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Reference: 18SUT-10177

24 September 2018

Dear Maria,

Ecological Assessment - Pacific Highway Intersection Upgrades between Turramurra and Wahroonga

Background

NSW Roads and Maritime Services (Roads and Maritime) are proposing to upgrade the Pacific Highway between Kirawa Close in Turramurra and Neringah Avenue in Wahroonga.

The proposal involves the improvement of three intersections along a section of the Pacific Highway between Turramurra and Wahroonga (**Appendix A: Figure 1**) at the following locations (from south to north), including the proposed compound site near Kissing Point Road (Figure 1):

- Pacific Highway at Finlay Road, Warrawee / Turramurra (Intersection 1) (**Figure 3**)
- Pacific Highway at Fox Valley Road, Wahroonga / Warrawee (Intersection 2) (**Figure 4** and **Figure 5**)
- Pacific Highway at Coonanbarra Road and Redleaf Avenue, Wahroonga (Intersection 3) (**Figure 6**)

The proposal would provide three continuous through lanes in either direction (northbound and southbound) on the Pacific Highway between Turramurra and Wahroonga over a length of about 2 km. This proposal would involve removal of patches of vegetation adjacent to the southern/western side of the Pacific Highway which is located both within the road corridor and on private land. The vegetation that may be affected on the northern/eastern side of the Pacific Highway are branches that overhang the road and interrupt the line of sight, and two to three trees located at the corner of Redleaf Avenue and Pacific Highway may require removal to establish a power pole / lighting pole.

Roads and Maritime require an assessment of potential ecological impacts, including the identification and validation of vegetation communities, identification of all flora species, and observations of fauna habitat and opportunistic fauna within the study area.

The proposed impacts to vegetation as part of the works, as identified by Roads and Maritime, have been mapped and identified in **Figure 2** to **Figure 6**. The compound site will not require the removal of any of the planted Camphor Laurels (*Cinnamomum camphora*) but may require some trimming of branches. A figure showing the compound site utilisation has been included in **Appendix B**. The arboricultural impact on individual trees is assessed in a separate report.

Methodology

A desktop review of existing ecological information pertaining to the site was undertaken on 1 June 2018 including:

- 5 km radial search of the Atlas of NSW Wildlife (BioNet)

- 5 km radial search of the EPBC Act Protected Matters Search Tool (PMST)
- Sydney Metropolitan CMA vegetation mapping (OEH 2016)

A site inspection was undertaken by ELA ecologist David Brennan on the 2 May 2018 to:

- validate the types and condition of vegetation communities to be removed
- search for threatened flora species likely to occur
- search for threatened fauna habitat.

The survey effort covered all vegetated areas within the study site that would be affected by clearing for the proposed road upgrade.

Results

Literature and data review

The BioNet and PMST database searches identified 71 threatened species, comprised of 41 fauna and 30 flora species and 1 endangered ecological community. The closest fauna records were *Pteropus poliocephalus* (Grey-headed Flying-fox) which had been located within the study area, 120 m to north east of the northern portion of the study area and 120 m west of the southern portion of the study area; *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat) 130 m to west of the southern portion of the study area; and multiple *Ninox strenua* (Powerful Owl) records within 1 km of the study area (**Figure 7**).

There were no database records of threatened flora species within the study area (OEH 2018). The closest threatened flora record was *Genoplesium plumosum* (Tallong Midge Orchid) 180 m east of the northern portion of the study area; *Genoplesium bauera* (Brittle Midge Orchid) 210 m east of the northern portion of the study area; *Tetratheca glandulosa* (Black-eyed Susan) 450 m east of the northern portion of the study area; and *Syzygium paniculatum* (Magenta Lilly Pilly) 450 m west of the central portion of the study area (**Figure 8**).

Field survey

A single mature planted Magenta Lilly Pilly was observed within the School of Philosophy grounds (Figure 8). Magenta Lilly Pilly is an Endangered species under the NSW *Biodiversity Act 2016* (BC Act) and a Vulnerable species under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The trunk of the tree is outside of the study area, however its roots may be impacted by works. The location of the Magenta Lilly Pilly is also identified in the draft State Heritage Assessment which has been prepared on behalf of Roads and Maritime, which contains a detailed outline of the plant locations that will or may be impacted by the proposed works on the Mahratta site. No other threatened flora were observed during the site visit, or are considered likely to occur within the site.

The vegetation to the east and west of the study area has been mapped as either Blue Gum High Forest (BGHF) or Urban Exotic/Native. Blue Gum High Forest of the Sydney bioregion is a critically endangered ecological community under both the NSW *Biodiversity Act 2016* (BC Act) and the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The total local extent of BGHF within a 1 km radius of the study site is 121 ha, including Dalrymple Hay Nature Reserve, Wahroonga Public School, Bannockburn Oval, Turramurra Memorial Park, Rushall Street Reserve and Maddison Reserve (**Figure 9**). Whilst a small area of Sydney Turpentine-Ironbark Forest (STIF) occurs within 400 m of the eastern extent of the study area, STIF is generally found downslope of BGHF. As the study area runs along the Pacific Highway, which follows the natural ridgeline, STIF is not expected within the study area.

Two small patches of vegetation within the study area have been mapped as BGHF by broad scale mapping (OEH 2016). On field inspection, one of these patches was found not to contain any BGHF species and the other patch (approximately 60 m²) was found to contain one large remnant *Eucalyptus saligna* (Sydney Blue Gum) with no other BGHF species (**Figure 4**). A further area, (approximately 260 m²) in front of Warrawee Primary School

was found to contain some BGHF species, namely six semi-mature *E. saligna* (Sydney Blue Gum), two possibly planted *Acacia parramattensis* (Parramatta Wattle) and two possibly planted *Pittosporum undulatum* (Sweet Pittosporum), with no ground cover species identified (**Figure 3**).

These two BGHF patches are consistent with the listing criteria for Blue Gum High Forest under the BC Act. As such an Assessment of Significance (AoS) under the BC Act was undertaken and included as **Appendix E**.

It is noted that BGHF is also listed under the EPBC Act. However, the vegetation within the site did not meet the more stringent Commonwealth listing criteria. The EPBC Act listing only includes high quality remnant patches with characteristic native plant species present in all structural layers, and that have the following characteristics:

- Tree canopy cover >10% and a patch area > 1 ha, or
- Tree canopy cover <10% and a patch area > 1 ha if that patch is located within native vegetation with an area > 5 ha.

The Commonwealth listing advice notes that “*single isolated trees or stands of trees, characteristic of the canopy of Blue Gum High Forest of the Sydney Basin Bioregion, without a native understorey are considered important as biodiversity reservoirs. However, due to having been severely modified, these areas fall outside the definition of this ecological community and therefore do not form part of this listing*”.

The field inspection verified that the remaining vegetation to be removed or modified was exotic garden plants, weeds or a planted native species present. Three priority weeds are present within this patch including *Ligustrum lucidum* (Broad-leaved Privet), *Ligustrum sinense* (Small-Leaved Privet) and *Olea europaea* subsp. *cuspidata* (African Olive). African Olive is classified as a ‘Regional Priority Weed’ for the Greater Sydney Regional, while Small-Leaved Privet is a lower priority species classified as ‘other weed of regional concern’. A full list of flora species observed is provided in **Appendix C**, including the closest intersection where they were observed.

No hollow-bearing trees or other native fauna habitat features were observed within the study area.

Conclusion

ELA assessed the ecological values of the study area and the impacts of a proposed development against relevant State and Commonwealth legislation. Likelihood of occurrence tables are included as **Appendix D**.

No hollow-bearing trees or other native fauna habitat features were observed within the study area. As a result, the site is only considered to contain limited foraging habitat for birds, microchiropteran bats, flying-foxes and other highly mobile native fauna species as such, an AoS under the BC Act was not undertaken. The development is considered unlikely to impact important foraging habitat for any native fauna species.

Magenta Lilly Pilly is a widely cultivated species and the single planted tree in the study area is growing outside of its natural habitat, as such no AoS was required.

The proposed road extension works would require the clearance of about 0.02 ha of BGHF, comprising seven *E. saligna* trees and four potentially planted mid-storey species. An AoS under the BC Act was undertaken as included in **Appendix E**. The assessment concluded that the proposed road widening and compound site works were not likely to have a significant impact on threatened species or endangered ecological communities listed under the BC or EPBC Acts.

Recommendations to mitigate the potential ecological impacts include:


1. Retain native vegetation if possible.
2. Minimise impacts during development design and construction phase, including establishing a buffer area adjacent to any native vegetation and ensuring a AQF5 Consulting Arborist is present when

excavating near the roots of Tree 19 (Magenta Lilly Pilly) and when trimming branches in the compound site area.

3. Ensure protection of native vegetation outside of the construction footprint.
4. Ecologist to undertake preclearance surveys of trees prior to clearance for potential nests.
5. Compensate / offset the removal of habitat trees in consultation with the landowner and relevant consent authorities i.e. Ku-ring-gai Council and Office of Environment and Heritage.

If you have questions about any aspect of this assessment, please feel free to contact me on 8536 8612.

Yours sincerely,



Beth Medway
Senior Consultant

References

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Appendix A: Maps

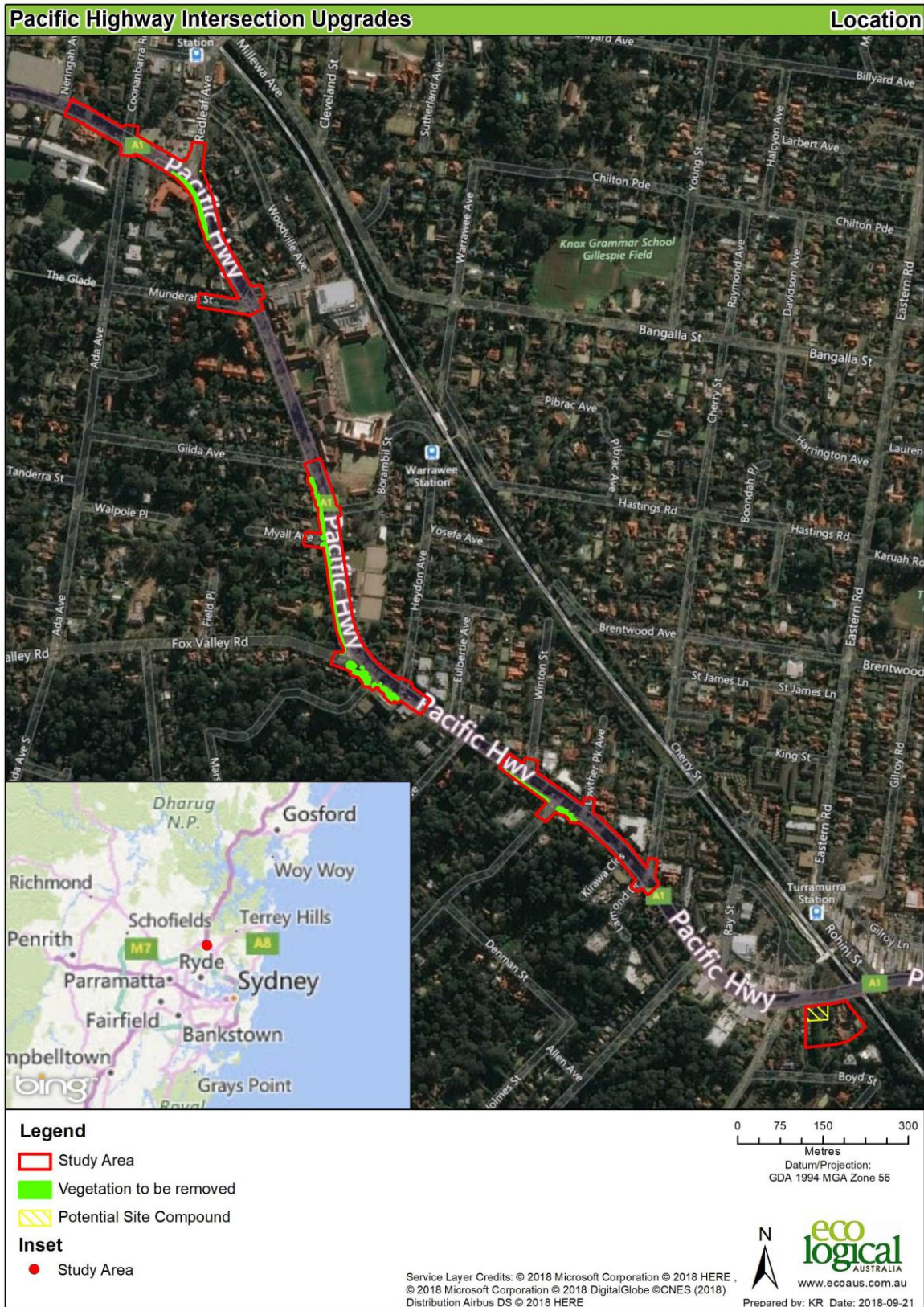


Figure 1: Study area detailing areas of vegetation to be removed and potential site compound

Pacific Highway Intersection Upgrades Map 1



Legend		Vegetation Communities (OEH 2016) Blue Gum High Forest Sydney Turpentine-Ironbark Forest Urban Exotic/Native	0 10 20 40 Metres Datum/Projection: GDA 1994 MGA Zone 56
	Study Area		
	Potential Site Compound		
	Proposed works		

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Figure 2: Proposed compound site location

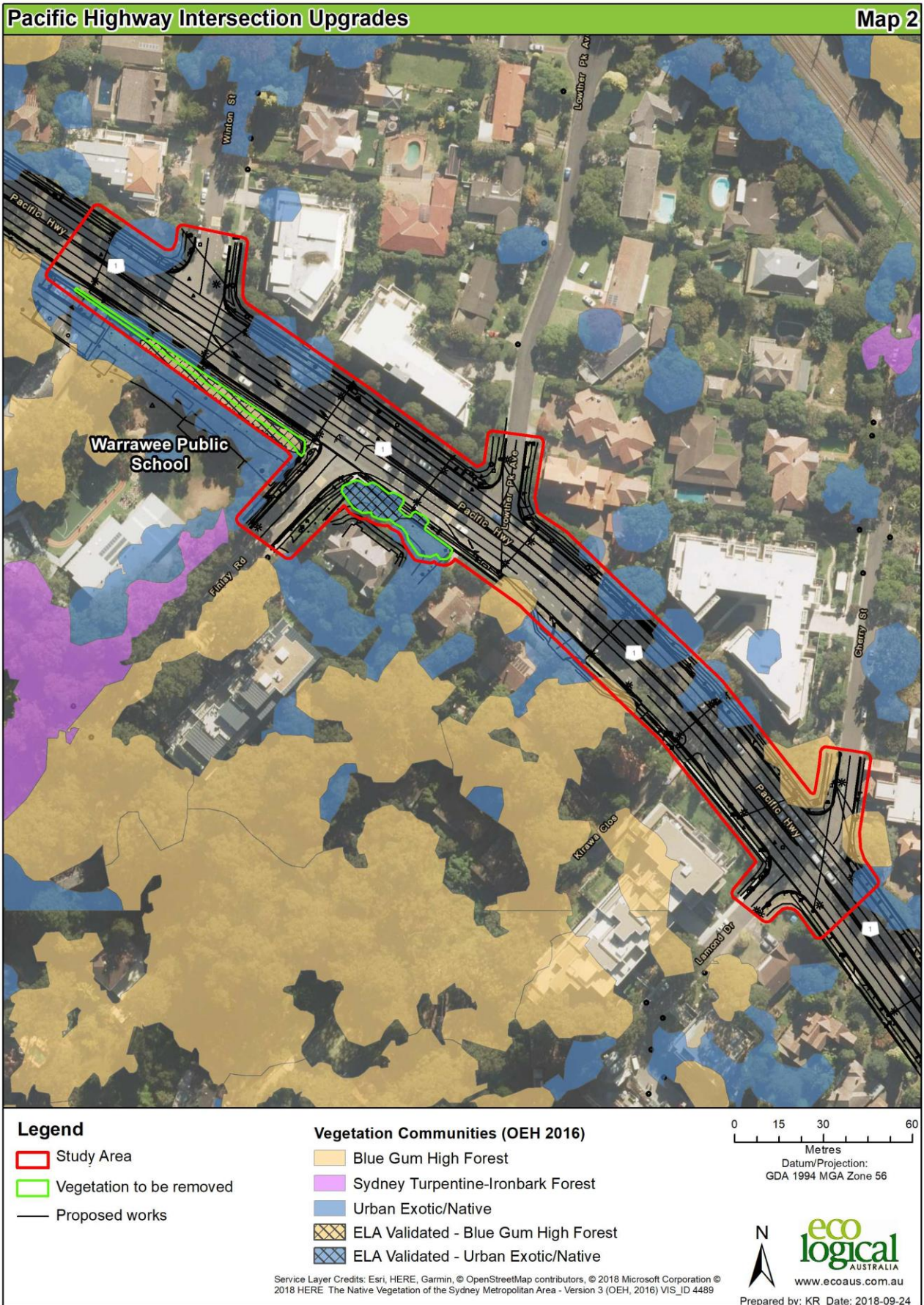
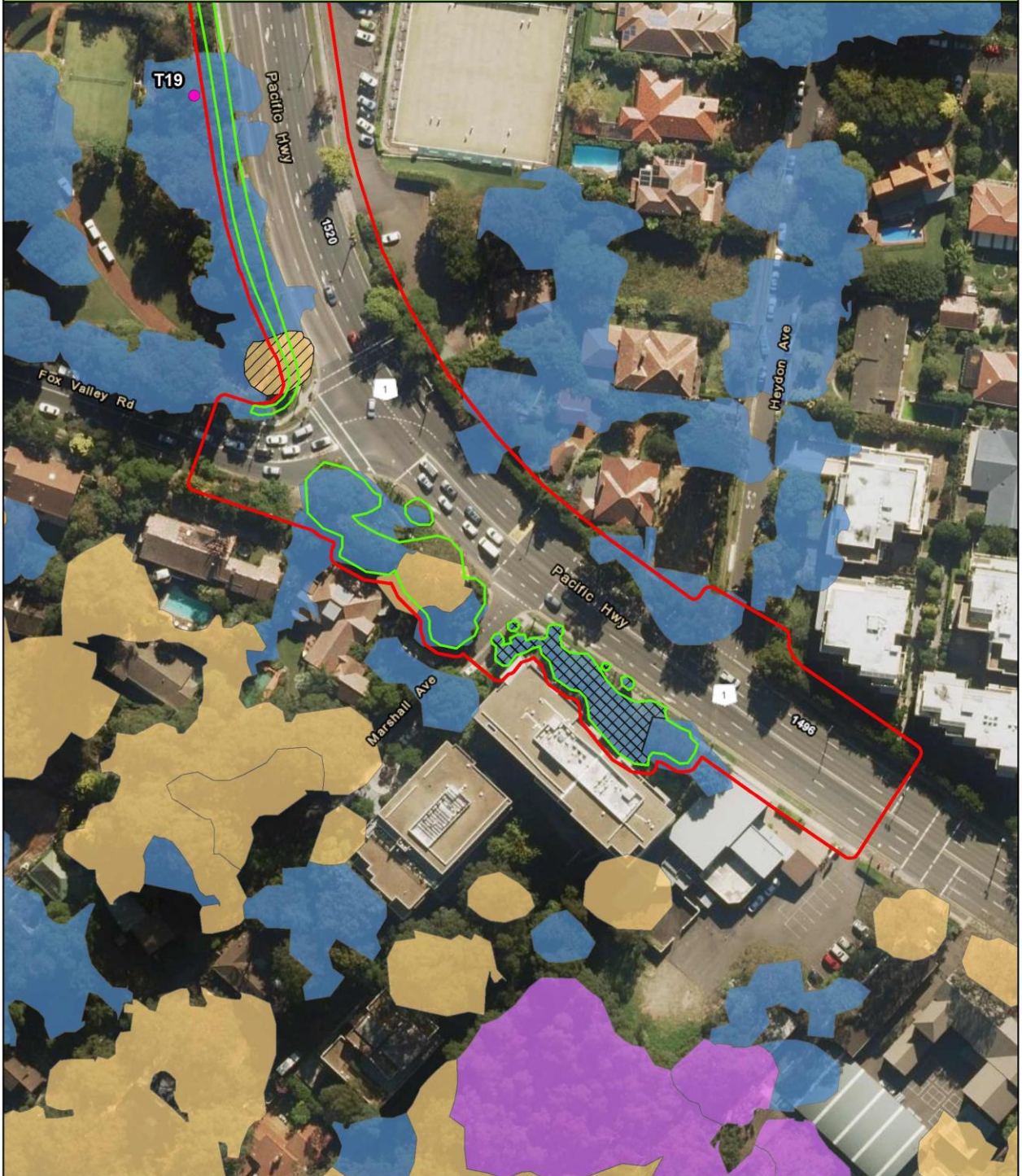


Figure 3: Vegetation communities, Intersection 1 - Finlay Road

Pacific Highway Intersection Upgrades Map 3

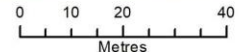


Legend

- Study Area
- Vegetation to be removed
- Tree 19 - *Syzygium paniculatum* (Magenta Cherry)

Vegetation Communities (OEH 2016)

- Blue Gum High Forest
- Sydney Turpentine-Ironbark Forest
- Urban Exotic/Native
- ELA Validated – Urban Exotic/Native not Blue Gum High Forest
- ELA Validated - Urban Exotic/Native



Datum/Projection:
GDA 1994 MGA Zone 56



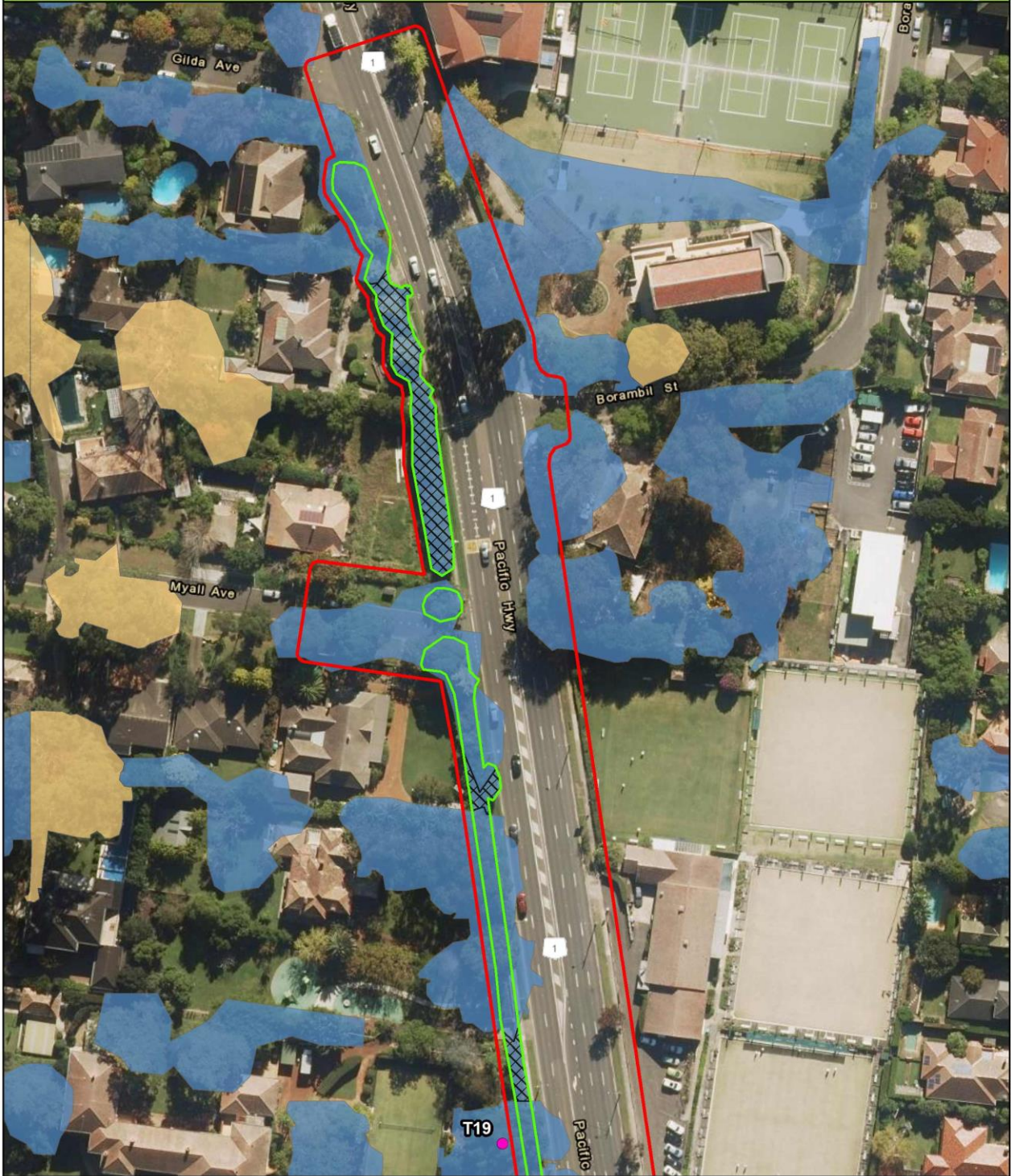
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Prepared by: KR Date: 2018-09-24

Figure 4: Vegetation communities, Intersection 2 - Fox Valley Road

Pacific Highway Intersection Upgrades Map 4

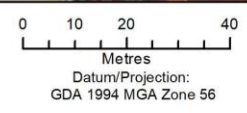


Legend

- Study Area
- Vegetation to be removed
- Tree 19 - *Syzygium paniculatum* (Magenta Cherry)

Vegetation Communities (OEH 2016)

- Blue Gum High Forest
- Urban Exotic/Native
- ELA Validated - Urban Exotic/Native



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Prepared by: KR Date: 2018-09-24

Figure 5: Vegetation communities, Intersection 2. Gilda Avenue and Myall Avenue



Figure 6: Vegetation communities, Intersection 3 - Coonanbarra Road and Redleaf Ave

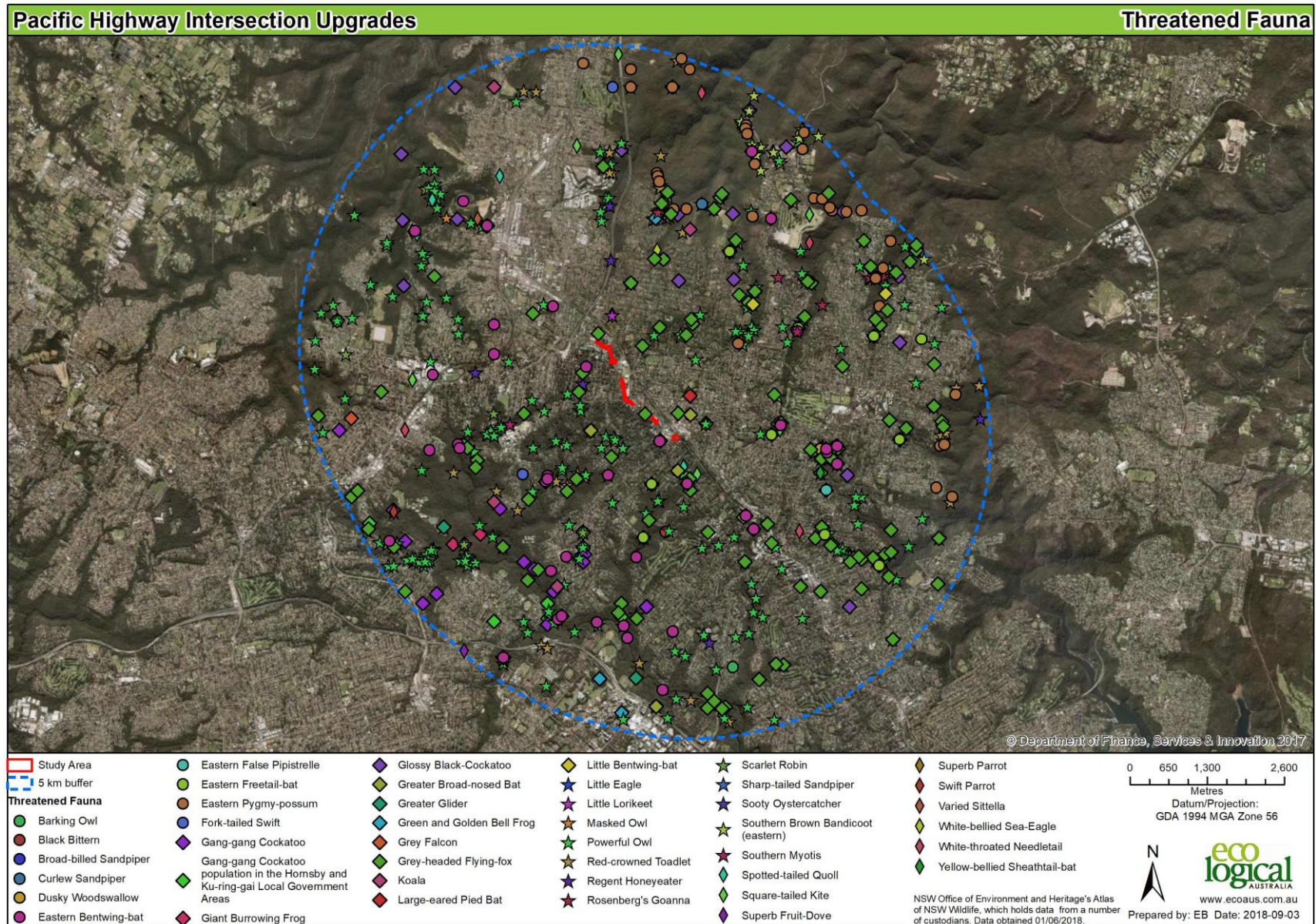


Figure 7: Threatened fauna species recorded within the locality

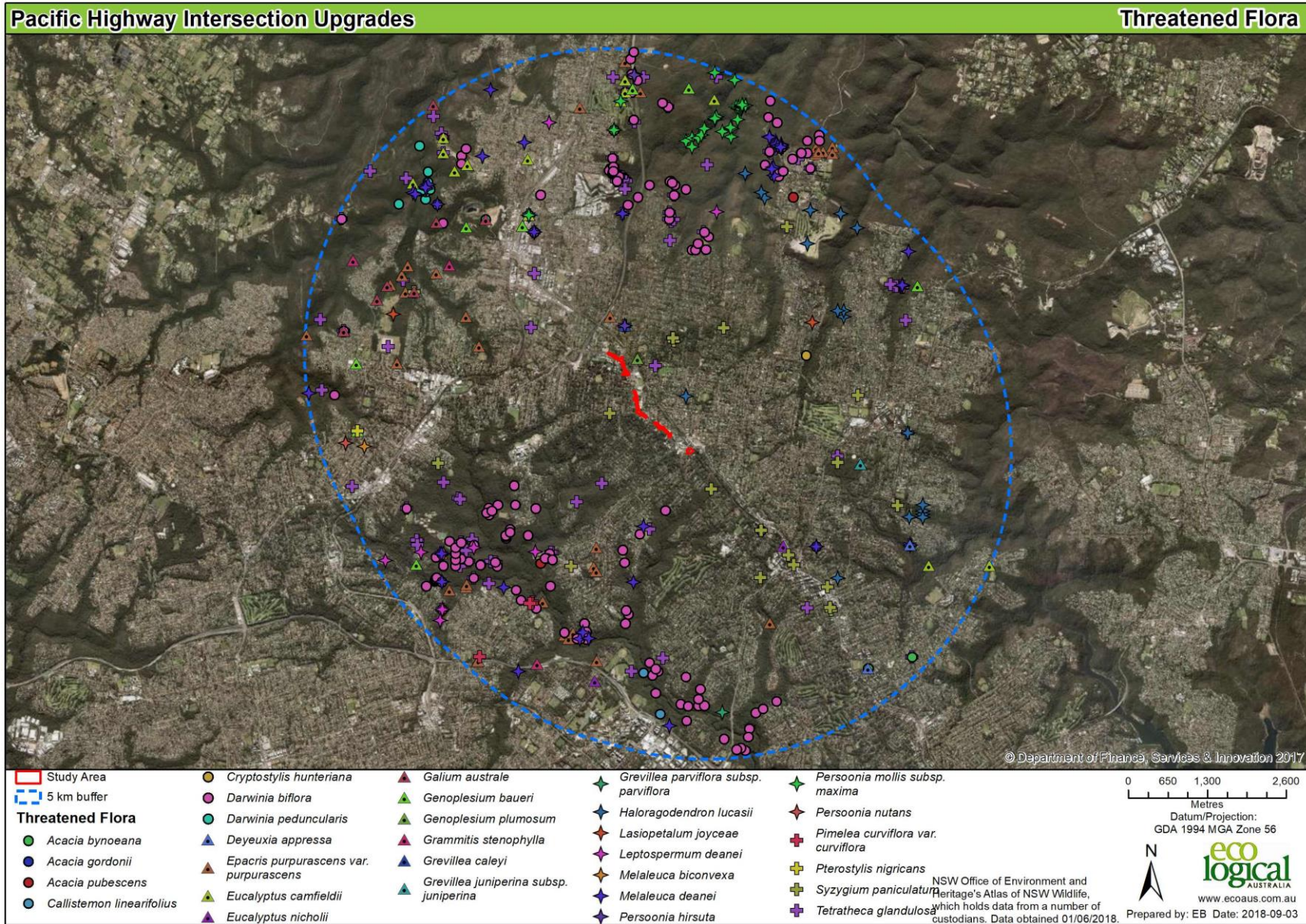


Figure 8: Threatened flora species recorded within the locality

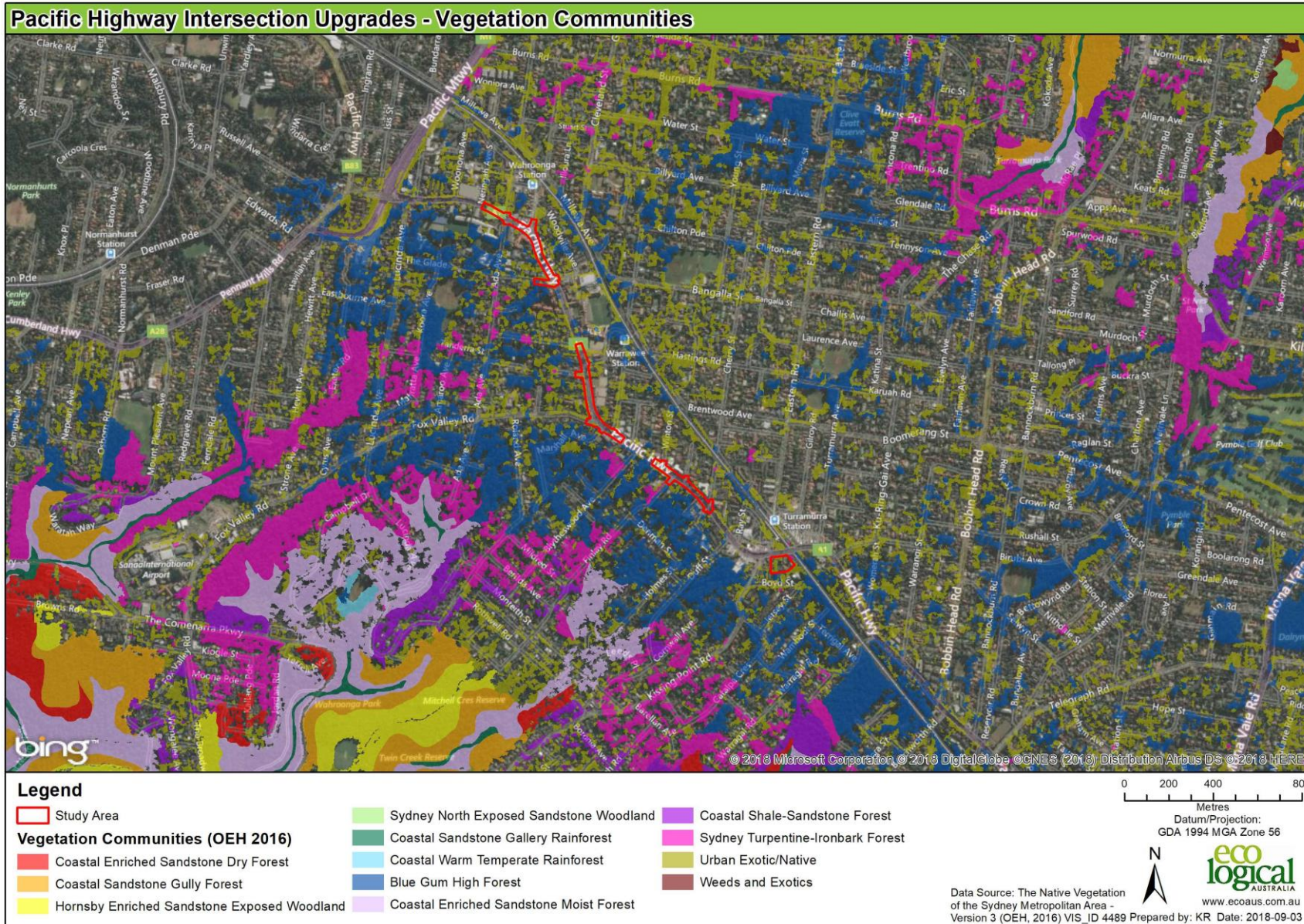


Figure 9: Overview of vegetation communities mapped within the locality (OEH 2016 – *The Native Vegetation of the Sydney Metropolitan Area*)

Appendix B: Proposed compound site

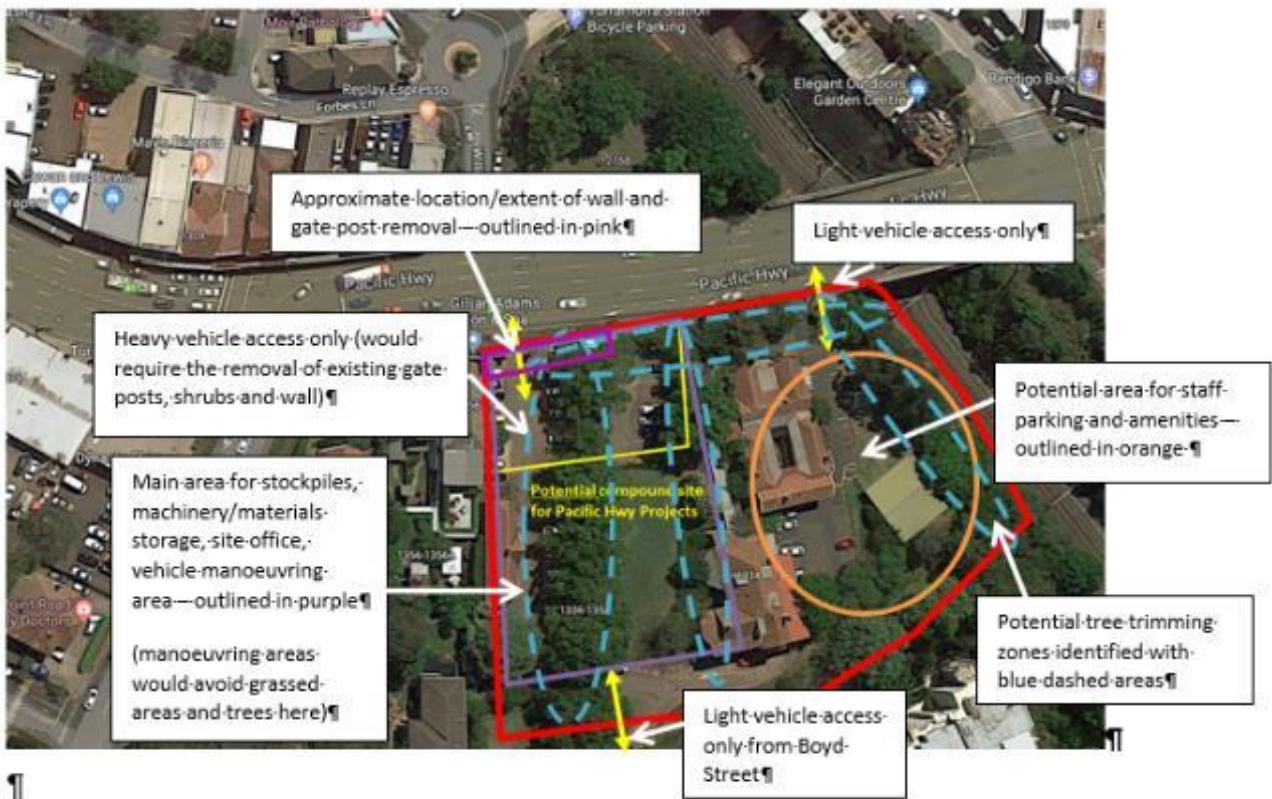


Figure 1: Proposed compound site location at 1334-1354 Pacific Highway, Turramurra (extent shown in red, potential access points shown in yellow)

Appendix C: Flora species recorded on site

Family	Scientific Name	Common Name	Status	Priority Weed	Closest Intersection
Amaryllidaceae	<i>Agapanthus</i> sp.	Agapanthus	Exotic		Redleaf Avenue, Turrumurra Avenue
Apocynaceae	<i>Nerium oleander</i>	Oleander	Exotic		Fox Valley Road, William Street
	<i>Murraya paniculata</i>	Murraya	Exotic		Finlay Road
Araceae	<i>Monstera deliciosa</i>	Fruit Salad Plant	Exotic		Turrumurra Avenue
Araliaceae	<i>Hedera helix</i>	English Ivy	Exotic		Redleaf Avenue, Kissing Point Road
Arecaceae	<i>Phoenix</i> sp.	Phoenix Palm	Exotic		Redleaf Avenue
Asphodelaceae	<i>Aloe vera</i>		Exotic		Redleaf Avenue
Asteraceae	<i>Gazania</i> sp.	Gazania	Exotic		Fox Valley Road
Bignoniaceae	<i>Jacaranda mimosifolia</i>	Jacaranda	Exotic		Redleaf Avenue, Finlay Road, Ray Street, Kissing Point Road, Turrumurra Avenue
	<i>Dolichandra unguis-cati</i>	Cat's Claw Creeper	Exotic		Finlay Road
Ericaceae	<i>Azalea</i> sp.		Exotic		Fox Valley Road
	<i>Rhododendron</i> sp.		Exotic		Fox Valley Road
Fabaceae - Caesalpinioideae	<i>Senna pendula</i> var. <i>glabrata</i>	Senna	Exotic		Redleaf Avenue
Fabaceae - Faboideae	<i>Erythrina x sykesii</i>	Coral Tree	Exotic		Neringah Avenue South
Fabaceae - Mimosoideae	<i>Acacia baileyana</i>	Cootamundra Wattle	Naturalised		Redleaf Avenue
	<i>Acacia parramattensis</i>	Parramatta Wattle	Native		Finlay Road
Fagaceae	<i>Quercus</i> sp.	Oak Tree	Exotic		Redleaf Avenue, Turrumurra Avenue
Hypericaceae	<i>Cinnamomum camphora</i>	Camphor Laurel	Exotic		Redleaf Avenue, Myall Avenue, Fox Valley Road, William Street
Lomandraceae	<i>Lomandra longifolia</i>	Spike-headed Mat-rush	Native		Redleaf Avenue, Ray Street
Lomariopsidaceae	<i>Nephrolepis cordifolia</i>	Fishbone Fern	Exotic		Redleaf Avenue
Musaceae	<i>Musa</i> sp.	Banana Tree	Exotic		Fox Valley Road
Myrtaceae	<i>Callistemon</i> sp.	Bottlebrush	Planted Native		William Street
	<i>Lophostemon confertus</i>	Brush Box	Planted Native		Redleaf Avenue
	<i>Eucalyptus microcorys</i>	Tallowwood	Native		Neringah Avenue South,

Family	Scientific Name	Common Name	Status	Priority Weed	Closest Intersection
					Myall Avenue, Finlay Road
	<i>Eucalyptus saligna</i>	Sydney Blue Gum	Native		Fox Valley Road, Finlay Road
	<i>Melaleuca</i> sp.	Tea Tree	Planted Native		William Street
	<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree	Native		Rohini Street
	<i>Syzygium paniculatum</i> *	Magenta Lilly Pilly	Planted Native		Fox Valley Road
	<i>Acmena smithii</i>	Lilly Pilly	Native		Kissing Point Road
	<i>Syzygium</i> sp.	Lilly Pilly	Native		Kissing Point Road, William Street
	<i>Tristaniopsis laurina</i>	Water Gum	Native		Neringah Avenue South
Oleaceae	<i>Ligustrum lucidum</i>	Broad-leaved Privet	Exotic	Regional : Other- Environmental	Redleaf Avenue, Turrumurra Avenue
	<i>Ligustrum sinense</i>	Small-Leaved Privet	Exotic	Regional : Other- Environmental	Redleaf Avenue
Ochnaceae	<i>Olea europaea</i> ssp. <i>cuspidata</i>	African Olive	Exotic	Regional priority - Containment	William Street, Turrumurra Avenue
Phormiaceae	<i>Pittosporum undulatum</i>	Sweet Pittosporum	Native		Redleaf Avenue, Finlay Road
Poaceae	<i>Setaria palmifolia</i>	Palm Grass	Exotic		Redleaf Avenue
Rosaceae	<i>Rosa rubiginosa</i>	Sweet Briar	Exotic		Redleaf Avenue
	<i>Prunus</i> sp.		Exotic		Redleaf Avenue
	<i>Eriobotrya japonica</i>	Loquat	Exotic		Myall Avenue, Fox Valley Road
	<i>Cotoneaster</i> sp.		Exotic		Neringah Avenue South
Rutaceae	<i>Murraya paniculata</i>	Murraya	Exotic		Redleaf Avenue, Finlay Road
Sapindaceae	<i>Acer pseudoplatanus</i>	False Plane-tree	Exotic		Neringah Avenue South, Fox Valley Road, Ray Street, Turrumurra Avenue
Solanaceae	<i>Physalis peruviana</i>	Cape Gooseberry	Exotic		William Street
Theaceae	<i>Camellia</i> sp.		Exotic		Redleaf Avenue, Fox Valley Road
Ulmaceae	<i>Celtis</i> sp.		Exotic		Redleaf Avenue, Turrumurra Avenue
Verbenaceae	<i>Lantana montevidensis</i>	Trailing Lantana	Exotic		Kissing Point Road

Appendix D: Likelihood of occurrence

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the database search. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the field survey and professional judgement. The terms for likelihood of occurrence are defined below:

- “yes” = the species was or has been observed on the site
- “likely” = a medium to high probability that a species uses the site
- “potential” = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- “unlikely” = a very low to low probability that a species uses the study area, and
- “no” = habitat on site and in the vicinity is unsuitable for the species.

An assessment of significance is conducted for threatened species or ecological communities that were recorded within the study area or had a higher likelihood of occurring and were not recorded during the site visit. It is noted that some threatened fauna species that are highly mobile, wide ranging and vagrant may use portions of the study area intermittently for foraging. For these fauna species, the habitat present and likely to be impacted is not considered to be important to the threatened species, particularly in relation to the amount of similar habitat remaining in the surrounding landscape. As such, an assessment of significance under State or Commonwealth legislation was not considered necessary

Assessments for the likelihood of occurrence were made both prior to field survey and following field survey. The pre-survey assessments were performed to determine which species were “affected species”, and hence determine which sorts of habitat to look for during field survey. The post-survey assessments to determine “final affected species” were made after observing the available habitat in the study area and are depicted in the table below.

The information provided in the habitat association column of the table below has been obtained from the NSW Threatened Species Profile (OEH 2017a)

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
Endangered ecological communities							
Blue Gum High Forest of the Sydney bioregion	Blue Gum High Forest	CE	CE	This community is a moist, tall open forest community, with dominant canopy trees of <i>E. saligna</i> and <i>E. pilularis</i> . <i>Allocasuarina torulosa</i> and <i>Angophora costata</i> also occur. Species adapted to moist habitat such as <i>Acmena smithii</i> , <i>Ficus coronata</i> , <i>Calochleana dubia</i> and <i>Adiantum aethiopicum</i> may also occur. It occurs only in areas where rainfall is high (above 1100 mm per year) and the soils are relatively fertile and derived from Wianamatta shale. In lower rainfall areas, it grades into Sydney Turpentine-Ironbark Forest. The rainforest understorey species rely on birds and mammals to disperse their seeds and are vulnerable to fire. Along the drier ridgelines, fire would have been more frequent and an important factor in maintaining understorey diversity. The community also occurs on soils associated with localised volcanic intrusions, 'diatremes'.	Local occurrence - 121 ha	Yes	Yes

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
Threatened Flora							
<i>Acacia bynoeana</i>	Bynoe's Wattle	E1	V	<i>Acacia bynoeana</i> is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains, and has recently been found in the Colymea and Parma Creek areas west of Nowra. It is found in heath and dry sclerophyll forest, typically on a sand or sandy clay substrate, often with ironstone gravels.	5	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Callistemon linearifolius</i>	Netted Brush Bottle	V		<i>Callistemon linearifolius</i> has been recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW, growing in dry sclerophyll forest. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River.	7	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V	V	Known from a range of vegetation types including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); where it prefers open areas in the understorey of this community and is often found in association	1	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
				with the Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>). Occurs in Coastal Plains Scribbly Gum Woodland and Coastal Plains Smoothed-barked Apple Woodland. Flowers between November and February.			
<i>Darwinia biflora</i>	<i>Darwinia biflora</i>	V	V	<i>Darwinia biflora</i> is an erect or spreading shrub to 80cm high associated with habitats where weathered shale capped ridges intergrade with Hawkesbury Sandstone, where soils have a high clay content.	182	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Deyeuxia appressa</i>	<i>Deyeuxia appressa</i>	E1	E	Almost nothing is known of the habitat and ecology of this highly restricted NSW endemic known only from two records in the Sydney area; first collected in 1930 at Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown; then collected in 1941 from Killara, near Hornsby.	3	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	<i>Epacris purpurascens</i> var. <i>purpurascens</i>	V		<i>Epacris purpurascens</i> var. <i>purpurascens</i> has been recorded between Gosford in the north to Avon Dam in the south, in a range of habitats, but most have a strong shale soil influence.	43	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V	Camfield's Stringybark occurs mostly in small scattered stands in exposed situations on sandstone plateaus, ridges and slopes near the coast, often on the boundary of tall coastal heaths or low open woodland. It grows in shallow sandy soils overlying Hawkesbury sandstone.	30	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	V	V	The Narrow-leaved Peppermint occurs in grassy or sclerophyll woodland, in association with other eucalypts that grow in the region, including New England Blackbutt (<i>E. andrewsii</i>) and many of the stringybarks, such as Broad-leaved Stringybark (<i>E. caliginosa</i>).The species is found on shallow, relatively infertile soils on shale and slate geology.	2	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Galium australe</i>	Tangled Bedstraw	E1		Recorded historically in the Nowra (Colymea) and Narooma areas; extant in Nadgee Nature Reserve, south of Eden. Unconfirmed records from the Sydney region. Turpentine forest and coastal Acacia shrubland in NSW. Elsewhere sand dunes, sand spits, shrubland and woodland.	7	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
<i>Genoplesium baueri</i>	Bauer's Midge Orchid	E1	E	Known from coastal areas from northern Sydney south to the Nowra district. Previous records from the Hunter Valley and Nelson Bay are now thought to be erroneous. Grows in shrubby woodland in open forest on shallow sandy soils.	19	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Genoplesium plumosum</i>	Tallong Midge Orchid	E4A	E	Known only around Tallong and a site in Morton National Park 8.5 km south-east of Wingello. "Heathland, generally dominated by <i>Kunzea parvifolia</i> (Violet Kunzea), <i>Calytrix tetragona</i> (Common Fringe-myrtle) and <i>Dillwynia</i> spp. (parrot-peas), on very shallow soils, often on sandstone conglomerate rock shelves.	1	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Grammitis stenophylla</i>	Narrow-leaf Finger Fern	E1		In NSW it has been found on the south, central and north coasts and as far west as Mount Kaputar National Park near Narrabri. Rainforest and moist eucalypt forest, usually near streams, on rocks or in trees.	3	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Grevillea caleyi</i>	Caley's Grevillea	E4A	CE	<i>Grevillea caleyi</i> is restricted to an 8 km square area around Terrey Hills, approximately 20 km north of Sydney. It occurs in three major areas of suitable habitat, namely Belrose, Ingleside and Terrey Hills / Duffys Forest within the Kuring-gai, Pittwater and Warringah LGAs. It occurs on ridgetops between elevations of	1	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
				170 to 240 m asl, on laterite soils in open or low open forests, generally dominated by <i>Eucalyptus sieberi</i> , <i>Corymbia gummifera</i> and <i>E. haemastoma</i> .			
<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	Juniper-leaved Grevillea	V		<i>Grevillea juniperina</i> subsp. <i>juniperina</i> is endemic to Western Sydney, centred on an area bounded by Blacktown, Erskine Park, Londonderry and Windsor with outlier populations at Kemps Creek and Pitt Town. It grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium, typically containing lateritic gravels (DECC 2007).	1	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	V	V	Sporadically distributed throughout the Sydney Basin mainly around Picton, Appin and Bargo. Separate populations are also known further north from Putty to Wyong and Lake Macquarie and Cessnock and Kurri Kurri. It grows in sandy or light clay soils over thin shales, often with lateritic ironstone gravels. It often occurs in open, slightly disturbed sites such as tracks.	1	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Haloragodendron lucasii</i>		E1	E	Very narrow distribution on the north shore of Sydney. Associated with low woodland on sheltered slopes near creeks on moist loamy	33	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
				sand on bench below small sandstone cliff lines, with continuous seepage.			
<i>Lasiopetalum joyceae</i>	Lasiopetalum joyceae	V	V	Grows in ridgetop woodland, heath, woodland or open scrub, often with a clay influence.	5	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Leptospermum deanei</i>	Leptospermum deanei	V	V	Previously recorded in Hornsby, Warringah, Ku-ring-gai and Ryde LGAs, in woodland on lower hill slopes or near creeks, at sites with sandy alluvial soil or sand over sandstone. It has also been recorded in riparian scrub dominated by <i>Tristaniopsis laurina</i> and <i>Baeckea myrtifolia</i> ; woodland dominated by <i>Eucalyptus haemastoma</i> ; and open forest dominated by <i>Angophora costata</i> , <i>Leptospermum trinervium</i> and <i>Banksia ericifolia</i> .	15	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	Occurs in coastal districts and adjacent tablelands from Jervis Bay north to the Port Macquarie district. It grows in damp places often near streams.	1	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
<i>Melaleuca deanei</i>	Deane's Paperbark	V	V	Found in heath on sandstone, and also associated with woodland on broad ridge tops and slopes on sandy loam and lateritic soils.	54	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Persoonia hirsuta</i>	Hairy Geebung	E1	E	Scattered distribution around Sydney, from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	5	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Persoonia mollis</i> subsp. <i>maxima</i>	<i>Persoonia mollis</i> subsp. <i>maxima</i>	E1	E	Deep gullies or on the steep upper hillsides of narrow gullies incised from Hawkesbury Sandstone, characterised by steep side slopes, rocky benches and broken scarps, with creeks fed by small streams and intermittent drainage depressions. Occurrences of this plant have been recorded on the dry upper-hillsides of gullies and in more exposed aspects.	49	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Persoonia nutans</i>	Nodding Geebung	E1	E	Associated with dry woodland, Castlereagh Scribbly Gum Woodland, Agnes Banks Woodland and sandy soils associated with tertiary alluvium, occasionally poorly drained. Endemic to the Western Sydney.	1	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
<i>Pimelea curviflora</i> var. <i>curviflora</i>	Pimelea curviflora var. curviflora	V	V	<i>Pimelea curviflora</i> var. <i>curviflora</i> is confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. It grows on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Flowers October to May.	5	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Pterostylis nigricans</i>	Dark Greenhood	V	-		1	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E1	V	This species occupies a narrow coastal area between Bulahdelah and Conjola State Forests in NSW. On the Central Coast, it occurs on Quaternary gravels, sands, silts and clays, in riparian gallery rainforests and remnant littoral rainforest communities. In the Ourimbah Creek valley, <i>S. paniculatum</i> occurs within gallery rainforest with <i>Alphitonia excelsa</i> , <i>Acmena smithii</i> , <i>Cryptocarya glaucescens</i> , <i>Toona ciliata</i> , <i>Syzygium oleosum</i> with emergent <i>Eucalyptus saligna</i> . At Wyrabalong NP, <i>S. paniculatum</i> occurs in littoral rainforest as a co-dominant with <i>Ficus fraseri</i> , <i>Syzygium oleosum</i> , <i>Acmena smithii</i> , <i>Cassine australe</i> , and <i>Endiandra sieberi</i> .	21	One planted specimen observed on-site.	No. Species widely in cultivation, specimen observed was planted. Limited suitable habitat available within the study area.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
<i>Tetratheca glandulosa</i>	Tetratheca glandulosa	V		Associated with ridgetop woodland habits on yellow earth, also in sandy or rocky heath and scrub. Often associated with sandstone / shale interface where soils have a stronger clay influence.	131	Unlikely. Not observed during field survey.	No. Limited suitable habitat available within the study area.
<i>Reptiles</i>							
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V		Heath, open forest and woodland.	13	No. Suitable habitat not recorded during site inspection.	No
<i>Amphibians</i>							
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	Forages in woodlands, wet heath, dry and wet sclerophyll forest. Associated with semi-permanent to ephemeral sand or rock based streams, where the soil is soft and sandy so that burrows can be constructed.	3	No. Suitable habitat not recorded during site inspection.	No
<i>Litoria aurea</i>	Green and Golden Bell Frog	E1	V	Marshes, dams and stream-sides, particularly those containing <i>Typha</i> spp. (bullrushes) or <i>Eleocharis</i> spp. (spikerushes). Some populations occur in highly disturbed areas.	3	No. Suitable habitat not recorded during site inspection.	No

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V		Open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.	91	No. Suitable habitat not recorded during site inspection.	No
<i>Mammals (excluding bats)</i>							
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V		Rainforest, sclerophyll forest (including Box-Ironbark), woodland and heath.	47	Unlikely. Preferred habitat not recorded within study area. Foraging habitat limited within impact area.	No. Foraging habitat within study area is limited compared with habitat available in locality.
<i>Petauroides volans</i>	Greater Glider		V	Prefers older forests including tall open woodland, eucalypt forests and low woodlands with a large number of hollows.	2	Unlikely. Preferred habitat not recorded within study area. Foraging habitat limited within impact area.	No. Foraging habitat within study area is limited compared with habitat available in locality.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	6	No. Preferred habitat not recorded within study area. Foraging habitat limited within impact area.	No
<i>Isodon obesulus</i> <i>obesulus</i>	Southern Brown Bandicoot (eastern)	E1	E	Inhabits a variety of habitats including heathland, shrubland, sedgeland, heathy open forest and woodland and are usually associated with infertile, sandy and well drained soils, but can be found in a range of soil types. Within these vegetation communities they typically inhabit areas of dense ground cover. Patches of native or exotic vegetation, within their distribution, which contains understorey vegetation structure with 50–80% average foliage density in the 0.2–1 m height range. In areas where native habitats have been degraded or diminished, exotic vegetation, such as Blackberry (<i>Rubus</i> spp.), can and often does, provide important habitat.	23	No. Preferred habitat not recorded within study area. Foraging habitat limited within impact area.	No. Foraging habitat within study area is limited compared with habitat available in locality.
<i>Phascolarctos cinereus</i>	Koala	V	V	Koala habitat can be broadly defined as any forest or woodland containing species that are known koala food trees, or shrubland with emergent food trees. The distribution of this	5	No. Preferred habitat not recorded within study area.	No. Foraging habitat within study area is limited

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
				habitat is largely influenced by land elevation, annual temperature and rainfall patterns, soil types and the resultant soil moisture availability and fertility. Preferred food and shelter trees are naturally abundant on fertile clay soils. Koalas are also known to occur in modified or regenerating native vegetation communities, as well as urban and rural landscapes where food trees or shelter trees may be highly scattered.		Foraging habitat limited within impact area.	compared with habitat available in locality.
Aves							
<i>Anthochaera phrygia</i>	Regent Honeyeater	C4A	CE	Associated with temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts, and riparian forests of River Oak (<i>C. cunninghamiana</i>). It primarily feeds on nectar from box and ironbark eucalypts and occasionally from Banksia's and mistletoes. It is reliant on locally abundant nectar sources with different flowering times to provide reliable supply of nectar. Suitable habitat likely to be present within the Precinct.	7	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Apus pacificus</i>	Fork-tailed Swift		Mi	Sometimes travels with Needletails. Varied habitat with a possible tendency to more arid areas but also over coasts and urban areas.	7	No. Suitable habitat not available in study area.	No.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
							Highly mobile and vagrant species.
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow			The Dusky Woodswallow is found in open forests and woodlands, and may be seen along roadsides and on golf courses. The Dusky Woodswallow nests colonially in 'neighbourhoods'. The nest is a loose bowl of twigs, grass and roots, lined with fine grass, and is placed in a tree fork, behind bark, in a stump hollow or in a fence post, about 1 m - 10 m above the ground.	1	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper		MI	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	9	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Calidris ferruginea</i>	Curlew Sandpiper	E1	CE; Mi	Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	5	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas	E2,V		Forest and woodland, urban fringes.	53	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		Tall mountain forests and woodlands in summer; in winter, may occur at lower altitudes in open eucalypt forests and woodlands, and urban areas.	54	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V		Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	34	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Inhabits eucalypt forests and woodlands, mallee and <i>Acacia</i> woodland.	5	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Falco hypoleucos</i>	Grey Falcon	E1		Shrubland, grassland and wooded watercourses, occasionally in open woodlands near the coast, and near wetlands.	1	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V		Rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	3	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V		Forages over large open fresh or saline waterbodies, coastal seas and open terrestrial areas. Breeding habitat consists of tall trees, mangroves, cliffs, rocky outcrops, silts, caves and crevices and is located along the coast or major rivers. Breeding habitat is usually in or close to water, but may occur up to a kilometre away.	5	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Hieraetus morphnoides</i>	Little Eagle	V		Open eucalypt forest, woodland or open woodland, including sheoak or <i>Acacia</i> woodlands and riparian woodlands of interior NSW.	8	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Hirundapus caudacutus</i>	White-throated Needletail		Mi	Forages aerially over a variety of habitats usually over coastal and mountain areas, most likely with a preference for wooded areas. Has been observed roosting in dense foliage of canopy trees, and may seek refuge in tree hollows in inclement weather	38	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
<i>Ixobrychus flavicollis</i>	Black Bittern	V		Terrestrial and estuarine wetlands. Also flooded grassland, forest, woodland, rainforest and mangroves where permanent water is present.	1	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Lathamus discolor</i>	Swift Parrot	E1	CE	Breeds in Tasmania between September and January. Migrates to mainland in autumn, where it forages on profuse flowering Eucalypts. Hence, in this region, autumn and winter flowering eucalypts are important for this species. Favoured feed trees include winter flowering species such as Swamp Mahogany (<i>Eucalyptus robusta</i>), Spotted Gum (<i>Corymbia maculata</i>), Red Bloodwood (<i>C. gummifera</i>), Mugga Ironbark (<i>E. sideroxylon</i>), and White Box (<i>E. albens</i>).	1	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Lophoictinia isura</i>	Square-tailed Kite	V		Timbered habitats including dry woodlands and open forests, particularly timbered watercourses.	10	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Petroica boodang</i>	Scarlet Robin	V		Dry eucalypt forests and woodlands, and occasionally in mallee, wet forest, wetlands and tea-tree swamps.	4	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
<i>Polytelis swainsonii</i>	Superb Parrot	V	V	Box-gum woodland, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest.	1	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	V		Rainforest and closed forests. May also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	6	No. Suitable habitat not available in study area.	No. Highly mobile and vagrant species.
<i>Bats</i>							
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country. Roosts in caves, rock overhangs and disused mine shafts.	1	Unlikely. Preferred habitat not available within the study area.	No
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		Tall (greater than 20m) moist habitats.	3	Unlikely. Preferred habitat not available within the study area.	No
<i>Miniopterus australis</i>	Little Bentwing-bat	V		Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca	5	Unlikely. Preferred habitat not available	No

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
				swamps, dense coastal forests and banksia scrub.		within the study area.	
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	48	Unlikely. Preferred habitat not available within the study area.	No
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V		Dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	15	Unlikely. Preferred habitat not available within the study area.	No
<i>Myotis macropus</i>	Southern Myotis	V		Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20m.	3	Unlikely. Preferred habitat not available within the study area.	No
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas. Camps are often located in gullies, typically close to water, in vegetation with a dense canopy.	1060	Potential. Known within locality	No. Highly mobile species. Breeding habitat not present within

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
							the study area Habitat abundant in locality.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		Almost all habitats, including wet and dry sclerophyll forest, open woodland, open country, mallee, rainforests, heathland and waterbodies.	4	Unlikely. Preferred habitat not available within the study area.	No
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		Woodland, moist and dry eucalypt forest and rainforest.	4	Unlikely. Preferred habitat not available within the study area.	No
<i>Nocturnal aves</i>							
<i>Ninox connivens</i>	Barking Owl	V		Woodland and open forest, including fragmented remnants and partly cleared farmland, wetland and riverine forest.	2	Unlikely	No. Highly mobile species. Breeding habitat not present within the study area Habitat

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	No of records within 5 km radius	Likelihood of occurrence	Test for significant impact required?
							abundant in locality.
<i>Ninox strenua</i>	Powerful Owl	V		Woodland open sclerophyll forest, tall open wet forest and rainforest.	275	Potential	No. Highly mobile species. Breeding habitat not present within the study area Habitat abundant in locality.
<i>Tyto novaehollandiae</i>	Masked Owl	V		Dry eucalypt forests and woodlands from sea level to 1100 m.	2	Unlikely	No. Highly mobile species. Breeding habitat not present within the study area Habitat abundant in locality.

Appendix E: Assessment of Significance

The Assessment of Significance (5-part test) conducted in this report is applied to species, populations and ecological communities listed in the BC Act that are known, likely or have the potential to be impacted by the development. The assessment sets out five factors, which when considered, allow proponents to undertake a qualitative analysis of the likely impacts of an action and to determine whether further assessment is required via a Species Impact Statement (SIS). All factors must be considered and an overall conclusion made based on all factors in combination. An SIS is required if, through application of the 5-part test, an action is considered likely to have a significant impact on a listed threatened species, population or ecological community.

Blue Gum High Forest

This community is a moist, tall open forest community, with dominant canopy trees of *Eucalyptus saligna* and *Eucalyptus pilularis*. *Allocasuarina torulosa* and *Angophora costata* also occur. Species adapted to moist habitat such as *Acmena smithii*, *Ficus coronata*, *Calochlaena dubia* and *Adiantum aethiopicum* may also occur. It occurs in areas where rainfall is high (above 1100 mm per year) and the soils are relatively fertile and derived from Wianamatta shale. In lower rainfall areas, it grades into Sydney Turpentine-Ironbark Forest. The rainforest understorey species rely on birds and mammals to disperse their seeds and are vulnerable to fire.

Blue Gum High Forest present within the study area comprised seven *E. saligna* a key diagnosis canopy species and four mid-storey individuals, including two possibly planted *A. parramattensis* and two possibly planted *P. undulatum*. The validated BGHF areas are shown in **Figures 3** and **4**. No BGHF groundcover species were observed.

A total of 0.02 ha of Blue Gum High Forest would be cleared for the proposed road widening, representing less than 0.03% of the local (within 1 km radius) BGHF extent (121 ha).

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

BGHF is a critically endangered ecological community and therefore this question is not applicable.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Actions that are likely to have an adverse effect on the extent of a local occurrence of BGHF include direct clearing of vegetation and indirect effects such as inappropriate water run-off, which leads to increased nutrients, erosion and sedimentation, weed invasion, particularly woody, smothering and grassy weeds and inappropriate fire regimes, which would alter the floristic and structural diversity.

Blue Gum High Forest present within the study area comprised seven *E. saligna* a key diagnosis canopy species and four mid-storey individuals, including two possibly planted *A. parramattensis* and two possibly planted *P. undulatum*. A total of 0.03 ha of Blue Gum High Forest would be cleared for the proposed road widening, representing less than 0.03% of the local (within 1km radius) BGHF extent (121 ha).

In consideration of the above, it is unlikely that the proposal would adversely affect the extent of the community, such that its local occurrence is placed at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

The vegetation to be cleared represents 0.02 ha of degraded Blue Gum High Forest and consists of seven *E. saligna* a key diagnosis canopy species and four mid-storey individuals, including two possibly planted *A. parramattensis* and two possibly planted *P. undulatum*. The community generally exists as canopy trees over an understorey of exotic and garden species. These BGHF species identified within the study area are common and widespread among BGHF patches, including the extent of the community in the locality and beyond. Furthermore, higher quality patches of BGHF such as the occurrence in Dalrymple Hay Nature Reserve, will not be impacted by the works, and contain a diverse range of BGHF species in each vegetative strata.

Whilst there will be a small (less than 0.03%) direct impact on the local occurrence, the proposed development will not substantially or adversely modify the composition of the community such that the local occurrence is placed at risk of extinction.

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

The small amount of vegetation to be removed represents 0.02 ha of degraded Blue Gum High Forest present within the study area comprised of seven *E. saligna* canopy trees and four mid-storey individuals, including two possibly planted *A. parramattensis* and two possibly planted *P. undulatum*. The total of area Blue Gum High Forest cleared for the proposed road widening, represents less than 0.03% of the local BGHF extent (121 ha) (within 1km radius).

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

The local occurrence of BGHF is already fragmented by existing urban development. The proposal would not increase this fragmentation or contribute to further isolation of BGHF in the locality. Removal of 0.02 ha of a common canopy species and mid-storey (possibly planted) would not result in fragmentation or isolation of these patches.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The area of BGHF in the study area is small, of poor quality and contains seven *E. saligna* individuals and four native mid-storey individuals, intermixed with exotic garden species and weeds, with no BGHF groundcovers present. The BGHF within the study area is of similar or poorer quality to the BGHF that would remain in the locality (e.g. Dalrymple Hay Nature Reserve represents a high quality patch and occurs in the locality). The site is not currently managed for conservation and is unlikely to be returned to a diverse state with all structural layers present. While the patch is present within the study area, it is unlikely to be a patch of great connective importance to BGHF in the locality. Therefore, the BGHF within the study area is not considered to be important to the survival of the EEC in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

No declared area of outstanding biodiversity value has been identified within the study area.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

A key threatening process (KTP) is defined under the BC Act as “*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*”.

KTPs that are relevant to the proposal and BGHF include:

- clearing of native vegetation
- invasion of native plant communities by exotic perennial grasses
- loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.

While the proposal involves the clearing of a limited extent of BGHF in the locality (seven canopy trees and four mid-storey individuals), the clearing occurs in a modified environment with a primarily exotic understorey containing a high diversity of weeds. Thus, the vegetation is considered to be in low condition and it does not contain native vegetation across all strata.

Conclusion

Approximately 0.02 ha of BGHF in a highly modified condition will be impacted by the proposed development. The proposal is unlikely to have a significant impact upon the BGHF because:

- The local occurrence of this community would not be placed at risk of extinction.
- The viability of the local occurrence of this community would not be reduced.
- The works would not increase fragmentation or modify the composition of the local occurrence of the community.

Therefore, the proposal is unlikely to have a significant impact on BGHF and a Species Impact Statement (SIS) is not required.

Pacific Highway Intersection Upgrades in Wahroonga

Landscape Character and Visual Impact Assessment

Client: Road and Maritime Services - Easing Sydney's Congestion

ABN: N/A

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Table of Contents

Executive Summary		iv
Introduction		iv
Report Scope and Purpose		iv
Proposal Background and Objectives		iv
Proposal Description		v
Methodology		vi
Existing Environment		vi
Landscape Character Zones		vii
Urban Design Strategy		viii
Landscape Character Impact Assessment		ix
Summary of Visual Impacts		ix
Mitigation Measures		x
Operational Mitigation Measures		xi
Mitigation Measures for Construction Activities		xi
Conclusion		xii
1.0 Introduction		1
1.1 Report Scope and Purpose		1
1.2 Proposal Background and Objectives		1
1.2.1 Proposal Background		1
1.2.2 Proposal Objectives		2
1.3 Proposal Description		3
1.3.1 Intersection 3: Pacific Highway at Redleaf Avenue and Coonanbarra Road, Wahroonga		3
1.3.2 Construction compound site		4
1.4 Study Area		5
1.5 Methodology		6
1.5.1 Landscape Character Assessment Method		6
1.5.2 Visual Impact Assessment Method		7
2.0 Existing Environment		9
2.1 Site Context		9
2.2 Built Form, Land use and Heritage		10
2.3 Landscape Character Zones		16
2.3.1 LCZ 1: Infrastructure Corridor		17
2.3.2 LCZ 2: Mixed Use Development Corridor		18
2.3.3 LCZ 3: Residential Development		20
2.3.4 LCZ 4: Recreational Open Space		21
2.3.5 LCZ 5: Local Centres		23
3.0 Urban Design Strategy		26
3.1 Urban Design Objectives and Principles		26
3.2 Requirements of planning documents		28
3.2.1 Ku-ring-gai Local Environmental Plan 2015		28
3.2.2 Ku-ring-gai Local Environmental Plan (Local Centres) 2012		29
3.2.3 Ku-ring-gai Development Control Plan 2017		29
3.2.4 Ku-ring-gai Local Centres Development Control Plan 2012		30
4.0 Landscape Character Impact Assessment		31
4.1 LCZ 1: Infrastructure Corridor		31
4.2 LCZ 2: Mixed Use Development Corridor		31
4.3 LCZ 3: Residential Development		33
4.4 LCZ 4: Recreational Open Space		34
4.5 LCZ 5: Local Centres		35
5.0 Visual Impact Assessment		37
5.1 Intersection 3: Pacific Highway at Redleaf Avenue and Coonanbarra Road, Wahroonga		37
5.1.1 Visibility of the Proposal		40
5.1.2 Visual Receptors		41
5.1.3 Representative Viewpoints		41

5.2	Construction Compound Site	48
5.2.1	Visibility of Proposal	48
5.2.2	Visual Receptors	48
5.2.3	Representative Viewpoints	48
5.3	Cumulative Visual Impact on Views along the Pacific Highway	54
6.0	Summary and Mitigation Measures	56
6.1	Summary of Landscape Character Impacts	56
6.2	Summary of Visual Impacts	56
6.3	Mitigation Measures	58
6.3.1	Operational Mitigation Measures	58
6.3.2	Mitigation Measures for Construction Activities	58
7.0	Conclusion	60
8.0	References	61
Appendix A		62
	Detailed design drawings of the Proposal (Intersection 3)	62

Executive Summary

Introduction

Report Scope and Purpose

AECOM has been appointed by Roads and Maritime Services NSW (Roads and Maritime) to undertake a Landscape Character and Visual Impact Assessment (LCVIA) to assess the impact of the Pacific Highway Intersection Upgrades in Wahroonga proposed at Redleaf Avenue and Coonanbarra Road in the suburb of Wahroonga (hereafter known as 'the Proposal') on landscape character and views, in order to inform the Project Review of Environmental Factors (REF) for the proposed works. The Proposal also includes the use of a temporary construction compound site in Turramurra.

This assessment includes a desktop review of the Proposal components during construction (the temporary construction compound at Turramurra), at operation (the upgraded intersection at Wahroonga), an inspection of the Proposal area and surrounding landscape, an assessment of the cumulative impacts of the Proposal and the approved future upgrades to two intersections along the Pacific Highway between Wahroonga and Turramurra just south of the Proposal (assessed in *Pacific Highway Intersection Upgrades Landscape Character and Visual Impact Assessment* (Prepared by AECOM, 19 October 2018), and the development of an urban design strategy informed by *Beyond the Pavement: Urban Design Policy Procedures and Design Principles* (Roads and Maritime, 2014).

A series of recommendations and mitigation measures have been proposed as a result of this assessment which have been informed by the urban design strategy.

Proposal Background and Objectives

Easing Sydney's Congestion Program Office (ESCPO) under Roads and Maritime is developing projects on the State Road Network in accordance with government initiatives for managing and improving traffic congestion and road safety within the Sydney region. The Pinch Point Program is one of many ESCPO initiatives that aim to provide an effective short-term solution and long-term proposal in planning for the improvement of severe congestion points.

Roads and Maritime propose to upgrade an intersection on the Pacific Highway at Coonanbarra Road and Redleaf Avenue in Wahroonga (originally referred to as 'Intersection 3' as part of a wider group of intersection upgrades on the Pacific Highway between Turramurra and Wahroonga). The proposal (as a whole) would ultimately result in the provision of three continuous through lanes in the northbound direction of the Pacific Highway between the M1 Pacific Motorway and Munderah Street for a length of about one kilometre.

The intersection locations subject to this proposal originally formed part of a wider road project in Wahroonga, Warrawee and Turramurra involving the following two intersections (refer Figure i):

- Pacific Highway at Finlay Road, Warrawee/Turramurra (referred to as 'Intersection 1' under the original scope); and
- Pacific Highway at Fox Valley Road, Wahroonga/Warrawee (referred to as 'Intersection 2' under the original scope).

The Proposal area was originally referred to as 'Intersection 3' under this scope until it was removed from the project scope following community consultation in 2018.

The project involving Intersections 1 and 2 has recently received environmental approval in April 2019.

The high level objectives for ESCPO are to:

- Optimise the existing road network, improving travel reliability;
- Improve access throughout Sydney; and
- Implement an integrated approach to infrastructure for urban renewal.

In line with the above objectives, the primary objective for the Proposal is to reduce congestion along the Pacific Highway at Wahroonga by providing for three continuous lanes of traffic in the northbound direction of the road corridor at this location. Other objectives include:

- Improve northbound traffic flow by providing three continuous through lanes along the Pacific Highway between 150 metres south and 150 metres north of Redleaf Avenue.
- Improve traffic safety at the intersection of Redleaf Avenue and the Pacific Highway.
- Improve traffic safety by providing a larger curve radius and wider kerbside lanes at the northbound direction of the Pacific Highway.

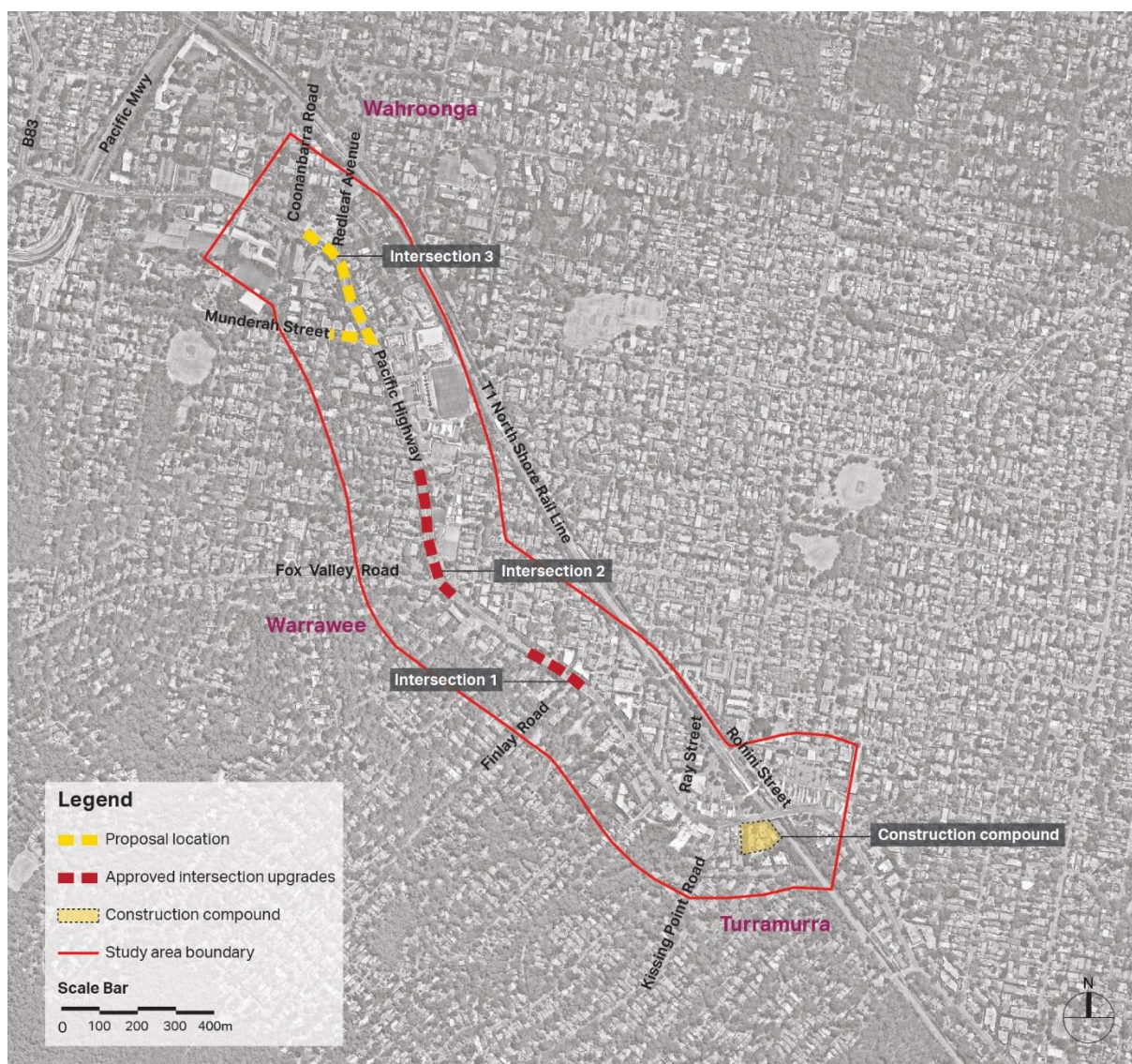


Figure i The original project scope comprised upgrades at three intersection locations (referred to as Intersections 1, 2 and 3) along the Pacific Highway at Wahroonga, Warrawee and Turramurra, and the temporary use of a construction compound site at Turramurra

Proposal Description

The Proposal involves the improvement along a section of the Pacific Highway at Coonanbarra Road and Redleaf Avenue, Wahroonga (also referred to as 'Intersection 3' for the purposes of this report).

The Proposal would ultimately provide three continuous through lanes in the northbound direction on the Pacific Highway at Wahroonga. Potential upgrades would include road widening as well as adjustments to traffic lanes, medians, traffic lights, footpaths, drainage, utilities and road pavement. Road widening would require strip acquisition and property adjustments to one private property on the northbound side of the Pacific Highway.

The Proposal also includes a temporary construction compound site at 1334-1354 Pacific Highway in Turramurra (the community health centre and carpark). This site is heritage listed and located within a Heritage Conservation Area (HCA) under the Ku-ring-gai Local Environment Plan (Local Centres) 2012. The construction compound would include a site office; stockpile areas; concrete washout areas; a laydown hardstand for materials; staff parking; generators; fuel stores; vehicle circulation areas; amenity areas and areas for refuelling of plant and equipment.

Refer Section 1.3 for a detailed description of the Proposal.

Methodology

This LCVIA has been undertaken in accordance with Roads and Maritime's *Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment* (Reference number EIA-N04, 2013). This method is widely accepted by NSW government authorities.

The impact of the Proposal on landscape character and views (visual impact) comprises an analysis of sensitivity (of either the landscape itself, the view, or the receptor seeing the view subject to change), and an assessment of the magnitude of change on that zone or view as recommended by the Roads and Maritime's *Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment* (Reference number EIA-N04, 2013). The resulting sensitivity and magnitude ratings are then combined to generate an overall impact rating. Refer Section 1.5.1 for a description of the method to assess impact to landscape character, and Section 1.5.2 for a description of the assessment method for visual impact.

Existing Environment

The study area for the Proposal is situated on the Pacific Highway at Turramurra and Wahroonga on Sydney's North Shore, approximately 17 kilometres north of Sydney's central business district (CBD). The North Shore lies at a high elevation (Turramurra approximately 170 metres above sea level). The steep, hilly topography of the area meant it was slow to be developed within the Sydney Basin compared to other areas. This relatively recent development has meant that large swathes of indigenous bush (particularly in creek and river corridors and on steep land) has been retained, resulting in a 'bushy', well-treed character.

The Pacific Highway typically follows a ridgeline between Turramurra and Wahroonga, with the landform falling gently to the east to Lovers Jump Creek and Cowan Creek, and more dramatically to the west towards Lane Cove River. The land increases in height towards the northern part of the study area (from Turramurra to Wahroonga).

The landscape surrounding the Highway corridor is well vegetated, with a high proportion of homes retaining remnant trees including Eucalypts, Angophoras and Turpentine. The land to the west of the Highway contains a higher proportion of tree cover due to the steeper landform, with fingers of remnant bushland vegetation retained along minor drainage corridors between housing.

The road corridor itself contains some street trees, but with most of the 'bushy', well vegetated character coming from the mature trees situated in private lots. Street trees along the Highway are scattered and irregular, with a mix of small to very large trees present, but with some stretches of road containing no trees.

Within the study area there are a number of land uses present. A majority of the land is zoned R2 'Low Density Residential', with these areas comprising single detached dwellings on medium to large blocks of land. A mix of architectural styles are present in these areas, with the low density housing on the Pacific Highway within the study area dominated by large, stately homes situated on big blocks of land with mature gardens. Many of these are listed as having local heritage significance and/or situated

within Heritage Conservation Areas (HCAs), with one listed as being of State significance ('Mahratta' at 1526 Pacific Highway, Wahroonga). The Warrawee Function Centre and Bowling Club is also situated within R2 zoned land opposite Mahratta.

Several schools lie along the Pacific Highway within the study area which are zoned 'SP2 Infrastructure'. These include Abbotsleigh Girls School, Knox Grammar School, Knox Senior Academy and Warrawee Public School. The schools add to the character of the local area with built form and garden design referencing the surrounding landscape, given: Knox Grammar and Knox Senior Academy School building reflect the architecture of the large, stately homes in Warrawee between Fox Valley Road and Gilda Avenue; Warrawee Public School has retained a canopy of indigenous trees; and Abbotsleigh Girls School large, contains picturesque buildings and mature trees within well-established gardens fronting the Pacific Highway.

The landscape immediately surrounding Intersection 3 is the highest point within the study area, at 208 metres above sea level. Land uses include low, medium and high density residential, infrastructure, and a local centre positioned near the Petrol Station at the corner of Redleaf Avenue and the Pacific Highway, with the local centre orientated along Redleaf Avenue and Railway Avenue. Two schools lie within the vicinity of this intersection upgrade: Abbotsleigh Girls School and Knox Grammar School and Senior Academy. The Thomas and Rosetta Agst Aged Care Facility lies to the south west of the Pacific Highway at this location.

Landscape Character Zones

Landscape Character Zones (LCZs) were identified within and beyond the study area as the greater landscape was considered when assessing the impact on overall landscape character. The impact on landscape character due to the Proposal was considered inside the study area and throughout the greater landscape. Five LCZs have been identified in the areas surrounding the Proposal and the approved future intersection upgrade locations at Finlay Road and Fox Valley Road (refer Figure ii), these being:

- LCZ 1: Infrastructure Corridor;
- LCZ 2: Mixed Use Development Corridor;
- LCZ 3: Residential Development;
- LCZ 4: Recreational Open Space; and
- LCZ 5: Local Centres.

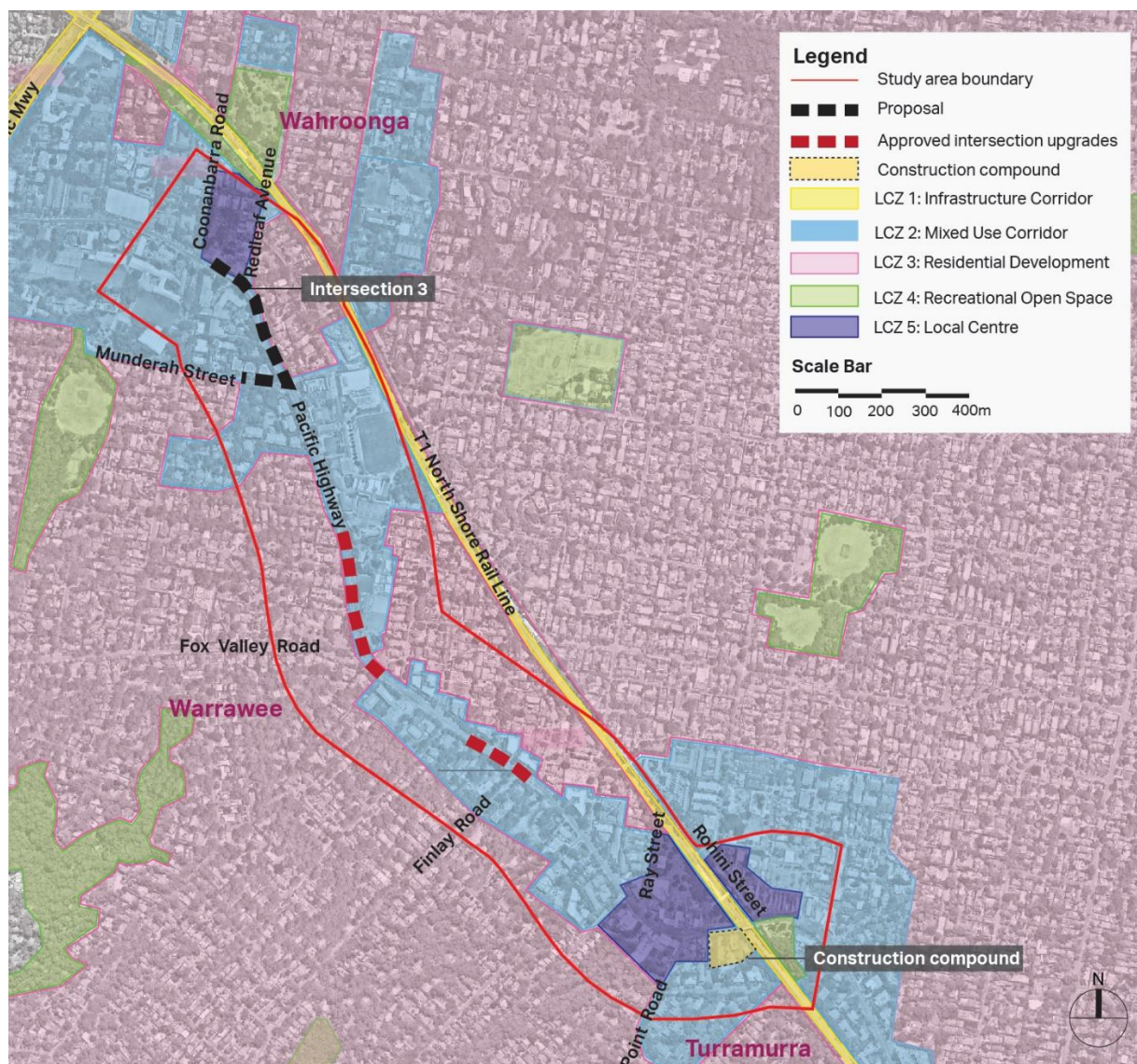


Figure ii Landscape Character Zones identified within and around the study area

The Proposal predominantly lies within LCZ 2: Mixed Use Development Corridor and LCZ 3: Residential Development, which are the most prevalent LCZs within the study area and wider environment. The Proposal also lies adjacent to LCZ 1 at its southern most extent, and LCZ 5 at both the northern and southern extents of the Proposal area.

Urban Design Strategy

An urban design strategy has been developed to provide an overarching vision for the upgraded road corridor for the Proposal, which builds on the urban design strategy developed for the approved intersection upgrades at Intersection 1 and 2. The aim of this vision is the visual integration of the three intersection upgrades into their surrounding environment, providing a more enjoyable experience for the road user and surrounding property owners by the preservation of the local character of the road corridor and adjoining landscape.

In order to fulfil this overarching vision, a series of urban design objectives and principles have been developed, informed by *Beyond the Pavement: Urban Design Policy Procedures and Design Principles* (Roads and Maritime, 2014), with more detailed principles developed with guidance from the following local environmental plans (LEPs) applicable to the Proposal area (refer Section 3.2):

- Ku-ring-gai Local Environmental Plan (Local Centres) 2012

- Ku-ring-gai Local Centres Development Control Plan 2017
- Ku-ring-gai Local Environment Plan 2015, and
- Ku-ring-gai Development Control Plan 2017.

Further recommendations and mitigation measures have been developed with consideration of the *Statement of Heritage Impact for Locally Significant Heritage Items within the Ku-ring-gai Local Government Area* prepared by Phillips Marler and Biosis, September 2018.

Landscape Character Impact Assessment

The impacts of the Proposal on landscape character are summarised in Table i. These ratings have also assessed the cumulative impact of the Proposal in conjunction with the recently approved Pacific Highway intersection upgrades at Fox Valley Road and Finlay Road just south of the Proposal, as well as the construction compound at Turramurra.

The Proposal would result in changes to an existing element (the road width and typically one road verge) within three LCZs (LCZs 2, 3, and 5). The impact of the road widening would typically be due to the encroachment of the road corridor onto a private property, which in the case of the Pacific Highway within the study area is responsible for most of the tree canopy in this location, softening the road corridor and providing a 'bushy' or 'leafy' character unique to the area. The proposal location and wider study area contains a number of heritage conservation areas and items, increasing the sensitivity in these areas due to the high visual quality of the landscape.

However, the Proposal would be relatively contained within the road corridor, with impacts to overall landscape character limited to the areas directly surrounding the changes.

Table i Landscape Character Zone assessment ratings

Landscape Character Zone (LCZ)	Sensitivity	Magnitude	Rating
LCZ 1: Infrastructure Corridor	Moderate	Negligible	Negligible
LCZ 2: Mixed Use Development	Moderate	Moderate	Moderate
LCZ 3: Residential Development	Moderate	Low	Moderate to Low
LCZ 4: Recreational Open Space	High	Negligible	Negligible
LCZ 5: Local Centres	Moderate	Low	Moderate to Low

Summary of Visual Impacts

The potential impacts of the Proposal on viewpoints are summarised in Table ii and Table iii.

The 'Moderate' to 'High' sensitivity of views and receptors is in part due to the sensitivity of residential receptors to changes in the vicinity of their homes. At Viewpoint 1, the importance of the band of tall hedging and trees within the Thomas and Rosetta Agst Aged Care Facility, coupled with heritage values associated with the property add to receptor sensitivity.

From all viewpoints, the magnitude of change is mostly influenced by the changes to the western verge of the Highway, the removal of vegetation, modifications to boundary wall structures and the introduction of a signalised intersection. Overall, the proposed intersection upgrades would visually result in permanent changes to the western (northbound) and eastern (southbound) side of the Pacific Highway primarily, with changes assessed as having an overall 'High to Moderate' visual impact from surrounding locations.

Table ii Visual impact assessment ratings for Intersection 3

Viewpoint	Sensitivity	Magnitude	Rating
Viewpoint 1: Thomas and Rosetta Agst Aged Care Facility	High	High	High
Viewpoint 2: Residence at 1567 Pacific Highway, Wahroonga	Moderate	Moderate	Moderate
Viewpoint 3: The Pacific Highway north and south of Intersection 3	Moderate	High	High to Moderate

At the proposed construction compound site, the sensitivity of the views and receptors at this location are heightened due to the heritage values of the property and the three receptor types (residential, commercial and recreational) that fringe this property. These elements create a sensitive environment within which to assess changes to the view. However, the changes would be temporary, with the land returned to its original state post construction. This has assisted in lowering the magnitude of the temporary changes from all viewpoints in this location to 'Low'.

Table iii Visual impact assessment ratings for the construction compound

Viewpoint	Sensitivity	Magnitude	Rating
Viewpoint 4: Turramurra Village Park	High	Low	Moderate
Viewpoint 5: Residences at 16-18 Boyd Street, Turramurra	High	Low	Moderate
Viewpoint 6: The Pacific Highway north and south of the Construction Compound Site	Moderate	Low	Moderate to Low

The cumulative impact of the changes to the views along the Pacific Highway as a result of the Proposal and recently approved intersection upgrades at Finlay Road and Fox Valley Road (i.e. Intersections 1, 2 and 3), would be 'High to Moderate'. As a road user travels along the Highway they would see almost continuous changes to the corridor within the study area.

Overall, the permanent changes would result in changes to an existing piece of road infrastructure (the widening and reconfiguration of lanes within and adjoining an existing road corridor) between Wahroonga and Turramurra. The most significant visual impacts would occur due to the loss of fringing vegetation, including mature trees within the road corridor as well as in private property and council owned land. Some loss of lower screening vegetation would also result in changes to the views to and from the road corridor.

Mitigation Measures

Based on the outcomes of the landscape character and visual impact assessment, a series of mitigation measures have been proposed to address the potential visual and landscape character impacts associated with the Proposal. These measures are consistent with measures outlined for the approved intersection upgrades at Intersections 1 and 2 (at Finlay Road and Fox Valley Road) just south of the Proposal.

Recommended mitigation measures have also been informed by the urban design strategy developed for the Proposal as part of the landscape character and visual impact assessment in Chapter 3.0, and the local heritage assessment prepared for the REF as referenced in this report.

Operational Mitigation Measures

All mitigation measures should be undertaken with reference to the urban design strategy principles and objectives as outlined in this report in Chapter 3.0, and the heritage report for locally significant items prepared for the REF.

Prior to the commencement of works, a pre-condition survey should be undertaken on private property affected by the Proposal. Changes to structures and vegetation within private property should be appropriately reinstated in agreement with the property owners.

A Landscape Plan should be prepared to support the final detailed design of the project, addressing the works proposed within the road corridor and that required within the private property as described in the Proposal.

The Landscape Plan would include design treatments for:

- location and identification of existing vegetation to be removed, and proposed replacement landscaping, including placement of vegetation and species to be used;
- built elements, including retaining walls, fences, gates, and walls. Replacement structures should respond to local character as well as the individual visual circumstances of each property, and visually contribute to the character of the road corridor and local area;
- pedestrian elements including footpath location, paving types and pedestrian crossings;
- fixtures such as seating, lighting, fencing and signs;
- details of the staging of landscape works taking into account related environmental controls such as erosion and sedimentation controls and drainage; and
- procedures for monitoring and maintaining landscaped or rehabilitated areas.

Street tree replacement along the Pacific Highway is not possible due to space and road safety issues. However, where tree replacement on private property or within the road verge is possible (e.g. on local roads such as Munderah Street), it should be done with the following aims:

- Species selection should respond to the individual lot within which they are situated;
- Tree placement and species should be selected to allow solar access to nearby building residences and outdoor living areas;
- Species selection should respond to the local character (potentially chosen from a list of indigenous species, where appropriate);
- Potential maintenance requirements should be considered in species and placement of trees; and
- Safety of road users, property owners/occupiers and pedestrians should be considered in species and placement of trees.

Mitigation Measures for Construction Activities

General mitigation measures to be applied during the construction phase to minimise the potential visual impacts on sensitive receivers should include the following:

- Avoid unnecessary loss or damage to vegetation adjacent to the intersection works areas and compound site by protecting trees (and their root zones) prior to construction, and/or pruning to avoid total removal;
- Apply appropriate screening with shade cloth or similar materials (where necessary) around the works areas and site compound to minimise visual impacts on key viewing locations;
- Remove any temporary hoardings, traffic management, barriers and signage when no longer required;
- Direct construction lighting away from visually sensitive receivers to minimise light spill; and

- Keep work areas tidy and well maintained with no storage of materials beyond the construction boundaries.

Conclusion

Overall, the Proposal would result in permanent changes to the western (northbound) side of the Pacific Highway primarily, with changes assessed as having an overall 'Moderate' impact on landscape character and a 'High to Moderate' visual impact from surrounding locations. The greatest impact on overall landscape character would stem from the loss of vegetation (predominantly mature trees) fringing the road corridor, mostly in private property.

Overall, the widening of the road corridor and the reconfiguration / replacement of road signage, changes to medians and turning lanes, and changes to utilities and road furniture would be partially visually absorbed due to these being characteristic elements seen within the existing road corridor. The scale and character of these changes are of good visual fit with the existing situation. This assessment is true of the Proposal, but also of the cumulative impact experienced along the Pacific Highway between Turramurra and Wahroonga, inclusive of those changes resulting from the upgrade of the approved Intersections 1 and 2.

Temporary changes to the proposed construction compound site would result in an overall 'Moderate' visual impact, predominantly due to the local heritage significance of the site chosen for the compound activities rather than the visibility of the compound site from the surrounding environment.

With consideration to the urban design strategy (refer Chapter 3.0) and potential adoption of mitigation measures discussed above (refer Section 6.3), the visual impact of the changes due to the Proposal would be reduced over time as trees and vegetation mature and fill the gaps in the canopy, both within private property and on Council managed land. The replacement of hard structures (eg. retaining walls) and screening vegetation of the affected property would also assist in mitigating the changes seen due to the Proposal which would be done in consultation with the property owners. Potential street tree replacement planting on Munderah Street would be carried out in consultation with Ku-ring-gai Council.

1.0 Introduction

1.1 Report Scope and Purpose

AECOM has been appointed by Roads and Maritime Services NSW (Roads and Maritime) to undertake a Landscape Character and Visual Impact Assessment (LCVIA) to assess the impact of the Pacific Highway Intersection Upgrades in Wahroonga proposed at Redleaf Avenue and Coonanbarra Road in the suburb of Wahroonga (hereafter known as 'the Proposal') on landscape character and views, in order to inform the Project Review of Environmental Factors (REF) for the proposed works. The Proposal also includes the use of a temporary construction compound site in Turramurra.

This assessment includes a desktop review of the Proposal components during construction (the temporary construction compound at Turramurra), at operation (the upgraded intersection at Wahroonga), an inspection of the Proposal area and surrounding landscape, an assessment of the cumulative impacts of the Proposal and the approved upgrades to two intersections along the Pacific Highway at Finlay Road and Fox Valley Road between in Wahroonga and Turramurra just south of the Proposal (assessed in *Pacific Highway Intersection Upgrades Landscape Character and Visual Impact Assessment* (Prepared by AECOM, 19 October 2018), and the development of an urban design strategy informed by *Beyond the Pavement: Urban Design Policy Procedures and Design Principles* (Roads and Maritime, 2014).

A series of recommendations and mitigation measures have been proposed as a result of this assessment which have been informed by the urban design strategy. The recommendations and mitigation measures are consistent with and /or complement the recommendations and mitigation measures proposed for the approved Pacific Highway intersection upgrades at Fox Valley Road and Finlay Road.

1.2 Proposal Background and Objectives

1.2.1 Proposal Background

Easing Sydney's Congestion Program Office (ESCPO) under Roads and Maritime is developing projects on the State Road Network in accordance with government initiatives for managing and improving traffic congestion and road safety within the Sydney region. The Pinch Point Program is one of many ESCPO initiatives that aim to provide an effective short-term solution and long-term proposal in planning for the improvement of severe congestion points.

The Pacific Highway is a major State arterial road providing a primary access route to Sydney's central business district from Sydney's north western suburbs and beyond. The Pacific Highway in the Proposal location also provides access to drivers who are commuting to the Central Coast via the M1 Pacific Motorway just north of Wahroonga.

Roads and Maritime propose to upgrade the Pacific Highway at Coonanbarra Road and Redleaf Avenue in Wahroonga (referred to as 'Intersection 3' for the purposes of this report). The proposal (as a whole) would ultimately result in the provision of three continuous through lanes in the northbound direction of the Pacific Highway between the M1 Pacific Motorway and Munderah Street for a length of about one kilometre. The intersection locations subject to this proposal originally formed part of a wider road project in Wahroonga, Warrawee and Turramurra involving the following two intersections (refer Figure 1-1):

- Pacific Highway at Finlay Road, Warrawee/Turramurra (referred to as 'Intersection 1' under the project scope)
- Pacific Highway at Fox Valley Road, Wahroonga/Warrawee (referred to as 'Intersection 2' under the project scope)

The proposal area was originally referred to as 'Intersection 3' until it was removed from the project scope following community and stakeholder consultation in 2018.

The project involving Intersections 1 and 2 has recently received environmental approval in April 2019.

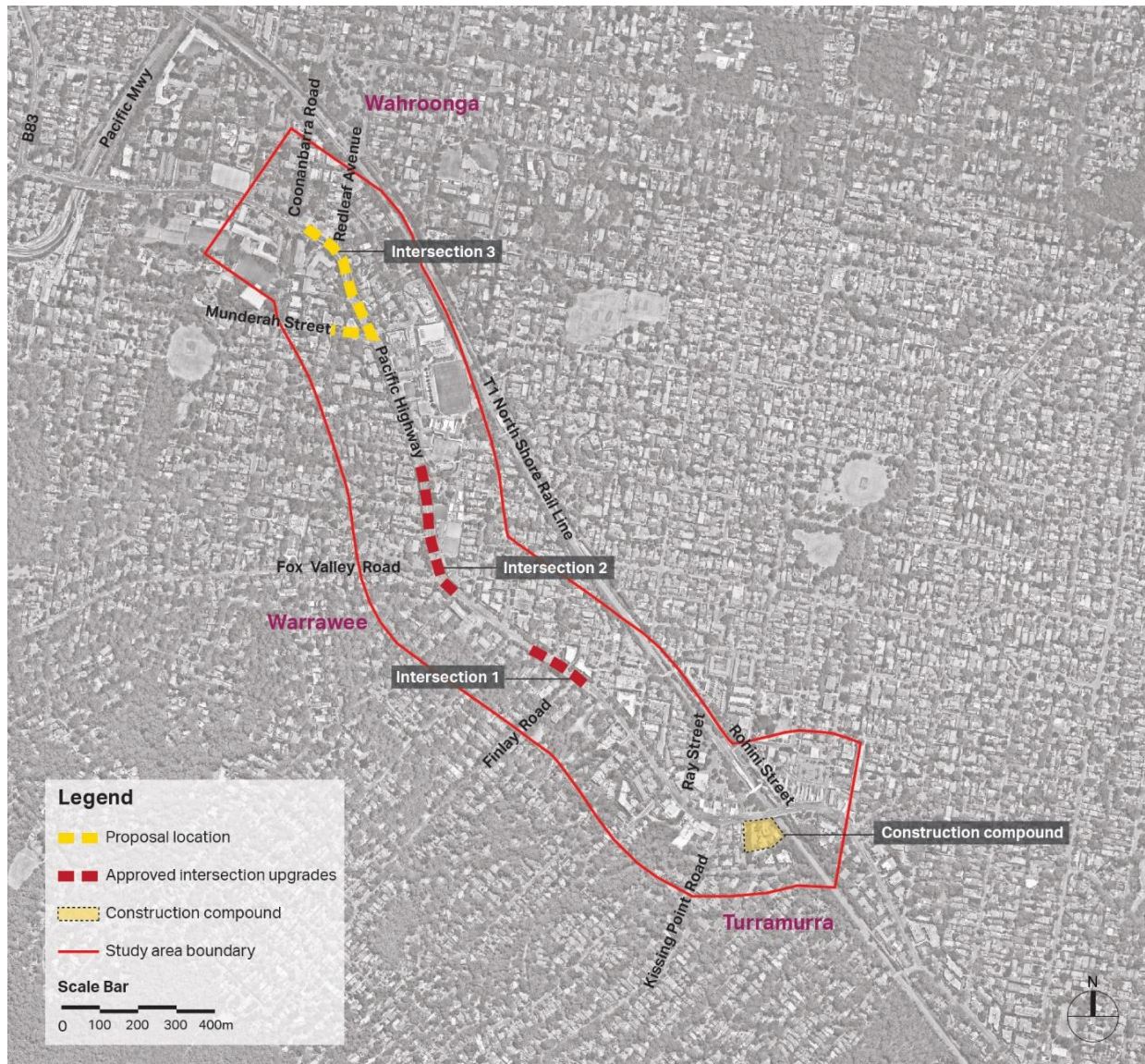


Figure 1-1 The wider road upgrade to three intersection locations along the Pacific Highway between Turramurra and Warrroonga, and a temporary construction compound site at Turramurra

1.2.2 Proposal Objectives

The Pinch Points Program within ESCPO targets peak-hour traffic hotspots and investigates ways to relieve traffic congestion on several corridors across the State Road Network, as well as improve safety for all road users.

The high level objectives for ESCPO are to:

- Optimise the existing road network, improving travel reliability;
- Improve access throughout Sydney; and
- Implement an integrated approach to infrastructure for urban renewal.

In line with the above objectives, the primary objective for the Proposal (and approved Intersections 1 and 2) is to reduce congestion along the Pacific Highway between Turramurra and Warrroonga by providing for three continuous lanes of traffic in the northbound direction of the road corridor at this location.

Objectives specific to the Proposal include:

- Improve northbound traffic flow by providing three continuous through lanes along the Pacific Highway between 150 metres south and 150 metres north of Redleaf Avenue.
- Improve traffic safety at the intersection of Redleaf Avenue and the Pacific Highway.
- Improve traffic safety by providing a larger curve radius and wider kerbside lanes at the northbound direction of the Pacific Highway.

The development criteria for the Proposal include:

- Minimise environmental impacts, in particular, heritage, biodiversity and landscape character impacts;
- Minimise community issues and land acquisition impacts;
- Minimise constructability issues, including potential traffic disruption during construction;
- Minimise impact on utility services.

1.3 Proposal Description

1.3.1 Intersection 3: Pacific Highway at Redleaf Avenue and Coonanbarra Road, Wahroonga

The proposal would extend along about 450 metres of the Pacific Highway between Neringah Avenue and Munderah Street in Wahroonga and would include:

- Provision of an additional northbound lane by widening to the western side of the Pacific Highway resulting in three continuous northbound through lanes on the Pacific Highway
- Converting the right-turn bay into Coonanbarra Road from the Pacific Highway (northbound) to a through lane (banning the right-turn into Coonanbarra Road)
- Realigning the existing right-turn bay into Redleaf Avenue from the Pacific Highway (existing 65 metre queuing length to remain the same)
- Signalising the intersection at Redleaf Avenue including:
 - providing an additional left-turn lane from Redleaf Avenue onto the Pacific Highway (southbound) to create a dual left-turn
 - removing the existing right-turn from Redleaf Avenue onto the Pacific Highway (northbound)
 - introducing a signalised pedestrian crossing on the western leg of the intersection (across the Pacific Highway) and a two-staged signalised pedestrian crossing on the northern leg of the intersection (across Redleaf Avenue)
 - modifying the existing raised traffic island on the northern leg of the intersection
 - introducing stop lines on the northern, western and eastern legs of the intersection.
- Partial property acquisition (about 380 square metres) and property adjustments from a local heritage item located at 1614-1634 Pacific Highway, Wahroonga (occupied by Thomas and Rosetta Agst Aged Care Facility) including:
 - relocation and reconstruction of an existing pedestrian stair access on the northern road frontage boundary
 - removal of an existing masonry retaining wall on the northern road frontage boundary extending about 130 metres in length with a varying height of up to 2.4 metres
 - establishment of new replacement retaining wall along the new northern property boundary (a minimum offset of about three metres would be provided to the existing Aged Care Building on this property)
 - vegetation and tree clearance along the north eastern extent of the property next to the road frontage (within the area of strip acquisition and part of the adjoining land to this which is to remain under private ownership following the works)

- establishment of additional drainage within the property adjacent to the new wall alignment
- Modifications to the existing driveway accesses fronting the proposed works
- Widening the existing median on the Pacific Highway directly south of the right-turn bay into Redleaf Avenue
- Modifications to the western kerbside footpath on the Pacific Highway between Munderah Street and Redleaf Avenue to accommodate the modified road alignment
- Removal of street trees and vegetation on the western side of the Pacific Highway between Coonanbarra Road and Munderah Street
- Removal of street trees and vegetation on the northern side of Munderah Street on the approach to the intersection of the Pacific Highway
- Relocation of traffic signal poles and provision of new mast arms at the intersection of the Pacific Highway, Ada Avenue and Coonanbarra Road
- Milling and re-sheeting
- Relocation of above and below ground utilities including gas, water mains, local communication cables, street lighting and electricity poles/lines
- Stormwater infrastructure upgrades in the following locations to accommodate the widened carriageway and address existing drainage issues in this location:
 - the northbound kerb and channel of the Pacific Highway between Redleaf Avenue and Munderah Street and
 - the eastbound kerb and channel of Munderah Street on approach to the Pacific Highway.
- New traffic signs, line markings and road furniture.

1.3.2 Construction compound site

A construction compound site is proposed at 1334-1354 Pacific Highway in Turramurra (currently occupied by a community health centre and carpark). This site is heritage listed and located within a Heritage Conservation Area (HCA) under the Ku-ring-gai LEP (Local Centres) 2012. The construction compound would include a site office, stockpile areas, concrete washout areas, a laydown hardstand for materials, staff parking, generators, fuel stores, vehicle circulation areas, amenity areas and areas for refuelling of plant and equipment (refer Figure 1-2).

Vehicle manoeuvring areas would generally be located on relatively level ground and on existing hardstand areas, where possible, with some existing grass areas temporarily gravelled where needed. Stockpiling of excavated or raw material may be required at the site compound. Any stockpiles would be managed in accordance with the Roads and Maritime's *Stockpile Site Management Guideline* (EMS-TG-10).

Access to the compound site would be via the existing formed vehicle crossings from Pacific Highway and Boyd Street. A small section of the existing sandstone wall and gate posts along the site's northern road frontage boundary may need to be removed to widen the entrance for larger vehicles to utilise the site during construction. Once the works are completed, the wall and gate would be reinstated. The site access points and vehicle manoeuvring areas may require some additional stabilisation for heavy vehicle movements, particularly on unsealed surfaces. Standard tree protection measures (such as setbacks and exclusion fencing) would be in place within the site for the duration of construction to ensure the long-term health and retention of trees on site following future reinstatement.

Pedestrian access would be maintained during operation of the compound site with appropriate traffic controls at the site access points to avoid pedestrian conflicts. The site would be securely confined with temporary fencing and shade cloth. Signage would be erected advising the general public of access restrictions. Upon completion of the construction work, the temporary site compound, work area and stockpiles would be removed, the site cleared of all rubbish and materials and rehabilitated.

No earthworks or tree removals would be required within the compound site, however, some minor tree trimming may be required to trees within the property and road frontage boundary near the vehicle access points and within the road corridor to facilitate access for heavy vehicles from the Pacific Highway. Tree trimming would be undertaken in accordance with Part 5 of the *Australian Standard 4373-2007 Pruning of amenity trees* with arboricultural supervision.

No utility relocations would be required for the purposes of the construction compound activities. An existing northbound bus stop (TSN #207414) in front of the site on the Pacific Highway may require temporary relocation to facilitate access to the compound site during construction.

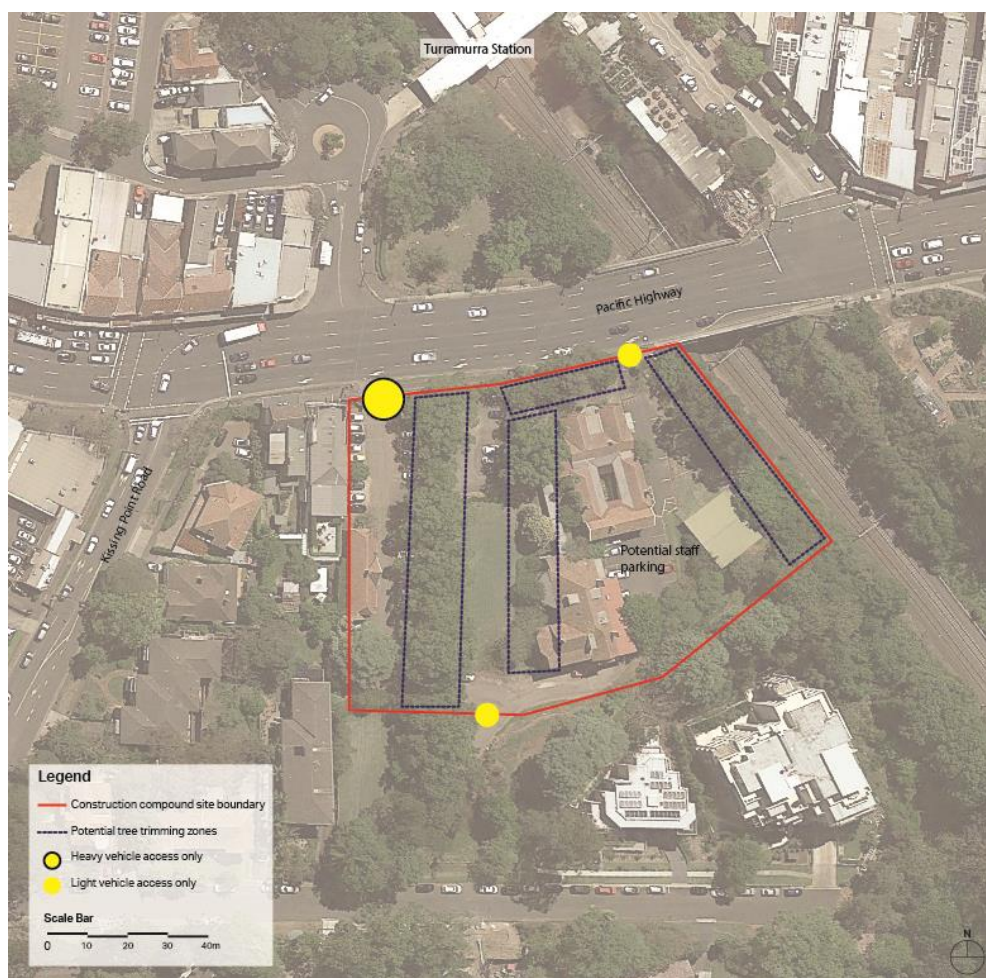


Figure 1-2 Proposed construction compound at 1334-1354 Pacific Highway, Turramurra. The main area for stockpiles, storage of machinery and site offices would be situated within the existing carpark to the west of the existing buildings on the property

1.4 Study Area

The study area around the Proposal has been identified as a 400 metre wide corridor offset 200 metres from the centre line of the Pacific Highway, running over a length of 3.6 kilometres (refer Figure 1-1) between Intersection 3 and the proposed construction compound. The study area includes Intersections 1 and 2 recently approved along the Pacific Highway which would have an influence the future landscape character of the road corridor in conjunction with the Proposal.

This width of study area corridor was chosen due to the visually contained nature of the Proposal within the road corridor. The effects of the Proposal on landscape character would not be felt beyond this corridor. In addition, the visibility of the Pacific Highway from the surrounding area is limited by the built form and vegetation lining the roadway. The most distant views to the Pacific Highway (and therefore the Proposal) in this area is from the larger streets running perpendicular to the Highway,

with the largest distance the Proposal can be seen from being a cross street approximately 200 metres from the Highway at Redleaf Avenue, Wahroonga.

1.5 Methodology

This LCVIA has been undertaken in accordance with Roads and Maritime's *Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment* (Reference number EIA-N04, 2018). This method is widely accepted by NSW government authorities.

The impact of the Proposal on landscape character and views (visual impact) comprises an analysis of sensitivity (of either the landscape itself or the receptor seeing the view subject to change), and an assessment of the magnitude of change on that zone or view as recommended by Roads and Maritime's *Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment* (Reference number EIA-N04, 2018). The resulting sensitivity and magnitude ratings are then combined to generate an overall impact rating (refer Table 1). Refer Section 1.5.1 for a description of the method to assess impact to landscape character, and Section 1.5.2 for a description of the assessment method for visual impact.

It is important to note that the rating itself does not contain a value judgement regarding the nature of the visual change (i.e. if the change is a positive or negative impact on the landscape character or on the views seen by receptors).

Table 1 Landscape Character and Visual Impact Assessment matrix

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High	High - Moderate	Moderate	Negligible
	Moderate	High - Moderate	Moderate	Moderate - Low	Negligible
	Low	Moderate	Moderate - Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

1.5.1 Landscape Character Assessment Method

Landscape character assessment determines the overall impact of a proposal on the area's character. Landscape Character Zones (LCZs) are identified as sharing broadly homogenous characteristics or spatial qualities. These may include:

- Planning designations (including desired future character)
- Topographical qualities
- Natural drainage qualities
- Ecological characteristics / land cover
- Parks and open space
- Cultural and recreational characteristics
- Architecture
- Spatial qualities
- Infrastructure.

The impact of the Proposal on each LCZ was assessed using the visual impact assessment matrix (refer Table 1) by examining sensitivity and magnitude to give an impact rating between 'Negligible' and 'High'.

Sensitivity and Magnitude

The sensitivity of the landscape is assessed based upon the extent to which it can accept change of a particular type and scale without adverse impacts upon its character. Sensitivity varies according to the type of development and nature of the landscape, including:

- inherent landscape value, e.g. its condition, perceptual qualities, and cultural importance; and
- likely congruency of the proposed change, i.e. the extent to which the Proposal may fit or be 'visually absorbed' into the landscape, e.g. in relation to line, colour, texture, scale etc.

The magnitude of change affecting landscape character depends on factors such as the nature, scale and duration of the particular change that is expected to occur. In the landscape, the magnitude of change would depend on factors such as the extent of loss, change or addition of a feature, or changes in the backdrop, or outlook from a landscape that affects its character.

1.5.2 Visual Impact Assessment Method

Visual impact assessment defines the day to day visual effects of a proposal on receptors.

The visual impact of the changes seen at the intersection location subject to the Proposal was assessed by examining the views seen from a number of representative viewpoints. The changes seen at each viewpoint were assessed using the visual impact assessment matrix (refer Table 1), which examined sensitivity against magnitude to give a combined impact rating between 'Negligible' and 'High'. A higher impact rating indicates the likelihood of a visual change being detectable. Importantly, it does not contain a value judgement regarding the nature of the visual change (i.e. if the change is a positive or negative impact on the landscape character or on the views seen by receptors).

The visual impact of the Proposal has been assessed using the following methodology:

1. Describe the site context:
 - Site elements and character
 - Describe the Proposal
2. Map the visibility of the Proposal
3. Identify the main viewpoints to the site: map and photograph. Prepare visual simulations at key locations
4. Define a range of criteria against which the relative importance of each viewpoint can be assessed, including:
 - a. criteria relating to sensitivity of the view and the receptor:
 - i. visibility / visual prominence of the development (including skyline view / backdrop / screening / etc.)
 - ii. land use (public open space / private ownership / road)
 - iii. heritage significance or other specific issues
 - iv. distance to view
 - v. observer type (e.g. tourist, other recreational user, resident, local user)
 - vi. number of observers
 - vii. duration of observation; and
 - b. criteria relating to magnitude of change:
 - viii. extent of loss

- ix. change or addition of a feature
 - x. changes in the backdrop
5. Assess the visual impact at each viewpoint using the visual impact assessment results matrix that assumes criteria of sensitivity and magnitude to determine the extent of the impact (refer Table 1)
 6. Identify mitigation measures where relevant (according to scale of impact)
 7. Provide a conclusion.

Visibility of the Proposal

The visibility of the Proposal was mapped at the intersection location subject to the Proposal by using a combination of desktop analysis and site exploration on foot and by car. The resulting mapping shows an approximate area from which the Proposal can be seen from the surrounding landscape.

Sensitivity and magnitude

The sensitivity of views would be dependent on:

- the location and context of the viewpoint;
- the expectations and activity of the receptor;
- the extent to which the Proposal may fit or be 'visually absorbed' into the landscape, e.g. in relation to line, colour, texture, scale etc.; and
- the importance of the view, including any additional factors such as heritage or cultural significance.

The most sensitive receptors may include:

- users of outdoor recreational facilities;
- communities where the development results in changes in the landscape setting or valued views enjoyed by the community; and
- occupiers of residences with views affected by the Proposal.

The number of receptors is also considered when assessing sensitivity.

The magnitude of change due to a proposal on a view would depend on factors such as the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, duration of view and distance from the Proposal.

Viewpoints

Viewpoints were chosen to assess visual impact to the area due to the Proposal. These visual catchments were often bounded by landmarks, including intersections, cross streets and bends in the road. They were defined using a combination of desktop analysis and on-site survey of the landscape.

Photos and photomontage

A photograph or series of photographs, arranged together to produce a panorama of the study area from a viewpoint is used to assist in the analysis of the proposed changes to the surrounding landscape due to the Proposal.

A visual simulation has been prepared at a key viewpoint within the study area to graphically illustrate the potential changes as seen from this location. This location was chosen to represent the public view most affected by changes due to the Proposal. Visual simulations are a type of photomontage which provide the most accurate representation of relative position and size of the Proposal from a given viewpoint.

2.0 Existing Environment

2.1 Site Context

The study area around the Proposal is situated on the Pacific Highway between Wahroonga and Turramurra on Sydney's North Shore, approximately 17 kilometres north of Sydney's central business district (CBD). The North Shore lies at a high elevation (Turramurra approximately 170 metres above sea level). The steep, hilly topography of the area meant it was slow to be developed within the Sydney Basin compared to other areas. This relatively recent development has meant that large swathes of indigenous bush (particularly in creek and river corridors and on steep land) has been retained, resulting in a 'bushy', well-treed character.

The Pacific Highway corridor has undergone a dramatic change over the past 10 years, with multi-unit residential apartment development replacing the prior single dwelling residential lots. This has resulted in a shift in the character of the corridor, however, the well-treed character of the area has been retained due to the relatively large building setback of apartment blocks which has maintained a wide vegetated front area. Planting along the road corridor and within private properties includes many large native and indigenous tree species (refer Figure 2-1).



Figure 2-1 The well-treed character of the area is maintained where medium to high density residential developments have been established with the relatively large setback of buildings from the road and the inclusion of large native and indigenous trees which have been established or retained in the front garden areas

The Pacific Highway typically follows a ridgeline between Turramurra and Wahroonga, with the landform falling gently to the east to Lovers Jump Creek and Cowan Creek, and more dramatically to the west towards Lane Cove River. The land increases in height towards the northern part of the study area (from Turramurra to Wahroonga).

The landscape surrounding the Highway corridor is well vegetated, with a high proportion of homes retaining remnant trees including Eucalypts, Angophoras and Turpentines. The land to the west of the Highway contains a higher proportion of tree cover due to the steeper landform, with fingers of remnant bushland vegetation retained along minor drainage corridors between housing.

The road corridor itself contains some street trees, but with most of the 'bushy', well vegetated character coming from the mature trees situated in private lots. Street trees along the Highway are

scattered and irregular, with a mix of small to very large trees present, but with some stretches of road not containing any trees (refer Figure 2-2).



Figure 2-2 Street trees along the Highway are scattered and irregular, with some stretches of road devoid of street trees in the road reserve all together. The 'bushy', well treed character is influenced by the large number of mature trees in private lots, as with this example at Warrawee Public School

Future road upgrades on the Pacific Highway between Turramurra and Warrroonga

With the completion of the recently approved upgrades to Intersections 1 and 2 as described in *Pacific Highway Intersection Upgrades Landscape Character and Visual Impact Assessment* (AECOM, 19 October 2018), there would be localised changes to the Pacific Highway in the vicinity of Fox Valley Road and Finlay Road, including the removal of trees and vegetation within the road verge and within private property on the western side of the corridor, the widening of the road corridor itself and the reconfiguration / replacement of road signage, property boundary fencing and walls, changes to medians and turning lanes, and changes to utilities and road furniture.

2.2 Built Form, Land use and Heritage

Within the study area there are a number of land uses present (refer Figure 2-3). A majority of the land is zoned R2 'Low Density Residential' under the local environmental plans for the Ku-ring-gai LGA, with these areas comprising single detached dwellings on medium to large blocks of land. A mix of architectural styles are present in these areas, with the low density housing on the Pacific Highway within the study area dominated by large, stately homes situated on big blocks of land with mature gardens. Many of these are listed as having local heritage significance, with one listed as having State significance ('Mahratta' on the corner of Fox Valley Road and the Pacific Highway occupied by the School of Practical Philosophy). The Warrawee Function Centre and Bowling Club is also situated within R2 zoned land opposite Mahratta near Fox Valley Road.

Several schools lie along the Pacific Highway within the study area which are zoned SP2 'Infrastructure'. These include Abbotsleigh Girls School, Knox Grammar, Knox Senior Academy and Warrawee Public School. The schools add to the character of the local area with built form and garden design referencing the surrounding landscape: Knox Grammar and Senior Academy schools echo the large, stately homes in Warrawee between Fox Valley Road and Gilda Avenue; Warrawee Public

School campus having retained a canopy of indigenous trees; and Abbotsleigh Girls School large, picturesque buildings and mature trees within well-established gardens fronting the Pacific Highway.

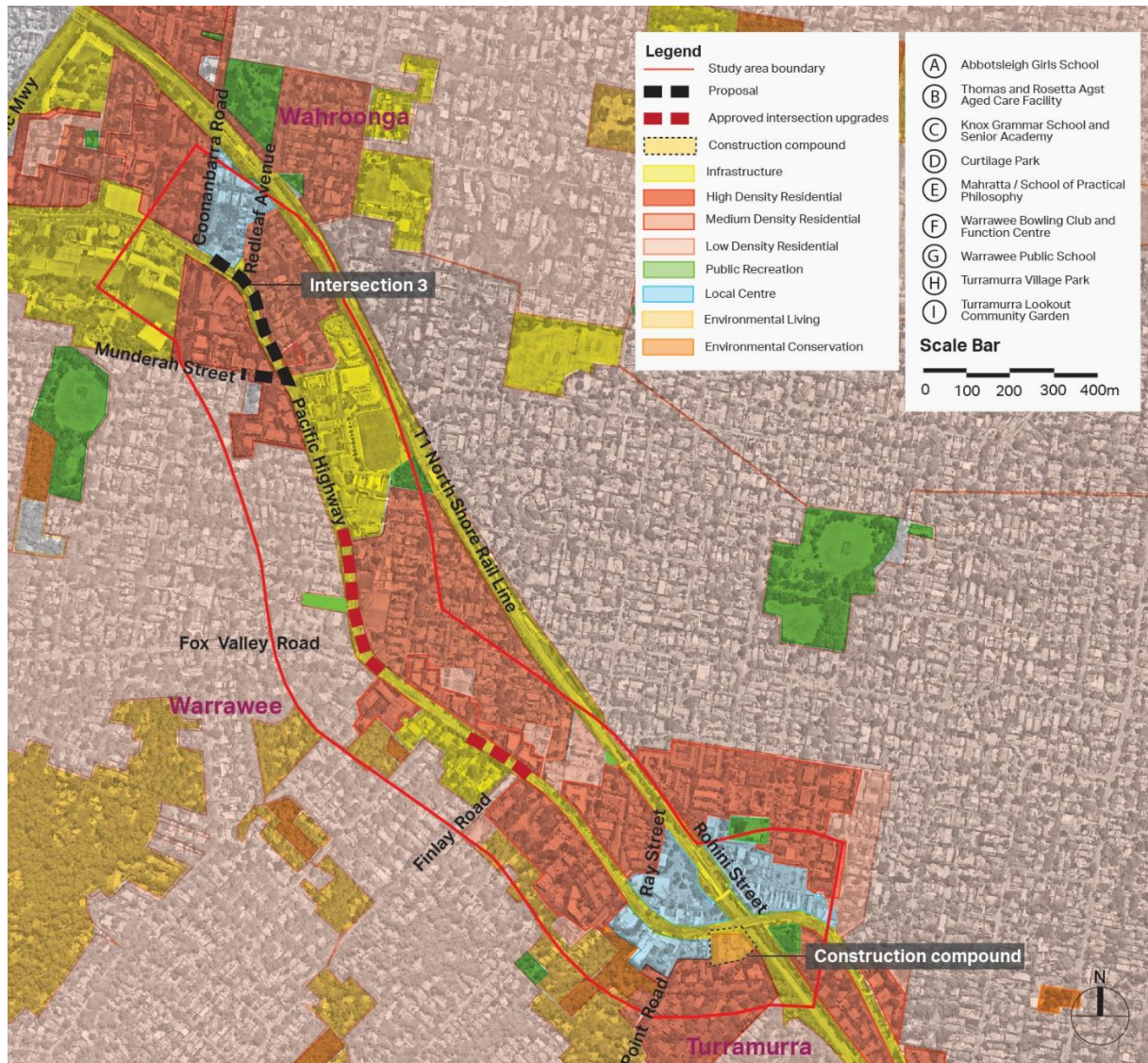


Figure 2-3 Zoning within and around the study area

Two local centres are situated along the Pacific Highway within and near to the study area. These are at Warramunga and Turrumurra and are associated with the train stations at each location. At Warramunga, the local centre is adjacent to the Pacific Highway, with shops and restaurants fronting onto Railway and Redleaf Avenues rather than the Highway and positioned around a central carpark. A petrol station lies on the corner of the Pacific Highway and Redleaf Avenue within the local centre and is the only commercial element fronting the Highway.

At Turrumurra, the local centre is positioned on either side of the Highway, with shops and restaurants fronting onto the Highway itself. A secondary shopping area fronts onto Rohini Street, north of the Pacific Highway and east of the rail line, and a third minor area with a Coles shopping centre and community library positioned on the western side of the rail line, fronting Ray Street.

Four areas zoned RE1 'Public Recreation' are situated within the study area, but only two of these parks front onto the Pacific Highway, these being Turramurra Lookout Community Garden (refer Figure 2-4), and Curtilage Park in Wahroonga (refer Figure 2-5). Both these two parks are long, elongated blocks, with a narrower side fronting the Pacific Highway. To this end, they remain somewhat visually isolated from the Pacific Highway corridor. It is noted that there is another park fronting the Pacific Highway in the study area opposite the proposed compound site (Turramurra Village Park), however this park is zoned B2 'Local Centre'.



Figure 2-4 Turramurra Lookout community garden viewed from the northern side of the Pacific Highway. The garden has a narrow frontage in comparison with the depth of the park, and slopes away from the Highway



Figure 2-5 The view from the entry point of the Warrawee Bowling Club carpark entry south along the Highway, with Curtilage Park situated to the right of frame behind a brick retaining wall and fence

Several Heritage Conservation Areas (HCAs) and heritage items lie within the study area. The HCAs present within the study area are summarised in Table 2, while heritage items are listed in Table 3. All HCAs and heritage items are shown in Figure 2-6 and are described and discussed in further detail in the local heritage assessment prepared for the Proposal as part of the REF.

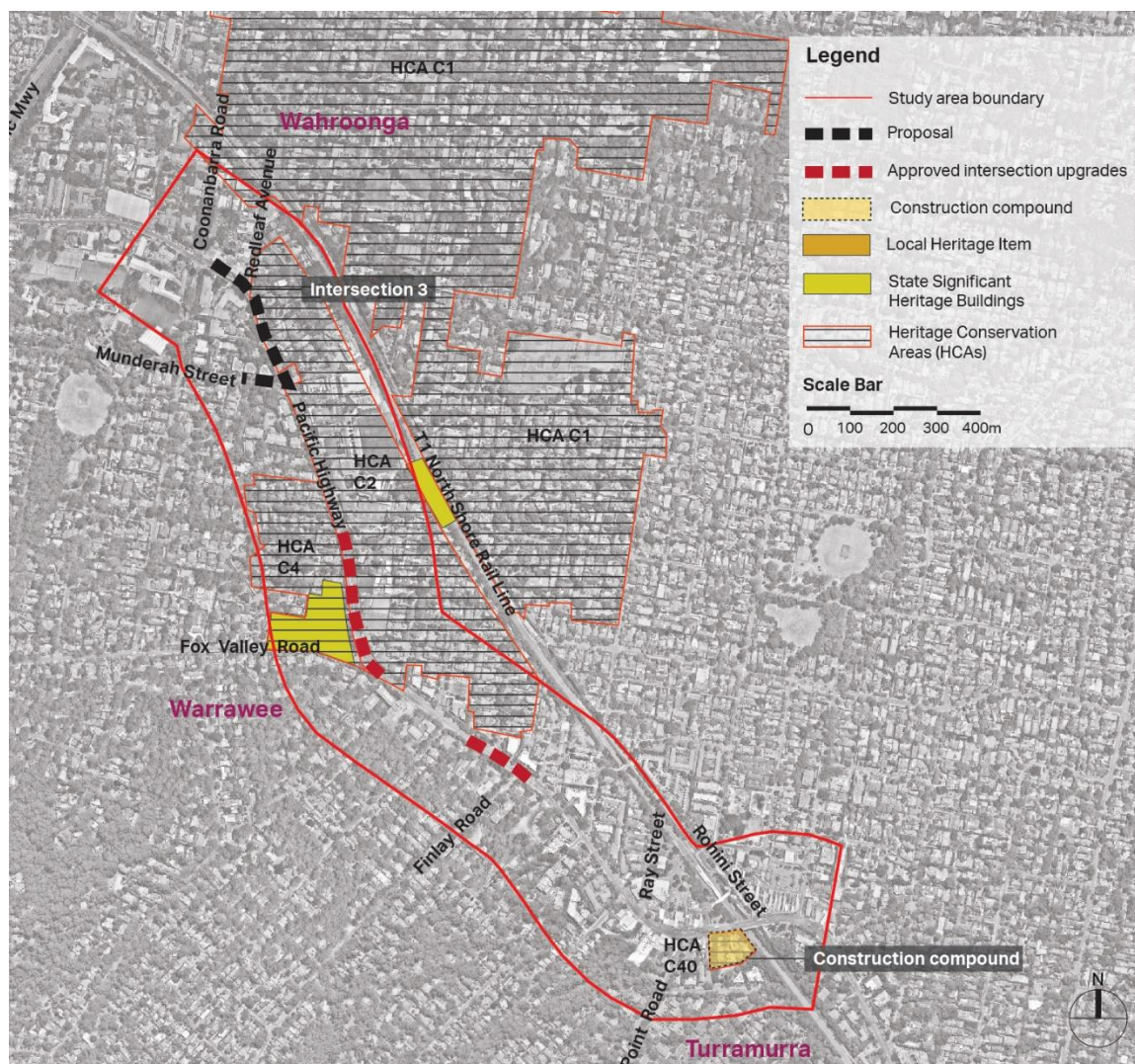


Figure 2-6 Heritage conservation zones and items within the study area

Table 2 Description of Heritage Conservation Zones within the study area

Name	Level of significance	Description
Wamboona Heritage Conservation Area (HCA C1)	Local	<p>Currently Residential and Civic land use.</p> <p>Contains distinctive streetscapes from the early 1890's with areas containing significant collections of residences from the Federation and interwar period that were built following the North Shore rail line in 1890. Some of the residences of prominent families of this period were designed by notable architects of the time, including Herbert Wardell and Howard Joseland.</p> <p>The Wamboona Progress Association in the early 20th century commissioned the formal avenues of street trees along Burns Road, Water Street and Coonanbarra Road, the development of</p>

		Wahroonga Park and the distinctive John Sulman designed shops facing the park along Coonanbarra Road.
Warrawee Heritage Conservation Area (HCA C2)	Local	<p>Currently Residential and Civic land use.</p> <p>An area of strong aesthetic significance for its concentration of architecturally distinguished houses that sit within large gardens. The houses were designed by a variety of notable architects including Eleanor Cullis-Hill, John Horbury Hunt and Howard Joseland.</p> <p>This exclusively residential area retains evidence of early settlement with its main road layout from the 1890s. A notable feature of the area is the creation of battleaxe allotments from the 1917 subdivision of the Warrawee Garden Estate. The area was also historically home to a number of historically prominent figures.</p>
Hillview Conservation Area (HCA C40)	Local	The Hillview Area HCA includes an original cottage, a guesthouse built in 1913, garages and other landscape elements. They are a rare example of a grand private boarding house built on the Upper North Shore following the opening of the railway. The prominent hilltop setting of the house with views over the harbour adds to the significance of the property. The garages are a significant element of the property, having maintained their setting in relationship to the main house.
Mahratta Conservation Area (HCA C4)	Local	<p>The Mahratta HCA is of historic and aesthetic significance due to its largely intact built and landscape fabric dating from the 1890s through to the inter war period into the 1940s. It contains the State Heritage Listed 'Mahratta' designed by Paul Sorenson, the 1924 subdivision of Myall Avenue with distinctive inter-war period housing and circular planting bed, and the 1912 subdivision of Gilda Avenue with its collection of Federation to inter-war period housing.</p> <p>The area is of historical significance as one of the earliest areas of housing development on the western side of the Pacific Highway at Wahroonga. Street tree plantings shown on a 1943 aerial photograph indicate the influence of the Wahroonga Progress Association in the 20th Century.</p>

Table 3 Heritage items potentially affected by the Proposal

Name and address of heritage item	Potential impact
<i>Gateposts to the Former "Estha" Dwelling</i> – (LEP Item I976), 1614-1634 Pacific Highway, Wahroonga, Lot 102 DP 1034668. Item of local heritage significance	Directly impacted by the Proposal at Intersection 3
<i>Dwelling house</i> - (LEP Item No. I969), 1563 Pacific Highway, Wahroonga NSW, Lot 4, DP 229736. Item of local heritage significance	Located adjacent to the Proposal to the north east with potential views to the changes at Intersection 3
<i>Dwelling house</i> - (LEP Item No. I967), 1551 Pacific Highway, Wahroonga NSW, Lots 4, 5, 6, 11 and 12, DP 16715. Item of local heritage significance	Located adjacent to the Proposal at Intersection 3 to the north east with potential views to the changes

<p><i>"Redleaf", dwelling house and grounds</i> – (LEP Item No. I1008), 28-30 Woodville Avenue, Wahroonga NSW, Lot 4 DP 16893; Lots 1 and 2 DP 746487; Lot 12 DP 615524.</p> <p>Item of local heritage significance</p>	<p>Located adjacent to the Proposal at Intersection 3 to the north east with potential views to the changes</p>
<p><i>Dwelling house</i> - (LEP Item No. I969), 1563 Pacific Highway, Wahroonga NSW, Lot 4, DP 229736. Item of local heritage significance</p>	<p>Located adjacent to the Proposal at Intersection 3 to the north east with potential views to the changes</p>
<p><i>Hillview Garages & Precincts</i> (Section 170 Register - Department of Planning and Infrastructure, Item No. 3490028), 1334-1340 Pacific Highway, Turramurra NSW.</p> <p>Item of local heritage significance</p>	<p>Within the proposed construction compound site</p>
<p><i>Hillview</i> - (LEP Item No. I155), 1334 Pacific Highway, Turramurra NSW, Lot 7, DP 214733. Item of local heritage significance</p>	<p>Within the proposed construction compound site</p>
<p><i>Hillview Garages</i> - (Section 170 Register - Roads and Maritime Services), 1334-1340 Pacific Highway, Turramurra NSW</p> <p>Item of local heritage significance</p>	<p>Within the proposed construction compound site</p>
<p><i>Former Commonwealth Bank building</i> - (LEP Item No. I157), 1356 Pacific Highway, Turramurra NSW, Lot 5, DP 132873.</p> <p>Item of local heritage significance</p>	<p>Located to the west of the proposed compound site with potential views to the changes</p>
<p><i>Residential flat building</i> – (LEP Item No. I132), 2-4 Boyd Street, Turramurra NSW, Lot 2, DP 596228</p> <p>Item of local heritage significance</p>	<p>Located to the south west of the proposed compound site, but with no likely views to the changes within the proposed compound</p>
<p><i>Dwelling house</i> – (LEP Item No. I139), 8 Kissing Point Road, Turramurra NSW, Lot 1, DP 743998.</p> <p>Item of local heritage significance</p>	<p>Located to the south west of the proposed compound site, but with no likely views to within the proposed compound</p>
<p><i>Commercial buildings</i> - (LEP Item No. I158), 1358 and 1360 Pacific Highway, Turramurra NSW, Lots A and B, DP 445374; Lot 8, DP 237813.</p> <p>Item of local heritage significance</p>	<p>Located to the west of the proposed compound site, but with no likely views to within the proposed compound</p>

The Pacific Highway corridor on the North Shore has been subject to an increase in residential density in recent years, with typical residential properties trending from a mix of single detached dwellings and three storey walk-up apartments to a majority of dwellings comprising apartment blocks of varying heights, typically above four storeys. Between Wahroonga and Turramurra along the Pacific Highway there are a number of sites currently under development, including at least three new multi-dwelling residential properties: Embrace Warrawee, Aminya Warrawee, and a 5-7 storey apartment block at 1444 Pacific Highway in Turramurra (Hansen Investment Group Australia).

With the completion of upgrades to Intersections 1 and 2 as described in *Pacific Highway Intersection Upgrades Landscape Character and Visual Impact Assessment* (AECOM, 19 October 2018), there would be localised changes to the Pacific Highway in the vicinity of Fox Valley Road and Finlay Road. While these changes would include the removal of trees, shrubs and changes to fencing at these locations, there would be no change to built form due to the Proposal.

Impacts to heritage sites primarily occur at the Fox Valley Road intersection with the Pacific Highway, where the realignment of the intersection and the widening of the Highway to the north of the intersection would result in changes at the State heritage listed 'Mahratta' House and site (SHR Item No. 709 and LEP item No.s 1913 and 1964), Curtilage Park (associated with LEP Item No. 1964), Yaamba dwelling house (LEP Item No. 1965) and Kyeamba dwelling house (LEP Item No. 1966).

Changes to these items would comprise the removal and replacement of fencing and retaining walls on the western verge of the Pacific Highway, including the removal and potential replacement of vegetation fringing these properties on their eastern boundaries.

2.3 Landscape Character Zones

Landscape Character Zones (LCZs) were identified within and beyond the study area as the greater landscape was considered when assessing the impact on overall landscape character. The impact on landscape character due to the Proposal was considered inside the study area and throughout the greater landscape. Five LCZs have been identified in the areas surrounding the Proposal (refer Figure 2-7), these being:

- LCZ 1: Infrastructure Corridor;
- LCZ 2: Mixed Use Development Corridor;
- LCZ 3: Residential Development;
- LCZ 4: Recreational Open Space; and
- LCZ 5: Local Centres.

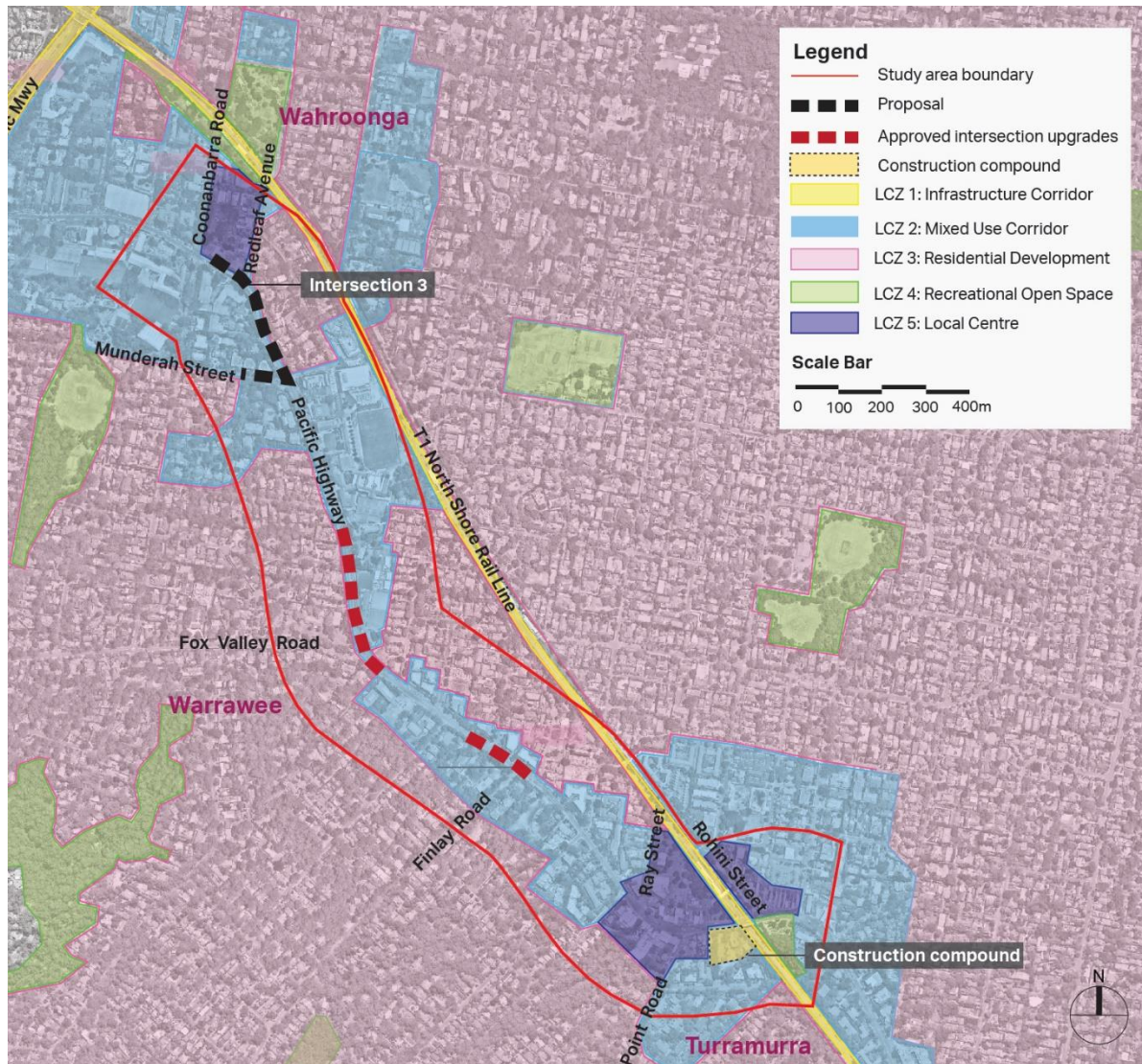


Figure 2-7 Landscape Character Zones identified within and around the study area

The Proposal predominantly lies within LCZ 2: Mixed Use Development Corridor and LCZ 3: Residential Development, which are the most prevalent LCZs within the study area. The Proposal also lies adjacent to LCZ 1 at its southern most extent near the proposed compound site, and LCZ 5 at both the northern and southern extents of the Proposal.

2.3.1 LCZ 1: Infrastructure Corridor

Infrastructure corridors are unique from other transport corridors in that they are typically either visually or physically isolated from their surrounding landscape, or the corridor itself is significantly different from the surrounding landscape. Their character comes from the design of the landscape and landform situated within the corridor, or the relationship between the corridor and greater landscape features. While the Pacific Highway is a major State transport corridor, it is embedded into the fringing development; therefore, it has been included in LCZ 2: Mixed Use Development Corridor.

This LCZ comprises two corridors within and around the study area:

- The start of the M1 Motorway; and
- The T1 North Shore Rail Line.

The M1 Motorway (also known as the Pacific Motorway) is a wide, six-lane road beginning at Pennant Hills Road in Wahroonga and heading north to Beresfield. The motorway passes through several suburban areas as well as through large tracts of bushland. When passing through suburban areas, the road corridor is visually contained by noise walls screened from the road by bands of indigenous vegetation which include trees and understorey plants, creating visually impermeable barriers. The northbound and southbound carriageways of the motorway are separated by a median strip of varying widths, typically vegetated with shrubs and grasses, but in some areas containing strips of retained sandstone where the road passes through sandstone cuttings.

Overall, the motorway is a hard, linear element set amongst a natural or naturalistic setting. The shape of the road responds to the surrounding landform, and vegetation is limited to an indigenous plant palette which helps bed the road into the landscape. The rock cuttings have been kept reasonably intact expressing the natural geology of the surrounding area. However, within the study area, the road only passes through residential areas, meaning the character in this small southern portion is influenced by noise walls and associated planting. Construction work in this area has resulted in the removal of a lot of vegetation in this stretch of road.

The North Shore Rail Line is predominantly visually screened from the surrounding landscape by the existing landform and planting. The rail line is most often situated either below or above the surrounding ground plane, with the batters on either side of the tracks heavily vegetated with a mix of exotic and indigenous vegetation. They are typically utilitarian in character, with a high proportion of weeds, as the landscapes are not often maintained due to safety issues and inaccessibility. Properties on either side 'back onto' the rail corridor, with physical structures and vegetative screening used to block views into and out of the corridor. This further assists in isolating the corridor from the surrounding landscape.

The rail corridor contains a number of heritage items at the stations (the State Heritage Listed Warrawee Station and the local heritage items Wahroonga and Turramurra stations) and passes through HCA 1. While the stations themselves have are visually integrated into their surrounds due to landscaped grounds and access points, the rail corridor between the stations is utilitarian in character and typically visually separated from the surrounding landscape due to screening by vegetation and changes in ground level, as discussed above.

At crossing points (typically with roads) the difference between the level of the tracks or road surface and the surrounding landscape is most pronounced, either dropping to accommodate road bridges over the top (and sometimes utilising tunnels) or rising on vegetated berms which culminate in a rail bridge over roads or other landscape features.

2.3.2 LCZ 2: Mixed Use Development Corridor

This LCZ is an unevenly shaped corridor of land that roughly follows the Pacific Highway within the study area. The LCZ typically comprises high density residential development (refer Figure 2-8), schools, and other community facilities clustered in unevenly shaped areas around the central 'spine' of the Pacific Highway. While the built form of these developments differs greatly within the corridor, the zone is characterised by increased community activity and a higher amount of open space (including car parks and hard gathering spaces) juxtaposed with larger built forms (refer Figure 2-9). These areas typically have mature gardens, including large trees (both indigenous and exotic species).



Figure 2-8 View to 1389-1397 Pacific Highway, Warraroo, looking east. High density residential development within the LCZ comprises larger built forms with mature tree and shrub planting within the front yard setbacks



Figure 2-9 The view from the Highway looking north east towards Knox Grammar School, showing the larger built forms and open school grounds with mature vegetation

The road corridor itself remains relatively unadorned by tree and shrub planting, with limited street trees along its length. The character of the road is heavily dependent on the surrounding development and private gardens, with the well-treed character of the area provided by private or semi-private properties along the corridor, as shown in Figure 2-10.



Figure 2-10 Mature indigenous and exotic trees within adjoining properties (in this case Warrawee Public School, as seen from the Pacific Highway looking south east) contributes to the road corridor's 'bushy' character

Parts of this LCZ lie within HCAs, including HCA C2 at Wahroonga and Warrawee, and HCA C40 at Turramurra. At Turramurra, HCA C40 is the Hillview Conservation Area, which is a small area situated on the southern side of the Pacific Highway. This site is relatively visually contained by the rail corridor to the east, the Highway to the north, commercial buildings with heritage value to the west and modern, multi-storey residential apartments to the south.

2.3.3 LCZ 3: Residential Development

Although a majority of the surrounding area (i.e. beyond the study area) is made up of LCZ 3: Residential Development, within the study area this is the second most prevalent development type after LCZ 2: Mixed Use Development.

This LCZ is typically found on land zoned R2 'Low Density Residential' and comprises single detached dwellings of mixed sizes and architectural styles. In Warrawee, some of the residential housing falls within the Warrawee Heritage Conservation Area (HCA C2), which has a high concentration of large stately homes (some built by notable architects) and built as early as the 1890s. Many homes within this heritage conservation area have large, mature gardens with large exotic and indigenous trees. The Mahratta Conservation Area (HCA C4) also falls partially within this LCZ. This HCA is characterised by stately homes and gardens dating back to the 1890s. A number of heritage items are also located within the study area, most notably 'Mahratta' at the corner of the Pacific Highway and Fox Valley Road (refer Figure 2-11).



Figure 2-11 Building within 'Mahratta' site on the corner of the Pacific Highway and Fox Valley Road, Wahroonga (State heritage listed site)

The North Shore of Sydney was developed relatively late in Sydney's history due to the steep, sloping landform. Although development began as early as the 1890s along the Pacific Highway in this area, much of the housing development and subdivisions in this area occurred during the 1950s to 1970s, so architectural styles differ throughout the area. Typical residential development in this area comprises single and double storey homes of brick construction.

Indigenous vegetation communities in the area have responded to deep, rich soils and high rainfall, and the tall remnant trees and patches of thick vegetation retained in road reserves, front gardens and pocket parks contribute to the leafy, well-treed character of the area. Residential properties in the area typically have mature gardens, and streetscape character is influenced by tall street trees and retained trees on private properties.

Small parcels of recreational land are positioned within this LCZ and are considered a part of the character of these residential areas. One such park is Curtilage Park, which lies within the study area for the Proposal and is positioned between 'Mahratta' and the locally significant heritage item 'Yaamba' on the Pacific Highway, having once been a part of this housing estate.

2.3.4 LCZ 4: Recreational Open Space

Within the study area there is only one instance of LCZ 4: Recreational Open Space (the Turramurra Lookout Community Garden). The surrounding area (outside the study area boundary) has several larger recreational open spaces within this LCZ, typically scattered throughout LCZ 3: Residential Development. Smaller parks within the study area, such as Curtilage Park in Wahroonga and Turramurra Village Park lie within other LCZs as they contribute to the landscape character of the LCZs within which they lie.

There are two broad categories of recreational open space in the surrounding landscape:

- Isolated parks and playing fields, which are predominantly scattered throughout LCZ 3: Residential Development; and
- Larger tracts of bushland which are often linked to drainage corridors. These often have parks and playing fields associated with them positioned at their boundaries.

There are several open spaces (particularly playing fields) which are associated with schools along the Pacific Highway. These have been considered as belonging to LCZ 2: Mixed Use Development Corridor as they are private land and are integral to the character of this landscape zone.

Typically, small, isolated parks in this area comprise blocks of land with turf with scattered shade trees, perimeter planting and occasional playgrounds. The character of many of these parks is heavily influenced by remnant indigenous vegetation left within these blocks and at the edges. Typically, parks and open spaces contain bands of indigenous vegetation or trees at the property edges, with scattered trees in turf through the middle or at sports field edges (refer Figure 2-12).



Figure 2-12 Turramurra Memorial Park, showing the sports field surrounded by large, indigenous trees (photo source: <http://sydney.kidtown.com.au>)

Some parks have been planted with primarily exotic species, with deciduous trees planted within the parks to allow winter sun into the spaces. Even in these cases, indigenous vegetation can be seen at park edges.

The Turramurra Lookout Community Garden is a unique piece of public / semi-public open space within the study area. The site is a steeply sloped piece of open space that has been set up as a community garden (refer Figure 2-13). While the garden is typically maintained by the approximately 50 Garden Club members, working bees are open to the public, and the public are invited to walk through and experience the space regardless or not of if they help maintain it. As described above, the garden has been planted with primarily exotic tree and shrub species, but with indigenous trees seen at the park edges and beyond its boundaries.



Figure 2-13 The view into Turramurra Lookout Community Garden from the Pacific Highway, looking along the planted edge that buffers the garden from the road corridor

Other types of recreational open space found in the area are tracts of remnant bushland. The North Shore is topographically high and has several steep areas, with creek corridors still typically vegetated with remnant bushland. Walking tracks pass through these corridors, linking the tracts of bushland in a network of recreational paths. Overall, these tracts of bushland contribute to the overall unique character of the North Shore landscape. Many parks and playing fields are associated with these tracts of land, positioned at their edges where the bushland meets development.

2.3.5 LCZ 5: Local Centres

This LCZ is positioned at two locations within the study area, typically clustered near train stations running parallel to the north of the Pacific Highway (Turramurra and Wahroonga stations). The LCZ typically comprises local retail centres and other community facilities such as the Turramurra Library. While the built form of these developments differs greatly within the study area, the zone is characterised by increased community activity and a higher amount of open space (including car parks, communal green open spaces and hard gathering spaces) juxtaposed with larger built forms. These areas typically have fewer mature trees within the road corridor or on private property.

The character of these areas is predominantly influenced by the built form, typically two storey terrace development with shops and commercial services (e.g. medical professions, restaurants and cafes, or hair dressers) at the street frontage, and storage areas and offices on the first floors. Shop fronts are located in close proximity to the road corridor, with pedestrian footpaths along the Highway and side streets protected by covered walkways (refer Figure 2-14).

At the Wahroonga local centre, the commercial activity is centred away from the Pacific Highway, instead fronting Railway Avenue and Redleaf Avenue just north of the Proposal. A rear carpark on Coonanbarra Road provides access to these shops, and a secondary frontage onto the carpark itself. Built form is typical of this LCZ, comprising two storey terrace buildings with no setback from the road corridor, and awnings protecting the footpath along the roads.

Where trees have been planted in the streetscape, they visually soften the streetscape, providing shade and softness to the surrounding area (refer Figure 2-15 and Figure 2-16).



Figure 2-14 The northern verge of the Pacific Highway at the Kissing Point Road intersection at Turramurra (looking north)



Figure 2-15 Jacaranda trees planted at Turramurra near the Kissing Point Road intersection soften the hardscape of the area and provide shade to the buildings (looking east)



Figure 2-16 Mature trees along Coonanbarra Road looking north east towards the public car park

Turrumurra Village Park is located within this LCZ, which is a small public park which lies between the Pacific Highway and Turrumurra Station. This park, which lies opposite the Hillview Conservation Area, offers a visual cue to the position of Turrumurra Station to travellers on the Highway, with mature exotic trees and formal hedging within the park.

3.0 Urban Design Strategy

An urban design strategy was developed to provide an overarching vision for the Proposal. This strategy is similar to and builds on the urban design strategy prepared for the recently approved Intersections 1 and 2. The aim of this vision is the visual integration of the Proposal into its surrounding environment, providing a more enjoyable experience for the road user and surrounding property owners by the preservation of the local character of the road corridor and adjoining landscape as described in Chapter 2.0 of this report.

In order to fulfil this overarching vision, urban design objectives have been developed in order to overlay the landscape values identified along the corridor as a whole, informed by *Beyond the Pavement: Urban Design Policy Procedures and Design Principles* (Roads and Maritime, 2014), with more detailed principles developed with guidance from the following local environmental plans (LEPs) applicable to the Proposal area (refer Section 3.2):

- Ku-ring-gai Local Environmental Plan (Local Centres) 2012
- Ku-ring-gai Local Centres Development Control Plan 2017
- Ku-ring-gai Local Environment Plan 2015, and
- Ku-ring-gai Development Control Plan 2017.

The Urban Design Strategy has also been informed by the *Statement of Heritage Impact for Locally Significant Heritage Items within the Ku-ring-gai Local Government Area* prepared by Phillips Marler and Biosis (September 2018).

3.1 Urban Design Objectives and Principles

Urban design objectives for the Proposal have been developed using the nine overarching principles from *Beyond the Pavement: Urban Design Policy Procedures and Design Principles* (Roads and Maritime, 2014).

Four specific urban design objectives have been identified as relevant to the Proposal, with related principles and their associated areas of the Proposal that they influence as outlined in Table 4

Table 4 Urban design objectives and related principles for the Proposal

Urban design objectives and related principles	Within Roads and Maritime owned corridor ¹	Outside Roads and Maritime owned corridor
<i>Objective 1: Rebuilt and new structures along the road corridor should fit with the built fabric of the local area through which the Pacific Highway passes</i>		
Principle 1a: Design of replacement fences, gateposts and retaining walls should be sympathetic to the architecture of the local environment and the requirements of individual property owners in relation to visual issues (e.g. screening of the road corridor from the property, solar access, etc).	Not applicable	Road widened to the west, structures along and adjacent to front boundary of affected property would require reinstatement within adjusted property boundary.
Principle 1b: Within Heritage Conservation Areas (HCAs) and the curtilage of heritage items, replacement fences, gateposts and retaining walls should be similar in character (including height and materiality) to the existing structures.		

¹ Includes local side road tie-ins to the State road impacted by the Proposal

<p>Principle 1c: Pedestrian footpaths and verges should be replaced to match with existing within the road corridor.</p>	<p>Footpaths and verges to be replaced along the western verge of the Pacific Highway.</p> <p>Footpaths and verges to be replaced along the northern verge of the Munderah Street which ties into the Pacific Highway.</p>	<p>Not applicable</p>
<p>Objective 2: The existing 'green corridor' of the Pacific Highway (and adjoining local side roads) should be protected and enhanced</p>		
<p>Principle 2a: Identify where changes to the road corridor would result in gaps in the existing canopy and mitigate these changes with replacement planting.</p>	<p>Footpaths and verges to be replaced along the western verge on the Pacific Highway and the northern verge on Munderah Street. Opportunity to replace juvenile trees impacted on northern verge of Munderah Street.</p>	<p>Road widened to the west, vegetation along and adjacent to the front boundary of affected property would require reinstatement within adjusted property boundary.</p>
<p>Principle 2b: Plant species selected should be determined and designed in consultation with the landscape architect for the project and landowner</p> <p><i>[for heritage areas refer to Principle 3B also]</i></p>	<p>Extent of planting area is limited to turf on verge</p>	
<p>Principle 2c: Tree replacement species / locations should address road safety and maintenance requirements including:</p> <ul style="list-style-type: none"> - State / local road functions - Provision of utilities - Existing and new hardscape features present within the road frontage of adjoining properties 	<p>Footpaths and verges to be replaced along the western verge on the Pacific Highway and the northern verge on Munderah Street. Opportunity to replace impacted juvenile trees on northern verge of Munderah Street.</p>	
<p>Objective 3: The Proposal should respond to local and State heritage elements (both hardscape and planting) within and along the road corridor</p>		
<p>Principle 3a: Existing fencing, gateposts and retaining walls present within the curtilage of heritage items should be retained and reinstated where possible. If reuse of original materials is not possible, new fences, gateposts and retaining walls should be designed in consultation with the Project heritage and landscape specialists and property owners, and with consideration of the local Statement of Heritage Impact for the Proposal.</p>	<p>Not applicable</p>	<p>Road widened to the west at Intersection 3, structures along and adjacent to the front boundary of affected property would require reinstatement within adjusted property boundary.</p> <p>At the proposed construction compound, the wall on the southern side of the Pacific Highway would be temporarily removed</p>

		and replaced with the original wall.
Principle 3b: Plant species selected within heritage items and HCAs should be determined and designed in consultation with the Project heritage and landscape specialists and property owners, and with consideration of the local Statement of Heritage Impact for the Proposal.	Not applicable	Road widened to the west, vegetation along and adjacent to the front boundary of affected property would require reinstatement within adjusted property boundary.
Principle 3c: Placement of services and signs within heritage items and HCAs should be simple, coordinated and neat and not detract from the existing heritage character of the heritage item or HCA.	Signage and utilities	Not applicable
<i>Objective 4: Durability should be considered in the design of hardscape elements and planting along the corridor</i>		
Principle 4a: Robust, durable materials should be used which are fit for purpose and place.	Not applicable	Fencing, gateposts and retaining walls within private property.
Principle 4b: Plant species should be chosen for suitability to the local climate and soil to create a low maintenance landscape that is more likely to persist and become integral to the overall character of the road corridor.	Replacement trees within the northern verge at Munderah Street.	Replacement trees and shrubs within private property.
Principle 4c: Opportunities for vandalism should be minimised with the use of materials (particularly for fencing and retaining walls) and the placement of vegetation.	Signage and utilities	Fencing, gateposts and retaining walls within private property.
Principle 4d: Placement of services and signs within the road corridor should be simple, coordinated and neat.	Signage and utilities	Not applicable

3.2 Requirements of planning documents

Future developments within Ku-ring-gai local government area (LGA) are required to consider Council's planning controls in relation to streetscape and overall character. These aspects should be considered in the design of streetscape elements and the reinstatement of built form and vegetation within the adjusted private property boundaries as a result of the proposed road widening and site compound activities.

3.2.1 Ku-ring-gai Local Environmental Plan 2015

The overall aims of the Ku-ring-gai Local Environmental Plan 2015 (Ku-ring-gai LEP) include the following:

- To guide the future development of land and the management of environmental, social, economic, heritage and cultural resources within Ku-ring-gai;
- To protect, enhance and sustainably manage the biodiversity, natural ecosystems, scenic values, water resources and ecological processes within the catchments of Ku-ring-gai for the benefit of current and future generations; and
- To recognize, protect and conserve Ku-ring-gai's indigenous and non-indigenous cultural heritage.

In relation to heritage conservation, the Ku-ring-gai LEP lists the following objectives:

- To conserve the environmental heritage of Ku-ring-gai;
- To conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views;
- To conserve archaeological sites; and
- To conserve Aboriginal objects and Aboriginal places of heritage significance.

3.2.2 Ku-ring-gai Local Environmental Plan (Local Centres) 2012

The overall aims of the Ku-ring-gai Local Environmental Plan (Local Centres) (Ku-ring-gai LEP (Local Centres)) include the following:

- To guide the future development of land and the management of environmental, social, economic, heritage and cultural resources in Ku-ring-gai for the benefit of present and future generations;
- To recognise, protect and conserve Ku-ring-gai's indigenous and non-indigenous cultural heritage;

In relation to heritage conservation, the Ku-ring-gai LEP (Local Centres) lists the following objectives:

- To conserve the environmental heritage of Ku-ring-gai;
- To conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views;
- To conserve archaeological sites; and
- To conserve Aboriginal objects and Aboriginal places of heritage significance.

3.2.3 Ku-ring-gai Development Control Plan 2017

The objectives of the Ku-ring-gai Development Control Plan 2017 (Ku-ring-gai DCP) for land consolidation and subdivision include:

- To protect established trees and vegetation on sites and road verges;
- To protect the ecological, cultural and aesthetic values of the site and surrounds;
- To ensure the appropriate planting of street trees in subdivisions involving new roads; and
- To ensure that street trees are located to minimise the impact on services.

In relation to development within the vicinity of heritage items or HCAs, the DCP objectives for local character and streetscape include:

- To consider the impact on the historic curtilage and setting of the Heritage Item or HCA and related heritage features such as views, streetscape context, historical subdivisions, garden settings, alienated trees and other landscape features;
- To retain the significance of Heritage Items or HCAs in their settings;
- To ensure that the scale of new development does not dominate, detract from or compete with Heritage Items or HCAs in the vicinity;
- To ensure that new development respects and conserves the significance of any nearby Heritage Items or HCA and their settings;
- To ensure that new development does not visually dominate the adjoining or nearby Heritage Item or HCA; and
- To ensure that the scale of new development in the vicinity of the HCA is in harmony with the streetscape and does not dominate, detract from or compete with the Heritage Item or HCA.

3.2.4 Ku-ring-gai Local Centres Development Control Plan 2012

The objectives of the Ku-ring-gai Local Centres Development Control Plan 2012 (Ku-ring-gai Local Centres DCP) for land consolidation and subdivision include:

- Establish a future character for Ku-ring-gai's Local Centres, and ensure that development across the Local Government Area positively contributes to the existing character of the residential areas;
- Provide high quality public spaces and streets;
- Promote increased use of public transport, walking and cycling;
- Provide traffic control measures and outcomes that manage and improve local traffic impacts and promote pedestrian safety;
- Ensure the heritage significance of the Heritage Items and Heritage Conservation Areas is conserved, and encourage development which respects that significance;
- Ensure the long-term survival of Ku-ring-gai's native and exotic tree and vegetation cover;

In relation to development within the vicinity of heritage items or HCAs, the DCP objectives for local character and streetscape include:

- To retain the historic subdivision patterns within HCAs that reflect the age and circumstances of the early and later subdivisions including the characteristic rhythm and built form spacing.
- To ensure that new development respects the established streetscape, and the historical patterns of development.
- To ensure new subdivisions and lot consolidations do not have an adverse impact upon the curtilage of Heritage Items, the streetscape setting of significant buildings and the identified character of the HCA as a whole.

4.0 Landscape Character Impact Assessment

Existing Landscape Character Zones (LCZs) have been identified within and beyond the study area which share broadly homogenous characteristics or spatial qualities (refer Section 2.3 and Figure 2-7).

Five LCZs have been identified in the areas surrounding the Proposal, these being:

- LCZ 1: Infrastructure Corridor;
- LCZ 2: Mixed Use Development Corridor;
- LCZ 3: Residential Development;
- LCZ 4: Recreational Open Space; and
- LCZ 5: Local Centres.

4.1 LCZ 1: Infrastructure Corridor

The impact on landscape character due to the Proposal for LCZ 1: Infrastructure Corridor is assessed in Table 5.

Table 5 Landscape character impact assessment for LCZ 1: Infrastructure Corridor

Changes due to the Proposal	The Proposal is positioned adjacent to this LCZ at Turramurra, with the proposed construction compound lying next to the rail corridor. However, the rail corridor at this location lies at a lower level, with steep batters covered in vegetation visually containing the corridor. For this reason, there would be no changes within this LCZ due to the Proposal.
Sensitivity	This LCZ has been assessed as having a 'Moderate' sensitivity, due to the following: <ul style="list-style-type: none"> • Road and rail corridors are typically utilitarian in that their primary function is the safe and efficient movement of traffic and goods; and • Typically, this LCZ is somewhat isolated, with fringing vegetation, built form and localised landform visually containing it. The rail corridor fits this description; however, the M1 Motorway only fits this description where the road passes through suburban areas and is fringed by noise walls and screening vegetation. As a landscape element, the motorway is particularly scenic in parts, and passes through more sensitive landscapes, including national parks.
Magnitude of Change	The magnitude of change would be 'Negligible', as there would be no changes due to the Proposal within this LCZ.
Overall Assessment	Using the Landscape Character and Visual Impact Assessment Matrix (refer Table 1) the overall impact on landscape character within this LCZ is 'Negligible'.

4.2 LCZ 2: Mixed Use Development Corridor

The impact on landscape character due to the Proposal for LCZ 2: Mixed Use Development Corridor is assessed in Table 6.

Table 6 Landscape character impact assessment for LCZ 2: Mixed Use Development Corridor

Changes due to the Proposal	Changes within this LCZ due to the Proposal are outlined in Section 1.3 and include: <ul style="list-style-type: none"> • Provision of an additional northbound lane by widening to the western side of the Pacific Highway;
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	<ul style="list-style-type: none"> • Reconfiguration of intersections with side streets along the Highway, resulting in changes to turning bays and lanes; • Strip acquisition and property adjustments in one location, changes including: <ul style="list-style-type: none"> - encroachment in the existing property; - relocation and reconstruction of a retaining wall and pedestrian stair access; and - removal and potential replacement of vegetation (including mature trees) along the property boundary next to the road frontage; • Modifications to an existing driveway accesses fronting the road corridor; • Modifications to the existing raised central medians on the Pacific Highway; • Modifications to the western kerbside footpath on the Pacific Highway to accommodate the modified road alignment; • Removal of street trees on the western side of the Pacific Highway and northern side of Munderah Street; • Relocation of traffic signal poles at the intersections; • Establishment of a signalised intersection with new traffic signal poles at the intersection of Redleaf Avenue and the Pacific Highway; • Milling and re-sheeting; • Relocation of above and below ground utilities including gas, water mains, local communication cables, street lighting and electricity poles/lines; and • New traffic signs, line markings and road furniture. <p>The construction compound at Turramurra also lies within this LCZ. Changes at this site include:</p> <ul style="list-style-type: none"> • Temporary removal of the existing gateposts and part of the stone wall along the Pacific Highway road frontage to facilitate heavy vehicle entry; • Heavy vehicle movements to and from the compound site along the Pacific Highway and light vehicle movements along Boyd Street; • Trimming of vegetation within the compound site which will be visible from the Pacific Highway; and • Stockpiles, site offices, vehicle storage and staff parking within the compound site.
<p>Sensitivity</p>	<p>This LCZ has been assessed as having a ‘Moderate’ sensitivity, due to the following:</p> <ul style="list-style-type: none"> • The corridor contains areas with inherent landscape values, including places of cultural interest and importance (e.g. the Masonic Temple and churches within school grounds), and places of heightened sensitivity (e.g. school grounds and community facilities); • The LCZ contains items of heritage significance and land that falls within heritage conservation areas;

	<ul style="list-style-type: none"> • The landscape contains areas with picturesque qualities, including mature gardens and trees; • However, the Proposal comprises changes to an existing road (rather than adding a new element), therefore changes would be likely to be visually absorbed into the landscape in terms of line, colour and scale.
Magnitude of Change	<p>The magnitude of change would be 'Moderate' due to the following:</p> <ul style="list-style-type: none"> • The Pacific Highway is an integral part of the character of this LCZ, and would undergo a reasonable amount of change within the study area (widening and reconfiguration of lanes and intersections); • The loss of fringing vegetation along the roadway (e.g. opposite Redleaf Avenue at Wahroonga) would affect the character of the road corridor and some of the fringing development; • However, much of the character of the LCZ would remain unchanged due to the changes being limited to the Pacific Highway; and • Changes at the construction compound site would be temporary (seen only during the construction period) and would be predominantly visually contained within the site. Vehicle movements within the surrounding streets would not be uncharacteristic for these roads, with heavy vehicles limited to the Pacific Highway and light vehicles to the quieter, residential area surrounding Boyd Street.
Overall Assessment	Using the Landscape Character and Visual Impact Assessment Matrix (refer Table 1 the overall impact on landscape character within this LCZ would be 'Moderate'.

4.3 LCZ 3: Residential Development

The impact on landscape character due to the Proposal for LCZ 3: Residential Development is assessed in Table 7.

Table 7 Landscape character impact assessment for LCZ 3: Residential Development

Changes due to the Proposal	<p>Changes adjacent to this LCZ would comprise:</p> <ul style="list-style-type: none"> • Provision of an additional northbound lane by widening to the western side of the Pacific Highway; • Strip acquisition and property adjustments at one location (including heritage listed properties), changes including: <ul style="list-style-type: none"> - encroachment in the existing property; - relocation and reconstruction of a retaining wall and pedestrian stair access; and - removal and potential replacement of vegetation (including mature trees) along the property boundary next to the road frontage; • Modifications to the existing raised central medians on the Pacific Highway; • Modifications to the western kerbside footpath on the Pacific Highway to accommodate the modified road alignment; and • Removal of street trees on the western side of the Pacific Highway and northern side of Munderah Street; <p>These changes would visually comprise an overall widening of the road corridor at this location with a reduction of mature trees and vegetation on the western side of the Highway. Fences, walls, gates and gateposts would be</p>
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	reconstructed, and signalised intersections at these locations would be slightly reconfigured. A new signalised intersection would be constructed at Redleaf Avenue.
Sensitivity	<p>This LCZ has been assessed as having a 'Moderate' sensitivity. The more sensitive aspects of the LCZ include:</p> <ul style="list-style-type: none"> • The LCZ contains items of heritage significance and land that falls within heritage conservation areas; • The landscape contains areas with picturesque qualities, including mature gardens (e.g. the stately homes within the heritage conservation area HCA C2, which includes the State Significant 'Mahratta' site on the corner of Fox Valley Road and the Pacific Highway); and • The LCZ is picturesque in the more recently developed areas (i.e. outside the heritage conservation areas) due to large tracts of retained bushland and mature indigenous and exotic tree cover within private properties. <p>However, the sensitivity of the LCZ is somewhat reduced due to the large extent of the LCZ in the locality, of which the LCZ within the study area makes up only a small proportion.</p>
Magnitude of Change	<p>The magnitude of change is 'Low' within the study area due to the following:</p> <ul style="list-style-type: none"> • Residential properties adjacent to the Pacific Highway respond to the Highway in built structures (retaining walls, fencing and landscape / vegetation), however, there is not a lot of change that would occur within this LCZ due to the Proposal. Most of the change would occur within LCZ 2; • While the loss of vegetation along the residential edge on the Pacific Highway would affect the character of the fringing development, particularly within the heritage conservation area (HCA C2), only a small number of trees would be removed within this LCZ due to the Proposal; • The Proposal comprises changes to an existing road (rather than adding a new element), therefore changes would be likely to be absorbed into the landscape in terms of line, colour and scale.
Overall Assessment	Using the Landscape Character and Visual Impact Assessment Matrix (refer Table 1) the overall impact on landscape character within this LCZ would be 'Moderate to Low'. The Proposal is limited to a small area within the LCZ when considering the greater landscape; however, the changes are primarily affecting a sensitive area within this LCZ: areas with heritage significance.

4.4 LCZ 4: Recreational Open Space

The impact on landscape character due to the Proposal for LCZ 4: Recreational Open Space is assessed in Table 8.

Table 8 Landscape character impact assessment for LCZ 4: Recreational Open Space

Changes due to the Proposal	There would be no changes within this LCZ due to the Proposal. The Turramurra Lookout Garden lies east of the temporary construction compound site in Turramurra but is visually buffered by the rail corridor which lies within the garden and the construction compound site. For this reason, there would be no changes within this LCZ due to the Proposal.
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Sensitivity	Recreational land typically has a 'High' sensitivity as this LCZ has high inherent landscape values, scenic properties and cultural importance. These areas increase the quality of surrounding landscapes due to outlook and environmental impact, particularly that green spaces cool climatic conditions, filter air and water, provide habitat, etc.
Magnitude of Change	The magnitude of change would be 'Negligible', as there would be no changes within or directly adjacent to this LCZ within the study area due to the Proposal.
Overall Assessment	Using the Landscape Character and Visual Impact Assessment Matrix (refer Table 1) the overall impact on landscape character within this LCZ is 'Negligible'.

4.5 LCZ 5: Local Centres

The impact on landscape character due to the Proposal for LCZ 5: Local Centres is assessed in Table 9.

Table 9 Landscape character impact assessment for LCZ 5: Local Centres

Changes due to the Proposal	<p>The Proposal is positioned adjacent to this LCZ at the Turramurra and Wahroonga local centres.</p> <p>At Turramurra, this LCZ directly adjoins the construction compound site. While no changes would occur within this LCZ, changes to the construction compound site would include:</p> <ul style="list-style-type: none"> • Temporary removal of the existing gateposts and part of the stone wall along the Pacific Highway to facilitate heavy vehicle entry; • Vehicle movements to and from the compound site, through the Local Centre at Turramurra along the Pacific Highway; • Trimming of vegetation surrounding and within the compound site which would be visible within LCZ 5 at this location; and • Stockpiles, site offices, vehicle storage and staff parking within the compound site, visible from LCZ 5 at this location. <p>At Wahroonga, changes to the western side of the Pacific Highway and changes to the intersection with Redleaf Avenue lie adjacent to this LCZ. These changes include the reconfiguration of the intersection at Redleaf Avenue, the addition of traffic lights and signage, widening of the Pacific Highway to the west (including the removal and reinstatement of existing landscape within private property), and the reconfiguration of the traffic lanes and median adjacent to this LCZ.</p>
Sensitivity	<p>This LCZ has been assessed as having a 'Moderate' sensitivity, due to the following:</p> <ul style="list-style-type: none"> • The LCZ includes areas of cultural and community importance, such as community centres, libraries and other gathering places; and • The LCZ contains pockets of public open space that have increased scenic value.
Magnitude of Change	<p>The magnitude of change would be 'Low'. The overall character of the LCZ would remain unchanged due to the changes being limited to one site outside this LCZ. The changes to the construction compound site would be temporary; visible only during the construction period and returned to its existing state at operation. Although the changes would comprise the addition of construction materials, stockpiles, vehicular movement and site offices, these would be predominantly contained within the compound site, which is surrounded by vegetation and visually contained by the rail corridor to the east of the site.</p>

Overall Assessment	Using the Landscape Character and Visual Impact Assessment Matrix (refer Table 1) the overall impact on landscape character within this LCZ would be 'Low to Moderate'.
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5.0 Visual Impact Assessment

The visibility of the Proposal was mapped using desktop analysis and site exploration (on foot and by car), and a list of representative viewpoints were determined from which to assess the visual impact. From some viewpoints, views from private property are discussed, and the sensitivity of the view seen from these locations, as well as the receptors, are included within the assessment at these viewpoints.

5.1 Intersection 3: Pacific Highway at Redleaf Avenue and Coonanbarra Road, Wahroonga

Intersection 3 is located between Neringah Avenue and Woodville Avenue/Munderah Street, Wahroonga (refer Figure 5-1). The main works for the Proposal in this location would extend along about 150 metres along the Pacific Highway between these roads, with drainage works occurring on the northern verge of Munderah Street.



Figure 5-1 Visual envelope map and viewpoints at Intersection 3

Key features within this area include:

- Gateposts to the former “Estha”, dwelling house (Item No. I976), 1614–1634 Pacific Highway, Wahroonga NSW, Lot 102, DP 1034668. Item of local heritage significance listed in the Kuring-gai LEP, 2015 (refer Figure 5-2);
- South east of the ‘Estha’ Gateposts, tall hedging plants (including *Xylosma senticosum* and *Syzygium* ssp.) are situated behind the retaining wall within the heritage curtilage of this property which screens the Thomas and Rosetta Agst Aged Care Facility from the road, with other trees directly behind the wall including *Quercus robur*, *Cinnamomum camphora* and *Jacaranda mimosifolia*. The ground layer is a mix of native and exotic species (refer Figure 5-3).



Figure 5-2 Estha Gates (locally listed heritage item) and the existing newer sandstone wall and the entry driveway to the aged care facility

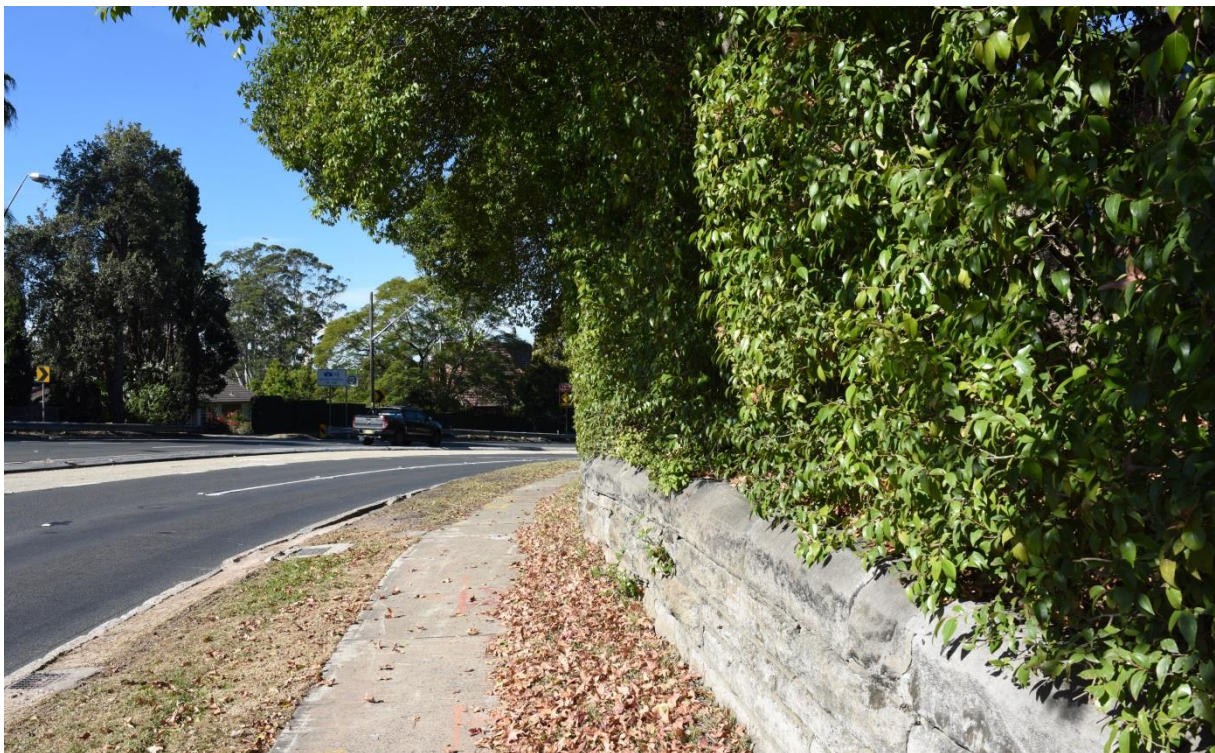


Figure 5-3 The view south east along the footpath adjacent to the hedge screening the Thomas and Rosetta Agst Aged Care Facility from the Pacific Highway

Changes due to the Proposal are detailed in Section 1.3 and shown in Appendix A, with the most visually prominent changes including:

- Provision of an additional northbound lane by widening to the western side of the Pacific Highway resulting in three continuous northbound through lanes on the Pacific Highway;
- Converting the right-turn bay into Coonanbarra Road from the Pacific Highway (northbound) to a through lane (banning the right-turn);
- Realigning the existing right-turn bay into Redleaf Avenue from the Pacific Highway (existing queuing length to remain the same);
- Signalising the intersection at Redleaf Avenue including:
 - providing an additional left-turn lane from Redleaf Avenue onto the Pacific Highway (southbound) to create a dual left-turn;
 - removing the existing right-turn from Redleaf Avenue onto the Pacific Highway (northbound);
 - introducing a signalised pedestrian crossing on the western leg of the intersection (across the Pacific Highway) and a two-staged signalised pedestrian crossing on the northern leg of the intersection (across Redleaf Avenue);
 - modifying the existing raised traffic island on the northern leg of the intersection; and
 - introducing stop lines on the northern, western and eastern legs of the intersection.
- Partial property acquisition (about 380 square metres) and property adjustments from a local heritage item located at 1614-1634 Pacific Highway, Wahroonga (occupied by Thomas and Rosetta Agst Aged Care Facility) including:
 - relocation and reconstruction of an existing pedestrian stair access on the northern road frontage boundary;
 - removal of an existing masonry retaining wall on the northern road frontage boundary extending about 130 metres in length with a varying height of up to 2.4 metres;
 - establishment of new replacement retaining wall along the new northern property boundary (a minimum offset of about three metres would be provided to the existing aged care facility building on this property);
 - vegetation and tree clearance along the north eastern extent of the property next to the road frontage; and
 - establishment of additional drainage within the property adjacent to the new wall alignment.
- Modifications to the existing driveway accesses to accommodate the new road layout;
- Widening the existing median on the Pacific Highway directly south of the right-turn bay into Redleaf Avenue;
- Modifications to the western kerbside footpath on the Pacific Highway between Munderah Street and Redleaf Avenue to accommodate the modified road alignment;
- Removal of street trees and vegetation on the western side of the Pacific Highway between Coonanbarra Road and Munderah Street;
- Removal of street trees and vegetation on the northern side of Munderah Street on the approach to the intersection of the Pacific Highway;
- Relocation of traffic signal poles and provision of new mast arms at the intersection of the Pacific Highway, Ada Avenue and Coonanbarra Road;
- Milling and re-sheeting;

- Relocation of above and below ground utilities including gas, water mains, local communication cables, street lighting and electricity poles/lines;
- Stormwater infrastructure upgrades in the following locations to accommodate the widened carriageway and address existing drainage issues in this location:
 - the northbound kerb and channel of the Pacific Highway between Redleaf Avenue and Munderah Street; and
 - the eastbound kerb and channel of Munderah Street on approach to the Pacific Highway; and
- New traffic signs, line markings and road furniture.

5.1.1 Visibility of the Proposal

The Proposal is primarily situated along the Pacific Highway, with visible changes seen within the road corridor and affecting properties on the south western verge and the north eastern verge of the road corridor at this location. Changes would also be visible on the northern verge of Munderah Street near the Pacific Highway. The visibility of the Proposal at this location is shown in Figure 5-1.

The Proposal would be seen along and within a road corridor from:

- Redleaf Avenue near Wahroonga Train Station looking south towards the Pacific Highway;
- Woodville Avenue westbound towards the Pacific Highway
- North of the northern extent of works, north of Coonanbarra Road on the Pacific Highway looking south east along the Highway (although due to the distance of viewing and the signalised intersection and pedestrian bridge at Coonanbarra Road, a detailed view from this location would not be possible, refer Figure 5-4);
- South of the southern extent of works from Woodville Avenue north along the Pacific Highway; and
- Munderah Street westbound towards the Pacific Highway.

The Proposal would also be seen from the front gardens and facades of residential properties adjacent to the works fronting the Pacific Highway, Redleaf Avenue, and Munderah Street, and from the front of commercial properties directly adjacent to the works (e.g. the Petrol station on the corner of Redleaf Avenue). Other commercial properties on Redleaf Avenue would be unlikely to see views to the Proposal due to the orientation of the shop fronts and distance of viewing. Typically, residential properties fronting onto the Pacific Highway have tall fences and screening vegetation that screen views to the Highway.



Figure 5-4 Photomontage showing the view looking south west along the Pacific Highway north of Coonanbarra Road

5.1.2 Visual Receptors

Visual receptors viewing the Proposal would include:

- Residents in homes (including the Thomas and Rosetta Agst Aged Care Facility) on the Pacific Highway and Munderah Street adjacent to the Proposal;
- Employees and visitors of commercial properties adjacent to the Proposal (e.g. the petrol station on the Highway on the corner of Redleaf Avenue); and
- Road users on the Pacific Highway and Munderah Street, including motorists, cyclists and pedestrians.

5.1.3 Representative Viewpoints

Three representative viewpoints were chosen to assess views seen of the Proposal from the surrounding area at this location (refer Figure 5-1). These are:

- Viewpoint 1: Thomas and Rosetta Agst Aged Care Facility;
- Viewpoint 2: Residence at 1563 Pacific Highway, Wahroonga; and
- Viewpoint 3: The Pacific Highway north and south of Intersection 3.

A representative viewpoint was not selected for Munderah Street due to the changes being limited to drainage works within the road verge. Some street trees would be removed from this area, but the existing trees are juvenile and have been heavily pruned due to their position underneath electrical wires. If trees were replaced with shorter species, replacement trees would be more likely to achieve good form within the streetscape than the existing small trees.

5.1.3.1 Viewpoint 1: Thomas and Rosetta Agst Aged Care Facility

Receptors	Receptors from this location include residents and visitors within the Thomas and Rosetta Agst Aged Care Facility looking north and east towards the Pacific Highway (refer Figure 5-5). Many of these receptors would see the view towards the Highway from an elevated position (i.e. from windows of apartments on the first and second floor of the residential building). Others would get views north and north east towards the Highway from ground floor apartments and outdoor courtyards.
Existing views	This viewpoint is situated on private property, therefore the view seen from this location are estimated on what can be seen from the Pacific Highway looking south and east towards the viewpoint. Views to the Pacific Highway from rooms along the northern façade of the facility and along the south eastern edges of the aged care facility are partly or fully screened by a thick band of vegetation along the northern and eastern boundaries of the property. Views from these facades primarily comprise views to the gardens and screening vegetation, with the road pavement itself screened. Views from within the grounds of the facility to the Highway are also partially or fully screened by vegetation, unless they were seen from along one of the two driveway entrances at Estha Gates or at the southern limit of Intersection 3 on the Pacific Highway.
Changes to the view	From the northern and south eastern facades of the facility, the view to the Highway would be clearly seen due to the removal of the thick band of screening vegetation along the boundary to the north and east. A view to the new signalised intersection at Redleaf Avenue would also be clearly seen from apartments with windows positioned on the northern and south eastern façades of the building. The road pavement of the Highway would be physically closer to the buildings due to the widening of the Highway, including street lighting and the traffic signals at the

	<p>intersection. In the winter, it is likely that the northern façade would also be more exposed to the sun due to the removal of vegetation (seen partially shading the façade in Figure 5-5). A new retaining wall would also be built on the new boundary of the property.</p>
Sensitivity	<p>The value of the view from this location has been assessed as 'High'. From within the aged care facility grounds, the band of mature trees and shrubs would partly to fully screen the view to the Highway from apartments and from open spaces and pathways within the property, depending on the position of the apartments within the building. This vegetation visually softens the view and provides a green, 'leafy' character to the outlook.</p> <p>The sensitivity of these receptors has been assessed as 'High' due to the following:</p> <ul style="list-style-type: none"> Residents are typically a sensitive viewer group, given that they have a proprietary interest in the views from their apartment / room, although only a moderate to low number of receptors would see views to the Proposal from this location due to the low number of windows along the northern and south eastern facades of the building; Residents would regularly see views to the Proposal for moderate periods of time from within their homes and the property grounds, and from a closer proximity.
Magnitude of change	<p>The magnitude of change to the view from this location would be 'High'. The view to the road pavement and new signalised intersection from rooms in this building and within the grounds of the facility would be opened up, with mature screening vegetation and trees being removed and the road pavement and items within the road corridor, including traffic lights and street lighting, moving closer to the built form within the facility due to the widening of the Highway.</p> <p>The amount of garden area and screening vegetation previously seen from the windows would be reduced, with mature trees and shrubs potentially replaced (subject to detailed design). A new retaining wall would replace the existing wall to be removed but would be positioned up to five metres closer to the built form within the facility at its greatest extent (about a three metre minimum offset from the existing building).</p> <p>Vegetation closest to the eastern corner of the building would not be replaced due to space limitations with the existing pedestrian path and new stormwater dish drains required, opening up permanent views to the Highway from some apartments and from within the grounds.</p>
Overall assessment	<p>Using the Landscape Character and Visual Impact Assessment Matrix (refer Table 1) the overall visual impact would be 'High'.</p>



Figure 5-5 Tall vegetation on the northern and eastern boundaries of the aged care facility (Thomas and Rosetta Agst Aged) screen views from many areas within the aged care facility towards the Pacific Highway, and partially shades the building façade in the winter months

5.1.3.2 Viewpoint 2: Residence at 1563 Pacific Highway, Wahroonga

<p>Receptors</p>	<p>Receptors from this location include residents and visitors to the property at 1563 Pacific Highway, Wahroonga, on the eastern side of the Pacific Highway looking west towards the Highway. Receptors at this location would typically be viewing the Pacific Highway Road corridor from street level, however some views from upper storey windows (and to a limited extent the ground floor windows) may be seen from the building within this property. Adjacent properties would see similar views to the Proposal from this location. The addition of traffic signals to the Highway would clearly be seen from the upper storey windows.</p>
<p>Existing views</p>	<p>This viewpoint is situated on private property, therefore the view seen from this location are estimated on what can be seen from the Pacific Highway looking east towards the viewpoint.</p> <p>Views to the Pacific Highway from this property (including front gardens of the property) are partly or fully screened by solid fencing, large palm trees and a thick band of vegetation along property boundary adjacent to the road corridor (refer Figure 5-6). Views from this property primarily comprise views to the private garden in the foreground, the fence and screening vegetation (including palm trees) in the middle and background.</p> <p>Along the driveway of this property, a clear view can be seen to the road pavement and verges of the Pacific Highway (refer Figure 5-7).</p>
<p>Changes to the view</p>	<p>Changes to the road corridor would only be seen from the driveway of this property and from the first floor of the building. These changes would include:</p> <ul style="list-style-type: none"> • Minor changes would occur to a driveway on the north eastern side of the Pacific Highway on Redleaf Avenue;

	<ul style="list-style-type: none"> • Widening of the road pavement to the west, including changes to the median strip within the road and the reconfiguration of lanes; • Construction of a signalised intersection at Redleaf Avenue, including reconfiguration of the road pavement at the intersection and the addition of traffic lights; • The removal of a wide band of screening vegetation (including mature trees) within the aged care facility on the western side of the road, and the constructed retaining wall along the new property boundary; • Removal of street trees on the western side of the Pacific Highway; and • Changes to the signage and above ground utilities within the road corridor, including street lighting.
Sensitivity	<p>The sensitivity of these receptors has been assessed as 'Moderate' due to the following:</p> <ul style="list-style-type: none"> • Residents are typically a sensitive viewer group, given that they have a proprietary interest in the views from their homes; and • Residents would regularly see views to the Proposal for moderate periods of time from within their property and from close proximity; however, the view to the Proposal from this location is at least partially screened by dense vegetation and seen from across a busy road corridor. <p>From this viewpoint, the value of the view towards the Proposal would be 'Moderate'. The view would include glimpse views to the road corridor and beyond but would primarily be focussed on the view within the property boundary walls and vegetation.</p>
Magnitude of change	<p>The magnitude of change to the view from this location would be 'Moderate'. Changes to the view from outside the property would include a wider road pavement with a changed median and road signage, a new retaining wall along the new property boundary along the western side of the highway, removal of vegetation along the aged care facility boundary, which in turn would open up views to the aged care facility building on the other side of the road. The addition of a signalised intersection would be a new element within the view. However, these changes would only be seen through the opening by the driveway reducing the impact of the changes to the view on the receptor. The taller elements within the view (i.e. the proposed traffic signals) may be seen from upper levels of residences, or from within front garden.</p>
Overall assessment	<p>Using the Landscape Character and Visual Impact Assessment Matrix (refer Table 1) the overall visual impact would be 'Moderate'.</p>



Figure 5-6 The view looking south along the Pacific Highway from in front of 1563 Pacific Highway, showing the tall front fencing along many of the properties in this location, limiting views from within these properties



Figure 5-7 The view from outside residence at 1563 Pacific Highway looking west towards the Thomas and Rosetta Agst Aged Care Facility

5.1.3.3 Viewpoint 3: The Pacific Highway north and south of Intersection 3

Receptors	Receptors from this location include road users on the Pacific Highway, including motorists, cyclists and pedestrians.
Existing views	Views along the Pacific Highway are seen from the north and south of the Proposal. From the north, the view along the Highway is terminated by the bend in the road at Redleaf Avenue (refer Figure 5-8). The view down the road corridor from the north of the Proposal is characterised by the sandstone wall and Estha gates on the western and southern sides of the road, framed by tall, thick screening vegetation on the boundary of the Thomas and Rosetta Agst Aged Care Facility; the red brick building within the aged care facility; and the tall palms and mature vegetation within the residential properties on the eastern side of the Highway at the bend in the road.

	<p>From south of the Proposal, the view seen along the road corridor follows the road up to the crest at the bend in the road at Redleaf Avenue. As per the view from the north, the view from the south along the road corridor is characterised by the sandstone retaining wall along the boundary of the aged care facility and the mature screening vegetation and fences on the eastern residential development along the Highway. The view from the south culminates in a view to the tops of trees at Redleaf Avenue seen against the backdrop of the sky, as the road goes up in elevation at this location.</p> <p>The view along the road corridor is often blocked by traffic, particularly during morning and evening peak hours.</p>
<p>Changes to the view</p>	<p>At completion of the Proposal, the greatest change that would be seen in both the northern and southern views along the Highway would be the introduction of a signalised intersection and the widening of the median at Redleaf Avenue. There would also be the relocation of the sandstone wall on the boundary of the aged care facility and the removal (and potential replacement) of the screening vegetation (refer Figure 5-9). The removal of vegetation would open up views to the aged care facility site, particularly the large red brick building situated on the corner of the site adjacent to the Highway. The scale of the building would be seen as a new, hard element from the road.</p> <p>The western / southern sides of the Highway would be wider, with street trees along the verge of the road removed.</p> <p>Overall, the view along the Highway from both directions would be less 'bushy' or 'leafy', and with more emphasis on built form adjacent and within the Highway.</p>
<p>Sensitivity</p>	<p>The value of the view along the Pacific Highway to the north and south is assessed as 'Moderate'. While the view is along a major road corridor, this road has picturesque parts, many of which are dependent on the green, 'bushy' character due to the almost continuous canopy of mature trees that line the Highway. The band of mature shrubs and trees within the Thomas and Rosetta Agst Aged Care Facility contributes to this character at this location.</p> <p>The sensitivity of road users has been assessed as 'Moderate' due to the following:</p> <ul style="list-style-type: none"> • The Pacific Highway road corridor is somewhat scenic at this location given the 'bushy' character of the area, which is expressed in the well-established vegetation predominantly within private properties on either side of the Highway; • A large number of receptors would obtain views to the Proposal, but these individual views to the changes would be seen as a series of individual, 'snapshot' views within their greater journey; and • Cyclists would obtain more prolonged views to the Proposal, although as with motorists, the view would be a small proportion of the views experienced within their overall journey, and lower numbers of cyclists are anticipated. <p>Changes due to the Proposal would be seen at close proximity as the driver or pedestrian passed the Proposal.</p>
<p>Magnitude of change</p>	<p>The magnitude of change to the view from viewpoints to the north and south of the Proposal, and while the receptor passes the location, would be 'High'. Along the road corridor with the installation of a signalised intersection along with the built form of the aged care facility would be opened up and more visible, with mature vegetation being removed and the road pavement moving closer to the aged care facility due to the widening of the Highway. Over time, the growth of replacement</p>

	hedge planting would soften the view to the aged care facility, as shown in Figure 5-10.
Overall assessment	Using the Landscape Character and Visual Impact Assessment Matrix (refer Table 1) the overall visual impact would be 'High to Moderate'.



Figure 5-8 Existing view from outside the petrol station at the corner of the Pacific Highway and Redleaf Avenue, looking south east along the Highway towards the aged care facility



Figure 5-9 Visual Simulation showing the changes due to the Proposal as seen from the petrol station at the corner of the Pacific Highway and Redleaf Avenue, looking south east along the Highway, just after construction



Figure 5-10 Visual simulation showing the changes due to the Proposal as seen from the petrol station at the corner of the Pacific Highway and Redleaf Avenue, with more established plant growth

5.2 Construction Compound Site

The proposed construction compound site would be located at 1334-1354 Pacific Highway in Turrumurra (currently occupied by a carpark and a community health centre). This site is heritage listed and located within a Heritage Conservation Area (HCA). The construction compound would include a site office; stockpile areas; concrete washout areas; a laydown hardstand for materials; staff parking; generators; fuel stores; vehicle circulation areas; amenity areas and areas for refuelling of plant and equipment (refer Section 1.3.2 and Figure 1-2).

Access to the compound site would be via the existing formed vehicle crossings from Pacific Highway (heavy vehicle access) and Boyd Street (light vehicle access). A small section of the existing sandstone wall and gate posts along the site's northern road frontage boundary may need to be removed to widen the entrance for larger vehicles to utilise the site during construction. The wall and gate would be reinstated once the construction works are completed.

Tree protection measures would be in place within the site for the duration of construction, however, some minor tree trimming may be required to trees within the property and road frontage boundary near the vehicle access points and within the road corridor to facilitate access for heavy vehicles from the Pacific Highway.

Pedestrian access would be maintained during operation of the compound site with appropriate traffic controls at the site access points to avoid pedestrian conflicts. The site would be securely confined with temporary fencing.

5.2.1 Visibility of Proposal

The proposed construction compound would be situated at 1334-1354 Pacific Highway in Turrumurra, with changes visible within the road corridor but from a limited distance away and from the areas directly north and south of the site. The visibility of the Proposal is shown in Figure 5-11.

The site of the proposed construction compound lies adjacent to the rail corridor to the east, the Pacific Highway to the north, commercial buildings fronting the Pacific Highway to the west, and residential apartment blocks to the south. It is a high point in the landscape, with the topography sloping away from the site to the north and south.

5.2.2 Visual Receptors

Visual receptors viewing the Proposal in this location would include:

- Visitors to the Turrumurra Village Park, a small park opposite the proposed construction compound site on the Pacific Highway to the north;
- Visitors to commercial properties to the west of the proposed construction compound;
- Residents in two apartment blocks directly south of the proposed construction compound fronting Boyd Street; and
- Road users on the Pacific Highway, including motorists, cyclists and pedestrians.

Due to dense fringing vegetation and the position of windows in adjacent commercial properties, views beyond these locations are unlikely.

5.2.3 Representative Viewpoints

Three viewpoints have been chosen to assess the visual impact of the Proposal at this location (refer Figure 5-11):

- Viewpoint 4: Turrumurra Village Park;
- Viewpoint 5: Residences at 16-18 Boyd Street, Turrumurra; and
- Viewpoint 6: The Pacific Highway north and south of the Construction Compound Site.



Figure 5-11 Visibility of the Proposal and location of viewpoints at the proposed construction compound at Turramurra

5.2.3.1 Viewpoint 4: Turramurra Village Park

Receptors	Receptors from this location include visitors to Turramurra Village Park situated on the corner of the Pacific Highway and William Street opposite the proposed compound site to the north (refer Figure 5-11 for location).
Existing views	<p>Turramurra Village Park is located on a corner block of land between the Highway, William Street, the Turramurra train station and the rail corridor. It is surrounded by a double hedge to the west and north and has a number of mature trees within the park and at the boundaries (refer Figure 5-12). The land slopes gently down to the north away from the Highway, with the interior of the park lying approximately one to two metres below the level of the Highway. The above factors limit views out of the park.</p> <p>When inside the park, the view to the south comprises a garden edge along the southern boundary of the park in the foreground, with the Pacific Highway and passing traffic in the middle ground. However, views to the road pavement are at least partially screened by the level change and fringing vegetation surrounding the park. The site of the proposed construction compound is seen in the background beyond the Highway, and is viewed as a row of mature trees lying behind a stone wall. The buildings within the site are only seen as glimpse views between the vegetation from some areas within the park (refer Figure 5-13).</p>
Changes to the view	From inside the park, changes due to the Proposal would include the addition of heavy vehicles entering and leaving the site; the pruning of fringing vegetation, partial removal and modifications to the stone wall surrounding the construction

	compound site, and glimpse views to the construction compound elements within the boundaries (e.g. site offices, equipment and stockpiles).
Sensitivity of receptors	<p>The sensitivity of receptors at this location has been assessed as ‘High’ due to the following:</p> <ul style="list-style-type: none"> • Recreational park users are typically a sensitive receptor group due to the importance on the visual quality of the landscape as they use the park facilities for active or passive recreation; • However, this park is situated on a busy corner between the Highway and the train station. It offers limited opportunities for recreation (e.g. no play equipment) but does offer benches for sitting on. It would be unlikely to draw a high number of visitors; • These receptors would see views to the proposed construction compound from within the park, although these views would be partially screened by vegetation along the park edge; • The construction compound would be situated within a site with heritage significance; • However, the view would only be seen while the receptor was within the park, therefore would not be seen for long periods of time; and • Visitors within the park would be more likely to have their attention focussed on views within the park, as views to the proposed construction compound site are seen from across the busy road corridor.
Magnitude of change	<p>The magnitude of change to the view from this location would be ‘Low’. While some views to the changes would be seen from this location, they would be viewed from across the busy road corridor. Views into the proposed construction compound site would also be at least partially screened by vegetation. These changes would only be temporary, seen during the construction period, with the site remediated to an existing state at the completion of the Proposal.</p>
Overall assessment	<p>Using the Landscape Character and Visual Impact Assessment Matrix (refer Table 1) the overall visual impact would be ‘Moderate’.</p>



Figure 5-12 The view to Turramurra Village Park, a small public park on the corner of the Pacific Highway and William Street, Turramurra. The entry to Turramurra Station can be seen to the left of frame



Figure 5-13 The view from Turramurra Village Park looking south east towards the proposed construction compound site is dominated by the road corridor in the foreground and the fringing vegetation of the site in the middle to background.

5.2.3.2 Viewpoint 5: Residences at 16-18 Boyd Street, Turramurra

Receptors	Receptors from this location include residents and visitors to the apartment block at 16-18 Boyd Street, Turramurra to the south of the proposed construction compound site (refer Figure 5-14). These apartments are built at a lower level to the proposed construction compound site, meaning only upper apartments facing north would get potential views to the proposed compound site (refer Figure 5-15).
Existing views	Views to the north from the upper, northern apartments within this block would probably get views into the proposed construction compound site, however, these views are likely to be at least partially screened by fringing vegetation (including mature trees) surrounding the compound site. These apartments would see this vegetation in the foreground of the view, with glimpse views into the site to the existing buildings, lawn and carparking areas seen between vegetation in the middle to background.
Changes to the view	Receptors at this location would see changes including the increase in vehicular activity within the site, and an increase in light vehicular traffic on Boyd Street. Stockpiles, site offices and equipment would predominantly be contained within the north west of the site, meaning it would be unlikely that these elements would be clearly seen from these apartments. If they were seen, it would be most likely partially screened by vegetation and the existing built form within the site.
Sensitivity of receptors	The sensitivity of these receptors has been assessed as 'High' due to the following: <ul style="list-style-type: none"> Residents are typically a sensitive viewer group, given that they have a proprietary interest in the views from their homes; Residents would see views to the Proposal for moderate periods of time from within their homes and properties and from reasonably close proximity, however the view to the Proposal from this location is at least partially screened by dense vegetation around and within the site; and The site contains heritage items.
Magnitude of change	The magnitude of change to the view from this location would be 'Low'. Changes to the view would be at least partially screened and would be temporary, occurring during the construction period for the Proposal. At completion, the site would be remediated to its existing state.
Overall assessment	Using the Landscape Character and Visual Impact Assessment Matrix (refer Table 1) the overall visual impact is 'Moderate'.



Figure 5-14 Apartments at 16-18 Boyd Street, Turramurra. Photo taken from Boyd Street looking east along the road towards the apartments

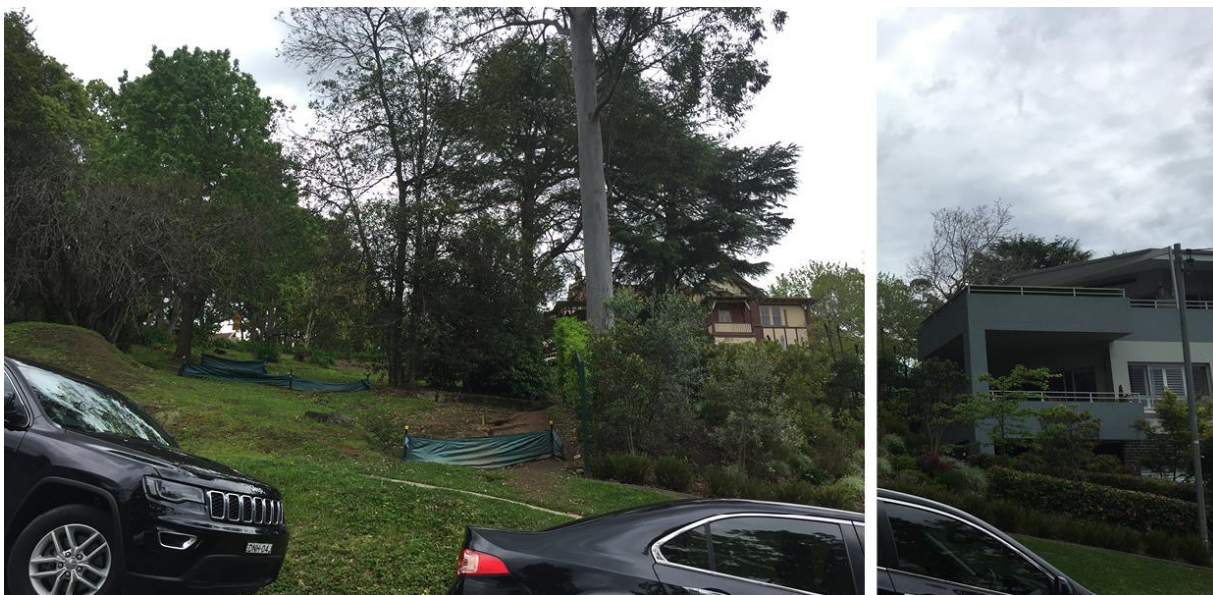


Figure 5-15 The view from Boyd Street looking north towards the proposed construction compound site with the apartments seen to the right of frame. Apartment blocks at this location have been constructed at a lower level to the proposed construction compound site, meaning only upper apartments facing north would get potential views to the Proposal

5.2.3.3 Viewpoint 6: The Pacific Highway north and south of the Construction Compound Site

<p>Receptors</p>	<p>Receptors from this location include road users on the Pacific Highway, including motorists, cyclists and pedestrians.</p>
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Existing views	<p>Views which include the proposed construction compound site are seen from east and west of the Pacific Highway, but only for short distances due to the curve in the Highway at this location and the placement of vegetation and taller built forms.</p> <p>Views west along the Highway to the proposed compound site can be seen from the intersection with Rohini Street on the Pacific Highway, approximately 70 metres away, while views east along the Highway to the proposed construction site can be seen from approximately 100 metres away. The site is viewed from both directions as a heavily treed property, with the stone fence and gateposts a landmark feature as they are passed. The heritage property is viewed glimpsed through fringing vegetation, including mature trees, and the many mature trees are seen within the site.</p> <p>The large, art deco building to the west of the site is also a landmark building at this stretch of the Highway, given its striking design and white colour.</p> <p>However, traffic at this area is often heavy, which both blocks views to the site, and prolongs views to it as traffic passes at a slow rate.</p>
Changes to the view	<p>During construction, the changes seen would include the addition of heavy vehicles entering and leaving the site on the Highway; the pruning of fringing vegetation (which may open up views into the site), modifications to the stone wall surrounding the site, and glimpse views to the compound elements within the boundaries (e.g. site offices, equipment and stockpiles).</p>
Sensitivity of receptors	<p>The sensitivity of road users has been assessed as 'Moderate' due to the following:</p> <ul style="list-style-type: none"> • The Pacific Highway road corridor is somewhat scenic at this location given the 'bushy' character of the area, which is expressed in the well-established vegetation predominantly within private properties on either side of the Highway. • A large number of receptors would obtain views to the Proposal, but these individual views to the changes would be seen as a series of individual, 'snapshot' views within their greater journey. • Cyclists would obtain more prolonged views to the Proposal, although as with motorists, the view would be a small proportion of the views experienced within their overall journey, and lower numbers of cyclists are anticipated. <p>Changes due to the Proposal would be seen at close proximity as the driver or pedestrian passed the Proposal.</p>
Magnitude of change	<p>The magnitude of change to the view from this location would be 'Low' due to the small frontage of the site along the road corridor and the temporary nature of the changes. Changes within the site would be partially screened by fringing vegetation.</p>
Overall assessment	<p>Using the Landscape Character and Visual Impact Assessment Matrix (refer Table 1) the overall visual impact would be 'Moderate to Low'.</p>

5.3 Cumulative Visual Impact on Views along the Pacific Highway

At completion of the Proposal and approved intersection upgrades (i.e. Intersections 1 and 2 and Intersection 3) road users on the Pacific Highway would potentially experience changes at all three intersection locations, depending on how far along the Highway they travel. For this reason, the cumulative visual impact on views seen as receptors travel along the Pacific Highway has been assessed to capture the cumulative impact of experiencing changes at all three locations in succession.

The receptors, sensitivity and overall rating would be universal along the corridor within the study area, with only existing and changes to views at individual locations requiring individual descriptions between intersection locations.

Receptors	Receptors from this location include road users on the Pacific Highway, including motorists and cyclists. Pedestrians are unlikely to experience changes at all three intersection locations due to the distance.
Key changes to the views	<ul style="list-style-type: none"> • Widening to the western side of the Pacific Highway, including; <ul style="list-style-type: none"> - Removal street trees on the western side of the Pacific Highway within the existing road corridor; - Removal of trees, shrubs and fences / walls and gates on the western side of the Highway within private property at certain locations; - Replacement of fences, walls, gates, etc, and some replacement planting within private property; - Modifications to the western kerbside footpath on the Pacific Highway; • Changes to the width and extent of raised medians on the Pacific Highway; • New signalised intersection; • Changes to intersection and lane layouts along the Pacific Highway; • Milling and re-sheeting; • Relocation of traffic signal poles and the provision of new traffic mast arms at some intersections; • Relocation of aboveground and underground utilities including street lighting, gas, water mains, local communication cables and above ground and underground electricity infrastructure; • New stormwater pits and pipes; and • New traffic signs, line markings and road furniture.
Sensitivity	<p>The sensitivity of the views along the road and receptors has been assessed as 'Moderate' due to the following:</p> <ul style="list-style-type: none"> • The Pacific Highway road corridor is somewhat scenic at this location given the 'bushy' character of the area, which is expressed in the well-established vegetation predominantly within private properties on either side of the Highway; • A large number of receptors would obtain views to the Proposal, but these individual views to the changes would be seen as a series of individual, 'snapshot' views within their greater journey; • Cyclists would obtain more prolonged views to the Proposal, although as with motorists, the view would be a small proportion of the views

	<p>experienced within their overall journey, and lower numbers of cyclists are anticipated; and</p> <ul style="list-style-type: none"> • Changes due to the Proposal would be seen at close proximity.
Magnitude of change	<p>Considering the cumulative impact of the changes to the views along the Pacific Highway as a result of the Proposal and approved intersection upgrades (i.e. Intersections 1, 2 and 3), the magnitude of the change to the views would be 'High'. As a road user travels along the Highway they would see almost continuous changes to the corridor.</p> <p>The loss of canopy along the Highway within private property would constitute the most significant change to the experience of travelling along the Highway between Turramurra and Wahroonga, both in areas where gaps in the continuous canopy along the road corridor would be seen (e.g. at Mahratta or the St Thomas Agst Aged Care Facility), or removal of single trees where there is little streetscape vegetation.</p> <p>The overall widening of the road corridor would also be a visually significant change, with a larger area of road pavement seen as the receptor travels along the Highway. This change would potentially speed up the rate at which the receptor travels along the corridor, as the need for merging traffic would be removed at these locations.</p>
Overall assessment	<p>Using the Landscape Character and Visual Impact Assessment Matrix (refer Table 1) the overall visual impact is would be 'High to Moderate'.</p>

6.0 Summary and Mitigation Measures

6.1 Summary of Landscape Character Impacts

The impacts of the Proposal on landscape character are summarised in Table 10.

Overall, the Proposal would visually result in permanent changes to the western (northbound) side of the Pacific Highway primarily, with changes assessed as having an overall 'Moderate' impact on landscape character.

The Proposal would result in changes to an existing element (the road width and typically one road verge) within two LCZs (LCZs 2 and 3). The impact on the road widening would typically be due to the encroachment of the road corridor onto private property and council owned land, which in the case of the Pacific Highway within the study area is responsible for most of the tree canopy, softening the road corridor and providing a 'bushy' or 'leafy' character unique to the area. The study area contains several heritage conservation areas and items, increasing the sensitivity in these areas due to the high visual quality of the landscape.

However, the Proposal would be relatively contained within the road corridor, with impact to overall landscape character limited to the areas directly surrounding the changes.

Table 10 Landscape Character Zone assessment ratings

Landscape Character Zone	Sensitivity	Magnitude	Rating
LCZ 1: Infrastructure Corridor	Moderate	Negligible	Negligible
LCZ 2: Mixed Use Development	Moderate	Moderate	Moderate
LCZ 3: Residential Development	Moderate	Low	Moderate to Low
LCZ 4: Recreational Open Space	High	Negligible	Negligible
LCZ 5: Local Centres	Moderate	Low	Moderate to Low

At the completion of upgrades at all three intersection locations (i.e. Intersections 1, 2 and 3) the ratings for change in landscape character within the study area would remain unchanged from Table 10.

6.2 Summary of Visual Impacts

The impacts of the Proposal on viewpoints are summarised in Table 11.

At Intersection 3, the 'Moderate' to 'High' sensitivity of views and receptors is in part due to the sensitivity of residential receptors to changes in the vicinity of their homes. At Viewpoint 1, the importance of the band of tall hedging and trees within the Thomas and Rosetta Agst Aged Care Facility, coupled with heritage values associated with the property add to receptor sensitivity.

From all viewpoints surrounding Intersection 3, the magnitude of change is most influenced by the changes to the western verge of the Highway, the removal of vegetation and the introduction of a signalised intersection. Overall, the proposed intersection upgrades would visually result in permanent changes to the western (northbound) and eastern (southbound) side of the Pacific Highway primarily, with changes assessed as having an overall 'High to Moderate' visual impact from surrounding locations.

At completion, the Proposal would involve a change to an existing piece of road infrastructure (the widening and reconfiguration of lanes within a road and the construction of a signalised intersection). The most significant visual impacts would occur due to the loss of fringing vegetation, including many mature trees in private property. Some loss of lower screening vegetation would also result in changes to the views to and from the road corridor.

Temporary changes to the proposed construction compound site would result in an overall 'Moderate' visual impact, predominantly due to the heritage significance of the site chosen for the compound rather than the visibility of the compound from the surrounding environment.

At the proposed construction compound site, the sensitivity of the views and receptors at this location are heightened due to the heritage values of the property and the three receptor types (residential, commercial and recreational) that fringe the property. These elements create a sensitive environment within which to assess changes to the view. However, the changes would be temporary, with the site returned to its original state post construction.

Considering the cumulative impact of the changes to the views along the Pacific Highway as a result of to the original scope of the Proposal (i.e. both approved and proposed upgrades), the visual impact would be 'High to Moderate'. As a road user travels along the Highway they would see almost continuous changes to the corridor.

The loss of canopy along the Highway within private property would constitute the most significant change to the experience of travelling along the Highway between Turramurra and Wahroonga, both in areas where gaps in the continuous canopy along the road corridor would be seen (e.g. at Mahratta or the St Thomas Agst Aged Care Facility), or removal of single trees where there is little streetscape vegetation.

The overall widening of the road corridor would also be a visually significant change, with a larger area of road pavement seen as the receptor travels along the Highway. This change would potentially speed up the rate at which the receptor travels along the corridor, as the need for merging traffic would be removed at these locations.

Table 11 Visual impact assessment ratings

Viewpoint	Sensitivity	Magnitude	Rating
Intersection subject to the Proposal (Intersection 3)			
Viewpoint 1: Thomas and Rosetta Agst Aged Care Facility	High	High	High
Viewpoint 2: Residence at 1567 Pacific Highway, Wahroonga	Moderate	Moderate	Moderate
Viewpoint 3: The Pacific Highway north and south of Intersection 3	Moderate	High	High to Moderate
Construction compound			
Viewpoint 4: Turramurra Village Park	High	Low	Moderate
Viewpoint 5: Residences at 16-18 Boyd Street, Turramurra	High	Low	Moderate
Viewpoint 6: The Pacific Highway north and south of the Construction Compound Site	Moderate	Low	Moderate to Low
Cumulative visual impact (Intersections 1, 2 and 3)			
The Pacific Highway	Moderate	High	High to Moderate

6.3 Mitigation Measures

6.3.1 Operational Mitigation Measures

All mitigation measures should be undertaken with reference to the urban design strategy for the Proposal (as outlined in Chapter 3.0 this report) and the heritage report prepared for the locally significant heritage items impacted by the Proposal as part of the REF. These measures are consistent with the mitigation measures outlined for the approved Intersections 1 and 2.

Pre-condition surveys

Prior to the commencement of works, a pre-condition survey should be undertaken on all private properties affected. Changes to structures and vegetation within private properties and council owned land shall be reinstated to their original condition (or equivalent as agreed with the property owner).

Landscape Design and Planning

Landscape Plans should be prepared to support the final detailed project, addressing the works proposed within the road corridor and that required within private property. These would be prepared in consultation with the property owners.

The Landscape Plans would include design treatments addressing:

- location and identification of existing vegetation to be removed, and proposed replacement landscaping, including placement of vegetation and species to be used;
- built elements, including retaining walls, fences, gates, and walls. Replacement structures should respond to local character as well as the individual visual circumstances of each property, and visually contribute to the character of the road corridor and local area;
- pedestrian elements including footpath location, paving types and pedestrian crossings;
- fixtures such as seating, lighting, fencing and signs;
- details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage; and
- procedures for monitoring and maintaining landscaped or rehabilitated areas.

These works should be undertaken with reference to the urban design principles and objectives (refer Table 4) and the heritage report for locally significant heritage items prepared as part of the REF.

Where tree or large shrub replacement on private property is possible (e.g. street trees on Munderah Street or the mature screening at the Thomas and Rosetta Agst Aged Care Facility), it should be done with the following aims:

- Species selection should respond to the individual lot within which they are situated;
- Tree and shrub placement and species should be selected to allow solar access to nearby homes and private open spaces;
- Species selection should respond to local character (potentially chosen from a list of indigenous species, where appropriate);
- Potential maintenance requirements should be considered in species and placement of trees and shrubs; and
- Safety of road users, home owners and pedestrians should be considered in species and placement of trees.

6.3.2 Mitigation Measures for Construction Activities

Mitigation measures to be applied during the construction phase to minimise the potential visual impacts on sensitive receivers should include the following:

- Avoid unnecessary loss or damage to vegetation adjacent to the works areas and construction compound site by protecting trees (and their root zones) prior to construction and/or trimming to avoid total removal;

- Apply appropriate screening with shade cloth or similar materials (where necessary) around the works areas and site compound to minimise visual impacts on key viewing locations;
- Remove any temporary hoardings, traffic management, barriers and signage when no longer required;
- Direct construction lighting away from visually sensitive receivers (particularly residential properties) to minimise light spill; and
- Keep work areas tidy and well maintained with no storage of materials beyond the construction boundaries.

7.0 Conclusion

Overall, the Proposal would result in permanent changes to the western (northbound) side of the Pacific Highway at Wahroonga, with changes assessed as having an overall 'Moderate' impact on landscape character and a 'High to Moderate' visual impact from surrounding locations. The greatest impact on overall landscape character would stem from the loss of vegetation (predominantly mature trees and large shrubs) fringing the road corridor, mostly in private property.

Considering the cumulative impact of the changes to the views along the Pacific Highway within the context of the original scope of the Proposal (i.e. both approved and proposed upgrades), the visual impact would remain 'High to Moderate'. As a road user travels along the Highway they would see almost continuous changes to the corridor.

The loss of canopy along the Highway within private property would constitute the most significant change to the experience of travelling along the Highway between Turramurra and Wahroonga, both in areas where gaps in the continuous canopy along the road corridor would be seen (e.g. at Mahratta or the St Thomas Agst Aged Care Facility), or removal of single trees where there is little streetscape vegetation.

The overall widening of the road corridor would also be a visually significant change, with a larger area of road pavement seen as the receptor travels along the Highway. This change would potentially speed up the rate at which the receptor travels along the corridor, as the need for merging traffic would be removed at these locations.

The widening of the road corridor and the reconfiguration / replacement of road signage, changes to medians and turning lanes, and changes to utilities and road furniture would be somewhat visually absorbed due to these being typically acceptable changes seen within an existing road corridor. The scale and character of these changes are of good visual fit with the existing situation.

With consideration to the urban design strategy (refer Chapter 3.0) and potential adoption of mitigation measures discussed above (refer Sections 6.3), the visual impact of the changes due to the Proposal would be reduced over time as trees and vegetation mature and fill the gaps in the canopy. The replacement of fences, walls and screening vegetation of affected properties would also assist in mitigating the changes seen due to the Proposal which would be done in consultation with the property owners.

8.0 References

Australian Standard 4373-2007 Pruning of amenity trees – Part 5

Beyond the Pavement: Urban Design Policy Procedures and Design Principles (Roads and Maritime, 2014)

Ku-ring-gai Development Control Plan, 2016

Ku-ring-gai Local Environment Plan, 2017

Ku-ring-gai Local Environmental Plan (Local Centres) 2012

Ku-ring-gai (Local Centres) Development Control Plan 2017

Pacific Highway Intersection Upgrades between Turramurra and Wahroonga – Review of Environmental Factors, April 2019, Sydney: Roads and Maritime Services – Easing Sydney's Congestion Program Office (Roads and Maritime, 2019).

Pacific Highway Intersection Upgrades Landscape Character and Visual Impact Assessment (Prepared by AECOM, 19 October 2018)

Roads and Maritime Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment (Reference number EIA-N04, 2018)

Statement of Heritage Impact for Locally Significant Heritage Items within Ku-ring-gai Local Government Area (prepared by Phillips Marler/Biosis, September 2018)

Stockpile Site Management Guideline (EMS-TG-10) (Roads and Maritime, 2015).

Appendix A

Detailed design drawings of the Proposal (Intersection 3)



Pacific Highway Intersection Improvements in Wahroonga / Warrawee /
Turrumurra
Statement of Heritage Impact for Locally Significant Heritage Items within
Ku-ring-gai Local Government Area

For Roads and Maritime Services

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Contents

Glossary	viii
Summary	ix
1 Introduction.....	15
1.1 Project background.....	15
1.2 Location of the proposal and scope of works.....	16
1.3 Scope of assessment	21
1.4 Limitations.....	22
1.5 Report authorship	22
2 Consultation.....	25
2.1 Consultation with Ku-ring-gai Council under State Environmental Planning Policy (Infrastructure) 2007	25
2.2 Consultation with the Office of Environment and Heritage	25
2.3 Consultation with directly impacted property owners on locally listed heritage properties	26
2.4 Consultation with the local community	26
3 Statutory framework	27
3.1 Environmental Protection and Biodiversity Conservation Act 1999	27
3.2 NSW Heritage Act 1977	27
3.2.1 State Heritage Register	28
3.2.2 Archaeological relics	29
3.2.3 Section 170 Heritage and Conservation Registers	30
3.3 Environmental Planning and Assessment Act 1979 and State Environmental Planning Policy (Infrastructure) 2007)	31
3.3.1 Ku-Ring-Gai (Local Centres) Local Environmental Plan 2012	31
3.3.2 Ku-Ring-Gai (Local Centres) Development Control Plan 2016	32
3.3.3 Ku-Ring-Gai Local Environmental Plan 2015.....	35
3.3.4 Ku-Ring-Gai Development Control Plan 2016	36
3.4 Summary of heritage listings	36
4 Historical context	55
4.1 Topography and resources	55

4.2	Aboriginal past	55
4.3	Historical development	56
4.3.1	Exploration	56
4.3.2	Early development (c.1809 to 1854)	56
4.3.3	Subdivision and orchards (1855 to 1889).....	59
4.3.4	The North Shore Rail Line and beginnings of a gentile villages (1890 to 1920s).....	66
4.3.5	The Pacific Highway and suburban growth (1920s to present)	78
4.4	Chronology of archaeological features within the proposal area.....	94
4.5	Research themes	96
5	Physical inspection and potential impacts to local heritage items	98
5.1	Proposal area	98
5.2	Proposal Description by Intersection Location and Impacted Heritage Items.....	100
5.2.1	Pacific Highway at Coonanbarra Road and Redleaf Avenue, Wahroonga.....	100
5.2.2	Pacific Highway at Fox Valley Road, Wahroonga/Warrawee.....	106
5.2.3	Pacific Highway at Finlay Road, Warrawee/Turramurra.....	122
5.2.4	Proposed compound site, 1334-1354 Pacific Highway, Turramurra.....	124
5.3	Archaeological assessment.....	132
5.3.1	Archaeological resource	132
5.3.2	Integrity of sub-surface deposits.....	133
5.3.3	Research potential.....	133
5.3.4	Summary of archaeological potential	136
6	Significance assessment	127
6.1	Levels of heritage significance	128
6.2	Statements of significance.....	129
7	Archaeological impact assessment.....	147
7.1	Proposal details	148
7.2	Assessing impact to heritage item(s)	148
7.2.1	Discussion of heritage impact(s)	148
7.3	Assessment of impacts.....	150
7.4	Impact assessment statement	155
7.4.1	Impact to Archaeological Values	155
7.4.2	Impact to Landscape Values	156
8	Recommendations	159
	Appendices.....	165
Appendix 1	Roads and Maritime Unexpected Heritage Items Procedure	166

Tables

Table 1	Report authorship	22
Table 2	Summary of heritage listings within and directly adjacent to the proposal area	37
Table 3	Chronological development of the buildings and structures within the proposal area	95
Table 4	Identified historical themes for the proposal area	97
Table 5	Assessment of archaeological potential	120
Table 6	Statements of significance for listed heritage items, where available	130
Table 7	Evaluation and statement of significance for areas of archaeological potential in areas of proposed works	134
Table 8	Assessment of impacts to potential archaeological material within the proposal area	151
Table 9	Assessment of landscape impacts to Heritage Listed items within and opposite the proposal area	153

Figures

Figure 1	Location of the proposal area	24
Figure 2	Pacific Highway at Coonabarra Road and Redleaf Avenue, Wahroonga	41
Figure 3	Pacific Highway at Fox Valley Road, Wahroonga/Warrawee	42
Figure 4	Pacific Highway at Finlay Road, Warrawee/Turramurra	43
Figure 5	Proposed compound site, Turramurra	44
Figure 6	An 1883 map of Gordon parish with the proposal area situated along the road between the red arrows (Source: NSW Department of Lands)	58
Figure 7	An 1862 survey of the St Leonards to Pennant Hills Road, with the proposal area highlighted; several structures are present on the plan, but only one may be located within the proposal area (Source: NSW Land Registry Services, Crown plan R290.1603)	61
Figure 8	Detail from an 1862 survey of the St Leonards to Pennant Hills Road, showing a hut [1] near the junction of Fox Valley Road and Lane Cove Road; it appears this hut [1] may be partially within the proposal area at Fox Valley Road (Intersection 2) (Source: NSW Land Registry Services, Crown plan R290.1603)	62
Figure 9	Extract from an 1888-1889 survey for the roads within the parishes of Gordon and South Colah, with the proposal area highlighted; several structures are recorded near the proposal area (Source: NSW Land Registry Services, Crown plan R3824.1603)	64
Figure 10	Detail from an 1888-1889 survey for the roads within the parishes of Gordon and South Colah, showing a structure [2] recorded within the current alignment of Redleaf Avenue (Source: NSW Land Registry Services, Crown plan R3824.1603)	65
Figure 11	Extract from an 1893 subdivision plan of Hyndes' grant south of Lane Cove Road, with the study area highlighted (Source: NSW Department of Lands, DP 3312)	67
Figure 12	Plan of the land acquired by owned by Beckx in 1902 (Source: NSW Department of Lands, Certificate of Title Volume 1470 Folio 115)	68

Figure 13 A Certificate of Title plan dating to 1893 records a structure [5] in the vicinity of Lane Cove Road (Source: NSW Land Registry Services, Certificate of Title Volume 1470 Folio 116)	70
Figure 14 Extracts from an 1881/1899 survey for the Lane Cove Road, with the proposal area highlighted; several structures of brick and weatherboard are recorded near the proposal area (Source: NSW Land Registry Services, Crown plan R6224.1603)	71
Figure 15 Detail from an 1881/1899 survey for the Lane Cove Road, showing a weatherboard cottage and brick house positioned on either side of the current Redleaf Avenue; the earlier structure [2] is no longer present (Source: NSW Land Registry Services, Crown plan R6224.1603)	72
Figure 16 Detail from an 1881/1899 survey for the Lane Cove Road, showing an unspecified structure [7] near the current Winton Street (Source: NSW Land Registry Services, Crown plan R6224.1603).....	73
Figure 17 Plan from the 1907 Certificate of Title to Paul for the Hillview Property, recording a structure [8] adjacent to the rail line and an area later resumed for road purposes (Source: NSW Land Registry Services, Certificate of Title Volume 1821 Folio 94)	74
Figure 18 Plan from the 1913 Certificate of Title to Paul, showing a structure [9] adjacent to the Lane Cove Road, and two more south of it [10] [11], which are likely to have been buildings associated with Weise’s store business (Source: NSW Land Registry Services, Certificate of Title Volume 2434 Folio 3).....	75
Figure 19 Weise's store on Lane Cove Road, recorded on the 1902 auction advertisement for Boyd's Orchard subdivision (Source: National Library of Australia)	76
Figure 20 Plan of area resumed in 1928-1929 from Estha [15] for the widening of Lane Cove Road for the Pacific Highway (Source: NSW Land Registry Services, Certificate of Title Volume 4062 Folio 192).....	79
Figure 21 Plan of area resumed in 1938 from the Hillview property for the widening of Lane Cove Road for the Pacific Highway (Source: NSW Land Registry Services, Certificate of Title Volume 4182 Folio 86)	80
Figure 22 Area of land resumed in 1929 from current Lot 1 of DP 3312 for the widening of Lane Cove Road for the Pacific Highway (Source: NSW Land Registry Services, Crown plan 7942.3000)	81
Figure 23 A 1955 subdivision plan of Hillview, showing stone and brick walls marking the boundary of the property (Source: NSW Land Registry Services, DP 26828)	82
Figure 24 A 1947 plan from a Certificate of Title for Yaamba [18], showing a dwarf brick wall [23] marking the boundary of the property on the Pacific Highway (Source: NSW Land Registry Services, Certificate of Title Volume 5667 Folio 13).....	89
Figure 25 A plan from the Certificate of Title for the Milneroyd [19] property, showing the portion of land resumed by the Commissioner for Main Roads in 1956 (Source: NSW Land Registry Services, Certificate of Title Volume 3130 Folio 213).....	90
Figure 26 Complete 1955 subdivision plan for the Hillview estate, showing the car garage [14] (Source: NSW Land Registry Services, DP 26828)	91
Figure 27 A 1987 subdivision plan for the current DP 1034668 (which contains Estha [15]), showing the presence of a sandstone wall [24] marking the boundary of the property on the Pacific Highway (Source: NSW Land Registry Services, DP 740329)	92
Figure 28 Extract from a 1966 map of Gordon Parish, with the proposal area highlighted (Source: NSW Land Registry Services)	93
Figure 29 Detail from a 1966 map of Gordon Parish, showing areas of road resumptions from the Estha [15] property (Source: NSW Land Registry Services)	94

Figure 30 Area of former Estha site [15] showing the impact area and buffer zone resulting from the proposed works for Pacific Highway at Coonanbarra Road and Readleaf Avenue, Wahroonga.....	103
Figure 31 Area of Kyeamba site impacted by the proposed works for Pacific Highway at Fox Valley Road, Wahroonga/Warrawee.....	108
Figure 32 Area of Yaamba site impacted by the proposed works for Pacific Highway at Fox Valley Road, Wahroonga/Warrawee.....	110
Figure 33 Area of Curtilage Park site impacted by the proposed works for Pacific Highway at Fox Valley Road, Wahroonga/Warrawee.....	113
Figure 34 Area of Mahratta [12] site impacted by the proposed works of Pacific Highway at Fox Valley Road, Wahroonga/Warrawee.....	116
Figure 35 Area of Dwelling House site impacted by the proposed works of Pacific Highway at Finlay Road, Warrawee/Turramurra	123
Figure 36 Proposed compound site location at 1334-1354 Pacific Highway, Turramurra (extent shown in red, potential access points shown in yellow).....	126
Figure 37 Assessment of archaeological potential.....	123
Figure 38 Areas where no ground disturbance or excavation is permitted without a S140 excavation permit	152

Plates

Plate 1 Typical view of Lane Cove Road through Wahroonga, Warrawee and Turramurra, 1908 (Source: NSW State Archives).....	77
Plate 2 Detail from a 1943 aerial photograph of the proposal area at Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue) featuring local heritage item Estha [15], which is situated within the proposal area (Source: SIX Maps).....	84
Plate 3 Detail from a 1943 aerial photograph of the proposal area at Intersection 2 (Pacific Highway and Fox Valley Road), featuring local heritage items within the proposal area including dwellings 'Kyeamba' [17] and Yaamba [18], and the State and local heritage item Mahratta [12] (Source: SIX Maps).....	85
Plate 4 Detail from a 1943 aerial photograph of the proposal area at Intersection 1 (Pacific Highway at Finlay Road) showing Milneroyd [19] (Source: SIX Maps).....	86
Plate 5 Detail from a 1943 aerial photograph of the proposal area (compound site location), showing Hillview cottage [6], guesthouse [13] and garages [14], some potential garden walls [20] and indistinct garden feature [21] (Source: SIX Maps).....	87
Plate 6 Detail of the 1943 aerial, identifying the area currently occupied by Lowther Park Avenue and a potential garden feature [22], next to Milneroyd [19] (Source: SIX Maps)	88
Plate 7 Detail of the gatepost wall to Estha [15].....	104
Plate 8 Detail of stone boundary wall [24] to Estha [15].....	105
Plate 9 Evidence of sub-surface works within the road reserve in the vicinity of the stone boundary wall of Estha [15], facing north-west.....	105
Plate 10 View of stone boundary wall of heritage listed Kyeamba dwelling [17] adjacent to Yaamba [29] and road reserve area with evidence of sub-surface infrastructure works, facing north-west.....	109
Plate 11 View of Kyeamba dwelling [17] adjacent to Yaamba [18].....	109
Plate 12 Fencing leading to gate entry of Yaamba [18], and adjacent footpath within road reserve	111
Plate 13 Gate entry to and fencing of heritage listed Yaamba dwelling [18].....	112

Plate 14	View of Yaamba dwelling [18].....	112
Plate 15	Modern brick boundary wall of Curtilage Park and the Mahratta site [12] and adjacent road reserve, facing south-east	114
Plate 16	Gardens within Curtilage Park (previously part of the historical Mahratta [12] property) adjacent to Pacific Highway, facing south-east.....	114
Plate 17	View of Mahratta [12] gardens, in area without brick boundary wall, facing east	120
Plate 18	Typical view of gardens within Mahratta [12] grounds with brick boundary wall	120
Plate 19	Brick boundary wall of Mahratta [12] and adjacent road reserve, facing north-west	121
Plate 20	Evidence of sub-surface drainage infrastructure within the Mahratta [12] grounds.....	121
Plate 21	Typical view Milneroyd [19] from the Lowther Park Avenue road reserve	124
Plate 22	View south at the entry of Hillview Community Centre car park showing sandstone wall and gates	130
Plate 23	View north from Hillview Community Centre car park showing boundary planting including Syzgiums.....	130
Plate 24	View south across Hillview Community Centre car park with <i>Camphor laurels</i> on the eastern boundary.....	130
Plate 25	View north-west across the Hillview Community Centre gardens.....	131
Plate 26	View south-west across the Hillview Community Centre lawn and gardens	131

Glossary

c.	Circa
CBD	Central Business District
CHL	Commonwealth Heritage List
DEE	Department of Environment and Energy
DP	Deposited Plan
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
Heritage Act	<i>Heritage Act 1977</i>
Heritage curtilage	Entire area of the heritage listing identified as heritage curtilage
LEP	Local Environmental Plan
NHL	National Heritage List
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
Proposal area	Extent of the proposed works area. This includes any ancillary facilities (such as compound sites) used for the proposal.
REF	Review of Environmental Factors
SHR	State Heritage Register
Study area	The potential area of impact within the identified heritage curtilage as a result of the proposed works. This includes impacts from compound site activities associated with the proposal.

Summary

Phillips Marler has been commissioned by Roads and Maritime Services to undertake a Statement of Heritage Impact to include landscape and non-Aboriginal historical archaeological impact assessment of the Pacific Highway intersection improvements project located in Wahroonga, Warrawee and Turramurra, New South Wales (NSW) (Figure 1), referred to as the 'proposal area' herein. Built heritage and items of State heritage significance have not been assessed in this report.

The proposal area is located approximately 2.3 kilometres south-east of Hornsby and approximately 16.8 kilometres north-west of Sydney (CBD). The assessment will support a Review of Environmental Factors (REF) under Division 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

The assessment specifically covers the potential impacts of the proposal on existing local heritage items which are all located within the Ku-ring-gai local government area. The heritage curtilage of these items potentially impacted by the proposal is referred to as 'the study area' within this report.

The proposal involves intersection improvements, including road widening, adjustments to traffic lanes and turning bays, median extensions and reconstructions, utility relocations, street tree removals, drainage upgrades and new road pavement. The proposal would also require strip adjustments on private properties on the northbound side of the Pacific Highway including clearance of roadside vegetation and reconstruction of retaining walls, driveway accesses and fences. The proposal would also require the use of a local heritage item (known as 'Hillview/Hillview Garages') as a temporary compound site during construction located at 1334 Pacific Highway in Turramurra.

This assessment has been undertaken to assess the areas of proposed works for their impact on potential archaeological resources which may be present within the proposal area, and the potential heritage significance these may hold.

The proposed intersection improvements on the Pacific Highway corridor would occur at the following locations (from south to north):

1. Pacific Highway at Finlay Road, Warrawee/Turramurra
2. Pacific Highway at Fox Valley Road, Wahroonga/Warrawee
3. Pacific Highway at Coonanbarra Road and Redleaf Avenue, Wahroonga

Portions of the proposal area are listed as items of State and local heritage significance under the State Heritage Register, Ku-ring-gai (Local Centres) Local Environmental Plan 2012 and Ku-ring-gai Local Environmental Plan (LEP) 2015. The proposal area is also contained within several conservation areas

within Wahrenonga, Warrawee and Turramurra under the Ku-ring-gai LEP 2015 and Ku-ring-gai LEP (Local Centres) 2012. The historical research undertaken as part of this assessment has identified that the proposal area may contain archaeological material relating to the mid-19th to early-20th century residential settlement of the area, and the old Lane Cove Road which preceded the Pacific Highway.

Four locations were assessed as having the potential to hold local heritage value, should archaeological resources be encountered during any subsurface works. The likelihood of encountering these archaeological resources in three of these locations is considered low due to potential disturbances resulting from earlier road works in establishing and maintaining the Pacific Highway from the 1920s. These previous works are likely to have damaged the integrity of any archaeological material which may be present, such as removal or damage of archaeological deposits and truncating walls or building foundations and footings, resulting in a reduced level of research potential for these possible archaeological remains. However, should undisturbed archaeological remains be present in these areas, they have the potential to hold local heritage significance.

The impact to these areas has been assessed as acceptable, provided that an unexpected finds policy is implemented to record any archaeological materials which may be encountered during works.

Due to potentially low levels of disturbance within the north-western and north-eastern portions of the Hillview complex at 1334 Pacific Highway, Turramurra (proposed compound site), there is moderate potential to find relatively intact archaeological remains of former shed store structures and associated deposits and features in the north-western corner of the property. Disturbance to a further structure in the north-eastern portion of the property has not been assessed due to inaccessibility for inspection. Should undisturbed archaeological remains associated with these former structures be present, they have the potential to hold local heritage significance.

The remaining areas throughout the proposal area which may contain archaeological material were assessed as holding no heritage significance. .

The proposed works would impact the boundary fences, retaining walls and front gardens of several heritage listed properties fronting the northbound side of the Pacific Highway road corridor. The cumulative loss of trees and overall vegetation would mean that properties would be more visually exposed to the road corridor. The cumulative loss of trees within the various sections of the road corridor could diminish the aesthetic values of the Pacific Highway as a green corridor between Wahrenonga and Turramurra. The mitigation of this impact could be undertaken with the preparation of a Tree Canopy Enhancement Plan (in consultation with the property owners and council) to recommend tree replacements along the corridor where vegetation is removed as a result of the proposal.

The proposal has the potential to indirectly impact upon the areas which may contain archaeological resources. The impact to these areas has been assessed as acceptable, provided that the Unexpected Finds Procedure under Recommendations 1 and 2 (outlined below) are implemented.

The following recommendations have been formulated to respond to client requirements regarding management of and fulfilling environmental obligations under the EP&A Act, and the significance of the local heritage items that are impacted by the works. They are guided by the ICOMOS *Burra Charter* with the aim of doing as much as necessary to care for the place and make it useable and as little as possible to retain its cultural significance.¹

Recommendation 1 Heritage Management Plan for Construction

A Heritage Management Plan (HMP) should be prepared for the proposal area as a whole (as part of the Construction Environmental Management Plan (CEMP)) to mitigate any construction-related impacts to these areas and their wider heritage curtilage during construction.

A key objective of the HMP would be to ensure that any impacts to heritage values / features of the Mahratta site during construction are minimised and carried out within the scope permitted by the approval instruments.

The HMP should include (as a minimum):

- Purpose and objectives for the protection and management of the study area during construction
- Acknowledgement of relevant legislative requirements and guidelines, including any conditions of approval and permits
- Details on any necessary pre-construction consultation and landowner approvals
- Details on the construction activities to be undertaken and proposed construction methodology
- Heritage management and mitigation measures to be applied during construction (such as staff training, implementation of unexpected finds procedures, proposed access, work method statements, exclusion zones and setback areas, proposed reinstatement works)

¹ Australia ICOMOS 2013

- Compliance management including roles and responsibilities, staff training, monitoring, inspections, auditing and reporting

The HMP should make specific reference to the heritage assessment prepared for the Project REF and any conditions of approval outlined by State agencies. The HMP must be prepared by a suitably qualified heritage specialist.

Unexpected Heritage Items

The HMP must include a procedure for the management of unexpected potential archaeological relics discovered during construction. The management of unexpected potential archaeological relics must be in accordance with Roads and Maritime's "Unexpected Heritage Items" documentation (refer Appendix 1). The procedure for unexpected finds must include the following steps:

- (a) Cease work in the immediate area of the identified potential heritage object immediately;
- (b) Notify Roads and Maritime immediately;
- (c) Provide access to the affected works area to any heritage specialist to assess the finds;
- (d) Provide temporary exclusion (pedestrian) fencing;
- (e) Implement additional safeguards as required.

The Non-Aboriginal Heritage Management Plan must provide for all personnel working within the study area on their responsibilities under the *Heritage Act 1977* (NSW) (Heritage Act). Make personnel aware of all non-Aboriginal heritage sites/areas including cultural plantings and areas of archaeological potential, which are identified in the Environmental Assessment documents provided in the Review of Environmental Factors.

Where the remains are identified as being 'relics', the Heritage Council of NSW must be notified in accordance with section 146 of the Heritage Act. Failure to notify the Heritage Council is considered an offence under the Act, with penalties including fines and imprisonment. After contacting the Heritage Council, a permit or exemption should be sought under the relevant section of the Act to allow works to recommence.

All Aboriginal objects and places are protected under the *National Parks and Wildlife Act 1974* (NSW). It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the Office of Environment and Heritage (OEH). If the find is determined to be an Aboriginal object, the archaeologist will provide further recommendations. These may include notifying the OEH and Aboriginal stakeholders.

Recommendation 2 Avoidance of impacts to former ‘Hillview’ shed store structures within Compound Site at 1334 Pacific Highway, Turramurra

Under the Heritage Act, a person must not disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an excavation permit. It is recommended that no disturbance or excavation be permitted in areas assessed as holding moderate archaeological potential as part of a Construction Heritage Management Sub-Plan (Recommendation 1). The location and significance of the potential archaeological remains should also be referenced in site inductions for all staff and contractors.

Ground disturbance or excavation in areas of moderate archaeological potential would only be permitted with a s139 excavation exception or s140 excavation permit (as relevant) (see Figure 38). Should the temporary relocation and reinstatement of the northern boundary wall of the Hillview complex be required and also involve disturbance or excavation in the area of moderate archaeological potential, a s139 excavation exception or s140 excavation permit (as relevant) will be required to undertake these works. Depending on the scale of works, archaeological monitoring or excavation may be required to identify and assess the significance of any archaeological material encountered during these works.

Recommendation 3 Property Adjustment works - reinstatement of boundary walls and vegetation - former Estha 1614-1634, Pacific Highway, Wahroonga, Kyeamba 1548 Pacific Highway Wahroonga, Yaamba 1544 Pacific Highway Wahroonga, Curtilage Park 1534 Pacific Highway Wahroonga, Mahratta, 1526 Pacific Highway, Wahroonga and Dwelling House, 1548 Pacific Highway, Warrawee

Property adjustments should include reinstatement of boundary walls, trees and vegetation within the boundaries to all the above properties. The properties will be reinstated in consultation with property owners and RMS.

Recommendation 4 Former Hillview Community Health Centre (formerly Hillview Garages & Precinct) 1334 - 1440 Pacific Highway, Turramurra - Reinstatement of entry posts, walls, gardens and lawn within the proposed compound site

If the landscape of this property is removed during construction the reinstatement should include the following:

- The front entry walls and gates should be photographed by an appropriate heritage specialist in accordance with NSW Heritage guidelines. The dismantled stonework should be stored safely in an

appropriate location. When the wall and gates are reinstated the reconstruction of the stonework should match the original as closely as possible.

- If the turf areas across the lawn are impacted and the ground compacted, then the ground should be de-compacted, and the turf reinstated to match existing. Garden beds and planting affected by the compound site activities should be re-instated with soil improvements, and ground covers, and shrubs as required.

Recommendation 5 Tree Canopy Enhancement Plan

The potential loss of vegetation within private property and the road corridor with the loss of large tree species would be widespread throughout all of the sections of proposed road widening. The cumulative effect of the potential canopy loss would impact on the aesthetic significance of the Pacific Highway as a historic tree lined corridor. A Tree Canopy Replacement Plan would review the species to be removed and recommend locations, species and sizes of replacement trees to mitigate potential losses.

1 Introduction

1.1 Project background

Phillips Marler in association with Biosis Pty Ltd have been commissioned by Roads and Maritime Services (Roads and Maritime) to undertake a statement of heritage impact including landscape historical archaeological impact assessment of the Pacific Highway intersection improvements project located in Wahroonga, Warrawee and Turramurra, New South Wales (NSW) (Figure 1), referred to as the 'proposal area' herein. The assessment specifically covers the potential impacts of the proposal on existing local heritage items and archaeological features located within the proposal area. The 'study area' comprises of the local heritage items directly impacted by the proposal.

The report preparation has been undertaken as a collaboration. Biosis have prepared the history and chronology, described statements of significance as available and have prepared the historical archaeological impact assessment. Phillips Marler has provided landscape descriptions of affected items and assessment of impacted boundaries and vegetation with additional photography and mapping of the works and the heritage items. Items of State heritage significance have not been assessed in this report.

The proposed intersection improvements on the Pacific Highway corridor would occur at the following locations (from south to north) within the suburbs of Wahroonga, Warrawee and Turramurra:

1. Pacific Highway at Finlay Road, Warrawee/Turramurra
2. Pacific Highway at Fox Valley Road, Wahroonga/Warrawee
3. Pacific Highway at Coonanbarra Road and Redleaf Avenue, Wahroonga

The proposed works are part of the Pinch Points program within Roads and Maritime's Easing Sydney's Congestion Program Office. The intersection locations subject to this proposal have been identified as traffic congestion points in a traffic corridor study carried out by Roads and Maritime in 2016². It was identified that the Pacific Highway experiences excessive queuing and delays in both the northbound and southbound directions at all times of the day, particularly during peak hours. The

² *Pacific Highway North Pinch Point Corridor Study* in March 2016 (Roads and Maritime, 2016a and b).

proposal would ultimately result in the provision of three continuous northbound through lanes along the Pacific Highway between Turramurra and Wahroonga over a length of about 2.5 km.

The proposal will be assessed in accordance with Division 5.1 of the EP&A Act. This assessment has been prepared as part of the Project Review of Environmental Factors (REF) for the proposal.

1.2 Location of the proposal and scope of works

The proposal (as a whole) would ultimately provide three continuous through lanes northbound on the Pacific Highway from the M1 Pacific Motorway to the suburb of Turramurra for a length of about 2.5 kilometres.

The proposed intersection improvements on the Pacific Highway corridor would occur at the following locations (from south to north):

- Pacific Highway at Finlay Road, Warrawee/Turramurra (referred to as 'Intersection 1')
- Pacific Highway at Fox Valley Road, Wahroonga/Warrawee (referred to as 'Intersection 2')
- Pacific Highway at Coonanbarra Road and Redleaf Avenue, Wahroonga (referred to as 'Intersection 3')

The key features and the extent of the proposal (by intersection location) are detailed below.:

Intersection 1: Pacific Highway at Finlay Road, Warrawee/Turramurra

The proposal would extend along about 210 metres of the Pacific Highway in this location between Blytheswood Avenue and Kirawa Close and would include:

- Widening to the western side of the Pacific Highway to provide an additional northbound through lane resulting in three continuous northbound through lanes along the Pacific Highway in this location
- Provision of new central raised median on the Pacific Highway between Finlay Road and Lowther Park Avenue
- Modifications to the existing central median on the Pacific Highway south of Lowther Park Avenue
- Banning the existing right-turn movement from the Pacific Highway onto Finlay Road
- Banning the existing right-turn movement from Finlay Road onto the Pacific Highway
- Partial property acquisition from two properties and associated property adjustments (including adjustments to retaining/boundary walls, safety barriers and driveways and vegetation clearance):

- 1466-1486 Pacific Highway, Warrawee [Lots 2, 3 and 4 DP21398 and Lot 5 DP21700] also known as 'Warrawee Public School' (about 52 sqm)
- 1458 Pacific Highway, Warrawee [Lot A DP374006] also a local heritage item containing a vacant dwelling to be redeveloped (about 35 sqm)
- Removal of a street tree and collection of roadside shrubs on the western side of the Pacific Highway within the existing road corridor
- Modifications to the western kerbside footpath on the Pacific Highway
- Milling and re-sheeting within the proposal area
- Relocation of traffic signal poles and the provision of new traffic mast arms
- Relocation of aboveground and underground utilities including gas, water mains, local communication cables and above ground and underground electricity
- New stormwater pits and pipes
- New traffic signs, line markings and road furniture.

Intersection 2: Pacific Highway at Fox Valley Road, Wahroonga/Warrawee

The proposal would extend along about 500 metres of the Pacific Highway in this location between Gilda Avenue and Heydon Avenue and would include:

- Provision of an additional northbound lane by widening to the western side along the Pacific Highway resulting in three continuous northbound through lanes on the Pacific Highway in this location
- Extension of the right-turn bay from the Pacific Highway southbound approach onto Fox Valley Road by adjusting the existing central median from about 95m to 190m
- Provision of a dedicated left-turn lane (about 60 m in length) from the Pacific Highway northbound approach onto Fox Valley Road
- Partial property acquisition from ten properties and associated property adjustments (including adjustments to retaining/boundary walls and driveways and vegetation clearance):
 - 2 Marshall Avenue, Wahroonga [SP76417] (about 80 sqm)
 - 2 Fox Valley Road, Wahroonga [Lot 1 DP4696] (about 40 sqm)
 - 25 Fox Valley Road / 1526 Pacific Highway, Wahroonga [Lot 1 DP62488] also known as the 'Mahratta' and a State and local heritage site (about 270 sqm)
 - 1536 Pacific Highway, Wahroonga [Lot 14 DP810712] also known as 'Curtilage Park' and a local heritage site (about 75 sqm)

- 1544 Pacific Highway, Wahroonga [Lot A DP354970] (about 110 sqm) also known as “Yaamba” dwelling house and a local heritage site
 - 1548 Pacific Highway, Wahroonga [Lot 4 DP523216] also known as “Kyeamba” dwelling house and a local heritage site (about 140 sqm)
 - 1550 Pacific Highway, Wahroonga [Lot 2 DP9991] (about 70 sqm)
 - 1552 Pacific Highway, Wahroonga [Lot 1 DP9991] (about 60 sqm)
 - 1558 Pacific Highway, Wahroonga [Lot 2 DP527984] (about 90 sqm)
 - 1560 Pacific Highway, Wahroonga [Lot A DP385263] (about 35 sqm)
- Removal of street trees and roadside vegetation on the western side of the Pacific Highway within the existing road corridor
 - Modifications to the western kerbside footpath on the Pacific Highway to accommodate the modified road alignment
 - Modifications the central raised median on the Pacific Highway (including lengthening, extending, widening and reconstruction) between Borambil Street and Fox Valley Road
 - Providing a ‘Do Not Queue Across Intersection’ sign on Pacific Highway southbound at Borambil Avenue
 - Connecting the central raised median along Pacific Highway south of the intersection with Fox Valley Road to Marshall Avenue to prohibit the right-turn movement from Marshall Avenue onto the Pacific Highway
 - Realignments to existing signalised pedestrian crossings at the intersection of Fox Valley Road and Pacific Highway
 - Milling and re-sheeting within the proposal area
 - Relocation of traffic signal poles and the provision of new traffic mast arms at the intersection of Fox Valley Road and the Pacific Highway
 - Relocation of aboveground and underground utilities including gas, water mains, local communication cables and above ground and underground electricity
 - New stormwater pits and pipes
 - New traffic signs, line markings and road furniture.

Intersection 3: Pacific Highway at Coonanbarra Road and Redleaf Avenue, Wahroonga

The proposal would extend along about 150 metres of the Pacific Highway in this location between Neringah Avenue and Woodville Avenue and would include:

- Provision of an additional northbound lane by widening to the western side of the Pacific Highway resulting in three continuous northbound through lanes on the Pacific Highway in this location
- Reconfiguration of the right-turn bay onto Coonanbarra Road from the Pacific Highway northbound approach to a through lane by banning the right-turn
- Provision of a high entry angle left-turn lane from Redleaf Avenue onto the Pacific Highway by modifying the existing intersection in this location to eliminate the traffic island and build out the kerb. Works would include a new pedestrian crossing island across Redleaf Avenue
- Partial property acquisition (about 380 sqm) and property adjustments from a local heritage item located at 1614-1634 Pacific Highway, Wahrenonga (occupied by Thomas and Rosetta Agst Aged Care Facility) including:
 - maximum encroachment in the existing property by about 5 m (tapering away towards the northern and southern extents of the property)
 - relocation and reconstruction of an existing pedestrian stair access on the northern road frontage boundary
 - removal of an existing masonry retaining wall on the northern road frontage boundary extending 130 m in length with a varying height of up to 2.4 metres
 - establishment of new replacement retaining wall along the new northern property boundary (a minimum 3.6 m offset would be provided to the existing Aged Care Building on this property)
 - vegetation and tree clearance along the northern extent of the property next to the road frontage (within the area of acquisition and part of the adjoining land to this which is to remain under private ownership following the works)
- Property adjustments to the driveway at 1565 Pacific Highway (a residential property) to accommodate the kerb adjustments required for the high-entry angle left-turn from Redleaf Avenue onto the Pacific Highway
- Modifications to the existing raised central medians on the Pacific Highway including:
 - narrowing the existing median from about 1.2 m to 0.5 m either side of Ada Avenue and Coonanbarra Road
 - narrowing the existing median from about 1.2 m to 0.5 m south of the right-turn bay into Redleaf Avenue

- modifying the nose and widening the existing median to provide a larger turn radius at Redleaf Avenue
- Modifications to the western kerbside footpath on the Pacific Highway to accommodate the modified road alignment
- Removal of street trees and vegetation on the western side of the Pacific Highway within the existing road corridor opposite 1614-1634 Pacific Highway, Wahroonga occupied by Thomas and Rosetta Agst Aged Care Facility and street trees on the eastern side of the Pacific Highway within the Redleaf Avenue works area
- Relocation of traffic signal poles and provision of new mast arms at the intersection of the Pacific Highway, Ada Avenue and Coonanbarra Road
- Milling and re-sheeting within the proposal area
- Relocation of above and below ground utilities including gas, water mains, local communication cables, street lighting and electricity
- Stormwater infrastructure upgrades within the northbound kerb and channel of the road corridor to accommodate the widened carriageway extending south of the road widening up to Mundarah Street
- New traffic signs, line markings and road furniture.

A construction compound site would be required close to the proposed works areas. At present, one site has been proposed which is located at 1334 Pacific Highway in Turramurra (the community health centre and a locally listed heritage item 'Hillview').

This exact layout and configuration of the compound site is to be decided, but it is assumed that the gateway may need to be dismantled and stored so that the site entry can be used for larger vehicles. No tree removal would be required for the purposes of the site compound; however, some minor tree trimming may be required to trees within the property and road frontage boundary near the vehicle access points and within the road corridor to facilitate access for heavy vehicles from the Pacific Highway.

The proposal area is located within the Ku-ring-gai Local Government Area (LGA), Parish of Gordon, County of Cumberland (Figure 1). It includes both public and private land currently zoned 'SP2 – Infrastructure – Classified Roads/Educational Establishment', 'R2 – Low Density Residential', 'R3 – Medium Density Residential', 'R4 – High Density Residential', and 'RE1 – Public Recreation' under the Ku-ring-gai Local Environmental Plan 2015 and Ku-ring-gai Local Environmental Plan (Local Centres) 2012.

The area of impact to the locally listed heritage items situated within the proposal area is referred to as the 'study area' (as identified above).

1.3 Scope of assessment

This report was prepared in accordance with current heritage guidelines including *Assessing Heritage Significance*, *Assessing Significance for Historical Archaeological Sites and "Relics"* and the *Burra Charter*.³ This report provides a heritage assessment to identify if any heritage items or relics exist within or in the vicinity of the proposal area. The heritage significance of these heritage items has been investigated and assessed in order to determine the most appropriate management strategy.

This assessment focuses on local non-Aboriginal heritage listed items located within or in the vicinity of the proposal area. An assessment of State heritage listed items has not been undertaken within this report. A separate heritage assessment has been prepared by Phillips Marler and Biosis in relation to the State heritage listed item 'Mahratta' as part of a Section 60 application under the Heritage Act dated September 2018 and the Project REF.⁴

The following is a summary of the major objectives of the assessment:

- Identify and assess the local heritage values associated with the study area and proposal area. The assessment aims to achieve this objective through providing a brief summary of the principal historical influences that have contributed to creating the present – day built environment of the study area and proposal area using resources already available and some limited new research.
- Assess the impact of the proposed works on the cultural heritage significance of the study area.
- Identify sites and features within the study area and proposal area which are already recognised for their heritage value through statutory and non – statutory heritage listings.
- Recommend measures to avoid or mitigate any negative impacts on areas of local heritage significance of the study area.

³ NSW Heritage Office 2001; NSW Heritage Branch, Department of Planning 2009; Australia ICOMOS 2013

⁴ Phillips Marler and Biosis Pty Ltd, Statement of Heritage Impact for State Significant Heritage Item No. 708 'Mahratta', 1526 Pacific Highway, Wahroonga, 2018

1.4 Limitations

This report is based on historical research and field inspections. It is possible that further historical research or the emergence of new historical sources may support different interpretations of the evidence in this report.

The historical research undertaken for this report is based on primary documents including Crown and deposited plans, Certificates of Title and historical parish maps. This information was supplemented by existing studies and sources in order to present a history of the study area and proposal area. Issues were encountered with access to several primary documents, including aerial photographs prior to 1943, and as such there may be additional data which has not been incorporated into this assessment. The archaeological survey was constrained by the presence of built fabric and modified ground surface areas in some locations, limiting the observations of ground surface and identification of potential archaeological resources.

Although this report was undertaken to best archaeological practice and its conclusions are based on professional opinion, it does not warrant that there is no possibility that additional archaeological material would be located in subsequent works on the site. This is because limitations in historical documentation and archaeological methods make it difficult to accurately predict what is under the ground.

1.5 Report authorship

This assessment was completed jointly by Phillips Marler and Biosis. Table 1 provides a summary of the author responsible for each section of this assessment.

Phillips Marler staff involved in the assessment were Julie Marler, Principal Landscape Architect for field investigation and reporting and Daniel Hughes for additional written material, research and graphic support.

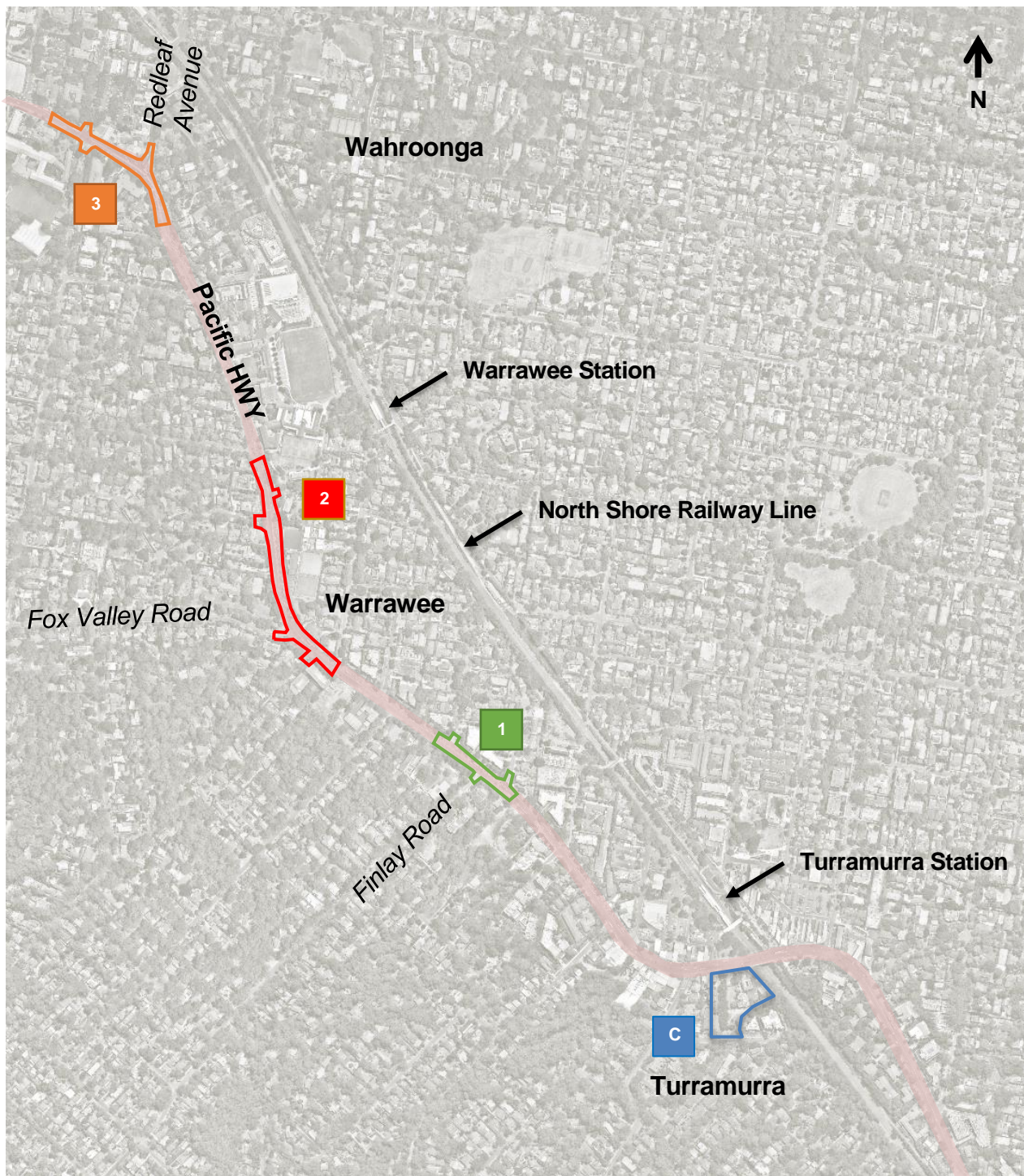
Biosis staff involved in the assessment were James Cole, Archaeologist for field investigation and reporting, Charlotte Allen, Field Archaeologist for background research and reporting, Gareth Davies, GIS Operator for mapping, and Alexander Beben, Principal Archaeologist for quality assurance.

Table 1 Report authorship

Section	Authorship
Summary	Phillips Marler and Biosis
1.1	Phillips Marler and Biosis
1.2	Phillips Marler
1.3	Biosis

Section	Authorship
1.4	Biosis
2	Biosis
3	Biosis
4.1	Phillips Marler and Biosis
4.2	Phillips Marler and Biosis
4.3	Biosis
5	Biosis
6	Biosis
6.3	Phillips Marler and Biosis
6.4.2	Phillips Marler
7	Phillips Marler and Biosis

Figure 1 Location of the proposal area



Legend:

- 3 Pacific Highway at Coonabarra Road & Redleaf Avenue, Wahroonga
- 2 Pacific Highway at Fox Valley Road, Wahroonga/Warrawee
- 1 Pacific Highway at Finlay Road, Warrawee/Turramurra
- C Compound Site at 1334 Pacific Highway, Turramurra

2 Consultation

2.1 Consultation with Ku-ring-gai Council under State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposal is for a road and road infrastructure facilities and is to be carried out on behalf of Roads and Maritime, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Development consent from council is not required.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development.

Ku-ring-gai Council is currently been consulted with about the proposal as per the requirements of Part 2, Division 1 Clause 14 of the ISEPP in relation to the potential impacts of the proposal on local heritage items within their LGA.

A meeting was held on 17 August 2018 with representatives from Ku-ring-gai Council (which included a council heritage officer) to brief them on the proposal. Following the meeting, Roads and Maritime issued a formal ISEPP letter to council with details on the proposal, including a final draft version of this report. At the date of finalising this report no response has been received from Ku-ring-gai Council to date about heritage related matters, however consultation with Ku-ring-gai Council remains on-going.

2.2 Consultation with the Office of Environment and Heritage

Roads and Maritime has met with the Office of Environment and Heritage (OEH) on two occasions (11 May 2018 and 14 June 2018) to discuss the proposal and its potential impacts to the Mahratta heritage curtilage (both a local and State listed heritage item). These meetings were also supplemented with associated email correspondence and phone conversations.

2.3 Consultation with directly impacted property owners on locally listed heritage properties

Consultation with impacted property owners directly affected by the proposal has been on-going. The purpose of the communications date has been to undertake pre-condition surveys and discuss the extent of potential property acquisition/adjustments and remediation requirements.

2.4 Consultation with the local community

Consultation with the wider community is currently being undertaken via a 'Have Your Say' process. The outcomes of this consultation will be provided in the Community Engagement Report for the project.

3 Statutory framework

This assessment will support a REF under Division 5.1 of the EP&A Act. In NSW, cultural heritage is managed in a three-tiered system: national, state and local. Certain sites and items may require management under all three systems or only under one or two. The following discussion aims to outline the various levels of protection and approvals required to make changes to cultural heritage in the state.

3.1 Environmental Protection and Biodiversity Conservation Act 1999

The *Environmental Protection and Biodiversity Act 1999* (EPBC Act) is the national Act protecting the natural and cultural environment. The EPBC Act is administered by the Department of Environment and Energy (DEE). The EPBC Act establishes two heritage lists for the management of the natural and cultural environment:

- The National Heritage List (NHL) contains items listed on the NHL have been assessed to be of outstanding significance and define "critical moments in our development as a nation".⁵
- The Commonwealth Heritage List (CHL) contains items listed on the CHL are natural and cultural heritage places that are on Commonwealth land, in Commonwealth waters or are owned or managed by the Commonwealth. A place or item on the CHL has been assessed as possessing "significant" heritage value.⁶

A search of the NHL and CHL did not yield any results associated with the study area.

3.2 NSW Heritage Act 1977

Heritage in NSW is principally protected by the Heritage Act (as amended) which was passed for the purpose of conserving items of environmental heritage of NSW. Environmental heritage is broadly defined under Section 4 of the Heritage Act as consisting of the following items: *"those places, buildings, works, relics, moveable objects, and precincts, of State or Local heritage significance"*. The Act is

⁵ "About National Heritage" <http://www.environment.gov.au/heritage/about/national/index.html>

⁶ "Commonwealth Heritage List Criteria" <http://www.environment.gov.au/heritage/about/commonwealth/criteria.html>

administered by the NSW Heritage Council, under delegation by the Heritage Division, Office of Environment and Heritage. The Heritage Act is designed to protect both known heritage items (such as standing structures) and items that may not be immediately obvious (such as potential archaeological remains or 'relics'). Different parts of the Heritage Act deal with different situations and types of heritage and the Act provides a number of mechanisms by which items and places of heritage significance may be protected.

3.2.1 State Heritage Register

Protection of items of State significance is by nomination and listing on the State Heritage Register (SHR) created under Part 3A of the Heritage Act. The Register came into effect on 2 April 1999. The Register was established under the *Heritage Amendment Act* 1998. It replaces the earlier system of Permanent Conservation Orders as a means for protecting items with State significance.

A permit under Section 60 of the Heritage Act is required for works on a site listed on the SHR, except for that work which complies with the conditions for exemptions to the requirement for obtaining a permit. Details of which minor works are exempted from the requirements to submit a Section 60 Application can be found in the Guideline "Standard Exemptions for Works requiring Heritage Council Approval". These exemptions came into force on 5 September 2008 and replace all previous exemptions.

The proposal area contains parts of the following items listed on the SHR:

- Mahratta and site, (Item No. 708), 1526 Pacific Highway, Wahroonga, NSW, Lot 29, Section 1, DP 3312, Lot 30, Section 1, DP 3312, Lot 1, D P62488, Lots 1-14, DP 810712, immediately adjacent and within the proposal area on the western extent of the proposed works at Intersection 2 (Pacific Highway and Fox Valley Road).

A Section 60 application will be submitted by Roads and Maritime to the OEH for the works proposed to this heritage item. A separate heritage assessment has been prepared by Phillips Marler and Biosis as part of the Section 60 application under the Heritage Act.⁷

There are no items of State heritage significance within the vicinity of the proposal area.

⁷ Phillips Marler and Biosis Pty Ltd, Statement of Heritage Impact for State Significant Heritage Item No. 708 'Mahratta', 1526 Pacific Highway, Wahroonga, 2018

3.2.2 Archaeological relics

Section 139 of the Heritage Act protects archaeological 'relics' from being 'exposed, moved, damaged or destroyed' by the disturbance or excavation of land. This protection extends to the situation where a person has 'reasonable cause to suspect' that archaeological remains may be affected by the disturbance or excavation of the land. This section applies to all land in NSW that is not included on the State Heritage Register.

Amendments to the Heritage Act made in 2009 changed the definition of an archaeological 'relic' under the Act. A 'relic' is defined by the Heritage Act as:

"Any deposit, object or material evidence:

(a) which relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and

(b) which is of State or Local significance"

It should be noted that not all remains that would be considered archaeological are relics under the NSW Heritage Act. Advice given in the Archaeological Significance Assessment Guidelines is that a "relic" would be viewed as a chattel and it is stated that:

"In practice, an important historical archaeological site will be likely to contain a range of different elements as vestiges and remnants of the past. Such sites will include 'relics' of significance in the form of deposits, artefacts, objects and usually also other material evidence from demolished buildings, works or former structures which provide evidence of prior occupations but may not be 'relics'.⁸"

If a relic, the discoverer is required to notify the NSW Heritage Council.

Section 139 of the Heritage Act requires any person who knows or has reasonable cause to suspect that their proposed works will expose or disturb a 'relic' to first obtain an Excavation Permit from the Heritage Council of NSW (pursuant to Section 140 of the Heritage Act), unless there is an applicable exception (pursuant to Section 139(4)). Excavation permits are issued by the Heritage Council of NSW in accordance with sections 60 or 140 of the Heritage Act. It is an offence to disturb or excavate land to discover, expose or move a relic without obtaining a permit. Excavation permits are usually issued

⁸ NSW Heritage Branch, Department of Planning 2009, 7

subject to a range of conditions. These conditions will relate to matters such as reporting requirements and artefact cataloguing, storage and curation.

Exceptions under Section 139(4) to the standard Section 140 process exist for applications that meet the appropriate criterion. An application is still required to be made. The Section 139(4) permit is an exception from the requirement to obtain a Section 140 permit and reflects the nature of the impact and the significance of the relics or potential relics being impacted upon.

If an exception has been granted and, during the course of the development, substantial intact archaeological relics of State or local significance, not identified in the archaeological assessment or statement required by this exception, are unexpectedly discovered during excavation, work must cease in the affected area and the Heritage Office must be notified in writing in accordance with Section 146 of the Heritage Act. Depending on the nature of the discovery, additional assessment and, possibly, an excavation permit may be required prior to the recommencement of excavation in the affected area.

3.2.3 Section 170 Heritage and Conservation Registers

Section 170 of the *Heritage Act* requires that culturally significant items or places managed or owned by Government agencies are listed on departmental Heritage and Conservation Register. Information on these registers has been prepared in accordance with Heritage Division guidelines.

Statutory obligations for archaeological sites that are listed on a Section 170 Register include notification to the Heritage Council in addition to relic's provision obligations

There are three items within the proposed compound area which are listed on the State government instrumentality Section 170 Register:

- Hillview Garages & Precincts, (Department of Planning and Infrastructure, Item No. 3490028), 1334-1340 Pacific Highway, Turrumurra NSW (proposed compound site).
- Hillview, (NSW Department of Health), 1334 Pacific Highway (Hillview), Turrumurra NSW (proposed compound site)..
- Hillview Garages, (Roads and Maritime Services), 1334-1340 Pacific Highway, Turrumurra NSW (proposed compound site).

There is one item in the vicinity of the proposal area which is listed on a State government instrumentality Section 170 Register:

- Wahroonga Railway Station group, (RailCorp, Item No. SRA940), North Shore railway, Wahroonga, NSW, DP 1133894, approximately 182 metres north of the proposal area at Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue).

3.3 Environmental Planning and Assessment Act 1979 and State Environmental Planning Policy (Infrastructure) 2007)

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposal is for a road and road infrastructure facilities and is to be carried out on behalf of Roads and Maritime, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Development consent from council is not required.

A summary of the Local Environmental Plan and Development Control Plan provisions relevant to the identification and assessment of the local heritage items and conservation areas potentially impacted by the proposal are described below.

3.3.1 Ku-Ring-Gai (Local Centres) Local Environmental Plan 2012

The Ku-Ring-Gai LEP (Local Centres) 2012 contains schedules of heritage items that are managed by the controls in the instrument. Heritage items in the vicinity of the proposal area are identified in Figure 2, Figure 3, Figure 4 and Figure 5.

The proposal area contains parts of the following listed items of local and State significance on the Ku-Ring-Gai LEP (Local Centres) 2012 Schedule 5:

- Hillview Garages, (Item No. I156), 1340 Pacific Highway, Turrumurra NSW, Lot 6, DP 26828. Item of local significance (proposed compound site).
- “Hillview”, (Item No. I155), 1334 Pacific Highway, Turrumurra NSW, Lot 7, DP 214733. Item of local significance located immediately west of the proposal area (proposed compound site).
- Dwelling house, (Item No. I160), 1458 Pacific Highway, Turrumurra NSW, Lot A, DP 374006. Item of local significance located within the proposed works area at Intersection 1 (Pacific Highway and Finlay Road).

The study area includes the following heritage conservation areas of local significance:

- Hillview Conservation Area, (Conservation Area No. C40). Area of local significance (proposed compound site).

The proposal area is also situated within the vicinity of heritage items/conservation area of local significance:

- Rohini House gates, (Item No. I161), Railway lands, Turrumurra NSW, Part Lot 1, DP 1129573. Item of local heritage significance (10 m to the north of the proposed compound site).
- “Milnerroyd”, residential flat building, (Item No. I167), 1–3 Lowther Park Avenue, Warrawee NSW, Lot A, DP 401969. Item of local significance located immediately east of the proposed works area at Intersection 1 (Pacific Highway and Finlay Road).
- Commercial buildings, (Item No. I158), 1358 and 1360 Pacific Highway, Turrumurra NSW, Lots A and B, DP 445374; Lot 8, DP 237813. Item of local significance located immediately west of the proposed compound site.
- Former Commonwealth Bank building, (Item No. I157), 1356 Pacific Highway, Turrumurra NSW, Lot 5, DP 132873. Item of local significance located immediately west of the proposed compound site.
- Dwelling house (Item No. I139), 8 Kissing Point Road Turrumurra NSW. Lot 1 Dp743998 Item of local significance located south west of the proposed compound site.
- Residential flat building (Item No. I132), 2-4 Boyd Street Turrumurra NSW. Lot 2 DP596228

3.3.2 Ku-Ring-Gai (Local Centres) Development Control Plan 2016

The Ku-Ring-Gai (Local Centres) Development Control Plan 2016 (‘KLCDCP’) outlines built form controls to guide development. The KLCDCP supplements the provisions of the Ku-Ring-Gai (Local Centres) LEP 2012.

The heritage controls within the KLCDCP aims to:

- retain, conserve and enhance Heritage Items, Heritage Conservation Areas (HCA) and their associated settings
- ensure the heritage significance, streetscape and landscape character of HCAs are maintained
- ensure alterations and additions to Heritage Items and within HCAs respect those buildings and do not compromise the significance and character of the individual Heritage Items or HCAs and
- ensure new development in the vicinity of Heritage Items and HCAs respects the heritage context and is sympathetic in terms of form, scale, character, bulk, orientation, setback, colours and textures and does not mimic or adversely affect the significance of Heritage Items or HCAs and their settings.

Any works to a heritage item, within an HCA or in the vicinity of a heritage item, a Heritage Impact Statement (HIS) is required. A Conservation Management Plan (CMP) may be required for works to a Heritage Item or significant works within an HCA. Heritage impact statements and CMPs are to be completed by an experienced heritage consultant. The HIS is to address the effect of the proposed development on a Heritage Item or HCA and demonstrate that the proposed works will not adversely impact upon significance, including any related heritage features within the identified curtilage and setting.

A number of conditions are in place regarding development within a conservation area:

- Applications must not have an adverse effect on the significance of a HCA or heritage item, and should retain the typical block width characteristics and historic subdivision pattern of the area.
- Setting and curtilage of Heritage Items or significant buildings in the vicinity, including important structures and landscape elements, must be retained, while vistas and views to and from Heritage Items and contributory properties, especially the principal elevations of buildings, are not to be interrupted or obscured.
- The landscape quality of the streetscape must be retained, and the contours and any natural features of the site should be retained and respected.
- Applications must ensure that any future development will not adversely affect the significance, character or appearance of the HCA.
- The setting or curtilage of any Heritage Items and contributory properties within or adjoining the heritage item should not be compromised. Any applications within an HCA will require a curtilage assessment.

Demolition of a Heritage Item, including buildings, other structures, trees and landscape features, will not be supported. However, applications may be considered which demonstrate that demolition will not result in any adverse impacts on the streetscape or character of the HCA, that the retention and stabilisation of the building or structure is unreasonable, taking into consideration the heritage significance of the property and whether the building constitutes a danger to the public, and that all alternatives to demolition have been considered with reasons provided as to why the alternatives are not acceptable. Applications for partial demolition will be assessed against the significance of the building part or structure and/or landscape features and whether its retention is considered necessary, its contribution to the significance of the streetscape or heritage item as a whole, and whether all alternatives to demolition have been considered with reasons provided as to why the alternatives are not acceptable. Archival recording may be required should permission be granted for partial or whole demolition of a heritage item in accordance with NSW Heritage Branch guidelines, both before and during works.

The established landscape character (height of the tree canopy, early gardens, remnant trees, historic tree plantings) that contributes to the significance of the streetscape and HCA as a whole are to be retained and conserved in any new development.

The reinstatement of original planting, where known, is encouraged. Original garden features such as gates, paths, stonework, garden terracing, tiling, cement crazy paving, walling and garden edging are to be retained and conserved; this also applies to elements which contribute to the significance of a heritage item. New gardens should be horticulturally and stylistically sympathetic to the period of the HCA. The use of similar materials such as sandstone, brick and gravel is encouraged, as is the use of a variety of plant species to avoid mono-cultural plantings along street frontages as screen planting. High solid hedges that screen the dwelling from the street are not permitted. New paving and hard surfacing, particularly to front setbacks is to be limited. Front gardens are to have a minimum of 70% landscaped area include substantial tree and shrub planting along street frontages. Materials for new garden paving or pathways are to be appropriate to the architectural style of the HCA, such as gravel for Federation style and sandstone flagging for Inter-war styles. Plain or stencilled concrete is not acceptable.

Original and early fences, piers, gates and retaining walls are to be retained and conserved. Original face brick or sandstone fences are not to be rendered, coated or painted. The configuration, finishes and details of original sandstone retaining walls that are located at the street front boundaries (whether identified as contributory properties or not) are to be retained and conserved. New front fencing is not encouraged in areas where it does not form part of the streetscape. In such areas, the front boundary can be defined by low hob walls, by garden beds or planting to allow private gardens to merge with their neighbours and support the landscape character of the area. Replacement of unsympathetic fences, gates and walls with new elements of appropriate height, style and materials is encouraged. Where historic records and physical evidence exists, new front fencing is to reinstate the original. Where no evidence is available to guide reconstruction of missing fences to contributory properties, new front fencing is to match the architectural style of the house, the period of construction and the character of the immediate streetscape. No metal panel fencing is to be constructed on any boundary within an HCA or heritage item.

There are additional controls for the HCAs relevant to the proposal area:

- *'HCA C40 – Hillview, Turrumurra'*, all individually listed heritage items are to be retained, while original face brickwork and sandstone is also to be retained and not rendered or painted; removal of paint from original face brick is encouraged. Gardens, gardens structures and landscaping which contribute to the significance of individual items and the conservation area as a whole must be retained and conserved.

3.3.3 Ku-Ring-Gai Local Environmental Plan 2015

The Ku-Ring-Gai LEP 2015 contain schedules of heritage items that are managed by the controls in the instrument. Heritage items in the vicinity of the proposal area are identified in Figure 2, Figure 3, Figure 4 and Figure 5.

The proposal area contains parts of the following listed items of local and State significance on the Ku-Ring-Gai LEP 2015 Schedule 5:

- Gateposts to the former “Estha”, dwelling house (Item No. I976), 1614–1634 Pacific Highway, Wahroonga NSW, Lot 102, DP 1034668. Item of local heritage significance located within the north-eastern extent of the proposed works area at Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue).
- Dwelling house, “Kyeamba” (Item No. I966), 1548 Pacific Highway, Wahroonga NSW, Lot 4, DP 523216. Item of local heritage significance located within the north western extent of the proposed works area at Intersection 2 (Pacific Highway and Fox Valley Road).
- “Yaamba”, dwelling house, (Item No. I965), 1544 Pacific Highway, Wahroonga NSW, Lot A, DP 354970, Item of local heritage significance located within the north western extent of the proposed works area at Intersection 2 (Pacific Highway and Fox Valley Road).
- “Mahratta”, dwelling house, (Item No. I964), 1536 Pacific Highway, Wahroonga NSW, Lot 14, DP 810712. Item of State and local significance located within the western extent of the proposed works area at Intersection 2 (Pacific Highway and Fox Valley Road).
- Mahratta, (Item No. I913), 25 Fox Valley Road, Wahroonga NSW, Lot 1, DP 62488. Item of State and local significance located within the western extent of the proposed works area at Intersection 2 (Pacific Highway and Fox Valley Road).

The proposal area is situated within the following heritage conservation areas of local significance:

- Mahratta Conservation Area, (Conservation Area No. C4). Area of local significance located within the western extent of the proposed works area at Intersection 2 (Pacific Highway and Fox Valley Road).
- Heydon Avenue, Warrawee and Woodville Avenue, Wahroonga Conservation Area, (Conservation Area No. C2). Area of local significance located within the eastern extent of the proposed works area at Intersection 2 (Pacific Highway and Fox Valley Road) and Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue).

The proposal area is also situated within the vicinity of heritage items/conservation area of local significance:

- “Redleaf”, dwelling house and grounds (Item No. I1008), 28–30 Woodville Avenue, Wahroonga NSW, Lot 4, DP 16893; Lots 1 and 2, DP 746487; Lot 12, DP 615524. Item of local significance located immediately east of the proposed works area at Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue).
- Dwelling house, (Item No. I969), 1565 Pacific Highway, Wahroonga NSW, Lot 4, DP 229736. Item of local significance located immediately east of the proposed works area at Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue).
- Dwelling house, (Item No. I967), 1551 Pacific Highway, Wahroonga NSW, Lots 4, 5, 6, 11 and 12, DP 16715. Item of local significance located immediately east of the proposed works area at Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue).
- “Inglewood”, dwelling house, (Item No. I1059), 1485 Pacific Highway, Warrawee NSW, Lot 11, DP 1009885. Item of local significance located immediately east of the proposed works area at Intersection 2 (Pacific Highway and Fox Valley Road).

3.3.4 Ku-Ring-Gai Development Control Plan 2016

The Ku-Ring-Gai Development Control Plan 2016 (KDCP) outlines built form controls to guide development. The KDCP supplements the provisions of the Ku-Ring-Gai LEP 2015.

The heritage controls within the KDCP largely mirror those specified within the KLCDP, which are described above in Section 3.1.2. However, there is an additional provision which stipulates that any detail or important elements which contribute to the significance and character of a heritage item property or HCA must be reinstated following unauthorised removal. There are no specific controls provided for C4 - Mahratta Conservation Area or C2 - Heydon Avenue, Warrawee and Woodville Avenue, Wahroonga Conservation Area.

3.4 Summary of heritage listings

A summary of heritage listings within and in the vicinity of the proposal area is presented in Table 2 and Figure 2, Figure 3, Figure 4 and Figure 5.

Table 2 Summary of heritage listings within and directly adjacent to the proposal area

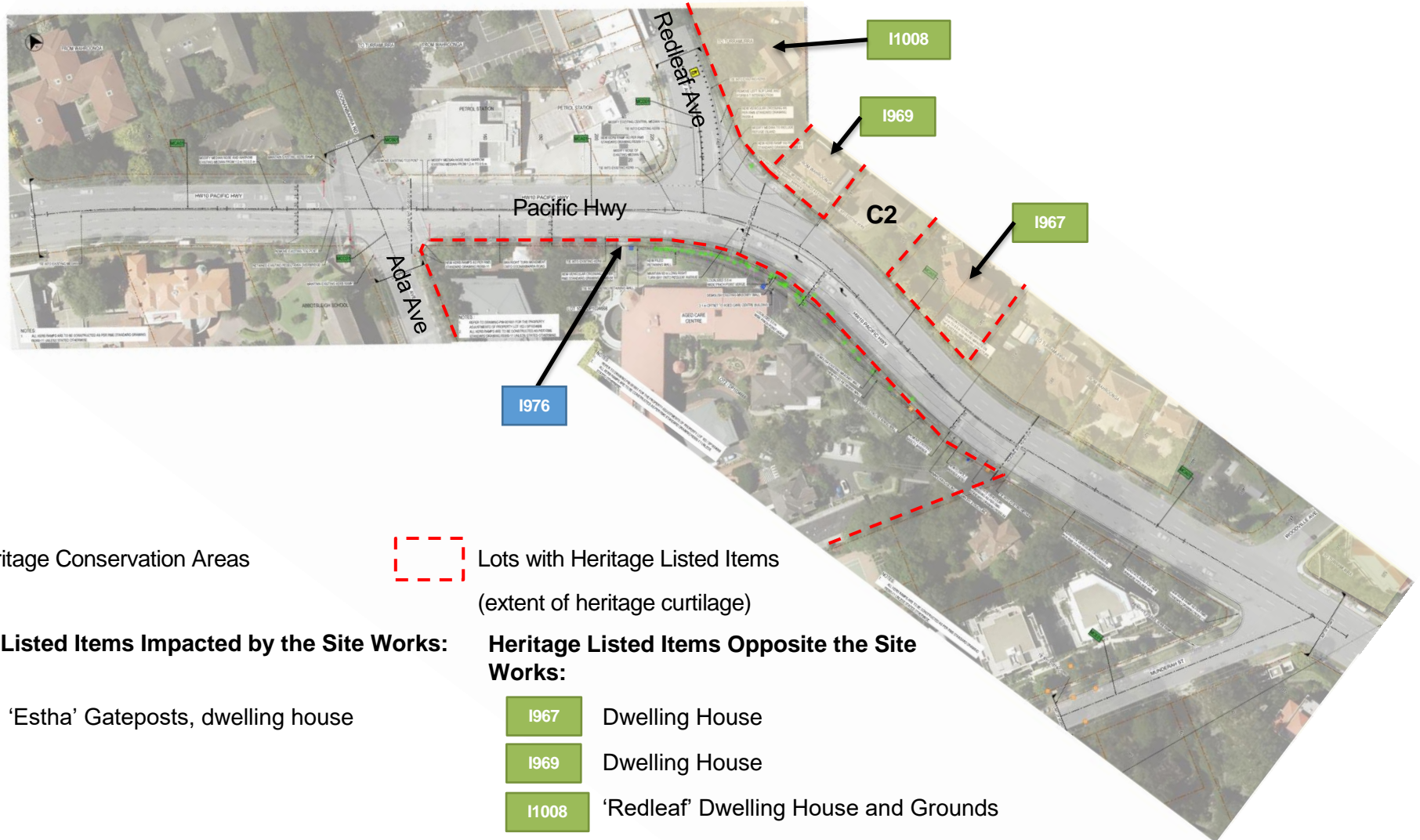
Item name	Address / Property description	Listings		Item number	Significance	Location relative to the proposal area
		Individual item	As a Conservation Area			
“Mahratta”, dwelling house / Mahratta / Mahratta Conservation Area	1526 Pacific Highway, Wahroonga, NSW	State Heritage Register	-	708	State	Within the proposal area at Intersection 2 (Pacific Highway and Fox Valley Road)
	1536 Pacific Highway, Wahroonga NSW	Ku-Ring-Gai LEP 2015	-	1964	State	
	25 Fox Valley Road, Wahroonga NSW	Ku-Ring-Gai LEP 2015	-	1913	State	
	Pacific Highway and Fox Valley Road, Wahroonga NSW	-	Ku-Ring-Gai LEP 2015	C4	Local	
Wahroonga Railway Station group	North Shore railway, Wahroonga, NSW	State Heritage Register	-	1280	State	Outside of the proposal area near Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue)
		RailCorp Section 170 Register	-	SRA940	State	
Hillview / Hillview Garages / Hillview Garages & Precincts / Hillview Conservation Area	1334-1340 Pacific Highway, Turramurra NSW	Department of Planning and Infrastructure S170 Register	-	3490028	Local	Within the proposal area (proposed compound site)
	1334-1340 Pacific Highway, Turramurra NSW	Roads and Maritime Services S170 Register	-	N/A	Local	
	1334 Pacific Highway, Turramurra	NSW Department of Health S170 Register	-	N/A	Local	
	1340 Pacific Highway, Turramurra NSW	Ku-Ring-Gai LEP (Local Centres) 2012 S170 Register	-	1156	Local	

Item name	Address / Property description	Listings		Item number	Significance	Location relative to the proposal area
		Individual item	As a Conservation Area			
	1334 Pacific Highway, Turrumurra NSW	Ku-Ring-Gai LEP (Local Centres) 2012 S170 Register	-	I155	Local	
	Pacific Highway, Turrumurra NSW	-	Ku-Ring-Gai LEP (Local Centres) 2012	C40	Local	
Dwelling house	8 Kissing Point Road Turrumurra NSW..	Ku-Ring-Gai LEP (Local Centres) 2012	-	I139	Local	Item of local significance located south west of the proposed compound site
Residential flat building	2-4 Boyd Street Turrumurra NSW	Ku-Ring-Gai LEP (Local Centres) 2012		I132	Local	Item of local significance located south west of the proposed compound site
Dwelling house	1458 Pacific Highway, Turrumurra NSW	Ku-Ring-Gai LEP (Local Centres) 2012	-	I160	Local	Within the proposed works area at Intersection 1 (Pacific Highway and Finlay Road)
“Milneroyd”, residential flat building	1–3 Lowther Park Avenue, Warrawee NSW	Ku-Ring-Gai LEP (Local Centres) 2012	-	I167	Local	Adjacent to the proposal area at Intersection 1 (Pacific Highway and Finlay Road)
Commercial buildings	1358 and 1360 Pacific Highway, Turrumurra NSW	Ku-Ring-Gai LEP (Local Centres) 2012	-	I158	Local	Adjacent to the proposal area (proposed compound site)

Item name	Address / Property description	Listings		Item number	Significance	Location relative to the proposal area
		Individual item	As a Conservation Area			
Former Commonwealth Bank building	1356 Pacific Highway, Turramurra NSW	Ku-Ring-Gai LEP (Local Centres) 2012	-	I157	Local	Adjacent to the proposal area (proposed compound site)
Gateposts to the former “Estha”, dwelling house	1614–1634 Pacific Highway, Wahroonga NSW	Ku-Ring-Gai LEP 2015	-	I976	Local	Within the proposed works area at Intersection 3 (Pacific Highway at Coonanbarra Road/Redleaf Avenue)
Dwelling house (also known as “Kyeamba”)	1548 Pacific Highway, Wahroonga NSW	Ku-Ring-Gai LEP 2015	-	I966	Local	Within the proposed works area at Intersection 2 (Pacific Highway at Fox Valley Road)
“Yaamba”, dwelling house	1544 Pacific Highway, Wahroonga NSW	Ku-Ring-Gai LEP 2015	-	I965	Local	Within the proposed works area at Intersection 2 (Pacific Highway at Fox Valley Road)
Heydon Avenue, Warrawee and Woodville Avenue, Wahroonga Conservation Area	Heydon Avenue, Warrawee and Woodville Avenue, Wahroonga	-	Ku-Ring-Gai LEP 2015	C2	Local	Within the proposed works area at Intersection 2 (Pacific Highway and Fox Valley Road) and Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue)
“Redleaf”, dwelling	28–30 Woodville Avenue,	Ku-Ring-Gai LEP 2015	-	I1008	Local	Adjacent to the proposal

Item name	Address / Property description	Listings		Item number	Significance	Location relative to the proposal area
		Individual item	As a Conservation Area			
house and grounds	Wahroonga NSW					area at Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue)
Dwelling house	1565 Pacific Highway, Wahroonga NSW	Ku-Ring-Gai LEP 2015	-	I969	Local	Adjacent to the proposal area at Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue)
Dwelling house	1551 Pacific Highway, Wahroonga NSW	Ku-Ring-Gai LEP 2015	-	I967	Local	Adjacent to the proposal area at Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue)
“Inglewood”, dwelling house	1485 Pacific Highway, Warrawee NSW	Ku-Ring-Gai LEP 2015	-	I1059	Local	Adjacent to the proposal area at Intersection 2 (Pacific Highway at Fox Valley Road)

Figure 2 Pacific Highway at Coonabarra Road and Redleaf Avenue, Wahroonga



Legend:

C2 Heritage Conservation Areas

 Lots with Heritage Listed Items
(extent of heritage curtilage)

Heritage Listed Items Impacted by the Site Works:

1976 'Estha' Gateposts, dwelling house

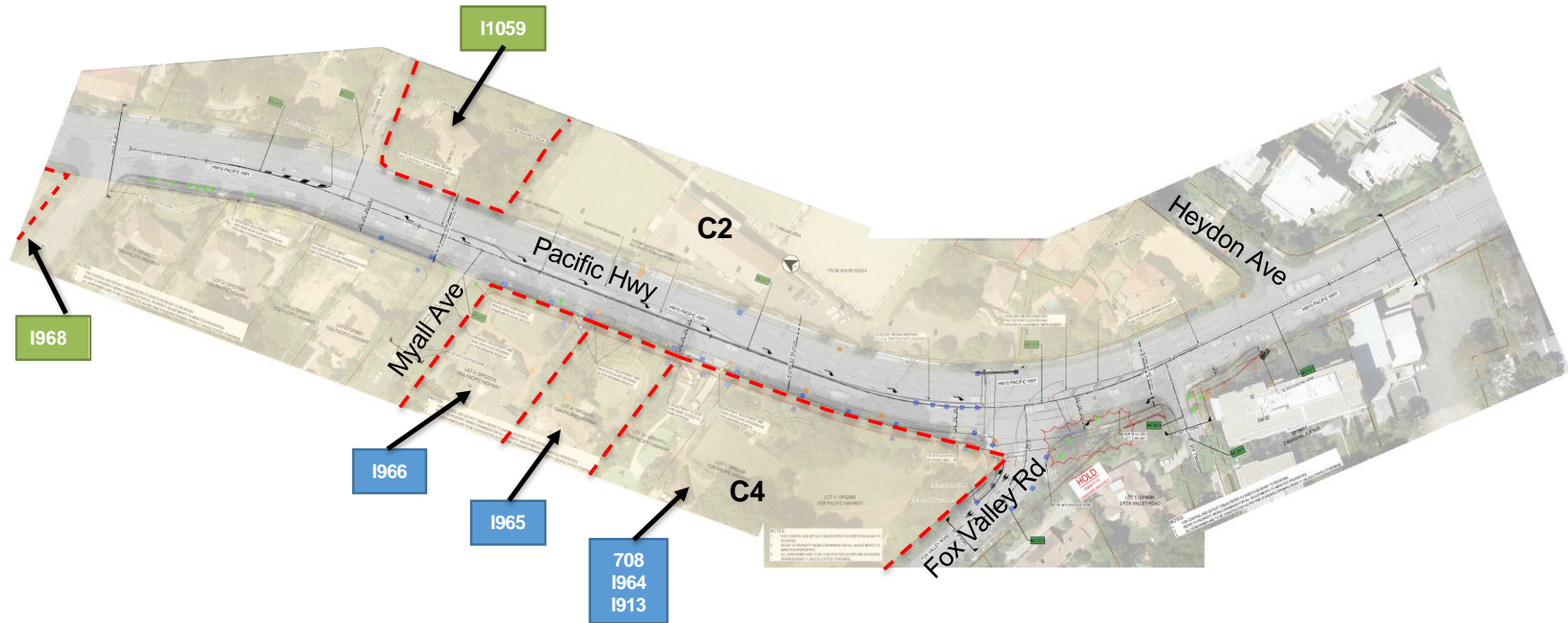
Heritage Listed Items Opposite the Site Works:

1967 Dwelling House

1969 Dwelling House

I1008 'Redleaf' Dwelling House and Grounds

Figure 3 Pacific Highway at Fox Valley Road, Wahroonga/Warrawee



Legend:

C2 Heritage Conservation Areas

Heritage Listed Items Impacted by the Site Works:

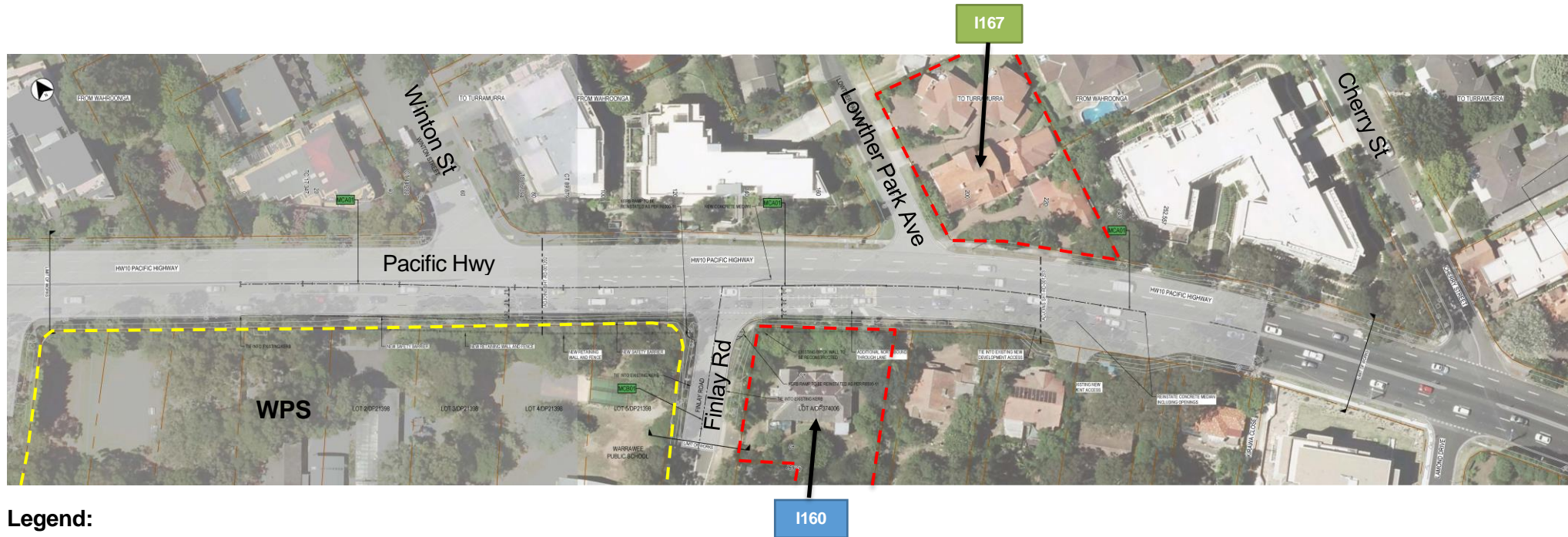
- 1966 'Kyeamba' Dwelling House
- 1965 'Yaamba' Dwelling House
- 708 1964 1913 'Mahratta' Site & Dwelling House

Lots with Heritage Listed Items (extent of heritage curtilage)

Heritage Listed Items Opposite the Site Works:

- 11059 'Inglewood' Dwelling House
- 1968 'Illilliwa' Dwelling House

Figure 4 Pacific Highway at Finlay Road, Warrawee/Turramurra



Legend:

WPS Warrawee Public School

[Red dashed line] Lots with Heritage Listed Items (extent of heritage curtilage)

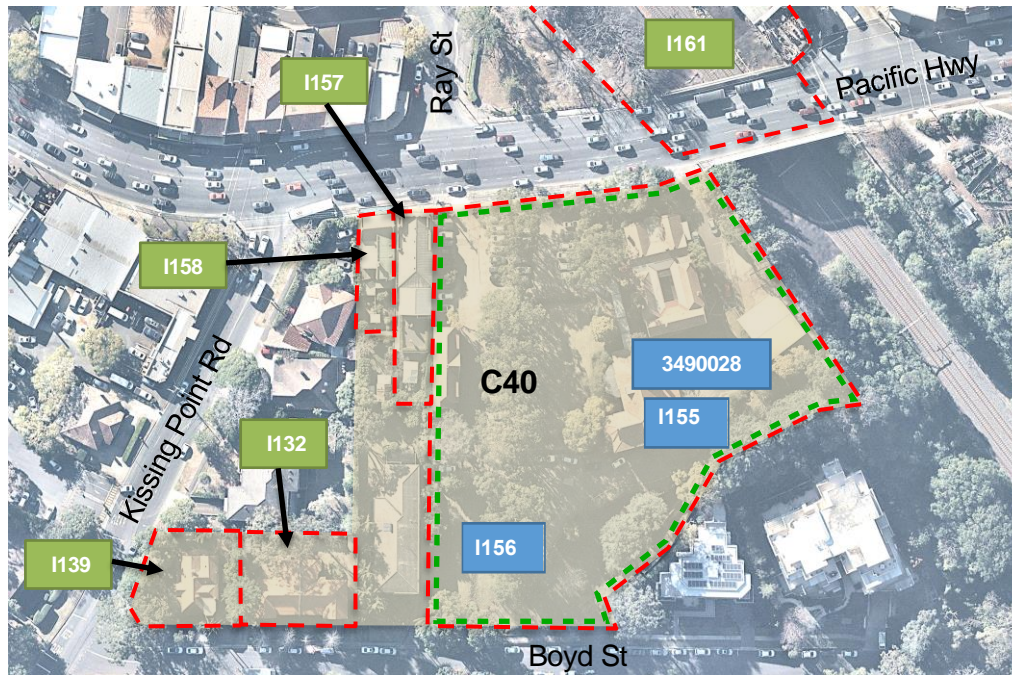
Heritage Listed Items Impacted by the Site Works:

Heritage Listed Items Opposite the Site Works:

1160 Dwelling House

1167 'Milneroyd' Residential Flat Building

Figure 5 Proposed compound site, Turramurra



Legend:

- C2** Heritage Conservation Areas
- Lots with Heritage Listed Items (extent of heritage curtilage)
- Potential Compound Site

Heritage Listed Items Impacted by the Site Compound:

- 3490028 Hillview Garages & Precinct
- I155 "Hillview"
- I156 Hillview Garages

Heritage Listed Items Opposite the Site Compound:

- I157 Former Commonwealth Bank Building
- I158 Commercial Buildings
- I132 Residential Flat Building
- I139 Dwelling House
- I161 Rohini House gates

4 Historical context

Historical research has been undertaken to identify the land use history of the proposal area, to isolate key phases in its history and to identify the location of any built heritage or archaeological resources which may be associated with the proposal area and the specific local heritage items that the proposal is impacting (ie. the study area). The historical research places the history of the proposal area into the broader context of the Ku-ring-gai district.

4.1 Topography and resources

The proposal area is situated in an urban environment, surrounding by dense suburban housing and associated infrastructure including the northern railway line. The land within and around the proposal area traverses a series of slopes and undulating ridgelines, which increase in height above sea level towards the northern part of the proposal area in Wahroonga. There are several non-perennial water sources in the vicinity, including the Coups Creek (approximately 550 metres south-south-west of the proposal area) and Cowan Creek (approximately 1 kilometre east of the proposal area).

4.2 Aboriginal past

It is generally accepted that people have inhabited the Australian landmass for the last 50,000 years.⁴¹ Dates of the earliest occupation of the continent by Aboriginal people are subject to continued revision as more research is undertaken. The timing for the human occupation of the Sydney Basin is still uncertain. While there is some possible evidence for occupation of the region around 40,000 years ago, the earliest known radiocarbon date for the Aboriginal occupation of the Sydney Basin is associated with a cultural / archaeological deposit at Parramatta, which was dated to 30,735 ± 407 BP.⁴²

Despite a proliferation of Aboriginal heritage sites there is considerable ongoing debate about the nature, territory and range of pre-contact Aboriginal language groups in the greater Sydney region. These debates have arisen largely because, by the time colonial diarists, missionaries and proto-

⁴¹ Allen et al. 2003

⁴² Jo McDonald Cultural Heritage Management 2005a; Jo McDonald Cultural Heritage Management 2005b

anthropologists began making detailed records of Aboriginal people in the late 19th century, pre-European Aboriginal groups had been broken up and reconfigured by European settlement activity. Even with conflicting views between historical sources of the exact boundaries of tribal groups in the region, the linguistic evidence does identify distinct language groups at the time of European contact. Based on this information it appears that the proposal area was situated within the Dharug linguistic group. The Dharug language group consisted of two dialects, one which was used east of Parramatta and between Sydney Harbour and Botany Bay, and the other which was spoken in the west. Although there is some confusion concerning the pre-European tribal organisation around Sydney, the Guringai tribe is believed to have inhabited the coastal area from Lake Macquarie to Botany Bay.⁴³

The areas inhabited by each of the groups are considered to be indicative only and would have changed through time and possibly also depending on circumstances (i.e. availability and distribution of resources). Interactions between different types of social groupings would have varied with seasons and resource availability. It has been noted that interactions between the groups inhabiting the many resource zones of the Sydney Basin (coastal and inland) would have varied but were continuous. This is reflected in the relatively homogenous observable cultural features such as art motifs, technology and resource use.⁴⁴

4.3 Historical development

4.3.1 Exploration

The route of the Pacific Highway likely originated as the tracks utilised by local Aboriginal people, the Guringai, following the topography of the ridgelines, and staying within close proximity to water sources. The early European explorers and timber-getters appropriated these paths for their own purposes, with timber-getters settling in the Ku-ring-gai region to exploit the timber resources available within the area.⁴⁵

4.3.2 Early development (c.1809 to 1854)

The timber industry in the Ku-ring-gai region was important in the early history of Sydney. These activities also cleared the land for cultivation and settlement, thus allowing for grants and subdivisions to

⁴³ Tindale 1974; National Parks and Wildlife Service 1999

⁴⁴ McDonald 1992

⁴⁵ Cushing 2002

be made more readily. The Wahroonga area is noted as one of Ku-ring-gai's richest areas for timber, containing large stands of cedar, mahogany, turpentine, ironbark, and blue gum. In order to encourage and support this industry, a government sawmill was established within the Ku-ring-gai region in c.1809. The mill closed in c.1814, following which a subsequent sawmill was commissioned by Governor Lachlan Macquarie in the current area of Pennant Hills, which at the time was on the northern edge of the Field of Mars Common, south-west of the proposal area.⁴⁶

Around 1822, Thomas Hyndes leased 2000 acres (809 hectares) of land north of the Lane Cove Road, which encompassed much of present-day Wahroonga, and also parts of Turramurra; the lease became known as the Big Island Estate. Hyndes arrived in Sydney on 11 March 1803, having been convicted for life at the Surry Assizes in August 1800. Hyndes was also granted 640 acres (around 259 hectares) south of his leased land, known as Fox Grounds Estate, in 1838, which he had been in possession of since 1830. Hyndes exploited the timber resources on his leased and granted land using convict labour, having worked his way up to master sawyer in 1822 since receiving a conditional pardon in 1808. It has been said that Hyndes constructed a house near the junction of the current Pacific Highway and Fox Valley Road (adjacent to the proposal area). In 1840, Hyndes sold his 640 acres (259 hectare) grant to Adolphus William Young.⁴⁷ Other early grants adjacent to the proposal area were made to George Wood, John Beattie, Thomas Boyd and John McMahon (Figure 6).

⁴⁶ Paul Davies Pty Ltd 2010; Kass 1993, cited by AECOM Australia Pty Ltd 2014, 5; Thorp 1987, 4; Cushing 2002

⁴⁷ Paul Davies Pty Ltd 2010; Ku-ring-gai Historical Society Inc. (n.d.)a; City of Sydney Council 2018; Ku-ring-gai Historical Society Inc. (n.d.)b; Godden Mackay Logan and Keys Young 2000, 379, cited by Paul Davies Pty Ltd 2008, 26; SHR listing for Mahratta and Site, <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5045079>, viewed 16 April 2018; John Oultram Heritage & Design 2013, 5

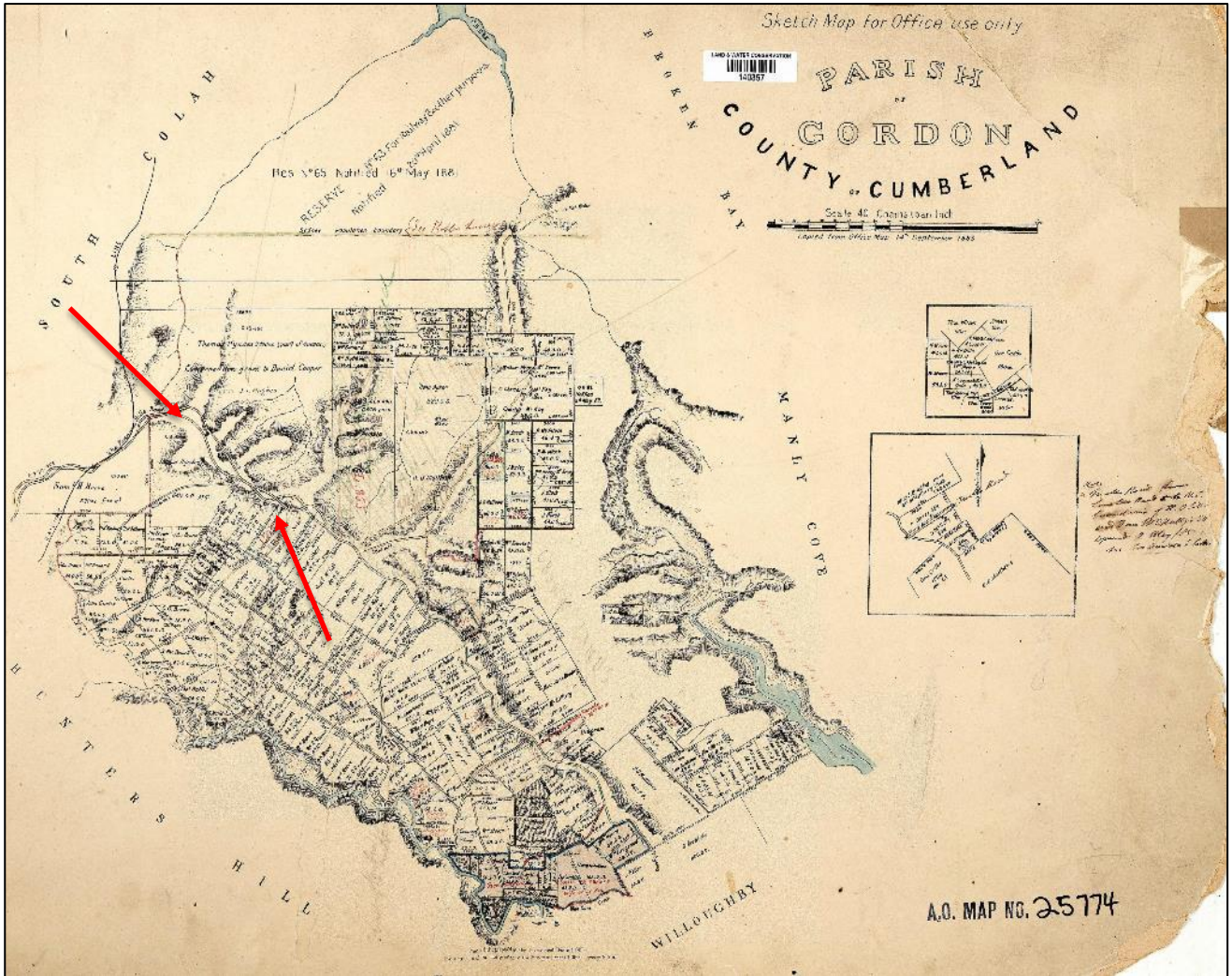


Figure 6 An 1883 map of Gordon parish with the proposal area situated along the road between the red arrows (Source: NSW Department of Lands)

It should be noted that early maps and plans apply several different names to the current Pacific Highway. An 1829 grant to the Clergy and School Lands in Gordon named the road as Hunters Hill

Road. It was also referred to as Pennant Hills Road in an 1858 plan of Fox Valley Road. However, Lane Cove Road became the more commonly used name until it was superseded by the Pacific Highway.⁴⁸

In 1840, John Terry Hughes re-leased Hyndes' land, and received the grant from Governor Sir George Gipps in August 1842. Due to the economic downturn of the 1840s, Hughes' lost his property to Adolphus William Young, who retained ownership until Power of Attorney was given to William Whaley Billyard in 1854.⁴⁹ In the same year, John Brown, a timber merchant, purchased the Hyndes' 640 acre (259 hectare) grant south of the Lane Cove Road from Young. Brown cleared areas of land for orchards and timber.⁵⁰

In 1839, Thomas Boyd, a former Lieutenant in the Royal Veteran's Corp, was granted 100 acres of land in what is currently Turramurra; Boyd named his property Toulouse Farm after the battle of Toulouse in the Napoleonic War, in which he fought. Boyd and his sons cleared the land of timber and established an orchard, and established a timber-selling business in Sussex Street, Sydney, in 1845. Subdivision plans dating to 1882 show the location of the Boyd's residence as being adjacent to Kissing Point Road, south-west of the proposal area (ie. compound site).⁵¹

4.3.3 Subdivision and orchards (1855 to 1889)

Citrus and stone fruit overtook the timber-getting industry after 1850, and as a result villages were established in several locations, including Wahroonga, to support the farmers and their workers.⁵² Early settlement within the Ku-ring-gai area generally gravitated towards the major roads.⁵³ The Big Island Estate was advertised for auction in April 1855, to be sold as farm lots sized between 12 and 50 acres (4.9 and 20.2 hectares) and described as ideal for orchards and market gardening, with an abundance of fuel and timber available. The estate was divided into five sections, which featured between two and 13

⁴⁸ Cushing 2002

⁴⁹ Paul Davies Pty Ltd 2010; Godden Mackay Logan and Keys Young 2000, 379, cited by Paul Davies Pty Ltd 2008, 26; NSW Department of Lands, Primary Application 6519; John Outram Heritage & Design 2013, 5

⁵⁰ SHR listing for Mahratta and Site,

<http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5045079>, viewed 16 April 2018

⁵¹ SHR listing for Hillview Garages,

<http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=4309663>, viewed 16 April 2018; NSW Land Registry Services, Certificate of Title Volume 5326 Folio 177

⁵² Kass 1993, cited by AECOM Australia Pty Ltd 2014, 5; Ku-ring-gai Historical Society Inc. (n.d.)a; Ku-ring-gai Historical Society Inc. (n.d.)b; Cushing 2002

⁵³ Paul Davies Pty Ltd 2010a, 5

farms each.⁵⁴ Unfortunately it has not been possible to locate a plan of this subdivision. However, it appears that John Brown acquired several portions of land from Young over time.⁵⁵ While two 1858 Crown plans for Kissing Point Road and Fox Valley Road do not record any structures on either side of the road, or where they intersect with the Lane Cove/Pennant Hills Road, an 1862 survey of the St Leonards to Pennant Hills Road shows a number of structures adjacent to this road, with one potentially within the proposal area [1] (Figure 7 and Figure 8).⁵⁶

⁵⁴ 1855 "Advertising" *Sydney Morning Herald* (NSW : 1842 - 1954), 5 April, p. 7, <http://nla.gov.au/nla.news-article12967646>, viewed 20 April 2018

⁵⁵ NSW Department of Lands, Primary application 6519; NSW Land Registry Services, Primary Application 4835

⁵⁶ NSW Land Registry Services, Crown Plan R290.1603



Figure 7 An 1862 survey of the St Leonards to Pennant Hills Road, with the proposal area highlighted; several structures are present on the plan, but only one may be located within the proposal area (Source: NSW Land Registry Services, Crown plan R290.1603)

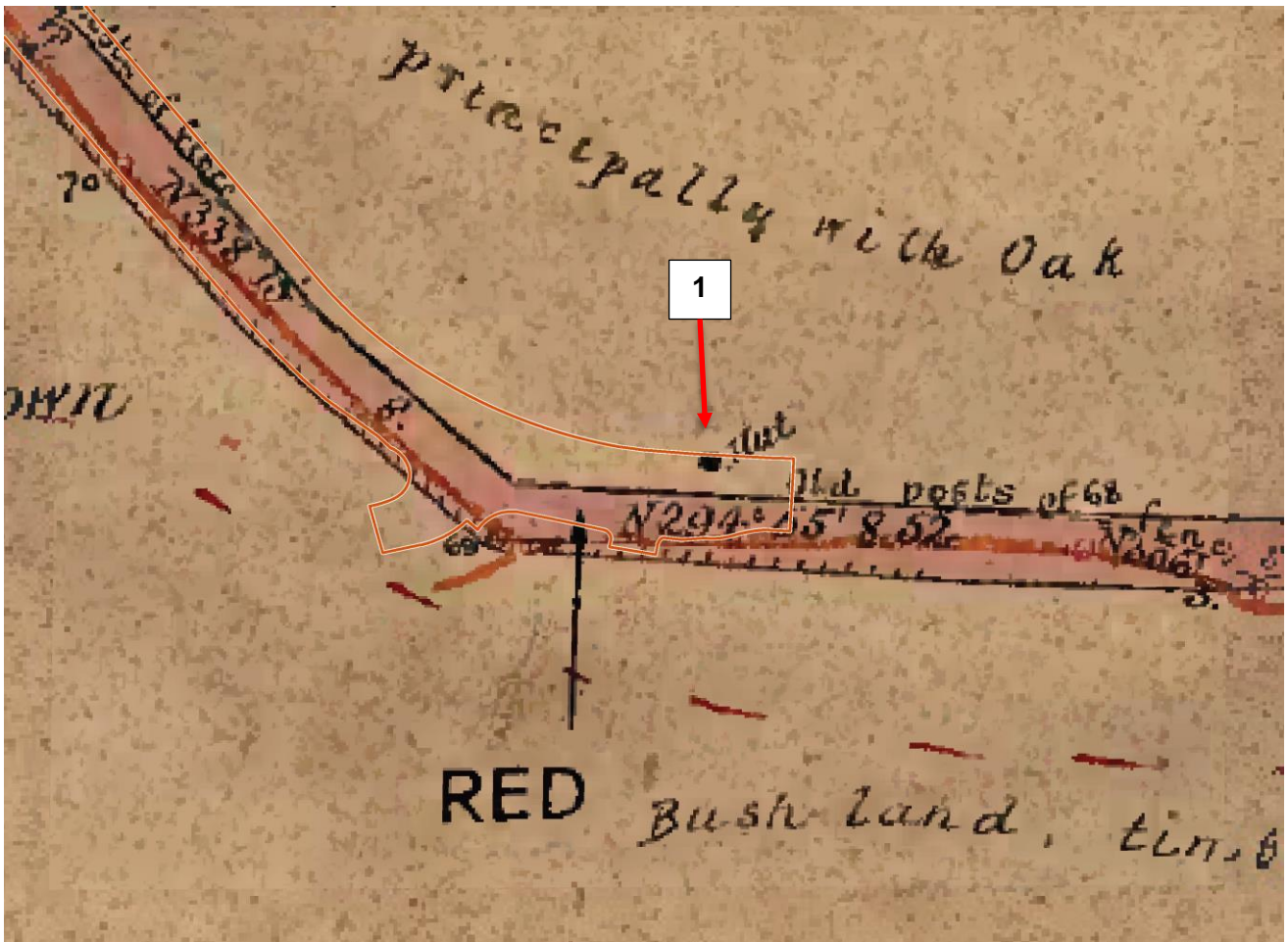


Figure 8 Detail from an 1862 survey of the St Leonards to Pennant Hills Road, showing a hut [1] near the junction of Fox Valley Road and Lane Cove Road; it appears this hut [1] may be partially within the proposal area at Fox Valley Road (Intersection 2) (Source: NSW Land Registry Services, Crown plan R290.1603)

In 1872, certain parts of the former Big Island Estate were subdivided, with secondary subdivisions following soon after. The Upper North Shore remained a rural area in 1880, with limited avenues of access and communication with the city. The local population mainly consisted of those working in

primary industries and those employed in education or religious institutions.⁵⁷ This can be seen in an 1888-1889 Crown plan for roads within parishes of Gordon and South Colah (Figure 9). The plan records several structures in the vicinity of Lane Cove Road, with one structure [2] within the current road alignment of Redleaf Avenue.⁵⁸

⁵⁷ Cushing 2002

⁵⁸ NSW Land Registry Services, Crown plan R3842.1603

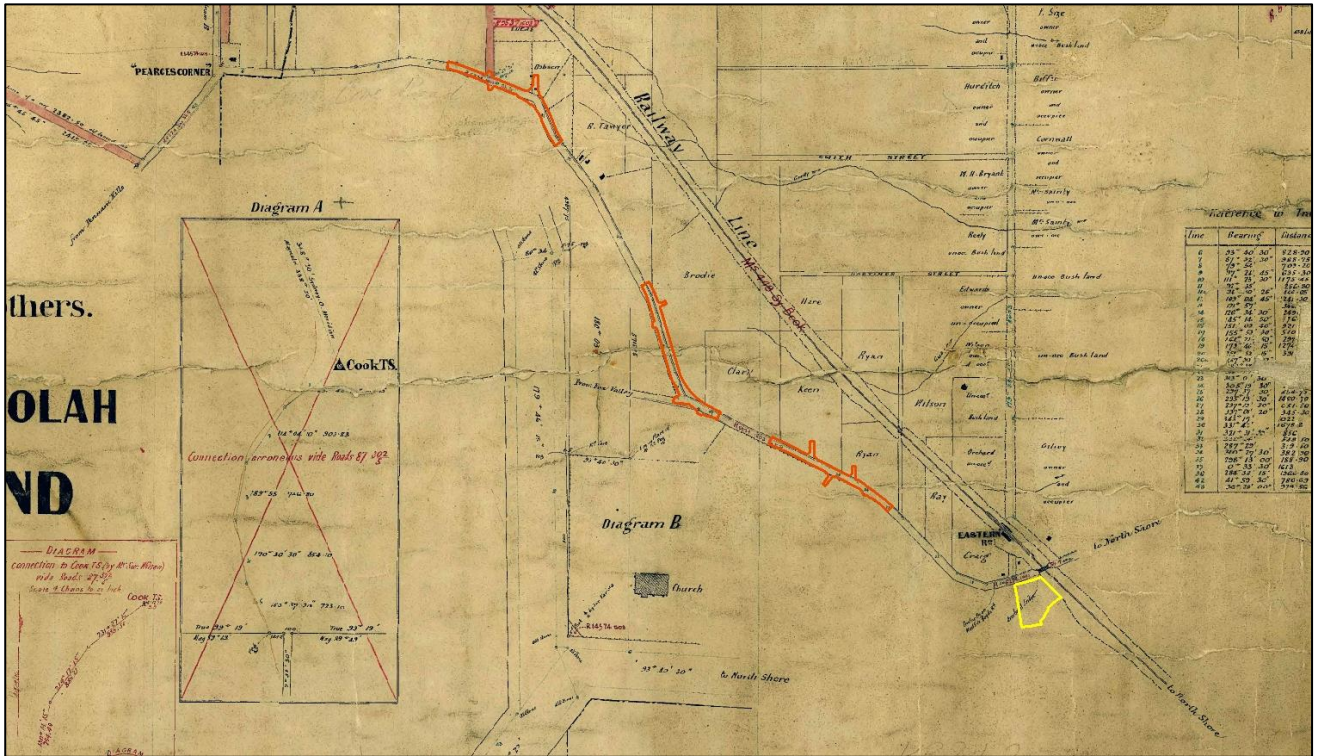


Figure 9 Extract from an 1888-1889 survey for the roads within the parishes of Godon and South Colah, with the proposal area highlighted; several structures are recorded near the proposal area (Source: NSW Land Registry Services, Crown plan R3824.1603)

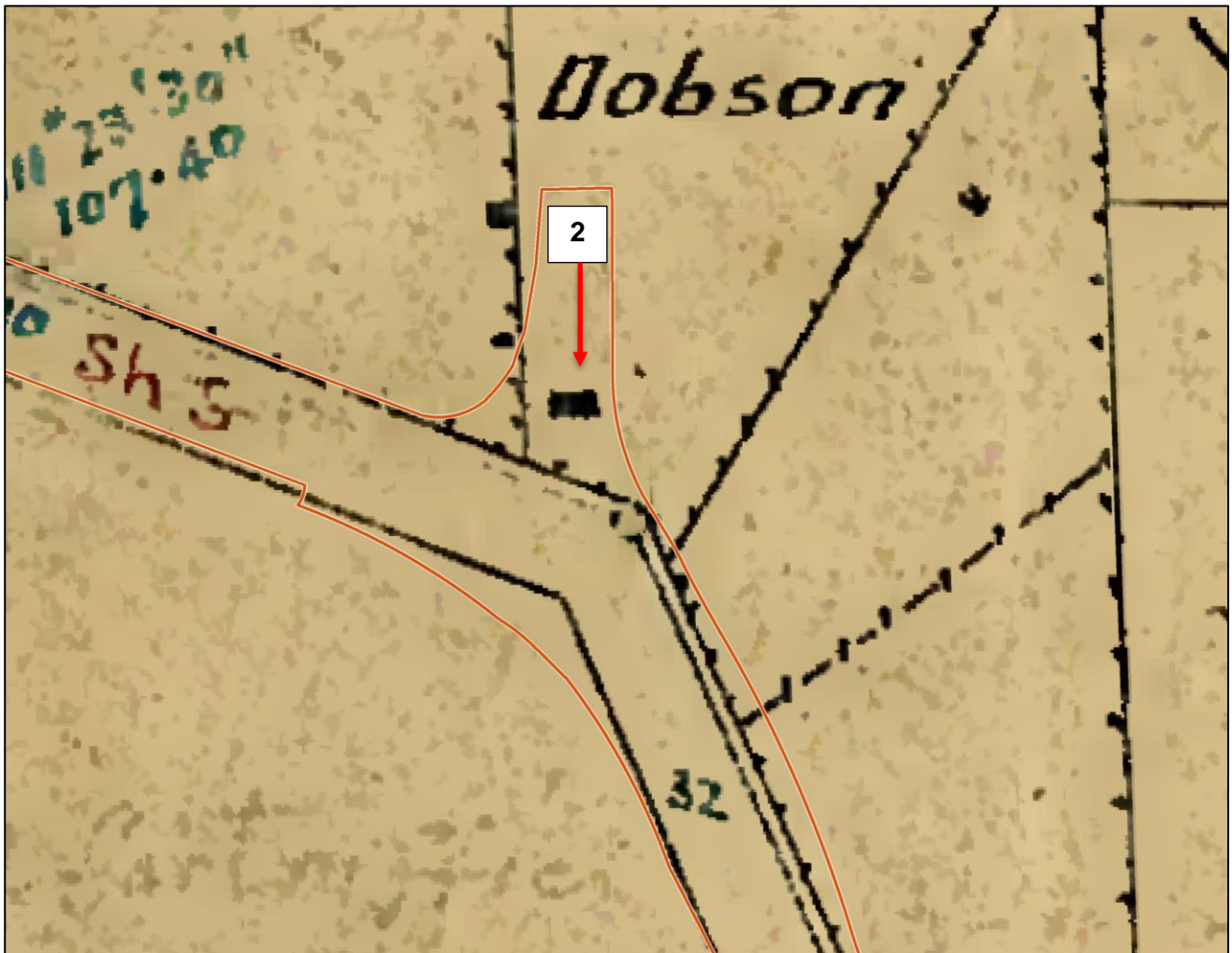


Figure 10 Detail from an 1888-1889 survey for the roads within the parishes of Gordon and South Colah, showing a structure [2] recorded within the current alignment of Redleaf Avenue (Source: NSW Land Registry Services, Crown plan R3824.1603)

Toulouse Farm remained in the Boyd family until its subdivision in 1882, when it was known locally as Boyd's Orchard. No sales resulted from this subdivision, and a second attempt was made in 1884.⁵⁹

⁵⁹ SHR listing for Hillview Garages, <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=4309663>, viewed 16 April 2018

4.3.4 The North Shore Rail Line and beginnings of a gentile villages (1890 to 1920s)

The establishment of the North Shore Rail Line sparked significant changes to the Ku-ring-gai district. Prior to its completion in 1890, land along the rail line, particularly near railway station sites were subdivided and sold off, including the large estates and orchard properties adjacent to the proposal area. The upper-middle classes were attracted to the Upper North Shore for its semi-rural environment away from the industry and business activity of the city and suburbia, and the fact it excluded those of lower financial means due to the cost of commuting. Like the major roads before them, the new railway stations became the focus of late-19th and early-20th century development within the region, with small lots being offered for sale.⁶⁰ One of the earliest of these appears to be the Wahroonga Estate, which was established and sold by auction from early 1890. No structures were recorded on Lots 1-6 on Lane Cove Road on the auction advertisement poster or subdivision plan.⁶¹ In the same year, the Fox Ground Estate was reconveyed to John Thomas Brown and others, likely William Henry Brown, Sophie Laing and Charlotte Mary Ann Brown, who later became the trustees of Brown's will upon his death in c.1894.⁶² It has been noted that a photograph dating to c.1890 shows a small weatherboard building with verandah [3] on the southern side of Lane Cove Road at Turramurra. It is believed that this building functioned as a shop, and was demolished in the mid-1930s and replaced by the Art Deco style Commonwealth Bank building.⁶³

In 1893, it appears the Fox Ground Estate was split, with Francis Gerard, a pastoralists' agent, acquiring the 6 acres (2.4 hectares) of land at the junction of Lane Cove Road (Pacific Highway) and Fox Valley Road. In the same year, Gerard sold his property to Adelaide Langtree and her husband Michael, a civil engineer and pastoralist (Figure 11).

⁶⁰ Paul Davies Pty Ltd 2010a, 5; Cushing 2002

⁶¹ 1889 "Advertising." *Sydney Morning Herald* (NSW : 1842 - 1954), 19 December, p. 15, <http://nla.gov.au/nla.news-article28275689>, viewed 19 April 2018; NSW Land Registry Services, DP 2666

⁶² NSW Department of Lands, Primary Application 9939; John Oultram Heritage & Design 2013, 6

⁶³ SHR listing for Hillview Garages, <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=4309663>, viewed 16 April 2018

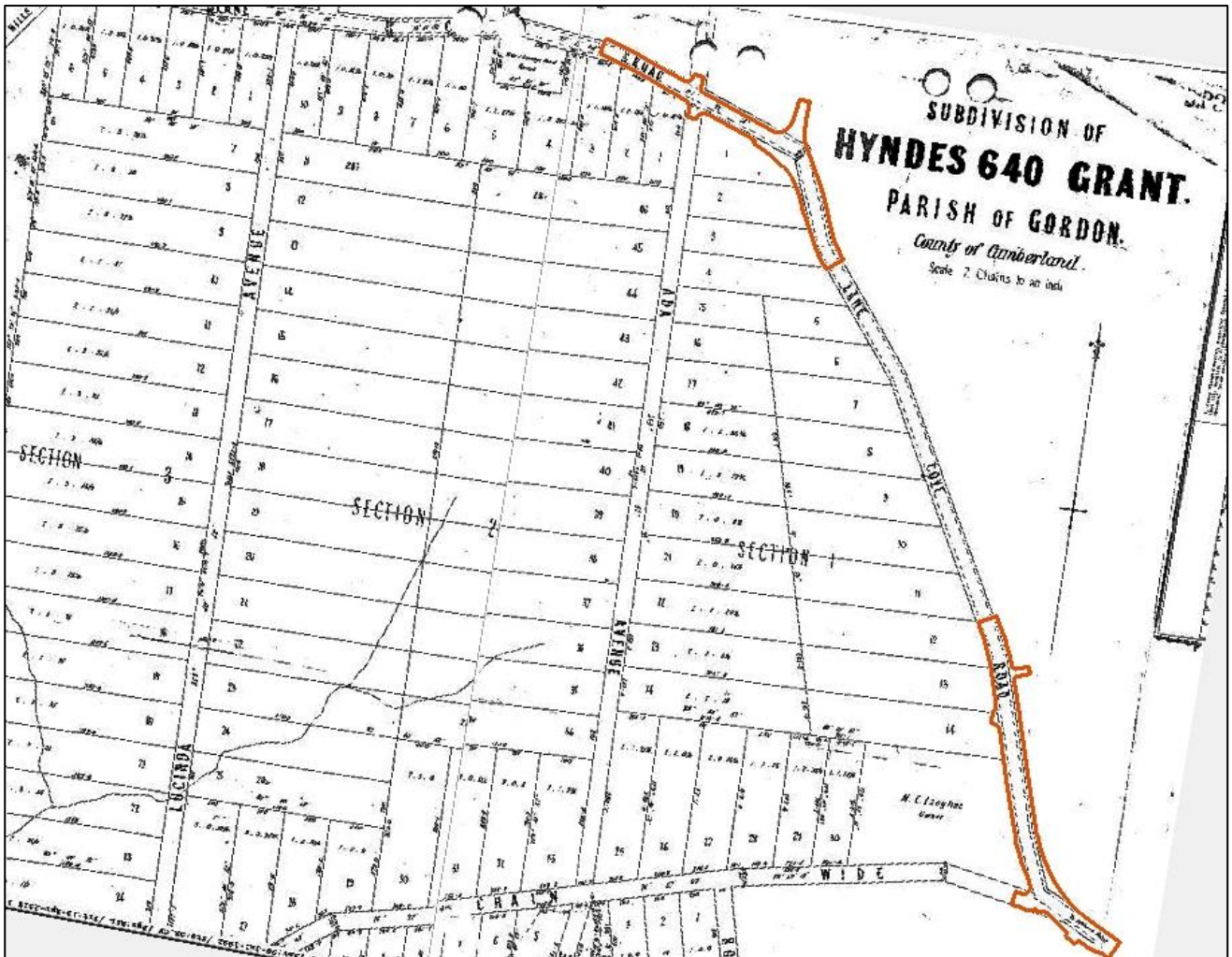


Figure 11 Extract from an 1893 subdivision plan of Hyndes' grant south of Lane Cove Road, with the study area highlighted (Source: NSW Department of Lands, DP 3312)

Langtree built Yaamba on the northern side of the property and sold the southern portion to Constance Maria Beckx in 1902 (Figure 12) who built a large residence Haverlee [4] ⁶⁴.

⁶⁴ NSW Land Registry Services, Certificate of Title Volume 1470 folio 115; Taylor Brammer Landscape Architects Pty Ltd 2011, 10

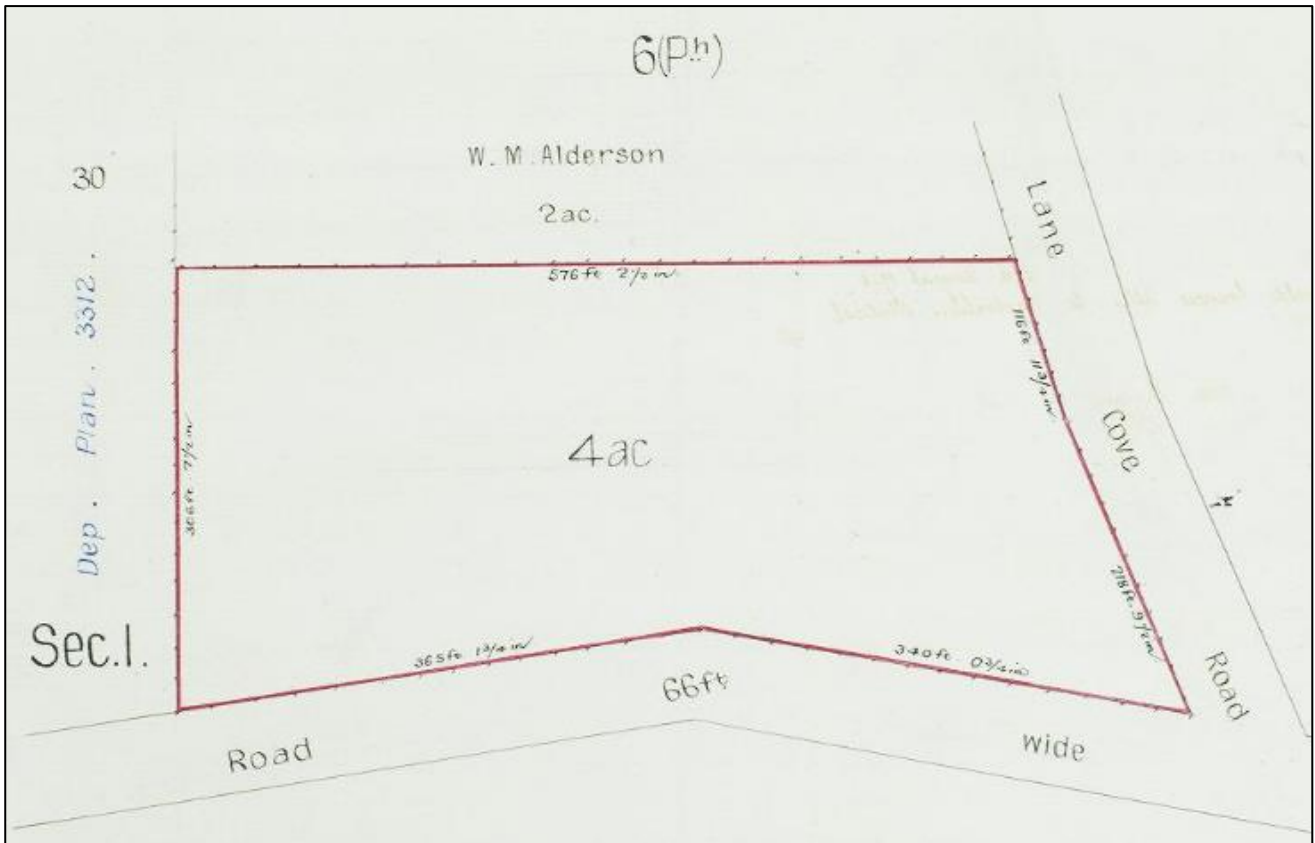


Figure 12 Plan of the land acquired by owned by Beckx in 1902 (Source: NSW Department of Lands, Certificate of Title Volume 1470 Folio 115)

Another portion of the Fox Ground Estate was acquired by William Mitford Alderson in the same year. The plan contained within Certificate of Title for Alderson’s land records a structure [5] facing Lane Cove Road (Figure 13).⁶⁵ The estate was subdivided several times within several years and in 1896, a large portion of the former estate was subdivided sold off as Brown’s Estate, with Lots 1-28 of Section 1

⁶⁵ NSW Land Registry Services, Primary application 12488; NSW Land Registry Services, Certificate of Title Volume 1470 Folio 115; NSW Land Registry Services, Certificate of Title Volume 1470-116; SHR listing for Mahratta and Site, <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5045079>, viewed 16 April 2018

forming their own subdivision within the same year. No structures are recorded on either of the subdivision plans.⁶⁶

⁶⁶ NSW Land Registry Services, Primary Application 12488; NSW Land Registry Services, DP 3312; NSW Land Registry Services, Certificate of Title Volume 1196 Folio 151; NSW Land Registry Services, DP 3295

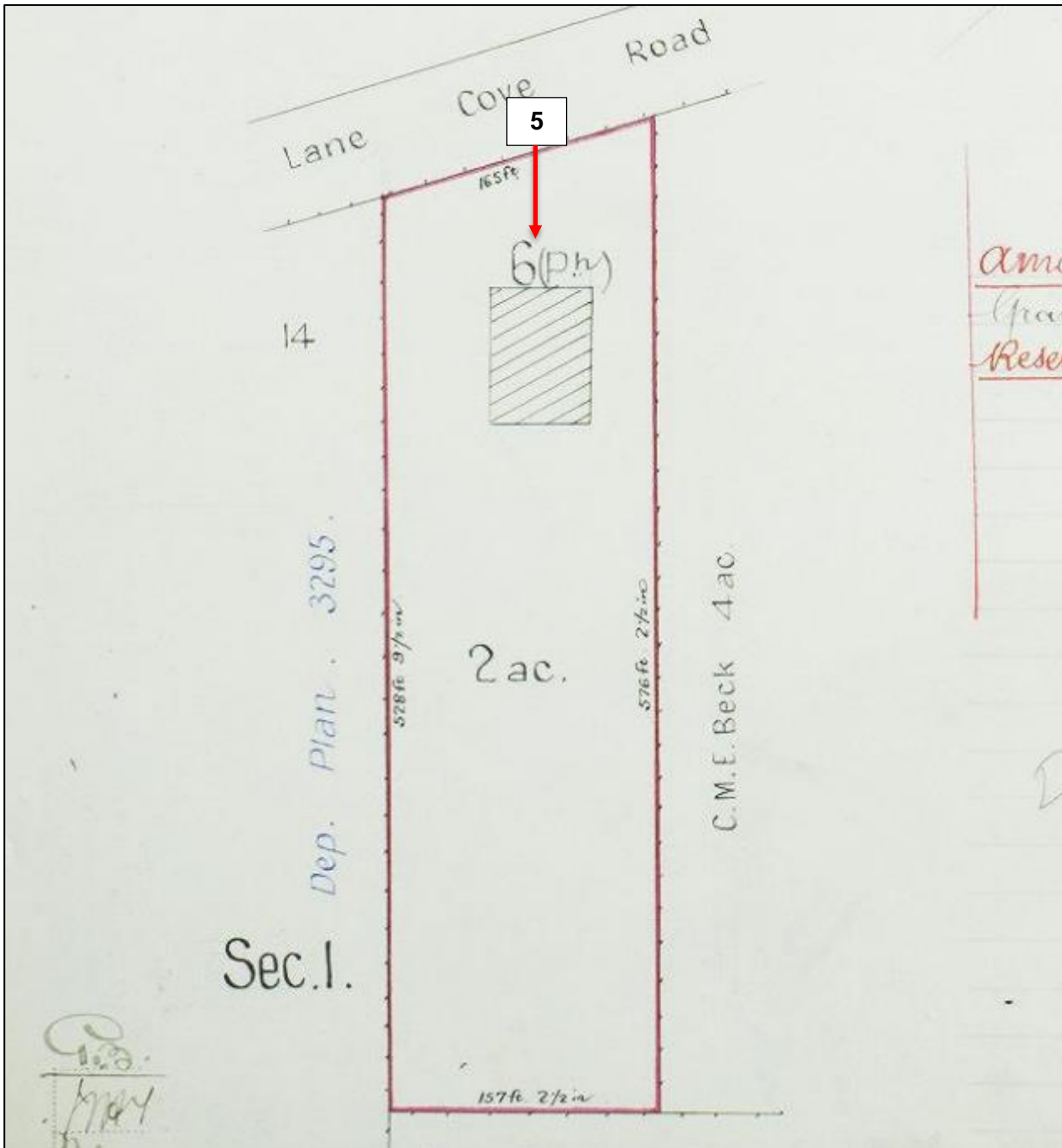


Figure 13 A Certificate of Title plan dating to 1893 records a structure [5] in the vicinity of Lane Cove Road (Source: NSW Land Registry Services, Certificate of Title Volume 1470 Folio 116)

Another attempt at selling off a subdivided Boyd's Orchard was made in 1893. Part of the subdivision located between Kissing Point Road and the North Shore railway line was purchased by Ian AuPrince and Edmund Sheffield Willoughby Paul. It has been suggested that the original cottage [6] was built

around this time⁶⁷. As a result of the rising population and changing demographic, large grand houses began to be built along Lane Cove Road³⁶.

An 1881, a Crown plan for the Lane Cove Road, revised in 1899, shows two brick houses, a weatherboard cottage and a structure of unspecified materials [7] in the vicinity of the proposal area (Figure 14, Figure 15 and Figure 16). It appears that the earlier structure [2] from the 1888-1889 Crown plan (Figure 10) is no longer present (Figure 15).

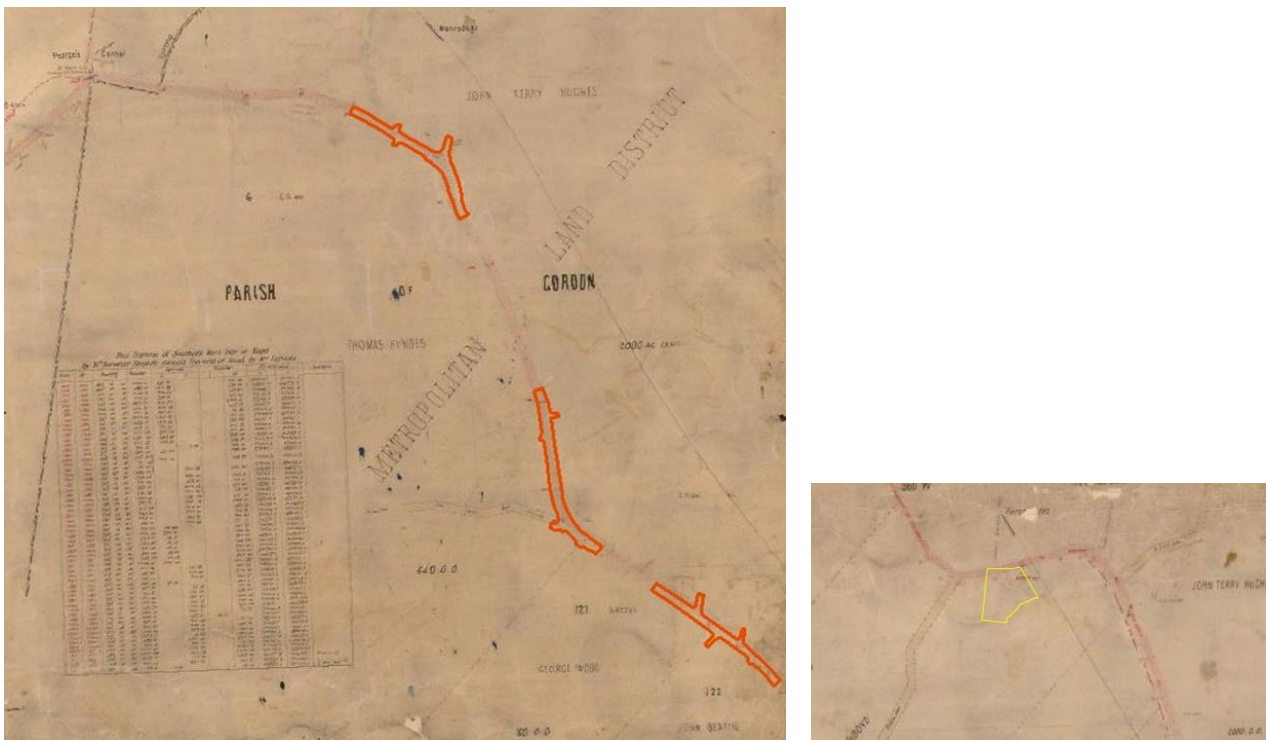


Figure 14 Extracts from an 1881/1899 survey for the Lane Cove Road, with the proposal area highlighted; several structures of brick and weatherboard are recorded near the proposal area (Source: NSW Land Registry Services, Crown plan R6224.1603)

⁶⁷ SHR listing for Hillview Garages & Precinct, <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=3490028>, viewed 16 April 2018

³⁶Cushing 2002

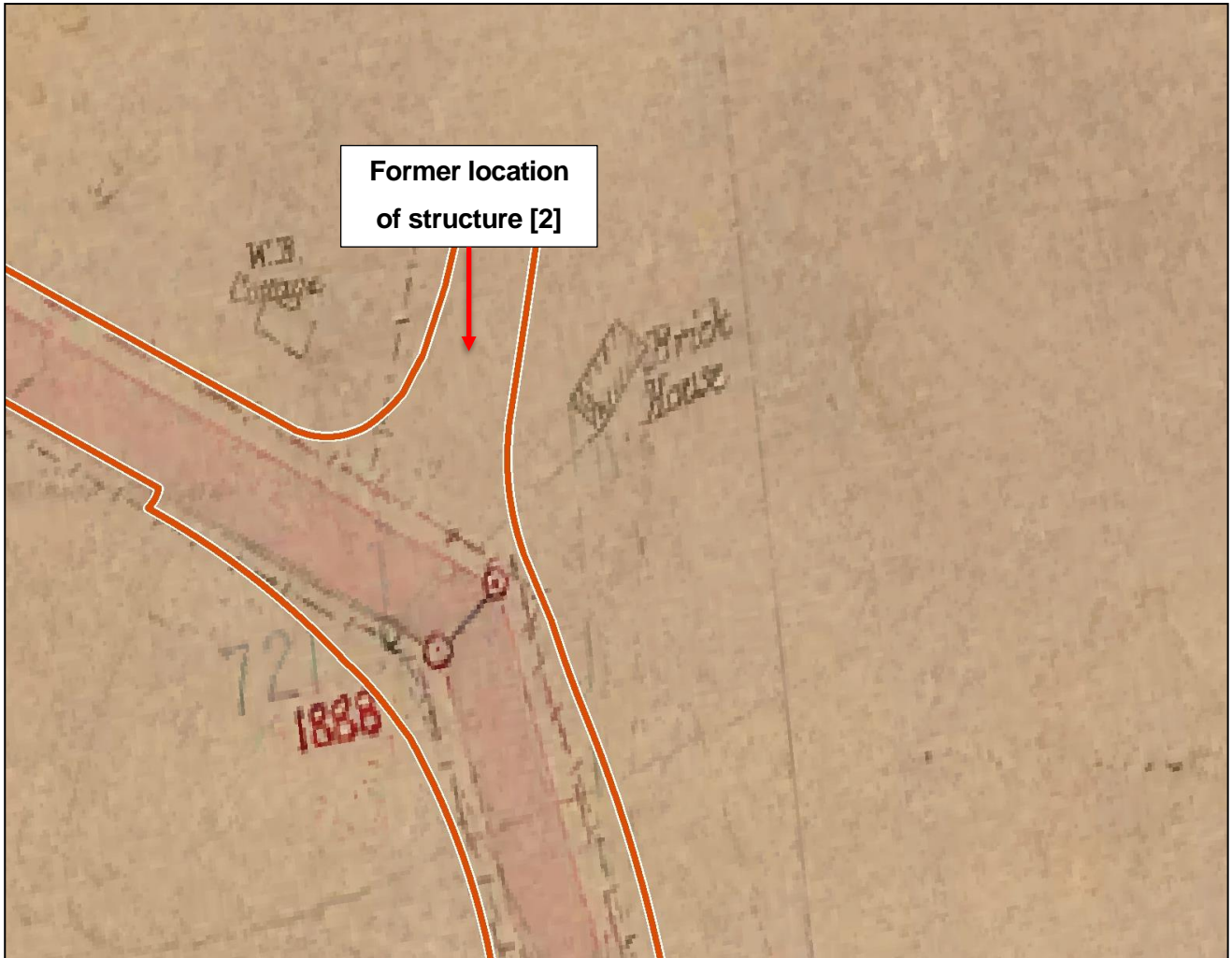


Figure 15 Detail from an 1881/1899 survey for the Lane Cove Road, showing a weatherboard cottage and brick house positioned on either side of the current Redleaf Avenue; the earlier structure [2] is no longer present (Source: NSW Land Registry Services, Crown plan R6224.1603)

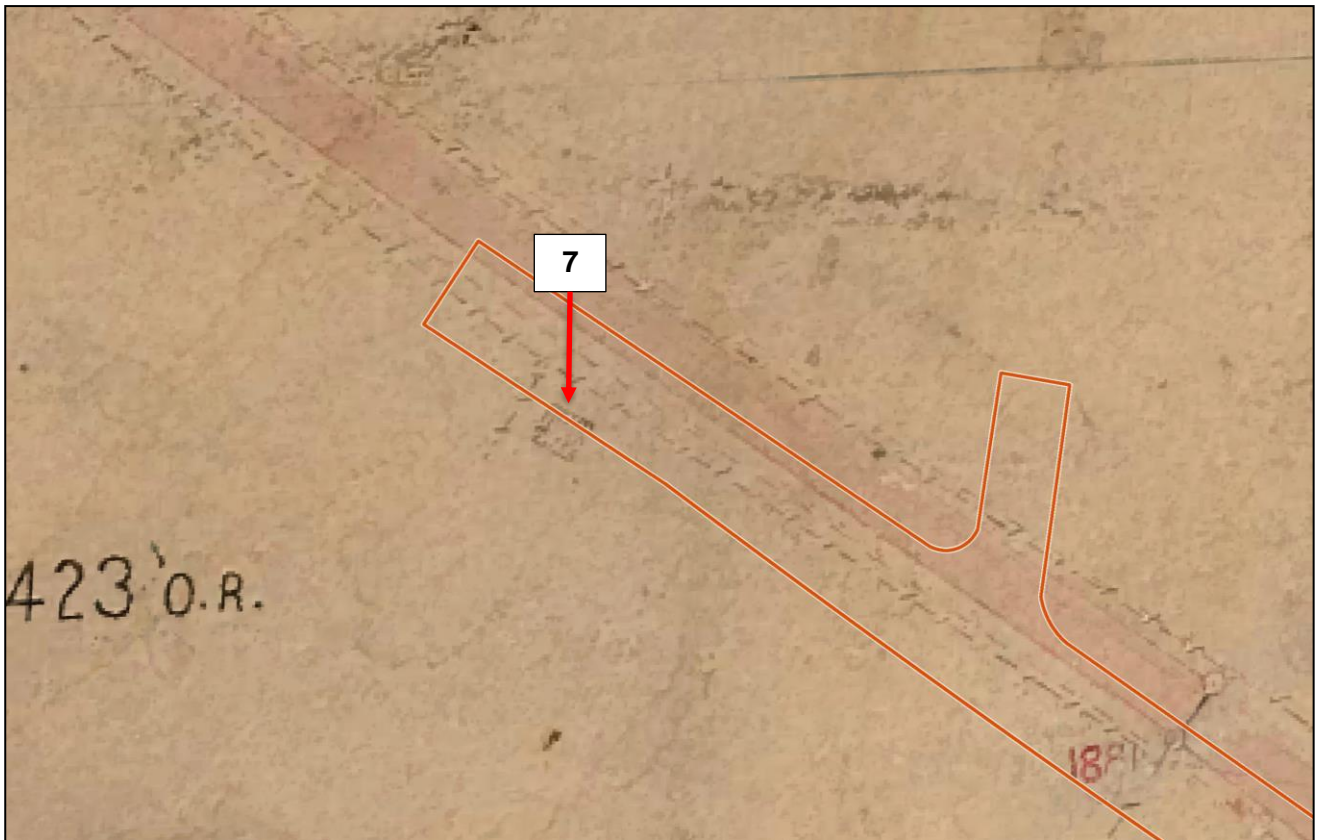


Figure 16 Detail from an 1881/1899 survey for the Lane Cove Road, showing an unspecified structure [7] near the current Winton Street (Source: NSW Land Registry Services, Crown plan R6224.1603)

Further land was acquired by Auprince in Turramurra in 1899 and 1902. From 1902, the property appears to have been established and run as a large boarding house and health resort, with joint property owners Ian Auprince and E.S.W. Paul taking advantage of the proximity of the Turramurra railway station and the exceptional views from the property which became known as Hill View. It has been suggested that at this time the original c.1830 cottage [6] was extended, with eastern and western wings added to the dwelling. The property was leased to Miss Jean Murray in 1905, who ran the boarding house on behalf of Auprince. In 1907, Auprince sold his share of the property to Paul, who purchased further land in the same year, and again in 1913: the property remained at that size until the 1960s. The plan contained within the 1907 Certificate of Title records a structure adjacent to the eastern property boundary [8] (Figure 17), while the 1913 Certificate of Title records a structure [9] adjacent to the Lane Cove Road, and two more south of it [10] [11] (Figure 18). It is likely that these structures were related to the occupation and use of Lot 4 of Boyd’s subdivision by Herman Weise, who had established a store there; several sheds in this location are visible in a c.1900 photograph of Lane Cove Road, and a

store is recorded on a 1902 subdivision auction advertisement of Boyd's Orchard in approximately the same location (Figure 19).⁶⁹

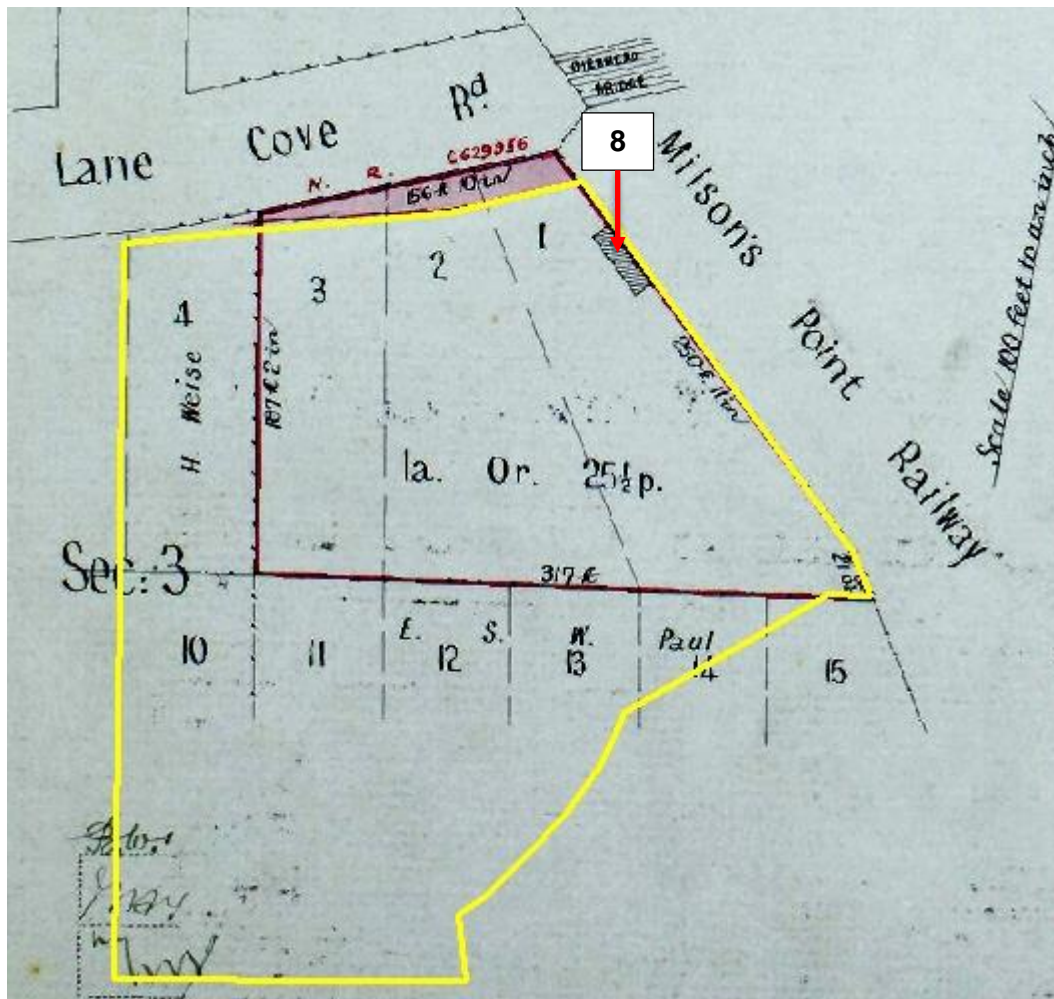


Figure 17 Plan from the 1907 Certificate of Title to Paul for the Hillview Property, recording a structure [8] adjacent to the rail line and an area later resumed for road purposes (Source: NSW Land Registry Services, Certificate of Title Volume 1821 Folio 94)

⁶⁹ SHR listing for Hillview Garages & Precinct, <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=3490028>, viewed 16 April 2018; SHR listing for Hillview Garages, <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=4309663>, viewed 16 April 2018; NSW Land Registry Services, Certificate of Title Volume 1821 Folio 94; NSW Land Registry Services, Certificate of Title Volume 2434 Folio 3

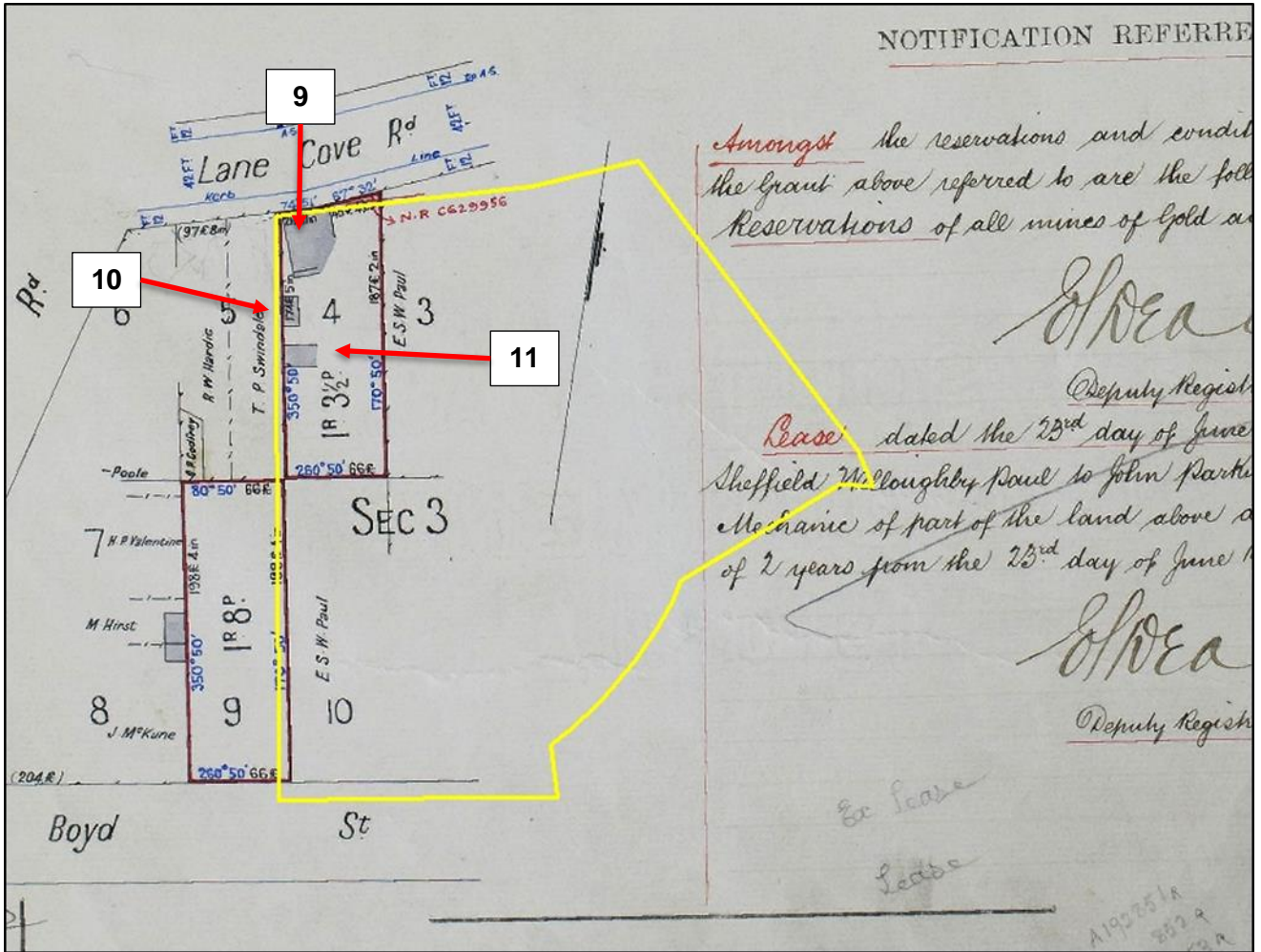


Figure 18 Plan from the 1913 Certificate of Title to Paul, showing a structure [9] adjacent to the Lane Cove Road, and two more south of it [10] [11], which are likely to have been buildings associated with Weise’s store business (Source: NSW Land Registry Services, Certificate of Title Volume 2434 Folio 3)

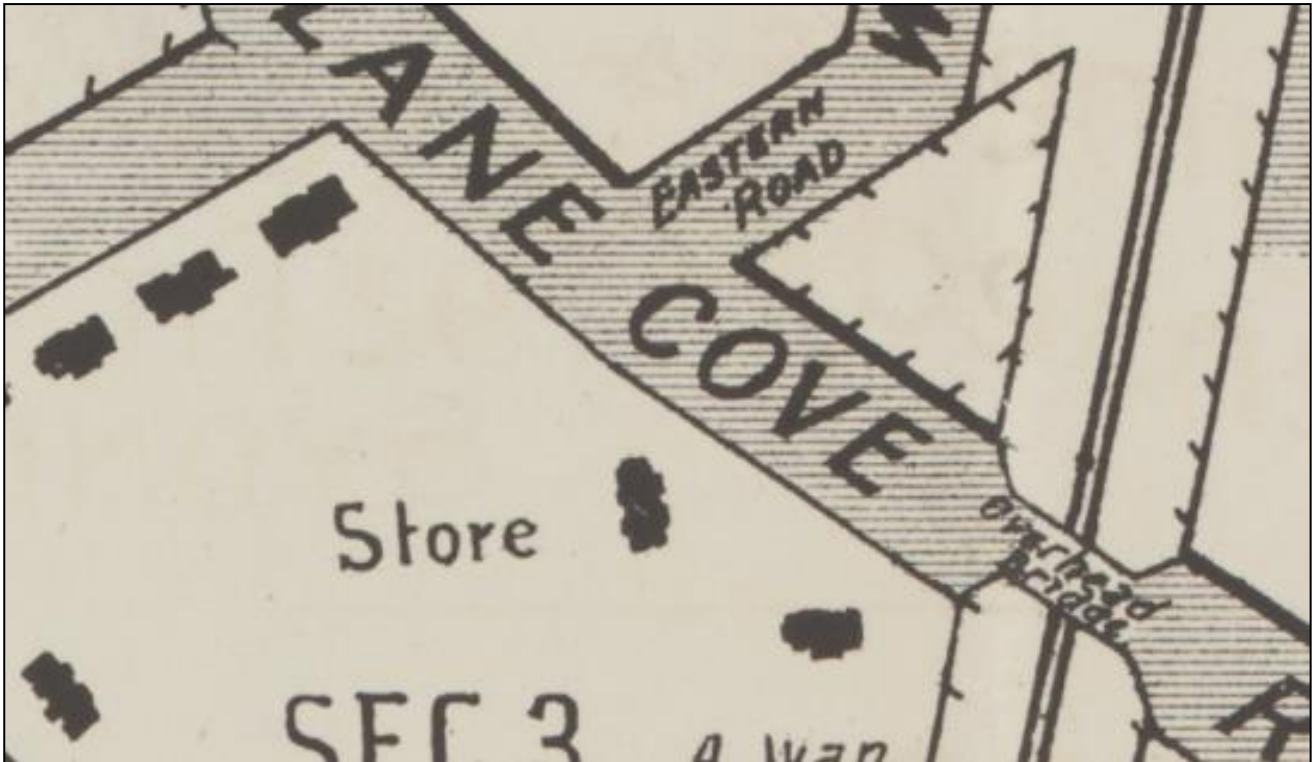


Figure 19 Weise's store on Lane Cove Road, recorded on the 1902 auction advertisement for Boyd's Orchard subdivision (Source: National Library of Australia)

A series of photographs taken in 1908 show the condition of Lane Cove Road in Wahroonga, Turramurra and Warrawee. The road appears to be a dirt surface at this time, with some possible instances of kerbing but also soft verges. Kerbside plantings are also present, as are electricity poles and wires, and street lamps (Plate 1).



Plate 1 Typical view of Lane Cove Road through Wahroonga, Warrawee and Turramurra, 1908 (Source: NSW State Archives)

In 1912, the corner of land at the junction of Lane Cove Road and Fox Valley Road, as shown in Figure 12 was acquired by Gerald Allen, renaming the property from 'Heverlee' to 'Mahratta' after the sheep station Bombala where his grandfather was employed as overseer. Allen extended and upgraded the house on the property and established exotic gardens. Sir James Joynton Smith acquired Mahratta from Allen in 1930 for £32,500. In addition to the main house [4] itself, garages, a head gardener's home and other structures had also been established on the property. Nine years later Thomas Alfred Field and the Carabagal Pastoral Company purchased the property. The following year in 1940, Field had the house

[4] demolished and constructed a new mansion [12] in the earlier building's footprint, which is the current State and local heritage item, Mahratta.⁷⁰

From 1913 to 1927, further structures and improvements were made to the Hillview property in Turramurra, including the construction of a two-storey guesthouse [13] south of the cottage, as well as terracing to yard and garden areas and installation of a croquet lawn and carriage loop; the property also contained an orchard, vegetable garden, a cow and poultry. Car garages [14] had been constructed by 1915 in the recently acquired western portion of the property.⁷¹

4.3.5 The Pacific Highway and suburban growth (1920s to present)

Prior to the rise of automobiles, Lane Cove Road remained largely a quiet local road, with much freight being transported via rail. However, once vehicles became more common, particularly amongst the affluent communities of the Upper North Shore, the road soon became damaged by narrow tyres creating ruts, with dust becoming a considerable issue in dry weather and creating a nuisance with their noise and pollution.⁷² During the early 1920s, works were undertaken on the Lane Cove Road in preparation for an anticipated rise in traffic once the Harbour Bridge opened in 1932; the road was sealed and upgraded, and opened as the Pacific Highway in 1931.⁷³

As part of this, areas of private property along the realignment were resumed for the purpose of the road reserve. There was considerable local opposition to the upgrading of Lane Cove Road from local residents, which prompted the founding of numerous resident action groups.⁷⁴ The boundaries of several properties which are now listed heritage items were changed. In 1928 and 1929, a portion of land was resumed from the Estha dwelling [15] (Ku-ring-gai LEP local heritage item no. I976), which dates to the

⁷⁰ SHR listing for Mahratta and Site, <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5045079>, viewed 16 April 2018; 1930 "Warrawee Mansion." *Sydney Morning Herald* (NSW : 1842 - 1954), 8 February, p. 21, <http://nla.gov.au/nla.news-article16624299>, viewed 30 April 2018

⁷¹ SHR listing for Hillview Garages & Precinct, <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=3490028>, viewed 16 April 2018

⁷² Cushing 2002; NSW Land Registry Services, Certificate of Title Volume 1470 Folio 115

⁷³ Paul Davies Pty Ltd 2010a, 6; Cushing 2002

⁷⁴ NSW Land Registry Services, Certificate of Title Volume 4062 Folio 192; NSW Land Registry Services, Certificate of Title Volume 3415 Folio 173; NSW Land Registry Services, Certificate of Title Volume 3408 Folio 174; NSW Department of Lands, Certificate of Title Volume 4182 Folio 86; Paul Davies Pty Ltd 2010, 6; Cushing 2002; NSW Land Registry Services, DP 26828; NSW Land Registry Services, Certificate of Title Volume 1821 Folio 94; NSW Land Registry Services, Certificate of Title Volume 2434 Folio 3; NSW Land Registry Services, Crown plan 7942.3000; SHR listing for Commonwealth Bank (former), <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=1880282>, viewed 27 April 2018

period 1901-1920 (Figure 20). In 1938, land was acquired by the Commissioner of Roads from the Hillview property. Several other resumptions were also made for non-heritage properties, including within the current 1666-1670 Pacific Highway Wahroonga in 1929 (Figure 21). As a result of proposed resumptions to Hillview, the front stone wall [16] was disassembled in 1936 and reconstructed closer to the house itself. The position of the new wall can be seen on a 1955 subdivision plan which also shows the Hillview Garages [14], noted as being of brick construction. The plan does not record the three structures [9] [10] [11] which were present on the 1913 Certificate of Title, suggesting they had been demolished prior to 1955 (Figure 23).

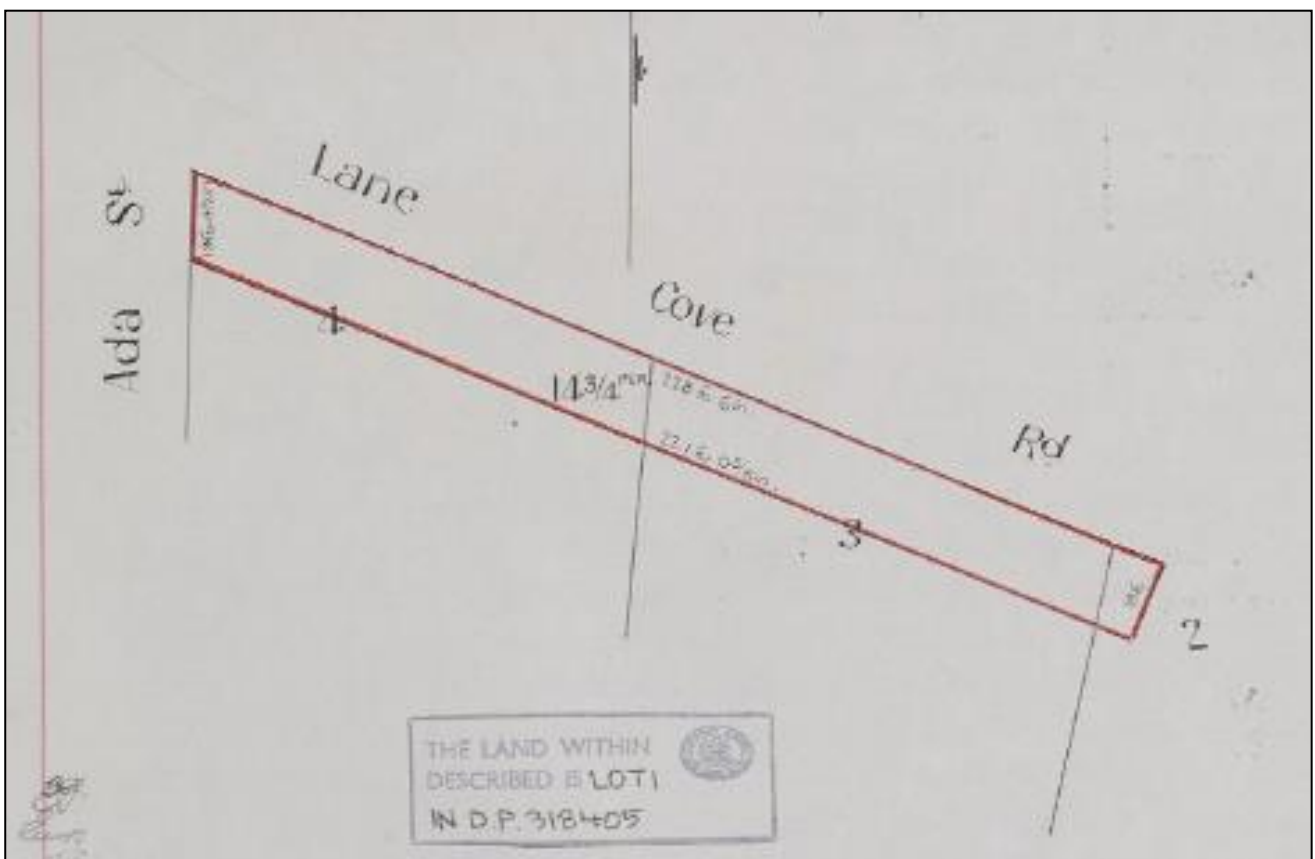


Figure 20 Plan of area resumed in 1928-1929 from Estha [15] for the widening of Lane Cove Road for the Pacific Highway (Source: NSW Land Registry Services, Certificate of Title Volume 4062 Folio 192)

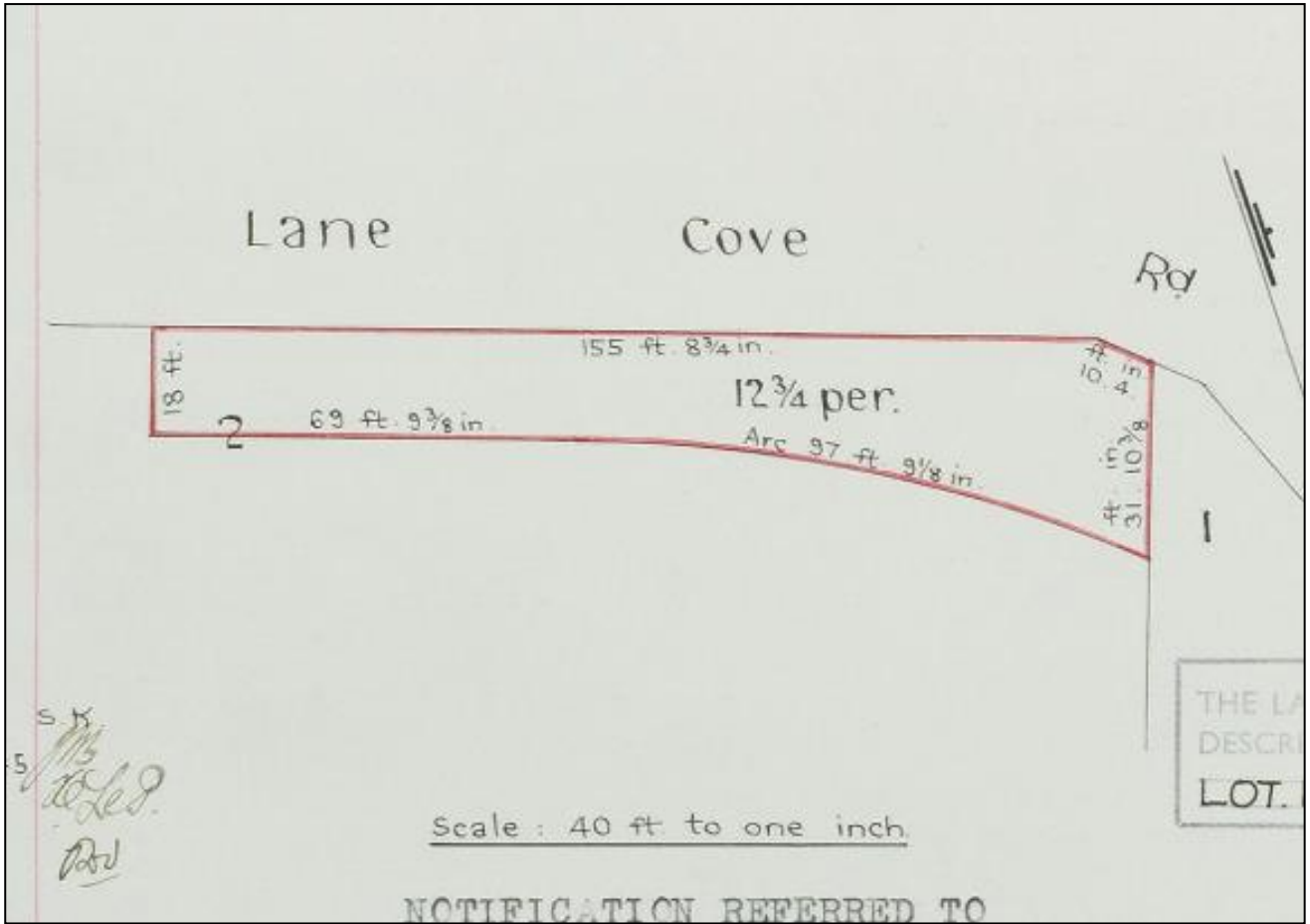


Figure 21 Plan of area resumed in 1938 from the Hillview property for the widening of Lane Cove Road for the Pacific Highway (Source: NSW Land Registry Services, Certificate of Title Volume 4182 Folio 86)

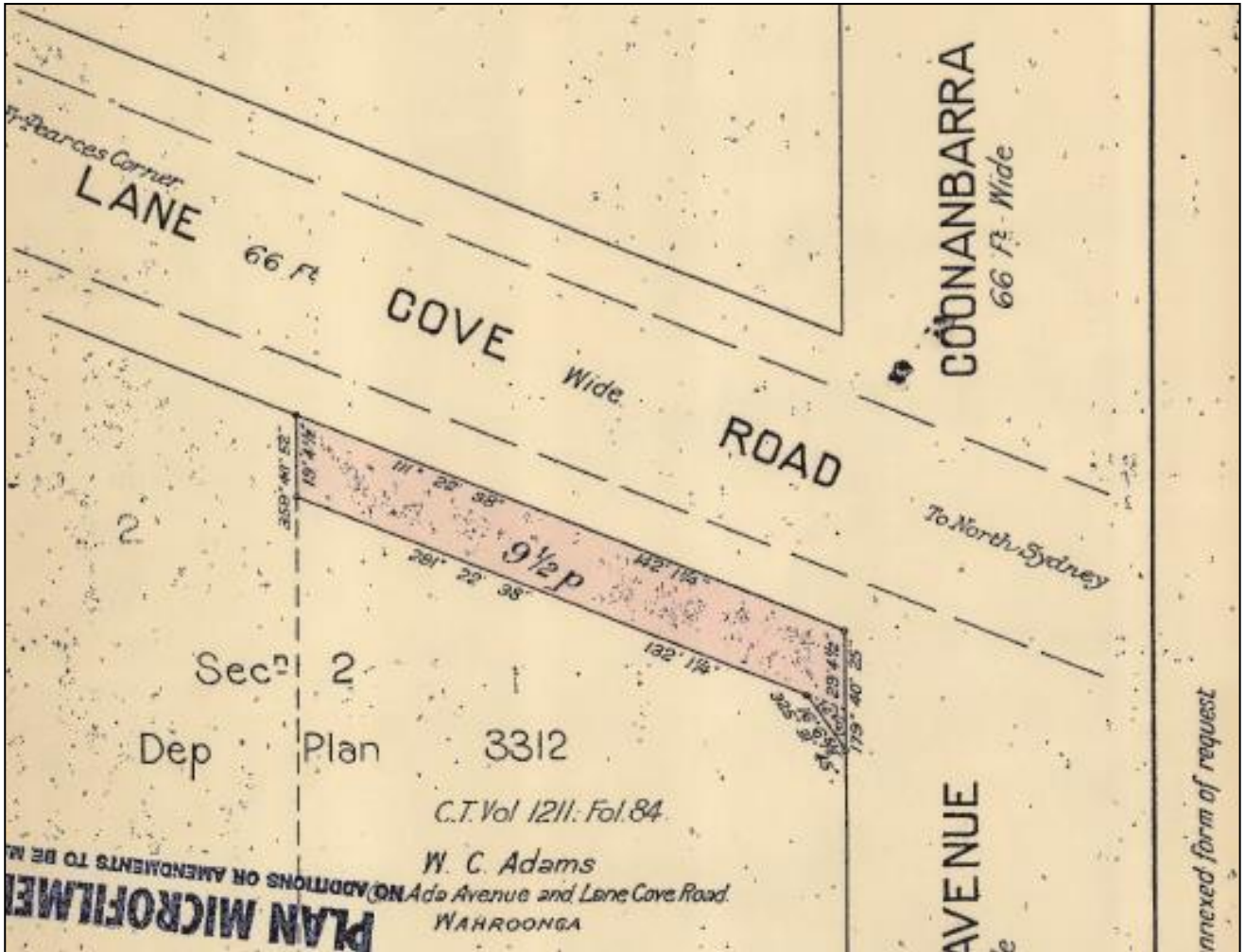


Figure 22 Area of land resumed in 1929 from current Lot 1 of DP 3312 for the widening of Lane Cove Road for the Pacific Highway (Source: NSW Land Registry Services, Crown plan 7942.3000)

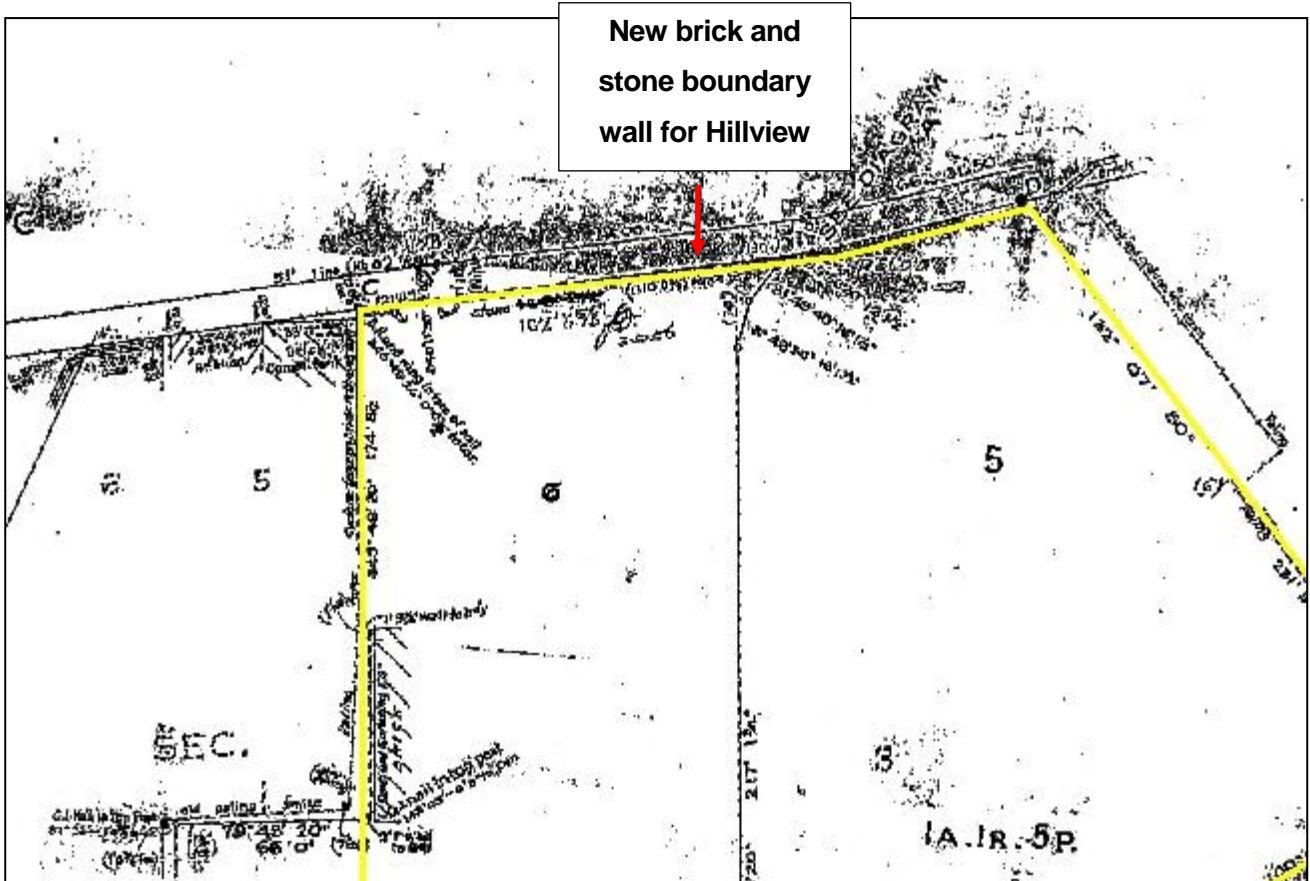


Figure 23 A 1955 subdivision plan of Hillview, showing stone and brick walls marking the boundary of the property (Source: NSW Land Registry Services, DP 26828)

Aerial photographs dating to 1943 provide an indication of the land use within the proposal area and vicinity. Areas of Wahroonga, Warrawee and Turramurra have developed a suburban character, featuring large residential lots with substantial domestic dwellings and landscaped gardens with driveways fronting the Pacific Highway (Plate 2, Plate 3, Plate 4 and Plate 5). A number of locally listed heritage items are visible on the aerials which are contained within the proposal area and directly adjoining this. These include: Estha [15], a Kyeamba [17] (Ku-ring-gai LEP item no. 1966), Yaamba [18], a grand house dating to 1897 (Ku-ring-gai LEP item no. 1965), Mahratta [12] and Milneroyd [19], an early

20th century flat building (Ku-ring-gai (Local Centres) LEP item no. I167).⁷⁵ The Hillview complex is also visible [6] [13] [14] with its various landscape features, including some potential garden walls [20] and an indistinct garden feature [21], and facilities is also visible: the structure [8] from the 1907 Certificate of Title plan (Figure 17) does not appear to be present.

⁷⁵ Ku-ring-gai Council 2014; SNH listing for Milneroyd, <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=188010Z>, viewed 30 April 2018

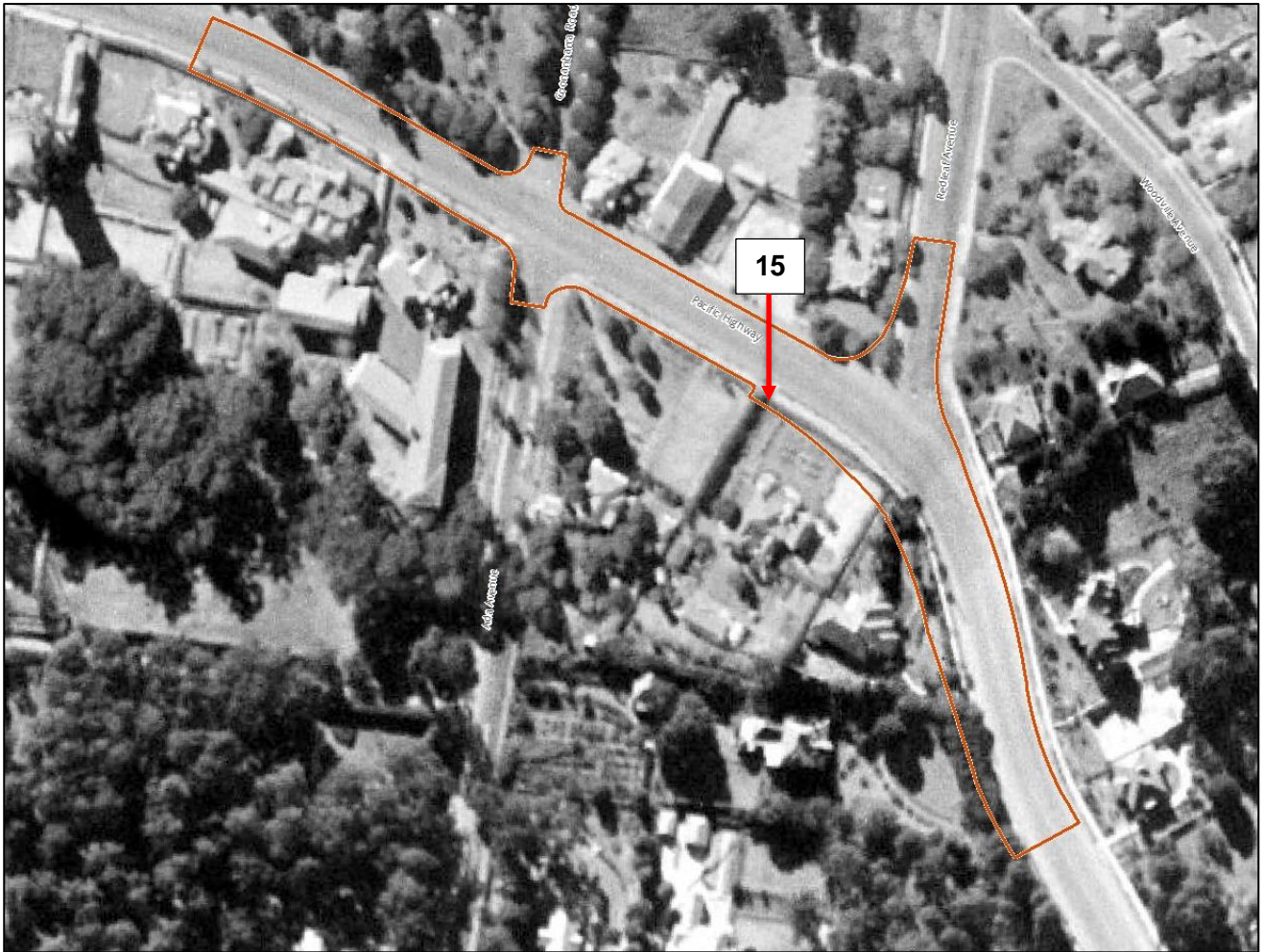


Plate 2 Detail from a 1943 aerial photograph of the proposal area at Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue) featuring local heritage item Estha [15], which is situated within the proposal area (Source: SIX Maps)

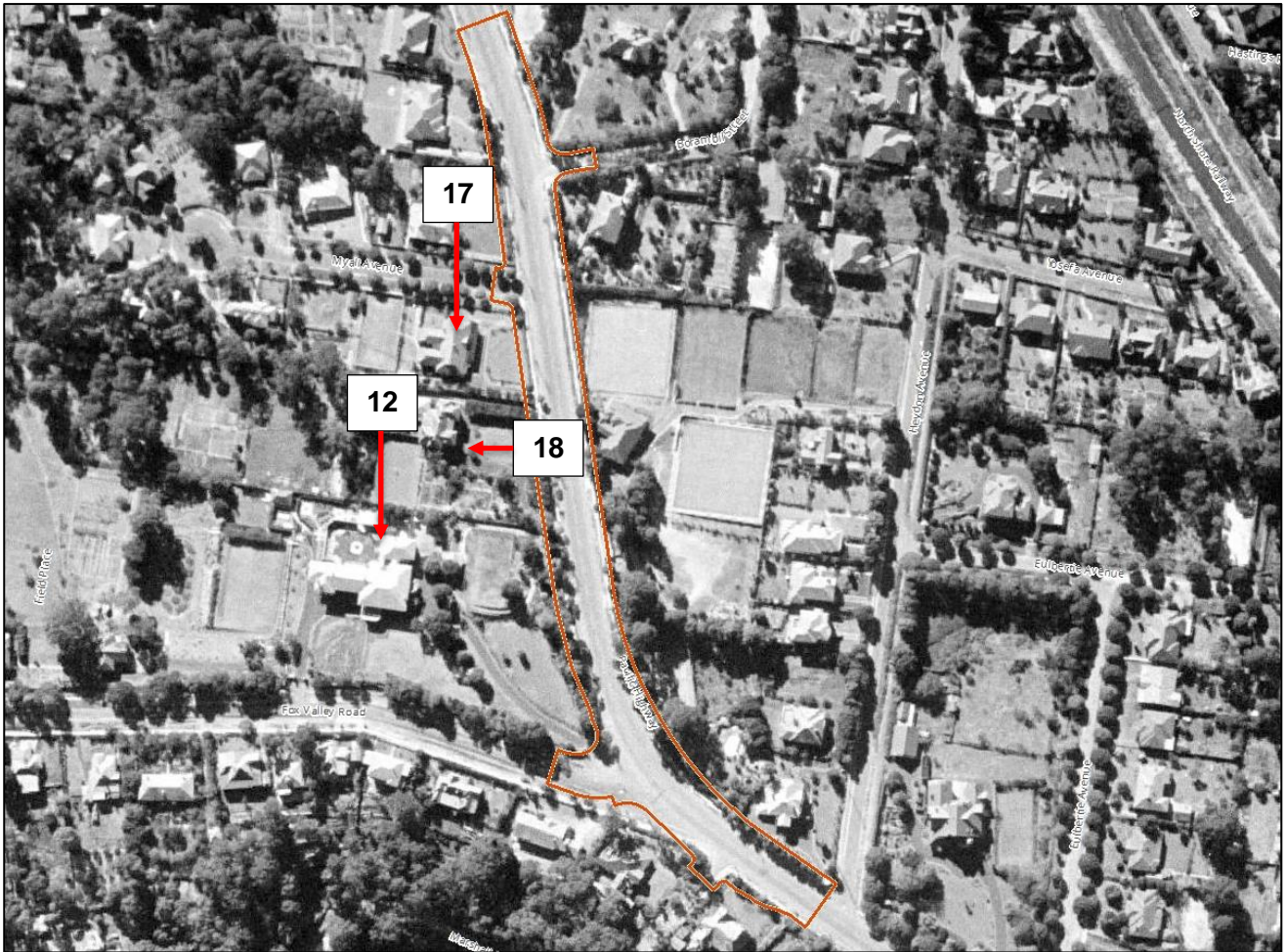


Plate 3 Detail from a 1943 aerial photograph of the proposal area at Intersection 2 (Pacific Highway and Fox Valley Road), featuring local heritage items within the proposal area including dwellings ‘Kyeamba’ [17] and Yaamba [18], and the State and local heritage item Mahratta [12] (Source: SIX Maps)



Plate 4 Detail from a 1943 aerial photograph of the proposal area at Intersection 1 (Pacific Highway at Finlay Road) showing Milneroyd [19] (Source: SIX Maps)

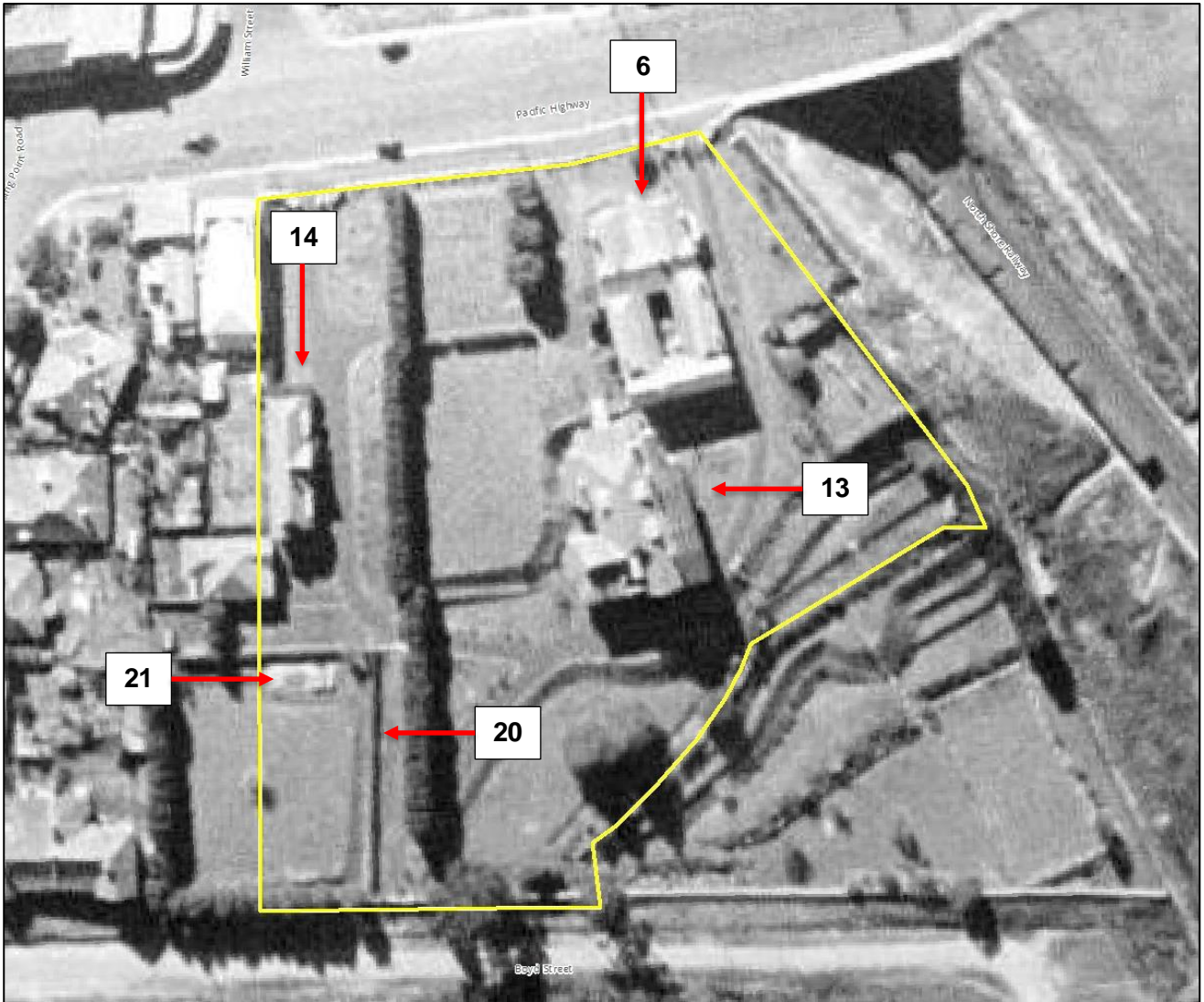


Plate 5 Detail from a 1943 aerial photograph of the proposal area (compound site location), showing Hillview cottage [6], guesthouse [13] and garages [14], some potential garden walls [20] and indistinct garden feature [21] (Source: SIX Maps)

It appears that at this date in 1943 Lowther Park Avenue has have not yet been established (see Plate 4). Lowther Park Avenue is situated adjacent to Milneroyd [19], and, prior to a 1955 subdivision, the road appears to have been partially part of the Milneroyd property. The 1943 aerial shows what might be a

garden feature [22], such as a fountain, lying within the path of the newly created Lowther Park Avenue (Plate 6).⁷⁶

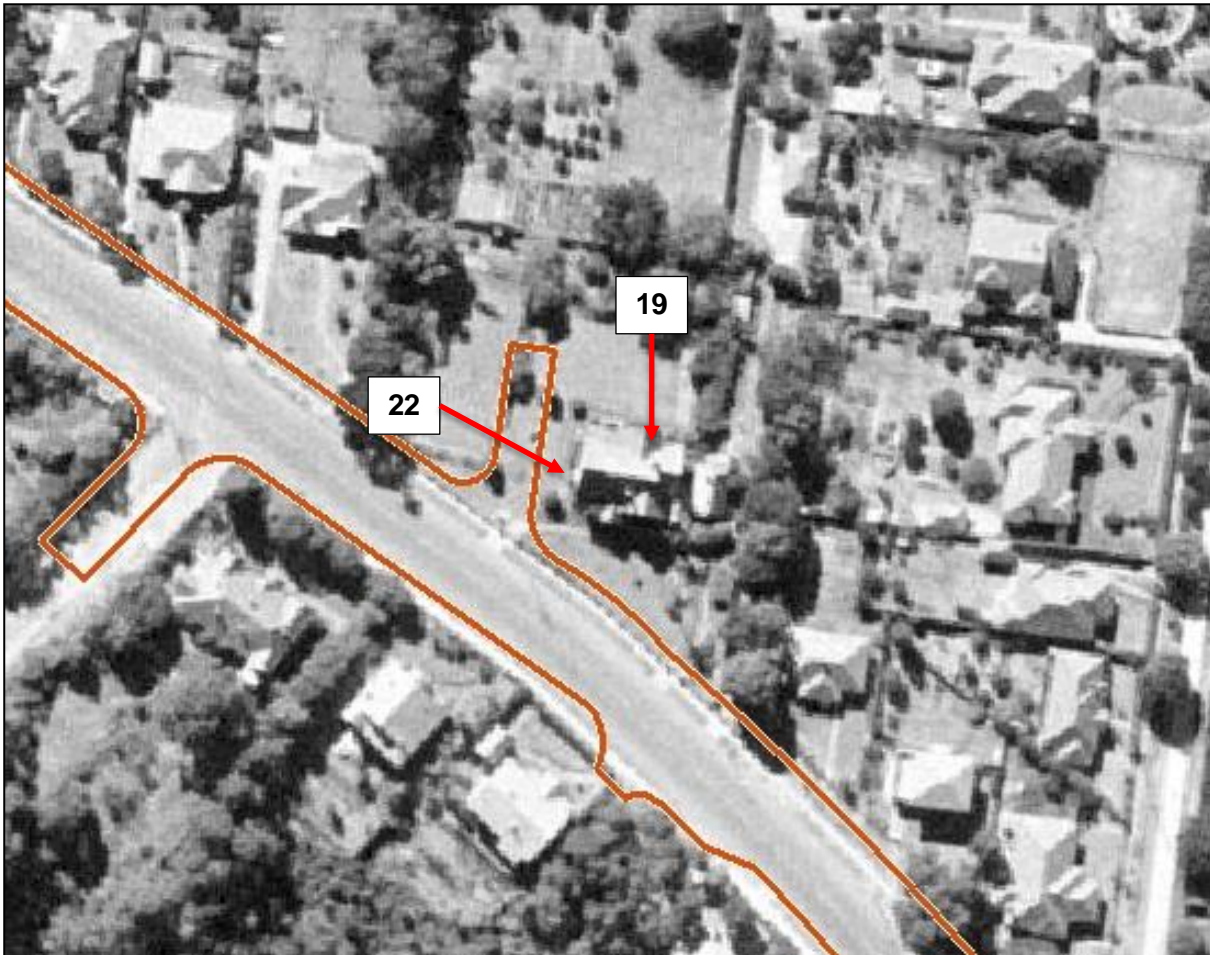


Plate 6 Detail of the 1943 aerial, identifying the area currently occupied by Lowther Park Avenue and a potential garden feature [22], next to Milneroyd [19] (Source: SIX Maps)

Plans dating from the mid-20th century provide further information about structures adjacent to the Pacific Highway, and changes to the road’s alignment. A 1947 plan contained within a Certificate of Title for Yaamba [18] records a dwarf brick wall [23] which runs adjacent to the Pacific Highway for the

⁷⁶ NSW Land Registry Services, Certificate of Title, Volume 3159 Folio 213

majority of the property’s eastern boundary (Figure 24).⁷⁷ Further resumptions were made along the Pacific Highway in the 1950s. A portion of land within the lot containing Milneroyd [19] was acquired by the Commissioner for Main Roads in 1956(Figure 25)⁷⁸.

The 1943 historical aerial does not indicate that there were any structures present in this resumed portion of land (see Plate 6). A subdivision was established using this neighbouring lot and part of the Milneroyd [19] property two years later in 1958, with Lowther Park Avenue created by the Council of the Municipality of Ku-ring-gai.⁷⁹

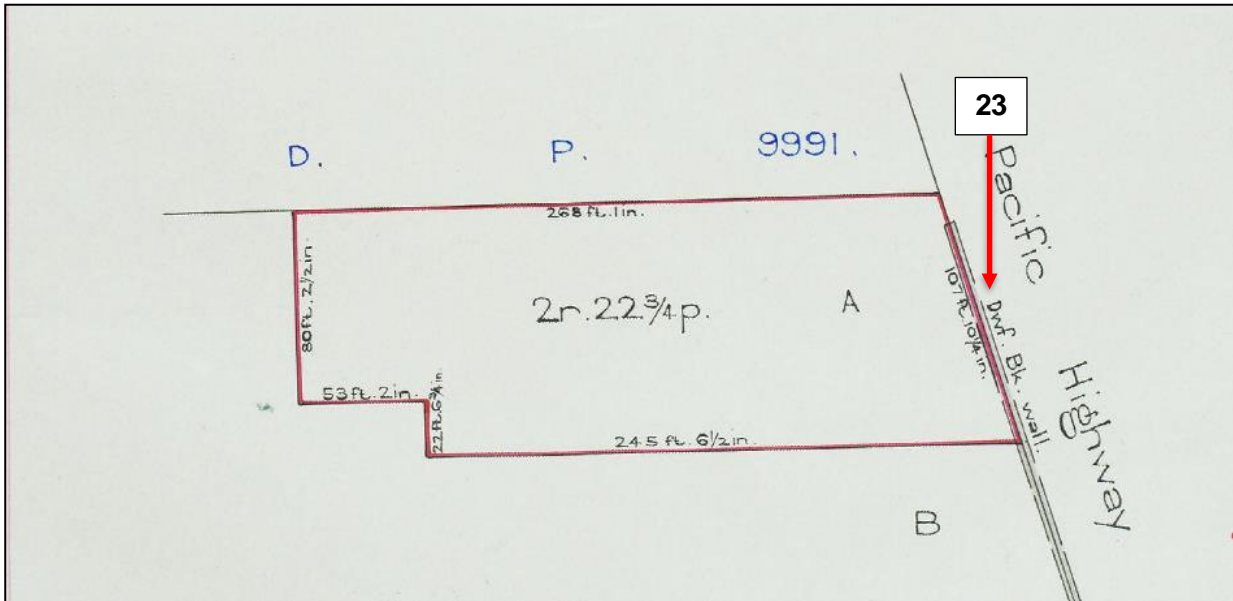


Figure 24 A 1947 plan from a Certificate of Title for Yaamba [18], showing a dwarf brick wall [23] marking the boundary of the property on the Pacific Highway (Source: NSW Land Registry Services, Certificate of Title Volume 5667 Folio 13)

⁷⁷ NSW Land Registry Services, Certificate of Title Volume 5667 Folio 13
⁷⁸ NSW Land Registry Services, Certificate of Title Volume 3130 Folio 213
⁷⁹ NSW Land Registry Services, Certificate of Title, Volume 3159 Folio 213;

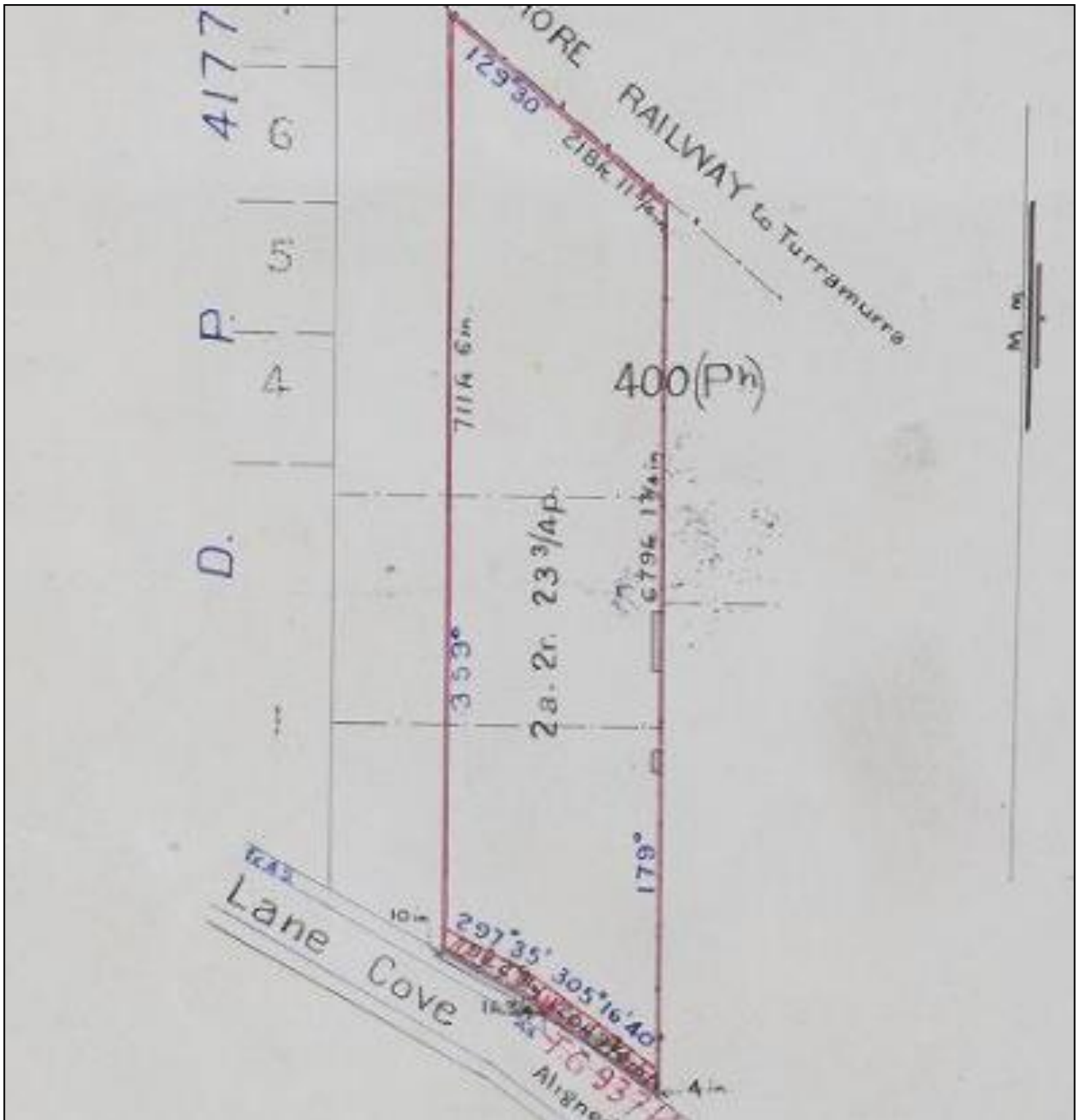


Figure 25 A plan from the Certificate of Title for the Milneroyd [19] property, showing the portion of land resumed by the Commissioner for Main Roads in 1956 (Source: NSW Land Registry Services, Certificate of Title Volume 3130 Folio 213)

The Hillview property was subdivided following Paul’s death in 1955 (Figure 26). However, acquisition of the subdivided lots did not take place until 1963-1964. The western portion of the property, containing the garages [14], was rezoned for the purposes of a road planned by the Department of Main Roads, while in 1974 the Cumberland County Council purchased the eastern part of the estate, including the converted guesthouse [13] and cottage [6], and leased out the properties for a short period. The Hornsby

Ku-ring-gai Hospital entered into a lease with the Council and established the Hillview Community Health Resource and Information Centre. The Hospital acquired the site in 1980, with the western portion remaining under the ownership of the Department of Main Roads and Department of Urban Affairs and Planning.⁸⁰

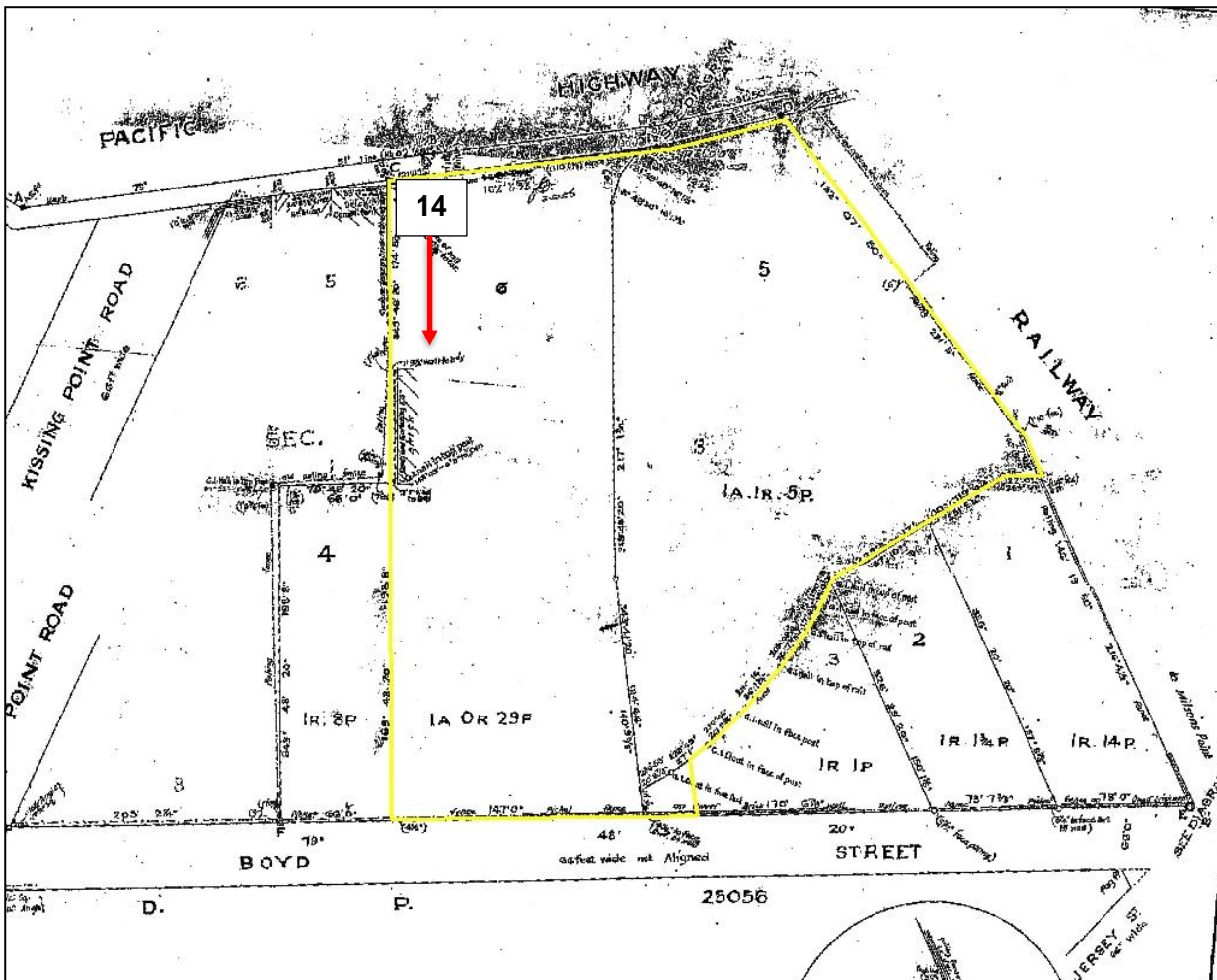


Figure 26 Complete 1955 subdivision plan for the Hillview estate, showing the car garage [14] (Source: NSW Land Registry Services, DP 26828)

⁸⁰ SHR listing for Hillview Garages & Precinct, <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=3490028>, viewed 16 April 2018

Between 1957 and 1967, the United Protestant Association Trust Limited acquired several lots which are now part of DP 1034668 (Estha [15]). The plans contained within the certificates of title related to this location do not record any structures within the proposal area.⁸¹ However, a 1987 plan relating to the consolidation of several lots does record the locations of a sandstone and retaining wall [24] on the boundary of the property (Figure 27). These walls are present in the 1943 aerial photograph of the study area (Plate 2).

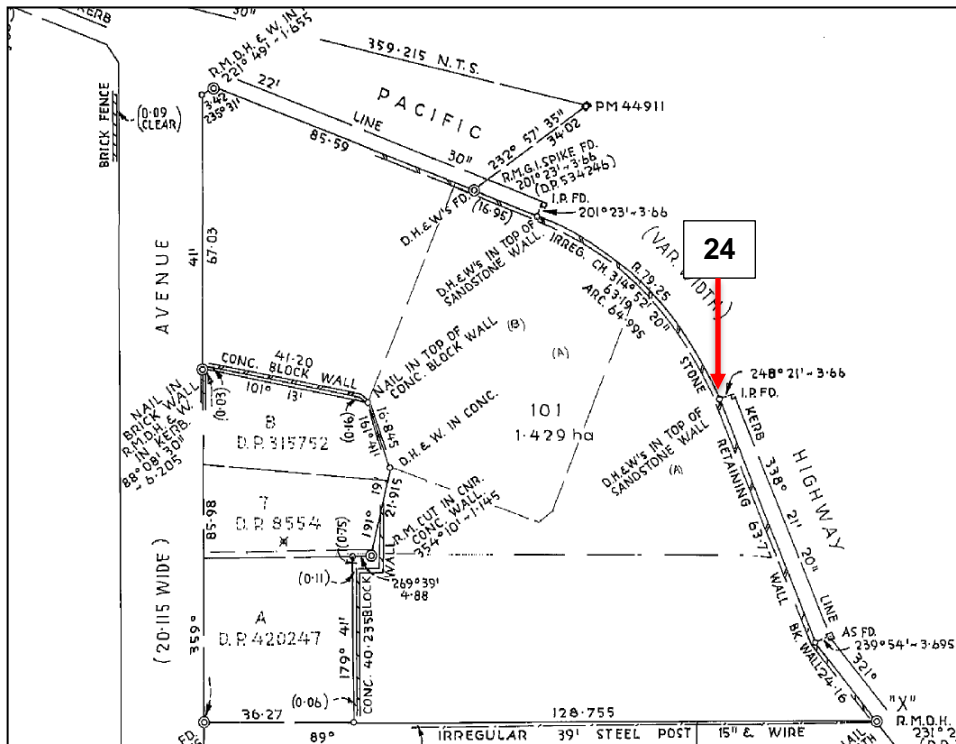


Figure 27 A 1987 subdivision plan for the current DP 1034668 (which contains Estha [15]), showing the presence of a sandstone wall [24] marking the boundary of the property on the Pacific Highway (Source: NSW Land Registry Services, DP 740329)

⁸¹ NSW Land Registry Services, Certificate of Title Volume 4385 Folio 237; NSW Land Registry Services, Certificate of Title Volume 4323 Folio 111; NSW Land Registry Services, Certificate of Title Volume 5044 Folio 152; NSW Land Registry Services, Certificate of Title Volume 6382 Folio 73; NSW Land Registry Services, Certificate of Title Volume 7303 Folio 103; NSW Land Registry Services, Certificate of Title Volume 8325 Folio 190

Further changes were made to the alignment of the Pacific Highway in the mid-1960s. A regional charting map for the parish of Gordon dating to 1966 provides an indication of some of the road resumptions which have taken place within and adjacent to the northern part of the proposal area in Warrong (Figure 28).



Figure 28 Extract from a 1966 map of Gordon Parish, with the proposal area highlighted (Source: NSW Land Registry Services)

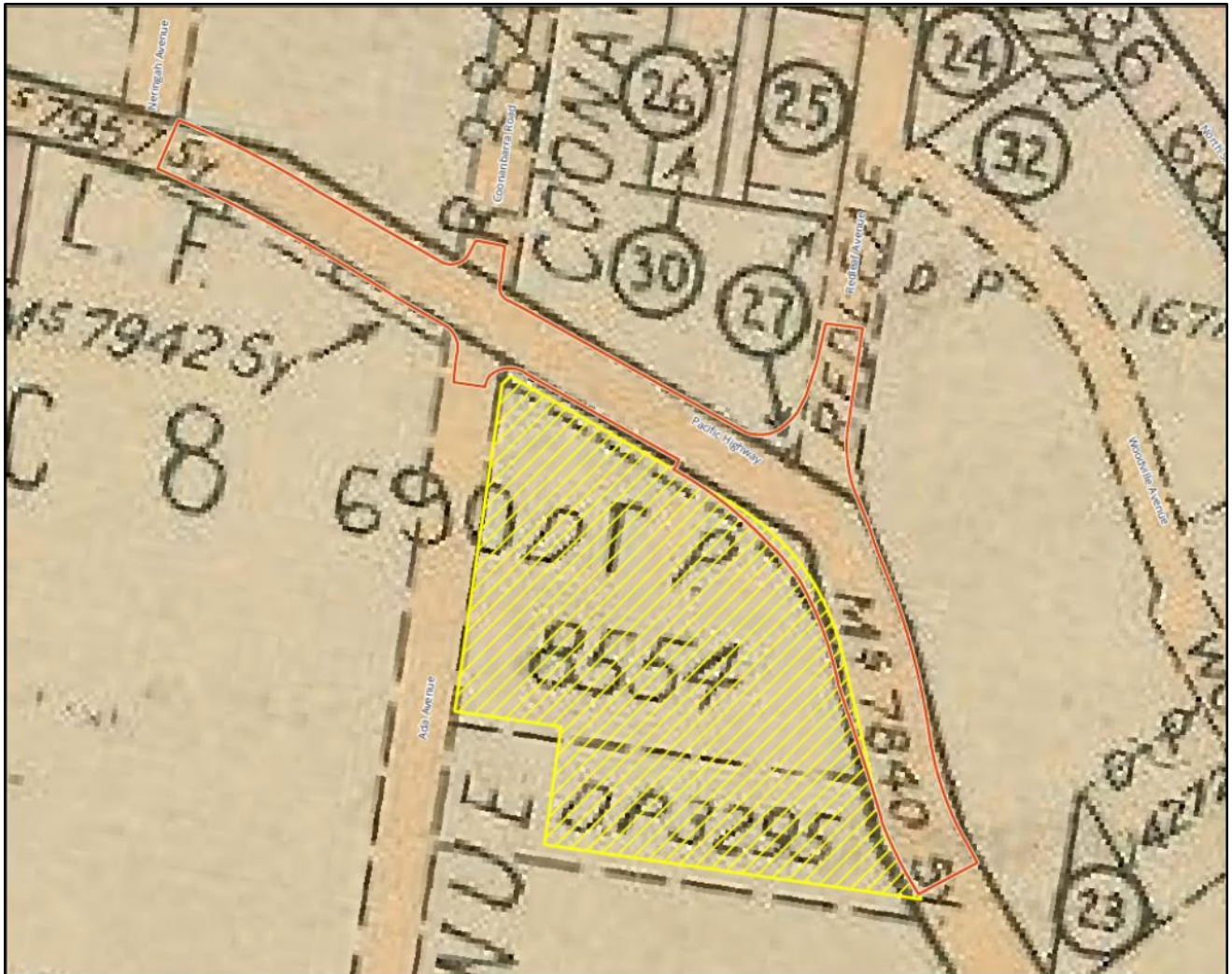


Figure 29 Detail from a 1966 map of Gordon Parish, showing areas of road resumptions from the Estha [15] property (Source: NSW Land Registry Services)

4.4 Chronology of archaeological features within the proposal area

Based upon the historical research presented, it is possible to summarise the chronology of the buildings and structures which were developed within the proposal area over time. This is presented in Table 3.

Table 3 Chronological development of the buildings and structures within the proposal area

N o.	Structure	Date	Location
1	Hut	pre-1862	Potentially within the study area - Intersection 2 (Pacific Highway and Fox Valley Road)
2	Structure	pre-1888	Within the study area - Intersection 3 Pacific Highway and Coonanbarra Road/Redleaf Avenue)
3	Weatherboard store	Pre-1890	Adjacent to the study area - Compound site
4	Heverlee property	c.1900	Within the study area - Intersection 2 (Pacific Highway and Fox Valley Road)
5	Structure, likely house	pre-1893	Adjacent to the study area - Intersection 2 (Pacific Highway and Fox Valley Road)
6	Hillview cottage	c.1893	Within the study area - Compound site
7	Structure	c.1881/1899	Potentially within the study area - Intersection 1 (Pacific Highway and Finlay Road)
8	Structure	pre-1907	Within the study area - Compound site
9	Structure	1902-1913	Within the study area - Compound site
10	Structure	1902-1913	Within the study area - Compound site
11	Structure	1902-1913	Within the study area - Compound site
12	Mahratta property	1940	Within the study area - Intersection 2 (Pacific Highway and Fox Valley Road)
13	Hillview guesthouse	1913-1927	Within the study area - Compound site
14	Hillview car garages	1915	Within the study area - Compound site
15	Estha property	1901-1920	Within the study area - Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue)
16	Former stone wall, Hillview property	c.1890	Adjacent to the study area - Compound site
17	Kyeamba	pre-1943	Within the study area - Intersection 2 (Pacific Highway and Fox Valley Road)
18	Yaamba property	1897	Within the study area - Intersection 2 (Pacific Highway and Fox Valley Road)
19	Milneroyd property	early 20th century\	Adjacent to the study area - Intersection 1 (Pacific Highway and Finlay Road)
20	Potential garden walls	pre-1943	Within the study area - Intersection 1 (Pacific Highway and Finlay Road)

N o.	Structure	Date	Location
21	Garden feature, Hillview	pre-1943	Within the study area - Compound site
22	Garden feature, Milneroyd property	pre-1943	Within the study area - Compound site
23	Dwarf brick wall, Yaamba property	pre-1947	Within the study area - Intersection 2 (Pacific Highway and Fox Valley Road)
24	Sandstone retaining wall, Estha property	pre-1943	Within the study area - Intersection 3 (Pacific Highway and Coonanbarra Road/Redleaf Avenue)

4.5 Research themes

Contextual analysis is undertaken to place the history of a particular site within relevant historical contexts in order to gauge how typical or unique the history of a particular site actually is. This is usually ascertained by gaining an understanding of the history of a site in relation to the broad historical themes characterising Australia at the time. Such themes have been established by the Australian Heritage Commission and the NSW Heritage Office and are outlined in synoptic form in New South Wales Historical Themes.⁸²

There are 38 State Historical Themes, which have been developed for NSW, as well as nine National Historical Themes. These broader themes are usually referred to when developing sub-themes for a local area to ensure they complement the overall thematic framework for the broader region.

A review of the contextual history in conjunction with the local historical thematic history has identified a number of historical themes which relates to the occupational history of the proposal area.⁸³ These are summarised in Table 4.

⁸² NSW Heritage Council 2001

⁸³ Proudfoot 1987

Table 4 Identified historical themes for the proposal area

Australian Theme	NSW Theme	Local Theme
Developing local, regional and national economies	Transport	Utilities
	Health	Key residences
Building settlements, towns and cities	Towns, suburbs and villages	Suburban consolidation
	Land tenure	Suburban consolidation
	Accommodation	Suburban consolidation
Developing Australia's cultural life	Domestic life	Suburban consolidation

5 Physical inspection and potential impacts to local heritage items

A physical inspection of the proposal area was undertaken on 10 April 2018 by Julie Marler (Phillips Marler) and James Cole (Biosis). Roads and Maritime later requested additional inspections of the Hillview Garages site in July 2018 which was undertaken by Daniel Hughes (Phillips Marler) on 10 July 2018 and by Charlotte Allen (Biosis) on 16 July 2018. Further scope changes resulted in the addition of L07, DP 214733 to the area proposed for the compound site. This additional area of the Hillview complex was not inspected. The principal aims of the site inspections were to identify the heritage items and the surrounding landscape context within which the items are situated; this included any heritage items and places (Heritage items can be buildings, structures, places, relics or other works of historical, aesthetic, social, technical/research or natural heritage significance. 'Places' include conservation areas, sites, precincts, gardens, landscapes and areas of archaeological potential).

5.1 Proposal area

The proposal area consists of the compound site at 1334 Pacific Highway, Turramurra and three sections of the Pacific Highway road corridor, focusing on the following intersection locations:

- Intersection 1: Finlay Road, Warrawee/Turramurra;
- Intersection 2: Fox Valley Road, Wahroonga/Warrawee; and
- Intersection 3: Coonanbarra Road and Redleaf Avenue, Wahroonga.

The proposal area also contains land on private properties including:

- 1340 Pacific Highway, Turramurra [Lot 6, DP 26828] also known as 'Hillview Garages' and a local heritage site (about 930sqm)

And portions of:

- 1614-1634 Pacific Highway, Wahroonga [Lot 102, DP 1034668] also known as Thomas and Rosetta Agst Aged Care Facility Apartments (about 380 sqm)
- 1560 Pacific Highway, Wahroonga [Lot A DP385263] (about 35 sqm)
- 1558 Pacific Highway, Wahroonga [Lot 2 DP527984] (about 90 sqm)
- 1550 Pacific Highway, Wahroonga [Lot 2 DP9991] (about 70 sqm)
- 1552 Pacific Highway, Wahroonga [Lot 1 DP9991] (about 60 sqm)

- 1548 Pacific Highway, Wahroonga [Lot 4 DP523216] also known as “Kyeamba” dwelling house and a local heritage site (about 140 sqm)
- 1544 Pacific Highway, Wahroonga [Lot A DP354970] also known as “Yaamba” dwelling house and a local heritage site (about 110 sqm)
- 1536 Pacific Highway, Wahroonga [Lot 14 DP810712] also known as ‘Curtilage Park’ and a local heritage site (about 75 sqm)
- 25 Fox Valley Road / 1526 Pacific Highway, Wahroonga [Lot 1 DP62488] also known as the ‘Mahratta’ and a State and local heritage site (about 270 sqm)
- 2 Fox Valley Road, Wahroonga [Lot 1 DP4696] (about 40 sqm)
- 2 Marshall Avenue, Wahroonga [Lot 1 DP1086440 SP76417] (about 80 sqm)
- 1482 Pacific Highway, Warrawee [Lot 2,3,4&5 DP 21398] also known as ‘Warrawee Public School’ (about 52 sqm)
- 1458 Pacific Highway, Turramurra [Lot A DP 374006] a local heritage site (about 35 sqm)

The proposal area consists largely of roadways and footpaths within the road reserve, with some boundary walls, fences and garden areas within those parts of the study area which extend outside of the road reserve (ie. within private land). Lot 6 DP 26828 is currently used as an access area and car park area for the Hillview Community Health Centre.

The majority of the proposal area has been used for road transportation through the suburbs of Turramurra, Warrawee and Wahroonga, the history of which has revolved around timber-getting, orchard farming and residential development. The topography of the Pacific Highway within this proposal area traverses a series of slopes and undulating ridgelines, which increase in height towards the northern part of the proposal area in Wahroonga.

The areas inspected in more detail were those locations that would be directly impacted by the proposed works (ie. the ‘study area’), with particular attention paid to areas containing heritage-listed items where the road resumptions and compound site are proposed. Sub surface remains were found to be invisible. Plate 7 to Plate 26 demonstrates the current setting of the proposal area and presents a level of development in both the road reserve and adjacent areas.

5.2 Proposal Description by Intersection Location and Impacted Heritage Items

5.2.1 Pacific Highway at Coonanbarra Road and Redleaf Avenue, Wahroonga

Description of proposed works:

The proposal would extend along about 150 metres of the Pacific Highway in this location between Neringah Avenue and Woodville Avenue and would include:

- Provision of an additional northbound lane by widening to the western side of the Pacific Highway resulting in three continuous northbound through lanes on the Pacific Highway in this location
- Reconfiguration of the right-turn bay onto Coonanbarra Road from the Pacific Highway northbound approach to a through lane by banning the right-turn
- Provision of a high entry angle left-turn lane from Redleaf Avenue onto the Pacific Highway by modifying the existing intersection in this location to eliminate the traffic island and build out the kerb. Works would include a new pedestrian crossing island across Redleaf Avenue
- Partial property acquisition (about 380 sqm) and property adjustments from a local heritage item located at 1614-1634 Pacific Highway, Wahroonga (occupied by Thomas and Rosetta Agst Aged Care Facility) including:
 - maximum encroachment in the existing property by about 5m (tapering away towards the northern and southern extents of the property)
 - relocation and reconstruction of an existing pedestrian stair access on the northern road frontage boundary
 - removal of an existing masonry retaining wall on the northern road frontage boundary extending 130m in length with a varying height of up to 2.4 metres
 - establishment of new replacement retaining wall along the new northern property boundary (a minimum 3.6m offset would be provided to the existing Aged Care Building on this property)
 - vegetation and tree clearance along the northern extent of the property next to the road frontage (within the area of acquisition and part of the adjoining land to this which is to remain under private ownership following the works)
- Property adjustments to the driveway at 1565 Pacific Highway (a residential property) to accommodate the kerb adjustments required for the high-entry angle left-turn from Redleaf Avenue onto the Pacific Highway
- Modifications to the existing raised central medians on the Pacific Highway including:

- narrowing the existing median from about 1.2m to 0.5m either side of Ada Avenue and Coonanbarra Road
- narrowing the existing median from about 1.2m to 0.5m south of the right-turn bay into Redleaf Avenue
- modifying the nose and widening the existing median to provide a larger turn radius at Redleaf Avenue
- Modifications to the western kerbside footpath on the Pacific Highway to accommodate the modified road alignment
- Removal of street trees and vegetation on the western side of the Pacific Highway within the existing road corridor opposite 1614-1634 Pacific Highway, Wahroonga occupied by Thomas and Rosetta Agst Aged Care Facility and street trees on the eastern side of the Pacific Highway within the Redleaf Avenue works area
- Relocation of traffic signal poles and provision of new mast arms at the intersection of the Pacific Highway, Ada Avenue and Coonanbarra Road
- Milling and re-sheeting within the proposal area
- Relocation of above and below ground utilities including gas, water mains, local communication cables, street lighting and electricity
- Stormwater infrastructure upgrades within the northbound kerb and channel of the road corridor to accommodate the widened carriageway extending south of the road widening up to Mundarah Street
- New traffic signs, line markings and road furniture.

Impacted Local Heritage Listed Item:

Gateposts to the Former “Estha” Dwelling – Item 1976

Address: 1614-1634 Pacific Highway, Wahroonga

Description:

- Sandstone gate posts (Plate 7) and retaining wall (Plate 8) are situated on the road frontage boundary of Rosetta Park and the Thomas and Rosetta Agst Aged Care Facility.
- The gate posts were originally built with the Estha House, the original building on the site (built post-1901), which has since been demolished.

- The gate posts (located on the north eastern extent of the property) are in good condition and remain at the entry to the property from the Pacific Highway.
- Plantings behind the retaining wall are on a slope rising up from the pavement and include a variety of trees including *Quercus robur*, English Oaks, *Syzygium* Lilly pillys of various varieties, *Cinnamomum camphora*, *Jacaranda mimosifolia*, *Celtis occidentalis* and *Acacia baileyana* and several palms including *Setaria palmifolia*. Various natives and exotic shrubs including *Camelia* spp, *Prunus* spp, *Murraya paniculata*, *Pittosporum undulatum*, *Cotoneaster* spp, and various grasses and ground covers including *Hedera helix*, *Setaria palmifolia* and *Nephrolepis cordifolia*.
- The ground cover vegetation is extensive beneath the trees and spills over the sandstone retaining wall on the boundary. The vegetation and retaining wall form a closed edge on the western side of the road corridor and forms a screen to the buildings in the aged care facility.
- The sandstone wall is not original but forms a contiguous built element along the eastern boundary.

Impacts of the proposed works on heritage curtilage:

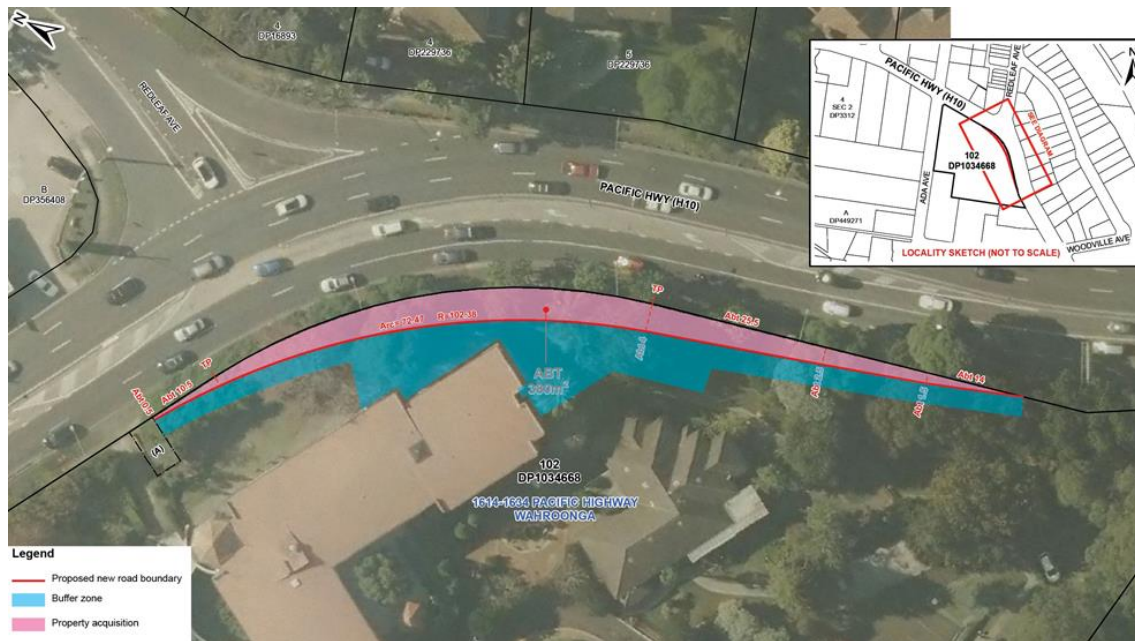


Figure 30 Area of former Estha site [15] showing the impact area and buffer zone resulting from the proposed works for Pacific Highway at Coonanbarra Road and Readleaf Avenue, Wahroonga

The intended work would cut into the site, reaching a maximum of about 4m into the slope and garden beds, the works would form a taper ending just before the driveway and gate post structure at the northern end of the site. The works would remove approximately 380m² of vegetation. The existing gate posts would remain unaltered in their current location during and after construction. The buffer zone between the vegetated planting area and the proposed works is car parking area and a new vegetated buffer would need to be less than 2m in width.

The addition of a third northbound through lane on the Pacific Highway and the relocation of the pavement and services would necessitate the relocation of the wall as well as the removal of trees, ground cover and shrub planting in the area of encroachment as shown on Figure 2.

- Extent of land acquisition of the new proposal is 380 m²- the extent of encroachment would include the existing sandstone retaining wall and boundary planting bed.
- The vegetation to be cleared is extensive along the boundary. There would be a loss of up to thirty (30) medium and large trees, around twenty (20) medium sizes shrubs and all ground covers.
- Extent of modifications to structures/retaining wall -- the sandstone boundary wall along the eastern boundary would be demolished with a new sandstone faced piled retaining wall built on the new alignment, with a 3.6m offset from the aged care centre. This tapers to 3.1m offset

between the aged care centre and the new retaining walls at the eastern end of the building. The sandstone gate posts will not be affected by the proposed works as the encroachment area tapers off close to the main entry gate.

- Impact Level to aesthetic significance: moderate



Plate 7 Detail of the gatepost wall to Estha [15]



Plate 8 Detail of stone boundary wall [24] to Estha [15]



Plate 9 Evidence of sub-surface works within the road reserve in the vicinity of the stone boundary wall of Estha [15], facing north-west

5.2.2 Pacific Highway at Fox Valley Road, Wahroonga/Warrawee

Description of proposed works:

The proposal would extend along about 500 metres of the Pacific Highway in this location between Gilda Avenue and Heydon Avenue and would include:

- Provision of an additional northbound lane by widening to the western side along the Pacific Highway resulting in three continuous northbound through lanes on the Pacific Highway in this location
- Extension of the right-turn bay from the Pacific Highway southbound approach onto Fox Valley Road by adjusting the existing central median from about 95 m to 190 m
- Provision of a dedicated left-turn lane (about 60 m in length) from the Pacific Highway northbound approach onto Fox Valley Road
- Partial property acquisition from ten properties and associated property adjustments (including adjustments to retaining/boundary walls and driveways and vegetation clearance):
 - 2 Marshall Avenue, Wahroonga [SP76417] (about 80 sqm)
 - 2 Fox Valley Road, Wahroonga [Lot 1 DP4696] (about 40 sqm)
 - 25 Fox Valley Road / 1526 Pacific Highway, Wahroonga [Lot 1 DP62488] also known as the 'Mahratta' and a State and local heritage site (about 270 sqm)
 - 1536 Pacific Highway, Wahroonga [Lot 14 DP810712] also known as 'Curtilage Park' and a local heritage site (about 75 sqm)
 - 1544 Pacific Highway, Wahroonga [Lot A DP354970] (about 110 sqm) also known as "Yaamba" dwelling house and a local heritage site
 - 1548 Pacific Highway, Wahroonga [Lot 4 DP523216] also known as "Kyeamba" dwelling house and a local heritage site (about 140 sqm)
 - 1550 Pacific Highway, Wahroonga [Lot 2 DP9991] (about 70 sqm)
 - 1552 Pacific Highway, Wahroonga [Lot 1 DP9991] (about 60 sqm)
 - 1558 Pacific Highway, Wahroonga [Lot 2 DP527984] (about 90 sqm)
 - 1560 Pacific Highway, Wahroonga [Lot A DP385263] (about 35 sqm)
- Removal of street trees and roadside vegetation on the western side of the Pacific Highway within the existing road corridor
- Modifications to the western kerbside footpath on the Pacific Highway to accommodate the modified road alignment
- Modifications the central raised median on the Pacific Highway (including lengthening, extending, widening and reconstruction) between Borambil Street and Fox Valley Road

- Providing a 'Do Not Queue Across Intersection' sign on Pacific Highway southbound at Borambil Avenue
- Connecting the central raised median along Pacific Highway south of the intersection with Fox Valley Road to Marshall Avenue to prohibit the right-turn movement from Marshall Avenue onto the Pacific Highway
- Realignments to existing signalised pedestrian crossings at the intersection of Fox Valley Road and Pacific Highway
- Milling and re-sheeting within the proposal area
- Relocation of traffic signal poles and the provision of new traffic mast arms at the intersection of Fox Valley Road and the Pacific Highway
- Relocation of aboveground and underground utilities including gas, water mains, local communication cables and above ground and underground electricity
- New stormwater pits and pipes
- New traffic signs, line markings and road furniture.

Impacted Local Heritage Listed Items:

“Dwelling house” (also known as Kyeamba) – Item 1966:

1548 Pacific Highway, Wahroonga (on the corner with Myall Avenue)

Description:

Kyeamba is a 1930's double brick bungalow set back from the road corridor by approximately 20 metres (refer Plate 11). It is only slightly visible from a low stepped sandstone wall on the Pacific Highway boundary (Plate 10) with a timber arbor and wrought iron gate for pedestrians located on the corner with Myall Avenue. The road frontage boundary of the property is planted very densely with a range of trees, shrubs and ground covers including a *Brachychiton acerifolius* Illawarra Flame Tree. A large variegated Cupressus tree is located close to the corner with Myall Lane and a range of *Syzygium* lilly pilly forming a hedge and a range of other vegetation including:-

- *Brachychiton acerifolius* feature tree.
- *Cupressus* trees either side of the Arbor
- *Syzygium* spp lilly pillies planted along the rear of the wall.
- *Agapanthus* line the front of the wall.

The vegetation and retaining wall, combined with similar elements on the adjacent property boundary to the south, form a closed edge on the western side of the road corridor and acts as a screen for the building.

Impacts of the proposed works on heritage curtilage:



Figure 31 Area of Kyeamba site impacted by the proposed works for Pacific Highway at Fox Valley Road, Wahroonga/Warrawee

- The proposed land acquisition totals 140 m² on the eastern boundary
- An additional northbound lane and pedestrian path construction would impact the sandstone wall and the planting. The road widening and land acquisition is 140 m² with excavation up to 5.5m along the eastern boundary.
- The removal of the retaining wall, including the timber arbor and the trees and vegetation, would open up views directly to the Pacific Highway and remove all screening between the house and the road corridor.
- The remaining garden and driveway directly behind the proposed acquisition zone forms a buffer to the proposed works and will need to accommodate new retaining wall, shrubs and vegetation. The nature and extent of reinstatement of these works will need to be discussed with the owners and RMS.

Impact Level to aesthetic significance: moderate



Plate 10 View of stone boundary wall of heritage listed Kyeamba dwelling [17] adjacent to Yaamba [29] and road reserve area with evidence of sub-surface infrastructure works, facing north-west



Plate 11 View of Kyeamba dwelling [17] adjacent to Yaamba [18].

Dwelling house “Yaamba” – Item 1965:

Address: 1544 Pacific Highway, Wahroonga

Description:

- Built in 1897, this Federation style 2-storey house is constructed of brick on stone foundation, tiled roof, with verandahs and balconies (refer Plate 14). The former stables and coach house is located to the rear of the main building.
- A timber panel fence is located on the Pacific Highway boundary with two entry gates for vehicles, one formal, the other for maintenance access (refer Plate 12 and Plate 13). Both gates are wrought iron.
- A large, mature *Cinnamomum camphora* is planted behind the fence with several *Ravenala madagascariensis palm* and a single small variety of Fig.
- The vegetation and fence, combined with similar elements on the adjacent property boundaries, form a closed edge on the western side of the road corridor and act as a screen for the building.
- This site forms part of the visual curtilage of Mahratta and Kyeamba.

Impacts of the proposed works on heritage curtilage:



Figure 32 Area of Yaamba site impacted by the proposed works for Pacific Highway at Fox Valley Road, Wahroonga/Warrawee

- The proposed land acquisition totals 110m² along the eastern boundary
- The site works would impact the site with construction of the new footpath and road carriageway
- The addition of a third through lane to the outside edge of northbound side of the road would result in an encroachment into the property by up to 3.5 metres and require the removal of fencing and vegetation along the existing road frontage boundary.
- Removal of site fence and boundary planting would result in direct views from the road to Yaamba.
- The remaining garden and driveway directly behind the proposed acquisition zone forms a buffer to the proposed works and will need to accommodate new retaining wall, shrubs and vegetation. The nature and extent of reinstatement of these works will need to be discussed with the owners and RMS.

Impact Level to aesthetic significance: moderate



Plate 12 Fencing leading to gate entry of Yaamba [18], and adjacent footpath within road reserve



Plate 13 Gate entry to and fencing of heritage listed Yaamba dwelling [18]



Plate 14 View of Yaamba dwelling [18]

Curtilage Park (part of Item 1964)

Address: 1534 Pacific Highway, Wahroonga

Description:

- Opened as a public park in early 2014.
- Part of the visual curtilage of the neighbouring state-listed heritage site Mahratta and locally listed heritage site Yaamba.
- A stepped brick retaining wall is present on the Pacific Highway (Plate 15) frontage with two wrought iron gates that allow pedestrian access (disabled access ramp) to the park and vehicle access to the Mahratta site directly to the south.
- The existing brick retaining wall was styled to look like an extension of the Mahratta boundary wall to the south.
- Garden beds behind the wall are located behind the wall.
- The retaining wall, combined with similar elements on the adjacent property boundaries, form a closed edge on the western side of the road corridor.

Impacts of the proposed works on heritage curtilage:



Figure 33 Area of Curtilage Park site impacted by the proposed works for Pacific Highway at Fox Valley Road, Wahroonga/Warrawee

- The proposed land acquisition is 75 sqm² on the eastern boundary
- The extent of encroachment is about 3.5m into the boundary with the Pacific Highway.
- The impact of construction is the removal and relocation of the eastern boundary brick retaining wall (and associated ramp structure) as well as the removal of a garden bed with a range of shrub and ground cover plantings. The planting bed and ramp would require rebuilding and the plants either transplanted or replanted.

-

Impact Level to aesthetic significance: moderate

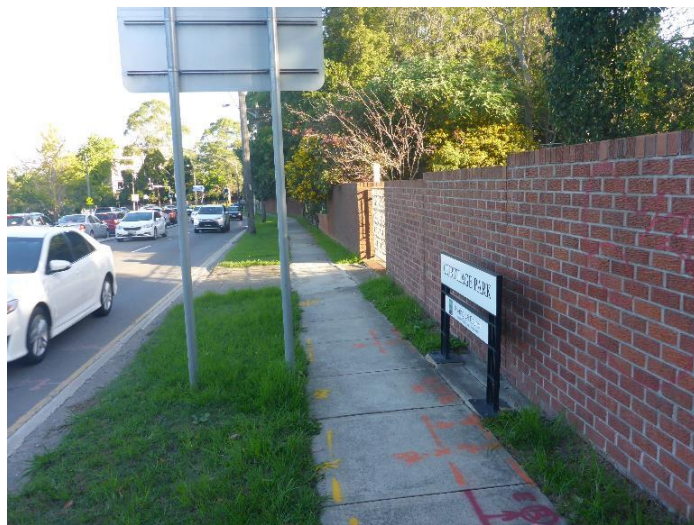


Plate 15 Modern brick boundary wall of Curtilage Park and the Mahratta site [12] and adjacent road reserve, facing south-east



Plate 16 Gardens within Curtilage Park (previously part of the historical Mahratta [12] property) adjacent to Pacific Highway, facing south-east

Mahratta – Item 708

Address: 1526 Pacific Highway, Wahroonga

Description:

Mahratta is within the C4 Mahratta Conservation Area. The boundary fencing and boundary tree plantings are contributing to the character of the streetscape of Fox Valley Road as well as the Pacific Highway.⁸⁴

The proposed intersection improvements at the intersection of Fox Valley Road and the Pacific Highway would include road widening, median works, clearance of roadside vegetation, utility relocations, property adjustments and property acquisitions.

The proposed works in the portion of the study area would involve clearance of trees and vegetation within the eastern boundary planting bed, relocation and reconstruction of the eastern brick retaining wall and property adjustments and acquisitions.

Four options for the reconstruction of the Mahratta boundary retaining wall were considered in relation to the proposed works within the study area:

- Option 1 – Pad footing wall
- Option 2 – Piled footing wall
- Option 3 – Steel sheet piling
- Option 4 – Secant pile wall

Option 3 and 4 were discarded as their construction would produce high noise and vibration and would require machinery to be located within the Mahratta property beyond the existing study area. Option 1 is the preferred solution as it would involve a standard method of construction, would be quicker and safer

⁸⁴ Phillips Marler and Biosis Pty Ltd, Statement of Heritage Impact for State Significant Heritage Item No. 708 'Mahratta', 1526 Pacific Highway, Wahroonga, 2018

to construct, result in less disturbance to the neighbourhood (noise and vibration) and would have the same tree impacts as all other options. ⁸⁵

Impact of the proposed works on heritage curtilage:

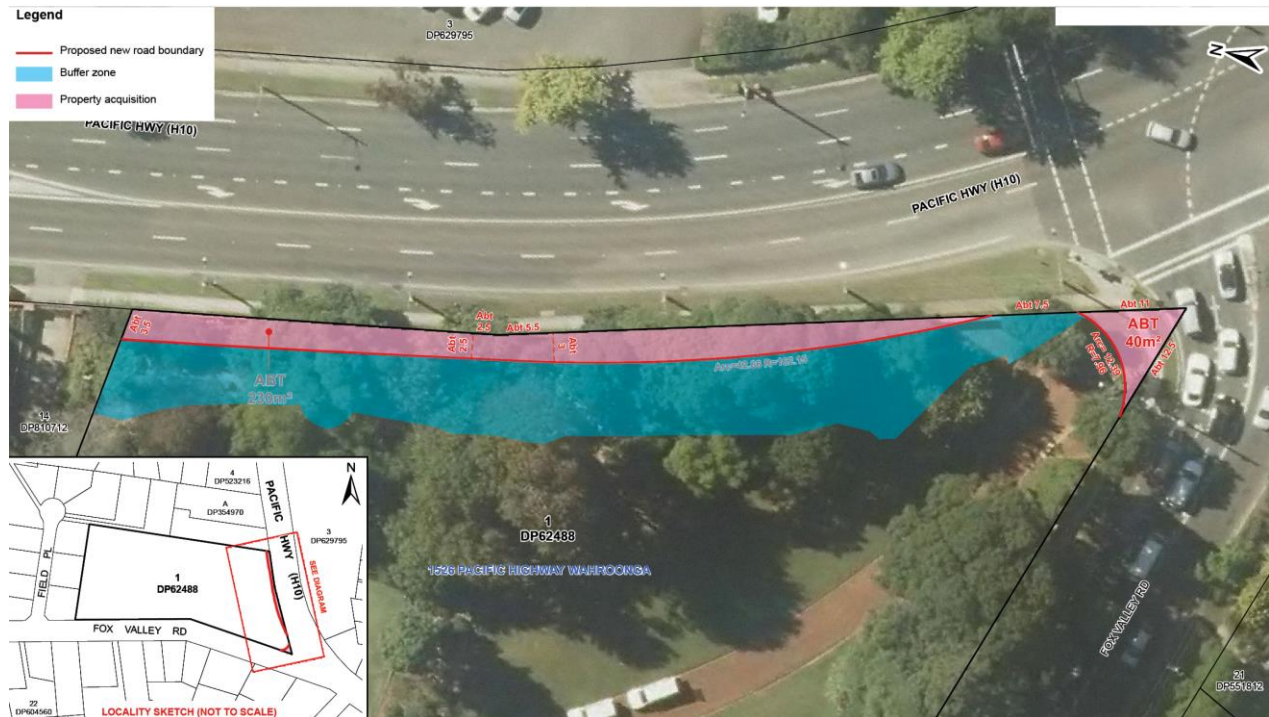


Figure 34 Area of Mahratta [12] site impacted by the proposed works of Pacific Highway at Fox Valley Road, Warraree

As Mahratta is a state heritage item, Philips Marler and Biosis have prepared a Statement of Heritage Impact for this site⁸⁶. Research for this indicates that archaeological material may be present within the study area, largely relating to the historical use of residential areas adjacent to the Lane Cove Road. The study area would likely have contained garden spaces and property boundaries, as the previous house,

⁸⁶ Phillips Marler and Biosis Pty Ltd, Statement of Heritage Impact for State Significant Heritage Item No. 708 'Mahratta', 1526 Pacific Highway, Warraree, 2018

Heverlee [1], was located in the footprint of the current house. Any associated outbuildings are likely to have been located close to the main house away from Lane Cove Road. Archaeologically, these garden features and property boundaries would present as wall foundations of garden walls, fencing postholes, yard surfaces and evidence of landscaping or gardens such as fill layers and garden beds.

It should also be noted that modern services are likely to be contained within the study area. These may include sub-surface electricity or telephone wiring, drainage channels and tunnels, as well as sewerage and water services.

Summary of archaeological potential

Where areas of low, moderate or high archaeological potential have been identified, these have been delineated with references to specific features to which they are related. Specific features have not been identified in areas of low potential as it is considered unlikely that archaeologically significant remains relating to the historical site of the study area would be present in these areas.⁸⁷

Landscape heritage impact assessment

Up to twenty trees would be removed as a result of the proposed road widening work and Appendix 1 for locations and species). As described, the high significance trees are noted for their landscape contribution to the garden as a whole, especially as a screen from the house across the lawn to the Pacific Highway. The mix of trees, particularly several species of *Syzygium* Lilly Pilly contribute to the aesthetics of the garden.

The planting bed on the western side of the brick path would be affected by the likely removal of the *Liquidamber styraciflua* and the *Syzygium paniculatum*. These two removals would result in the loss of canopy in the overall planting bed.

The encroachment of the road widening into the eastern garden of Mahratta would substantially reduce the amount of tree canopy and vegetation cover along the eastern boundary and would expose the house to views of the Pacific Highway. Many low shrub plantings including *Azalea* spp. are close to the

⁸⁷ Phillips Marler and Biosis Pty Ltd, Statement of Heritage Impact for State Significant Heritage Item No. 708 'Mahratta', 1526 Pacific Highway, Wahroonga, 2018

boundary within the eastern garden area of Mahratta and would be affected by the removal of the trees. The large lawn that sweeps from the house to the eastern boundary would not be affected by the works and would be retained in the form and scale it is currently.

Historic Significance

The proposed tree and vegetation removals would impact and substantially remove a key element in the Paul Sorensen landscape design for the garden particularly as these plantings may have been embellished when Sorensen returned to the site in the 1960s to continue the work.

Impact Level: Moderate

Aesthetic Significance

The lot boundary curtilage of Mahratta as described in the State Heritage Register listing would be encroached upon by the works reducing the curtilage for the entire landscape. As described in the listing *'The open lawns and gardens to the north, east and south of the main house are an essential component in achieving a fine open setting for the house'*.⁸⁸

The existing brick boundary wall alongside the Mahratta site's eastern road frontage boundary would be demolished and relocated about 3.5m into the garden, effectively removing the wall from the boundary edge to within the garden itself. The existing boundary wall has structural issues and has been removed in places as a result of this. The new wall would be of a similar height and form to the existing (about 1.8m in height) and would form a more continuous, robust and consistent façade across the entire new eastern boundary following the works. It would be reinforced with brick facing to match existing.

The removal and relocation of the eastern boundary wall westwards between 2.5 and 3.5 metres and the incursion of the roadworks into the Mahratta landscape would effectively narrow the garden to the east and remove all the trees and ground cover vegetation which is providing a vegetated screen to the Pacific Highway from the house and garden. Four trees are located in a narrow garden bed between the

⁸⁸ Heritage Division, SHR listing for Mahratta and Site <https://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?id=5045079>, viewed 28 August 2018

brick path and the existing lawn. These trees would offer limited capacity to screen views to the east towards the proposed replacement brick wall and the Pacific Highway.

The lot boundary curtilage of the site as described in the State Heritage Register listing would be encroached upon by the proposed works by up to approximately 3.5m. The lot boundary curtilage is 34,803m². The property acquisition area at 217m² is approximately 0.8% of the SHR Listing with a wider area of impact in the Mahratta garden of 696m². Therefore, the combined impact of the acquisition and the impact area s there is a 2.4% impact on the SHR curtilage and approximately 6.1% impact on the Mahratta property. Therefore, the overall setting of the Mahratta site would be reduced by the proposal.

Impact Level: The removal of the existing wall is considered moderate but the removal of the trees and vegetation are considered high. So, the overall impact remains as high for aesthetic significance.



Plate 17 View of Mahratta [12] gardens, in area without brick boundary wall, facing east



Plate 18 Typical view of gardens within Mahratta [12] grounds with brick boundary wall



Plate 19 Brick boundary wall of Mahratta [12] and adjacent road reserve, facing north-west



Plate 20 Evidence of sub-surface drainage infrastructure within the Mahratta [12] grounds

5.2.3 Pacific Highway at Finlay Road, Warrawee/Turramurra

Description of proposed works:

The proposal would extend along about 210 metres of the Pacific Highway in this location between Blytheswood Avenue and Kirawa Close and would include:

- Widening to the western side of the Pacific Highway to provide an additional northbound through lane resulting in three continuous northbound through lanes along the Pacific Highway in this location
- Provision of new central raised median on the Pacific Highway between Finlay Road and Lowther Park Avenue
- Modifications to the existing central median on the Pacific Highway south of Lowther Park Avenue
- Banning the existing right-turn movement from the Pacific Highway onto Finlay Road
- Banning the existing right-turn movement from Finlay Road onto the Pacific Highway
- Partial property acquisition from two properties and associated property adjustments (including adjustments to retaining/boundary walls, safety barriers and driveways and vegetation clearance):
 - 1466-1486 Pacific Highway, Warrawee [Lots 2, 3 and 4 DP21398 and Lot 5 DP21700] also known as 'Warrawee Public School' (about 52 sqm)
 - 1458 Pacific Highway, Warrawee [Lot A DP374006] also a local heritage item containing a vacant dwelling to be redeveloped (about 35 sqm)
- Removal of a street tree and collection of roadside shrubs on the western side of the Pacific Highway within the existing road corridor
- Modifications to the western kerbside footpath on the Pacific Highway
- Milling and re-sheeting within the proposal area
- Relocation of traffic signal poles and the provision of new traffic mast arms
- Relocation of aboveground and underground utilities including gas, water mains, local communication cables and above ground and underground electricity
- New stormwater pits and pipes
- New traffic signs, line markings and road furniture.

It is noted that a large number of trees would need to be removed from the property boundary with Warrawee School including *Eucalyptus saligna* and other large specimens.

These trees contribute to the aesthetic values of the western boundary of the Pacific Highway and provide boundary screening from the school to the road and should be assessed for their arboricultural qualities as well as the visual impact for their removal.

Dwelling House: 1548, Pacific Highway, Warrawee

Site Description

Freestanding single storey Federation house surrounded by garden

Low brick boundary wall with decorative columns.

Boundary planting beds with trees, shrubs and ground covers.

Impacts of the proposed works on heritage curtilage:



Figure 35 Area of Dwelling House site impacted by the proposed works of Pacific Highway at Finlay Road, Warrawee/Turrumurra

- The proposed land acquisition totals 35m² along the eastern boundary.
- The site works would impact the site with construction of the new footpath and road carriageway resulting in an encroachment of 0.5m tapering to 2m.

- Removal of brick boundary fence and high shrub planting on the boundary planting would remove some screening from the house.

Impact Level to aesthetic significance: low

Milneroyd – Item No: 1167 Address 1-3 Lowther Park Road Warrawee

Former residence now residential flat building

No proposed works on the property

Kerb adjustments works on the street

Impacts of the proposed works on heritage curtilage: (include mapping)

No impact is proposed on this item



Plate 21 Typical view Milneroyd [19] from the Lowther Park Avenue road reserve

5.2.4 Proposed compound site, 1334-1354 Pacific Highway, Turrumurra

A construction compound site would be required close to the proposed works areas. At present, one site is being considered and assessed which is located at 1334 Pacific Highway in Turrumurra (the community health centre and carpark, all of which is heritage listed and located within a heritage conservation area).

Figure 36 below depicts the location and extent of the proposed compound site in relation to the surrounding area and the general layout/features/considerations. No earthworks or tree removals are proposed for the purposes of the site compound; however, some minor tree trimming may be required to trees within the property and road frontage boundary near the vehicle access points and within the road corridor to facilitate access for heavy vehicles from the Pacific Highway.

The compound site would likely include some of the following: a site office, stockpile areas, concrete washout areas, a laydown hardstand for materials, staff parking, generators, fuel stores, vehicle circulation areas, amenity areas and refuelling of plant and equipment.

Vehicle manoeuvring areas would generally be located on relatively level ground and on existing hardstand areas where possible with some existing grass areas temporarily gravelled where needed.

No utility relocations would be required for the purposes of the site compound. Stockpiling of excavated or raw material may be required at the site compound. Any stockpiles would be managed in accordance with the Roads and Maritime's Stockpile Site Management Guideline (EMS-TG-10).

Access to the compound site would be via the existing formed vehicle crossings from Pacific Highway and Boyd Street. A small section of the existing sandstone wall and gate posts along the site's road frontage boundary may need to be removed to widen the entrance for larger vehicles to utilise the site during construction. Once the works are complete, the wall and gate would be reinstated. The site access points and vehicle manoeuvring areas may require some additional stabilisation for heavy vehicle movements, particularly where there are unsealed surfaces. Standard tree protection measures would be in place within the site for the duration of construction.

Pedestrian access would be maintained during operation of the compound site with appropriate traffic controls at the site access points to avoid pedestrian conflicts. The site would be securely confined with temporary fencing. Signage would be erected advising the general public of access restrictions. Upon completion of the construction work, the temporary site compound, work area and stockpiles would be removed, the site cleared of all rubbish and materials and rehabilitated.

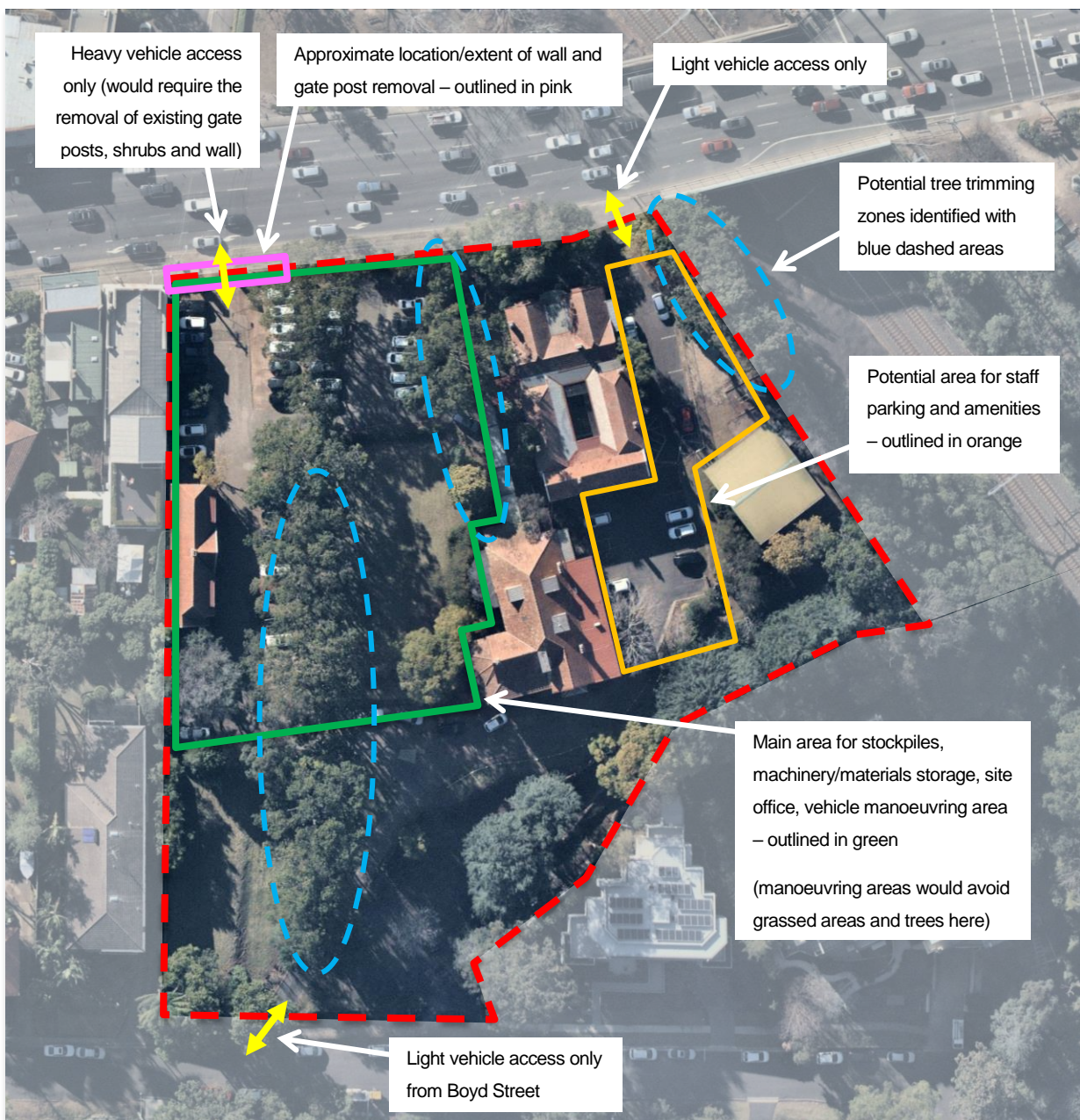


Figure 36 Proposed compound site location at 1334-1354 Pacific Highway, Turramurra (extent shown in red, potential access points shown in yellow)

Hillview Community Health Centre (formerly Hillview Garages & Precinct) – Items 1155 and 1156:

Address: 1334-1340 Pacific Highway, Turramurra

Description:

The SHR listing description of the property is as follows:

1334 Pacific Highway, Turramurra –

1913 Guesthouse: Federation Queen Anne style building, of face brick with a terra cotta tiled roof. The elevations are asymmetrically arranged with projecting timber verandahs and bay windows. It has a grand front entrance with substantial stone columns, stone quoining and arch.

The building is well detailed and constructed of high-quality materials and finishes throughout. There is a c.1926 two storey addition to the eastern side of the building, which facilitated its conversion to flats. Although not of the same quality as the original construction, the addition does not detract from the overall architectural integrity of the place.

Cottage:

A late Victorian brick cottage probably built on speculation c.1890. The building has had a number of additions, mostly at the turn of the century and the overall character of the building is of the Federation rather than Victorian era.

The house features unusual terra cotta block wings and it appears that the main facade may originally have featured the same material. A rear wing was added in 1915 and in 1926 the building was converted into four flats. Substantial internal alterations were made in 1996.

1340 Pacific Highway

Hillview Garages: the building consists of six garages with a three-bedroom residence above.

The style is reminiscent of a coach house with large central doors balanced by lower openings on both sides.

The garages retain the following original details: timber roller shutters to the two northern garages; arched timber, ledged, braced and sheeted doors to the two central garages; a mechanic's pit; two unusual cast iron and tile chimney pieces in the flat above; quality joinery including awning windows that sit under the eaves; early gas lighting filaments in the garages.

The original spatial arrangement of the residence has been retained, although the opening between the two main living spaces has been infilled.

Pacific Highway frontage

- A sandstone wall of random rubble construction with rubble faced pillars is located on the road frontage boundary to the Pacific Highway with large feature pillars, square-cut blocks and planter beds marking the entry (Plate 22). The wall was a later addition to the precinct being built sometime between 1913 and 1927.
- The sandstone wall forms a contiguous built element along the boundary with the Pacific Highway. Overall, the wall is in good condition. The wrought iron gates have been removed and replaced with bollards in the ground but the fixing points to the pillars are still visible.

Frangipanis are planted in the small garden beds on either side of carpark entry while screening plants such as *Syzygiums* are planted behind the wall.

Carparking

The main carpark is on the western boundary of the Hillview precinct and is approximately 70m long by 18m wide with space for up to 28 vehicles. There are two vehicle entries to the carpark, one at the northern end via the Pacific Highway and the second at the southern end from the driveway off Boyd Street. The Pacific Highway entrance is currently blocked with bollards. The Hillview Garages building is in the south-west corner of the carpark.

The secondary carpark is situated between the main carpark on its western edge, the Hillview buildings on its eastern edge and the Pacific Highway on its northern edge. It is approximately 20m long by 18m wide with space for up to 14 vehicles.

The secondary car park is screened by plants on the boundary in front of the secondary carpark, looking south from the Pacific Highway. Plantings include Frangipani, *Jacaranda mimosaeifolia*, *Syzygium spp.* and *Melaleuca spp.*

- The carparks are made up of several types of surfaces including bitumen, exposed concrete aggregate and loose gravel (Plate 24).
- A mature row of Camphor Laurel trees runs the length of the eastern boundary of the secondary carpark and gives screened views onto the formal lawn and gardens as well as the main house (Plate 29).

Garden

- Jacaranda trees and gardens beds separate the lawn from the residence on the eastern edge of the site.

- The southern edge of the lawn is open and drops off to a steep slope with views of vegetation. (Plate 26).
- The northern edge of the lawn is separated from the carpark with a small embankment planted primarily with agapanthus and several pruned rose bushes.

Proposed impact to the heritage item

The proposal for compound activities on the site are temporary and additional hardstand areas for the manouvering of works will be laid down. The compound would be fenced and unauthorised vehicle and pedestrian access will be controlled. The site will be reinstated when works are complete.

Activities such as site office, general parking and storage of materials will need to be carefully located to avoid the tree roots and canopies of trees and trampling of garden beds and vegetation where possible. Trimming of tree canopies can be damaging to the form of trees and should be undertaken with due consideration to the species and form of the tree with the expectation that the tree will regain that growth following construction.

As no excavations are being considered or utility relocations, ground disturbance should be minimal. Proposed concrete wash outs, storage of fuel and refueling operations should be managed to avoid spills.

Impact Level to aesthetic significance: Moderate (during use as compound site only). The views into the Hillview Precinct from north and south would be changed by the proposed compound structures and equipment. This will change the landscape character from buildings and garden with small car parks to an industrial environment with increased activity during the construction period.



Plate 22 View south at the entry of Hillview Community Centre car park showing sandstone wall and gates



Plate 23 View north from Hillview Community Centre car park showing boundary planting including Syzgiums



Plate 24 View south across Hillview Community Centre car park with *Camphor laurels* on the eastern boundary



Plate 25 View north-west across the Hillview Community Centre gardens



Plate 26 View south-west across the Hillview Community Centre lawn and gardens

5.3 Archaeological assessment

The potential non-Aboriginal archaeological resource relates to the predicted level of preservation of archaeological resources within the proposal area. Archaeological potential is influenced by the geographical and topographical location, the level of development, subsequent impacts, levels of onsite fill and the factors influencing preservation such as soil type. An assessment of archaeological potential has been derived from the historical analysis undertaken during the preparation of this report. Only those sites identified as being contained within the proposal area (see Table 3) have been considered in this assessment. Aboriginal heritage within the proposal area will be addressed in the Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation in the REF for the proposal.

5.3.1 Archaeological resource

This section discusses the non-Aboriginal archaeological resource within the proposal area. The purpose of the analysis is to outline what archaeological deposits or structures are likely to be present within the proposal area and how these relate to the history of land use associated with the proposal area.

The historical context presented in this report indicates that archaeological material may be present within the proposal area. These can be divided into two categories: items related to the historical use of Lane Cove Road, and material from former residential land which was resumed or acquired for the purposes of road widening between the 1920s and 1960s. Photographs dating to 1908 (Plate 1) appear to show a dirt road surface, with some possible stone kerbing. As such, it is possible that compacted dirt road surfaces and stone kerbing may be present. Regarding the former residential land, much of what was contained within resumed areas would likely have been garden spaces and property boundaries; archaeologically, these would present as wall foundations of garden walls, fencing postholes, and evidence of landscaping or gardens such as fill layers and garden beds. The 1943 aerials (Plate 2, Plate 3, Plate 4 and Plate 5) show potential garden walls [21] and an indistinct garden feature [22] within the Hillview complex proposed for the compound site. These items could not be relocated during the physical inspection. It is also possible that the Hillview complex proposed for the compound site may contain evidence of occupation in the form of yard surfaces or secondary rubbish dump deposits containing domestic archaeological material related to the historical occupation of Hillview and the Boyd farm.

Several structures [1] [2] [7] [8] [9] [10] [11] dating from the mid- to late-19th century and early 20th century were identified as being located within the proposal, partially located or potentially located within the proposal area. Potential archaeological material from these structures may include building

foundations or footings, underfloor occupation deposits in the area of structure footprints, yard surfaces, secondary deposits from backfilled privies, cesspits or dump pits, and fencing postholes.

It should also be noted that modern services are likely to be contained within the proposal area. These may include sub-surface electricity or telephone wiring, drainage channels and tunnels, as well as sewerage and water services.

5.3.2 Integrity of sub-surface deposits

Sub-surface deposits can be disturbed or damaged by later development or taphonomic processes. Works undertaken within the road reserve since the 1920s have likely impacted the integrity of any sub-surface deposits for those structures identified as being within or partially within the proposal area [1] [2] [7] [8] [9] [10] [11]. These disturbances would likely have been caused by the construction of new road surfaces and footpaths which may incorporate some level of excavation for foundations. The installation of underground services and infrastructure, such as piping and cabling, both underneath the road surface and road verges, would also involve targeted excavation at varying depths and would have significantly impacted any archaeological material. It is also possible that the demolition of the structures may have removed any sub-surface deposits or features or disturbed their placement, so they are no longer in-situ. These impacts may have removed/partially removed or disturbed archaeological deposits such as underfloor occupation deposits, yard surfaces, postholes and secondary deposits, and truncated walls and building foundations or footings. As a result, the potential heritage value of and research potential of any subsurface remains of former structures would be significantly reduced.

For those portions of residential properties proposed to be resumed, the integrity of any sub-surface deposits may be in relatively good condition; however, the installation of services or infrastructure may have disturbed any intact deposits. Furthermore, significant landscaping works in the form of terracing, garden features and installation of driveways and parking facilities has been undertaken within the Hillview complex proposed for the compound site; most of these works date from 1913-1927 and later. However, it is possible that the north-western portion of this area may have relatively little disturbance as it has functioned as a driveway and carpark from at least 1943; any introduced fill layers may have preserved sub-surface remains of the shed store structures [8] [9] [10] [11]. Disturbance within the eastern portion of the Hillview complex proposed for the compound could not be assessed due to no inspection being undertaken.

5.3.3 Research potential

Archaeological research potential refers to the ability of archaeological evidence to provide information about a site that could not be derived from any other source and which contributes to the archaeological significance of that site. Archaeological research potential differs from archaeological potential in that the presence of an archaeological resource (i.e. archaeological potential) does not mean that it can provide

any additional information that increases our understanding of a site or the past (i.e. archaeological research potential).

The research potential of a site is also affected by the integrity of the archaeological resource within a proposal area. If a site is disturbed, then vital contextual information that links material evidence to a stratigraphic sequence may be missing and it may be impossible to relate material evidence to activities on a site. This is generally held to reduce the ability of an archaeological site to answer research questions.

Assessment of the research potential of a site also relates to the level of existing documentation of a site and of the nature of the research done so far (the research framework), to produce a 'knowledge' pool to which research into archaeological remains can add.

Of the research themes (Australian, State and local) identified in Section 4.5, the following are relevant to the potential archaeological resource within the proposal area.

Developing local, regional and national economies – Transport - Utilities

The proposal area follows the old Lane Cove Road, which was realigned to its current path in 1862 (**Figure 7**). While the presence of the road is an important component in the history and development of the Ku-ring-gai district, it is unlikely that any archaeological material relating to former road surfaces and kerbing will provide further information regarding transport within the Ku-ring-gai district that cannot be gained from historical documentation.

Developing local, regional and national economies – Health – Key residences

Several parts of the proposal area contain areas that were resumed on several instances during the 20th century for widening of the Pacific Highway. These portions of land are likely to have been part of landscaped gardens or grounds for the large properties which lined the old Lane Cove Road prior to the Pacific Highway. These landscaped areas can be considered to be places and settings in which the wellbeing of the property's occupants was considered and promoted. Should any evidence of these landscaped areas be encountered, they are unlikely to contribute to research questions relating to health activities within the Ku-ring-gai district that cannot be gained from historical documentation.

Building settlements, towns and cities – Towns, suburbs and villages – Suburban consolidation

The proposal area forms part of the old Lane Cove Road, and as the main road running through the suburbs of Wahroonga, Warrawee and Turramurra, it played a vital role in the development of these communities. However, it is unlikely that any archaeological material associated with former road or residential property boundaries and garden spaces are likely to contribute to research questions

regarding the development of towns, suburbs and villages within the Ku-ring-gai district that cannot be gained from historical documentation.

Building settlements, towns and cities – Land tenure - Suburban consolidation

The proposal area may contain archaeological material relating to former property boundaries, such as stone and brick walls or former fence lines, which were changed following widening of the Pacific Highway on several occasions throughout the 20th century. While physical evidence of these former property boundaries is valuable, it would be unlikely to provide further information regarding land tenure of properties adjacent to the proposal area.

Building settlements, towns and cities – Accommodation - Suburban consolidation

The proposal area may contain the archaeological remains of several mid- to late-19th century structures [1] [2] [7], most likely domestic dwellings or small businesses. Should any archaeological remains associated with these structures be present and encountered during works, they could potentially contribute to research questions relating to the range of accommodation present within Wahroonga, Warrawee and Turramurra prior to or during the subdivision of the larger estates in the 1880s and 1890s, which may relate to the occupation of the study area by timber-getters and orchardists.

It is highly likely that sub-surface archaeological remains have been impacted by 20th century road and infrastructure works involving excavation for road construction and maintenance, and for underground services and cabling within the proposal area. These works are likely to have damaged the integrity of any archaeological material which may be present, such as removal or damage of archaeological deposits and truncating walls or building foundations and footings. This results in a reduced level of research potential for these possible archaeological remains.

Developing Australia's cultural life – Domestic life - Suburban consolidation

The proposal area may contain the archaeological remains of several mid- to late-19th century or early-20th century structures [1] [2] [7] [8] [9] [10] [11], most likely domestic dwellings or small businesses. Should any archaeological remains associated with these structures be encountered during works, they could potentially contribute to research questions relating to the domestic and working lives and practices of the early residents of Wahroonga, Warrawee and Turramurra, such as timber-getters and orchardists, and their consumer choices, both prior to and during the subdivision of the larger estates in the 1880s and 1890s.

It is highly likely that sub-surface archaeological remains have been impacted by 20th century road and infrastructure works involving excavation for road construction and maintenance, and for underground services and cabling within the study area. These works are likely to have damaged the integrity of any

archaeological material which may be present, such as removal or damage of archaeological deposits and truncating walls or building foundations and footings. This results in a reduced level of research potential for these possible archaeological remains.

However, it is possible that the north-western portion of the Hillview complex proposed for the compound site may have relatively little disturbance as it has functioned as a driveway and carpark from at least 1943; any introduced fill layers may have preserved sub-surface remains of the shed store structures [9] [10] [11].

5.3.4 Summary of archaeological potential

Through an analysis of the above factors a number of assumptions have been made relating to the archaeological potential of the study area, these are presented in Table 5.

The assessment of archaeological potential has been divided into three categories:

- **High archaeological potential** – based upon the historical context and documentary evidence presented within this report there is a high degree of certainty that archaeologically significant remains relating to this period, theme or event will occur within the proposal area.
- **Moderate archaeological potential** – based upon the historical context and documentary evidence presented within this assessment it is probable that archaeological significant remains relating to this period, theme or event could be present within the proposal area,
- **Low archaeological potential** – based upon the historical context and documentary evidence presented within this assessment it is unlikely that archaeological significant remains relating to this period, theme or event will occur within the proposal area.

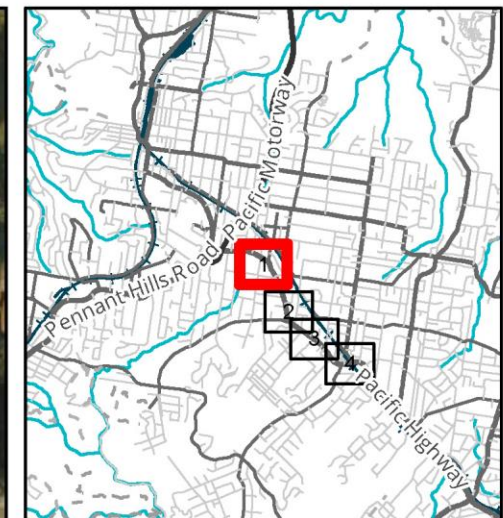
Where areas of low, moderate or high archaeological potential have been identified, these have been delineated with references to specific features to which they are related. Specific features have not been identified in areas of low potential as it is considered unlikely that archaeologically significant remains relating to the historical site of the proposal area would be present in these areas.

Table 5 Assessment of archaeological potential

Designation	Description	Probable feature(s)	Possible construction date	Likely sub-surface integrity	Archaeological potential
Pacific Highway / Lane Cove Road	Former road surfaces, kerbing	Compacted surface deposits, stone kerbing	Post-1862	Disturbance or removal of surface deposits; truncation or removal of stone kerbing	Low
Lot 1, DP 3312	Property boundaries, gardens	Wall foundations, post holes, garden beds, cuts, fill deposits	Pre-1929	Disturbance or removal of post holes, garden beds, cuts and fill deposits; truncation or removal of garden wall foundations	Low
Hut [1]	Pre-1862 dwelling, yard and boundary fencing	Building foundations or footings, underfloor occupation deposits, yard surfaces, secondary deposits from backfilled privies, cesspits or dump pits, fencing postholes	Pre-1862	Disturbance or removal of underfloor occupation deposits, yard surfaces, secondary deposits, fencing postholes; truncation or removal of walls, building foundations and footings	Low
Structure [2]	Pre-1888 structure, yard and boundary fencing	Building foundations or footings, underfloor occupation deposits, yard surfaces, secondary deposits from backfilled privies, cesspits or dump pits, fencing postholes	Pre-1888	Disturbance or removal of underfloor occupation deposits, yard surfaces, secondary deposits, fencing postholes; truncation or removal of walls, building foundations and footings	Low
Structure [7]	Pre-1881/1899 structure, yard and boundary fencing	Building foundations or footings, underfloor occupation deposits, yard surfaces, secondary deposits from backfilled privies, cesspits or dump pits, fencing postholes	Pre-1899	Disturbance or removal of underfloor occupation deposits, yard surfaces, secondary deposits, fencing postholes; truncation or removal of walls, building foundations and footings	Low

Shed store structures [8] [9] [10] [11]	c.1900-1913 shed structures	Building foundations or footings, Structural postholes, compacted floor surfaces, yard surfaces, secondary deposits from backfilled privies, cesspits or dump pits, fencing postholes	c.1900-1913	Disturbance or removal of underfloor occupation deposits, yard surfaces, secondary deposits, fencing postholes; truncation or removal of walls, building foundations and footings. Potentially preserved through possible introduced fill layers for the carpark and driveway;	Moderate
Former stone wall [16], potential garden walls [20], garden feature [21], Hillview property	Former stone wall property boundary, garden walls, landscaped gardens and features	Wall foundations, garden beds, cuts, fill deposits, footings or foundations	c.1890 [22] pre-1943 [26] [27]	Disturbance or removal of cuts, garden bed and fill deposits; truncation or removal of garden wall foundations	Low
Heverlee property [4]	Property boundary, landscaped gardens	Wall foundations, post holes, garden beds, cuts, fill deposits	c.1900	Disturbance or removal of cuts, garden bed and fill deposits; truncation or removal of garden wall foundations	Low
Mahratta property [12]	Current brick wall property boundary, landscaped gardens	Wall foundations, garden beds, cuts, fill deposits	c.1939	Disturbance or removal of cuts, garden bed and fill deposits; truncation or removal of garden wall foundations	Low

Estha property [15] and sandstone retaining wall in Estha [24]	Current and previous stone wall property boundaries, landscaped gardens	Wall foundations, garden beds, cuts, fill deposits	Post-1901	Disturbance or removal of cuts, garden bed and fill deposits; truncation or removal of garden wall foundations	Low
Kyeamba [17]	Stone wall property boundaries, landscaped gardens	Wall foundations, garden beds, cuts, fill deposits	Pre-1943	Disturbance or removal of cuts, garden bed and fill deposits; truncation or removal of garden wall foundations	Low
Yaamba property [18] and dwarf brick wall [23]	Stone wall property boundaries, landscaped gardens	Wall foundations, garden beds, cuts, fill deposits	c.1897	Disturbance or removal of cuts, garden bed and fill deposits; truncation or removal of garden wall foundations	Low
Milneroyd property [19] and garden feature [22]	Property boundaries, landscaped gardens, garden feature	Wall foundations, post holes, garden beds, cuts, fill deposits	Post-1901	Disturbance or removal of postholes, cuts, garden bed and fill deposits; truncation or removal of garden wall foundations	Low



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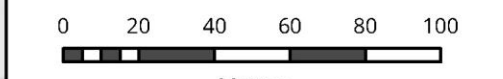
- Proposal area
- Compound area

Archaeological potential

- Low

Figure 37.1 Assessment of archaeological potential

Pacific Highway at Coonanbarra Road and Redleaf Avenue, Wahroonga

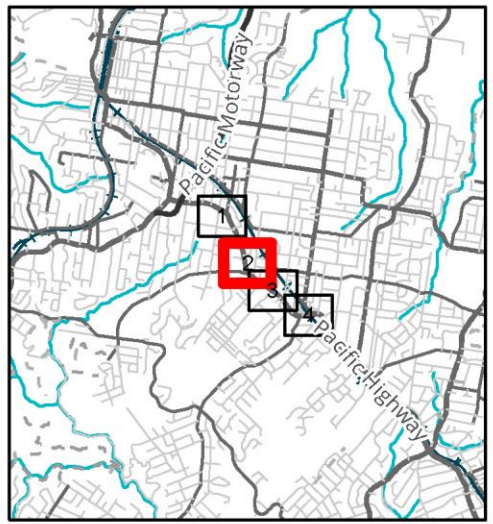


Scale: 1:2,000 @ A3
 Coordinate System: GDA 1994 MGA Zone 56



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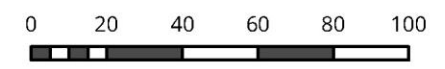
- Proposal area
- Compound area

Archaeological potential

- Low

Figure 37.2 Assessment of archaeological potential

Pacific Highway at Fox Valley Road, Wahroonga

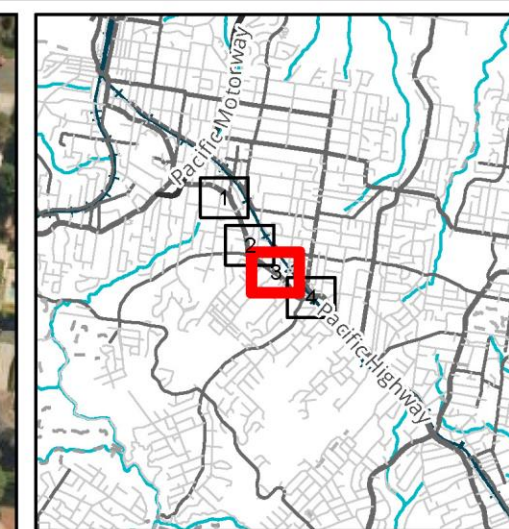


Scale: 1:2,000 @ A3
 Coordinate System: GDA 1994 MGA Zone 56



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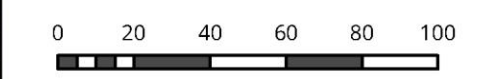
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- Legend**
- Proposal area
 - Compound area
- Archaeological potential**
- Low

Figure 37.3 Assessment of archaeological potential

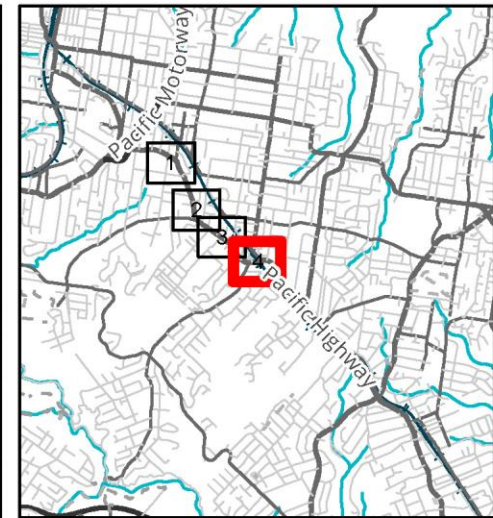
Pacific Highway at Finlay Road, Warrawee



Scale: 1:2,000 @ A3
 Coordinate System: GDA 1994 MGA Zone 56

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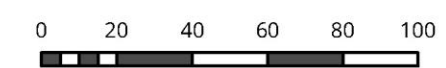
- Proposal area
- Compound area

Archaeological potential

- Low
- Moderate

Figure 37.4 Assessment of archaeological potential

Pacific Highway between Ray Street and Ku-Ring-Gai Avenue, Turramurra



Scale: 1:2,000 @ A3
 Coordinate System: GDA 1994 MGA Zone 56

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Matter: 27217
 Date: 11 September 2018,
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6 Significance assessment

An assessment of heritage significance encompasses a range of heritage criteria and values. The heritage values of a site or place are broadly defined as the ‘aesthetic, historic, scientific or social values for past, present or future generations’⁵⁷. This means a place can have different levels of heritage value and significance to different groups of people.

The archaeological significance of a site is commonly assessed in terms of historical and scientific values, particularly by what a site can tell us about past lifestyles and people. There is an accepted procedure for determining the level of significance of an archaeological site.

A detailed set of criteria for assessing the State’s cultural heritage was published by the (then) NSW Heritage Office. These criteria are divided into two categories: nature of significance, and comparative significance.

Heritage assessment criteria in NSW fall broadly within the four significance values outlined in the Burra Charter. The Burra Charter has been adopted by State and Commonwealth heritage agencies as the recognised document for guiding best practice for heritage practitioners in Australia. The four significance values are:

- Historical significance (evolution and association).
- Aesthetic significance (scenic/architectural qualities and creative accomplishment).
- Scientific significance (archaeological, industrial, educational, research potential and scientific significance values).
- Social significance (contemporary community esteem).

The NSW Heritage Office issued a more detailed set of assessment criteria to provide consistency with heritage agencies in other States and to avoid ambiguity and misinterpretation. These criteria are based

⁵⁷ NSW Heritage Office, 2001

on the Burra Charter. The following SHR criteria were gazetted following amendments to the Heritage Act that came into effect in April 1999:

- Criterion (a) - an item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area).
- Criterion (b) - an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area).
- Criterion (c) - an item is important in demonstrating the aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area).
- Criterion (d) - an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons.
- Criterion (e) - an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area).
- Criterion (f) - an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area).
- Criterion (g) - an item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places; or cultural or natural environments; or a class of the local area's cultural or natural places; or cultural or natural environments.

6.1 Levels of heritage significance

Items, places, buildings, works, relics, movable objects or precincts can be of either local or State heritage significance or have both local and State heritage significance. Places can have different values to different people or groups.

Local heritage items

Local heritage items are those of significance to the local government area. In other words, they contribute to the individuality and streetscape, townscape, landscape or natural character of an area and are irreplaceable parts of its environmental heritage. They may have greater value to members of the local community, who regularly engage with these places and/or consider them to be an important part of their day-to-day life and their identity. Collectively, such items reflect the socio-economic and natural history of a local area. Items of local heritage significance form an integral part of the State's environmental heritage.

State heritage items

State heritage items, places, buildings, works, relics, movable objects or precincts of State heritage significance include those items of special interest in the State context. They form an irreplaceable part of the environmental heritage of NSW and must have some connection or association with the State in its widest sense.

The following evaluation attempts to identify the cultural significance of the study area. This significance is based on the assumption that the site contains intact or partially intact archaeological deposits.

6.2 Statements of significance

The proposal area contains and is in the vicinity of a number of listed heritage items of State and local significance. Existing statements of significance for these items are provided in **Table 6**. **Table 7** presents an evaluation and subsequent statements of significance for the areas identified as holding archaeological potential in **Table 5**.

Table 6 Statements of significance for listed heritage items, where available

Site number	Site name	Address / Property description	Listings	Significance	Statement of significance
1964	"Mahratta", dwelling house	1536 Pacific Highway, Wahroonga NSW	Ku-Ring-Gai LEP 2015	State	<p>Defaults to State statement of significance:</p> <p>Mahratta is a large, intact, 2 storey mansion erected in 1941 in an unusual style which combines Art Deco and Classical Georgian Revival elements. It is perhaps the largest and finest property of its type erected in wartime Sydney. The house replaced a substantial Federation period residence situated on an 8.6 acre site in Warrawee but retained and incorporated the majority of the earlier landscape elements including a sunken rose garden and outbuildings. It was built for T.A.Field, a notable figure in the retail and wholesale meat industry, by the architect Douglas Agnew.</p> <p>The house is substantially intact exhibiting a high degree of face brick, bronze and wrought iron detailing externally and is characterised by a dramatic porte cochere on the south and an enclosed Pompeian Court on the north. Extended in 1964 by the addition of a west wing, the whole achieves a unity of style, form, texture and materials from the sensitively designed additions.</p> <p>Internally the house retains a series of superb public spaces and rooms of fluid design and highly crafted materials. The oval staircase executed in marble and scagliola, the well-proportioned ball room and elliptical dining room, finely detailed joinery and original fittings all combine to achieve a very rare and dramatic domestic interior from the period.</p> <p>The property has historic associations and aesthetic values due to the involvement and</p>

Site number	Site name	Address / Property description	Listings	Significance	Statement of significance
					<p>advice of landscape designer Paul Sorensen in its garden. The open landscaped setting and mature plantings provide a fine setting and backdrop to the house. Red gravel driveways snaking through the open lawns reinforce the colour and texture of the house.</p> <p>Occupation by the Westpac Banking Corporation since the 1960s, using the house as a Staff Training College has ensured a high level of maintenance to both the house and grounds. This has ensured that Mahratta has retained all of the essential characteristics of its cultural significance.</p> <p>NB: separate statements of significance exist for the garage and chauffeur's quarters, gardener's cottage, tennis pavilion, laundry, sheds and greenhouses. (see Schweger Brooks, 1989 sections 5.2-5.5)</p> <p>The open lawns and gardens to the north, east and south of the main house are an essential component in achieving a fine open setting for the house. To the west the Croquet Lawn and Rose Garden with their backdrop of dense mature trees and shrubs are a key component of the cultural and historic setting having survived almost intact from the original (Federation era) house.</p> <p>The open areas to the west of the property are of little cultural significance to the main house, but contain a series of very large native trees. (Schweger Brooks, 1989).</p> <p>Reasons for listing; cultural, architectural, landmark value, state significance Note: grounds, fence, outbuilding to Fox Valley Road & garage building (LEP, 1992).</p>
1913	Mahratta	25 Fox Valley Road, Wahroonga NSW	Ku-Ring-Gai LEP 2015	State	Defaults to State statement of significance.

Site number	Site name	Address / Property description	Listings	Significance	Statement of significance
3490028	Hillview Garages & Precincts	1334-1340 Pacific Highway, Turramurra NSW	Department of Planning and Infrastructure S170 Register	State	The Hillview Group, including the original cottage, the c.1913 guesthouse, the garages, and the various landscape elements, are an excellent and rare example of a grand private boarding house, built on the Upper North shore following the opening of the railway. The prominent hilltop setting of the house and the spectacular views over the harbour, add to the significance of the property. The garages are a significant element of the Hillview Group, having maintained their setting in relationship to the main house. They are indicative of the grand stature of the place and the aspirations of its wealthy owner.
N/A	Hillview Garages	1334-1340 Pacific Highway, Turramurra NSW	Roads and Maritime Services S170 Register	State	<p>The Hillview Group, including the original cottage, the c1913 guesthouse, the garages, the stone wall and gates to the Pacific Highway, carriage loop, croquet lawn, terracing and mature landscape setting, is of Local significance. It is an excellent and rare example of a grand private boarding house built in the Upper North Shore following the opening of the railway. Hillview had even greater significance than most boarding or guesthouses in the area given its prominent and very visible position adjacent to the railway line and its spectacular views over the whole of Sydney from the coast to the mountains and south to Botany Bay.</p> <p>The garages are a significant element in the Hillview Group. They were built by Mr E.S.W. Paul, a Managing Director of Schweppes Limited, to accommodate his Rolls Royce and Chauffeur. They are indicative of the grand stature of the place and the aspirations of its wealthy owner.</p> <p>The garages have been built to a good design (probably architect designed) with high-quality finishes which are extremely rare for a building of this type, but reflect the quality of finishes in the c1913 guesthouse. The garages are substantially intact, with only minor alterations.</p>
N/A	Hillview	1334 Pacific	NSW	State	This modest Federation style cottage is historically related to adjacent Hillview and

Site number	Site name	Address / Property description	Listings	Significance	Statement of significance
		Highway, Turramurra	Department of Health S170 Register		enhances its setting.
I156	Hillview Garages	1340 Pacific Highway, Turramurra NSW	Ku-Ring-Gai LEP (Local Centres) 2012 S170 Register	Local	Defaults to State statement of significance.
I155	"Hillview"	1334 Pacific Highway, Turramurra NSW	Ku-Ring-Gai LEP (Local Centres) 2012 S170 Register	Local	Defaults to State statement of significance.
I167	"Milneroyd", residential flat building	1–3 Lowther Park Avenue, Warrawee NSW	Ku-Ring-Gai LEP (Local Centres) 2012	Local	Reasons for listing; cultural, architectural, landmark value, municipal significance
I976	Gateposts to the former "Estha", dwelling house	1614–1634 Pacific Highway, Wahroonga NSW	Ku-Ring-Gai LEP 2015	Local	Reasons for listing; cultural, architectural, municipal, state (?) significance
I966	Dwelling house	1548 Pacific Highway, Wahroonga NSW	Ku-Ring-Gai LEP 2015	Local	Reasons for listing; architectural, municipal significance Note: fine wicket & vehicle gates with pergolas
I965	"Yaamba", dwelling house	1544 Pacific Highway, Wahroonga NSW	Ku-Ring-Gai LEP 2015	Local	Not available.

Table 7 Evaluation and statement of significance for areas of archaeological potential in areas of proposed works

Site name	Significance assessment criteria							Level of significance	Statutory requirements	Statement of significance
	A	B	C	D	E	F	G			
Pacific Highway / Lane Cove Road								Nil	S139 'Relics Provision' Heritage Act	<p>The potential archaeological material associated with the old Lane Cove Road, such as former road surfaces and kerbing, is not considered an important component or will yield information that will contribute to an understanding of the cultural history of NSW or Ku-ring-gai, nor hold associations with the life or works of a person(s) of importance in NSW or Ku-ring-gai's cultural history. The potential archaeological materials are unlikely to demonstrate aesthetic characteristics or a high degree of creative or technical achievement in NSW or Ku-ring-gai, and they do not hold a strong or special association with a community or cultural group in NSW or Ku-ring-gai for social, cultural or spiritual reasons. The potential archaeological materials are not considered to possess uncommon, rare or endangered aspects of NSW or Ku-ring-gai's cultural history, nor do they demonstrate the principal characteristics of a class of NSW or Ku-ring-gai's cultural places or environments.</p> <p>The potential archaeological materials associated with the Pacific Highway / Lane Cove Road do not hold heritage significance.</p>

Site name	Significance assessment criteria							Level of significance	Statutory requirements	Statement of significance
	A	B	C	D	E	F	G			
Lot 1, DP 3312 (1666 Pacific Highway, Wahroonga)								Nil	S139 'Relics Provision' Heritage Act	<p>The potential archaeological materials associated with the Lot 1, DP 3312, such as former property boundaries and landscaped gardens, are not considered an important component of or will yield information that will contribute to an understanding of the cultural history of NSW or Ku-ring-gai, nor hold associations with the life or works of a person(s) of importance in NSW or Ku-ring-gai's cultural history. The potential archaeological materials are unlikely to demonstrate aesthetic characteristics or a high degree of creative or technical achievement in NSW or Ku-ring-gai, and they do not hold a strong or special association with a community or cultural group in NSW or Ku-ring-gai for social, cultural or spiritual reasons. The potential archaeological materials are not considered to possess uncommon, rare or endangered aspects of NSW or Ku-ring-gai's cultural history, nor do they demonstrate the principal characteristics of a class in NSW or Ku-ring-gai's cultural places or environments.</p> <p>The potential archaeological materials associated with Lot 1, DP 3312 do not hold heritage significance.</p>

Site name	Significance assessment criteria							Level of significance	Statutory requirements	Statement of significance
	A	B	C	D	E	F	G			
Hut [1]					X			Local	S139 'Relics Provision' Heritage Act	<p>The potential archaeological materials associated with the former hut [1], such as building foundations or footings, underfloor occupation deposits, yard surfaces, secondary deposits from backfilled privies, cesspits or dump pits, fencing postholes, may be able to yield information that will contribute to the understanding of the cultural history of Ku-ring-gai and the areas of Wahroonga, Warrawee and Turramurra, specifically regarding the range of accommodation and the domestic life, practices and consumer choices of the area's occupants, such as timber-getters and orchardists, during or prior to the mid-19th century.</p> <p>However, there is a high likelihood that sub-surface archaeological remains have been impacted by 20th century road and infrastructure works which are likely to have damaged the integrity of any archaeological material present, resulting in a reduced level of research potential for these possible archaeological remains.</p> <p>Should undisturbed archaeological materials associated with the former hut [1] be present, they would be considered to hold heritage significance at a local level. However, if archaeological material has been disturbed or are not present at all, they would not be considered to hold heritage significance.</p>

Site name	Significance assessment criteria							Level of significance	Statutory requirements	Statement of significance
	A	B	C	D	E	F	G			
Structure [2]					X			Local	S139 'Relics Provision' Heritage Act	<p>The potential archaeological materials associated with the former structure [2], such as building foundations or footings, underfloor occupation deposits, yard surfaces, secondary deposits from backfilled privies, cesspits or dump pits, fencing postholes, may be able to yield information that will contribute to the understanding of the cultural history of Ku-ring-gai and the areas of Wahroonga, Warrawee and Turramurra, specifically regarding the range of accommodation and the domestic life, practices and consumer choices of the area's occupants, such as timber-getters and orchardists, prior and/or during the subdivision of larger estates in the 1880s and 1890s.</p> <p>However, there is a high likelihood that sub-surface archaeological remains have been impacted by 20th century road and infrastructure works which are likely to have damaged the integrity of any archaeological material present, resulting in a reduced level of research potential for these possible archaeological remains.</p> <p>Should undisturbed archaeological materials associated with the former structure [2] be present, they would be considered to hold heritage significance at a local level. However, if archaeological material has been disturbed or are not present at all, they would not be considered to hold heritage significance.</p>

Site name	Significance assessment criteria							Level of significance	Statutory requirements	Statement of significance
	A	B	C	D	E	F	G			
Structure [7]					X			Local	S139 'Relics Provision' Heritage Act	<p>The potential archaeological materials associated with the former structure [7], such as building foundations or footings, underfloor occupation deposits, yard surfaces, secondary deposits from backfilled privies, cesspits or dump pits, fencing postholes, may be able to yield information that will contribute to the understanding of the cultural history of Ku-ring-gai and the areas of Wahroonga, Warrawee and Turramurra, specifically regarding the range of accommodation and the domestic life, practices and consumer choices of the area's occupants, such as timber-getters and orchardists, prior and/or during the subdivision of larger estates in the 1880s and 1890s.</p> <p>However, there is a high likelihood that sub-surface archaeological remains have been impacted by 20th century road and infrastructure works which are likely to have damaged the integrity of any archaeological material present, resulting in a reduced level of research potential for these possible archaeological remains.</p> <p>Should undisturbed archaeological materials associated with the former structure [7] be present, they would be considered to hold heritage significance at a local level. However, if archaeological material has been disturbed or are not present at all, they would not be considered to hold heritage significance.</p>

Site name	Significance assessment criteria							Level of significance	Statutory requirements	Statement of significance
	A	B	C	D	E	F	G			
Shed store structures [8] [9] [10] [11]					X			Local	S139 'Relics Provision' Heritage Act	<p>The potential archaeological materials associated with the former shed store structures [8] [9] [10] [11], such as building foundations or footings, structural postholes, compacted floor surfaces, yard surfaces, secondary deposits from backfilled privies, cesspits or dump pits, and fencing postholes may be able to yield information that will contribute to the understanding of the cultural history of Ku-ring-gai and the areas of Wahroonga, Warrawee and Turramurra, specifically regarding the domestic and working lives, practices and consumer choices of the area's occupants, such as timber-getters and orchardists, prior and/or during the subdivision of larger estates in the 1880s and 1890s.</p> <p>The introduction of services and infrastructure may have disturbed or removed compacted floor and yard surfaces, secondary deposits, fencing postholes, or truncated or removed building foundations and footings. However, should fill layers have been introduced for the creation of the driveway and carpark, sub-surface remains may be relatively intact.</p> <p>Should undisturbed archaeological materials associated with the former shed store structures [8] [9] [10] [11], be present, they would be considered to hold heritage significance at a local level. However, if archaeological material has been disturbed or are not present at all, they would not be considered to hold heritage significance.</p>

Site name	Significance assessment criteria							Level of significance	Statutory requirements	Statement of significance
	A	B	C	D	E	F	G			
Former stone wall [16], potential garden walls [20], garden feature [21], Hillview								Nil	Section 60, Heritage Act or exemption under the Heritage Act S139 'Relics Provision' Heritage Act	<p>The potential archaeological materials associated with the former stone wall, [16], potential garden walls [20], garden feature [21], Hillview property, such as former stone wall property boundaries and landscaped gardens, are not considered an important component of or will yield information that will contribute to an understanding of the cultural history of NSW or Ku-ring-gai, nor hold associations with the life or works of a person(s) of importance in NSW or Ku-ring-gai's cultural history. The potential archaeological materials are unlikely to demonstrate aesthetic characteristics or a high degree of creative or technical achievement in NSW or Ku-ring-gai, and they do not hold a strong or special association with a community or cultural group in NSW or Ku-ring-gai for social, cultural or spiritual reasons. The potential archaeological materials are not considered to possess uncommon, rare or endangered aspects of NSW or Ku-ring-gai's cultural history, nor do they demonstrate the principal characteristics of a class of NSW or Ku-ring-gai's cultural places or environments.</p> <p>The potential archaeological materials associated with the former stone wall, [16], potential garden walls [20], garden feature [21], Hillview property] do not hold heritage significance.</p>

Site name	Significance assessment criteria							Level of significance	Statutory requirements	Statement of significance
	A	B	C	D	E	F	G			
Heverlee property [4]								Nil	S139 'Relics Provision' Heritage Act	<p>The potential archaeological materials associated with Heverlee [4], such as former stone wall property boundaries and landscaped gardens, are not considered an important component of or will yield information that will contribute to an understanding of the cultural history of NSW or Ku-ring-gai, nor hold associations with the life or works of a person(s) of importance in NSW or Ku-ring-gai's cultural history. The potential archaeological materials are unlikely to demonstrate aesthetic characteristics or a high degree of creative or technical achievement in NSW or Ku-ring-gai, and they do not hold a strong or special association with a community or cultural group in NSW or Ku-ring-gai for social, cultural or spiritual reasons. The potential archaeological materials are not considered to possess uncommon, rare or endangered aspects of NSW or Ku-ring-gai's cultural history, nor do they demonstrate the principal characteristics of a class in NSW or Ku-ring-gai's cultural places or environments.</p> <p>The potential archaeological materials associated with Heverlee [4] do not hold heritage significance.</p>

Site name	Significance assessment criteria							Level of significance	Statutory requirements	Statement of significance
	A	B	C	D	E	F	G			
Mahratta property [12]								Nil	<p>Section 60, Heritage Act or exemption under the Heritage Act</p> <p>S139 'Relics Provision' Heritage Act</p>	<p>The potential archaeological materials associated with Mahratta [12] (gardens and wall), such as former stone wall property boundaries and landscaped gardens, are not considered an important component of or will yield information that will contribute to an understanding of the cultural history of NSW or Ku-ring-gai, nor hold associations with the life or works of a person(s) of importance in NSW or Ku-ring-gai's cultural history. The potential archaeological materials are unlikely to demonstrate aesthetic characteristics or a high degree of creative or technical achievement in NSW or Ku-ring-gai, and they do not hold a strong or special association with a community or cultural group in NSW or Ku-ring-gai for social, cultural or spiritual reasons. The potential archaeological materials are not considered to possess uncommon, rare or endangered aspects of NSW or Ku-ring-gai's cultural history, nor do they demonstrate the principal characteristics of a class of NSW or Ku-ring-gai's cultural places or environments.</p> <p>The potential archaeological materials associated with Mahratta [12] do not hold heritage significance.</p>

Site name	Significance assessment criteria							Level of significance	Statutory requirements	Statement of significance
	A	B	C	D	E	F	G			
Estha property [15] and sandstone retaining wall in Estha [24]								Nil	<p>Ku-ring-gai LEP 2015 or ISEPP</p> <p>S139 'Relics Provision' Heritage Act</p>	<p>The potential archaeological materials associated with Estha [15] and the sandstone retaining wall [24], such as former stone wall property boundaries and landscaped gardens, are not considered an important component of or will yield information that will contribute to an understanding of the cultural history of NSW or Ku-ring-gai, nor hold associations with the life or works of a person(s) of importance in NSW or Ku-ring-gai's cultural history. The potential archaeological materials are unlikely to demonstrate aesthetic characteristics or a high degree of creative or technical achievement in NSW or Ku-ring-gai, and they do not hold a strong or special association with a community or cultural group in NSW or Ku-ring-gai for social, cultural or spiritual reasons. The potential archaeological materials are not considered to possess uncommon, rare or endangered aspects of NSW or Ku-ring-gai's cultural history, nor do they demonstrate the principal characteristics of a class of NSW or Ku-ring-gai's cultural places or environments.</p> <p>The potential archaeological materials associated with Estha [15] and the sandstone retaining wall [24] do not hold heritage significance.</p>

Site name	Significance assessment criteria							Level of significance	Statutory requirements	Statement of significance
	A	B	C	D	E	F	G			
Kyeamba [17]								Nil	<p>Ku-ring-gai LEP 2015 or ISEPP</p> <p>S139 'Relics Provision' Heritage Act</p>	<p>The potential archaeological materials associated with Kyamba [17], such as former stone wall property boundaries and landscaped gardens, are not considered an important component of or will yield information that will contribute to an understanding of the cultural history of NSW or Ku-ring-gai, nor hold associations with the life or works of a person(s) of importance in NSW or Ku-ring-gai's cultural history. The potential archaeological materials are unlikely to demonstrate aesthetic characteristics or a high degree of creative or technical achievement in NSW or Ku-ring-gai, and they do not hold a strong or special association with a community or cultural group in NSW or Ku-ring-gai for social, cultural or spiritual reasons. The potential archaeological materials are not considered to possess uncommon, rare or endangered aspects of NSW or Ku-ring-gai's cultural history, nor do they demonstrate the principal characteristics of a class of NSW or Ku-ring-gai's cultural places or environments.</p> <p>The potential archaeological materials associated with Kyamba [17] do not hold heritage significance.</p>

Site name	Significance assessment criteria							Level of significance	Statutory requirements	Statement of significance
	A	B	C	D	E	F	G			
Yaamba property [18] and dwarf brick wall [23]								Nil	<p>Ku-ring-gai LEP 2015 or ISEPP</p> <p>S139 'Relics Provision' Heritage Act</p>	<p>The potential archaeological materials associated with Yaamba [18] and dwarf brick wall [23], such as former stone wall property boundaries and landscaped gardens, are not considered an important component of or will yield information that will contribute to an understanding of the cultural history of NSW or Ku-ring-gai, nor hold associations with the life or works of a person(s) of importance in NSW or Ku-ring-gai's cultural history. The potential archaeological materials are unlikely to demonstrate aesthetic characteristics or a high degree of creative or technical achievement in NSW or Ku-ring-gai, and they do not hold a strong or special association with a community or cultural group in NSW or Ku-ring-gai for social, cultural or spiritual reasons. The potential archaeological materials are not considered to possess uncommon, rare or endangered aspects of NSW or Ku-ring-gai's cultural history, nor do they demonstrate the principal characteristics of a class of NSW or Ku-ring-gai's cultural places or environments.</p> <p>The potential archaeological materials associated with the Yaamba [18] and dwarf brick wall [23] do not hold heritage significance.</p>

Site name	Significance assessment criteria							Level of significance	Statutory requirements	Statement of significance
	A	B	C	D	E	F	G			
Milneroyd property [19] and garden feature [22]								Nil	<p>Ku-ring-gai LEP 2015 or ISEPP</p> <p>S139 'Relics Provision' Heritage Act</p>	<p>The potential archaeological materials associated with Milneroyd [19] and the garden feature [22], such as former stone wall property boundaries and landscaped garden areas, are not considered an important component of or will yield information that will contribute to an understanding of the cultural history of NSW or Ku-ring-gai, nor hold associations with the life or works of a person(s) of importance in NSW or Ku-ring-gai's cultural history. The potential archaeological materials are unlikely to demonstrate aesthetic characteristics or a high degree of creative or technical achievement in NSW or Ku-ring-gai, and they do not hold a strong or special association with a community or cultural group in NSW or Ku-ring-gai for social, cultural or spiritual reasons. The potential archaeological materials are not considered to possess uncommon, rare or endangered aspects of NSW or Ku-ring-gai's cultural history, nor do they demonstrate the principal characteristics of a class of NSW or Ku-ring-gai's cultural places or environments.</p> <p>The potential archaeological materials associated with the Milneroyd [19] and the garden feature [22] do not hold heritage significance.</p>

7 Archaeological impact assessment

This archaeological impact assessment has been prepared to address impacts to potential archaeological materials resulting from the proposed redevelopment of the study area.

Several parts of the proposal area may contain archaeological material. Of these, four locations (Hillview complex; west of the intersection of Winton Street and the Pacific Highway; opposite the intersection of Fox Valley Road and the Pacific Highway; Redleaf Avenue) have the potential to hold local heritage value. Several structures [1] [2] [7] [8] [9] [10] [11] dating from the mid- to late-19th century or early 20th century were identified as being or potentially being located or partially located within the proposal area. Potential archaeological material from these structures may include building foundations or footings, underfloor occupation deposits in the area of structure footprints, yard surfaces, secondary deposits from backfilled privies, cesspits or dump pits, and fencing postholes. Should any archaeological remains associated with these structures be encountered during works, they could be a valuable resource in answering research questions relating to the range of accommodation within Wahroonga, Warrawee and Turramurra and the domestic life, practices and consumer choices of the early residents of these areas, such as timber-getters and orchardists, prior to or during the subdivision of the larger estates in the 1880s and 1890s.

It is highly likely that sub-surface archaeological remains have been impacted by 20th century road and infrastructure works involving excavation for road construction and maintenance, and for underground services and cabling within the proposal area. These works are likely to have damaged the integrity of any archaeological material which may be present, such as removal or damage of archaeological deposits and truncating walls or building foundations and footings. This results in a reduced level of research potential for these possible archaeological remains. However, it is possible that the northern portion of the Hillview Precinct at 1334-1340 Pacific Highway, Turramurra NSW, proposed for the compound site may have relatively little disturbance as it has functioned as a driveway and carpark from at least 1943; any introduced fill layers may have preserved sub-surface remains of the shed store structures [9] [10] [11].

Other areas which were identified as possibly containing sub-surface archaeological material have not been considered in this assessment, as they have been assessed as holding no heritage significance and are therefore have low archaeological potential. However, any impacts which may occur within the curtilage of a State heritage item (i.e. Mahratta), regardless of archaeological potential or impacts, will require an exemption or permit from the NSW Heritage Council.

The archaeological impact assessment identifies the level of impact arising from the proposed development and discusses mitigation measures which must be taken to avoid or reduce those impacts.

This section of the report has been prepared in accordance with the Heritage Manual guideline *Statements of Heritage Impact*.⁵⁸

7.1 Proposal details

As described in earlier sections of this report, the proposed works involve intersection improvements, including road widening, additional traffic lanes and medians, clearance of roadside vegetation, reconstruction of retaining walls, and property adjustments and acquisitions. A compound site would also be temporarily established in Lot 6, DP 26828, and Lot 7, DP 214733, which contains several local heritage items as part of the Hillview complex in Turramurra.

The most significant of these proposed works with regards to potential archaeological materials would be:

- the resumption of land
- the demolition and reconstruction of property boundary walls within the curtilage of heritage items
- any sub-surface excavations, particularly within the road reserve (including verges); the proposal would not involve any excavation within the compound area.

7.2 Assessing impact to heritage item(s)

7.2.1 Discussion of heritage impact(s)

The discussion of impacts to heritage can be centered upon a series of questions which must be answered as part of an archaeological impact assessment which frame the nature of impact to a heritage item. The Heritage Manual guideline *Statements of Heritage Impact* includes a series of questions in relation to indicate the criterion which must be answered.⁵⁹ These are:

- *Is the addition sited on any known, or potentially significant archaeological deposits? If so, have alternative positions for the additions been considered?*

⁵⁸ Heritage Office and Department of Urban Affairs & Planning 1996

⁵⁹ *ibid*

- *Is the development sited on any known, or potentially significant archaeological deposits? If so, have alternative sites been considered? Why were they rejected?*
- *Are any known or potential archaeological deposits (underground or under floor) affected by the proposed new services?*
- *Are any known or potential archaeological deposits affected by the landscape works? If so, what alternatives have been considered?*

The proposed works may have a number of impacts on the potential archaeological materials within the proposal area. This would largely involve the demolition of existing walls and their reconstruction within the curtilage of heritage items, as well as any sub-surface excavations and vegetation clearance for road works and widening. Some of these walls fall within the curtilage of State and local heritage items. These activities may potentially disturb or destroy any archaeological material or deposits which may be present within the proposal area.

In assessing the proposed works, the questions outlined in the Heritage Manual have been considered to determine if the impacts to potential archaeological resources are acceptable, and to ensure that measures have been taken to mitigate these impacts. Road works, installation of services and infrastructure and urban development undertaken throughout the 20th century may have disturbed or destroyed potential archaeological material within the road reserve and verges. These works are likely to have damaged the integrity of any archaeological material which may be present, such as removal or damage of archaeological deposits and truncating walls or building foundations and footings. As such, the likelihood of encountering intact and undisturbed archaeological remains associated with the former mid- to late-19th century structures [1] [2] [7] which may hold heritage value and contribute to research questions is considered to be low. The impacts of the proposed works to the former mid- to late-19th century structures [1] [2] [7] have been assessed as acceptable. However, there is potential for relatively intact archaeological remains to be present in the north-western and north-eastern portions of the Hillview Precinct at 1334-1340 Pacific Highway, Turramurra NSW, proposed for the compound site. Under the Heritage Act, a person must not disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an excavation permit. It is therefore recommended that no ground disturbance or excavation be permitted within those areas of moderate archaeological potential as indicated in Figure 32, without a s139 excavation exception or s140 excavation permit (as relevant) (see Figure 38).

7.3 Assessment of impacts

An assessment and mitigation of impacts to potential archaeological resources which may hold local heritage significance within the proposal area is presented in **Table 8**. An assessment and mitigation of impacts to landscape of heritage items within and opposite the proposal area is presented in **Table 9**.

Based upon the discussion of impacts to heritage items, impact to these items can be quantified under three main categories: direct impacts, indirect impacts and no impact. These kinds of impacts are dependent on the proposed impacts, nature of the heritage item and its associated curtilage.

Direct impacts

Direct impacts are where the completion of the proposed development will result in a physical loss or alteration to a heritage item which will impact the heritage value or significance of the place. Direct impacts can be divided into whole or partial impacts. Whole impacts essentially will result in the removal of a heritage item as a result of the development whereas partial impacts normally constitute impacts to a curtilage or partial removal of heritage values. For the purposes of this assessment direct impacts to heritage items have been placed into the following categories:

- Physical impact - whole: where the development will have a whole impact on a heritage item resulting in the complete physical loss of significance attributed to the item.
- Physical impact - partial: where the project will have a partial impact on an item which could result in the loss or reduction in heritage significance. The degree of impact through partial impacts is dependent on the nature and setting of a heritage item. Typically these impacts are minor impacts to a small proportion of a curtilage of an item or works occurring within the curtilage of a heritage item which may impact on its setting (i.e. gardens and plantings).

Indirect impacts

Indirect impacts to a heritage item relate to alterations to the environment or setting of a heritage item which will result in a loss of heritage value. This may include permanent or temporary visual, noise or vibration impacts caused during construction and after the completion of the development. Indirect impacts diminish the significance of an item through altering its relationship to its surroundings; this in turn impacts its ability to be appreciated for its historical, functional or aesthetic values.

Cumulative impacts

Cumulative impacts relate to minimal or gradual impacts from a single or multiple developments upon heritage values. A cumulative impact would constitute a minimal impact being caused by the proposed development which over time may result in the partial or total loss of heritage value to the study area or associated heritage item. Cumulative impacts may need to be managed carefully over the prolonged period of time.

No impact

This is where the project does not constitute a measurable direct or indirect impact to the heritage item.

Table 8 Assessment of impacts to potential archaeological material within the proposal area

Area of potential archaeological resource	Significance	Archaeological potential	Probably impact	Mitigation measures
Hut [1]	Local	Low	Indirect – vibration during works	Roads and Maritime Unexpected Heritage Items Procedure (see Recommendation 1)
Structure [2]	Local	Low	Indirect – vibration during works	Roads and Maritime Unexpected Heritage Items Procedure (see Recommendation 1)
Structure [7]	Local	Low	Indirect – vibration during works	Roads and Maritime Unexpected Heritage Items Procedure (see Recommendation 1)
Shed store structures [8] [9] [10] [11]	Local	Moderate	Indirect – vibration during works	Disturbance or excavation of areas of moderate archaeological potential not permitted without a s139 excavation exception or s140 excavation permit (see Recommendation 2).



- Legend**
- Compound area
 - Areas where no ground disturbance or excavation is permitted without a s140 excavation permit

Figure 38 Areas where no ground disturbance or excavation is permitted without a S140 excavation permit

0 10 20 30 40 50
Metres
Scale: 1:1,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56

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Table 9 Assessment of landscape impacts to Heritage Listed items within and opposite the proposal area

Landscape items	Significance	Landscape impact	Probable impact	Mitigation measures (all to be carried out in consultation with property owners in consultation with RMS) (Refer Recommendations Section)
1976 Estha gateposts,,wall and gardens	Local	Moderate aesthetic significance	Indirect	Gateposts to be protected during construction Reinstatement of wall and garden beds Refer Recommendation 3
11008 'Redleaf' Dwelling House & Grounds	Local	Moderate aesthetic significance	Direct	Garden reinstatement and tree canopy enhancement Refer Recommendation 3
1969 Dwelling House	Local	Negligible	Indirect	None required
1967 Dwelling House	Local	Negligible	Indirect	None required
1966 Kyeamba' Dwelling House (and garden)	Local	Moderate aesthetic significance	Direct	Boundary wall, garden reinstatement and tree canopy enhancement Refer Recommendation 3
1965 Yaamba' Dwelling House (and garden)	Local	Moderate	Direct	Boundary fence garden reinstatement and tree canopy enhancement Refer Recommendation 3
Curtilage Park (part of Mahratta Heritage listing)	Local	Moderate	Direct	Reinstatement of walls, garden beds and accessible paths and tree canopy enhancement Refer Recommendation 3
708 1964 1913 Mahratta' Site & Dwelling House	State	Moderate historic significance. High aesthetic significance	Direct	Reinstatement of wall, garden beds and accessible paths. Tree canopy enhancement Refer Recommendation 3
No. 1160 – Dwelling House 1458 Pacific Highway, Turrumurra NSW, Lot A, DP 374006.	Local	Moderate aesthetic impact	Direct	Reinstatement of wall, garden beds and accessible paths. Tree canopy enhancement Refer Recommendation 3
11059 Inglewood' Dwelling House	Local	Negligible	Indirect	None required

Landscape items	Significance	Landscape impact	Probable impact	Mitigation measures (all to be carried out in consultation with property owners in consultation with RMS) (Refer Recommendations Section)
I167 Milneroyd' Residential Flat Building	State	Negligible	Indirect	None required
I160 Dwelling House	Local	Negligible	Indirect	None required
I157 Former Commonwealth Bank Building	Local	Negligible	Indirect	None required
I158 Commercial Buildings	Local	Negligible	Indirect	None required
3490028 Hillview Garages & Precinct	State	Moderate aesthetic significance (during use as a compound site only)	Direct	Reinstatement of sandstone entry gate posts and walls Reinstatement of any ground covers, and turf as required. Refer Recommendation 4
I154 Masonic Temple	Local	Negligible	Indirect	None required
I143 Dwelling House	Local	Negligible	Indirect	None required

7.4 Impact assessment statement

7.4.1 Impact to Archaeological Values

The proposed works as part of the project would involve road widening, additional traffic lanes and medians, clearance of roadside vegetation, reconstruction of retaining walls and property adjustments and acquisitions. A compound site would also be established in Lot 6, DP 26828, and Lot 7, DP 214733, which contains several local heritage items as part of the Hillview complex in Turrumurra. The most significant of these with regards to potential archaeological materials would be the resumption of land, demolition and reconstruction of property boundary walls within the curtilage of heritage items, and any sub-surface excavations, particularly within the road reserve (including verges). The proposal would not involve any excavation within the compound area.

It has been assessed that there is low potential for archaeological resources to be present throughout the proposal area, with two areas of moderate potential within the Hillview complex proposed for the compound site. Five areas have been identified which have the potential to hold local heritage significance: the former hut [1]; a former structure [2]; another former structure [7] and four former shed / store structures [8] [9] [10] [11] within the proposed compound site within the Hillview complex. The likelihood of encountering undisturbed archaeological resources for the hut [1] and structures [2] [7] is considered low due to potential disturbances resulting from earlier road works in establishing and maintaining the Pacific Highway from the 1920s onwards. These previous works are likely to have damaged the integrity of any archaeological material which may be present, such as removal or damage of archaeological deposits and truncating walls or building foundations and footings, resulting in a reduced level of research potential for these possible archaeological remains. However, should undisturbed archaeological remains associated with these former structures [1] [2] [7] be present, they have the potential to hold local heritage significance. The impact to these areas has been assessed as acceptable, provided that an Unexpected Finds Policy is implemented to record any archaeological materials which may be encountered during works.

Due to potentially low levels of disturbance within the north-western and north-eastern portions of the Hillview complex proposed for the compound site, there is moderate potential to find relatively intact archaeological remains of three former shed store structures [9] [10] [11] and associated deposits and features in this location. Disturbance to a further structure [8] has not been assessed due to inaccessibility for inspection. Should undisturbed archaeological remains associated with these former structures [8] [9] [10] [11] be present, they have the potential to hold local heritage significance. Under the Heritage Act, a person must not disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an

excavation permit. It is therefore recommended that no ground disturbance or excavation be permitted within those areas of moderate archaeological potential as indicated in Figure 37.4, without a s139 excavation exception or s140 excavation permit (as relevant) (see Figure 38). The current wall and gate posts at the northern boundary of the Hillview complex are proposed be temporarily relocated to enable the access of heavy goods vehicles into the proposed compound site. Should any planned works associated with the removal or reinstatement of the wall involve the disturbance or excavation of the land contained within the area of moderate potential, a s139 excavation exception or s140 excavation (as relevant) permit will be required and archaeological monitoring undertaken during both the removal and reinstatement of the wall.

7.4.2 Impact to Landscape Values

The potential widening of the Pacific Highway in the three intersection locations identified in this report would have impacts to the landscape values of the locally heritage items directly affected by the proposed works.

The intersection improvements between Coonanbarra Road and Redleaf Avenue would impact the former Redleaf property now known as the Thomas and Rosetta Agst Aged Care Facility. The sandstone wall on the northern and eastern extents of this property would need to be removed and replaced closing to the existing building on this property and all the plantings on the slope removed for re-grading. Vegetation would need to replace the existing vegetation screening that would be removed in this location. This should be a mixture of trees, shrubs and ground cover vegetation.

The intersection location with the most landscape heritage impact is the road widening proposed for the Fox Valley Road intersection improvements.

Boundary fences and gardens would be impacted with significant tree removals within the gardens of Kyeamba, Yaamba, Curtilage Park and Mahratta. The reinstatement of boundary walls would also be required to emulate the character and construction of the existing fences and walls and maintain the aesthetic qualities of the western boundary. These actions will positively contribute to mitigating the proposed works.

The level of impact of the proposed works on the landscape and designs by Paul Sorensen in the Mahratta landscape is assessed as a moderate impact because Mahratta is a large garden and many elements that Sorensen designed such as the Sunken Garden and other shrubberies remain intact and are not affected by the proposal. To maintain historic significance, consideration should be given to the loss of vegetation, and considering infill plantings in the garden that emulate Sorensen's style. These actions should be considered by RMS in consultation with the site owners. The remaining areas of the

Mahratta garden should be enhanced to retain the historic significance of Paul Sorensen's work in the garden.

Although the new brick wall is proposed to replace the old brick wall, the impact locating the wall closer to the garden with limited opportunity for planting beds in front does have a moderate aesthetic impact. The high level of proposed impact to aesthetic significance is due to the substantial loss of trees on the eastern boundary and the overall impact this has on the screening of the eastern façade of the house and the garden. The removal of the eastern boundary planting bed means that the opportunities to replant trees and vegetation close to the eastern boundary is limited.⁶⁰ Consideration should be given to a tree and vegetation strategy to reinstate the tree canopy. These actions will positively contribute to mitigating the proposed works.

The Finlay Road intersection improvements affects one property - 1548 Pacific Highway where boundary fence and planting will be impacted by the works and would need to be reinstated. This would positively contribute to mitigating the proposed works.

The loss and reinstatement of trees across the entire proposal area would need to be addressed through replacement tree plantings within all gardens affected by the proposed road widening. It is essential that tree plantings are a mix of native and exotic vegetation, and where possible, advanced tree stock should be considered and implemented where possible to ensure reinstatement of the tree canopy along the impacted road corridor.

Roads and Maritime are proposing the temporary use of Hillview Community Health Centre (formerly Hillview Garages & Precinct) – Items 1155 and 1156: as a construction compound. The use of the site would include car parking, materials and equipment storage, stockpile areas and temporary office buildings.

The proposal for compound activities on the site are temporary and additional hardstand areas to accommodate activities such as vehicle manoeuvring would be laid down. The compound would be

⁶⁰ Phillips Marler and Biosis Pty Ltd, Statement of Heritage Impact for State Significant Heritage Item No. 708 'Mahratta', 1526 Pacific Highway, Wahroonga, 2018

fenced and unauthorised vehicle and pedestrian access would be controlled. The site would be reinstated when works are complete.

It is proposed that the sandstone entry gate posts and part of the boundary wall may need to be removed to allow access for larger vehicles. The gate posts and the wall are intended on being reinstated at the end of the works.

Activities such as site office, general parking and storage of materials would need to be carefully located to avoid the tree roots and canopies of trees and trampling of garden beds and vegetation where possible.

As no excavations are being considered or utility relocations, ground disturbance should be minimal. Proposed concrete wash outs, storage of fuel and refueling operations should be managed to avoid spills.

The works do not propose to remove trees at the proposed compound site. Tree trimming should be kept to a minimum where possible with only 10 per cent of the tree canopy removed from any tree that requires trimming. Garden beds and lawns that may be affected by the works should be re-instated with ground covers and shrubs as required.

8 Recommendations

These recommendations have been formulated to respond to client requirements and the significance of the site. They are guided by the ICOMOS *Burra Charter* with the aim of doing as much as necessary to care for the place and make it useable and as little as possible to retain its cultural significance.⁶¹

Recommendation 1 Heritage Management Plan for Construction

A Heritage Management Plan (HMP) should be prepared for the proposal area as a whole (as part of the Construction Environmental Management Plan (CEMP)) to mitigate any construction-related impacts to these areas and their wider heritage curtilage during construction.

A key objective of the HMP would be to ensure that any impacts to heritage values / features of the Mahratta site during construction are minimised and carried out within the scope permitted by the approval instruments.

The HMP should include (as a minimum):

- Purpose and objectives for the protection and management of the study area during construction
- Acknowledgement of relevant legislative requirements and guidelines, including any conditions of approval and permits
- Details on any necessary pre-construction consultation and landowner approvals
- Details on the construction activities to be undertaken and proposed construction methodology
- Heritage management and mitigation measures to be applied during construction (such as staff training, implementation of unexpected finds procedures, proposed access, work method statements, exclusion zones and setback areas, proposed reinstatement works)
- Compliance management including roles and responsibilities, staff training, monitoring, inspections, auditing and reporting

⁶¹ Australia ICOMOS 2013

The HMP should make specific reference to the heritage assessment prepared for the Project REF and any conditions of approval outlined by State agencies. The HMP must be prepared by a suitably qualified heritage specialist.

Unexpected Heritage Items

The HMP must include a procedure for the management of unexpected potential archaeological relics discovered during construction. The management of unexpected potential archaeological relics must be in accordance with Roads and Maritime's "Unexpected Heritage Items" documentation (refer Appendix 1). The procedure for unexpected finds must include the following steps:

- (a) Cease work in the immediate area of the identified potential heritage object immediately;
- (b) Notify Roads and Maritime immediately;
- (c) Provide access to the affected works area to any heritage specialist to assess the finds;
- (d) Provide temporary exclusion (pedestrian) fencing;
- (e) Implement additional safeguards as required.

The Non-Aboriginal Heritage Management Plan must provide for all personnel working within the study area on their responsibilities under the Heritage Act. Make personnel aware of all non-Aboriginal heritage sites/areas including cultural plantings and areas of archaeological potential, which are identified in the Environmental Assessment documents provided in the REF.

Where the remains are identified as being 'relics', the Heritage Council of NSW must be notified in accordance with section 146 of the Heritage Act. Failure to notify the Heritage Council is considered an offence under the Heritage Act, with penalties including fines and imprisonment. After contacting the Heritage Council, a permit or exemption should be sought under the relevant section of the Heritage Act to allow works to recommence.

All Aboriginal objects and places are protected under the *National Parks and Wildlife Act 1974*. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the OEH. If the find is determined to be an Aboriginal object, the archaeologist will provide further recommendations. These may include notifying the OEH and Aboriginal stakeholders.

Recommendation 2 Avoidance of impacts to former 'Hillview' shed store structures within Compound Site at 1334 Pacific Highway, Turramurra

Under the Heritage Act, a person must not disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an excavation permit. It is recommended that no disturbance or excavation be permitted in areas assessed as holding moderate archaeological potential as part of a Construction Heritage Management Sub-Plan (Recommendation 1) (see Figure 38). The location and significance of

the potential archaeological remains should also be referenced in site inductions for all staff and contractors.

Ground disturbance or excavation in areas of moderate archaeological potential would only be permitted with a s139 excavation exception or s140 excavation permit (as relevant). Should the temporary relocation and reinstatement of the northern boundary wall of the Hillview complex be required and also involve disturbance or excavation in the area of moderate archaeological potential, a s139 excavation exception or s140 excavation permit (as relevant) will be required to undertake these works. Depending on the scale of works, archaeological monitoring or excavation may be required to identify and assess the significance of any archaeological material encountered during these works.

Recommendation 3 Property Adjustment works - reinstatement of boundary walls and vegetation - former Estha 1614-1634, Pacific Highway, Wahroonga, Kyeamba 1548 Pacific Highway Wahroonga, Yaamba 1544 Pacific Highway Wahroonga, Curtilage Park 1534 Pacific Highway Wahroonga, Mahratta, 1526 Pacific Highway, Wahroonga and Dwelling House, 1548 Pacific Highway, Warrawee

Property adjustments should include reinstatement of boundary walls, trees and vegetation within the boundaries to all the above properties. The properties will be reinstated in consultation with property owners and RMS.

Recommendation 4 Former Hillview Community Health Centre (formerly Hillview Garages & Precinct) 1334 - 1440 Pacific Highway, Turramurra - Reinstatement of entry posts, walls, gardens and lawn within the proposed compound site

If the landscape of this property is removed during construction the reinstatement should include the following:

- The front entry walls and gates should be photographed by an appropriate heritage specialist in accordance with NSW Heritage guidelines. The dismantled stonework should be stored safely in an appropriate location. When the wall and gates are reinstated the reconstruction of the stonework should match the original as closely as possible.
- If the turf areas across the lawn are impacted and the ground compacted, then the ground should be de-compacted, and the turf reinstated to match existing. Garden beds and planting affected by the compound site activities should be re-instated with soil improvements, and ground covers, and shrubs as required.

Recommendation 5 Tree Canopy Enhancement Plan

The potential loss of vegetation within private property and the road corridor with the loss of large tree species would be widespread throughout all of the sections of proposed road widening. The cumulative effect of the potential canopy loss would impact on the aesthetic significance of the Pacific Highway as a historic tree lined corridor. A Tree Canopy Replacement Plan would review the species to be removed and recommend locations, species and sizes of replacement trees to mitigate potential losses.

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Appendices

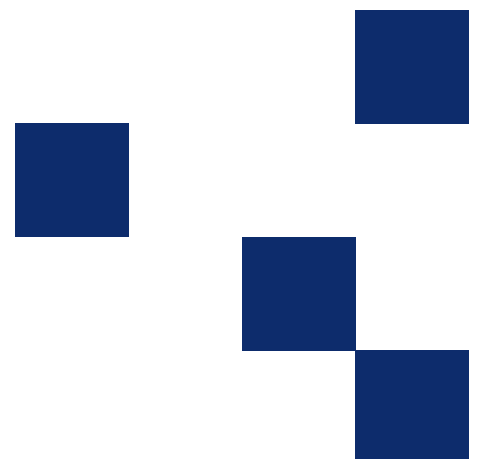
Appendix 1 Roads and Maritime Unexpected Heritage Items Procedure



STANDARD MANAGEMENT PROCEDURE

Unexpected Heritage Items

March 2015



About this release

RMS/ISBN numbers	RMS 12.003 ISBN 9781922040305
Title	Unexpected Heritage Items Procedure

Approval and authorisation		Name
Prepared by	Environmental Officer (Heritage)	Gretta Logue
Revised by	Environmental Officer (Heritage)	Daniel Percival
Approved by	Manager Environmental Policy	Michael Crowley

File location	File name
Objective - SF2013/153770	Unexpected heritage items procedure.doc

Document status	Date
Final	16 March 2015

Version	Date	Revision Description
Final	1 November 2011	First Draft
Revised	23 July 2012	Amended to reflect that (a) unexpected finds do not include items covered by a relevant approval; (b) Aboriginal people must be consulted where an unexpected find is likely to be an Aboriginal object; (c) the Department of Planning and Environment must be notified in accordance with Step 5 of this procedure for Part 3A and Part 5.1 projects.
Revised	09 October 2013	Amended to clarify that the procedure applies to all types of unexpected heritage items, not just archaeological items. The procedure introduces the term 'Historic Items' to cover both 'archaeological relics' and 'other historic items' such as works, structures, buildings and movable objects. The title of the document has been amended to better reflect this clarification.
Revised	16 March 2015	The procedure was streamlined to address all project types including maintenance works. The separate maintenance procedure (formerly Appendix B) was removed. Names and titles updated throughout.

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Please note

This procedure applies to all development and activities concerning roads, road infrastructure and road related assets undertaken by Roads and Maritime.

For advice on how to manage unexpected heritage items as a result of activities related to maritime infrastructure projects, please contact the Senior Environmental Specialist (Heritage).

Contents

About this release	2
1. Purpose	2
2. Scope.....	2
3. Types of unexpected heritage items and their legal protection	3
3.1 Aboriginal objects	3
3.2 Historic heritage items	4
3.3 Human skeletal remains	5
4. Responsibilities	7
5. Acronyms.....	8
6. Overview of the procedure	9
7. Unexpected heritage items procedure.....	10
8. Seeking advice.....	19
9. Related information	19
10. List of appendices.....	20
Appendix A	21
Identifying unexpected heritage items	21
Appendix B	27
Unexpected heritage item recording form 418.....	27
Appendix C	30
Photographing unexpected heritage items	30
Appendix D	32
Key environmental contacts	32
Appendix E	33
Uncovering bones	33
Appendix F	37
Archaeological/heritage advice checklist	37
Appendix G	39
Template notification letter	39

Unexpected heritage items procedure

1. Purpose

This procedure has been developed to provide a consistent method for managing unexpected heritage items (both Aboriginal and non-Aboriginal) that are discovered during Roads and Maritime activities. This procedure includes Roads and Maritime's heritage notification obligations under the *Heritage Act 1977* (NSW), *National Parks and Wildlife Act 1974* (NSW), *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth) and the *Coroner's Act 2009* (NSW).

This document provides relevant background information in Section 3, followed by the technical procedure in Sections 6 and 7. Associated guidance referred to in the procedure can be found in Appendices A-H.

2. Scope

This procedure assumes that an appropriate level of Aboriginal and non-Aboriginal heritage assessment has been undertaken prior to on site project work commencing. In some case, such as exempt development, detailed heritage assessment may not be required.

Despite appropriate and adequate investigation, unexpected heritage items may still be discovered during maintenance and construction works. When this happens, this procedure must be followed. This procedure provides direction on when to stop work, where to seek technical advice and how to notify the regulator, if required.

This procedure applies to all Road and Maritime construction and maintenance activities

This procedure **applies to**:

- The discovery of any unexpected heritage item (usually during construction), where Roads and Maritime does not have approval to disturb the item or where safeguards for managing the disturbance (apart from this procedure) are not contained in the environmental impact assessment.
- All Roads and Maritime projects that are approved or determined under Part 3A (including Transitional Part 3A Projects), Part 4, Part 5 or Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), or any development that is exempt under the Act.

This procedure must be followed by Roads and Maritime staff, alliance partners (including local council staff working under Road Maintenance Council Contracts, [RMCC]), developers under works authorisation deeds or any person undertaking Part 5 assessment for Roads and Maritime.

This procedure **does not apply** to:

- The legal discovery and disturbance of heritage items as a result of investigations being undertaken in accordance with OEH's *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (2010); an Aboriginal Heritage Impact Permit (AHIP) issued under the *National Parks and Wildlife Act*

1974; or an approval issued under the *Heritage Act 1977*¹.

- The legal discovery and disturbance of heritage items as a result of investigations (or other activities) that are required to be carried out for the purpose of complying with any environmental assessment requirements under Part 3A (including Transitional Part 3A Projects) or Part 5.1 of the EP&A Act.
- The legal discovery and disturbance of heritage items as a result of construction related activities, where the disturbance is permissible in accordance with an AHIP²; an approval issued under the *Heritage Act 1977*; the Minister for Planning's conditions of project approval; or safeguards (apart from this procedure) that are contained in the relevant environmental impact assessment.

All construction environment management plans (CEMPs) must make reference to and/or include this procedure (often included as a heritage sub-plan). Where approved CEMPs exist they must be followed in the first instance. Where there is a difference between approved CEMPs and this procedure, the approved CEMP must be followed. Where an approved CEMP does not provide sufficient detail on particular issues, this procedure should be used as additional guidance. When in doubt always seek environment and legal advice on varying approved CEMPs.

3. Types of unexpected heritage items and their legal protection

The roles of project, field and environmental staff are critical to the early identification and protection of unexpected heritage items. **Appendix A** illustrates the wide range of heritage discoveries found on Roads and Maritime projects and provides a useful photographic guide. Subsequent confirmation of heritage discoveries must then be identified and assessed by technical specialists (usually an archaeologist).

An 'unexpected heritage item' means any unanticipated discovery of an actual or potential heritage item, for which Roads and Maritime does not have approval to disturb³ or does not have a safeguard in place (apart from this procedure) to manage the disturbance.

These discoveries are categorised as either:

- (a) Aboriginal objects
- (b) Historic (non-Aboriginal) heritage items
- (c) Human skeletal remains.

The relevant legislation that applies to each of these categories is described below.

3.1 Aboriginal objects

The *National Park and Wildlife Act 1974* protects *Aboriginal objects* which are defined as:

¹ RMS' heritage obligations are incorporated into the conditions of heritage approvals.

² RMS *Procedure for Aboriginal cultural heritage consultation and investigation* (2011) recommends that Part 4 and Part 5 projects that are likely to impact Aboriginal objects during construction seek a whole-of-project AHIP. This type of AHIP generally allows a project to impact known and potential Aboriginal objects within the entire project area, without the need to stop works. It should be noted that an AHIP may exclude impact to certain objects and areas, such as burials or ceremonial sites. In such cases, the project must follow this procedure.

³ Disturbance is considered to be any physical interference with the item that results in it being destroyed, defaced, damaged, harmed, impacted or altered in any way (this includes archaeological investigation activities).

“any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non Aboriginal extraction, and includes Aboriginal remains”⁴.

Examples of Aboriginal objects include stone tool artefacts, shell middens, axe grinding grooves, pigment or engraved rock art, burials and scarred trees.

IMPORTANT!

All Aboriginal objects, regardless of significance, are protected under law.

If any impact is expected to an Aboriginal object, an Aboriginal Heritage Impact Permit (AHIP) is usually required from the Office of Environment and Heritage (OEH)⁵. Also, when a person becomes aware of an Aboriginal object they must notify the Director-General of OEH about its location⁶. Assistance on how to do this is provided in Section 7 (Step 5).

3.2 Historic heritage items

Historic (non-Aboriginal) heritage items may include:

- Archaeological ‘relics’
- Other historic items (i.e. works, structures, buildings or movable objects).

3.2.1 Archaeological relics

The *Heritage Act 1977* protects *relics* which are defined as:

“any deposit, artefact, object or material evidence that relates to the settlement of the area that comprises NSW, not being Aboriginal settlement; and is of State or local heritage significance”⁷.

Relics are archaeological items of local or state significance which may relate to past domestic, industrial or agricultural activities in NSW, and can include bottles, remnants of clothing, pottery, building materials and general refuse.

⁴ Section 5(1) *National Park and Wildlife Act 1974*.

⁵ Except when Part 3A, Division 4.1 of Part 4 or Part 5.1 of the *EP&A Act* applies.

⁶ This is required under s89(A) of the *National Park and Wildlife Act 1974* and applies to **all projects** assessed under Part 3A, Part 4, Part 5 and Part 5.1 of the *EP&A Act*, including exempt development.

⁷ Section 4(1) *Heritage Act 1977*.

IMPORTANT!

All relics are subject to statutory controls and protections.

If a relic is likely to be disturbed, a heritage approval is usually required from the NSW Heritage Council⁸. Also, when a person discovers a relic they must notify the NSW Heritage Council of its location⁹. Advice on how to do this is provided in Section 7 (Step 5).

3.2.2 Other historic items

Some historic heritage items are not considered to be ‘relics’; but are instead referred to as works, buildings, structures or movable objects. Examples of these items that Roads and Maritime may encounter include culverts, historic road formations, historic pavements, buried roads, retaining walls, tramlines, cisterns, fences, sheds, buildings and conduits. Although an approval under the *Heritage Act 1977* may not be required to disturb these items, their discovery must be managed in accordance with this procedure.

As a general rule, an archaeological relic requires discovery or examination through the act of excavation. An archaeological excavation permit under Section 140 of the *Heritage Act 1977* is required to do this. In contrast, ‘other historic items’ either exist above the ground’s surface (e.g. a shed), or they are designed to operate and exist beneath the ground’s surface (e.g. a culvert).

Despite this difference, it should be remembered that relics can often be associated with ‘other heritage items’, such as archaeological deposits within cisterns and underfloor deposits under buildings.

3.3 Human skeletal remains

Human skeletal remains can be identified as either an Aboriginal object or non-Aboriginal relic depending on ancestry of the individual (Aboriginal or non-Aboriginal) and burial context (archaeological or non-archaeological). Remains are considered to be archaeological when the time elapsed since death is suspected of being 100 years or more. Depending on ancestry and context, different legislation applies.

As a simple example, a pre-contact archaeological Aboriginal burial would be protected under the *National Park and Wildlife Act 1974*, while a historic (non-Aboriginal) archaeological burial within a cemetery would be protected under the *Heritage Act 1977*. For these cases, the relevant heritage approval and notification requirements described in the above sections 3.1 and 3.2 would apply. In addition to the *National Park and Wildlife Act 1974*, finding Aboriginal human remains also triggers notification requirements to the Commonwealth Minister for the Environment under s20(1) of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth).

⁸ Except when Part 3A, Division 4.1 of Part 4 or Part 5.1 of the *EP&A Act* applies.

⁹ This is required under s146 of the *Heritage Act 1977* and applies to **all projects** assessed under Part 3A, Part 4, Part 5 and Part 5.1 of the *EP&A Act*, including exempt development.

 **IMPORTANT!**

All human skeletal remains are subject to statutory controls and protections.

All bones must be treated as potential human skeletal remains and work around them must stop while they are protected and investigated urgently.

However, where it is suspected that less than 100 years has elapsed since death, the human skeletal remains come under the jurisdiction of the State Coroner and the *Coroners Act 2009* (NSW). Such a case would be considered a 'reportable death' and under legal notification obligations set out in s35(2); a person must report the death to a police officer, a coroner or an assistant coroner as soon as possible. This applies to all human remains less than 100 years old¹⁰ regardless of ancestry (ie both Aboriginal and non-Aboriginal remains). Public health controls may also apply.

Guidance on what to do when suspected human remains are found is provided in **Appendix E**.

¹⁰ Under s19 of the *Coroners Act 2009*, the coroner has no jurisdiction to conduct an inquest into reportable death unless it appears to the coroner that (or that there is reasonable cause to suspect that) the death or suspected death occurred within the last 100 years.

4. Responsibilities

The following roles and responsibilities are relevant to this procedure.

Role	Definition/responsibility
Aboriginal Cultural Heritage Advisor (ACHA)	Provides Aboriginal cultural heritage advice to project teams. Acts as Aboriginal community liaison for projects on cultural heritage matters. Engages and consults with the Aboriginal community as per the Roads and Maritime <i>Procedure for Aboriginal Cultural Heritage Consultation and Investigation</i> .
Aboriginal Sites Officer (ASO)	Is an appropriately trained and skilled Aboriginal person whose role is to identify and assess Aboriginal objects and cultural values. For details on engaging Aboriginal Sites Officers, refer to Roads and Maritime <i>Procedure for Aboriginal Cultural Heritage Consultation and Investigation</i> .
Archaeologist (A)	Professional consultant, contracted on a case-by-case basis to provide heritage and archaeological advice and technical services (such as reports, heritage approval documentation etc). Major projects with complex heritage issues often have an on call Project archaeologist.
Project Manager (PM)	Ensures all aspects of this procedure are implemented. The PM can delegate specific tasks to a construction environment manager, Roads and Maritime site representatives or regional environment staff, where appropriate.
Regional Environment Staff (RES)	Provides advice on this procedure to project teams. Ensuring this procedure is implemented consistently by supporting the PM. Supporting project teams during the uncovering of unexpected finds. Reviewing archaeological management plans and liaising with heritage staff and archaeological consultants as needed.
Registered Aboriginal Parties (RAPs)	RAPs are Aboriginal people who have registered with Roads and Maritime to be consulted about a proposed Roads and Maritime project or activity in accordance with OEH's Aboriginal cultural heritage consultation requirements for proponents (2010).
Senior Environmental Specialist (Heritage) (SES(H))	Provides technical assistance on this procedure and archaeological technical matters, as required. Reviewing the archaeological management plans and facilitating heritage approval applications, where required. Assists with regulator engagement, where required.
Team Leader - Regional Maintenance Delivery (TL-RMD)	Ensures Regional Maintenance Delivery staff stop work in the vicinity of an unexpected heritage item. Completes Unexpected Heritage Item Recording Form 418 and notifies WS-RMD.
Technical Specialist	Professional consultant contracted to provide specific technical advice that relates to the specific type of

	unexpected heritage find (eg a forensic or physical anthropologist who can identify and analyse human skeletal remains).
Works Supervisor - Regional Maintenance Delivery (WS-RMD)	Ensures Regional Maintenance Delivery staff are aware of this procedure. Supports the Team Leader - Regional Maintenance Delivery during the implementation of this procedure and ensures reporting of unexpected heritage items through environment management systems.

5. Acronyms

The following acronyms are relevant to this procedure.

Acronym	Meaning
A	Archaeologist
ACHA	Aboriginal Cultural Heritage Advisor
AHIP	Aboriginal Heritage Impact Permit
ASO	Aboriginal Site Officer
CEMP	Construction Environment Management Plan
OEH	Office of Environment and Heritage.
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PM	Project Manager
RAP	Registered Aboriginal Parties
RES	Regional Environmental Staff
SES(H)	Senior Environmental Specialist (Heritage)
TL-RMD	Team Leader – Regional Maintenance Division
RMD	Regional Maintenance Delivery
RMS	Roads and Maritime
WS-RMD	Works Supervisor - Regional Maintenance Division

6. Overview of the procedure

On discovering something that could be an unexpected heritage item ('the item'), the following procedure must be followed. There are eight steps in the procedure. These steps are summarised in **Figure 1** below and explained in detail in Section 7.

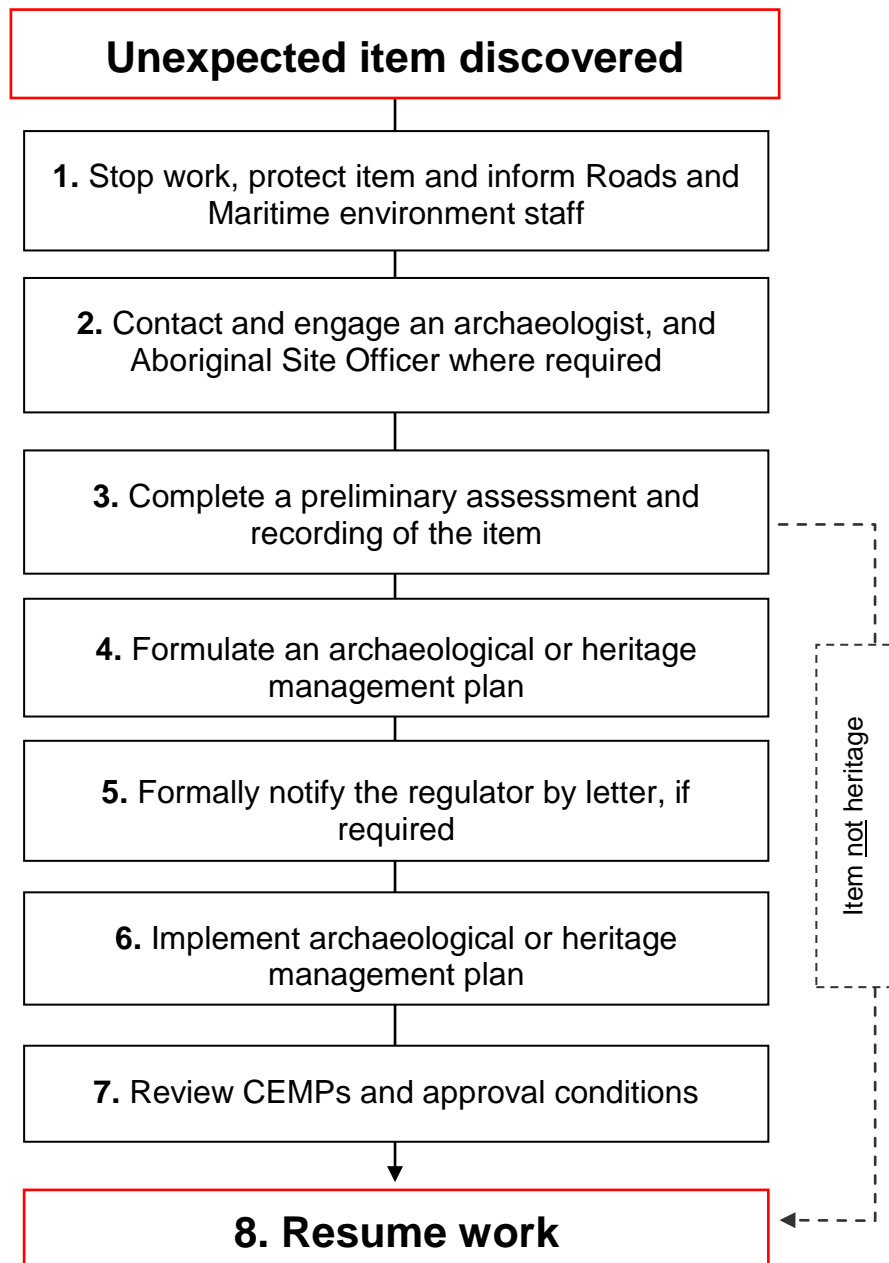


Figure 1: Overview of steps to be undertaken on the discovery of an unexpected heritage item.

IMPORTANT!

RMS may have approval or specific safeguards in place (apart from this procedure) to impact on certain heritage items during construction. If you discover a heritage item and you are unsure whether an approval or safeguard is in place, STOP works and follow this procedure.

7. Unexpected heritage items procedure

Table 1: Specific tasks to be implemented following the discovery of an unexpected heritage item.

Aboriginal Cultural Heritage Advisor (ACHA); Aboriginal Sites Officer (ASO); Archaeologist (A); Project Manager (PM); Regional Environment Staff (RES); Registered Aboriginal Parties (RAPs); Senior Environmental Specialist (Heritage) (SES(H)); Team leader – Roads and Maintenance Division (TL - RMD); Works supervisor – Roads and Maintenance Division (WS - RMD).

Step	Task	Responsibility	Guidance & Tools
1	Stop work, protect item and inform Roads and Maritime environment staff		
1.1	Stop all work in the immediate area of the item and notify the Project Manager or Team Leader-RMD. (For maintenance activities, the Team Leader is to also notify the Works Supervisor-RMD)	All	Appendix A (Identifying Unexpected Heritage items)
1.2	Establish a 'no-go zone' around the item. Use high visibility fencing, where practical.	PM or TL-RMD	
1.3	Inform all site personnel about the no-go zone. No further interference, including works, ground disturbance, touching or moving the item must occur within the no-go zone.	PM or TL-RMD	
1.4	Inspect, document and photograph the item using 'Unexpected Heritage Item Recording Form 418'.	PM or TL-RMD	Appendix B (Unexpected Heritage Item Recording Form 418) Appendix C (Photographing Unexpected Heritage items)

Step	Task	Responsibility	Guidance & Tools
1.5	<p>Is the item likely to be bone?</p> <p>If yes, follow the steps in Appendix E – ‘Uncovering bones’. Where it is obvious that the bones are human remains, you must notify the local police by telephone immediately. They may take command of all or part of the site.</p> <p>If no, proceed to next step.</p>	PM or WS-RMD	Appendix E (Uncovering Bones)
1.6	<p>Is the item likely to be:</p> <p>a) A relic? (A relic is evidence of past human activity which has local or state heritage significance. It may include items such as bottles, utensils, remnants of clothing, crockery, personal effects, tools, machinery and domestic or industrial refuse) and/or</p> <p>b) An Aboriginal object? (An Aboriginal object may include a shell midden, stone tools, bones, rock art or a scarred tree).</p> <p>If yes, proceed directly to Step 1.8</p> <p>If no, proceed to next step.</p>	PM or WS-RMD	Appendix A (Identifying heritage items)
1.7	<p>Is the item likely to be a “work”, building or standing structure? (This may include tram tracks, kerbing, historic road pavement, fences, sheds or building foundations).</p> <p>If yes, can works avoid further disturbance to the item? (E.g. if historic road base/tram tracks have been exposed, can they be left in place?) If yes, works may proceed without further disturbance to the item. Complete Step 1.8 within 24 hours.</p> <p>If works cannot avoid further disturbance to the item, works must not recommence at this time. Complete the remaining steps in this procedure.</p>	PM or WS-RMD	Appendix A (Identifying heritage items)

Step	Task	Responsibility	Guidance & Tools
1.8	Inform relevant Roads and Maritime Regional Environmental Staff of item by providing them with the completed 'Form 418'.	PM or WS-RMD (RES)	Appendix D (Key Environmental Contacts)
1.9	<p>Regional Environmental Staff to advise Project Manager or Works Supervisor whether RMS has an approval or safeguard in place (apart from this procedure) to impact on the 'item'. (An approval may include an approval under the <i>Heritage Act</i>, the <i>National Parks and Wildlife Act</i> or the <i>Planning and Assessment Act</i>).</p> <p>Does RMS have an approval, permit or appropriate safeguard in place to impact on the item?</p> <p>If yes, work may recommence in accordance with the approval, permit or safeguard. There is no further requirement to follow this procedure.</p> <p>If no, continue to next step.</p>		
1.10	Liaise with Traffic Management Centre where the delay is likely to affect traffic flow.	PM or WS-RMD	
1.11	Report the item as a 'Reportable Event' in accordance with the Roads and Maritime <i>Environmental Incident Classification and Reporting Procedure</i> . Implement any additional reporting requirements related to the project's approval and CEMP, where relevant.	PM or WS-RMD	RMS Environmental Incident Classification and Reporting Procedure
2	Contact and engage an archaeologist and, where required, an Aboriginal site officer		
2.1	<p>Contact the Project (on-call) Archaeologist to discuss the location and extent of the item and to arrange a site inspection, if required. The project CEMP may contain contact details of the Project Archaeologist.</p> <p>OR</p>	PM or WS-RMD (A; RES; SES(H))	Also see Appendix D (Key Environmental Contacts)

Step	Task	Responsibility	Guidance & Tools
	Where there is no project archaeologist engaged for the works, engage a suitably qualified and experienced archaeological consultant to assess the find. A list of heritage consultants is available on the RMS contractor panels on the Buyways homepage. Regional environment staff and Roads and Maritime heritage staff can also advise on appropriate consultants.		<u>Buyways</u>
2.2	Where the item is likely to be an Aboriginal object, speak with your Aboriginal Cultural Heritage Advisor to arrange for an Aboriginal Sites Officer to assess the find. Generally, an Aboriginal Sites Officer would be from the relevant local Aboriginal land council. If an alternative contact person (ie a RAP) has been nominated as a result of previous consultation, then that person is to be contacted.	PM or WS-RMD (ACHA; ASO)	
2.3	If requested, provide photographs of the item taken at Step 1.4 to the archaeologist, and Aboriginal Sites Officer if relevant.	PM or WS-RMD (RES)	Appendix C (Photographing Unexpected Heritage items)
3	Preliminary assessment and recording of the find		
3.1	In a minority of cases, the archaeologist (and Aboriginal Sites Officer, if relevant) may determine from the photographs that no site inspection is required because no archaeological constraint exists for the project (eg <i>the item is not a 'relic', a 'heritage item' or an 'Aboriginal object'</i>). Any such advice should be provided in writing (eg via email) and confirmed by the Project Manager or Works Supervisor - RMD.	A/PM/ASO/ WS-RMD	Proceed to Step 8
3.2	Arrange site access for the archaeologist (and Aboriginal Sites Officer, if relevant) to inspect the item as soon as practicable. In the majority of cases a site inspection is required to conduct a preliminary assessment.	PM or WS-RMD	
3.3	Subject to the archaeologist's assessment (and the Aboriginal Sites Officer's assessment, if relevant), work may recommence at a set distance from the item. This is to protect any other archaeological material that may exist in the vicinity, which has not yet been uncovered. Existing protective fencing established in Step 1.2 may need to be adjusted to	A/PM/ASO/ WS-RMD	

Step	Task	Responsibility	Guidance & Tools
	reflect the extent of the newly assessed protective area. No works are to take place within this area once established.		
3.4	The archaeologist (and Aboriginal Sites Officer, if relevant) may provide advice after the site inspection and preliminary assessment that no archaeological constraint exists for the project (<i>eg the item is not a 'relic', a 'heritage item' or an 'Aboriginal object'</i>). Any such advice should be provided in writing (eg via email) and confirmed by the Project Manager or Works Supervisor - RMD.	A/PM/ASO/ WS-RMD	Proceed to Step 8
3.5	Where required, seek additional specialist technical advice (such as a forensic or physical anthropologist to identify skeletal remains). Regional environment staff and/or Roads and Maritime heritage staff can provide contacts for such specialist consultants.	RES/SES(H)	Appendix D (Key Environmental Contacts)
3.6	Where the item has been identified as a 'relic', 'heritage item' or an 'Aboriginal object' the archaeologist should formally record the item.	A	
3.7	The regulator can be notified informally by telephone at this stage by the archaeologist, Project Manager (or delegate) or Works Supervisor - RMD. Any verbal conversations with regulators must be noted on the project file for future reference.	PM/A/WS-RMD	
4	Prepare an archaeological or heritage management plan		
4.1	The archaeologist must prepare an archaeological or heritage management plan (with input from the Aboriginal Sites Officer, where relevant) shortly after the site inspection. This plan is a brief overview of the following: (a) description of the feature, (b) historic context, if data is easily accessible, (c) likely significance, (d) heritage approval and regulatory notification requirements, (e) heritage reporting requirements, (f) stakeholder consultation requirements, (g) relevance to other project approvals and management plans etc.	A/ASO	Appendix F (Archaeological/ Heritage Advice Checklist)
4.2	In preparing the plan, the archaeologist with the assistance of regional environment staff must review the CEMP, any heritage sub-plans, any conditions of heritage approvals, conditions of project approval (and or Minister's Conditions of Approval) and heritage assessment documentation (eg Aboriginal Cultural Heritage Assessment Report). This will outline if the unexpected item is consistent with previous heritage/project approval(s)	A/RES/PM	Appendix F (Archaeological/ Heritage Advice Checklist)

Step	Task	Responsibility	Guidance & Tools
	and/or previously agreed management strategies. The Project Manager and regional environment staff must provide all relevant documents to the archaeologist to assist with this. Discussions should occur with design engineers to consider if re-design options exist and are appropriate.		
4.3	The archaeologist must submit this plan as a letter, brief report or email to the Project Manager outlining all relevant archaeological or heritage issues. This plan should be submitted to the Project Manager as soon as practicable. Given that the archaeological management plan is an overview of all the necessary requirements (and the urgency of the situation), it should take no longer than two working days to submit to the Project Manager.	A	
4.4	The Project Manager or Works Supervisor must review the archaeological or heritage management plan to ensure all requirements can reasonably be implemented. Seek additional advice from regional environment staff and Roads and Maritime heritage staff, if required.	PM/RES/SES(H)/ WS-RMD	
5	Notify the regulator, if required.		
5.1	Review the archaeological or heritage management plan to confirm if regulator notification is required. Is notification required? If no , proceed directly to Step 6 If yes , proceed to next step.	PM/RES/SES(H)/ WS-RMD	
5.2	If notification is required, complete the template notification letter.	PM or WS-RMD	Appendix G (Template Notification Letter)
5.3	Forward the draft notification letter, archaeological or heritage management plan and the site recording form to regional environment staff and Senior Environmental Specialist (Heritage) for review, and consider any suggested amendments.	PM/RES/SES(H)/ WS-RMD	

Step	Task	Responsibility	Guidance & Tools
5.4	Forward the signed notification letter to the relevant regulator (ie notification of relics must be given to the Heritage Division, Office of Environment and Heritage (OEH), while notification for Aboriginal objects must be given to the relevant Aboriginal section of OEH). Informal notification (via a phone call or email) to the regulator prior to sending the letter is appropriate. The archaeological management plan and the completed site recording form must be submitted with the notification letter. For Part 3A and Part 5.1 projects, the Department of Planning and Environment must also be notified.	PM or WS-RMD	Appendix D (Key Environmental Contacts)
5.5	A copy of the final signed notification letter, archaeological or heritage management plan and the site recording form should be kept on file by the Project Manager or Works Supervisor- RMD and a copy sent to the Senior Environmental Specialist (Heritage).	PM or WS-RMD	
6	Implement archaeological or heritage management plan		
6.1	Modify the archaeological or heritage management plan to take into account any additional advice resulting from notification and discussions with the regulator.	A/PM or WS-RMD (RES)	
6.2	Implement the archaeological or heritage management plan. Where impact is expected, this would include such things as a formal assessment of significance and heritage impact assessment, preparation of excavation or recording methodologies, consultation with registered Aboriginal parties, obtaining heritage approvals etc, if required.	PM or WS-RMD (RAPs and RES)	PACHCI Stage 3
6.3	Where heritage approval is required contact regional environment staff for further advice and support material. Please note time constraints associated with heritage approval preparation and processing. Project scheduling may need to be revised where extensive delays are expected.	PM/RES/WS-RMD	
6.4	For Part 3A/Part 5.1 projects, assess whether heritage impact is consistent with the project approval or if project approval modification is required from the Department of Planning and Environment. Seek advice from regional environment staff and Environment Branch specialist staff if unsure.	PM/RES	

Step	Task	Responsibility	Guidance & Tools
6.5	Where statutory approvals (or project approval modification) are required, impact upon relics and/or Aboriginal objects must not occur until heritage approvals are issued by the appropriate regulator.	PM or WS-RMD	
6.6	Where statutory approval (or Part 3A/Part 5.1 project modification) is not required and where recording is recommended by the archaeologist, sufficient time must be allowed for this to occur.	PM or WS-RMD	
6.7	Ensure short term and permanent storage locations are identified for archaeological material or other heritage material is removed from site, where required. Interested third parties (eg museums or local councils) should be consulted on this issue. Contact regional environment staff and Senior Environmental Specialist (Heritage) for advice on this matter, if required.	PM or WS-RMD	
7	Review CEMPs and approval conditions		
7.1	Check whether written notification is required to be sent to the regulator before re-commencing work. Where this is not explicit in heritage approval conditions, expectations should be clarified directly with the regulator.	PM	
7.2	Update the CEMP, site mapping and project delivery program as appropriate with any project changes resulting from final heritage management (eg retention of heritage item, salvage of item). Updated CEMPs must incorporate additional conditions arising from any heritage approvals, and Aboriginal community consultation if relevant. Include any changes to CEMP in site induction material and update site workers during toolbox talks.	PM	
8	Resume work		
8.1	Seek written clearance to resume project work from regional environment staff and the archaeologist (and regulator, if required). Clearance would only be given once all archaeological excavation and/or heritage recommendations (where required) are complete. Resumption of project work must be in accordance with the all relevant project/heritage approvals/determinations.	RES/A/PM/WS-RMD	
8.2	If required, ensure archaeological excavation/heritage reporting and other heritage	PM/A/WS-RMD	

Step	Task	Responsibility	Guidance & Tools
	approval conditions are completed in the required timeframes. This includes artefact retention repositories, conservation and/or disposal strategies.		
8.3	Forward all heritage/archaeological assessments, heritage location data and its ownership status to the Senior Environmental Specialist (Heritage). They will ensure all heritage items in Roads and Maritime ownership and/or control are considered for the Roads and Maritime S170 Heritage and Conservation Register.	PM/SES(H)/ WS-RMD	
8.4	If additional unexpected items are discovered this procedure must begin again from Step 1.	PM/TL-RMD	

8. Seeking advice

Advice on this procedure should be sought from Roads and Maritime regional environment staff in the first instance. Contractors and alliance partners should ensure their own project environment managers are aware of and understand this procedure. Regional environment staff can assist non-Roads and Maritime project environment managers with enquires concerning this procedure.

IMPORTANT!

Roads and Maritime Services staff and contractors are not to seek advice on this procedure directly from the Office of Environment and Heritage without first seeking advice from regional environment staff and heritage policy staff.

Technical archaeological or heritage advice regarding an unexpected heritage item should be sought from the contracted archaeologist. Technical specialist advice can also be sought from heritage policy staff within Environment Branch to assist with the preliminary archaeological identification and technical reviews of heritage/archaeological reports.

9. Related information

Contact details: Senior Environmental Specialist (Heritage), Environment Branch, 02 8588 5754

Effective date: 01 February 2015

Review date: 01 February 2016

This procedure should be read in conjunction with:

- Roads and Maritimes' *Heritage Guidelines 2015*.
- Roads and Maritime Services *Environmental Incident Classification and Reporting Procedure*
- Roads and Maritime's *Procedure for Aboriginal Cultural Heritage Consultation and Investigation*
- RTA *Environmental Impact Assessment Guidelines*.

This procedure replaces:

- Procedure 5.5 ("*unexpected discovery of an archaeological relic or Aboriginal object*") outlined in the RTA's *Heritage Guidelines 2004*.

Other relevant reading material:

- NSW Heritage Office (1998), *Skeletal remains: guidelines for the management of human skeletal remains*.
- Department of Environment and Conservation NSW (2006), *Manual for the identification of Aboriginal remains*.
- Department of Health (April 2008), *Policy Directive: Burials - exhumation of human remains*¹¹.

¹¹ http://www.health.nsw.gov.au/policies/pd/2008/pdf/PD2008_022.pdf

10. List of appendices

The following appendices are included to support this procedure.

Appendix A	Identifying Unexpected Heritage items
Appendix B	Unexpected Heritage Item Recording Form 418
Appendix C	Photographing Unexpected Heritage Items
Appendix D	Key Environment Contacts
Appendix E	Uncovering Bones
Appendix F	Archaeological Advice Checklist
Appendix G	Template Notification Letter

Appendix A

Identifying unexpected heritage items

The following images can be used to assist in the preliminary identification of potential unexpected items (both Aboriginal and non-Aboriginal) during construction and maintenance works. Please note this is not a comprehensive typology.



Top left hand picture continuing clockwise: Stock camp remnants (Hume Highway Bypass at Tarcutta); Linear archaeological feature with post holes (Hume Highway Duplication), Animal bones (Hume Highway Bypass at Woomargama); Cut wooden stake; Glass jars, bottles, spoon and fork recovered from refuse pit associated with a Newcastle Hotel (Pacific Highway, Adamstown Heights, Newcastle area).



Wood stave water pipe



Tram tracks



Retaining wall



Cistern

Top left hand picture continuing clockwise: Woodstave water pipe with tar and wire sealing (Horsley Drive); Tram tracks (Sydney); Brick lined cistern (Clyde); Retaining wall (Great Western Highway, Leura).



Top left hand picture continuing clockwise: Road pavement (Great Western Highway, Lawson); Sandstone kerbing and guttering (Parramatta Road, Mays Hill); Telford road (sandstone road base, Great Western Highway, Leura); Ceramic conduit and sandstone culvert headwall (Blue Mountains, NSW); Corduroy road (timber road base, Entrance Road, Wamberai).



Alignment pin



Survey tree



Alignment stone



Survey tree



Milestone



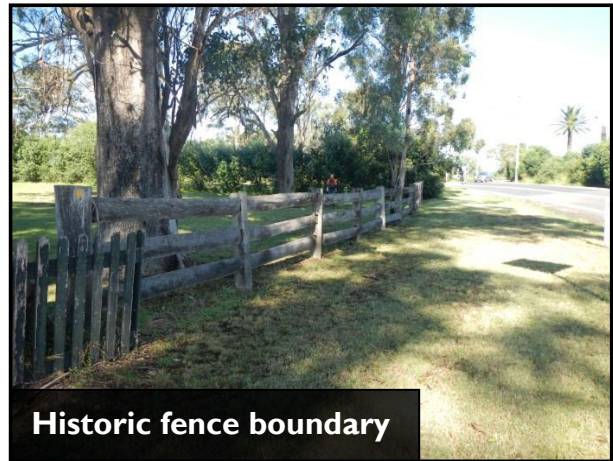
Top left hand corner continuing clockwise: Alignment Pin (Great Western Highway, Wentworth Falls); Survey tree (MR7, Albury); Survey tree (Kidman Way, Darlington Point, Murrumbidgee); Survey tree (Cobb Highway, Deniliquin); Milestone (Great Western Highway, Kingswood, Penrith); Alignment Stone (near Guntawong Road, Riverstone). Please note survey marks may have additional statutory protection under the *Surveying and Spatial Information Act 2002*.



Remnant Bridge Piers



Mine Shaft



Historic fence boundary



Dairy shed

Top left hand corner continuing clockwise: Remnant bridge piers (Putty Road, Bulga); Wooden boundary fence (Campbelltown Road, Denham Court); Dairy shed (Ballina); Golden Arrow Mine Shaft.



Top left hand corner: Culturally modified stone discovered on Main Road 92, about two kilometres west of Sassafras. The remaining images show a selection of stone artefacts retrieved from test and salvage archaeological excavations during the Hume Highway Duplication and Bypass projects from 2006-2010.

Appendix B

Unexpected heritage item recording form 418



This form is to be filled in by a project manager (or their delegate) or a team leader – Road and Maintenance Division, on the discovery of an unexpected heritage item during construction or maintenance works.

Date:		Recorded by: (Include name and position)	
Project name:			
Description of works being undertaken (eg Removal of failed pavement by excavation and pouring concrete slabs in 1m x 1m replacement sections).			
Description of exact location of item (eg Within the road formation on Parramatta Road, east bound lane, at the corner of Johnston Street, Annandale, Sydney).			
Description of item found (What type of item is it likely to be? Tick the relevant boxes).			
A. A relic	<input type="checkbox"/>	A 'relic' is evidence of a past human activity relating to the settlement of NSW with local or state heritage significance. A relic might include bottles, utensils, plates, cups, household items, tools, implements, and similar items.	
B. A 'work, building or structure'	<input type="checkbox"/>	A 'work' can generally be defined as a form infrastructure such as tram tracks, a culvert, road base, a bridge pier, kerbing, and similar items.	
C. An Aboriginal object	<input type="checkbox"/>	An 'Aboriginal object' may include stone tools, stone flakes, shell middens, rock art, scarred trees and human bones.	
D. Bone	<input type="checkbox"/>	Bones can either be human or animal remains. Remember that you must contact the local police immediately by telephone if you are <u>certain</u> that the bone(s) are <u>human remains</u>.	
E. Other	<input type="checkbox"/>		

<p>Provide short description of item (eg Metal tram tracks running parallel to road alignment. Good condition. Tracks set in concrete, approximately 10cms (100 mm) below the current ground surface).</p>	
<p>Sketch (Provide a sketch of the item's general location in relation to other road features so its approximate location can be mapped without having to re-excavate it. In addition, please include details of the location and direction of any photographs of the item taken).</p>	
<p>Action taken (Tick either A or B)</p>	
<p>A. Unexpected item would not be further impacted on by works <input type="checkbox"/></p>	
<p>Describe how works would avoid impact on the item. (eg The tram tracks will be left <i>in situ</i>, and recovered with road paving).</p>	
<p>B. Unexpected item would be further impacted on by works <input type="checkbox"/></p>	
<p>Describe how works would impact on the item. (eg Milling is required to be continued to 200 mm depth to ensure road pavement requirements are met. Tram tracks will need to be removed).</p>	
<p>Important: It is a statutory offence to disturb Aboriginal objects and historic relics (including human remains) without an approval. All works affecting objects and relics must cease until an approval is sought. Approvals may also be required to impact on certain works. Contact your regional environment staff for guidance.</p>	
<p>Project manager / works supervisor signature</p>	

Appendix C

Photographing unexpected heritage items

✋ Removal of the item from its context (e.g. excavating from the ground) for photographic purposes is not permitted.

Photographs of unexpected items in their current context (*in situ*) may assist heritage staff and archaeologists to better identify the heritage values of the item. Emailing good quality photographs to specialists can allow for better quality and faster heritage advice. The key elements that must be captured in photographs of the item include its position, the item itself and any distinguishing features. All photographs must have a scale (ruler, scale bar, mobile phone, coin) and a note describing the direction of the photograph.

Context and detailed photographs

It is important to take a general photograph (Figure 1) to convey the location and setting of the item. This will add much value to the subsequent detailed photographs also required (Figure 2).

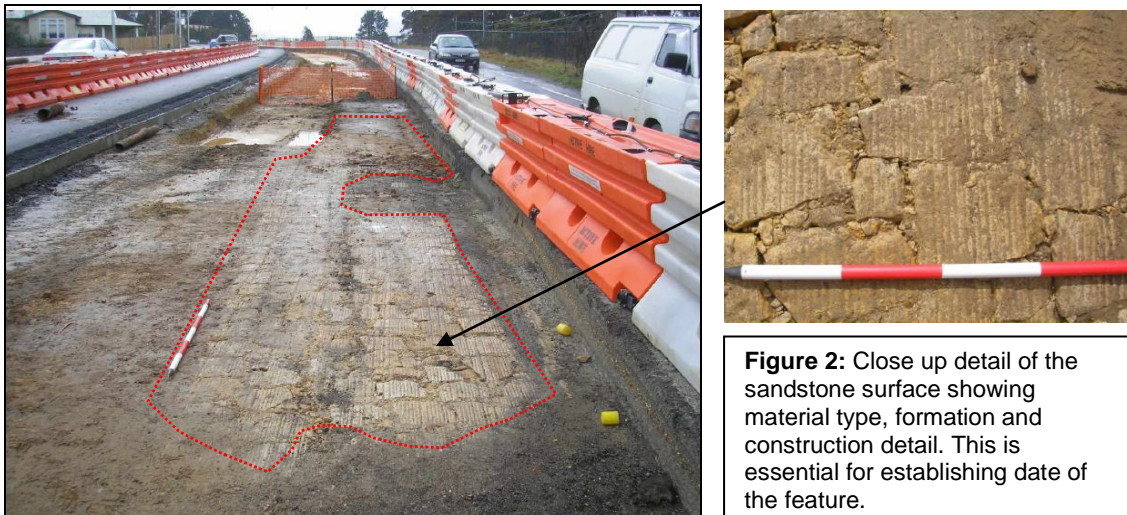


Figure 1: Telford road uncovered on the Great Western Highway (Leura) in 2008.

Photographing distinguishing features

Where unexpected items have a distinguishing feature, close up detailed photographs must be taken of this, where practicable. In the case of a building or bridge, this may include diagnostic details architectural or technical features. See Figures 3 and 4 for examples.



Figure 3: Ceramic bottle artefact with stamp.

Figure 4: Detail of the stamp allows 'Tooth & Co Limited' to be made out. This is helpful to a specialist in gauging the artefact's origin, manufacturing date and likely significance.

Photographing bones

The majority of bones found on site will those of be recently deceased animal bones often requiring no further assessment (unless they are in archaeological context). However, if bones are human, Roads and Maritime must contact the police immediately (see Appendix F for detailed guidance). Taking quality photographs of the bones can often resolve this issue quickly. Heritage staff in Environment Branch can confirm if bones are human or non-human if provided with appropriate photographs. Ensure that photographs of bones are not concealed by foliage (Figure 5) as this makes it difficult to identify. Minor hand removal of foliage can be undertaken as long as disturbance of the bone does not occur. Excavation of the ground to remove bone(s) should not occur, nor should they be pulled out of the ground if partially exposed. Where sediment (adhering to a bone found on the ground surface) conceals portions of a bone (Figure 6) ensure the photograph is taken of the bone (if any) that is not concealed by sediment.



Figure 5: Bone concealed by foliage.



Figure 6: Bone covered in sediment

Ensure that all close up photographs include the whole bone and then specific details of the bone (especially the ends of long bones, the *epiphysis*, which is critical for species identification). Figures 7 and 8 are examples of good photographs of bones that can easily be identified from the photograph alone. They show sufficient detail of the complete bone and the epiphysis.



Figure 7: Photograph showing complete bone.



Figure 8: Close up of a long bone's epiphysis.

Appendix D

Key environmental contacts

Hunter region	Environmental Manager (Hunter)	4924 0440
	Aboriginal Cultural Heritage Advisor	4924 0383
Northern region	Environment Manager (North)	6640 1072
	Aboriginal Cultural Heritage Advisor	6604 9305
Southern region	Environmental Manager (South)	6492 9515
	Aboriginal Cultural Heritage Advisor	4221 2767
South West region	Environment Manager (South West)	6937 1634
	Aboriginal Cultural Heritage Advisor	6937 1647
Sydney region	Environment Manager (Sydney)	8849 2516
	Aboriginal Cultural Heritage Advisor	8849 2583
Western region	Environment Manager (West)	6861 1628
	Aboriginal Cultural Heritage Advisor	6861 1658
Pacific Highway Office	Environment Manager	6640 1375
Regional Maintenance Delivery	Environment Manager	9598 7721
Environment Branch	Senior Environmental Specialist (Heritage)	8588 5754

Heritage Regulators

Heritage Division Office of Environment and Heritage Locked Bag 5020 Parramatta NSW 2124 Phone: (02) 9873 8500	Department of the Environment (Clth) GPO Box 787 Canberra ACT 2601 Phone: (02) 6274 1111
Office of Environment and Heritage (Sydney Metropolitan) Planning and Aboriginal Heritage Section PO Box 668 Parramatta NSW 2124 Phone: (02) 9995 5000	Office of Environment and Heritage (North Eastern NSW) Planning and Aboriginal Heritage Section Locked Bag 914 Coffs Harbour NSW 2450 Phone: (02) 6651 5946
Office of Environment and Heritage (North Western NSW) Environment and Conservation Programs PO Box 2111 Dubbo NSW 2830 Phone: (02) 6883 5330	Office of Environment and Heritage (Southern NSW) Landscape and Aboriginal Heritage Protection Section PO Box 733 Queanbeyan NSW 2620 Phone: (02) 6229 7188

Project-Specific Contacts

Position	Name	Phone Number
Project Manager		
Site/Alliance Environment Manager		
Regional Environmental Officer		
Aboriginal Cultural Heritage Advisor		
Consultant Archaeologist		
Local Police Station		
OEH: Environment Line		131 555

Appendix E

Uncovering bones

Hand icon All matters relating to uncovering bones and RMS' human remains notification obligations should involve RMS regional environment and heritage staff. They will guide Project Managers through occurrences of uncovering bones.

This appendix provides Project Managers with advice (1) on what to do on first uncovering bones (2) the range of human skeletal notification pathways and (3) additional considerations and requirements when managing the discovery of human remains.

1. First uncovering bones

Stop all work in the vicinity of the find. All bones uncovered during project works should be **treated with care and urgency** as they have the potential to be human remains. Therefore they must be identified as either human or non-human as soon as possible by a qualified forensic or physical anthropologist. These specialist consultants can be sought by contacting regional environment staff and/or heritage staff at Environment Branch.

On the very rare occasion where it is *instantly obvious* from the remains that they are human, the Project Manager (or a delegate) should **inform the police by telephone** prior to seeking specialist advice. It will be obvious that it is human skeletal remains where there is no doubt, as demonstrated by the example in Figure 1. Often skeletal elements in isolation (such as a skull) can also clearly be identified as human. Note it may also be obvious that human remains have been uncovered when soft tissue and clothing are present.

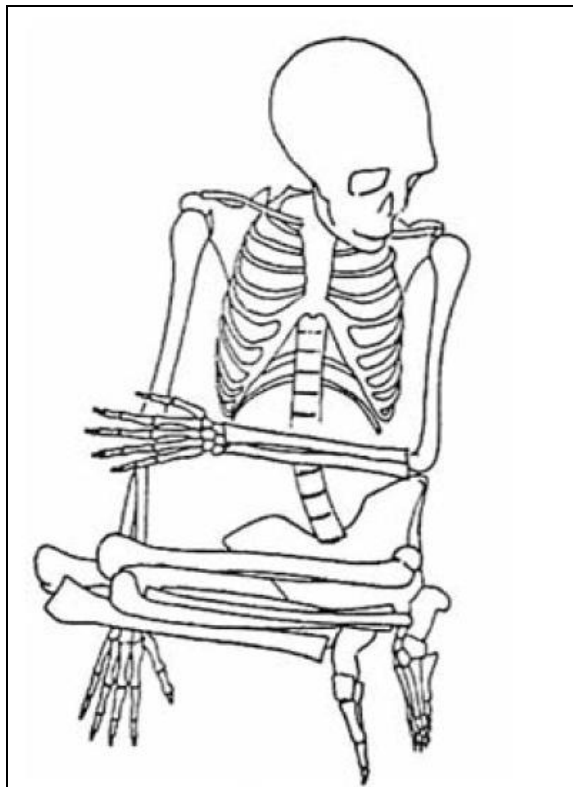


Figure 1: Schematic of a complete skeleton that is 'obviously' human¹².



Figure 2: Disarticulated bones that require assessment to determine species.

¹² After Department of Environment and Conservation NSW (2006), *Manual for the identification of Aboriginal Remains*: 17.

This preliminary phone call is to let the police know that Roads and Maritime is undertaking a specialist skeletal assessment to determine the approximate date of death which will inform legal jurisdiction. The police may wish to take control of the site at this stage. If not, a forensic or physical anthropologist must be requested to make an on-site assessment of the skeletal remains.

Where it is not 'obvious' that the bones are human (in the majority of cases, illustrated by Figure 2), specialist assessment is required to establish the species of the bones. Photographs of the bones can assist this assessment if they are clear and taken in accordance with guidance provided in Appendix C. Good photographs often result in the bones being identified by a specialist without requiring a site visit; noting they are nearly always non-human. In these cases, non-human skeletal remains must be treated like any other unexpected archaeological find.

If the bones are identified as human (either by photographs or an on-site inspection) a technical specialist must determine the likely ancestry (Aboriginal or non-Aboriginal) and burial context (archaeological or forensic). This assessment is required to identify the legal regulator of the human remains so **urgent notification** (as below) can occur. Preliminary telephone or verbal notification by the Project Manager or regional environment staff is considered appropriate. This must be followed up later by Roads and Maritime's formal letter notification as per Appendix G when a management plan has been developed and agreed to by the relevant parties.

2. Range of human skeletal notification pathways

The following is a summary of the different notification pathways required for human skeletal remains depending on the preliminary skeletal assessment of ancestry and burial context.

A. Human bones are from a recently deceased person (*less than 100 years old*).

Action

A police officer must be notified immediately as per the obligations to report a death or suspected death under s35 of the *Coroners Act 2009* (NSW). It should be assumed the police will then take command of the site until otherwise directed.

B. Human bones are archaeological in nature (*more than 100 years old*) and are likely to be **Aboriginal** remains.

Action

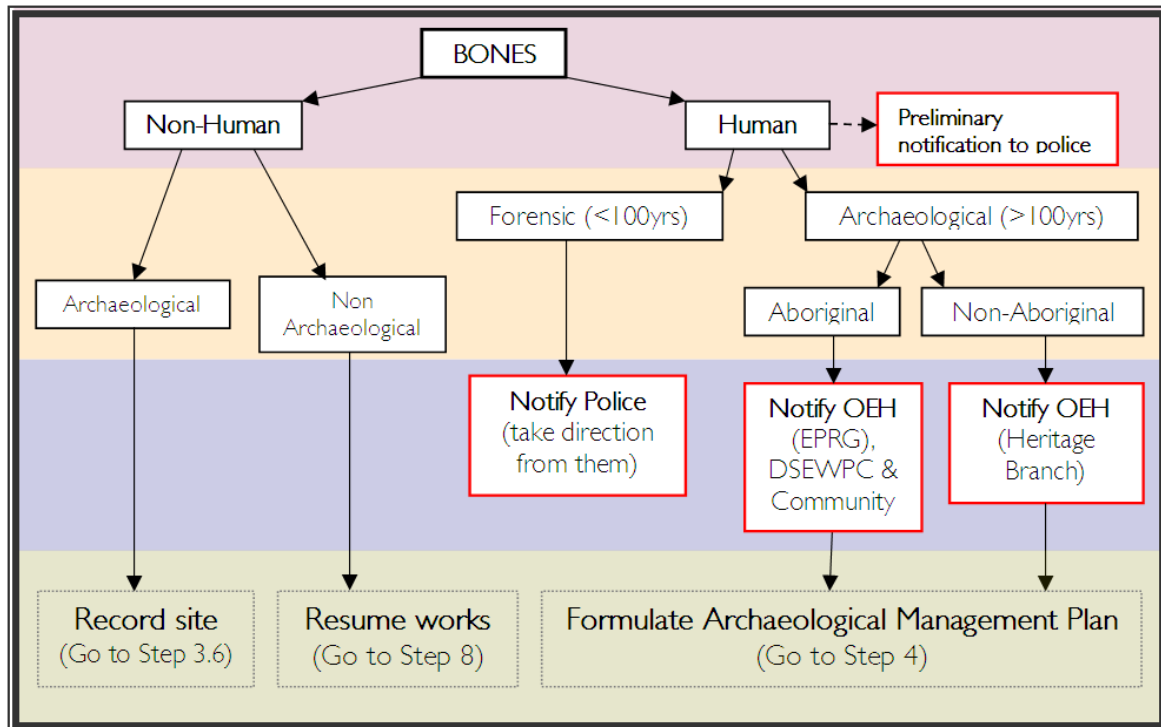
The OEH and the RMS Aboriginal Cultural Heritage Advisor (ACHA) must be notified immediately. The ACHA must contact and inform the relevant Aboriginal community stakeholders who may request to be present on site. Relevant stakeholders are determined by the RTA's *Procedure for Aboriginal Cultural Heritage Consultation and Investigation*.

C. Human bones are archaeological in nature (*more than 100 years old*) and likely to be **non-Aboriginal** remains.

Action

The OEH (Heritage Branch, Conservation Team) must be notified immediately.

The simple diagram below summarises the notification pathways on finding bones.



After the appropriate verbal notifications (as described in B and C), the Project Manager must proceed through the *Unexpected Heritage Items Procedure* to formulate an archaeological management plan (Step 4). Note no archaeological management plan is required for forensic cases (A), as all future management is a police matter. Non-human skeletal remains must be treated like any other unexpected archaeological find and so must proceed to recording the find as per Step 3.6.

3. Additional considerations and requirements

Uncovering archaeological human remains must be managed intensively and needs to consider a number of additional specific issues. These issues might include facilitating culturally appropriate processes when dealing with Aboriginal remains (such as repatriation and cultural ceremonies). Roads and Maritime's ACHA can provide advice on this and how to engage with the relevant Aboriginal community. Project Managers, more generally, may also need to consider overnight site security of any exposed remains and may need to manage the onsite attendance of a number of different external stakeholders during assessment and/or investigation of remains. Project Managers may also be advised to liaise with local church/religious groups and the media to manage community issues arising from the find. Additional investigations may be required to identify living descendants, particularly if the remains are to be removed and relocated.

If exhumation of the remains (from a formal burial or a vault) is required, Project Managers should also be aware of additional approval requirements under the *Public Health Act 1991* (NSW). Specifically, Roads and Maritime is required to apply to the Director General of NSW Department of Health for approval to exhume human remains as per Clause 26 of the *Public Health (Disposal of Bodies) Regulation 2002* (NSW)¹³. Further, the exhumation of such remains needs to consider health risks such as infectious disease control, exhumation procedures and reburial approval and registration. Further guidance on this matter can be found at the NSW Department of Health [website](#).

In addition, due to the potential significant statutory and common law controls and prohibitions associated with interfering with a public cemetery, project teams are

¹³ This requirement is in addition to heritage approvals under the *Heritage Act 1977*.

advised, when works uncover human remains adjacent to cemeteries, to confirm the cemetery's exact boundaries.

Appendix F

Archaeological/heritage advice checklist

The archaeologist must advise the Project Manager of an appropriate archaeological or heritage management plan as soon as possible after site inspection (see Step 4). An archaeological or heritage management plan can include a range of activities and processes, which differ depending on the find and its significance. In discussions with the archaeologist the following checklist can be used by the Project Manager and the archaeologist as a prompt to ensure all relevant archaeological issues are considered when developing this plan. This will allow the project team to receive clear and full advice to move forward quickly and in the right direction. Archaeological and/or heritage advice on how to proceed can be received in a letter or email outlining all relevant archaeological and/or heritage issues.

	Required	Outcome/notes
Assessment and investigation		
• Assessment of significance	Yes/No	
• Assessment of heritage impact	Yes/No	
• Archaeological excavation	Yes/No	
• Archival photographic recording	Yes/No	
Heritage approvals and notifications		
• AHIPs, Section 140, S139 exceptions etc	Yes/No	
• Regulator relics/objects notification	Yes/No	
• Roads and Maritime's S170 Heritage and Conservation Register listing requirements	Yes/No	
• Compliance with CEMP or other project heritage approvals	Yes/No	
Stakeholder consultation		
• Aboriginal stakeholder consultation requirements and how it relates to RTA <i>Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI)</i> .	Yes/No	
• Advice from regional environmental staff, Aboriginal Cultural Heritage Advisor, Roads and Maritime heritage team.	Yes/No	
Artefact/ heritage item management		
• Retention or conservation strategy (eg items may be subject to long conservation and interpretation) • Disposal strategy (eg former road pavement) • Short term and permanent storage locations (interested third parties should be	Yes/No	

Roads & Maritime Services

consulted on this issue).		
• Control Agreement for Aboriginal objects.	Yes/No	
Program and budget		
• Time estimate associated with archaeological or heritage conservation work.		
• Total cost of archaeological/heritage work.		

Appendix G

Template notification letter

[Select and type date]

[Select and type reference number]

[Select and type file number]

[Insert recipient's name and address, see **Appendix D**]

[Select and type salutation and name],

Re: Unexpected heritage item discovered during Roads and Maritime Services project works.

I write to inform you of an unexpected [select: relic, heritage item or Aboriginal object] found during Roads and Maritime Services construction works at [insert location] on [insert date]. [Where the regulator has been informally notified at an earlier date by telephone, this should be referred to here].

This letter is in accordance with the notification requirement under [select: Section 146 of the *Heritage Act 1977* (NSW) or Section 89(A) of the *National Parks and Wildlife Act 1974* (NSW)] **NB:** There may be not be statutory requirement to notify of the discovery of a 'heritage Item that is not a relic or Aboriginal object].

NB: On finding Aboriginal human skeletal remains this letter must also be sent to the Commonwealth Minister for Sustainability, Environment, Water, Populations and Communities (SEWPC) in accordance with notification requirements under Section 20(1) of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth).

[Provide a brief overview of the project background and project area. Provide a summary of the description and location of the item, including a map and image where possible. Also include how the project was assessed under the *Environmental Planning and Assessment Act 1979* (NSW) (eg Part 5). Also include any project approval number, if available].

Roads and Maritime Services [or contractor] has sought professional archaeological advice regarding the item. A preliminary assessment indicates [provide a summary description and likely significance of the item]. Please find additional information on the site recording form attached.

Resulting from these preliminary findings, Roads and Maritime Services [or contractor] is proposing [provide a summary of the proposed archaeological/heritage approach (eg develop archaeological research design (where relevant), seek heritage approvals, undertake archaeological investigation or conservation/interpretation strategy). Also include preliminary justification of such heritage impact with regard to project design constraints and delivery program].

The proposed approach will be further developed in consultation with a nominated Office of Environment and Heritage staff member.

Please contact me if you have any input on this approach or if you require any further information.

Yours sincerely

[Sender name and position]

[Attach the archaeological/heritage management plan and site recording form].

MEMO

To: Ana Perez – Project Manager ESC Jared Crossley – Design Lead ESC Angus Sturrock – Project Director ESC Maria Doumit – Environmental Officer ESC Sasha Kovacina – Project Manager ESC	Date: 25/07/2019
CC: Andersen Hui – Traffic Lead ESC Ben Midgley – Traffic Modeller ESC	Revision: 2
From: Trung Mai – Traffic Modeller ESC	Pages: 7
Subject: Easing Sydney’s Congestion (Pinch Points) – Pacific Highway Intersection Upgrades Wahroonga – Redleaf Avenue Right Turn Ban & Alternative Route Assessment	Reference: 02-011-P0021512-MEM-TE-003

1.0 Introduction

As part of the Pinch Points program under Easing Sydney’s Congestion (ESC), Roads and Maritime Services NSW (Roads and Maritime) propose to upgrade a section of the Pacific Highway in Wahroonga at Coonanbarra Road and Redleaf Avenue to provide three continuous northbound lanes between Munderah Street and Woonona Avenue. As part of the proposal, it is proposed to signalise the intersection of Pacific Highway and Redleaf Avenue. To facilitate the proposed signalisation, the right turn from Redleaf Avenue onto Pacific Highway is set to be banned.

Redleaf Avenue is a local road¹ located in Wahroonga, providing access to retail premises located adjacent to the Pacific Highway and Wahroonga Station, as well as the wider residential area of Wahroonga. Pacific Highway is a State road¹ which forms a critical part of the Sydney road network. It links people and goods within the urban centres of Sydney, Newcastle, Central Coast, and Wollongong and throughout the State. It carries approximately 67,000² vehicles daily along the Warrawee section of road (south of Fox Valley Road) – about 32,000 northbound and 35,000 southbound.

The purpose of the study is to identify alternative routes and to assess the impact on adjacent intersections of implementing the right turn ban from Redleaf Avenue onto Pacific Highway. With the proposed right turn ban, Redleaf Avenue will operate as a ‘left in left out’ connection with Pacific Highway. The intersection of Pacific Highway / Redleaf Avenue is located in Wahroonga, as shown in **Figure 1**.

¹ Source: NSW road classification review – Sydney Inner Map.

² Source: Roads and Maritime Services Traffic Volume Viewer, 2018 data.



Figure 1: Location of the right turn ban

2.0 Justifications for the right turn ban

This section provides the justifications for the right turn ban out of Redleaf Avenue onto Pacific Highway.

Firstly, the right turn from Redleaf Avenue onto Pacific Highway is already banned in the AM (6:30 – 9:30) and PM (3:30 – 6:30) weekday peaks. Thus, the proposed right turn ban is expected to only have impacts on the surrounding network in off-peak periods on weekdays and all weekend. Traffic surveys undertaken in February 2019 indicate that the right turn volume out of Redleaf Avenue is considered minimal with the maximum hourly volume being **44** vehicles, which occurred on Saturday 9th February 2019 between 9:30-10:30 am.

As mentioned in **Section 1.0**, Redleaf Avenue at Pacific Highway is set to be upgraded to become a signalised intersection. Retaining the right turn out of Redleaf Avenue would require the introduction of an additional phase. If the right turn phase out of Redleaf Avenue is called every cycle, it would require a *minimum* of 11 seconds (5 seconds of minimum green plus 6 seconds of intergreen). As a result, the phase will take 275 seconds (11 seconds/cycle time multiply by 25 cycles) of the total hourly green time out of the intersection and away from the Pacific Highway, which is likely to have a detrimental impact on the overall intersection performance. Along with the signalisation, it is also proposed to provide dual left turn lanes from Redleaf Avenue onto Pacific Highway. Without these dual left turn lanes, the left turn movement from Redleaf Avenue onto Pacific Highway is expected to deteriorate significantly in the future with an estimated delay of more than three minutes (extracted from a VISSIM model at the intersection), particularly in the 2027 AM peak. As such, banning the right turn provides the required footprint to facilitate the dual left turn lanes.

Also, the current priority-controlled arrangement of crossing three Pacific Highway northbound approach lanes from Redleaf Avenue to get into a destination lane while giving way for total bidirectional traffic of approximately 4,000 vehicles is considered unsafe.

3.0 Alternative routes

For this assessment, only local origins and destinations associated with the movement of vehicles through the intersection via the right turn were assessed. This is because Redleaf Avenue is only intended for local access to retail premises located adjacent to the Pacific Highway and Wahroonga Station, as well as the wider residential area of Wahroonga.

By assessing the road function, service area and connection to the adjacent road network, the local origin was determined by examining the areas north of Redleaf Avenue as only traffic originating from this direction would be affected by the proposed right turn ban. It is anticipated that right turning traffic is generated in the residential areas north of Redleaf Avenue.

The destination was determined by examining the area northwest of the intersection. The indicative origin and destination locations are shown in **Figure 2**.

There is a raised median lane currently located along Pacific Highway, it is therefore anticipated that banning the right turn out of Redleaf Avenue would result in traffic rerouting onto Coonanbarra Road. The affected traffic is expected to reroute via Railway Avenue and turn left into Coonanbarra Road before making a right turn onto Pacific Highway to continue their journey. The alternative route associated with the right turn ban is illustrated in **Figure 2**.

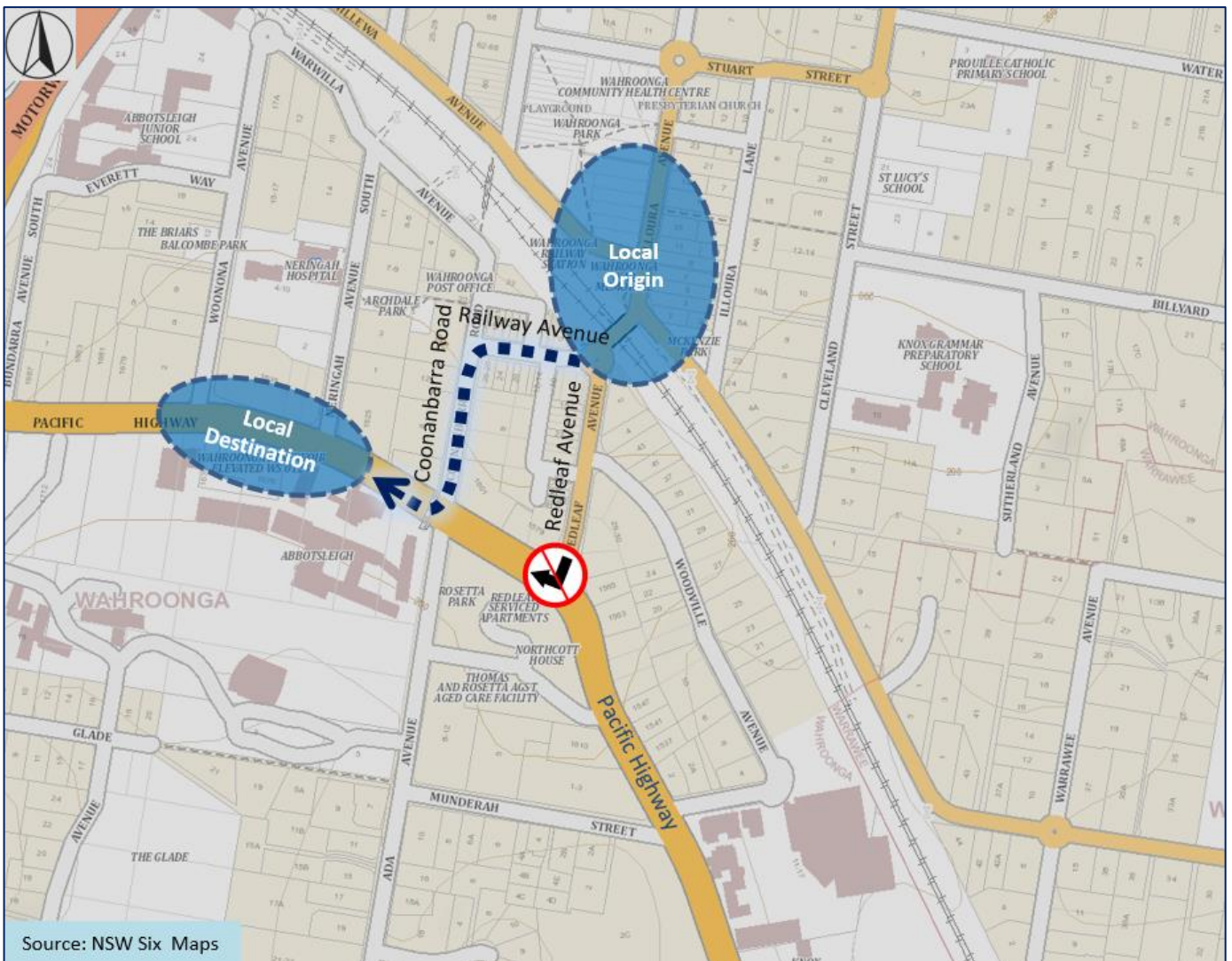


Figure 2: Alternative route from the local origin to the local destination

4.0 Comparison of alternative routes by time and distance

To enable a quantitative comparison between the existing and alternative routes, an analysis was carried out to determine the time and distance taken to traverse each route using Google Maps. The estimated travel time from Google is based on a variety of factors, ranging from posted speed limit, speed derived from road types and historical average speed. The travel time estimation also considers traffic conditions and delays at intersections. As the estimated travel time and distance are approximate, time has been given to within a minute's accuracy, and distance is given to within an accuracy of 50 m. It is noted that the alternative route travel time suggested by Google Maps does not consider the impact of additional traffic taking this route, as a result of the right turn ban.

As mentioned in **Section 2.0**, the right turn from Redleaf Avenue onto Pacific Highway is currently banned in the weekday AM (6:30 – 9:30) and PM (3:30 – 6:30) peaks. In addition, the right turn from Coonanbarra Road onto Pacific Highway is also currently banned in the weekday AM (6:30 – 9:30) and PM (3:30 – 6:30) peaks. Thus, the proposed right turn ban is expected to have impacts on the surrounding network in the off-peak periods on weekdays and all weekend. **Table 1** presents the maximum right turn volume in the AM and PM peaks, derived from traffic surveys undertaken in February 2019 during both the weekday of 5th February (outside of the peak periods when the right turn is currently banned) and the weekend of 9th February. These periods were adopted for the comparisons.

Table 1: Maximum right turn volume out of Redleaf Avenue – weekday and weekend

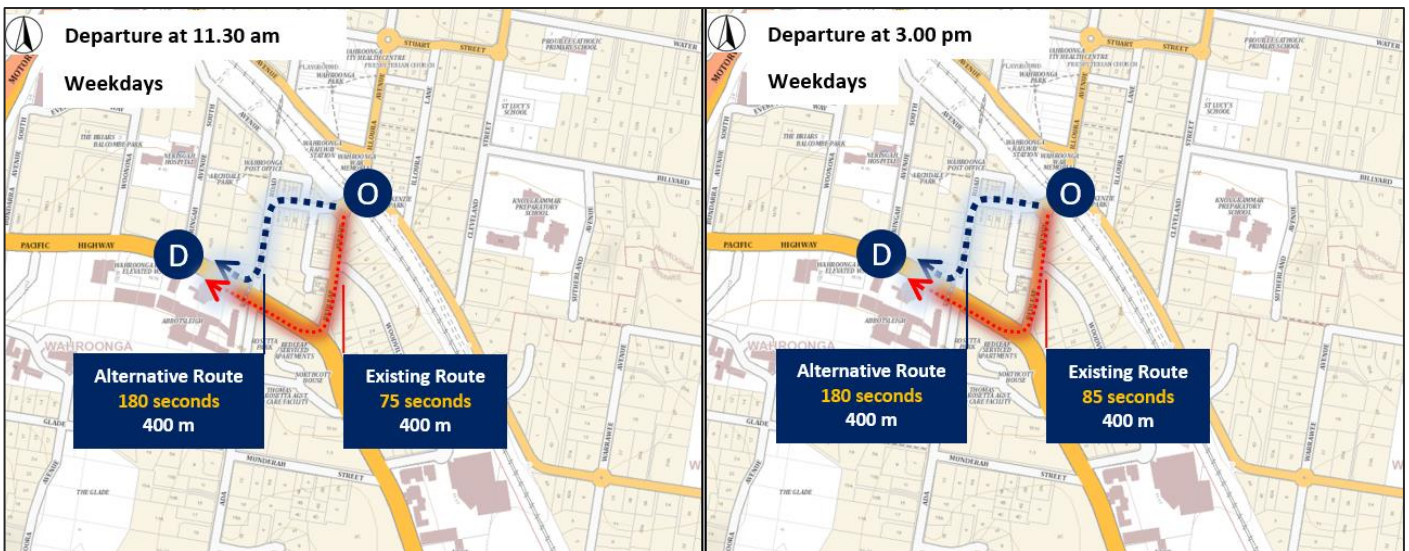
Weekday		Weekend	
AM peak ¹	PM peak ¹	AM peak	PM peak
11:00 – 12:00 pm (17 vehicles)	2:30 – 3:30 pm (37 vehicles)	9:30 – 10:30 am (44 vehicles)	13:45 – 14:45 pm (39 vehicles)

¹ The 'AM peak' and 'PM peak' during weekdays used for the comparisons is the period with the maximum right turn volume outside of the weekday AM (6:30 – 9:30) and PM (3:30 – 6:30) peak, when the right turn is currently banned.

The existing and alternative routes were compared in terms of vehicle travel time and distance along the study routes between O (origin) and D (destination).

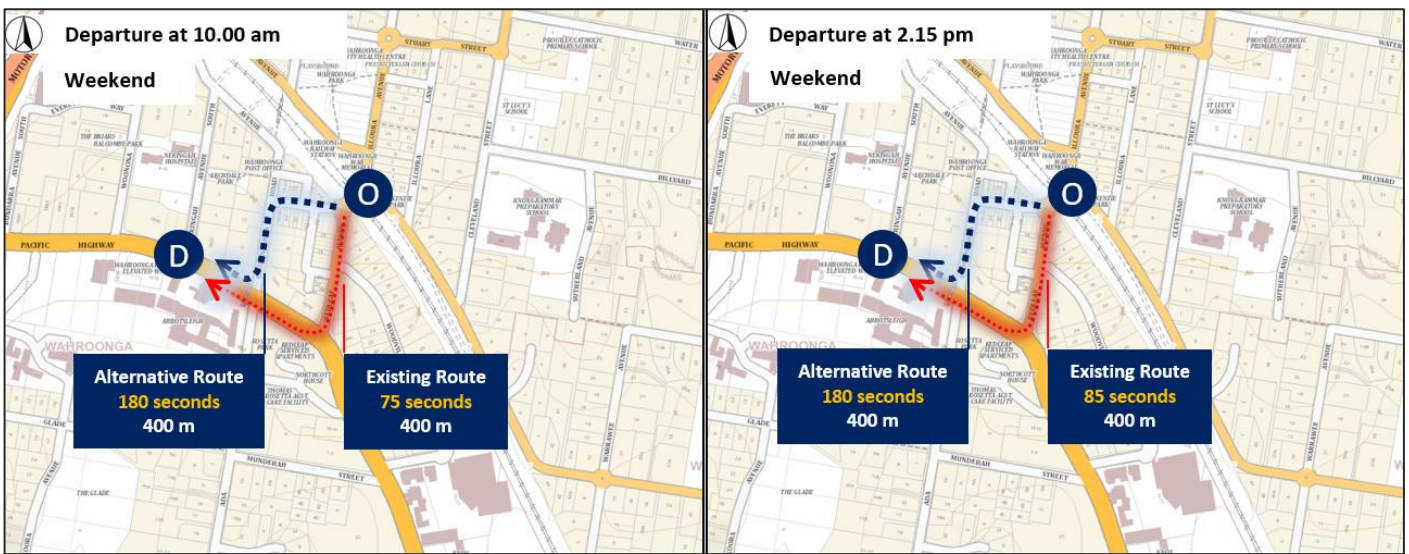
Figure 3 and **Figure 4** demonstrate the distances of the existing and alternative routes. It also presents the estimated travel times of the alternative route. For a like-for-like comparison, both routes were set to depart at the same time within the peak hours as presented in **Table 1**, on a typical Tuesday (weekday) and Saturday (weekend). The estimated travel time of the existing route is not available as Google assumes there is no path for the right turn movement out of Redleaf Avenue. As such, it was derived from the relationship between speed, distance and time. It is assumed that vehicles waiting to turn right onto Pacific Highway from Redleaf Avenue would have to wait for approximately 30 seconds and the waiting time in the northbound direction of the stop line at Coonanbarra Road / Ada Avenue is approximately 10 seconds for the AM peak and 20 seconds for the PM peak (extracted from a VISSIM model at the intersection). The resultant travel time of the existing route would equalate to 75 seconds and 85 seconds for the respective AM and PM peaks.

In summary, both routes have the same travel distance of 400 m. It has been estimated that the travel time of the alternative route is expected to increase by up to 100 seconds in both AM and PM peak hours.



Source: image from SIX Maps, time and distance estimations from Google Maps and travel time principle

Figure 3: Right turn ban out of Redleaf Avenue - Time and distance comparison - weekday



Source: image from SIX Maps, time and distance estimations from Google Maps and travel time principle

Figure 4: Right turn ban out of Redleaf Avenue - Time and distance comparison - weekend

A review of traffic demand and signal timings at the impacted intersection, Pacific Highway / Coonanbarra Road / Ada Avenue, was undertaken to understand how they vary with different times in weekdays and weekends. The traffic demand and phase timings were extracted from SCATS detector counts and SCATS History on a typical Tuesday (weekday) and Saturday (weekend) and at the same time traffic surveys were conducted.

Table 2: Demand comparisons with different peaks in weekday and weekend

Hourly traffic demand (vehicles)		Weekday		Weekend	Compared to weekday peak	
Peak	Approach	Peak	Off-peak	Peak	Weekday Off-peak	Weekend Peak
AM	Pacific Highway	4,570	2,940	4,070	-36%	-11%
	Coonanbarra Road	320	290	280	-10%	-11%
	Ada Avenue	220	140	290	-38%	31%
PM	Pacific Highway	4,040	3,380	3,810	-16%	-6%
	Coonanbarra Road	370	310	320	-16%	-15%
	Ada Avenue	370	270	250	-28%	-32%

Table 3: Phase timings comparisons with different peaks in weekday and weekend

Hourly phase timings (seconds)		Weekday		Weekend	Compared to weekday peak	
Peak	Approach	Peak	Off-Peak	Peak	Weekday Off-peak	Weekend Peak
AM	Pacific Highway (Phase A)	105	87	102	-17%	-3%
	Coonanbarra Road / Ada Avenue (Phase B)	35	33	38	-6%	9%
PM	Pacific Highway (Phase A)	101	101	102	1%	1%
	Coonanbarra Road / Ada Avenue (Phase B)	38	37	38	-3%	0%

Table 2 indicates that in comparison to the weekday peak, traffic demand in the weekday off-peak and weekend peak is reduced between 6% to 38% on Pacific Highway, Coonanbarra Road and Ada Avenue, except for Ada Avenue in weekend AM peak for which volume increases. **Table 3** reveals that the allocated phase timings on Pacific Highway (Phase A) and Coonanbarra Road / Ada Avenue (Phase B) were quite similar with different assessed time periods, except for weekday (AM) off-peak that recorded a reduction of 17% on Pacific Highway when compared with that of the weekday peak. However, it has been shown that there was about 36% of volume reduction on Pacific Highway between the weekday AM peak and weekday off-peak (**Table 2**).

Traffic performance of the intersection in existing conditions was assessed using the VISSIM model along the Pacific Highway corridor, between Coonanbarra Road and Grandview Street. The 2017 VISSIM base model was developed and calibrated using the traffic and signal data collected through traffic surveys and SCATS inputs and was validated with site observations and Roads and Maritime Q Travel Time Analysis data. Details of the model calibration and validation outcomes are available in the *Pacific Highway Base VISSIM Model – Local Model Validation Report, 2017*.

Table 4 presents the Pacific Highway / Coonanbarra Road intersection performance. The intersection performs at Level of Service (LoS) B and C in the respective AM and PM peaks. The movements along Pacific Highway perform at LoS A in the 2017 AM peak and LoS B in the 2017 PM peak.

Table 4: Intersection performance at Pacific Highway / Coonanbarra Road

	2017 AM		2017 PM	
	Delay (seconds)	LoS	Delay (seconds)	LoS
Pacific Highway SB	13	A	17	B
Pacific Highway NB	11	A	19	B
Overall Intersection	20	B	31	C

The above analysis suggests that there is the potential to provide additional green time for Phase B, which includes the right turn movement from Coonanbarra Road onto Pacific Highway.

Given the good performance on Pacific Highway, the reduction of traffic volume of Pacific Highway in the weekday off-peak and weekend peak (**Table 2**), the additional right turn vehicles from Coonanbarra Road would be manageable with the redistribution of a couple of seconds of green time from Phase A onto Phase B.

5.0 Conclusion

This technical memo investigated potential impacts of implementing a right turn ban from Redleaf Avenue onto Pacific Highway.

The reasons for the right turn ban are due to traffic safety and efficiency. The right turn is already banned in the AM (6:30 – 9:30) and PM (3:30 – 6:30) weekday peaks. Thus, the proposed right turn ban is expected to only have impacts on the surrounding network in weekday off-peak periods and all weekend.

Traffic assessment indicates that the proposed turn ban is likely to redirect additional traffic through Railway Avenue and Coonanbarra Road before turning right onto Pacific Highway to continue their journey. Analysis of the alternative route is discussed in **Section 3**, with **Figure 2** presenting the possible alternative route.

To enable a quantitative comparison between the existing and the alternative route, an analysis was carried out to determine the time and distance taken to traverse each route using Google Maps and the principle of travel time in the assessed hours (**Table 1**) in both weekdays and the weekend. In summary:

- Rerouted vehicles onto Coonanbarra Road (**Figure 3** and **Figure 4**) are estimated to travel the same distance to that of the existing route from Redleaf Avenue.
- The rerouted vehicles are expected to travel up to approximately 100 seconds in addition to the existing situation.

A review of traffic demand and phase timings at the intersection of Pacific Highway / Coonanbarra Road / Ada Avenue was also undertaken. The analysis indicates that a couple of seconds of green time could be redistributed from Pacific Highway movement (Phase A) to Coonanbarra Road (Phase B), which would help the right turn movement cater with additional traffic demand.

Based on the information presented above, it is concluded that the right turn ban at Redleaf Avenue would result in a safer and better operation at the Redleaf Avenue intersection. The rerouted traffic would be manageable if diverted onto Coonanbarra Road.