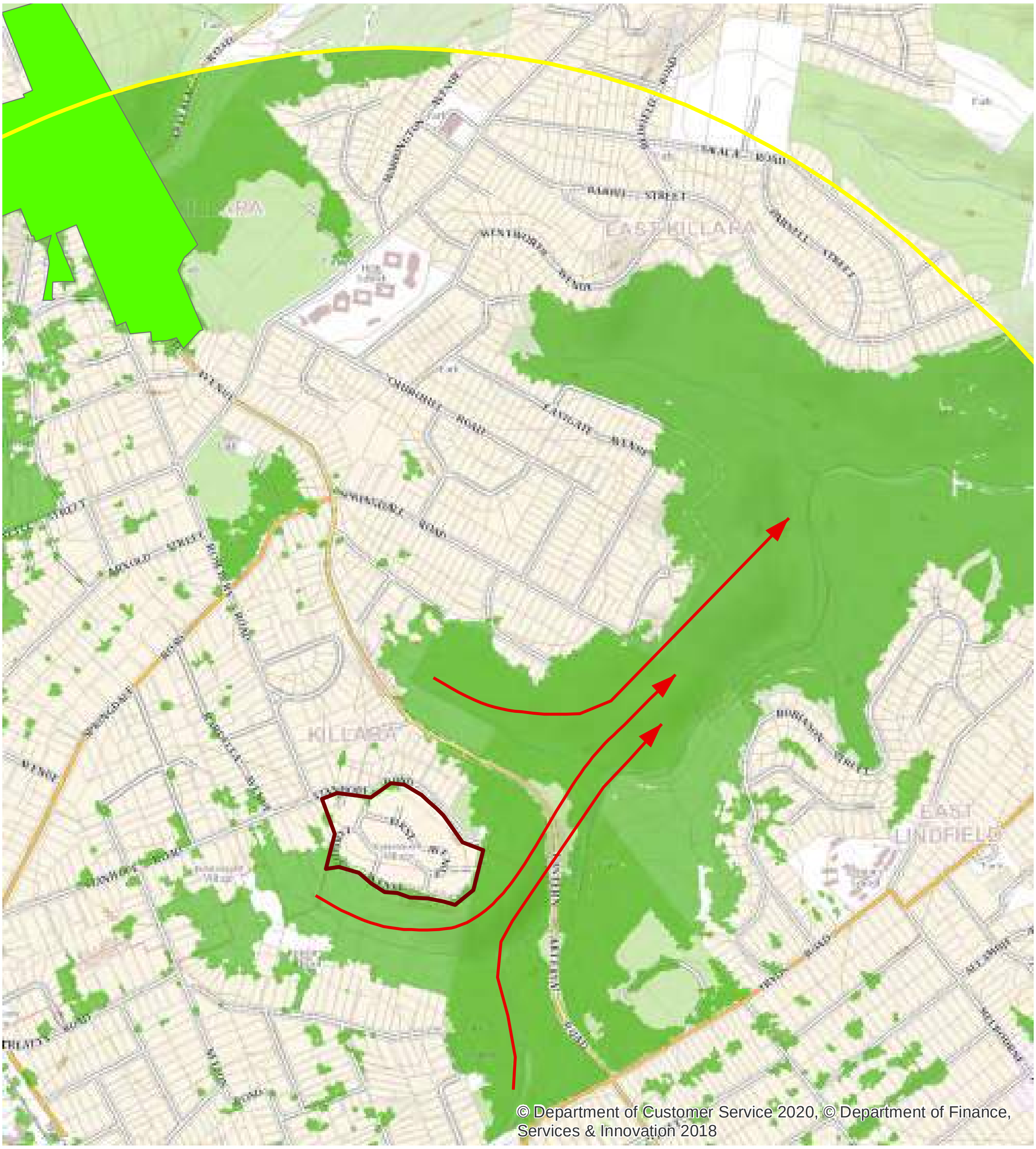
Figure 8. Native vegetation cover

Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 16 March 2023

Data source: SVTM (DPE 2022)
SydneyMetroArea_v3_2016_E_4489

Data drawn: 20 April 2023



© Department of Customer Service 2020, © Department of Finance, Services & Innovation 2018

Legend

- BDAR_assessment_area
- Subject_site
- Regional Corridor
- Connectivity

N

0 200 400 800
m

Lourdes Retirement Village

Figure 9. Connectivity

Coordinate System: MGA Zone 56 (GDA 2020)

Data drawn: 20 April 2023

Lourdes Retirement Village
95 Stanhope Road, Killara

Figure 10. SMA (OEH 2016) vegetation mapping

Legend

- Subject land
- SCCGR | PCT 3038 ex_1828
- SCESF | PCT 3592 ex_1776
- SCSGF | PCT 3595 ex_1250
- BGHF | PCT 3136 ex_1237
- STIF | PCT 3262 ex_1281
- SCSSF | PCT 3259 ex_1845

Inset

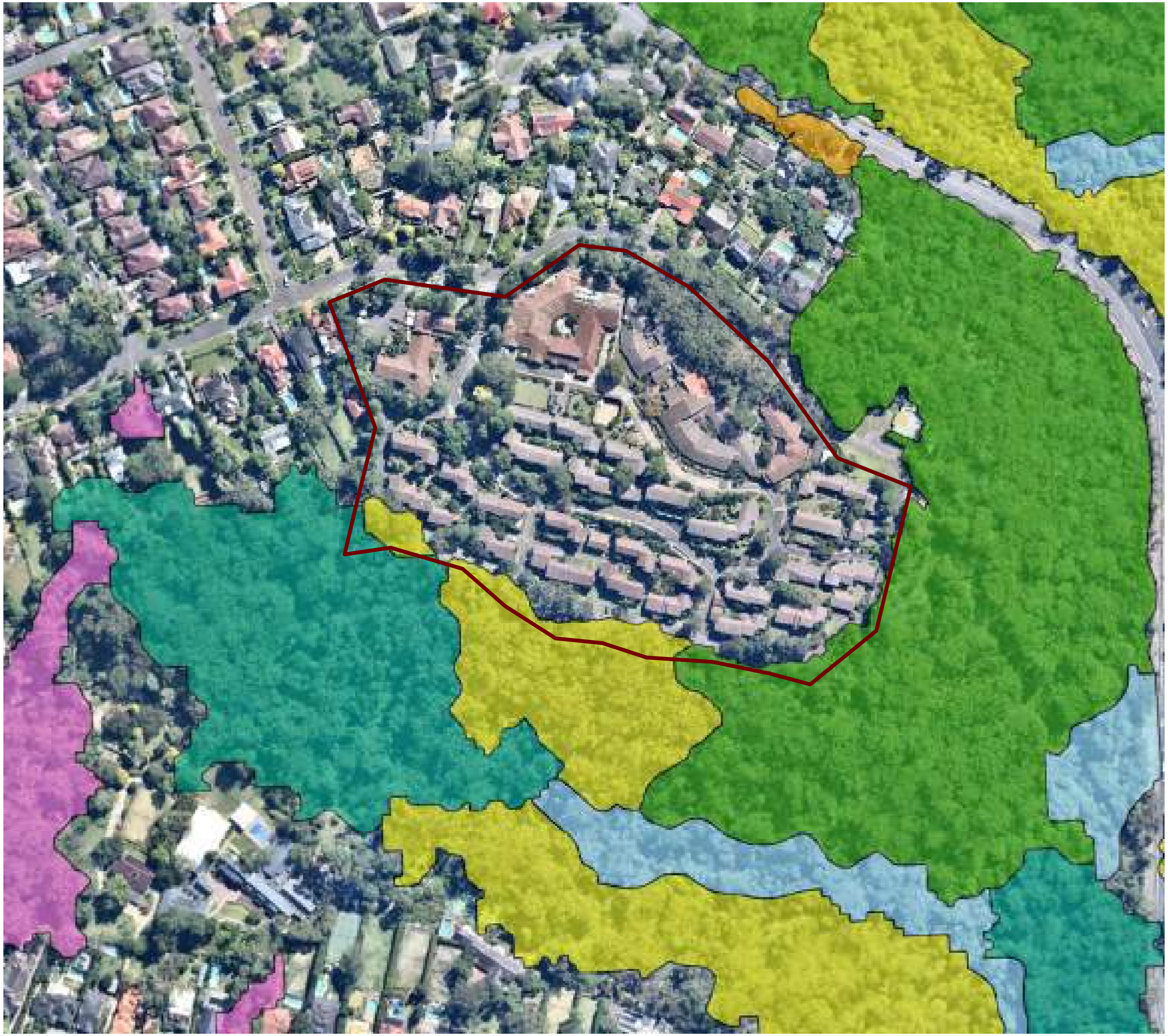
- Wet Sclerophyll Forests
- Dry Sclerophyll Forests

Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 20 June 2023

Data source: SydneyMetroArea_v3_2016_E_4489

Data drawn: 30 September 2023



Lourdes Retirement Village 95 Stanhope Road, Killara

Figure 11. SVTM (DPE 2022) vegetation mapping

Legend

- SCCGR | PCT 3038 ex_1828
- SCESF | PCT 3592 ex_1776
- SCSGF | PCT 3595 ex_1250
- BGHF | PCT 3136 ex_1237
- STIF | PCT 3262 ex_1281
- SCSSF | PCT 3259 ex_1845

N

0 40 80 160

m

Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 16 March 2023

Data source: SVTM_NSW_Extant_PCT_Quickview.gdb

Data drawn: 3 July 2023


Plot 4
Plot 6 (ELA)
Plot 7
Plot 8 (ELA)
Plot/transect 3
Plot/transect 2
Plot 5 (ELA)
Plot 9 (ELA)

Lourdes Retirement Village

Figure 13.
Subject land PCT clearing

Legend

Subject land

Vegetation clearing

PCT 3592

Landscaping

Landscaping-shrubs

Uncertain impacts

Tree no. 244

Tree no. 252

Dying - dead trees

Tree no. 285

Tree no. 287

N

0 20 40 80

m

Coordinate System: MGA Zone 56 (GDA 2020)
Image source: Nearmap 20 June 2023

Lourdes Retirement Village

Figure 14.
Subject land TECs

Legend

Subject land
PCT 3262
PCT 3262 understorey

N

0 20 40 80
m

Coordinate System: MGA Zone 56 (GDA 2020)
Image source: Nearmap 20 June 2023

Lourdes Retirement Village

Figure 15. Patch size

Legend

Subject_site

Patch_size

N

0 140 280 560

m

Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 16 March 2023

Data source: SydneyMetroArea_v3_2016_E_4489

Data drawn: 28 April 2023

Lourdes Retirement Village

Figure 16. Avoidance

Legend

- Subject land
- Exhibited Master Plan
- Updated Master Plan (July 2023)
- Current Master Plan (September 2023)

N

0 25 50 100
m

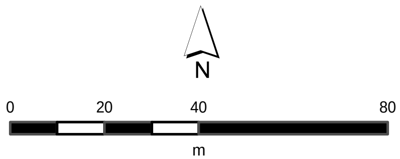
Coordinate System: MGA Zone 56 (GDA 2020)
Image source: Nearmap 20 June 2023
Data drawn: 5 October 2023

Lourdes Retirement Village

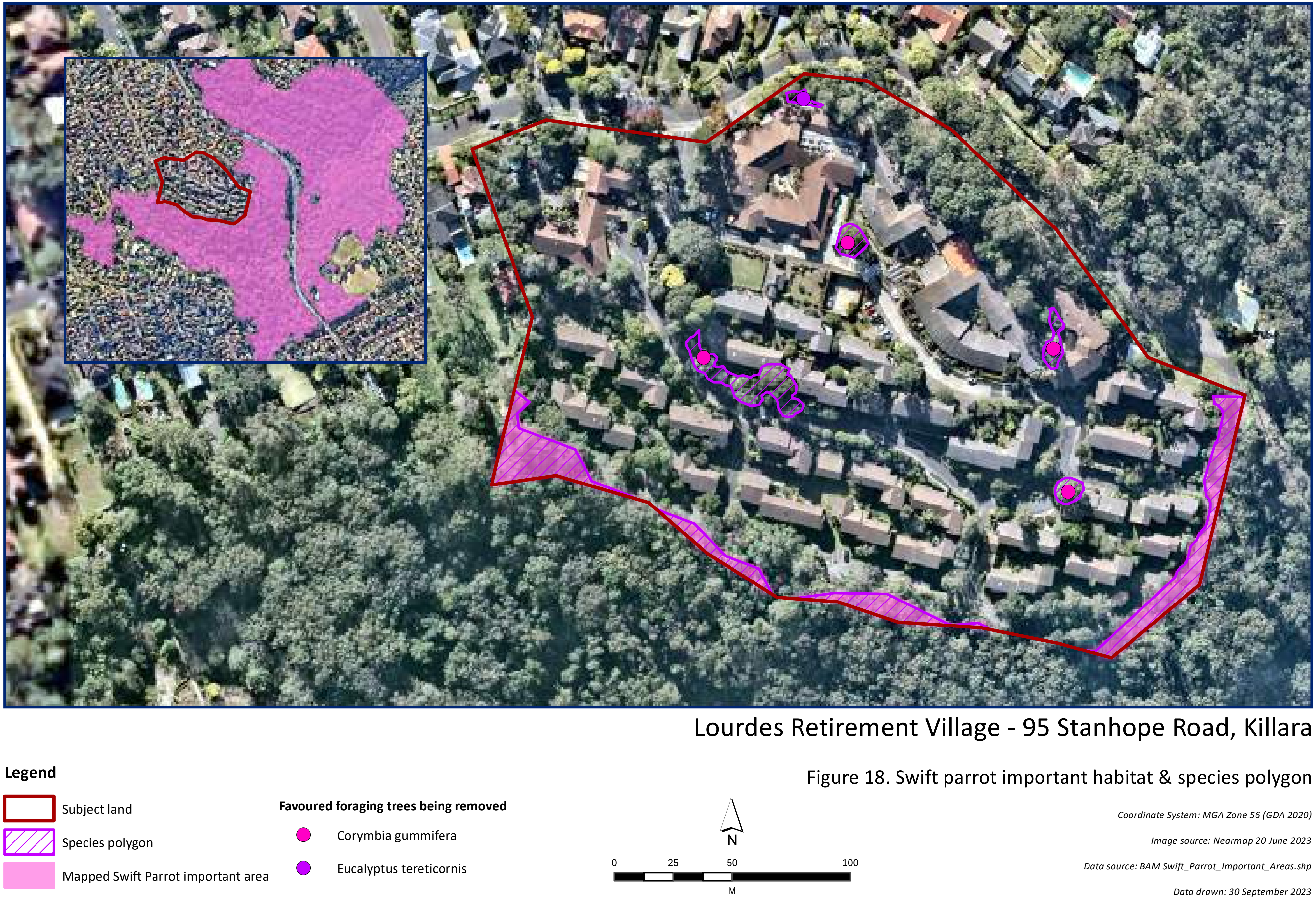
Figure 17.
Vegetation avoided

Legend

- Subject land
- PCT 3262
- PCT 3262 understorey
- PCT 3592
- Landscaping



Coordinate System: MGA Zone 56 (GDA 2020)
Image source: Nearmap 20 June 2023



Lourdes Retirement Village - 95 Stanhope Road, Killara

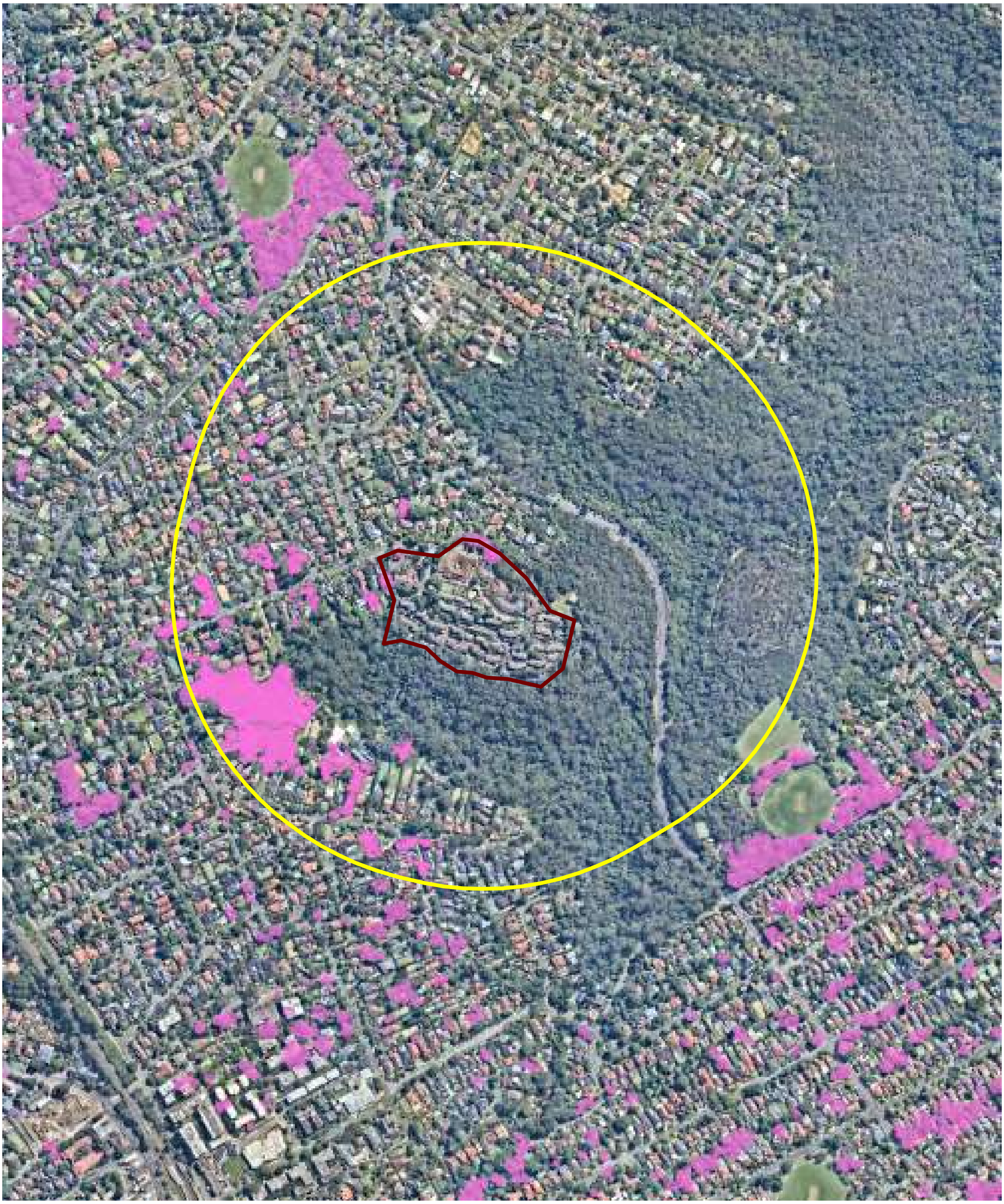
Figure 18. Swift parrot important habitat & species polygon

Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 20 June 2023

Data source: BAM Swift_Parrot_Important_Areas.shp

Data drawn: 30 September 2023



Legend

Subject land

SAII_500m_buffer

Sydney Turpentine Ironbark Forest

N

0 160 320 640

m

Lourdes Retirement Village

Figure 19. SAII TEC entity

Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 16 March 2023

Data source: SydneyMetroArea_v3_2016_E_4489

Data drawn: 12 July 2023

Lourdes Retirement Village
95 Stanhope Road, Killara

Figure 20. Escarpment habitat

Legend

Subject land

Escarpment

Escarpment distance (kms)

Escarpment_2kmBuffer

C.dwyeri_species_polygon

0 230 460 920

M

Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 30 August 2023

Data sources: Escarpment data provided by ECO LOGICAL AUSTRALIA PTY LTD

Data drawn: 30 September 2023

Lourdes Retirement Village

Figure 21.
Offsets required & proposed

Legend

Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 20 June 2023

Data source: BAM Swift_Parrot_Important_Areas.shp

Data drawn: 30 September 2023

Lourdes Retirement Village

Figure 22.
Offsets not required

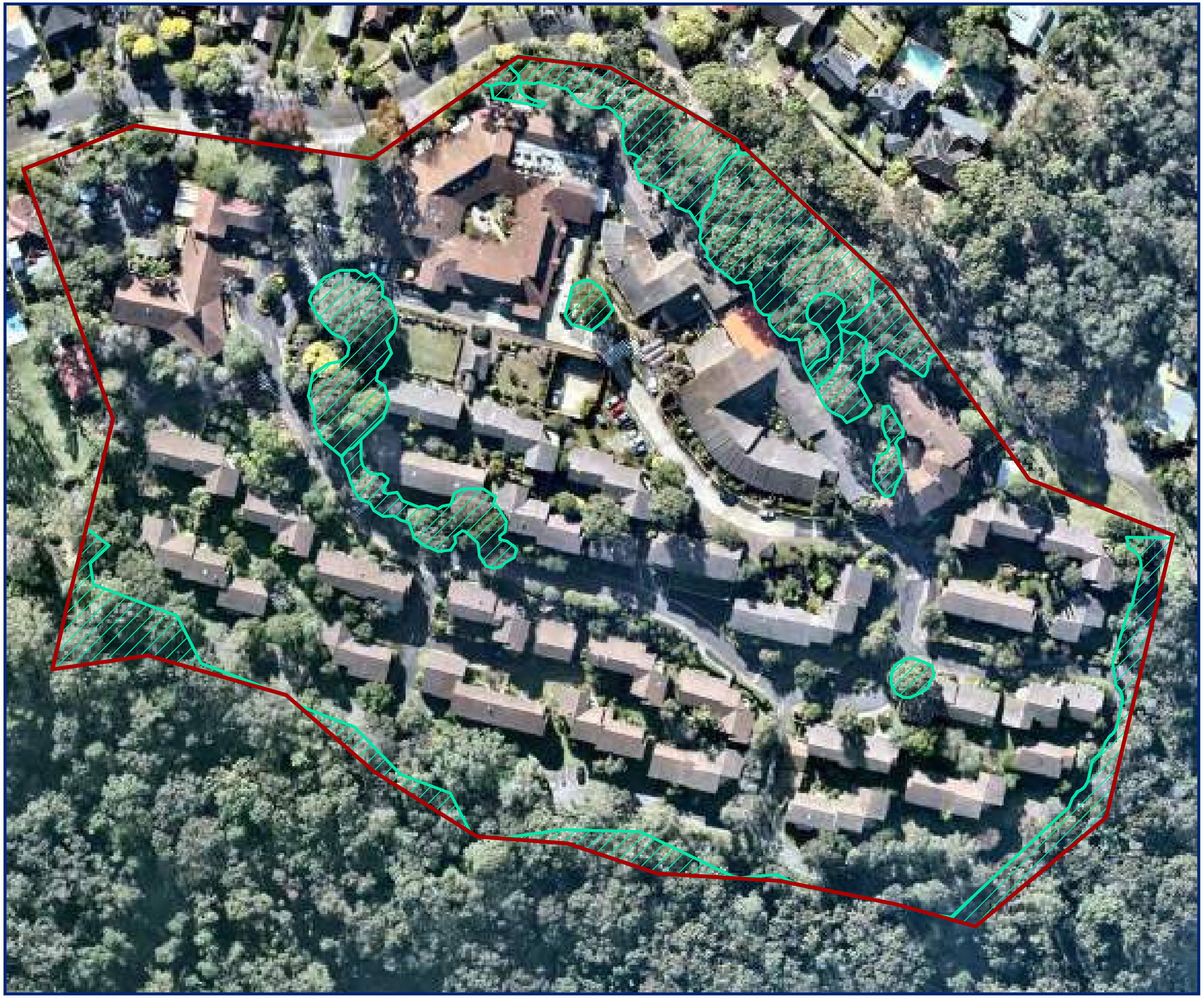
Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 20 June 2023

Data drawn: 30 September 2023

Lourdes Retirement Village
95 Stanhope Road, Killara

Figure 23.
Eastern pygmy-possum habitat



Legend

Subject land

Species polygon

Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 30 August 2023

Data drawn: 03 October 2023

Appendix A. Credit reports

Appendix B. BAM data

Appendix C.Historical Imagery Assessment

Appendix D. Historic Construction Photographic records – circa 1980's

Appendix E. Development and Landscape Plans – 1981 to 1988

Appendix F. Eco Logical Australia PCT assessment

Appendix G. Eco Logical Australia - PCT Mapping

Appendix H. Eco Logical Australia - Response to Department of Planning Letter

Appendix I. Lourdes Retirement Village Arborist Report Rev E

Appendix J. Black Ash - Response to Department of Planning (Asset Protection Zone) Letter

Appendix K. BG&E - Proposed Development Stormwater Requirements & Proposed Stormwater Plan

Appendix L. Construction Management & Sediment Control Plans

Appendix M. Concept Stormwater Management Plan

Appendix N. Construction Staging plans

Appendix O. Operational Footprint Plan

Appendix P. BDAR requirements compliance

LOURDES RETIREMENT VILLAGE

95 STANHOPE ROAD, KILLARA

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

APPENDIX A to J

Final Report October 2023

Angophora costata on sandstone outcropping | First Avenue, Lourdes Retirement Village

Appendix A. Credit reports

BAM Credit Summary Report

Proposal Details

Assessment Id
00043194/BAAS17054/23/00043195

Proposal Name
Lourdes Retirement Village

BAM data last updated *
22/06/2023

Assessor Name
Kat Duchatel

Report Created
05/10/2023

BAM Data version *
61

Assessor Number
BAAS17054

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
0

Assessment Type
Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Sydney Coastal Enriched Sandstone Forest												
1	3592_Low	Not a TEC	22.7	22.7	0.22	PCT Cleared - 61%	High Sensitivity to Gain			1.75		2

3	3592_Management	Not a TEC	62.9	22.4	0.36	PCT Cleared - 61%	High Sensitivity to Gain			1.75		4
											Subtotal	**6**
Sydney Turpentine Ironbark Forest												
2	3262_Management	Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	50	19.4	0.34	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	4
											Subtotal	**4**
											Total	**10**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Cercartetus nanus / Eastern Pygmy-possum (Fauna)									
3592_Low	22.7	22.7	0.22	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	2

3262_Management	19.4	19.4	0.34	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	3
3592_Management	22.4	22.4	0.36	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	4
								Subtotal	**9**
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)									
3592_Low	22.7	22.7	0.22	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	True	4
3262_Management	19.4	19.4	0.34	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	True	5
3592_Management	22.4	22.4	0.36	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	True	6
								Subtotal	**15**

Lathamus discolor / Swift Parrot (Fauna)									
3592_Low	22.7	22.7	0.22	Environment Protection and Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Critically Endangered	True	4
3592_Management	22.4	22.4	0.36	Environment Protection and Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Critically Endangered	True	6
								Subtotal	**10**

BAM Vegetation Zones Report

Proposal Details

Assessment Id

00043194/BAAS17054/23/00043195

Assessment name

Lourdes Retirement Village

BAM data last updated *

22/06/2023

Assessor Name

Kat Duchatel

Report Created

03/10/2023

BAM Data version *

61

Assessor Number

BAAS17054

Assessment Type

Major Projects

BAM Case Status

Open

Assessment Revision

0

Date Finalised

To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	3592_Low	3592-Sydney Coastal Enriched Sandstone Forest	Low	0.22	1	
2	3262_Management	3262-Sydney Turpentine Ironbark Forest	Management	0.34	1	

3	3592_Management	3592-Sydney Coastal Enriched Sandstone Forest	Management	0.36	1	

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00043194/BAAS17054/23/00043195	Lourdes Retirement Village	22/06/2023
Assessor Name	Report Created	BAM Data version *
Kat Duchatel	03/10/2023	61
Assessor Number	Assessment Type	BAM Case Status
BAAS17054	Major Projects	Open
Assessment Revision		Date Finalised
0		To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Broad-headed Snake	Hoplocephalus bungaroides	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Diamond Firetail	Stagonopleura guttata	3262-Sydney Turpentine Ironbark Forest
Dusky Woodswallow	Artamus cyanopterus cyanopterus	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Eastern False Pipistrelle	Falsistrellus tasmaniensis	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Eastern Osprey	Pandion cristatus	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest

Flame Robin	Petroica phoenicea	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Gang-gang Cockatoo	Callocephalon fimbriatum	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Glossy Black-Cockatoo	Calyptorhynchus lathami	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Greater Broad-nosed Bat	Scoteanax rueppellii	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Grey-headed Flying-fox	Pteropus poliocephalus	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Large Bent-winged Bat	Miniopterus orianae oceanensis	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Little Bent-winged Bat	Miniopterus australis	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Little Eagle	Hieraaetus morphnoides	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Little Lorikeet	Glossopsitta pusilla	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Masked Owl	Tyto novaehollandiae	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Powerful Owl	Ninox strenua	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Regent Honeyeater	Anthochaera phrygia	3262-Sydney Turpentine Ironbark Forest
Rosenberg's Goanna	Varanus rosenbergi	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Scarlet Robin	Petroica boodang	3592-Sydney Coastal Enriched Sandstone Forest
Speckled Warbler	Chthonicola sagittata	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Spotted-tailed Quoll	Dasyurus maculatus	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Square-tailed Kite	Lophoictinia isura	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Swift Parrot	Lathamus discolor	3592-Sydney Coastal Enriched Sandstone Forest

Swift Parrot	Lathamus discolor	3262-Sydney Turpentine Ironbark Forest
Turquoise Parrot	Neophema pulchella	3592-Sydney Coastal Enriched Sandstone Forest
Varied Sittella	Daphoenositta chrysoptera	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
White-bellied Sea-Eagle	Haliaeetus leucogaster	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
White-throated Needletail	Hirundapus caudacutus	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Black Bittern	Ixobrychus flavicollis	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Black-necked Stork	Ephippiorhynchus asiaticus	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest
Painted Honeyeater	Grantiella picta	3592-Sydney Coastal Enriched Sandstone Forest
		3262-Sydney Turpentine Ironbark Forest

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Black Bittern	Ixobrychus flavicollis	Habitat constraints
Black-necked Stork	Ephippiorhynchus asiaticus	Habitat constraints
Painted Honeyeater	Grantiella picta	Habitat constraints

BAM Candidate Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00043194/BAAS17054/23/00043195	Lourdes Retirement Village	22/06/2023
Assessor Name	**Report Created**	**BAM Data version ***
Kat Duchatel	03/10/2023	61
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS17054	Major Projects	Open
Assessment Revision	**Date Finalised**	
0	To be finalised	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Acacia pubescens Downy Wattle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Anthochaera phrygia Regent Honeyeater	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Callistemon linearifolius Netted Bottle Brush	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Cercartetus nanus Eastern Pygmy-possum	Yes (assumed present)	☐ **Jan** ☐ **Feb** ☐ **Mar** ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ **Oct** ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?
Chalinolobus dwyeri Large-eared Pied Bat	Yes (assumed present)	☐ **Jan** ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?
Darwinia biflora Darwinia biflora	No (surveyed)	☐ **Jan** ☐ **Feb** ☐ **Mar** ☑ **Apr** ☐ **May** ☐ **Jun** ☐ **Jul** ☐ **Aug** ☑ **Sep** ☐ **Oct** ☑ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?
Darwinia peduncularis Darwinia peduncularis	No (surveyed)	☐ **Jan** ☐ **Feb** ☐ **Mar** ☑ **Apr** ☐ **May** ☐ **Jun** ☐ **Jul** ☐ **Aug** ☑ **Sep** ☐ **Oct** ☑ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?
Dillwynia tenuifolia Dillwynia tenuifolia	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ **Aug** ☑ **Sep** ☐ **Oct** ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Epacris purpurascens var. purpurascens Epacris purpurascens var. purpurascens	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ **Sep** ☐ **Oct** ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Eucalyptus camfieldii Camfield's Stringybark	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Hibbertia puberula Hibbertia puberula	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Hibbertia spanantha Julian's Hibbertia	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Hibbertia superans Hibbertia superans	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Lasiopetalum joyceae Lasiopetalum joyceae	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Lathamus discolor Swift Parrot	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Leucopogon fletcheri subsp. fletcheri Leucopogon fletcheri subsp. fletcheri	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Melaleuca deanei Deane's Paperbark	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Persoonia hirsuta Hairy Geebung	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Persoonia mollis subsp. maxima Persoonia mollis subsp. maxima	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Pimelea curviflora var. curviflora Pimelea curviflora var. curviflora	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Pomaderris brunnea Brown Pomaderris	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Rhodamnia rubescens Scrub Turpentine	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Tetratheca glandulosa Tetratheca glandulosa	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Barking Owl	Ninox connivens	Habitat constraints
Bauer's Midge Orchid	Genoplesium baueri	Habitat degraded
Broad-headed Snake	Hoplocephalus bungaroides	Habitat constraints
Bush Stone-curlew	Burhinus grallarius	Habitat constraints
Cumberland Plain Land Snail	Meridolum corneovirens	Habitat degraded
Deyeuxia appressa	Deyeuxia appressa	Habitat degraded
Dural Land Snail	Pommerhelix duralensis	Habitat degraded
Eastern Australian Underground Orchid	Rhizanthella slateri	Habitat degraded
Eastern Osprey	Pandion cristatus	Habitat constraints
Gang-gang Cockatoo	Callocephalon fimbriatum	Habitat constraints
Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas	Callocephalon fimbriatum - endangered population	Habitat constraints Geographic limitations
Giant Burrowing Frog	Heleioporus australiacus	Habitat degraded

Glossy Black-Cockatoo	Calyptorhynchus lathami	Habitat constraints
Gosford Wattle, Hurstville and Kogarah Local Government Areas	Acacia prominens - endangered population	Refer to BAR
Green and Golden Bell Frog	Litoria aurea	Habitat constraints
Grevillea parviflora subsp. supplicans	Grevillea parviflora subsp. supplicans	Refer to BAR
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Haloragodendron lucasii	Haloragodendron lucasii	Habitat constraints Geographic limitations
Koala	Phascolarctos cinereus	Habitat degraded
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Little Eagle	Hieraaetus morphnoides	Habitat constraints
Long-nosed Bandicoot population in inner western Sydney	Perameles nasuta - endangered population	Refer to BAR
Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Marsdenia viridiflora subsp. viridiflora - endangered population	Refer to BAR
Masked Owl	Tyto novaehollandiae	Habitat constraints
P. prunifolia in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas	Pomaderris prunifolia - endangered population	Refer to BAR
Powerful Owl	Ninox strenua	Habitat constraints
Red-crowned Toadlet	Pseudophryne australis	Habitat degraded
Southern Greater Glider	Petauroides volans	Habitat degraded
Southern Myotis	Myotis macropus	Habitat constraints
Square-tailed Kite	Lophoictinia isura	Habitat constraints
Squirrel Glider	Petaurus norfolcensis	Habitat degraded

Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	Wahlenbergia multicaulis - endangered population	Refer to BAR
White-bellied Sea-Eagle	Haliaeetus leucogaster	Habitat constraints
Zieria involucrata	Zieria involucrata	Habitat degraded

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00043194/BAAS17054/23/00043195	Lourdes Retirement Village	22/06/2023
Assessor Name	Assessor Number	BAM Data version *
Kat Duchatel	BAAS17054	61
Proponent Names	Report Created	BAM Case Status
	05/10/2023	Open
Assessment Revision	Assessment Type	Date Finalised
0	Major Projects	To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	Critically Endangered Ecological Community	3262-Sydney Turpentine Ironbark Forest

Species
Chalinolobus dwyeri / Large-eared Pied Bat
Lathamus discolor / Swift Parrot

BAM Biodiversity Credit Report (Like for like)

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Ephippiorhynchus asiaticus / Black-necked Stork
Grantiella picta / Painted Honeyeater
Ixobrychus flavicollis / Black Bittern

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3592-Sydney Coastal Enriched Sandstone Forest	Not a TEC	0.6	4	2	6
3262-Sydney Turpentine Ironbark Forest	Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	0.3	0	4	4

3262-Sydney Turpentine Ironbark Forest	**Like-for-like credit retirement options**					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion This includes PCT's: 3262	-	3262_Management	No	4	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
3592-Sydney Coastal Enriched Sandstone Forest	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 3583, 3592, 3594	Sydney Coastal Dry Sclerophyll Forests >=50% and <70%	3592_Low	No	2	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 3583, 3592, 3594	Sydney Coastal Dry Sclerophyll Forests >=50% and <70%	3592_Management	Yes	4	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

3592-Sydney Coastal Enriched Sandstone Forest

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Cercartetus nanus / Eastern Pygmy-possum	**3592_Low, 3262_Management, 3592_Management**	0.9	9.00
Chalinolobus dwyeri / Large-eared Pied Bat	**3592_Low, 3262_Management, 3592_Management**	0.9	15.00
Lathamus discolor / Swift Parrot	**3592_Low, 3592_Management**	0.6	10.00

Credit Retirement Options

Like-for-like credit retirement options

	Spp	IBRA subregion
Cercartetus nanus / Eastern Pygmy-possum		
	Cercartetus nanus / Eastern Pygmy-possum	Any in NSW
Chalinolobus dwyeri / Large-eared Pied Bat	Spp	IBRA subregion
	Chalinolobus dwyeri / Large-eared Pied Bat	Any in NSW

Lathamus discolor / Swift Parrot	Spp	IBRA subregion
	Lathamus discolor / Swift Parrot	Any in NSW

Appendix B. BAM data

Plot	Zone	Coordinates		Bearing
1	56H	330800	6262304	170
2	56H	330830	6262178	55
3	56H	330978	6262214	60
4	56H	330974	6262217	65
7	56H	331087	6262280	225

Composition

Plot	Tree	Shrub	Grass	Forb	Fern	Other
1	3	2	0	4	0	0
2	3	0	1	3	0	0
3	3	3	0	1	1	0
4	4	2	1	4	0	0
7	4	2	7	4	1	1

Structure

Plot	Tree	Shrub	Grass	Forb	Fern	Other
1	50	10	0	6	0	0
2	58	0	15	7	0	0
3	15	15	0	2	2	0
4	22	3	1	2.3	0	0
7	45	6	6	1	0	0.1

Function

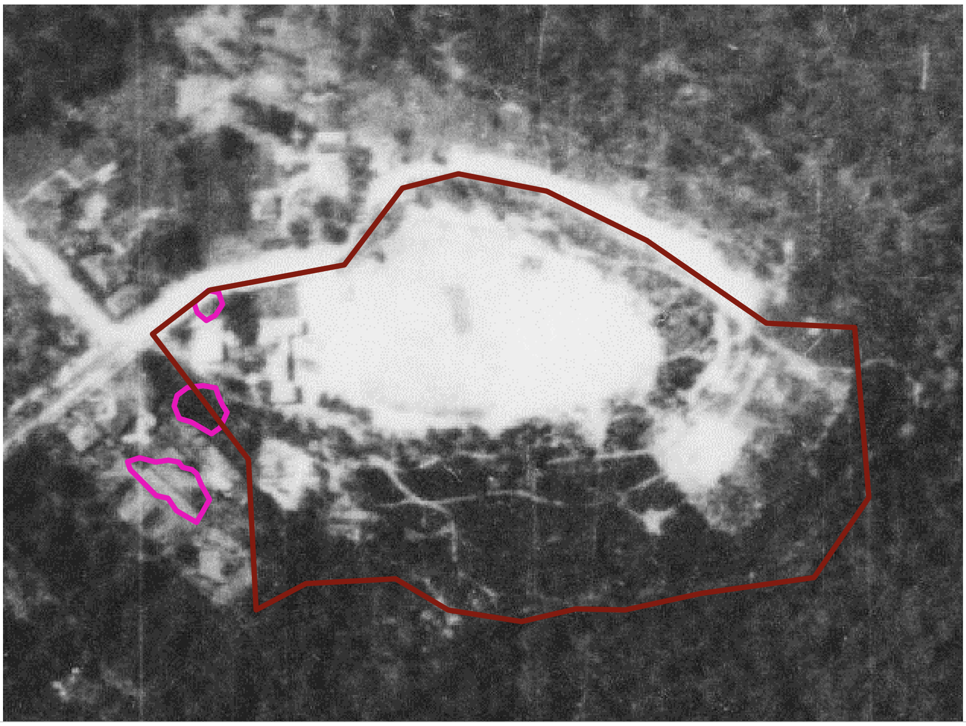
Plot	Stem classes (cm)					
	<5	5-9	10-19	20-29	30-49	>50
1	0	0	2	4	0	0
2	0	2	0	1	3	3
3	0	1	0	4	4	0

Plot	HBTs	Litter cover	LWD (m)	HTW
1	0	15	0	0
2	0	58	0	2
3	0	5	0	0

Appendix B BAM data

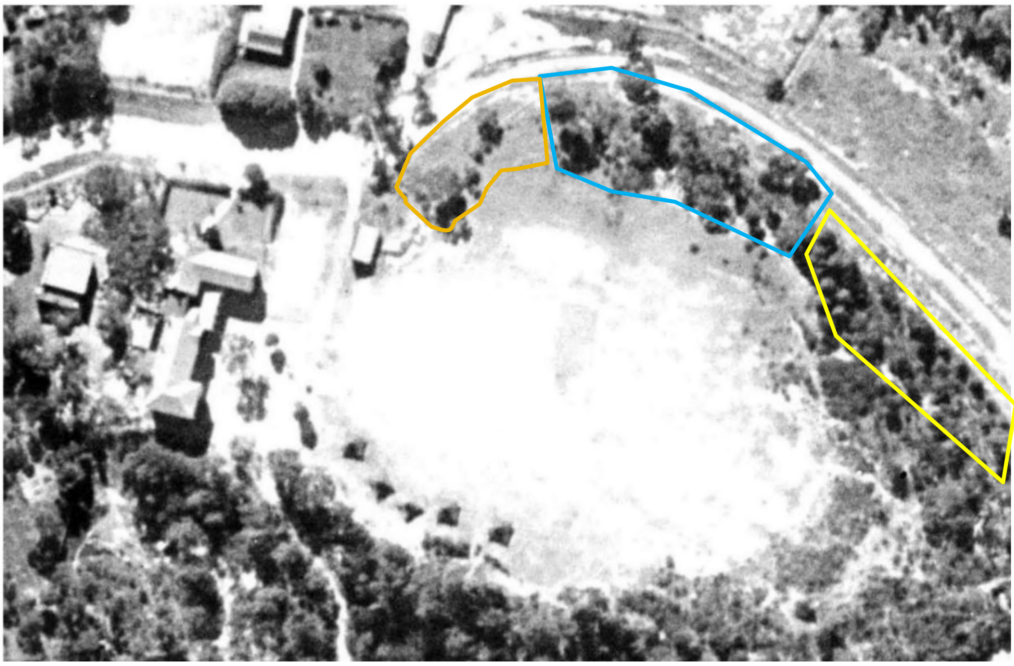
GF	Species name	Common name	Plot 1 Cover	Plot 2 Cover	Plot 3 Cover	Plot 4 Cover	Plot 7 Cover
TG	Allocasuarina littoralis	Black sheoak	15				15
TG	Allocasuarina torulosa	Forest oak					
TG	Angophora costata	Smooth-barked apple			5	15	
TG	Angophora floribunda	Rough-barked apple			0.1		
TG	Banksia integrifolia	Coastal banksia					
TG	Banksia serrata	Old-man banksia			10		
TG	Corymbia gummifera	Red bloodwood				5	5
TG	Corymbia maculata	Spotted gum		15			
TG	Eucalyptus microcorys	Tallowwood					10
TG	Eucalyptus paniculata	Grey ironbark				5	
TG	Eucalyptus pilularis	Blackbutt		40			
TG	Eucalyptus robusta	Swamp mahogany	10				10
TG	Eucalyptus saligna	Sydney bluegum				10	
TG	Syncarpia glomulifera	Turpentine	25	3			
SG	Acacia implexa	Hickory wattle					2
SG	Acacia longifolia		2				
TG	Allocasuarina torulosa	Forest oak					
SG	Banksia spinulosa	Hairpin banksia			5		
SG	Callistemon citrinus	Crimson bottlebrush			5		
SG	Leucopogon juniperinus	Prickly Beard-heath					3
SG	Polyscias sambucifolia	Elderberry panash					0.1
SG	Elaeocarpus reticulatus	Blueberry ash			5	2	
SG	Ozothamnus diosmifolius	Rice flower				1	0.1
SG	Pittosporum undulatum	Sweet pittosporum	8				
GG	Aristida vagans	Three-awned spear grass					1
GG	Cyathochaeta diandra						0.5
GG	Entolasia marginata	Bordered panic					0.1
GG	Entolasia stricta	Wiry bordered panic					1
GG	Gahnia clarkei	Saw sedge					1
GG	Lachnagrostis filiformis	Blown grass			0.1		
GG	Lomandra longifolia	Spiny mat rush		15			1
GG	Microlaena stipoides	Weeping meadow grass			0.1	1	1
GG	Oplismenus aemulus	Basket grass			0.1		
FG	Centella asiatica	Indian pennywort	1	3		0.1	
FG	Commelina cyanea	Scurvy weed	2			0.1	
FG	Dianella caerulea	Native flax lily			5	0.1	1
FG	Dichondra repens	Kidney weed	2	2		2	
FG	Geranium homeanum	Native geranium	1	2			
EG	Calochalena dubia	False bracken			2		
OG	Billardiera scandens	Hairy apple berry					0.1

Appendix C.Historical Imagery Assessment



1929: extent of early 1900s clearing – area denoted in pink coincides with SMA mapping of PCT 3262 (STIF)

1943: Showing central-north site portion and land to north of subject land cleared



1943: zoomed in to show potential remnant native vegetation (in orange and blue outline) in the central-north site portion whereas the mid-right side of photograph indicates plantings (even aged trees and linear arrangement in yellow outline), which coincides with existing tallowwood trees.

1951: Regrowth from surrounding bushland and some development along Stanhope Road evident – zones outlined in 1943 provided for comparison over time. Areas outlined in pink show indicative location of STIF mapped by OEH (2016)

1960: pre-existing development with regrowth from surrounding bushland and residential development along Stanhope Road evident – zones outlined in 1943 provided for comparison over time

1977: pre-existing development regrowth evident as denser bushland – zones outlined in 1943 provided for comparison over time

1982: development of existing village underway, existing fire track evident – zones outlined in 1943 provided for comparison over time. Additional area outlined in green shows the location of tree no's. 244 & 245 which were evident in construction photography taken in 1982 (refer Appendix I) but only location of tree no. 245 evident here

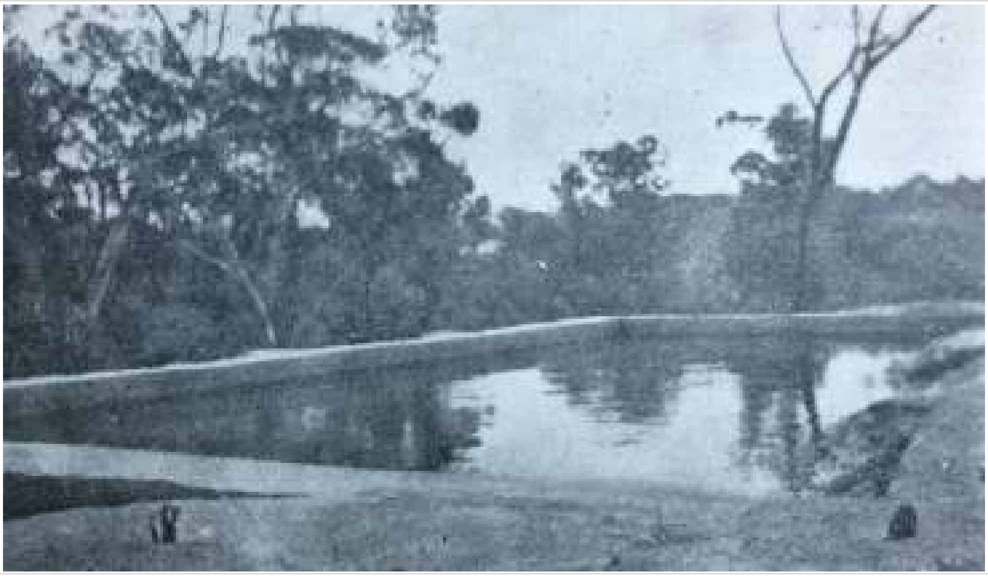
1985: current day development evident with southern site portion vegetation clearance completed. The area of PCT 3259 mapped by OEH (2016) is predominantly cleared. As in 1982 (above), the green outlines the location of tree no's. 244 & 245, with only tree no. 245 evident, and what is potentially the existing tree no. 244 evident as a small planting

Further historical information is provided in the Project's heritage assessment (GML Heritage 2017), which discusses land ownership and land use that pre-dates the available historical aerial imagery.

Site photographs (albeit limited to the cleared and developed area of the subject land associated the Headfort School) shows views into surrounding bushland and the habit of retained remnant trees (see photo plates below).

Photo plates

Headfort School, taken in c.1921 (source. The Headfort Chronicle: The Magazine of Headfort School, Killara in GML Heritage, 2017)



Swimming pool at Headfort School taken in c.1921 (source. The Headfort Chronicle: The Magazine of Headfort School, Killara in GML Heritage, 2017)

The irregularly shaped land located between the boundary of Lots 217-219 in 1897 and that acquisitioned by 1934 into the land holdings of the Congregational Union of NSW (shown in red outline), encompasses the northern most area of vegetation in the contemporary subject land.

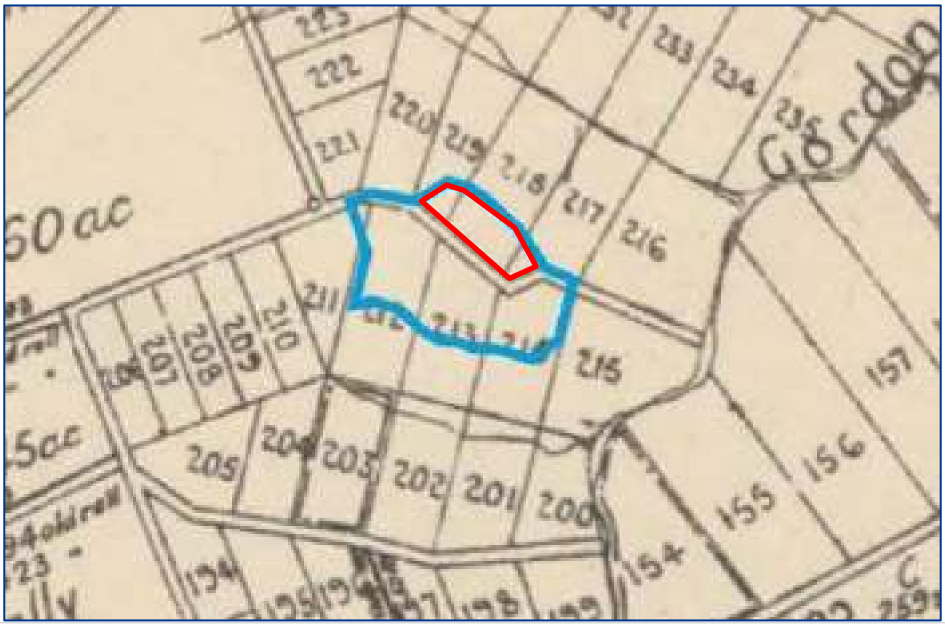


Figure 0-1. Extract from 1897 parish map of Gordon showing the present-day location of Lourdes Retirement Village - outlined in blue (reference: GML Heritage 2017)

Figure 0-2. 1934 plan of Congregational Union of NSW landholdings (reference: GML Heritage 2017) – showing contemporary location of Stanhope Road

Appendix D. Historic Construction Photographic records – circa 1980's

Appendix E. Development and Landscape Plans – 1981 to 1988

GEOFFREY TWIBILL & ASSOCI
ARCHITECTS & PLANNE

AMENDMENTS

NO.	DATE	ITEM
A	18/1/82	UNITS RENUMBERED, UNIT TYPES ADDED

UNIT SUMMARY

TYPE / PRECINCT	A	B	C1	C2	D
1	6	4	11	6	7
2	1	4	6	2	–
3	7	–	1	8	1
4	4	6	10	2	3
5	4	3	5	4	3
TOTAL	22	17	31	24	14

FIRST FLOOR UNIT NUMBER
UNIT TYPE
26 C1
24
GROUND FLOOR UNIT NUMBER

SCALE	DATE
1:500	DEC 81

CONTRACTORS SHALL VERIFY ALL DIMENSIONS AT THE JOB BEFORE COMMENCING WORK OR PREPARING SHOP DRAWINGS.

PROJECT
LOURDES VILLAGE
KILLARA

DRAWING
DEVELOPMENT PLAN

JOB NO	DRAWING NO
8006	1A

GEOFFREY TWIBILL & ASSOCIATES
ARCHITECTS & PLANNERS

AMENDMENTS
NO. DATE ITEM

TREES TO BE REMOVED

NOTE: THIS DRAWING DOES NOT SHOW ALL TREES TO BE PRESERVED SEE 1:200 SITE PLANS

SCALE	DATE	DRAWN
1:500	DEC 81	$

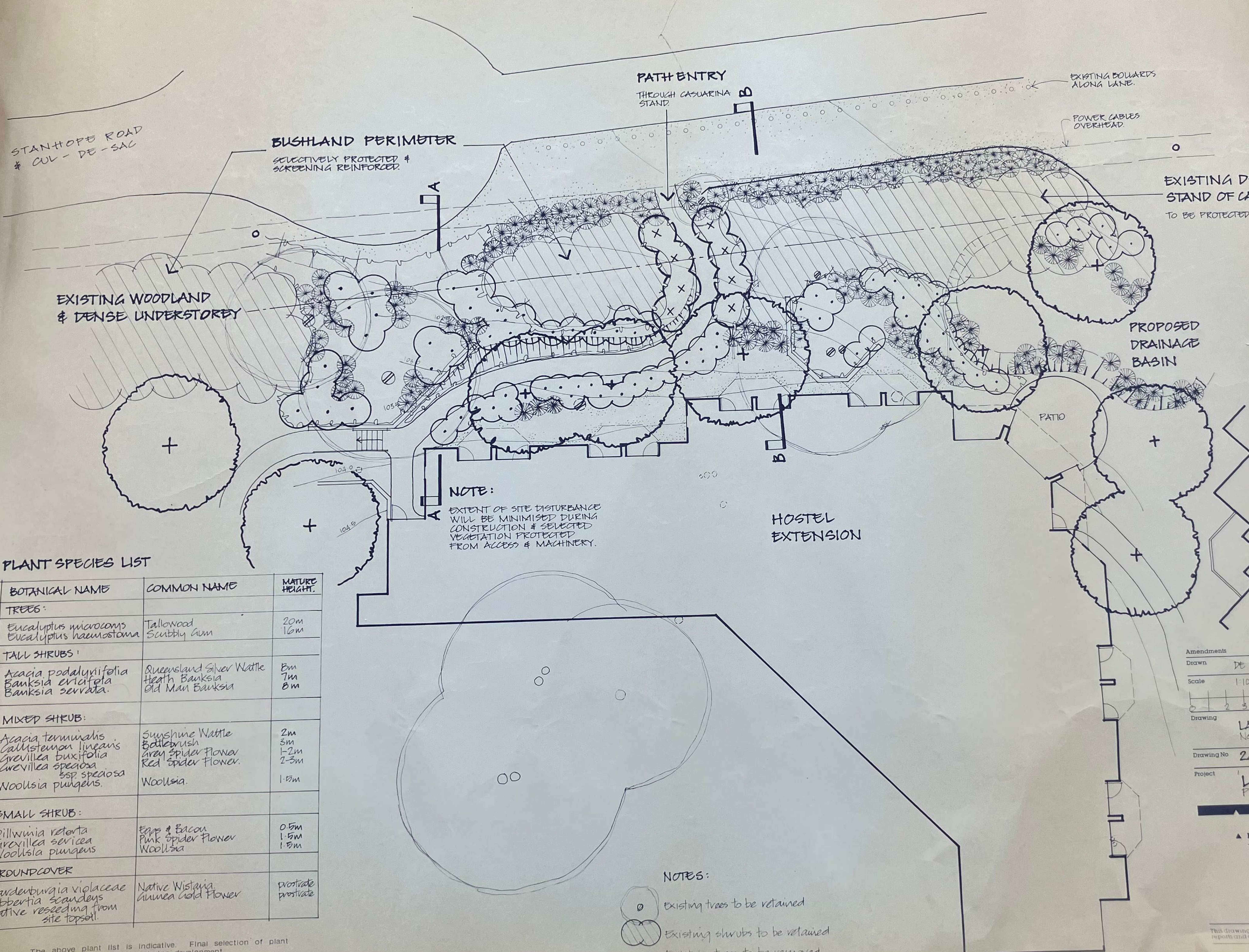
CONTRACTORS SHALL VERIFY ALL DIMENSIONS AT THE JOB BEFORE COMMENCING WORK OR PREPARING SHOP DRAWINGS.

PROJECT
LOURDES VILLAGE
KILLARA

DRAWING
SITE PLAN
INDICATING TREES
TO BE REMOVED

JOB NO	DRAWING N
8006 /	L4

LEGEND.
MAJOR EXISTING TREES
MAJOR TREES (5-8m)
U/GROUND CAR PARKING COVER WITH SOIL & TURFED. AS FOR DETAIL 7 DWG 3781/L/3.
SCREEN PLANTING (3-4m)
COURTYARD PLANTING EXOTIC SPECIES (4-5m)
SCREEN PLANTING OF ACACIA SPECIES AS TEMPORARY LANDSCAPING TO SITE OF PROPOSED NURSING HOME.
EXISTING VEGETATION TO BE RETAINED AND CLEARED OF UNDERGROWTH WALKWAY TO BE FORMED TO JOIN TO PATHWAY SYSTEM
STANHOPE ROAD
PRECINCT 1
COURTYARD ZONE
FIRE TRAIL
DETENTION BASIN
ESCARPMENT
AMENDMENTS
NO. DATE ITEM
SCALE
1:500
DATE
NOV'89
DRAWN
CONTRACTORS SHALL VERIFY ALL DIMENSIONS AT THE JOB BEFORE COMMENCING WORK OR PREPARING SHOP DRAWINGS.
PROJECT
LOURDES VILLAGE KILLARA
DRAWING
LANDSCAPE MASTERPLAN
JOB NO
DRAWING
3781/
CO ORDINATED LANDSCAPES
P.O. BOX 101, SUTHERLAND 2232
jack c. dalton
company architect
520-4122



PLANT SPECIES LIST

BOTANICAL NAME	COMMON NAME	MATURE HEIGHT.
TREES:		
Eucalyptus microcorys Eucalyptus haemostoma	Tallowood Scribbly Gum	20m 16m
TALL SHRUBS:		
Acacia podalyriifolia Banksia ericifolia Banksia serrata.	Queensland Silver Wattle Heath Banksia Old Man Banksia	8m 7m 8m
MIXED SHRUB:		
Acacia terminalis Callistemon linearis Grevillea buxifolia Grevillea speciosa ssp. speciosa Woollsia pungens.	Sunshine Wattle Bottlebrush Grey Spider Flower Red Spider Flower. Woollsia.	2m 3m 1-2m 2-3m 1.5m
SMALL SHRUB:		
Dillwynia retorta Grevillea sericea Woollsia pungens	Eggs & Bacon Pink Spider Flower Woollsia	0.5m 1.5m 1.5m
GROUNDCOVER		
Hardenbergia violaceae Hibbertia scandens Native reseeding from site topsoil.	Native Wistaria Guinea Gold Flower	prostrate prostrate

Note: The above plant list is indicative. Final selection of plant material will be subject to design development.

Amendments | No | Date

Drawn: DE | Date: 18 October 1988

Scale: 1:100

0 1 2 3 4 5 M

Drawing: LANDSCAPE SKETCH PLAN
North East Boundary - Buffer Concept

Drawing No: 2403 / S1

Project: 'LOURDES VILLAGE' - KILLARA
PROPOSED HOSTEL EXTENSIONS

▲ Land Systems Pty Ltd
Landscape Architects Urban Designers Landscape Planners
202 Jersey Road
Woollahra
New South Wales 2025
Telephone (02) 32 3284
Telex AA 21822/SY977
Fax (02) 327 3915
Inc in SA

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Appendix F. Eco Logical Australia PCT assessment

Level 3
101 Sussex Street
Sydney NSW 2000
t: (02) 9259 3800

12 July 2023
Our ref: 23SYD5827

Levande Pty. Ltd.
Level 18,
9 Castlereagh Street,
Sydney, NSW 2000

Attention: Nathan Donn

Dear Nathan,

RE: PCT validation to assist Planning Proposal at 95 Stanhope Road – Killara

Eco Logical Australia Pty. Ltd. (ELA) was engaged by Levande Pty. Ltd. to review a Biodiversity Development Assessment Report (BDAR) prepared by ASC Environmental (4 May 2023) for the Planning Proposal at 95 Stanhope Road, Killara; and to review Environment and Heritage Group's (EHG's) response to the BDAR.

Upon review of the BDAR and EHG's response, ELA were commissioned to undertake a site inspection, focusing on the areas mapped as remnant vegetation on page 17 of the BDAR. The site inspection was required to validate native Plant Community Types present within the subject land and collect BAM floristic plot data to assist in the determination of Plant Community Types. The subject land is defined at 95 Stanhope Road, Killara, which is legally identified as Lot 21 and Lot 22 in Deposited Plan 634645, in the Ku-ring-gai Local Government Area (LGA).

This letter describes the field survey undertaken over one day within the subject land and provides ELA's Plant Community Type validation, and PCT selection process. It also describes the occurrence of Threatened Ecological Communities likely to be present within the subject land.

If you have any queries, please feel free to contact me via email at staceyw@ecoaus.com.au

Regards,

Stacey Wilson
Senior Ecologist BAAS22030

Regards,

Dr Daniel McDonald

Principal Ecologist and Senior Arborist BAAS170

1.1. Field survey

A field survey was conducted over one day on 14 June 2023 by Principal Ecologist Daniel McDonald and Senior Ecologist Stacey Wilson. The purpose of the field survey was to:

- review previous vegetation mapping on site as assessed by ACS environmental
- validate the PCTs present
- identify the potential for any threatened ecological communities listed under the BC Act and/or EPBC Act to occur within the subject land.

A total of two 20 m x 20 m full floristic plots were surveyed to identify Plant Community types (PCTs) and assist in informing threatened ecological communities (TECs) on the subject land. Figure 3 shows the location of the plots undertaken.

Plot 1 was undertaken in the north-eastern portion of the subject land which has been previously assigned to PCT 3592 *Sydney Coastal Enriched Sandstone Forest* in the Biodiversity Development Assessment Report 4 May 2023 prepared by ACS Environmental Pty. Ltd.

As mentioned above, much of the subject land has been historically cleared, and areas on the east and south of the development site contain very little native species cover to assist in informing PCT selection. Therefore, the decision was made to undertake the second floristic plot, Plot 2 within an area of native vegetation to the south of the subject land.

The use of this floristic information in the adjacent vegetation would provide a greater understanding of the PCTs present in the locality and would assist in the selection of the best-fit PCT for the vegetation within the southern portion of the subject land. This area has been previously mapped by DPE in their regional mapping project (State Type Vegetation Map 2022)as PCT 3136 as *Blue Gum High Forest*.

1.1.1. Survey Limitations

This assessment was completed over one day and not intended to provide an inventory of all species present across the subject land but instead an overall assessment of the ecological values of the subject land with particular emphasis on mapping Plant Community Types and threatened ecological communities.

The field survey was undertaken using a hand-held GPS unit. It should be noted that these units can have errors in accuracy of up to 20 m (subject to availability of satellites on the day).

Additional survey work undertaken in the wider area may assist in identification of plant community types present in the site. However, due to time constraints additional survey work was not undertaken.

1.2. Results – Plant Community Type validation

Two PCTs were identified within the subject land following the field survey; they are PCT 3262 *Sydney Turpentine Ironbark Forest* and PCT 3592 *Sydney Coastal Enriched Sandstone Forest.* A summary of the vegetation validated as part of ELA's assessment is presented in Table 1 and shown in Figure 3. A description of the Plant Community Types identified is detailed below.

Table 1: Vegetation communities validated within the subject land

PCT ID	PCT Name	Area of vegetation validated	No. of plots collected
3262	Sydney Turpentine Ironbark Forest	Regrowth of remnant vegetation in the north east of the subject land	1
3592	Sydney Coastal Enriched Sandstone Forest	Vegetation within Seven Little Australians Park directly adjacent to the south of the subject land.	1

1.2.1. PCT 3262 Sydney Turpentine Ironbark Forest

Vegetation which was validated as PCT 3262 contains canopy species *Eucalyptus pilularis* (Blackbutt) and *Eucalyptus microcorys* (Tallowwood) within the floristic plot. *E. microcorys* is not a native species to Sydney and is naturally found on the north coast of New South Wales and Queensland and is likely to have been planted. The midstorey is sparse and contains *Elaeocarpus reticulatus* (Blueberry Ash) and *Ozothamnus diosmifolius* (White Dogwood). The groundcover contains a very sparse cover of grasses, including *Entolasia stricta* (Wiry Panic), *Microlaena stipoides* (Weeping Grass), *Aristida vagans* (Threeawn speargrass), *Oplismenus aemulus* (Australian Basket Grass) and *Digitaria* sp. Forbs present in the groundcover include *Dianella caerulea* var*. producta, Centella asiatica* (Indian Pennywort), *Dichondra repens* (Kidney Weed) and *Commelina cyanea.* Exotic species include *Osteospermum* sp. (African Daisy), *Ehrharta erecta* (Panic Veldtgrass), *Chlorophytum* sp., *Phoenix canariensis* (Canary Island Date Palm) and *Cinnamomum camphora* (Camphor Laurel).

A list of species immediately surrounding the 20 m x 20 m plot includes native canopy species, *Eucalyptus robusta* (Swamp Mahogany), *Angophora hispida* (Dwarf Apple), midstorey species, *Callistemon citrinus* (Crimson Bottlebrush), *Acacia longifolia* (Sydney Golden Wattle) *Breynia oblongifolia* (Coffee Bush), *Imperata cylindrica* (Blady Grass), *Acacia ulicifolia* (Prickly Moses), *Melaleuca nodosa* (Prickly-leaved Paperbark). Groundcovers outside of plot 1, though present in the surrounding area include *Eragrostis brownii* (Brown's Love Grass), *Glycine microphylla* (Small-leaf glycine), *Cyperus gracilis* (Slender Flat-sedge), *Calystegia* sp., *Lomandra longifolia* (Spiny-headed Mat-Rush) and *Lomandra gracilis.* Weeds included *Sida rhombifolia* (Paddy's Lucerne), *Nandina domestica* (Nanten), *Sporobolus africanuus* (Parramatta Grass), *Senecio madagascariensis* (Fireweed). Also present were *Acacia podalyriifolia* and *Acacia saligna* (Golden Wreath Wattle) which have naturalised in the Sydney region. The vegetated area in the north east portion of the subject land appears to have undergone historical disturbance. As can be seen on the right side in Photo 1, a built-up area of soil, forming a mound is present. It is likely that the soil has been moved around this area during past construction activities. However, the soil on the flattest part of the area, has a more natural appearance and are potentially remnant soils.

Photo 1 below shows the start of the 20 m x 20 m floristic plot looking towards the end of the 50 m plot. Photo 2 shows the end of the plot looking back towards the start.

1.2.2. PCT 3592 Sydney Coastal Enriched Sandstone Forest

As discussed above, due to the lack of native species that could be collected in a 20 m x 20 m plot within the subject land, analysis of plot data would likely not produce a meaningful result to assist in PCT determination. Therefore, the decision was made to collect a second floristic plot within vegetation to the south of the development site, to help inform the best fit PCT in the southern portion of the subject land.

The vegetation validated as PCT 3592 includes canopy species *Corymbia gummifera* (Red Bloodwood), *Angophora costata* (Sydney Red Gum), *Eucalyptus pilularis* (Blackbutt), *Syncarpia glomulifera* subsp. *glomulifera* (Turpentine) and a sub-canopy of *Ceratopetalum gummiferum* (Christmas Bush), *Allocasuarina littoralis* (Black She-oak) and *Pittosporum undulatum* (Sweet Pittosporum). The midstorey was diverse, with an open structure and includes *Acacia longissima* (Long Leaf Wattle), *Elaeocarpus reticulatus* (Blueberry Ash), *Leucopogon juniperinus* (Prickly Beard-heath), *Coronidium elatum* subsp. *elatum, Dodonaea triquetra* (Large-leaf Hop-bush), *Polyscias sambucifolia* (Elderberry Panax), and *Ozothamnus diosmifolius* (White Dogwood). The groundcover is diverse and includes grasses; *Microlaena stipoides* (Weeping Grass), *Entolasia stricta* (Wiry Panic), *Lomandra longifolia* (Spiny-headed Mat Rush), *Oplismenus imbecillis* (Creeping Beard Grass). Forbs included *Dianella caerulea* var. *producta,* ferns included *Pteridium esculentum* (Common Bracken) and *Calochlaena dubia* (Rainbow Fern), while other growth form group species included *Billardiera scandens* (Hairy Apple Berry). Non-native species *Cordyline australis* (Cabbage Tree) were also present. Invasive exotic species present include *Cinnamomum camphora* (Camphor Laurel), *Lantana camara* (Lantana), *Ligustrum sinense* (Small-leaved Privet), *Ochna serrulata* (Mickey Mouse Plant), *Solanum mauritianum* (Wild Tobacco Bush), *Hedychium gardnerianum* (Ginger Lily), *Asparagus* spp., *Agapanthus* sp., *Ageratina adenophora* (Crofton Weed) and *Cestrum parqui* (Green Cestrum). Photo 3 shows vegetation validated as PCT 3592 adjacent to the southern boundary of the subject land.

Photo 1: Start of 20 m x 20 m floristic plot taken within vegetation at the north east of the subject land

Photo 2: end of the 20 m x 20 m floristic plot within vegetation at the north east of the subject land

Photo 3: Vegetation validated as PCT 3592 Sydney Coastal Enriched Sandstone Forest

1.3. Soil profile

Two soil profiles were undertaken within the subject land to assist in PCT selection justification. One soil profile was taken within proximity to the start of the floristic plot 1 and is referred to as soil profile site 1. The second soil profile was undertaken at the north west boundary of the Subject land. The locations of the soil profiles taken is presented in Figure 3.

Texture assessments at soil profile site 1 (Photo 1) are consistent with the soil being approximately a sandy clay loam to clay loam. The results of the soil profile assessment are that the soil characteristics are consistent with a yellow podzolic soil (Great Soil Group). This soil appeared relatively undisturbed. However, an unusual artifact was present in the earthen wall of the profile trench. The white coloured fragment can be seen in Photo 1. It lies horizontally within the profile and is right of the tape measure near the '10' on the measuring tape. Perhaps some minor disturbance has occurred at this location.

The soil assessment at soil profile site 2 recorded fill in the soil sample. Additionally, the A horizon was relatively thin and it overlayed a very hard B/C horizon. The soil at site 2 shows evidence of significant disturbance, with blue metal gravel and concrete fragments (See Photo 2).

Photo 1: Soil profile site 1

Photo 2: Soil profile site 2

Figure 3: ELA validated Plant Community Types within the subject land.

1.4. Quantitative analysis

Quantitative analysis was completed, using the Hager/Steenebeeke 2010 analysis excel spreadsheet for each vegetation integrity plot to determine the best fit PCT using standardised ratio comparison positive native to total native score. This analysis uses the diagnostic species as described by Tozer (2003) and Tozer (2010). Vegetation integrity plot 1 has undergone historical disturbance and contained only a small number of native species. Plot 2 had a greater number of native species recorded during floristic survey. The analysis is provided in Appendix B.

1.5. PCT selection justification

Plant Community Type (PCT) justifications are provided for PCT 3262 validated by ELA.

The following inputs were used to build queries in the BioNet Vegetation Classification Dataset (DPE 2023) for the vegetation within the north-east portion of the subject land:

- IBRA region text contains 'Sydney Basin'
- IBRA subregion text contains 'Cumberland'
- Vegetation Formation text contains 'Dry Sclerophyll Forests (Shrubby sub-formation) AND 'Dry Sclerophyll Forests (Shrub/grass sub-formation) AND 'Wet Sclerophyll Forests (Shrubby sub-formation AND 'Wet Sclerophyll Forests (Grassy sub-formation).
- Species text contains '*Eucalyptus pilularis, Elaeocarpus reticulatus*, *Dianella caerulea* var. *producta, Lobelia purpurascens, Melia azedarach, Microlaeana stipodies, Oplismenus aemulus, Ozothamnus diosmifolius, Oxalis* sp., *Digitaria* sp., *Dichondra repens, Cynodon dactylon, Commelina cyanea, Centella asicatica, Aristida vagans* and *Entolasia stricta'.*

The outputs of this query provided a preliminary list of potential PCTs. The PCTs were then further investigated by comparing the matches of upper stratum species listed in the BioNet Vegetation Classification for those PCTs against the species recorded within plots for each vegetation zone. The descriptive attribute of the PCTs, landscape position and information on dominant soils or geology, average annual rainfall and elevation above sea level was also considered.

Other documentation consulted to assist in PCT selection included

- Final determination - Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion - critically endangered ecological community listing (NSW Threatened Species Scientific Committee 2019).
- Sydney turpentine ironbark forest - endangered ecological community profile (NSW Department of Environment and Conservation)
- Best practice guidelines for Sydney Turpentine Ironbark Forest (Department of Environment and Climate Change NSW 2008).
- Turpentine-Ironbark Forest of the Sydney Basin Bioregion Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (TSSC) on amendments to the List of Ecological Communities under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (2005).
- Approved Conservation Advice for Turpentine–Ironbark Forest in the Sydney Basin Bioregion (2014)

- Tozer, M (2003). The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* 8, 1–75.
- Tozer, et al. (2010). Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. *Cunninghamia* 11(3).
- The NSW State Vegetation Type Map (DPE 2022)
- Department of Planning and Environment (DPE) 2023a, eSPADE online tool. Available: https://www.environment.nsw.gov.au/eSpade2Webapp (Accessed June 2023).
- Department of Planning and Environment (DPE) 2019. Blue Gum High Forest in the Sydney Basin Bioregion – critically endangered ecological community listing. Available: Blue Gum High Forest in the Sydney Basin Bioregion - critically endangered ecological community listing | NSW Environment and Heritage.
- Preston, B. (SC) and Adam, P. (1995) Describing and listing threatened ecological communities under the *Threatened Species Conservation Act 1995* (NSW): Part 1 – the assemblage of species and the particular area. *Environmental Planning and Law Journal* 21:250 – 263.Justification for the selection of PCT 3262 Sydney Turpentine Ironbark Forest

A number of other PCTs were considered in the selection process for PCT 3262. An analysis of these PCTs is included in Table 2.

Table 2: Other PCTs considered during the selection process for PCT 3262

PCT	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
3259	Sydney Coastal Shale-Sandstone Forest	The tree canopy almost always includes *Corymbia gummifera*, very frequently with *Angophora costata*. Species from the stringybarks eucalypt group (*Eucalyptus globoidea, Eucalyptus capitellata* rarely *Eucalyptus sparsifolia*) are also common however rarely with high cover. In contrast *Eucalyptus pilularis* or species from the mahogany eucalypt group (*Eucalyptus resinifera or Eucalyptus umbra*) are occasional however with high cover.	PCT 3259 was considered for selection as the vegetation community occurs within the Sydney Basin bioregion, and Cumberland sub-region and had the same match of species which were entered into the PCT filer query (13 matches). However, it was considered that PCT 3262 is a better fit based on overall species composition and known local occurrence within the Ku-ring-gai LGA. PCT 3259 does list *E. pilularis* as a species which can occasionally occur in this community, with high cover and the PCT does contain similar groundcover species which were collected in the floristic plot. However, the dominant midstory species listed for this community frequently includes *Persoonia levis, Banksia spinulosa, Lomatia silaifolia* with *Acacia myrtifolia* and *Hakea sericea* also common. None of these species were recorded in the floristic plot, which makes PCT 32562 a better fit PCT selection based on the assemblage of species present. Further, another characteristic of this PCT is that it has a grassier ground layer than other coastal sandstone ridgetop forests. *Entolasia stricta* is very frequent, often with a moderate cover, with *Austrostipa pubescens*, *Imperata cylindrica* and *Themeda triandra* with high cover. The vegetation mapped within plot 2 did contain *Entolasia stricta* but only recorded a low cover (0.5) within the 20 m x 20

PCT	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
			m floristic plot and did not record the presence of *A. pubescens*, *I. cylindrica* nor *T. triandra.* This PCT is not mapped within proximity to the subject land, whilst PCT other PCTs such as 3592, 3595 and 3262 and 3136 are mapped within proximity, making these PCTs potentially better fits for this PCT (DPE 2022).
3594	Sydney Coastal Sandstone Foreshores Forest	The tree canopy is very frequently dominated by *Angophora costata* with occasional local stands of *Eucalyptus botryoides* or rarely other eucalypt species. A sparse taller layer in the mid-stratum commonly includes *Banksia integrifolia* or *Allocasuarina littoralis* and occasionally *Ficus rubiginosa.*	This PCT is described as a tall, occasionally very tall, sclerophyll open forest with a mixed understorey of dry shrubs and mesic small trees found along the foreshores of Sydney's major waterways and coastal escarpments. It is not known within the Ku-ring-gai LGA. Its maximum elevation is 90 m above sea level. Although this PCT had 13 matches against the VIS filtering tool selection criteria, the vegetation within the subject land is not located along major waterways and coastal escarpments. The assemblage of species listed for this community in the VIS contains a high proportion of *Glochidion ferdinandi* (Cheese Tree) and *A. costata. PCT 3594* was not considered to be the best fit PCT for this community.
3592	Sydney Coastal Enriched Sandstone Forest	*Angophora costata* commonly in combination with *Corymbia gummifera* and *Eucalyptus piperita*, with *Eucalyptus pilularis* occasionally locally abundant. A taller mid-stratum is characterised by very frequent however sparse cover of *Pittosporum undulatum* and *Allocasuarina littoralis* or *Allocasuarina torulosa.*	This PCT was considered as a potentially strong selection for the vegetation community. PCT 3592 is known to occur within the Sydney Basin Bioregion, Cumberland subregion, and is known to occur within the Ku-ring-gai LGA. The vegetation within the subject land falls within the average annual rainfall for this PCT and elevation ranges above sea level. However the frequently recorded canopy species in this PCT did not occur within the vegetation in the north east portion of the subject land, with only *E. pilularis* and *Allocasuarina littoralis* in common. Further, this PCT is more commonly known to occur on slightly enriched Hawkesbury sandstone soils on sheltered slopes and occasional crests. The soil landscape where this vegetation is found is more likely to lie on the Lucas Heights soil landscape, and its position was on the top of the ridge rather than a sheltered slope. Therefore, PCT 3262 was considered a better fit for this community.
3136	Blue Gum High Forest	The tree canopy very frequently includes a high cover of *Eucalyptus saligna*, commonly with *Eucalyptus pilularis* and occasionally *Syncarpia glomulifera*. The mid-stratum is layered, with a sparse cover of small trees that very frequently includes *Pittosporum undulatum* and occasionally *Elaeocarpus reticulatus.*	Blue Gum High Forest was considered for the selection of PCTs. PCT3136 is known to occur in the Sydney Basin Bioregion, Cumberland Subregion and is known in the Kur-ring-gai LGA and has been previously mapped by DPE 2022 as occurring to the south and west of the subject land. This community is described as a very tall to extremely tall sclerophyll open forest, dominated by either *Eucalyptus pilularis* (Blackbutt) or *E. saligna* (Sydney Blue Gum), with a mean tree height of 39.3 m (±16.2 m) and a mean

PCT	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
			foliage cover of 30.7% (±13.7%). In areas located close to the shale/sandstone boundary *Angophora costata* (Smooth-barked Apple) is present frequently in the tallest tree layer. The vegetation within the north east of the subject land is tall, and approximately to 20 to 30 m (Naturally Trees 2023), however, would not be considered an extremely tall forest. The vegetation did contain *E. pilularis* as a dominant canopy species within the plot however, lacked *E. saligna* or *A. costata* within this area. Blue Gum High Forest is generally found at altitudes higher than 100 m above sea level on the Hornsby Plateau in the North Shore and northern suburbs of Sydney. The subject land's highest point is approximately 110 m above sea level. Blue Gum High Forest is predominantly restricted to deep soils derived from Wianamatta Shale in high-rainfall areas that receive more than 1100 mm per year. The mean annual rainfall is 1241 mm for the area and is likely situated on Wianamatta Shale, also making this PCT a possible fit for this community. However, this PCT was not selected as the best-fit community due to the understorey species more closely aligning with a drier, understorey of sub-canopy and shrub species which is more representative of 3262 than a more mesic, moist rainforest midstorey and ferny or herbaceous understorey. The soil landscape on the top of the ridge is also mapped as Lucas Heights (shale with fine-grained sandstones) which is more likely to fit PCT 3262 than soils with a deep shale influence. The Arboricultural Impact Appraisal and Method Statement has also included *E. paniculata* as one of the Eucalypt species present within the north-eastern portion of the subject land. *E. paniculata* is listed as one of the characteristic canopy species for Sydney Turpentine ironbark Forest but can also be found on upper slopes of Blue Gum High Forest. Sydney Turpentine Forest and Blue Gum High Forest share many similar characteristics and can be difficult to discern between the two communities, particularly in a modified landscape with a long disturbance history. Quantitative analysis using Hager/Steenebeeke 2010 analysis excel spreadsheet was conducted for each vegetation integrity plot to determine the best fit PCT using standardised ratio comparison positive native to total native score. The score achieved for Sydney Turpentine Forest was (67%) in favour of this community compared to (33%) for Blue Gum High Forest.

PCT	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
			In summary, PCT 3136 was a possible PCT selection of the vegetation in the north-east of the subject land, however, based on rapid soil texture assessment, review of soil landscape mapping, position on top of the ridgeline, the tall to very tall rather than tall to extremely tall forest (Walker and Hopkins 1990), lack of mesic species in the understorey and comparison of diagnostic species with the Hager/Steenebeeke 2010 analysis excel spreadsheet which incorporates diagnostic species from Tozer 2003 favouring towards Sydney Turpentine Ironbark Forest, PCT 3262 was selected as the best fit PCT for the vegetation in the north-east portion of the subject land.
3258	Sydney Basin Creekflat Blue Gum-Apple Forest	The tree canopy is variable however very frequently includes *Angophora floribunda* in the canopy or as a small tree. Common eucalypts with a high foliage cover are species from the blue gum eucalypt group, *Eucalyptus deanei* or *Eucalyptus saligna*, occasionally in association with stringybark eucalypts including *Eucalyptus eugenioides.*	PCT 3528 is known to occur in the Sydney Basin Bioregion and Cumberland subregion. This vegetation community also had the same number of matches in the PCT filtering tool with 3262. However, the matches more closely aligned with the groundcover species present, the dominant canopy species listed for this community comprise of a number of species which were not recorded within the north-east portion of vegetation within the subject land. PCT 3258 is also described as primarily distributed at elevations of less than 200 m above sea level downslope of shale soils on the north shore of Sydney. The location of the plot was taken on the top of the ridge and was therefore not downslope of shale soils. The location of the plot on top of the flatter ridge aligns more closely with PCT 3262, as described in the final determination where Sydney Turpentine-Ironbark Forest occurs on low rolling hills characteristic of the Cumberland Lowlands and the broad, shale-capped ridges of the surrounding plateaux. Therefore PCT 3258 was considered as a potential fit, however, PCT 3262 is a better fir for the vegetation present within the north east of the subject land.
3262	Sydney Turpentine Ironbark Forest	The tree canopy very frequently includes *Syncarpia glomulifera* either as a canopy dominant or as a smaller tree or both. Other species which are localised and occasionally dominant or co-dominant occasionally include *Eucalyptus pilularis, Angophora costata* and *Eucalyptus punctata*, rarely with *Eucalyptus paniculata, Eucalyptus globoidea* or *Eucalyptus resignifera.*	This community occurs as a tall to very tall sclerophyll open forest found on shale or sheltered shale-sandstone soils mainly in the northern suburbs of Sydney and lower Blue Mountains. This was considered to be the best fit PCT for the vegetation community assessed in Plot 1~~on site~~. This PCT occurs in the Sydney Basin Bioregion and Cumberland subregion, it is known to the Ku-ring-gai LGA and has been previously mapped within proximity to the subject land (DPE 2022). Whilst the vegetation collected in the plot analysis only recorded *Eucalyptus pilularis* as the potentially remnant dominant canopy species, the arborist report also identified that *Eucalyptus paniculata* may occur within this location.

PCT	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
			The position of the vegetation is located on the top of a ridge, and the rapid texture assessment undertaken at soil profile site 1 in the vicinity of the plot, was consistent with the soil being approximately a sandy clay loam to clay loam. The results of the soil profile assessment are that the soil characteristics are consistent with a yellow podzolic soil (Great Soil Group). Yellow podzolic soil is a characteristic of the Lucas Heights soil landscape. The vegetation within the north east portion of the subject land is mapped at the boundary of the Lucas Heights and the Hawkesbury soil landscape. The shrub species listed in the VIS for this community were lacking within the vegetation zone, likely due to historical disturbance of the area. However, the groundcover species recorded shared species listed in the VIS for PCT including *Microlaena stipoides* and *Entolasia stricta* and *Lobelia purpurascens* and species located just outside the 20 m x 20 x plot *Lomandra longifolia, Imperata cylindrica, Ozothamnus diosmifolius, Breynia oblongifolia.* Finally, as discussed for Blue Gum High Forest above, the *Hager/Steenebeeke 2010* analysis excel spreadsheet which incorporates diagnostic species from Tozer 2003 favouring towards Sydney Turpentine Ironbark Forest, PCT 3262 was selected as the best fit PCT for the vegetation in the north-east portion of the subject land. Therefore, given the position in the landscape, the assemblage of species present, and the soil characteristics present. PCT 3262 was the best-fit Plant Community Type for this location.

The assemblage of key species, formation characteristics in combination with its known occurrence in the Local Government Area (LGA) of Ku-ring-gai, and occurrence within the Cumberland IBRA-subregion of the Sydney Basin Bioregion aligns with the Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion.

The TEC is known to occur between elevations of 5 m to 460 m above sea level. The elevation of the subject land is approximately 110 m above sea level and therefore falls within the elevation range for this TEC.

The TEC is known to occur in areas with annual rainfall between 806 mm to 1256 mm. The average annual rainfall taken from BOM Station data at the Gordon Golf Club (66120) with the mean annual rainfall 1241 for the area. The subject land falls within the range of average annual rainfall for this TEC.

The vegetation is located on top of a ridge on the boundary between the Lucas Heights soil landscape and is in close proximity to the Hawkesbury soil landscape. The Lucas Heights soil landscape is characterised by gently undulating crests and ridges on plateau surfaces of the Mittagong formation (alternating bands of shale and fine-grained sandstones). The soils associated with this soil landscape are moderately deep (50–150 cm), hardsetting Yellow Podzolic Soils and Yellow Soloths (Figure 4). A rapid soil analysis (Soil profile site 1) taken in close proximity to the floristic plot 1 found that the texture assessments were consistent with the soil being approximately a sandy clay loam to clay loam. The results of the soil profile assessment are that the soil characteristics are consistent with a yellow podzolic soil (Great Soil Group).

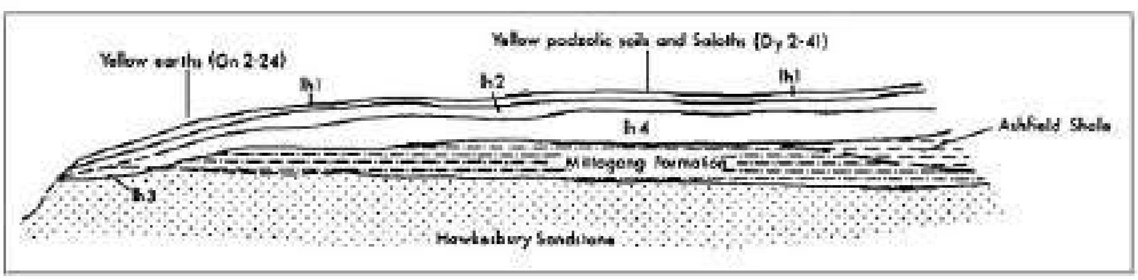


Figure 4: Schematic cross-section of Lucas Heights soil landscape illustrating the occurrence and relationship of the dominant soil materials.

The rapid soil assessment undertaken at soil profile site 1 suggests a clay influence in the soils, which is consistent with the occurrence of Sydney Turpentine Ironbark Forest which is known to occur on soils derived from shale interbedded with Hawkesbury Sandstone.

An additional desktop assessment of online mapping was undertaken to assist the assessment. Figure 5_below shows the Sydney Metro Vegetation Map (SMVM; OEH 2016) for the locality. Many of the vegetation polygons (small patches) were allocated to a PCT (vegetation community) based on a site inspection by the authors of the SMVM. However, it is likely that other parameters may have been used to allocate vegetation to a likely PCT. A trend that can be observed on Figure 5 is that Sydney Turpentine (PCT1281) is mapped on the western side of the site (approximately to the left of the blue line) and Smooth-barked Apple – Red Bloodwood – Blackbutt tall open forest on shale sandstone transition soils in eastern Sydney (PCT1845) is mapped to the east (right-side) of the line.

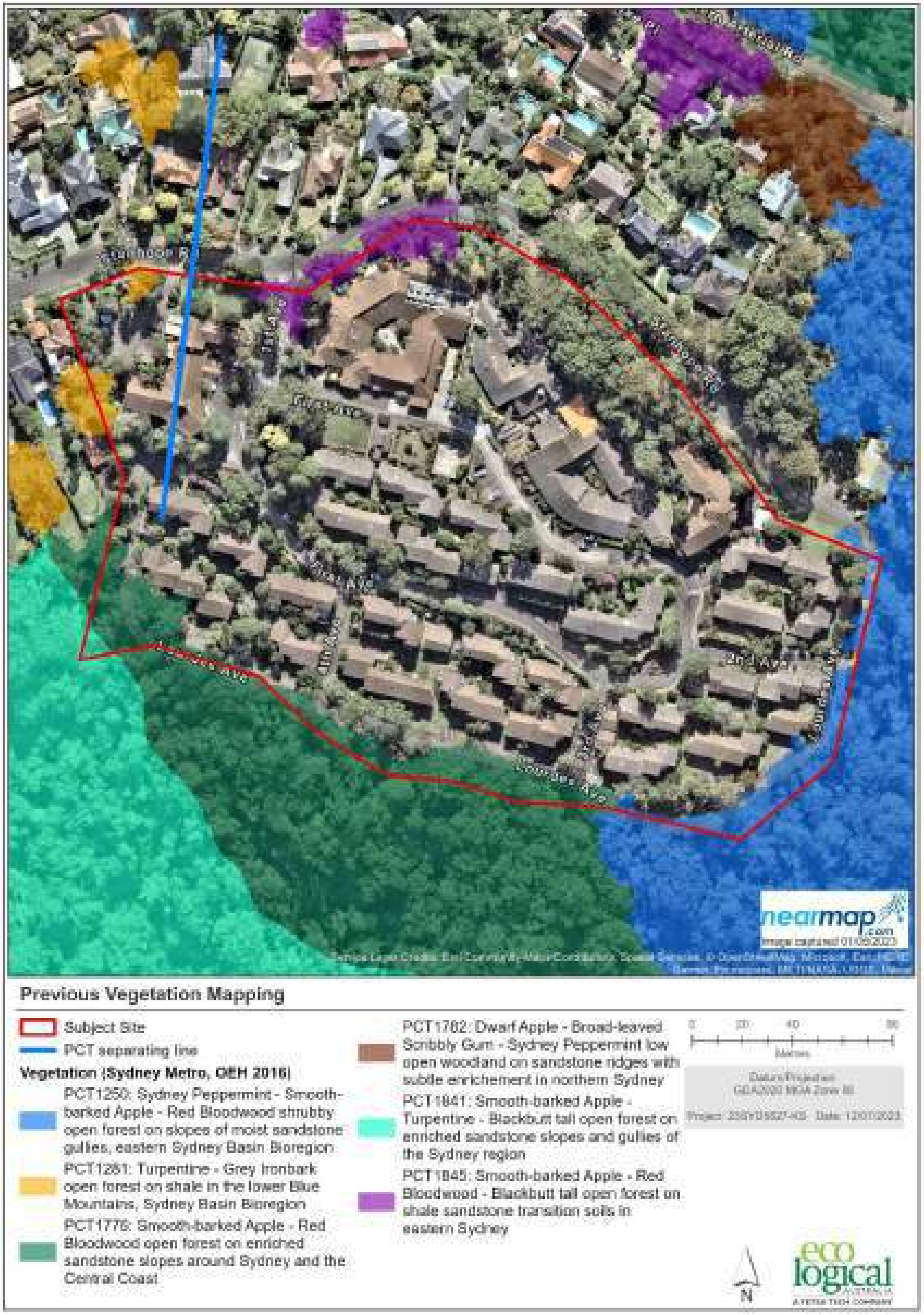


Figure 5: Sydney Metro Vegetation Mapping 2016 for the locality.

A possibility is that modelled soil types may have been used to assist in allocating each polygon (small patch) to a PCT. Figure 6 shows Great Soil Group (GSG) mapping for the locality at 1:75,000 scale. This scale was chosen as it is consistent with the scale of GSG mapping provided on the NSW eSpade website.

The site lies near the boundary of Yellow Podzolic Soils (less fertile) and Siliceous Sands (Figure 6). One difference between these two soil types is that podzolic soils will generally have a higher clay content compared to siliceous sand soils. The real boundary / transition zone between these two soil types in the locality is unknown. If the boundary / transition zone between the two soil types is present it is likely that there would be a corresponding change in the PCT.

If a plot is used for the determination of a PCT then strictly only the plot can be allocated to a PCT. However, nearby similar vegetation is highly likely to represent the same PCT.

At the location of plot 1 both the vegetation within the plot and adjacent to the plot has experienced disturbance. A gradual change in the vegetation community might not be obvious.

The area to the south-east of the plot but within the polygon (small patch) has also been allocated to Sydney Turpentine Ironbark Forest PCT 3262 (see Figure 3) by ELA. The most useful species for selecting a PCT in forest and woodland are often remnant trees. The majority of the trees within this area are the planted species *Eucalyptus microcorys* (Tallowwood). The lack of remnant trees within parts of the patch make a confident allocation of PCT difficult for the whole patch. No obvious change is PCT was observed at within the patch however, the lack of indigenous tree species makes any transition more difficult to observe. If a change or transition in soil type occurs within the patch, parts of the patch may represent different PCTs.ELA did not determine the boundary between PCTs within the site and nearby. This can be a difficult task. Preston and Adam (2004) quoted Hodgson JA to emphasise the difficulties defining ecological community boundaries:

> '*There will often be cases where there are areas of transition between one ecological community, broadly considered, and another ecological community, where species which are part of each ecological community occur. Precise determination of whether those species in the transitional area are to be regarded as part of one ecological community or of the other, or of neither, will be incapable of precise and definite determination.'*

Figure 6: Great Soil Group (GSG) mapping for the locality.

The following inputs were used to build queries in the Vegetation Classification for the vegetation directly adjacent to the south of the subject land, with the intention of providing a best-fit PCT for the vegetation within the southern boundary of the subject land.

- IBRA region text contains 'Sydney Basin'
- IBRA subregion text contains 'Cumberland'
- Vegetation Formation text contains 'Dry Sclerophyll Forests (Shrubby sub-formation) AND 'Dry Sclerophyll Forests (Shrub/grass sub-formation) AND 'Wet Sclerophyll Forests (Shrubby sub-formation AND 'Wet Sclerophyll Forests (Grassy sub-formation).
- Species text contains '*Acacia ulicifolia, Allocasuarina littoralis, Angophora costata, Billardiera scandens, Calochlaena dubia, Ceratopetalum gummiferum, Corymbia gummifera, Dianella caerulea* var. *producta, Dodonaea triquetra, Elaeocarpus reticulatus, Entolasia marginata, Entolasia stricta, Eucalyptus pilularis, Ficus spp., Glochidion ferdinandi var. ferdinandi, Hypolepis muelleri, Juncus usitatus, Leucopogon juniperinus, Lindsaea microphylla, Lobelia purpurascens, Lomandra filiformis* subsp. *filiformis, Lomandra longifolia, Microlaena stipoides, Oplismenus imbecillis, Ozothamnus diosmifolius, Parsonsia straminea, Pittosporum undulatum, Plectranthus parviflorus, Pteridium esculentum, Pultenaea flexilis, Smilax glyciphylla, Veronica plebeia, Zieria smithii, Polyscias sambucifolia, Syncarpia glomulifera* subsp. *glomulifera, Xanthorrhoea media, Helichrysum elatum* and *Sigesbeckia orientalis* subsp. *orientalis'*

1.5.1. Justification for the selection of PCT 3592 Sydney Coastal Enriched Sandstone Forest

A number of other PCTs were considered in the selection process for PCT 3592 Sydney Coastal Enriched Sandstone Forest. An analysis of these PCTs is included in Table 3.

Table 3: Other PCTs considered during the selection process for PCT 3592

PCT no.	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
3136	Blue Gum High Forest	The tree canopy very frequently includes a high cover of *Eucalyptus saligna*, commonly with *Eucalyptus pilularis* and occasionally *Syncarpia glomulifera*. The mid-stratum is layered, with a sparse cover of small trees that very frequently includes *Pittosporum undulatum* and occasionally *Elaeocarpus reticulatus.*	Blue Gum High Forest was considered for the section of PCTs. 3136 is known to occur in the Sydney Basin Bioregion, Cumberland Subregion is known to the Kur-ring-gai LGA and has been previously mapped by DPE 2022 as occurring to the south and west of the subject land. This community is described as a very tall to extremely tall sclerophyll open forest, dominated by either *Eucalyptus pilularis* (Blackbutt) or *E. saligna* (Sydney Blue Gum), with a mean tree height of 39.3 m (±16.2 m) and a mean foliage cover of 30.7% (±13.7%). In areas located close to the shale/sandstone boundary *Angophora costata* (Smooth-barked Apple) is present frequently in the tallest tree layer. The vegetation within the north east of the subject land is tall, and approximately to 20 to 30 m (Naturally Trees 2023), however, would not be considered an extremely tall forest. The vegetation did contain *E. pilularis* as a dominant canopy species within the plot however, lacked *E. saligna*. Blue Gum High Forest is generally found at altitudes higher than 100 m above sea level on the Hornsby Plateau in the North Shore and northern

PCT no.	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
			suburbs of Sydney. The location of the vegetation community on the downhill slope is situated at approximately 92 m above sea level. This community is slightly below the altitudes in which Blue Gum High Forest is found. Quantitative analysis using Hager/Steenebeeke 2010 analysis excel spreadsheet was conducted for each vegetation integrity plot to determine the best fit PCT using standardised ratio comparison positive native to total native score. The total number of diagnostic species for Blue Gum High Forest was 14 while it was 20 for other communities such as STIF and Hinterland sandstone Gully Forest. In summary, PCT 3136 was a possible PCT selection of the vegetation in the north-east of the subject land, however, elevation of the vegetation within the landscape, the tall rather than extremely tall forest, and comparison of diagnostic species with the Hager/Steenebeeke 2010 analysis excel spreadsheet which incorporates diagnostic species from Tozer 2003 and Tozer 2010 favouring towards either Sydney Turpentine Ironbark Forest, or Sydney Hinterland Gully Forest were considered as other options for the vegetation in the north-east portion of the subject land.
3595	Sydney Coastal Sandstone Gully Forest	A tall to very tall heathy sclerophyll open forest associated with Hawkesbury sandstone gullies found along the eastern extent of the Sydney sandstone plateaus. The tree canopy very frequently includes a high cover of *Eucalyptus piperita* and *Angophora costata* with *Corymbia gummifera* occurring less frequently and with a lower cover. The mid-stratum includes a sparse small tree layer that very frequently includes *Ceratopetalum gummiferum* and *Banksia serrata*	PCT 3595 is known to occur in the Sydney Bioregion and Cumberland subregion, this PCT had the highest number of diagnostic species present in the Quantitative (Tozer) analysis along with STIF. This PCT had the third highest number of matches against the VIS PCT filtering tool, following 3592 and 3262. Therefore this PCT was considered during the selection process, however was not selected as the best fit PCT for this community as; the position of the vegetation in the landscape was mid-slope and not within the gully, the dominant canopy did not record any *E piperita* and had contained *E. pilularis,* which is not a frequently recorded species for this community in the VIS Species by Growth Form. PCT 3595 is also described as a heathy sclerophyll open forest, whereas this community was considered to be less of a heath community and lacked some of the dominant species for this community such as *Leptospermum trinervium*, *Dillwynia retorta*, *Lomatia salicifolia* and *Persoonia spp.*. Another feature of PCT 3595 is the high occurrence of *B. serrata,* the plot data did not record any *B. serrata*
3262	Sydney Turpentine Ironbark Forest	The tree canopy very frequently includes *Syncarpia glomulifera* either as a canopy dominant or as a smaller tree or both. Other species	This PCT occurs in the Sydney Basin Bioregion and Cumberland subregion, it is known to the Ku-ring-gai LGA and was validated as the best fit PCT for the vegetation community at the top of the subject land.

PCT no.	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
		which are localised and occasionally dominant or co-dominant occasionally include *Eucalyptus pilularis, Angophora costata* and *Eucalyptus punctata*, rarely with *Eucalyptus paniculata, Eucalyptus globoidea* or *Eucalyptus resignifera.*	This PCT had the second highest number of matches in the PCT VIS filtering tool and received the same number of diagnostic species in the Quantitative (Tozer) analysis of plot 2 data, therefore this PCT was considered in the selection process for the vegetation in the south of the subject land. Whilst the canopy species recorded similar dominant canopy species, being *Syncarpia glomulifera Eucalyptus pilularis* and *Angophora costata,* the diversity of canopy species present in this community was higher and also included, Corymbia gummifera and a smaller canopy of *Pittosporum undulatum* and *Allocasuarina littoralis*. *The mdstory and groundcover layer was also much more mesic* compared to the vegetation at the top of the ridge and had a high diversity and cover of ferns and forbs. Sydney Turpentine Ironbark Forest is also known to occur on the ridgetops or crests in the landscape whereas this vegetation community was located downslope of the ridgetop and is also more likely to occur on Hawkesbury sandstone soils, both features favour the selection of a sandstone community rather than a vegetation community with a shale influence. Due to the assemblage of species present, position in the landscape and likely soils present, PCT 3592 was selected as a better fit for this community than Sydney Turpentine Ironbark Forest
3592	Sydney Coastal Enriched Sandstone Forest	*Angophora costata* commonly in combination with *Corymbia gummifera* and *Eucalyptus piperita*, with *Eucalyptus pilularis* occasionally locally abundant. A taller mid-stratum is characterised by very frequent however sparse cover of *Pittosporum undulatum* and *Allocasuarina littoralis* or *Allocasuarina torulosa.*	This PCT was selected as the best fit PCT for the vegetation community within the vegetation directly adjacent the southern boundary of the subject land. This PCT had the highest number of matches (34) in the VIS PCT filtering tool. Followed by the other PCTs compared; 3262 with 33 matches and PCT 3595 with 32 matches. The description of the dominant upper stratum species listed in the VIS for this PCT shared many of the same species including *A.costata* commonly in combination with *Corymbia gummifera, E.pilularis, A. littoralis* and *P.undulatum.* PCT 3592 is known to occur within the Sydney Basin Bioregion, Cumberland subregion, and is known to occur within the Ku-ring-gai LGA. The vegetation within the subject land falls within the average annual rainfall for this PCT and elevation ranges above sea level. However the frequently recorded canopy species in this PCT did not occur within the vegetation in the north east portion of the subject land, with only *E. pilularis* and *Allocasuarina littoralis* in common. Further, this PCT is more commonly known to occur on slightly enriched Hawkesbury sandstone soils on sheltered slopes and occasional crests. The soil landscape is

PCT no.	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
			also likely to be Hawkesbury soil landscape, as mapped by ESspade which is more aligned with the description of this PCT occurring on Hawkesbury sandstone, rather than the likely more clay influenced Lucas heights soil landscape at the top of the ridge. The position of this vegetation within the landscape is also downslope of the ridge but it positioned higher than the gully, also matching the PCT description in the VIS for this community. Considering the assemblages of species present, the soil landscape and position in the landscape, along with the Quantitative plot analysis (Tozer) favouring a sandstone influenced community, PCT3592 was considered to be the best fit PCT to assign to this vegetation community.

1.6. Threatened ecological communities

There is one threatened ecological community (TEC) within the subject land. The listing status of the TEC and consistency of PCTs with the TECs is provided in Table 4.

PCT 3262 is consistent with the critically threatened ecological community (TEC) *Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion*. This community is critically endangered under the *Biodiversity Conservation Act 2016* (BC Act). It is also noted that this community is listed as critically endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), where it meets specific condition thresholds.

Occurrences of the Turpentine–Ironbark Forest in the Sydney Basin Bioregion ecological community are considered to be part of the nationally listed ecological community if patches are in good condition (Conservation Advice 2014).

> *'Good condition is generally determined as:*
>
> - *the vegetation has some characteristic components from all structural layers (tree canopy, small tree/shrub midstorey, and understorey); and*
> - *the tree canopy cover is greater than 10%; and*
> - *the patch size is greater than one hectare.*
>
> *However, patches with a tree canopy cover of less than 10% are also included in the ecological community, if:*
>
> - *the patch of the ecological community is greater than one hectare in size; and*
> - *it is part of a remnant of native vegetation that is 5 hectares or more in area.'*

The plot data collected had structural characteristic components from all structural layers. The plot data collected also had a tree canopy cover of approximately 85%.

Eco Logical Australia have only validated the patch of Sydney Turpentine Ironbark Forest within the north east of the subject land and cannot comment if Sydney Turpentine Ironbark Forest is present in patches directly adjacent to the north east of the subject land and are therefore unable to comment if the Sydney Turpentine Ironbark Forest within the subject land meets the condition threshold to be listed as the Commonwealth listed community. That is, if the patch identified is greater than 1 ha in size or is part of remnant vegetation that is 5 ha or more in area. Further plot data and validation of vegetation in surrounding areas adjacent to the subject land would be required to determine whether the Sydney Turpentine Ironbark Forest on site meets the EPBC Act definition of this community.

PCT 3592 Sydney Coastal Enriched Sandstone Forest identified is not associated with any threatened ecological communities under the BC and or EPBC Acts.

Table 4: Threatened ecological communities present within the subject land

PCT ID	PCT Name	BC Act listing status and name	BC Act Associated TEC justification	EPBC Act listing status and name	EPBC Act Associated TEC justification
3262	Sydney Turpentine Ironbark Forest	Critically endangered - *Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion*	Yes – the PCT meets characteristic of the BC Act listed TEC. The assemblage of key species, formation characteristics in combination with its known occurrence in the Local Government Area (LGA) of Ku-ring-gai, and occurrence within the Cumberland IBRA-subregion of the Sydney Basin Bioregion aligns with the Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion.	Critically *endangered – Turpentine-Ironbark Forest of the Sydney Basin Bioregion*	Potential - see Section 1.6. Insufficient time for ELA to collect data to inform EPBC Act condition criteria listing.
3592	Sydney Coastal Enriched Sandstone Forest	Not listed	N/A	Not listed	N/A

The final determination for Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion listed as critically endangered under the NSW BC Act. Defines this community:

> *Section 1.6 of the Act defines an ecological community as "an assemblage of species occupying a particular area". These features of Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion are described in Parts 1 and 2 of this Determination, respectively.*

Presented in Table 5 below are the Parts 1, 2 and 4 listed in the final determination for this ecological community and a review against characteristics of the subject land to determine if the vegetation on site is likely to conform to the TEC.

Table 5: Parts presented in the Final Determination for Sydney Turpentine Ironbark Forest and review against characteristics of the subject land

Part 1. Assemblage of species

Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion (hereafter referred to as Sydney Turpentine-Ironbark Forest) is characterised by the assemblage of species listed below.

The species collected in Plot 1 along with those species recorded around the edge of the floristic plot within the north-east of the subject land are highlighted in **bold** text.

Acacia falcata	*Acacia floribunda*
Acacia implexa	***Acacia longifolia***
Acacia parramattensis	*Adiantum aethiopicum*
Allocasuarina torulosa	*Angophora costata*
Anisopogon avenaceus	***Aristida vagans***
Arthropodium milleflorum	*Austrostipa pubescens*
Austrostipa rudis	*Billardiera scandens*
Breynia oblongifolia	*Brunoniella australis*
Brunoniella pumilio	*Bursaria spinosa*
Cayratia clematidea	***Centella asiatica***
Cheilanthes sieberi	*Clematis aristata*
Clematis glycinoides var. *glycinoides*	*Clerodendrum tomentosum*
Commelina cyanea	*Daviesia ulicifolia*
Denhamia silvestris	*Desmodium rhytidophyllum*
Desmodium varians	***Dianella caerulea***
Dianella longifolia	*Dichelachne inaequiglumis*
Dichelachne rara	***Dichondra* spp.**
Digitaria parviflora	*Dodonaea triquetra*
Doodia aspera	*Echinopogon caespitosus* var. *caespitosus*
Echinopogon ovatus	*Einadia hastata*
Elaeocarpus reticulatus	*Entolasia marginata*
Entolasia stricta	*Eucalyptus acmenoides*
Eucalyptus fibrosa	*Eucalyptus globoidea*
Eucalyptus notabilis	***Eucalyptus paniculata* subsp. *paniculata* (likely present)**
Eucalyptus pilularis	*Eucalyptus punctata*
Eucalyptus resinifera subsp. *resinifera*	*Eucalyptus saligna* X *E. botryoides*
Eustrephus latifolius	*Exocarpos cupressiformis*
Gahnia aspera	*Geranium solanderi* var. *solanderi*
Glochidion ferdinandi var. *ferdinandi*	*Glycine clandestina*
Glycine microphylla	*Glycine tabacina*
Gonocarpus tetragynus	*Goodenia hederacea* subsp. *hederacea*
Goodenia heterophylla	*Hibbertia aspera* subsp. *aspera*
Hibbertia diffusa	*Hydrocotyle sibthorpioides*
Imperata cylindrica	*Indigofera australis*
Kennedia rubicunda	*Kunzea ambigua*
Lepidosperma laterale	*Leucopogon juniperinus*
Lindsaea microphylla	*Lomandra filiformis* subsp. *filiformis*
Lomandra longifolia	***Microlaena stipoides***
Myrsine variabilis	*Notelaea longifolia* forma *longifolia*
Opercularia hispida	*Opercularia varia*

Oplismenus aemulus	*Oplismenus imbecillis*
Oxalis exilis	***Ozothamnus diosmifolius***
Pandorea pandorana	*Panicum simile*
Paspalidium distans	*Passiflora herbertiana* subsp. *herbertiana*
Persoonia linearis	*Pittosporum revolutum*
Pittosporum undulatum	*Poa affinis*
Poa sieberiana var. *sieberiana*	*Polyscias sambucifolia*
Pomaderris intermedia	*Poranthera microphylla*
***Pratia purpurascens* *(now *Lobelia purpurascens*)**	*Pseuderanthemum variabile*
Pultenaea villosa	*Rubus parvifolius*
Rumex brownii	*Sarcopetalum harveyanum*
Sigesbeckia orientalis subsp. *orientalis*	*Smilax australis*
Smilax glyciphylla	*Solanum prinophyllum*
Syncarpia glomulifera subsp. *glomulifera*	*Themeda triandra*
Trema tomentosa var. *viridis*	*Tylophora barbata*
Veronica plebeia	*Zieria smithii*

Of the 112 species listed in the final determination for this ecological community. There are 18, (potentially 19) species present in the north east perimeter of the subject land. This is a promising indication for this community to meet the TEC listing given the general lack of understorey species present due to historical land disturbance.

Part 2. Particular area occupied by the ecological community occupied by Sydney Turpentine Ironbark Forest as listed in the final determination against the characteristics of the subject land	
2.1.1 The assemblage of species listed in Part 1.1 above which characterises the Sydney Turpentine-Ironbark Forest occurs within the Sydney Basin Bioregion	The subject land occurs within the Sydney Basin IBRA region and is consistent with the final determination.
2.2 It is the intent of the NSW Threatened Species Scientific Committee that all occurrences of the ecological community (both recorded and as yet unrecorded, and independent of their condition) that occur within this bioregion be covered by this Determination.	Given the information collected over one rapid field day, and review of existing mapping and information collected on soil landscapes that the vegetation within the subject land may be included as the TEC due to the assemblage of species present and the location of this vegetation within the Sydney Basin Bioregion, despite the disturbance history at this location.

Part 4 Additional information about the ecological community. The following information is additional to that required to meet the definition of an ecological community under the Act but is provided to assist in the recognition of the Sydney Turpentine- Ironbark Forest in the Sydney Basin Bioregion	
4.1 Sydney Turpentine-Ironbark Forest typically has the structural form of Open Forest (*sensu* Specht 1970) with a tree canopy ranging in height from the mid to upper range for this form (10-30 m) and with projected foliage cover at the mid to lower end of the range (30-50%)	The structure of the vegetation within the north east portion of the subject land had an open forest structure and ranged between 20 to 30 m in height, which fits the description of the TEC. However, the projected foliage cover recorded in plot 1 was 85.1%. Which is considerably higher than that listed in the final determination for the community, which the upper limit is around 50%.
4.2 Sydney Turpentine-Ironbark Forest has been reported as occurring in areas receiving moderate rainfall (900-1100 mm) on soils derived either from Wianamatta Shale or from Wianamatta Shale interbedded with Hawkesbury Sandstone (Benson and Howell 1994, Tozer 2003). In most of these locations STIF occurs up to approximately 100 m above sea level although it is found as high as 200 m above sea level on the western edge of the Hornsby Plateau where average annual rainfall falls below 1050 mm (Tozer 2003).	The subject land's highest point is approximately 110 m above sea level where the Plot 1 floristic data was collected. The subject land is mapped as occurring on the Lucas Heights soil landscape which contains Yellow Podzolic Soils which are likely overlain on Ashfield Shale from the Mittagong formation which contains alternating bands of shale and fine-grained sandstones which is over Hawkesbury Sandstone. The average annual rainfall taken from BOM Station data at the Gordon Golf Club (66120) with the mean annual rainfall 1241 for the area. The subject land falls within the range of average annual rainfall for this TEC.
4.3 Sydney Turpentine-Ironbark Forest occurs on low rolling hills characteristic of the Cumberland Lowlands and the broad, shale-capped ridges of the surrounding plateaux.	The landscape position of the vegetation was located on the top of the ridge, which is consistent with the shale-capped ridges as described in the Final Determination.

4.5 Based on plot samples analysed by Tozer et al. (2010), species which have been recorded more frequently in Blue Gum High Forest (WSFp153) compared with STIF (WSFp87) include, in decreasing order of diagnostic power*, *Platylobium formosum, Calochlaena dubia, Alphitonia excelsa, Smilax glyciphylla, Morinda jasminoides, Blechnum cartilagineum and Marsdenia rostrata.* **Species which have been recorded more frequently in STIF include,** in decreasing order of diagnostic power*, *Clematis glycinoides* var. *glycinoides, Solanum prinophyllum,* ***Glycine microphylla,*** *Bursaria spinosa, Echinopogon caespitosus* var. *caespitosus, Eucalyptus punctata, Acacia parramattensis, Panicum simile,* ***Centella asiatica, Acacia floribunda,*** *Hydrocotyle sibthorpioides, Veronica plebeia,* ***Aristida vagans****,* *Lomandra filiformis* subsp. *filiformis* and *Billardiera scandens.*	The vegetation within the north east boundary contains the highlighted in bold diagnostic species recorded more frequently in Sydney Turpentine Ironbark Forest than Blue Gum High Forest
4.7 Sydney Turpentine-Ironbark Forest is characterised by a number of frequently recorded species which are highly diagnostic of STIF but are much less frequently recorded in samples of the adjacent Sandstone Ridgetop Woodland and Sandstone Gully Forest (map units DSFp131 and DSFp142 of Tozer et al. (2010). These include, in decreasing order of diagnostic power*, ***Pratia purpurascens, Dichondra*** **spp**., *Eustrephus latifolius, Oplismenus imbecillis, Entolasia marginata,* ***Breynia oblongifolia****, Pittosporum undulatum, Bursaria spinosa, Hibbertia aspera* subsp. *aspera,* ***Imperata cylindrica,*** *Clematis glycinoides var. glycinoides, Pseuderanthemum variabile,* ***Ozothamnus diosmifolius****, Adiantum aethiopicum, Notelaea longifolia* forma *longifolia, Pittosporum revolutum, Solanum prinophyllum, Echinopogon caespitosus* var. *caespitosus,* ***Leucopogon juniperinus, Glycine microphylla,*** *Acacia parramattensis,* ***Oplismenus aemulus****, Panicum simile, Myrsine variabilis,* ***Acacia floribunda****, Echinopogon ovatus, Themeda triandra, Clerodendrum tomentosum, Tylophora barbata, Veronica plebeia* and ***Aristida vagans*** (Tozer et al. 2010).	A number of the highly diagnostic species of STIF listed, were recorded within the north portion of vegetation within the subject land, as highlighted in bold text.
Considering all the information above, it was determined that PCT 3262 was likely to fit the descriptions of Part 1, 2 and additional information in Part 4 of the Final Determination to list assign PCT 3262 as *Sydney Turpentine Ironbark Forest of the Sydney Basin Bioregion*.	

Appendix A Vegetation floristic plot data

Two full floristic plots were undertaken as part of the assessment of PCTs. One plot (Plot 1) was undertaken within vegetating to the north-eastern portion of the subject land. Plot 2 was undertaken in vegetation directly adjacent to the south of the subject land. Table 6 presents the locations of the plots and Table 7 contains the floristic plot data collected.

Table 6: Plot locations

Plot ID	PCT ID	PCT Name	Zone	Eastings	Northings	Bearing
Plot 1	3262	Sydney Turpentine Ironbark Forest	56	330986	6262320	117
Plot 2	3592	Sydney Coastal Enriched Sandstone Forest	56	330808	6262153	90

Table 7: 20 m x 20 m full floristic plot data taken for Plot 1 and Plot 2.

Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2		
					Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Acacia implexa	Hickory Wattle			Shrub (SG)				M	3	2
Acacia ulicifolia	Prickly Moses			Shrub (SG)				G	0.1	1
Acer spp.		*			G	0.1	1			
Agapanthus spp.		*						G	4	20
Ageratina adenophora	Crofton Weed	*	1					G	0.1	2
Allocasuarina littoralis	Black She-Oak			Tree (TG)				U	5	2
Angophora costata	Sydney Red Gum			Tree (TG)				U	25	8
Araujia sericifera	Moth Vine	*	1		G	0.1	1			
Aristida vagans	Threeawn Speargrass			Grass & grasslike (GG)	G	0.1	10			
Asparagus aethiopicus	Asparagus Fern	*	1		G	8	50	G	0.1	1
Asparagus spp.		*						G	0.1	10
Bidens pilosa var. *pilosa*		*			G	0.1	1	G	0.1	1
Billardiera scandens	Hairy Apple Berry			Other (OG)				G	0.2	5
Bromus catharticus	Praire Grass	*			G	0.1	1			
Calochlaena dubia	Rainbow Fern			Other (OG)				G	35	100
Centella asiatica	Indian Pennywort			Forb (FG)	G	0.1	10			
Ceratopetalum gummiferum	Christmas Bush			Tree (TG)				M	2	5
Cestrum parqui	Green Cestrum	*	1					G	0.1	1

Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2		
					Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Chlorophytum spp.		*			G	0.2	1			
Cinnamomum camphora	Camphor Laurel	*	1		G	0.1	1	G	3	2
Corymbia gummifera	Red Bloodwood			Tree (TG)				U	2	1
Cirsium vulgare	Spear Thistle	*			G	0.1	1			
Commelina cyanea	Native Wandering Jew			Forb (FG)	G	0.1	10			
Conyza spp.	A Fleabane	*			G	0.1	1	G	0.1	1
Cordyline australis				Other (OG)				G	0.5	1
Coronidium elatum subsp. *elatum*				Shrub (SG)				G	0.2	1
Corymbia gummifera	Red Bloodwood			Tree (TG)				U		
Cotoneaster spp.		*	1					G	0.1	5
Cynodon dactylon	Common Couch			Grass & grasslike (GG)	G	0.1	1			
Dianella caerulea var. *producta*				Forb (FG)	G	8	50	G	0.2	10
Dichondra repens	Kidney Weed			Forb (FG)	G	0.1	10			
Dietes spp.				Forb (FG)	G	0.1	1			
Digitaria spp.	A Finger Grass			Grass & grasslike (GG)	G	0.1	100			
Dodonaea triquetra	Large-leaf Hop-bush			Shrub (SG)				G	0.2	1
Ehrharta erecta	Panic Veldtgrass	*	1		G	1	100			
Elaeocarpus reticulatus	Blueberry Ash			Shrub (SG)	M	4	1	M	2	5
Entolasia marginata	Bordered Panic			Grass & grasslike (GG)				G	0.1	1

Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2		
					Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Entolasia stricta	Wiry Panic			Grass & grasslike (GG)	G	1	100	G	0.5	1000
Eucalyptus microcorys	Tallowwood			Tree (TG)	U	15	4			
Eucalyptus sp.				Tree (TG)	U	50	8			
Eucalyptus pilularis	Blackbutt			Tree (TG)	U	20	1	U	35	2
Ficus rubiginosa	Port Jackson Fig			Tree (TG)				G	0.1	1
Geranium spp.				Forb (FG)				G	0.1	5
Glochidion ferdinandi var. *ferdinandi*	Cheese Tree			Tree (TG)				G	0.1	1
Hedychium gardnerianum	Ginger Lily	*						G	0.2	5
Hydrocotyle tripartita	Pennywort			Forb (FG)				G	0.1	1
Hypolepis muelleri	Harsh Ground Fern			Fern (EG)				G	0.1	1
Jacaranda spp.		*			G	0.1	2			
Juncus usitatus				Grass & grasslike (GG)				G	0.2	2
Lantana camara	Lantana	*	1					G	0.1	1
Leucopogon juniperinus	Prickly Beard-heath			Shrub (SG)				M	2	5
Ligustrum sinense	Small-leaved Privet	*	1					G	0.1	2
Lindsaea microphylla	Lacy Wedge Fern			Fern (EG)				G	0.1	1
Lobelia purpurascens	whiteroot			Forb (FG)	G	0.2	100	G	0.1	20
Lomandra filiformis subsp. *filiformis*				Grass & grasslike (GG)				G	0.1	2
Lomandra longifolia	Spiny-headed Mat-rush			Grass & grasslike (GG)				G	10	50

Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2		
					Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Melia azedarach	White Cedar			Tree (TG)	G	0.1	1			
Microlaena stipoides var. *stipoides*	Weeping Grass			Grass & grasslike (GG)	G	0.5	100	G	1	50
Nephrolepis cordifolia	Fishbone Fern			Fern (EG)				G	0.1	10
Ochna serrulata	Mickey Mouse Plant	*	1		G	0.5	1	G	0.1	5
Oplismenus aemulus				Grass & grasslike (GG)	G	0.1	10			
Oplismenus imbecillis				Grass & grasslike (GG)				G	0.2	100
Acianthus spp.	Mosquito Orchid			Forb (FG)				G	0.2	4
Osteospermum spp.	South African daisy	*			G	0.5	10			
Oxalis spp.				Forb (FG)	G	0.1	1	G	0.1	1
Ozothamnus diosmifolius	White Dogwood			Shrub (SG)	M	0.2	1	G	0.2	10
Parsonsia straminea	Common Silkpod			Other (OG)				G	0.1	2
Passiflora edulis	Common Passionfruit	*						G	0.1	1
Phoenix canariensis	Canary Island Date Palm	*	1		G	0.5	1			
Physalis peruviana	Cape Gooseberry	*						G	0.1	1
Pittosporum undulatum	Sweet Pittosporum			Shrub (SG)				M	0.5	1
Plectranthus parviflorus				Forb (FG)				G	0.1	1
Polyscias sambucifolia				Shrub (SG)				G	0.2	5
Pteridium esculentum	Bracken			Fern (EG)				G	0.5	1
Pultenaea flexilis				Shrub (SG)				G	0.1	3

Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2		
					Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Richardia brasiliensis	Mexican Clover	*			G	0.1	1			
Sigesbeckia orientalis subsp. *orientalis*	Indian Weed			Forb (FG)				G	0.1	5
Smilax glyciphylla	Sweet Sarsparilla			Other (OG)				G	0.1	10
Solanum americanum	Glossy Nightshade			Forb (FG)				G	0.1	2
Solanum mauritianum	Wild Tobacco Bush	*						G	0.2	2
Solanum nigrum	Black-berry Nightshade	*			G	0.1	10			
Sonchus oleraceus	Common Sowthistle	*			G	0.1	1			
Syagrus spp.		*						G	0.2	1
Syncarpia glomulifera subsp. *glomulifera*				Tree (TG)	U			U	15	4
Triadica sebifera	Chinese Tallowood	*	1		G	0.1	1	G	0.1	4
Veronica plebeia	Trailing Speedwell			Forb (FG)				G	0.1	1
Xanthorrhoea media				Other (OG)				G	0.1	1
Zieria smithii	Sandfly Zieria			Shrub (SG)				G	0.1	1

Appendix B Floristic analysis results

Plot	Vegetation analysis tool (Tozers Metro)	Selected PCT rational
Plot 1	Blue Gum High Forest Sydney Turpentine-Ironbark Forest	The plot located within the north east of the subject land has undergone historical disturbances, and therefore generally lacks a diverse number of species. The required minimum + positive diagnostic species was not achieved for either Sydney Turpentine Ironbark Forest nor Blue Gum High Forest, there the analysis relied on the presence of total diagnostic species between Sydney Turpentine Ironbark Forest and Blue Gum High Forest. The plot data contained 12 diagnostic species belonging to Sydney Turpentine Ironbark Forest and 6 against Blue Gum High Forest. It was determined that Sydney Turpentine Ironbark Forest (PCT 3262) was the most appropriate PCT for the vegetation based on numerous factors outlined in Table 2, in conjunction with the results of the Tozer analysis.
Plot 2	Blue Gum High Forest Sydney Turpentine-Ironbark Forest Hinterland Sandstone Gully Forest	Sydney Turpentine-Ironbark Forest had 20 diagnostic species as did Sydney Hinterland Sandstone Gully Forest, and Blue Gum High Forest with 14 diagnostic species. However, the Hinterland Sandstone Gully Forest was the only vegetation community between the three which had the highest count of diagnostic species and also achieved the ratio of positive diagnostic species to total native species ratio. Given this outcome, Sandstone PCTs were investigated in the PCT selection process. Whilst Hinterland Sandstone Gully Forest was not selected as the final vegetation community. A similar community 3592, Sydney Coastal Enriched Sandstone Forest was selected, based on the number of characteristic canopy species present, including *Angophora costata Corymbia gummifera, Eucalyptus pilularis, Ceratopetalum gummiferum* and *Syncarpia glomulifera* subsp*. glomulifera* and a taller mid-stratum is characterised by very frequent however sparse cover of *Pittosporum undulatum* and *Allocasuarina littoralis.* This PCT is primarily distributed at elevations of less than 200 metres asl downslope of shale soils on the north shore of Sydney. The landscape position fit this PCT the best as it is downslope of shale soils on north shore of Sydney, but is not located higher upslope before it grads into a gully below. This PCT was the best fit PCT for the vegetation directly adjacent to the subject land and was therefore selected as the most appropriate PCT to assign to the vegetation along the southern portion of the subject land, including the vegetation within the detention basin.

B1 Analysis of vegetation plot 1 – identified as PCT 3262 Sydney Turpentine Ironbark Forest

The images below show the outputs from the Hager / Steenbeecke tool.

	A	B	C	D	E	F	G	H	I	J	K	L	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
1	Community Type	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Correct ID	CIF	SSTF	BNHW	GSGW	CSW	SHW	SPW	SGTF	STIF	CRFF	NSCF	GMDX	WSDR	MSW	SSF	CSF	LBMW	BGHF	SRS	CSGF	HSGF	SSCF	SHTW	CSRW	ABW	SCS
3	**Total diagnostic species**	5	6	2	3	3	4	9	6	12	8	1	3	4	3	3	3	4	6	1	2	8	2	7	1	0	0
4	**Required minimum +ve diagnostic species**	21	26	17	33	19	20	26	26	23	16	6	18	22	19	9	10	20	15	8	23	28	26	31	31	20	16
5	Achieved?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
6	**No. by which required minimum +ve diagnostic spp. is exceeded?**																										
7	**Ratio of actual : required +ve diagnostic species**	24%	23%	18%	10%	16%	20%	35%	23%	52%	50%	17%	20%	18%	16%	33%	30%	20%	40%	13%	13%	10%	8%	23%	3%	0%	0%
8	**Total native species**	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
9	**Required minimum total native species**	35	39	37	43	37	31	31	37	40	26	27	31	32	30	17	21	35	38	25	36	36	43	42	41	30	24
10	Achieved?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No
11	**Ratio of +ve diagnostic species : total native species**	26%	32%	16%	16%	16%	21%	47%	32%	63%	42%	5%	26%	21%	16%	16%	16%	21%	32%	5%	16%	26%	11%	37%	5%	0%	0%
12	**Native Species**																										
13	Aristida vagans	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
14	Centella asiatica	0	0	0	0	1	0	1	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
15	Commelina cyanea	0	0	0	0	0	1	1	0	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
16	Cynodon dactylon	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	Dianella caerulea var. producta	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0
18	Dichondra repens	0	1	0	0	0	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
19	Digitaria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Elaeocarpus reticulatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	0	0
21	Entolasia stricta	1	1	1	1	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0
22	Eucalyptus microcorys	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Eucalyptus pilularis	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	1	1	1	1	0	0	0
24	pratia purpurascens	1	1	1	0	1	0	1	1	1	1	1	1	0	0	1	0	1	1	0	0	0	0	1	0	0	0
25	Melia azedarach	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Microlaena stipoides	1	1	0	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
27	Oplismenus aemulus	0	0	0	0	0	1	1	0	1	1	0	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0
28	Oxalis sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	Ozothamnus diosmifolius	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0

B2 : Analysis of Plot 2 - identified as Sydney Coastal Enriched Sandstone Forest

	A	B	C	D	E	F	G	H	I	J	K	L	N	O	P	Q	R	S	T	U	V	W	X
1	Community Type	DSF p1	DRY p2	DSF p6	DSF p7	DSF p4	DRY p29	DRY p29	DSF p520	WSF p87	FoW p33	WSF p89	RF p88	RF p89	DRY p214	FoW p44	DSF p84	WSF p102	wet p103	FoW p88	DSF p140	DSF p182	DSF p169
2	**Correct ID**	CIF	SSTF	BNHW	CSGW	CSW	SHW	SPW	SGTF	STIF	CRFF	NSLF	GMDF	WSDF	MSW	SSF	CSF	LBMWF	BGHF	SHS	CSGF	HSGF	SSICF
3	**Total diagnostic species**	7	10	2	2	3	3	8	8	20	8	2	6	4	1	5	7	15	14	5	12	20	12
4	**Required minimum +ve diagnostic species**	21	28	17	30	19	20	28	25	23	16	6	18	22	19	9	10	20	15	8	23	28	28
5	Achieved?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
6	**No. by which required minimum +ve diagnostic spp. is exceeded?**																						
7	**Ratio of actual : required +ve diagnostic species**	33%	36%	12%	7%	16%	15%	31%	32%	87%	50%	33%	33%	18%	5%	56%	70%	75%	93%	63%	52%	71%	46%
8	**Total native species**	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
9	**Required minimum total native species**	35	39	37	43	37	31	31	37	40	28	27	31	32	30	17	21	35	39	25	38	38	43
10	Achieved?	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
11	**Ratio of +ve diagnostic species : total native species**	18%	26%	5%	5%	8%	8%	21%	21%	53%	21%	5%	16%	11%	3%	13%	18%	39%	37%	13%	32%	53%	32%
12	**Native Species**																						
13	Acacia ulicifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
14	Allocasuarina littoralis	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
15	Angophora costata	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1	1	1
16	Billardiera scandens	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1
17	Calochlaena dubia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0
18	Ceratopetalum gummiferum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1
19	Corymbia gummifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
20	Dianella caerulea var. producta	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0
21	Dodonaea triquetra	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	1	1	1
22	Elaeocarpus reticulatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0
23	Entolasia marginata	0	1	0	0	0	0	1	0	1	1	1	0	0	0	1	0	0	1	0	0	0	0
24	Entolasia stricta	1	1	1	1	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1	1	1	1
25	Eucalyptus pilularis	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	1	1	1
26	Ficus rubiginosa	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
27	Glochidion ferdinandi var. ferdinandi	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0	0	0	0
28	Hypolepis muelleri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	Juncus usitatus	0	0	0	0	1	0	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0
30	Leucopogon juniperinus	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0
31	Lindsaea microphylla	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	1
32	Pratia purpurascens	1	1	1	0	1	0	1	1	1	1	1	1	0	0	1	0	1	1	0	0	0	0
33	Lomandra filiformis subsp. filiformis	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
34	Lomandra longifolia	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1	0
35	Microlaena stipoides	1	1	0	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0
36	Oplismenus imbecillis	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0
37	Ozothamnus diosmifolius	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0
38	Parsonsia straminea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
39	Pittosporum undulatum	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0
40	Plectranthus parviflorus	0	0	0	0	0	1	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0
41	Pteridium esculentum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	1

Appendix G. Eco Logical Australia - PCT Mapping

Plant Community Types

Subject Site

Plot location (20 x 20m full floristic and vegetation integrity survey)

Plant Community Types (ELA 2023)

PCT3262: Sydney Turpentine Ironbark Forest

PCT3592: Sydney Coastal Enriched Sandstone Forest

Non-local native

Landscaping

0 20 40 80
Metres

Datum/Projection:
GDA2020 MGA Zone 56

Project: 23SYD5527-KS Date: 14/09/2023

N

eco logical AUSTRALIA
A TETRA TECH COMPANY

Appendix H. Eco Logical Australia - Response to Department of Planning Letter

Level 13
420 George Street
Sydney NSW 2000
t: 1300 646 131

6 October 2023

Our ref: 23SYD-5827

Levande Pty Ltd
Level 18
9 Castlereagh Street,
Sydney, NSW 2000

Attention: Nathan Donn

Dear Nathan,

Letter from the NSW Department of Planning and Environment – Request for Agency Advice – Amended Information for Planning Proposal 95-97 Stanhope Road, Killara (PP-2022-658).

This letter will address the comments from the NSW Department of Planning regarding the ELA report. Each dot point under the heading 'ELA report' in the letter from the NSW Department of Planning will be reproduced below. ELA will then provide a response. Thank you for providing the opportunity for ELA to provide additional information about their site assessment and letter (12 July 2023).

Overall summary

It is considered extremely unlikely that Blue Gum High Forest is or was present near or on the site. Blue Gum High Forest is defined as a Plant Community Type (PCT) by the NSW government and as a Threatened Ecological Community (TEC) by the NSW Scientific Committee. Both the NSW government and the NSW Scientific Committee provide additional information that assists in deciding whether either definition of Blue Gum High Forest is present, particularly on highly disturbed sites such as the Lourdes site. The disturbed native vegetation on the Lourdes site is generally species poor.

The additional information is called *supplementary descriptors* by the NSW Scientific Committee and *descriptive attributes* by the NSW government. Consideration of this additional information has been helpful in deciding that Blue Gum High Forest highly unlikely to be present near or on the site.

Plant Community Types (PCTs) and Threatened Ecological Communities (TECs)

The EHG letter discusses both Plant Community Types (PCTs) and Threatened Ecological Communities (TECs). As much of this letter discusses PCTs and TECs, the difference between the two methods of classification of vegetation communities is described below.

While there is a relationship between PCTs and TECs, they are defined differently. As stated in Section 7.5 of the *Plot to PCT Assignment Tool User Guide* (Department of Planning and Environment 2022):

> *'TECs are legally defined entities that use independent classifications applied by Scientific Committees under NSW and Commonwealth biodiversity legislation. As at June 2021 there are no current NSW TEC determinations that cite quantitative PCTs in the coast and tablelands bioregions.'*

All TECs are defined by their Final Determination (FD) as published by the NSW Scientific Committee. An example of a Final Determination for an ecological community is: The FD for TEC Sydney Turpentine Ironbark Forest is found at: Sydney Turpentine Ironbark Forest (nsw.gov.au). The proposed publication date of this FD noted in the document is 31 May 2019.

The NSW Scientific Committee, does not publish definitions of non-threatened ecological communities. It is reasonable to assume that if an area of native vegetation does not meet the definition of any threatened ecological community, then the area of native vegetation can be described as a non-threatened ecological community.

PCTs are defined by the NSW government. The document *A Revised Classification of Plant Communities of Eastern New South Wales* (NSW Department of Planning and Environment) states in Section 1.1:

> *The PCT master list is defined in BioNet, the NSW biodiversity data repository administer by the Department of Planning and Environment (DPE). 'Approved' PCTs represent the master set of native vegetation communities that are recognised for NSW. As at November 2018 the BioNet Vegetation Classification applications held over 200 fields of text-based descriptions of PCT composition, structure, distribution, and reference sources.*

Consequently, this letter will provide an individual response to either PCTs, TECs or both when appropriate.

EHG biodiversity technical comments

> *The ELA report provided a comparison of PCTs on the site. The discussion doesn't consider the site disturbance influences on the diagnosis of PCT to the extent that is warranted given the current land use.*

ELA response

It is acknowledged that the majority of the site is highly disturbed. The ELA letter dated 12 July 2023 includes the following paragraph under *Section 1.1 Field survey* on page 2:

> *As mentioned above, much of the subject land has been historically cleared, and areas on the east and south of the development site contain very little native species cover to assist in informing PCT selection. Therefore, the decision was made to undertake the second floristic plot, Plot 2 within an area of native vegetation to the south of the subject land.*

While this paragraph does not use the word *disturbance,* vegetation clearing is a major component of ecological disturbance in urban areas. The underlying reason that ELA surveyed the plot off-site to the south was because the site is disturbed. The author has previously been recommended to use nearby plots by the state government to study disturbed sites.

ELA noted disturbance on the site as described on page 7 of their letter. Photo 1: Soil profile site 1 noted a white fragment in the wall of the soil profile hole and stated: '*Perhaps some minor disturbance has occurred at this location.'* In a brief discussion of Photo 2 *Soil profile site 2* the following text was stated: *The soil at site 2 shows evidence of significant disturbance, with blue metal gravel and concrete fragments.*

It is accepted that the site shows considerable disturbance in some areas so an additional information will be provided below.

The JK Geotechnics (29 September 2022) reports fill at the following boreholes:

Fill or significant disturbance present (total of 26 boreholes):

- Current boreholes: Borehole 1, Borehole 2, Borehole 3, Borehole 4, Borehole 5, Borehole 6, Borehole 7, Borehole 8, Borehole 9.
- 1981 boreholes: Borehole 3, Borehole 4, Borehole 5, Borehole 6, Borehole 7.
- 1989 boreholes: Borehole 1.
- 2001 boreholes: Borehole 1, Borehole 2, Borehole 3, Borehole 4.
- 2010A boreholes: Borehole 1, Borehole 2, Borehole 8.
- 2010B boreholes: Borehole 2, Borehole 3.
- 2014 boreholes: Borehole 2, Borehole 4.

Limited or no disturbance present (total of 5 boreholes):

- 1981 boreholes: Borehole 1, Borehole 2.
- 1989 boreholes: Borehole 2, Borehole 3.
- 2010B boreholes: Borehole 1.

In summary, approximately 84% of the boreholes display evidence of soil disturbance.

EHG have not recommended a method that may provide adequate justification for PCT allocation on disturbed sites in their letter (ref: DOC23/628482). Although, not stated explicitly it appears that EHG believe that an assessment that relies only upon, or too heavily upon on plant species composition may be inadequate for the site due to the history of disturbance.

The author agrees that identification of PCTs and TECS on highly disturbed sites is challenging. It is difficult to provide a definitive answer based on strong evidence.

The BAM 2020 provides the following guidance on identifying PCTs.

Section 4.2 *Identify and map plant community types and ecological communities* of the BAM 2020 includes the following text:

> *The assessor must identify and map the distribution of PCTs, or the most likely PCTs, and all TECs on the subject land. The identification must be in accordance with the NSW PCT classification as described in the BioNet Vegetation Classification. The identification of TECs must be consistent with the Threatened Species Scientific Committee Final Determination for the TEC. Information that can support the identification of PCTs and TECs can be found on the:*

a. BioNet Vegetation Classification database, which describes how to identify PCTs and TECs as per the NSW PCT classification, and details each PCT and its geographic distribution

b. Threatened biodiversity profile search webpage, which describes TECs.

A document: *BioNet Vegetation Classification user manual* explains the process of Plant Community Identification in chapter three (3). The described method in this document relies upon plant species composition of a plot or other characteristics directly related to plants, such as (vegetation) community structure, (vegetation) community height and cover. As these characters require the presence of plants, they are not easy to apply to situations where clearing or partial clearing has occurred.

The *BioNet Vegetation Classification database* also includes additional information such as '*Descriptive Attributes'* and '*References'.* The *Bionet Vegetation Classification user manual* does not direct the reader to use these additional sources of information. However, the additional information is provided in the database, so the additional information will be discussed below as it may assist in identifying PCTs on disturbed sites.

Using PCT *descriptive attributes* to assist in the identification of PCTs is similar to the approach described below by Preston and Adam (2004a; 2004b). PCT *descriptive attributes* are conceptually similar to TEC *supplementary descriptors.*

EHG biodiversity technical comments

One of the CEECs discussed in the ELA report is Blue Gum High Forest (BGHF). The Final Determination for Blue Gum High Forest (BGHF) states that "Highly modified relics of the community also persist as small clumps of trees without a native understorey." If trees from this community are present on the site and the geographical location and the physical characteristics align with the Final Determination descriptions, then there is no reason to assume that the vegetation on site does not form part of this community or is a transitional intergrade of this community with another. Table 2 of the ELA report states "this PCT was not selected as the best-fit community due to the understorey species more closely aligning with a drier, understorey or sub-canopy and shrub species which is more representative of [PCT] 3262 than a more mesic moist rainforest midstorey and ferny or herbaceous understorey." This statement makes conclusions based on the absence of one stratum of species from this community without consideration of the historical disturbance on the Site. The conclusion for the exclusion of this PCT as occurring on the site is not based on adequate justification.

ELA response

The use of the phrase 'Blue Gum High Forest' is potentially confusing. 'Blue Gum High Forest is both the name of Threatened Ecological Community as described by the NSW Scientific Committee and the name of PCT 1237. This section will separate the two entities by referring to either *Blue Gum High Forest FD* to refer to the Critically Endangered Ecological Community defined by the NSW Scientific Committee or to *PCT 1237 Blue Gum High Forest* to refer to the PCT.

The response below will first discuss on the Threatened Ecological Community Blue Gum High Forest (FD). Blue Gum High Forest FD has been listed by the NSW Scientific Community as a Critically Endangered Ecological Community.

The letter prepared by ELA focused on floristics following the guidance of Preston and Adam (2004b) who state on page 382:

> *'In conclusion, there is merit in Scientific Committee including in its descriptions of threatened ecological communities, features of the community in addition to its floristic composition and location. As we have illustrated, the Scientific Committee has used some of these features in some of its descriptions of listed communities. However, more abundant use of the characteristics, where appropriate to the community, would assist in providing more clarity and certainty in the description of the community and more ready practical application of the Scientific Committee's description by users in the field.'*

However, such other characteristics cannot be used as a substitute for a description of the assemblage of species and the particular area in which the community is located. Rather, they should be seen as a valuable adjunct.'

Additionally, as inferred above, some of additional descriptions provided in Final Determinations that are neither floristic nor geographical and are not abundant. ELA will consider some the non-floristic and non-geographical descriptions in the Final Determination for TECs below. This is similar to the use of additional information such as '*Descriptive Attributes*' and '*References*' as discussed previously about the method used to select a PCT.

The two papers by Preston and Adam (2004a; 2004b) separate the description of threatened ecological communities into two components: 1. The assemblage of species and the particular area; and 2. Supplementary descriptors. The document *Guidelines for interpreting listing criteria for species, populations and ecological communities under the NSW Biodiversity Conservation Act 2016* also follow the Preston and Adam (2004a; 2004b) method. Much of the text below will focus on supplementary descriptors.

The statement above refers Table 2 of the ELA report. Table 2 provided an assessment of the plot in the north-western section of the site. Additional information and a discussion about the plot, the surrounding vegetation and other information will be provided below.

Only one typical Blue Gum High Forest (BGHF) canopy species was present in the plot, *Eucalyptus pilularis* (Blackbutt).

ELA conducted an additional site survey on Friday 8 September. No *Eucalyptus saligna* (Sydney Blue Gums) were observed in the vegetation adjacent to the southern side of Stanhope Road. Potential local remnant species recorded in this area that are included in the Final Determination list of species for the Threatened Ecological Community Sydney Turpentine Ironbark Forest (STIF) include: *Angophora costata* (Smooth-barked Apple), *Eucalyptus paniculata* (Grey Ironbark), *Eucalyptus pilularis* (Blackbutt) and *Syncarpia glomulifera* (Turpentine). Additionally, non-local canopy tree species were more common than STIF species adjacent to Stanhope Road. Non-local canopy species observed include: *Corymbia citriodora* (Lemon-scented Gum), *Eucalyptus maidenii* (Maiden's Gum), *Eucalyptus melliodora* (Yellow Box), *Eucalyptus microcorys* (Tallowwood) and a red gum (probably *Eucalyptus tereticornis*).

EHG have noted (see below) that there is an overlap between the flora species of BGHF and Sydney Turpentine Ironbark Forest (STIF). While STIF species are more common in this area additional analysis

if provided below to support the decision to choose STIF to represent the local native vegetation within this area.

ELA have in their letter dated 12 July 2023 previously provided a floristic assessment. To gain further insight into the vegetation on the site, an assessment of relevant supplementary descriptors will be provided.

Preston and Adam (2004b) have stated that supplementary descriptors may provide greater '*more clarity and certainty'* about the recognition of TECs. However, Preston & Adam (2004b) state the following about supplementary descriptors:

> '*cannot be used as a substitute for a description of the assemblage of species and the particular area in which the community is located. Rather they should be seen as a valuable adjunct.'*

Consequently, while the use of supplementary descriptors cannot replace a floristic assessment, they can provide potentially valuable information.

Tree height and soil type are provided as supplementary descriptors in the Final Determination (FD) for BGHF. Information about tree height is not provided in the FD for STIF. Both the BGHF FD and the STIF FD provide similar information about soil types. The supplementary information about soil types associated with STIF and BGHF is similar as both TECs are described as occurring on clay soils derived from Wianamatta Shale. Some other information about soil types is provided, for example, BGH may occurs in areas underlain by Hawkesbury Sandstone. The STIF FD notes that STIF may also occur on shale layers over sandstone. There is no obvious difference between the soil associated with BGHF or STIF, so a discussion about soil types is unlikely to assist in deciding which TEC is present on the site.

There are other supplementary descriptors such as:

BGHF FD:

> *Typically, Blue Gum High Forest occurs more than 100m above sea level, where rainfall exceeds 1050 mm per annum, although it may be present in sheltered locations with lower rainfall.*

STIF FD:

> *Occurrences of STIF may occur on plateaus and hillsides and on the margins of shale cappings over sandstone.*

These other supplementary descriptors do not provide additional information that will assist in deciding which TEC is likely to be present on the site.

The NSW *Interpretation Act 1987 no. 15* provides guidance that will assist in providing more certainty in unclear situations. The text below is an extract from the *Interpretation Act 1987.*

> *Use of extrinsic material in the interpretation of Acts and statutory rules*
>
> *34. (1) In the interpretation of a provision of an Act or statutory rule, if any material not forming part of the Act or statutory rule is capable of assisting in the ascertainment of the meaning of the provision, consideration may be given to that material—*

(a) to confirm that the meaning of the provision is the ordinary meaning conveyed by the text of the provision (taking into account its context in the Act or statutory rule and the purpose or object underlying the Act or statutory rule and, in the case of a statutory rule, the purpose or object underlying the Act under which the rule was made); or

(b) to determine the meaning of the provision—

(i) if the provision is ambiguous or obscure; or

(ii) if the ordinary meaning conveyed by the text of the provision (taking into account its context in the Act or statutory rule and the purpose or object underlying the Act or statutory rule and, in the case of a statutory rule, the purpose or object underlying the Act under which the rule was made) leads to a result that is manifestly absurd or is unreasonable.

(2) Without limiting the effect of subsection (1), the material that may be considered in the interpretation of a provision of an Act, or a statutory rule made under the Act, includes—

(a) all matters not forming part of the Act that are set out in the document containing the text of the Act as printed by the Government Printer;

(b) any relevant report of a Royal Commission, Law Reform Commission, committee of inquiry or other similar body that was laid before either House of Parliament before the provision was enacted or made;

(c) any relevant report of a committee of Parliament or of either House of Parliament before the provision was enacted or made;

(d) any treaty or other international agreement that is referred to in the Act;

(e) any explanatory note or memorandum relating to the Bill for the Act, or any other relevant document, that was laid before, or furnished to the members of, either House of Parliament by a Minister before the provision was enacted or made;

(f) the speech made to a House of Parliament by a Minister on the occasion of the moving by that Minister of a motion that the Bill for the Act be read a second time in that House;

(g) any document (whether or not a document to which a preceding paragraph applies) that is declared by the Act to be a relevant document for the purposes of this section; and

(h) any relevant material in the Minutes of Proceedings or the Votes and Proceedings of either House of Parliament or in any official record of debates in Parliament or either House of Parliament.

(3) In determining whether consideration should be given to any material, or in considering the weight to be given to any material, regard shall be had, in addition to any other relevant matters, to—

(a) the desirability of persons being able to rely on the ordinary meaning conveyed by the text of the provision (taking into account its context in the Act or statutory rule and the purpose or

object underlying the Act or statutory rule and, in the case of a statutory rule, the purpose or object underlying the Act under which the rule was made); and

(b) the need to avoid prolonging legal or other proceedings without compensating advantage.

The Final Determination for BGHF and STIF refer to a number of publications that may assist *'in the ascertainment of the meaning of the provision',* so in this letter '*consideration may be given to that material*'. In the present situation, referring to the FD referenced publications may assist in deciding if one or the other TEC is present on the site.

The publications are: Benson and Howell (1990; 1994) and Tozer (2003). Informative supplementary descriptors from these publications will be provided below. Site characters will then be compared to the supplementary descriptors. Preston and Adam (2004b) indicate that supplementary descriptor may assist in field recognition of the threatened ecological community.

Benson and Howell (1990) provide the following information:

BGHF:

'*Sydney Blue Gum, Eucalyptus saligna, and Blackbutt, Eucalyptus pilularis, were the main trees, with Blue Gum particularly abundant on the lower slopes and depressions and Blackbutt more prevalent on the ridges. Other tree species were smooth-barked Angophora costata; Grey Ironbark, Eucalyptus paniculata; White Stringybark, Eucalyptus globoidea; Turpentine, Syncarpia glomulifera; and Forest Oak, Allocasuarina torulosa.'*

STIF

The lower rainfall Wianamatta Shale soils of the inner western suburbs and on the north side from Ryde to Glenorie, the Blue Gum High Forest, requiring good rainfall and deep clay soils, gave way to Turpentine-Ironbark Forest.

Benson and Howell (1990) state that BGHF is more common on deep soils.

Benson and Howell (1994) describe the landscape occurrence for BGHF as '*Broad ridges with residual shale soils'.* Their description for the landscape occurrence for *STIF* is: '*Inner western Sydney. Lower rainfall between Glenorie and Ryde; often near junction with sandstone'.*

'*Turpentine-Ironbark Forest vegetation extended into the transition zone between the shale and the underlying Hawkesbury Sandsone, on soils formerly known as the Hammondville Association (Walker 1960). Some of this transitional vegetation still survives as narrow edges to cleared land on private property and on the margins of sandstone bushland reserves in northern Sydney, were there are remnants of shale overlying sandstone, eg: Pennant Hills Park, Land Cove National Park (formerly State Recreation Area) (Clarke & Benson 1987) and Garigal National Park (formerly Davidson State Recreation Area), Ku-ring-gai National Park, and a number of Council parks.*

The argument above primarily considers the presence or absence of the TEC BGHF (FD). A similar argument could be presented for the absence of PCT 3136 Blue Gum High Forest.

As the site is highly disturbed it is relevant to include Preston and Adam's (2004a) consideration of site disturbance and the presence of TECs. Preston and Adam (2004a) note that on highly disturbed sites that while local native species may be present, some legal judgements have decided that the listed Threatened Ecological Community (TEC) is not present. They state on page 259:

> *'The lack of many typical native species and the dominance of exotic species, together with other factors such as the extent of modification and alteration of the understorey structural component of the community, led McClellan CJ to conclude that the vegetation was no longer part of the Blue Gum High Forest community.'*

This letter will not attempt to determine whether any of the local native species that are growing in disturbed areas on the site are not part of an TEC. However, it is clear that high levels of disturbance mean that the TEC may not be present in some locations.

EHG biodiversity technical comments

> *The BGHF Final Determination states "BGHF is dominated by a tall canopy of eucalypts that may exceed 30 m in height. Its understorey is typically multi-layered with a midstorey of mesophyllous shrubs and small trees and a diverse ground layer of herbs, ferns and some grasses. Most stands of the community are in a state of regrowth after past clearing or logging activities, and consequently trees may be shorter, less dense or more dense than less disturbed stands." The ELA report states, "The vegetation within the north east of the site is tall, and approximately to 20 to 30 m (Naturally Trees 2023), however, would not be considered an extremely tall forest." However, the Final Determination for does not require that the trees be extremely tall. The wording of the Final Determination indicates that trees within BGHF may or may not exceed 30m in height, therefore the remnant trees of this community found on the site could have formed part of this community and aren't required to be excluded based on tree height.*

ELA response

It is acknowledged that the site is disturbed and that past clearing of vegetation including trees has occurred.

Other characteristics appropriate for examining the presence of TECs are Supplementary descriptors. Supplementary descriptors for BGHF are examined elsewhere in this document.

EHG biodiversity technical comments

> *The Final Determination states "it can also intergrade with Sydney Turpentine Ironbark Forest (STIF)…stands that contain intermediate characteristics are collectively covered by the Final Determinations of BGHF and STIF and may be diagnosed by detailed consideration of the assemblage of species present at the site." Given STIF has been confirmed as likely to be present on the site, it is also possible that stands of remnant trees could form BGHF given the intergrading often observed between the two communities.*

ELA response

Integrades between BGHF and STIF are likely to occur along the boundary of deeper soils and shallower clay soils. Deep clay soils are not present near or within the site. While the site is clearly disturbed the local remnant trees adjacent to Stanhope Road are more consistent with STIF and less consistent with BGHF.

Paragraph six of the BGHF FD (Proposed Gazettal date 14/10/11) includes the following text:

> *'Blue Gum High Forest is typically associated with soils derived from Wianamatta Shale (Tozer 2003), though may occur in adjacent areas underlain by Hawkesbury Sandstone. The community also occurs on soils associated with localised volcanic intrusions, 'diatremes' (Benson and Howell 1994). Typically, Blue Gum High Forest occurs more than 100m above sea level, where rainfall exceeds 1050 mm per annum, although it may be present in sheltered locations with lower rainfall (Tozer 2003). In drier areas and approaching the shale/sandstone boundary, it intergrades with Sydney Turpentine Ironbark Forest, which is currently listed as an Endangered Ecological Community under the TSC Act. Stands that exhibit intermediate characteristics are collectively covered by the Determinations of these communities and may be diagnosed by detailed consideration of the assemblage of species present at the site.'*

In areas nearby where BGHF and STIF occur near to each other it is highly likely that both communities receive similar rainfall. The local distribution of BGHF and STIF is more likely to be correlated with soil factors. Blue Gum High Forest can occur on soils that are underlain by Hawkesbury sandstone. However, Benson and Howell (1990) state that BGHF is more common on deep soils. Therefore, it is likely that BGHF occurs above sandstone when soils are deep. As stated above STIF is more likely to occur near the shale/sandstone boundary. While it is not explicitly included in the BGHF FD, it can be assumed that clay soils derived from Wianamatta shale are likely to be shallower near the shale/sandstone boundary.

EHG biodiversity technical comments

> *If the upper stratum of BGHF was sparse or absent, then the final determination states that the relatively diverse stratum of small trees including Pittosporum undulatum, Elaeocarpus reticulatus and Allocasuarina torulosa is usually present, all of which are found on the site.*

ELA response

It is acknowledged that paragraph four (4) of the Blue Gum High Forest Final Determination proposed Gazettal date: 14 October 2011 includes the following sentence:

> *'A relatively diverse stratum of small trees is usually present, and includes Pittosporum undulatum (Sweet Pittosporum), Elaeocarpus reticulatus (Blueberry Ash) and Allocasuarina torulosa (Forest Oak).'*

The Final Determination for Sydney Turpentine-Ironbark Forest (Proposed Publication date 31/05/19) includes the following sentence in paragraph 4.1:

> *'STIF is frequently characterised by a stratum of smaller trees which, in addition to saplings of the species listed above, is dominated by species such as Pittosporum undulatum, Acacia parramattensis, Allocasuarina torulosa and Elaeocarpus reticulatus (Tozer et al. 2010).'*

The extracts above from both Final Determinations provide similar information. Thus the presence of these tree species cannot be easily used to decide whether BGHF or STIF is present.

EHG biodiversity technical comments

> *The ELA report states "Quantitative analysis was completed, using the Hager/Steenebeeke 2010 analysis excel spreadsheet for each vegetation integrity plot to determine the best fit PCT using standardised ratio comparison positive native to total native score. This analysis uses the diagnostic species as described by Tozer (2003) and Tozer (2010)." The ELA report has included many discussion points in regard to the analysis of plot data in both the Hager/Steenebeeke excel spreadsheet and the PCT filter tool. The use of the Hager/Steenebeeke tool and the PCT filter tool can be limited on sites which have high levels of disturbance. The reliance on meeting the number of positive diagnostic species to identify the best-fit PCT (e.g. Appendix B of the ELA report for Plot 1), may not be justified given the level of disturbance. While the analysis of species presence and their dominance can assist in assigning the likely best-fit PCT, total numbers of positive diagnostic species aren't always the best indicator, especially when the numbers of positive diagnostic species are so close between PCTs. EHGs advice dated 29 July 2023 has highlighted that the number of positive diagnostic species present on the site is only one component of the analysis for assigning the best-fit PCT. Section 4.2.3.2 of the revised BDAR notes this limitation in the use of positive diagnostic species saying "As can be seen in Table 21 and Table 25, the constituent species in both PCTs are very similar and in the absence of diverse and an abundance of shrub and ground layer species, the use of analytical tools such as the Vegetation classification database PCT filter tool (refer Section 2.2.5) and Hager and Steenbeeke tool used by ELA, are limited."*

ELA response

The analysis of PCT *descriptive attributes* provide additional information about whether a PCT is present in an area. PCT3136 Blue Gum High Forest includes the following descriptive attribute: '*it* [PCT3136 Blue Gum High Forest] *grades into tall forests PCT 3262* [STIF] *on thinner shale soils that adjoin*'

The soils on or near the site are relatively thin clay soils or alternatively sandy soils. None of the soils are typical of the soils associated with PCT3136 Blue Gum High Forest.

EHG biodiversity technical comments

> *The ELA report compares the results of using both the Hager/Steenebeeke tool and the PCT filter tool. The differences in number of positive diagnostic species between the use of the two tools may indicate that the use of older tools such as the Hager/Steenebeeke tool is based on PCT analysis that is outdated.*

ELA response

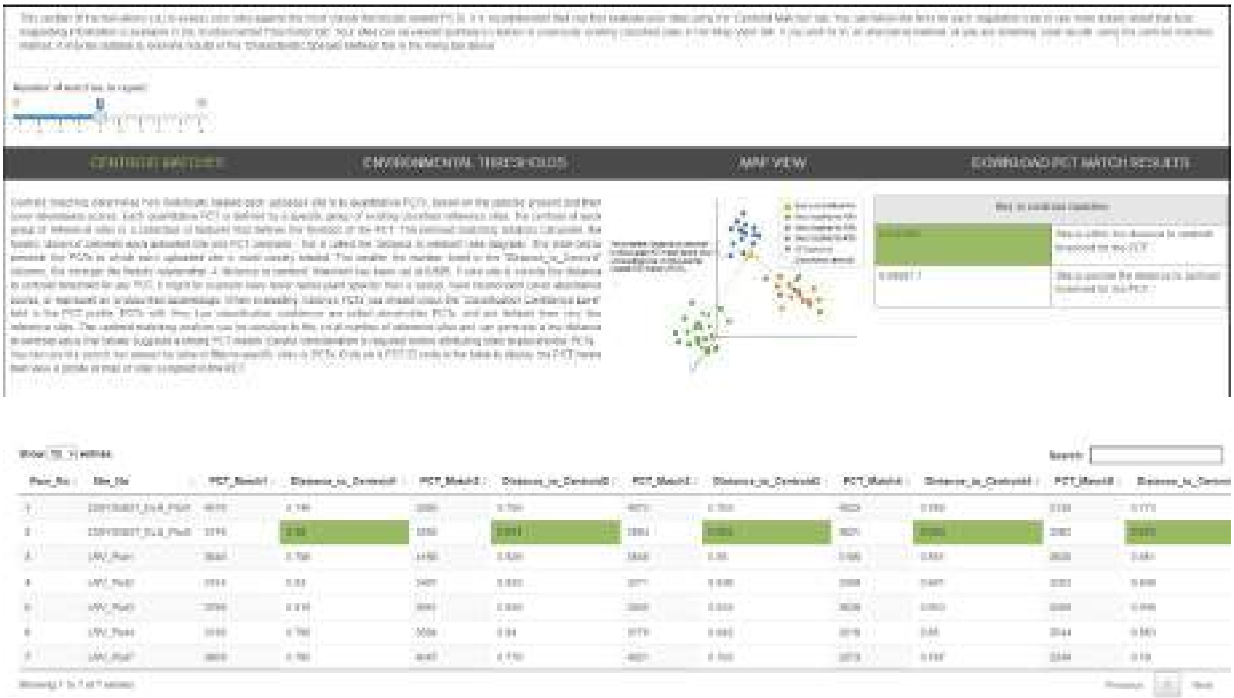
The Hager / Steenbeeke tool relies on a method similar to methods described in Tozer (2003) and Tozer *et al.* (2010). The PCT filter tool has was suggested as a suitable tool during the accreditation training process for BAM accredited assessors.

While at least one newer method of assigning plot data to PCT is available, namely the *Plot to PCT Assignment Tool* (Department of Planning and Environment 2022), it is unclear if the tool is an improvement on older methods. Representatives of the NSW government provided a presentation of the tool in at the NSW ECA conference in Wollongong in 2022. The author of this letter (DM) asked representatives of the NSW government about the tool during the NSW ECA conference held at Wollongong in 2022. Representatives of the NSW government stated that the *Plot to PCT Assignment Tool* was an alternative option for selecting PCTs, it was not necessarily an improved option. The document *Plot to PCT Assignment Tool User Guide* also does not state that the *Plot to PCT Assignment Tool* is an improved option.

Additionally, the *Plot to PCT Assignment Tool* relies on plant species (floristic) data and may potentially suffer from the same weakness associated with other quantitative floristic methods.

Nevertheless, the Plot to PCT Assignment Tool has been used to analyse the plot data collected from on or near to the site by ELA and ACS/Ecologique. The Plot to PCT Assignment Tool provides various outputs. Results of two of the main analyses are shown and discussed below.

Output from Centroid Matches Plot to PCT Tool (First Seven Plots)



A key feature of the Centroid Plot to PCT Tool is the shading of the cells. Green shaded 'Distance to Centroid' cells indicate that there is a reasonable level of statistical confidence associated with PCT matches. White shaded 'Distance to Centroid' cells indicate that there is a lower level of confidence associated with any PCT match.

The only Plot in the above Figure to generate green shaded cells is ELA Plot 2, the plot located in bushland south of the site. The Distance to Centroid cells for the other six plots generated plots with white shaded cells. The likely reason that ELA Plot 2 generated green shaded cells is that the number of NSW native species recorded in the plot was reasonably high. The number of NSW native species recorded in all other plots was significantly lower.

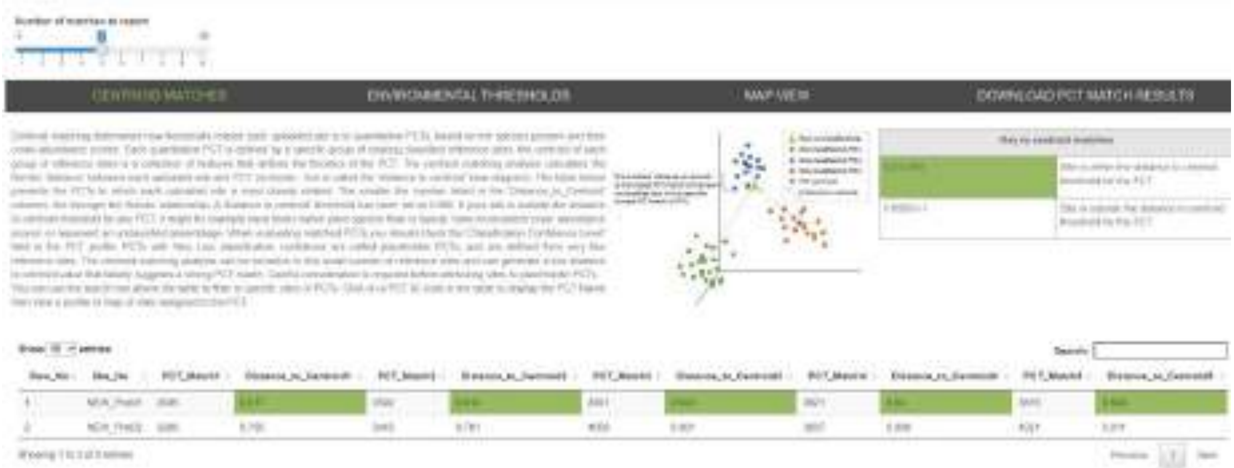
Output of the Characteristic Species Method (First seven plots)

It is important to note as stated above 'The characteristic species method is still under development.' The listed PCT matches for ELA Plot 2 were similar regardless of whether the Centroid Method or the Characteristic species method was used. In contrast, there was significantly less consistency between both methods for the PCT matches analysis of the other plots.

Two additional Plots surveyed by ELA on Tuesday 5 September 2023

ELA surveyed two additional plots on 5 September 2023. One plot was south-east of the site in relatively undisturbed bushland. A second plot was surveyed in the vegetation adjacent to Stanhope Road, east of the previous plot surveyed by ELA. ACS and Ecologique assisted in the field survey work for the plot adjacent to Stanhope Road. The results of the Plot to PCT analysis for these two plots are presented below.

Output from the Centroid Matches analysis (two new plots)



The only Plot in the above Figure to generate green shaded cells is the new ELA Plot 1, the plot located in bushland south-east of the site. The Distance to Centroid cells for the other plot generated white

shaded cells. The likely reason that the new ELA Plot 1 generated green shaded cells is that the number of NSW native species recorded in the plot was reasonably high. The number of NSW native species recorded in new plot 2 was significantly lower.

Output from the characteristic species analysis (Two new plots)

There was less similarity between the output of the distance to centroid and characteristic species match for this second round of analysis. However, the pattern that plots with a greater number of NSW native species generate more similar results for both the distance to centroid and characteristic species analysis is still present.

The less reliability of the Plot to PCT Tool for the analysis of disturbed plots provides support for the use of descriptive attributes to assist in the decision about which PCT is present on a site.

Section 2.2 from the *Plot to PCT Assignment Tool User Guide* states:

> *Where possible within other constraints sites should: be located in least-disturbed available vegetation, avoid obvious ecotones, use an acceptable method for choice of precise start point for the quadrat (e.g. section 4.3.4 (3) in DPIE 2020), be surveyed in suitable seasons when most plants have identifiable material.*

ELA agree the site is disturbed and that ideally plots (quadrats) should be located in relatively undisturbed bushland. Unfortunately, the site offered little if any areas of undisturbed bushland within the site boundaries.

EHG biodiversity technical comments

> *Even if PCT 3592 Sydney Coastal Enriched Sandstone Forest was present within Plot 2 in the ELA Report, the plot is outside of the subject site. The plot is located downslope of the site and could reasonably be argued to show a transition area between any TEC's on the site and adjoining area. EHG considers that the plot doesn't necessarily provide data that should be used to draw conclusions in regard to vegetation found on the site.*

ELA response

It is agreed that vegetation not on the same contour is more likely to differ from vegetation on the same contour. There was no opportunity to assess undisturbed vegetation on the same contour directly adjacent to the site. It is believed that while an assessment of vegetation on a different contour is of less value, it still generates information that may assist in understanding the vegetation on the site.

Regards,

Daniel McDonald
Principal Ecologist and Senior Arborist

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JK Geotechnics (29 September 2022) Report to Stockland on Preliminary Geotechnical Investigation for Proposed Redevelopment at Lourdes Retirement Village, 95 Stanhope Road, Killara, NSW. Ref: 34446Arpt.

Appendix I. Lourdes Retirement Village Arborist Report Rev E

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Arboricultural Impact Appraisal and Method Statement

(Revision E)

95 Stanhope Road
Killara, NSW

Prepared for
Lourdes Retirement Village

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25 September 2023

by Andrew Scales
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Summary

The proposed development is to demolish a number of single and two-story buildings and replace them with a number of multi-story buildings and a single-story chapel. The proposed development also involves the re-arrangement of some of the surrounding roadways and associated services. I have inspected all the trees that could be affected and list their details in Appendix 2. Based on this information, I provided guidance to project architect on the constraints these trees impose on the use of the site.

Forty-nine high category trees and one hundred and thirty-eight low category trees will be lost because of this proposal. However, sixty-nine of the low category trees are exempt from Ku-Ring-Gai Council's Tree Preservation Order and a comprehensive landscaping scheme to mitigate these losses is proposed that will include the planting of new trees.

The proposed changes may adversely affect a further one hundred and fourteen high category trees and seventy-seven low category trees if appropriate protective measures are not taken. However, if adequate precautions to protect the retained trees are specified and implemented through the arboricultural method statement included in this report, the development proposal is expected to have a moderate to high impact on the contribution of trees to local amenity or character.

Table of Contents

Appendices

1. INTRODUCTION

1.1 **Instruction:** I am instructed by Levande Lourdes to inspect the tree population at 95 Stanhope Road, Killara and to provide an arboricultural report to accompany a development application. This report investigates the impact of the proposed development on trees and provides the following guidelines for appropriate tree management and protective measures:

- a schedule of the relevant trees to include basic data and a condition assessment;
- an appraisal of the impact of the proposal on trees and any resulting impact that has on local character and amenity;
- a preliminary arboricultural method statement setting out appropriate protective measures and management for trees to be retained

1.2 **Purpose of this report**: This report provides an analysis of the impact of the development proposal on trees with additional guidance on appropriate management and protective measures. Its primary purpose is for the council to review the tree information in support of the planning submission and use as the basis for issuing a planning consent or engaging in further discussions towards that end. Within this planning process, it will be available for inspection by people other than tree experts, so the information is presented to be helpful to those without a detailed knowledge of the subject.

1.3 **Qualifications and experience:** I have based this report on my site observations and the provided information, and I have come to conclusions in the light of my experience. I have experience and qualifications in arboriculture and include a summary in Appendix 1.

1.4 **Documents and information provided:** Levande Lourdes provided me with copies of the following documents:

- Survey Plan, Dwg No. 21388 (Sheet S1 to S11), by Norton Survey Partners dated 22 April 2015;
- Ground Floor Plan by Plus Architecture dated 25 September 2023; and
- Lower Ground Plan by Plus Architecture dated 20 September 2023.

1.5 **Scope of this report:** This report is only concerned with three hundred and seventy-nine trees located within and adjacent to the subject site. It takes no account of other trees, shrubs or groundcovers within the site unless stated otherwise. It includes a preliminary assessment based on the site visit and the documents provided, listed in 1.4 above.

2. THE LAYOUT DESIGN

2.1 **Tree AZ method of tree assessment:** The TreeAZ assessment method determines the worthiness of trees in the planning process. TreeAZ is based on a systematic method of assessing whether individual trees are important and how much weight they should be given in management considerations. Simplistically, trees assessed as potentially important are categorised as '**A**' and those assessed as less important are categorised as '**Z**'. Further explanation of TreeAZ can be found in Appendix 3.

In the context of new development, all the Z trees are discounted as a material constraint in layout design. All the A trees are potentially important and they dictate the design constraints. This relatively simple constraints information is suitable for use by the architect to optimise the retention of the best trees in the context of other material considerations.

2.2 Site visit and collection of data

2.2.1 **Site visit:** I carried out an unaccompanied site visit on 24 May 2021 and 28 March 2023. All my observations were from ground level and I estimated all dimensions unless otherwise indicated. Aerial inspections, root or soil analysis, exploratory root trenching and internal diagnostic testing was not undertaken as part of this assessment. I did not have access to trees on other private properties and have confined observations of them to what was visible from within the property. The weather at the time of inspection was clear and dry with good visibility.

2.2.2 **Brief site description:** 95 Stanhope Road is located in the residential suburb of Killara (refer figure 1). The site is on the southern side of the road and surrounded by residential development. The property consists of the existing Lourdes Retirement Village that is currently occupied. A variety of ornamental, coniferous and local indigenous trees are scattered throughout the site and around the site boundaries.

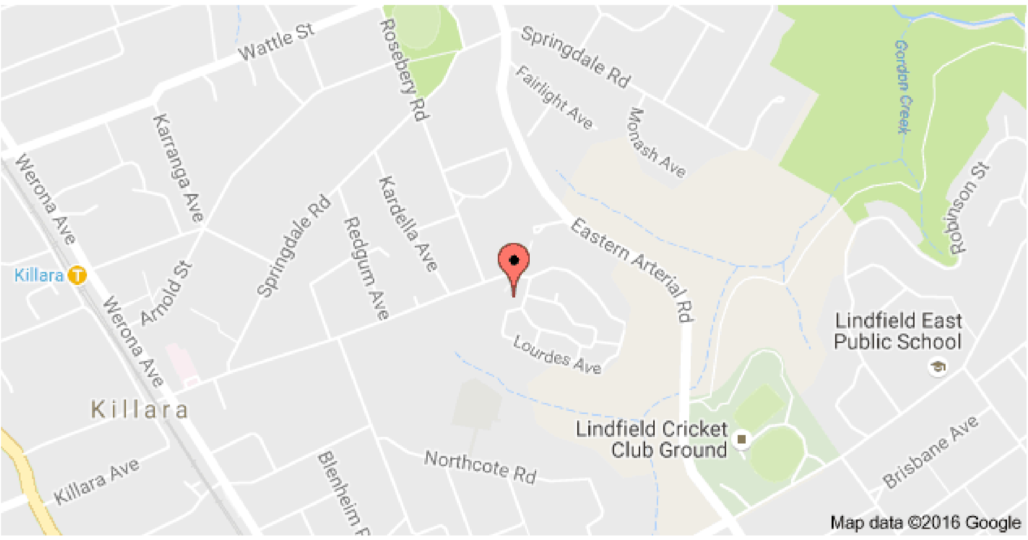

Figure 1: The location of the subject site (www.googlemaps.com).

2.2.3 **Collection of basic data:** I inspected each tree and have collected information on species, height, diameter, maturity and potential for contribution to amenity in a development context. I have recorded this information in the tree schedule included, with explanatory notes, in Appendix 2. Each tree was then allocated to one of four categories (**AA**, **A**, **Z** or **ZZ**), which reflected its suitability as a material constraint on development.

2.2.4 **Identification and location of the trees:** I have illustrated the locations of the significant trees on the Tree Management Plan (Plan TMP01) included as Appendix 8. This plan is for illustrative purposes only and it should not be used for directly scaling measurements.

2.2.5 **Advanced interpretation of data:** Australian Standard *Protection of trees on development sites* (AS4970-2009), recommends that the trunk diameter measurement for each tree is used to calculate the tree protection zone (TPZ), which can then be interpreted to identify the design constraints and, once a layout has been consented, the exclusion zone is to be protected by barriers.

2.2.6 **Plan updates:** During my site visit, I noted five trees (Trees 121, 175, 176, 200 and 236) that were not shown on the land survey. I have illustrated their approximate locations on plan TMP01 but these positions have not been accurately surveyed. I do not consider that this has affected the conclusions of this report but if their locations are considered important, they should be accurately surveyed. Additionally, a number of trees were no longer present on site and have been removed from the plan.

2.3 **The use of the tree information in layout design:** Following my inspection of the trees, the information listed in Appendix 2 was used to provide constraints guidance based on the locations of all the A trees. All the Z trees were discounted because they were not considered worthy of being a material constraint. This guidance identified two zones of constraint based on the following considerations:

- **The tree protection zone** (TPZ) is an area where ground disturbance must be carefully controlled. The TPZ was established according to the recommendations set out in AS4970-2009 and is the radial offset distance of twelve (x12) times the trunk diameter. In principle, a maximum encroachment of 10% is acceptable within the TPZ and a high level of care is needed during any activities that are authorised within it if important trees are to be successfully retained.

- **The structural root zone** (SRZ) is a radial distance from the centre of a tree's trunk, where it is likely that structural, woody roots would be encountered. The distance is calculated on trunk flare diameter at ground level. The SRZ may also be influenced by natural or built structures, such as rocks and footings. The SRZ only needs to be calculated when major encroachment (>10%) into a TPZ is proposed.

3. ARBORICULTURAL IMPACT APPRAISAL

3.1 **Summary of the impact on trees:** I have assessed the impact of the proposal on trees by the extent of disturbance in TPZs and the encroachment of structures into the SRZ (as set out briefly in 2.3 above and more extensively in Appendix 2). All the trees that may be affected by the development proposal are listed in Table 1

Table 1: Summary of existing trees and trees that may be affected by development

Impact	Reason	Important trees		Unimportant trees	
		AA	A	Z	ZZ
Retained trees that may be affected through disturbance to TPZs	Removal of existing surfacing/structures/ landscaping and/or installation of new surfacing/structures/ landscaping	TOTAL 22	TOTAL 92	TOTAL 67	TOTAL 10
Trees to be removed	Building and civil construction and/or level variations within TPZ	TOTAL 1	TOTAL 49	TOTAL 115	TOTAL 23

3.2 **Detailed impact appraisal**

3.2.1 **Category AA and A trees to be removed:** The proposed development will necessitate the removal of forty-nine high category trees. These trees will be directly or indirectly impacted by the proposed works and are considered moderate to high significance with good health and condition. In order to compensate for loss of amenity, consideration should be given to replacement planting within the site.

3.2.2 **Category AA and A trees that could potentially be adversely affected through TPZ disturbance:** One hundred and fourteen category A and AA trees could potentially be adversely affected through disturbance to their TPZs as follows:

- **Trees 8, 9, 10, 22, 25, 32, 41, 46, 60, 103, 108, 118, 123, 124, 125, 165, 175, 176, 189, 196, 201, 231, 232, 262, 263, 264, 280, 283, 284, 286, 288, 296, 297, 309, 319, 320, 322, 323, 325, 332, 326, 327, 338, 358, 368, 369 and 371:** These are important trees with a high potential to contribute to amenity so any adverse impacts on them should be minimised. The proposed demolition and construction works will come within close proximity to these and will cause harm if not carried out with care. I have reviewed the situation carefully and my experience is that these trees could be successfully retained without any adverse effects if appropriate protective measures are properly specified and controlled through a detailed arboricultural method statement.

- **Trees 244 and 252:** These are important trees with a high potential to contribute to amenity so any adverse impacts on them should be minimised. The proposed demolition and construction works will come within close proximity to these trees and will cause harm if not carried out with care. It is highly unlikely these trees can be successfully retained long-term due to the foreseen disturbance during construction. If it is intended to retain these trees, all existing ground levels would be required to remain within their TPZ to avoid severance of structural roots. Appropriate protective measures are to be properly specified and controlled through the detailed arboricultural method statement.

- **The Remaining Trees:** The remaining high category trees are positioned away from the proposed development. Although, the changes may cause harm if not carried out with care, I have reviewed the situation carefully and my experience is that these trees could be successfully retained without any adverse effects if appropriate protective measures are properly specified and controlled through a detailed arboricultural method statement.

3.2.3 **Low category trees to be retained:** Seventy-seven low category trees remain outside the works areas and can be retained successfully retained without any adverse effects if appropriate protective measures are properly specified and controlled through a detailed arboricultural method statement.

3.2.4 **Low category trees to be removed:** The proposed development will necessitate the removal of one hundred and thirty-eight trees of low and very low retention value. None of these trees are considered significant or worthy of special measures to ensure their preservation. It should be noted that Trees 2, 15, 23, 35, 49, 50, 51, 76, 85, 87, 88, 91, 92, 93, 94, 98, 99, 100, 130, 132, 134, 143, 145–161, 171, 188, 191, 207, 209, 210, 214, 215, 216, 217, 220–228, 234, 235, 247, 250, 251, 254, 255, 260, 270, 293, 330 and 331 are exempt from Ku-Ring-Gai Council's Tree Preservation Order.

3.3 Proposals to mitigate any impact

3.3.1 **Protection of retained trees:** The successful retention of trees within the site will depend on the quality of the protection and the administrative procedures to ensure protective measures remain in place throughout the development. An effective way of doing this is through an arboricultural method statement that can be specifically referred to in the planning condition. An arboricultural method statement for this site is set out in detail in Section 4.

3.3.2 **New planting:** In the context of the loss of trees, a comprehensive new landscaping scheme is proposed including semi-mature trees to be planted within available areas in prominent locations. The new trees should have the potential to reach a significant height without excessive inconvenience and be sustainable into the long term, significantly improving the potential of the site to contribute to local amenity and character.

3.3.3 **Summary of the impact on local amenity:** Forty-nine high category trees and one hundred and thirty-eight low category trees will be lost because of this proposal. However, sixty-nine of the low category trees are exempt from Ku-Ring-Gai Council's Tree Preservation Order and a comprehensive landscaping scheme to mitigate these losses is proposed that will include the planting of new trees. The proposed changes may adversely affect a further one hundred and fourteen high category trees and seventy-seven low category trees if appropriate protective measures are not taken. However, if adequate precautions to protect the retained trees are specified and implemented through the arboricultural method statement included in this report, the development proposal is expected to have a moderate to high impact on the contribution of trees to local amenity or character.

4. ARBORICULTURAL METHOD STATEMENT

4.1 Introduction

4.1.1 **Terms of reference:** The impact appraisal in Section 3 identified the potential impacts on trees caused by proposed development. Section 4 is an arboricultural method statement setting out management and protection details that must be implemented to secure successful tree retention. It has evolved from Australian Standard AS4970-2009 *Protection of trees on development sites*.

4.1.2 **Plan TMP01:** Plan TMP01 in Appendix 8 is illustrative and based entirely on provided information. This plan should only be used for dealing with the tree issues and all scaled measurements must be checked against the original submission documents. The precise location of all protective measures must be confirmed at the pre-commencement meeting before any demolition or construction activity starts. Its base is the existing land survey, which has the proposed layout superimposed so the two can be easily compared. It shows the existing trees numbered, with high categories (A) highlighted in green triangles and low categories (Z) highlighted in blue rectangles. It also shows the locations of the proposed protective measures.

4.2 Tree protection with fencing and ground protection

4.2.1 **Protection fencing:** Tree protection fencing must comply with AS4970 (section 4.3) recommendations. An illustrative guide is included as Appendix 4. The approximate location of the barriers and the TPZs is illustrated on plan TMP01. The precise location of the fencing must be agreed with the project Arborist before any development activity starts.

4.2.2 **Ground protection:** Any TPZs outside the protective fencing must be covered in ground protection based on AS4970 recommendations until there is no risk of damage from the demolition and construction activity. An illustrative specification for this ground protection is included as Appendix 5. On this site, it must be installed near retained trees as illustrated on plan TMP01 before any demolition and construction starts.

4.3 **Precautions when working in TPZs:** Any work in TPZs must be done with care as set out in Appendix 6. On this site, special precautions must be taken near the trees that are in close proximity to the development of the buildings and new roadways as illustrated on plan TMP01 and summarised below:

- **Removal of existing surfacing/structures and replacement with new surfacing/structures:** Retained trees, including Trees 8, 9, 10, 22, 25, 32, 41, 46, 60, 103, 108, 118, 123, 124, 125, 165, 175, 176, 189, 196, 201, 231, 232, 244, 252, 262, 263, 264, 280, 283, 284, 286, 288, 296, 297, 309, 319, 320, 322, 323, 325, 332, 326, 327, 338, 358, 368, 369 and 371, may be adversely affected by the demolition and construction works or the installation of a small area of new surfacing. Any adverse impact must be minimised by following the guidance set out in Appendix 6.

- **Installation of new soft landscaping:** All landscaping activity within TPZs has the potential to cause severe damage and any adverse impact must be minimised by following the guidance set out in Section 7 of Appendix 6.

- **Installation of new services or upgrading of existing services:** It is often difficult to clearly establish the detail of services until the construction is in progress. Where possible, it is proposed to use the existing services into the site and keep all new services outside TPZs. However, where existing services within TPZs require upgrading or new services have to be installed in TPZs, great care must be taken to minimise any disturbance. Trenchless installation should be the preferred option but if that is not feasible, any excavation must be carried out by hand according to the guidelines set out in Section 6 of Appendix 6. If services do need to be installed within TPZs, consultation must be obtained from the project Arborist and/or council before any works are carried out.

- **Damage to street trees:** Any damage to street trees as a result of erection of hoardings, scaffolding or due to the loading/unloading of vehicles adjacent the site must be immediately reported to the Council's Street Tree Contract Coordinator, in order to determine the appropriate action for maintaining the health and structural integrity of any damaged street tree.

4.4 Other tree related works

4.4.1 **Site storage, cement mixing and washing points:** All site storage areas, cement mixing and washing points for equipment and vehicles must be outside TPZs unless otherwise agreed with the project Arborist and/or council. Where there is a risk of polluted water run off into TPZs, heavy-duty plastic sheeting and sandbags must be used to contain spillages and prevent contamination.

4.4.2 **Pruning:** Any pruning that is required to accommodate hoardings, scaffolding or to accommodate the unloading/loading of vehicles and has been approved by Council shall be carried out by a qualified Arborist (AQF3) and must be in accordance with AS4373 Australian Standards 'Pruning of Amenity Trees'.

4.5 Programme of tree protection and supervision

4.5.1 **Overview:** Tree protection cannot be reliably implemented without arboricultural input. The nature and extent of that input varies according to the complexity of the issues and the resources available on site. For this site, a summary of the level of arboricultural input that is likely to be required is set out in Appendix 7. The project arborist must be instructed to work within this framework to oversee the implementation of the protective measures and management proposals set out in this arboricultural method statement.

The framework in Appendix 7 must form the basis for the discharge of planning conditions through site visits by the project arborist. These supervisory actions must be confirmed by formal letters circulated to all relevant parties. These permanent records of each site visit will accumulate to provide the proof of compliance and allow conditions to be discharged as the development progresses. The developer must instruct the project arborist to comply with the supervision requirements set out in this document before any work begins on site.

4.5.2 **Phasing of arboricultural input:** Trees can only be properly budgeted for and factored into the developing work programmes if the overall project management takes full account of tree issues once consent is confirmed. The project arborist must be involved in the following phases of the project management:

1. **Administrative preparation before work starts on site:** It is normal for a development proposal to vary considerably from the expectations before consent as the detailed planning of implementation evolves. The early instruction of the project arborist ensures that tree issues are factored into the complexities of site management and can often help ease site pressures through creative approaches to tree protection. Pre-commencement discussions between the project arborist and the developer's team is an effective means of managing the tree issues with difficult constraints.

2. **Pre-commencement site meeting:** A pre-commencement meeting must be held on site before any of the demolition and construction work begins. This must be attended by the site manager and the project arborist. Any clarifications or modifications to the consented details must be recorded and circulated to all parties in writing. This meeting is where the details of the programme of tree protection will be agreed and finalised by all parties, which will then form the basis of any supervision arrangements between the project arborist and the developer.

3. **Site supervision:** Once the site is active, the project arborist must visit at an interval agreed at the pre-commencement site meeting. The supervision arrangement must be sufficiently flexible to allow the supervision of all sensitive works as they occur. The project arborist's initial role is to liaise with developer to ensure that appropriate protective measures are designed and in place before any works start on site. Once the site is working, that role will switch to monitoring compliance with arboricultural conditions and advising on any tree problems that arise or modifications that become necessary.

4.6 **Site management:** It is the developer's responsibility to ensure that the details of this arboricultural method statement and any agreed amendments are known and understood by all site personnel. Copies of the agreed documents must be kept on site at all times and the site manager must brief all personnel who could have an impact on trees on the specific tree protection requirements. This must be a part of the site induction procedures and written into appropriate site management documents.

5. HOW TO USE THIS REPORT

5.1 **Limitations:** It is common that the detail of logistical issues such as site storage and the build programme are not finalised until after consent is issued. As this report has been prepared in advance of consent, some of its content may need to be updated as more detailed information becomes available once the post-consent project management starts. Although this document will remain the primary reference in the event of any disputes, some of its content may be superseded by authorised post-consent amendments.

5.2 **Suggestions for the effective use of this report:** Section 4 of this report, including the relevant appendices, is designed as an enforcement reference. It is constructed so the council can directly reference the detail in a planning condition. Referencing the report by name and relating conditions to specific subsections is an effective means of reducing confusion and facilitating enforcement in the event of problems during implementation. More specifically, the following issues should be directly referenced in the conditions for this site:

1. Pre-commencement meeting	4.5
2. Protection fence	4.2.1 and Appendix 4
3. Ground protection	4.2.2 and Appendix 5
4. Removal of surfacing/structures	4.3 and Appendix 6 (Section 4)
5. Installation of surfacing/structures	4.3 and Appendices 6 (Section 5)
6. Services	4.3 and Appendix 6 (Section 6)
7. Landscaping	4.3 and Appendix 6 (Section 7)
8. Programming of tree protection	4.5 and Appendix 7
9. Arboricultural supervision	4.5 and Appendix 7

Each of the above matters shall be supervised by the project arborist and the relevant conditions can only be discharged once that supervision has been confirmed in writing to the relevant parties. The last column of the table in Appendix 7 is to be used so that the various supervision issues can be recorded as they are confirmed by supervision letters. It is intended to act as a summary quick reference to help keep track of the progress of the supervision.

6. OTHER CONSIDERATIONS

6.1 **Trees subject to statutory controls:** The subject trees (excluding Trees 2, 15, 23, 35, 49, 50, 51, 76, 85, 87, 88, 91, 92, 93, 94, 98, 99, 100, 130, 132, 134, 143, 145–161, 171, 188, 191, 207, 209, 210, 214, 215, 216, 217, 220–228, 234, 235, 247, 250, 251, 254, 255, 260, 270, 293, 330 and 331) are legally protected under Ku-ring-gai Council's Tree Preservation Order, it will be necessary to consult the council before any pruning or removal works other than certain exemptions can be carried out. The works specified above are necessary for reasonable management and should be acceptable to the council. However, tree owners should appreciate that the council may take an alternative point of view and have the option to refuse consent.

6.2 **Trees outside the property:** Trees located in the adjacent properties effectively out of the control of the owners of 95 Stanhope Road, Killara. It will not be possible to easily carry out the recommended works without the full co-operation of the tree owners. The implications of non-cooperation require legal interpretation and are beyond the scope of this report.

7. BIBLIOGRAPHY

7.1 **List of references:**

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Kangaroo Press, Kenthurst NSW

8. DISCLAIMER

8.1 Limitations on use of this report:

This report is to be utilized in its entirety only. Any written or verbal submission, report or presentation that includes statements taken from the findings, discussions, conclusions or recommendations made in this report, may only be used where the whole of the original report (or a copy) is referenced in, and directly attached to that submission, report or presentation.

ASSUMPTIONS

Care has been taken to obtain all information from reliable sources. All data has been verified insofar as possible: however, Naturally Trees can neither guarantee nor be responsible for the accuracy of information provided by others.

Unless stated otherwise:

- *Information contained in this report covers only those trees that were examined and reflects the condition of those trees at time of inspection: and*
- *The inspection was limited to visual examination of the subject trees without dissection, excavation, probing or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject trees may not arise in the future.*

Yours sincerely

Andrew Scales
Dip. Horticulture
Dip. Arboriculture AQF5

APPENDIX 1

Brief qualifications and experience of Andrew Scales

1. Qualifications:

Associate Diploma Horticulture	Northern Sydney Institute of TAFE	1998
Certificate in Tree Surgery	Northern Sydney Institute of TAFE	1998
Diploma of Horticulture (Arboriculture)	Northern Sydney Institute of TAFE	2006
Diploma of Arboriculture AQF5	Northern Sydney Institute of TAFE	2019

2. Practical experience:

Practical experience: Being involved in the arboricultural/horticultural industry for in excess of 20 years, I have developed skills and expertise recognized in the industry. Involvement in the construction industry and tertiary studies has provided me with a good knowledge of tree requirements within construction sites.

As director of Naturally Trees, in this year alone I have undertaken hundreds of arboricultural consultancy projects and have been engaged by a range of clients to undertake tree assessments. I have gained a wide range of practical tree knowledge through tree removal and pruning works.

3. Continuing professional development:

Visual Tree Assessment (Prof. Dr. Claus Mattheck)	Northern Sydney Institute of TAFE 2001
Wood Decay in Trees (F.W.M.R.Schwarze)	Northern Sydney Institute of TAFE 2004
Visual Tree Assessment (Prof. Dr. Claus Mattheck)	Carlton Hotel, Parramatta NSW 2004
Tree A-Z / Report Writing (Jeremy Barrell)	Northern Sydney Institute of TAFE 2006
Up by Roots – Healthy Soils and Trees in the Built Environment (James Urban)	The Sebel Parramatta NSW 2008
Tree Injection for Insect Control (Statement of Attainment)	Northern Sydney Institute of TAFE 2008
Quantified Tree Risk Assessment (QTRA) Registered Licensee #1655	South Western Sydney Institute TAFE 2011
Practitioners Guide to Visual Tree Assessment	South Western Sydney Institute TAFE 2011
Quantified Tree Risk Assessment (QTRA) Registered Licensee #1655	Richmond College NSW TAFE 2014
VALID Approach to Likelihood of Failure (David Evans)	Centennial Park NSW 2017

APPENDIX 2

Tree schedule

NOTE: Colour annotation is AA & A trees with green background; Z & ZZ trees with blue background; trees to be removed in red text.

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
1	*Cedrus deodara*	12	9	500	**6**	80%	M	Nil	Grass	Nil	M	**A1**
2	*Acer negundo*	4	3	200	**2.4**	70%	S	Topped	Garden bed	Adjacent building	L	**Z3**
4	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
5	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
7	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Co-dominant	Garden bed	Nil	M	**A1**
8	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
9	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
10	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
11	*Phoenix canariensis*	8	5	500	**6**	90%	M	Nil	Garden bed	Nil	M	**A1**
12	*Phoenix canariensis*	8	5	500	**6**	90%	M	Nil	Garden bed	Nil	M	**A1**
13	*Phoenix canariensis*	8	5	500	**6**	90%	M	Nil	Garden bed	Nil	M	**A1**
14	*Phoenix canariensis*	8	5	500	**6**	90%	M	Nil	Garden bed	Nil	M	**A1**
15	*Acer negundo*	4	3	100	**1.2**	60%	S	Nil	Garden bed	Nil	L	**ZZ1**
16	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
17	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
18	*Araucaria heterophylla*	12	5	300	**3.6**	80%	S	Nil	Garden bed	Nil	M	**A1**
19	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
20	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
21	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
22	*Araucaria heterophylla*	20	9	500	**6**	80%	M	Nil	Garden bed	Nil	H	**A1**
23	*Gordonia axillaris*	4	4	100	**1.2**	70%	M	Nil	Grass	Nil	L	**Z1**
24	*Liquidambar styraciflua*	26	26	1200	**14.4**	80%	M	Lopped crown, Large epicormic growth	Grass	LV wires	H	**Z9**
25	*Corymbia gummifera*	12	5	300	**3.6**	70%	S	Nil	Garden bed	Nil	M	**A1**
26	*Araucaria heterophylla*	28	10	700	**8.4**	80%	M	Nil	Grass	Nil	H	**AA1**
27	*Magnolia grandiflora*	9	8	500	**6**	80%	M	Nil	Garden bed	Nil	M	**A1**
28	*Syncarpia glomulifera*	16	14	400	**4.8**	90%	M	Four similar trees	Garden bed	Nil	M	**A1**
29	*Phoenix canariensis*	8	5	500	**3**	90%	M	Nil	Garden bed	Nil	M	**A1**
30	*Araucaria heterophylla*	20	9	500	**6**	80%	M	Nil	Garden bed	Nil	H	**A1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
31	*Cupressus sp.*	18	9	700	**8.4**	50%	O	Major failure, Leaning	Garden bed	LV wires	M	**ZZ9**
32	*Corymbia gummifera*	8	5	300	**3.6**	80%	M	Nil	Grass	Nil	L	**A1**
33	*Melaleuca linariifolia*	8	6	300	**3.6**	80%	M	Nil	Grass	Nil	L	**A1**
34	*Corymbia gummifera*	9	5	300	**3.6**	80%	M	Nil	Grass	Nil	L	**A1**
35	*Olea europaea*	5	6	250	**3**	80%	M	Nil	Garden bed	Nil	L	**Z3**
37	*Jacaranda mimosifolia*	4	4	200	**2.4**	60%	S	Lopped under powerlines	Grass	LV wires	L	**ZZ9**
38	*Acacia baileyana*	4	3	150	**1.8**	50%	S	Lopped under powerlines, Borer	Grass	LV wires	L	**ZZ9**
39	*Corymbia gummifera*	7	8	300	**3.6**	70%	M	Lopped under powerlines	Grass	LV wires	M	**Z10**
40	*Eucalyptus robusta*	8	7	300	**3.6**	70%	M	Nil	Grass	Nil	L	**Z10**
41	*Melaleuca linariifolia*	8	6	300	**3.6**	80%	M	Nil	Grass	Nil	L	**A1**
42	*Eucalyptus robusta*	8	7	300	**3.6**	70%	M	Nil	Grass	Nil	L	**A1**
43	*Melaleuca linariifolia*	8	6	300	**3.6**	80%	M	Nil	Grass	Nil	L	**A1**
44	*Syncarpia glomulifera*	10	6	350	**4.2**	70%	M	Lopped central leader	Grass	Nil	M	**ZZ9**
45	*Pittosporum undulatum*	5	5	250	**3**	70%	M	Nil	Grass	Nil	L	**Z1**
46	*Syncarpia glomulifera*	12	10	400	**4.8**	80%	M	Nil	Grass	Underground services	M	**A1**
47	*Syncarpia glomulifera*	10	8	350	**4.2**	70%	M	Nil	Grass	Nil	M	**A1**
48	*Jacaranda mimosifolia*	5	3	100	**1.2**	70%	S	Nil	Garden bed	Nil	L	**Z1**
49	*Syagrus romanzoffiana*	9	3	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**Z10**
50	*Syagrus romanzoffiana*	9	3	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**Z10**
51	*Syagrus romanzoffiana*	9	3	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**Z10**
52	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
53	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
54	*Melaleuca quinquenervia*	6	3	200	**2.4**	80%	S	Nil	Garden bed	Nil	L	**Z1**
55	*Acer palmatum*	5	6	250	**3**	90%	M	Nil	Garden bed	Nil	L	**Z1**
56	*Jacaranda mimosifolia*	12	9	350	**4.2**	80%	M	Nil	Grass	Nil	M	**A1**
57	*Jacaranda mimosifolia*	10	7	300	**3.6**	80%	M	Nil	Grass	Nil	M	**A1**
59	*Araucaria heterophylla*	14	6	350	**4.2**	80%	M	Nil	Grass	Nil	M	**A1**
60	*Liquidambar styraciflua*	16	12	400	**4.8**	80%	M	Nil	Grass	Nil	M	**A1**
61	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
62	*Allocasuarina torulosa*	6	5	300	**3.6**	80%	M	Nil	Garden bed	Nil	L	**Z1**
63	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
64	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
65	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
66	*Pittosporum undulatum*	7	5	250	**3**	70%	M	Nil	Garden bed	Nil	L	**Z1**
67	*Eucalyptus pilularis*	20	20	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**AA1**
68	*Syzygium paniculatum*	7	5	250	**3**	80%	S	Nil	Garden bed	Adjacent structure	M	**Z1**
69	*Syzygium paniculatum*	7	5	250	**3**	80%	S	Nil	Garden bed	Adjacent structure	M	**Z1**
70	*Syzygium paniculatum*	7	5	250	**3**	80%	S	Nil	Garden bed	Adjacent structure	M	**Z1**
71	*Syzygium paniculatum*	7	5	250	**3**	80%	S	Nil	Garden bed	Adjacent structure	M	**Z1**
72	*Cupressus sp.*	14	9	400	**4.8**	80%	M	Co-dominant	Garden bed	Adjacent structure	M	**A1**
73	*Phoenix canariensis*	6	4	600	**7.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
74	*Corymbia citriodora*	12	6	300	**3.6**	80%	M	Nil	Garden bed	Nil	L	**A1**
75	*Melaleuca styphelioides*	7	5	250	**3**	70%	M	Nil	Garden bed	Nil	L	**Z1**
76	*Pittosporum undulatum*	3	3	100	**1.2**	50%	S	Borer, Failures throughout canopy	Garden bed	Nil	L	**ZZ10**
77	*Lophostemon confertus*	10	5	300	**3.6**	80%	M	Nil	Steep slope	Nil	M	**A1**
78	*Eucalyptus pilularis*	12	6	300	**3.6**	80%	M	Nil	Steep slope	Nil	M	**A1**
79	*Angophora costata*	14	7	350	**4.2**	80%	M	Nil	Steep slope	Nil	M	**A1**
80	*Angophora costata*	14	7	350	**4.2**	80%	M	Nil	Steep slope	Nil	M	**A1**
81	*Corymbia citriodora*	10	6	300	**3.6**	80%	M	Nil	Garden bed	Nil	L	**A1**
82	*Sapium sebiferum*	7	7	400	**4.8**	80%	M	Nil	Garden bed	Nil	M	**A1**
83	*Jacaranda mimosifolia*	10	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
84	*Jacaranda mimosifolia*	8	5	250	**3**	70%	M	Nil	Garden bed	Nil	L	**Z10**
85	*Camellia sp.*	3	3	100	**1.2**	80%	S	Nil	Garden bed	Nil	L	**Z1**
87	*Brugmansia sp.*	3	3	100	**1.2**	80%	M	Nil	Garden bed	Nil	L	**ZZ1**
88	*Melaleuca quinquenervia*	8	5	250	**3**	80%	S	Nil	Garden bed	Adjacent building	L	**Z10**
89	*Melaleuca quinquenervia*	12	8	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
90	*Phoenix canariensis*	8	7	600	**7.2**	90%	M	Nil	Grass	Nil	M	**A1**
91	*Callistemon sp.*	2	2	100	**1.2**	40%	S	Topped	Grass	Nil	L	**ZZ1**
92	*Callistemon sp.*	2	2	100	**1.2**	40%	S	Nil	Grass	Nil	L	**ZZ1**
93	*Prunus sp.*	3	3	100	**1.2**	70%	M	Nil	Grass	Nil	L	**ZZ1**
94	*Callistemon sp.*	4	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
95	*Robinia pseudoacacia*	9	9	300	**3.6**	70%	M	Co-dominant, Topped upper canopy	Grass	Nil	M	**Z9**
96	*Callistemon sp.*	5	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
97	*Callistemon sp.*	5	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
98	*Callistemon sp.*	4	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
99	*Callistemon sp.*	2	2	100	**1.2**	40%	S	Topped	Grass	Nil	L	**ZZ1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
100	*Callistemon sp.*	2	2	100	**1.2**	40%	S	Topped	Grass	Nil	L	**ZZ1**
101	*Sapium sebiferum*	9	7	250	**3**	80%	M	Nil	Grass	Nil	L	**Z10**
102	*Cupressus sp.*	12	10	400	**4.8**	80%	M	Nil	Garden bed	Nil	M	**A1**
103	*Angophora costata*	22	16	400	**4.8**	80%	M	Nil	Natural ground	Nil	H	**AA1**
104	*Acer palmatum*	3	4	100	**1.2**	80%	M	Nil	Garden bed	Nil	L	**Z1**
105	*Melaleuca quinquenervia*	8	8	350	**4.2**	90%	M	Nil	Garden bed	Nil	M	**A1**
106	*Melaleuca armillaris*	9	8	250	**3**	80%	M	Nil	Garden bed	Nil	M	**A1**
107	*Melaleuca quinquenervia*	12	8	400	**4.8**	80%	M	Nil	Garden bed	Nil	M	**A1**
108	*Corymbia maculata*	18	14	450	**5.4**	90%	M	Nil	Garden bed	Adjacent building	H	**A1**
109	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
110	*Casuarina cunninghamiana*	20	16	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**A1**
111	*Melaleuca quinquenervia*	10	6	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
112	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
113	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
114	*Corymbia maculata*	24	14	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
115	*Eucalyptus pilularis*	26	12	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
116	*Eucalyptus pilularis*	26	12	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
117	*Melaleuca quinquenervia*	10	6	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
118	*Eucalyptus pilularis*	20	15	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
120	*Jacaranda mimosifolia*	12	8	250	**3**	80%	M	Co-dominant base	Gravel	Nil	M	**Z9**
121	*Banksia integrifolia*	12	7	300	**3.6**	90%	M	Nil	Garden bed	Nil	M	**A1**
123	*Araucaria heterophylla*	14	7	300	**3.6**	80%	S	Nil	Garden bed	Nil	M	**A1**
124	*Angophora costata*	20	12	450	**5.4**	70%	M	Nil	Garden bed	Nil	H	**A1**
125	*Grevillea robusta*	22	10	500	**6**	80%	M	Nil	Garden bed	Nil	H	**A1**
126	*Leptospermum petersonii*	8	6	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**Z10**
127	*Lophostemon confertus*	18	14	500	**6**	90%	M	Nil	Garden bed	Adjacent building	H	**A1**
128	*Lophostemon confertus*	18	14	450	**5.4**	90%	M	Nil	Garden bed	Adjacent building	H	**A1**
129	*Pittosporum undulatum*	7	5	250	**3**	60%	M	Borer	Garden bed	Nil	L	**Z1**
130	*Prunus sp.*	4	3	100	**1.2**	80%	M	Nil	Garden bed	Nil	L	**Z1**
131	*Corymbia gummifera*	16	9	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
132	*Schefflera actinophylla*	5	3	100	**1.2**	80%	S	Nil	Garden bed	Adjacent building	L	**Z3**
133	*Cupressus sp.*	7	3	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
134	*Magnolia × soulangeana*	3	3	100	**1.2**	70%	M	Nil	Garden bed	Nil	L	**Z1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
136	*Callistemon sp.*	5	5	100	**1.2**	70%	M	Nil	Grass	Nil	L	**Z1**
137	*Prunus sp.*	5	4	200	**2.4**	70%	M	Nil	Garden bed	Nil	M	**Z3**
138	*Angophora costata*	10	10	450	**5.4**	90%	M	Nil	Garden bed	Adjacent structure	M	**A1**
139	*Allocasuarina torulosa*	10	6	300	**3.6**	70%	M	Nil	Garden bed	Adjacent building	M	**Z10**
140	*Callistemon sp.*	5	3	100	**1.2**	70%	M	Nil	Garden bed	Nil	L	**Z1**
141	*Melaleuca armillaris*	8	6	250	**3**	80%	M	Nil	Garden bed	Nil	M	**A1**
142	*Melaleuca armillaris*	8	6	250	**3**	80%	M	Nil	Garden bed	Nil	M	**A1**
143	*Camellia sp.*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
144	*Eucalyptus haemastoma*	8	6	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
145	*Schefflera actinophylla*	3	3	100	**1.2**	80%	S	Nil	Garden bed	Nil	L	**Z1**
146	*Schefflera actinophylla*	3	3	100	**1.2**	80%	S	Nil	Garden bed	Nil	L	**Z1**
147	*Cotoneaster sp.*	5	7	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z3**
148	*Callistemon sp.*	4	3	100	**1.2**	70%	M	Nil	Garden bed	Nil	L	**Z1**
149	*Buckinghamia celsissima*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
150	*Buckinghamia celsissima*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
151	*Buckinghamia celsissima*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
152	*Buckinghamia celsissima*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
153	*Buckinghamia celsissima*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
154	*Buckinghamia celsissima*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
155	*Buckinghamia celsissima*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
156	*Camellia sp.*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
157	*Prunus sp.*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
158	*Camellia sp.*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
159	*Camellia sp.*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
160	*Duranta repens*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
161	*Hibiscus sp.*	2	2	100	**1.2**	60%	M	Nil	Garden bed	Nil	L	**Z1**
162	*Melaleuca quinquenervia*	16	10	500	**6**	80%	M	Co-dominant	Grass	Adjacent building	H	**A1**
163	*Melaleuca quinquenervia*	10	7	250	**3**	70%	M	Nil	Grass	Nil	L	**Z10**
164	*Melaleuca quinquenervia*	16	10	500	**6**	80%	M	Nil	Grass	Adjacent building	H	**A1**
165	*Melaleuca quinquenervia*	16	10	500	**6**	80%	M	Nil	Grass	Adjacent building	H	**A1**
166	*Melaleuca quinquenervia*	7	3	200	**2.4**	80%	S	Nil	Grass	Nil	L	**Z1**
167	*Archontophoenix alexandrae*	7	3	200	**2.4**	90%	M	Nil	Garden bed	Nil	L	**Z1**
168	*Archontophoenix alexandrae*	7	3	200	**2.4**	90%	M	Nil	Garden bed	Nil	L	**Z1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
169	*Ulmus glabra*	5	5	150	**1.8**	60%	M	Lopped, Epicormic growth	Garden bed	Adjacent structure	L	**Z9**
170	*Melaleuca quinquenervia*	9	5	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
171	*Cyathea cooperi*	4	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
172	*Melaleuca quinquenervia*	9	5	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
173	*Eucalyptus piperita*	18	16	450	**5.4**	80%	M	Cambium damage, Borer throughout base	Natural ground	Nil	H	**Z9**
174	*Angophora costata*	20	16	400	**4.8**	80%	M	Nil	Natural ground	Nil	H	**A1**
175	*Casuarina cunninghamiana*	16	9	450	**5.4**	80%	M	Nil	Garden bed	Adjacent structure	H	**A1**
176	*Casuarina cunninghamiana*	16	9	450	**5.4**	80%	M	Nil	Garden bed	Adjacent structure	H	**A1**
177	*Melaleuca armillaris*	8	4	100	**1.2**	70%	M	Nil	Garden bed	Nil	L	**Z10**
178	*Pittosporum undulatum*	8	6	250	**3**	70%	M	Nil	Garden bed	Nil	L	**Z10**
179	*Melia azedarach*	7	4	200	**2.4**	70%	M	Nil	Garden bed	Nil	L	**Z1**
180	*Pittosporum undulatum*	6	5	100	**1.2**	70%	S	Nil	Garden bed	Nil	L	**Z1**
181	*Pittosporum undulatum*	6	5	100	**1.2**	70%	S	Nil	Garden bed	Nil	L	**Z1**
182	*Acacia elata*	18	9	400	**4.8**	80%	M	Nil	Garden bed	Nil	H	**A1**
183	*Angophora costata*	20	18	500	**6**	90%	M	Nil	Garden bed	Nil	H	**A1**
185	*Melia azedarach*	10	7	300	**3.6**	70%	M	Nil	Garden bed	Nil	M	**Z10**
186	*Allocasuarina torulosa*	8	5	250	**3**	70%	M	Nil	Garden bed	Nil	L	**Z10**
187	*Ficus benjamina*	5	3	200	**2.4**	50%	M	Lopped, Epicormic growth	Garden bed	Adjacent building	L	**ZZ9**
188	*Prunus sp.*	3	3	100	**1.2**	80%	M	Nil	Grass	Nil	L	**Z1**
189	*Melaleuca quinquenervia*	18	14	600	**7.2**	80%	M	Nil	Garden bed	Adjacent driveway	H	**A1**
190	*Cupressus sp.*	8	5	200	**2.4**	70%	M	Co-dominant	Garden bed	Adjacent driveway	L	**Z10**
191	*Callistemon sp.*	2	2	100	**1.2**	70%	M	Nil	Garden bed	Nil	L	**ZZ1**
192	*Macadamia sp.*	5	4	100	**1.2**	90%	M	Nil	Grass	Nil	L	**Z1**
193	*Melaleuca quinquenervia*	10	6	350	**4.2**	80%	M	Lopped at 2m, Epicormic growth only	Garden bed	Nil	M	**Z9**
194	*Melaleuca quinquenervia*	10	6	350	**4.2**	80%	M	Lopped at 2m, Epicormic growth only	Garden bed	Nil	M	**Z9**
195	*Melaleuca quinquenervia*	10	6	350	**4.2**	80%	M	Lopped at 2m, Epicormic growth only	Garden bed	Nil	M	**Z9**
196	*Melaleuca quinquenervia*	8	5	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
197	*Melaleuca quinquenervia*	10	6	350	**4.2**	80%	M	Lopped at 2m, Epicormic growth only	Garden bed	Nil	M	**Z9**
198	*Melaleuca quinquenervia*	6	4	150	**1.8**	70%	M	Nil	Garden bed	Nil	L	**Z1**
199	*Melaleuca quinquenervia*	6	4	150	**1.8**	70%	M	Nil	Garden bed	Nil	L	**Z1**
200	*Melaleuca quinquenervia*	6	4	150	**1.8**	70%	M	Nil	Garden bed	Nil	L	**Z1**
201	*Melaleuca quinquenervia*	16	9	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
202	*Melaleuca quinquenervia*	16	9	400	**4.8**	80%	M	Nil	Garden bed	Nil	H	**A1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
203	*Casuarina cunninghamiana*	14	6	250	**3**	80%	M	Nil	Garden bed	Nil	M	**Z10**
204	*Melaleuca quinquenervia*	16	9	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
205	*Melaleuca quinquenervia*	16	9	400	**4.8**	80%	M	Nil	Garden bed	Nil	H	**A1**
206	*Acer palmatum*	5	6	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
207	*Unknown shrub*	4	4	100	**1.2**	70%	M	Co-dominant	Garden bed	Nil	L	**Z1**
208	*Callistemon sp.*	6	6	200	**2.4**	70%	M	Nil	Garden bed	Nil	L	**Z1**
209	*Citrus × sinensis*	2	3	100	**1.2**	80%	M	Nil	Grass	Nil	L	**Z1**
210	*Citrus × sinensis*	2	3	100	**1.2**	80%	M	Nil	Grass	Nil	L	**Z1**
211	*Jacaranda mimosifolia*	7	7	200	**2.4**	70%	M	Lopped at 1m, Epicormic growth only	Garden bed	Nil	M	**Z9**
212	*Melaleuca quinquenervia*	14	9	600	**7.2**	80%	M	Nil	Grass	Adjacent driveway	H	**A1**
213	*Pittosporum eugenioides 'Variegatum'*	6	4	100	**1.2**	70%	M	Borer	Garden bed	Adjacent building	L	**Z4**
214	*Camellia sp.*	5	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
215	*Camellia sp.*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
216	*Camellia sp.*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
217	*Camellia sp.*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
218	*Corymbia gummifera*	20	14	400	**4.8**	80%	M	Nil	Garden bed	Adjacent building	H	**A1**
219	*Alnus jorullensis*	12	12	450	**5.4**	80%	M	Nil	Garden bed	Adjacent structure	M	**Z3**
220	*Tibouchina sp.*	4	4	100	**1.2**	90%	M	Nil	Grass	Nil	L	**Z1**
221	*Callistemon sp.*	2	2	100	**1.2**	60%	S	Lopped at 2m	Garden bed	Nil	L	**ZZ1**
222	*Callistemon sp.*	5	4	100	**1.2**	80%	M	Nil	Garden bed	Nil	L	**Z1**
223	*Magnolia × soulangeana*	3	4	100	**1.2**	70%	M	Nil	Garden bed	Nil	L	**Z1**
224	*Elaeocarpus reticulatus*	4	3	100	**1.2**	80%	S	Nil	Garden bed	Nil	L	**Z1**
225	*Pittosporum eugenioides 'Variegatum'*	2	2	100	**1.2**	50%	M	Topped	Garden bed	Nil	L	**ZZ1**
226	*Callistemon sp.*	2	2	100	**1.2**	50%	M	Topped	Garden bed	Nil	L	**ZZ1**
227	*Callistemon sp.*	2	2	100	**1.2**	50%	M	Topped	Garden bed	Nil	L	**ZZ1**
228	*Citrus × sinensis*	2	3	100	**1.2**	80%	M	Nil	Grass	Nil	L	**Z1**
229	*Yucca sp.*	5	3	200	**2.4**	80%	M	Nil	Garden bed	Nil	L	**Z1**
231	*Angophora costata*	20	14	450	**5.4**	80%	M	Nil	Natural ground	Nil	H	**A1**
232	*Lophostemon confertus*	12	10	300	**3.6**	70%	M	Nil	Grass	Nil	M	**A1**
233	*Callistemon sp.*	5	4	200	**2.4**	80%	M	Nil	Garden bed	Nil	L	**Z1**
234	*Citrus × sinensis*	2	3	100	**1.2**	80%	M	Nil	Grass	Nil	L	**Z1**
235	*Callistemon sp.*	2	2	100	**1.2**	50%	M	Topped	Garden bed	Nil	L	**ZZ1**
236	*Banksia serrata*	5	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
237	*Casuarina cunninghamiana*	12	8	350	**4.2**	70%	M	Splits along upper boughs	Garden bed	Adjacent structure	M	**Z9**
238	*Banksia serrata*	5	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
239	*Acacia sp.*	5	6	250	**3**	80%	M	Nil	Garden bed	Nil	L	**Z1**
240	*Banksia serrata*	5	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
241	*Banksia serrata*	7	5	250	**3**	80%	M	Nil	Garden bed	Nil	L	**Z1**
242	*Camellia sp.*	5	4	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
243	*Callistemon sp.*	6	5	200	**2.4**	80%	M	Nil	Garden bed	Nil	M	**Z1**
244	*Angophora floribunda*	22	16	600	**7.2**	80%	M	Nil	Grass	Adjacent building	H	**AA1**
245	*Angophora costata*	16	14	500	**6**	80%	M	Nil	Garden bed	Adjacent building	H	**A1**
246	*Callistemon sp.*	4	3	100	**1.2**	80%	M	Nil	Garden bed	Nil	L	**Z1**
247	*Grevillea spinosa*	3	3	100	**1.2**	80%	M	Nil	Garden bed	Nil	L	**Z1**
248	*Cupressus sp.*	6	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
249	*Tibouchina sp.*	5	5	100	**1.2**	90%	M	Nil	Grass	Nil	L	**Z1**
250	*Acer negundo*	5	5	200	**2.4**	80%	M	Nil	Grass	Adjacent structure	L	**Z1**
251	*Ficus benjamina*	3	3	100	**1.2**	50%	M	Topped	Garden bed	Nil	L	**ZZ9**
252	*Syzygium paniculatum*	12	9	400	**4.8**	90%	M	Nil	Garden bed	Nil	M	**A1**
253	*Eucalyptus haemastoma*	9	12	700	**8.4**	80%	M	Cambium damage	Garden bed	Adjacent building	M	**Z9**
254	*Acer negundo*	9	10	350	**4.2**	80%	M	Nil	Garden bed	Adjacent structure	M	**Z3**
255	*Acer negundo*	9	10	350	**4.2**	80%	M	Nil	Garden bed	Adjacent structure	M	**Z3**
256	*Corymbia gummifera*	20	14	500	**6**	80%	M	Nil	Garden bed	Nil	H	**A1**
257	*Callistemon sp.*	5	5	100	**1.2**	80%	M	Nil	Garden bed	Adjacent building	L	**Z1**
258	*Banksia serrata*	5	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
259	*Callistemon sp.*	6	5	200	**2.4**	80%	M	Nil	Garden bed	Nil	L	**Z1**
260	*Citrus × sinensis*	2	3	100	**1.2**	80%	M	Nil	Grass	Nil	L	**Z1**
261	*Callistemon sp.*	6	5	200	**2.4**	80%	M	Nil	Garden bed	Nil	L	**Z1**
262	*Corymbia gummifera*	22	12	400	**4.8**	80%	M	Nil	Garden bed	Nil	H	**A1**
263	*Lophostemon confertus*	22	14	450	**5.4**	80%	M	Nil	Grass	Nil	H	**A1**
264	*Lophostemon confertus*	20	10	300	**3.6**	80%	M	Nil	Grass	Adjacent driveway	M	**A1**
265	*Liquidambar styraciflua*	18	14	450	**5.4**	90%	M	Nil	Garden bed	Adjacent structure	H	**A1**
266	*Liquidambar styraciflua*	14	10	400	**4.8**	80%	M	Nil	Grass	Nil	M	**A1**
268	*Jacaranda mimosifolia*	10	9	250	**3**	80%	M	Co-dominant	Grass	Nil	M	**A1**
269	*Eucalyptus haemastoma*	22	14	600	**7.2**	80%	M	One dead bough, should be ok	Garden bed	Nil	H	**A1**
270	*Cinnamomum camphora*	8	8	300	**3.6**	70%	M	Lopped under powerlines, Epicormic growth	Garden bed	LV wires	M	**ZZ9**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
271	*Corymbia gummifera*	20	8	350	**4.2**	70%	M	Heavily pruned from powerlines, Slender habit	Garden bed	HV wires	M	**Z10**
272	*Lophostemon confertus*	14	9	300	**3.6**	70%	M	Nil	Garden bed	HV wires	M	**A1**
273	*Lophostemon confertus*	14	9	300	**3.6**	70%	M	Nil	Garden bed	HV wires	M	**A1**
274	*Eucalyptus scoparia*	8	5	200	**2.4**	70%	M	Nil	Garden bed	Nil	L	**Z10**
275	*Tristaniopsis laurina*	6	4	150	**1.8**	70%	M	Nil	Garden bed	HV wires	L	**Z1**
276	*Lophostemon confertus*	14	10	350	**4.2**	80%	M	Co-dominant	Garden bed	Nil	M	**A1**
278	*Banksia serrata*	5	3	200	**2.4**	70%	M	Nil	Garden bed	Nil	L	**Z1**
279	*Banksia serrata*	5	3	200	**2.4**	70%	M	Nil	Garden bed	Nil	L	**Z1**
280	*Lophostemon confertus*	16	14	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
282	*Eucalyptus botryoides*	14	8	250	**3**	60%	M	Heavily pruned from powerlines	Garden bed	HV wires	M	**ZZ9**
283	*Lophostemon confertus*	10	7	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
284	*Eucalyptus robusta*	18	16	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**A1**
285	*Acacia elata*	7	5	250	**3**	30%	O	Borer	Garden bed	Nil	L	**ZZ4**
286	*Eucalyptus robusta*	22	14	400	**4.8**	70%	M	Nil	Garden bed	Nil	M	**A1**
287	*Acacia elata*	7	5	250	**3**	30%	O	Borer	Garden bed	Nil	L	**ZZ4**
288	*Eucalyptus melliodora*	20	14	350	**4.2**	70%	M	Nil	Garden bed	Nil	H	**A1**
289	*Eucalyptus robusta*	14	7	300	**3.6**	80%	M	Nil	Steep slope	Nil	M	**A1**
290	*Allocasuarina torulosa*	7	4	200	**2.4**	60%	M	Failures	Steep slope	Nil	L	**Z10**
291	*Corymbia gummifera*	18	12	400	**4.8**	80%	M	Nil	Garden bed	Adjacent structure	H	**A1**
292	*Cupressus sp.*	6	1	100	**1.2**	80%	M	Nil	Garden bed	Nil	L	**Z1**
293	*Washingtonia robusta*	2	2	200	**2.4**	90%	S	Nil	Garden bed	Nil	L	**Z1**
294	*Banksia serrata*	6	5	150	**1.8**	80%	S	Nil	Garden bed	Adjacent building	L	**Z1**
295	*Acacia baileyana*	7	5	200	**2.4**	80%	M	Weed species	Garden bed	Nil	L	**Z1**
296	*Eucalyptus botryoides*	22	14	500	**6**	80%	M	Nil	Grass	Nil	H	**A1**
297	*Eucalyptus botryoides*	16	8	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
298	*Eucalyptus haemastoma*	4	4	150	**1.8**	80%	S	Nil	Grass	Nil	L	**Z1**
299	*Eucalyptus botryoides*	10	5	200	**2.4**	80%	S	Nil	Garden bed	Nil	L	**Z1**
300	*Eucalyptus botryoides*	16	8	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
301	*Pittosporum undulatum*	4	4	150	**1.8**	70%	S	Failures	Garden bed	Nil	L	**Z1**
302	*Casuarina cunninghamiana*	6	4	150	**1.8**	70%	S	Nil	Garden bed	Nil	L	**Z1**
303	*Casuarina cunninghamiana*	6	4	150	**1.8**	70%	S	Nil	Garden bed	Nil	L	**Z1**
304	*Elaeocarpus reticulatus*	6	3	100	**1.2**	80%	S	Nil	Garden bed	Nil	L	**Z1**
305	*Corymbia gummifera*	9	3	100	**1.2**	10%	S	Failures	Garden bed	Nil	L	**ZZ4**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
306	*Corymbia gummifera*	10	4	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
307	*Corymbia gummifera*	10	4	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
308	*Acacia implexa*	8	3	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
309	*Eucalyptus microcorys*	12	7	250	**3**	80%	M	Nil	Grass	Nil	M	**A1**
310	*Eucalyptus scoparia*	10	6	150	**1.8**	70%	S	Nil	Garden bed	Nil	M	**A1**
311	*Eucalyptus microcorys*	12	7	250	**3**	80%	M	Nil	Grass	Nil	M	**A1**
312	*Eucalyptus sp.*	8	7	250	**3**	0%	O	Nil	Garden bed	Nil	L	**ZZ4**
313	*Eucalyptus microcorys*	12	7	250	**3**	80%	M	Nil	Grass	Nil	M	**A1**
314	*Eucalyptus microcorys*	12	7	250	**3**	80%	M	Nil	Grass	Nil	M	**A1**
315	*Eucalyptus microcorys*	9	5	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
316	*Eucalyptus microcorys*	9	5	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
317	*Eucalyptus microcorys*	9	5	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
318	*Eucalyptus microcorys*	9	5	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
319	*Eucalyptus microcorys*	18	12	400	**4.8**	80%	M	Nil	Garden bed	Nil	H	**A1**
320	*Eucalyptus microcorys*	24	14	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**AA1**
321	*Eucalyptus microcorys*	9	5	150	**1.8**	80%	S	Nil	Grass	Nil	L	**Z1**
322	*Eucalyptus microcorys*	24	14	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**AA1**
323	*Eucalyptus microcorys*	24	14	450	**5.4**	80%	M	Co-dominant	Garden bed	Nil	H	**AA1**
324	*Eucalyptus microcorys*	24	16	500	**6**	80%	M	Included bark	Garden bed	Nil	H	**Z9**
325	*Eucalyptus microcorys*	24	16	500	**6**	80%	M	Nil	Garden bed	Nil	H	**AA1**
326	*Eucalyptus pilularis*	24	16	600	**7.2**	80%	M	Nil	Grass	Adjacent building	H	**AA1**
327	*Corymbia gummifera*	14	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
328	*Eucalyptus tereticornis*	20	12	350	**4.2**	80%	M	Nil	Garden bed	Nil	H	**A1**
330	*Acer negundo*	8	8	300	**3.6**	80%	M	Nil	Grass	Adjacent building	M	**Z3**
331	*Cinnamomum camphora*	7	5	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z3**
332	*Eucalyptus tereticornis*	22	12	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
333	*Casuarina cunninghamiana*	14	9	350	**4.2**	80%	M	Included bark	Garden bed	Adjacent building	M	**ZZ5**
334	*Casuarina cunninghamiana*	14	6	300	**3.6**	80%	M	Splits throughout base	Garden bed	Nil	M	**Z9**
335	*Casuarina cunninghamiana*	14	6	300	**3.6**	80%	M	Splits throughout base	Garden bed	Nil	M	**Z9**
336	*Corymbia maculata*	9	4	200	**2.4**	80%	S	Nil	Garden bed	Nil	M	**Z1**
337	*Casuarina cunninghamiana*	16	7	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
338	*Casuarina cunninghamiana*	16	7	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
339	*Casuarina cunninghamiana*	14	6	300	**3.6**	80%	M	Splits throughout base	Garden bed	Nil	M	**Z9**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
340	*Corymbia gummifera*	14	6	300	**3.6**	70%	M	Heavily pruned	Garden bed	Nil	M	**A1**
341	*Corymbia gummifera*	24	14	500	**6**	0%	O	Nil	Garden bed	Nil	H	**ZZ4**
342	*Angophora costata*	14	9	350	**4.2**	60%	M	Borer, Heavily pruned	Garden bed	HV wires	M	**Z10**
343	*Eucalyptus tereticornis*	8	5	250	**3**	80%	S	Nil	Garden bed	Nil	M	**Z1**
345	*Casuarina cunninghamiana*	14	6	300	**3.6**	80%	M	Splits throughout base	Garden bed	Nil	M	**Z9**
346	*Eucalyptus tereticornis*	24	12	450	**5.4**	80%	M	Major storm failures	Garden bed	Nil	H	**ZZ4**
347	*Eucalyptus tereticornis*	24	12	400	**4.8**	80%	M	Major storm failures	Garden bed	Nil	H	**ZZ4**
348	*Banksia serrata*	5	3	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
349	*Corymbia gummifera*	18	12	400	**4.8**	80%	M	Nil	Garden bed	Kerb	M	**A1**
350	*Eucalyptus paniculata*	24	10	400	**4.8**	70%	M	Heavily pruned	Garden bed	HV wires	H	**A1**
351	*Angophora costata*	10	5	200	**2.4**	70%	S	Borer	Garden bed	Nil	L	**Z4**
352	*Angophora costata*	16	12	350	**4.2**	60%	M	Nil	Garden bed	Nil	M	**A1**
353	*Eucalyptus tereticornis*	22	7	250	**3**	70%	M	Borer in base, Slender habit	Garden bed	Nil	M	**Z9**
354	*Eucalyptus paniculata*	24	14	450	**5.4**	80%	M	Included bark at co-dominant	Garden bed	HV wires	H	**Z9**
355	*Eucalyptus tereticornis*	20	8	200	**2.4**	80%	S	Slender habit	Garden bed	Nil	M	**A1**
356	*Eucalyptus tereticornis*	22	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	H	**A1**
357	*Eucalyptus tereticornis*	22	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	H	**A1**
358	*Angophora costata*	18	12	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
359	*Eucalyptus tereticornis*	9	4	100	**1.2**	80%	S	Nil	Garden bed	Nil	L	**Z1**
360	*Eucalyptus pilularis*	28	26	1000	**12**	80%	M	Nil	Garden bed	Nil	H	**AA1**
361	*Eucalyptus microcorys*	26	22	800	**9.6**	80%	M	Co-dominant	Garden bed	HV wires	H	**AA1**
362	*Allocasuarina torulosa*	4	4	150	**1.8**	0%	O	Dead tree	Garden bed	Nil	L	**ZZ4**
363	*Eucalyptus microcorys*	26	22	800	**9.6**	80%	M	Co-dominant	Garden bed	HV wires	H	**AA1**
364	*Eucalyptus microcorys*	18	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
365	*Eucalyptus microcorys*	14	7	200	**2.4**	70%	S	Nil	Garden bed	Nil	M	**Z1**
366	*Eucalyptus microcorys*	18	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
367	*Eucalyptus microcorys*	20	18	600	**7.2**	70%	M	Topped, Central leader removed, Leaning across road	Garden bed	HV wires	H	**Z10**
368	*Eucalyptus microcorys*	18	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
369	*Eucalyptus microcorys*	18	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
370	*Eucalyptus microcorys*	14	7	200	**2.4**	70%	S	Cambium damage	Garden bed	Nil	M	**Z10**
371	*Eucalyptus microcorys*	30	26	800	**9.6**	80%	M	Nil	Garden bed	Nil	H	**AA1**
372	*Eucalyptus microcorys*	28	20	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**AA1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
373	*Eucalyptus microcorys*	18	9	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
374	*Eucalyptus microcorys*	30	22	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**AA1**
375	*Eucalyptus microcorys*	30	22	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**AA1**
376	*Eucalyptus microcorys*	22	14	400	**4.8**	80%	M	Nil	Garden bed	Nil	H	**AA1**
377	*Eucalyptus microcorys*	24	16	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**AA1**
378	*Eucalyptus microcorys*	30	22	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**AA1**
379	*Eucalyptus microcorys*	30	22	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**AA1**
380	*Eucalyptus microcorys*	14	7	200	**2.4**	80%	S	Nil	Garden bed	Nil	M	**A1**
381	*Eucalyptus tereticornis*	22	12	500	**6**	50%	M	Heavily pruned, Only one lateral branch remaining	Garden bed	HV wires	M	**ZZ10**
382	*Eucalyptus microcorys*	20	18	600	**7.2**	70%	M	Topped, Central leader removed, Leaning across road	Garden bed	HV wires	H	**Z10**
383	*Eucalyptus microcorys*	20	18	600	**7.2**	70%	M	Topped, Central leader removed, Leaning across road	Garden bed	HV wires	H	**Z10**
384	*Eucalyptus microcorys*	14	10	350	**4.2**	70%	M	Topped, Central leader removed, Leaning across road	Garden bed	HV wires	M	**Z10**
385	*Eucalyptus microcorys*	28	14	400	**4.8**	80%	M	Nil	Garden bed	HV wires	H	**AA1**
386	*Eucalyptus microcorys*	18	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
387	*Eucalyptus maidenii*	30	28	1100	**13.2**	80%	M	Bracket fungi in base, Further investigation required	Garden bed	Nil	H	**AA2**
388	*Eucalyptus sp.*	12	3	500	**6**	0%	O	Nil	Garden bed	HV wires	L	**ZZ4**
389	*Eucalyptus melliodora*	26	20	1000	**12**	80%	M	Co-dominant	Garden bed	HV wires	H	**AA1**
390	*Eucalyptus melliodora*	20	16	400	**4.8**	70%	M	Nil	Garden bed	Nil	H	**A1**
391	*Eucalyptus melliodora*	14	10	300	**3.6**	70%	M	Nil	Garden bed	HV wires	M	**A1**
392	*Eucalyptus robusta*	16	8	300	**3.6**	70%	M	Nil	Garden bed	HV wires	M	**A1**
393	*Eucalyptus melliodora*	14	9	300	**3.6**	60%	M	Heavily pruned	Garden bed	HV wires	M	**Z4**
394	*Angophora costata*	14	6	250	**3**	70%	S	Heavily pruned, Hazard beam	Garden bed	HV wires	M	**Z9**

Explanatory Notes

- **Measurements/estimates:** All dimensions are estimates unless otherwise indicated. Measurements taken with a tape or clinometer are indicated with a '*'. Less reliable estimated dimensions are indicated with a '?'.
- **Species:** The species identification is based on visual observations and the botanical name. In some instances, it may be difficult to quickly and accurately identify a particular tree without further detailed investigations. Where there is some doubt of the precise species of tree, it is indicated with a '?' after the name in order to avoid delay in the production of the report. The botanical name is followed by the abbreviation sp if only the genus is known. The species listed for groups and hedges represent the <u>main</u> component and there may be other minor species not listed.
- **Tree number:** relates to the reference number used on site diagram/report.
- **Height:** Height is estimated to the nearest metre.
- **Spread:** The average crown spread is visually estimated to the nearest metre from the outermost tips of the live lateral branches.
- **DBH:** These figures relate to 1.4m above ground level and are recorded in millimetres. If appropriate, diameter is measured with a diameter tape. 'M' indicates trees or shrubs with multiple stems.
- **Foliage Cover:** Percent of estimated live foliage cover for particular species range.
- **Age class:**

Y	Young = recently planted
S	Semi-mature (<20% of life expectancy)
M	Mature (20-80% of life expectancy)
O	Over-mature (>80% of life expectancy)

- **TPZ:** The Tree Protection Zone (TPZ) is the radial offset distance of twelve times the trunk diameter in meters.
- **Tree AZ:** See reference for Tree AZ categories in Appendix 3.
- **Significance:** A tree's significance/value in the landscape takes into account its prominence from a wide range of perspectives. This includes, but is not limited to neighbour hood perspective, local perspective and site perspective. The significance of the subject trees has been categorized into three groups, such as: High, Moderate or Low significance.

APPENDIX 3

TreeAZ Categories (Version 10.04-ANZ)

Z Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species

Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc

High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure

Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc

Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people

Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognised court or tribunal would be likely to authorise removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognised court or tribunal would be likely to authorise removal, i.e. severe structural damage to surfacing and buildings, etc

Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population

Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorisation hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

A Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorisation hierarchy and should be given the most weight in any selection process.

TreeAZ is designed by Barrell Tree Consultancy (www.treeaz.com/tree_az/)

APPENDIX 4

Tree protection fencing and signs - Illustrative specification

Protective fencing: Protective 1.8m high fencing should be installed at the location illustrated on the Tree Management Plan before any site works start. All uprights should be fixed in position for the duration of the development activity. The fixings must be able to withstand the pressures of everyday site work.

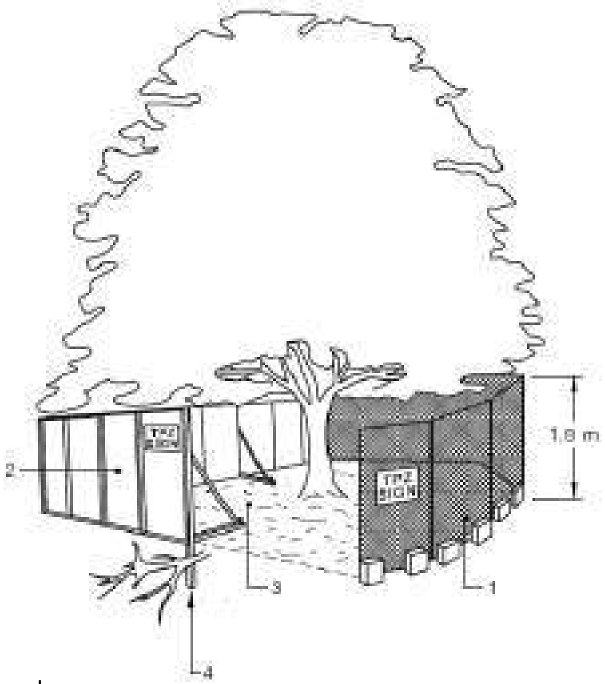
Inside the protective fencing, the following rules must be strictly observed:

- **No vehicular access**
- **No storage of excavated debris, building materials or fuels**
- **No excessive cultivation for landscape planting**
- **No fires**
- **No mixing of cement**
- **No service installation or excavation**

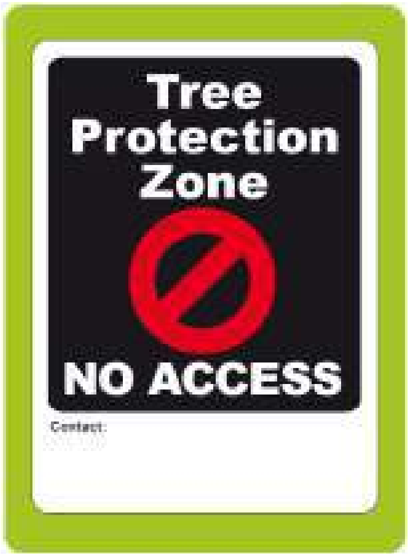
Once erected, protective fencing must not be removed or altered without consulting first with the project Arborist.

Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area and signage must be attached to outside of fencing.

Signage: All signs are to provide clear and readily accessible information to indicate that a TPZ has been established. Signage identifying the TPZ must be attached to outside of fencing and be visible from within the development site.



Signage example:



Legend
1. Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2. Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3. Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4. Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

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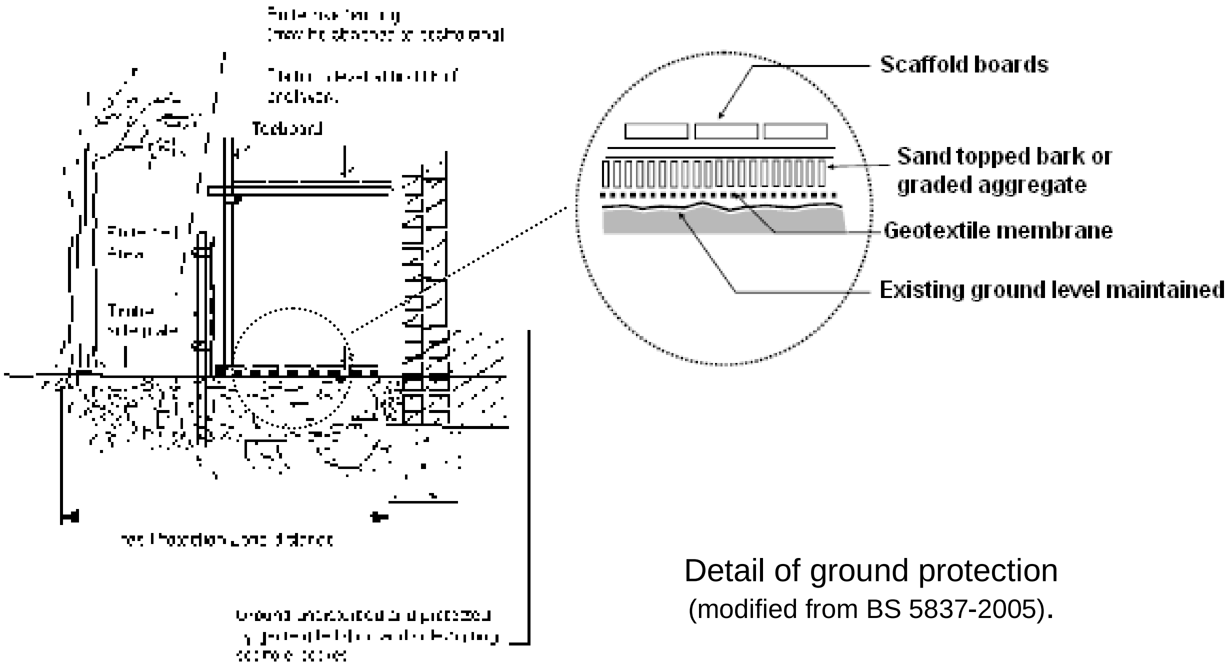
APPENDIX 5

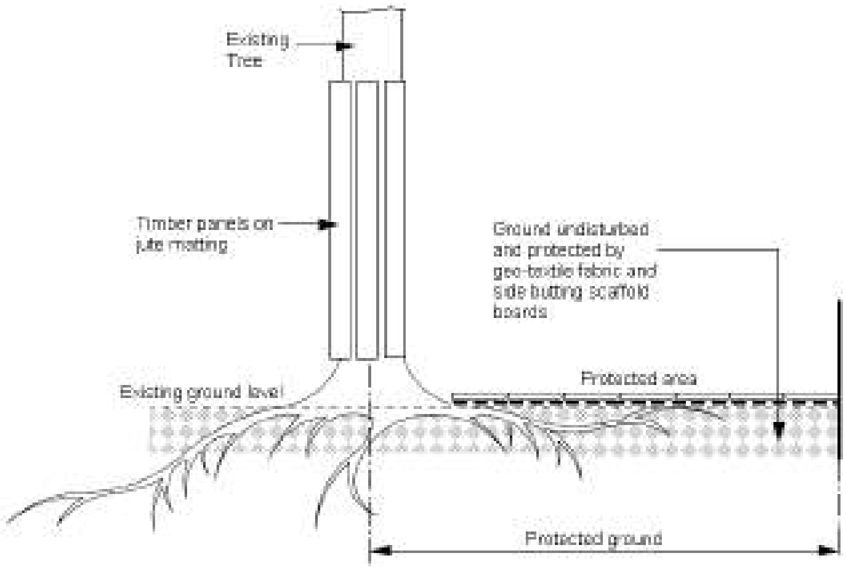
Root zone and trunk protection - Illustrative specification

Root zone protection: Where necessary, access through the TPZ can be achieved by laying aggregate and timber boards (or similar) over the root zone to protect roots. The ground beneath the boarding should be left undisturbed and should be protected with a porous geo-textile fabric covered with sand or mulch.



Detail of ground protection
(modified from BS 5837-2005).

Trunk protection: Where fencing cannot be installed, the vertical trunk of exposed trees shall be protected by the placement of 3.6m lengths of 50 x 100mm hardwood timbers, spaced vertically, at 150mm centres and secured by 2mm wire at 300mm wide spacing over suitable protective padding material e.g. Jute Matting. The trunk protection shall be maintained intact until the completion of all work on site.



Detail of trunk protection.

APPENDIX 6

General guidance for working in TPZ

1 PURPOSE OF THIS GUIDANCE

This guidance sets out the general principles that must be followed when working within a TPZ. Where more detail is required, it will be supplemented by illustrative specifications in other appendices in this document (refer Appendix 4 and 5).

This guidance is based on the Australian Standards (2009) AS4970: *Protection of Trees on Construction Sites*.

Once the site works start, this guidance is specifically for the site personnel to help them understand what has been agreed and explain what is required to fully meet their obligations to protect trees. All personnel working in TPZs must be properly briefed about their responsibilities towards important trees based on this guidance.

This guidance should always be read in conjunction with the Tree Management Plan (TMP01) illustrating the areas where specific precautions are necessary. Each area where precautions are required is explained on the plan as identified on the legend. All protective measures should be installed according to the prevailing site conditions and agreed as satisfactory by the Project Arborist before any demolition or construction work starts.

2 TREE PROTECTION

2.1 Tree Protection Zone (TPZ)

The TPZ is a radial setback, extending outwards from the centre of the trunk, where disturbance must be minimised if important trees are to be successfully retained. The TPZ area is illustrated on the Tree Management Plan (TMP01) accompanying this guidance.

- The TPZ is a radial setback extending outwards from the centre of the trunk equal to the DBH x 12.
- This area shall be protected by tree protective fencing (refer Appendix 4).
- Any part of the TPZ outside of the tree protective fencing area must be isolated from the work operations by protective barriers and/or root zone protection for the duration of the work (refer Appendix 5).
- The Project Arborist shall approve the extent of the TPZ prior to commencement of works.
- The TPZ shall be mulched to a depth of 90mm with approved organic mulch e.g. leaf and wood chip where possible.
- Supplementary watering shall be provided in dry periods to reduce water or construction stress, particularly to those trees which may incur minor root disturbance.

The following activities shall be excluded within the TPZ:

- Excavation, compaction or disturbance of the existing soil.
- The movement or storage of materials, waste or fill.
- Soil level changes
- Disposal/runoff of waste materials and chemicals including paint, solvents, cement slurry, fuel, oil and other toxic liquids
- Movement or storage of plant, machinery, equipment or vehicles.
- Any activity likely to damage the trunk, crown or root system.

2.2 Arboricultural supervision

Any work within TPZs requires a high level of care. Qualified arboricultural supervision is essential to minimise the risk of misunderstanding and misinterpretation. Site personnel must be properly briefed before any work starts. Ongoing work must be inspected regularly and, on completion, the work must be signed off by the Project Arborist to confirm compliance by the contractor.

2.3 Tree protection fencing, root zone and trunk protection

Prior to site establishment, tree protection fencing and root zone and trunk protection shall be installed to establish the TPZ for trees to be retained in accordance with site conditions. These protective barriers shall be maintained entire for the duration of the construction program (refer Appendix 4 and 5).

Tree protection fencing and trunk and root zone protection shall be removed following completion of construction. The mulch layer in the TPZ shall be retained and replenished where required to maintain a 75mm thickness

2.4 Pruning

All pruning work required (including root pruning) should be in accordance with Australian Standard No 4373-1996 - Pruning of Amenity Trees.

2.5 Tree Damage

In the event of damage to a tree or the TPZ, the Project Arborist shall be engaged to inspect and provide advice on remedial action. This should be implemented as soon as practicable and certified by the Project Arborist.

2.6 Post construction maintenance

In the event of any tree deteriorating in health after the construction period, the Project Arborist shall be engaged to provide advice on any remedial action. Remedial action shall be implemented as soon as practicable and certified by the Project Arborist.

3 EXCAVATION AND FILL IN TPZ

3.1 Excavation within TPZ

If excavation within the TPZ is required the following shall be applied to preserve tree root systems:

- Excavation within TPZ must be carried out under the instruction and supervision of the Project Arborist.
- A root mapping exercise is to be undertaken and certified by the Project Arborist. Root mapping shall be undertaken by either ground penetrating radar, air spade, water laser or by hand excavation using hand tools, taking care not to damage the bark and wood of any roots.
- The purpose of the root mapping shall be to locate woody structural roots greater than 40mm in diameter. Where possible, flexible clumps of smaller roots, including fibrous roots, should be retained if they can be displaced temporarily or permanently beyond the excavation without damage.
- If digging by hand, a fork shall be used to loosen the soil and help locate any substantial roots.
- Once roots have been located, the trowel shall be used to clear the soil away from them without damaging the bark.
- Exposed roots to be removed shall be cut cleanly with a sharp saw or secateurs.
- Roots temporarily exposed shall be protected from direct sunlight, drying out and extremes of temperature by appropriate covering.

3.2 Fill within TPZ

Placement of fill material within the Tree Protection Zone of trees to be retained should be avoided where possible. However, where fill cannot be avoided:

- All fill material to be placed within the TPZ should be approved by Project Arborist and consist of a course, gap-graded material to provide aeration and percolation to the root zone. Materials containing a high percentage of 'fines' is unacceptable for this purpose.
- The fill material should be consolidated with a non-vibrating roller to minimise compaction of the underlying soil.
- No fill material should be placed in direct contact with the trunk.

4 DEMOLITION OF SURFACING/STRUCTURES IN TPZ

4.1 Definitions of surfacing and structures

For the purposes of this guidance, the following broad definitions apply:

• **Surfacing:** Any hard surfacing used as a vehicular road, parking or pedestrian path including tarmac, solid stone, crushed stone, compacted aggregate, concrete and timber decking.

• **Structures:** Any man-made structure above or below ground including service pipes, walls, gate piers, buildings and foundations. Typically, this would include drainage structures, services, car-ports, bin stores and concrete slabs that support buildings.

4.2 Demolition and access

Roots frequently grow adjacent to and beneath existing surfacing/structures so great care is needed during access and demolition. Damage can occur through physical disturbance of roots and/or the compaction of soil around them from the weight of machinery or repeated pedestrian passage. This is not generally a problem whilst surfacing/structures are in place because they spread the load on the soil beneath and further protective measures are not normally necessary. However, once they are removed and the soil below is newly exposed, damage to roots becomes an issue and the following guidance must be implemented:

- No vehicular or repeated pedestrian access into TPZ permitted unless on existing hard surfacing or root zone protection.
- Regular vehicular and pedestrian access routes must be protected from compaction with temporary root zone protection as set out in Appendix 5.
- Where a TPZ is exposed by the work, it must be protected as set out in AS4970 until there is no risk of damage from the development activity.

4.3 Removal of surfacing/structures

Removing existing surfacing/structures is a high-risk activity for any adjacent roots and the following guidance must be observed:

- Appropriate tools for manually removing debris may include a pneumatic breaker, crow bar, sledgehammer, pick, mattock, shovel, spade, trowel, fork and wheelbarrow.
- Machines with a long reach may be used if they can work from outside the TPZ or from protected areas within the TPZ.
- Debris to be removed from the TPZ manually must be moved across existing hard surfacing or temporary root zone protection in a way that prevents compaction of soil. Alternatively, it can be lifted out by machines provided this does not disturb the TPZ.
- Great care must be taken throughout these operations not to damage roots.

5 INSTALLATION OF SURFACING/STRUCTURES IN TPZ

5.1 Basic principles: New surfacing/structures in a TPZ are potentially damaging to trees because they may disturb the soil and disrupt the existing exchange of water and gases in and out of it. Adverse impact on trees can be reduced by minimising the extent of these changes within the TPZ.

- **Surfacing:** Suitable surfacing should be relatively permeable to allow water and gas movement, load spreading to avoid localised compaction and require little or no excavation to limit direct damage. The actual specification of the surfacing is an engineering issue that needs to be considered in the context of the bearing capacity of the soil, the intended loading and the frequency of loading. The detail of product and specification are beyond the scope of this guidance and must be provided separately by the appropriate specialist.

- **Structures:** Where possible structures are to be constructed above ground level on piled supports and redirecting water to where it is needed. The detailed design and specification of such structures is an engineering issue that should be informed and guided by the Project Arborist. Conventional strip foundations in the TPZ for any significant structure may cause excessive root loss and are unlikely to be acceptable. However, disturbance can be significantly reduced by supporting the above ground part of the structures on small diameter piles/piers or cast floor slabs set above ground level. The design should be sufficiently flexible to allow the piles to be moved if significant roots are encountered in the preferred locations.

5.2 Establishing the depth of roots

The precise location and depth of roots within the soil is unpredictable and will only be known when careful digging starts on site. Ideally, all new surfacing within a TPZ should be no-dig, i.e. requiring no excavation whatsoever, but this is rarely possible on undulating surfaces.

New surfacing normally requires an evenly graded sub-base layer, which can be made up to any high points with granular, permeable fills such as crushed stone or sharp sand. This sub-base must not be compacted as would happen in conventional surface installation. Some limited excavation is usually necessary to achieve this and need not be damaging to trees if carried out carefully and large roots are not cut.

Tree roots and grass roots rarely occupy the same soil volume at the top of the soil profile, so the removal of a turf layer up to 50mm is unlikely to be damaging to trees. It may be possible to dig to a greater depth depending on local conditions but this would need to be assessed by the Project Arborist.

6 SERVICES IN TPZ

For the purposes of this guidance, services are considered as structures. Excavation to upgrade existing services or to install new services within a TPZ may damage retained trees and should only be chosen as a last resort. In the event that excavation emerges as the preferred option, the decision should be reviewed by the Project Arborist before any work is carried out. If excavation is agreed, all digging should be done carefully and follow the guidance set out in 3.1 above.

7 SOFT LANDSCAPING IN TPZ

For the purposes of this guidance, soft landscaping includes the re-profiling of existing soil levels and covering the soil surface with new plants or an organic covering (mulch). It does not include the installation of solid structures or compacted surfacing.

Soft landscaping activity after construction can be extremely damaging to trees.

No significant excavation or cultivation shall occur within the TPZ (e.g. planting holes). Where new designs require levels to be increased to tie in with new structures or surrounding ground level, good quality and relatively permeable top soil should be used for the fill. It should be firmed into place but not over compacted in preparation for turfing or careful shrub planting.

All areas close to tree trunks should be kept at the original ground level and have a mulched finish rather than grass to reduce the risk of mowing damage.

APPENDIX 7

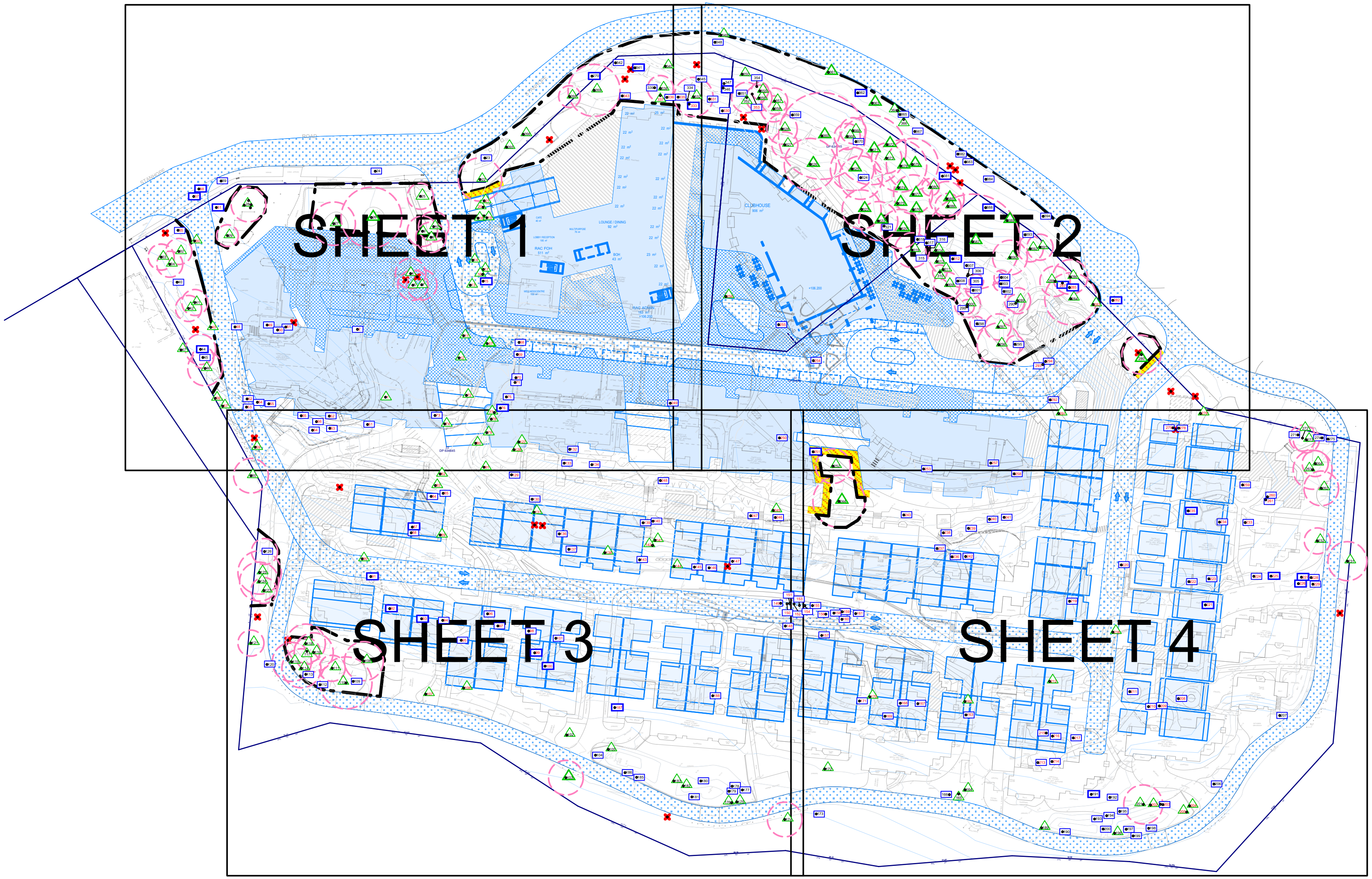
Schedule of works and responsibilities

Hold Point	Task	Responsibility	Certification	Timing of Inspection
1	Indicate clearly (with spray paint) trees approved for removal only	Principal Contractor	Project Arborist	Prior to demolition and site establishment
2	Establishment of tree protection fencing and additional root, trunk and/or branch protection	Principal Contractor	Project Arborist	Prior to demolition and site establishment
3	Supervise all excavations works proposed within the TPZ	Principal Contractor	Project Arborist	As required prior to the works proceeding adjacent to the tree
4	Inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Monthly during construction period
5	Final inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Prior to the issue of Occupation Certificate

APPENDIX 8

Tree management plan

-refer attached Tree Management Plan, Dwg No. TMP01 (Revision E),
by Naturally Trees dated 25 September 2023



LEGEND:

01	Category AA	Trees worthy of being a constraint
01	Category A	
01	Category Z	Trees not worthy of being a constraint
01	Category ZZ	
	Existing layout	
	Proposed layout	
	Tree protection zone (TPZ) boundaries	
	Protective fencing and TPZ area within	
	TPZ where ground protection must be installed. Retain all existing levels.	
01	Tree to be removed	
	Tree no longer on site	

ISSUE	DATE	REVISION

NOTE DO NOT SCALE FROM DRAWING. USE FIGURED DIMENSIONS ONLY. CHECK ALL DIMENSIONS ON SITE BEFORE ANY MANUFACTURE OR CONSTRUCTION

PROJECT
95 Stanhope Road, Killara NSW

CLIENT
Lourdes Retirement Village

DRAWING
Tree Management Plan

PROJECT #

DATE 25/09/2023

SCALE @ A1 **NTS**

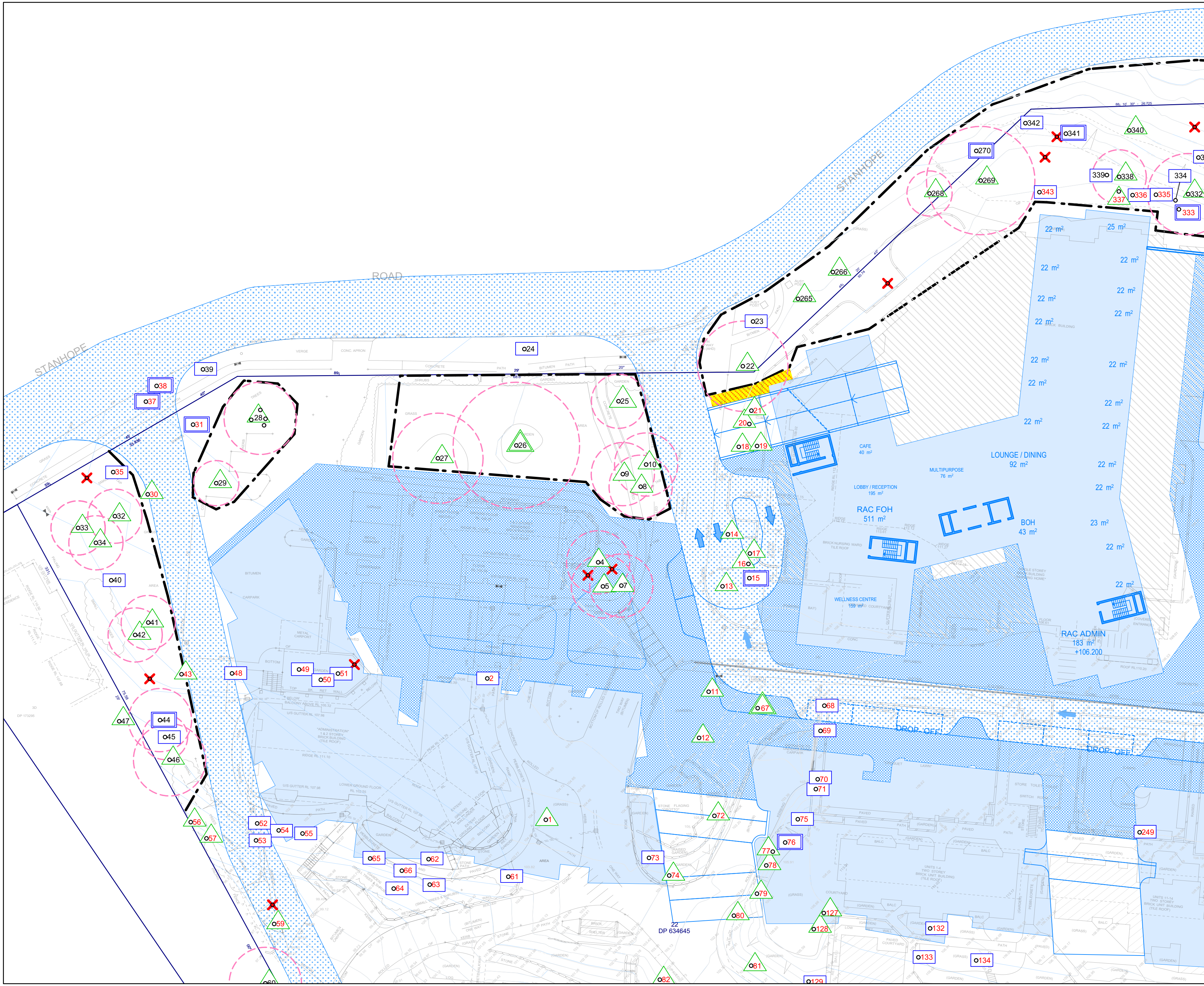
DRAWN AS

DWG # TMP01

REV E

Cover Sheet

Naturally Trees Arboricultural Consulting
PO Box 5085 Elanora Heights NSW 2101 Australia
T: 0417 250 420 **W**: www.naturallytrees.com.au **E**: info@naturallytrees.com.au



LEGEND:

- 01 Category AA — Trees worthy of being a constraint
- 01 Category A — Trees worthy of being a constraint
- 01 Category Z — Trees not worthy of being a constraint
- 01 Category ZZ — Trees not worthy of being a constraint
- Existing layout
- Proposed layout
- Tree protection zone (TPZ) boundaries
- Protective fencing and TPZ area within
- TPZ where ground protection must be installed. Retain all existing levels.
- 01 Tree to be removed
- Tree no longer on site

N

0 10 20m

ISSUE	DATE	REVISION

NOTE DO NOT SCALE FROM DRAWING. USE FIGURED DIMENSIONS ONLY. CHECK ALL DIMENSIONS ON SITE BEFORE ANY MANUFACTURE OR CONSTRUCTION

PROJECT
95 Stanhope Road, Killara NSW

CLIENT
Lourdes Retirement Village

DRAWING
Tree Management Plan

Naturally Trees

PROJECT # | DWG # | REV

DATE 25/09/2023
SCALE @ A1 1:650
DRAWN AS

TMP01 E

Sheet 1 of 4

Naturally Trees Arboricultural Consulting
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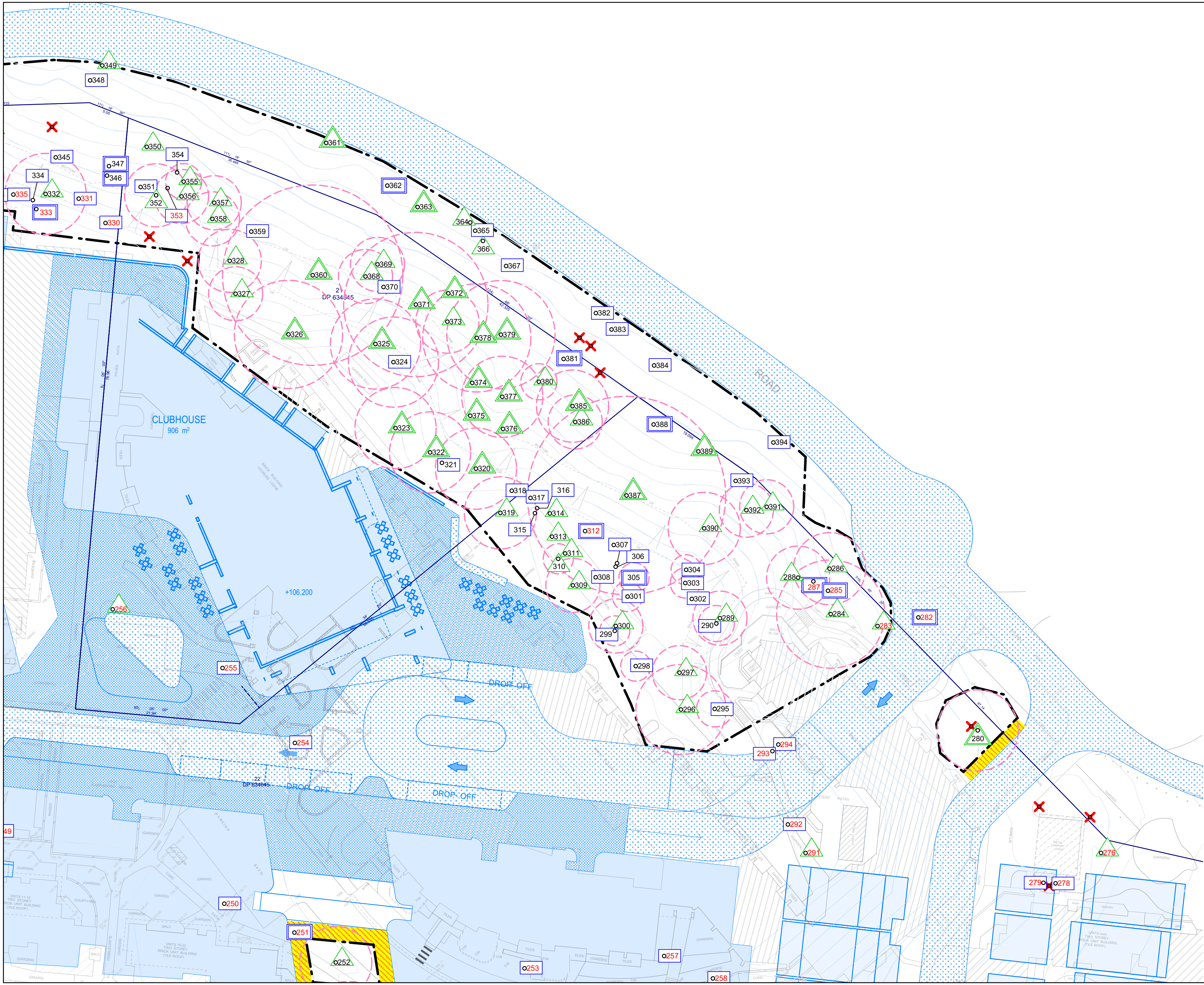

LEGEND:

01	Category AA	Trees worthy of being a constraint
01	Category A	
01	Category Z	Trees not worthy of being a constraint
01	Category ZZ	
	Existing layout	
	Proposed layout	
	Tree protection zone (TPZ) boundaries	
	Protective fencing and TPZ area within	
	TPZ where ground protection must be installed. Retain all existing levels.	
01	Tree to be removed	
	Tree no longer on site	

N

0 10 20m

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PROJECT
95 Stanhope Road, Killara NSW

CLIENT
Lourdes Retirement Village

DRAWING
Tree Management Plan

Naturally Trees

PROJECT # | DWG # TMP01 | REV E

DATE 25/09/2023
SCALE @ A1 1:650
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Sheet 2 of 4

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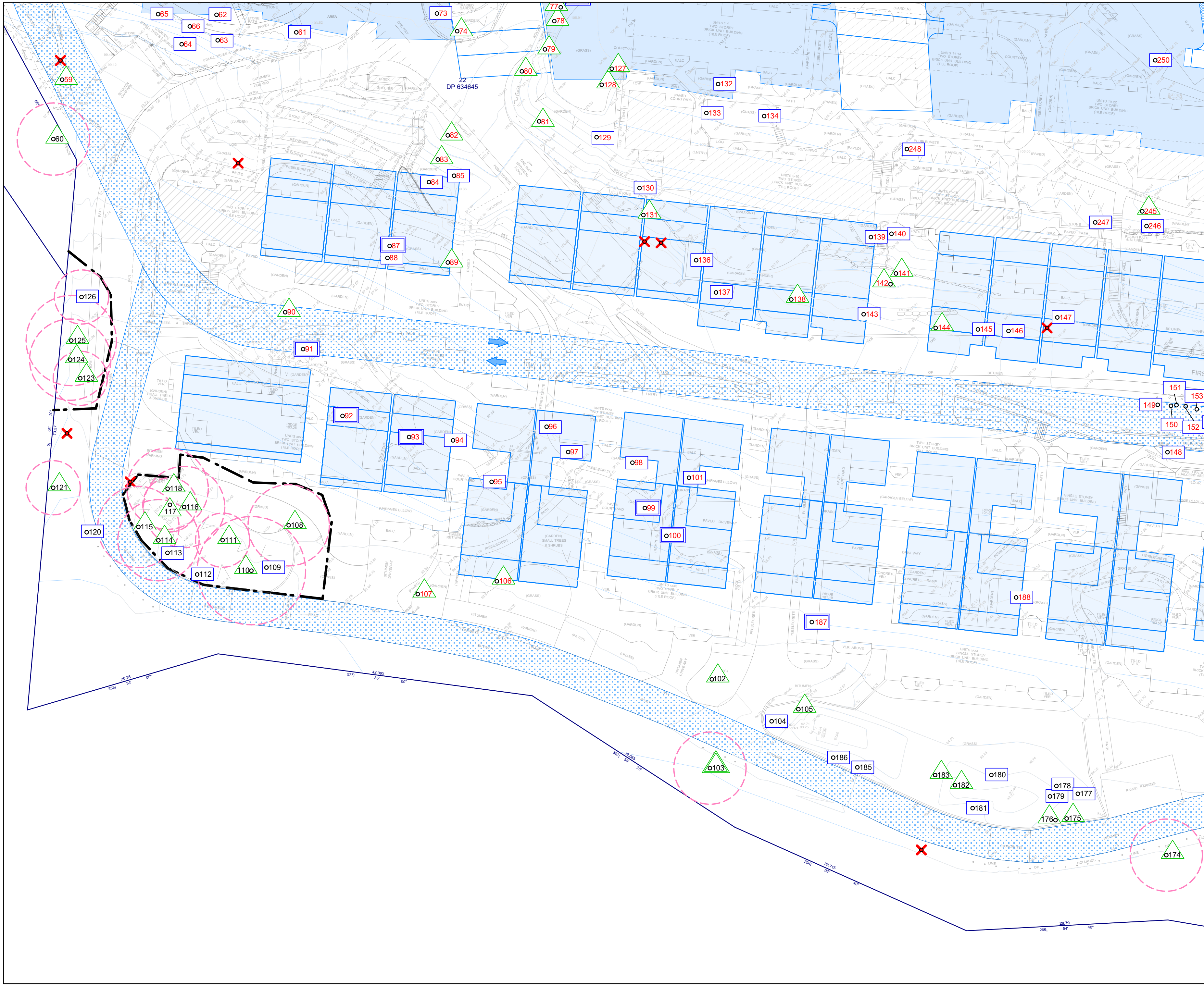

LEGEND:

01	Category AA	Trees worthy of being a constraint
01	Category A	
01	Category Z	Trees not worthy of being a constraint
01	Category ZZ	
	Existing layout	
	Proposed layout	
	Tree protection zone (TPZ) boundaries	
	Protective fencing and TPZ area within	
	TPZ where ground protection must be installed. Retain all existing levels.	
01	Tree to be removed	
	Tree no longer on site	

ISSUE | DATE | REVISION

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95 Stanhope Road, Killara NSW

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DRAWING
Tree Management Plan

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DATE 25/09/2023

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TMP01 E

Sheet 3 of 4

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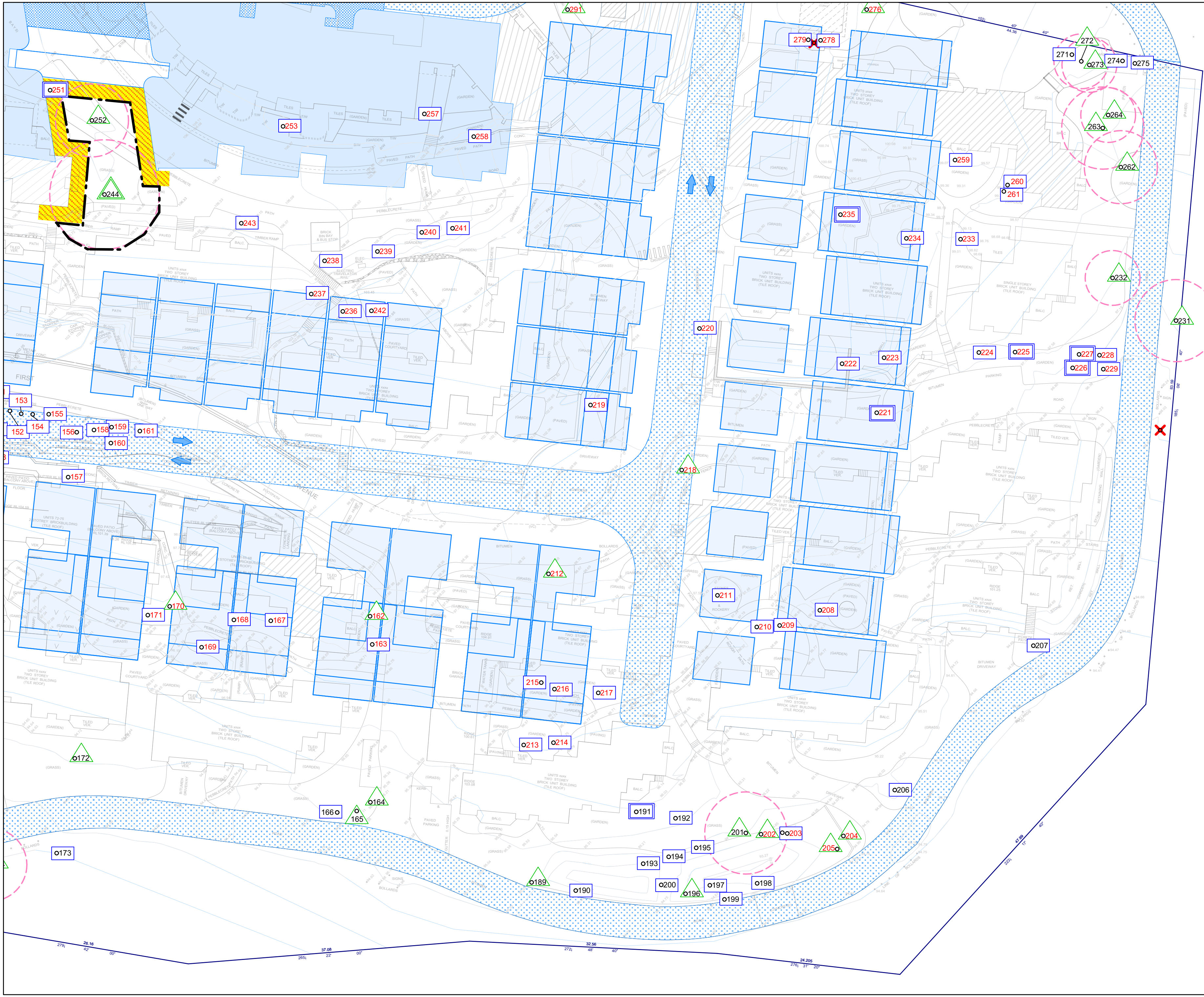

LEGEND:

01	Category AA	Trees worthy of being a constraint
01	Category A	
01	Category Z	Trees not worthy of being a constraint
01	Category ZZ	
	Existing layout	
	Proposed layout	
	Tree protection zone (TPZ) boundaries	
	Protective fencing and TPZ area within	
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ISSUE DATE REVISION

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PROJECT
95 Stanhope Road, Killara NSW

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Lourdes Retirement Village

DRAWING
Tree Management Plan

Naturally Trees

PROJECT # DWG # REV

DATE 25/09/2023

SCALE @ A1 1:650

DRAWN AS

TMP01 E

Sheet 4 of 4

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Appendix J. Black Ash - Response to Department of Planning (Asset Protection Zone) Letter

28 September 2023

Nathan Donn
Senior Development Manager
Levande

Email: nathan.donn@levande.com.au

Dear Mr. Donn,

Re: Lourdes Retirement Village – DPE Issues

Blackash Bushfire Consulting has been engaged to review the email correspondence from the Department of Planning and Environment (dated 18 August 2023) and specifically the "additional associated issues" for the proposed master plan presented in the Planning Proposal of the Lourdes Retirement Village.

I have reviewed the correspondence and from a bushfire perspective the following key matter is relevant to bushfire and discussed below:

1. ***Direction 4.3 Planning for bushfire protection****: While the Rural Fire Service (RFS) have confirmed that the proposed performance-based approach satisfies this Direction, the Department will require justification that changes to any biodiversity assessments and the planning approval pathway (being SSD which switches off requirements for a s100B bushfire authority) would not change the position from RFS. In addition, the Department will require confirmation from the RFS that the proposed floor space can be achieved, having regard to the indicative masterplan.*

The modification of vegetation retention within the Bio-diversity report dated Sept 2023 will have no impact on the NSW Rural Fire Service (NSW RFS) approved the *Bushfire Engineering Design Compliance Strategy* (November 2020) or the Bushfire Assessment prepared by Blackash Bushfire Consulting (dated 14 June 2022, V4.0). The compliance strategy utilises a performance-based approach which is designed as holistic package of bushfire measures but is not reliant/contingent on a specified APZ or separation from the bushland. The key elements of the *Bushfire Engineering Design Compliance Strategy* are the building construction and emergency management arrangements.

As indicated in previous correspondence, the proposed tree / vegetation retention and landscaping can accommodate the required APZ which will provide a fuel reduced area surrounding the buildings and between the buildings and the bush fire hazard. The fuels within these areas will be such that the vegetation does not provide a path for the spread of fire to the buildings, therefore satisfying the requirements of an APZ without the need for any additional tree removal.

The existing village site is historically managed as an APZ and the continued management of the site and proposed tree / native vegetation retention and landscaping can accommodate the required APZ which will provide a fuel-reduced area surrounding the buildings and between the buildings and the bush fire hazard. The areas of retained native vegetation will only require minimal maintenance by way of the removal of leaf litter, twigs and debris.

The proposed design has been carefully developed to ensure the bushfire protection measures are appropriately addressed consistent with the intent of Planning for Bush Fire Protection 2019 and therefore it is possible to simultaneously retain vegetation on the site and meet bushfire protection requirements.

In terms of State Significant Development, while such projects are exempt from requiring a Bushfire Safety Authority (BFSA) under 100B of the Rural Fires Act 1997 and are not required to be assessed under s4.14 of the *Environmental Planning and Assessment Act 1979*, the Department can, and does (as standard practice), refer State Significant Development Applications to the NSW RFS for advice. The NSW RFS advice in these matters is consistent with PBP and approached in the same manner as if a BFSA was required. In my experience (since its inception and as the Director responsible for this portfolio at the NSW RFS for over a decade) the NSW RFS advice is always adopted by the Department in the determination of an SSD matter.

Notwithstanding, the nature of the Performance Based Design Brief Process (as agreed through the *Bushfire Engineering Design Compliance Strategy*) requires ongoing and considerable collaboration and approval from the NSW RFS as a key stakeholder. This process provides for a more rigorous and collaborative process then what is provided for through the typical BFSA process.

In terms of the Department requiring confirmation from the RFS that the proposed floor space can be achieved, having regard to the indicative masterplan, this consultation has already occurred and is covered conclusively in the latest NSW RFS submission on 8 February 2023, which stated:

- *The NSW Rural Fire Service (RFS) has no objection to the planning/ rezoning proposal for seniors housing and nominated residential uses as per the above, based on the additional work and documentation provided by BlackAsh Bushfire Consulting, as contained within the "Addendum Bushfire Report for Lourdes Retirement Village", dated the 22 December 2022 Version 1.0.*
- *The additional work referenced in the above Addendum was considered to address a maximum number of occupants that could be on-site, the adequacy/appropriateness of roadways for emergency egress and fire brigade access given reasonable worst case bush fire scenarios.*

The proposed design has been carefully developed to ensure the bushfire protection measures are appropriately addressed consistent with the intent of *Planning for Bush Fire Protection 2019* and Direction 4.3 and no further consultation with the NSW RFS is necessary.

If you have any questions, please contact me on 0418 412 118.

Yours sincerely,

Corey Shackleton

Principal Bushfire & Resilience
B.Sc., Grad. Dip. (Design for Bush fires)
Fire Protection Association of Australia BPAD Level 3 –34603

LOURDES RETIREMENT VILLAGE

95 STANHOPE ROAD, KILLARA

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

APPENDIX K to P

Final Report October 2023

Angophora costata on sandstone outcropping | First Avenue, Lourdes Retirement Village

Appendix K. BG&E - Proposed Development Stormwater Requirements & Proposed Stormwater Plan

28 September 2023

Nathan Donn
Senior Development Manager
Levande
Level 18,
9 Castlereagh Street
Sydney NSW 2000 Australia

Email: nathan.donn@levande.com.au

Document Number S22172 - LTR-0003

Dear Nathan

Re: 95 Stanhope Road, Killara - Lourdes Proposed Development Stormwater Requirements

The proposed development at 95 Stanhope Road, Killara will comply with Ku-Ring-Gai Development Control Plan (DCP) for stormwater quantity and quality. These are stated below:

- Ku-ring-gai Development Control Plan Section 25R.2 (Drainage Catchments for On-site Detention (OSD)) for OSD tank region requirements.
  - Moreover, based on Section 24R.3, the following permissible site discharge (PSD) and on-site detention (OSD) volume rates apply for the site:
    - PSD: 166 L/s/ha
    - Minimum OSD Storage Volume: 241 m³/ha

- Ku-ring-gai DCP Table 24C.6-1 Stormwater quality requirements are:
  - Gross Pollutants (GP) = 70% reduction
  - Total Suspended Solids = 85% reduction
  - Total Phosphorus = 65% reduction
  - Total Nitrogen = 45% reduction

The proposed stormwater quantity will be managed through an On-site Detention, and the stormwater water quality will be managed through proprietary and natural devices.

During construction, the site excavation and site works will be managed through proposed sediment and erosion control devices in line with the BlueBook. Sediment caught in stormwater runoff during construction will be controlled through an internal swale and pipe network discharging into a settling basin. The sediment will then be left to fall out of suspension. The basin will then be controlled and discharged into the bushland through the existing stormwater discharge point, with importance placed on discharge rates not to damage the bush.

If the sediment cannot be allowed to fall out of suspension in the basin due to continuous rain or the exception of a large storm coming through the area, the basin should be pumped out into sucker trucks and disposed offsite at a facility.

These methods outlined above, as outlined in the BlueBook, follow NSW best practices for managing sediment and erosion during construction. Through the use of these measures, the downstream drainage system and receiving waters are protected from sediment laden runoff.

Yours sincerely,

Stephen Hazlewood

BG&E Pty Limited
Level 2, 8 Windmill Street, Millers Point NSW 2000 Australia
sydney@bgeeng.com
+61 2 9770 3300

Appendix L. Construction Management & Sediment Control Plans

PLAN

SCALE 1:500

0 5 10 15 20 25 30m
SCALE 1:500 AT A1 SIZE

REV	DATE	DESCRIPTION	RVD
D	22.09.23	ISSUED FOR INFORMATION	SH
C	20.09.22	ISSUED FOR INFORMATION	SH
B	18.09.23	ISSUED FOR INFORMATION	SH
A	01.09.23	ISSUED FOR INFORMATION	SH

REVISIONS

REV	DATE	DESCRIPTION	RVD

REVISIONS

CLIENT
LEVANDE

ARCHITECT
plus architecture

Sydney *Office —*
L2, 8 Windmill St
Sydney NSW 2000
P / +61 2 9770 3300 *E* / info@bgeeng.com
bgeeng.com—
BG&E

PROJECT
LOURDES RETIREMENT VILLAGE
95 STANHOPE ROAD, KILLARA NSW 2071

STATUS
SKETCH ONLY
NOT TO BE USED FOR CONSTRUCTION

DRAWN	DESIGNED	CHECKED	APPROVED
SR	SM	SH	

DATUM	GRID	SCALE
AHD	GDA2020 MGA-56	AS SHOWN AT A1 SIZE

TITLE
EARTHWORKS
DEPTH RANGE SKETCH PLAN

PROJECT No.	DRAWING No.	REV.
S22172	SK-0120	D

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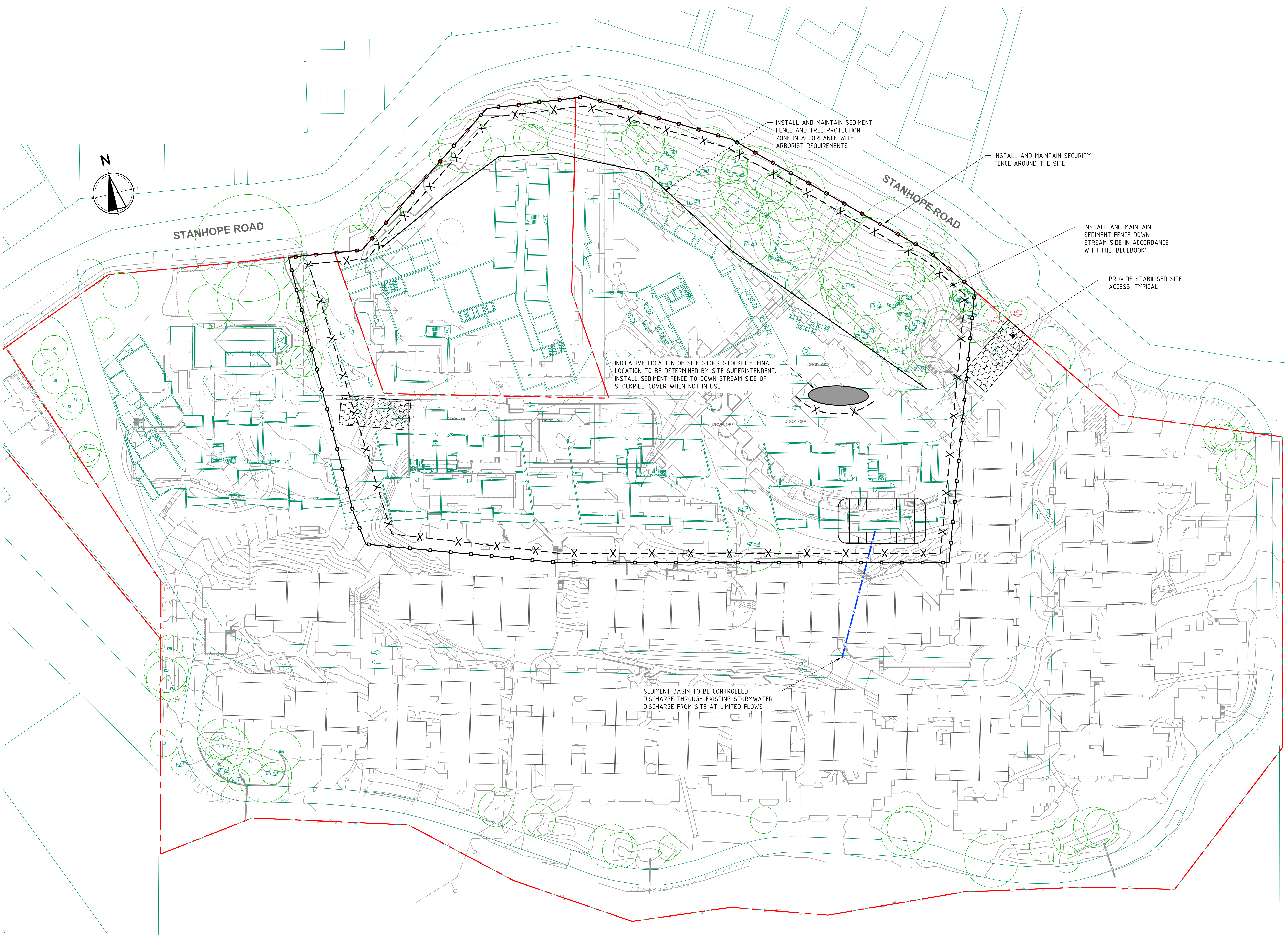

PLAN

SCALE 1:500

LEGEND

- SITE BOUNDARY
- SURVEY
- ARCHITECTURAL
- LANDSCAPING
- GEOTEXTILE INLET FILTER
- STABILISED SITE ACCESS
- MESH & GRAVEL INLET FILTER
- SECURITY FENCE
- SEDIMENT FENCE
- SUGGESTED TEMPORARY STOCKPILE LOCATION
- SITE ACCESS GATE

NOTES

1. REFER DRAWING CI-0710 FOR EROSION AND SEDIMENT CONTROL DETAILS.
2. CONTRACTOR TO ENSURE SITE DRAINAGE IS NOT ADVERSELY IMPACTED DURING CONSTRUCTION.
3. CONTRACTOR TO PROVIDE 'SANDBAG SEDIMENT TRAP' TO ALL PAVED/ROAD AREAS (BOTH PROPOSED AND EXISTING) IN ACCORDANCE WITH THE 'BLUE BOOK'.
4. CONTRACTOR TO PROVIDE 'GEOTEXTILE INLET FILTER TRAPS' TO ALL STORMWATER DRAINAGE INLETS (BOTH PROPOSED AND EXISTING) IN ACCORDANCE WITH THE 'BLUE BOOK'.
5. TREE PROTECTION ZONES TO BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH ARBORIST REQUIREMENTS.

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SCALE 1:500 AT A1 SIZE

REV	DATE	DESCRIPTION	RVD
B	20.09.23	ISSUED FOR INFORMATION	SH
A	19.09.23	ISSUED FOR INFORMATION	SH

REVISIONS

REV	DATE	DESCRIPTION	RVD

REVISIONS

CLIENT: LEVANDE

ARCHITECT: plus architecture

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PROJECT: LOURDES RETIREMENT VILLAGE
95 STANHOPE ROAD, KILLARA NSW 2071

STATUS: SKETCH ONLY
NOT TO BE USED FOR CONSTRUCTION

DRAWN	DESIGNED	CHECKED	APPROVED
JC	SM	SH	

DATUM	GRID	SCALE
AHD	GDA2020 MGA-56	AS SHOWN AT A1 SIZE

TITLE: SKETCH PLAN
STAGE 1
SEDIMENT AND EROSION PLAN

PROJECT No.	DRAWING No.	REV.
S22172	SK-0130	B

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PLAN

SCALE 1:500

LEGEND

- SITE BOUNDARY
- SURVEY
- ARCHITECTURAL
- LANDSCAPING
- GEOTEXTILE INLET FILTER
- STABILISED SITE ACCESS
- MESH & GRAVEL INLET FILTER
- SECURITY FENCE
- SEDIMENT FENCE
- SUGGESTED TEMPORARY STOCKPILE LOCATION
- SITE ACCESS GATE

NOTES

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SCALE 1:500 AT A1 SIZE

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REVISIONS

REV	DATE	DESCRIPTION	RVD

REVISIONS

CLIENT: LEVANDE

ARCHITECT: plus architecture

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Sydney NSW 2000
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bgeeng.com—
BG&E

PROJECT: LOURDES RETIREMENT VILLAGE
95 STANHOPE ROAD, KILLARA NSW 2071

STATUS: SKETCH ONLY
NOT TO BE USED FOR CONSTRUCTION

DRAWN	DESIGNED	CHECKED	APPROVED
JC	SM	SH	

DATUM	GRID	SCALE
AHD	GDA2020 MGA-56	AS SHOWN AT A1 SIZE

TITLE: SKETCH PLAN
STAGE 2
SEDIMENT AND EROSION PLAN

PROJECT No.	DRAWING No.	REV.
S22172	SK-0131	B

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PLAN

SCALE 1:500

LEGEND

- SITE BOUNDARY
- SURVEY
- ARCHITECTURAL
- LANDSCAPING
- GEOTEXTILE INLET FILTER
- STABILISED SITE ACCESS
- MESH & GRAVEL INLET FILTER
- SECURITY FENCE
- SEDIMENT FENCE
- SUGGESTED TEMPORARY STOCKPILE LOCATION
- SITE ACCESS GATE

NOTES

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REVISIONS

REV	DATE	DESCRIPTION	RVD

REVISIONS

CLIENT: LEVANDE

ARCHITECT: plus architecture

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PROJECT
LOURDES RETIREMENT VILLAGE
95 STANHOPE ROAD, KILLARA NSW 2071

STATUS
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DRAWN	DESIGNED	CHECKED	APPROVED
JC	SM	SH	

DATUM	GRID	SCALE
AHD	GDA2020 MGA-56	AS SHOWN AT A1 SIZE

TITLE
SKETCH PLAN
STAGE 3
SEDIMENT AND EROSION PLAN

PROJECT No.	DRAWING No.	REV.
S22172	SK-0132	B

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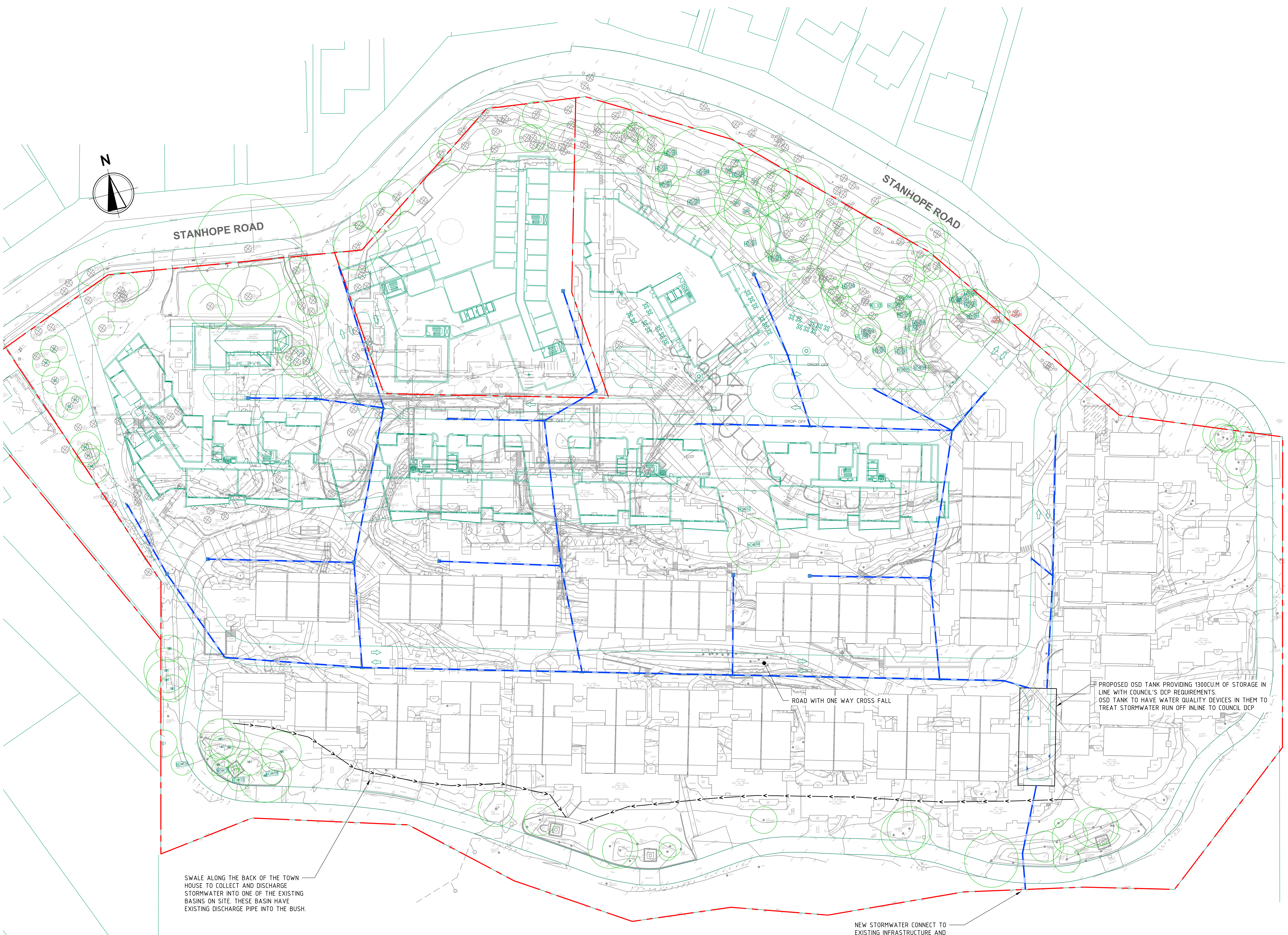
Appendix M. Concept Stormwater Management Plan



PLAN

SCALE 1:500

LEGEND

- SITE BOUNDARY
- SURVEY
- ARCHITECTURAL
- LANDSCAPING
- Ø150 uPVC, 1% MIN — PROPOSED STORMWATER (SIZE AND GRADE)
- FUTURE DRAINAGE PIPE
- EXISTING DRAINAGE PIPE
- SW — SW — DOWNPIPE CONNECTIONS TO PROPOSED STORMWATER
- GD — PROPOSED GRATED DRAIN
- SS — SS — PROPOSED SUBSOIL DRAIN
- PROPOSED CHANNEL FLOW PATH
- PROPOSED GRATED INLET PIT/ PROPOSED KERB INLET PIT
- FUTURE GRATED INLET PIT/ FUTURE KERB INLET PIT

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SCALE 1:500 AT A1 SIZE

REV	DATE	DESCRIPTION	RVD
B	20.09.23	ISSUED FOR INFORMATION	
A	19.09.23	ISSUED FOR INFORMATION	SH

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REV	DATE	DESCRIPTION	RVD

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CLIENT: LEVANDE

ARCHITECT: plus architecture

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PROJECT
LOURDES RETIREMENT VILLAGE
95 STANHOPE ROAD, KILLARA NSW 2071

STATUS
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DRAWN	DESIGNED	CHECKED	APPROVED
JC	SM	SH	

DATUM	GRID	SCALE
AHD	GDA2020 MGA-56	AS SHOWN AT A1 SIZE

TITLE
SKETCH PLAN
CONCEPT STORMWATER
MANAGEMENT PLAN

PROJECT No.	DRAWING No.	REV.
S22172	SK-0140	B

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Appendix N. Construction Staging plans

KEY

Contractor site fencing and compound (General location)

Site entrance / sediment control device

Site compound - Site office / site lunchroom / Amenities / wash bay area

Stage 1 - Tree Protection Zones - Refer to Arborist report & Ecology report for detail requirements including maintenance

Property Boundary

Site access gates (from existing roadways

Notes:

1. Site Fencing / Tree protection zones to be undertaken under the direction from Project Arborist / Project Ecologist. Arborist / Ecologist to approve location of zones prior to works commencement. Ongoing management / maintenance of these zones required to ensure compliance with Ecologist / Arborist requirements
2. Sediment control fencing plan to be undertaken, inspected and certified in accordance with Civil Engineers & Ecologist requirements. Maintenance of this fencing will be continual throughout construction cycle.
3. Minimum monthly inspections of sediment controls and additional checks after heavy rainfall events to mitigate against any potential indirect impacts to adjacent bushland areas.

STAGE 1 - CONSTRUCTION PLAN REVISION: 01 - DRAFT

DATED: 19TH SEPT 2023

LEVANDE

KEY

- Contractor site fencing and compound (General location)
- Site entrance / sediment control device / wash bay area
- Site compound - Site office / site lunchroom / Amenities
- Stage 1 - Tree Protection Zones - Refer to Arborist report & Ecology report for detail requirements including maintenance
- Property Boundary
- Operating village
- Site access gates (from existing roadways

Notes:

1. Site Fencing / Tree protection zones to be undertaken under the direction from Project Arborist / Project Ecologist. Arborist / Ecologist to approve location of zones prior to works commencement. Ongoing management / maintenance of these zones required to ensure compliance with Ecologist / Arborist requirements
2. Sediment control fencing plan to be undertaken, inspected and certified in accordance with Civil Engineers & Ecologist requirements. Maintenance of this fencing will be continual throughout construction cycle.
3. Minimum monthly inspections of sediment controls and additional checks after heavy rainfall events to mitigate against any possible indirect impacts to adjacent bushland areas.

95 Stanhope Road, Killara

STAGE 2 - CONSTRUCTION PLAN REVISION: 01 - DRAFT

DATED: 19TH SEPT 2023

KEY

- Contractor site fencing and compound (General location)
- Site entrance / sediment control device / wash bay area
- Site compound - Site office / site lunchroom / Amenities
- Stage 1 - Tree Protection Zones - Refer to Arborist report & Ecology report for detail requirements including maintenance
- Property Boundary
- Operating village and townhouse precinct
- Site access gates (from existing roadways)

Notes:

1. Site Fencing / Tree protection zones to be undertaken under the direction from Project Arborist / Project Ecologist. Arborist / Ecologist to approve location of zones prior to works commencement. Ongoing management / maintenance of these zones required to ensure compliance with Ecologist / Arborist requirements
2. Sediment control fencing plan to be undertaken, inspected and certified in accordance with Civil Engineers & Ecologist requirements. Maintenance of this fencing will be continual throughout construction cycle.
3. Minimum monthly inspections of sediment controls and additional checks after heavy rainfall events to mitigate against any potential indirect impacts to adjacent bushland areas.

95 Stanhope Road, Killara

STAGE 3 - CONSTRUCTION PLAN REVISION: 01 - DRAFT

DATED: 19TH SEPT 2023

LEVANDE

Appendix O. Operational Footprint Plan

Development Site

Operational Roads / Impact Areas

Development Footprints

Paved/ Landscaped Footprints

95 Stanhope Road, Killara **NO:20576** **DATE: 29/09/2023** **GROUND FLOOR PLAN**

plus architecture

Nominated Architect (NSW):
Amit Julka 10002
Rido Pin 11286

Appendix P. BDAR requirements compliance

Appendix E: BDAR requirements compliance

Table 1. Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
Introduction	Chapters 2 and 3	**Information**	
		Introduction to the biodiversity assessment including: ▪ brief description of the proposal ▪ identification of subject land boundary ▪ general description of the subject land ▪ sources of information used in the assessment, including reports and spatial data ▪ identification and justification for entering the BOS	Section 1.1 ▪ Section 1.1.3 ▪ Section 1.1.2 ▪ Section 1.1.4 ▪ Section 1.1.5 ▪ Section 1.2
		Maps and tables	
		Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated (Note: temporary/ancillary construction facilities and infrastructure yet to be determined and submitted with SSD	Figure 1. Subject land Figure 2. Proposal layout Figure 13. Subject land PCT clearing
Landscape	Sections 3.1 and 3.2, Appendix E	**Information**	
		Identification of site context components and landscape features, including: ▪ general description of subject land topographic and hydrological setting, geology and soils ▪ per cent native vegetation cover in the assessment area (as described in BAM Section 3.2) ▪ IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.)) ▪ rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) ▪ wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.)) ▪ connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.)) ▪ karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.))	▪ Sections 1.1.4 & 3.1 ▪ Sections 2.2.3 & 3.3 ▪ Sections 2.2.1 & 3.2.2 ▪ Section 3.2.3 ▪ Section 3.2.3 ▪ Section 3.2.4 ▪ Section 3.2.5

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		▪ areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.)) ▪ any additional landscape features identified in any SEARs for the proposal ▪ NSW (Mitchell) landscape on which the subject land occurs ▪ details of field reconnaissance undertaken to confirm the extent and condition of landscape features and native vegetation cover (as described in Operational Manual Stage 1 Section 2.4)	▪ Section 3.2.6 ▪ N/A ▪ Section 3.2.7 ▪ Section 2
		Maps and tables	
		Site Map ▪ Property boundary ▪ Cadastre of subject land (including labelling of Lot and DP or section plan if relevant) ▪ Boundary of subject land ▪ Landscape features identified in BAM Subsection 3.1.3	Figure 1 Figure 7 Figure 1 Figure 7
		Location Map ▪ Digital aerial photography at 1:1,000 scale or finer ▪ Boundary of subject land ▪ Assessment area (i.e., the subject land and either 1500 m buffer area or 500 m buffer for linear development) ▪ IBRA bioregions and subregions regions ▪ rivers, streams and estuaries ▪ wetlands and important wetlands ▪ connectivity of different areas of habitat ▪ karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features ▪ areas of outstanding biodiversity value occurring on the subject land and assessment area ▪ NSW (Mitchell) landscape on which the subject land occurs	Figure 7 Figure 7 Figure 7 Figure 7 Figure 7 Figure 9 Figure 20 Figure 7

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Data	
		All report maps as separate jpeg files	
		Individual digital shape files of: ▪ subject land & assessment area (i.e., subject land and 1500 m buffer area) boundary ▪ cadastral boundary of subject land ▪ areas of native vegetation cover ▪ landscape features	
Native vegetation	**Chapter 4, Appendix A & Appendix H**	**Information**	
		Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	
		Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	
		Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	
		Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	
		Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	
		For each PCT within the subject land, describe: ▪ PCT name and ID ▪ vegetation class ▪ extent (ha) within subject land ▪ evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.)) ▪ plant species relied upon for identification of the PCT and relative abundance of each species	▪ Section 4.3 ▪ Section 4.3 ▪ Section 4.3 ▪ Sections 4.3 & 2.2 ▪ Sections 4.3 & Appendix B

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		▪ if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.)) ▪ estimate of per cent cleared value of PCT (BAM Subsection 4.2.1(5.))	▪ Section 4.4 ▪ Section 4.3
		Describe the vegetation integrity assessment of the subject land, including: ▪ identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1) ▪ description of vegetation zones within the subject land (as described in Operational Manual Stage 1 Table 2 and Subsection 3.3.2) ▪ area (ha) of each vegetation zone ▪ assessment of patch size (as described in BAM Subsection 4.3.2) ▪ survey effort (i.e., number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.) ▪ use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	▪ Sections 4.1 & 4.3 ▪ Section 4.3 ▪ Section 4.6 ▪ Sections 2.4.2 ▪ N/A
		Maps and tables	
		Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of all areas of native vegetation including areas that are ground cover only, cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2) Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figure 12
		▪ Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1) ▪ Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries ▪ Map of TEC distribution on the subject land and table of TEC listing, status and area (ha) ▪ Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	Figures 12 & 13 Figure 12 Figure 14 Figure 15
		Table of current vegetation integrity scores for each vegetation zone within the site and including: ▪ composition condition score ▪ structure condition score ▪ function condition score ▪ presence of hollow bearing trees	Table 28

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Data	
		All report maps as separate jpeg files Plot field data (MS Excel format) Plot field datasheets	Provided to Client
		Digital shape files of: ▪ PCT boundaries within subject land ▪ TEC boundaries within subject land ▪ vegetation zone boundaries within subject land ▪ floristic vegetation survey and vegetation integrity plot locations	

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
Native vegetation	Chapter 4, Appendices A and H	**Information**	
		Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	Sections 2.1.2 & 4.1
		Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	Section 4.1.2
		Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	Sections 2.1.2 & 4.1
		Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	Sections 2.2.5 & 2.2.6
		Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	N/A
		For each PCT within the subject land, describe:	
		▪ PCT name and ID	Section 4.3
		▪ vegetation class	Section 4.3
		▪ extent (ha) within subject land	Section 4.3
		▪ evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.))	Sections 4.2 & 4.3
		▪ plant species relied upon for identification of the PCT and relative abundance of each species	Section 4.3
		▪ if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.))	Section 4.4
		▪ estimate of per cent cleared value of PCT (BAM Subsection 4.2.1(5.))	Section 4.3
		Describe the vegetation integrity assessment of the subject land, including:	
		▪ identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	Section 4.1
		▪ description of vegetation zones within the subject land (as described in Operational Manual Stage 1 Table 2 and Subsection 3.3.2)	Section 4.3
		▪ area (ha) of each vegetation zone	Section 4.3
		▪ assessment of patch size (as described in BAM Subsection 4.3.2)	Section 4.6

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		▪ survey effort (i.e., number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.)	Section 2.2.6
		▪ use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	N/A
		Maps and tables	
		Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of all areas of native vegetation including areas that are ground cover only, cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	Figures 12-13
		Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figures 12-13
		Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1)	Figure 13
		Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries	Figure 12
		Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	Figure 14
		Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	Figure 15
		Table of current vegetation integrity scores for each vegetation zone within the site and including:	
		▪ composition condition score	Table 28
		▪ structure condition score	
		▪ function condition score	
		▪ presence of hollow bearing trees	
		Data	
		All report maps as separate jpeg files	Provided to Client
		Plot field data (MS Excel format)	
		Plot field datasheets	
		Digital shape files of:	
		▪ PCT boundaries within subject land ▪ TEC boundaries within subject land ▪ vegetation zone boundaries within subject land ▪ floristic vegetation survey and vegetation integrity plot locations	
Threatened species	Chapter 5	**Information**	

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Identify ecosystem credit species likely to occur on the subject land, including:	
		▪ list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.))	Table 29
		▪ justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	
		▪ justification for addition of any ecosystem credit species to the list	
		Identify species credit species likely to occur on the subject land, including:	
		▪ list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1)	Tables 30 & 31
		▪ justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	
		▪ justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2)	
		▪ justification for addition of any species credit species to the list	
		From the list of candidate species credit species, identify:	
		▪ species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.))	Tables 32 & 33
		▪ species present within the subject land based on being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.))	
		▪ species for which targeted surveys are to be completed to determine species presence (BAM Subsection 5.2.4(2.b.))	
		▪ species for which an expert report is to be used to determine species presence (BAM Subsection 5.2.4(2.c.))	
		Present the outcomes of species credit species assessments from:	
		▪ threatened species survey (as described in BAM Section 5.2.4)	Section 5
		▪ expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Subsection 5.2.4, Section 5.3, Box 3)	N/A
		Where survey has been undertaken include detailed information on:	
		▪ survey method and effort (as described in BAM Section 5.3)	Sections 2.3 & 2.4
		▪ justification of survey method and effort (e.g., citation of peer-reviewed literature) if approach differs from the department’s taxa-specific survey guides or where no relevant guideline has been published	N/A

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		▪ timing of survey in relation to requirements in the TBDC or the department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys	Sections 2.3 & 2.4
		▪ survey personnel and relevant experience	
		▪ describe any limitations to surveys and how these were addressed/overcome	
		Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include:	
		▪ justification of the use of an expert report	N/A
		▪ identify the expert, provide evidence of their expert credentials and departmental approval of expert status	
		▪ all requirements of Box 3 have been addressed in the expert report	
		Where use of local data is proposed (BAM Subsection 1.4.2):	
		▪ identify relevant species	N/A
		▪ identify data to be amended	
		▪ identify source of information for local data, e.g., published literature, additional survey data, etc.	
		▪ justify use of local data in preference to VIS Classification or TBDC data	
		provide written confirmation from the decision-maker that they support the use of local data	
		Species polygon completed for species credit species present within the subject land (assumed present or determined based on survey, expert report or important habitat map) ensuring that:	
		▪ the unit of measure for each species is documented	Section 5.6 and Figures 18 & 20
		▪ for species assessed by area:	
		the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5)	
		a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied	
		▪ for species assessed by counts of individuals:	N/A
		▪ the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.))	
		▪ the method used to derive this number (i.e., threatened species survey or expert report) and evidence-based justification for the approach taken	
		▪ the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land	

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		▪ Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	Tables 34 & 35
		Maps and tables	
		Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and identifying:	
		▪ the ecosystem credit species removed from the list	Table 29
		▪ the sensitivity to gain class of each species	
		Table detailing species credit species in accordance with BAM Section 5.2 and identifying:	
		▪ the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or microhabitat features are not present	Tables 30 - 36
		▪ the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	
		▪ Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	
		▪ Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM Subsection 5.2.5)	Figures 18 & 20
		Data	
		Digital shape files of suitable habitat identified for survey for each candidate species credit species	Provided to client
		Survey locations including GPS coordinates of any plots, transects, grids	
		Digital shape files of each species polygon including GPS coordinates of located individuals	
		Species polygon map in jpeg format	
		Field datasheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	TBD

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
Prescribed impacts	Chapter 6	**Information**	
		Identify potential prescribed biodiversity impacts on threatened entities, including:	
		▪ karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1) ▪ occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2) ▪ corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3) ▪ waterbodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4)	Sections 6 & 8.3
		▪ protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5)	N/A
		▪ where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)	Sections 6 & 8.3
		Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	Sections 6 & 8.3
		Describe the importance of habitat features to the species including, where relevant, impacts on life cycle or movement patterns (e.g., Subsection 6.1.3)	Sections 6 & 8.3
		Where the proposed development is for a wind farm:	
		▪ identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5)	N/A
		▪ provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.)	
		▪ predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Where the proposal may result in vehicle strike:	
		▪ identify a list of threatened fauna or protected fauna species that are part of a TEC and at risk of vehicle strike due to the proposal	Sections 6 & 8.3
		Maps and tables	
		Map showing location of any prescribed impact features (i.e., karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	Figures 18 & 20
		Map showing location of potential vehicle strike locations	-
		Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	N/A
		Data	
		Digital shape files of prescribed impact feature locations	Provided to client
		Prescribed impact features map in jpeg format	
Avoid and minimise impacts	Chapter 7	**Information**	
		Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative:	
		▪ modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology	Section 7
		▪ routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route	
		▪ alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	
		▪ alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	
		Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2)	Sections 7.1.2 & 7.1.3
		Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.))	Section 7
		Detail measures or options considered but not implemented because they are not feasible and/or practical (e.g., due to site constraints)	N/A

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Maps and tables	
		Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	Tables 39 & 43
		Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	Figure 16
		Maps demonstrating indirect impact zones where applicable	-
		Data	
		Digital shape files of:	
		▪ alternative and final proposal footprint	Provided to client
		▪ direct and indirect impact zones	
		Maps in jpeg format	
Assessment of impacts	Chapter 8, Sections 8.1 and 8.2	**Information**	
		Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	Section 8
		Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2):	Section 8.1 & Tables 39-43
		▪ description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal	
		▪ documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications	
		▪ reporting any limitations or assumptions, etc. made during the assessment	
		▪ identification of the threatened entities and their habitat likely to be affected	
		Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including:	
		Assessment of the nature, extent frequency, duration and timing of impacts on the habitat of threatened species or ecological communities associated with:	
		▪ karst, caves, crevices, cliffs, rocks and other features of geological significance	Section 8.3
		▪ human-made structures	Section 8.3.1

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		▪ non-native vegetation	Section 8.3.2
		▪ connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Section 8.3.4
		▪ movement of threatened species that maintains their life cycle	-
		▪ water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities	Section 8.3.3
		▪ assessment of the impacts of wind turbine strikes on protected animals	N/A
		▪ assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	Section 8.3.5
		▪ evaluate the consequences of prescribed impacts	Section 8.3
		▪ describe impacts that are uncertain	-
		▪ document limitations to data, assumptions and predictions	-
		Maps and tables	
		Table showing change in vegetation integrity score for each vegetation zone because of identified impacts	Table 28
		Data	
		N/A	
Mitigation and management of impacts	Chapter 8, Sections 8.4 and 8.5	**Information**	
		Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5 including:	
		▪ techniques, timing, frequency and responsibility	Section 8.4 & Tables 39 & 43
		▪ identify measures for which there is risk of failure	
		▪ evaluate the risk and consequence of any residual impacts	
		▪ document any adaptive management strategy proposed	
		Identification of measures for mitigating impacts related to:	
		▪ displacement of resident fauna (as described in BAM Subsection 8.4.1(2.))	Tables 39 & 43
		▪ indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.))	

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		▪ mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	Table 39
		Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	-
		Maps and tables	
		Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Table 43
		Data	
		N/A	
Impact summary	Chapter 9	**Information**	
		Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including:	
		▪ addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land	Section 9.1.1
		▪ for each TEC, report the extent of the TEC in NSW	
		▪ addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land	Section 9.1.2
		▪ for each threatened species, report the population size in NSW	
		▪ documenting assumptions made and/or limitations to information	
		▪ documenting all sources of data, information, references used or consulted	
		▪ clearly justifying why any criteria could not be addressed	
		Identification of impacts requiring offset in accordance with BAM Section 9.2	Section 10.1
		Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	Section 10.2
		Identification of areas not requiring assessment in accordance with BAM Section 9.3	-
		Maps and tables	
		Map showing the extent of TECs at risk of an SAII within the subject land	Figure 19
		Map showing location of threatened species at risk of an SAII within the subject land	Figures 18 & 20
		Map showing location of:	
		▪ impacts requiring offset	Figure 21
		▪ impacts not requiring offset	Figure 22

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		▪ areas not requiring assessment	
		Data	
		Digital shape files of:	
		▪ extent of TECs at risk of an SAII within the subject land	Provided to client
		▪ location of threatened species at risk of an SAII within the subject land	
		▪ boundary of impacts requiring offset	
		▪ boundary of impacts not requiring offset	
		▪ boundary of areas not requiring assessment	
		Maps in jpeg format	
Impact summary	Chapter 10	**Information**	
		Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including:	
		▪ future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H)	Table 41
		▪ change in vegetation integrity score (BAM Subsection 8.1.1)	
		▪ number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 10.1.2)	
		▪ biodiversity risk weighting for each	
		▪ number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3)	
		Maps and tables	
		Table of PCTs requiring offset and the number of ecosystem credits required	Table 49
		Table of threatened species requiring offset and the number of species credits required	Table 50
		Data	
		Submitted proposal in the BAM Calculator	Appendix A
Biodiversity credit report	Chapter 10	**Information**	
		Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	Section 11

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		BAM credit report in pdf format	Appendix A
		Maps and tables	
		Table of credit class and matching credit profile	Tables 52 & 53
		Data	
		BAM credit report in pdf format	Appendix A

Level 13
420 George Street
Sydney NSW 2000
t: 1300 646 131

6 October 2023

Our ref: 23SYD-5827

Levande Pty Ltd
Level 18
9 Castlereagh Street,
Sydney, NSW 2000

Attention: Nathan Donn

Dear Nathan,

Letter from the NSW Department of Planning and Environment – Request for Agency Advice – Amended Information for Planning Proposal 95-97 Stanhope Road, Killara (PP-2022-658).

This letter will address the comments from the NSW Department of Planning regarding the ELA report. Each dot point under the heading 'ELA report' in the letter from the NSW Department of Planning will be reproduced below. ELA will then provide a response. Thank you for providing the opportunity for ELA to provide additional information about their site assessment and letter (12 July 2023).

Overall summary

It is considered extremely unlikely that Blue Gum High Forest is or was present near or on the site. Blue Gum High Forest is defined as a Plant Community Type (PCT) by the NSW government and as a Threatened Ecological Community (TEC) by the NSW Scientific Committee. Both the NSW government and the NSW Scientific Committee provide additional information that assists in deciding whether either definition of Blue Gum High Forest is present, particularly on highly disturbed sites such as the Lourdes site. The disturbed native vegetation on the Lourdes site is generally species poor.

The additional information is called *supplementary descriptors* by the NSW Scientific Committee and *descriptive attributes* by the NSW government. Consideration of this additional information has been helpful in deciding that Blue Gum High Forest highly unlikely to be present near or on the site.

Plant Community Types (PCTs) and Threatened Ecological Communities (TECs)

The EHG letter discusses both Plant Community Types (PCTs) and Threatened Ecological Communities (TECs). As much of this letter discusses PCTs and TECs, the difference between the two methods of classification of vegetation communities is described below.

While there is a relationship between PCTs and TECs, they are defined differently. As stated in Section 7.5 of the *Plot to PCT Assignment Tool User Guide* (Department of Planning and Environment 2022):

'TECs are legally defined entities that use independent classifications applied by Scientific Committees under NSW and Commonwealth biodiversity legislation. As at June 2021 there are no current NSW TEC determinations that cite quantitative PCTs in the coast and tablelands bioregions.'

All TECs are defined by their Final Determination (FD) as published by the NSW Scientific Committee. An example of a Final Determination for an ecological community is: The FD for TEC Sydney Turpentine Ironbark Forest is found at: Sydney Turpentine Ironbark Forest (nsw.gov.au). The proposed publication date of this FD noted in the document is 31 May 2019.

The NSW Scientific Committee, does not publish definitions of non-threatened ecological communities. It is reasonable to assume that if an area of native vegetation does not meet the definition of any threatened ecological community, then the area of native vegetation can be described as a non-threatened ecological community.

PCTs are defined by the NSW government. The document *A Revised Classification of Plant Communities of Eastern New South Wales* (NSW Department of Planning and Environment) states in Section 1.1:

The PCT master list is defined in BioNet, the NSW biodiversity data repository administer by the Department of Planning and Environment (DPE). 'Approved' PCTs represent the master set of native vegetation communities that are recognised for NSW. As at November 2018 the BioNet Vegetation Classification applications held over 200 fields of text-based descriptions of PCT composition, structure, distribution, and reference sources.

Consequently, this letter will provide an individual response to either PCTs, TECs or both when appropriate.

EHG biodiversity technical comments

The ELA report provided a comparison of PCTs on the site. The discussion doesn't consider the site disturbance influences on the diagnosis of PCT to the extent that is warranted given the current land use.

ELA response

It is acknowledged that the majority of the site is highly disturbed. The ELA letter dated 12 July 2023 includes the following paragraph under *Section 1.1 Field survey* on page 2:

As mentioned above, much of the subject land has been historically cleared, and areas on the east and south of the development site contain very little native species cover to assist in informing PCT selection. Therefore, the decision was made to undertake the second floristic plot, Plot 2 within an area of native vegetation to the south of the subject land.

While this paragraph does not use the word *disturbance,* vegetation clearing is a major component of ecological disturbance in urban areas. The underlying reason that ELA surveyed the plot off-site to the south was because the site is disturbed. The author has previously been recommended to use nearby plots by the state government to study disturbed sites.

ELA noted disturbance on the site as described on page 7 of their letter. Photo 1: Soil profile site 1 noted a white fragment in the wall of the soil profile hole and stated: '*Perhaps some minor disturbance has occurred at this location.'* In a brief discussion of Photo 2 *Soil profile site 2* the following text was stated: *The soil at site 2 shows evidence of significant disturbance, with blue metal gravel and concrete fragments.*

It is accepted that the site shows considerable disturbance in some areas so an additional information will be provided below.

The JK Geotechnics (29 September 2022) reports fill at the following boreholes:

Fill or significant disturbance present (total of 26 boreholes):

- Current boreholes: Borehole 1, Borehole 2, Borehole 3, Borehole 4, Borehole 5, Borehole 6, Borehole 7, Borehole 8, Borehole 9.
- 1981 boreholes: Borehole 3, Borehole 4, Borehole 5, Borehole 6, Borehole 7.
- 1989 boreholes: Borehole 1.
- 2001 boreholes: Borehole 1, Borehole 2, Borehole 3, Borehole 4.
- 2010A boreholes: Borehole 1, Borehole 2, Borehole 8.
- 2010B boreholes: Borehole 2, Borehole 3.
- 2014 boreholes: Borehole 2, Borehole 4.

Limited or no disturbance present (total of 5 boreholes):

- 1981 boreholes: Borehole 1, Borehole 2.
- 1989 boreholes: Borehole 2, Borehole 3.
- 2010B boreholes: Borehole 1.

In summary, approximately 84% of the boreholes display evidence of soil disturbance.

EHG have not recommended a method that may provide adequate justification for PCT allocation on disturbed sites in their letter (ref: DOC23/628482). Although, not stated explicitly it appears that EHG believe that an assessment that relies only upon, or too heavily upon on plant species composition may be inadequate for the site due to the history of disturbance.

The author agrees that identification of PCTs and TECS on highly disturbed sites is challenging. It is difficult to provide a definitive answer based on strong evidence.

The BAM 2020 provides the following guidance on identifying PCTs.

Section 4.2 *Identify and map plant community types and ecological communities* of the BAM 2020 includes the following text:

> *The assessor must identify and map the distribution of PCTs, or the most likely PCTs, and all TECs on the subject land. The identification must be in accordance with the NSW PCT classification as described in the BioNet Vegetation Classification. The identification of TECs must be consistent with the Threatened Species Scientific Committee Final Determination for the TEC. Information that can support the identification of PCTs and TECs can be found on the:*

a. BioNet Vegetation Classification database, which describes how to identify PCTs and TECs as per the NSW PCT classification, and details each PCT and its geographic distribution

b. Threatened biodiversity profile search webpage, which describes TECs.

A document: *BioNet Vegetation Classification user manual* explains the process of Plant Community Identification in chapter three (3). The described method in this document relies upon plant species composition of a plot or other characteristics directly related to plants, such as (vegetation) community structure, (vegetation) community height and cover. As these characters require the presence of plants, they are not easy to apply to situations where clearing or partial clearing has occurred.

The *BioNet Vegetation Classification database* also includes additional information such as '*Descriptive Attributes'* and '*References'.* The *Bionet Vegetation Classification user manual* does not direct the reader to use these additional sources of information. However, the additional information is provided in the database, so the additional information will be discussed below as it may assist in identifying PCTs on disturbed sites.

Using PCT *descriptive attributes* to assist in the identification of PCTs is similar to the approach described below by Preston and Adam (2004a; 2004b). PCT *descriptive attributes* are conceptually similar to TEC *supplementary descriptors.*

EHG biodiversity technical comments

One of the CEECs discussed in the ELA report is Blue Gum High Forest (BGHF). The Final Determination for Blue Gum High Forest (BGHF) states that "Highly modified relics of the community also persist as small clumps of trees without a native understorey." If trees from this community are present on the site and the geographical location and the physical characteristics align with the Final Determination descriptions, then there is no reason to assume that the vegetation on site does not form part of this community or is a transitional intergrade of this community with another. Table 2 of the ELA report states "this PCT was not selected as the best-fit community due to the understorey species more closely aligning with a drier, understorey or sub-canopy and shrub species which is more representative of [PCT] 3262 than a more mesic moist rainforest midstorey and ferny or herbaceous understorey." This statement makes conclusions based on the absence of one stratum of species from this community without consideration of the historical disturbance on the Site. The conclusion for the exclusion of this PCT as occurring on the site is not based on adequate justification.

ELA response

The use of the phrase 'Blue Gum High Forest' is potentially confusing. 'Blue Gum High Forest is both the name of Threatened Ecological Community as described by the NSW Scientific Committee and the name of PCT 1237. This section will separate the two entities by referring to either *Blue Gum High Forest FD* to refer to the Critically Endangered Ecological Community defined by the NSW Scientific Committee or to *PCT 1237 Blue Gum High Forest* to refer to the PCT.

The response below will first discuss on the Threatened Ecological Community Blue Gum High Forest (FD). Blue Gum High Forest FD has been listed by the NSW Scientific Community as a Critically Endangered Ecological Community.

The letter prepared by ELA focused on floristics following the guidance of Preston and Adam (2004b) who state on page 382:

> *'In conclusion, there is merit in Scientific Committee including in its descriptions of threatened ecological communities, features of the community in addition to its floristic composition and location. As we have illustrated, the Scientific Committee has used some of these features in some of its descriptions of listed communities. However, more abundant use of the characteristics, where appropriate to the community, would assist in providing more clarity and certainty in the description of the community and more ready practical application of the Scientific Committee's description by users in the field.'*

However, such other characteristics cannot be used as a substitute for a description of the assemblage of species and the particular area in which the community is located. Rather, they should be seen as a valuable adjunct.'

Additionally, as inferred above, some of additional descriptions provided in Final Determinations that are neither floristic nor geographical and are not abundant. ELA will consider some the non-floristic and non-geographical descriptions in the Final Determination for TECs below. This is similar to the use of additional information such as '*Descriptive Attributes*' and '*References*' as discussed previously about the method used to select a PCT.

The two papers by Preston and Adam (2004a; 2004b) separate the description of threatened ecological communities into two components: 1. The assemblage of species and the particular area; and 2. Supplementary descriptors. The document *Guidelines for interpreting listing criteria for species, populations and ecological communities under the NSW Biodiversity Conservation Act 2016* also follow the Preston and Adam (2004a; 2004b) method. Much of the text below will focus on supplementary descriptors.

The statement above refers Table 2 of the ELA report. Table 2 provided an assessment of the plot in the north-western section of the site. Additional information and a discussion about the plot, the surrounding vegetation and other information will be provided below.

Only one typical Blue Gum High Forest (BGHF) canopy species was present in the plot, *Eucalyptus pilularis* (Blackbutt).

ELA conducted an additional site survey on Friday 8 September. No *Eucalyptus saligna* (Sydney Blue Gums) were observed in the vegetation adjacent to the southern side of Stanhope Road. Potential local remnant species recorded in this area that are included in the Final Determination list of species for the Threatened Ecological Community Sydney Turpentine Ironbark Forest (STIF) include: *Angophora costata* (Smooth-barked Apple), *Eucalyptus paniculata* (Grey Ironbark), *Eucalyptus pilularis* (Blackbutt) and *Syncarpia glomulifera* (Turpentine). Additionally, non-local canopy tree species were more common than STIF species adjacent to Stanhope Road. Non-local canopy species observed include: *Corymbia citriodora* (Lemon-scented Gum), *Eucalyptus maidenii* (Maiden's Gum), *Eucalyptus melliodora* (Yellow Box), *Eucalyptus microcorys* (Tallowwood) and a red gum (probably *Eucalyptus tereticornis*).

EHG have noted (see below) that there is an overlap between the flora species of BGHF and Sydney Turpentine Ironbark Forest (STIF). While STIF species are more common in this area additional analysis

if provided below to support the decision to choose STIF to represent the local native vegetation within this area.

ELA have in their letter dated 12 July 2023 previously provided a floristic assessment. To gain further insight into the vegetation on the site, an assessment of relevant supplementary descriptors will be provided.

Preston and Adam (2004b) have stated that supplementary descriptors may provide greater '*more clarity and certainty'* about the recognition of TECs. However, Preston & Adam (2004b) state the following about supplementary descriptors:

> '*cannot be used as a substitute for a description of the assemblage of species and the particular area in which the community is located. Rather they should be seen as a valuable adjunct.'*

Consequently, while the use of supplementary descriptors cannot replace a floristic assessment, they can provide potentially valuable information.

Tree height and soil type are provided as supplementary descriptors in the Final Determination (FD) for BGHF. Information about tree height is not provided in the FD for STIF. Both the BGHF FD and the STIF FD provide similar information about soil types. The supplementary information about soil types associated with STIF and BGHF is similar as both TECs are described as occurring on clay soils derived from Wianamatta Shale. Some other information about soil types is provided, for example, BGH may occurs in areas underlain by Hawkesbury Sandstone. The STIF FD notes that STIF may also occur on shale layers over sandstone. There is no obvious difference between the soil associated with BGHF or STIF, so a discussion about soil types is unlikely to assist in deciding which TEC is present on the site.

There are other supplementary descriptors such as:

BGHF FD:

> *Typically, Blue Gum High Forest occurs more than 100m above sea level, where rainfall exceeds 1050 mm per annum, although it may be present in sheltered locations with lower rainfall.*

STIF FD:

> *Occurrences of STIF may occur on plateaus and hillsides and on the margins of shale cappings over sandstone.*

These other supplementary descriptors do not provide additional information that will assist in deciding which TEC is likely to be present on the site.

The NSW *Interpretation Act 1987 no. 15* provides guidance that will assist in providing more certainty in unclear situations. The text below is an extract from the *Interpretation Act 1987.*

> *Use of extrinsic material in the interpretation of Acts and statutory rules*
>
> *34. (1) In the interpretation of a provision of an Act or statutory rule, if any material not forming part of the Act or statutory rule is capable of assisting in the ascertainment of the meaning of the provision, consideration may be given to that material—*

(a) to confirm that the meaning of the provision is the ordinary meaning conveyed by the text of the provision (taking into account its context in the Act or statutory rule and the purpose or object underlying the Act or statutory rule and, in the case of a statutory rule, the purpose or object underlying the Act under which the rule was made); or

(b) to determine the meaning of the provision—

(i) if the provision is ambiguous or obscure; or

(ii) if the ordinary meaning conveyed by the text of the provision (taking into account its context in the Act or statutory rule and the purpose or object underlying the Act or statutory rule and, in the case of a statutory rule, the purpose or object underlying the Act under which the rule was made) leads to a result that is manifestly absurd or is unreasonable.

(2) Without limiting the effect of subsection (1), the material that may be considered in the interpretation of a provision of an Act, or a statutory rule made under the Act, includes—

(a) all matters not forming part of the Act that are set out in the document containing the text of the Act as printed by the Government Printer;

(b) any relevant report of a Royal Commission, Law Reform Commission, committee of inquiry or other similar body that was laid before either House of Parliament before the provision was enacted or made;

(c) any relevant report of a committee of Parliament or of either House of Parliament before the provision was enacted or made;

(d) any treaty or other international agreement that is referred to in the Act;

(e) any explanatory note or memorandum relating to the Bill for the Act, or any other relevant document, that was laid before, or furnished to the members of, either House of Parliament by a Minister before the provision was enacted or made;

(f) the speech made to a House of Parliament by a Minister on the occasion of the moving by that Minister of a motion that the Bill for the Act be read a second time in that House;

(g) any document (whether or not a document to which a preceding paragraph applies) that is declared by the Act to be a relevant document for the purposes of this section; and

(h) any relevant material in the Minutes of Proceedings or the Votes and Proceedings of either House of Parliament or in any official record of debates in Parliament or either House of Parliament.

(3) In determining whether consideration should be given to any material, or in considering the weight to be given to any material, regard shall be had, in addition to any other relevant matters, to—

(a) the desirability of persons being able to rely on the ordinary meaning conveyed by the text of the provision (taking into account its context in the Act or statutory rule and the purpose or

object underlying the Act or statutory rule and, in the case of a statutory rule, the purpose or object underlying the Act under which the rule was made); and

(b) the need to avoid prolonging legal or other proceedings without compensating advantage.

The Final Determination for BGHF and STIF refer to a number of publications that may assist *'in the ascertainment of the meaning of the provision',* so in this letter '*consideration may be given to that material*'. In the present situation, referring to the FD referenced publications may assist in deciding if one or the other TEC is present on the site.

The publications are: Benson and Howell (1990; 1994) and Tozer (2003). Informative supplementary descriptors from these publications will be provided below. Site characters will then be compared to the supplementary descriptors. Preston and Adam (2004b) indicate that supplementary descriptor may assist in field recognition of the threatened ecological community.

Benson and Howell (1990) provide the following information:

BGHF:

'*Sydney Blue Gum, Eucalyptus saligna, and Blackbutt, Eucalyptus pilularis, were the main trees, with Blue Gum particularly abundant on the lower slopes and depressions and Blackbutt more prevalent on the ridges. Other tree species were smooth-barked Angophora costata; Grey Ironbark, Eucalyptus paniculata; White Stringybark, Eucalyptus globoidea; Turpentine, Syncarpia glomulifera; and Forest Oak, Allocasuarina torulosa.'*

STIF

The lower rainfall Wianamatta Shale soils of the inner western suburbs and on the north side from Ryde to Glenorie, the Blue Gum High Forest, requiring good rainfall and deep clay soils, gave way to Turpentine-Ironbark Forest.

Benson and Howell (1990) state that BGHF is more common on deep soils.

Benson and Howell (1994) describe the landscape occurrence for BGHF as '*Broad ridges with residual shale soils'.* Their description for the landscape occurrence for *STIF* is: '*Inner western Sydney. Lower rainfall between Glenorie and Ryde; often near junction with sandstone'.*

'*Turpentine-Ironbark Forest vegetation extended into the transition zone between the shale and the underlying Hawkesbury Sandsone, on soils formerly known as the Hammondville Association (Walker 1960). Some of this transitional vegetation still survives as narrow edges to cleared land on private property and on the margins of sandstone bushland reserves in northern Sydney, were there are remnants of shale overlying sandstone, eg: Pennant Hills Park, Land Cove National Park (formerly State Recreation Area) (Clarke & Benson 1987) and Garigal National Park (formerly Davidson State Recreation Area), Ku-ring-gai National Park, and a number of Council parks.*

The argument above primarily considers the presence or absence of the TEC BGHF (FD). A similar argument could be presented for the absence of PCT 3136 Blue Gum High Forest.

As the site is highly disturbed it is relevant to include Preston and Adam's (2004a) consideration of site disturbance and the presence of TECs. Preston and Adam (2004a) note that on highly disturbed sites that while local native species may be present, some legal judgements have decided that the listed Threatened Ecological Community (TEC) is not present. They state on page 259:

> *'The lack of many typical native species and the dominance of exotic species, together with other factors such as the extent of modification and alteration of the understorey structural component of the community, led McClellan CJ to conclude that the vegetation was no longer part of the Blue Gum High Forest community.'*

This letter will not attempt to determine whether any of the local native species that are growing in disturbed areas on the site are not part of an TEC. However, it is clear that high levels of disturbance mean that the TEC may not be present in some locations.

EHG biodiversity technical comments

> *The BGHF Final Determination states "BGHF is dominated by a tall canopy of eucalypts that may exceed 30 m in height. Its understorey is typically multi-layered with a midstorey of mesophyllous shrubs and small trees and a diverse ground layer of herbs, ferns and some grasses. Most stands of the community are in a state of regrowth after past clearing or logging activities, and consequently trees may be shorter, less dense or more dense than less disturbed stands." The ELA report states, "The vegetation within the north east of the site is tall, and approximately to 20 to 30 m (Naturally Trees 2023), however, would not be considered an extremely tall forest." However, the Final Determination for does not require that the trees be extremely tall. The wording of the Final Determination indicates that trees within BGHF may or may not exceed 30m in height, therefore the remnant trees of this community found on the site could have formed part of this community and aren't required to be excluded based on tree height.*

ELA response

It is acknowledged that the site is disturbed and that past clearing of vegetation including trees has occurred.

Other characteristics appropriate for examining the presence of TECs are Supplementary descriptors. Supplementary descriptors for BGHF are examined elsewhere in this document.

EHG biodiversity technical comments

> *The Final Determination states "it can also intergrade with Sydney Turpentine Ironbark Forest (STIF)…stands that contain intermediate characteristics are collectively covered by the Final Determinations of BGHF and STIF and may be diagnosed by detailed consideration of the assemblage of species present at the site." Given STIF has been confirmed as likely to be present on the site, it is also possible that stands of remnant trees could form BGHF given the intergrading often observed between the two communities.*

ELA response

Integrades between BGHF and STIF are likely to occur along the boundary of deeper soils and shallower clay soils. Deep clay soils are not present near or within the site. While the site is clearly disturbed the local remnant trees adjacent to Stanhope Road are more consistent with STIF and less consistent with BGHF.

Paragraph six of the BGHF FD (Proposed Gazettal date 14/10/11) includes the following text:

> *'Blue Gum High Forest is typically associated with soils derived from Wianamatta Shale (Tozer 2003), though may occur in adjacent areas underlain by Hawkesbury Sandstone. The community also occurs on soils associated with localised volcanic intrusions, 'diatremes' (Benson and Howell 1994). Typically, Blue Gum High Forest occurs more than 100m above sea level, where rainfall exceeds 1050 mm per annum, although it may be present in sheltered locations with lower rainfall (Tozer 2003). In drier areas and approaching the shale/sandstone boundary, it intergrades with Sydney Turpentine Ironbark Forest, which is currently listed as an Endangered Ecological Community under the TSC Act. Stands that exhibit intermediate characteristics are collectively covered by the Determinations of these communities and may be diagnosed by detailed consideration of the assemblage of species present at the site.'*

In areas nearby where BGHF and STIF occur near to each other it is highly likely that both communities receive similar rainfall. The local distribution of BGHF and STIF is more likely to be correlated with soil factors. Blue Gum High Forest can occur on soils that are underlain by Hawkesbury sandstone. However, Benson and Howell (1990) state that BGHF is more common on deep soils. Therefore, it is likely that BGHF occurs above sandstone when soils are deep. As stated above STIF is more likely to occur near the shale/sandstone boundary. While it is not explicitly included in the BGHF FD, it can be assumed that clay soils derived from Wianamatta shale are likely to be shallower near the shale/sandstone boundary.

EHG biodiversity technical comments

> *If the upper stratum of BGHF was sparse or absent, then the final determination states that the relatively diverse stratum of small trees including Pittosporum undulatum, Elaeocarpus reticulatus and Allocasuarina torulosa is usually present, all of which are found on the site.*

ELA response

It is acknowledged that paragraph four (4) of the Blue Gum High Forest Final Determination proposed Gazettal date: 14 October 2011 includes the following sentence:

> *'A relatively diverse stratum of small trees is usually present, and includes Pittosporum undulatum (Sweet Pittosporum), Elaeocarpus reticulatus (Blueberry Ash) and Allocasuarina torulosa (Forest Oak).'*

The Final Determination for Sydney Turpentine-Ironbark Forest (Proposed Publication date 31/05/19) includes the following sentence in paragraph 4.1:

> *'STIF is frequently characterised by a stratum of smaller trees which, in addition to saplings of the species listed above, is dominated by species such as Pittosporum undulatum, Acacia parramattensis, Allocasuarina torulosa and Elaeocarpus reticulatus (Tozer et al. 2010).'*

The extracts above from both Final Determinations provide similar information. Thus the presence of these tree species cannot be easily used to decide whether BGHF or STIF is present.

EHG biodiversity technical comments

> *The ELA report states "Quantitative analysis was completed, using the Hager/Steenebeeke 2010 analysis excel spreadsheet for each vegetation integrity plot to determine the best fit PCT using standardised ratio comparison positive native to total native score. This analysis uses the diagnostic species as described by Tozer (2003) and Tozer (2010)." The ELA report has included many discussion points in regard to the analysis of plot data in both the Hager/Steenebeeke excel spreadsheet and the PCT filter tool. The use of the Hager/Steenebeeke tool and the PCT filter tool can be limited on sites which have high levels of disturbance. The reliance on meeting the number of positive diagnostic species to identify the best-fit PCT (e.g. Appendix B of the ELA report for Plot 1), may not be justified given the level of disturbance. While the analysis of species presence and their dominance can assist in assigning the likely best-fit PCT, total numbers of positive diagnostic species aren't always the best indicator, especially when the numbers of positive diagnostic species are so close between PCTs. EHGs advice dated 29 July 2023 has highlighted that the number of positive diagnostic species present on the site is only one component of the analysis for assigning the best-fit PCT. Section 4.2.3.2 of the revised BDAR notes this limitation in the use of positive diagnostic species saying "As can be seen in Table 21 and Table 25, the constituent species in both PCTs are very similar and in the absence of diverse and an abundance of shrub and ground layer species, the use of analytical tools such as the Vegetation classification database PCT filter tool (refer Section 2.2.5) and Hager and Steenbeeke tool used by ELA, are limited."*

ELA response

The analysis of PCT *descriptive attributes* provide additional information about whether a PCT is present in an area. PCT3136 Blue Gum High Forest includes the following descriptive attribute: '*it* [PCT3136 Blue Gum High Forest] *grades into tall forests PCT 3262* [STIF] *on thinner shale soils that adjoin*'

The soils on or near the site are relatively thin clay soils or alternatively sandy soils. None of the soils are typical of the soils associated with PCT3136 Blue Gum High Forest.

EHG biodiversity technical comments

> *The ELA report compares the results of using both the Hager/Steenebeeke tool and the PCT filter tool. The differences in number of positive diagnostic species between the use of the two tools may indicate that the use of older tools such as the Hager/Steenebeeke tool is based on PCT analysis that is outdated.*

ELA response

The Hager / Steenbeeke tool relies on a method similar to methods described in Tozer (2003) and Tozer *et al.* (2010). The PCT filter tool has was suggested as a suitable tool during the accreditation training process for BAM accredited assessors.

While at least one newer method of assigning plot data to PCT is available, namely the *Plot to PCT Assignment Tool* (Department of Planning and Environment 2022), it is unclear if the tool is an improvement on older methods. Representatives of the NSW government provided a presentation of the tool in at the NSW ECA conference in Wollongong in 2022. The author of this letter (DM) asked representatives of the NSW government about the tool during the NSW ECA conference held at Wollongong in 2022. Representatives of the NSW government stated that the *Plot to PCT Assignment Tool* was an alternative option for selecting PCTs, it was not necessarily an improved option. The document *Plot to PCT Assignment Tool User Guide* also does not state that the *Plot to PCT Assignment Tool* is an improved option.

Additionally, the *Plot to PCT Assignment Tool* relies on plant species (floristic) data and may potentially suffer from the same weakness associated with other quantitative floristic methods.

Nevertheless, the Plot to PCT Assignment Tool has been used to analyse the plot data collected from on or near to the site by ELA and ACS/Ecologique. The Plot to PCT Assignment Tool provides various outputs. Results of two of the main analyses are shown and discussed below.

Output from Centroid Matches Plot to PCT Tool (First Seven Plots)

A key feature of the Centroid Plot to PCT Tool is the shading of the cells. Green shaded 'Distance to Centroid' cells indicate that there is a reasonable level of statistical confidence associated with PCT matches. White shaded 'Distance to Centroid' cells indicate that there is a lower level of confidence associated with any PCT match.

The only Plot in the above Figure to generate green shaded cells is ELA Plot 2, the plot located in bushland south of the site. The Distance to Centroid cells for the other six plots generated plots with white shaded cells. The likely reason that ELA Plot 2 generated green shaded cells is that the number of NSW native species recorded in the plot was reasonably high. The number of NSW native species recorded in all other plots was significantly lower.

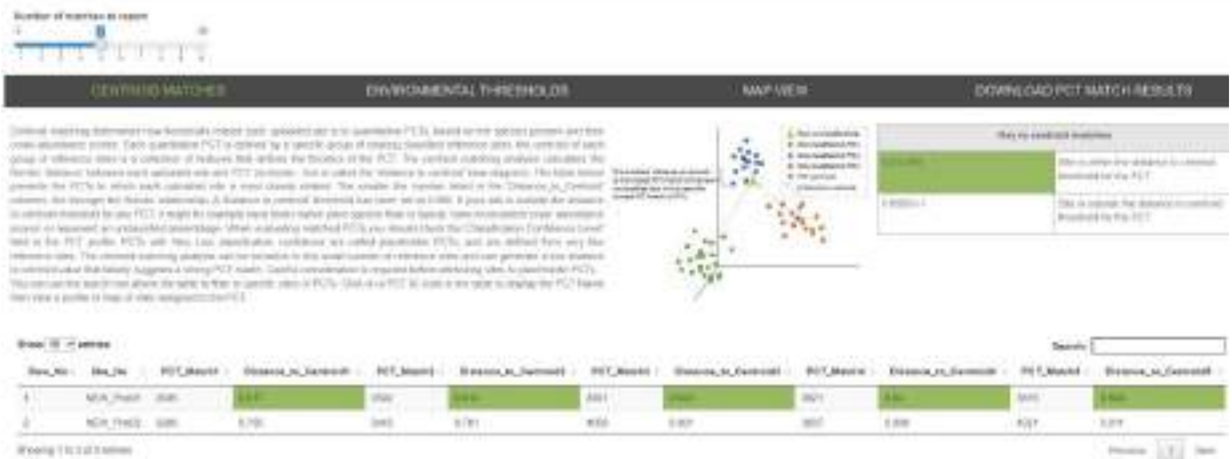
Output of the Characteristic Species Method (First seven plots)

It is important to note as stated above 'The characteristic species method is still under development.' The listed PCT matches for ELA Plot 2 were similar regardless of whether the Centroid Method or the Characteristic species method was used. In contrast, there was significantly less consistency between both methods for the PCT matches analysis of the other plots.

Two additional Plots surveyed by ELA on Tuesday 5 September 2023

ELA surveyed two additional plots on 5 September 2023. One plot was south-east of the site in relatively undisturbed bushland. A second plot was surveyed in the vegetation adjacent to Stanhope Road, east of the previous plot surveyed by ELA. ACS and Ecologique assisted in the field survey work for the plot adjacent to Stanhope Road. The results of the Plot to PCT analysis for these two plots are presented below.

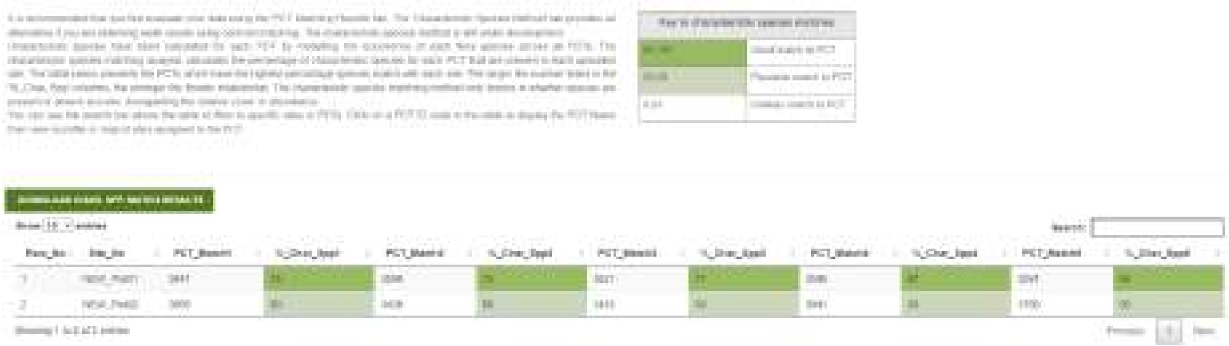
Output from the Centroid Matches analysis (two new plots)



The only Plot in the above Figure to generate green shaded cells is the new ELA Plot 1, the plot located in bushland south-east of the site. The Distance to Centroid cells for the other plot generated white

shaded cells. The likely reason that the new ELA Plot 1 generated green shaded cells is that the number of NSW native species recorded in the plot was reasonably high. The number of NSW native species recorded in new plot 2 was significantly lower.

Output from the characteristic species analysis (Two new plots)



There was less similarity between the output of the distance to centroid and characteristic species match for this second round of analysis. However, the pattern that plots with a greater number of NSW native species generate more similar results for both the distance to centroid and characteristic species analysis is still present.

The less reliability of the Plot to PCT Tool for the analysis of disturbed plots provides support for the use of descriptive attributes to assist in the decision about which PCT is present on a site.

Section 2.2 from the *Plot to PCT Assignment Tool User Guide* states:

> *Where possible within other constraints sites should: be located in least-disturbed available vegetation, avoid obvious ecotones, use an acceptable method for choice of precise start point for the quadrat (e.g. section 4.3.4 (3) in DPIE 2020), be surveyed in suitable seasons when most plants have identifiable material.*

ELA agree the site is disturbed and that ideally plots (quadrats) should be located in relatively undisturbed bushland. Unfortunately, the site offered little if any areas of undisturbed bushland within the site boundaries.

EHG biodiversity technical comments

> *Even if PCT 3592 Sydney Coastal Enriched Sandstone Forest was present within Plot 2 in the ELA Report, the plot is outside of the subject site. The plot is located downslope of the site and could reasonably be argued to show a transition area between any TEC's on the site and adjoining area. EHG considers that the plot doesn't necessarily provide data that should be used to draw conclusions in regard to vegetation found on the site.*

ELA response

It is agreed that vegetation not on the same contour is more likely to differ from vegetation on the same contour. There was no opportunity to assess undisturbed vegetation on the same contour directly adjacent to the site. It is believed that while an assessment of vegetation on a different contour is of less value, it still generates information that may assist in understanding the vegetation on the site.

Regards,

Daniel McDonald
Principal Ecologist and Senior Arborist

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Arboricultural Impact Appraisal and Method Statement

(Revision E)

95 Stanhope Road
Killara, NSW

Prepared for
Lourdes Retirement Village

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25 September 2023

by Andrew Scales
Dip. Horticulture / Dip. Arboriculture AQF5

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Summary

The proposed development is to demolish a number of single and two-story buildings and replace them with a number of multi-story buildings and a single-story chapel. The proposed development also involves the re-arrangement of some of the surrounding roadways and associated services. I have inspected all the trees that could be affected and list their details in Appendix 2. Based on this information, I provided guidance to project architect on the constraints these trees impose on the use of the site.

Forty-nine high category trees and one hundred and thirty-eight low category trees will be lost because of this proposal. However, sixty-nine of the low category trees are exempt from Ku-Ring-Gai Council's Tree Preservation Order and a comprehensive landscaping scheme to mitigate these losses is proposed that will include the planting of new trees.

The proposed changes may adversely affect a further one hundred and fourteen high category trees and seventy-seven low category trees if appropriate protective measures are not taken. However, if adequate precautions to protect the retained trees are specified and implemented through the arboricultural method statement included in this report, the development proposal is expected to have a moderate to high impact on the contribution of trees to local amenity or character.

Table of Contents

Appendices

1. INTRODUCTION

1.1 **Instruction:** I am instructed by Levande Lourdes to inspect the tree population at 95 Stanhope Road, Killara and to provide an arboricultural report to accompany a development application. This report investigates the impact of the proposed development on trees and provides the following guidelines for appropriate tree management and protective measures:

- a schedule of the relevant trees to include basic data and a condition assessment;
- an appraisal of the impact of the proposal on trees and any resulting impact that has on local character and amenity;
- a preliminary arboricultural method statement setting out appropriate protective measures and management for trees to be retained

1.2 **Purpose of this report**: This report provides an analysis of the impact of the development proposal on trees with additional guidance on appropriate management and protective measures. Its primary purpose is for the council to review the tree information in support of the planning submission and use as the basis for issuing a planning consent or engaging in further discussions towards that end. Within this planning process, it will be available for inspection by people other than tree experts, so the information is presented to be helpful to those without a detailed knowledge of the subject.

1.3 **Qualifications and experience:** I have based this report on my site observations and the provided information, and I have come to conclusions in the light of my experience. I have experience and qualifications in arboriculture and include a summary in Appendix 1.

1.4 **Documents and information provided:** Levande Lourdes provided me with copies of the following documents:

- Survey Plan, Dwg No. 21388 (Sheet S1 to S11), by Norton Survey Partners dated 22 April 2015;
- Ground Floor Plan by Plus Architecture dated 25 September 2023; and
- Lower Ground Plan by Plus Architecture dated 20 September 2023.

1.5 **Scope of this report:** This report is only concerned with three hundred and seventy-nine trees located within and adjacent to the subject site. It takes no account of other trees, shrubs or groundcovers within the site unless stated otherwise. It includes a preliminary assessment based on the site visit and the documents provided, listed in 1.4 above.

2. THE LAYOUT DESIGN

2.1 **Tree AZ method of tree assessment:** The TreeAZ assessment method determines the worthiness of trees in the planning process. TreeAZ is based on a systematic method of assessing whether individual trees are important and how much weight they should be given in management considerations. Simplistically, trees assessed as potentially important are categorised as '**A**' and those assessed as less important are categorised as '**Z**'. Further explanation of TreeAZ can be found in Appendix 3.

In the context of new development, all the Z trees are discounted as a material constraint in layout design. All the A trees are potentially important and they dictate the design constraints. This relatively simple constraints information is suitable for use by the architect to optimise the retention of the best trees in the context of other material considerations.

2.2 **Site visit and collection of data**

2.2.1 **Site visit:** I carried out an unaccompanied site visit on 24 May 2021 and 28 March 2023. All my observations were from ground level and I estimated all dimensions unless otherwise indicated. Aerial inspections, root or soil analysis, exploratory root trenching and internal diagnostic testing was not undertaken as part of this assessment. I did not have access to trees on other private properties and have confined observations of them to what was visible from within the property. The weather at the time of inspection was clear and dry with good visibility.

2.2.2 **Brief site description:** 95 Stanhope Road is located in the residential suburb of Killara (refer figure 1). The site is on the southern side of the road and surrounded by residential development. The property consists of the existing Lourdes Retirement Village that is currently occupied. A variety of ornamental, coniferous and local indigenous trees are scattered throughout the site and around the site boundaries.

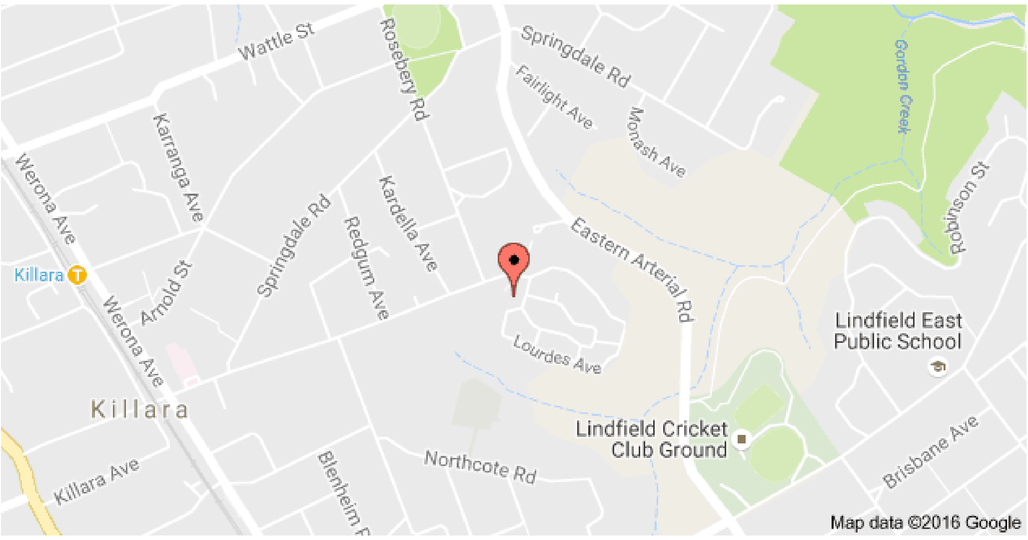

Figure 1: The location of the subject site (www.googlemaps.com).

2.2.3 **Collection of basic data:** I inspected each tree and have collected information on species, height, diameter, maturity and potential for contribution to amenity in a development context. I have recorded this information in the tree schedule included, with explanatory notes, in Appendix 2. Each tree was then allocated to one of four categories (**AA**, **A**, **Z** or **ZZ**), which reflected its suitability as a material constraint on development.

2.2.4 **Identification and location of the trees:** I have illustrated the locations of the significant trees on the Tree Management Plan (Plan TMP01) included as Appendix 8. This plan is for illustrative purposes only and it should not be used for directly scaling measurements.

2.2.5 **Advanced interpretation of data:** Australian Standard *Protection of trees on development sites* (AS4970-2009), recommends that the trunk diameter measurement for each tree is used to calculate the tree protection zone (TPZ), which can then be interpreted to identify the design constraints and, once a layout has been consented, the exclusion zone is to be protected by barriers.

2.2.6 **Plan updates:** During my site visit, I noted five trees (Trees 121, 175, 176, 200 and 236) that were not shown on the land survey. I have illustrated their approximate locations on plan TMP01 but these positions have not been accurately surveyed. I do not consider that this has affected the conclusions of this report but if their locations are considered important, they should be accurately surveyed. Additionally, a number of trees were no longer present on site and have been removed from the plan.

2.3 **The use of the tree information in layout design:** Following my inspection of the trees, the information listed in Appendix 2 was used to provide constraints guidance based on the locations of all the A trees. All the Z trees were discounted because they were not considered worthy of being a material constraint. This guidance identified two zones of constraint based on the following considerations:

- **The tree protection zone** (TPZ) is an area where ground disturbance must be carefully controlled. The TPZ was established according to the recommendations set out in AS4970-2009 and is the radial offset distance of twelve (x12) times the trunk diameter. In principle, a maximum encroachment of 10% is acceptable within the TPZ and a high level of care is needed during any activities that are authorised within it if important trees are to be successfully retained.

- **The structural root zone** (SRZ) is a radial distance from the centre of a tree's trunk, where it is likely that structural, woody roots would be encountered. The distance is calculated on trunk flare diameter at ground level. The SRZ may also be influenced by natural or built structures, such as rocks and footings. The SRZ only needs to be calculated when major encroachment (>10%) into a TPZ is proposed.

3. ARBORICULTURAL IMPACT APPRAISAL

3.1 **Summary of the impact on trees:** I have assessed the impact of the proposal on trees by the extent of disturbance in TPZs and the encroachment of structures into the SRZ (as set out briefly in 2.3 above and more extensively in Appendix 2). All the trees that may be affected by the development proposal are listed in Table 1

Table 1: Summary of existing trees and trees that may be affected by development

Impact	Reason	Important trees		Unimportant trees	
		AA	A	Z	ZZ
Retained trees that may be affected through disturbance to TPZs	Removal of existing surfacing/structures/ landscaping and/or installation of new surfacing/structures/ landscaping	TOTAL 22	TOTAL 92	TOTAL 67	TOTAL 10
Trees to be removed	Building and civil construction and/or level variations within TPZ	TOTAL 1	TOTAL 49	TOTAL 115	TOTAL 23

3.2 Detailed impact appraisal

3.2.1 **Category AA and A trees to be removed:** The proposed development will necessitate the removal of forty-nine high category trees. These trees will be directly or indirectly impacted by the proposed works and are considered moderate to high significance with good health and condition. In order to compensate for loss of amenity, consideration should be given to replacement planting within the site.

3.2.2 **Category AA and A trees that could potentially be adversely affected through TPZ disturbance:** One hundred and fourteen category A and AA trees could potentially be adversely affected through disturbance to their TPZs as follows:

- **Trees 8, 9, 10, 22, 25, 32, 41, 46, 60, 103, 108, 118, 123, 124, 125, 165, 175, 176, 189, 196, 201, 231, 232, 262, 263, 264, 280, 283, 284, 286, 288, 296, 297, 309, 319, 320, 322, 323, 325, 332, 326, 327, 338, 358, 368, 369 and 371:** These are important trees with a high potential to contribute to amenity so any adverse impacts on them should be minimised. The proposed demolition and construction works will come within close proximity to these and will cause harm if not carried out with care. I have reviewed the situation carefully and my experience is that these trees could be successfully retained without any adverse effects if appropriate protective measures are properly specified and controlled through a detailed arboricultural method statement.

- **Trees 244 and 252:** These are important trees with a high potential to contribute to amenity so any adverse impacts on them should be minimised. The proposed demolition and construction works will come within close proximity to these trees and will cause harm if not carried out with care. It is highly unlikely these trees can be successfully retained long-term due to the foreseen disturbance during construction. If it is intended to retain these trees, all existing ground levels would be required to remain within their TPZ to avoid severance of structural roots. Appropriate protective measures are to be properly specified and controlled through the detailed arboricultural method statement.

- **The Remaining Trees:** The remaining high category trees are positioned away from the proposed development. Although, the changes may cause harm if not carried out with care, I have reviewed the situation carefully and my experience is that these trees could be successfully retained without any adverse effects if appropriate protective measures are properly specified and controlled through a detailed arboricultural method statement.

3.2.3 **Low category trees to be retained:** Seventy-seven low category trees remain outside the works areas and can be retained successfully retained without any adverse effects if appropriate protective measures are properly specified and controlled through a detailed arboricultural method statement.

3.2.4 **Low category trees to be removed:** The proposed development will necessitate the removal of one hundred and thirty-eight trees of low and very low retention value. None of these trees are considered significant or worthy of special measures to ensure their preservation. It should be noted that Trees 2, 15, 23, 35, 49, 50, 51, 76, 85, 87, 88, 91, 92, 93, 94, 98, 99, 100, 130, 132, 134, 143, 145–161, 171, 188, 191, 207, 209, 210, 214, 215, 216, 217, 220–228, 234, 235, 247, 250, 251, 254, 255, 260, 270, 293, 330 and 331 are exempt from Ku-Ring-Gai Council’s Tree Preservation Order.

3.3 Proposals to mitigate any impact

3.3.1 **Protection of retained trees:** The successful retention of trees within the site will depend on the quality of the protection and the administrative procedures to ensure protective measures remain in place throughout the development. An effective way of doing this is through an arboricultural method statement that can be specifically referred to in the planning condition. An arboricultural method statement for this site is set out in detail in Section 4.

3.3.2 **New planting:** In the context of the loss of trees, a comprehensive new landscaping scheme is proposed including semi-mature trees to be planted within available areas in prominent locations. The new trees should have the potential to reach a significant height without excessive inconvenience and be sustainable into the long term, significantly improving the potential of the site to contribute to local amenity and character.

3.3.3 **Summary of the impact on local amenity:** Forty-nine high category trees and one hundred and thirty-eight low category trees will be lost because of this proposal. However, sixty-nine of the low category trees are exempt from Ku-Ring-Gai Council's Tree Preservation Order and a comprehensive landscaping scheme to mitigate these losses is proposed that will include the planting of new trees. The proposed changes may adversely affect a further one hundred and fourteen high category trees and seventy-seven low category trees if appropriate protective measures are not taken. However, if adequate precautions to protect the retained trees are specified and implemented through the arboricultural method statement included in this report, the development proposal is expected to have a moderate to high impact on the contribution of trees to local amenity or character.

4. ARBORICULTURAL METHOD STATEMENT

4.1 Introduction

4.1.1 **Terms of reference:** The impact appraisal in Section 3 identified the potential impacts on trees caused by proposed development. Section 4 is an arboricultural method statement setting out management and protection details that must be implemented to secure successful tree retention. It has evolved from Australian Standard AS4970-2009 *Protection of trees on development sites*.

4.1.2 **Plan TMP01:** Plan TMP01 in Appendix 8 is illustrative and based entirely on provided information. This plan should only be used for dealing with the tree issues and all scaled measurements must be checked against the original submission documents. The precise location of all protective measures must be confirmed at the pre-commencement meeting before any demolition or construction activity starts. Its base is the existing land survey, which has the proposed layout superimposed so the two can be easily compared. It shows the existing trees numbered, with high categories (A) highlighted in green triangles and low categories (Z) highlighted in blue rectangles. It also shows the locations of the proposed protective measures.

4.2 Tree protection with fencing and ground protection

4.2.1 **Protection fencing:** Tree protection fencing must comply with AS4970 (section 4.3) recommendations. An illustrative guide is included as Appendix 4. The approximate location of the barriers and the TPZs is illustrated on plan TMP01. The precise location of the fencing must be agreed with the project Arborist before any development activity starts.

4.2.2 **Ground protection:** Any TPZs outside the protective fencing must be covered in ground protection based on AS4970 recommendations until there is no risk of damage from the demolition and construction activity. An illustrative specification for this ground protection is included as Appendix 5. On this site, it must be installed near retained trees as illustrated on plan TMP01 before any demolition and construction starts.

4.3 **Precautions when working in TPZs:** Any work in TPZs must be done with care as set out in Appendix 6. On this site, special precautions must be taken near the trees that are in close proximity to the development of the buildings and new roadways as illustrated on plan TMP01 and summarised below:

- **Removal of existing surfacing/structures and replacement with new surfacing/structures:** Retained trees, including Trees 8, 9, 10, 22, 25, 32, 41, 46, 60, 103, 108, 118, 123, 124, 125, 165, 175, 176, 189, 196, 201, 231, 232, 244, 252, 262, 263, 264, 280, 283, 284, 286, 288, 296, 297, 309, 319, 320, 322, 323, 325, 332, 326, 327, 338, 358, 368, 369 and 371, may be adversely affected by the demolition and construction works or the installation of a small area of new surfacing. Any adverse impact must be minimised by following the guidance set out in Appendix 6.

- **Installation of new soft landscaping:** All landscaping activity within TPZs has the potential to cause severe damage and any adverse impact must be minimised by following the guidance set out in Section 7 of Appendix 6.

- **Installation of new services or upgrading of existing services:** It is often difficult to clearly establish the detail of services until the construction is in progress. Where possible, it is proposed to use the existing services into the site and keep all new services outside TPZs. However, where existing services within TPZs require upgrading or new services have to be installed in TPZs, great care must be taken to minimise any disturbance. Trenchless installation should be the preferred option but if that is not feasible, any excavation must be carried out by hand according to the guidelines set out in Section 6 of Appendix 6. If services do need to be installed within TPZs, consultation must be obtained from the project Arborist and/or council before any works are carried out.

- **Damage to street trees:** Any damage to street trees as a result of erection of hoardings, scaffolding or due to the loading/unloading of vehicles adjacent the site must be immediately reported to the Council's Street Tree Contract Coordinator, in order to determine the appropriate action for maintaining the health and structural integrity of any damaged street tree.

4.4 Other tree related works

4.4.1 **Site storage, cement mixing and washing points:** All site storage areas, cement mixing and washing points for equipment and vehicles must be outside TPZs unless otherwise agreed with the project Arborist and/or council. Where there is a risk of polluted water run off into TPZs, heavy-duty plastic sheeting and sandbags must be used to contain spillages and prevent contamination.

4.4.2 **Pruning:** Any pruning that is required to accommodate hoardings, scaffolding or to accommodate the unloading/loading of vehicles and has been approved by Council shall be carried out by a qualified Arborist (AQF3) and must be in accordance with AS4373 Australian Standards 'Pruning of Amenity Trees'.

4.5 Programme of tree protection and supervision

4.5.1 **Overview:** Tree protection cannot be reliably implemented without arboricultural input. The nature and extent of that input varies according to the complexity of the issues and the resources available on site. For this site, a summary of the level of arboricultural input that is likely to be required is set out in Appendix 7. The project arborist must be instructed to work within this framework to oversee the implementation of the protective measures and management proposals set out in this arboricultural method statement.

The framework in Appendix 7 must form the basis for the discharge of planning conditions through site visits by the project arborist. These supervisory actions must be confirmed by formal letters circulated to all relevant parties. These permanent records of each site visit will accumulate to provide the proof of compliance and allow conditions to be discharged as the development progresses. The developer must instruct the project arborist to comply with the supervision requirements set out in this document before any work begins on site.

4.5.2 **Phasing of arboricultural input:** Trees can only be properly budgeted for and factored into the developing work programmes if the overall project management takes full account of tree issues once consent is confirmed. The project arborist must be involved in the following phases of the project management:

1. **Administrative preparation before work starts on site:** It is normal for a development proposal to vary considerably from the expectations before consent as the detailed planning of implementation evolves. The early instruction of the project arborist ensures that tree issues are factored into the complexities of site management and can often help ease site pressures through creative approaches to tree protection. Pre-commencement discussions between the project arborist and the developer's team is an effective means of managing the tree issues with difficult constraints.

2. **Pre-commencement site meeting:** A pre-commencement meeting must be held on site before any of the demolition and construction work begins. This must be attended by the site manager and the project arborist. Any clarifications or modifications to the consented details must be recorded and circulated to all parties in writing. This meeting is where the details of the programme of tree protection will be agreed and finalised by all parties, which will then form the basis of any supervision arrangements between the project arborist and the developer.

3. **Site supervision:** Once the site is active, the project arborist must visit at an interval agreed at the pre-commencement site meeting. The supervision arrangement must be sufficiently flexible to allow the supervision of all sensitive works as they occur. The project arborist's initial role is to liaise with developer to ensure that appropriate protective measures are designed and in place before any works start on site. Once the site is working, that role will switch to monitoring compliance with arboricultural conditions and advising on any tree problems that arise or modifications that become necessary.

4.6 **Site management:** It is the developer's responsibility to ensure that the details of this arboricultural method statement and any agreed amendments are known and understood by all site personnel. Copies of the agreed documents must be kept on site at all times and the site manager must brief all personnel who could have an impact on trees on the specific tree protection requirements. This must be a part of the site induction procedures and written into appropriate site management documents.

5. HOW TO USE THIS REPORT

5.1 **Limitations:** It is common that the detail of logistical issues such as site storage and the build programme are not finalised until after consent is issued. As this report has been prepared in advance of consent, some of its content may need to be updated as more detailed information becomes available once the post-consent project management starts. Although this document will remain the primary reference in the event of any disputes, some of its content may be superseded by authorised post-consent amendments.

5.2 **Suggestions for the effective use of this report:** Section 4 of this report, including the relevant appendices, is designed as an enforcement reference. It is constructed so the council can directly reference the detail in a planning condition. Referencing the report by name and relating conditions to specific subsections is an effective means of reducing confusion and facilitating enforcement in the event of problems during implementation. More specifically, the following issues should be directly referenced in the conditions for this site:

1.	Pre-commencement meeting	4.5
2.	Protection fence	4.2.1 and Appendix 4
3.	Ground protection	4.2.2 and Appendix 5
4.	Removal of surfacing/structures	4.3 and Appendix 6 (Section 4)
5.	Installation of surfacing/structures	4.3 and Appendices 6 (Section 5)
6.	Services	4.3 and Appendix 6 (Section 6)
7.	Landscaping	4.3 and Appendix 6 (Section 7)
8.	Programming of tree protection	4.5 and Appendix 7
9.	Arboricultural supervision	4.5 and Appendix 7

Each of the above matters shall be supervised by the project arborist and the relevant conditions can only be discharged once that supervision has been confirmed in writing to the relevant parties. The last column of the table in Appendix 7 is to be used so that the various supervision issues can be recorded as they are confirmed by supervision letters. It is intended to act as a summary quick reference to help keep track of the progress of the supervision.

6. OTHER CONSIDERATIONS

6.1 **Trees subject to statutory controls:** The subject trees (excluding Trees 2, 15, 23, 35, 49, 50, 51, 76, 85, 87, 88, 91, 92, 93, 94, 98, 99, 100, 130, 132, 134, 143, 145–161, 171, 188, 191, 207, 209, 210, 214, 215, 216, 217, 220–228, 234, 235, 247, 250, 251, 254, 255, 260, 270, 293, 330 and 331) are legally protected under Ku-ring-gai Council's Tree Preservation Order, it will be necessary to consult the council before any pruning or removal works other than certain exemptions can be carried out. The works specified above are necessary for reasonable management and should be acceptable to the council. However, tree owners should appreciate that the council may take an alternative point of view and have the option to refuse consent.

6.2 **Trees outside the property:** Trees located in the adjacent properties effectively out of the control of the owners of 95 Stanhope Road, Killara. It will not be possible to easily carry out the recommended works without the full co-operation of the tree owners. The implications of non-cooperation require legal interpretation and are beyond the scope of this report.

7. BIBLIOGRAPHY

7.1 **List of references:**

Australian Standard AS4373-2007 *Pruning of Amenity Trees*.
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Mattheck, Dr. Claus R., Breloer, Helge (1995) The Body Language of Trees - A Handbook for Failure Analysis;
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Kangaroo Press, Kenthurst NSW

8. DISCLAIMER

8.1 **Limitations on use of this report:**

This report is to be utilized in its entirety only. Any written or verbal submission, report or presentation that includes statements taken from the findings, discussions, conclusions or recommendations made in this report, may only be used where the whole of the original report (or a copy) is referenced in, and directly attached to that submission, report or presentation.

ASSUMPTIONS

Care has been taken to obtain all information from reliable sources. All data has been verified insofar as possible: however, Naturally Trees can neither guarantee nor be responsible for the accuracy of information provided by others.

Unless stated otherwise:

- *Information contained in this report covers only those trees that were examined and reflects the condition of those trees at time of inspection: and*
- *The inspection was limited to visual examination of the subject trees without dissection, excavation, probing or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject trees may not arise in the future.*

Yours sincerely

Andrew Scales
Dip. Horticulture
Dip. Arboriculture AQF5

APPENDIX 1

Brief qualifications and experience of Andrew Scales

1. Qualifications:

Associate Diploma Horticulture	Northern Sydney Institute of TAFE	1998
Certificate in Tree Surgery	Northern Sydney Institute of TAFE	1998
Diploma of Horticulture (Arboriculture)	Northern Sydney Institute of TAFE	2006
Diploma of Arboriculture AQF5	Northern Sydney Institute of TAFE	2019

2. Practical experience:

Being involved in the arboricultural/horticultural industry for in excess of 20 years, I have developed skills and expertise recognized in the industry. Involvement in the construction industry and tertiary studies has provided me with a good knowledge of tree requirements within construction sites.

As director of Naturally Trees, in this year alone I have undertaken hundreds of arboricultural consultancy projects and have been engaged by a range of clients to undertake tree assessments. I have gained a wide range of practical tree knowledge through tree removal and pruning works.

3. Continuing professional development:

Visual Tree Assessment (Prof. Dr. Claus Mattheck)	Northern Sydney Institute of TAFE 2001
Wood Decay in Trees (F.W.M.R.Schwarze)	Northern Sydney Institute of TAFE 2004
Visual Tree Assessment (Prof. Dr. Claus Mattheck)	Carlton Hotel, Parramatta NSW 2004
Tree A-Z / Report Writing (Jeremy Barrell)	Northern Sydney Institute of TAFE 2006
Up by Roots – Healthy Soils and Trees in the Built Environment (James Urban)	The Sebel Parramatta NSW 2008
Tree Injection for Insect Control (Statement of Attainment)	Northern Sydney Institute of TAFE 2008
Quantified Tree Risk Assessment (QTRA) Registered Licensee #1655	South Western Sydney Institute TAFE 2011
Practitioners Guide to Visual Tree Assessment	South Western Sydney Institute TAFE 2011
Quantified Tree Risk Assessment (QTRA) Registered Licensee #1655	Richmond College NSW TAFE 2014
VALID Approach to Likelihood of Failure (David Evans)	Centennial Park NSW 2017

APPENDIX 2

Tree schedule

NOTE: Colour annotation is AA & A trees with green background; Z & ZZ trees with blue background; trees to be removed in red text.

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
1	*Cedrus deodara*	12	9	500	**6**	80%	M	Nil	Grass	Nil	M	**A1**
2	*Acer negundo*	4	3	200	**2.4**	70%	S	Topped	Garden bed	Adjacent building	L	**Z3**
4	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
5	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
7	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Co-dominant	Garden bed	Nil	M	**A1**
8	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
9	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
10	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
11	*Phoenix canariensis*	8	5	500	**6**	90%	M	Nil	Garden bed	Nil	M	**A1**
12	*Phoenix canariensis*	8	5	500	**6**	90%	M	Nil	Garden bed	Nil	M	**A1**
13	*Phoenix canariensis*	8	5	500	**6**	90%	M	Nil	Garden bed	Nil	M	**A1**
14	*Phoenix canariensis*	8	5	500	**6**	90%	M	Nil	Garden bed	Nil	M	**A1**
15	*Acer negundo*	4	3	100	**1.2**	60%	S	Nil	Garden bed	Nil	L	**ZZ1**
16	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
17	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
18	*Araucaria heterophylla*	12	5	300	**3.6**	80%	S	Nil	Garden bed	Nil	M	**A1**
19	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
20	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
21	*Melaleuca quinquenervia*	14	7	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
22	*Araucaria heterophylla*	20	9	500	**6**	80%	M	Nil	Garden bed	Nil	H	**A1**
23	*Gordonia axillaris*	4	4	100	**1.2**	70%	M	Nil	Grass	Nil	L	**Z1**
24	*Liquidambar styraciflua*	26	26	1200	**14.4**	80%	M	Lopped crown, Large epicormic growth	Grass	LV wires	H	**Z9**
25	*Corymbia gummifera*	12	5	300	**3.6**	70%	S	Nil	Garden bed	Nil	M	**A1**
26	*Araucaria heterophylla*	28	10	700	**8.4**	80%	M	Nil	Grass	Nil	H	**AA1**
27	*Magnolia grandiflora*	9	8	500	**6**	80%	M	Nil	Garden bed	Nil	M	**A1**
28	*Syncarpia glomulifera*	16	14	400	**4.8**	90%	M	Four similar trees	Garden bed	Nil	M	**A1**
29	*Phoenix canariensis*	8	5	500	**3**	90%	M	Nil	Garden bed	Nil	M	**A1**
30	*Araucaria heterophylla*	20	9	500	**6**	80%	M	Nil	Garden bed	Nil	H	**A1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
31	*Cupressus sp.*	18	9	700	**8.4**	50%	O	Major failure, Leaning	Garden bed	LV wires	M	**ZZ9**
32	*Corymbia gummifera*	8	5	300	**3.6**	80%	M	Nil	Grass	Nil	L	**A1**
33	*Melaleuca linariifolia*	8	6	300	**3.6**	80%	M	Nil	Grass	Nil	L	**A1**
34	*Corymbia gummifera*	9	5	300	**3.6**	80%	M	Nil	Grass	Nil	L	**A1**
35	*Olea europaea*	5	6	250	**3**	80%	M	Nil	Garden bed	Nil	L	**Z3**
37	*Jacaranda mimosifolia*	4	4	200	**2.4**	60%	S	Lopped under powerlines	Grass	LV wires	L	**ZZ9**
38	*Acacia baileyana*	4	3	150	**1.8**	50%	S	Lopped under powerlines, Borer	Grass	LV wires	L	**ZZ9**
39	*Corymbia gummifera*	7	8	300	**3.6**	70%	M	Lopped under powerlines	Grass	LV wires	M	**Z10**
40	*Eucalyptus robusta*	8	7	300	**3.6**	70%	M	Nil	Grass	Nil	L	**Z10**
41	*Melaleuca linariifolia*	8	6	300	**3.6**	80%	M	Nil	Grass	Nil	L	**A1**
42	*Eucalyptus robusta*	8	7	300	**3.6**	70%	M	Nil	Grass	Nil	L	**A1**
43	*Melaleuca linariifolia*	8	6	300	**3.6**	80%	M	Nil	Grass	Nil	L	**A1**
44	*Syncarpia glomulifera*	10	6	350	**4.2**	70%	M	Lopped central leader	Grass	Nil	M	**ZZ9**
45	*Pittosporum undulatum*	5	5	250	**3**	70%	M	Nil	Grass	Nil	L	**Z1**
46	*Syncarpia glomulifera*	12	10	400	**4.8**	80%	M	Nil	Grass	Underground services	M	**A1**
47	*Syncarpia glomulifera*	10	8	350	**4.2**	70%	M	Nil	Grass	Nil	M	**A1**
48	*Jacaranda mimosifolia*	5	3	100	**1.2**	70%	S	Nil	Garden bed	Nil	L	**Z1**
49	*Syagrus romanzoffiana*	9	3	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**Z10**
50	*Syagrus romanzoffiana*	9	3	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**Z10**
51	*Syagrus romanzoffiana*	9	3	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**Z10**
52	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
53	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
54	*Melaleuca quinquenervia*	6	3	200	**2.4**	80%	S	Nil	Garden bed	Nil	L	**Z1**
55	*Acer palmatum*	5	6	250	**3**	90%	M	Nil	Garden bed	Nil	L	**Z1**
56	*Jacaranda mimosifolia*	12	9	350	**4.2**	80%	M	Nil	Grass	Nil	M	**A1**
57	*Jacaranda mimosifolia*	10	7	300	**3.6**	80%	M	Nil	Grass	Nil	M	**A1**
59	*Araucaria heterophylla*	14	6	350	**4.2**	80%	M	Nil	Grass	Nil	M	**A1**
60	*Liquidambar styraciflua*	16	12	400	**4.8**	80%	M	Nil	Grass	Nil	M	**A1**
61	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
62	*Allocasuarina torulosa*	6	5	300	**3.6**	80%	M	Nil	Garden bed	Nil	L	**Z1**
63	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
64	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
65	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
66	*Pittosporum undulatum*	7	5	250	**3**	70%	M	Nil	Garden bed	Nil	L	**Z1**
67	*Eucalyptus pilularis*	20	20	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**AA1**
68	*Syzygium paniculatum*	7	5	250	**3**	80%	S	Nil	Garden bed	Adjacent structure	M	**Z1**
69	*Syzygium paniculatum*	7	5	250	**3**	80%	S	Nil	Garden bed	Adjacent structure	M	**Z1**
70	*Syzygium paniculatum*	7	5	250	**3**	80%	S	Nil	Garden bed	Adjacent structure	M	**Z1**
71	*Syzygium paniculatum*	7	5	250	**3**	80%	S	Nil	Garden bed	Adjacent structure	M	**Z1**
72	*Cupressus sp.*	14	9	400	**4.8**	80%	M	Co-dominant	Garden bed	Adjacent structure	M	**A1**
73	*Phoenix canariensis*	6	4	600	**7.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
74	*Corymbia citriodora*	12	6	300	**3.6**	80%	M	Nil	Garden bed	Nil	L	**A1**
75	*Melaleuca stypheliodes*	7	5	250	**3**	70%	M	Nil	Garden bed	Nil	L	**Z1**
76	*Pittosporum undulatum*	3	3	100	**1.2**	50%	S	Borer, Failures throughout canopy	Garden bed	Nil	L	**ZZ10**
77	*Lophostemon confertus*	10	5	300	**3.6**	80%	M	Nil	Steep slope	Nil	M	**A1**
78	*Eucalyptus pilularis*	12	6	300	**3.6**	80%	M	Nil	Steep slope	Nil	M	**A1**
79	*Angophora costata*	14	7	350	**4.2**	80%	M	Nil	Steep slope	Nil	M	**A1**
80	*Angophora costata*	14	7	350	**4.2**	80%	M	Nil	Steep slope	Nil	M	**A1**
81	*Corymbia citriodora*	10	6	300	**3.6**	80%	M	Nil	Garden bed	Nil	L	**A1**
82	*Sapium sebiferum*	7	7	400	**4.8**	80%	M	Nil	Garden bed	Nil	M	**A1**
83	*Jacaranda mimosifolia*	10	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
84	*Jacaranda mimosifolia*	8	5	250	**3**	70%	M	Nil	Garden bed	Nil	L	**Z10**
85	*Camellia sp.*	3	3	100	**1.2**	80%	S	Nil	Garden bed	Nil	L	**Z1**
87	*Brugmansia sp.*	3	3	100	**1.2**	80%	M	Nil	Garden bed	Nil	L	**ZZ1**
88	*Melaleuca quinquenervia*	8	5	250	**3**	80%	S	Nil	Garden bed	Adjacent building	L	**Z10**
89	*Melaleuca quinquenervia*	12	8	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
90	*Phoenix canariensis*	8	7	600	**7.2**	90%	M	Nil	Grass	Nil	M	**A1**
91	*Callistemon sp.*	2	2	100	**1.2**	40%	S	Topped	Grass	Nil	L	**ZZ1**
92	*Callistemon sp.*	2	2	100	**1.2**	40%	S	Nil	Grass	Nil	L	**ZZ1**
93	*Prunus sp.*	3	3	100	**1.2**	70%	M	Nil	Grass	Nil	L	**ZZ1**
94	*Callistemon sp.*	4	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
95	*Robinia pseudoacacia*	9	9	300	**3.6**	70%	M	Co-dominant, Topped upper canopy	Grass	Nil	M	**Z9**
96	*Callistemon sp.*	5	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
97	*Callistemon sp.*	5	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
98	*Callistemon sp.*	4	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
99	*Callistemon sp.*	2	2	100	**1.2**	40%	S	Topped	Grass	Nil	L	**ZZ1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
100	*Callistemon sp.*	2	2	100	**1.2**	40%	S	Topped	Grass	Nil	L	**ZZ1**
101	*Sapium sebiferum*	9	7	250	**3**	80%	M	Nil	Grass	Nil	L	**Z10**
102	*Cupressus sp.*	12	10	400	**4.8**	80%	M	Nil	Garden bed	Nil	M	**A1**
103	*Angophora costata*	22	16	400	**4.8**	80%	M	Nil	Natural ground	Nil	H	**AA1**
104	*Acer palmatum*	3	4	100	**1.2**	80%	M	Nil	Garden bed	Nil	L	**Z1**
105	*Melaleuca quinquenervia*	8	8	350	**4.2**	90%	M	Nil	Garden bed	Nil	M	**A1**
106	*Melaleuca armillaris*	9	8	250	**3**	80%	M	Nil	Garden bed	Nil	M	**A1**
107	*Melaleuca quinquenervia*	12	8	400	**4.8**	80%	M	Nil	Garden bed	Nil	M	**A1**
108	*Corymbia maculata*	18	14	450	**5.4**	90%	M	Nil	Garden bed	Adjacent building	H	**A1**
109	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
110	*Casuarina cunninghamiana*	20	16	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**A1**
111	*Melaleuca quinquenervia*	10	6	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
112	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
113	*Melaleuca quinquenervia*	7	4	250	**3**	80%	S	Nil	Garden bed	Nil	L	**Z1**
114	*Corymbia maculata*	24	14	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
115	*Eucalyptus pilularis*	26	12	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
116	*Eucalyptus pilularis*	26	12	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
117	*Melaleuca quinquenervia*	10	6	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
118	*Eucalyptus pilularis*	20	15	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
120	*Jacaranda mimosifolia*	12	8	250	**3**	80%	M	Co-dominant base	Gravel	Nil	M	**Z9**
121	*Banksia integrifolia*	12	7	300	**3.6**	90%	M	Nil	Garden bed	Nil	M	**A1**
123	*Araucaria heterophylla*	14	7	300	**3.6**	80%	S	Nil	Garden bed	Nil	M	**A1**
124	*Angophora costata*	20	12	450	**5.4**	70%	M	Nil	Garden bed	Nil	H	**A1**
125	*Grevillea robusta*	22	10	500	**6**	80%	M	Nil	Garden bed	Nil	H	**A1**
126	*Leptospermum petersonii*	8	6	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**Z10**
127	*Lophostemon confertus*	18	14	500	**6**	90%	M	Nil	Garden bed	Adjacent building	H	**A1**
128	*Lophostemon confertus*	18	14	450	**5.4**	90%	M	Nil	Garden bed	Adjacent building	H	**A1**
129	*Pittosporum undulatum*	7	5	250	**3**	60%	M	Borer	Garden bed	Nil	L	**Z1**
130	*Prunus sp.*	4	3	100	**1.2**	80%	M	Nil	Garden bed	Nil	L	**Z1**
131	*Corymbia gummifera*	16	9	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
132	*Schefflera actinophylla*	5	3	100	**1.2**	80%	S	Nil	Garden bed	Adjacent building	L	**Z3**
133	*Cupressus sp.*	7	3	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
134	*Magnolia × soulangeana*	3	3	100	**1.2**	70%	M	Nil	Garden bed	Nil	L	**Z1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
136	*Callistemon sp.*	5	5	100	**1.2**	70%	M	Nil	Grass	Nil	L	**Z1**
137	*Prunus sp.*	5	4	200	**2.4**	70%	M	Nil	Garden bed	Nil	M	**Z3**
138	*Angophora costata*	10	10	450	**5.4**	90%	M	Nil	Garden bed	Adjacent structure	M	**A1**
139	*Allocasuarina torulosa*	10	6	300	**3.6**	70%	M	Nil	Garden bed	Adjacent building	M	**Z10**
140	*Callistemon sp.*	5	3	100	**1.2**	70%	M	Nil	Garden bed	Nil	L	**Z1**
141	*Melaleuca armillaris*	8	6	250	**3**	80%	M	Nil	Garden bed	Nil	M	**A1**
142	*Melaleuca armillaris*	8	6	250	**3**	80%	M	Nil	Garden bed	Nil	M	**A1**
143	*Camellia sp.*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
144	*Eucalyptus haemastoma*	8	6	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
145	*Schefflera actinophylla*	3	3	100	**1.2**	80%	S	Nil	Garden bed	Nil	L	**Z1**
146	*Schefflera actinophylla*	3	3	100	**1.2**	80%	S	Nil	Garden bed	Nil	L	**Z1**
147	*Cotoneaster sp.*	5	7	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z3**
148	*Callistemon sp.*	4	3	100	**1.2**	70%	M	Nil	Garden bed	Nil	L	**Z1**
149	*Buckinghamia celsissima*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
150	*Buckinghamia celsissima*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
151	*Buckinghamia celsissima*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
152	*Buckinghamia celsissima*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
153	*Buckinghamia celsissima*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
154	*Buckinghamia celsissima*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
155	*Buckinghamia celsissima*	3	3	100	**1.2**	90%	S	Nil	Garden bed	Nil	L	**Z1**
156	*Camellia sp.*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
157	*Prunus sp.*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
158	*Camellia sp.*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
159	*Camellia sp.*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
160	*Duranta repens*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
161	*Hibiscus sp.*	2	2	100	**1.2**	60%	M	Nil	Garden bed	Nil	L	**Z1**
162	*Melaleuca quinquenervia*	16	10	500	**6**	80%	M	Co-dominant	Grass	Adjacent building	H	**A1**
163	*Melaleuca quinquenervia*	10	7	250	**3**	70%	M	Nil	Grass	Nil	L	**Z10**
164	*Melaleuca quinquenervia*	16	10	500	**6**	80%	M	Nil	Grass	Adjacent building	H	**A1**
165	*Melaleuca quinquenervia*	16	10	500	**6**	80%	M	Nil	Grass	Adjacent building	H	**A1**
166	*Melaleuca quinquenervia*	7	3	200	**2.4**	80%	S	Nil	Grass	Nil	L	**Z1**
167	*Archontophoenix alexandrae*	7	3	200	**2.4**	90%	M	Nil	Garden bed	Nil	L	**Z1**
168	*Archontophoenix alexandrae*	7	3	200	**2.4**	90%	M	Nil	Garden bed	Nil	L	**Z1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
169	*Ulmus glabra*	5	5	150	**1.8**	60%	M	Lopped, Epicormic growth	Garden bed	Adjacent structure	L	**Z9**
170	*Melaleuca quinquenervia*	9	5	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
171	*Cyathea cooperi*	4	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
172	*Melaleuca quinquenervia*	9	5	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
173	*Eucalyptus piperita*	18	16	450	**5.4**	80%	M	Cambium damage, Borer throughout base	Natural ground	Nil	H	**Z9**
174	*Angophora costata*	20	16	400	**4.8**	80%	M	Nil	Natural ground	Nil	H	**A1**
175	*Casuarina cunninghamiana*	16	9	450	**5.4**	80%	M	Nil	Garden bed	Adjacent structure	H	**A1**
176	*Casuarina cunninghamiana*	16	9	450	**5.4**	80%	M	Nil	Garden bed	Adjacent structure	H	**A1**
177	*Melaleuca armillaris*	8	4	100	**1.2**	70%	M	Nil	Garden bed	Nil	L	**Z10**
178	*Pittosporum undulatum*	8	6	250	**3**	70%	M	Nil	Garden bed	Nil	L	**Z10**
179	*Melia azedarach*	7	4	200	**2.4**	70%	M	Nil	Garden bed	Nil	L	**Z1**
180	*Pittosporum undulatum*	6	5	100	**1.2**	70%	S	Nil	Garden bed	Nil	L	**Z1**
181	*Pittosporum undulatum*	6	5	100	**1.2**	70%	S	Nil	Garden bed	Nil	L	**Z1**
182	*Acacia elata*	18	9	400	**4.8**	80%	M	Nil	Garden bed	Nil	H	**A1**
183	*Angophora costata*	20	18	500	**6**	90%	M	Nil	Garden bed	Nil	H	**A1**
185	*Melia azedarach*	10	7	300	**3.6**	70%	M	Nil	Garden bed	Nil	M	**Z10**
186	*Allocasuarina torulosa*	8	5	250	**3**	70%	M	Nil	Garden bed	Nil	L	**Z10**
187	*Ficus benjamina*	5	3	200	**2.4**	50%	M	Lopped, Epicormic growth	Garden bed	Adjacent building	L	**ZZ9**
188	*Prunus sp.*	3	3	100	**1.2**	80%	M	Nil	Grass	Nil	L	**Z1**
189	*Melaleuca quinquenervia*	18	14	600	**7.2**	80%	M	Nil	Garden bed	Adjacent driveway	H	**A1**
190	*Cupressus sp.*	8	5	200	**2.4**	70%	M	Co-dominant	Garden bed	Adjacent driveway	L	**Z10**
191	*Callistemon sp.*	2	2	100	**1.2**	70%	M	Nil	Garden bed	Nil	L	**ZZ1**
192	*Macadamia sp.*	5	4	100	**1.2**	90%	M	Nil	Grass	Nil	L	**Z1**
193	*Melaleuca quinquenervia*	10	6	350	**4.2**	80%	M	Lopped at 2m, Epicormic growth only	Garden bed	Nil	M	**Z9**
194	*Melaleuca quinquenervia*	10	6	350	**4.2**	80%	M	Lopped at 2m, Epicormic growth only	Garden bed	Nil	M	**Z9**
195	*Melaleuca quinquenervia*	10	6	350	**4.2**	80%	M	Lopped at 2m, Epicormic growth only	Garden bed	Nil	M	**Z9**
196	*Melaleuca quinquenervia*	8	5	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
197	*Melaleuca quinquenervia*	10	6	350	**4.2**	80%	M	Lopped at 2m, Epicormic growth only	Garden bed	Nil	M	**Z9**
198	*Melaleuca quinquenervia*	6	4	150	**1.8**	70%	M	Nil	Garden bed	Nil	L	**Z1**
199	*Melaleuca quinquenervia*	6	4	150	**1.8**	70%	M	Nil	Garden bed	Nil	L	**Z1**
200	*Melaleuca quinquenervia*	6	4	150	**1.8**	70%	M	Nil	Garden bed	Nil	L	**Z1**
201	*Melaleuca quinquenervia*	16	9	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
202	*Melaleuca quinquenervia*	16	9	400	**4.8**	80%	M	Nil	Garden bed	Nil	H	**A1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
203	*Casuarina cunninghamiana*	14	6	250	**3**	80%	M	Nil	Garden bed	Nil	M	**Z10**
204	*Melaleuca quinquenervia*	16	9	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
205	*Melaleuca quinquenervia*	16	9	400	**4.8**	80%	M	Nil	Garden bed	Nil	H	**A1**
206	*Acer palmatum*	5	6	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
207	*Unknown shrub*	4	4	100	**1.2**	70%	M	Co-dominant	Garden bed	Nil	L	**Z1**
208	*Callistemon sp.*	6	6	200	**2.4**	70%	M	Nil	Garden bed	Nil	L	**Z1**
209	*Citrus × sinensis*	2	3	100	**1.2**	80%	M	Nil	Grass	Nil	L	**Z1**
210	*Citrus × sinensis*	2	3	100	**1.2**	80%	M	Nil	Grass	Nil	L	**Z1**
211	*Jacaranda mimosifolia*	7	7	200	**2.4**	70%	M	Lopped at 1m, Epicormic growth only	Garden bed	Nil	M	**Z9**
212	*Melaleuca quinquenervia*	14	9	600	**7.2**	80%	M	Nil	Grass	Adjacent driveway	H	**A1**
213	*Pittosporum eugenioides 'Variegatum'*	6	4	100	**1.2**	70%	M	Borer	Garden bed	Adjacent building	L	**Z4**
214	*Camellia sp.*	5	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
215	*Camellia sp.*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
216	*Camellia sp.*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
217	*Camellia sp.*	3	3	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
218	*Corymbia gummifera*	20	14	400	**4.8**	80%	M	Nil	Garden bed	Adjacent building	H	**A1**
219	*Alnus jorullensis*	12	12	450	**5.4**	80%	M	Nil	Garden bed	Adjacent structure	M	**Z3**
220	*Tibouchina sp.*	4	4	100	**1.2**	90%	M	Nil	Grass	Nil	L	**Z1**
221	*Callistemon sp.*	2	2	100	**1.2**	60%	S	Lopped at 2m	Garden bed	Nil	L	**ZZ1**
222	*Callistemon sp.*	5	4	100	**1.2**	80%	M	Nil	Garden bed	Nil	L	**Z1**
223	*Magnolia × soulangeana*	3	4	100	**1.2**	70%	M	Nil	Garden bed	Nil	L	**Z1**
224	*Elaeocarpus reticulatus*	4	3	100	**1.2**	80%	S	Nil	Garden bed	Nil	L	**Z1**
225	*Pittosporum eugenioides 'Variegatum'*	2	2	100	**1.2**	50%	M	Topped	Garden bed	Nil	L	**ZZ1**
226	*Callistemon sp.*	2	2	100	**1.2**	50%	M	Topped	Garden bed	Nil	L	**ZZ1**
227	*Callistemon sp.*	2	2	100	**1.2**	50%	M	Topped	Garden bed	Nil	L	**ZZ1**
228	*Citrus × sinensis*	2	3	100	**1.2**	80%	M	Nil	Grass	Nil	L	**Z1**
229	*Yucca sp.*	5	3	200	**2.4**	80%	M	Nil	Garden bed	Nil	L	**Z1**
231	*Angophora costata*	20	14	450	**5.4**	80%	M	Nil	Natural ground	Nil	H	**A1**
232	*Lophostemon confertus*	12	10	300	**3.6**	70%	M	Nil	Grass	Nil	M	**A1**
233	*Callistemon sp.*	5	4	200	**2.4**	80%	M	Nil	Garden bed	Nil	L	**Z1**
234	*Citrus × sinensis*	2	3	100	**1.2**	80%	M	Nil	Grass	Nil	L	**Z1**
235	*Callistemon sp.*	2	2	100	**1.2**	50%	M	Topped	Garden bed	Nil	L	**ZZ1**
236	*Banksia serrata*	5	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
237	*Casuarina cunninghamiana*	12	8	350	**4.2**	70%	M	Splits along upper boughs	Garden bed	Adjacent structure	M	**Z9**
238	*Banksia serrata*	5	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
239	*Acacia sp.*	5	6	250	**3**	80%	M	Nil	Garden bed	Nil	L	**Z1**
240	*Banksia serrata*	5	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
241	*Banksia serrata*	7	5	250	**3**	80%	M	Nil	Garden bed	Nil	L	**Z1**
242	*Camellia sp.*	5	4	100	**1.2**	90%	M	Nil	Garden bed	Nil	L	**Z1**
243	*Callistemon sp.*	6	5	200	**2.4**	80%	M	Nil	Garden bed	Nil	M	**Z1**
244	*Angophora floribunda*	22	16	600	**7.2**	80%	M	Nil	Grass	Adjacent building	H	**AA1**
245	*Angophora costata*	16	14	500	**6**	80%	M	Nil	Garden bed	Adjacent building	H	**A1**
246	*Callistemon sp.*	4	3	100	**1.2**	80%	M	Nil	Garden bed	Nil	L	**Z1**
247	*Grevillea spinosa*	3	3	100	**1.2**	80%	M	Nil	Garden bed	Nil	L	**Z1**
248	*Cupressus sp.*	6	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
249	*Tibouchina sp.*	5	5	100	**1.2**	90%	M	Nil	Grass	Nil	L	**Z1**
250	*Acer negundo*	5	5	200	**2.4**	80%	M	Nil	Grass	Adjacent structure	L	**Z1**
251	*Ficus benjamina*	3	3	100	**1.2**	50%	M	Topped	Garden bed	Nil	L	**ZZ9**
252	*Syzygium paniculatum*	12	9	400	**4.8**	90%	M	Nil	Garden bed	Nil	M	**A1**
253	*Eucalyptus haemastoma*	9	12	700	**8.4**	80%	M	Cambium damage	Garden bed	Adjacent building	M	**Z9**
254	*Acer negundo*	9	10	350	**4.2**	80%	M	Nil	Garden bed	Adjacent structure	M	**Z3**
255	*Acer negundo*	9	10	350	**4.2**	80%	M	Nil	Garden bed	Adjacent structure	M	**Z3**
256	*Corymbia gummifera*	20	14	500	**6**	80%	M	Nil	Garden bed	Nil	H	**A1**
257	*Callistemon sp.*	5	5	100	**1.2**	80%	M	Nil	Garden bed	Adjacent building	L	**Z1**
258	*Banksia serrata*	5	4	150	**1.8**	80%	M	Nil	Garden bed	Nil	L	**Z1**
259	*Callistemon sp.*	6	5	200	**2.4**	80%	M	Nil	Garden bed	Nil	L	**Z1**
260	*Citrus × sinensis*	2	3	100	**1.2**	80%	M	Nil	Grass	Nil	L	**Z1**
261	*Callistemon sp.*	6	5	200	**2.4**	80%	M	Nil	Garden bed	Nil	L	**Z1**
262	*Corymbia gummifera*	22	12	400	**4.8**	80%	M	Nil	Garden bed	Nil	H	**A1**
263	*Lophostemon confertus*	22	14	450	**5.4**	80%	M	Nil	Grass	Nil	H	**A1**
264	*Lophostemon confertus*	20	10	300	**3.6**	80%	M	Nil	Grass	Adjacent driveway	M	**A1**
265	*Liquidambar styraciflua*	18	14	450	**5.4**	90%	M	Nil	Garden bed	Adjacent structure	H	**A1**
266	*Liquidambar styraciflua*	14	10	400	**4.8**	80%	M	Nil	Grass	Nil	M	**A1**
268	*Jacaranda mimosifolia*	10	9	250	**3**	80%	M	Co-dominant	Grass	Nil	M	**A1**
269	*Eucalyptus haemastoma*	22	14	600	**7.2**	80%	M	One dead bough, should be ok	Garden bed	Nil	H	**A1**
270	*Cinnamomum camphora*	8	8	300	**3.6**	70%	M	Lopped under powerlines, Epicormic growth	Garden bed	LV wires	M	**ZZ9**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
271	*Corymbia gummifera*	20	8	350	**4.2**	70%	M	Heavily pruned from powerlines, Slender habit	Garden bed	HV wires	M	**Z10**
272	*Lophostemon confertus*	14	9	300	**3.6**	70%	M	Nil	Garden bed	HV wires	M	**A1**
273	*Lophostemon confertus*	14	9	300	**3.6**	70%	M	Nil	Garden bed	HV wires	M	**A1**
274	*Eucalyptus scoparia*	8	5	200	**2.4**	70%	M	Nil	Garden bed	Nil	L	**Z10**
275	*Tristaniopsis laurina*	6	4	150	**1.8**	70%	M	Nil	Garden bed	HV wires	L	**Z1**
276	*Lophostemon confertus*	14	10	350	**4.2**	80%	M	Co-dominant	Garden bed	Nil	M	**A1**
278	*Banksia serrata*	5	3	200	**2.4**	70%	M	Nil	Garden bed	Nil	L	**Z1**
279	*Banksia serrata*	5	3	200	**2.4**	70%	M	Nil	Garden bed	Nil	L	**Z1**
280	*Lophostemon confertus*	16	14	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
282	*Eucalyptus botryoides*	14	8	250	**3**	60%	M	Heavily pruned from powerlines	Garden bed	HV wires	M	**ZZ9**
283	*Lophostemon confertus*	10	7	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
284	*Eucalyptus robusta*	18	16	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**A1**
285	*Acacia elata*	7	5	250	**3**	30%	O	Borer	Garden bed	Nil	L	**ZZ4**
286	*Eucalyptus robusta*	22	14	400	**4.8**	70%	M	Nil	Garden bed	Nil	M	**A1**
287	*Acacia elata*	7	5	250	**3**	30%	O	Borer	Garden bed	Nil	L	**ZZ4**
288	*Eucalyptus melliodora*	20	14	350	**4.2**	70%	M	Nil	Garden bed	Nil	H	**A1**
289	*Eucalyptus robusta*	14	7	300	**3.6**	80%	M	Nil	Steep slope	Nil	M	**A1**
290	*Allocasuarina torulosa*	7	4	200	**2.4**	60%	M	Failures	Steep slope	Nil	L	**Z10**
291	*Corymbia gummifera*	18	12	400	**4.8**	80%	M	Nil	Garden bed	Adjacent structure	H	**A1**
292	*Cupressus sp.*	6	1	100	**1.2**	80%	M	Nil	Garden bed	Nil	L	**Z1**
293	*Washingtonia robusta*	2	2	200	**2.4**	90%	S	Nil	Garden bed	Nil	L	**Z1**
294	*Banksia serrata*	6	5	150	**1.8**	80%	S	Nil	Garden bed	Adjacent building	L	**Z1**
295	*Acacia baileyana*	7	5	200	**2.4**	80%	M	Weed species	Garden bed	Nil	L	**Z1**
296	*Eucalyptus botryoides*	22	14	500	**6**	80%	M	Nil	Grass	Nil	H	**A1**
297	*Eucalyptus botryoides*	16	8	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
298	*Eucalyptus haemastoma*	4	4	150	**1.8**	80%	S	Nil	Grass	Nil	L	**Z1**
299	*Eucalyptus botryoides*	10	5	200	**2.4**	80%	S	Nil	Garden bed	Nil	L	**Z1**
300	*Eucalyptus botryoides*	16	8	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
301	*Pittosporum undulatum*	4	4	150	**1.8**	70%	S	Failures	Garden bed	Nil	L	**Z1**
302	*Casuarina cunninghamiana*	6	4	150	**1.8**	70%	S	Nil	Garden bed	Nil	L	**Z1**
303	*Casuarina cunninghamiana*	6	4	150	**1.8**	70%	S	Nil	Garden bed	Nil	L	**Z1**
304	*Elaeocarpus reticulatus*	6	3	100	**1.2**	80%	S	Nil	Garden bed	Nil	L	**Z1**
305	*Corymbia gummifera*	9	3	100	**1.2**	10%	S	Failures	Garden bed	Nil	L	**ZZ4**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
306	*Corymbia gummifera*	10	4	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
307	*Corymbia gummifera*	10	4	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
308	*Acacia implexa*	8	3	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
309	*Eucalyptus microcorys*	12	7	250	**3**	80%	M	Nil	Grass	Nil	M	**A1**
310	*Eucalyptus scoparia*	10	6	150	**1.8**	70%	S	Nil	Garden bed	Nil	M	**A1**
311	*Eucalyptus microcorys*	12	7	250	**3**	80%	M	Nil	Grass	Nil	M	**A1**
312	*Eucalyptus sp.*	8	7	250	**3**	0%	O	Nil	Garden bed	Nil	L	**ZZ4**
313	*Eucalyptus microcorys*	12	7	250	**3**	80%	M	Nil	Grass	Nil	M	**A1**
314	*Eucalyptus microcorys*	12	7	250	**3**	80%	M	Nil	Grass	Nil	M	**A1**
315	*Eucalyptus microcorys*	9	5	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
316	*Eucalyptus microcorys*	9	5	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
317	*Eucalyptus microcorys*	9	5	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
318	*Eucalyptus microcorys*	9	5	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
319	*Eucalyptus microcorys*	18	12	400	**4.8**	80%	M	Nil	Garden bed	Nil	H	**A1**
320	*Eucalyptus microcorys*	24	14	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**AA1**
321	*Eucalyptus microcorys*	9	5	150	**1.8**	80%	S	Nil	Grass	Nil	L	**Z1**
322	*Eucalyptus microcorys*	24	14	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**AA1**
323	*Eucalyptus microcorys*	24	14	450	**5.4**	80%	M	Co-dominant	Garden bed	Nil	H	**AA1**
324	*Eucalyptus microcorys*	24	16	500	**6**	80%	M	Included bark	Garden bed	Nil	H	**Z9**
325	*Eucalyptus microcorys*	24	16	500	**6**	80%	M	Nil	Garden bed	Nil	H	**AA1**
326	*Eucalyptus pilularis*	24	16	600	**7.2**	80%	M	Nil	Grass	Adjacent building	H	**AA1**
327	*Corymbia gummifera*	14	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
328	*Eucalyptus tereticornis*	20	12	350	**4.2**	80%	M	Nil	Garden bed	Nil	H	**A1**
330	*Acer negundo*	8	8	300	**3.6**	80%	M	Nil	Grass	Adjacent building	M	**Z3**
331	*Cinnamomum camphora*	7	5	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z3**
332	*Eucalyptus tereticornis*	22	12	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**A1**
333	*Casuarina cunninghamiana*	14	9	350	**4.2**	80%	M	Included bark	Garden bed	Adjacent building	M	**ZZ5**
334	*Casuarina cunninghamiana*	14	6	300	**3.6**	80%	M	Splits throughout base	Garden bed	Nil	M	**Z9**
335	*Casuarina cunninghamiana*	14	6	300	**3.6**	80%	M	Splits throughout base	Garden bed	Nil	M	**Z9**
336	*Corymbia maculata*	9	4	200	**2.4**	80%	S	Nil	Garden bed	Nil	M	**Z1**
337	*Casuarina cunninghamiana*	16	7	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
338	*Casuarina cunninghamiana*	16	7	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
339	*Casuarina cunninghamiana*	14	6	300	**3.6**	80%	M	Splits throughout base	Garden bed	Nil	M	**Z9**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
340	*Corymbia gummifera*	14	6	300	**3.6**	70%	M	Heavily pruned	Garden bed	Nil	M	**A1**
341	*Corymbia gummifera*	24	14	500	**6**	0%	O	Nil	Garden bed	Nil	H	**ZZ4**
342	*Angophora costata*	14	9	350	**4.2**	60%	M	Borer, Heavily pruned	Garden bed	HV wires	M	**Z10**
343	*Eucalyptus tereticornis*	8	5	250	**3**	80%	S	Nil	Garden bed	Nil	M	**Z1**
345	*Casuarina cunninghamiana*	14	6	300	**3.6**	80%	M	Splits throughout base	Garden bed	Nil	M	**Z9**
346	*Eucalyptus tereticornis*	24	12	450	**5.4**	80%	M	Major storm failures	Garden bed	Nil	H	**ZZ4**
347	*Eucalyptus tereticornis*	24	12	400	**4.8**	80%	M	Major storm failures	Garden bed	Nil	H	**ZZ4**
348	*Banksia serrata*	5	3	150	**1.8**	80%	S	Nil	Garden bed	Nil	L	**Z1**
349	*Corymbia gummifera*	18	12	400	**4.8**	80%	M	Nil	Garden bed	Kerb	M	**A1**
350	*Eucalyptus paniculata*	24	10	400	**4.8**	70%	M	Heavily pruned	Garden bed	HV wires	H	**A1**
351	*Angophora costata*	10	5	200	**2.4**	70%	S	Borer	Garden bed	Nil	L	**Z4**
352	*Angophora costata*	16	12	350	**4.2**	60%	M	Nil	Garden bed	Nil	M	**A1**
353	*Eucalyptus tereticornis*	22	7	250	**3**	70%	M	Borer in base, Slender habit	Garden bed	Nil	M	**Z9**
354	*Eucalyptus paniculata*	24	14	450	**5.4**	80%	M	Included bark at co-dominant	Garden bed	HV wires	H	**Z9**
355	*Eucalyptus tereticornis*	20	8	200	**2.4**	80%	S	Slender habit	Garden bed	Nil	M	**A1**
356	*Eucalyptus tereticornis*	22	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	H	**A1**
357	*Eucalyptus tereticornis*	22	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	H	**A1**
358	*Angophora costata*	18	12	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
359	*Eucalyptus tereticornis*	9	4	100	**1.2**	80%	S	Nil	Garden bed	Nil	L	**Z1**
360	*Eucalyptus pilularis*	28	26	1000	**12**	80%	M	Nil	Garden bed	Nil	H	**AA1**
361	*Eucalyptus microcorys*	26	22	800	**9.6**	80%	M	Co-dominant	Garden bed	HV wires	H	**AA1**
362	*Allocasuarina torulosa*	4	4	150	**1.8**	0%	O	Dead tree	Garden bed	Nil	L	**ZZ4**
363	*Eucalyptus microcorys*	26	22	800	**9.6**	80%	M	Co-dominant	Garden bed	HV wires	H	**AA1**
364	*Eucalyptus microcorys*	18	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
365	*Eucalyptus microcorys*	14	7	200	**2.4**	70%	S	Nil	Garden bed	Nil	M	**Z1**
366	*Eucalyptus microcorys*	18	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
367	*Eucalyptus microcorys*	20	18	600	**7.2**	70%	M	Topped, Central leader removed, Leaning across road	Garden bed	HV wires	H	**Z10**
368	*Eucalyptus microcorys*	18	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
369	*Eucalyptus microcorys*	18	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
370	*Eucalyptus microcorys*	14	7	200	**2.4**	70%	S	Cambium damage	Garden bed	Nil	M	**Z10**
371	*Eucalyptus microcorys*	30	26	800	**9.6**	80%	M	Nil	Garden bed	Nil	H	**AA1**
372	*Eucalyptus microcorys*	28	20	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**AA1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage cover	Age Class	Defects	Location	Services	Significance	Tree AZ
373	*Eucalyptus microcorys*	18	9	350	**4.2**	80%	M	Nil	Garden bed	Nil	M	**A1**
374	*Eucalyptus microcorys*	30	22	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**AA1**
375	*Eucalyptus microcorys*	30	22	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**AA1**
376	*Eucalyptus microcorys*	22	14	400	**4.8**	80%	M	Nil	Garden bed	Nil	H	**AA1**
377	*Eucalyptus microcorys*	24	16	450	**5.4**	80%	M	Nil	Garden bed	Nil	H	**AA1**
378	*Eucalyptus microcorys*	30	22	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**AA1**
379	*Eucalyptus microcorys*	30	22	600	**7.2**	80%	M	Nil	Garden bed	Nil	H	**AA1**
380	*Eucalyptus microcorys*	14	7	200	**2.4**	80%	S	Nil	Garden bed	Nil	M	**A1**
381	*Eucalyptus tereticornis*	22	12	500	**6**	50%	M	Heavily pruned, Only one lateral branch remaining	Garden bed	HV wires	M	**ZZ10**
382	*Eucalyptus microcorys*	20	18	600	**7.2**	70%	M	Topped, Central leader removed, Leaning across road	Garden bed	HV wires	H	**Z10**
383	*Eucalyptus microcorys*	20	18	600	**7.2**	70%	M	Topped, Central leader removed, Leaning across road	Garden bed	HV wires	H	**Z10**
384	*Eucalyptus microcorys*	14	10	350	**4.2**	70%	M	Topped, Central leader removed, Leaning across road	Garden bed	HV wires	M	**Z10**
385	*Eucalyptus microcorys*	28	14	400	**4.8**	80%	M	Nil	Garden bed	HV wires	H	**AA1**
386	*Eucalyptus microcorys*	18	9	300	**3.6**	80%	M	Nil	Garden bed	Nil	M	**A1**
387	*Eucalyptus maidenii*	30	28	1100	**13.2**	80%	M	Bracket fungi in base, Further investigation required	Garden bed	Nil	H	**AA2**
388	*Eucalyptus sp.*	12	3	500	**6**	0%	O	Nil	Garden bed	HV wires	L	**ZZ4**
389	*Eucalyptus melliodora*	26	20	1000	**12**	80%	M	Co-dominant	Garden bed	HV wires	H	**AA1**
390	*Eucalyptus melliodora*	20	16	400	**4.8**	70%	M	Nil	Garden bed	Nil	H	**A1**
391	*Eucalyptus melliodora*	14	10	300	**3.6**	70%	M	Nil	Garden bed	HV wires	M	**A1**
392	*Eucalyptus robusta*	16	8	300	**3.6**	70%	M	Nil	Garden bed	HV wires	M	**A1**
393	*Eucalyptus melliodora*	14	9	300	**3.6**	60%	M	Heavily pruned	Garden bed	HV wires	M	**Z4**
394	*Angophora costata*	14	6	250	**3**	70%	S	Heavily pruned, Hazard beam	Garden bed	HV wires	M	**Z9**

Explanatory Notes

- **Measurements/estimates:** All dimensions are estimates unless otherwise indicated. Measurements taken with a tape or clinometer are indicated with a '*'. Less reliable estimated dimensions are indicated with a '?'.
- **Species:** The species identification is based on visual observations and the botanical name. In some instances, it may be difficult to quickly and accurately identify a particular tree without further detailed investigations. Where there is some doubt of the precise species of tree, it is indicated with a '?' after the name in order to avoid delay in the production of the report. The botanical name is followed by the abbreviation sp if only the genus is known. The species listed for groups and hedges represent the main component and there may be other minor species not listed.
- **Tree number:** relates to the reference number used on site diagram/report.
- **Height:** Height is estimated to the nearest metre.
- **Spread:** The average crown spread is visually estimated to the nearest metre from the outermost tips of the live lateral branches.
- **DBH:** These figures relate to 1.4m above ground level and are recorded in millimetres. If appropriate, diameter is measured with a diameter tape. 'M' indicates trees or shrubs with multiple stems.
- **Foliage Cover:** Percent of estimated live foliage cover for particular species range.
- **Age class:**

Y	Young = recently planted
S	Semi-mature (<20% of life expectancy)
M	Mature (20-80% of life expectancy)
O	Over-mature (>80% of life expectancy)

- **TPZ:** The Tree Protection Zone (TPZ) is the radial offset distance of twelve times the trunk diameter in meters.
- **Tree AZ:** See reference for Tree AZ categories in Appendix 3.
- **Significance:** A tree's significance/value in the landscape takes into account its prominence from a wide range of perspectives. This includes, but is not limited to neighbour hood perspective, local perspective and site perspective. The significance of the subject trees has been categorized into three groups, such as: High, Moderate or Low significance.

APPENDIX 3

TreeAZ Categories (Version 10.04-ANZ)

Z — Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species

Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc

High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure

Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc

Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people

Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognised court or tribunal would be likely to authorise removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognised court or tribunal would be likely to authorise removal, i.e. severe structural damage to surfacing and buildings, etc

Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population

Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorisation hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

A — Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorisation hierarchy and should be given the most weight in any selection process.

TreeAZ is designed by Barrell Tree Consultancy (www.treeaz.com/tree_az/)

APPENDIX 4

Tree protection fencing and signs - Illustrative specification

Protective fencing: Protective 1.8m high fencing should be installed at the location illustrated on the Tree Management Plan before any site works start. All uprights should be fixed in position for the duration of the development activity. The fixings must be able to withstand the pressures of everyday site work.

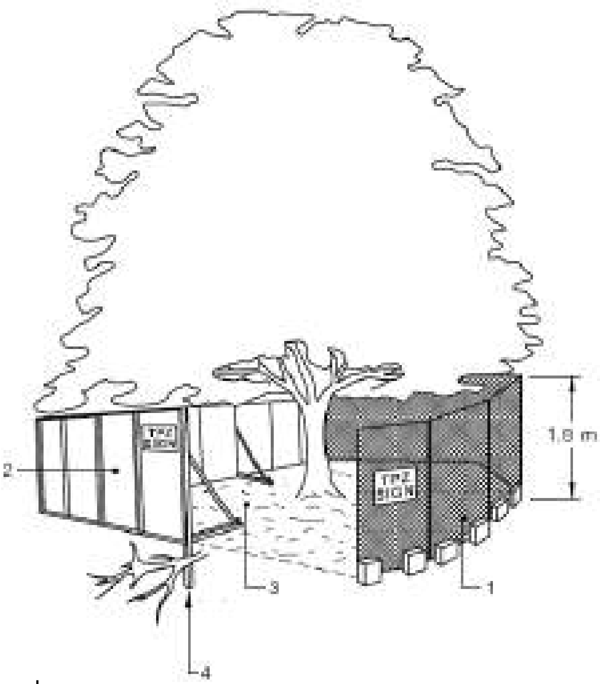
Inside the protective fencing, the following rules must be strictly observed:

- **No vehicular access**
- **No storage of excavated debris, building materials or fuels**
- **No excessive cultivation for landscape planting**
- **No fires**
- **No mixing of cement**
- **No service installation or excavation**

Once erected, protective fencing must not be removed or altered without consulting first with the project Arborist.

Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area and signage must be attached to outside of fencing.

Signage: All signs are to provide clear and readily accessible information to indicate that a TPZ has been established. Signage identifying the TPZ must be attached to outside of fencing and be visible from within the development site.



Signage example:

Legend
1. Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2. Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3. Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4. Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

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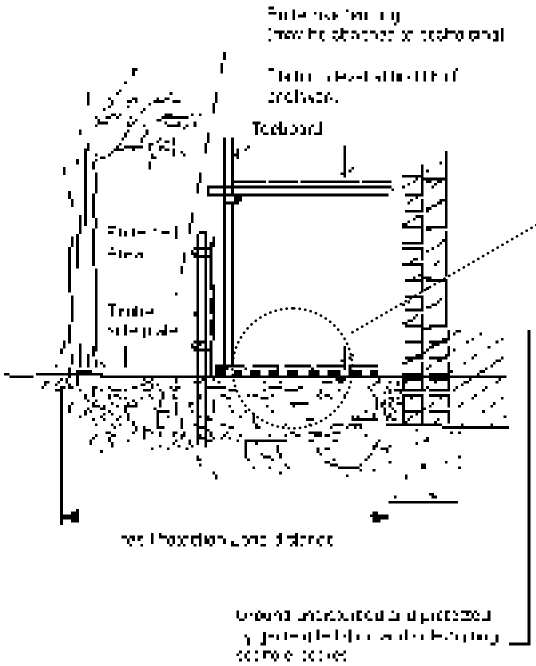
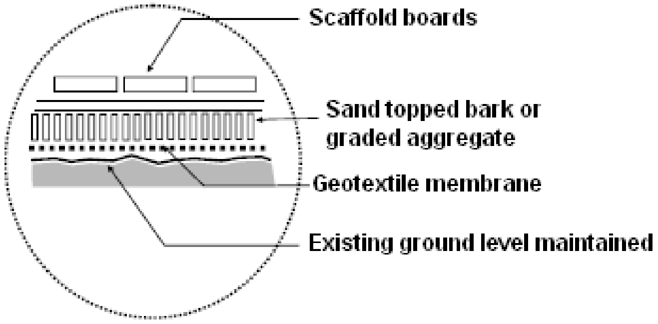
APPENDIX 5

Root zone and trunk protection - Illustrative specification

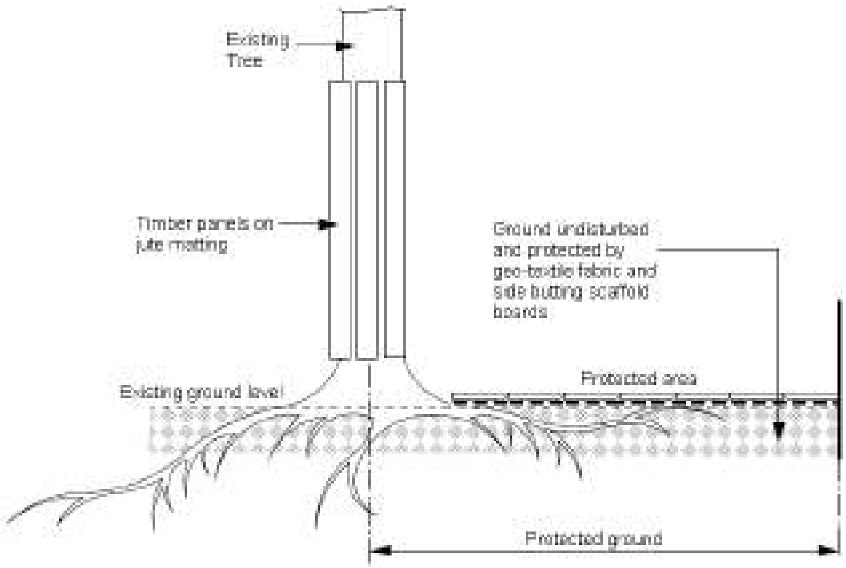
Root zone protection: Where necessary, access through the TPZ can be achieved by laying aggregate and timber boards (or similar) over the root zone to protect roots. The ground beneath the boarding should be left undisturbed and should be protected with a porous geo-textile fabric covered with sand or mulch.





Detail of ground protection
(modified from BS 5837-2005).

Trunk protection: Where fencing cannot be installed, the vertical trunk of exposed trees shall be protected by the placement of 3.6m lengths of 50 x 100mm hardwood timbers, spaced vertically, at 150mm centres and secured by 2mm wire at 300mm wide spacing over suitable protective padding material e.g. Jute Matting. The trunk protection shall be maintained intact until the completion of all work on site.



Detail of trunk protection.

APPENDIX 6

General guidance for working in TPZ

1 PURPOSE OF THIS GUIDANCE

This guidance sets out the general principles that must be followed when working within a TPZ. Where more detail is required, it will be supplemented by illustrative specifications in other appendices in this document (refer Appendix 4 and 5).

This guidance is based on the Australian Standards (2009) AS4970: *Protection of Trees on Construction Sites*.

Once the site works start, this guidance is specifically for the site personnel to help them understand what has been agreed and explain what is required to fully meet their obligations to protect trees. All personnel working in TPZs must be properly briefed about their responsibilities towards important trees based on this guidance.

This guidance should always be read in conjunction with the Tree Management Plan (TMP01) illustrating the areas where specific precautions are necessary. Each area where precautions are required is explained on the plan as identified on the legend. All protective measures should be installed according to the prevailing site conditions and agreed as satisfactory by the Project Arborist before any demolition or construction work starts.

2 TREE PROTECTION

2.1 Tree Protection Zone (TPZ)

The TPZ is a radial setback, extending outwards from the centre of the trunk, where disturbance must be minimised if important trees are to be successfully retained. The TPZ area is illustrated on the Tree Management Plan (TMP01) accompanying this guidance.

- The TPZ is a radial setback extending outwards from the centre of the trunk equal to the DBH x 12.
- This area shall be protected by tree protective fencing (refer Appendix 4).
- Any part of the TPZ outside of the tree protective fencing area must be isolated from the work operations by protective barriers and/or root zone protection for the duration of the work (refer Appendix 5).
- The Project Arborist shall approve the extent of the TPZ prior to commencement of works.
- The TPZ shall be mulched to a depth of 90mm with approved organic mulch e.g. leaf and wood chip where possible.
- Supplementary watering shall be provided in dry periods to reduce water or construction stress, particularly to those trees which may incur minor root disturbance.

The following activities shall be excluded within the TPZ:

- Excavation, compaction or disturbance of the existing soil.
- The movement or storage of materials, waste or fill.
- Soil level changes
- Disposal/runoff of waste materials and chemicals including paint, solvents, cement slurry, fuel, oil and other toxic liquids
- Movement or storage of plant, machinery, equipment or vehicles.
- Any activity likely to damage the trunk, crown or root system.

2.2 Arboricultural supervision

Any work within TPZs requires a high level of care. Qualified arboricultural supervision is essential to minimise the risk of misunderstanding and misinterpretation. Site personnel must be properly briefed before any work starts. Ongoing work must be inspected regularly and, on completion, the work must be signed off by the Project Arborist to confirm compliance by the contractor.

2.3 Tree protection fencing, root zone and trunk protection

Prior to site establishment, tree protection fencing and root zone and trunk protection shall be installed to establish the TPZ for trees to be retained in accordance with site conditions. These protective barriers shall be maintained entire for the duration of the construction program (refer Appendix 4 and 5).

Tree protection fencing and trunk and root zone protection shall be removed following completion of construction. The mulch layer in the TPZ shall be retained and replenished where required to maintain a 75mm thickness

2.4 Pruning

All pruning work required (including root pruning) should be in accordance with Australian Standard No 4373-1996 - Pruning of Amenity Trees.

2.5 Tree Damage

In the event of damage to a tree or the TPZ, the Project Arborist shall be engaged to inspect and provide advice on remedial action. This should be implemented as soon as practicable and certified by the Project Arborist.

2.6 Post construction maintenance

In the event of any tree deteriorating in health after the construction period, the Project Arborist shall be engaged to provide advice on any remedial action. Remedial action shall be implemented as soon as practicable and certified by the Project Arborist.

3 EXCAVATION AND FILL IN TPZ

3.1 Excavation within TPZ

If excavation within the TPZ is required the following shall be applied to preserve tree root systems:

- Excavation within TPZ must be carried out under the instruction and supervision of the Project Arborist.
- A root mapping exercise is to be undertaken and certified by the Project Arborist. Root mapping shall be undertaken by either ground penetrating radar, air spade, water laser or by hand excavation using hand tools, taking care not to damage the bark and wood of any roots.
- The purpose of the root mapping shall be to locate woody structural roots greater than 40mm in diameter. Where possible, flexible clumps of smaller roots, including fibrous roots, should be retained if they can be displaced temporarily or permanently beyond the excavation without damage.
- If digging by hand, a fork shall be used to loosen the soil and help locate any substantial roots.
- Once roots have been located, the trowel shall be used to clear the soil away from them without damaging the bark.
- Exposed roots to be removed shall be cut cleanly with a sharp saw or secateurs.
- Roots temporarily exposed shall be protected from direct sunlight, drying out and extremes of temperature by appropriate covering.

3.2 Fill within TPZ

Placement of fill material within the Tree Protection Zone of trees to be retained should be avoided where possible. However, where fill cannot be avoided:

- All fill material to be placed within the TPZ should be approved by Project Arborist and consist of a course, gap-graded material to provide aeration and percolation to the root zone. Materials containing a high percentage of ‘fines’ is unacceptable for this purpose.
- The fill material should be consolidated with a non-vibrating roller to minimise compaction of the underlying soil.
- No fill material should be placed in direct contact with the trunk.

4 DEMOLITION OF SURFACING/STRUCTURES IN TPZ

4.1 Definitions of surfacing and structures

For the purposes of this guidance, the following broad definitions apply:

• **Surfacing:** Any hard surfacing used as a vehicular road, parking or pedestrian path including tarmac, solid stone, crushed stone, compacted aggregate, concrete and timber decking.

• **Structures:** Any man-made structure above or below ground including service pipes, walls, gate piers, buildings and foundations. Typically, this would include drainage structures, services, car-ports, bin stores and concrete slabs that support buildings.

4.2 Demolition and access

Roots frequently grow adjacent to and beneath existing surfacing/structures so great care is needed during access and demolition. Damage can occur through physical disturbance of roots and/or the compaction of soil around them from the weight of machinery or repeated pedestrian passage. This is not generally a problem whilst surfacing/structures are in place because they spread the load on the soil beneath and further protective measures are not normally necessary. However, once they are removed and the soil below is newly exposed, damage to roots becomes an issue and the following guidance must be implemented:

- No vehicular or repeated pedestrian access into TPZ permitted unless on existing hard surfacing or root zone protection.
- Regular vehicular and pedestrian access routes must be protected from compaction with temporary root zone protection as set out in Appendix 5.
- Where a TPZ is exposed by the work, it must be protected as set out in AS4970 until there is no risk of damage from the development activity.

4.3 Removal of surfacing/structures

Removing existing surfacing/structures is a high-risk activity for any adjacent roots and the following guidance must be observed:

- Appropriate tools for manually removing debris may include a pneumatic breaker, crow bar, sledgehammer, pick, mattock, shovel, spade, trowel, fork and wheelbarrow.
- Machines with a long reach may be used if they can work from outside the TPZ or from protected areas within the TPZ.
- Debris to be removed from the TPZ manually must be moved across existing hard surfacing or temporary root zone protection in a way that prevents compaction of soil. Alternatively, it can be lifted out by machines provided this does not disturb the TPZ.
- Great care must be taken throughout these operations not to damage roots.

5 INSTALLATION OF SURFACING/STRUCTURES IN TPZ

5.1 Basic principles: New surfacing/structures in a TPZ are potentially damaging to trees because they may disturb the soil and disrupt the existing exchange of water and gases in and out of it. Adverse impact on trees can be reduced by minimising the extent of these changes within the TPZ.

- **Surfacing:** Suitable surfacing should be relatively permeable to allow water and gas movement, load spreading to avoid localised compaction and require little or no excavation to limit direct damage. The actual specification of the surfacing is an engineering issue that needs to be considered in the context of the bearing capacity of the soil, the intended loading and the frequency of loading. The detail of product and specification are beyond the scope of this guidance and must be provided separately by the appropriate specialist.

- **Structures:** Where possible structures are to be constructed above ground level on piled supports and redirecting water to where it is needed. The detailed design and specification of such structures is an engineering issue that should be informed and guided by the Project Arborist. Conventional strip foundations in the TPZ for any significant structure may cause excessive root loss and are unlikely to be acceptable. However, disturbance can be significantly reduced by supporting the above ground part of the structures on small diameter piles/piers or cast floor slabs set above ground level. The design should be sufficiently flexible to allow the piles to be moved if significant roots are encountered in the preferred locations.

5.2 Establishing the depth of roots

The precise location and depth of roots within the soil is unpredictable and will only be known when careful digging starts on site. Ideally, all new surfacing within a TPZ should be no-dig, i.e. requiring no excavation whatsoever, but this is rarely possible on undulating surfaces.

New surfacing normally requires an evenly graded sub-base layer, which can be made up to any high points with granular, permeable fills such as crushed stone or sharp sand. This sub-base must not be compacted as would happen in conventional surface installation. Some limited excavation is usually necessary to achieve this and need not be damaging to trees if carried out carefully and large roots are not cut.

Tree roots and grass roots rarely occupy the same soil volume at the top of the soil profile, so the removal of a turf layer up to 50mm is unlikely to be damaging to trees. It may be possible to dig to a greater depth depending on local conditions but this would need to be assessed by the Project Arborist.

6 SERVICES IN TPZ

For the purposes of this guidance, services are considered as structures. Excavation to upgrade existing services or to install new services within a TPZ may damage retained trees and should only be chosen as a last resort. In the event that excavation emerges as the preferred option, the decision should be reviewed by the Project Arborist before any work is carried out. If excavation is agreed, all digging should be done carefully and follow the guidance set out in 3.1 above.

7 SOFT LANDSCAPING IN TPZ

For the purposes of this guidance, soft landscaping includes the re-profiling of existing soil levels and covering the soil surface with new plants or an organic covering (mulch). It does not include the installation of solid structures or compacted surfacing.

Soft landscaping activity after construction can be extremely damaging to trees.

No significant excavation or cultivation shall occur within the TPZ (e.g. planting holes). Where new designs require levels to be increased to tie in with new structures or surrounding ground level, good quality and relatively permeable top soil should be used for the fill. It should be firmed into place but not over compacted in preparation for turfing or careful shrub planting.

All areas close to tree trunks should be kept at the original ground level and have a mulched finish rather than grass to reduce the risk of mowing damage.

APPENDIX 7

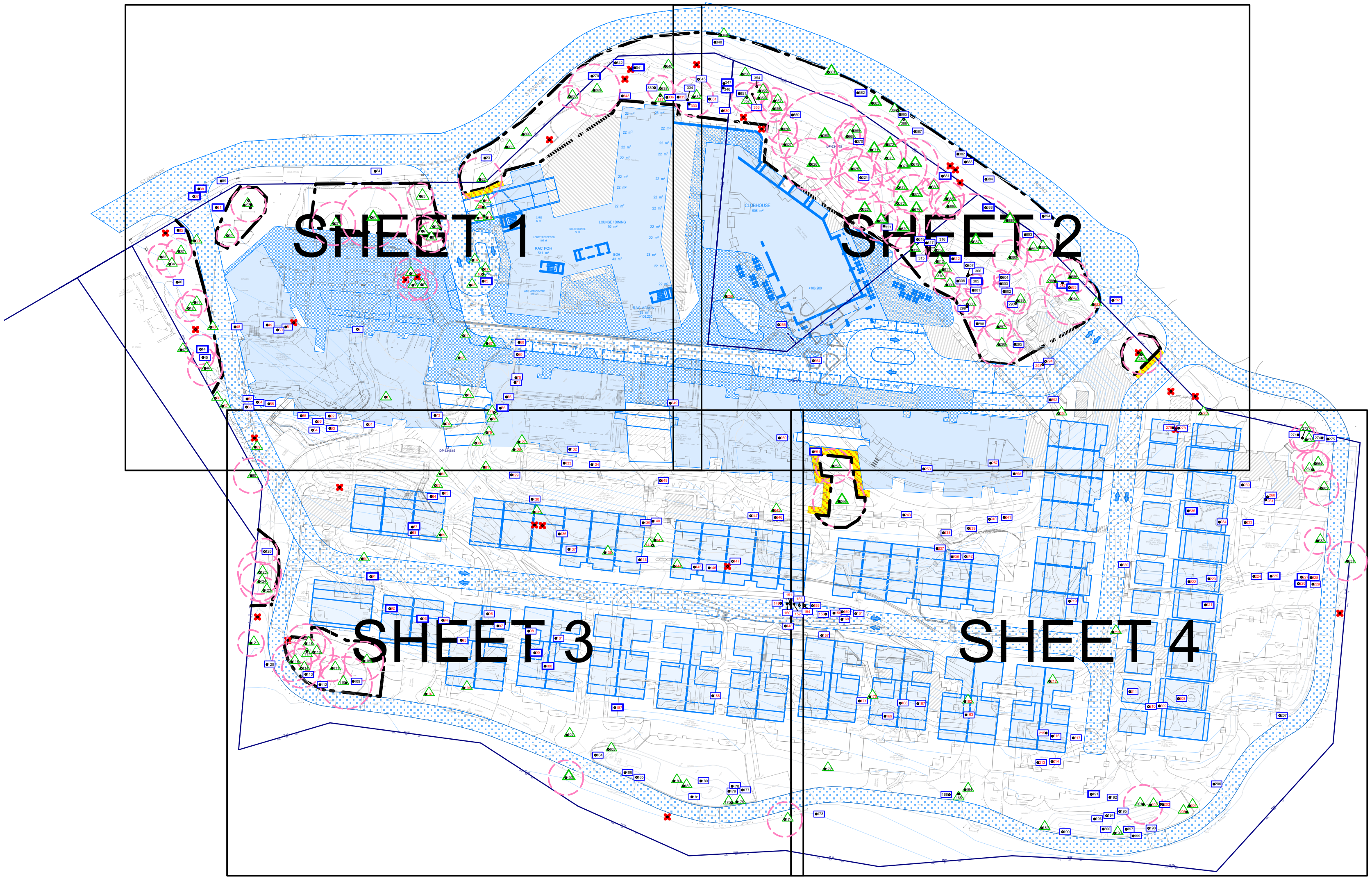
Schedule of works and responsibilities

Hold Point	Task	Responsibility	Certification	Timing of Inspection
1	Indicate clearly (with spray paint) trees approved for removal only	Principal Contractor	Project Arborist	Prior to demolition and site establishment
2	Establishment of tree protection fencing and additional root, trunk and/or branch protection	Principal Contractor	Project Arborist	Prior to demolition and site establishment
3	Supervise all excavations works proposed within the TPZ	Principal Contractor	Project Arborist	As required prior to the works proceeding adjacent to the tree
4	Inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Monthly during construction period
5	Final inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Prior to the issue of Occupation Certificate

APPENDIX 8

Tree management plan

-refer attached Tree Management Plan, Dwg No. TMP01 (Revision E), by Naturally Trees dated 25 September 2023



LEGEND:

01 (triangle)	Category AA	Trees worthy of being a constraint
01 (triangle)	Category A	
01 (box)	Category Z	Trees not worthy of being a constraint
01 (double box)	Category ZZ	
	Existing layout	
	Proposed layout	
	Tree protection zone (TPZ) boundaries	
	Protective fencing and TPZ area within	
	TPZ where ground protection must be installed. Retain all existing levels.	
01	Tree to be removed	
X	Tree no longer on site	

ISSUE	DATE	REVISION

NOTE DO NOT SCALE FROM DRAWING. USE FIGURED DIMENSIONS ONLY. CHECK ALL DIMENSIONS ON SITE BEFORE ANY MANUFACTURE OR CONSTRUCTION

PROJECT
95 Stanhope Road, Killara NSW

CLIENT
Lourdes Retirement Village

DRAWING
Tree Management Plan

Naturally Trees

PROJECT # | DWG # | REV

DATE 25/09/2023
SCALE @ A1 **NTS**
DRAWN AS

TMP01 E
Cover Sheet

Naturally Trees Arboricultural Consulting
PO Box 5085 Elanora Heights NSW 2101 Australia
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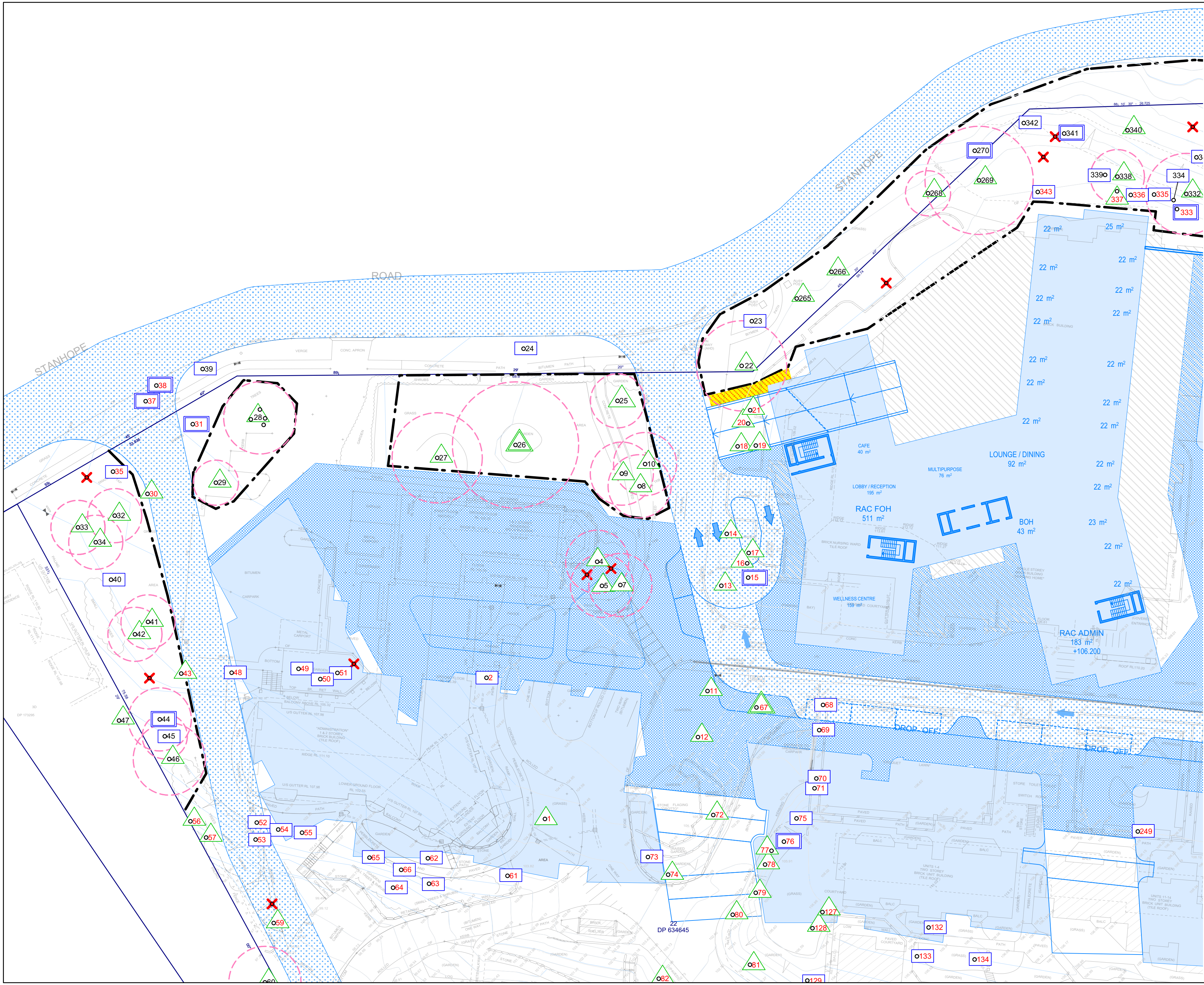

LEGEND:

01	Category AA	Trees worthy of being a constraint
01	Category A	
01	Category Z	Trees not worthy of being a constraint
01	Category ZZ	
	Existing layout	
	Proposed layout	
	Tree protection zone (TPZ) boundaries	
	Protective fencing and TPZ area within	
	TPZ where ground protection must be installed. Retain all existing levels.	
01	Tree to be removed	
	Tree no longer on site	

ISSUE | DATE | REVISION

NOTE: DO NOT SCALE FROM DRAWING. USE FIGURED DIMENSIONS ONLY. CHECK ALL DIMENSIONS ON SITE BEFORE ANY MANUFACTURE OR CONSTRUCTION

PROJECT
95 Stanhope Road, Killara NSW

CLIENT
Lourdes Retirement Village

DRAWING
Tree Management Plan

Naturally Trees

PROJECT # | DWG # | REV

DATE 25/09/2023
SCALE @ A1 1:650
DRAWN AS

TMP01 E
Sheet 1 of 4

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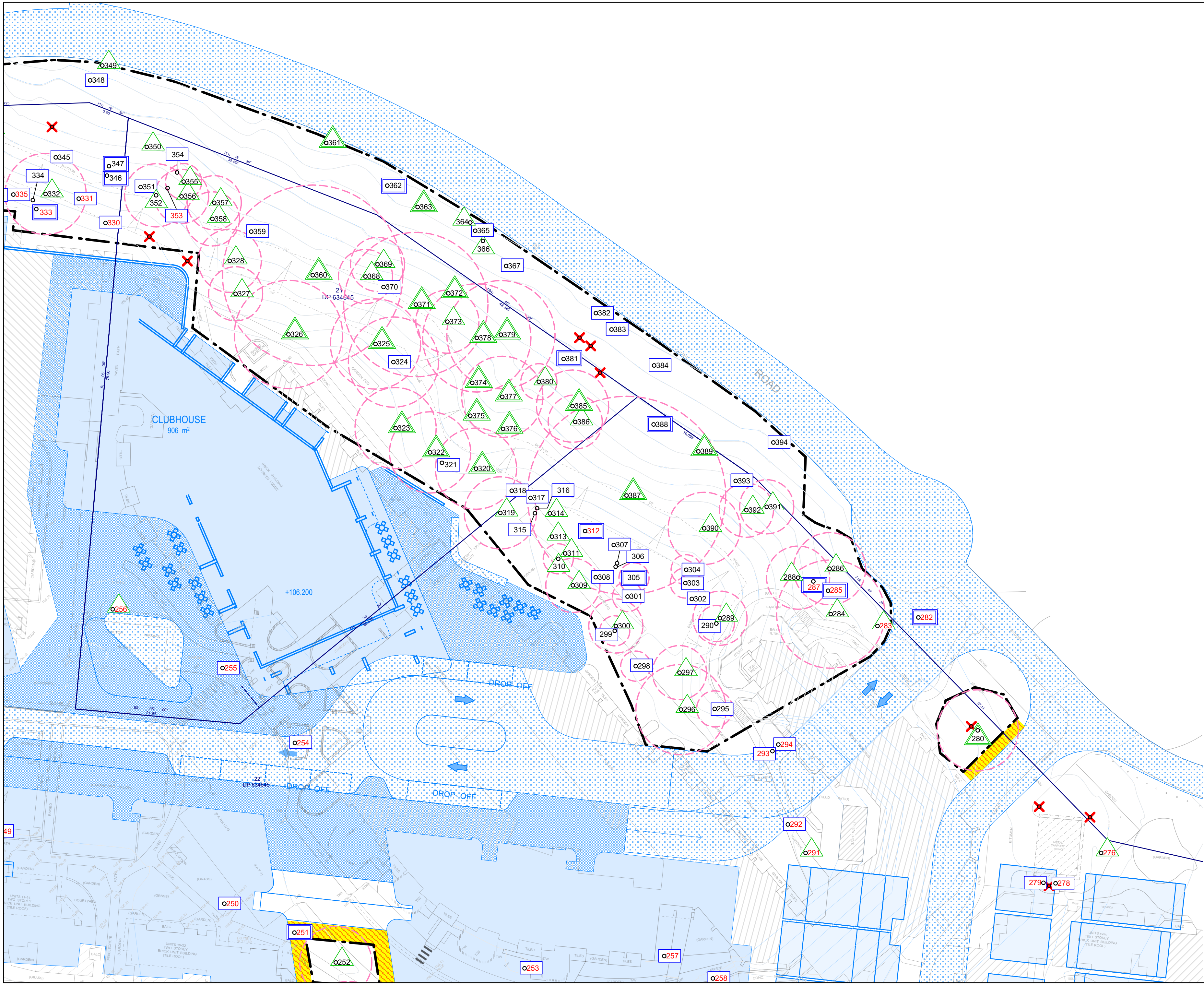

LEGEND:

01	Category AA	Trees worthy of being a constraint
01	Category A	
01	Category Z	Trees not worthy of being a constraint
01	Category ZZ	
	Existing layout	
	Proposed layout	
	Tree protection zone (TPZ) boundaries	
	Protective fencing and TPZ area within	
	TPZ where ground protection must be installed. Retain all existing levels.	
01	Tree to be removed	
	Tree no longer on site	

N

0 10 20m

ISSUE | DATE | REVISION

NOTE DO NOT SCALE FROM DRAWING. USE FIGURED DIMENSIONS ONLY. CHECK ALL DIMENSIONS ON SITE BEFORE ANY MANUFACTURE OR CONSTRUCTION

PROJECT
95 Stanhope Road, Killara NSW

CLIENT
Lourdes Retirement Village

DRAWING
Tree Management Plan

Naturally Trees

PROJECT # | DWG # | REV

DATE 25/09/2023
SCALE @ A1 1:650
DRAWN AS

TMP01 E
Sheet 2 of 4

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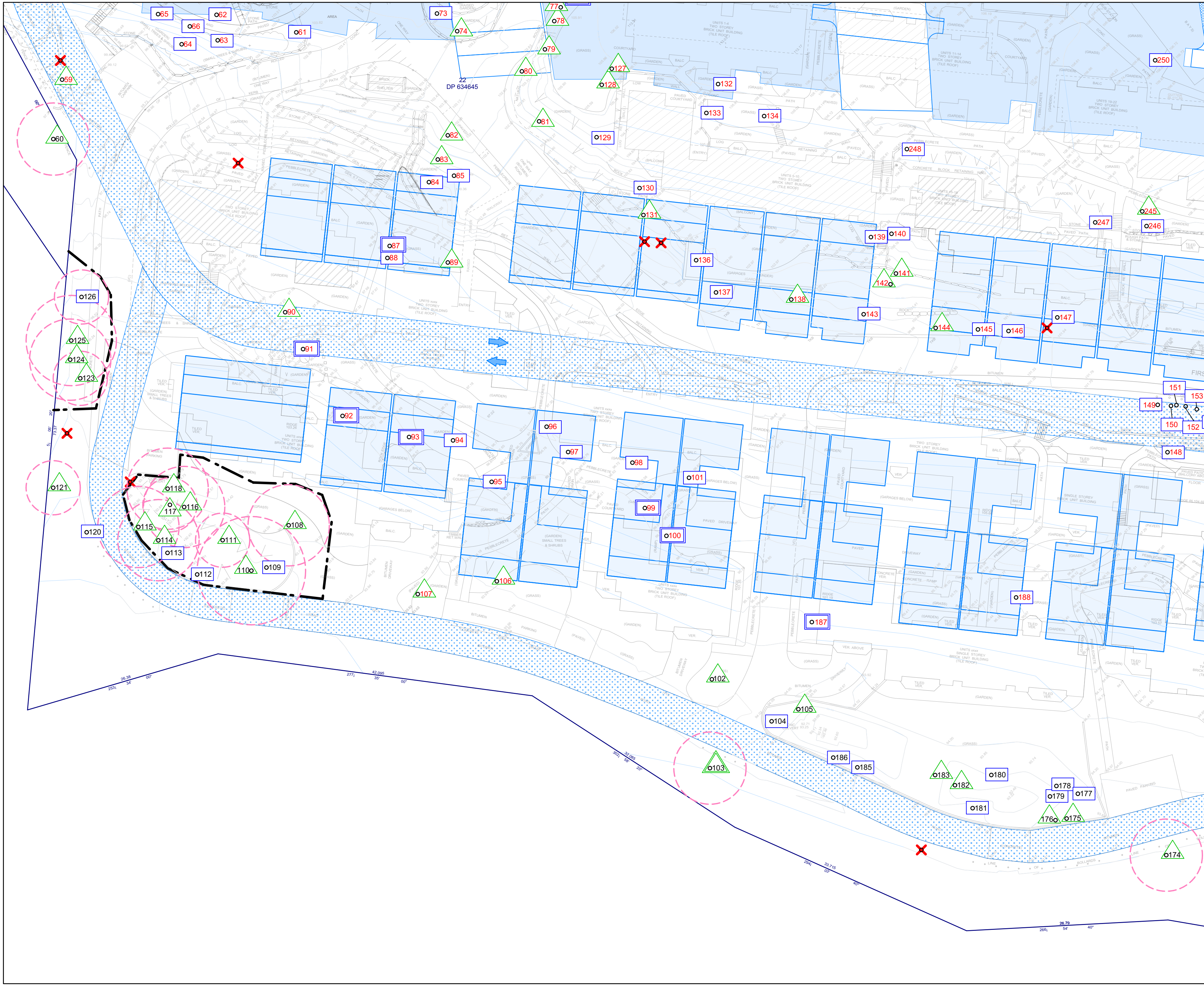

LEGEND:

- Category AA
- Category A

Trees worthy of being a constraint

- Category Z
- Category ZZ

Trees not worthy of being a constraint

- Existing layout
- Proposed layout
- Tree protection zone (TPZ) boundaries
- Protective fencing and TPZ area within
- TPZ where ground protection must be installed. Retain all existing levels.
- 01 Tree to be removed
- Tree no longer on site

N

0 10 20m

ISSUE	DATE	REVISION

NOTE DO NOT SCALE FROM DRAWING. USE FIGURED DIMENSIONS ONLY. CHECK ALL DIMENSIONS ON SITE BEFORE ANY MANUFACTURE OR CONSTRUCTION

PROJECT
95 Stanhope Road, Killara NSW

CLIENT
Lourdes Retirement Village

DRAWING
Tree Management Plan

Naturally Trees

PROJECT # DWG # REV

DATE 25/09/2023
SCALE @ A1 1:650
DRAWN AS

TMP01 E
Sheet 3 of 4

Naturally Trees Arboricultural Consulting
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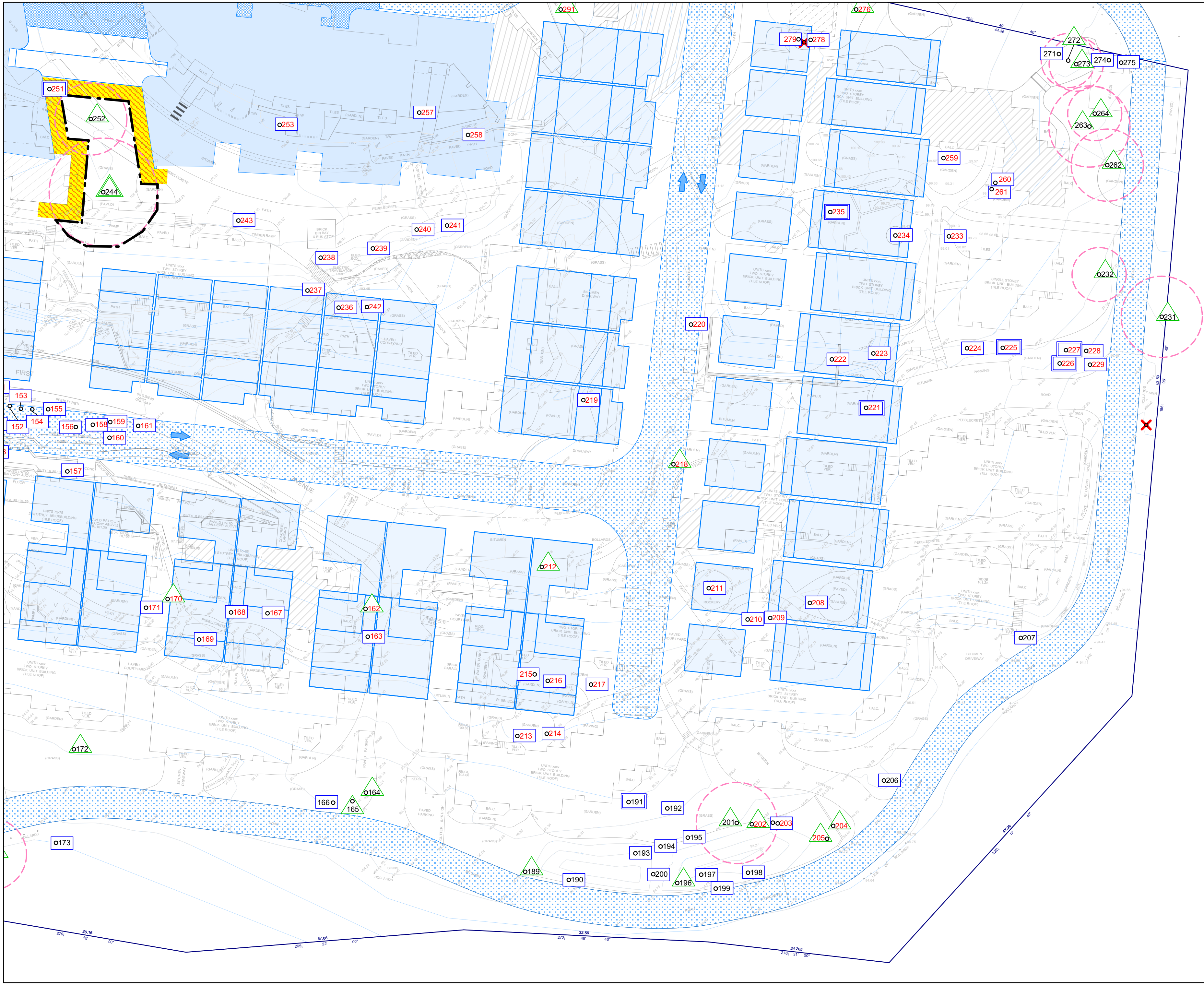

LEGEND:

01	Category AA	Trees worthy of being a constraint
01	Category A	
01	Category Z	Trees not worthy of being a constraint
01	Category ZZ	

Existing layout

Proposed layout

Tree protection zone (TPZ) boundaries

Protective fencing and TPZ area within

TPZ where ground protection must be installed. Retain all existing levels.

01 Tree to be removed

Tree no longer on site

N

0 10 20m

ISSUE DATE REVISION

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PROJECT
95 Stanhope Road, Killara NSW

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DRAWING
Tree Management Plan

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TMP01 E

Sheet 4 of 4

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BLACKASH
BUSHFIRE CONSULTING

28 September 2023

Nathan Donn
Senior Development Manager
Levande

Email: nathan.donn@levande.com.au

Dear Mr. Donn,

Re: Lourdes Retirement Village – Asset Protection Zone Requirements

Blackash Bushfire Consulting has been engaged to review the correspondence from the Department of Planning and Environment regarding the Asset Protection Zone (APZ) requirements for the proposed master plan presented in the Planning Proposal of the Lourdes Retirement Village and the technical comments by the Environment and Heritage Group (EHG).

I have reviewed the correspondence and from a bushfire perspective the following key matters were identified and are discussed below:

1. EHG notes that design changes have been made to retain additional vegetation, but EHG questions whether this vegetation can be retained given the entire site is to be managed as an Inner Protection Area (IPA).
2. The level of management required for trees, shrubs, grasses and leaf litter to achieve an IPA standard APZ is inconsistent with the retention of vegetation, including the Critically Endangered Ecological Communities (CEECs) present on the site.
3. EHG does not support the PP as evidence has not been provided that demonstrates it will be possible to simultaneously retain vegetation on the site and meet bushfire protection requirements. EHG reiterates that the PP should not progress if it cannot be demonstrated that the additional densities proposed can be achieved within the ecological and bushfire hazard constraints of the site.

It's important when considering the bushfire requirements, such as APZ, to remember the nature of compliance approach. The NSW Rural Fire Service (NSW RFS) approved the *Lourdes Retirement Village Bushfire Engineering Design Compliance Strategy* in November 2020. The compliance strategy utilises a performance-based approach which is designed as holistic package of bushfire measures but is not reliant/contingent on a specified APZ or separation from the bushland. The key elements are the building construction and emergency management arrangements.

The *Bushfire Engineering Design Compliance Strategy* will be used to inform more detailed design and

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BPAD

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engineering at the DA stage, so that bushfire risk and occupant safety is appropriately addressed through the final design.

One of the design strategies of the *Bushfire Engineering Design Compliance Strategy* is for APZs to be maximised wherever possible consistent with PBP 2019. As indicated in previous correspondence, the proposed tree / vegetation retention and landscaping can accommodate the required APZ which will provide a fuel reduced area surrounding the buildings and between the buildings and the bush fire hazard. The fuels within these areas will be such that the vegetation does not provide a path for the spread of fire to the buildings. The areas of retained native vegetation will only require minimal maintenance by way of the removal of leaf litter, twigs and debris, therefore, satisfying the requirements of an APZ without the need for any additional tree removal.

From a technical perspective, PBP 2019 defines an APZ is a fuel-reduced, physical separation between buildings and bushfire hazards. The Bushfire Assessment prepared by Blackash Bushfire Consulting (dated 14 June 2022, V4.0) as reviewed by the NSW RFS states that:

> *"A detailed analysis and application of APZ will be undertaken as part of the detailed bushfire assessment, engineering and design work at the DA stage. This will ensure appropriate APZ are incorporated into any future development. Regardless of the final design, the entire site will be managed as an APZ and the layout and construction of the site will ensure radiant heat shielding to all residents, enabling them to move safely to the onsite refuge without exposure to greater than 10kW/m2 of radiant heat."*

The existing village site is historically managed as an APZ and those practices are considered appropriate. Consistent with PBP 2019, the APZ across the site is/will be a combination of:

- fuel free areas (i.e. roads, paths, etc);
- intensely managed areas (i.e. mown grass); and
- pockets of garden and retained vegetation (i.e. native gardens, native vegetation).

The location of these different management areas, particularly the pockets of retained vegetation has been carefully reviewed and does not present a compliance issue as it satisfies the performance intent of an APZ. These areas of retention will only require minimal maintenance by way of the removal of leaf litter, twigs and debris. The design of an APZ in this manner is typical of larger sites such as Lourdes.

The areas of retained vegetation are not adjacent to buildings or provide for a direct path of the bushfire to the buildings. This is entirely consistent with standard practice for APZ design and compliance and typical for larger sites such as Lourdes.

The design of the APZ for Lourdes, as per PBP 2019, ensures:

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

The management of the bush fire fuels within the APZ is done in such a way 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. The APZ reduces the risk of:

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

The APZ is therefore consistent with PBP 2019.

It's worth clarifying that while PBP 2019 provides guidance on the design of an IPA, these are not mandatory requirements (i.e. use of the term 'should', rather than 'must'). In this regard, PBP 2019 states:

- Trees
  - tree canopy cover <u>should</u> be less than 15% at maturity;
  - trees at maturity <u>should not</u> touch or overhang the building;
  - lower limbs <u>should</u> be removed up to a height of 2m above the ground;
  - tree canopies <u>should</u> be separated by 2 to 5m; and
  - preference <u>should</u> 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 <u>should</u> be provided;
  - shrubs <u>should not</u> be located under trees;
  - shrubs <u>should not</u> form more than 10% ground cover; and
  - clumps of shrubs <u>should</u> be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.
- Grass
  - grass <u>should</u> be kept mown (as a guide grass should be kept to no more than 100mm in height); and
  - leaves and vegetation debris <u>should</u> be removed.

The word 'should' is used in PBP 2019 for actions/responsibilities that one thinks is best for the situation and issue. The word 'must' is used for actions/responsibilities that are considered compulsory/necessary.

As described earlier, the APZ at Lourdes, while it may contain areas of retained vegetation, will perform consistent with an APZ as required by PBP 2019.

As per the NSW RFS approved *Bushfire Engineering Design Compliance Strategy* a *Bushfire Protection, Operations and Maintenance Plan* will be developed as part of the detailed design. This will include an Emergency Management and Evacuation Plan and detail all ongoing maintenance requirements across the site, including specific APZ management regimes and the certification of essential bushfire protection measures (i.e., Annual APZ Certification).

The *Bushfire Protection, Operations and Maintenance Plan* will be developed on consultation with the NSW RFS and the annual certification undertaken by an NSW RFS 'recognised' bushfire practitioner (i.e. BPAD Level 3).

Finally, and most importantly, from a bushfire perspective, the renewal of the site as envisaged by the Planning Proposal will deliver a significantly enhanced bushfire safety outcome for the existing and future residents through improved access/egress from the site, improved bushfire construction of new buildings, and the location of vulnerable seniors housing residents further from the bushfire risk.

The continued management of the site and proposed tree retention and landscaping can accommodate an APZ which will provide a fuel-reduced area surrounding the buildings and between the buildings and the bush fire hazard. The fuels within the APZ will be such that the vegetation does not provide a path for the spread of fire to the buildings, therefore satisfying the requirements of an APZ without the need for any additional tree removal.

The proposed design has been carefully developed to ensure the bushfire protection measures are appropriately addressed consistent with the intent of *Planning for Bush Fire Protection 2019* and therefore possible to simultaneously retain vegetation on the site and meet bushfire protection requirements.

If you have any questions, please contact me on 0418 412 118.

Yours sincerely,

Corey Shackleton

Principal Bushfire & Resilience
B.Sc., Grad. Dip. (Design for Bush fires)
Fire Protection Association of Australia BPAD Level 3 –34603

28 September 2023

Nathan Donn
Senior Development Manager
Levande

Email: nathan.donn@levande.com.au

Dear Mr. Donn,

Re: Lourdes Retirement Village – DPE Issues

Blackash Bushfire Consulting has been engaged to review the email correspondence from the Department of Planning and Environment (dated 18 August 2023) and specifically the "additional associated issues" for the proposed master plan presented in the Planning Proposal of the Lourdes Retirement Village.

I have reviewed the correspondence and from a bushfire perspective the following key matter is relevant to bushfire and discussed below:

1. ***Direction 4.3 Planning for bushfire protection**: While the Rural Fire Service (RFS) have confirmed that the proposed performance-based approach satisfies this Direction, the Department will require justification that changes to any biodiversity assessments and the planning approval pathway (being SSD which switches off requirements for a s100B bushfire authority) would not change the position from RFS. In addition, the Department will require confirmation from the RFS that the proposed floor space can be achieved, having regard to the indicative masterplan.*

The modification of vegetation retention within the Bio-diversity report dated Sept 2023 will have no impact on the NSW Rural Fire Service (NSW RFS) approved the *Bushfire Engineering Design Compliance Strategy* (November 2020) or the Bushfire Assessment prepared by Blackash Bushfire Consulting (dated 14 June 2022, V4.0). The compliance strategy utilises a performance-based approach which is designed as holistic package of bushfire measures but is not reliant/contingent on a specified APZ or separation from the bushland. The key elements of the *Bushfire Engineering Design Compliance Strategy* are the building construction and emergency management arrangements.

As indicated in previous correspondence, the proposed tree / vegetation retention and landscaping can accommodate the required APZ which will provide a fuel reduced area surrounding the buildings and between the buildings and the bush fire hazard. The fuels within these areas will be such that the vegetation does not provide a path for the spread of fire to the buildings, therefore satisfying the requirements of an APZ without the need for any additional tree removal.

The existing village site is historically managed as an APZ and the continued management of the site and proposed tree / native vegetation retention and landscaping can accommodate the required APZ which will provide a fuel-reduced area surrounding the buildings and between the buildings and the bush fire hazard. The areas of retained native vegetation will only require minimal maintenance by way of the removal of leaf litter, twigs and debris.

The proposed design has been carefully developed to ensure the bushfire protection measures are appropriately addressed consistent with the intent of Planning for Bush Fire Protection 2019 and therefore it is possible to simultaneously retain vegetation on the site and meet bushfire protection requirements.

In terms of State Significant Development, while such projects are exempt from requiring a Bushfire Safety Authority (BFSA) under 100B of the Rural Fires Act 1997 and are not required to be assessed under s4.14 of the *Environmental Planning and Assessment Act 1979*, the Department can, and does (as standard practice), refer State Significant Development Applications to the NSW RFS for advice. The NSW RFS advice in these matters is consistent with PBP and approached in the same manner as if a BFSA was required. In my experience (since its inception and as the Director responsible for this portfolio at the NSW RFS for over a decade) the NSW RFS advice is always adopted by the Department in the determination of an SSD matter.

Notwithstanding, the nature of the Performance Based Design Brief Process (as agreed through the *Bushfire Engineering Design Compliance Strategy*) requires ongoing and considerable collaboration and approval from the NSW RFS as a key stakeholder. This process provides for a more rigorous and collaborative process then what is provided for through the typical BFSA process.

In terms of the Department requiring confirmation from the RFS that the proposed floor space can be achieved, having regard to the indicative masterplan, this consultation has already occurred and is covered conclusively in the latest NSW RFS submission on 8 February 2023, which stated:

- *The NSW Rural Fire Service (RFS) has no objection to the planning/ rezoning proposal for seniors housing and nominated residential uses as per the above, based on the additional work and documentation provided by BlackAsh Bushfire Consulting, as contained within the "Addendum Bushfire Report for Lourdes Retirement Village", dated the 22 December 2022 Version 1.0.*
- *The additional work referenced in the above Addendum was considered to address a maximum number of occupants that could be on-site, the adequacy/appropriateness of roadways for emergency egress and fire brigade access given reasonable worst case bush fire scenarios.*

The proposed design has been carefully developed to ensure the bushfire protection measures are appropriately addressed consistent with the intent of *Planning for Bush Fire Protection 2019* and Direction 4.3 and no further consultation with the NSW RFS is necessary.

If you have any questions, please contact me on 0418 412 118.

Yours sincerely,

Corey Shackleton

Principal Bushfire & Resilience
B.Sc., Grad. Dip. (Design for Bush fires)
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By email
5 October 2023

Bec Mahoney
Project Manager
Essence Project Management Pty Ltd

Our ref 244326

Lourdes Retirement Village

Response to Submissions – Department of Planning and Environment

Arup has been commissioned by Levande to assess the transport and traffic impacts of the planning proposal for Lourdes Retirement Village. The planning proposal and *Lourdes Retirement Village Transport Assessment* (Arup, 2022) were exhibited in August and September 2022.

In August 2023, Department of Planning and Environment requested for the following to be reviewed and reconsidered:

Traffic generation: Noting Council's submission and potential amendments to the master plan, please demonstrate that the trips generated by the proposed private dwellings can be adequately accommodated on the internal road lay and Stanhope Road without a significant impact on existing level of service and not adversely impacting the amenity of adjoining residential dwellings (to the west of the site).

This letter includes the following:

- Summary of the changes to the master plan since exhibition of the planning proposal.
- Assessment of the road capacity of the internal site road network and impacts on amenity of adjoining residential dwellings (to the west of the site).
- Review of the impact of trips generated by the proposal on the level of service of Stanhope Road.

Amended master plan

Following exhibition, the master plan was amended to include the following changes. These changes are shown graphically in Figure 1.

- Loading and servicing vehicle access has been amended such that access is proposed via the eastern-most entry to the site, with a dedicated ramp to the loading dock. This change would minimise heavy vehicle movements within the site.
- The road layout has been adjusted to segregate vehicles accessing the aged care facility parking from vehicles accessing the independent living units (ILUs) parking and town houses parking. This change would reduce vehicle movements on the access road near the adjoining property at 91 Stanhope Road.

Furthermore, the number of town houses in the amended master plan has reduced from 63 to 59.

Figure 1 Revised access points in the amended master plan

Traffic generation and Ku-ring-gai Council submission

Table 5 of the Transport Assessment outlines the traffic generation rates for land uses in the site (including service and visitor vehicles).

For the peak period from 11:30am to 12:30pm, the amended master plan is expected to generate:

- Aged care facility / apartments – 51 trips.
- Town houses – 39 trips. This equates to a reduction of 2 trips when compared to the planning proposal, due to the reduction in the number of town houses from 63 to 59 in the amended master plan.

In November 2022, Ku-ring-gai Council (Council) provided the following comments with regard to traffic generation:

Arup Transport Assessment (June 2022) estimates the traffic generation of the proposal. For the townhouses, the RTA traffic generation rate for medium density residential flat building was used (0.5-0.65 vehicle trips per hour in the peak hour) to derive total and peak hour traffic generation.

While the building typology of the townhouses is that of medium density residential flat buildings, the location factor (>1.3km from transport and services/facilities) is likely to result in the townhouses generating traffic similar to low density residential dwellings (0.85 trips per dwelling during the peak hour), as townhouses are likely to be located in a "missing middle" configuration.

The RTA (now TfNSW) *Guide to Traffic Generating Developments* (RTA, 2002) does not state that the rates for medium density residential flat buildings are based on sites located close to a retail/transport core. Therefore, we believe that the traffic generation rates used are the most appropriate. It is noted that using the rates for low density residential dwellings yields a relatively low increase in traffic generation of the townhouses from 39 trips per hour to 50 trips per hour.

Internal site road network capacity and impacts on amenity of adjoining residential dwellings

The *Guide to Traffic Generating Developments* provides guidance on the environmental capacity of roads for residential amenity. Section 4.3.5 of the guide suggests a maximum of 100 vehicles per hour for a local access way (maximum speed limit of 25 km/h).

To estimate the potential peak hour traffic volumes within the internal site road network, the traffic generation of the amended master plan has been distributed amongst the access points shown in Figure 1. Assuming a 50/50 split of traffic allocated to the aged care facility and apartments, and a 75/25 split between the western and eastern access points, the following vehicle movements are expected at each access point:

- Western ILU / town house access (adjacent to adjoining residential properties) – 48 trips
- Aged care facility access – 26 trips
- Eastern ILU access – 6 trips
- Eastern town house access – 10 trips

Traffic generated by the site is expected to be distributed among various access points and less than the environmental capacity of a local access way. Furthermore, the speed limit of internal roads is expected to be low to discourage high speeds (such as 10 kilometres per hour in line with existing speed limits). Therefore, the amenity impact of traffic within the site and on adjoining residential properties is expected to be low.

Stanhope Road – road capacity and level of service

An updated road network analysis for the amended master plan is shown in Table 1.

Table 1 Intersection modelling results with the amended master plan

Scenario		Level of Service	Average Delay (s)	Degree of Saturation
AM peak hour	Existing	B	28	0.660
	Existing + development	C	29	0.688
PM peak hour	Existing	B	24	0.547
	Existing + development	B	25	0.567
Saturday peak hour	Existing	B	26	0.488
	Existing + development	B	26	0.519

The intersection modelling identified that the impacts of additional trips generated by the amended master plan at the assessed Werona Avenue / Stanhope Road intersection are expected to be minimal, with trips expected to generally occur outside of the network peak hours.

As the number of town houses in the amended master plan has reduced from 63 to 59, it is expected that the impacts of the amended master plan on the Werona Avenue / Stanhope Road intersection are expected to remain minimal and lower than the impacts assessed in the planning proposal.

Summary

The amended master plan includes three access points to the site. Traffic generated by the site is expected to be distributed among these various access points and less than the environmental capacity of a local access way. Furthermore, the speed limit of internal roads is expected to be low to discourage high speeds (such as 10 kilometres per hour in line with existing speed limits). Therefore, the amenity impact of traffic within the site and on adjoining residential properties is expected to be low.

The number of town houses in the amended master plan has reduced from 63 to 59. Accordingly, impacts on the Werona Avenue / Stanhope Road intersection are expected to remain minimal, with trips expected to generally occur outside of the network peak hours.

The *Guide to Traffic Generating Developments* does not state that the rates for medium density residential flat buildings are based on sites located close to a retail/transport core. Therefore, we believe that the traffic generation rates used are the most appropriate. It is noted that using the rates for low density residential dwellings yields a relatively low increase in traffic generation of the townhouses from 39 trips per hour to 50 trips per hour, with impacts on amenity and intersection level of service expected to remain low.

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t: 1300 646 131

12 October 2023

Our ref: 23SYD-5827

Levande Pty. Ltd.
Level 18,
9 Castlereagh Street,
Sydney, NSW 2000

Attention: Nathan Donn

Dear Nathan,

RE: Eco Logical Australia Scope of Works

This letter provides information on Eco Logical Australia's (ELA) involvement in the Planning Proposal at 95 Stanhope Road, Killara (PP-2022-658).

Eco Logical was engaged for an initial Scope of Work on 7 June 2023. ELA's engagement for the current Scope of Work is between 31 August 2023 to 9 October 2023.

Regards,

Stacey Wilson
Senior Ecologist and BAM Accredited Assessor (BAAS22030)

1.1. Initial scope of works

Eco Logical Australia Pty Ltd (ELA) was engaged by Levande Pty. Ltd on 7 June 2023 to review the Environment and Heritage Group's (EHG's) Request for Agency Advice (dated 29 May 2023 (DOC23/364807)) for the Planning Proposal at 95 Stanhope Road, Killara.

Generally, further information was requested by EHG relating to:

- The use of the streamlined assessment module for planted native vegetation of the BAM 2020 to assess native vegetation present within the subject land.
- The justification for Plant Community Type (PCT) selection.
- The justification provided for the Threatened Ecological Community Selection.
- The exclusion of Ecosystem Credit Species (ECS) and Species Credit Species (SCS) due to the use of the streamlined assessment module for planted native vegetation rather than assigning native vegetation to PCTs.
- Impacts on Important Mapped Areas for Swift Parrot.
- Underestimation of impacts that may be required for an Asset Protection Zone (APZ) and
- The extent of indirect impacts assessed.

ELA peer reviewed the Biodiversity Development Assessment Report (BDAR) prepared by ASC Environmental (dated 4 May 2023). Following the review, ELA was commissioned to review Levande's response matrix dated 11 July 2023, in response to EHG Request for Agency Advice and provide input.

ELA was also commissioned to undertake a site inspection on 14 June 2023 to collect a full-floristic BAM plot data, specifically in the area to the north of the site to help determine the best-fit PCT present within the site and any threatened ecological communities that may be present. A second BAM plot was collected to the south west, with the intent to help inform PCTs present within the site.

ELA prepared a PCT confirmation letter for Levande letter dated 12 July 2023 (See Appendix A). This letter describes the methods and outcomes from the site inspection, and PCT selection and justification for the area within the north of the site

ELA peer reviewed the amended ASC Environmental BDAR (Final Report July 2023).

A summary of the initial scope if provided in Table 1.

Table 1: Summary of ELA's scope of works in relation to the Planning Proposal.

Section 1.1	Initial Scope of Works undertaken by ELA
1.1 and Appendix A	Peer review of the Biodiversity Development Assessment Report (BDAR) prepared by ASC Environmental (dated 4 May 2023) for the Planning Proposal at 95 Stanhope Road, Killara. Review of the Environment and Heritage Group's (EHG's) Request for Agency Advice (dated 29 May 2023 (DOC23/364807)). ELA commissioned to undertake a site inspection, focusing on the areas mapped as remnant vegetation on page 17 of the BDAR. The site inspection was required to validate native Plant Community Types present within the subject land and collect BAM floristic plot data to assist in the determination of Plant Community Types and potential Threatened Ecological Communities (TECs). Peer review of response matrix dated 11 July 2023, in response to EHG Request for Agency Advice and provide input.

	Peer review of amended ASC Environmental BDAR (Final Report July 2023) and provide advice.
Section 1.2	**Signification extension of scope of Works**
1.2.1 and Appendix B	Prepare a letter to Department of Planning in response to comments received within the EHG letter Request for Agency Advice – Amended Information for Planning Proposal 95-97 Stanhope Road, Killara (PP-2022-658)) (DOC23/628482). *'Response to Department of Planning_V2' (dated 6 October 2020)'.*
1.2.2	A site inspection to validate vegetation within the site which has previously been assigned to planted native vegetation and would look to assign the vegetation to a native Plant Community Type (PCT) being potentially Blue Gum High Forest, Sydney Turpentine Ironbark Forest.
Appendix B	Utilise EHG's Plot to PCT Assignment Tool. Plot to PCT Tool was used to compare the data produced by EHG's online tool with the analysis previously undertaken by using the Hager/Steenebeeke 2010 analysis method. Step 3 includes: • Utilise ELA's previously collected data (Plot 1 and Plot 2) and run this through the PCT Assignment Tool. • Utilise the plot data collected by ASC Environmental previously collected for the BDAR and run through the PCT Assignment Tool. • Utilise ELA's plot data collected (Plot 3 and Plot 4) following additional site inspection The details of the Plot to PCT Assignment Tool to be added to the Response to Department of Planning letter described in Section 1.2.1. .
1.2.6	Prepare a map, delineating native PCTs, planted native vegetation, non-local vegetation across the subject land following site inspection.
1.2.3	Attendance of ELA personnel at an on-site meeting between Levande Pty Ltd and Environment Heritage Group, 8 September 2023.
1.2.4	ELA to review ACS's response to the EHG's letter 'Request for Agency Advice – Amended Information for Planning Proposal 95-97 Stanhope' Road, Killara (PP-2022-658) (DOC23/628482)' and provide assisting commentary towards response.
1.2.5	ELA to undertake peer review and provide assisting commentary into ACS's amended BDAR and to provide a Scope of Works letter.

1.2. Significant extension of scope of works

Levande has significantly increased ELA scope of works and involvement as peer review consultant to provide recommendations and overall peer review of the revised BDAR. The below subsections provide an overview of the work performed by ELA in response to the revised BDAR dated October 2023

1.2.1. Response to Department of Planning

ELA were engaged to prepare a letter to Department of Planning in response to comments received within the EHG letter Request for Agency Advice – Amended Information for Planning Proposal 95-97 Stanhope Road, Killara (PP-2022-658) (DOC23/628482).

The letter included information pertaining to ELA's PCT mapping, which was informed by the use of the Plot to PCT Assignment Tool and review of the Final Determination(s) for Sydney Turpentine Ironbark Forest and Blue Gum High Forest.

This letter is provided in Appendix B *'Response to Department of Planning_V2' (dated 6 October 2020)*'.

1.2.2. Further site investigations

A total of 4 full-floristic plots have been undertaken by ELA to assist in the in the determination of PCTs and assist in informing TECs within the subject site.

As described in Section 1.2.2, an initial field investigation on 14 June 2023, a total of two 20 x 20 full-floristic plots were collected to assist in the determination of PCTs and assist in informing TECs within the subject site. An additional two plots were collected on 5 September 2023 to further assist in PCT allocation. Details relating to plot data collection are provided in Table 2.

Table 2: Total number of plots undertaken within and surrounding the subject site

Plot Number	Date plot data collected	Plot data collected by	Plot data collected	Location
Plot 1	14 June 2023	ELA	20 x 50 full floristic and function data	Within subject site
Plot 2	14 June 2023	ELA	20 x 20 floristic plot	South-west of subject site (off-site)
Plot 3	5 September 2023	ELA	20 x 20 floristic plot	South of subject site (off-site)
Plot 4	5 September 2023	ELA assisted by ACS and Ecologique	20 x 20 floristic plot	Within subject site.

An additional site inspection was undertaken by ELA staff on 8 September 2023 to review the tree species identified in the Arboricultural report. This was contained to the north-eastern section of the subject site to assist in determination of the PCTs in this to provide further justification if Blue Gum High Forest was present.. It was identified that several of the trees which had been previously identified in the Arboricultural report as *Eucalyptus saligna* (Blue Gum) were not *E. saligna* and more likely to be *E. melliodora* (Yellow Box), *E. tereticornis* (Forest Red Gum) and *E. maidenii* (Maiden's Gum). ELA provided the locations of these trees to ACS and Ecologique. Following this, a field survey was undertaken by ACS to confirm the species and subsequently, the arborist report was revised.

1.2.3. Onsite meeting

ELA staff attended an onsite meeting between Levande Pty Ltd, ACS Environmental, Ecologique and Environment Heritage Group. ELA staff in attendance included Senior Principal Ecologist Dr Meredith Henderson, Principal Ecologist and Senior Arborist Daniel McDonald and Senior Ecologist Stacey Wilson.

1.2.4. Review Response to Submissions Matrix

ELA conducted a review of Levande's Response to Submission to the EHG's letter Request for Agency Advice – Amended Information Planning Proposal 95-97 Stanhope Road, Killara in August 2023 and provide recommendations towards Response to Submissions Matrix.

1.2.5. Peer review revised BDAR and scope of works.

ELA undertook a peer review of the final revised BDAR dated 6 October 2023. ELA provided advice and assisted commentary on some matters which requested further information. This included advice on:

- PCT selection justification - ELA provided results of the Plot to PCT tool analysis which includes plots undertaken by ELA and ACS and Ecologique and engaged in meetings with Levande, ACS and Ecologique to discuss results.
- PCT mapping – ELA provided their PCT mapping of the entire site based on previous site visit, plot data results, Plot to PCT assignment tool results, and site visits of areas of known Blue Gum High Forest in the locality.
- Review of Ecosystem Credit Species being maintained in the BAMC and review of exclusion justification following assignment of previously mapped landscaping into a native PCT.
- Review of Species Credit Species for inclusion/exclusion and advice for inclusion of species polygon for *Chalinolobus dwyeri* (Large-eared Pied Bat) and *Lathamus discolor* (Swift Parrot).
- Advice on inclusion of SAII entity assessments
- Advice relating to the management of the understory within the subject site and how impacts to the understorey could be captured as a management zone within the BAMC.
- Review and advice on prescribed impacts to biodiversity and indirect impacts to biodiversity and prescribed impacts.

Provided below is ELA's PCT mapping and advice provided relating to Large-eared Pied Bat. These two items have been included specifically within this letter as they include mapping that was provided to ACS/Ecologique to inform the revised BDAR.

1.2.6. PCT mapping

Following the collection of plot data, the use of the Plot to PCT Tool, review of the revised arboricultural report a final Plant Community Type map was produced by ELA and provided to ACS and Ecologique to assist in their PCT selections for the revised BDAR.

ELA's PCT Map, including locations of plots is provided in Figure 1.

Figure 1: Plant Community Types mapped within the subject site (ELA 2023)

1.2.6.1. Large-eared Pied Bat

ELA has advised that all surveys undertaken for species credit species should be included in the BDAR, if the correct number of trap nights were not compliant, species presence is to be assumed. In particular, there is likely to be habitat for one of the microchiropteran bats, *Chalinolobus dwyeri* (Large-eared pied bat) within proximity to the site.

The Office of Environment and Heritage 2018 Species credit' threatened bats and their habitats guideline states that a total of 16 trap nights over a minimum of 4 nights must be undertaken between Mid Nov to end of January to detect the species. It has been identified by EHG that there is a deficiency in the number of traps nights recorded for Large-eared Pied Bat recorded in the BDAR.

ELA suggested that in lieu of the correct number of traps nights being completed within the BDAR, that species presence is to be assumed and a species polygon generated until such time that a targeted survey can be undertaken to discount this species.

ELA provided the following steps be undertaken to identify potential breeding features and potential roost features for Large-eared Pied Bat and the generation of a species polygon.

To undertake an updated analysis of habitat features within 2 km of the subject land by producing a 2 km buffer from the subject land. High resolution aerial imagery and terrain analysis should be used to identify potential roost habitat features on the subject land and within 2 km. A terrain analysis should be undertaken which utilises Hillshade Digital Elevation Model (DEM). Hillshade is a raster that maps the terrain using light and shadow to create a 3D-looking image. This may be used to assist in finding possible roosting features. Further slope analysis could then be used to inform terrain steepness. In general, if there are features with slope of greater than 50 degrees, that could be mapped as a possible ridgeline or escarpment that may have potential roost habitat for Large-eared Pied Bat.

Potential breeding habitat for Large-eared Pied Bat is stated in the TBDC as 100 m within of rocky areas, caves, overhangs crevices, cliffs and escarpments, or old mines or tunnels, old buildings, and sheds within the potential habitat. Breeding habitat is a potential Serious and Irreversible Impact (SAII). No breeding habitat as defined above, exists in the subject land for this species. Therefore, there is no SAII present for breeding habitat for this species in the subject land.

The TBDC also states when the species is present on the subject land and the proposed impact is not a potential SAII (breeding habitat), standard species credits will be generated.

ELA undertook an analysis of habitat features as described above and identified that there are no escarpments identified on or within 100 m of the subject land. Several escarpments were identified within 2 km of the subject land. The map showing the Hillshade analysis is provided in Figure 2and the map showing slope and identified escarpments is provided in Figure 3. The images were provided to ACS and Ecologique to assist with the revision of the BDAR.

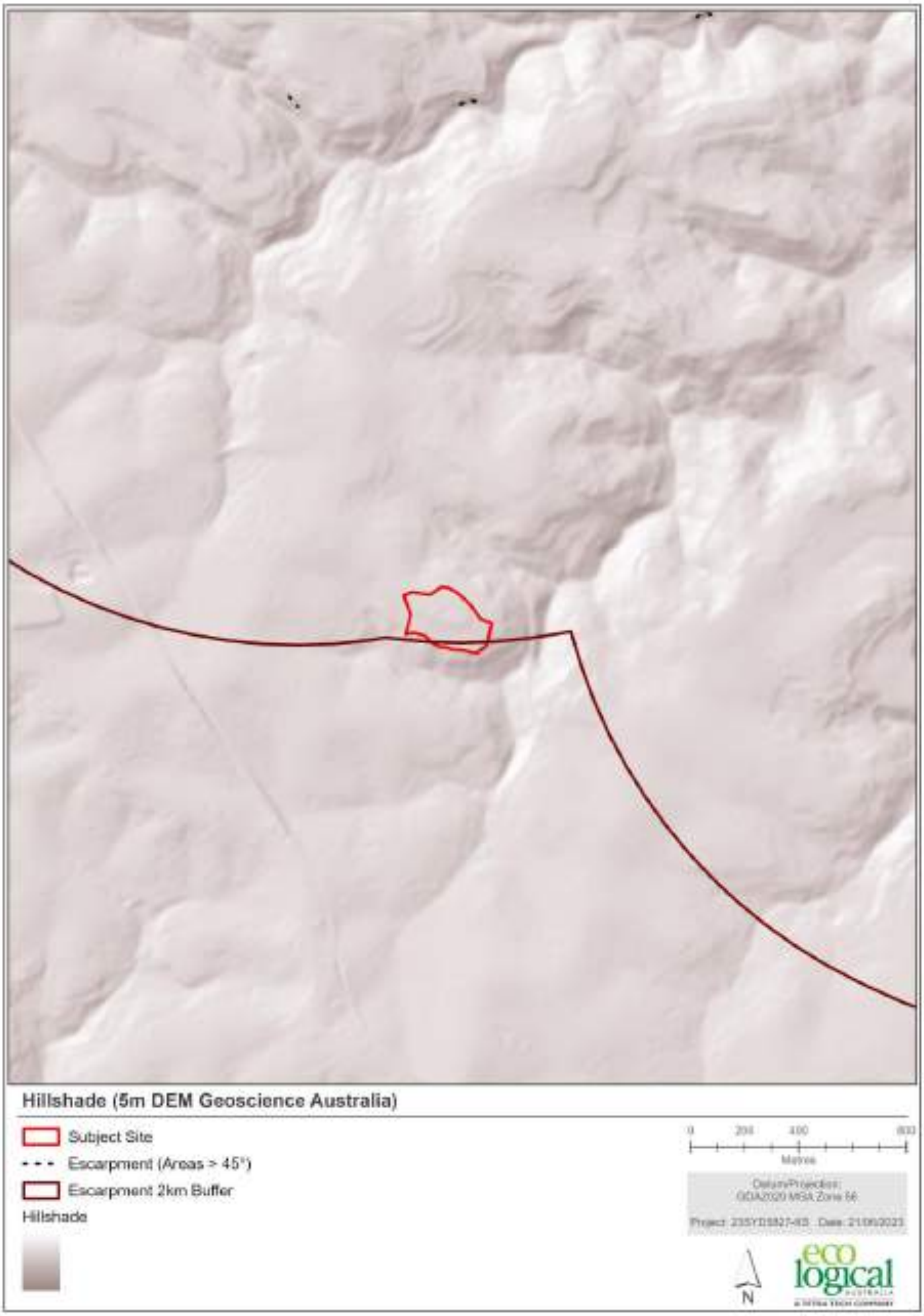


Figure 2: Hillshade DEM and identified escarpment features within 2 km of the subject land

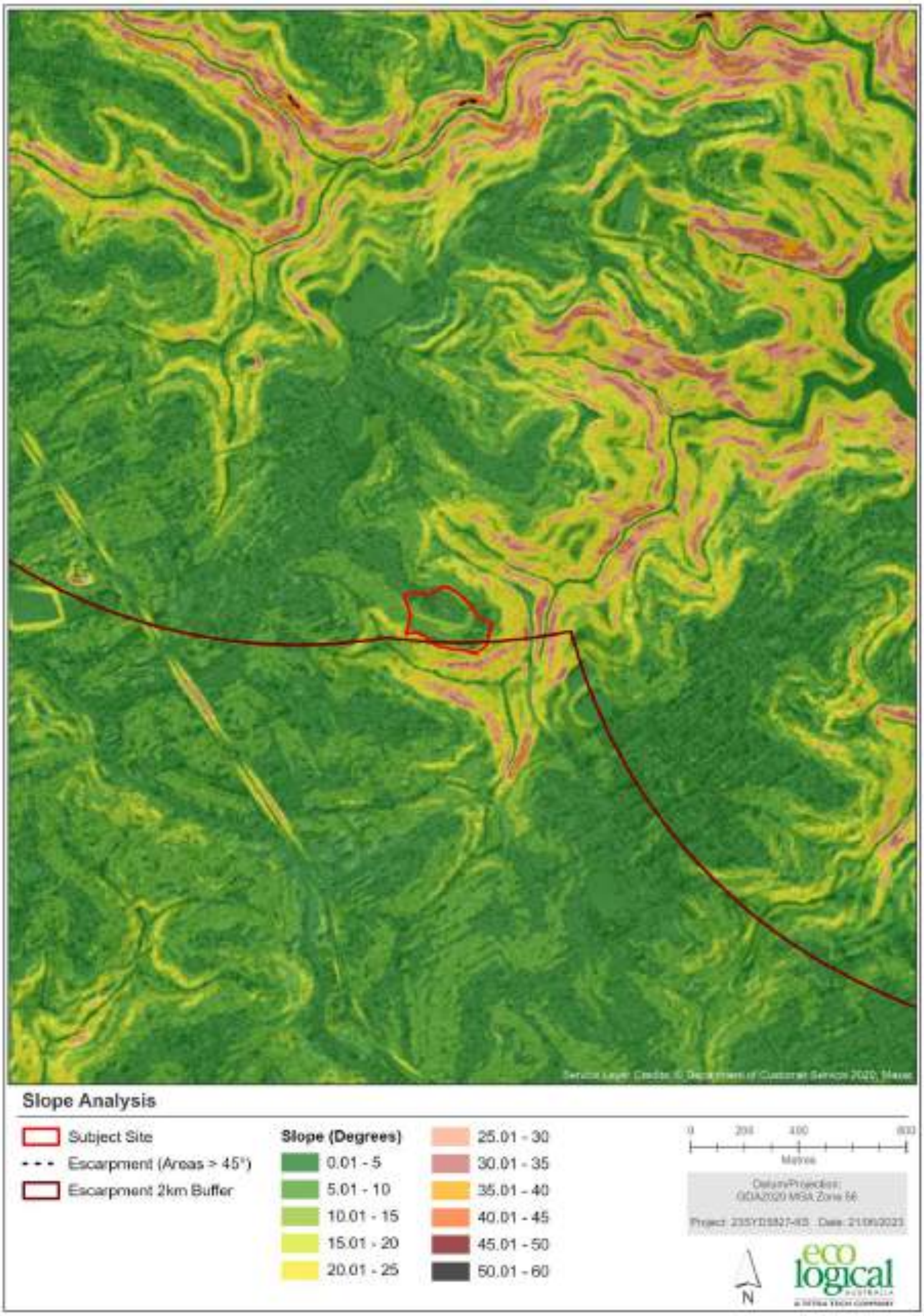


Figure 3: Slope analysis within 2 km of the subject land with the potential roost habitat features for microbats identified as escarpments.

Appendix A: PCT confirmation letter V2

See next page.

Level 3
101 Sussex Street
Sydney NSW 2000
t: (02) 9259 3800

12 October 2023
Our ref: 23SYD5827

Levande Pty. Ltd.
Level 18,
9 Castlereagh Street,
Sydney, NSW 2000

Attention: Nathan Donn

Dear Nathan,

RE: PCT validation to assist Planning Proposal at 95 Stanhope Road – Killara

Eco Logical Australia Pty. Ltd. (ELA) was engaged by Levande Pty. Ltd. to review a Biodiversity Development Assessment Report (BDAR) prepared by ASC Environmental (4 May 2023) for the Planning Proposal at 95 Stanhope Road, Killara; and to review Environment and Heritage Group's (EHG's) response to the BDAR.

Upon review of the BDAR and EHG's response, ELA were commissioned to undertake a site inspection, focusing on the areas mapped as remnant vegetation on page 17 of the BDAR. The site inspection was required to validate native Plant Community Types present within the subject land and collect BAM floristic plot data to assist in the determination of Plant Community Types. The subject land is defined at 95 Stanhope Road, Killara, which is legally identified as Lot 21 and Lot 22 in Deposited Plan 634645, in the Ku-ring-gai Local Government Area (LGA).

This letter describes the field survey undertaken over one day within the subject land and provides ELA's Plant Community Type validation, and PCT selection process. It also describes the occurrence of Threatened Ecological Communities likely to be present within the subject land.

If you have any queries, please feel free to contact me via email at staceyw@ecoaus.com.au

Regards,

Stacey Wilson
Senior Ecologist

Regards,

Dr Daniel McDonald

Principal Ecologist and Senior Arborist

1.1. Field survey

A field survey was conducted over one day on 14 June 2023 by Principal Ecologist Daniel McDonald and Senior Ecologist Stacey Wilson. The purpose of the field survey was to:

- review previous vegetation mapping on site as assessed by ACS environmental
- validate the PCTs present
- identify the potential for any threatened ecological communities listed under the BC Act and/or EPBC Act to occur within the subject land.

A total of two 20 m x 20 m full floristic plots were surveyed to identify Plant Community types (PCTs) and assist in informing threatened ecological communities (TECs) on the subject land. Figure 3 shows the location of the plots undertaken.

Plot 1 was undertaken in the north-eastern portion of the subject land which has been previously assigned to PCT 3592 *Sydney Coastal Enriched Sandstone Forest* in the Biodiversity Development Assessment Report 4 May 2023 prepared by ACS Environmental Pty. Ltd.

As mentioned above, much of the subject land has been historically cleared, and areas on the east and south of the development site contain very little native species cover to assist in informing PCT selection. Therefore, the decision was made to undertake the second floristic plot, Plot 2 within an area of native vegetation to the south of the subject land.

The use of this floristic information in the adjacent vegetation would provide a greater understanding of the PCTs present in the locality and would assist in the selection of the best-fit PCT for the vegetation within the southern portion of the subject land. This area has been previously mapped by DPE in their regional mapping project (State Type Vegetation Map 2022)as PCT 3136 as *Blue Gum High Forest*.

1.1.1. Survey Limitations

This assessment was completed over one day and not intended to provide an inventory of all species present across the subject land but instead an overall assessment of the ecological values of the subject land with particular emphasis on mapping Plant Community Types and threatened ecological communities.

The field survey was undertaken using a hand-held GPS unit. It should be noted that these units can have errors in accuracy of up to 20 m (subject to availability of satellites on the day).

Additional survey work undertaken in the wider area may assist in identification of plant communities. However, due to time constraints additional survey work was not undertaken.

1.2. Results – Plant Community Type validation

Two PCTs were identified within the subject land following the field survey; they are PCT 3262 *Sydney Turpentine Ironbark Forest* and PCT 3592 *Sydney Coastal Enriched Sandstone Forest.* A summary of the vegetation validated as part of ELA's assessment is presented in Table 1 and shown in Figure 3. A description of the Plant Community Types identified is detailed below.

Table 1: Vegetation communities validated within the subject land

PCT ID	PCT Name	Area of vegetation validated	No. of plots collected
3262	Sydney Turpentine Ironbark Forest	Regrowth of remnant vegetation in the north east of the subject land	1
3592	Sydney Coastal Enriched Sandstone Forest	Vegetation within Seven Little Australians Park directly adjacent to the south of the subject land.	1

1.2.1. PCT 3262 Sydney Turpentine Ironbark Forest

Vegetation which was validated as PCT 3262 contains canopy species *Eucalyptus pilularis* (Blackbutt) and *Eucalyptus microcorys* (Tallowwood) within the floristic plot. *E. microcorys* is not a native species to Sydney and is naturally found on the north coast of New South Wales and Queensland and is likely to have been planted. The midstorey is sparse and contains *Elaeocarpus reticulatus* (Blueberry Ash) and *Ozothamnus diosmifolius* (White Dogwood). The groundcover contains a very sparse cover of grasses, including *Entolasia stricta* (Wiry Panic), *Microlaena stipoides* (Weeping Grass), *Aristida vagans* (Threeawn speargrass), *Oplismenus aemulus* (Australian Basket Grass) and *Digitaria* sp. Forbs present in the groundcover include *Dianella caerulea* var*. producta, Centella asiatica* (Indian Pennywort), *Dichondra repens* (Kidney Weed) and *Commelina cyanea.* Exotic species include *Osteospermum* sp. (African Daisy), *Ehrharta erecta* (Panic Veldtgrass), *Chlorophytum* sp., *Phoenix canariensis* (Canary Island Date Palm) and *Cinnamomum camphora* (Camphor Laurel).

A list of species immediately surrounding the 20 m x 20 m plot includes native canopy species, *Eucalyptus robusta* (Swamp Mahogany), *Angophora hispida* (Dwarf Apple), midstorey species, *Callistemon citrinus* (Crimson Bottlebrush), *Acacia longifolia* (Sydney Golden Wattle) *Breynia oblongifolia* (Coffee Bush), *Imperata cylindrica* (Blady Grass), *Acacia ulicifolia* (Prickly Moses), *Melaleuca nodosa* (Prickly-leaved Paperbark). Groundcovers outside of plot 1, though present in the surrounding area include *Eragrostis brownii* (Brown's Love Grass), *Glycine microphylla* (Small-leaf glycine), *Cyperus gracilis* (Slender Flat-sedge), *Calystegia* sp., *Lomandra longifolia* (Spiny-headed Mat-Rush) and *Lomandra gracilis.* Weeds included *Sida rhombifolia* (Paddy's Lucerne), *Nandina domestica* (Nanten), *Sporobolus africanuus* (Parramatta Grass), *Senecio madagascariensis* (Fireweed). Also present were *Acacia podalyriifolia* and *Acacia saligna* (Golden Wreath Wattle) which have naturalised in the Sydney region. The vegetated area in the north east portion of the subject land appears to have undergone historical disturbance. As can be seen on the right side in Photo 1, a built-up area of soil, forming a mound is present. It is likely that the soil has been moved around this area during past construction activities. However, the soil on the flattest part of the area, has a more natural appearance and are potentially remnant soils.

Photo 1 below shows the start of the 20 m x 20 m floristic plot looking towards the end of the 50 m plot. Photo 2 shows the end of the plot looking back towards the start.

1.2.2. PCT 3592 Sydney Coastal Enriched Sandstone Forest

As discussed above, due to the lack of native species that could be collected in a 20 m x 20 m plot within the subject land, analysis of plot data would likely not produce a meaningful result to assist in PCT determination. Therefore, the decision was made to collect a second floristic plot within vegetation to the south of the development site, to help inform the best fit PCT in the southern portion of the subject land.

The vegetation validated as PCT 3592 includes canopy species *Corymbia gummifera* (Red Bloodwood), *Angophora costata* (Sydney Red Gum), *Eucalyptus pilularis* (Blackbutt), *Syncarpia glomulifera* subsp. *glomulifera* (Turpentine) and a sub-canopy of *Ceratopetalum gummiferum* (Christmas Bush), *Allocasuarina littoralis* (Black She-oak) and *Pittosporum undulatum* (Sweet Pittosporum). The midstorey was diverse, with an open structure and includes *Acacia longissima* (Long Leaf Wattle), *Elaeocarpus reticulatus* (Blueberry Ash), *Leucopogon juniperinus* (Prickly Beard-heath), *Coronidium elatum* subsp. *elatum, Dodonaea triquetra* (Large-leaf Hop-bush), *Polyscias sambucifolia* (Elderberry Panax), and *Ozothamnus diosmifolius* (White Dogwood). The groundcover is diverse and includes grasses; *Microlaena stipoides* (Weeping Grass), *Entolasia stricta* (Wiry Panic), *Lomandra longifolia* (Spiny-headed Mat Rush), *Oplismenus imbecillis* (Creeping Beard Grass). Forbs included *Dianella caerulea* var. *producta,* ferns included *Pteridium esculentum* (Common Bracken) and *Calochlaena dubia* (Rainbow Fern), while other growth form group species included *Billardiera scandens* (Hairy Apple Berry). Non-native species *Cordyline australis* (Cabbage Tree) were also present. Invasive exotic species present include *Cinnamomum camphora* (Camphor Laurel), *Lantana camara* (Lantana), *Ligustrum sinense* (Small-leaved Privet), *Ochna serrulata* (Mickey Mouse Plant), *Solanum mauritianum* (Wild Tobacco Bush), *Hedychium gardnerianum* (Ginger Lily), *Asparagus* spp., *Agapanthus* sp., *Ageratina adenophora* (Crofton Weed) and *Cestrum parqui* (Green Cestrum). Photo 3 shows vegetation validated as PCT 3592 adjacent to the southern boundary of the subject land.

Photo 1: Start of 20 m x 20 m floristic plot taken within vegetation at the north east of the subject land

Photo 2: end of the 20 m x 20 m floristic plot within vegetation at the north east of the subject land

Photo 3: Vegetation validated as PCT 3592 Sydney Coastal Enriched Sandstone Forest

1.3. Soil profile

Two soil profiles were undertaken within the subject land to assist in PCT selection justification. One soil profile was taken within proximity to the start of the floristic plot 1 and is referred to as soil profile site 1. The second soil profile was undertaken at the north west boundary of the Subject land. The locations of the soil profiles taken is presented in Figure 3.

Texture assessments at soil profile site 1 (Photo 1) are consistent with the soil being approximately a sandy clay loam to clay loam. The results of the soil profile assessment are that the soil characteristics are consistent with a yellow podzolic soil (Great Soil Group). This soil appeared relatively undisturbed. However, an unusual artifact was present in the earthern wall of the profile trench. The white coloured fragment can be seen in Photo 1. It lies horizontally within the profile and is right of the tape measure near the '10' on the measuring tape. Perhaps some minor disturbance has occurred at this location.

The soil assessment at soil profile site 2 recorded fill in the soil sample. Additionally, the A horizon was relatively thin and it overlayed a very hard B/C horizon. The soil at site 2 shows evidence of significant disturbance, with blue metal gravel and concrete fragments (See Photo 2).

Photo 1: Soil profile site 1

Photo 2: Soil profile site 2

Figure 3: ELA validated Plant Community Types within the subject land.

1.4. Quantitative analysis

Quantitative analysis was completed, using the Hager/Steenebeeke 2010 analysis excel spreadsheet for each vegetation integrity plot to determine the best fit PCT using standardised ratio comparison positive native to total native score. This analysis uses the diagnostic species as described by Tozer (2003) and Tozer (2010). Vegetation integrity plot 1 has undergone historical disturbance and contained only a small number of native species. Plot 2 had a greater number of native species recorded during floristic survey. The analysis is provided in Appendix B.

1.5. PCT selection justification

Plant Community Type (PCT) justifications are provided for PCT 3262 validated by ELA.

The following inputs were used to build queries in the BioNet Vegetation Classification Dataset (DPE 2023) for the vegetation within the north-east portion of the subject land:

- IBRA region text contains 'Sydney Basin'
- IBRA subregion text contains 'Cumberland'
- Vegetation Formation text contains 'Dry Sclerophyll Forests (Shrubby sub-formation) AND 'Dry Sclerophyll Forests (Shrub/grass sub-formation) AND 'Wet Sclerophyll Forests (Shrubby sub-formation AND 'Wet Sclerophyll Forests (Grassy sub-formation).
- Species text contains '*Eucalyptus pilularis, Elaeocarpus reticulatus*, *Dianella caerulea* var. *producta, Lobelia purpurascens, Melia azedarach, Microlaeana stipodies, Oplismenus aemulus, Ozothamnus diosmifolius, Oxalis* sp., *Digitaria* sp., *Dichondra repens, Cynodon dactylon, Commelina cyanea, Centella asicatica, Aristida vagans* and *Entolasia stricta'.*

The outputs of this query provided a preliminary list of potential PCTs. The PCTs were then further investigated by comparing the matches of upper stratum species listed in the BioNet Vegetation Classification for those PCTs against the species recorded within plots for each vegetation zone. The descriptive attribute of the PCTs, landscape position and information on dominant soils or geology, average annual rainfall and elevation above sea level was also considered.

Other documentation consulted to assist in PCT selection included

- Final determination - Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion - critically endangered ecological community listing (NSW Threatened Species Scientific Committee 2019).
- Sydney turpentine ironbark forest - endangered ecological community profile (NSW Department of Environment and Conservation)
- Best practice guidelines for Sydney Turpentine Ironbark Forest (Department of Environment and Climate Change NSW 2008).
- Turpentine-Ironbark Forest of the Sydney Basin Bioregion Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (TSSC) on amendments to the List of Ecological Communities under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (2005).
- Approved Conservation Advice for Turpentine–Ironbark Forest in the Sydney Basin Bioregion (2014)

- Tozer, M (2003). The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* 8, 1–75.
- Tozer, et al. (2010). Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. *Cunninghamia* 11(3).
- The NSW State Vegetation Type Map (DPE 2022)
- Department of Planning and Environment (DPE) 2023a, eSPADE online tool. Available: https://www.environment.nsw.gov.au/eSpade2Webapp (Accessed June 2023).
- Department of Planning and Environment (DPE) 2019. Blue Gum High Forest in the Sydney Basin Bioregion – critically endangered ecological community listing. Available: Blue Gum High Forest in the Sydney Basin Bioregion - critically endangered ecological community listing | NSW Environment and Heritage.
- Preston, B. (SC) and Adam, P. (1995) Describing and listing threatened ecological communities under the Threatened Species Conservation Act 1995 (NSW): Part 1 – the assemblage of species and the particular area. *Environmental Planning and Law Journal* 21:250 – 263.Justification for the selection of PCT 3262 Sydney Turpentine Ironbark Forest

A number of other PCTs were considered in the selection process for PCT 3262. An analysis of these PCTs is included in Table 2.

Table 2: Other PCTs considered during the selection process for PCT 3262

PCT	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
3259	Sydney Coastal Shale-Sandstone Forest	The tree canopy almost always includes *Corymbia gummifera*, very frequently with *Angophora costata*. Species from the stringybarks eucalypt group (*Eucalyptus globoidea, Eucalyptus capitellata* rarely *Eucalyptus sparsifolia*) are also common however rarely with high cover. In contrast *Eucalyptus pilularis* or species from the mahogany eucalypt group (*Eucalyptus resinifera or Eucalyptus umbra*) are occasional however with high cover.	PCT 3259 was considered for selection as the vegetation community occurs within the Sydney Basin bioregion, and Cumberland sub-region and had the same match of species which were entered into the PCT filer query (13 matches). However, it was considered that PCT 3262 is a better fit based on overall species composition and known local occurrence within the Ku-ring-gai LGA. PCT 3259 does list *E. pilularis* as a species which can occasionally occur in this community, with high cover and the PCT does contain similar groundcover species which were collected in the floristic plot. However, the dominant midstory species listed for this community frequently includes *Persoonia levis, Banksia spinulosa, Lomatia silaifolia* with *Acacia myrtifolia* and *Hakea sericea* also common. None of these species were recorded in the floristic plot, which makes PCT 32562 a better fit PCT selection based on the assemblage of species present. Further, another characteristic of this PCT is that it has a grassier ground layer than other coastal sandstone ridgetop forests. *Entolasia stricta* is very frequent, often with a moderate cover, with *Austrostipa pubescens*, *Imperata cylindrica* and *Themeda triandra* with high cover. The vegetation mapped within plot 2 did contain *Entolasia stricta* but only recorded a low cover (0.5) within the 20 m x 20

PCT	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
			m floristic plot and did not record the presence of *A. pubescens*, *I. cylindrica* nor *T. triandra.* This PCT is not mapped within proximity to the subject land, whilst PCT other PCTs such as 3592, 3595 and 3262 and 3136 are mapped within proximity, making these PCTs potentially better fits for this PCT (DPE 2022).
3594	Sydney Coastal Sandstone Foreshores Forest	The tree canopy is very frequently dominated by *Angophora costata* with occasional local stands of *Eucalyptus botryoides* or rarely other eucalypt species. A sparse taller layer in the mid-stratum commonly includes *Banksia integrifolia* or *Allocasuarina littoralis* and occasionally *Ficus rubiginosa.*	This PCT is described as a tall, occasionally very tall, sclerophyll open forest with a mixed understorey of dry shrubs and mesic small trees found along the foreshores of Sydney's major waterways and coastal escarpments. It is not known within the Ku-ring-gai LGA. Its maximum elevation is 90 m above sea level. Although this PCT had 13 matches against the VIS filtering tool selection criteria, the vegetation within the subject land is not located along major waterways and coastal escarpments. The assemblage of species listed for this community in the VIS contains a high proportion of *Glochidion ferdinandi* (Cheese Tree) and *A. costata. PCT 3594* was not considered to be the best fit PCT for this community.
3592	Sydney Coastal Enriched Sandstone Forest	*Angophora costata* commonly in combination with *Corymbia gummifera* and *Eucalyptus piperita*, with *Eucalyptus pilularis* occasionally locally abundant. A taller mid-stratum is characterised by very frequent however sparse cover of *Pittosporum undulatum* and *Allocasuarina littoralis* or *Allocasuarina torulosa.*	This PCT was considered as a potentially strong selection for the vegetation community. PCT 3592 is known to occur within the Sydney Basin Bioregion, Cumberland subregion, and is known to occur within the Ku-ring-gai LGA. The vegetation within the subject land falls within the average annual rainfall for this PCT and elevation ranges above sea level. However the frequently recorded canopy species in this PCT did not occur within the vegetation in the north east portion of the subject land, with only *E. pilularis* and *Allocasuarina littoralis* in common. Further, this PCT is more commonly known to occur on slightly enriched Hawkesbury sandstone soils on sheltered slopes and occasional crests. The soil landscape where this vegetation is found is more likely to lie on the Lucas Heights soil landscape, and its position was on the top of the ridge rather than a sheltered slope. Therefore, PCT 3262 was considered a better fit for this community.
3136	Blue Gum High Forest	The tree canopy very frequently includes a high cover of *Eucalyptus saligna*, commonly with *Eucalyptus pilularis* and occasionally *Syncarpia glomulifera*. The mid-stratum is layered, with a sparse cover of small trees that very frequently includes *Pittosporum undulatum* and occasionally *Elaeocarpus reticulatus.*	Blue Gum High Forest was considered for the selection of PCTs. PCT3136 is known to occur in the Sydney Basin Bioregion, Cumberland Subregion and is known in the Kur-ring-gai LGA and has been previously mapped by DPE 2022 as occurring to the south and west of the subject land. This community is described as a very tall to extremely tall sclerophyll open forest, dominated by either *Eucalyptus pilularis* (Blackbutt) or *E. saligna* (Sydney Blue Gum), with a mean tree height of 39.3 m (±16.2 m) and a mean

PCT	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
			foliage cover of 30.7% (±13.7%). In areas located close to the shale/sandstone boundary *Angophora costata* (Smooth-barked Apple) is present frequently in the tallest tree layer. The vegetation within the north east of the subject land is tall, and approximately to 20 to 30 m (Naturally Trees 2023), however, would not be considered an extremely tall forest. The vegetation did contain *E. pilularis* as a dominant canopy species within the plot however, lacked *E. saligna* or *A. costata* within this area. Blue Gum High Forest is generally found at altitudes higher than 100 m above sea level on the Hornsby Plateau in the North Shore and northern suburbs of Sydney. The subject land's highest point is approximately 110 m above sea level. Blue Gum High Forest is predominantly restricted to deep soils derived from Wianamatta Shale in high-rainfall areas that receive more than 1100 mm per year. The mean annual rainfall is 1241 mm for the area and is likely situated on Wianamatta Shale, also making this PCT a possible fit for this community. However, this PCT was not selected as the best-fit community due to the understorey species more closely aligning with a drier, understorey of sub-canopy and shrub species which is more representative of 3262 than a more mesic, moist rainforest midstorey and ferny or herbaceous understorey. The soil landscape on the top of the ridge is also mapped as Lucas Heights (shale with fine-grained sandstones) which is more likely to fit PCT 3262 than soils with a deep shale influence. The Arboricultural Impact Appraisal and Method Statement has also included *E. paniculata* as one of the Eucalypt species present within the north-eastern portion of the subject land. *E. paniculata* is listed as one of the characteristic canopy species for Sydney Turpentine ironbark Forest but can also be found on upper slopes of Blue Gum High Forest. Sydney Turpentine Forest and Blue Gum High Forest share many similar characteristics and can be difficult to discern between the two communities, particularly in a modified landscape with a long disturbance history. Quantitative analysis using Hager/Steenebeeke 2010 analysis excel spreadsheet was conducted for each vegetation integrity plot to determine the best fit PCT using standardised ratio comparison positive native to total native score. The score achieved for Sydney Turpentine Forest was (67%) in favour of this community compared to (33%) for Blue Gum High Forest.

PCT	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
			In summary, PCT 3136 was a possible PCT selection of the vegetation in the north-east of the subject land, however, based on rapid soil texture assessment, review of soil landscape mapping, position on top of the ridgeline, the tall to very tall rather than tall to extremely tall forest (Walker and Hopkins 1990), lack of mesic species in the understorey and comparison of diagnostic species with the Hager/Steenebeeke 2010 analysis excel spreadsheet which incorporates diagnostic species from Tozer 2003 favouring towards Sydney Turpentine Ironbark Forest, PCT 3262 was selected as the best fit PCT for the vegetation in the north-east portion of the subject land.
3258	Sydney Basin Creekflat Blue Gum-Apple Forest	The tree canopy is variable however very frequently includes *Angophora floribunda* in the canopy or as a small tree. Common eucalypts with a high foliage cover are species from the blue gum eucalypt group, *Eucalyptus deanei* or *Eucalyptus saligna*, occasionally in association with stringybark eucalypts including *Eucalyptus eugenioides.*	PCT 3528 is known to occur in the Sydney Basin Bioregion and Cumberland subregion. This vegetation community also had the same number of matches in the PCT filtering tool with 3262. However, the matches more closely aligned with the groundcover species present, the dominant canopy species listed for this community comprise of a number of species which were not recorded within the north-east portion of vegetation within the subject land. PCT 3258 is also described as primarily distributed at elevations of less than 200 m above sea level downslope of shale soils on the north shore of Sydney. The location of the plot was taken on the top of the ridge and was therefore not downslope of shale soils. The location of the plot on top of the flatter ridge aligns more closely with PCT 3262, as described in the final determination where Sydney Turpentine-Ironbark Forest occurs on low rolling hills characteristic of the Cumberland Lowlands and the broad, shale-capped ridges of the surrounding plateaux. Therefore PCT 3258 was considered as a potential fit, however, PCT 3262 is a better fir for the vegetation present within the north east of the subject land.
3262	Sydney Turpentine Ironbark Forest	The tree canopy very frequently includes *Syncarpia glomulifera* either as a canopy dominant or as a smaller tree or both. Other species which are localised and occasionally dominant or co-dominant occasionally include *Eucalyptus pilularis, Angophora costata* and *Eucalyptus punctata*, rarely with *Eucalyptus paniculata, Eucalyptus globoidea* or *Eucalyptus resignifera.*	This community occurs as a tall to very tall sclerophyll open forest found on shale or sheltered shale-sandstone soils mainly in the northern suburbs of Sydney and lower Blue Mountains. This was considered to be the best fit PCT for the vegetation community assessed in Plot 1. This PCT occurs in the Sydney Basin Bioregion and Cumberland subregion, it is known to the Ku-ring-gai LGA and has been previously mapped within proximity to the subject land (DPE 2022). Whilst the vegetation collected in the plot analysis only recorded *Eucalyptus pilularis* as the potentially remnant dominant canopy species, the arborist report also identified that *Eucalyptus paniculata* may occur within this location.

PCT	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
			The position of the vegetation is located on the top of a ridge, and the rapid texture assessment undertaken at soil profile site 1 in the vicinity of the plot, was consistent with the soil being approximately a sandy clay loam to clay loam. The results of the soil profile assessment are that the soil characteristics are consistent with a yellow podzolic soil (Great Soil Group). Yellow podzolic soil is a characteristic of the Lucas Heights soil landscape. The vegetation within the north east portion of the subject land is mapped at the boundary of the Lucas Heights and the Hawkesbury soil landscape. The shrub species listed in the VIS for this community were lacking within the vegetation zone, likely due to historical disturbance of the area. However, the groundcover species recorded shared species listed in the VIS for PCT including *Microlaena stipoides* and *Entolasia stricta* and *Lobelia purpurascens* and species located just outside the 20 m x 20 x plot *Lomandra longifolia, Imperata cylindrica, Ozothamnus diosmifolius, Breynia oblongifolia.* Finally, as discussed for Blue Gum High Forest above, the *Hager/Steenebeeke 2010* analysis excel spreadsheet which incorporates diagnostic species from Tozer 2003 favouring towards Sydney Turpentine Ironbark Forest, PCT 3262 was selected as the best fit PCT for the vegetation in the north-east portion of the subject land. Therefore, given the position in the landscape, the assemblage of species present, and the soil characteristics present. PCT 3262 was the best-fit Plant Community Type for this location.

The assemblage of key species, formation characteristics in combination with its known occurrence in the Local Government Area (LGA) of Ku-ring-gai, and occurrence within the Cumberland IBRA-subregion of the Sydney Basin Bioregion aligns with the Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion.

The TEC is known to occur between elevations of 5 m to 460 m above sea level. The elevation of the subject land is approximately 110 m above sea level and therefore falls within the elevation range for this TEC.

The TEC is known to occur in areas with annual rainfall between 806 mm to 1256 mm. The average annual rainfall taken from BOM Station data at the Gordon Golf Club (66120) with the mean annual rainfall 1241 for the area. The subject land falls within the range of average annual rainfall for this TEC.

The vegetation is located on top of a ridge on the boundary between the Lucas Heights soil landscape and is in close proximity to the Hawkesbury soil landscape. The Lucas Heights soil landscape is characterised by gently undulating crests and ridges on plateau surfaces of the Mittagong formation (alternating bands of shale and fine-grained sandstones). The soils associated with this soil landscape are moderately deep (50–150 cm), hardsetting Yellow Podzolic Soils and Yellow Soloths (Figure 4). A rapid soil analysis (Soil profile site 1) taken in close proximity to the floristic plot 1 found that the texture assessments were consistent with the soil being approximately a sandy clay loam to clay loam. The results of the soil profile assessment are that the soil characteristics are consistent with a yellow podzolic soil (Great Soil Group).

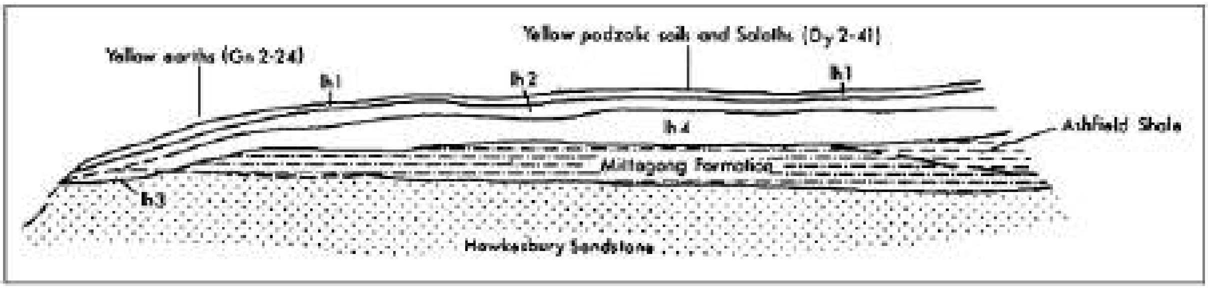


Figure 4: Schematic cross-section of Lucas Heights soil landscape illustrating the occurrence and relationship of the dominant soil materials.

The rapid soil assessment undertaken at soil profile site 1 suggests a clay influence in the soils, which is consistent with the occurrence of Sydney Turpentine Ironbark Forest which is known to occur on soils derived from shale interbedded with Hawkesbury Sandstone.

An additional desktop assessment of online mapping was undertaken to assist the assessment. Figure 5_below shows the Sydney Metro Vegetation Map (SMVM) for the locality. Many of the vegetation polygons (small patches) were allocated to a PCT (vegetation community) on the basis of a site inspection by the authors of the SMVM. However, it is likely that other parameters may have been used to allocate vegetation to a likely PCT. A trend that can be observed on Figure 5 is that Sydney Turpentine (PCT1281) is mapped on the western side of the site (approximately to the left of the blue line) and Smooth-barked Apple – Red Bloodwood – Blackbutt tall open forest on shale sandstone transition soils in eastern Sydney (PCT1845) is mapped to the east (right-side) of the line.

Figure 5: Sydney Metro Vegetation Mapping 2016 for the locality.

A possibility is that modelled soil types may have been used to assist in allocating each polygon (small patch) to a PCT. Figure 6 shows Great Soil Group (GSG) mapping for the locality at 1:75,000 scale. This scale was chosen as it is consistent with the scale of GSG mapping provided on the NSW eSpade website.

The site lies near the boundary of Yellow Podzolic Soils (less fertile) and Siliceous Sands (Figure 6). A One difference between these two soil types is that podzolic soils will generally have a higher clay content compared to siliceous sand soils. The real boundary / transition zone between these two soil types in the locality is unknown. If the boundary / transition zone between the two soil types is present it is likely that there would be a corresponding change in the PCT.

If a plot is used for the determination of a PCT then strictly only the plot can be allocated to a PCT. However, nearby similar vegetation is highly likely to represent the same PCT.

At the location of plot 1 both the vegetation within the plot and adjacent to the plot has experienced disturbance. A gradual change in the vegetation community might not be obvious.

The area to the south-east of the plot but within the polygon (small patch) has also been allocated to Sydney Turpentine Ironbark Forest PCT 3262 (see Figure 3) by ELA. The most useful species for selecting a PCT in forest and woodland are often remnant trees. The majority of the trees within this area are the planted species Tallowwood *Eucalyptus microcorys.* The lack of remnant trees within parts of the patch make a confident allocation of PCT difficult for the whole patch. No obvious change is PCT was observed at within the patch however, the lack of indigenous tree species makes any transition more difficult to observe. If a change or transition in soil type occurs within the patch, parts of the patch may represent different PCTs.ELA did not determine where the boundary between PCTs within the site and nearby. This can be a difficult task. Preston and Adam (2004) quoted Hodgson JA to emphasise the difficulties defining ecological community boundaries:

> '*There will often be cases where there are areas of transition between one ecological community, broadly considered, and another ecological community, where species which are part of each ecological community occur. Precise determination of whether those species in the transitional area are to be regarded as part of one ecological community or of the other, or of neither, will be incapable of precise and definite determination.'*

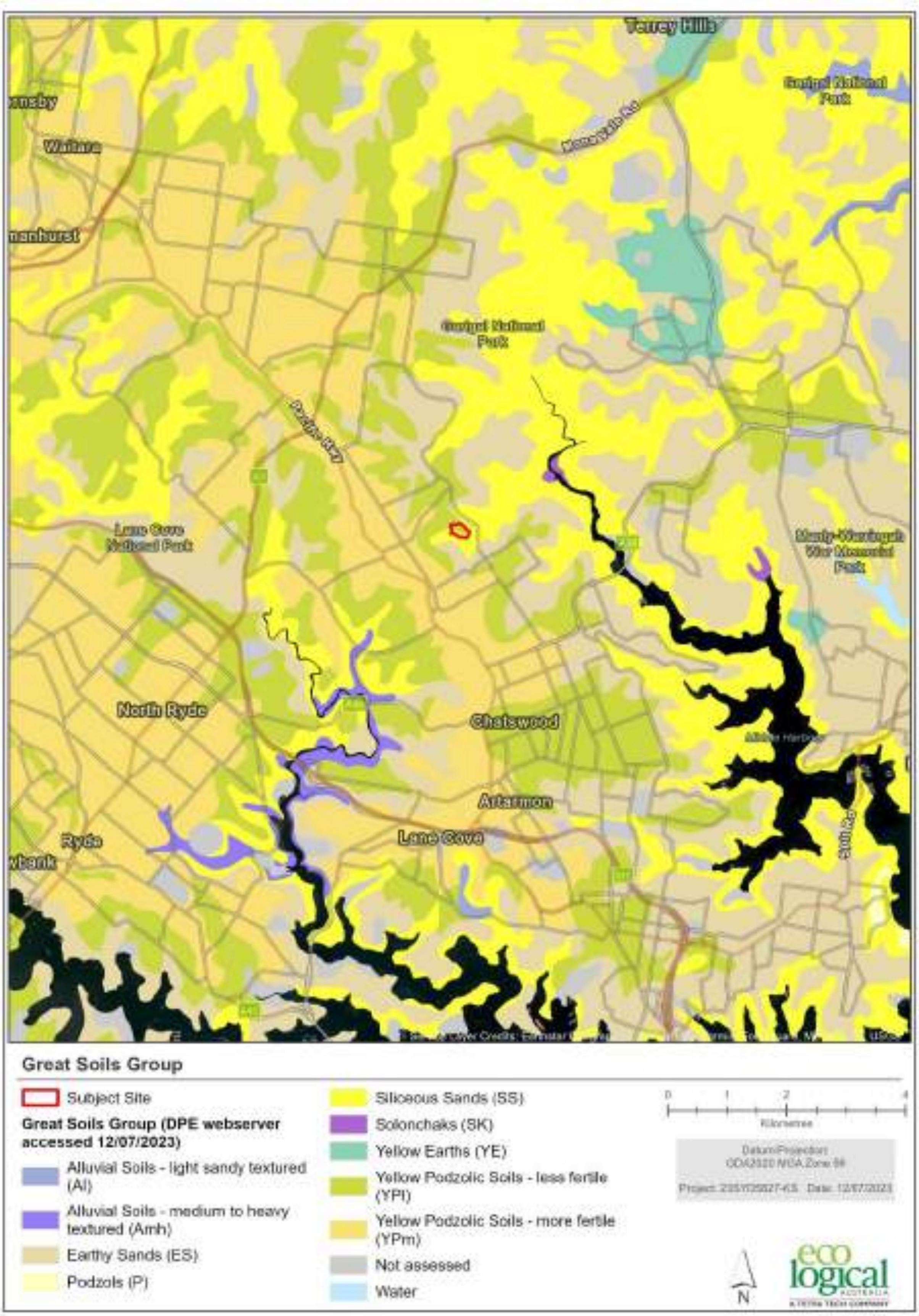


Figure 6: Great Soil Group (GSG) mapping for the locality.

The following inputs were used to build queries in the Vegetation Classification for the vegetation directly adjacent to the south of the subject land, with the intention of providing a best-fit PCT for the vegetation within the southern boundary of the subject land.

- IBRA region text contains 'Sydney Basin'
- IBRA subregion text contains 'Cumberland'
- Vegetation Formation text contains 'Dry Sclerophyll Forests (Shrubby sub-formation) AND 'Dry Sclerophyll Forests (Shrub/grass sub-formation) AND 'Wet Sclerophyll Forests (Shrubby sub-formation AND 'Wet Sclerophyll Forests (Grassy sub-formation).
- Species text contains '*Acacia ulicifolia, Allocasuarina littoralis, Angophora costata, Billardiera scandens, Calochlaena dubia, Ceratopetalum gummiferum, Corymbia gummifera, Dianella caerulea* var. *producta, Dodonaea triquetra, Elaeocarpus reticulatus, Entolasia marginata, Entolasia stricta, Eucalyptus pilularis, Ficus spp., Glochidion ferdinandi var. ferdinandi, Hypolepis muelleri, Juncus usitatus, Leucopogon juniperinus, Lindsaea microphylla, Lobelia purpurascens, Lomandra filiformis* subsp. *filiformis, Lomandra longifolia, Microlaena stipoides, Oplismenus imbecillis, Ozothamnus diosmifolius, Parsonsia straminea, Pittosporum undulatum, Plectranthus parviflorus, Pteridium esculentum, Pultenaea flexilis, Smilax glyciphylla, Veronica plebeia, Zieria smithii, Polyscias sambucifolia, Syncarpia glomulifera* subsp. *glomulifera, Xanthorrhoea media, Helichrysum elatum* and *Sigesbeckia orientalis* subsp. *orientalis'*

1.5.1. Justification for the selection of PCT 3592 Sydney Coastal Enriched Sandstone Forest

A number of other PCTs were considered in the selection process for PCT 3592 Sydney Coastal Enriched Sandstone Forest. An analysis of these PCTs is included in **Table 3**.

Table 3: Other PCTs considered during the selection process for PCT 3592

PCT no.	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
3136	Blue Gum High Forest	The tree canopy very frequently includes a high cover of *Eucalyptus saligna*, commonly with *Eucalyptus pilularis* and occasionally *Syncarpia glomulifera*. The mid-stratum is layered, with a sparse cover of small trees that very frequently includes *Pittosporum undulatum* and occasionally *Elaeocarpus reticulatus.*	Blue Gum High Forest was considered for the section of PCTs. 3136 is known to occur in the Sydney Basin Bioregion, Cumberland Subregion is known to the Kur-ring-gai LGA and has been previously mapped by DPE 2022 as occurring to the south and west of the subject land. This community is described as a very tall to extremely tall sclerophyll open forest, dominated by either *Eucalyptus pilularis* (Blackbutt) or *E. saligna* (Sydney Blue Gum), with a mean tree height of 39.3 m (±16.2 m) and a mean foliage cover of 30.7% (±13.7%). In areas located close to the shale/sandstone boundary *Angophora costata* (Smooth-barked Apple) is present frequently in the tallest tree layer. The vegetation within the north east of the subject land is tall, and approximately to 20 to 30 m (Naturally Trees 2023), however, would not be considered an extremely tall forest. The vegetation did contain *E. pilularis* as a dominant canopy species within the plot however, lacked *E. saligna*. Blue Gum High Forest is generally found at altitudes higher than 100 m above sea level on the Hornsby Plateau in the North Shore and northern

PCT no.	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
			suburbs of Sydney. The location of the vegetation community on the downhill slope is situated at approximately 92 m above sea level. This community is slightly below the altitudes in which Blue Gum High Forest is found. Quantitative analysis using Hager/Steenebeeke 2010 analysis excel spreadsheet was conducted for each vegetation integrity plot to determine the best fit PCT using standardised ratio comparison positive native to total native score. The total number of diagnostic species for Blue Gum High Forest was 14 while it was 20 for other communities such as STIF and Hinterland sandstone Gully Forest. In summary, PCT 3136 was a possible PCT selection of the vegetation in the north-east of the subject land, however, elevation of the vegetation within the landscape, the tall rather than extremely tall forest, and comparison of diagnostic species with the Hager/Steenebeeke 2010 analysis excel spreadsheet which incorporates diagnostic species from Tozer 2003 and Tozer 2010 favouring towards either Sydney Turpentine Ironbark Forest, or Sydney Hinterland Gully Forest were considered as other options for the vegetation in the north-east portion of the subject land.
3595	Sydney Coastal Sandstone Gully Forest	A tall to very tall heathy sclerophyll open forest associated with Hawkesbury sandstone gullies found along the eastern extent of the Sydney sandstone plateaus. The tree canopy very frequently includes a high cover of *Eucalyptus piperita* and *Angophora costata* with *Corymbia gummifera* occurring less frequently and with a lower cover. The mid-stratum includes a sparse small tree layer that very frequently includes *Ceratopetalum gummiferum* and *Banksia serrata*	PCT 3595 is known to occur in the Sydney Bioregion and Cumberland subregion, this PCT had the highest number of diagnostic species present in the Quantitative (Tozer) analysis along with STIF. This PCT had the third highest number of matches against the VIS PCT filtering tool, following 3592 and 3262. Therefore this PCT was considered during the selection process, however was not selected as the best fit PCT for this community as; the position of the vegetation in the landscape was mid-slope and not within the gully, the dominant canopy did not record any *E piperita* and had contained *E. pilularis,* which is not a frequently recorded species for this community in the VIS Species by Growth Form. PCT 3595 is also described as a heathy sclerophyll open forest, whereas this community was considered to be less of a heath community and lacked some of the dominant species for this community such as *Leptospermum trinervium*, *Dillwynia retorta*, *Lomatia salicifolia* and *Persoonia spp.*. Another feature of PCT 3595 is the high occurrence of *B. serrata,* the plot data did not record any *B. serrata*
3262	Sydney Turpentine Ironbark Forest	The tree canopy very frequently includes *Syncarpia glomulifera* either as a canopy dominant or as a smaller tree or both. Other species	This PCT occurs in the Sydney Basin Bioregion and Cumberland subregion, it is known to the Ku-ring-gai LGA and was validated as the best fit PCT for the vegetation community at the top of the subject land.

PCT no.	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
		which are localised and occasionally dominant or co-dominant occasionally include *Eucalyptus pilularis, Angophora costata* and *Eucalyptus punctata*, rarely with *Eucalyptus paniculata, Eucalyptus globoidea* or *Eucalyptus resignifera.*	This PCT had the second highest number of matches in the PCT VIS filtering tool and received the same number of diagnostic species in the Quantitative (Tozer) analysis of plot 2 data, therefore this PCT was considered in the selection process for the vegetation in the south of the subject land. Whilst the canopy species recorded similar dominant canopy species, being *Syncarpia glomulifera Eucalyptus pilularis* and *Angophora costata,* the diversity of canopy species present in this community was higher and also included, Corymbia gummifera and a smaller canopy of *Pittosporum undulatum* and *Allocasuarina littoralis. The mdstory and groundcover layer was also much more mesic* compared to the vegetation at the top of the ridge and had a high diversity and cover of ferns and forbs. Sydney Turpentine Ironbark Forest is also known to occur on the ridgetops or crests in the landscape whereas this vegetation community was located downslope of the ridgetop and is also more likely to occur on Hawkesbury sandstone soils, both features favour the selection of a sandstone community rather than a vegetation community with a shale influence. Due to the assemblage of species present, position in the landscape and likely soils present, PCT 3592 was selected as a better fit for this community than Sydney Turpentine Ironbark Forest
3592	Sydney Coastal Enriched Sandstone Forest	*Angophora costata* commonly in combination with *Corymbia gummifera* and *Eucalyptus piperita*, with *Eucalyptus pilularis* occasionally locally abundant. A taller mid-stratum is characterised by very frequent however sparse cover of *Pittosporum undulatum* and *Allocasuarina littoralis* or *Allocasuarina torulosa.*	This PCT was selected as the best fit PCT for the vegetation community within the vegetation directly adjacent the southern boundary of the subject land. This PCT had the highest number of matches (34) in the VIS PCT filtering tool. Followed by the other PCTs compared; 3262 with 33 matches and PCT 3595 with 32 matches. The description of the dominant upper stratum species listed in the VIS for this PCT shared many of the same species including *A.costata* commonly in combination with *Corymbia gummifera, E.pilularis, A. littoralis* and *P.undulatum.* PCT 3592 is known to occur within the Sydney Basin Bioregion, Cumberland subregion, and is known to occur within the Ku-ring-gai LGA. The vegetation within the subject land falls within the average annual rainfall for this PCT and elevation ranges above sea level. However the frequently recorded canopy species in this PCT did not occur within the vegetation in the north east portion of the subject land, with only *E. pilularis* and *Allocasuarina littoralis* in common. Further, this PCT is more commonly known to occur on slightly enriched Hawkesbury sandstone soils on sheltered slopes and occasional crests. The soil landscape is

PCT no.	PCT Name	Dominant upper stratum species listed in the VIS	Discussion
			also likely to be Hawkesbury soil landscape, as mapped by ESspade which is more aligned with the description of this PCT occurring on Hawkesbury sandstone, rather than the likely more clay influenced Lucas heights soil landscape at the top of the ridge. The position of this vegetation within the landscape is also downslope of the ridge but it positioned higher than the gully, also matching the PCT description in the VIS for this community. Considering the assemblages of species present, the soil landscape and position in the landscape, along with the Quantitative plot analysis (Tozer) favouring a sandstone influenced community, PCT3592 was considered to be the best fit PCT to assign to this vegetation community.

1.6. Threatened ecological communities

There is one threatened ecological community (TEC) within the subject land. The listing status of the TEC and consistency of PCTs with the TECs is provided in Table 4.

PCT 3262 is consistent with the critically threatened ecological community (TEC) *Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion*. This community is critically endangered under the *Biodiversity Conservation Act 2016* (BC Act). It is also noted that this community is listed as critically endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), where it meets specific condition thresholds.

Occurrences of the Turpentine–Ironbark Forest in the Sydney Basin Bioregion ecological community are considered to be part of the nationally listed ecological community if patches are in good condition (Conservation Advice 2014).

> *'Good condition is generally determined as:*
>
> - *the vegetation has some characteristic components from all structural layers (tree canopy, small tree/shrub midstorey, and understorey); and*
> - *the tree canopy cover is greater than 10%; and*
> - *the patch size is greater than one hectare.*
>
> *However, patches with a tree canopy cover of less than 10% are also included in the ecological community, if:*
>
> - *the patch of the ecological community is greater than one hectare in size; and*
> - *it is part of a remnant of native vegetation that is 5 hectares or more in area.'*

The plot data collected had structural characteristic components from all structural layers. The plot data collected also had a tree canopy cover of approximately 85%.

Eco Logical Australia have only validated the patch of Sydney Turpentine Ironbark Forest within the north east of the subject land and cannot comment if Sydney Turpentine Ironbark Forest is present in patches directly adjacent to the north east of the subject land and are therefore unable to comment if the Sydney Turpentine Ironbark Forest within the subject land meets the condition threshold to be listed as the Commonwealth listed community. That is, if the patch identified is greater than 1 ha in size or is part of remnant vegetation that is 5 ha or more in area. Further plot data and validation of vegetation in surrounding areas adjacent to the subject land would be required to determine whether the Sydney Turpentine Ironbark Forest on site meets the EPBC Act definition of this community.

PCT 3592 Sydney Coastal Enriched Sandstone Forest identified is not associated with any threatened ecological communities under the BC and or EPBC Acts.

Table 4: Threatened ecological communities present within the subject land

PCT ID	PCT Name	BC Act listing status and name	BC Act Associated TEC justification	EPBC Act listing status and name	EPBC Act Associated TEC justification
3262	Sydney Turpentine Ironbark Forest	Critically endangered - *Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion*	Yes – the PCT meets characteristic of the BC Act listed TEC. The assemblage of key species, formation characteristics in combination with its known occurrence in the Local Government Area (LGA) of Ku-ring-gai, and occurrence within the Cumberland IBRA-subregion of the Sydney Basin Bioregion aligns with the Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion.	Critically *endangered – Turpentine-Ironbark Forest of the Sydney Basin Bioregion*	Potential - see Section 1.6. Insufficient time for ELA to collect data to inform EPBC Act condition criteria listing.
3592	Sydney Coastal Enriched Sandstone Forest	Not listed	N/A	Not listed	N/A

The final determination for Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion listed as critically endangered under the NSW BC Act. Defines this community:

> *Section 1.6 of the Act defines an ecological community as "an assemblage of species occupying a particular area". These features of Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion are described in Parts 1 and 2 of this Determination, respectively.*

Presented in Table 5 below are the Parts 1, 2 and 4 listed in the final determination for this ecological community and a review against characteristics of the subject land to determine if the vegetation on site is likely to conform to the TEC.

Table 5: Parts presented in the Final Determination for Sydney Turpentine Ironbark Forest and review against characteristics of the subject land

Part 1. Assemblage of species

Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion (hereafter referred to as Sydney Turpentine-Ironbark Forest) is characterised by the assemblage of species listed below.

The species collected in Plot 1 along with those species recorded around the edge of the floristic plot within the north-east of the subject land are highlighted in **bold** text.

Acacia falcata	*Acacia floribunda*
Acacia implexa	***Acacia longifolia***
Acacia parramattensis	*Adiantum aethiopicum*
Allocasuarina torulosa	*Angophora costata*
Anisopogon avenaceus	***Aristida vagans***
Arthropodium milleflorum	*Austrostipa pubescens*
Austrostipa rudis	*Billardiera scandens*
Breynia oblongifolia	*Brunoniella australis*
Brunoniella pumilio	*Bursaria spinosa*
Cayratia clematidea	***Centella asiatica***
Cheilanthes sieberi	*Clematis aristata*
Clematis glycinoides var. *glycinoides*	*Clerodendrum tomentosum*
Commelina cyanea	*Daviesia ulicifolia*
Denhamia silvestris	*Desmodium rhytidophyllum*
Desmodium varians	***Dianella caerulea***
Dianella longifolia	*Dichelachne inaequiglumis*
Dichelachne rara	***Dichondra* spp.**
Digitaria parviflora	*Dodonaea triquetra*
Doodia aspera	*Echinopogon caespitosus* var. *caespitosus*
Echinopogon ovatus	*Einadia hastata*
Elaeocarpus reticulatus	*Entolasia marginata*
Entolasia stricta	*Eucalyptus acmenoides*
Eucalyptus fibrosa	*Eucalyptus globoidea*
Eucalyptus notabilis	***Eucalyptus paniculata* subsp. *paniculata* (likely present)**
Eucalyptus pilularis	*Eucalyptus punctata*
Eucalyptus resinifera subsp. *resinifera*	*Eucalyptus saligna* X *E. botryoides*
Eustrephus latifolius	*Exocarpos cupressiformis*
Gahnia aspera	*Geranium solanderi* var. *solanderi*
Glochidion ferdinandi var. *ferdinandi*	*Glycine clandestina*
Glycine microphylla	*Glycine tabacina*
Gonocarpus tetragynus	*Goodenia hederacea* subsp. *hederacea*
Goodenia heterophylla	*Hibbertia aspera* subsp. *aspera*
Hibbertia diffusa	*Hydrocotyle sibthorpioides*
Imperata cylindrica	*Indigofera australis*
Kennedia rubicunda	*Kunzea ambigua*
Lepidosperma laterale	*Leucopogon juniperinus*
Lindsaea microphylla	*Lomandra filiformis* subsp. *filiformis*
Lomandra longifolia	***Microlaena stipoides***
Myrsine variabilis	*Notelaea longifolia* forma *longifolia*
Opercularia hispida	*Opercularia varia*

Oplismenus aemulus	*Oplismenus imbecillis*
Oxalis exilis	***Ozothamnus diosmifolius***
Pandorea pandorana	*Panicum simile*
Paspalidium distans	*Passiflora herbertiana* subsp. *herbertiana*
Persoonia linearis	*Pittosporum revolutum*
Pittosporum undulatum	*Poa affinis*
Poa sieberiana var. *sieberiana*	*Polyscias sambucifolia*
Pomaderris intermedia	*Poranthera microphylla*
***Pratia purpurascens* *(now *Lobelia purpurascens*)**	*Pseuderanthemum variabile*
Pultenaea villosa	*Rubus parvifolius*
Rumex brownii	*Sarcopetalum harveyanum*
Sigesbeckia orientalis subsp. *orientalis*	*Smilax australis*
Smilax glyciphylla	*Solanum prinophyllum*
Syncarpia glomulifera subsp. *glomulifera*	*Themeda triandra*
Trema tomentosa var. *viridis*	*Tylophora barbata*
Veronica plebeia	*Zieria smithii*

Of the 112 species listed in the final determination for this ecological community. There are 18, (potentially 19) species present in the north east perimeter of the subject land. This is a promising indication for this community to meet the TEC listing given the general lack of understorey species present due to historical land disturbance.

Part 2. Particular area occupied by the ecological community occupied by Sydney Turpentine Ironbark Forest as listed in the final determination against the characteristics of the subject land	
2.1.1 The assemblage of species listed in Part 1.1 above which characterises the Sydney Turpentine-Ironbark Forest occurs within the Sydney Basin Bioregion	The subject land occurs within the Sydney Basin IBRA region and is consistent with the final determination.
2.2 It is the intent of the NSW Threatened Species Scientific Committee that all occurrences of the ecological community (both recorded and as yet unrecorded, and independent of their condition) that occur within this bioregion be covered by this Determination.	Given the information collected over one rapid field day, and review of existing mapping and information collected on soil landscapes that the vegetation within the subject land may be included as the TEC due to the assemblage of species present and the location of this vegetation within the Sydney Basin Bioregion, despite the disturbance history at this location.

Part 4 Additional information about the ecological community. The following information is additional to that required to meet the definition of an ecological community under the Act but is provided to assist in the recognition of the Sydney Turpentine- Ironbark Forest in the Sydney Basin Bioregion	
4.1 Sydney Turpentine-Ironbark Forest typically has the structural form of Open Forest (*sensu* Specht 1970) with a tree canopy ranging in height from the mid to upper range for this form (10-30 m) and with projected foliage cover at the mid to lower end of the range (30-50%)	The structure of the vegetation within the north east portion of the subject land had an open forest structure and ranged between 20 to 30 m in height, which fits the description of the TEC. However, the projected foliage cover recorded in plot 1 was 85.1%. Which is considerably higher than that listed in the final determination for the community, which the upper limit is around 50%.
4.2 Sydney Turpentine-Ironbark Forest has been reported as occurring in areas receiving moderate rainfall (900-1100 mm) on soils derived either from Wianamatta Shale or from Wianamatta Shale interbedded with Hawkesbury Sandstone (Benson and Howell 1994, Tozer 2003). In most of these locations STIF occurs up to approximately 100 m above sea level although it is found as high as 200 m above sea level on the western edge of the Hornsby Plateau where average annual rainfall falls below 1050 mm (Tozer 2003).	The subject land's highest point is approximately 110 m above sea level where the Plot 1 floristic data was collected. The subject land is mapped as occurring on the Lucas Heights soil landscape which contains Yellow Podzolic Soils which are likely overlain on Ashfield Shale from the Mittagong formation which contains alternating bands of shale and fine-grained sandstones which is over Hawkesbury Sandstone. The average annual rainfall taken from BOM Station data at the Gordon Golf Club (66120) with the mean annual rainfall 1241 for the area. The subject land falls within the range of average annual rainfall for this TEC.
4.3 Sydney Turpentine-Ironbark Forest occurs on low rolling hills characteristic of the Cumberland Lowlands and the broad, shale-capped ridges of the surrounding plateaux.	The landscape position of the vegetation was located on the top of the ridge, which is consistent with the shale-capped ridges as described in the Final Determination.

4.5 Based on plot samples analysed by Tozer et al. (2010), species which have been recorded more frequently in Blue Gum High Forest (WSFp153) compared with STIF (WSFp87) include, in decreasing order of diagnostic power*, *Platylobium formosum, Calochlaena dubia, Alphitonia excelsa, Smilax glyciphylla, Morinda jasminoides, Blechnum cartilagineum and Marsdenia rostrata.* **Species which have been recorded more frequently in STIF include,** in decreasing order of diagnostic power*, *Clematis glycinoides* var. *glycinoides, Solanum prinophyllum,* ***Glycine microphylla,*** *Bursaria spinosa, Echinopogon caespitosus* var. *caespitosus, Eucalyptus punctata, Acacia parramattensis, Panicum simile,* ***Centella asiatica, Acacia floribunda,*** *Hydrocotyle sibthorpioides, Veronica plebeia,* ***Aristida vagans****,* *Lomandra filiformis* subsp. *filiformis* and *Billardiera scandens.*	The vegetation within the north east boundary contains the highlighted in bold diagnostic species recorded more frequently in Sydney Turpentine Ironbark Forest than Blue Gum High Forest
4.7 Sydney Turpentine-Ironbark Forest is characterised by a number of frequently recorded species which are highly diagnostic of STIF but are much less frequently recorded in samples of the adjacent Sandstone Ridgetop Woodland and Sandstone Gully Forest (map units DSFp131 and DSFp142 of Tozer et al. (2010). These include, in decreasing order of diagnostic power*, ***Pratia purpurascens, Dichondra*** **spp**., *Eustrephus latifolius, Oplismenus imbecillis, Entolasia marginata,* ***Breynia oblongifolia****, Pittosporum undulatum, Bursaria spinosa, Hibbertia aspera* subsp. *aspera,* ***Imperata cylindrica,*** *Clematis glycinoides var. glycinoides, Pseuderanthemum variabile,* ***Ozothamnus diosmifolius****, Adiantum aethiopicum, Notelaea longifolia* forma *longifolia, Pittosporum revolutum, Solanum prinophyllum, Echinopogon caespitosus* var. *caespitosus,* ***Leucopogon juniperinus, Glycine microphylla,*** *Acacia parramattensis,* ***Oplismenus aemulus****, Panicum simile, Myrsine variabilis,* ***Acacia floribunda****, Echinopogon ovatus, Themeda triandra, Clerodendrum tomentosum, Tylophora barbata, Veronica plebeia* and ***Aristida vagans*** (Tozer et al. 2010).	A number of the highly diagnostic species of STIF listed, were recorded within the north portion of vegetation within the subject land, as highlighted in bold text.
Considering all the information above, it was determined that PCT 3262 was likely to fit the descriptions of Part 1, 2 and additional information in Part 4 of the Final Determination to list assign PCT 3262 as *Sydney Turpentine Ironbark Forest of the Sydney Basin Bioregion*.	

Appendix A Vegetation floristic plot data

Two full floristic plots were undertaken as part of the assessment of PCTs. One plot (Plot 1) was undertaken within vegetating to the north-eastern portion of the subject land. Plot 2 was undertaken in vegetation directly adjacent to the south of the subject land. Table 6 presents the locations of the plots and Table 7 contains the floristic plot data collected.

Table 6: Plot locations

Plot ID	PCT ID	PCT Name	Zone	Eastings	Northings	Bearing
Plot 1	3262	Sydney Turpentine Ironbark Forest	56	330986	6262320	117
Plot 2	3592	Sydney Coastal Enriched Sandstone Forest	56	330808	6262153	90

Table 7: 20 m x 20 m full floristic plot data taken for Plot 1 and Plot 2.

Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2		
					Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Acacia implexa	Hickory Wattle			Shrub (SG)				M	3	2
Acacia ulicifolia	Prickly Moses			Shrub (SG)				G	0.1	1
Acer spp.		*			G	0.1	1			
Agapanthus spp.		*						G	4	20
Ageratina adenophora	Crofton Weed	*	1					G	0.1	2
Allocasuarina littoralis	Black She-Oak			Tree (TG)				U	5	2
Angophora costata	Sydney Red Gum			Tree (TG)				U	25	8
Araujia sericifera	Moth Vine	*	1		G	0.1	1			
Aristida vagans	Threeawn Speargrass			Grass & grasslike (GG)	G	0.1	10			
Asparagus aethiopicus	Asparagus Fern	*	1		G	8	50	G	0.1	1
Asparagus spp.		*						G	0.1	10
Bidens pilosa var. *pilosa*		*			G	0.1	1	G	0.1	1
Billardiera scandens	Hairy Apple Berry			Other (OG)				G	0.2	5
Bromus catharticus	Praire Grass	*			G	0.1	1			
Calochlaena dubia	Rainbow Fern			Other (OG)				G	35	100
Centella asiatica	Indian Pennywort			Forb (FG)	G	0.1	10			
Ceratopetalum gummiferum	Christmas Bush			Tree (TG)				M	2	5
Cestrum parqui	Green Cestrum	*	1					G	0.1	1

Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2		
					Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Chlorophytum spp.		*			G	0.2	1			
Cinnamomum camphora	Camphor Laurel	*	1		G	0.1	1	G	3	2
Corymbia gummifera	Red Bloodwood			Tree (TG)				U	2	1
Cirsium vulgare	Spear Thistle	*			G	0.1	1			
Commelina cyanea	Native Wandering Jew			Forb (FG)	G	0.1	10			
Conyza spp.	A Fleabane	*			G	0.1	1	G	0.1	1
Cordyline australis				Other (OG)				G	0.5	1
Coronidium elatum subsp. *elatum*				Shrub (SG)				G	0.2	1
Corymbia gummifera	Red Bloodwood			Tree (TG)				U		
Cotoneaster spp.		*	1					G	0.1	5
Cynodon dactylon	Common Couch			Grass & grasslike (GG)	G	0.1	1			
Dianella caerulea var. *producta*				Forb (FG)	G	8	50	G	0.2	10
Dichondra repens	Kidney Weed			Forb (FG)	G	0.1	10			
Dietes spp.				Forb (FG)	G	0.1	1			
Digitaria spp.	A Finger Grass			Grass & grasslike (GG)	G	0.1	100			
Dodonaea triquetra	Large-leaf Hop-bush			Shrub (SG)				G	0.2	1
Ehrharta erecta	Panic Veldtgrass	*	1		G	1	100			
Elaeocarpus reticulatus	Blueberry Ash			Shrub (SG)	M	4	1	M	2	5
Entolasia marginata	Bordered Panic			Grass & grasslike (GG)				G	0.1	1

Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2		
					Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Entolasia stricta	Wiry Panic			Grass & grasslike (GG)	G	1	100	G	0.5	1000
Eucalyptus microcorys	Tallowwood			Tree (TG)	U	15	4			
Eucalyptus sp.				Tree (TG)	U	50	8			
Eucalyptus pilularis	Blackbutt			Tree (TG)	U	20	1	U	35	2
Ficus rubiginosa	Port Jackson Fig			Tree (TG)				G	0.1	1
Geranium spp.				Forb (FG)				G	0.1	5
Glochidion ferdinandi var. *ferdinandi*	Cheese Tree			Tree (TG)				G	0.1	1
Hedychium gardnerianum	Ginger Lily	*						G	0.2	5
Hydrocotyle tripartita	Pennywort			Forb (FG)				G	0.1	1
Hypolepis muelleri	Harsh Ground Fern			Fern (EG)				G	0.1	1
Jacaranda spp.		*			G	0.1	2			
Juncus usitatus				Grass & grasslike (GG)				G	0.2	2
Lantana camara	Lantana	*	1					G	0.1	1
Leucopogon juniperinus	Prickly Beard-heath			Shrub (SG)				M	2	5
Ligustrum sinense	Small-leaved Privet	*	1					G	0.1	2
Lindsaea microphylla	Lacy Wedge Fern			Fern (EG)				G	0.1	1
Lobelia purpurascens	whiteroot			Forb (FG)	G	0.2	100	G	0.1	20
Lomandra filiformis subsp. *filiformis*				Grass & grasslike (GG)				G	0.1	2
Lomandra longifolia	Spiny-headed Mat-rush			Grass & grasslike (GG)				G	10	50

Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2		
					Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Melia azedarach	White Cedar			Tree (TG)	G	0.1	1			
Microlaena stipoides var. *stipoides*	Weeping Grass			Grass & grasslike (GG)	G	0.5	100	G	1	50
Nephrolepis cordifolia	Fishbone Fern			Fern (EG)				G	0.1	10
Ochna serrulata	Mickey Mouse Plant	*	1		G	0.5	1	G	0.1	5
Oplismenus aemulus				Grass & grasslike (GG)	G	0.1	10			
Oplismenus imbecillis				Grass & grasslike (GG)				G	0.2	100
Acianthus spp.	Mosquito Orchid			Forb (FG)				G	0.2	4
Osteospermum spp.	South African daisy	*			G	0.5	10			
Oxalis spp.				Forb (FG)	G	0.1	1	G	0.1	1
Ozothamnus diosmifolius	White Dogwood			Shrub (SG)	M	0.2	1	G	0.2	10
Parsonsia straminea	Common Silkpod			Other (OG)				G	0.1	2
Passiflora edulis	Common Passionfruit	*						G	0.1	1
Phoenix canariensis	Canary Island Date Palm	*	1		G	0.5	1			
Physalis peruviana	Cape Gooseberry	*						G	0.1	1
Pittosporum undulatum	Sweet Pittosporum			Shrub (SG)				M	0.5	1
Plectranthus parviflorus				Forb (FG)				G	0.1	1
Polyscias sambucifolia				Shrub (SG)				G	0.2	5
Pteridium esculentum	Bracken			Fern (EG)				G	0.5	1
Pultenaea flexilis				Shrub (SG)				G	0.1	3

Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2		
					Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Richardia brasiliensis	Mexican Clover	*			G	0.1	1			
Sigesbeckia orientalis subsp. *orientalis*	Indian Weed			Forb (FG)				G	0.1	5
Smilax glyciphylla	Sweet Sarsparilla			Other (OG)				G	0.1	10
Solanum americanum	Glossy Nightshade			Forb (FG)				G	0.1	2
Solanum mauritianum	Wild Tobacco Bush	*						G	0.2	2
Solanum nigrum	Black-berry Nightshade	*			G	0.1	10			
Sonchus oleraceus	Common Sowthistle	*			G	0.1	1			
Syagrus spp.		*						G	0.2	1
Syncarpia glomulifera subsp. *glomulifera*				Tree (TG)	U			U	15	4
Triadica sebifera	Chinese Tallowood	*	1		G	0.1	1	G	0.1	4
Veronica plebeia	Trailing Speedwell			Forb (FG)				G	0.1	1
Xanthorrhoea media				Other (OG)				G	0.1	1
Zieria smithii	Sandfly Zieria			Shrub (SG)				G	0.1	1

Appendix B Floristic analysis results

Plot	Vegetation analysis tool (Tozers Metro)	Selected PCT rational
Plot 1	Blue Gum High Forest Sydney Turpentine-Ironbark Forest	The plot located within the north east of the subject land has undergone historical disturbances, and therefore generally lacks a diverse number of species. The required minimum + positive diagnostic species was not achieved for either Sydney Turpentine Ironbark Forest nor Blue Gum High Forest, there the analysis relied on the presence of total diagnostic species between Sydney Turpentine Ironbark Forest and Blue Gum High Forest. The plot data contained 12 diagnostic species belonging to Sydney Turpentine Ironbark Forest and 6 against Blue Gum High Forest. It was determined that Sydney Turpentine Ironbark Forest (PCT 3262) was the most appropriate PCT for the vegetation based on numerous factors outlined in Table 2, in conjunction with the results of the Tozer analysis.
Plot 2	Blue Gum High Forest Sydney Turpentine-Ironbark Forest Hinterland Sandstone Gully Forest	Sydney Turpentine-Ironbark Forest had 20 diagnostic species as did Sydney Hinterland Sandstone Gully Forest, and Blue Gum High Forest with 14 diagnostic species. However, the Hinterland Sandstone Gully Forest was the only vegetation community between the three which had the highest count of diagnostic species and also achieved the ratio of positive diagnostic species to total native species ratio. Given this outcome, Sandstone PCTs were investigated in the PCT selection process. Whilst Hinterland Sandstone Gully Forest was not selected as the final vegetation community. A similar community 3592, Sydney Coastal Enriched Sandstone Forest was selected, based on the number of characteristic canopy species present, including *Angophora costata Corymbia gummifera, Eucalyptus pilularis, Ceratopetalum gummiferum* and *Syncarpia glomulifera* subsp. *glomulifera* and a taller mid-stratum is characterised by very frequent however sparse cover of *Pittosporum undulatum* and *Allocasuarina littoralis.* This PCT is primarily distributed at elevations of less than 200 metres asl downslope of shale soils on the north shore of Sydney. The landscape position fit this PCT the best as it is downslope of shale soils on north shore of Sydney, but is not located higher upslope before it grads into a gully below. This PCT was the best fit PCT for the vegetation directly adjacent to the subject land and was therefore selected as the most appropriate PCT to assign to the vegetation along the southern portion of the subject land, including the vegetation within the detention basin.

B1 Analysis of vegetation plot 1 – identified as PCT 3262 Sydney Turpentine Ironbark Forest

The images below show the outputs from the Hager / Steenbeecke tool.

	A	B	C	D	E	F	G	H	I	J	K	L	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
1	Community Type	DSF p1	CW p2	DSF p6	DSF p7	DSF p4	CW p28	CW p29	DSF p502	WSF p87	FoW p35	WSF p66	RF p38	RF p18	CW p514	FoW p44	DSF p64	WSF p102	WSF p193	FoW p66	DSF p140	DSF p142	DSF p149	DSF p146	DSF p131	DSF p226	HL p60
2	Correct ID	GIF	SSTF	BKHW	DSGW	DSW	SHW	SPW	SGTF	STIF	CRFF	HSCF	GMDR	WSDR	MSW	SSF	CSF	LBMWF	BGHF	SRS	CSGF	HSGF	SSICF	SHTW	CSRW	ABW	SCS
3	Total diagnostic species	5	6	3	3	3	4	9	6	12	8	1	5	4	3	3	3	4	6	1	3	5	2	7	1	0	0
4	Required minimum +ve diagnostic species	21	26	17	30	18	20	26	25	23	16	6	18	22	19	9	10	20	15	8	23	26	26	31	31	20	16
5	Achieved?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
6	No. by which required minimum +ve diagnostic spp. is exceeded?																										
7	Ratio of actual : required +ve diagnostic species	24%	23%	18%	10%	16%	20%	35%	24%	52%	50%	17%	28%	18%	16%	33%	30%	20%	40%	13%	13%	19%	8%	23%	3%	0%	0%
8	Total native species	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
9	Required minimum total native species	35	38	37	43	37	31	31	37	40	29	27	31	32	30	17	21	35	38	25	38	36	43	42	41	30	24
10	Achieved?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No
11	Ratio of +ve diagnostic species : total native species	26%	32%	16%	16%	16%	21%	47%	32%	63%	42%	5%	26%	21%	16%	16%	16%	21%	32%	5%	16%	26%	11%	37%	5%	0%	0%
12	Native Species																										
13	Aristida vagans	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
14	Centella asiatica	0	0	0	0	1	0	1	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
15	Commelina cyanea	0	0	0	0	0	1	1	0	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
16	Cynodon dactylon	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	Dianella caerulea var. producta	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0
18	Dichondra repens	0	1	0	0	0	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
19	Digitaria sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Elaeocarpus reticulatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	0	0
21	Entolasia stricta	1	1	1	1	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0
22	Eucalyptus microcorys	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Eucalyptus pilularis	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	1	1	1	1	0	0	0
24	pratia purpurascens	1	1	1	0	1	0	1	1	1	1	1	1	0	0	1	0	1	1	0	0	0	0	1	0	0	0
25	Melia azedarach	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Microlaena stipoides	1	1	0	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
27	Oplismenus aemulus	0	0	0	0	0	1	1	0	1	1	0	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0
28	Oxalis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	Ozothamnus diosmifolius	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0

B2: Analysis of Plot 2 - identified as Sydney Coastal Enriched Sandstone Forest

	A	B	C	D	E	F	G	H	I	J	K	L	N	O	P	Q	R	S	T	U	V	W	X
1	Community Type	DSF p1	GW p2	DSF p6	DSF p7	DSF p4	GW p28	GW p29	DSF p502	WSF p87	FoW p33	WSF p68	RF p38	RF p39	GW p514	FoW p44	DSF p64	WSF p102	wsf p153	FoW p58	DSF p140	DSF p142	DSF p143
2	**Correct ID**	**CIF**	**SSTF**	**BNHW**	**CSGW**	**CSW**	**SHW**	**SPW**	**SGTF**	**STIF**	**CRFF**	**NSCF**	**GMDR**	**WSDR**	**MSW**	**SSF**	**CSF**	**LBMWF**	**BGHF**	**SRS**	**CSGF**	**HSGF**	**SSICF**
3	**Total diagnostic species**	**7**	**10**	**2**	**2**	**3**	**3**	**8**	**8**	**20**	**8**	**2**	**6**	**4**	**1**	**5**	**7**	**15**	**14**	**5**	**12**	**20**	**12**
4	**Required minimum +ve diagnostic species**	21	26	17	30	19	20	26	25	23	16	6	18	22	19	9	10	20	15	8	23	26	26
5	Achieved?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
6	**No. by which required minimum +ve diagnostic spp. is exceeded?**																						
7	**Ratio of actual : required +ve diagnostic species**	33%	38%	12%	7%	16%	15%	31%	32%	87%	50%	33%	33%	18%	5%	56%	70%	75%	93%	63%	52%	77%	46%
8	**Total native species**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**	**38**
9	**Required minimum total native species**	35	39	37	43	37	31	31	37	40	26	27	31	32	30	17	21	35	39	25	38	36	43
10	Achieved?	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
11	**Ratio of +ve diagnostic species : total native species**	18%	26%	5%	5%	8%	8%	21%	21%	53%	21%	5%	16%	11%	3%	13%	18%	39%	37%	13%	32%	53%	32%
12	**Native Species**																						
13	Acacia ulicifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
14	Allocasuarina littoralis	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
15	Angophora costata	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1	1	1
16	Billardiera scandens	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1
17	Calochlaena dubia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0
18	Ceratopetalum gummiferum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1
19	Corymbia gummifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
20	Dianella caerulea var. producta	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0
21	Dodonaea triquetra	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	1	1	1
22	Elaeocarpus reticulatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0
23	Entolasia marginata	0	1	0	0	0	0	1	0	1	1	1	0	0	0	1	0	0	1	0	0	0	0
24	Entolasia stricta	1	1	1	1	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1	1	1	1
25	Eucalyptus pilularis	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	1	1	1
26	Ficus rubiginosa	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
27	Glochidion ferdinandi var. ferdinandi	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0	0	0	0
28	Hypolepis muelleri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	Juncus usitatus	0	0	0	0	1	0	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0
30	Leucopogon juniperinus	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0
31	Lindsaea microphylla	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	1
32	Pratia purpurascens	1	1	1	0	1	0	1	1	1	1	1	1	0	0	1	0	1	1	0	0	0	0
33	Lomandra filiformis subsp. filiformis	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
34	Lomandra longifolia	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1	0
35	Microlaena stipoides	1	1	0	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0
36	Oplismenus imbecillis	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0
37	Ozothamnus diosmifolius	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0
38	Parsonsia straminea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
39	Pittosporum undulatum	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0
40	Plectranthus parviflorus	0	0	0	0	0	1	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0
41	Pteridium esculentum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	1

Appendix B: Response to Department of Planning V2

See next page.

Level 13
420 George Street
Sydney NSW 2000
t: 1300 646 131

6 October 2023

Our ref: 23SYD-5827

Levande Pty Ltd
Level 18
9 Castlereagh Street,
Sydney, NSW 2000

Attention: Nathan Donn

Dear Nathan,

Letter from the NSW Department of Planning and Environment – Request for Agency Advice – Amended Information for Planning Proposal 95-97 Stanhope Road, Killara (PP-2022-658).

This letter will address the comments from the NSW Department of Planning regarding the ELA report. Each dot point under the heading 'ELA report' in the letter from the NSW Department of Planning will be reproduced below. ELA will then provide a response. Thank you for providing the opportunity for ELA to provide additional information about their site assessment and letter (12 July 2023).

Overall summary

It is considered extremely unlikely that Blue Gum High Forest is or was present near or on the site. Blue Gum High Forest is defined as a Plant Community Type (PCT) by the NSW government and as a Threatened Ecological Community (TEC) by the NSW Scientific Committee. Both the NSW government and the NSW Scientific Committee provide additional information that assists in deciding whether either definition of Blue Gum High Forest is present, particularly on highly disturbed sites such as the Lourdes site. The disturbed native vegetation on the Lourdes site is generally species poor.

The additional information is called *supplementary descriptors* by the NSW Scientific Committee and *descriptive attributes* by the NSW government. Consideration of this additional information has been helpful in deciding that Blue Gum High Forest highly unlikely to be present near or on the site.

Plant Community Types (PCTs) and Threatened Ecological Communities (TECs)

The EHG letter discusses both Plant Community Types (PCTs) and Threatened Ecological Communities (TECs). As much of this letter discusses PCTs and TECs, the difference between the two methods of classification of vegetation communities is described below.

While there is a relationship between PCTs and TECs, they are defined differently. As stated in Section 7.5 of the *Plot to PCT Assignment Tool User Guide* (Department of Planning and Environment 2022):

'TECs are legally defined entities that use independent classifications applied by Scientific Committees under NSW and Commonwealth biodiversity legislation. As at June 2021 there are no current NSW TEC determinations that cite quantitative PCTs in the coast and tablelands bioregions.'

All TECs are defined by their Final Determination (FD) as published by the NSW Scientific Committee. An example of a Final Determination for an ecological community is: The FD for TEC Sydney Turpentine Ironbark Forest is found at: Sydney Turpentine Ironbark Forest (nsw.gov.au). The proposed publication date of this FD noted in the document is 31 May 2019.

The NSW Scientific Committee, does not publish definitions of non-threatened ecological communities. It is reasonable to assume that if an area of native vegetation does not meet the definition of any threatened ecological community, then the area of native vegetation can be described as a non-threatened ecological community.

PCTs are defined by the NSW government. The document *A Revised Classification of Plant Communities of Eastern New South Wales* (NSW Department of Planning and Environment) states in Section 1.1:

The PCT master list is defined in BioNet, the NSW biodiversity data repository administer by the Department of Planning and Environment (DPE). 'Approved' PCTs represent the master set of native vegetation communities that are recognised for NSW. As at November 2018 the BioNet Vegetation Classification applications held over 200 fields of text-based descriptions of PCT composition, structure, distribution, and reference sources.

Consequently, this letter will provide an individual response to either PCTs, TECs or both when appropriate.

EHG biodiversity technical comments

The ELA report provided a comparison of PCTs on the site. The discussion doesn't consider the site disturbance influences on the diagnosis of PCT to the extent that is warranted given the current land use.

ELA response

It is acknowledged that the majority of the site is highly disturbed. The ELA letter dated 12 July 2023 includes the following paragraph under *Section 1.1 Field survey* on page 2:

As mentioned above, much of the subject land has been historically cleared, and areas on the east and south of the development site contain very little native species cover to assist in informing PCT selection. Therefore, the decision was made to undertake the second floristic plot, Plot 2 within an area of native vegetation to the south of the subject land.

While this paragraph does not use the word *disturbance,* vegetation clearing is a major component of ecological disturbance in urban areas. The underlying reason that ELA surveyed the plot off-site to the south was because the site is disturbed. The author has previously been recommended to use nearby plots by the state government to study disturbed sites.

ELA noted disturbance on the site as described on page 7 of their letter. Photo 1: Soil profile site 1 noted a white fragment in the wall of the soil profile hole and stated: '*Perhaps some minor disturbance has occurred at this location.'* In a brief discussion of Photo 2 *Soil profile site 2* the following text was stated: *The soil at site 2 shows evidence of significant disturbance, with blue metal gravel and concrete fragments.*

It is accepted that the site shows considerable disturbance in some areas so an additional information will be provided below.

The JK Geotechnics (29 September 2022) reports fill at the following boreholes:

Fill or significant disturbance present (total of 26 boreholes):

- Current boreholes: Borehole 1, Borehole 2, Borehole 3, Borehole 4, Borehole 5, Borehole 6, Borehole 7, Borehole 8, Borehole 9.
- 1981 boreholes: Borehole 3, Borehole 4, Borehole 5, Borehole 6, Borehole 7.
- 1989 boreholes: Borehole 1.
- 2001 boreholes: Borehole 1, Borehole 2, Borehole 3, Borehole 4.
- 2010A boreholes: Borehole 1, Borehole 2, Borehole 8.
- 2010B boreholes: Borehole 2, Borehole 3.
- 2014 boreholes: Borehole 2, Borehole 4.

Limited or no disturbance present (total of 5 boreholes):

- 1981 boreholes: Borehole 1, Borehole 2.
- 1989 boreholes: Borehole 2, Borehole 3.
- 2010B boreholes: Borehole 1.

In summary, approximately 84% of the boreholes display evidence of soil disturbance.

EHG have not recommended a method that may provide adequate justification for PCT allocation on disturbed sites in their letter (ref: DOC23/628482). Although, not stated explicitly it appears that EHG believe that an assessment that relies only upon, or too heavily upon on plant species composition may be inadequate for the site due to the history of disturbance.

The author agrees that identification of PCTs and TECS on highly disturbed sites is challenging. It is difficult to provide a definitive answer based on strong evidence.

The BAM 2020 provides the following guidance on identifying PCTs.

Section 4.2 *Identify and map plant community types and ecological communities* of the BAM 2020 includes the following text:

> *The assessor must identify and map the distribution of PCTs, or the most likely PCTs, and all TECs on the subject land. The identification must be in accordance with the NSW PCT classification as described in the BioNet Vegetation Classification. The identification of TECs must be consistent with the Threatened Species Scientific Committee Final Determination for the TEC. Information that can support the identification of PCTs and TECs can be found on the:*

a. BioNet Vegetation Classification database, which describes how to identify PCTs and TECs as per the NSW PCT classification, and details each PCT and its geographic distribution

b. Threatened biodiversity profile search webpage, which describes TECs.

A document: *BioNet Vegetation Classification user manual* explains the process of Plant Community Identification in chapter three (3). The described method in this document relies upon plant species composition of a plot or other characteristics directly related to plants, such as (vegetation) community structure, (vegetation) community height and cover. As these characters require the presence of plants, they are not easy to apply to situations where clearing or partial clearing has occurred.

The *BioNet Vegetation Classification database* also includes additional information such as '*Descriptive Attributes'* and '*References'.* The *Bionet Vegetation Classification user manual* does not direct the reader to use these additional sources of information. However, the additional information is provided in the database, so the additional information will be discussed below as it may assist in identifying PCTs on disturbed sites.

Using PCT *descriptive attributes* to assist in the identification of PCTs is similar to the approach described below by Preston and Adam (2004a; 2004b). PCT *descriptive attributes* are conceptually similar to TEC *supplementary descriptors.*

EHG biodiversity technical comments

One of the CEECs discussed in the ELA report is Blue Gum High Forest (BGHF). The Final Determination for Blue Gum High Forest (BGHF) states that "Highly modified relics of the community also persist as small clumps of trees without a native understorey." If trees from this community are present on the site and the geographical location and the physical characteristics align with the Final Determination descriptions, then there is no reason to assume that the vegetation on site does not form part of this community or is a transitional intergrade of this community with another. Table 2 of the ELA report states "this PCT was not selected as the best-fit community due to the understorey species more closely aligning with a drier, understorey or sub-canopy and shrub species which is more representative of [PCT] 3262 than a more mesic moist rainforest midstorey and ferny or herbaceous understorey." This statement makes conclusions based on the absence of one stratum of species from this community without consideration of the historical disturbance on the Site. The conclusion for the exclusion of this PCT as occurring on the site is not based on adequate justification.

ELA response

The use of the phrase 'Blue Gum High Forest' is potentially confusing. 'Blue Gum High Forest is both the name of Threatened Ecological Community as described by the NSW Scientific Committee and the name of PCT 1237. This section will separate the two entities by referring to either *Blue Gum High Forest FD* to refer to the Critically Endangered Ecological Community defined by the NSW Scientific Committee or to *PCT 1237 Blue Gum High Forest* to refer to the PCT.

The response below will first discuss on the Threatened Ecological Community Blue Gum High Forest (FD). Blue Gum High Forest FD has been listed by the NSW Scientific Community as a Critically Endangered Ecological Community.

The letter prepared by ELA focused on floristics following the guidance of Preston and Adam (2004b) who state on page 382:

> *'In conclusion, there is merit in Scientific Committee including in its descriptions of threatened ecological communities, features of the community in addition to its floristic composition and location. As we have illustrated, the Scientific Committee has used some of these features in some of its descriptions of listed communities. However, more abundant use of the characteristics, where appropriate to the community, would assist in providing more clarity and certainty in the description of the community and more ready practical application of the Scientific Committee's description by users in the field.'*

However, such other characteristics cannot be used as a substitute for a description of the assemblage of species and the particular area in which the community is located. Rather, they should be seen as a valuable adjunct.'

Additionally, as inferred above, some of additional descriptions provided in Final Determinations that are neither floristic nor geographical and are not abundant. ELA will consider some the non-floristic and non-geographical descriptions in the Final Determination for TECs below. This is similar to the use of additional information such as '*Descriptive Attributes'* and '*References'* as discussed previously about the method used to select a PCT.

The two papers by Preston and Adam (2004a; 2004b) separate the description of threatened ecological communities into two components: 1. The assemblage of species and the particular area; and 2. Supplementary descriptors. The document *Guidelines for interpreting listing criteria for species, populations and ecological communities under the NSW Biodiversity Conservation Act 2016* also follow the Preston and Adam (2004a; 2004b) method. Much of the text below will focus on supplementary descriptors.

The statement above refers Table 2 of the ELA report. Table 2 provided an assessment of the plot in the north-western section of the site. Additional information and a discussion about the plot, the surrounding vegetation and other information will be provided below.

Only one typical Blue Gum High Forest (BGHF) canopy species was present in the plot, *Eucalyptus pilularis* (Blackbutt).

ELA conducted an additional site survey on Friday 8 September. No *Eucalyptus saligna* (Sydney Blue Gums) were observed in the vegetation adjacent to the southern side of Stanhope Road. Potential local remnant species recorded in this area that are included in the Final Determination list of species for the Threatened Ecological Community Sydney Turpentine Ironbark Forest (STIF) include: *Angophora costata* (Smooth-barked Apple), *Eucalyptus paniculata* (Grey Ironbark), *Eucalyptus pilularis* (Blackbutt) and *Syncarpia glomulifera* (Turpentine). Additionally, non-local canopy tree species were more common than STIF species adjacent to Stanhope Road. Non-local canopy species observed include: *Corymbia citriodora* (Lemon-scented Gum), *Eucalyptus maidenii* (Maiden's Gum), *Eucalyptus melliodora* (Yellow Box), *Eucalyptus microcorys* (Tallowwood) and a red gum (probably *Eucalyptus tereticornis*).

EHG have noted (see below) that there is an overlap between the flora species of BGHF and Sydney Turpentine Ironbark Forest (STIF). While STIF species are more common in this area additional analysis

if provided below to support the decision to choose STIF to represent the local native vegetation within this area.

ELA have in their letter dated 12 July 2023 previously provided a floristic assessment. To gain further insight into the vegetation on the site, an assessment of relevant supplementary descriptors will be provided.

Preston and Adam (2004b) have stated that supplementary descriptors may provide greater '*more clarity and certainty'* about the recognition of TECs. However, Preston & Adam (2004b) state the following about supplementary descriptors:

> '*cannot be used as a substitute for a description of the assemblage of species and the particular area in which the community is located. Rather they should be seen as a valuable adjunct.'*

Consequently, while the use of supplementary descriptors cannot replace a floristic assessment, they can provide potentially valuable information.

Tree height and soil type are provided as supplementary descriptors in the Final Determination (FD) for BGHF. Information about tree height is not provided in the FD for STIF. Both the BGHF FD and the STIF FD provide similar information about soil types. The supplementary information about soil types associated with STIF and BGHF is similar as both TECs are described as occurring on clay soils derived from Wianamatta Shale. Some other information about soil types is provided, for example, BGH may occurs in areas underlain by Hawkesbury Sandstone. The STIF FD notes that STIF may also occur on shale layers over sandstone. There is no obvious difference between the soil associated with BGHF or STIF, so a discussion about soil types is unlikely to assist in deciding which TEC is present on the site.

There are other supplementary descriptors such as:

BGHF FD:

> *Typically, Blue Gum High Forest occurs more than 100m above sea level, where rainfall exceeds 1050 mm per annum, although it may be present in sheltered locations with lower rainfall.*

STIF FD:

> *Occurrences of STIF may occur on plateaus and hillsides and on the margins of shale cappings over sandstone.*

These other supplementary descriptors do not provide additional information that will assist in deciding which TEC is likely to be present on the site.

The NSW *Interpretation Act 1987 no. 15* provides guidance that will assist in providing more certainty in unclear situations. The text below is an extract from the *Interpretation Act 1987.*

> *Use of extrinsic material in the interpretation of Acts and statutory rules*
>
> *34. (1) In the interpretation of a provision of an Act or statutory rule, if any material not forming part of the Act or statutory rule is capable of assisting in the ascertainment of the meaning of the provision, consideration may be given to that material—*

(a) to confirm that the meaning of the provision is the ordinary meaning conveyed by the text of the provision (taking into account its context in the Act or statutory rule and the purpose or object underlying the Act or statutory rule and, in the case of a statutory rule, the purpose or object underlying the Act under which the rule was made); or

(b) to determine the meaning of the provision—

(i) if the provision is ambiguous or obscure; or

(ii) if the ordinary meaning conveyed by the text of the provision (taking into account its context in the Act or statutory rule and the purpose or object underlying the Act or statutory rule and, in the case of a statutory rule, the purpose or object underlying the Act under which the rule was made) leads to a result that is manifestly absurd or is unreasonable.

(2) Without limiting the effect of subsection (1), the material that may be considered in the interpretation of a provision of an Act, or a statutory rule made under the Act, includes—

(a) all matters not forming part of the Act that are set out in the document containing the text of the Act as printed by the Government Printer;

(b) any relevant report of a Royal Commission, Law Reform Commission, committee of inquiry or other similar body that was laid before either House of Parliament before the provision was enacted or made;

(c) any relevant report of a committee of Parliament or of either House of Parliament before the provision was enacted or made;

(d) any treaty or other international agreement that is referred to in the Act;

(e) any explanatory note or memorandum relating to the Bill for the Act, or any other relevant document, that was laid before, or furnished to the members of, either House of Parliament by a Minister before the provision was enacted or made;

(f) the speech made to a House of Parliament by a Minister on the occasion of the moving by that Minister of a motion that the Bill for the Act be read a second time in that House;

(g) any document (whether or not a document to which a preceding paragraph applies) that is declared by the Act to be a relevant document for the purposes of this section; and

(h) any relevant material in the Minutes of Proceedings or the Votes and Proceedings of either House of Parliament or in any official record of debates in Parliament or either House of Parliament.

(3) In determining whether consideration should be given to any material, or in considering the weight to be given to any material, regard shall be had, in addition to any other relevant matters, to—

(a) the desirability of persons being able to rely on the ordinary meaning conveyed by the text of the provision (taking into account its context in the Act or statutory rule and the purpose or

object underlying the Act or statutory rule and, in the case of a statutory rule, the purpose or object underlying the Act under which the rule was made); and

(b) the need to avoid prolonging legal or other proceedings without compensating advantage.

The Final Determination for BGHF and STIF refer to a number of publications that may assist *'in the ascertainment of the meaning of the provision',* so in this letter '*consideration may be given to that material*'. In the present situation, referring to the FD referenced publications may assist in deciding if one or the other TEC is present on the site.

The publications are: Benson and Howell (1990; 1994) and Tozer (2003). Informative supplementary descriptors from these publications will be provided below. Site characters will then be compared to the supplementary descriptors. Preston and Adam (2004b) indicate that supplementary descriptor may assist in field recognition of the threatened ecological community.

Benson and Howell (1990) provide the following information:

BGHF:

'*Sydney Blue Gum, Eucalyptus saligna, and Blackbutt, Eucalyptus pilularis, were the main trees, with Blue Gum particularly abundant on the lower slopes and depressions and Blackbutt more prevalent on the ridges. Other tree species were smooth-barked Angophora costata; Grey Ironbark, Eucalyptus paniculata; White Stringybark, Eucalyptus globoidea; Turpentine, Syncarpia glomulifera; and Forest Oak, Allocasuarina torulosa.'*

STIF

The lower rainfall Wianamatta Shale soils of the inner western suburbs and on the north side from Ryde to Glenorie, the Blue Gum High Forest, requiring good rainfall and deep clay soils, gave way to Turpentine-Ironbark Forest.

Benson and Howell (1990) state that BGHF is more common on deep soils.

Benson and Howell (1994) describe the landscape occurrence for BGHF as '*Broad ridges with residual shale soils'.* Their description for the landscape occurrence for *STIF* is: '*Inner western Sydney. Lower rainfall between Glenorie and Ryde; often near junction with sandstone'.*

'*Turpentine-Ironbark Forest vegetation extended into the transition zone between the shale and the underlying Hawkesbury Sandsone, on soils formerly known as the Hammondville Association (Walker 1960). Some of this transitional vegetation still survives as narrow edges to cleared land on private property and on the margins of sandstone bushland reserves in northern Sydney, were there are remnants of shale overlying sandstone, eg: Pennant Hills Park, Land Cove National Park (formerly State Recreation Area) (Clarke & Benson 1987) and Garigal National Park (formerly Davidson State Recreation Area), Ku-ring-gai National Park, and a number of Council parks.*

The argument above primarily considers the presence or absence of the TEC BGHF (FD). A similar argument could be presented for the absence of PCT 3136 Blue Gum High Forest.

As the site is highly disturbed it is relevant to include Preston and Adam's (2004a) consideration of site disturbance and the presence of TECs. Preston and Adam (2004a) note that on highly disturbed sites that while local native species may be present, some legal judgements have decided that the listed Threatened Ecological Community (TEC) is not present. They state on page 259:

> *'The lack of many typical native species and the dominance of exotic species, together with other factors such as the extent of modification and alteration of the understorey structural component of the community, led McClellan CJ to conclude that the vegetation was no longer part of the Blue Gum High Forest community.'*

This letter will not attempt to determine whether any of the local native species that are growing in disturbed areas on the site are not part of an TEC. However, it is clear that high levels of disturbance mean that the TEC may not be present in some locations.

EHG biodiversity technical comments

> *The BGHF Final Determination states "BGHF is dominated by a tall canopy of eucalypts that may exceed 30 m in height. Its understorey is typically multi-layered with a midstorey of mesophyllous shrubs and small trees and a diverse ground layer of herbs, ferns and some grasses. Most stands of the community are in a state of regrowth after past clearing or logging activities, and consequently trees may be shorter, less dense or more dense than less disturbed stands." The ELA report states, "The vegetation within the north east of the site is tall, and approximately to 20 to 30 m (Naturally Trees 2023), however, would not be considered an extremely tall forest." However, the Final Determination for does not require that the trees be extremely tall. The wording of the Final Determination indicates that trees within BGHF may or may not exceed 30m in height, therefore the remnant trees of this community found on the site could have formed part of this community and aren't required to be excluded based on tree height.*

ELA response

It is acknowledged that the site is disturbed and that past clearing of vegetation including trees has occurred.

Other characteristics appropriate for examining the presence of TECs are Supplementary descriptors. Supplementary descriptors for BGHF are examined elsewhere in this document.

EHG biodiversity technical comments

> *The Final Determination states "it can also intergrade with Sydney Turpentine Ironbark Forest (STIF)…stands that contain intermediate characteristics are collectively covered by the Final Determinations of BGHF and STIF and may be diagnosed by detailed consideration of the assemblage of species present at the site." Given STIF has been confirmed as likely to be present on the site, it is also possible that stands of remnant trees could form BGHF given the intergrading often observed between the two communities.*

ELA response

Integrades between BGHF and STIF are likely to occur along the boundary of deeper soils and shallower clay soils. Deep clay soils are not present near or within the site. While the site is clearly disturbed the local remnant trees adjacent to Stanhope Road are more consistent with STIF and less consistent with BGHF.

Paragraph six of the BGHF FD (Proposed Gazettal date 14/10/11) includes the following text:

> *'Blue Gum High Forest is typically associated with soils derived from Wianamatta Shale (Tozer 2003), though may occur in adjacent areas underlain by Hawkesbury Sandstone. The community also occurs on soils associated with localised volcanic intrusions, 'diatremes' (Benson and Howell 1994). Typically, Blue Gum High Forest occurs more than 100m above sea level, where rainfall exceeds 1050 mm per annum, although it may be present in sheltered locations with lower rainfall (Tozer 2003). In drier areas and approaching the shale/sandstone boundary, it intergrades with Sydney Turpentine Ironbark Forest, which is currently listed as an Endangered Ecological Community under the TSC Act. Stands that exhibit intermediate characteristics are collectively covered by the Determinations of these communities and may be diagnosed by detailed consideration of the assemblage of species present at the site.'*

In areas nearby where BGHF and STIF occur near to each other it is highly likely that both communities receive similar rainfall. The local distribution of BGHF and STIF is more likely to be correlated with soil factors. Blue Gum High Forest can occur on soils that are underlain by Hawkesbury sandstone. However, Benson and Howell (1990) state that BGHF is more common on deep soils. Therefore, it is likely that BGHF occurs above sandstone when soils are deep. As stated above STIF is more likely to occur near the shale/sandstone boundary. While it is not explicitly included in the BGHF FD, it can be assumed that clay soils derived from Wianamatta shale are likely to be shallower near the shale/sandstone boundary.

EHG biodiversity technical comments

> *If the upper stratum of BGHF was sparse or absent, then the final determination states that the relatively diverse stratum of small trees including Pittosporum undulatum, Elaeocarpus reticulatus and Allocasuarina torulosa is usually present, all of which are found on the site.*

ELA response

It is acknowledged that paragraph four (4) of the Blue Gum High Forest Final Determination proposed Gazettal date: 14 October 2011 includes the following sentence:

> *'A relatively diverse stratum of small trees is usually present, and includes Pittosporum undulatum (Sweet Pittosporum), Elaeocarpus reticulatus (Blueberry Ash) and Allocasuarina torulosa (Forest Oak).'*

The Final Determination for Sydney Turpentine-Ironbark Forest (Proposed Publication date 31/05/19) includes the following sentence in paragraph 4.1:

> *'STIF is frequently characterised by a stratum of smaller trees which, in addition to saplings of the species listed above, is dominated by species such as Pittosporum undulatum, Acacia parramattensis, Allocasuarina torulosa and Elaeocarpus reticulatus (Tozer et al. 2010).'*

The extracts above from both Final Determinations provide similar information. Thus the presence of these tree species cannot be easily used to decide whether BGHF or STIF is present.

EHG biodiversity technical comments

> *The ELA report states "Quantitative analysis was completed, using the Hager/Steenebeeke 2010 analysis excel spreadsheet for each vegetation integrity plot to determine the best fit PCT using standardised ratio comparison positive native to total native score. This analysis uses the diagnostic species as described by Tozer (2003) and Tozer (2010)." The ELA report has included many discussion points in regard to the analysis of plot data in both the Hager/Steenebeeke excel spreadsheet and the PCT filter tool. The use of the Hager/Steenebeeke tool and the PCT filter tool can be limited on sites which have high levels of disturbance. The reliance on meeting the number of positive diagnostic species to identify the best-fit PCT (e.g. Appendix B of the ELA report for Plot 1), may not be justified given the level of disturbance. While the analysis of species presence and their dominance can assist in assigning the likely best-fit PCT, total numbers of positive diagnostic species aren't always the best indicator, especially when the numbers of positive diagnostic species are so close between PCTs. EHGs advice dated 29 July 2023 has highlighted that the number of positive diagnostic species present on the site is only one component of the analysis for assigning the best-fit PCT. Section 4.2.3.2 of the revised BDAR notes this limitation in the use of positive diagnostic species saying "As can be seen in Table 21 and Table 25, the constituent species in both PCTs are very similar and in the absence of diverse and an abundance of shrub and ground layer species, the use of analytical tools such as the Vegetation classification database PCT filter tool (refer Section 2.2.5) and Hager and Steenbeeke tool used by ELA, are limited."*

ELA response

The analysis of PCT *descriptive attributes* provide additional information about whether a PCT is present in an area. PCT3136 Blue Gum High Forest includes the following descriptive attribute: '*it* [PCT3136 Blue Gum High Forest] *grades into tall forests PCT 3262* [STIF] *on thinner shale soils that adjoin*'

The soils on or near the site are relatively thin clay soils or alternatively sandy soils. None of the soils are typical of the soils associated with PCT3136 Blue Gum High Forest.

EHG biodiversity technical comments

> *The ELA report compares the results of using both the Hager/Steenebeeke tool and the PCT filter tool. The differences in number of positive diagnostic species between the use of the two tools may indicate that the use of older tools such as the Hager/Steenebeeke tool is based on PCT analysis that is outdated.*

ELA response

The Hager / Steenbeeke tool relies on a method similar to methods described in Tozer (2003) and Tozer *et al.* (2010). The PCT filter tool has was suggested as a suitable tool during the accreditation training process for BAM accredited assessors.

While at least one newer method of assigning plot data to PCT is available, namely the *Plot to PCT Assignment Tool* (Department of Planning and Environment 2022), it is unclear if the tool is an improvement on older methods. Representatives of the NSW government provided a presentation of the tool in at the NSW ECA conference in Wollongong in 2022. The author of this letter (DM) asked representatives of the NSW government about the tool during the NSW ECA conference held at Wollongong in 2022. Representatives of the NSW government stated that the *Plot to PCT Assignment Tool* was an alternative option for selecting PCTs, it was not necessarily an improved option. The document *Plot to PCT Assignment Tool User Guide* also does not state that the *Plot to PCT Assignment Tool* is an improved option.

Additionally, the *Plot to PCT Assignment Tool* relies on plant species (floristic) data and may potentially suffer from the same weakness associated with other quantitative floristic methods.

Nevertheless, the Plot to PCT Assignment Tool has been used to analyse the plot data collected from on or near to the site by ELA and ACS/Ecologique. The Plot to PCT Assignment Tool provides various outputs. Results of two of the main analyses are shown and discussed below.

Output from Centroid Matches Plot to PCT Tool (First Seven Plots)

A key feature of the Centroid Plot to PCT Tool is the shading of the cells. Green shaded 'Distance to Centroid' cells indicate that there is a reasonable level of statistical confidence associated with PCT matches. White shaded 'Distance to Centroid' cells indicate that there is a lower level of confidence associated with any PCT match.

The only Plot in the above Figure to generate green shaded cells is ELA Plot 2, the plot located in bushland south of the site. The Distance to Centroid cells for the other six plots generated plots with white shaded cells. The likely reason that ELA Plot 2 generated green shaded cells is that the number of NSW native species recorded in the plot was reasonably high. The number of NSW native species recorded in all other plots was significantly lower.

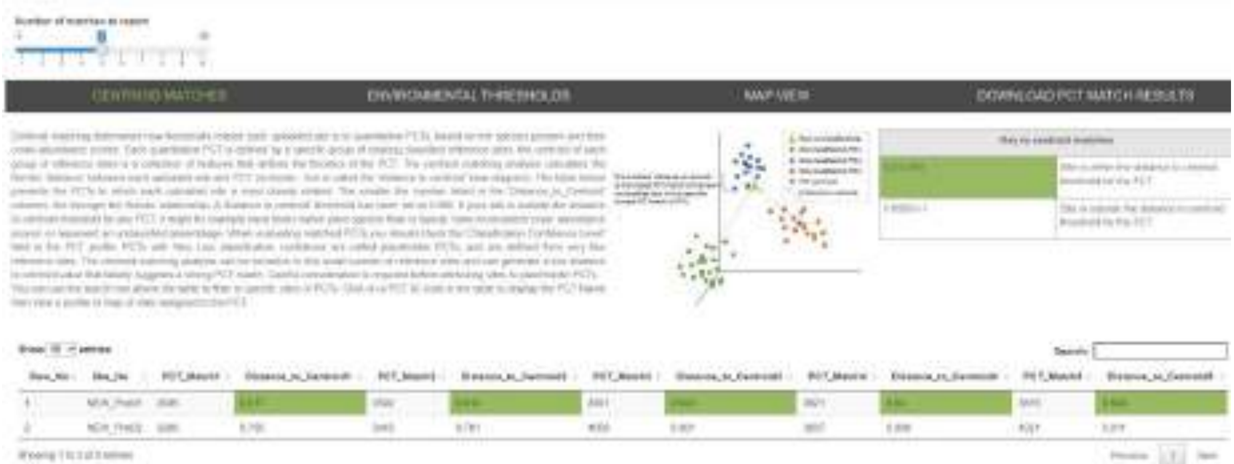
Output of the Characteristic Species Method (First seven plots)

It is important to note as stated above 'The characteristic species method is still under development.' The listed PCT matches for ELA Plot 2 were similar regardless of whether the Centroid Method or the Characteristic species method was used. In contrast, there was significantly less consistency between both methods for the PCT matches analysis of the other plots.

Two additional Plots surveyed by ELA on Tuesday 5 September 2023

ELA surveyed two additional plots on 5 September 2023. One plot was south-east of the site in relatively undisturbed bushland. A second plot was surveyed in the vegetation adjacent to Stanhope Road, east of the previous plot surveyed by ELA. ACS and Ecologique assisted in the field survey work for the plot adjacent to Stanhope Road. The results of the Plot to PCT analysis for these two plots are presented below.

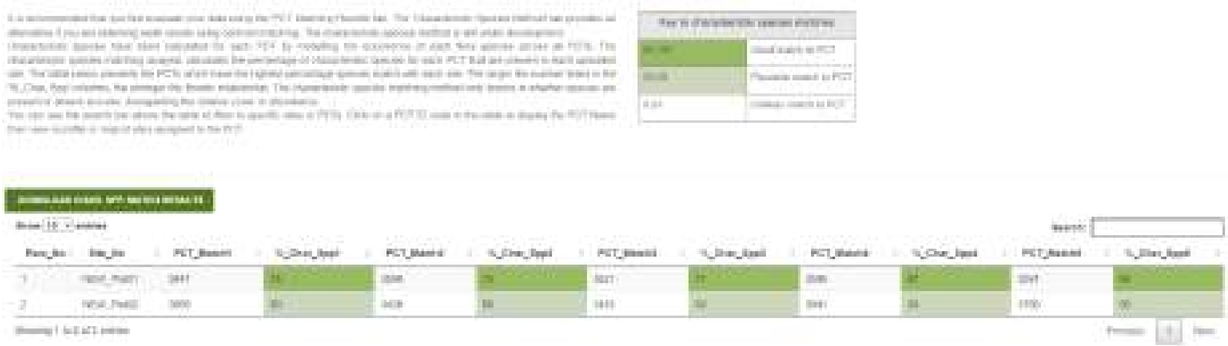
Output from the Centroid Matches analysis (two new plots)



The only Plot in the above Figure to generate green shaded cells is the new ELA Plot 1, the plot located in bushland south-east of the site. The Distance to Centroid cells for the other plot generated white

shaded cells. The likely reason that the new ELA Plot 1 generated green shaded cells is that the number of NSW native species recorded in the plot was reasonably high. The number of NSW native species recorded in new plot 2 was significantly lower.

Output from the characteristic species analysis (Two new plots)



There was less similarity between the output of the distance to centroid and characteristic species match for this second round of analysis. However, the pattern that plots with a greater number of NSW native species generate more similar results for both the distance to centroid and characteristic species analysis is still present.

The less reliability of the Plot to PCT Tool for the analysis of disturbed plots provides support for the use of descriptive attributes to assist in the decision about which PCT is present on a site.

Section 2.2 from the *Plot to PCT Assignment Tool User Guide* states:

> *Where possible within other constraints sites should: be located in least-disturbed available vegetation, avoid obvious ecotones, use an acceptable method for choice of precise start point for the quadrat (e.g. section 4.3.4 (3) in DPIE 2020), be surveyed in suitable seasons when most plants have identifiable material.*

ELA agree the site is disturbed and that ideally plots (quadrats) should be located in relatively undisturbed bushland. Unfortunately, the site offered little if any areas of undisturbed bushland within the site boundaries.

EHG biodiversity technical comments

> *Even if PCT 3592 Sydney Coastal Enriched Sandstone Forest was present within Plot 2 in the ELA Report, the plot is outside of the subject site. The plot is located downslope of the site and could reasonably be argued to show a transition area between any TEC's on the site and adjoining area. EHG considers that the plot doesn't necessarily provide data that should be used to draw conclusions in regard to vegetation found on the site.*

ELA response

It is agreed that vegetation not on the same contour is more likely to differ from vegetation on the same contour. There was no opportunity to assess undisturbed vegetation on the same contour directly adjacent to the site. It is believed that while an assessment of vegetation on a different contour is of less value, it still generates information that may assist in understanding the vegetation on the site.

Regards,

Daniel McDonald
Principal Ecologist and Senior Arborist

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Benson, D. and Howell, J. (1994) The natural vegetation of the Sydney 1:100 000 map sheet. *Cunninghamia* 3(4):677-787.

Preston, B.J. and Adam, P. (2004a) Describing and listing threatened ecological communities under the Threatened Species Conservation Act 1995 (NSW): Part 1 – the assemblage of species and the particular area. *Environmental Planning and Law Journal* 21: 250-263.

Preston, B.J. and Adam, P (2004b) Describing and listing threatened ecological communities under the Threatened Species Conservation Act 1995 (NSW): Part 2 – the role of supplementary descriptors and the listing process. *Environmental Planning and Law Journal* 21: 372-390.

Tozer, M. (2003) The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* 8(1): 1-75.

JK Geotechnics (29 September 2022) Report to Stockland on Preliminary Geotechnical Investigation for Proposed Redevelopment at Lourdes Retirement Village, 95 Stanhope Road, Killara, NSW. Ref: 34446Arpt.

LOURDES RETIREMENT VILLAGE
95 STANHOPE RD, KILLARA

URBAN DESIGN REPORT

RESPONSE TO SUBMISSION

PREPARED FOR LEVANDE
PLUS ARCHITECTURE

28/09/2023

1
INTRODUCTION

EXHIBITED MASTER PLAN

The exhibited master plan presented in the Planning Proposal report demonstrates a robust structure plan that carefully establishes land uses, public and private open spaces, facilities, site features and road networks based on a range of key design drivers that reflect the findings of a site analysis and provides improved community infrastructure that are already experiencing a decline in their useful life.

The master plan for Lourdes Retirement Village provides a new seniors housing development consisting of approximately 110 suites as well as approximately 141 new independent living units arranged within a series of buildings ranging from 3 to 6 storeys in height. Additionally, the redevelopment of the southern portion of the site provides approximately 63 townhouses with a separate road network and private amenities.

The adjacent plan shows the proposed locations of the new community facilities in the northern portion of the site off the proposed Main Street interface. The Headfort House which is to be retained under this Planning Proposal will continue to serve as a Chapel for the community.

INDICATIVE DWELLING YIELD

141
INDEPENDENT LIVING UNITS

110
RESIDENTIAL AGED CARE FACILITY BEDS

63
TOWNHOUSES

1. New Entry to Stanhope Road
2. Headfort House Gardens
3. Lady of the Lourdes Grotto
4. RAC drop-off
5. Main Street
6. The Village Green
7. Dementia Garden
8. RAC Courtyard Landscape
9. Terraced Landscape
10. Pedestrian Connection
11. Landscape Mounding
12. Green Corridors
13. Service Trail
14. Existing Landscape
15. NewRoad Connection

PREVIOUSLY PROPOSED MASTER PLAN (20/12/22)

The master plan underwent significant amendment to address issues raised in response to the exhibition of the Planning Proposal. The key features of the updated master plan included:

- A reduction in the perceived scale of the proposal by accommodating the ILU programme within four smaller buildings, rather than three, increasing visual permeability and the potential for through-site links.

- A further reduction in building height from 4 storeys to 3 storeys for the building adjacent to the western boundary, minimising impacts on the adjoining neighbour.

- The introduction of variations in built form and height, length, architectural expression and upper level setbacks across the development that serve to increase solar amenity and reduce the visual presence of the proposal.

- The further integration of the proposal with the existing levels on site through the use of stepped building forms to ensure that the design is appropriately embedded within the landscape.

- The proposed principal entry into the basement carpark (including loading and servicing vehicle docks) moved to the eastern portion of the site to reduce any perceived impacts to the developments western neighbours.

- A proposed new road connection from Stanhope Road to the townhouse precinct, allowing for the creation of precincts within the development that have a greater sense of urban identity.

- The unique bushland setting serving as the inspiration of an evolved landscape design response.

- The identification through further resolution of the design to retain a greater number of existing trees.

- The articulation of massing envelopes to ensure buildings that are fine-grain and in their expression and materiality reflective of the residential context that they sit within.

- The use of apartments at the interface of the ILU carpark and the townhouses to minimise the visual impact of the basement carpark.

- More granular building expression at the interfaces of the townhouse precinct with the surrounding bushland by creating a staggered built form.

- The total floor space and indicative yield has not changed as a result of the amended master plan.

1 RAC drop-off
2 Headfort House Gardens
3 Lady of the Lourdes Grotto
4 Main Street
5 Dementia Garden
6 The Village Square
7 ILU drop-off
8 The Village Green
9 Green Corridors
10 Road Connections

PREVIOUSLY PROPOSED MASTER PLAN (04/07/23)

In response to EHG submission (06/06/23), the master plan was further amended to increase the achievable tree retention.

The key features of the updated master plan include:

- The adjustment of the western road and the building adjacent to the road to increase retention of high value trees.

- The further realignment of the fire trail connection to the western road to minimise vegetation clearing and increase retained tree canopy.

- The use of more compact townhouse typologies at the interface of the fire trail located at the southwestern perimeter of the site to increase tree retention.

- The further adjustment of the ILU building adjacent to the northeast boundary facing Stanhope Road to retain more high value trees.

1 RAC drop-off
2 Headfort House Gardens
3 Lady of the Lourdes Grotto
4 Main Street
5 Dementia Garden
6 The Village Square
7 ILU drop-off
8 The Village Green
9 Green Corridors
10 Road Connections

UPDATED MASTER PLAN

1 RAC drop-off
2 Headfort House Gardens
3 Lady of the Lourdes Grotto
4 Main Street
5 Dementia Garden
6 The Village Square
7 ILU drop-off
8 The Village Green
9 Green Corridors
10 Road Connections

In response to EHG submission (August 2023), the master plan has undergone further amendment to retain additional vegetation and increase the achievable tree canopy cover.

The key features of the updated master plan include:

- The introduction of generous street setbacks along Stanhope Road and further integration of the ILU building adjacent to the northeast boundary facing Stanhope Road with the existing levels on site to retain the cluster of high value trees along northern boundary of the site.

- The further realignment of the principal road connection from Stanhope Road to ILU precinct from north-east of the site (including entry into the basement carpark) to retain additional vegetation within the existing landscaped setting fronting Stanhope Road.

- The introduction of three ILU buildings in lieu of previously proposed ILU buildings B and C to shape buildings around landscaped pockets, creating natural relief between proposed built form while integrating through-site links with existing retained trees.

- The further realignment of the western road to the townhouse precinct and its connection to fire trail to minimise vegetation clearing and increase retained tree canopy.

- A reduction in number of proposed townhouses while using more compact townhouse typologies at the interface of the fire trail located at the southwestern perimeter of the site to minimise vegetation clearing and increase tree retention.

The amended master plan has resulted in a reduction in floor space from approx. 39,650sqm to approx. 38,600sqm and would result in the following approximate dwelling yield, noting that the dwelling yield for seniors housing is unchanged and can be achieved through changes to the dwelling mix.

INDICATIVE DWELLING YIELD

141
INDEPENDENT LIVING UNITS

110
RESIDENTIAL AGED CARE FACILITY BEDS

59
TOWNHOUSES

PROPOSED PLANNING CONTROLS

PROPOSED HEIGHT OF BUILDINGS

J1	9
J2	9.5
L	11.5
N	14.5
O	16
P	17.5
Q1	20
Q2	20.5
R	22
S	24
T	26.5
U	32.5
V	39.5

PROPOSED FSR MAP

A1	0.2
A2	0.24
A3	0.3
A4	0.37
B	0.4
D	0.5
G	0.65
G1	0.73
I	0.75
J	0.8
K	0.85
N	1.0
Q	1.3
U	2.5
W	3.5

Current Planning Controls

The site is currently zoned R2 Low Density Residential. This zone permits low density housing (dwelling houses), but prohibits residential flat buildings. The Housing SEPP allows for residential accommodation for seniors housing, but limits the development to approximately 2 storeys in height. The maximum height for development on the site is 9.5 metres, which allows for development of 2-3 storeys. The maximum floor space ratio for the site is 0.3:1.

Exhibited Planning Controls

The exhibited Planning Proposal proposed to amend the Ku-ring-gai LEP to:

– Rezone the site from R2 Low Density Residential to R3 Medium Density Residential.

– Amend the Height of Buildings Map to allow for heights ranging from 9.5m to 22m across the site.

– Amend the maximum floor space ratio map to allow for an FSR of 0.75:1.

Amended Planning Controls

To reflect the amended master plan, the following changes have been made to the proposed planning controls:

– Height of Buildings: Changes to the height of buildings map to align building heights with the amended master plan.

– Floor Space Ratio: Reduction of FSR from 0.75:1 to 0.73:1 to reflect the reduced floor space potential under the amended master plan.

2
LANDSCAPE RESPONSE

LOCAL CHARACTER

LANDSCAPE CHARACTER

URBAN CHARACTER

Swain Gardens + Gordon Creek + Lane Cove + Garigal National Park

Killara is located within the Lower East of Ku-ring-gai council area and is surrounded by vegetation corridors distinctive of Sydney's bushland. Within close vicinity to the site you have Swain Gardens, Seven Little Australians Park, Gordon Creek, Lane Cove National Park and Garigal National Park National Park.

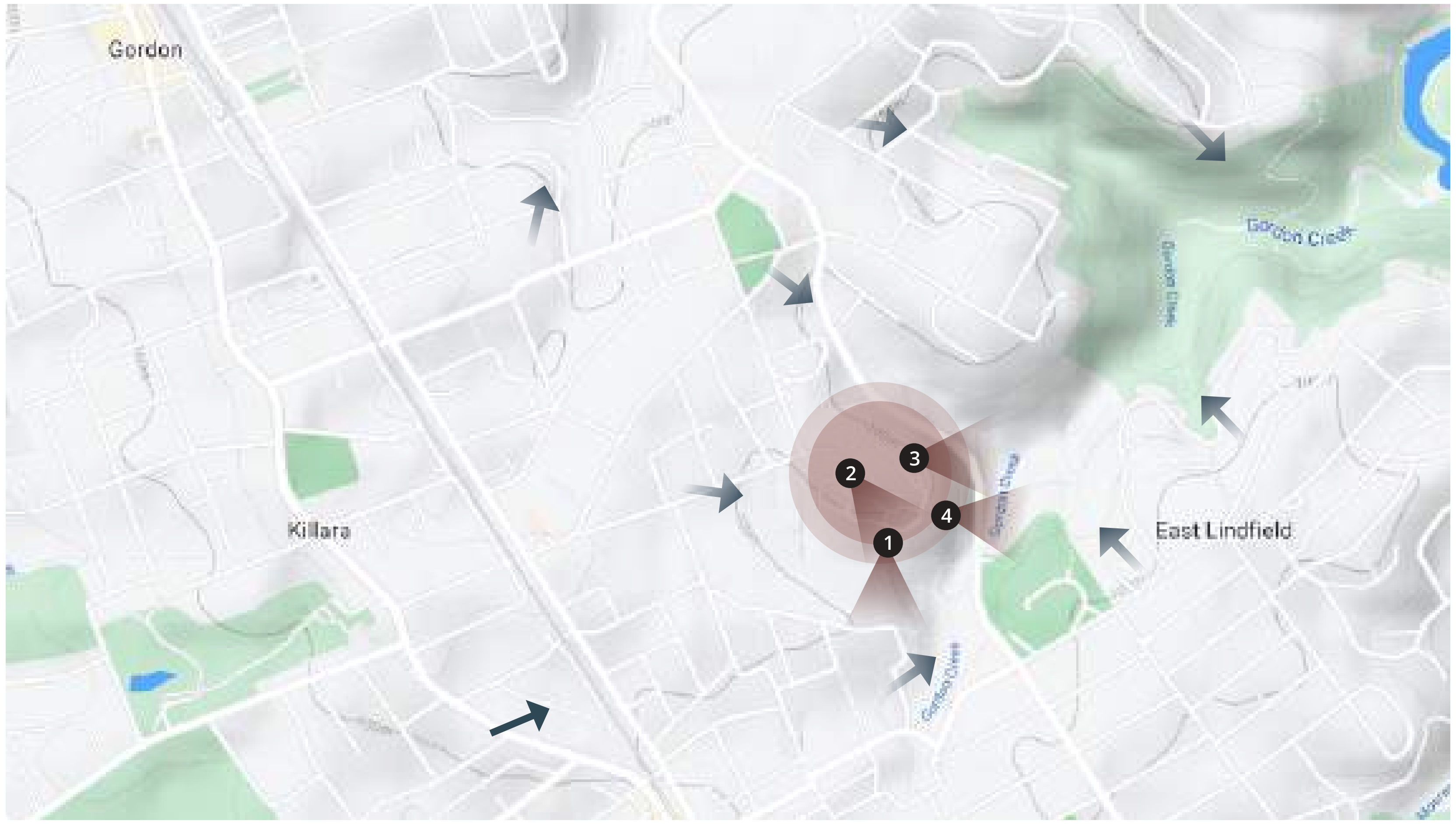
Detahed houses on large lots within garden settings feature heavily in the north of the Lower East. Complemented by mature well-planted streets, these areas are synonymous with the idea of the idyllic and leafy North Shore.

Killara Neighourhood

Key characteristics of the Lower East Killara neighbourhood include:
- Streets running perpendicular to the Pacific Highway
- High amount of heritage items
- Consistent street layout reflecting the urban development of the early 1900's
- Large residential lots with considerable private open space
- Many houses with pools and tennis courts
- Archbold and Eastern Arterial roads bisect this area as a major traffic cartery
- Dense tree canopy
- Undulating topography that drops away quickly from the Pacific Highway to Middle Harbour
- Excellent areas of flora and fauna habitat

GREENERY CONNECTIONS

TOPOGRAPHY & VIEWS



The site's topography is a defining characteristic which falls approximately 13 meters from the northern boundary with Stanhope Road to the southern boundary along Lourdes Avenue and the bushland edge. This level change and elevation provides valuable views of Chatswood and Sydney city skylines. Many existing roads and access paths are steep. Our design will make use of this challenge in creating safe access and movement for residents.

1 View of bushland to southern site boundary

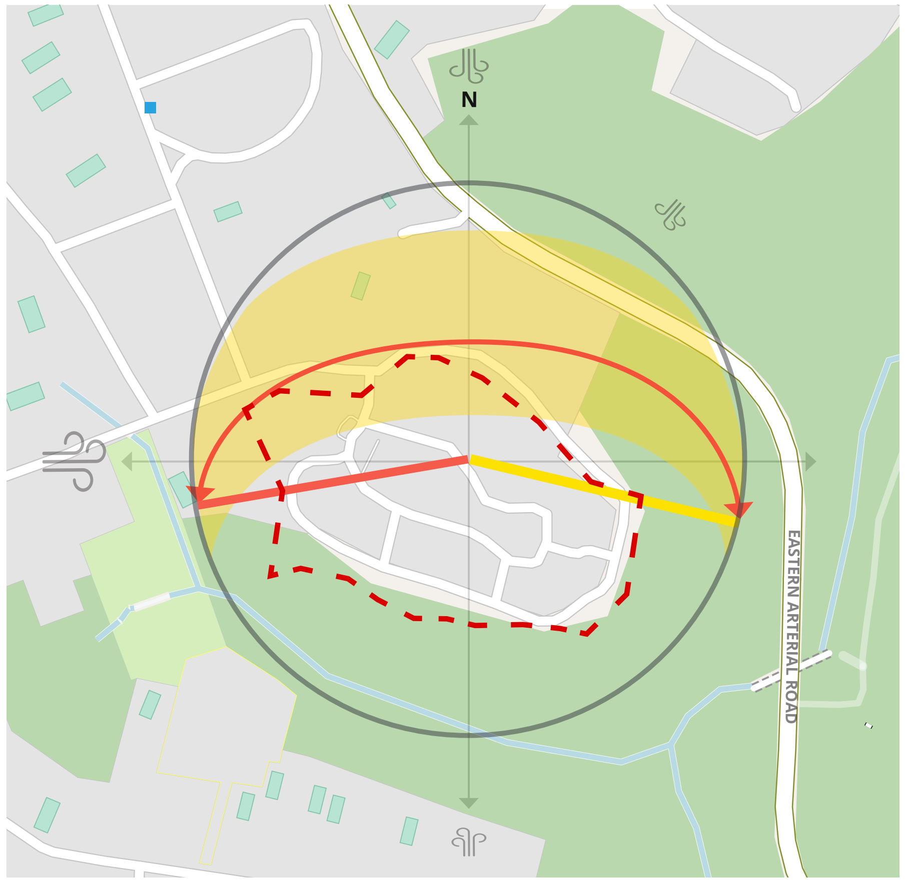
2 View from First Avenue

3 View of embankment along Stanhope Avenue

4 Access road along eastern site boundary

LOCAL ANALYSIS

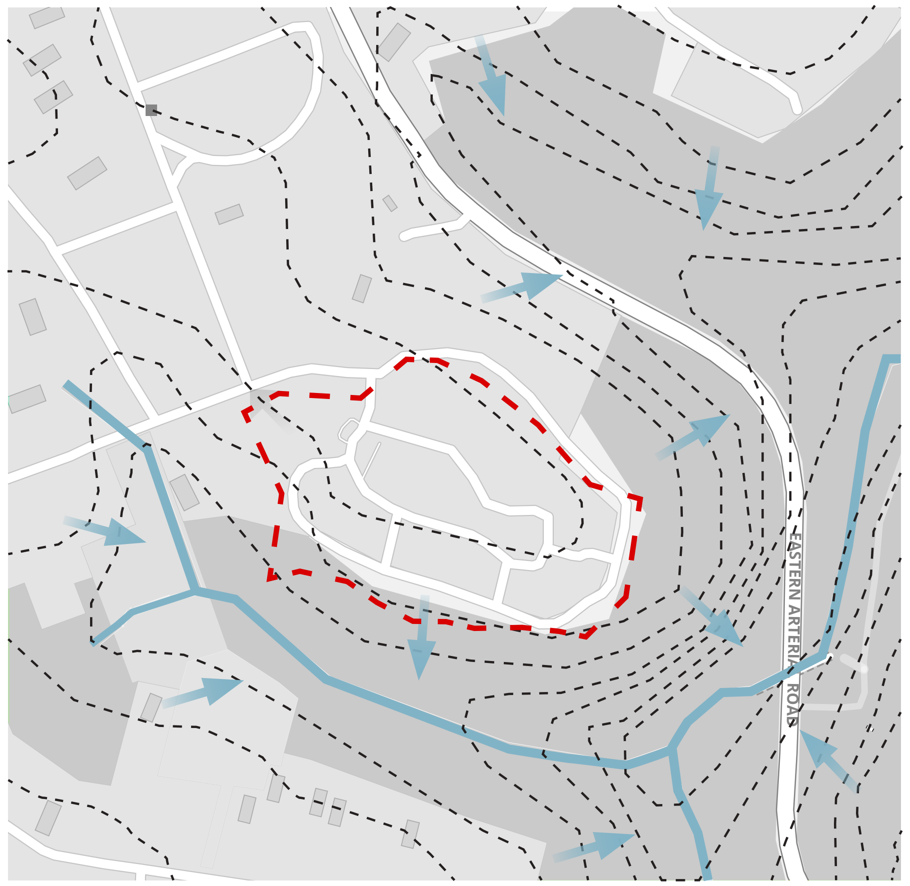
Solar Access



KEY

- SUNRISE
- SUNSET
- SOLAR PATH
- PREVAILING WINDS

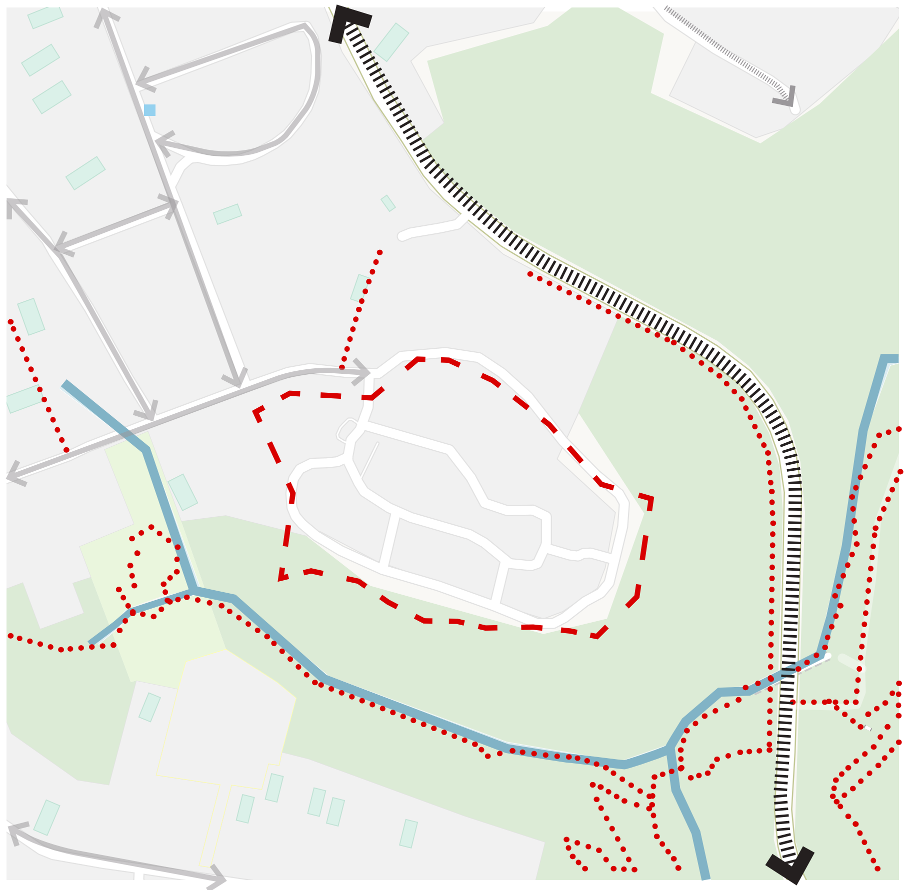
Hydrology



KEY

- 10M CONTOURS
- WATER FLOW
- WATER BODY

Circulation



KEY

- WALKING TRAILS
- WATER FLOW
- WATER BODY

LANDSCAPE MASTER PLAN

KEY

1. **POCKET PARK OPPORTUNITY**
2. **SHAREWAY**
3. **VILLAGE HEART**
4. **WALKING TRACK**
5. **GREEN CORRIDORS WITH DRAINGE SWALES**
6. **GROTTO**
7. **CENTRAL BUSH WALKING SPINE**

EXISTING TREE CANOPY

LEGEND

TREE CANOPY AREA = 11,518m² (22% OF SITE)

TOTAL SITE AREA = 52,906m²

PROPOSED TREE RETENTION: TREE CLASSIFICATION

- TOTAL TREES REMOVED = 188
- TOTAL TREES RETAINED = 191
- ADDITIONAL TREES RETAINED = 27
- ADDITIONAL RETAINED AA1 TREES = 4
- ADDITIONAL RETAINED A1 TREES = 8

PREVIOUS PROPOSAL (23/07/04)

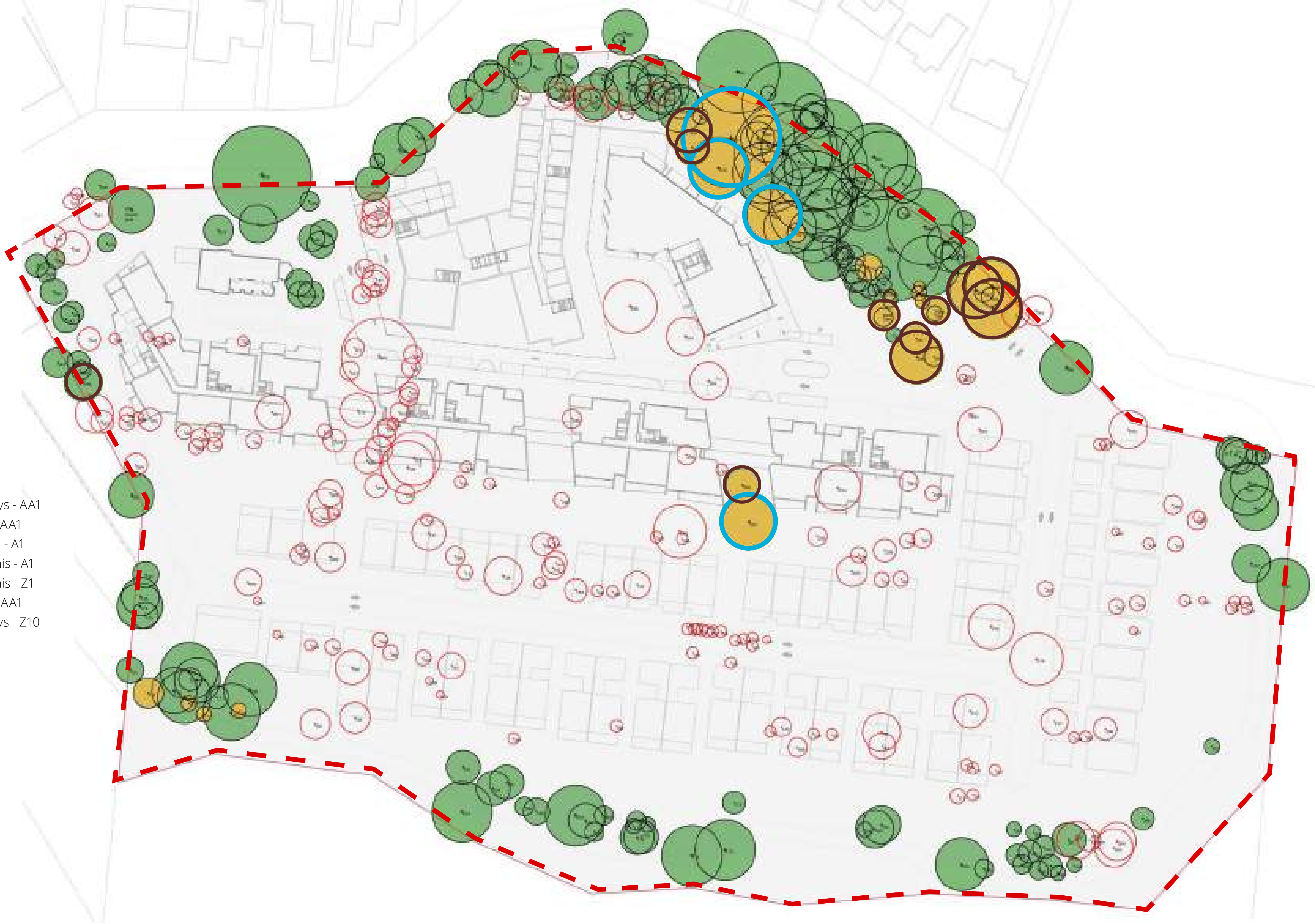
	IMPORTANCE (A/AA)	TOTAL TREES (Z/ZZ)	SUBTOTAL
TREES RETAINED	102	62	164
TREES REMOVED	62	153	215
		TOTAL	379

CURRENT PROPOSAL

	IMPORTANCE (A/AA)	TOTAL TREES (Z/ZZ)	SUBTOTAL
TREES RETAINED	114	77	191
TREES REMOVED	50	138	188
		TOTAL	379

ADDITIONAL RETAINED TREE SPECIES

- 109 - Melaleca quinquenervia - Z1
- 112 - Melaleca quinquenervia - Z1
- 113 - Melaleca quinquenervia - Z1
- 120 - Jacaranda mimosifolia - Z9
- 244 - Angophora floribunda - AA1
- 252 - Syzygium paniculatum - A1
- 284 - Eucalyptus robusta - A1
- 286 - Eucalyptus robusta - A1
- 288 - Eucalyptus melliodora - A1
- 289 - Eucalyptus robusta - A1
- 290 - Allocasuarina torulosa - Z10
- 295 - Acacia baileyana - Z1
- 296 - Eucalyptus botryoides - A1
- 297 - Eucalyptus botryoides - A1
- 298 - Eucalyptus haemastoma - Z1
- 299 - Eucalyptus botryoides - Z1
- 300 - Eucalyptus botryoides - A1
- 302 - Casuarina cunninghamiana - Z1
- 303 - Casuarina cunninghamiana - Z1
- 304 - Elaeocarpus reticulatus - Z1
- 305 - Corymbia gummifera - ZZ4
- 321 - Eucalyptus microcorys - Z1
- 323 - Eucalyptus microcorys - AA1
- 326 - Eucalyptus pilularis - AA1
- 327 - Corymbia gummifera - A1
- 328 - Eucalyptus tereticornis - A1
- 359 - Eucalyptus tereticornis - Z1
- 360 - Eucalyptus pilularis - AA1
- 370 - Eucalyptus microcorys - Z10



PROPOSED TREES

LEGEND

- NATIVE TREES = 84
- NATIVE FEATURE TREES = 83
- NATIVE FEATURE TREES = 9
- EXOTIC FEATURE TREES = 9
- STREET TREES = 47

- TOTAL TREES RETAINED = 191
- TOTAL TREES PROPOSED = 232

TOTAL TREES = 423

MATERIALITY

A practical and robust proposal of materials sympathetic with the natural surroundings and local ecotones of the Lourdes Development Site...

The materials strategy will curate a range of finishes which will express the unique characteristics of the Site. Priority will be given to materials of local provenance, visibly grounding the development in its connection to the surrounding bushland which defines the landscape character.

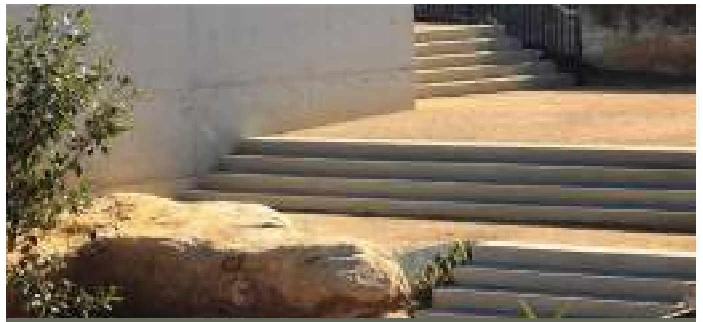
Feature finishes will be used to elevate key outdoor areas and provide definition to active and passive open spaces, and express a journey through a narrative of diverse and inter-connected web of landscape typologies.

In addition, the materials and finishes will be:

- Locally sourced from Australia and sustainable
- Durable and age gracefully over time
- Low maintenance solutions that can also minimise waste and reduce carbon footprint where possible
- Where possible, have high Solar Reflectance Index (SRI) value and/or lighter coloured materials to mitigate heat island effect.
- Robust, self-finished materials
- Considered materials that are non-combustible and protect from bushfire threat

SURFACES


Natural materials reinforcing the bush character

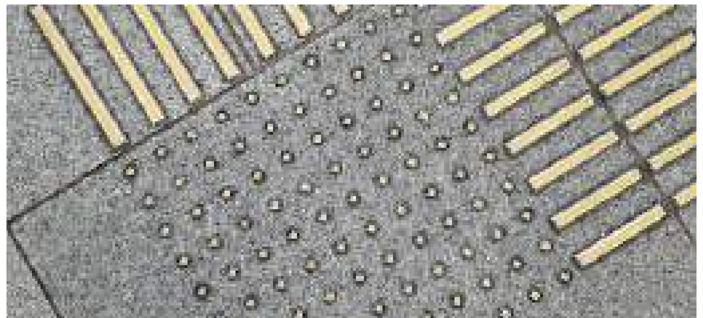

Decomposed gravel


Permeable trihex treatment to shared ways

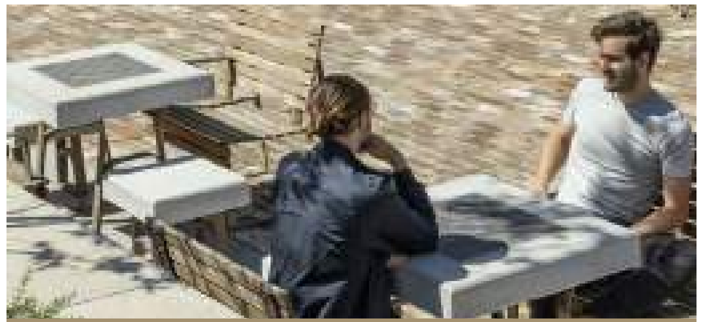

Decking


Warmer tones in pavement types


Concrete pavements


Coherent and safe pathway design

FURNITURE


Loose furniture to hardstand


Precast concrete seat


Rocks as incidental seating and wayfinding

PLANTING

Proposed plants that generate 'cooler' spaces, define areas, highlight views, create visual interest and provide shade...

The site is surrounded by ecologically rich bushland. The landscape design will incorporate appropriate plant species and design where land is managed as an Asset Protection Zone (APZ). The APZ Planting Palette will aim to aid reduction of potential bush fire impacts in nominated zones.

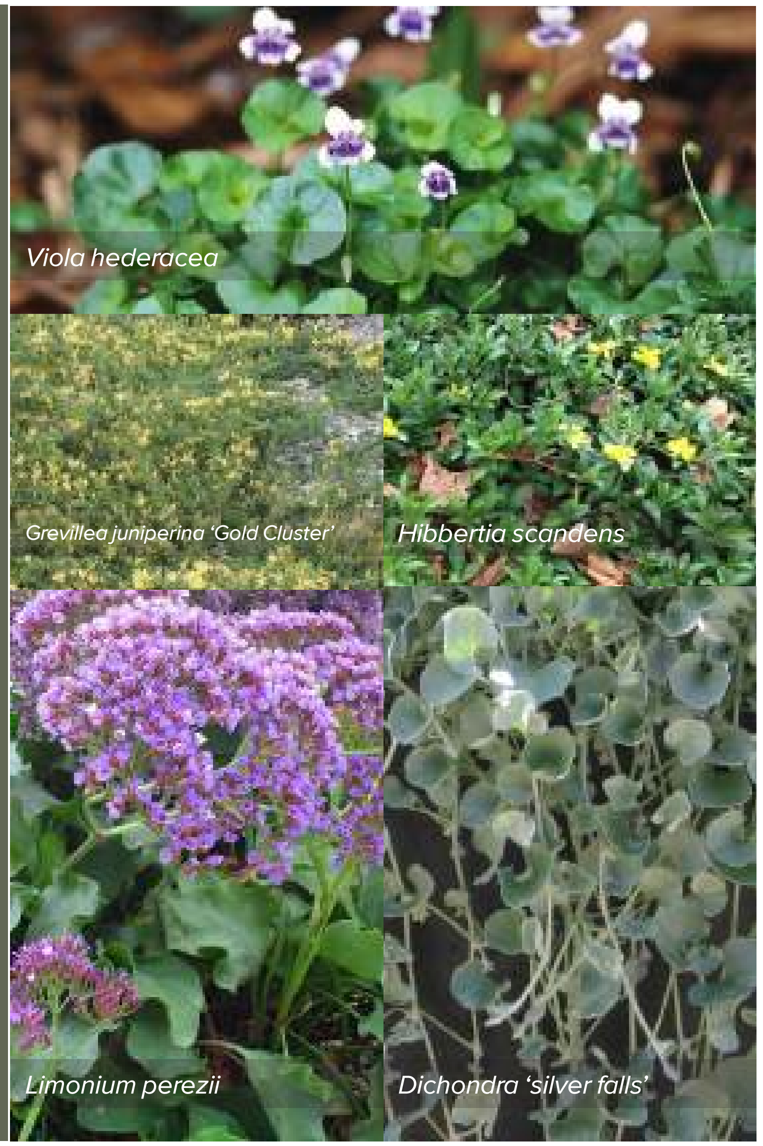
The strategic distribution of the Architecture will enable landscaping to be spaced around and between building form, delivering:

- Easy to maintain soft landscaping
- Uncomplicated landform and landscape structure - native trees and open grassland
- Plants the require minimal water and will generate 'cooler' green spaces, which in turn assist in transforming the urban heat island effect
- Level grass areas for flexible use
- Use of tree planting to provide visual interest, define areas, highlight views and provide shade
- Utilisation of locally native species to reinforce key landscape character zones
- Utilisation of native species to support year-round comfort to outdoor spaces

Trees

Grasses

Groundcovers + Climbers



Shrubs + Accents

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