Appendix B

Consideration of clause 228(2) factors and matters of national environmental significance

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* guideline as detailed in the REF, the following factors, listed in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000*, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
a. Any environmental impact on a community? The construction work would be likely to cause traffic delays and cause disturbance to local residents through construction noise. The work would be staged to minimise traffic impacts. Noise management measures would be put in place during construction to minimise noise impacts.	Short-term impact
b. Any transformation of a locality? The proposal widen Erskine Park Road within the road reserve. There would be no change to a locality.	Nil
c. Any environmental impact on the ecosystems of the locality? The proposal would require the removal of 0.44 hectares of vegetation. This has been assessed as not significant.	Minor impact
d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? The proposal would require the removal of trees. However, the proposal would also include landscaping to minimise any aesthetic impacts.	Short-term impact
e. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? There would be no impact on the locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations.	Nil
f. Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)? There would be no impact on habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974.*	Nil
g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? No species would be endangered by the proposal.	Nil
h. Any long-term effects on the environment? The removal of the vegetation would be a long-term impact.	Long-term impact
i. Any degradation of the quality of the environment? The proposal would require the removal of vegetation. Landscaping would take place after construction to revegetate impacted areas.	Short-term impact

Factor	Impact
j. Any risk to the safety of the environment? The proposal would have a positive impact on safety by increasing the capacity of turning lanes and reducing the risk of collisions in through lanes. The proposal would provide a shared path and provide pedestrian crossings at two junctions. This would improve safety for cyclists and pedestrians.	Long-term positive
k. Any reduction in the range of beneficial uses of the environment? There would be no reduction in the beneficial uses of the environment.	Nil
l. Any pollution of the environment? There is potential for sediment release to stormwater drains. Erosion and sediment control measures would be implemented to minimise this impact.	Potential short-term impact
m. Any environmental problems associated with the disposal of waste? There would be no problems associated with the disposal of waste.	Nil
n. Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The proposal would not place large demands on resources.	Nil
o. Any cumulative environmental effect with other existing or likely future activities? The proposal has the potential to cause cumulative traffic impacts with future development in the greater area.	Potential short-term impact
p. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? There would be no impact on coastal processes and coastal hazards, including those under projected climate change conditions.	Nil

Matters of National Environmental Significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of the Environment.

Factor	Impact
a. Any impact on a World Heritage property?	Nil
b. Any impact on a National Heritage place?	Nil
c. Any impact on a wetland of international importance?	Nil
d. Any impact on a listed threatened species or communities?	Nil
e. Any impacts on listed migratory species?	Nil
d. Any impact on a Commonwealth marine area?	Nil
g. Does the proposal involve a nuclear action (including uranium mining)?	Nil
Additionally, any impact (direct or indirect) on Commonwealth land?	Nil

Appendix C

Biodiversity

SPECIES RECORDED AT THE SITE

Relative abundance is given by a cover abundance scale (modified Braun-Blanquet):

1. 1 to a few individuals present, less than 5% cover
2. many individuals present, but still less than 5% cover
3. 5 - < 20% cover
4. 20 - < 50% cover
5. 50 - < 75% cover
6. 75 - 100% cover

Erskine - corner of Erskine Park Road and Explorers Way

Roadside – along Erskine Park Road between Coonawarra Drive and Bennett Road

Table 1. Species recorded along the study area at the Erskine (corner of Erskine Park Road and Explorers Way) and roadside (between Coonawarra Drive and Bennett Road)

* Denotes exotic species

Scientific name	Common name	Family	Erskine	Roadside
Trees				
Eucalyptus tereticornis	Forest Red Gum	Myrtaceae	1	1
Eucalyptus fibrosa	Red Ironbark	Myrtaceae	1	2
Eucalyptus molacana	Grey Box	Myrtaceae	1	3
Lophostemen confertus	Brush Box	Myrtaceae	1	
Eucalyptus microcorys	Tallowwood	Myrtaceae	1	
**Fraxinus excelsior*	European Ash	Oleaceae	1	
Casuarina cunninghamiana	River She-oak	Casuarinaceae		2
Araucaria heterophylla	Norfolk Island Pine	Araucariaceae		1
**Pinus radiata*	Radiata Pine	Pinaceae		1
**Thuja sp.*	Conifer	Cupressaceae		1
Syzigium oleosum	Blue Lilly Pilly	Myrtaceae		1
**Phoenix dactylifera*	Date palm	Arecaceae		1
Eucalyptus cerebra	Narrow-leaved Ironbark	Myrtaceae		1
Grevillea robusta	Silky Oak	Proteaceae		1
**Jacaranda mimosifolia*	Jackaranda	Bignoniaceae		1
* *Syagrus romanzoffiana*	Cocos palm	Arecaceae		1
Shrubs				

Scientific name	Common name	Family	Erskine	Roadside
Melaleuca decora		Myrtaceae	1	
Melaleuca stypheloides	Prickly-leaved Tea Tree	Myrtaceae		1
**Photinia glabra 'Rubens'*	Potinia	Malaceae	3	
Melaluca quinquinervia	Broad-leaved Paperbark	Myrtaceae		2
Callistemon viminalis	Bottle Brush	Myrtaceae		1
**Murraya paniculata*	Murraya	Rutaceae		2
**Cordyline australis*	Ti kouka	Asteliaceae		1
**Nerium oleander*	Oleander	Apocynaceae		1
Forbes				
**Hypochearis radicata*	Catsear	Asteraceae	2	2
**Trifolium repens*	White Clover	Fabaceae (Faboideae)	3	3
**Plantago lanceolata*	Plantain	Plantaginaceae	2	
**Cardamine hirsuta*	Flickweed	Brassicaceae	2	
**Sonchus oleraceus*	Sowthistle	Asteraceae	2	2
**Stellaria media*	Chickweed	Caryophyllaceae		2
Grass				
**Pennisetum clandestinum*	Kikuyu	Poaceae	4	3
**Paspulum dilatatum*	Paspalum	Poaceae	3	
Austrodathonia sp.	Wallaby Grass	Poaeceae		1
**Poa annua*	Winter grass	Poaceae	2	3
Cynadon dacylon	Couch	Poaceae		3
**Pennisetum clandestinum*	Buffalo Grass	Poaceae		2
Graminoid				
**Phyllostachys spp.*	Bamboo	Poaceae		1
Climbers				
**Marsdenia rostrata*	Milk Vine	Apocynaceae		1
**Solanum jasminoides*	Potatoe Vine	Solanaceae		1

THREATENED SPECIES, POPULATIONS AND COMMUNITIES (TSC ACT)

Table 1. Database searches for Threatened Flora within a 10km radius of the study area

Family	Scientific Name	Common Name	NSW status	Comm. status	Records
Apocynaceae	*Marsdenia viridiflora subsp. viridiflora*	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	E2		6
Fabaceae (Faboideae)	*Dillwynia tenuifolia*		V,P		76
Fabaceae (Faboideae)	*Pultenaea parviflora*		E1,P	V	33
Fabaceae (Mimosoideae)	*Acacia pubescens*	Downy Wattle	V,P	V	7
Lobeliaceae	*Hypsela sessiliflora*		E1,P,3	X	7
Myrtaceae	*Micromyrtus minutiflora*		E1,P	V	1
Proteaceae	*Grevillea juniperina subsp. juniperina*	Juniper-leaved Grevillea	V,P		159
Proteaceae	*Grevillea parviflora subsp. parviflora*	Small-flower Grevillea	V,P	V	1
Proteaceae	*Persoonia nutans*	Nodding Geebung	E1,P	E	13
Thymelaeaceae	*Pimelea spicata*	Spiked Rice-flower	E1,P	E	11

Table 2. Database searches for Threatened Faua within a 10km radius of the study area

Family	Species Code	Scientific Name	Common Name	NSW status	Comm. status	Records
Hylidae	3166	*Litoria aurea*	Green and Golden Bell Frog	E1,P	V	9
Ciconiidae	0183	*Ephippiorhynchus asiaticus*	Black-necked Stork	E1,P		1
Strigidae	0248	*Ninox strenua*	Powerful Owl	V,P,3		2
Meliphagidae	0603	*Anthochaera phrygia*	Regent Honeyeater	E4A,P	E	1
Meliphagidae	8303	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	V,P		1
Neosittidae	0549	*Daphoenositta chrysoptera*	Varied Sittella	V,P		5
Phascolarctidae	1162	*Phascolarctos cinereus*	Koala	V,P	V	1
Pteropodidae	1280	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	7
Molossidae	1329	*Mormopterus norfolkensis*	Eastern Freetail-bat	V,P		3
Vespertilionidae	1372	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V,P		1
Vespertilionidae	1346	*Miniopterus australis*	Little Bentwing-bat	V,P		1
Vespertilionidae	1834	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V,P		3
Vespertilionidae	1357	*Myotis macropus*	Southern Myotis	V,P		4
Vespertilionidae	1361	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V,P		1
Camaenidae	I006	*Meridolum corneovirens*	Cumberland Plain Land Snail	E1		141

Table 1. Database searches for Threatened Ecological Communities within a 10km radius of the study area.

Scientific Name	Common Name	NSW status	Comm. status
Agnes Banks Woodland in the Sydney Basin Bioregion	Agnes Banks Woodland in the Sydney Basin Bioregion	E4B	
Blue Gum High Forest in the Sydney Basin Bioregion	Blue Gum High Forest in the Sydney Basin Bioregion	E4B	CE
Blue Mountains Shale Cap Forest in the Sydney Basin Bioregion	Blue Mountains Shale Cap Forest in the Sydney Basin Bioregion	E3	CE
Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion	Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion	V2	E
Castlereagh Swamp Woodland Community	Castlereagh Swamp Woodland Community	E3	
Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion	Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion	E3	CE
Cumberland Plain Woodland in the Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion	E4B	CE
Elderslie Banksia Scrub Forest in the Sydney Basin Bioregion	Elderslie Banksia Scrub Forest in the Sydney Basin Bioregion	E4B	

Scientific Name	Common Name	NSW status	Comm. status
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	
Shale Gravel Transition Forest in the Sydney Basin Bioregion	Shale Gravel Transition Forest in the Sydney Basin Bioregion	E3	CE
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	E4B	CE
Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion	Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion	E3	
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	
Western Sydney Dry Rainforest in the Sydney Basin Bioregion	Western Sydney Dry Rainforest in the Sydney Basin Bioregion	E3	CE

EPBC PROTECTED MATTERS

Australian Government

Department of the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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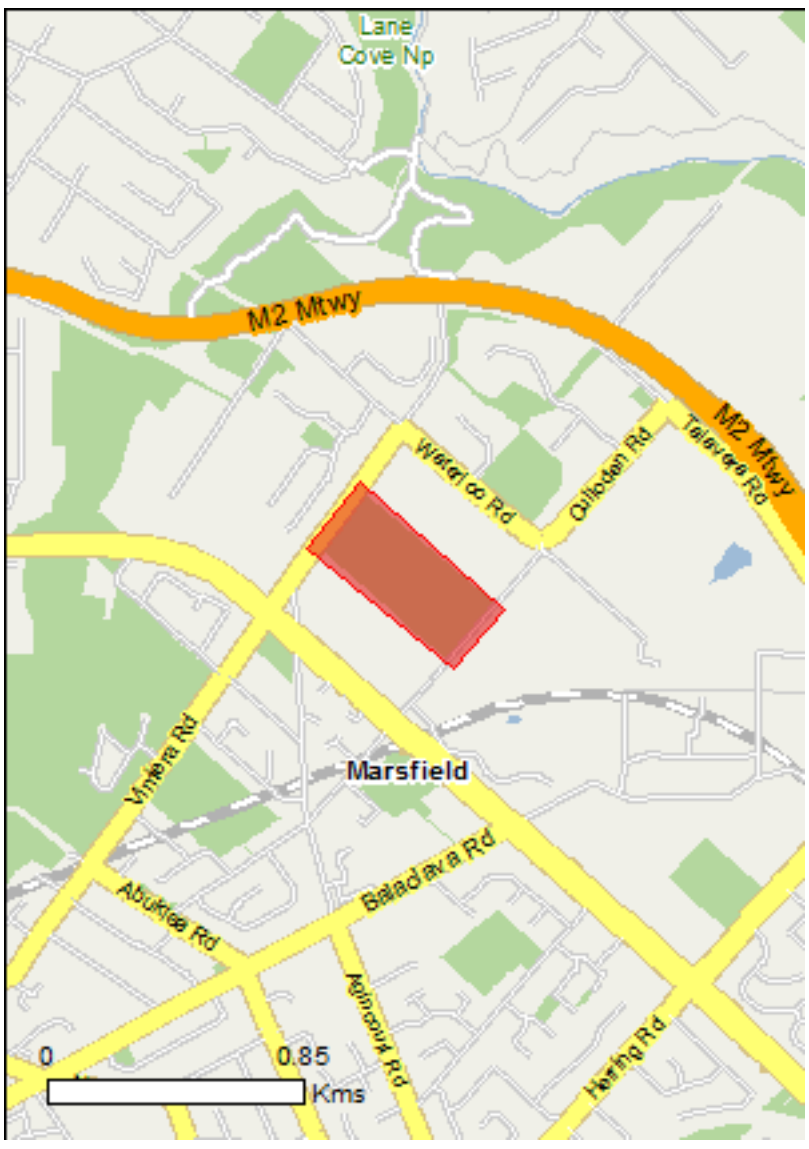

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

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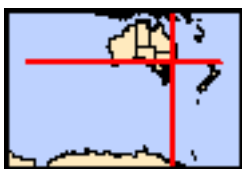

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	26
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	50
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coastal Upland Swamps in the Sydney Basin Bioregion	Endangered	Community may occur within area
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	Critically Endangered	Community may occur within area
Turpentine-Ironbark Forest in the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Western Sydney Dry Rainforest and Moist Woodland on Shale	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Isoodon obesulus obesulus Southern Brown Bandicoot (Eastern) [68050]	Endangered	Species or species habitat likely to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Other		
Pommerhelix duralensis Dural Land Snail [85268]	Endangered	Species or species habitat likely to occur within area
Plants		
Acacia pubescens Downy Wattle, Hairy Stemmed Wattle [18800]	Vulnerable	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
Darwinia biflora [14619]	Vulnerable	Species or species habitat likely to occur within area
Genoplesium baueri Yellow Gnat-orchid [7528]	Endangered	Species or species habitat known to occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area
Melaleuca deanei Deane's Melaleuca [5818]	Vulnerable	Species or species habitat likely to occur within area
Pimelea curviflora var. curviflora [4182]	Vulnerable	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax		Species or species

Name	Status	Type of Presence
Broom [2800] Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		habitat likely to occur within area Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-33.7692 151.103658,-33.772358 151.107907,-33.773856 151.106405,-33.770877 151.102071,-33.769218 151.103658,-33.769218 151.103658,-33.769236 151.103615,-33.769236 151.103615,-33.7692 151.103658

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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NOXIOUS WEED DECLARATIONS FOR HAWKESBURY RIVER COUNTY COUNCIL (INCLUDES PENRITH LGA)

Class 1: State Prohibited Weeds*

Class 1 noxious weeds are plants that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to limited extent.

The Noxious Weed Act 1993 requires for a Class 1 noxious weed, “The plant must be eradicated from the land and the land must be kept free of the plant.”

The control objective for weed control Class 1 is to prevent the introduction and establishment of those plants in NSW.

Class 2: Regionally Prohibited Weeds*

Class 2 noxious weeds are plants that pose a potentially serious threat to primary production or the environment of a region but are not present in the region or are present only to limited extent.

The Noxious Weed Act 1993 requires for a Class 2 noxious weed, “The plant must be eradicated from the land and the land must be kept free of the plant.”

The control objective for weed control Class 2 is to prevent the introduction and establishment of those plants in parts of NSW.

Class 3: Regionally Controlled Weeds

Class 3 noxious weeds are plants that pose a serious threat to primary production or the environment of an area and are not widely distributed in the area but are likely to spread in the area or to another area.

The Noxious Weed Act 1993 requires for a Class 3 noxious weed, “The weed must be fully and continuously suppressed and destroyed.”

The control objective for weed control Class 3 is to reduce the area and impact of those plants in parts of NSW.

Class 4: Locally Controlled Weeds

Class 4 noxious weeds are plants that pose a serious threat to primary production, the environment or human health, are widely distributed in an area and are likely to spread in the area or to another area.

The Noxious Weed Act 1993 requires for a Class 4 noxious weed that “The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread". Many listed Class 4 weeds have an extra requirement "that they not be sold, propagated or knowingly distributed.”

The control objective for weed control Class 4 is to minimise the negative impact of those plants on the economy, community or environment of NSW.

Weed	Class	Legal requirements
African boxthorn *Lycium ferocissimum*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
African feather grass *Pennisetum macrourum*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
African olive *Olea europaea* subsp. *cuspidata*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
African turnip weed - eastern *Sisymbrium thellungii*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
African turnip weed - western *Sisymbrium runcinatum*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Alligator weed *Alternanthera philoxeroides*	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed*
Anchored water hyacinth *Eichhornia azurea*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Annual ragweed *Ambrosia artemisiifolia*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Arrowhead *Sagittaria montevidensis*	4	Locally Controlled Weed *The plant must not be sold, propagated or knowingly distributed*
Artichoke thistle *Cynara cardunculus*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Asparagus - asparagus fern *Asparagus virgatus*	2	Regionally Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Asparagus - climbing asparagus *Asparagus africanus*	2	Regionally Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Asparagus - climbing asparagus fern *Asparagus plumosus*	4	Locally Controlled Weed *The plant must not be sold, propagated or knowingly distributed*
Asparagus - ground asparagus *Asparagus aethiopicus*	4	Locally Controlled Weed *The plant must not be sold, propagated or knowingly distributed*
Asparagus - ming asparagus fern *Asparagus macowanii* var. *zuluensis*	2	Regionally Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Asparagus - sicklethorn *Asparagus falcatus*	2	Regionally Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Asparagus weeds *Asparagus* species	4	Locally Controlled Weed *The plant must not be sold, propagated or knowingly distributed*

Weed	Class	Legal requirements
Athel pine *Tamarix aphylla*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Bear-skin fescue *Festuca gautieri*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Bitou bush *Chrysanthemoides monilifera* subsp. *rotundata*	2	Regionally Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Black knapweed *Centaurea nigra*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Black willow *Salix nigra*	2	Regionally Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Blackberry *Rubus fruticosus* species aggregate	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Boneseed *Chrysanthemoides monilifera* subsp. *monilifera*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Bridal creeper *Asparagus asparagoides*	4	Locally Controlled Weed *The plant must not be sold, propagated or knowingly distributed*
Bridal veil creeper *Asparagus declinatus*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Broad-leaf pepper tree *Schinus terebinthifolius*	2	Regionally Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Broomrapes *Orobanche* species	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Burr ragweed *Ambrosia confertiflora*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Cabomba *Cabomba caroliniana*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Cape broom *Genista monspessulana*	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed*
Cat's claw creeper *Dolichandra unguis-cati*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*
Cayenne snakeweed *Stachytarpheta cayennensis*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Chilean needle grass *Nassella neesiana*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that*

Weed	Class	Legal requirements
		continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Chinese celtis *Celtis sinensis*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Chinese violet *Asystasia gangetica* subsp. *micrantha*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Clockweed *Gaura parviflora*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Coolatai grass *Hyparrhenia hirta*	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed*
Corn sowthistle *Sonchus arvensis*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Creeping lantana *Lantana montevidensis*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*
Dodder *Cuscuta* species	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Espartillo - broad kernel *Amelichloa caudata*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Espartillo - narrow kernel *Amelichloa brachychaeta*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Eurasian water milfoil *Myriophyllum spicatum*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Fine-bristled burr grass *Cenchrus brownii*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Fireweed *Senecio madagascariensis*	4	Locally Controlled Weed *The plant must not be sold, propagated or knowingly distributed*
Flax-leaf broom *Genista linifolia*	4	Locally Controlled Weed *The plant must not be sold, propagated or knowingly distributed*
Fountain grass *Cenchrus setaceus*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Frogbit *Limnobium laevigatum*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Gallon's curse *Cenchrus biflorus*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*

Weed	Class	Legal requirements
Gamba grass *Andropogon gayanus*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Giant Parramatta grass *Sporobolus fertilis*	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed*
Giant reed *Arundo donax*	4	Locally Controlled Weed *The plant must not be sold, propagated or knowingly distributed*
Glaucous starthistle *Carthamus leucocaulos*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Golden dodder *Cuscuta campestris*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*
Golden thistle *Scolymus hispanicus*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Gorse *Ulex europaeus*	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed*
Green cestrum *Cestrum parqui*	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed*
Grey sallow *Salix cinerea*	2	Regionally Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Groundsel bush *Baccharis halimifolia*	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed*
Harrisia cactus *Harrisia* species	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Hawkweeds *Hieracium* species	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Honey locust *Gleditsia triacanthos*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Horsetails *Equisetum* species	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Hydrocotyl *Hydrocotyl ranunculoides*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Hygrophila *Hygrophila costata*	2	Regionally Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Hymenachne *Hymenachne amplexicaulis* and hybrids	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*

Weed	Class	Legal requirements
Italian bugloss *Echium italicum*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*
Karroo thorn *Acacia karroo*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Kidney-leaf mud plantain *Heteranthera reniformis*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Kochia *Bassia scoparia*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Koster's curse *Clidemia hirta*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Kudzu *Pueraria lobata*	2	Regionally Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Lagarosiphon *Lagarosiphon major*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Lantana *Lantana camara*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*
Leafy elodea *Egeria densa*	4	Locally Controlled Weed *The plant must not be sold, propagated or knowingly distributed*
Lippia *Phyla canescens*	4	Locally Controlled Weed *The plant must not be sold, propagated or knowingly distributed* ***except incidentally in hay or lucerne***
Long-leaf willow primrose *Ludwigia longifolia*	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed*
Ludwigia *Ludwigia peruviana*	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed*
Mexican feather grass *Nassella tenuissima*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Mexican poppy *Argemone mexicana*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Miconia *Miconia* species	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Mikania vine *Mikania micrantha*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Mimosa *Mimosa pigra*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*

Weed	Class	Legal requirements
Mossman River grass *Cenchrus echinatus*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Mother-of-millions *Bryophyllum* species	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed*
Pampas grass *Cortaderia* species	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed*
Paper mulberry *Broussonetia papyrifera*	2	Regionally Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Parthenium weed *Parthenium hysterophorus*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Paterson's curse *Echium plantagineum*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*
Pond apple *Annona glabra*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Prickly acacia *Acacia nilotica*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Prickly pear - common pear *Opuntia stricta*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Prickly pear - Hudson pear *Cylindropuntia rosea*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Prickly pear - smooth tree pear *Opuntia monacantha*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Prickly pear - tiger pear *Opuntia aurantiaca*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Prickly pear - velvety tree pear *Opuntia tomentosa*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Privet - broad-leaf *Ligustrum lucidum*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*
Privet - narrow-leaf *Ligustrum sinense*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*

Weed	Class	Legal requirements
Red rice *Oryza rufipogon*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Rhizomatous bamboo *Phyllostachys* species	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Rhus tree *Toxicodendron succedaneum*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Rubber vine *Cryptostegia grandiflora*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Sagittaria *Sagittaria platyphylla*	4	Locally Controlled Weed *The plant must not be sold, propagated or knowingly distributed*
Salvinia *Salvinia molesta*	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed*
Scotch broom *Cytisus scoparius*	4	Locally Controlled Weed *The plant must not be sold, propagated or knowingly distributed*
Senegal tea plant *Gymnocoronis spilanthoides*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Serrated tussock *Nassella trichotoma*	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed*
Siam weed *Chromolaena odorata*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Silverleaf nightshade *Solanum elaeagnifolium*	4	Locally Controlled Weed *The plant must not be sold, propagated or knowingly distributed*
Smooth-stemmed turnip *Brassica barrelieri* subsp. *oxyrrhina*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Soldier thistle *Picnomon acarna*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Spongeplant *Limnobium spongia*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Spotted knapweed *Centaurea stoebe* subsp. *micranthos*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
St. John's wort *Hypericum perforatum*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Texas blueweed *Helianthus ciliaris*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*

Weed	Class	Legal requirements
Tropical soda apple *Solanum viarum*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Tussock paspalum *Paspalum quadrifarium*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Viper's bugloss *Echium vulgare*	4	Locally Controlled Weed *The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*
Water caltrop *Trapa* species	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Water hyacinth *Eichhornia crassipes*	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed*
Water lettuce *Pistia stratiotes*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Water soldier *Stratiotes aloides*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Willows *Salix* species	4	Locally Controlled Weed *The plant must not be sold, propagated or knowingly distributed*
Witchweeds *Striga* species	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Yellow bells *Tecoma stans*	3	Regionally Controlled Weed *The plant must be fully and continuously suppressed and destroyed*
Yellow burrhead *Limnocharis flava*	1	State Prohibited Weed *The plant must be eradicated from the land and that land must be kept free of the plant*
Yellow nutgrass *Cyperus esculentus*	5	Restricted Plant *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*

ASSESSMENT OF SIGNIFICANCE

THREATENED SPECIES ASSESSMENT

Assessment of Significance (TSC Act)

Section 5A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) specifies seven factors to be taken into account in deciding whether a development is likely to have a significant impact on threatened species, populations or ecological communities, or their habitats listed on the *Threatened Species Act 1995* (TSC Act).

The following Assessment of Significance assesses the level of potential impacts associated with the proposed Erskine Park road intersection upgrades on the Cumberland Plain Woodland (CPW) Critically Endangered Ecological Community (CEEC)

a) In the case of a threatened species, whether the action proposed 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.

N/A

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

N/A

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(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

(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.

i) The total area of Cumberland Plain Woodland CEEC that is likely to be impacted is approximately 0.44 ha of the disturbed community located at the proposal site. The vegetation was identified as Shale Plains Woodland one of the two forms of CPW. Cumberland Plain Woodland is present within the Penrith Local Government Area (LGA). Based upon mapping undertaken in 2002 the extent of intact Cumberland Plain Woodland within the Penrith LGA was 1,525 ha (NSW NPWS, 2002). Thus the removal of a small amount of low quality vegetation consisting of street trees is unlikely to adversely affect the extent of the EEC such that its local occurrence is placed at risk of extinction.

ii) The current species composition of the community is highly disturbed as it does not include a structured understorey. The understorey consists mainly of maintained grass. The removal of vegetation is unlikely to modify the community at this location such that its local occurrence would be placed at risk of extinction.

d) In relation to the habitat of a threatened species, population or ecological community:

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

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

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

i) The proposed works would require the removal of approximately 0.44ha of Cumberland Plain Woodland CEEC of the disturbed community located at the proposal site. Vegetation to be removed would include trees and groundcover in a small section adjacent to an existing park approximately 90 meters long and 6 meters wide at the intersection of Erskine Park Road and Explorers Way and 480 meters long and 8 meters at the intersection of Erskine Park Road and Coonawarra Drive. The removal of vegetation is not considered significant in relation to the distribution of this community in the greater area.

ii) The vegetation to be removed is on the edge of an already fragmented and isolated patch of street trees along Erskine Park Road. Vegetation removal required as part of the works would have minimal impact upon fragmentation given the highly disturbed nature of the area and the present degree of fragmentation.

iii) The vegetation at the proposal site in its current state does not contribute to the long term survival of the Cumberland Plain Woodland CEEC. The surrounding landscape is highly disturbed and given the high degree of urbanisation, the chance of re-establishing this community in the immediate area is low. The importance of the habitat is therefore considered low. There are larger and more substantial patches of Cumberland Plain Woodland to the east and north of the proposal site.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No areas of critical habitat have been declared for the study area.

f) Whether the action proposed is consistent with the objectives or actions of a Recovery Plan or Threat Abatement Plan.

A recovery plan is currently being prepared for the Cumberland Plain's endangered ecological communities. The plan will focus on the threatened species, populations and ecological communities that are endemic (or primarily endemic) to western Sydney, and for which a recovery plan has been prepared. This will include Cumberland Plain Woodland CEEC.

The core principles on which the recovery plan are that:

- The protection and management of large, intact remnants is more effective and efficient than for smaller, fragmented remnants;
- Recovery efforts need to aim to ensure that a representative sample of biodiversity is conserved;
- Active management to best practice standards is needed to prevent the degradation of bushland in a fragmented landscape; and
- Where impacts on biodiversity cannot be avoided, they should be offset using appropriate means, including BioBanking.

The government wants to achieve a balance between the conservation of biodiversity, and other community needs such as housing, roads, railways and other urban development. The recovery plan aims to inform this process.

The proposed works are unlikely to affect the implementation of the plan.

No threat abatement plans are applicable to this project and Cumberland Plain Woodland EEC.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key threatening processes relevant to the proposal include:

- Clearing of native vegetation.

The clearing of native vegetation is considered a major contributor to the loss of biodiversity. In its determination, the NSW Scientific Committee found that 'clearing of any area of native vegetation, including areas less than two hectares in extent, may have significant impacts on biological diversity'. Clearing can lead to direct habitat loss, habitat fragmentation and associated genetic impacts, habitat degradation and off-site impacts such as downstream sedimentation.

The proposed works would require the removal of approximately 0.44 ha of Cumberland Plain Woodland Vegetation which would comprise of immature and semi mature trees. The vegetation removal would result in the operation of this key threatening process. However, the vegetation to be removed as part of this proposal is considered minor in terms of the local extent of this community in surrounding areas as well as the fragmented nature of the vegetation. There are larger stands of Cumberland Plain Woodland in nearby areas. As such the proposal is not likely to contribute significantly to the operation of clearing as a threatening process.

Conclusion

The Assessment of Significance has concluded that the proposal is not likely to significantly affect Cumberland Plain Woodlands CEEC, directly or indirectly. Specifically, the proposal would be unlikely to:

- Reduce the long-term viability of Cumberland Plains Woodland CEEC; or
- Significantly fragment Cumberland Plains Woodland CEEC

Based on this assessment a Species Impact Statement is not required.

References

New South Wales National Parks and Wildlife Service (2002) *Interpretation Guidelines for the Native Vegetation Maps of the Cumberland Plain, Western Sydney*, *Final Edition* NSW NPWS, Hurstville.

Appendix D

Traffic Modelling Study

ERSKINE PARK ROAD
Intersections Traffic Modelling

Final Draft Report

Prepared for Penrith City Council

April 2015

DOCUMENT CONTROL				
Title	Erskine Park RoadModelling Review			
Prepared for	Penrith City Council			
Saved Location	I:\projects\30011669 - Penrith Council Traffic Modelling\009 FinalReport			
Project Ref	30011669			
	Name	**Position**	**Signed/Approved**	**Date**
Originator	Alen Krljic, Anthony De Jongh	Associate Transport Planner, Project Engineer	Alen Krljic	23/04/2015
Review	Mary Haverland	Principal Transport Planner	Mary Haverland	23/04/2015
Approval	Mary Haverland	Principal Transport Planner	Mary Haverland	23/04/2015

Details of Revisions				
Rev	**Date**	**Description**	**WVR No.**	**Approved**
A	27/03/2015	Draft Report		Mary Haverland
B	17/04/2015	Final Draft Report		Mary Haverland
C	23/04/2015	Updated Final Draft Report		Mary Haverland

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1 Introduction

1.1 Overview

A Plan for Growing Sydney (the "Sydney Metropolitan Strategy") was released in December 2014 and is the NSW Government's 20-year plan for the Sydney Metropolitan Area. It provides direction for Sydney's productivity, environmental management, and liveability; and for the location of housing, employment, infrastructure and open space.

The Sydney Metropolitan Strategy identifies a sub-regional planning approach which will link growth in population and housing to the infrastructure that supports communities. Penrith is designated as a 'Regional City' (See Figure 1-1) in the Sydney Metropolitan Strategy in the Western Sub-region and it is targeted for both population and economic growth. Council is seeking to cater for planned growth in the Local Government Area (LGA) by investigating improvements to traffic flow, road safety, road network efficiency and reduction in journey travel time-particularly along key regional link roads which connect residential, education, employment, and transport and retail hubs.

SMEC Australia Pty Ltd (SMEC) has been commissioned by the Penrith City Council to carry out an independent traffic modelling study of selected intersections on Erskine Park Road in order to assess the impacts of the projected population and economic growth in the study area; and to identify potential intersection upgrade solutions suitable for the future traffic conditions.

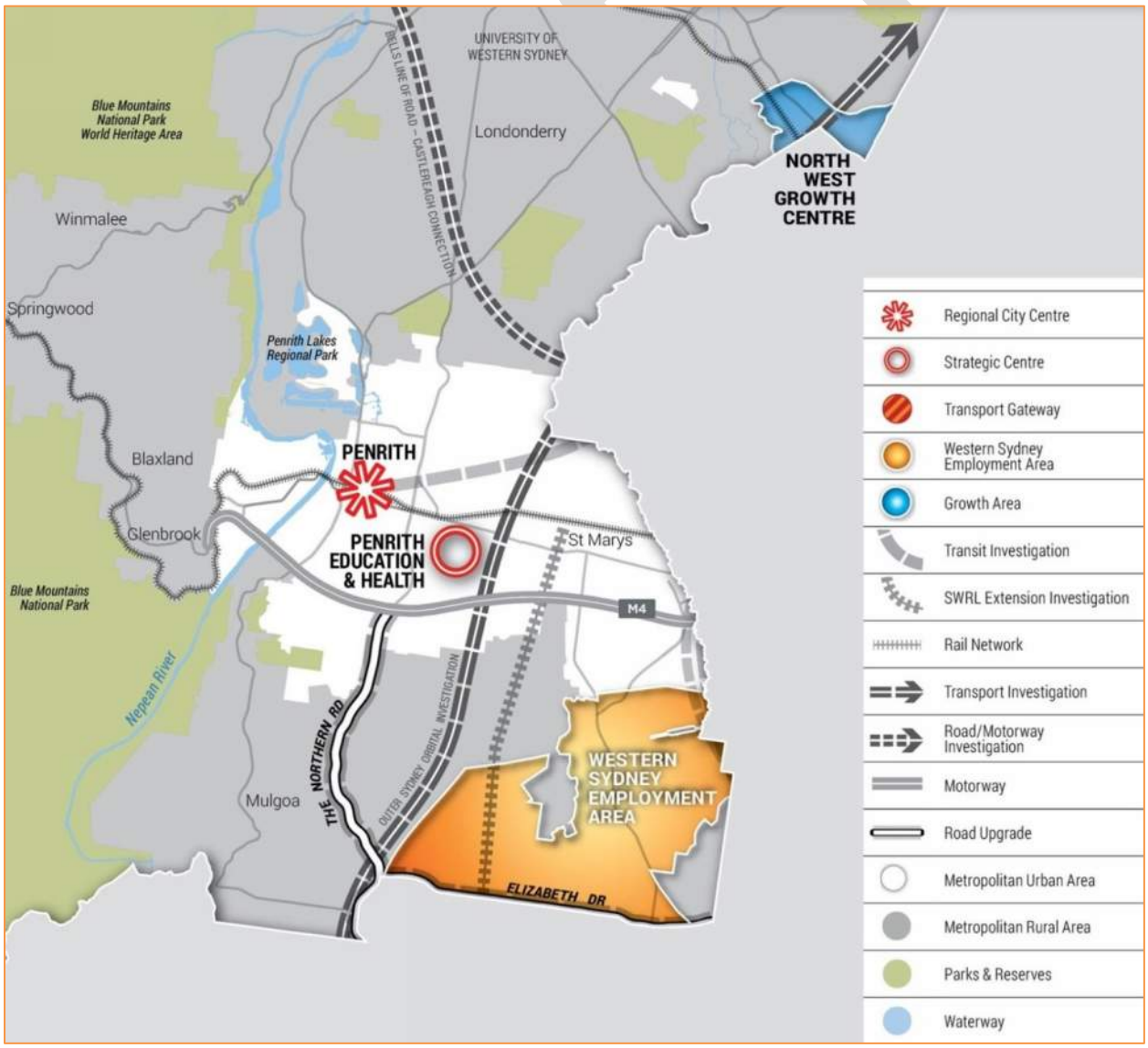


Figure 1-1 West Sub-Region (Sydney Metropolitan Strategy, Source: TfNSW)

1.2 Background

A Plan for Growing Sydney includes a vision for Western Sydney in order to meet its full potential and build strong centres which will drive the future productivity of Sydney and NSW. *A Plan for Growing Sydney* sets priorities and provides a direction for metropolitan and subregional planning. Subregional planning is a partnership between State Government, local councils and the community.

The wider area context was reviewed in order to gain a better understanding of the proposed land use, population and employment growth and the future role of Erskine Park Road in the Western Sydney road network.

1.2.1 Wider Area Context

The New South Wales Government established the Western Sydney Employment Area to provide businesses in the region with land for industry and employment, catering for transport and logistics, warehousing and office space.

Located about 50 kilometres from the Sydney central business district, the Western Sydney Employment Area gives these businesses access to roads and utility services and is close to the planned new airport at Badgerys Creek. To achieve the outcomes set by the NSW Government, the Broader Western Sydney Employment Area has been identified in the draft Metropolitan Strategy for Sydney as one of nine key 'city shaping projects' critical to Sydney's growth. It will be the single largest new employment space in New South Wales, once it is available to market.

Figure 1-2 shows location of the Erskine Park Road in the Broader Western Sydney Employment Area context.

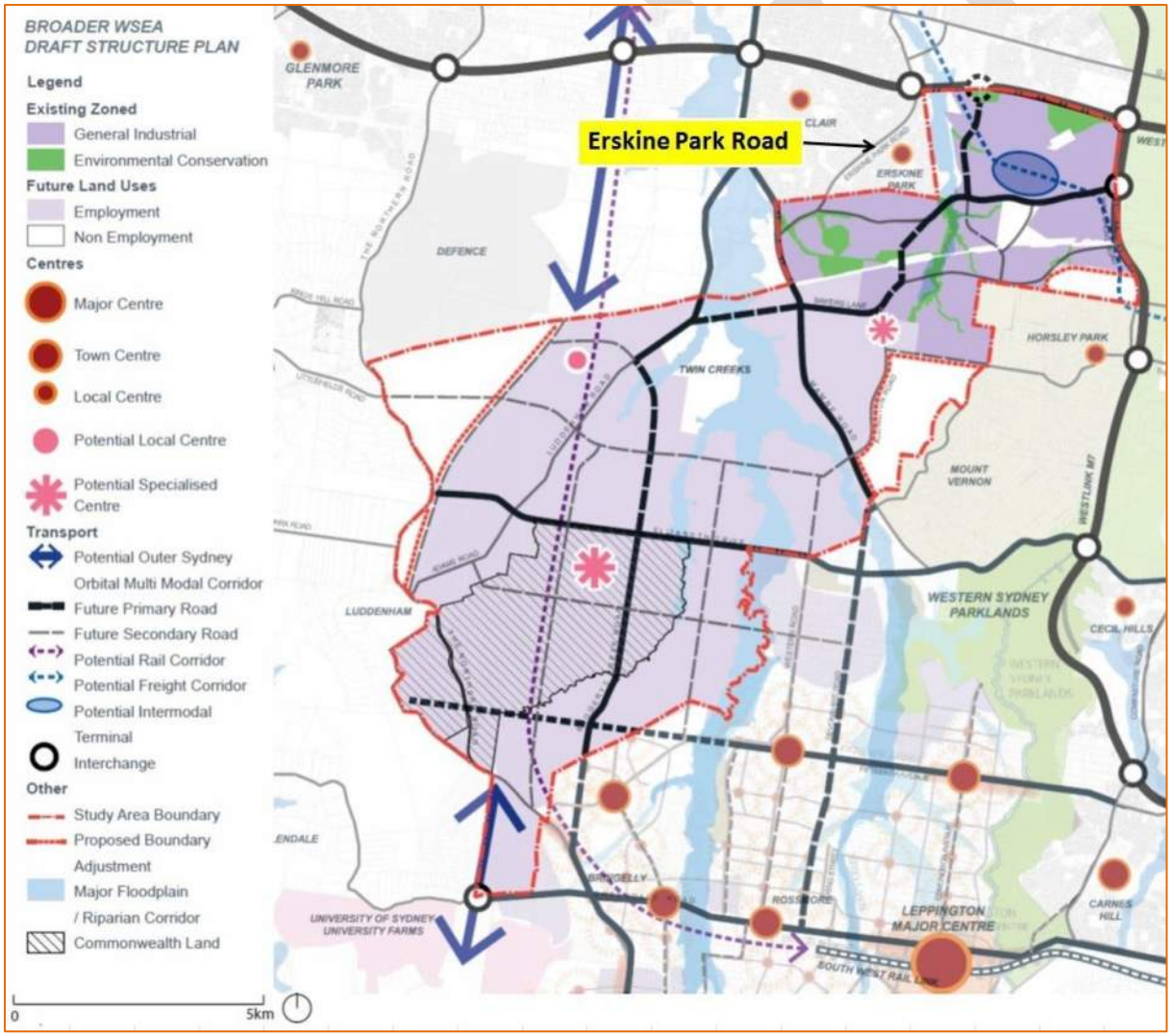


Figure 1-2 Location of Erskine Park Road in Wider Area Context

The Broader Western Sydney Employment Area (BWSEA) Draft Structure Plan was released in June 2013. It outlines a broad framework for the area including the location of future employment land and centres, a road network, potential freight and transport corridors and staging scenarios. Following the second airport announcement, TfNSW is further refining the draft Structure Plan for the area. This revision is anticipated to be completed by the close of 2015.

As a result, and after community consultation, TfNSW has extended the existing Western Sydney Employment Area boundary south to Elizabeth Drive and to include land west of the planned second Sydney Airport. These changes have allowed the NSW Government to dedicate 4,537 more hectares to economic growth in Western Sydney.

Figure 1-3 shows planned extension of BWSEA in western Sydney.

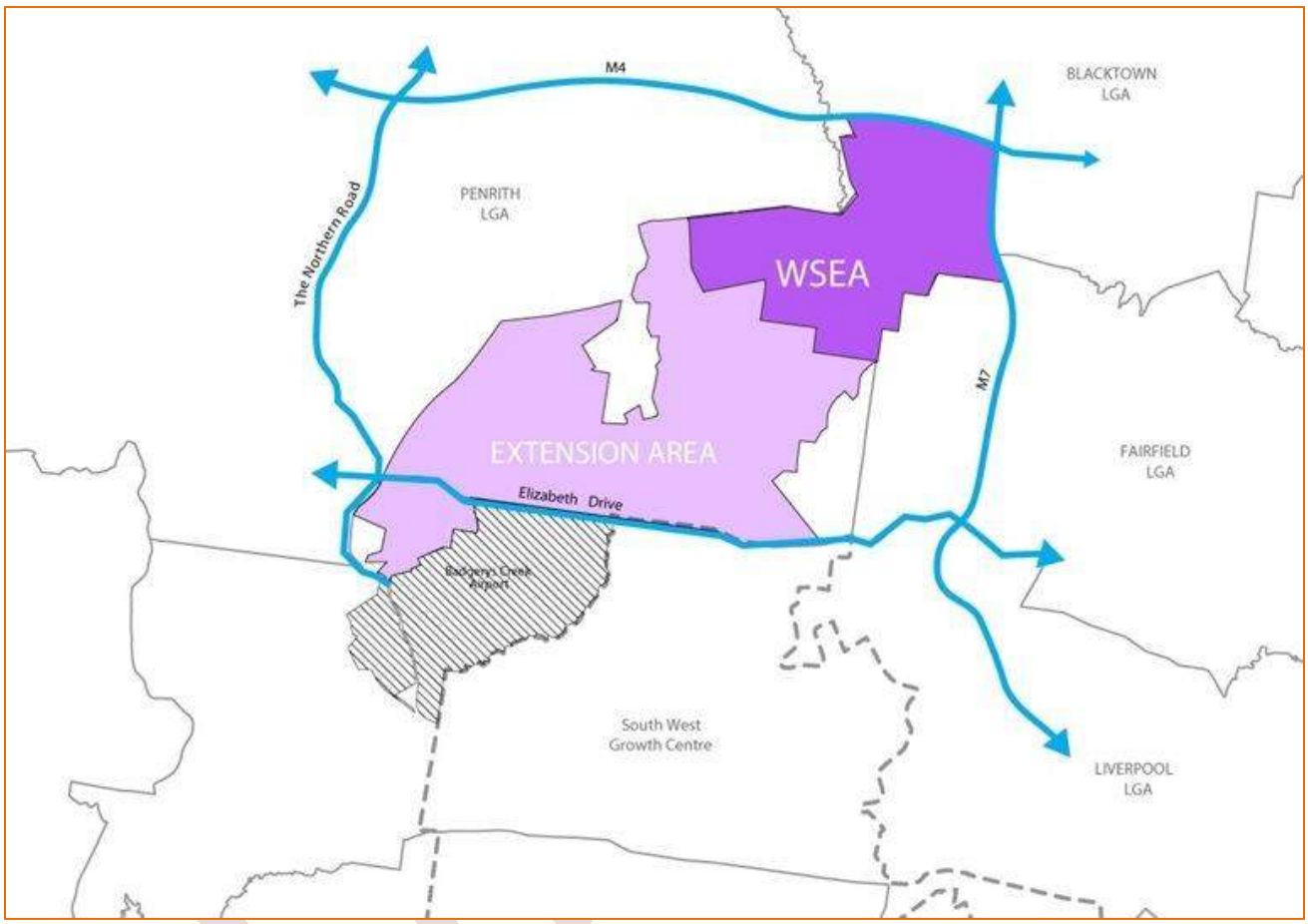


Figure 1-3 Planned Extension of Broader Western Sydney Employment Area (source: TfNSW, BWSEA Draft Structure Plan 2013)

Figure 1-4 shows Erskine Park Road in the context of planned road network in the BWSEA.

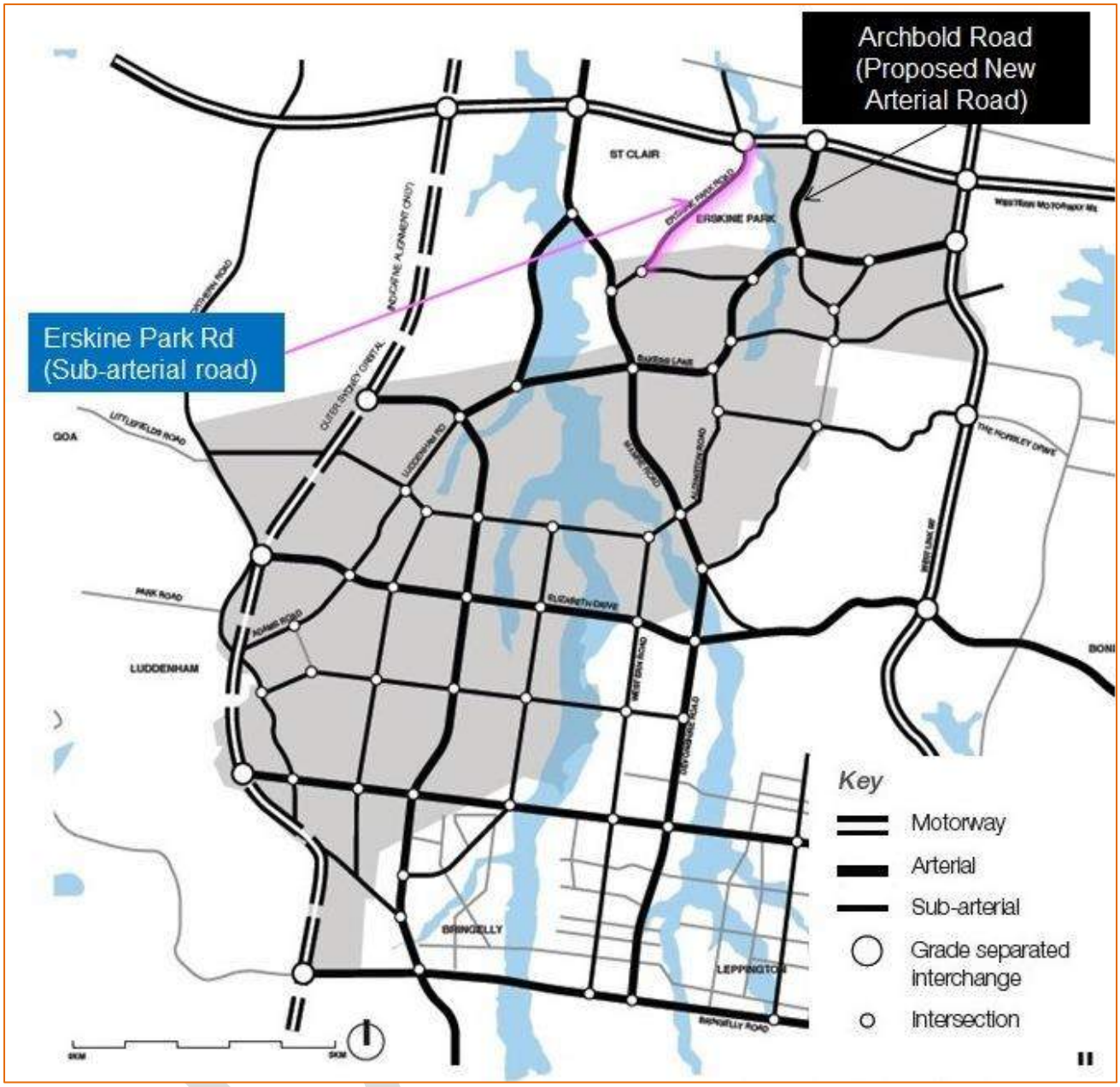


Figure 1-4 Wider Area Context- Road Network (source: TfNSW, BWSEA Draft Structure Plan 2013)

Figure 1-4 shows that Erskine Park Road is proposed to have a sub-arterial role in the BWSEA road hierarchy. Figure 1-4 also indicates that Archbold Road south of M4 Motorway is proposed to be built as a new arterial road parallel with the Erskine Park Road. The BWSEA Draft Structure Plan proposes a new grade separated interchange at M4 Motorway/Archbold Road approximately 1.3 km east of Erskine Park Road.

1.3 Core Study Area

Erskine Park Road is a two-way State road which runs from the M4 Motorway in the north to Mamre Road in the south. Erskine Park Road is a four lane road with a divided carriageway from the M4 Motorway to Coonawarra Drive. The southbound carriageway is two lanes from the M4 Motorway to Peppertree Drive. Erskine Park Road becomes one lane in each direction with an undivided carriageway south of Peppertree Drive. The core study area includes the section of Erskine Park Road from south of M4 Motorway to south of Bennett Road with the four key intersections along this section as listed in Table 1-1.

Table 1-1 Key Intersections in the Core Study Area

ID	Intersection	Control Type	Road Class
I-6	Erskine Park Road/ Explorers Way	Priority	State/Local
I-7	Erskine Park Road/ Coonawarra Drive	Priority	State/Local
I-8	Erskine Park Road/ Peppertree Drive	Priority	State/Local
I-9	Erskine Park Road/ Bennett Road	Priority	State/Local

Erskine Park Road has a posted speed limit of 70 km/h and it is classified as a State road as per the RMS *Schedule of Classified Roads and Unclassified Regional Roads (2009)*.

Explorers Way, Connawarra Drive and Bennett Road are local roads connecting residential area on the western side of Erskine Park Road while Peppertree Drive is local road located in the residential area on the eastern side of Erskine Park Road. These roads are two-way, two lane roads and are classified as local roads with the posted speed limits of 50 km/h. The study area is shown in Figure 1-5.

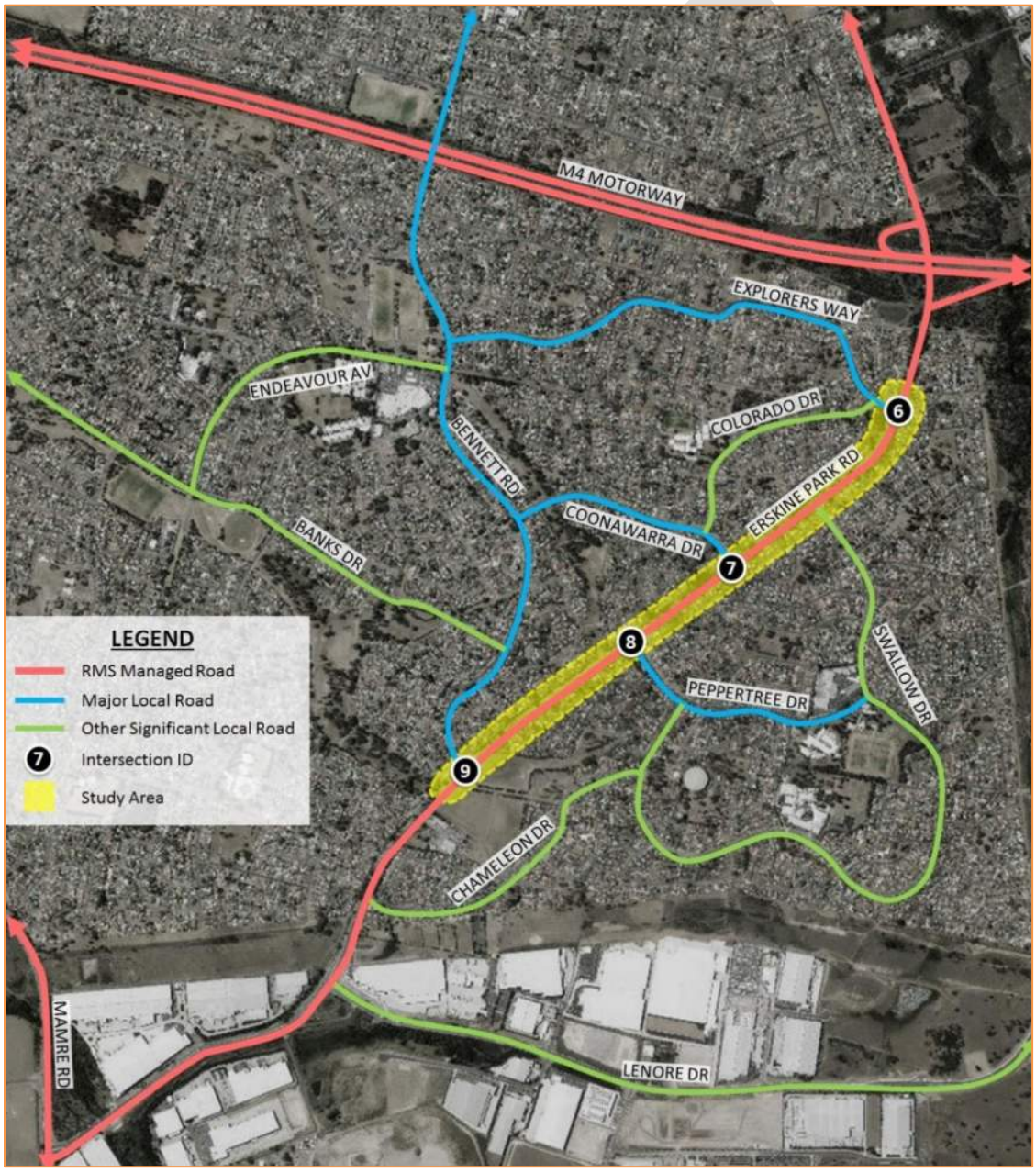


Figure 1-5 Study Area and Road Hierarchy

1.4 Study Objectives

The key objectives of the study are:

- Traffic modelling of key intersections listed in Table 1 in the "current" traffic conditions (2014/15), and future "projected" traffic conditions in 10 years (2025) and 15 years (2031);
- Determining the intersection Level of Service (LoS) and impact of proposed growth to intersection operations taking into account both traffic travelling along the main route (Erskine Park Road) and local traffic entering/crossing main road from minor (local) roads; and
- To investigate potential intersection upgrade options in order to improve intersection Level of Service, road network efficiency and traffic safety.

1.5 Traffic Study Process

SMEC has developed an effective approach to achieve the key objectives of the study in the given timeframe. It involves analysis of background information, traffic data analysis, developing road based SIDRA traffic models for key intersections, and application of the SIDRA models to assess the future intersection performance. The traffic study process is shown graphically in Figure 1-6.

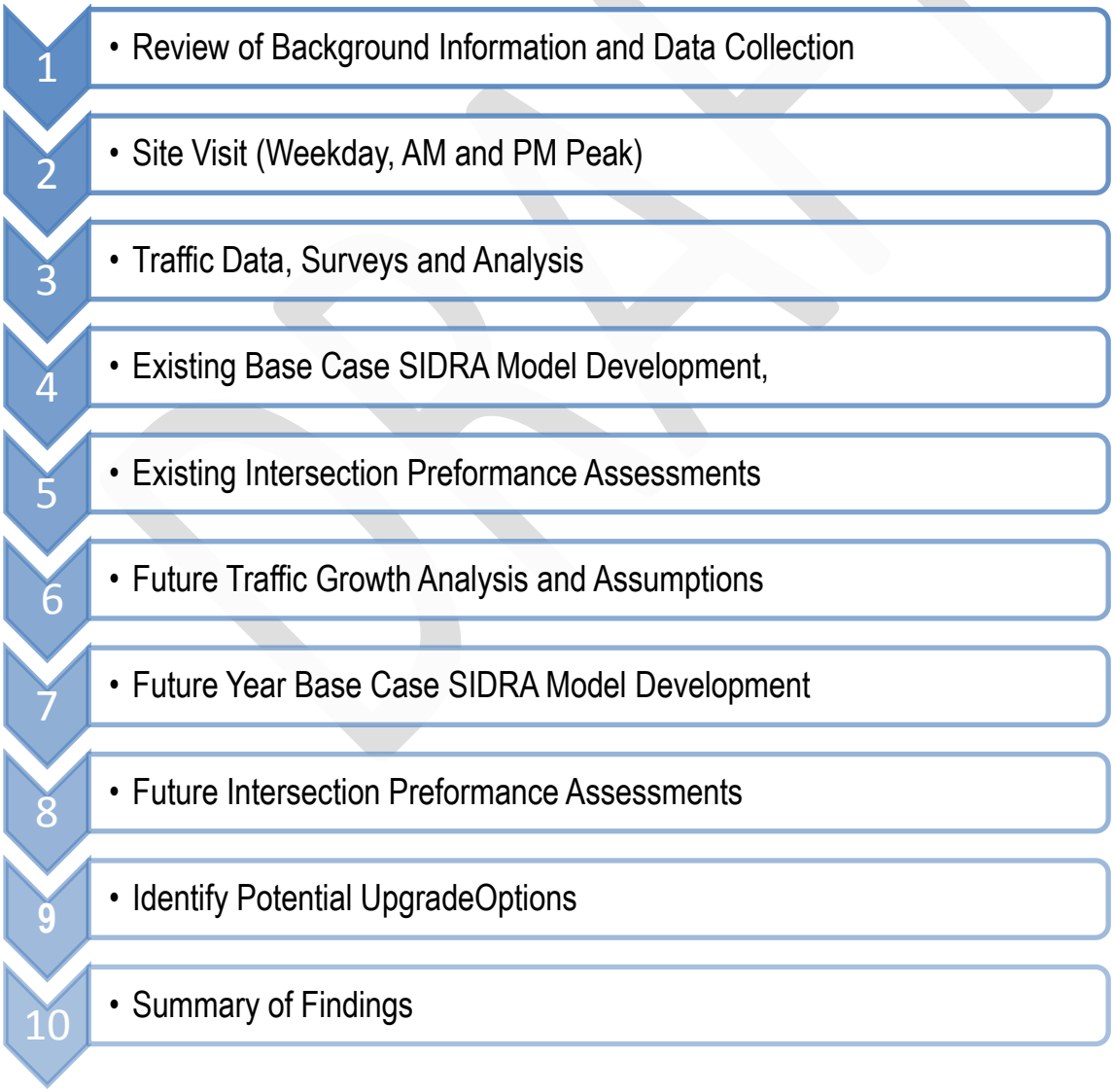


Figure 1-6 Study Process

2 Review of Key Transport Indicators

A review of the key transport indicators - including road hierarchy, commuter mode share, crash data, public transport and historical traffic growth - has been undertaken as part of this traffic study process.

2.1 Road Hierarchy

Roads and Maritime Services (RMS), in co-operation with local Councils, defines the functional road hierarchy in an urban area to establish a consistent basis for traffic management. There are three key road categories and their functions are stated as below:

- State Roads: Freeways/motorways and primary arterials;
- Regional Roads: secondary or sub arterials; and
- Local Roads: Collector and local access roads.

The road hierarchy in the study area is shown graphically in Figure 1-5.

As indicated in Figure 1-5 Erskine Park Road is classified as state road (RMS managed road) and Explorers Way; Coonawarra Drive; Peppertree Drive and Bennett Road are local roads owned and operated by Penrith City Council.

2.2 Journey to Work Data (JTW) and Commuter Mode Share

The Bureau of Transport Statistics (BTS) provides journey to work (JTW) for the Sydney Metropolitan Area (GMA) which includes a comprehensive sample of commuter travel, collected during the 2011 Census Year.

2.2.1 BTS Travel Zone System in the Core Study Area

We have analysed JTW 2011 census data within BTS 2011 travel zone system in the study area as show in Table 2-1 and Figure 2-1 below.

Table 2-1 BTS Travel Zone System (2011) in the core study area

TZ ID	Travel Zone Name
5000	Erskine Park Shopping Centre
5001	James Erskine High School
5002	Mount Vernon_ Erskine Park Landfill and Recycling
5005	St Clair_ Mark Leece Sport Complex
5006	St Clair_ Mamre Road and Banks Drive
5007	St Clair_ Clairgate Public School
5008	St Clair Shopping Centre
5009	St Clair- Mamre Road and Micintyre Avenue
5010	St Clair_ Blackwell Avenue and Coowarra Drive
5024	Colyton Shopping Centre

Source: BTS

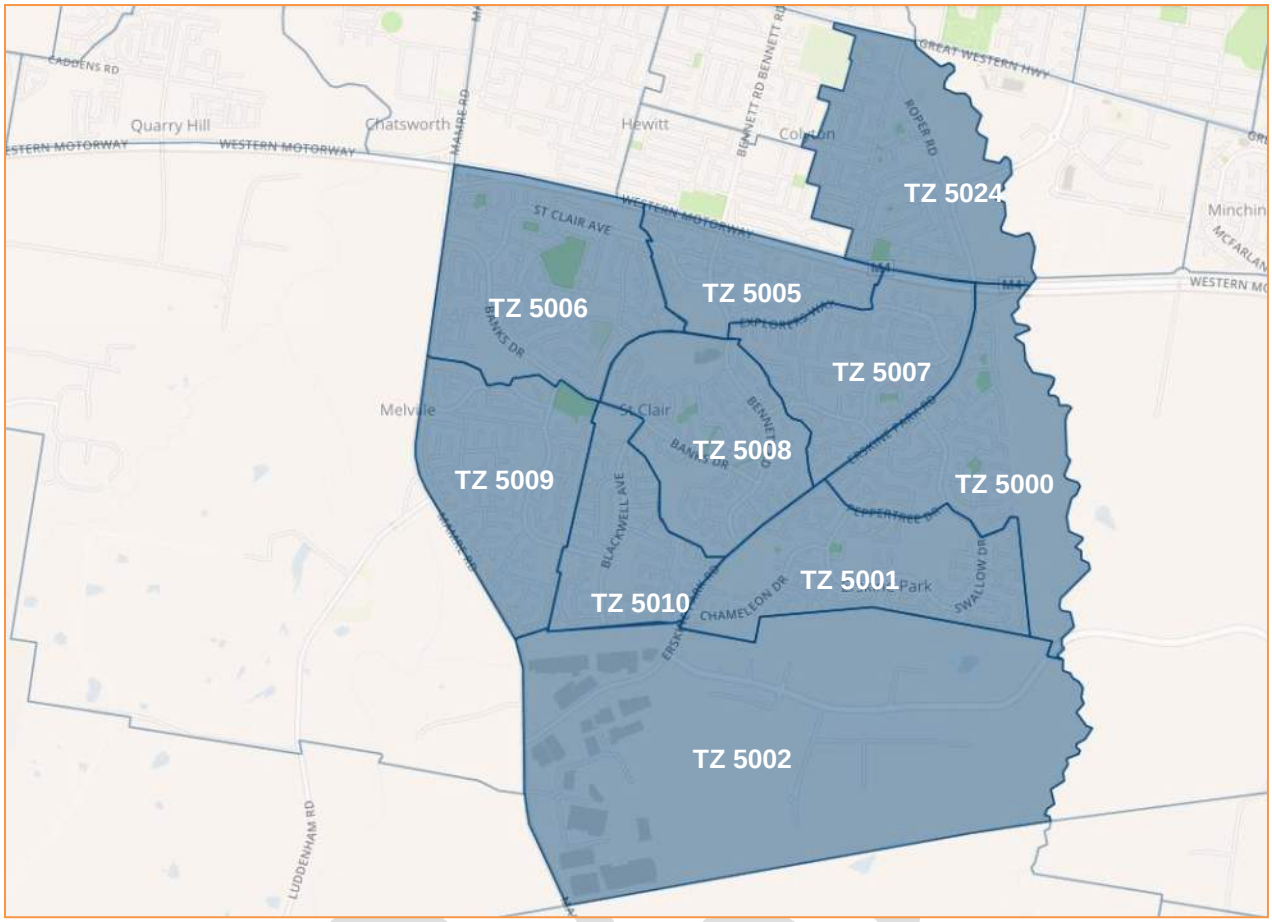


Figure 2-1 BTS Travel Zone System in the Study Area (TZ 2011, source BTS)

2.2.1 Commuter Transport Mode Share

Table 2-2 shows work (commuter) trips by mode of travel reported for the selected travel zones in the core study area based on 2011 JTW Census data.

Table 2-2 Daily Travel Mode Split in the Core Study Area, 2011 Census Data

Travel Mode	Study Area as a place of Residence (Outbound Trips)		Study Area as a place of Work (Inbound Trips)	
	Number of Trips	[%]	Number of Trips	[%]
Car Driver	11,080	70.69%	4060	73.59%
Bus	145	0.93%	55	1.00%
Car Passenger	923	5.95%	421	7.63%
Walked Only	103	0.66%	108	1.96%
Train	1386	8.84%	61	1.11%
Other Mode	82	0.52%	45	0.82%
Not Stated	267	1.70%	93	1.69%
Work at Home or Did not go to Work	1672	10.67%	671	12.16%
Total	**15,674**	**100%**	**5517**	**100%**

Source: 2011 JTW, BTS Selected travel zones (TZ11)

Figure 2-3 and Figure 2-4 below show the study area commuter transport mode share for outbound ('study area as place of residence') and inbound ('study area as place of work') trips respectively.

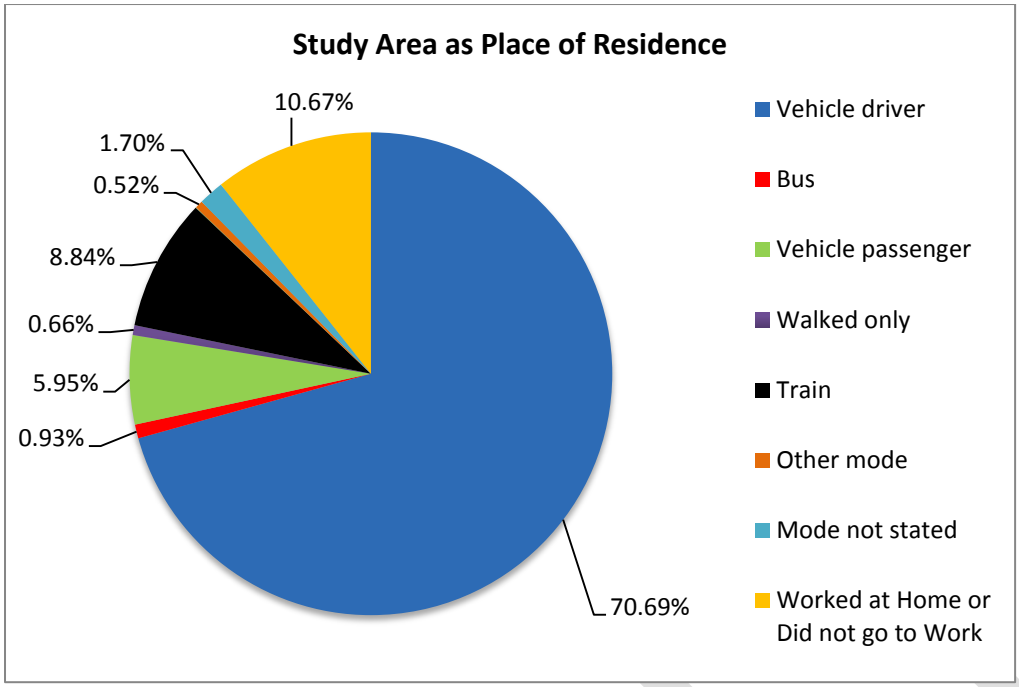


Figure 2-2 Transport Mode Share-Study Area as Place of Residence (2011 Census data)

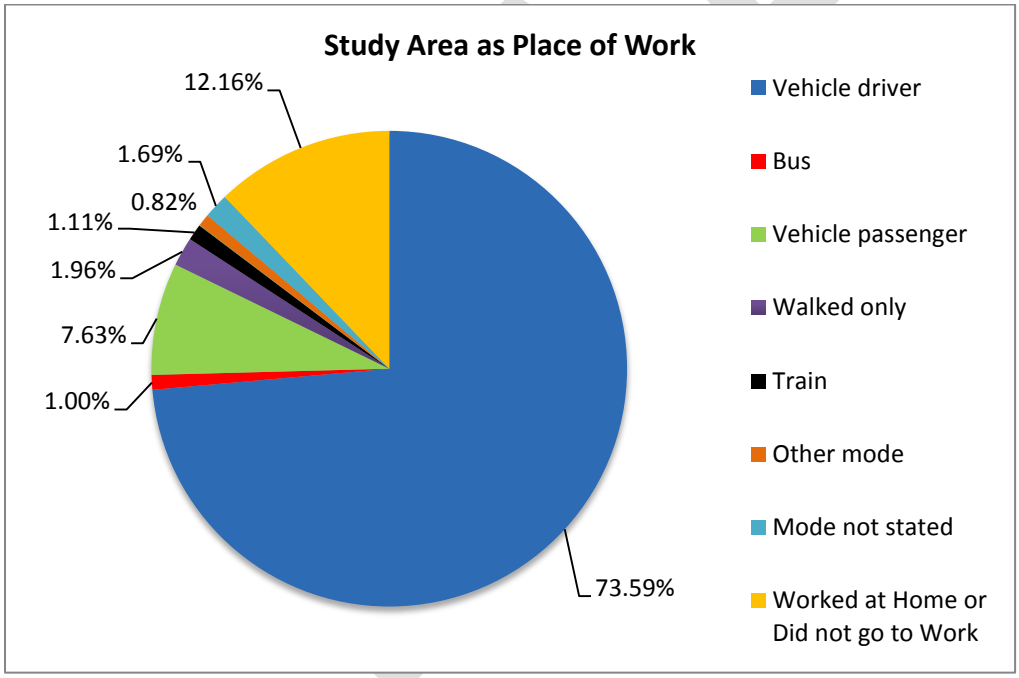


Figure 2-3 Transport Mode Share-Study Area as Place of Work (2011 Census data)

In 2011, about 15,700 residents travelled from the study area to work. About 11% of people did not travel to work or worked from home on the census day. The census data showed that around 77% of work related trips from the study area were made by motorists in private vehicles either as a car drivers or car passengers. Driving a car is the most dominant transport mode with the proportion of 71% of work related trips. Currently, there is a relatively low usage of public transport services in the study area with only 10% of workers travelled by public transport, and only 0.66% walked. Of 10% public transport users only about 1% were made by bus, with the remaining 9% per cent work related trips were made by train.

Similarly, in 2011, about 5,500 employees travelled to the study area to work. From the inbound trips statistics, it can be seen that private vehicles are still by far the dominant mode of transport to work comprising about 73.5% of all work

related trips. Only 2% of employees travelled by public transport and 2% walked. The percentage of people did not go to work or worked from home on the census day was about 12%.

From JTW data it can be concluded that driving a private car is by far the dominant modal transport choice for daily commuters. Considering the high proportion of private car mode share, it can be concluded that future population and employment growth would increase pressure on road network in the wider and core study area. However, there is a potential that improved, accessible, frequent and more reliable public transport system in the study area could reduce private car driving and increase public transport mode use in order to lower expected impact on road network in the future.

2.3 Public Transport

The nearest train station to the site is Mount Druitt station approximately 5.0 km to the north, which is serviced by the T1 western line.

Some local roads in the study area are serviced by public transport buses. This mainly includes buses which run from Penrith to Mt Druitt and vice versa. There is also a service which runs between UWS Penrith and Prairiewood.

The following table summarises the bus services in the local area, including their frequency during the AM and PM peaks.

Table 2-3 Public Transport (Bus) Routes and services

Service number	Description	No. of weekday services	No. of weekend services	No. of AM peak services	No. of PM peak services
775	Mt Druitt to Penrith via St Marys & Erskine Park	35	17	2	2
775	Penrith to Mt Druitt via St Marys & Erskine Park	25	17	2	3
776	Mt Druitt to Penrith via St Marys & St Clair	33	16	3	2
776	Penrith to Mt Druitt via St Marys & St Clair	34	17	2	2
835	Prairiewood to UWS Penrith	14	0	2	2
835	UWS Penrith to Prairiewood	13	0	2	2

Source: TfNSW, March 2015

The following key points are noted from Table 2-3:

- Currently there is a limited public transport service in the core study area with only few public bus routes serving local areas on both western and eastern side of Erskine Park Road;
- There is no direct City CBD public transport route from the study area;
- In the weekday peak periods there are only 2-3 bus services connecting study area with Penrith and Mt Druitt;

Figure 2-4 shows the existing bus routes in the study area.

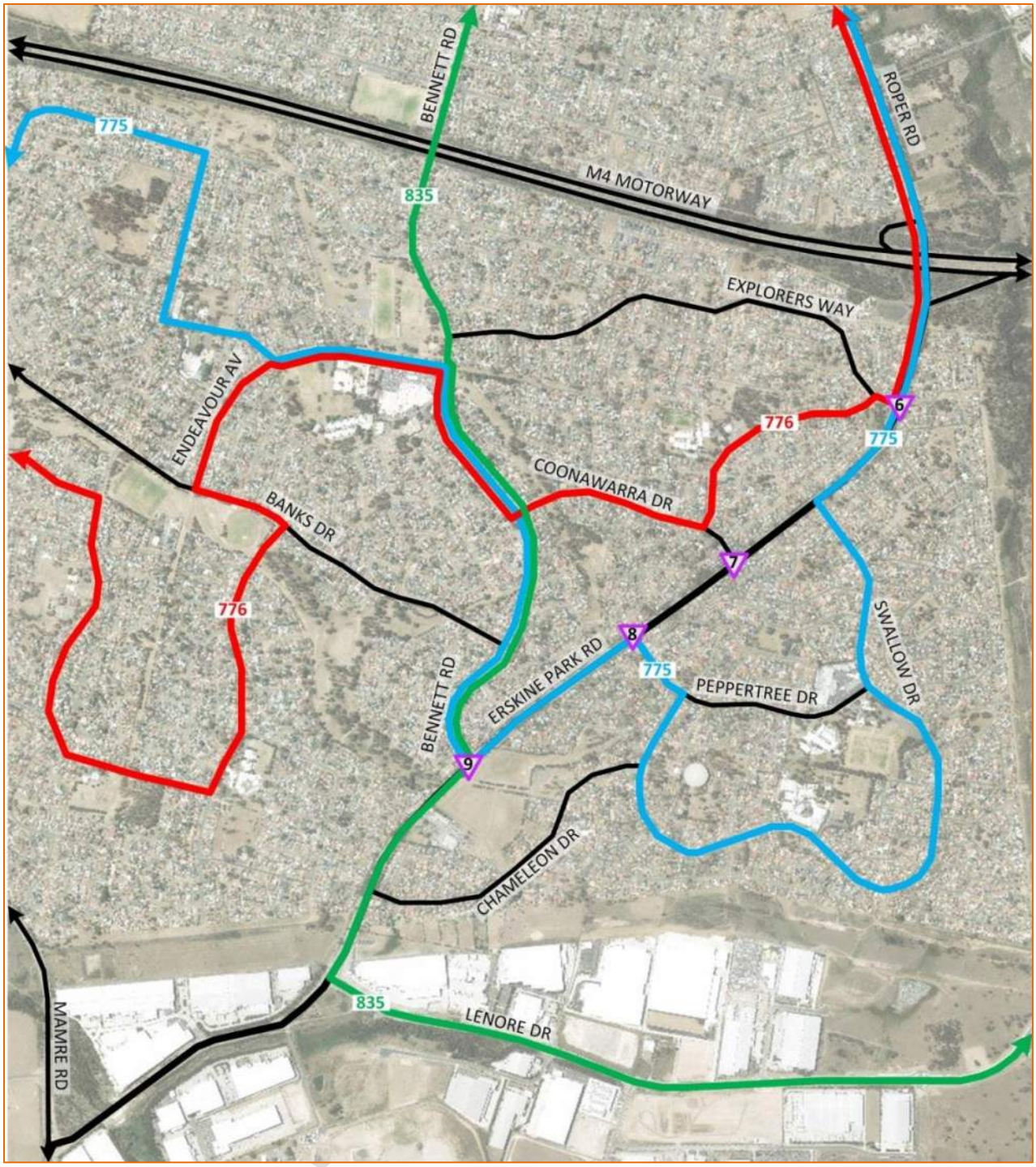


Figure 2-4 Existing Bus Routes in the Study Area

2.4 Crash Data Analysis

This assessment is based on the crash data supplied by RMS for the four year period from January 2009 to December 2013 inclusive. The data covers crashes reported to the Police, and includes fatal, injury or vehicle damage only accidents. A total of 43 crashes were recorded in the five year period within the study area. There was no fatality and 51.2% per cent of the total crashes involved people injury. Total of 31 people were injured over the five years period. About 81.4% of all crashes occurred at intersections. Heavy vehicles were involved in about 7% of all crashes occurred in the study area.

Table 2-4 shows crashes occurred in the last five year between 2008 and 2013 at all four key intersections in the study area.

Table 2-4 Crash Statistic in the Study Area (7/2008-6/2013)

Statistic	Explorers Way	Coonawarra Drive	Peppertree Drive	Bennett Road
Number of Crashes	10	7	7	7
Injury Crashes	3	2	3	6
Dominant Crash Type/s	Rear end northbound on Erskine Park Rd and right turn from Erskine Park Rd	Right turn to and from Erskine Park Rd	Right turn from Peppertree Dr	Right turn to and from Erskine Park Rd

Source: RMS

Figure 2-4 shows number of crashes per movement type. As it can be noted from the figure below, the dominant crash types in the study area include “Intersection, adjacent approaches”, “Rear-end”, and “Opposing vehicles; turning”. These types of crashes comprise about 86% of all recorded crashes in the study area and they could be potentially related to the current traffic congestion and the lack of available traffic gaps for turning traffic at priority controlled intersections.

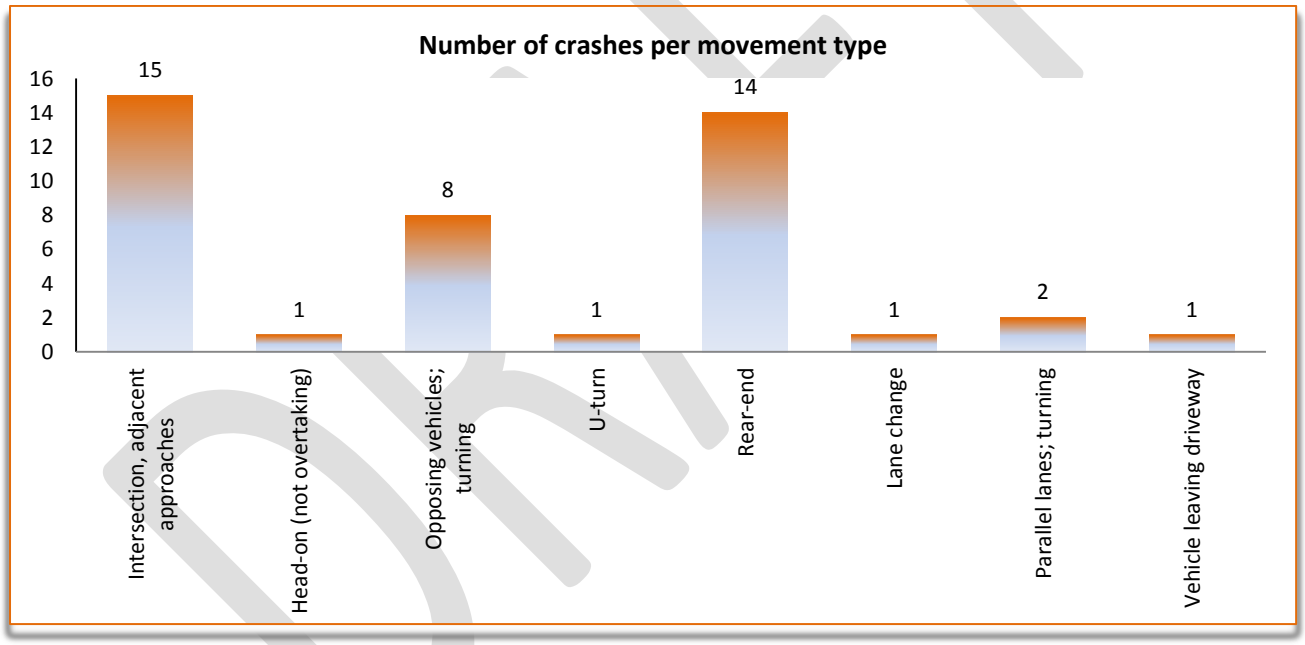


Figure 2-5 Number of crashes per movement type (7/2008-6/2013, source: RMS)

Figure 2-6 shows crash locations within the study area for the period between July 2008 and June 2013. Crashes on the map are classified by severity, showing fatal and non-casualty (tow-away) crashes.

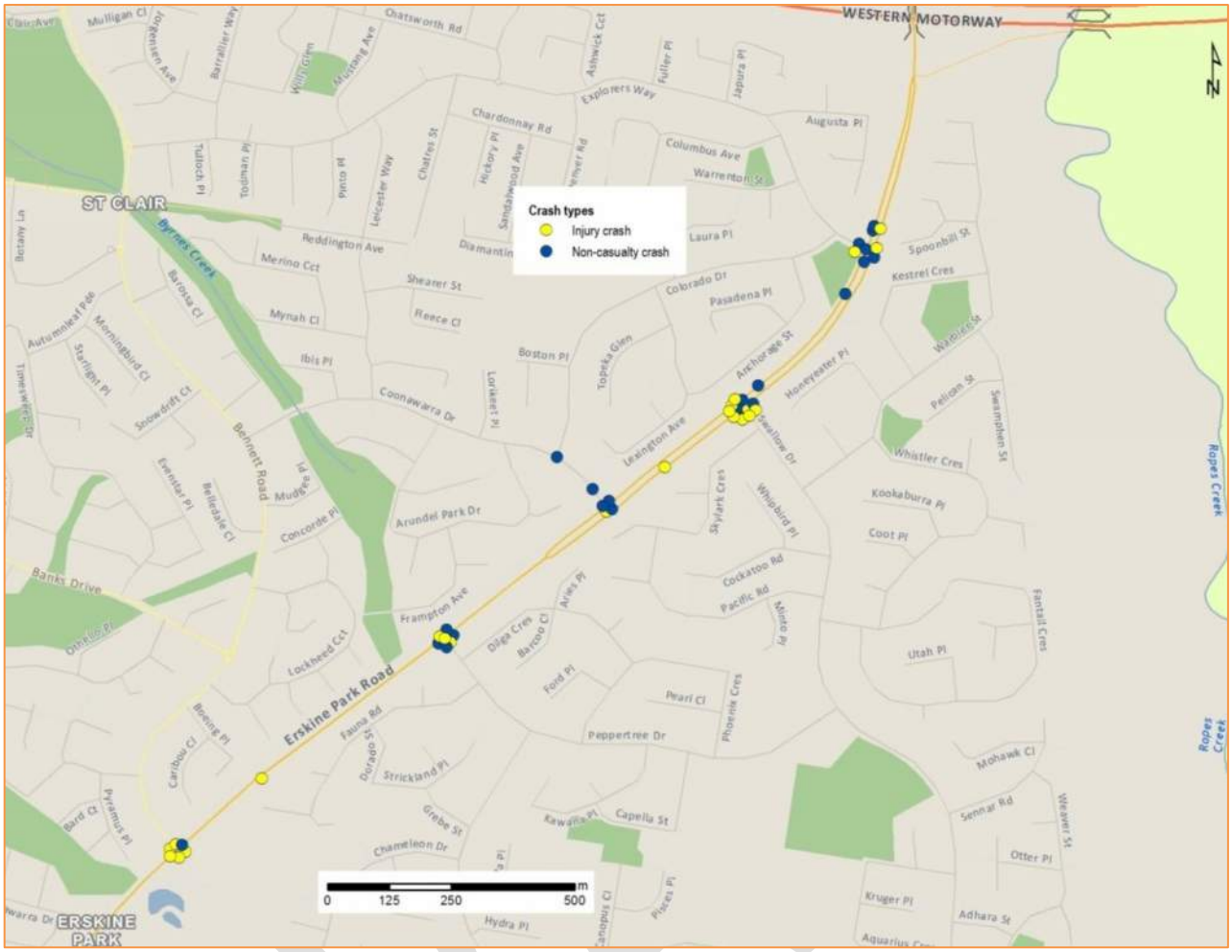


Figure 2-6 Spatial Distribution of Crashes in the Study Area (7/2008-6/2013, source: RMS)

The spatial crash distribution from Figure 2-6 indicates that crash clusters are concentrated dominantly at intersections. Some specific crash cluster locations include:

- Explorers Way/ Erskine Park Road Intersection (priority);
- Explorers Way/Swallow Drive (signal);
- Coonawarra Drive/ Erskine Park Road intersection (priority);
- Peppertree Drive/ Erskine Park Road Intersection (priority); and
- Bennett Road/ Erskine Park Road Intersection (priority).

3 Traffic Data

3.1 Overview

For the purpose of this study intersection turning volumes data in AM and PM peak periods were provided by Council. Traffic data analysis was undertaken as an input into SIDRA Intersection traffic modelling. All available traffic data was collated into a Microsoft Excel spreadsheet. Schematic diagrams with peak hour traffic volumes in the study area, comprising all four key intersections, were developed for AM and PM peak periods. Table 3-1 summarises the traffic data at the key intersections.

Table 3-1 Traffic Data Availability (Intersections)

ID	Road Names	Data Available	Traffic survey dates
I-6	Explorers Way/ Erskine Park Road	Intersection turning volume counts, Weekday AM peak (6:00-9:00), Weekday PM peak (3:00-6:00) and Saturday (9:00-15:00)	Saturday15th, November 2014 Tuesday18th, November 2014 Wednesday19th, November 2014 Thursday20th, November 2014 Friday, 21st, November 2014
I-7	Coonawarra Drive/ Erskine Park Road		
I-8	Peppertree Drive/ Erskine Park Road		
I-9	Bennett Road/ Erskine Park Road		

Source: Penrith City Council

3.2 Traffic Data Analysis

In order to determine the critical day (with the highest traffic volumes) in the week for traffic modelling purpose, we have analysed daily variations of the total traffic volumes passing through all four key intersections in the six peak hours on Tuesday; Wednesday; Thursday; Friday and Saturday. Based on this assessment we have identified Thursday as a critical day which has the highest traffic volumes at key intersections. Thursday peak hour traffic volumes were used for the existing base case SIDRA intersection model development purpose. Figure 3-1 shows daily variations of total traffic (six peak hours) volumes passing through all four key intersections.

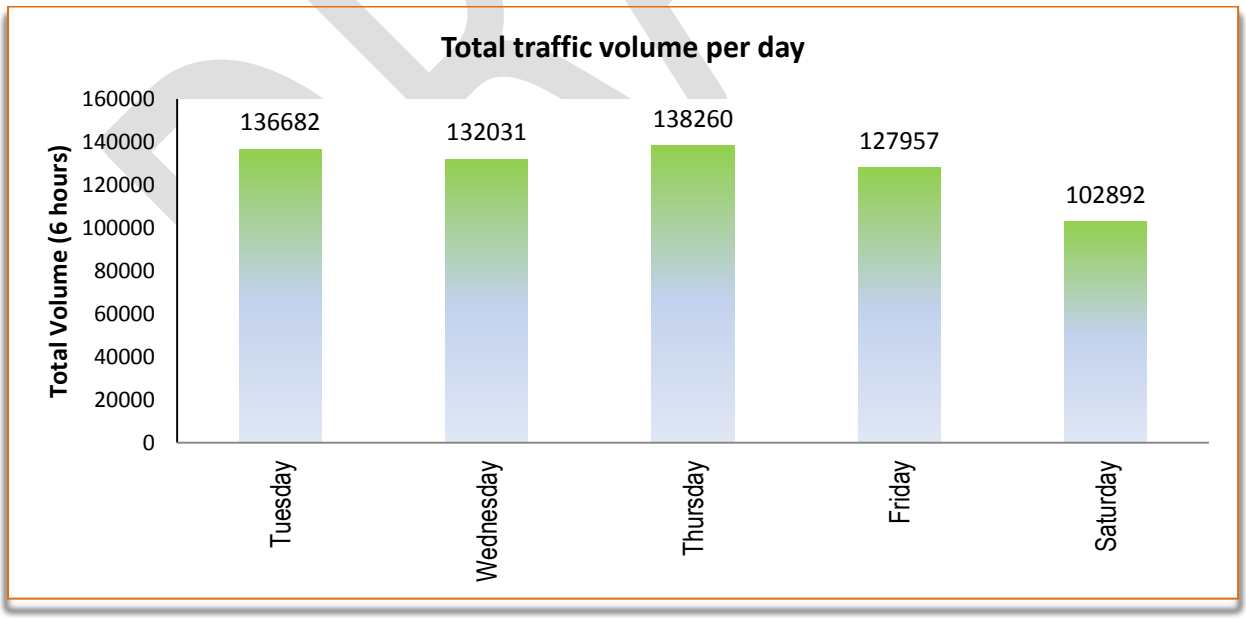


Figure 3-1 Daily Variations of Total Traffic (six peak hours) Passing Through all Four Key Intersections

3.3 Peak Hour Traffic Volumes at Key Intersections

Thursday (critical day) intersection traffic counts data at all four intersections were analysed in order to produce detailed intersection turning movement diagrams. These diagrams represent one hour peak volumes in AM peak and PM peak periods in 2014. The intersection turning movement data diagrams were used for the existing base case SIDRA model development. Figures 3-2 shows the 2014 existing peak hour traffic volumes at key intersections for the AM and PM peak periods (critical day-Thursday). From the Figure 3-2 it can be noted that AM peak period occurs from 7:45 to 8:45am while PM peak period occurs from 4:30 to 5:30pm.

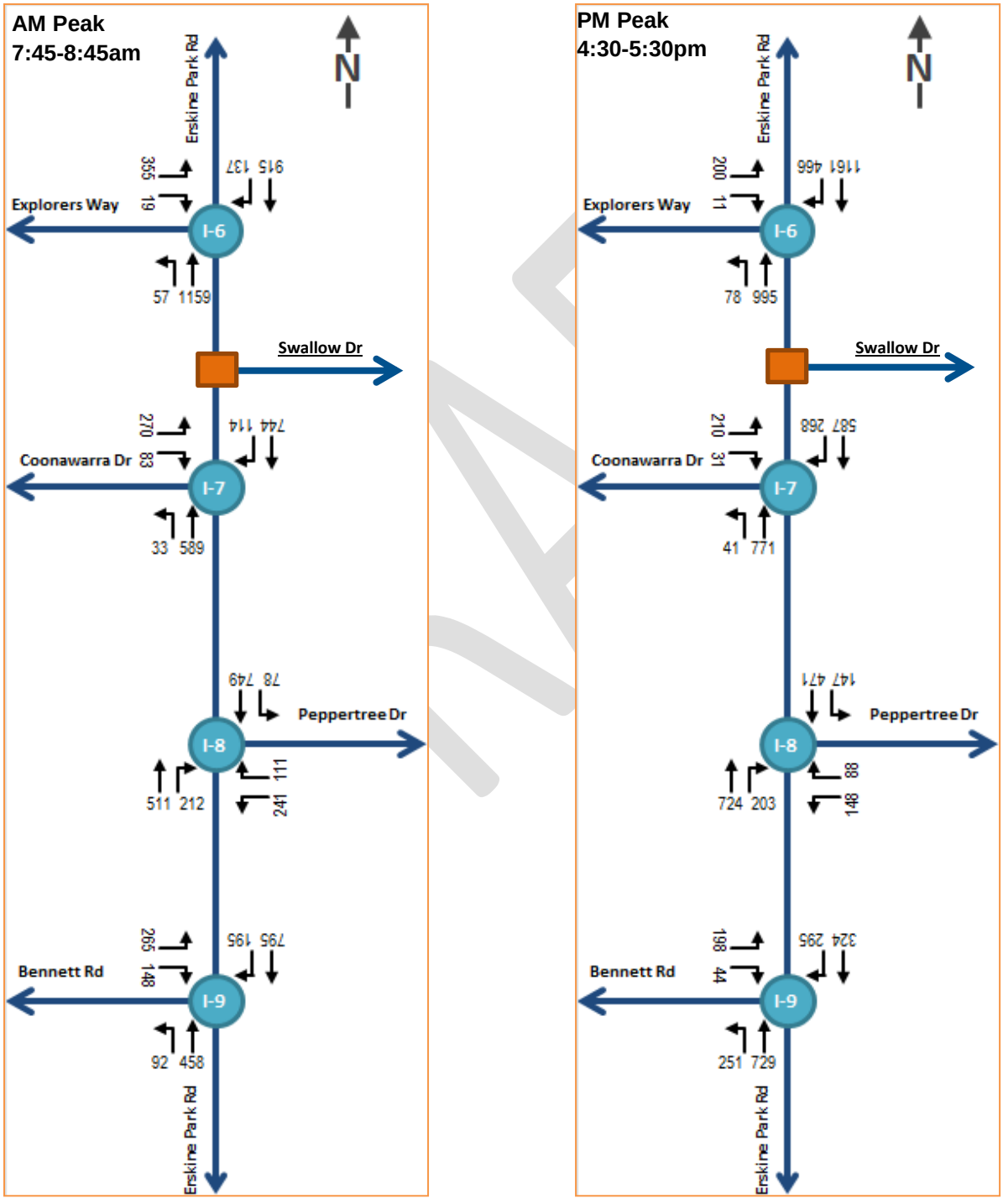


Figure 3-2 Existing Traffic Volumes at Intersections, AM and PM Peak (1hr)

3.4 Key Existing Traffic Patterns

Based on the intersection turning volumes presented in Figure 3-2 we have identified characteristic traffic pattern in the study area in both AM and PM peak hour periods. Figure 3- 3 below highlights characteristic movements with the high traffic volumes at each intersection in AM and PM peak respectively.

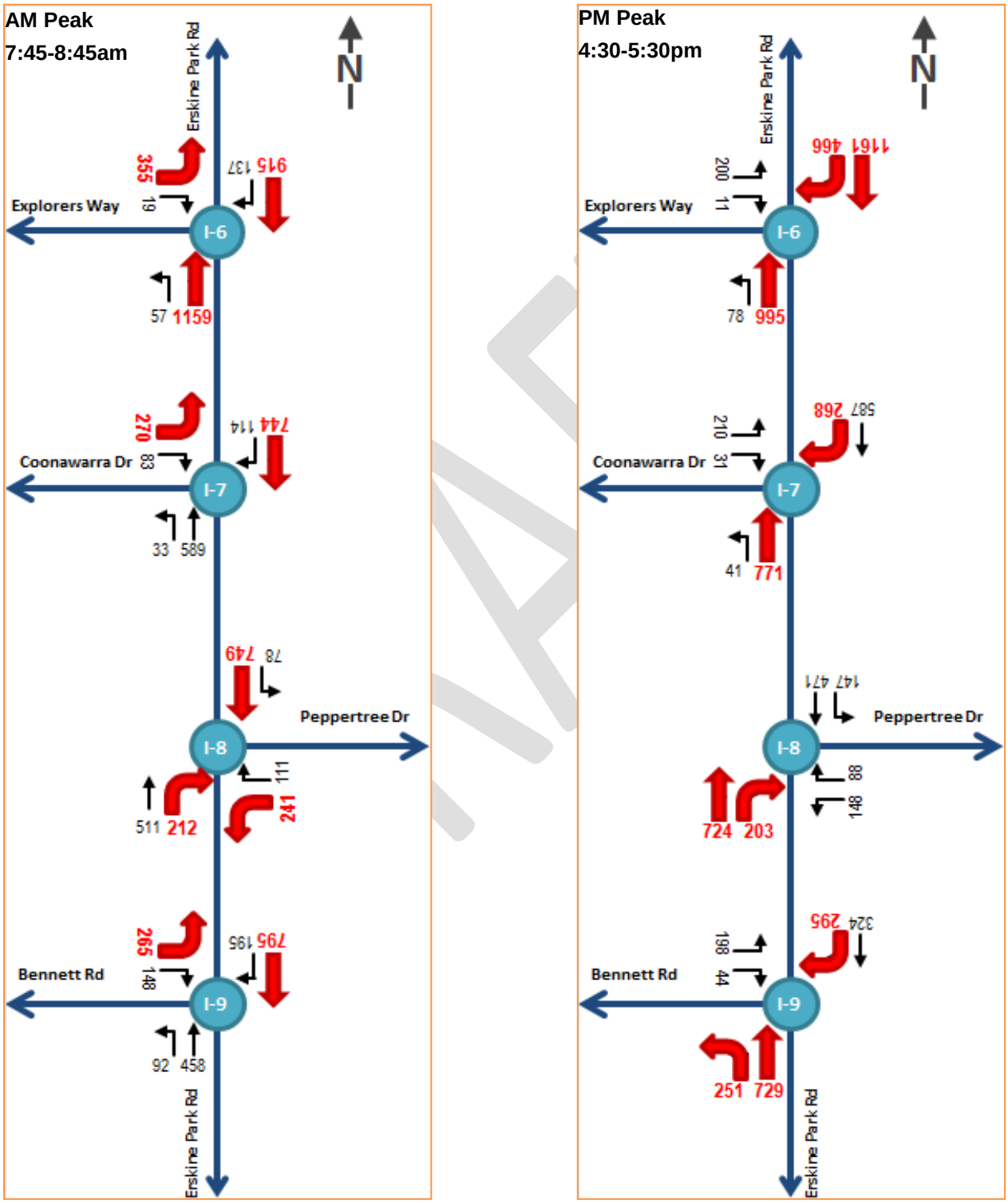


Figure 3-3 Existing Traffic Volumes at Intersections, AM and PM Peak (1hr)

The following key points are noted from Figure 3- 3:

- Residential areas west and east of Erskine Park Road have typical commuter trip pattern with the high demand outbound trips in AM Peak and high demand inbound trips in PM peak
- There is a high left turn traffic demand from Explorers Way; Coonawarra Drive and Bennett Road travelling northbound in AM Peak, while reversely, high right turn traffic demand from Erskine Park Road into these local roads occurs in PM peak
- There is a high left turn demand from Peppertree Drive in AM peak travelling southbound which is a different traffic pattern comparing to other local roads on the western side of Erskine Park Road with the dominant northbound traffic demand in the morning. It appears that people living in the residential area east of Erskine Park Road, instead of using priority controlled intersection at Peppertree Drive, mainly use adjacent signalised intersection at Swallow Drive to access Erskine Park Road in the northbound direction in AM peak
- Southbound through traffic on Erskine Park Road is the dominant movement at the intersections of Coonawarra Drive; Peppertree Drive and Bennett Road in AM peak while reversely in PM peak, the northbound through traffic volume is higher at these intersections. Through traffic on Erskine Park Road changes this directional pattern at Explorers Way intersection with the higher northbound demand in AM and higher southbound demand in PM peak. This traffic pattern change is contributed by high local traffic demand accessing Erskine Park Road from residential area with the dominant northbound distribution in AM peak and dominant southbound distribution in PM peak.

4 Site Visit Observations

Comprehensive study area site visits were undertaken on Friday, 6th of March 2015 in AM peak (7:00-9:00) and Thursday, 26th February 2015 in PM peak (4:00-6:00). The site visits provided information about existing network characteristic, traffic pattern, traffic behaviour, existing network capacity issues and contributing factors. During the site visit, we have identified five main locations where network/intersections currently have some capacity issues, these locations are as follows:

- M4 Motorway/Erskine Park/Roper Road interchange
- Erskine Park Road/Explorers Way Intersection
- Erskine Park Road/Coonawarra Drive Intersection
- Erskine Park Road/Peppertree Drive Intersection
- Erskine Park Road/Bennett Road Intersection.

Figure 4-1 shows locations with the observed capacity issues in the study area network.

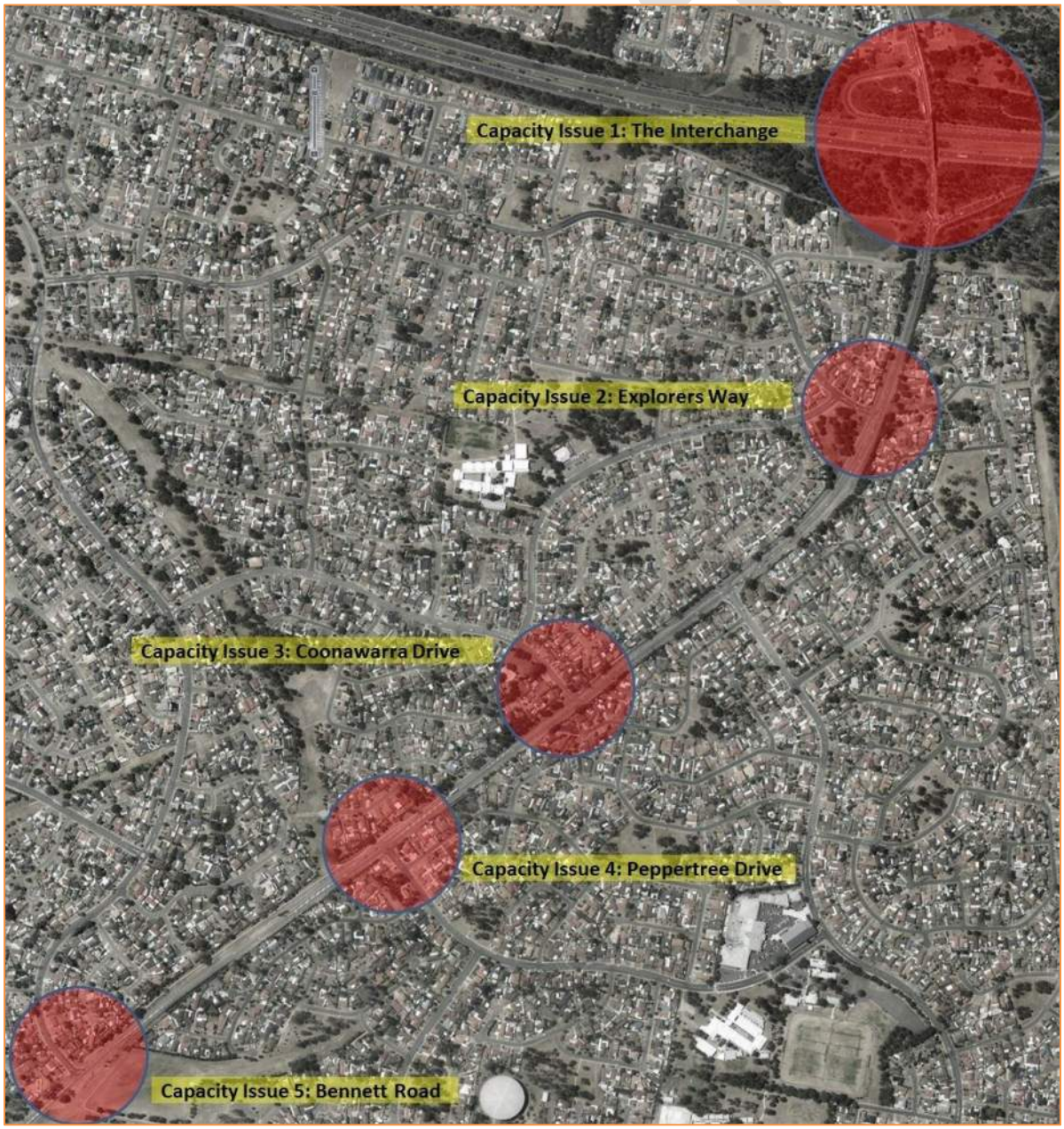


Figure 4-1 Locations with the existing capacity Issues on Erskine Park Road in the study area

4.1 M4 Motorway/ Erskine Park Road/Roper Road Interchange

The interchange is outside of the core study area and its assessment was not part of this study scope, however it was observed that the interchange currently operates with severe capacity issues in both the AM and PM peak periods and adversely affects operation of adjacent Erskine Park Road/Exploders Way intersection. Capacity issue associated with the high right turn demand from Ropers Road to M4 Motorway eastbound on-ramp results in the severe delays and long queues in the southbound direction on Roper Road in both AM and PM peak periods.

In the northbound direction, the existing merge on Roper Road just north of M4 Motorway (two-lane road section on Roper Road in northbound direction ends just north of M4 Motorway) which regularly creates traffic congestion and northbound queues in PM peak period.

Occasionally, these northbound queues on Roper Road will spill back from the merge section, causing an adverse impact on the operation of the Erskine Park Road/Explorers Way intersection in PM peak.

Figure 4-2 shows movements with the capacity issues at M4 Motorway/Erskine Park Road/Roper Road interchange.

Figure 4-2 Capacity Issues at M4 Motorway/ Erskine Park Road Interchange

Figure 4-3 shows long southbound queues on Roper Road extending back from M4 Motorway beyond the roundabout at Carlisle Road in both AM and PM peak periods.

Figure 4-3 Typical southbound queue on Ropers Rd in both AM and PM Peaks

Figure 4-4 shows occasional long queues on Erskine Park Road in northbound direction extending back from the M4 Motorway interchange up to Erskine Park Road/Explores Way intersection in PM Peak.

Figure 4-4 Erskine Park Road (looking north from Explorers Way in PM peak

Figure 4-5 shows northbound merge section on Ropers Road north of M4 Motorway.

Figure 4-5 Northbound merge at M4 interchange

Detailed site visit observations at key intersections in the core study area are summarised in the Sections 6, 7, 8 and 9 for each intersection respectively.
Site visit observation and network familiarisation played a very important role in the traffic model development, calibration and validation process.

5 SIDRA Intersection Models Development

5.1 Overview

The SIDRA Intersection software has been used for the traffic model development at key intersections. RMS' *Traffic Modelling Guideline, Version 1, February 2013* (RMS guideline) was used as the main guideline for the base year model development.

Figure 5-1 shows main steps undertaken in SIDRA intersection modelling process.

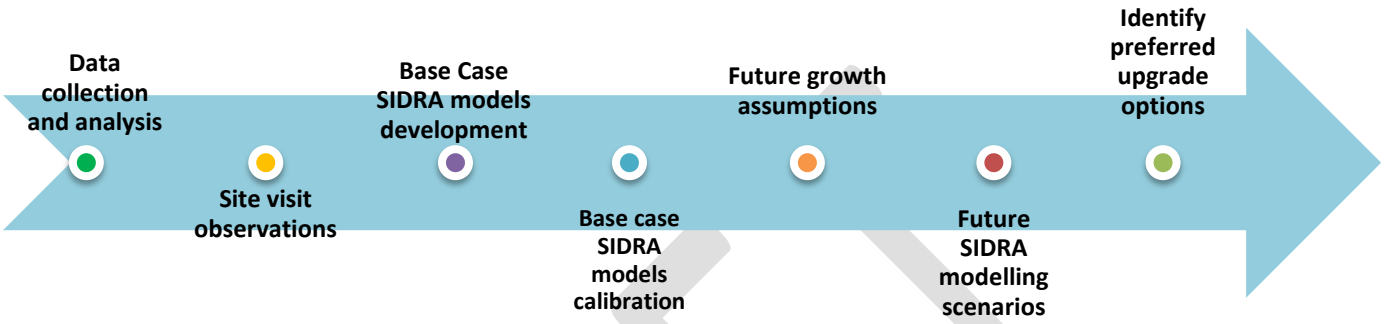


Figure 5-1 SIDRA Intersection Modelling Process

5.2 Peak Hour Periods

Based on the analysis of the hourly traffic variations at key intersections, we have identified peak hour traffic volumes on Thursday (critical day) in AM and PM peak periods. Highest one peak hour traffic volumes were used for SIDRA existing base case intersection models development. These peak hour periods are as follows:

- AM peak from 7:45 am to 8:45 am; and
- PM peak from 4:30 pm to 5:30 pm.

5.3 Software Version

The latest version of the SIDRA Intersection software version 6.1 has been used for model development.

5.4 Key Modelling Assumptions

5.4.1 Intersection Geometry (Layouts)

Available, aerial photography and site visit observations were used for the intersection geometry (layouts) coding in SIDRA.

From the current intersection layouts, it can be noted that at all four key intersections there is a small 10-20 meters storage space available near the median on the departure side of Erskine Park Road to be potentially used by right turning vehicles from local roads to undertake staged right turn crossings. However, site visit indicated that this opportunity is not used by all drivers as these small bays do not provide sufficiently safe space for staged right turns. In SIDRA modelling it was not assumed that current layouts at subject intersections comply with the standard "seagull" intersection design and therefore right turns were modelled as standard single stage movements. However, sensitivity tests and SIDRA calibration parameters were used to calibrate SIDRA models based on site visit observations.

5.4.2 Peak Flow Factors

Based on available intersection turning movement volumes given in 15-minute time intervals, we have calculated the peak flow factors for the each movement to take into account "peak of the peak" variations in the traffic flow within the modelled

one hour peak period. Calculated peak flow factors based on 15-minute traffic profiles for each movement were adopted in the SIDRA models.

5.4.3 Gap Acceptance Parameters

Performance of the priority controlled intersections is highly driven by the critical gap acceptance assumptions. There are many factors that can influence critical gap acceptance such as driver behaviour, driver age groups, vehicle types, road grades, intersection geometry, visibility, level of traffic congestion etc. For the SIDRA modelling purposes, we have used critical gap acceptance parameters recommended by Austroads and SIDRA guidelines.

Table 5-1 summarises gap acceptance parameters used for the modelling purposes in the study area:

Table 5-1 Critical Gap Acceptance Parameters

Period	Critical gap	Follow-up headway
Right turn movement from minor road to four - lane two-way major road	6.5s	3.5s
Right turn movement from minor road to two-lane two-way road	5.5s	3.5s
Right turn movement from major road	4.5s	2.5s
Left turn from minor road	5.0s	3.0s

Source: AUSTROADS and SIDRA guidelines

Note: SIDRA Standard (Akcelik M3D) Gap Acceptance Capacity settings were used.

5.5 Level of Service (LoS) Criteria

Intersection performance assessment was undertaken using SIDRA Intersection models.

The performance of an intersection can be measured by the intersection average delay per vehicle which corresponds to a Level of Service (LoS) measure for the intersection. In addition, Degree of Saturation (DoS) values were analysed for the each movement.

Performance of an intersection is measured in accordance with the RMS' guideline (*Guide to Traffic Generating Developments, Issue 2.2, RMS, October 2002*). The guideline recommends that for priority intersections - such as roundabout and sign controlled intersections - the Level of Service (LoS) value is determined by the critical movement with the highest delay whereas for a signalised intersection Level of Service (LoS) criteria are related to the average overall intersection delay measured in seconds per vehicle.

The Levels of Service (LoS) of intersections was assessed using the standard RMS Level of Service criteria for intersections which is reproduced in Table 5-2.

Table 5-2 Level of Service Criteria for Intersections

Level of Service	Average Delay per Vehicle (sec/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode
F	>70	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing

Source: RTA Guide to Traffic Generating Developments

5.6 Future Traffic Growth

5.6.1 Overview

We reviewed the following data sources in order to identify future traffic growth in the study area:

- TfNSW's Bureau of Transport Statistic (BTS) Population and Employment Forecast in the core study area
- RMS' 2006TZ Sydney GMA Strategic Traffic Forecasting Model (EMME model traffic volume forecast plots)
- Broader Western Sydney Employment Area (BWSEA) Draft Structure Plan 2013, TfNSW.

5.6.2 BTS Population and Employment Forecast in the Core Study Area

Tables 5-3 summarises BTS population and employment forecast in the core study area catchment (see Figure 2-1) between year 2011 and future year 2031.

Table 5-3 Population and Employment Growth

Year	Population	Employment
2011	30,601	6,254
2016	30,684	7,735
2021	30,735	9,082
2026	30,969	11,143
2031	31,207	11,507

Source: BTS, Core Study Area (TZ 5000, 5001, 5002, 5005, 5006, 5007, 5008, 5009, 5024)

Tables 5-4 summarises annual growth rates calculated based on BTS population and employment forecast in the core study area catchment (see Figure 2-1).

Table 5-4 Annual Growth Rates

Period	Annual Growth Rates		
	Population	Employment	Weighted Average
2011 to 2016	0.1%	4.7%	0.8%
2011 to 2021	0.0%	4.5%	0.8%
2011 to 2026	0.1%	5.2%	1.0%
2011 to 2031	0.1%	4.2%	0.8%
2016 to 2021	0.0%	3.5%	0.7%
2021 to 2026	0.2%	4.5%	1.2%
2026 to 2031	0.2%	0.7%	0.3%

Source: BTS, Core Study Area (TZ 5000, 5001, 5002, 5005, 5006, 5007, 5008, 5009, 5024)

The following key points were noted from Tables 5-3 and 5-4:

- BTS' forecasts very low or no population growth in the core study area catchment. This forecast is consistent with the current land use in the study area which comprises fully developed low density residential area
- Base on the available indicators, there is no plan for the significant future residential developments in the core study area
- BTS' forecast employment growth in the study area of 4.2% per annum between 2011 and 2031. This employment growth is manly associated with the growth projected in the Erskine Park Industrial Area (TZ 5002) along Lenore Drive
- Based on BTS' forecast analysis, overall annual growth in the core study area is projected to be in the range between 0.3% and 1.2% per annum between 2011 and 2031 calculated as a weighted average of both population and employment forecasts.

5.6.3 RMS' 2006TZ Sydney GMA Strategic Traffic Forecasting Model (STFM)

For the purpose of this study, RMS provided outputs (EMME traffic volume plots) from the Sydney GMA Strategic Traffic Forecasting Model (STFM) showing peak period traffic volume forecast by direction of travel on Erskine Park Road in 2014, 2026 and 2031 modelled years.

As indicated by RMS, following information should be noted regarding provided strategic model forecast:

- RMS EMME Strategic Traffic Assignment Model (2014 Future Networks Version, All Vehicles) - Periods: 7:00-9:00am and 4:00-6:00pm (two hours peak)
- Travel Forecast Assumptions are based on BTS Strategic Travel Model Ver.2.5 (Dec 2013), BTS FMM Freight Forecast, (December 2013, BTS Aug 2012 Land Use Assumptions)
- No Badgerys Creek Airport was assumed in the provided EMME model forecast. It was noted that RMS is currently updating Sydney GMA Strategic Traffic Forecasting Model to include Badgerys Creek Airport (expected model update completion is in June 2015)
- Intersection turning movements from the strategic model should be read in combination with the traffic surveys and travel zone population and employment forecast data.

Considering that Erskine Park Road has significant through traffic volume changes along its route between Lenore Drive and M4 Motorway, calculating an uniform traffic growth rate, from RMS' STFM applicable on through traffic component on the entire Erskine Park Road route was not considered as an appropriate approach for this study purpose. Instead, we have calculated additional through traffic volumes passing on Erskine Park Road (vehicles per hour) as a relative difference between 2014 and 2026 and 2026 and 2031 traffic forecast from RMS' STFM.

A review of the RMS' STFM EMME plots indicated that:

- Upgrade of the Erskine Park Road section between Lenora Drive and Coonawarra Drive is assumed in RMS' EMME model having four lanes (two-way two lane road) by 2026
- Extension of Archbold Road south of M4 Motorway including the new grade separated interchange at M4 Motorway about 1.3 km east of Erskine Park Road is assumed in RMS' EMME model in 2026
- Upgrade of M4 Motorway to four lanes in each direction is assumed in RMS EMME model in 2026
- Additional through traffic of 165 to 220 veh/h in each direction is forecast to travel in peak hour period on Erskine Park Road between south of Bennett Road and M4 Motorway in 2026 comparing to 2014 modelled traffic volumes
- Additional through traffic of 135 to 160 veh/h is forecast to travel in peak hour period on Erskine Park Road between south of Bennett Road and M4 Motorway in 2031 comparing to 2026 traffic volumes.

5.6.4 Traffic Growth Assumptions for Modelling Purpose

Based on a review of the available information we have applied following methodology to estimate future traffic volumes at key intersections in the study area for SIDRA intersection modelling purpose:

- Future 2026 traffic volumes estimate:
    - Apply 1.0% per annum growth from existing 2014 (counts) to 2026 on local traffic component (local roads in/out) and increase existing 2014 (counts) through traffic component on Erskine Park Road by 165 to 220 veh/h in each direction in peak period
- Future 2036 traffic volumes estimate:
    - Carry forward above estimated 2026 traffic volumes;
    - Apply 0.7%% per annum growth from 2026 to 2031 on local traffic component (local roads in/out) and increase future 2026 through traffic component on Erskine Park Road by 135 to 160 veh/h in each direction in peak period;

Figures 5-2 and 5-3 show future 2026 and 2031 traffic volumes on Erskine Park Road assumed in SIDRA modelling calculated based on above methodology. In addition, 2014 traffic volumes (counts) are also shown for comparative purpose, including calculated annual growth rates.

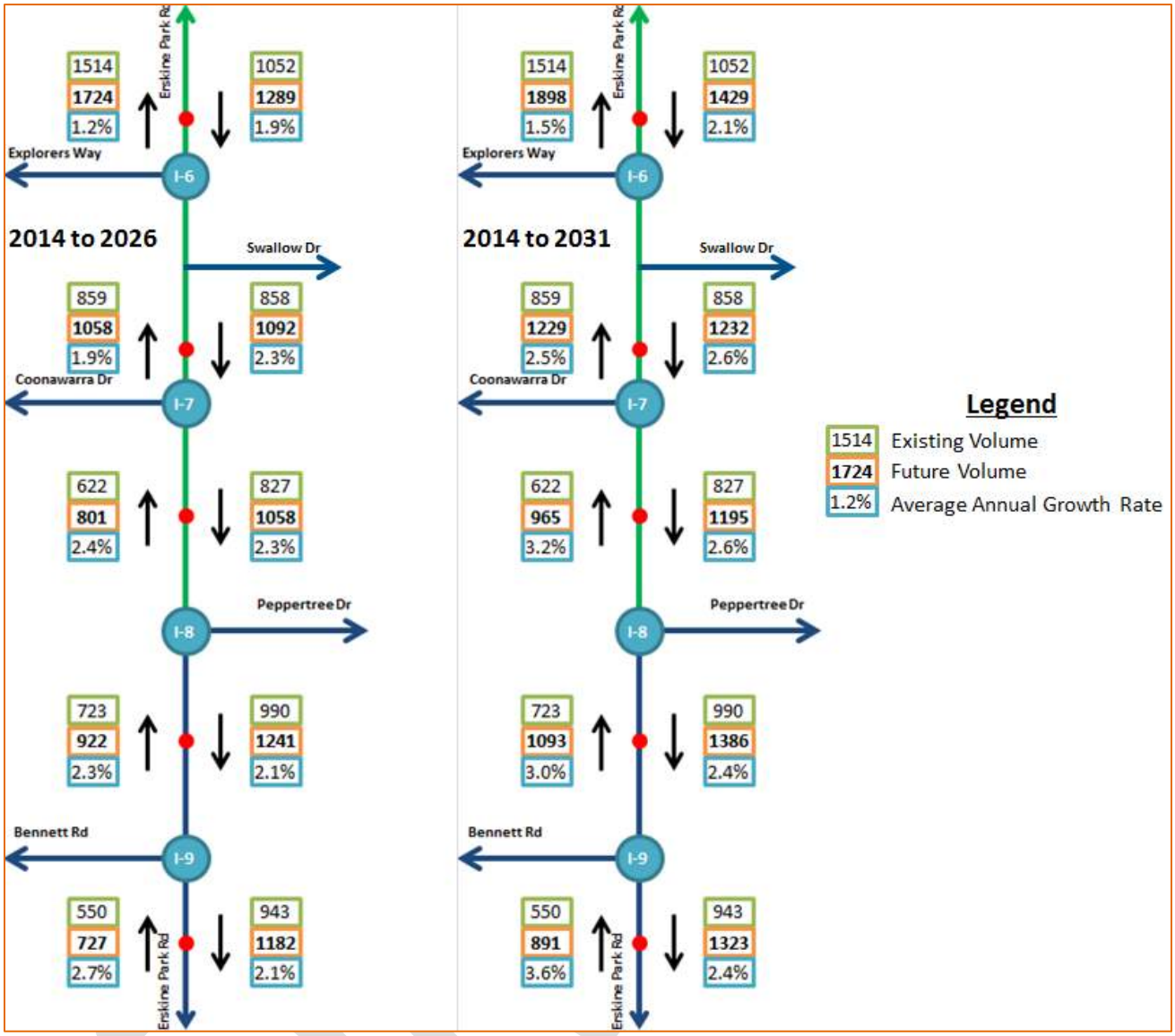


Figure 5-2 Future Traffic Growth Volumes and Growth Rates, AM Peak

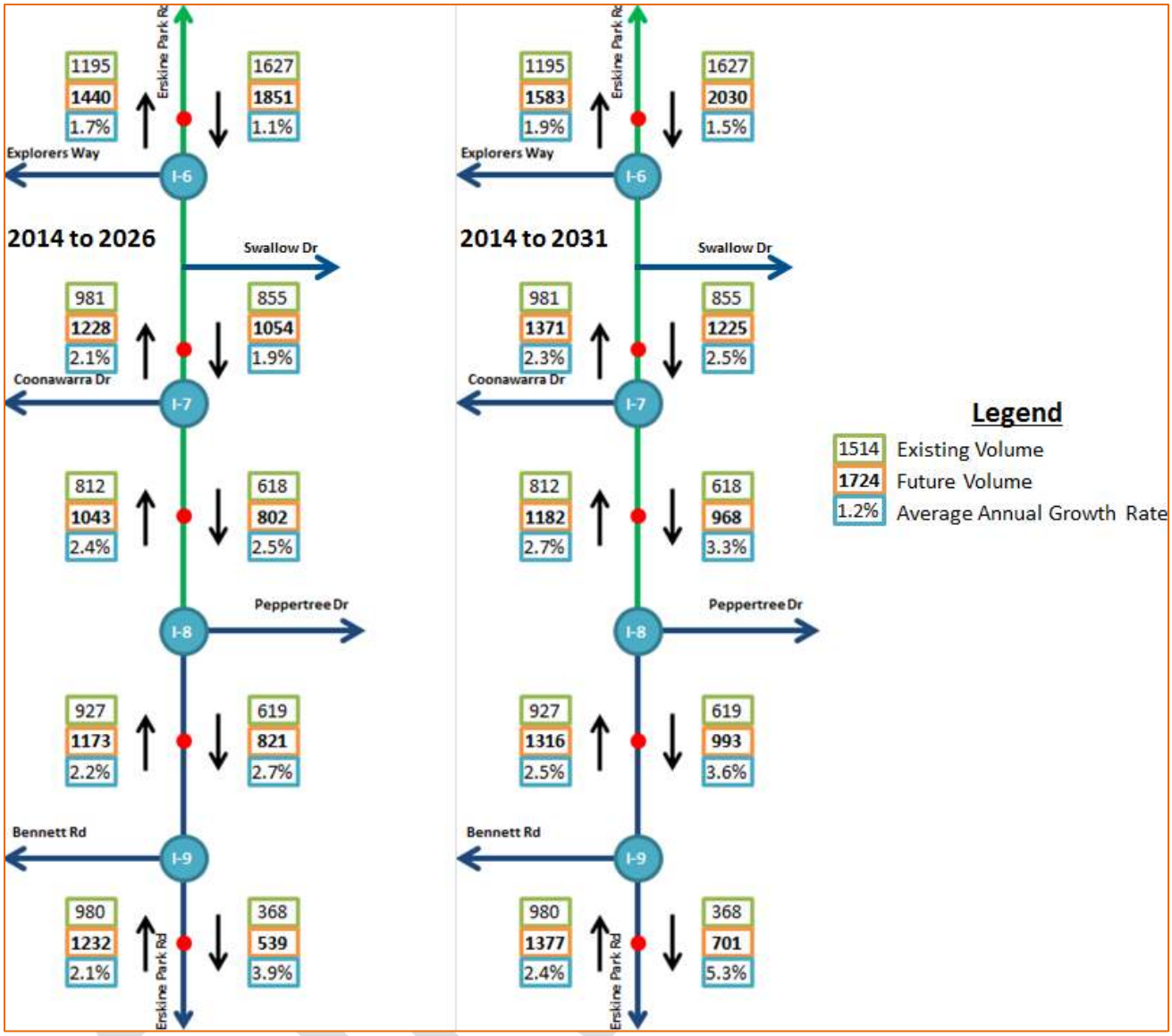


Figure 5-3 Future Traffic Growth Volumes and Growth Rates, PM Peak

5.7 Modelling Scenarios

In order to meet the study objectives outlined in the brief, the following traffic modelling scenarios were undertaken using SIDRA software for each intersection:

- 2014 Existing Base Case, AM and PM Peak
- 2026 Future Base Case ("Do Nothing"), AM and PM Peak
- 2031 Future Base Case ("Do Nothing"), AM and PM peak
- 2026 Future Upgrade Case, AM and PM peak
- 2031 Future Upgrade Case, AM and PM peak.

Following sections summarise modelling results at each key intersection respectively.

Detailed SIDRA modelling results for all modelling scenarios are given in **Appendix A**.

6 Erskine Park Road/ Explorers Way Intersection

6.1 Site Visit Observations

Currently, the Erskine Park Road/Explorers Way intersection operates as a priority controlled intersection. High left turn demand movement from Explorers Way experiences occasional high delays in AM peak period. In the PM peak, existing right turn bay on Erskine Park Road operates at capacity with the occasional queues spilling back from the available right turn bay. Capacity issues identified for movements turning out of Explorers Way and right movement from Erskine Park Road into Explorers Way are caused by the lack of adequate traffic gap opportunities on Erskine Park Road. In addition, as indicated in Section 4.1 operation of this intersection is adversely affected by capacity issues at adjacent M4 Motorway Interchange. Figure 6-1 shows movements with capacity issues at this intersection.

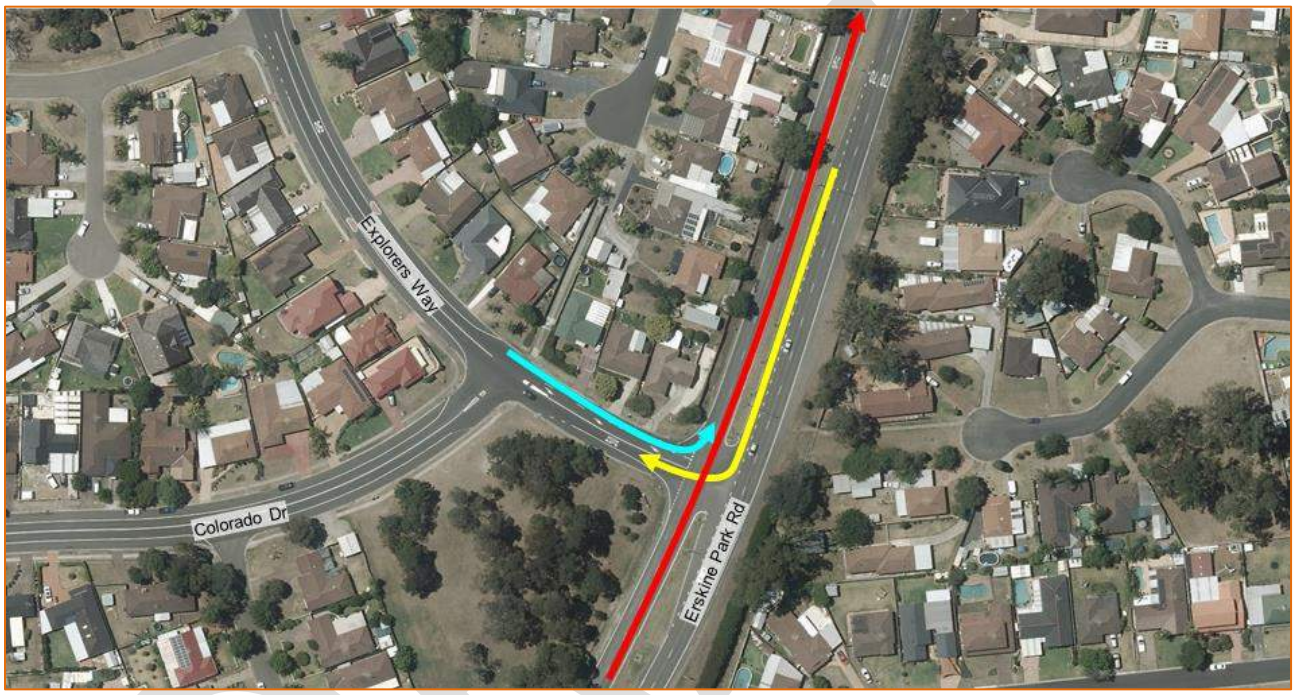


Figure 6-1 Capacity Issues 2: Erskine Park Road/Explorers Way Intersection

Occasional long queues on Erskine Park Road in the northbound direction extend back from the M4 Motorway interchange and adversely affect operation of the Erskine Park Road/Explores Way intersection in PM Peak. In this situation, Erskine Park Road/Explores Way intersection experiences severe capacity and traffic safety issues.

Figure 6-2 shows high left turn movement demand and typical queue on Explorers Way approaching Erskine Park Road in AM Peak.

Figure 6-2 Left turning traffic from Explorers Way during AM Peak

Figure 6-3 shows typical queue in the existing right turn bay on Erskine Park Road in PM Peak. The right turn movement from Erskine Park Road into Explorers Way occasionally exceeds the storage capacity of the existing right turn bay blocking the access to the adjacent southbound through lane on Erskine Park Road in PM peak period.

Figure 6-3 Right turn from Erskine Park Road into Explorers Way, PM peak

Figure 6-4 below shows typical traffic situation at this intersection when adverse impact from M4 Motorway interchange occurs.

Figure 6-4 Erskine Park Road at Explorers Way Intersection

6.2 Existing Intersection Performance

6.2.1 Existing Layout

Available, aerial photography and site visit observations were used for the intersection geometry (layouts) coding in SIDRA. Figure 6-5 shows existing base case intersection layouts assumed in the SIDRA models.

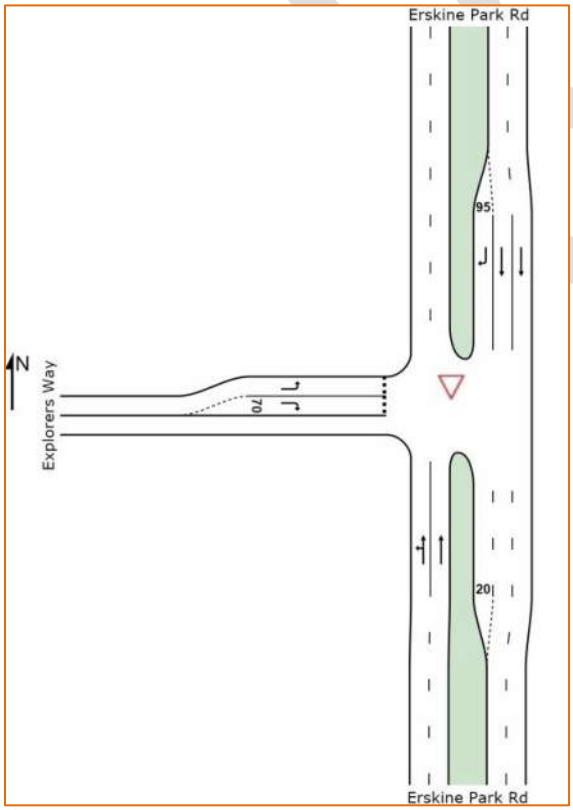


Figure 6-5 Existing Intersection Layouts assumed in the SIDRA models

6.2.2 Existing Level of Service (LoS)

Existing performance of the Erskine Park Road/Explorers Way Intersection was assessed using SIDRA Intersection model. Site visit observations were used for SIDRA model calibration purpose. The calibrated 2014 existing base case SIDRA Intersection model formed the basis of assessing existing intersection performance. Table 6-1 below summarises existing base case intersection level of service (LoS) results:

Table 6-1 Existing (2014) Intersection LoS, AM, PM

ID	Road Names	Road Classification	Control Type	AM Peak				PM peak			
				DoS	Avg. Delays [s]	LoS	95th Queue Length [m]	DoS	Avg. Delays [s]	LoS	95th Queue Length [m]
I-6	Erskine Park Road/Explorers Way/	State/Local	Priority	0.96	51	D	98	0.99	57	E	136

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Following key points are noted from the modelling results presented in the Table 6-1:

- The intersection is currently having particular critical movement which operates near or at capacity with the high delays and high DoS as follows:
  - Left turn from Explorers Way operates near capacity and LoS D in AM Peak period
  - Right turn from Erskine Park Road to Explorers Way operates at capacity with low LoS E in PM peak period
- Model confirmed that existing capacity issues at all intersections are mainly associated with the lack of adequate traffic gap opportunities for the critical turning movements to/from local roads
- Model confirmed similar existing capacity issues at all intersections as identified during the site visit.

6.3 Future Base Case ("Do Nothing")

The calibrated 2014 existing base case SIDRA Intersection models were carried forward for the future year base case scenario modelling. Intersection was assessed using SIDRA models to determine future intersection performance in the projected 2026 and 2031 traffic conditions.

Table 6-2 shows the forecast of the intersection performance for future base case ("Do nothing") scenario in 2026 and 2031.

Table 6-2 Projected Base Case ("Do Nothing") Intersection performance in 2026 and 2031, AM and PM Peak

ID	Road Names	Road Class	Control Type	Year	AM Peak				PM peak			
					DoS	Avg. Delays [s]	LoS	95th Queue Length [m]	DoS	Avg. Delays [s]	LoS	95th Queue Length [m]
I-6	Erskine Park Road/Explorers Way/	State/ Local	Priority	2026	1.15	176	F	315	1.27	277	F	577
				2031	1.33	326	F	525	1.39	379	F	750

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Following key points are noted from Table 6-2:

- Model indicated that current intersection layout would experience severe capacity issues in the both future 2026 and 2031 projected traffic conditions
- Model forecasts that intersections would operate with high degree of saturation, high delays and unacceptable level of service (LoS) F
- It is expected that increased through traffic flow on Erskine Park Road in the future would additionally reduce available traffic gap opportunities for turning movements. Model showed that future capacity issues at Erskine Park Road/Explorers Way intersection would be associated with the lack of adequate traffic gap opportunities for the critical turning movements to/from Explorers Way.

6.4 Potential Upgrade Options Modelling

Both existing and future years 2026 and 2031 base case ("Do nothing") intersection performance assessments indicated that upgrade of the Erskine Park Road/Explorers Way is required. Preferred upgrade option at this intersection was identified through an iterative SIDRA modelling process testing different upgrade solutions. In order to determine adequate and optimal upgrade solution, we have also considered local accessibility, connectivity and characteristics of the local roads in the study area. We have tested three potential signal upgrade options in order to identify preferred upgrade layout at this intersection.

Table 6-3 summarises preliminary upgrade options tested from vehicle traffic operation perspective.

Table 6-3 Preliminary Upgrade Options Tested at Erskine Park Road/ Explorers Way intersection

Upgrade Option	Upgrade Option Description	Figure reference
Option A Priority Controlled ("Seagull Layout")	▪ Upgrade intersection layout to "seagull" intersection arrangement (**Appendix B**) with the priority control. This intersection layout is proposed to provide adequate and safer two-stage right turn movement from Explorers Way with the channelised storage/acceleration lane near the median on the southbound departure side of Erskine Park Road for right turning vehicles; ▪ Extend existing right turn bay on Erskine Park Road to provide 170 m long right turn bay storage; ▪ Extend two-lane section on Explorers Way approach up to 100 m	Figure 6-6
Option B Traffic signal with the single right turn bay on Erskine Park Road	▪ Upgrade to full traffic signal with all movements permitted including signalised pedestrian crossings on all approaches; ▪ Extend existing single right turn lane on Erskine Park Road up to 170 m ▪ Provide exclusive left turn bay (70 m) on Erskine Park Road southern approach; ▪ Extend two-lane section on Explorers Way approach up to 100 m; ▪ Change lane discipline on Explorers Way stop line to have one exclusive left turn lane and one shared right/left turn lane	
Option C Full traffic signal with the double lane right turn bay on Erskine Park Road	▪ Upgrade to full traffic signal with all movements permitted including signalised pedestrian crossings on all approaches; ▪ Provide additional right turn lane on the Erskine Park Road northern approach (70 m) to have dual lane right turn bay; ▪ Extend existing right turn lane on Erskine Park Road up to 130 m ▪ Provide exclusive left turn bay (70 m) on Erskine Park Road southern approach; ▪ Provide additional (120 m) second departure lane at Explorers Way to accommodate dual right turn from Erskine Park Road; ▪ Extend two-lane section on Explorers Way approach up to 100 m; ▪ Change lane discipline on Explorers Way stop line to have one exclusive left turn lane and one shared right/left turn lane	

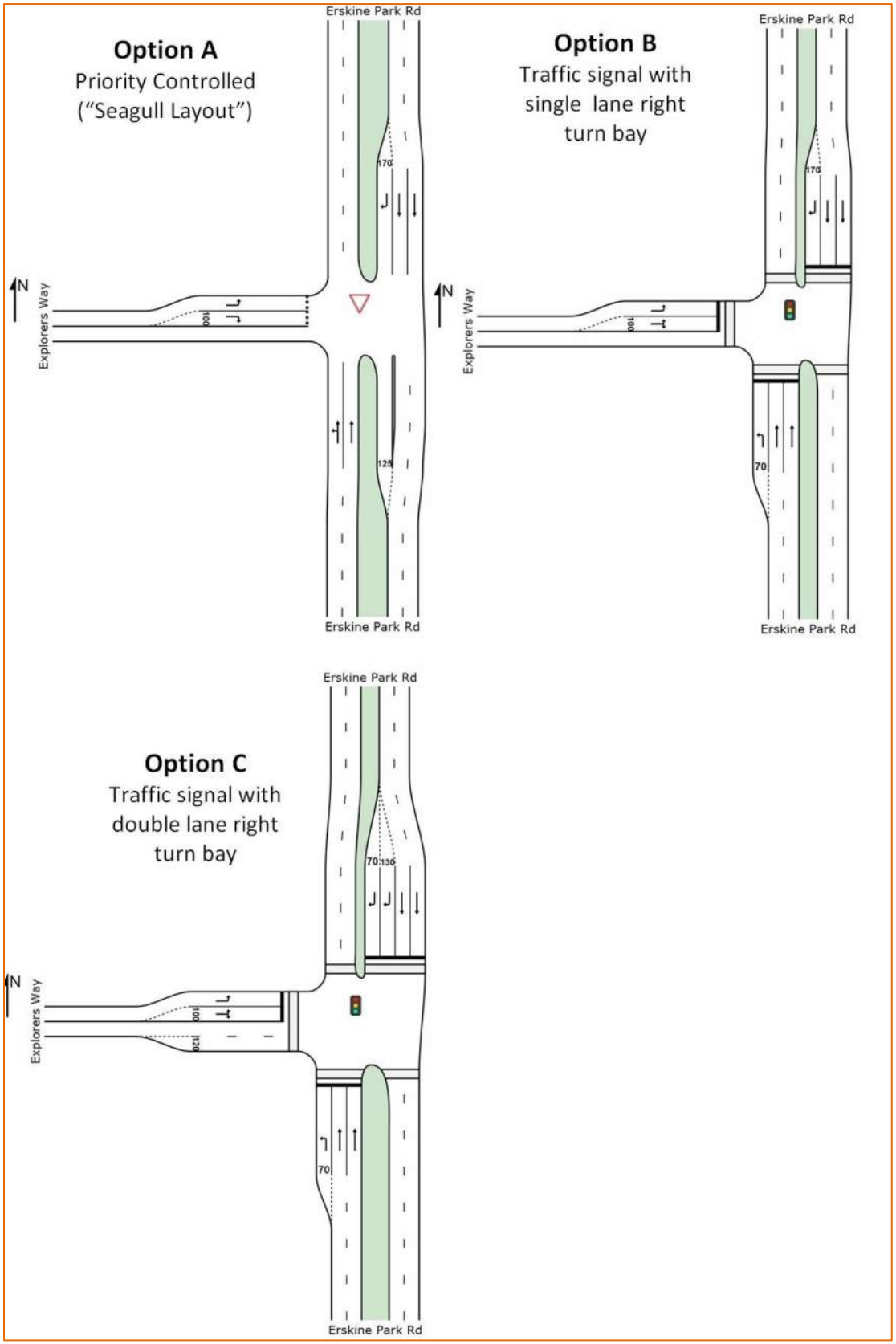


Figure 6-6 Preliminary Upgrade Options Modelled at Erskine Park Road/Explorers Way Intersection

Table 6-4 summarises future 2026 intersection performance results with the proposed upgrades in the AM and PM peak periods.

Table 6-4 2026 Future Intersection performance with proposed upgrade, AM Peak and PM Peak

ID	Road Names	Upgrade Option	Control Type	Upgrade Options 2026 AM Peak				Upgrade Option 2026 PM Peak			
				DoS	Avg. Delay [s]	LoS	95th Queue Length [m]	DoS	Avg. Delay [s]	LoS	95th Queue Length [m]
I-6	Erskine Park Road/Explorers Way	Option A	Priority Controlled ("Seagull Layout")	1.15	176	F	315	1.11	137	F	323
		Option B	Signal	0.80	17	B	189	0.92	34	C	324
		Option C	Signal	0.76	16	B	174	0.86	23	B	205

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Table 6-5 summarises future 2031 intersection performance results with the proposed upgrades in AM and PM peak.

Table 6-5 2031 Future Intersection performance with proposed upgrade, AM Peak and PM Peak

ID	Road Names	Upgrade Option	Control Type	Upgrade Options 2031 AM Peak				Upgrade Option 2031 PM Peak			
				DoS	Avg. Delay [s]	LoS	95th Queue Length [m]	DoS	Avg. Delay [s]	LoS	95th Queue Length [m]
I-6	Erskine Park Road/Explorers Way	Option A	Priority Controlled ("Seagull Layout")	1.33	326	F	525	1.21	214	F	485
		Option B	Signal	0.80	19	B	261	0.99	47	D	447
		Option C	Signal	0.80	18	B	231	0.85	25	B	280

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Following points are noted from Table 6-4 and 6-5:

- The model indicated that upgrade Option A at Erskine Park Road/ Explorers Way intersection would not have ability to significantly improve intersection performance in 2026 and particularly in 2031. Model forecasts that intersection with upgrade Option A would operate with an unacceptable level of service F in both AM and PM peak periods;
- The model indicated that traffic signal (Option B) would provide satisfactory overall intersection performance in 2026 and operation approaching capacity in 2031. The model showed that single lane right turn bay on Erskine Park Road would operate with the high degree of saturation 0.92-0.99 in PM peak and with traffic queues spilling back from the single lane right turn bay to adjacent through lane;
- The model forecasts that traffic signal (Option C) with the double lane right turn bay on Erskine Park Road would operate with good level of service B and spare capacity in both AM and PM peak periods by 2031;

Preferred upgrade option at Erskine Park Road/ Explorers Way intersection is Option C (traffic signal) with double lane right turn bay on Erskine Park Road. Traffic modelling results and analysis of the existing and future traffic movement pattern indicated that priority control at this intersection would not provide satisfactory intersection performance. Considering that there are high conflicting traffic flow demands at this intersection and certain traffic safety concerns it is recommended to upgrade this intersection to new traffic signal (Option C). Currently the M4 Motorway/Erskine Park Road/Roper Road interchange adversely affects the operation of the Erskine Park Road/Explorers Way intersection. It is recommended that an upgrade of Erskine Park Road/Explorers Way intersection to new traffic signal is coordinated with the proposed upgrade options at M4 Motorway/Erskine Park Road interchange.

7 Erskine Park Road/ Coonawarra Drive Intersection

7.1 Site Visit Observations

Currently, Erskine Park Road/Coonawarra Drive intersection operates as a priority controlled intersection. High right turn demand from Erskine Park Road into Coonawarra Drive experiences higher delays in PM peak period. Capacity issue identified for this movement is caused by the lack of adequate traffic gap opportunities on Erskine Park Road. Figure 7-1 shows movement with the higher delays at this intersection.

Figure 7-1 Capacity Issues 3: Erskine Park Road/Coonawarra Drive Intersection

Figure 7-2 shows typical traffic queue in the existing right turn bay on Erskine Park Road in PM Peak.

Figure 7-2 Right turn from Erskine Park Road into Coonawarra Drive, PM peak

7.2 Existing Intersection Performance

7.2.1 Existing Layout

Available, aerial photography and site visit observations were used for the intersection geometry (layouts) coding in SIDRA. Figure 7-3 shows existing base case intersection layouts assumed in the SIDRA models.

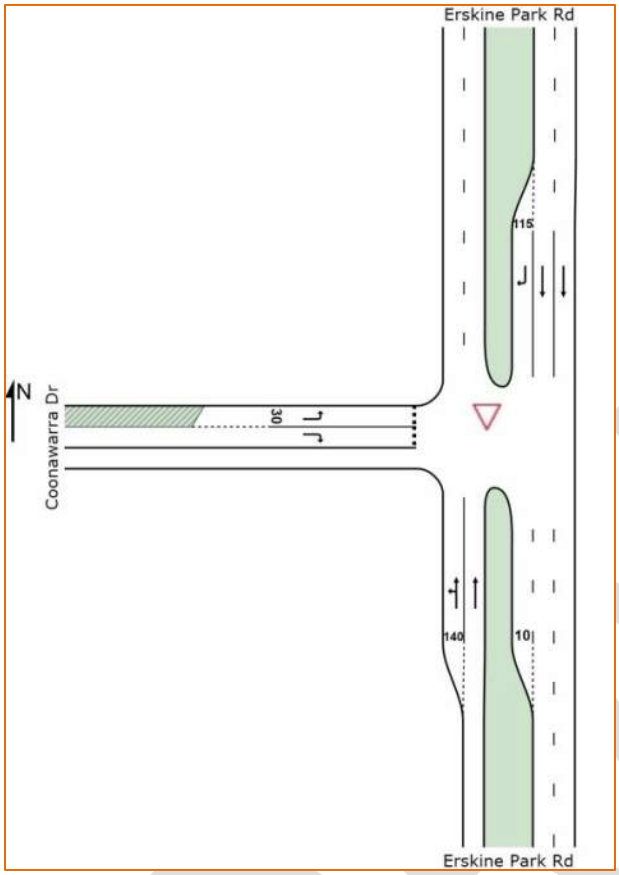


Figure 7-3 Existing Intersection Layouts assumed in the SIDRA models

7.2.2 Existing Level of Service (LoS)

Existing performance of the Erskine Park Road/Coonawarra Drive Intersection was assessed using SIDRA Intersection model. Site visit observations were used for SIDRA model calibration purpose. The calibrated 2014 existing base case SIDRA Intersection model formed the basis of assessing existing intersection performance. Table 7-1 below summarises existing base case intersection level of service (LoS) results:

Table 7-1 Existing (2014) Intersection LoS, AM, PM

ID	Road Names	Road Classification	Control Type	AM Peak				PM peak			
				DoS	Avg. Delays [s]	LoS	95th Queue Length [m]	DoS	Avg. Delays [s]	LoS	95th Queue Length [m]
I-7	Erskine Park Road/Coonawarra Drive	State/Local	Priority	0.63	49	D	18	0.90	45	D	58

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Following key points are noted from the modelling results presented in the Table 7-1:

- The intersection is currently having particular critical movement which operates near or at capacity with the high delays and high DoS as follows:
    - Right turn from Coonawarra Drive operates near capacity and LoS D in both AM and PM peak periods
    - Right turn from Erskine Park Road to Coonawarra Drive operates with high Degree of Saturation (DoS=0.90) in PM peak
- The model confirmed that existing capacity issues at this intersection is mainly associated with the lack of adequate traffic gap opportunities for the critical right turning movements to/from Coonawarra Drive
- The model confirmed similar existing capacity issues at this intersection as identified during the site visit.

7.3 Future Base Case ("Do Nothing")

The calibrated 2014 existing base case SIDRA Intersection models were carried forward for the future year base case scenario modelling. Intersection was assessed using SIDRA models to determine future intersection performance in the projected 2026 and 2031 traffic conditions.

Table 7-2 shows the forecast of the intersection performance for future base case ("Do nothing") scenario in 2026 and 2031.

Table 7-2 Projected Base Case ("Do Nothing") Intersection performance in 2026 and 2031, AM and PM Peak

ID	Road Names	Road Class	Control Type	Year	AM Peak				PM peak			
					DoS	Avg. Delays [s]	LoS	95th Queue Length [m]	DoS	Avg. Delays [s]	LoS	95th Queue Length [m]
I-7	Erskine Park Road/ Coonawarra Drive	State/ Local	Priority	2026	0.95	130	F	41	1.33	342	F	417
				2031	1.15	231	F	83	1.42	411	F	489

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Following key points are noted from Table 7-2:

- The model indicated that current intersection layout would experience severe capacity issues in the both future 2026 and 2031 projected traffic conditions
- The model forecasts that intersection would operate with high degree of saturation and unacceptable level of service (LoS) F in both 2026 and 2031
- It is expected that increased through traffic flow on Erskine Park Road in the future would additionally reduce available traffic gap opportunities for turning movements
- The model showed that future capacity issues at Erskine Park Road/Coonawarra Drive intersection would be associated with the lack of adequate traffic gap opportunities for the critical right turning movements to/from Coonawarra Drive.

7.4 Potential Upgrade Options Modelling

Future years 2026 and 2031 base case ("Do nothing") intersection performance assessment indicated that upgrade of the Erskine Park Road/Coonawarra Intersection is required. In order to determine adequate and optimal upgrade solution at this intersection, we have also considered local accessibility, connectivity and characteristics of the local roads in the study area.

Table 7-3 summarises description of the preliminary upgrade option modelled at Erskine Park Road/ Coonawarra Drive intersection.

Table 7-3 Preliminary Upgrade Option

Upgrade Option	Upgrade Option Description	Figure reference
Option A	▪ Upgrade intersection layout to "seagull" intersection arrangement (**Appendix B**) with the priority control. This intersection layout is proposed to provide adequate and safer two-stage right turn movement from Coonawarra Drive with the adequate channelised storage/acceleration lane near the median on the southbound departure side of Erskine Park Road for right turning vehicles; ▪ Provide two-through lanes on Erskine Park Road southern approach as a part of Erskine Park Road widening proposal between Coonawarra Drive and Lenora Drive; ▪ Extend existing right turn bay on Erskine Park Road to provide 150 m long right turn bay storage; ▪ Extend two-lane section on Coonawarra Drive approach up to 100 m	Figure 7-4

Figure 7-4 shows proposed upgrade option modelled at Erskine Park Road/Coonawarra Drive intersection.

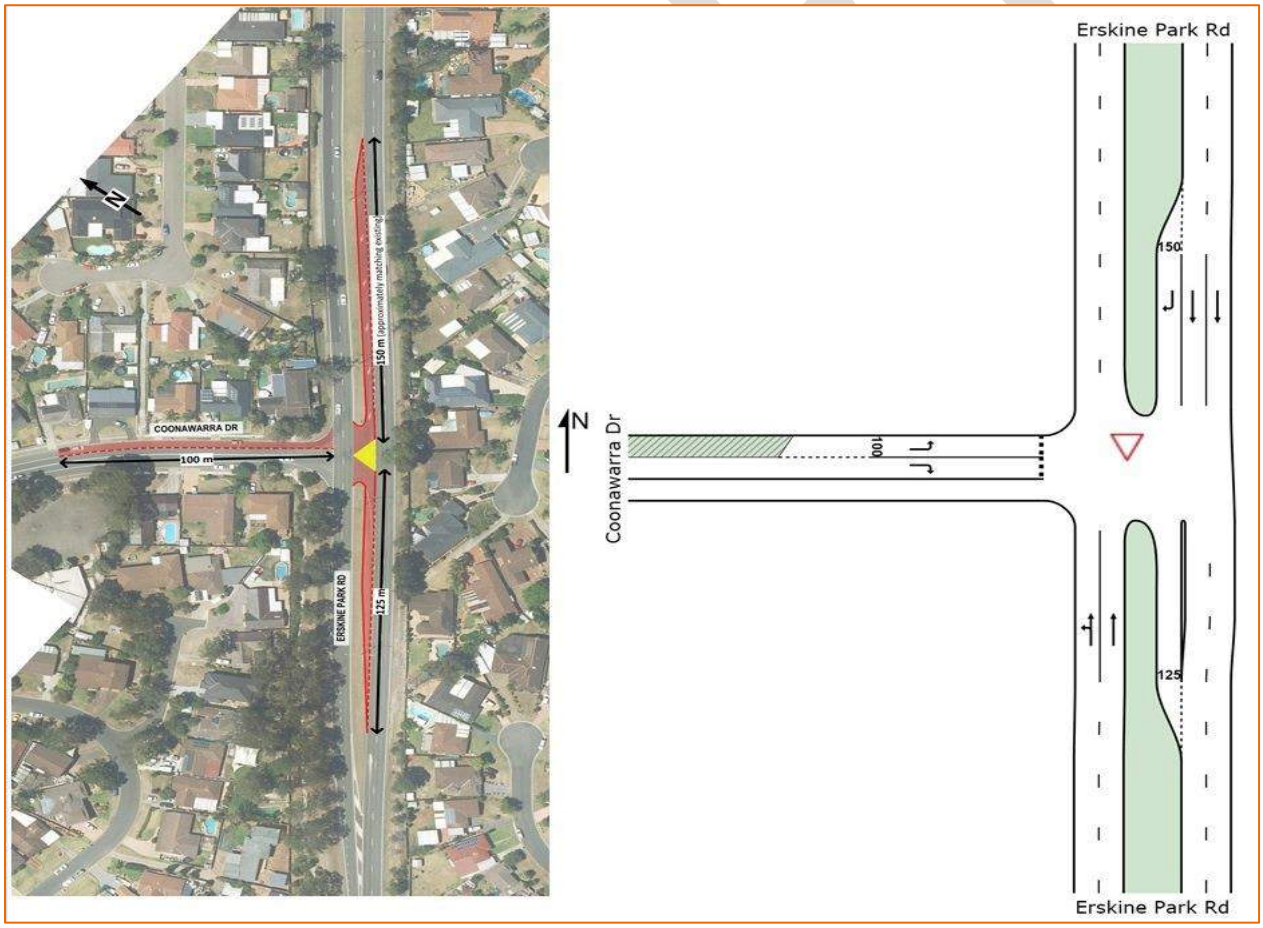


Figure 7-4 Preliminary Upgrade Option at Erskine Park Road/ Coonawarra Drive intersection

Proposed upgrade at Erskine Park Road/Coonawarra Drive intersection assumed that Erskine Park Road would be widened (upgraded) by 2026 to four lanes (two lane-two way road) between Lenora Drive and Coonawarra Drive as indicated in the RMS' STFM.

Table 7-4 summarises future 2026 intersection performance results with the proposed upgrade options in the AM and PM peak periods.

Table 7-4 2026 Future Intersection performance with proposed upgrade, AM Peak and PM Peak

ID	Road Names	Upgrade Option	Control Type	Upgrade Options 2026 AM Peak				Upgrade Option 2026 PM Peak			
				DoS	Avg. Delay [s]	LoS	95th Queue Length [m]	DoS	Avg. Delay [s]	LoS	95th Queue Length [m]
I-7	Erskine Park Road/ Coonawarra Drive	Option A	Priority Controlled ("Seagull Layout")	0.51	16	B	23	0.94	53	D	84

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Following points are noted from Table 7-4:

- The model indicated that identified upgrade option at Erskine Park Road/ Coonawarra Drive intersection would significantly improve intersection operation in both AM and PM peak periods by 2026
- The model forecasts that with the proposed upgrade Erskine Park Road/ Coonawarra Drive intersection would operate with satisfactory level of service by 2026.

Table 7-5 summarises future 2031 intersection performance results with the proposed upgrade options in the AM and PM peak periods.

Table 7-5 2031 Future Intersection performance with proposed upgrade, AM Peak and PM Peak

ID	Road Names	Upgrade Option	Control Type	Upgrade Options 2031 AM Peak				Upgrade Option 2031 PM Peak			
				DoS	Avg. Delay [s]	LoS	95th Queue Length [m]	DoS	Avg. Delay [s]	LoS	95th Queue Length [m]
I-7	Erskine Park Road/ Coonawarra Drive	Option A	Priority Controlled ("Seagull Layout")	0.64	22	B	31	1.26 (0.83)* See Note	276 (39)* See Note	F (C)* See Note	368 (41)* See Note

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

***Note:** The model indicated that proposed intersection upgrade (priority controlled "seagull") at Erskine Park Road/Coonawarra Drive intersection may start to experience capacity issues in the PM peak in 2031. These capacity issues in the PM peak are associated with the lack of available traffic gap opportunities for the right turning vehicles from Erskine Park Road to Coonawarra Drive. However, considering that adjacent Explorers Way intersection is proposed to be upgraded to new traffic signal with the dual lane right turn bay providing access to the same residential area, it can be expected that some of the right turning demand in PM peak would shift from Coonawarra Drive to Explorers Way intersection (future network "self-adjustments"). We have undertaken a sensitivity test assuming that 90 veh/h of the right turning demand may shift from Coonawarra Drive to Explorers Way signalised intersection. Modelling results of this scenario (results given in brackets) indicated that with the slightly reduced right turn demand in PM peak, proposed upgrade at Erskine Park Road/Coonawarra Drive would provide satisfactory level of service C by 2031. Sensitivity test assessing consequential impact of the expected network "self-adjustments" at upgraded (signalised) Erskine Park Road/Explorers Way and Erskine Park Road/Bennet Road intersections was also undertaken and reported in Section 10 of this report.

Preferred upgrade option at Erskine Park Road/Coonawarra Drive intersection is priority controlled ("Seagull" layout) which would provide an optimal upgrade solution with the ability to accommodate projected traffic volumes by 2026. Considering that adjacent Explorers Way intersection is proposed to be upgraded to new traffic signal with the dual lane right turn bay on Erskine Park Road providing access to the same residential area, it can be expected that some of the critical right turning demand from Erskine Park Road to Coonawarra Drive in PM peak would shift from Coonawarra Drive to Explorers Way intersection (future network "self-adjustments"). It is recommended to monitor operation of the Erskine Park Road/Coonawarra Drive intersection beyond 2026.

8 Erskine Park Road/Peppertree Drive

8.1 Site Visit Observations

Currently, Erskine Park Road/Peppertree Drive intersection operates as a priority controlled intersection. Site visit indicated that right turn movement from Peppertree Drive experiences higher delays in AM peak period with occasional queues extending back beyond Dilga Crescent. Capacity issue identified for this movement is caused by the lack of adequate traffic gap opportunities on Erskine Park Road. Figure 8-1 shows movement with the higher delays at this intersection.

Figure 8-1 Capacity Issues 4: Erskine Park Road/Peppertree Drive Intersection

Figure 8-2 shows occasional long queues on Peppertree Dive approaching Erskine Park Road in AM peak.

Figure 8-2 Typical queue on Peppertree Drive approaching Erskine Park Road in AM peak

8.2 Existing Intersection Performance

8.2.1 Existing Layout

Available, aerial photography and site visit observations were used for the intersection geometry (layouts) coding in SIDRA. Figure 8-3 shows existing base case intersection layouts assumed in the SIDRA models.

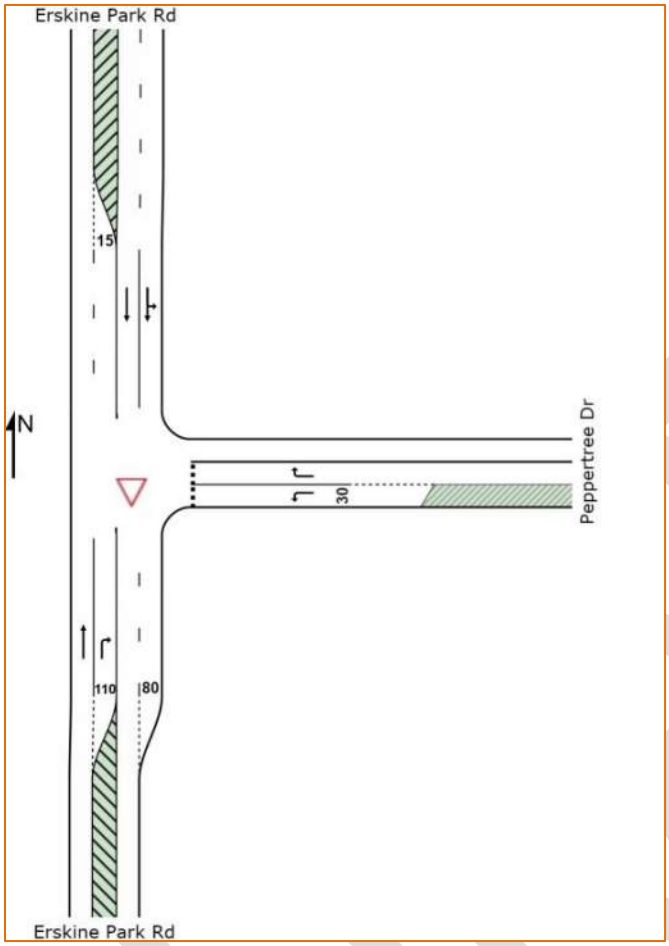


Figure 8-3 Existing Intersection Layouts assumed in the SIDRA models

8.2.2 Existing Level of Service (LoS)

Existing performance of the Erskine Park Road/Peppertree Drive intersection was assessed using SIDRA Intersection model. Site visit observations were used for SIDRA model calibration purpose. The calibrated 2014 existing base case SIDRA Intersection model formed the basis of assessing existing intersection performance. Table 8-1 below summarises existing base case intersection level of service (LoS) results:

Table 8-1 Existing (2014) Intersection LoS, AM, PM

ID	Road Names	Road Classification	Control Type	AM Peak				PM peak			
				DoS	Avg. Delays [s]	LoS	95th Queue Length [m]	DoS	Avg. Delays [s]	LoS	95th Queue Length [m]
I-8	Erskine Park Road/Peppertree Drive	State/Local	Priority	0.81	66	E	37	0.49	31	C	15

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Following key points are noted from the modelling results presented in the Table 8-1:

- Right turn movement from Peppertree Drive operates with high delays and LoS E in AM Peak
- The model confirmed that existing capacity issue at this intersection is mainly associated with the lack of adequate traffic gap opportunities for the critical right turning movements to/from Peppertree Drive
- The model confirmed similar existing capacity issues at this intersection as identified during the site visit.

8.3 Future Base Case ("Do Nothing")

The calibrated 2014 existing base case SIDRA Intersection models were carried forward for the future year base case scenario modelling. Intersection was assessed using SIDRA models to determine future intersection performance in the projected 2026 and 2031 traffic conditions.

Table 8-2 shows the forecast of the intersection performance for future base case ("Do nothing") scenario in 2026 and 2031.

Table 8-2 Projected Base Case ("Do Nothing") Intersection performance in 2026 and 2031, AM and PM Peak

ID	Road Names	Road Class	Control Type	Year	AM Peak				PM peak			
					DoS	Avg. Delays [s]	LoS	95th Queue Length [m]	DoS	Avg. Delays [s]	LoS	95th Queue Length [m]
I-8	Erskine Park Road/ Peppertree Drive	State/ Local	Priority	2026	1.33	393	F	247	0.86	85	F	29
				2031	1.45	488	F	523	1.17	263	F	104

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Following key points are noted from Table 8-2:

- The model indicated that current intersection layout would experience severe capacity issues in the both future 2026 and 2031 projected traffic conditions
- The model forecasts that intersections would operate with high degree of saturation and unacceptable level of service (LoS) F
- It is expected that increased through traffic flow on Erskine Park Road in the future would additionally reduce available traffic gap opportunities for turning movements
- The model showed that future capacity issues at Erskine Park Road/Peppertree Drive intersection would be associated with the lack of adequate traffic gap opportunities for the critical right turning movements to/from Peppertree Drive.

8.4 Potential Upgrade Options Modelling

Both existing and future years 2026 and 2031 base case ("Do nothing") intersection performance assessments indicated that upgrade of the Erskine Park Road/Peppertree Drive is required.

In order to determine adequate and optimal upgrade solution, we have also considered local accessibility, connectivity and characteristics of the local roads in the study area.

Table 8-3 summarises preliminary upgrade options tested from vehicle traffic operation perspective.

Table 8-3 Preliminary Upgrade Options

Upgrade Option	Upgrade Option Description	Figure reference
Option A	▪ Upgrade intersection layout to "seagull" intersection arrangement (See Appendix B) with the priority control. This intersection layout is proposed to provide adequate and safer two-stage right turn movement from Peppertree Drive with the adequate channelised storage/acceleration lane near the median on the northbound departure side of Erskine Park Road for right turning vehicles; ▪ Provide two-through lanes on both Erskine Park Road approaches as a part of Erskine Park Road widening proposal between Coonawarra Drive and Lenora Drive; ▪ Extend existing right turn bay on Erskine Park Road to provide 150 m long right turn bay storage; ▪ Extend two-lane section on Peppertree Drive approach up to 60 m	Figure 8-4

Figure 8-4 shows proposed upgrade option modelled at Erskine Park Road/Coonawarra Drive intersection.

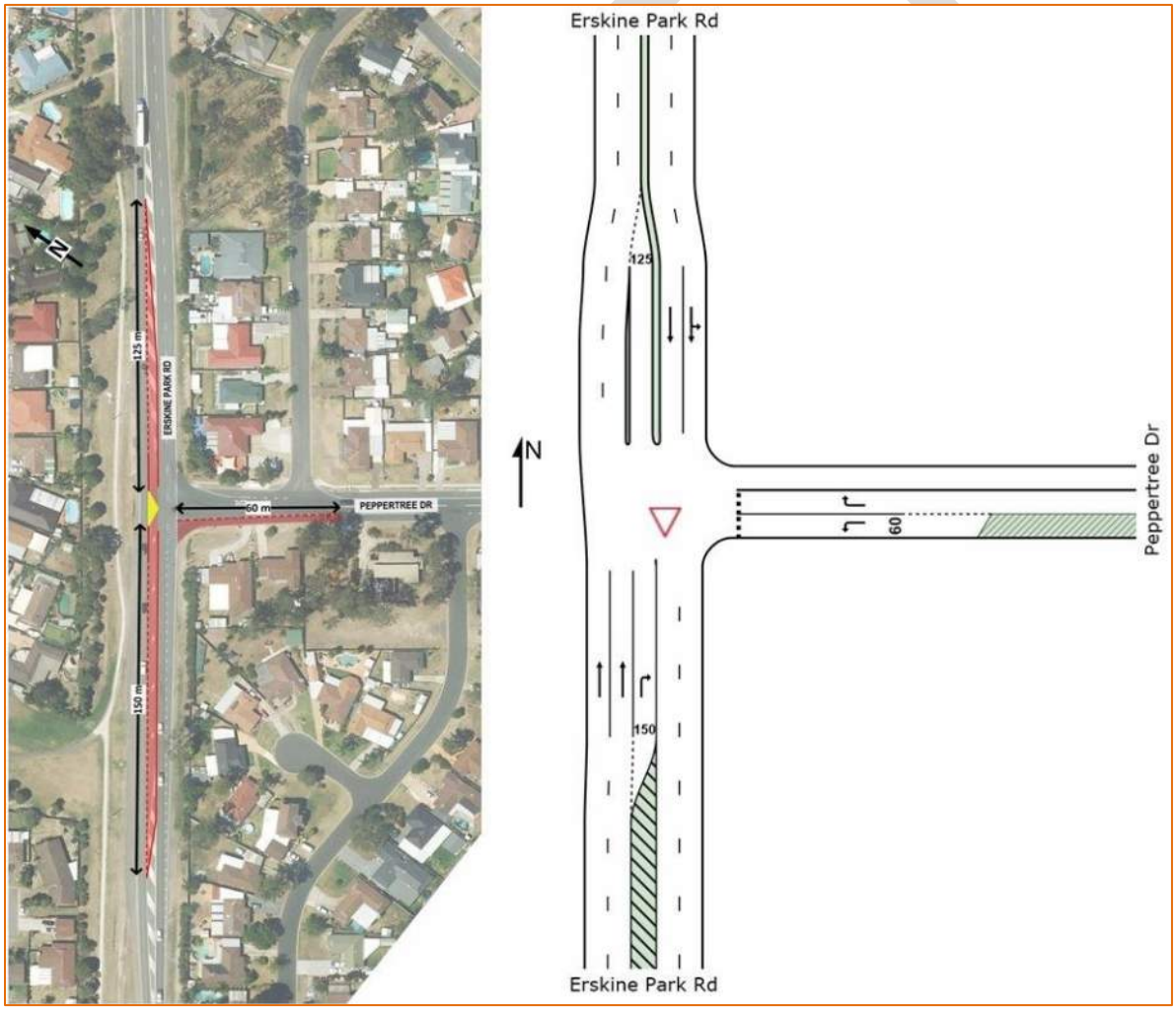


Figure 8-4 Preliminary Upgrade Option at Erskine Park Road/ Peppertree Drive intersection

Proposed upgrade at Erskine Park Road/Peppertree Drive intersection assumed that Erskine Park Road would be widened (upgraded) by 2026 to four lanes (two lane-two way road) between Lenora Drive and Coonawarra Drive as indicated in the RMS' STFM.

Table 8-4 summarises future 2026 intersection performance results with the proposed upgrade option in the AM and PM peak periods.

Table 8-4 2026 Future Intersection performance with proposed upgrade, AM Peak and PM Peak

ID	Road Names	Upgrade Option	Control Type	Upgrade Options 2026 AM Peak				Upgrade Option 2026 PM Peak			
				DoS	Avg. Delay [s]	LoS	95th Queue Length [m]	DoS	Avg. Delay [s]	LoS	95th Queue Length [m]
I-8	Erskine Park Road/ Peppertree Drive	Option A	Priority Controlled ("Seagull Layout")	0.91	44	D	61	0.47	15	B	16

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Following points are noted from Table 8-4:

- The model indicated that identified upgrade option at Erskine Park Road/ Peppertree Drive intersection would significantly improve intersection operation in both AM and PM peak periods by 2026
- The model forecasts that with the proposed upgrade Erskine Park Road/ Peppertree Drive intersection would operate with satisfactory level of service by 2026.

Table 8-5 summarises future 2031 intersection performance results with the proposed upgrade option in the AM and PM peak periods.

Table 8-5 2031 Future Intersection performance with proposed upgrade, AM Peak and PM Peak

ID	Road Names	Upgrade Option	Control Type	Upgrade Options 2026 AM Peak				Upgrade Option 2026 PM Peak			
				DoS	Avg. Delay [s]	LoS	95th Queue Length [m]	DoS	Avg. Delay [s]	LoS	95th Queue Length [m]
I-8	Erskine Park Road/ Peppertree Drive	Option A	Priority Controlled ("Seagull Layout")	1.12	152	F* See Note	213	0.64	21	B	25

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Note: The model indicated that proposed intersection upgrade (priority controlled "seagull") at Erskine Park Road/Peppertree Drive intersection may start to experience capacity issues in the AM peak in 2031. These capacity issues in the AM peak are associated with the lack of available traffic gap opportunities for the right turning vehicles from Erskine Park Road to Peppertree Drive. However, considering that adjacent Swallow Drive intersection has signalised right turn bay on Erskine Park Road providing access to the same residential area, it can be expected that some of the right turning demand in PM peak would shift from Peppertree Drive to Swallow Drive intersection (future network "self-adjustments").

Preferred upgrade option at Erskine Park Road/Peppertree Drive intersection is priority controlled ("Seagull" layout) which would provide an optimal upgrade solution with the ability to accommodate projected traffic volumes by 2026. It is recommended to monitor operation of the Erskine Park Road/Peppertree Drive intersection beyond 2026. Any further upgrade of this intersection beyond 2026 is recommended to be undertaken in conjunction with the potential future upgrade solutions at adjacent Erskine Park Road/Swallow Drive intersection. Upgrade solution at Erskine Park Road/Swallow Drive intersection was not part of this study scope.

9 Erskine Park Road/Bennett Road Intersection

9.1 Site Visit Observations

Currently, Erskine Park Road/Bennett Road intersection operates as a priority controlled intersection. High left and right turn demand movements from Bennett Road experience occasional high delays and long queues, particularly in AM peak period. It was observed on the site visit, a maximum queue length of 18 vehicles on Bennet Road in AM Peak. In the PM peak, the existing right turn bay on Erskine Park Road operates at capacity. Capacity issues identified for movements turning out of Bennett Road and right movement from Erskine Park Road into Bennet Road are caused by the lack of adequate traffic gap opportunities on Erskine Park Road. Figure 9-1 shows the movements with capacity issues at this intersection.

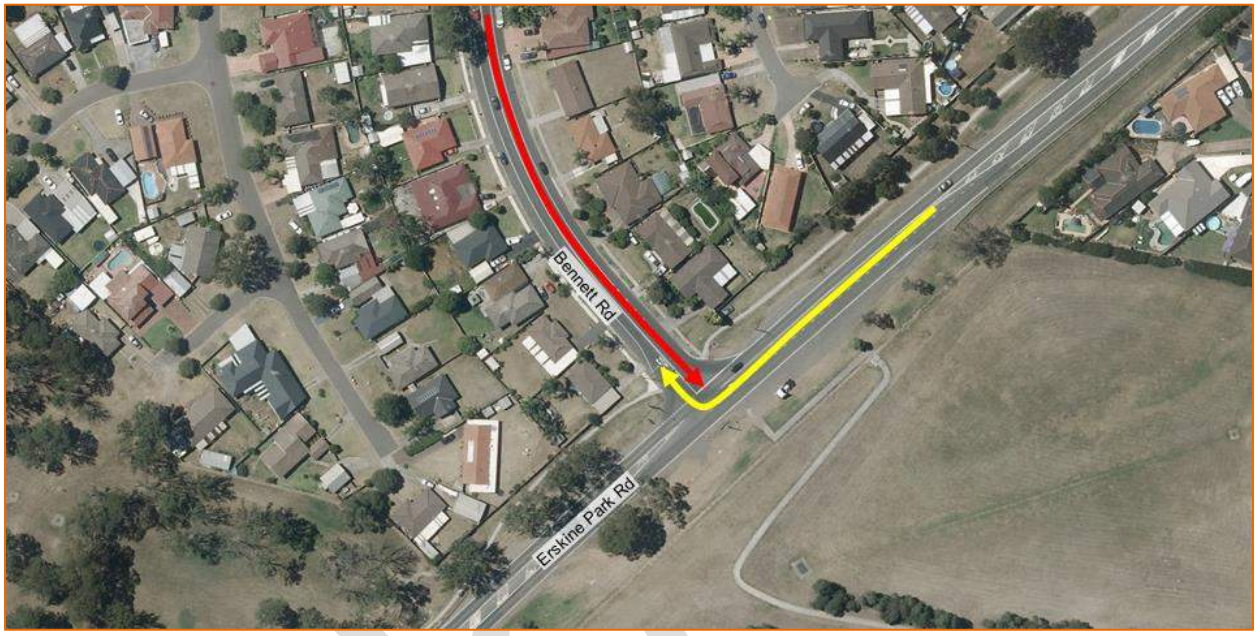


Figure 9-1 Capacity Issues 5: Bennett Road/ Erskine Park Road Intersection

Figure 9-2 shows occasional long queues on Bennett Road approaching Erskine Park Road in the AM peak.

Figure 9-2 Occasional long queue on Bennet Road approaching Erskine Park Road in AM peak

Figure 9-3 shows characteristic traffic flows on Erskine Park Road approaching Bennet Road in the northbound direction on the one available through lane. These queues indicate a severe lack of appropriate traffic gap opportunities for turning traffic at Bennet Road.

Figure 9-3 Erskine Park Road northbound traffic approaching Bennett Road, PM peak

Figure 9-4 shows capacity issues for right turn movement from Erskine Park Road into Bennet Road in PM peak

Figure 9-4 Right turn from Erskine Park Road into Bennett Road, PM peak

9.2 Existing Intersection Performance

9.2.1 Existing Layout

Available, aerial photography and site visit observations were used for the intersection geometry (layouts) coding in SIDRA. Figure 9-5 shows existing base case intersection layouts assumed in the SIDRA models.

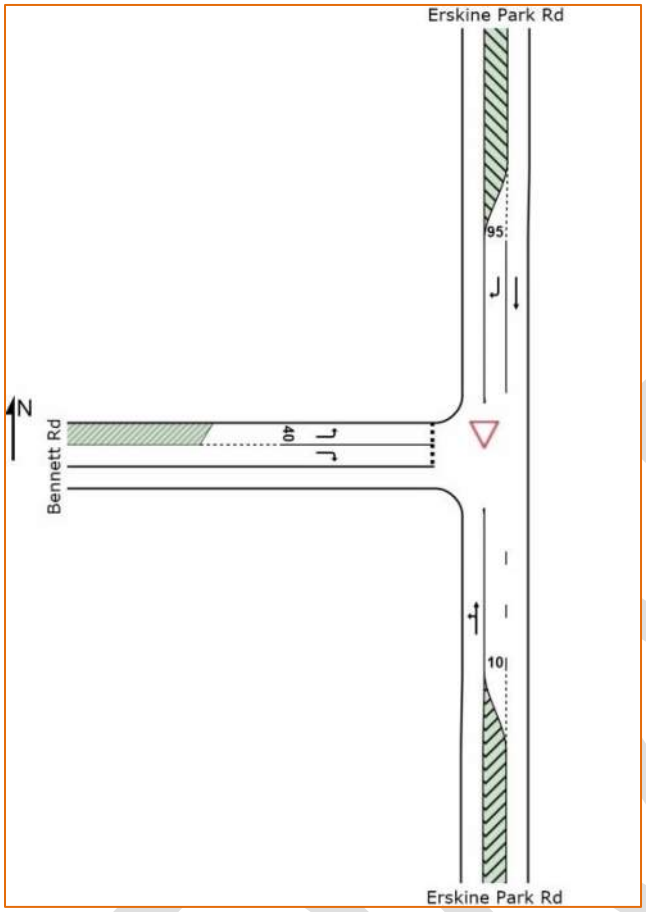


Figure 9-5 Existing Intersection Layouts assumed in the SIDRA model

9.2.2 Existing Level of Service (LoS)

Existing performance of the Erskine Park Road/Bennett Road intersection was assessed using SIDRA Intersection model. Site visit observations were used for SIDRA model calibration purpose. The calibrated 2014 existing base case SIDRA Intersection model formed the basis of assessing existing intersection performance. Table 9-1 below summarises existing base case intersection level of service (LoS) results:

Table 9-1 Existing (2014) Intersection LoS, AM, PM

ID	Road Names	Road Classification	Control Type	AM Peak				PM peak			
				DoS	Avg. Delays [s]	LoS	95th Queue Length [m]	DoS	Avg. Delays [s]	LoS	95th Queue Length [m]
I-9	Erskine Park Road/Bennett Road	State/Local	Priority	1.0	103	F	73	0.95	61	E	82

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Following key points are noted from the modelling results presented in the Table 9-1:

- The intersection is currently having particular critical movements which operate near or at capacity with the high delays and high DoS as follows:
    - Right turn from Bennett Road operates with high delays and LoS F in AM peak period
    - Right turn from Erskine Park Road to Bennett Road operates at capacity with low LoS E in PM peak period
- Model confirmed that existing capacity issues at this intersection are mainly associated with the lack of adequate traffic gap opportunities for the critical right turning movements to/from Bennett Road
- Model confirmed similar existing capacity issues at this intersection as identified during the site visit.

9.3 Future Base Case ("Do Nothing")

The calibrated 2014 existing base case SIDRA Intersection models were carried forward for the future year base case scenario modelling. Intersection was assessed using SIDRA models to determine future intersection performance in the projected 2026 and 2031 traffic conditions.

Table 9-2 shows the forecast of the intersection performance for future base case ("Do nothing") scenario in 2026 and 2031.

Table 9-2 Projected Base Case ("Do Nothing") Intersection performance in 2026 and 2031, AM and PM Peak

ID	Road Names	Road Class	Control Type	Year	AM Peak				PM peak			
					DoS	Avg. Delays [s]	LoS	95th Queue Length [m]	DoS	Avg. Delays [s]	LoS	95th Queue Length [m]
I-9	Erskine Park Road/Bennett Road	State/ Local	Priority	2026	1.21	252	F	203	1.51	500	F	571
				2031	1.33	349	F	274	1.70	672	F	990

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Following key points are noted from Table 9-2:

- Model indicated that current intersection layout would experience severe capacity issues in the both future 2026 and 2031 projected traffic conditions
- Model forecasts that intersections would operate with high degree of saturation and unacceptable level of service (LoS) F
- It is expected that increased through traffic flow on Erskine Park Road in the future would additionally reduce available traffic gap opportunities for turning movements. Model showed that future capacity issues at Erskine Park Road/Bennett Road intersection would be associated with the lack of adequate traffic gap opportunities for the critical right turning movements to/from Bennett Road.

9.4 Potential Upgrade Options Modelling

Both existing and future years 2026 and 2031 base case ("Do nothing") intersection performance assessments indicated that upgrade of the Erskine Park Road/Bennett Road is required. Preferred upgrade option at this intersection was identified through an iterative SIDRA modelling process testing different upgrade solutions; including variations of both potential intersections upgrade layout s and potential traffic control options.

In order to determine adequate and optimal upgrade solution, we have also considered local accessibility, connectivity and characteristics of the local roads in the study area. Table 9-3 summarises preliminary upgrade options tested from vehicle traffic operation perspective.

Table 9-3 Preliminary Upgrade Options

Upgrade Option	Upgrade Option Description	Figure reference
Option A Priority Controlled ("Seagull Layout")	▪ Upgrade intersection layout to "seagull" intersection arrangement (See Appendix B) with the priority control. This intersection layout is proposed to provide adequate and safer two-stage right turn movement from Bennett Road with the channelised storage/acceleration lane near the median on the southbound departure side of Erskine Park Road for right turning vehicles; ▪ Provide two-through lanes on both Erskine Park Road approaches as a part of Erskine Park Road widening proposal between Coonawarra Drive and Lenora Drive; ▪ Extend existing right turn bay on Erskine Park Road to provide 150 m long right turn bay storage; ▪ Extend two-lane section on Bennett Road approach up to 100 m	Figure 9-6
Option B Traffic Signal	▪ Upgrade to traffic signal with all movements permitted including signalised pedestrian crossings on all approaches; ▪ Provide two-through lanes on both Erskine Park Road approaches as a part of Erskine Park Road widening proposal between Coonawarra Drive and Lenora Drive; ▪ Extend existing right turn bay on Erskine Park Road to provide 150 m long right turn bay storage; ▪ Provide exclusive left turn bay (100 m) on Erskine Park Road southern approach; ▪ Extend two-lane section on Bennett Road approach up to 100 m;	

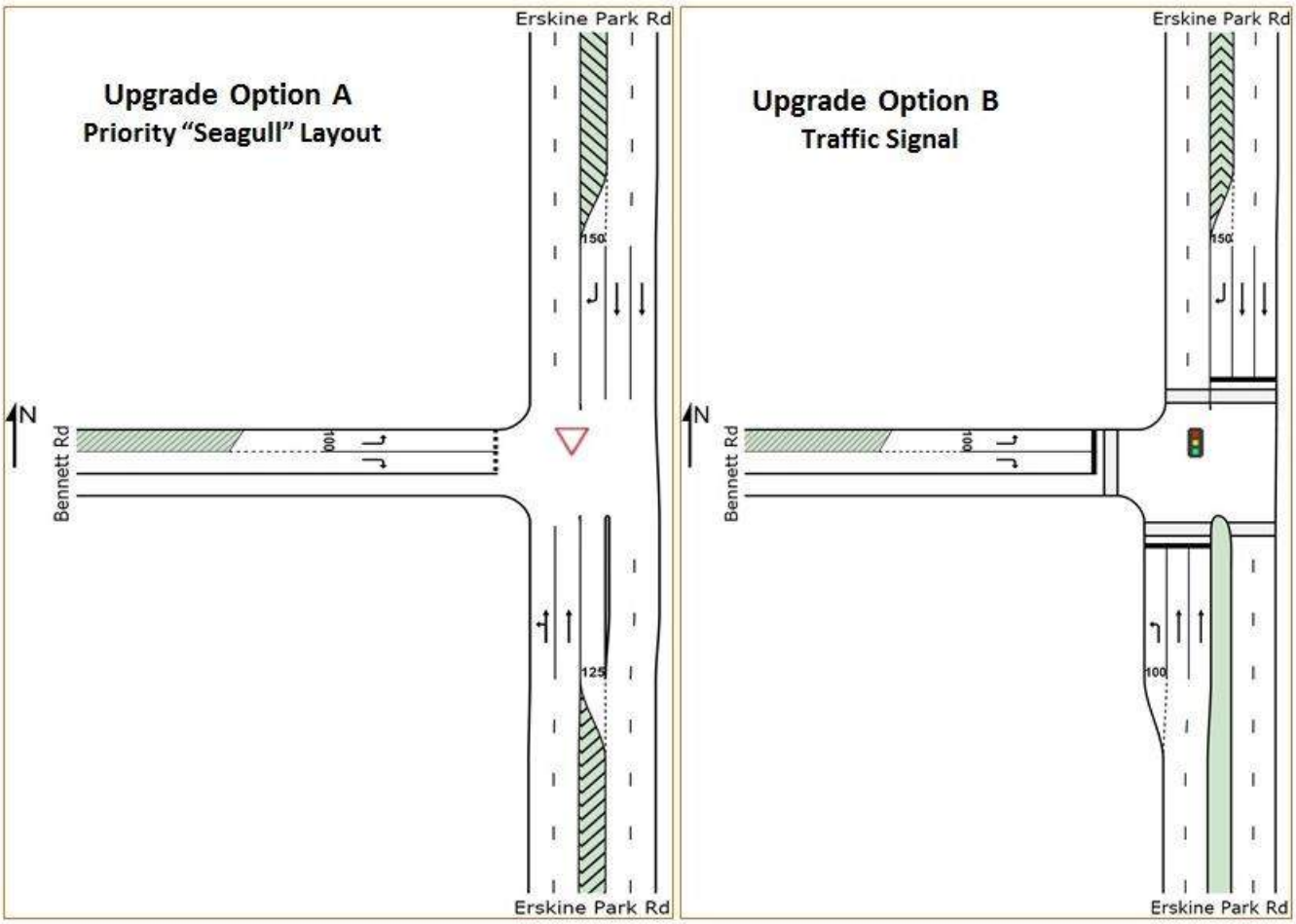


Figure 9-6 Preliminary Upgrade Option A and B modelled at Erskine Park Road/Bennett Road intersection

Table 9-4 summarises future 2026 intersection performance results with the proposed upgrade options in the AM and PM peak periods.

Table 9-4 2026 Future Intersection performance with proposed upgrades, AM Peak and PM Peak

ID	Road Names	Upgrade Option	Control Type	Upgrade Options 2026 AM Peak				Upgrade Option 2026 PM Peak			
				DoS	Avg. Delay [s]	LoS	95th Queue Length [m]	DoS	Avg. Delay [s]	LoS	95th Queue Length [m]
I-9	Erskine Park Road/Bennett Road	Option A	Priority Controlled ("Seagull Layout")	0.61	18	B	27	1.15	182	F	267
		Option B	Signal	0.85	16	B	71	0.79	21	B	119

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Following points are noted from Table 9-4:

- The model indicated that upgrade Option A at Erskine Park Road/ Bennett Road intersection would not have ability to significantly improve intersection performance in PM peak in 2026. Model forecasts that intersection with upgrade Option A would operate with good level of service B in AM peak but with an unacceptable level of service F in PM peak
- Model showed that with upgrade Option A Erskine Park Road/Bennett Road intersection would still have capacity issues in PM peak due to lack of adequate traffic gap opportunities for the critical right turning movement from Erskine Park Road to Bennett Road
- The model forecasts that with the proposed upgrade Option B Erskine Park Road/ Bennett Road intersection would operate with good level of service B and spare capacity in both AM and PM peak periods in 2026;
- Model suggested that preferred upgrade option at Erskine Park Road/ Bennett Road intersection is Option B (traffic signal).

Table 9-5 summarises future 2031 intersection performance results with the proposed upgrade options in the AM and PM peak periods.

Table 9-5 2031 Future Intersection performance with proposed upgrades, AM Peak and PM Peak

ID	Road Names	Upgrade Option	Control Type	Upgrade Options 2031 AM Peak				Upgrade Option 2031 PM Peak			
				DoS	Avg. Delay [s]	LoS	95th Queue Length [m]	DoS	Avg. Delay [s]	LoS	95th Queue Length [m]
I-9	Erskine Park Road/Bennett Road	Option A	Priority Controlled ("Seagull Layout")	0.79	28	B	43	1.38	382	F	494
		Option B	Signal	0.79	18	B	112	0.83	21	B	155

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

Preferred upgrade option at Erskine Park Road/Bennett Road intersection is new traffic signal. Model indicated that traffic signal would operate with the spare capacity and good level of service B by 2031. Proposed upgrade at Erskine Park Road/Bennett Road intersection assumed that Erskine Park Road would be widened (upgraded) by 2026 to four lanes (two lane-two way road) between Lenora Drive and Coonawarra Drive as indicated in the RMS' STFM.

10 Sensitivity Tests-Potential Future Network Self Adjustments

As a result of the proposed signalisation of the Explorers Way and Bennett Road intersections with Erskine Park Road, it is anticipated that there will be some potential "self-adjustment" of vehicle movements in the network. This is primarily expected to involve some vehicles shifting from the right turn movement out of Coonawarra Drive to the right turn movement out of Bennett Road in the AM peak period; and from turning right from Erskine Park Road to Coonawarra Drive to turning right from Erskine Park Road to Explorers Way or Bennet Road in the PM peak period. The change in travel patterns will occur as the right turn movement at the priority controlled intersections will experience longer delays than the right turn movement at the new signalised intersections.

It is estimated that this change in travel pattern will result in up to50 vehicles per hour shifting from the right turn movement at the Coonawarra Drive intersection to performing the right turn movement at the Bennett Road intersection in the AM peak period, as shown in Figure 10-1.

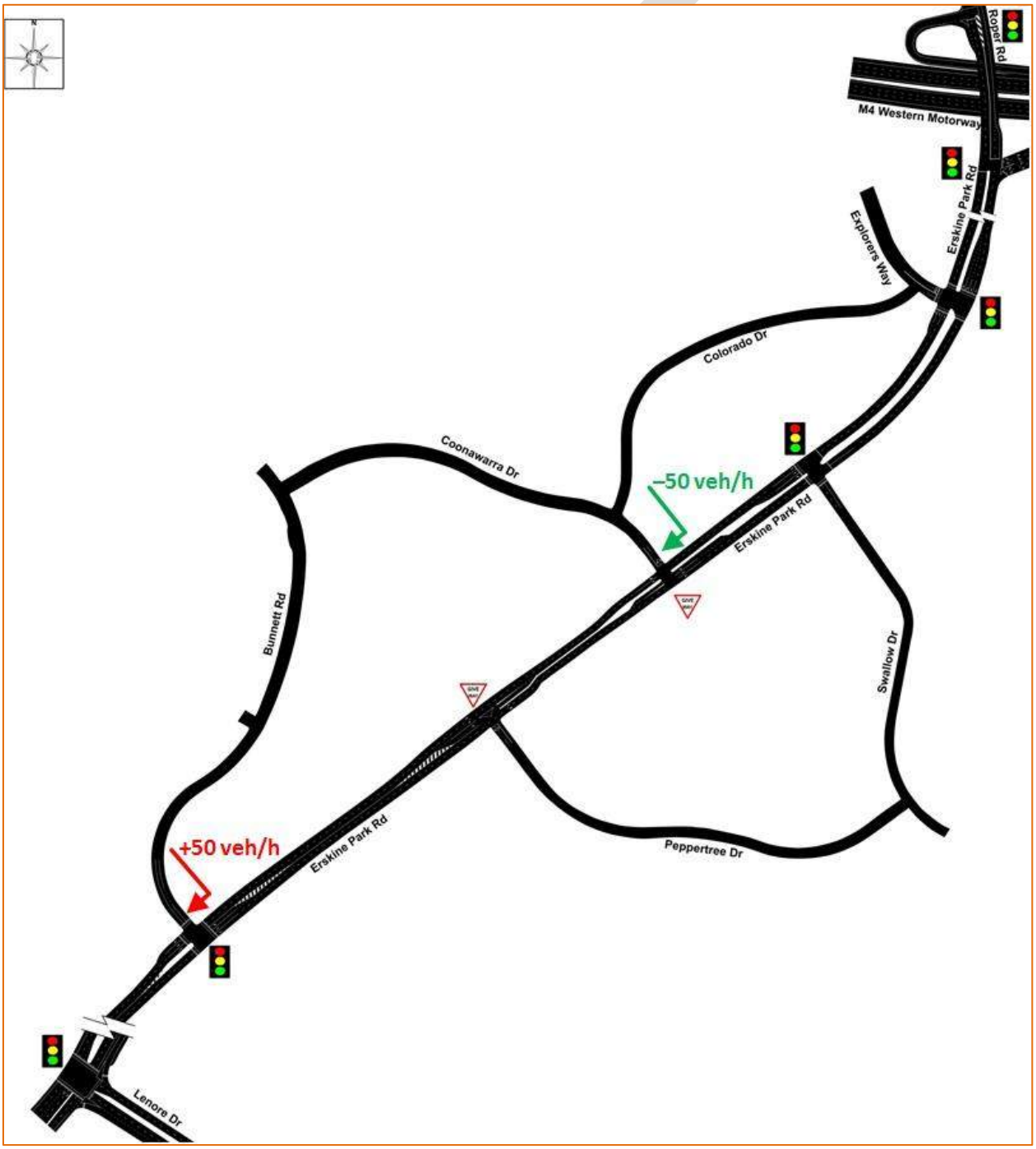


Figure 10-1 Future network anticipated "self-adjustment" – 2031 AM peak

Similarly, it is estimated that right turn demand in the order of 90 vehicles per hour could potentially shift from the Coonawarra Drive intersection to the Explorers Way and/or Bennett Road intersections during the PM peak period (both tested at the maximum number of possible additional vehicles), as shown in Figure 10-2.

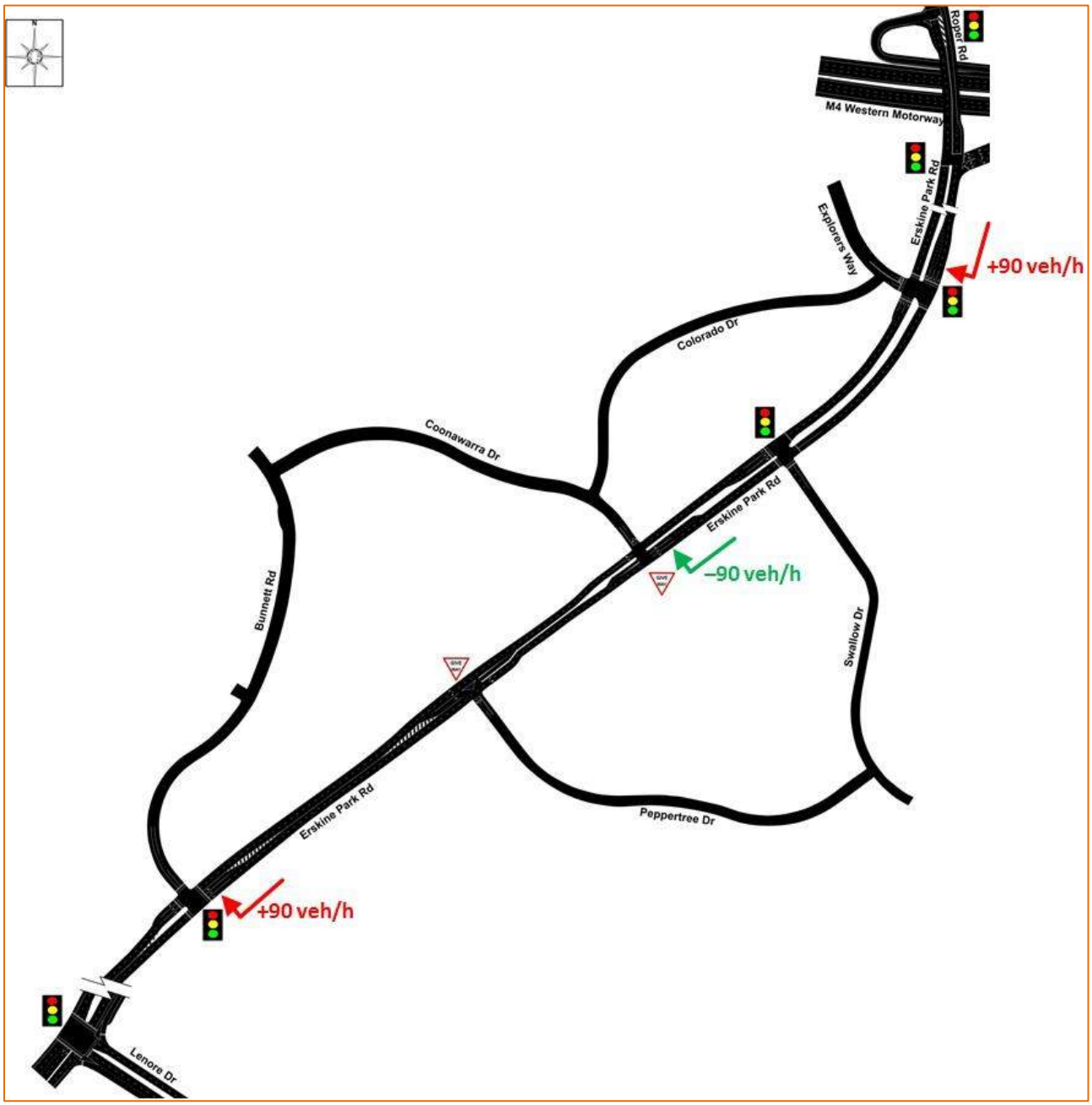


Figure 10-2 Future network anticipated "self-adjustment" – 2031 PM peak

Sensitivity tests were carried out in SIDRA to assess the consequential impact of anticipated traffic shift (network "self-adjustment") to the performance of the proposed preferred upgrade options at Erskine Park Road/Explorers Way and Erskine Park Road/Bennett Road intersections with the additional volumes. The results are shown in Tables 10-1 and 10-2.

Table 10-1 2031 Future Intersection performance with and without adjusted volume, AM Peak and PM Peak

ID	Road Names	Upgrade Option	Control Type	Upgrade Options 2031 AM Peak Adjusted				Upgrade Option 2031 PM Peak Adjusted			
				DoS	Avg. Delay [s]	LoS	95th Queue Length [m]	DoS	Avg. Delay [s]	LoS	95th Queue Length [m]
I-9	Erskine Park Road/ Bennett Road	Preferred Upgrade Option B without additional traffic	Signal	0.79	18	B	112	0.83	21	B	155
		Preferred Upgrade Option B without additional traffic	Signal	0.87	20	B	115	0.83	27	B	192

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

The above results show that preferred upgrade Option B at Erskine Park Road/Bennett Road intersection is expected to have sufficient spare capacity to absorb the additional traffic diverted to its right turn movements in AM and PM peak periods as a result of potential network "self-adjustment" by 2031.

Table 10-2 2031 Future Intersection performance with adjusted volume, PM Peak

ID	Road Names	Upgrade Option	Control Type	Upgrade Option 2031 PM Peak Adjusted			
				DoS	Avg. Delay [s]	LoS	95th Queue Length [m]
I-6	Erskine Park Road/Explorers Way	Preferred Upgrade Option C without additional traffic	Signal	0.85	25	B	280
		Preferred Upgrade Option C with additional traffic	Signal	0.91	31	C	333

Source: \projects\30011669 - Penrith Council Traffic Modelling\010 Modelling\1-SIDRA\Revision F

The above results show that preferred upgrade Option C at Erskine Park Road/Explorers Way intersection is expected to have sufficient spare capacity to absorb the additional traffic diverted to the right turn movement from Erskine Park Road to Explorers Way as a result of potential network "self-adjustment" by 2031.

11 Preferred Upgrade Options

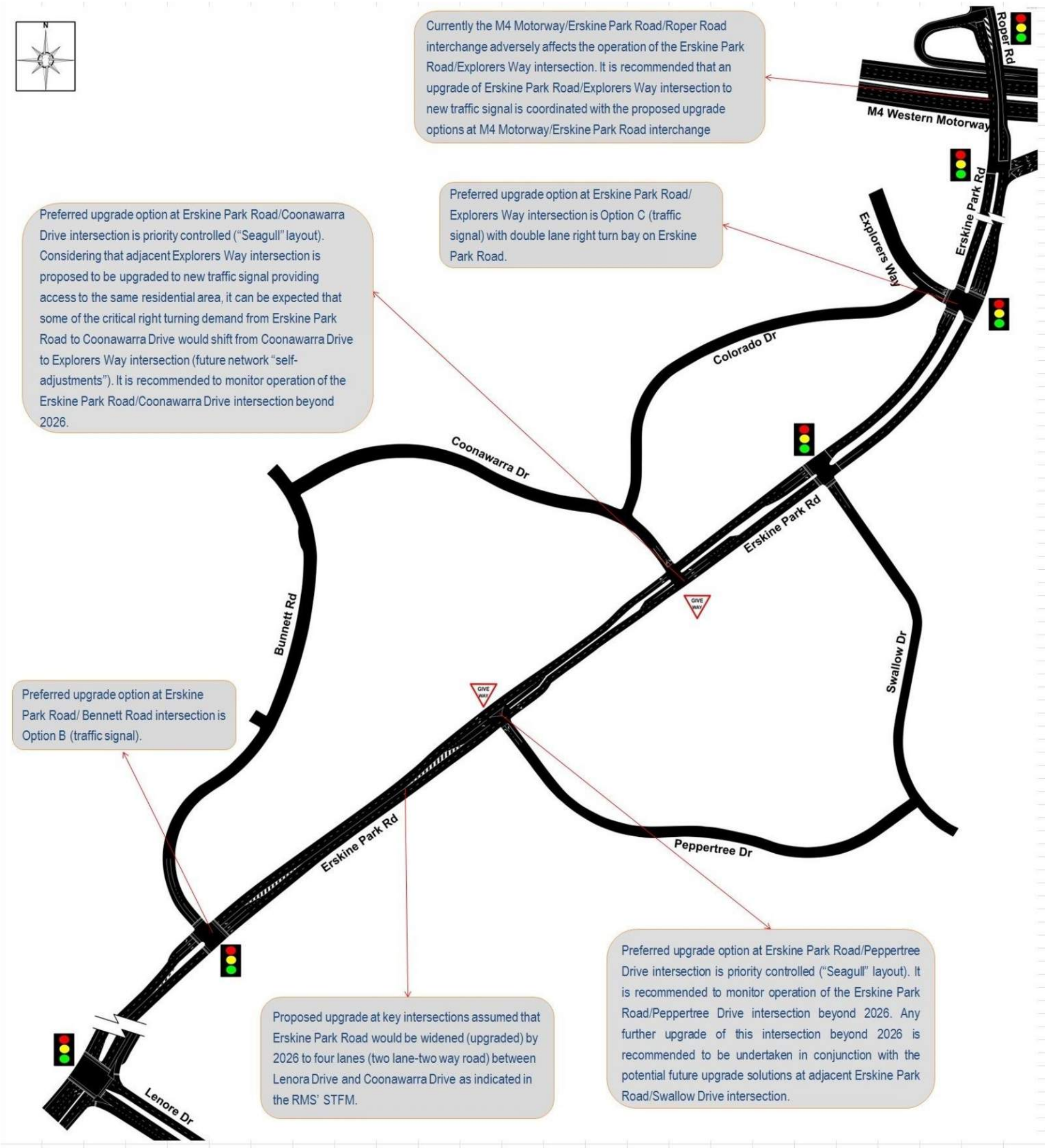


Figure 11-1 Proffered Upgrade Options at key intersections

12 Summary of Findings

This traffic report summarises the traffic modelling outcomes of selected intersections on Erskine Park Road. SMEC has assessed the impacts of the projected population and economic growth in the study area in order to identify potential intersection upgrade solutions which would be suitable for the future projected traffic conditions.

Penrith is designated as a Regional City in the Sydney metropolitan strategy in the Western Sub-region and it is targeted for both population and economic growth. Council is seeking to cater for planned growth in the Local Government Area (LGA) by investigating improvements to traffic flow, road safety, road network efficiency and reduction in journey travel time-particularly along key regional link roads which connect residential, education, employment, transport and retail hubs.

The New South Wales Government established the Western Sydney Employment Area to provide businesses in the region with land for industry and employment, catering for transport and logistics, warehousing and office space.

TfNSW has extended the existing Western Sydney Employment Area boundary south to Elizabeth Drive and to include land west of the planned second Sydney Airport. These changes have allowed the NSW Government to dedicate 4,537 more hectares to economic growth in Western Sydney indicated that significant traffic growth can be expected in the study area by 2031.

The core study area includes section of Erskine Park Road from south of M4 Motorway to south of Bennett Road with the four key priority controlled intersections along this section as follows:

- Erskine Park Road/ Explorers Way;
- Erskine Park Road/ Coonawarra Drive
- Erskine Park Road/ Peppertree Drive
- Erskine Park Road/ Bennett Road.

A review of available journey to work (JTW) data indicated that around 77% of work related outbound trips from the study area were made by motorists in private vehicles either as a car drivers or car passengers. From the inbound trips statistics, it can be seen that private vehicles are still by far the dominant mode of transport to work comprising about 73.5% of all work related trips. Both JTW data and current public transport data indicated very limited existing public transport services in the study area.

Traffic data, including intersection turning volumes in AM and PM peak periods were provided by Council for the purpose of this study. Traffic data analysis indicated that highest peak hour traffic volumes in the study area occur on Thursday. Thursday (critical day) peak hour traffic volumes are used as an input into SIDRA Intersection traffic modelling.

In addition to traffic data analysis, SMEC undertook an extensive study area site visits on Friday, 6th of March 2015 in AM peak (7:00-9:00) and Thursday, 26th February 2015 in PM peak (4:00-6:00). The site visits provided information about existing network characteristic, traffic pattern, traffic behaviour, existing network capacity issues and contributing factors. During the site visit, we have identified five main locations where network/intersections currently have some capacity issues (Section 4).

Traffic data and site visit observations formed main inputs to SIDRA intersection modelling. RMS Traffic Modelling Guideline, Version 1, February 2013 (RMS guideline) was used as the main guideline for the base year model development.

An existing intersection performance assessment was undertaken using developed SIDRA Intersection models. The performance of an intersection can be measured by the intersection average delay per vehicle which corresponds to a Level of Service (LoS) measure for the intersection. In addition, Degree of Saturation (DoS) values were analysed for the each movement. Model indicated that current level of service (LoS) at key intersections is in the range between D and F in AM peak and between LoS C and E in PM peak period. All four key intersections are currently having particular critical movement which operates near or at capacity with the high delays and high DoS. Model confirmed that existing capacity issues at all intersections are mainly associated with the lack of adequate traffic gap opportunities for the critical turning movements to/from local roads.

For the purposes of modelling future traffic scenarios, SMEC has reviewed various available sources in order to identify the future traffic growth in the study area: including TfNSW's Bureau of Transport Statistic (BTS) Population and

Employment Forecast in the core study area, RMS' 2006TZ Sydney GMA Strategic Traffic Forecasting Model (EMME model traffic volume forecast plots) and Broader Western Sydney Employment Area (BWSEA) Draft Structure Plan 2013, TfNSW (Section 7).

In order to meet the study objectives, future traffic modelling scenarios were undertaken for each of the intersections:

- 2026 Future Base Case ("Do Nothing"), AM and PM Peak;
- 2026 Future Upgrade Case, AM and PM peak; and
- 2031 Future Upgrade Case, AM and PM peak.

The modelling results of the 2026 Base Case ("Do Nothing") scenario for both AM and PM peak periods indicates that the current intersection layouts at all four intersections will experience severe capacity issues in the future 2026 traffic conditions. The model forecasts that without upgrade ("consequence of no action"), all intersections will operate with a high degree of saturation and an unacceptable level of service (LoS) in 2026.

Both the existing and future year 2026 base case ("Do nothing") intersection performance assessments indicated that intersection upgrades are necessary at all four intersections. Preliminary upgrade options at each intersection were identified through the iterative SIDRA modelling process which tested different upgrade solutions, including variations of both potential intersection upgrade layouts and potential traffic control options.

In order to determine the adequate and optimal upgrade solutions we have also considered local accessibility, connectivity and characteristics of the local roads in the study area.

The following upgrade options are proposed:

- New traffic signals at Erskine Park Road/Explorers Way and Erskine Park Road/Bennet Road
- A priority controlled "seagull" layout providing a two-stage right turn movements from local roads at Erskine Park Road/Coonawarra Drive and Erskine Park Road/Peppertree Drive intersections.

The proposed intersection upgrade options were assessed for 2026 and 2031 future traffic conditions using SIDRA intersection models. The modelling forecasts that implementing the identified upgrade options would significantly improve the performance of key intersections. The model indicated that the proposed improvement works will provide LoS D or better at all four modelled intersections in future 2026 projected traffic conditions.

The modelling suggested that the identified upgrade options at Erskine Park Road/Explorers Way and Erskine Park Road/Bennet Road intersections (new signals) would operate with spare capacity and good level of service B by 2031. The model also indicated that proposed intersection upgrades (priority controlled "seagull") at Erskine Park Road/Coonawarra Drive and Erskine Park Road/ Peppertree Drive intersections may start to experience capacity issues in 2031. These capacity issues are associated with the lack of available traffic gap opportunities for the right turning vehicles to/from Erskine Park Road from/to local roads. However, it can be expected that some of the right turning demand at Coonawarra Drive and Peppertree Drive may shift to adjacent signals at Explorers Way, Swallow Drive and Bennett Road (future network "self-adjustments").

Sensitivity tests were carried out in SIDRA to assess the consequential impact of anticipated traffic shift (network "self-adjustment") to the performance of the proposed preferred upgrade options at Erskine Park Road/Explorers Way and Erskine Park Road/Bennett Road intersections with the additional volumes. Sensitivity test showed that preferred upgrade Option B at Erskine Park Road/Bennett Road intersection and preferred upgrade Option C at Erskine Park road/Explores Way intersection are expected to have sufficient spare capacity to absorb the additional traffic diverted to their right turn movements in AM and PM peak periods as a result of potential network "self-adjustment" by 2031. It is recommended to monitor operation of the Erskine Park Road/ Coonawarra Drive and Erskine Park Road/Peppertree Drive intersections beyond 2026.

Currently the M4 Motorway/Erskine Park Road/Roper Road interchange adversely affects the operation of the Erskine Park Road/Explorers Way intersection. It is recommended that an upgrade of Erskine Park Road/Explorers Way intersection to new traffic signal is coordinated with the proposed upgrade options at M4 Motorway interchange.

It is likely that the identified intersection upgrades will require property acquisition and utility adjustments. It is recommended that a prefeasibility study is undertaken to determine potential site constraints and opportunities should planning proposals necessitating these upgrades proceed. Future consultation with RMS is recommended as all upgrade options involve intersections with the State road.

Appendix A Detailed SIDRA modelling results

Erskine Park Road/Explorers Way Intersection

MOVEMENT SUMMARY

Site: Site6 - 2014 BC AM Peak_Reported

Erskine Park Rd / Explorers Way
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
1	L2	78	12.3	0.367	6.5	LOS A	0.0	0.0	0.00	0.07	60.6
2	T1	1283	6.9	0.367	0.0	LOS A	0.0	0.0	0.00	0.03	69.3
Approach		1361	7.2	0.367	0.4	NA	0.0	0.0	0.00	0.04	68.6
North: Erskine Park Rd											
8	T1	966	12.2	0.267	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
9	R2	142	3.6	0.436	21.2	LOS B	1.7	12.2	0.87	1.01	40.4
Approach		1108	11.1	0.436	2.7	NA	1.7	12.2	0.11	0.13	63.2
West: Explorers Way											
10	L2	368	1.7	0.960	51.2	LOS D	13.8	98.1	0.98	2.16	28.3
12	R2	22	5.3	0.213	42.3	LOS C	0.7	4.9	0.92	0.98	31.4
Approach		390	1.9	0.960	50.7	LOS D	13.8	98.1	0.98	2.09	28.5
All Vehicles		2860	8.0	0.960	8.1	NA	13.8	98.1	0.18	0.35	55.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site6 - 2014 BC PM Peak_Reported

Erskine Park Rd / Explorers Way
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
1	L2	92	1.3	0.302	6.4	LOS A	0.0	0.0	0.00	0.10	64.3
2	T1	1036	6.4	0.302	0.0	LOS A	0.0	0.0	0.00	0.05	69.0
Approach		1128	6.0	0.302	0.5	NA	0.0	0.0	0.00	0.05	68.5
North: Erskine Park Rd											
8	T1	1234	6.1	0.463	0.8	LOS A	3.3	24.6	0.30	0.00	67.4
9	R2	480	1.5	0.992	57.2	LOS E	19.2	136.2	1.00	2.17	27.4
Approach		1714	4.8	0.992	16.6	NA	19.2	136.2	0.49	0.61	46.5
West: Explorers Way											
10	L2	210	1.0	0.401	12.4	LOS A	1.9	13.5	0.72	0.96	44.1
12	R2	12	9.1	0.126	42.1	LOS C	0.4	2.8	0.92	0.96	31.2
Approach		222	1.4	0.401	14.0	LOS A	1.9	13.5	0.73	0.96	43.1
All Vehicles		3064	5.0	0.992	10.5	NA	19.2	136.2	0.33	0.43	52.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site6 - 2026 BC AM Peak_Reported

Erskine Park Rd / Explorers Way
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
1	L2	88	12.3	0.418	6.5	LOS A	0.0	0.0	0.00	0.07	60.6
2	T1	1466	6.9	0.418	0.0	LOS A	0.0	0.0	0.00	0.03	69.3
Approach		1554	7.2	0.418	0.4	NA	0.0	0.0	0.00	0.04	68.6
North: Erskine Park Rd											
8	T1	1199	12.2	0.332	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
9	R2	160	3.6	0.509	23.0	LOS B	2.0	14.4	0.90	1.04	39.5
Approach		1358	11.2	0.509	2.7	NA	2.0	14.4	0.11	0.12	63.4
West: Explorers Way											
10	L2	415	1.7	1.155	175.8	LOS F	44.4	315.5	1.00	4.22	13.2
12	R2	24	5.3	0.248	45.8	LOS D	0.8	5.6	0.94	0.99	30.4
Approach		439	1.9	1.155	168.6	LOS F	44.4	315.5	1.00	4.04	13.7
All Vehicles		3351	8.1	1.155	23.3	NA	44.4	315.5	0.17	0.60	42.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site6 - 2026 BC PM Peak_Reported

Erskine Park Rd / Explorers Way
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
1	L2	104	1.3	0.366	6.4	LOS A	0.0	0.0	0.00	0.10	64.3
2	T1	1266	6.4	0.366	0.0	LOS A	0.0	0.0	0.00	0.04	69.0
Approach		1369	6.0	0.366	0.5	NA	0.0	0.0	0.00	0.05	68.6
North: Erskine Park Rd											
8	T1	1409	6.1	0.557	2.3	LOS A	3.4	24.9	0.26	0.00	65.9
9	R2	541	1.5	1.277	277.4	LOS F	81.4	577.2	1.00	5.01	9.3
Approach		1950	4.8	1.277	78.6	NA	81.4	577.2	0.46	1.39	22.9
West: Explorers Way											
10	L2	236	1.0	0.517	15.5	LOS B	2.6	18.4	0.81	1.06	42.2
12	R2	13	9.1	0.121	36.0	LOS C	0.3	2.6	0.92	0.96	33.1
Approach		249	1.4	0.517	16.6	LOS B	2.6	18.4	0.82	1.05	41.6
All Vehicles		3569	5.1	1.277	44.3	NA	81.4	577.2	0.31	0.85	32.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site6 - 2031 BC AM Peak_Reported

Erskine Park Rd / Explorers Way
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
1	L2	90	12.3	0.467	6.5	LOS A	0.0	0.0	0.00	0.07	60.7
2	T1	1643	6.9	0.467	0.0	LOS A	0.0	0.0	0.00	0.03	69.3
Approach		1734	7.2	0.467	0.4	NA	0.0	0.0	0.00	0.03	68.7
North: Erskine Park Rd											
8	T1	1341	12.2	0.371	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
9	R2	165	3.6	0.570	25.8	LOS B	2.2	16.1	0.93	1.07	38.1
Approach		1506	11.3	0.570	2.9	NA	2.2	16.1	0.10	0.12	63.3
West: Explorers Way											
10	L2	429	1.7	1.328	326.0	LOS F	73.9	524.6	1.00	5.82	8.0
12	R2	25	5.3	0.287	51.7	LOS D	0.9	6.4	0.95	1.00	28.8
Approach		454	1.9	1.328	310.6	LOS F	73.9	524.6	1.00	5.55	8.4
All Vehicles		3694	8.2	1.328	39.5	NA	73.9	524.6	0.16	0.75	33.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site6 - 2031 BC PM Peak_Reported

Erskine Park Rd / Explorers Way
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
1	L2	107	1.3	0.405	6.4	LOS A	0.0	0.0	0.00	0.09	64.4
2	T1	1406	6.4	0.405	0.0	LOS A	0.0	0.0	0.00	0.04	69.1
Approach		1514	6.1	0.405	0.5	NA	0.0	0.0	0.00	0.04	68.6
North: Erskine Park Rd											
8	T1	1579	6.1	0.637	2.4	LOS A	3.6	26.2	0.24	0.00	65.7
9	R2	560	1.5	1.392	379.2	LOS F	105.8	750.4	1.00	5.93	7.1
Approach		2139	4.9	1.392	101.1	NA	105.8	750.4	0.44	1.55	19.3
West: Explorers Way											
10	L2	245	1.0	0.575	17.4	LOS B	2.9	20.8	0.85	1.11	41.2
12	R2	13	9.1	0.120	35.8	LOS C	0.3	2.5	0.92	0.97	33.2
Approach		258	1.4	0.575	18.3	LOS B	2.9	20.8	0.86	1.10	40.6
All Vehicles		3911	5.1	1.392	56.7	NA	105.8	750.4	0.30	0.94	28.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site6 - 2026 Upgrade Option C_AM Peak_RevB_Repoted

Erskine Park Rd / Explorers Way
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
1	L2	88	12.3	0.098	16.7	LOS B	1.7	13.1	0.53	0.71	43.8
2	T1	1466	6.9	0.761	16.8	LOS B	23.5	174.4	0.84	0.78	48.7
Approach		1554	7.2	0.761	16.8	LOS B	23.5	174.4	0.83	0.77	48.3
North: Erskine Park Rd											
8	T1	1199	12.2	0.492	6.8	LOS A	11.3	87.4	0.52	0.47	59.5
9	R2	160	3.6	0.712	49.2	LOS D	4.1	29.7	1.00	0.81	29.6
Approach		1358	11.2	0.712	11.7	LOS A	11.3	87.4	0.58	0.51	52.5
West: Explorers Way											
10	L2	415	1.7	0.401	28.7	LOS C	7.3	52.1	0.84	0.78	35.7
12	R2	24	5.3	0.401	30.5	LOS C	6.5	46.1	0.86	0.79	35.7
Approach		439	1.9	0.401	28.8	LOS C	7.3	52.1	0.84	0.78	35.7
All Vehicles		3351	8.1	0.761	16.3	LOS B	23.5	174.4	0.73	0.67	47.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site6 - 2026 Upgrade Option C_PM Peak_RevB_Reported

Erskine Park Rd / Explorers Way
Signals - Fixed Time Isolated Cycle Time = 87 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
1	L2	104	1.3	0.136	23.3	LOS B	2.7	19.3	0.65	0.74	40.3
2	T1	1266	6.4	0.837	30.2	LOS C	27.8	205.4	0.95	0.94	39.2
Approach		1369	6.0	0.837	29.7	LOS C	27.8	205.4	0.93	0.93	39.3
North: Erskine Park Rd											
8	T1	1409	6.1	0.545	7.1	LOS A	14.7	108.4	0.54	0.49	59.0
9	R2	541	1.5	0.861	47.1	LOS D	15.7	111.3	0.98	0.90	30.2
Approach		1950	4.8	0.861	18.2	LOS B	15.7	111.3	0.66	0.60	45.7
West: Explorers Way											
10	L2	236	1.0	0.183	23.3	LOS B	3.8	27.0	0.69	0.72	38.2
12	R2	13	9.1	0.183	29.1	LOS C	3.1	22.2	0.78	0.74	35.9
Approach		249	1.4	0.183	23.6	LOS B	3.8	27.0	0.69	0.72	38.0
All Vehicles		3569	5.1	0.861	23.0	LOS B	27.8	205.4	0.77	0.74	42.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site6 - 2031 Upgrade Option C_AM Peak_RevB_Reported

Erskine Park Rd / Explorers Way
Signals - Fixed Time Isolated Cycle Time = 95 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
1	L2	90	12.3	0.093	16.4	LOS B	1.9	14.5	0.48	0.70	44.0
2	T1	1643	6.9	0.795	17.9	LOS B	31.2	231.2	0.84	0.78	47.7
Approach		1734	7.2	0.795	17.8	LOS B	31.2	231.2	0.82	0.77	47.5
North: Erskine Park Rd											
8	T1	1341	12.2	0.526	7.0	LOS A	14.4	111.2	0.51	0.46	59.2
9	R2	165	3.6	0.748	57.1	LOS E	5.0	36.3	1.00	0.82	27.5
Approach		1506	11.3	0.748	12.5	LOS A	14.4	111.2	0.56	0.50	51.8
West: Explorers Way											
10	L2	429	1.7	0.443	34.7	LOS C	9.3	66.2	0.87	0.80	33.4
12	R2	25	5.3	0.443	36.5	LOS C	8.1	57.6	0.88	0.80	33.5
Approach		454	1.9	0.443	34.8	LOS C	9.3	66.2	0.87	0.80	33.4
All Vehicles		3694	8.2	0.795	17.7	LOS B	31.2	231.2	0.72	0.67	46.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site6 - 2031 Upgrade Option C_PM Peak_RevB_Reported

Erskine Park Rd / Explorers Way
Signals - Fixed Time Isolated Cycle Time = 114 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
1	L2	107	1.3	0.125	24.7	LOS B	3.3	23.6	0.60	0.73	39.6
2	T1	1406	6.4	0.839	32.4	LOS C	38.0	280.5	0.93	0.89	37.9
Approach		1514	6.1	0.839	31.9	LOS C	38.0	280.5	0.90	0.88	38.1
North: Erskine Park Rd											
8	T1	1579	6.1	0.571	7.2	LOS A	19.6	144.2	0.49	0.45	59.0
9	R2	560	1.5	0.854	56.2	LOS D	20.1	142.7	0.98	0.89	27.7
Approach		2139	4.9	0.854	20.0	LOS B	20.1	144.2	0.62	0.57	44.4
West: Explorers Way											
10	L2	245	1.0	0.204	30.8	LOS C	5.6	39.2	0.72	0.73	34.9
12	R2	13	9.1	0.204	39.9	LOS C	4.2	29.6	0.82	0.75	32.1
Approach		258	1.4	0.204	31.2	LOS C	5.6	39.2	0.72	0.74	34.8
All Vehicles		3911	5.1	0.854	25.4	LOS B	38.0	280.5	0.74	0.70	41.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site6 - 2031 Upgrade Option C_PM Peak_RevB_Sensitivity Test

Erskine Park Rd / Explorers Way
Signals - Fixed Time Isolated Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
1	L2	107	1.3	0.134	27.0	LOS B	3.6	25.2	0.63	0.74	38.5
2	T1	1406	6.4	0.899	44.8	LOS D	45.0	332.7	0.98	1.02	32.3
Approach		1514	6.1	0.899	43.5	LOS D	45.0	332.7	0.95	1.00	32.8
North: Erskine Park Rd											
8	T1	1579	6.1	0.570	7.1	LOS A	19.6	144.2	0.49	0.45	59.0
9	R2	653	1.5	0.910	58.9	LOS E	24.6	174.2	0.97	0.92	27.0
Approach		2232	4.8	0.910	22.3	LOS B	24.6	174.2	0.63	0.59	42.8
West: Explorers Way											
10	L2	245	1.0	0.197	29.4	LOS C	5.5	38.7	0.69	0.73	35.5
12	R2	13	9.1	0.197	41.1	LOS C	4.0	28.5	0.83	0.75	31.7
Approach		258	1.4	0.197	30.0	LOS C	5.5	38.7	0.70	0.73	35.2
All Vehicles		4004	5.0	0.910	30.8	LOS C	45.0	332.7	0.76	0.75	37.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.

Erskine Park Road/Coonawarra Drive Intersection

MOVEMENT SUMMARY

Site: Site7 - 2014 BC AM Peak_Reported

Erskine Park Rd / Coonawarra Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	47	3.0	0.166	6.4	LOS A	0.0	0.0	0.00	0.10	64.2
11	T1	666	15.6	0.166	0.0	LOS A	0.0	0.0	0.00	0.04	69.2
Approach		714	14.8	0.237	0.4	NA	0.0	0.0	0.00	0.04	68.8
North: Erskine Park Rd											
5	T1	849	14.1	0.238	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
6	R2	118	4.4	0.301	15.5	LOS B	1.1	8.0	0.72	0.92	43.0
Approach		967	12.9	0.301	1.9	NA	1.1	8.0	0.09	0.11	65.0
West: Coonawarra Dr											
7	L2	294	2.2	0.401	9.1	LOS A	2.1	14.9	0.60	0.89	45.6
9	R2	87	1.2	0.627	48.8	LOS D	2.5	17.7	0.96	1.12	31.8
Approach		382	2.0	0.627	18.2	LOS B	2.5	17.7	0.68	0.94	40.8
All Vehicles		2063	11.5	0.627	4.4	NA	2.5	17.7	0.17	0.24	59.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site7 - 2014 BC PM Peak_Reported

Erskine Park Rd / Coonawarra Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	53	0.0	0.190	6.4	LOS A	0.0	0.0	0.00	0.09	65.4
11	T1	797	8.7	0.190	0.0	LOS A	0.0	0.0	0.00	0.04	69.3
Approach		850	8.2	0.271	0.4	NA	0.0	0.0	0.00	0.04	69.0
North: Erskine Park Rd											
5	T1	619	12.6	0.172	0.0	LOS A	0.0	0.0	0.00	0.00	70.0
6	R2	292	1.9	0.896	40.3	LOS C	8.1	57.9	0.96	1.50	31.7
Approach		911	9.2	0.896	12.9	NA	8.1	57.9	0.31	0.48	50.4
West: Coonawarra Dr											
7	L2	234	1.4	0.355	9.6	LOS A	1.7	11.7	0.61	0.88	45.3
9	R2	33	3.2	0.310	44.6	LOS D	1.0	7.0	0.94	1.01	32.8
Approach		267	1.7	0.355	13.9	LOS A	1.7	11.7	0.65	0.89	42.9
All Vehicles		2028	7.8	0.896	7.8	NA	8.1	57.9	0.22	0.35	55.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site7 - 2026 BC AM Peak_Reported

Erskine Park Rd / Coonawarra Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	53	3.0	0.210	6.4	LOS A	0.0	0.0	0.00	0.09	64.3
11	T1	853	15.6	0.210	0.0	LOS A	0.0	0.0	0.00	0.03	69.3
Approach		906	14.9	0.301	0.4	NA	0.0	0.0	0.00	0.04	68.9
North: Erskine Park Rd											
5	T1	1100	14.1	0.308	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
6	R2	133	4.4	0.424	20.3	LOS B	1.6	11.7	0.83	1.00	40.3
Approach		1233	13.1	0.424	2.2	NA	1.6	11.7	0.09	0.11	64.8
West: Coonawarra Dr											
7	L2	331	2.2	0.512	11.4	LOS A	2.9	20.8	0.70	1.00	44.1
9	R2	99	1.2	0.953	130.1	LOS F	5.8	41.3	1.00	1.48	18.6
Approach		430	2.0	0.953	38.7	LOS C	5.8	41.3	0.77	1.11	32.2
All Vehicles		2569	11.9	0.953	7.7	NA	5.8	41.3	0.17	0.25	56.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site7 - 2026 BC PM Peak_Reported

Erskine Park Rd / Coonawarra Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	59	0.0	0.242	6.4	LOS A	0.0	0.0	0.00	0.08	65.5
11	T1	1025	8.7	0.242	0.0	LOS A	0.0	0.0	0.00	0.03	69.3
Approach		1084	8.2	0.345	0.4	NA	0.0	0.0	0.00	0.03	69.1
North: Erskine Park Rd											
5	T1	793	12.6	0.349	2.9	LOS A	2.3	17.9	0.21	0.00	65.5
6	R2	329	1.9	1.339	342.5	LOS F	58.7	417.2	1.00	3.95	7.5
Approach		1122	9.5	1.339	102.5	NA	58.7	417.2	0.44	1.16	20.0
West: Coonawarra Dr											
7	L2	264	1.4	0.469	12.2	LOS A	2.4	16.7	0.74	0.99	43.6
9	R2	37	3.2	0.450	63.6	LOS E	1.4	10.1	0.97	1.03	28.0
Approach		302	1.7	0.469	18.6	LOS B	2.4	16.7	0.76	1.00	40.3
All Vehicles		2508	8.0	1.339	48.2	NA	58.7	417.2	0.29	0.65	31.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site7 - 2031 BC AM Peak_Reported

Erskine Park Rd / Coonawarra Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	55	3.0	0.253	6.4	LOS A	0.0	0.0	0.00	0.08	64.5
11	T1	1034	15.6	0.253	0.0	LOS A	0.0	0.0	0.00	0.03	69.3
Approach		1089	15.0	0.361	0.4	NA	0.0	0.0	0.00	0.03	69.0
North: Erskine Park Rd											
5	T1	1255	14.1	0.351	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
6	R2	138	4.4	0.558	27.2	LOS B	2.2	15.8	0.90	1.06	36.8
Approach		1392	13.2	0.558	2.7	NA	2.2	15.8	0.09	0.10	64.2
West: Coonawarra Dr											
7	L2	343	2.2	0.609	14.0	LOS A	3.6	25.9	0.80	1.11	42.4
9	R2	102	1.2	1.115	231.0	LOS F	11.7	83.1	1.00	1.94	12.3
Approach		445	2.0	1.115	63.8	LOS E	11.7	83.1	0.84	1.30	25.6
All Vehicles		2926	12.1	1.115	11.1	NA	11.7	83.1	0.17	0.26	52.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site7 - 2031 BC PM Peak_Reported

Erskine Park Rd / Coonawarra Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	62	0.0	0.273	6.4	LOS A	0.0	0.0	0.00	0.08	65.6
11	T1	1164	8.7	0.273	0.0	LOS A	0.0	0.0	0.00	0.03	69.3
Approach		1226	8.3	0.391	0.4	NA	0.0	0.0	0.00	0.03	69.1
North: Erskine Park Rd											
5	T1	962	12.6	0.429	2.9	LOS A	2.6	20.1	0.20	0.00	65.5
6	R2	341	1.9	1.416	410.5	LOS F	68.8	489.3	1.00	4.36	6.4
Approach		1303	9.8	1.416	109.6	NA	68.8	489.3	0.41	1.14	19.2
West: Coonawarra Dr											
7	L2	273	1.4	0.496	12.9	LOS A	2.5	17.5	0.77	1.02	43.2
9	R2	38	3.2	0.349	44.6	LOS D	1.1	7.6	0.96	1.02	32.8
Approach		312	1.6	0.496	16.8	LOS B	2.5	17.5	0.80	1.02	41.3
All Vehicles		2840	8.2	1.416	52.2	NA	68.8	489.3	0.27	0.65	30.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site7 - 2026 Upgrade Option A-Seagull AM Peak_Reported

Erskine Park Rd / Coonawarra Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	53	3.0	0.210	6.4	LOS A	0.0	0.0	0.00	0.09	66.3
11	T1	853	15.6	0.210	0.0	LOS A	0.0	0.0	0.00	0.03	69.5
Approach		906	14.9	0.301	0.4	NA	0.0	0.0	0.00	0.04	69.3
North: Erskine Park Rd											
5	T1	1100	14.1	0.308	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
6	R2	133	4.4	0.307	15.6	LOS B	1.2	8.9	0.75	0.94	43.0
Approach		1233	13.1	0.308	1.7	NA	1.2	8.9	0.08	0.10	67.2
West: Coonawarra Dr											
7	L2	331	2.2	0.508	11.5	LOS A	3.2	22.7	0.68	0.99	44.0
9	R2	99	1.2	0.249	13.9	LOS A	1.0	6.9	0.75	0.91	52.6
Approach		430	2.0	0.508	12.1	LOS A	3.2	22.7	0.70	0.98	46.8
All Vehicles		2569	11.9	0.508	3.0	NA	3.2	22.7	0.16	0.22	64.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site7 - 2026 Upgrade Option A-Seagull PM Peak_Reported

Erskine Park Rd / Coonawarra Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	59	0.0	0.242	6.4	LOS A	0.0	0.0	0.00	0.08	67.1
11	T1	1025	8.7	0.242	0.0	LOS A	0.0	0.0	0.00	0.03	69.6
Approach		1084	8.2	0.345	0.4	NA	0.0	0.0	0.00	0.03	69.4
North: Erskine Park Rd											
5	T1	793	12.6	0.220	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
6	R2	329	1.9	0.946	53.5	LOS D	11.8	83.8	0.98	1.74	27.8
Approach		1122	9.5	0.946	15.7	NA	11.8	83.8	0.29	0.51	54.0
West: Coonawarra Dr											
7	L2	264	1.4	0.466	12.4	LOS A	2.6	18.1	0.71	0.99	43.5
9	R2	37	3.2	0.155	19.6	LOS B	0.5	3.7	0.84	0.93	49.9
Approach		302	1.7	0.466	13.3	LOS A	2.6	18.1	0.73	0.98	44.7
All Vehicles		2508	8.0	0.946	8.8	NA	11.8	83.8	0.22	0.36	59.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site7 - 2031 Upgrade Option A-Seagull AM Peak_Reported

Erskine Park Rd / Coonawarra Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	55	3.0	0.253	6.4	LOS A	0.0	0.0	0.00	0.08	66.4
11	T1	1034	15.6	0.253	0.0	LOS A	0.0	0.0	0.00	0.03	69.6
Approach		1089	15.0	0.361	0.4	NA	0.0	0.0	0.00	0.03	69.4
North: Erskine Park Rd											
5	T1	1255	14.1	0.351	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
6	R2	138	4.4	0.435	21.6	LOS B	1.8	13.0	0.85	1.01	39.6
Approach		1392	13.2	0.435	2.2	NA	1.8	13.0	0.08	0.10	66.8
West: Coonawarra Dr											
7	L2	343	2.2	0.638	15.7	LOS B	4.4	31.4	0.80	1.16	41.4
9	R2	102	1.2	0.345	19.4	LOS B	1.4	9.9	0.84	0.99	50.1
Approach		445	2.0	0.638	16.5	LOS B	4.4	31.4	0.81	1.12	44.2
All Vehicles		2926	12.1	0.638	3.6	NA	4.4	31.4	0.16	0.23	64.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site7 - 2031 Upgrade Option A-Seagull PM Peak_Reported

Erskine Park Rd / Coonawarra Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	62	0.0	0.273	6.4	LOS A	0.0	0.0	0.00	0.08	67.1
11	T1	1164	8.7	0.273	0.0	LOS A	0.0	0.0	0.00	0.03	69.6
Approach		1226	8.3	0.391	0.4	NA	0.0	0.0	0.00	0.03	69.4
North: Erskine Park Rd											
5	T1	962	12.6	0.421	1.4	LOS A	2.8	21.9	0.21	0.00	68.6
6	R2	341	1.9	1.261	275.8	LOS F	51.7	367.8	1.00	3.64	9.0
Approach		1303	9.8	1.261	73.2	NA	51.7	367.8	0.42	0.95	32.3
West: Coonawarra Dr											
7	L2	273	1.4	0.561	15.5	LOS B	3.3	23.1	0.80	1.08	41.6
9	R2	38	3.2	0.207	25.5	LOS B	0.7	5.0	0.88	0.96	47.5
Approach		312	1.6	0.561	16.7	LOS B	3.3	23.1	0.81	1.07	42.7
All Vehicles		2840	8.2	1.261	35.6	NA	51.7	367.8	0.28	0.57	44.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site7 - 2031 Upgrade Option A-Seagull PM Peak with reduced RT demand_Reported

Erskine Park Rd / Coonawarra Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	62	0.0	0.273	6.4	LOS A	0.0	0.0	0.00	0.08	67.1
11	T1	1164	8.7	0.273	0.0	LOS A	0.0	0.0	0.00	0.03	69.6
Approach		1226	8.3	0.391	0.4	NA	0.0	0.0	0.00	0.03	69.4
North: Erskine Park Rd											
5	T1	962	12.6	0.267	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
6	R2	243	1.9	0.827	39.2	LOS C	5.8	41.4	0.95	1.33	32.1
Approach		1205	10.4	0.827	7.9	NA	5.8	41.4	0.19	0.27	60.7
West: Coonawarra Dr											
7	L2	273	1.4	0.537	14.8	LOS B	3.2	22.5	0.78	1.06	42.0
9	R2	38	3.2	0.167	20.6	LOS B	0.6	4.0	0.85	0.93	49.5
Approach		312	1.6	0.537	15.5	LOS B	3.2	22.5	0.78	1.05	43.4
All Vehicles		2742	8.5	0.827	5.4	NA	5.8	41.4	0.17	0.25	62.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

Erskine Park Road/Peppertree Drive Intersection

MOVEMENT SUMMARY

Site: Site8 - 2014 BC AM Peak_Reported

Erskine Park Rd / Peppertree Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Erskine Park Rd											
11	T1	570	17.2	0.325	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
12	R2	273	4.2	0.745	27.3	LOS B	5.1	36.9	0.91	1.24	40.3
Approach		843	13.0	0.745	8.9	NA	5.1	36.9	0.30	0.40	56.4
East: Peppertree Dr											
1	L2	310	3.7	0.448	9.7	LOS A	2.3	16.3	0.62	0.92	47.9
3	R2	118	4.5	0.813	66.2	LOS E	4.0	28.8	0.98	1.28	27.4
Approach		428	3.9	0.813	25.3	LOS B	4.0	28.8	0.72	1.02	39.7
North: Erskine Park Rd											
4	L2	80	0.0	0.153	6.4	LOS A	0.0	0.0	0.00	0.18	64.2
5	T1	814	14.2	0.153	0.0	LOS A	0.0	0.0	0.00	0.04	69.2
Approach		894	12.9	0.346	0.6	NA	0.0	0.0	0.00	0.06	68.7
All Vehicles		2165	11.2	0.813	8.7	NA	5.1	36.9	0.26	0.38	55.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site8 - 2014 BC PM Peak_Reported

Erskine Park Rd / Peppertree Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Erskine Park Rd											
11	T1	738	9.0	0.401	0.0	LOS A	0.0	0.0	0.00	0.00	69.8
12	R2	224	2.0	0.397	13.6	LOS A	2.0	14.4	0.69	0.95	47.5
Approach		962	7.3	0.401	3.2	NA	2.0	14.4	0.16	0.22	63.0
East: Peppertree Dr											
1	L2	150	1.4	0.164	6.4	LOS A	0.6	4.1	0.42	0.66	50.6
3	R2	94	2.3	0.487	31.3	LOS C	1.8	13.1	0.93	1.06	37.4
Approach		244	1.7	0.487	16.0	LOS B	1.8	13.1	0.62	0.81	44.6
North: Erskine Park Rd											
4	L2	152	0.7	0.114	6.4	LOS A	0.0	0.0	0.00	0.45	61.0
5	T1	512	15.7	0.114	0.0	LOS A	0.0	0.0	0.00	0.05	69.2
Approach		664	12.3	0.257	1.5	NA	0.0	0.0	0.00	0.14	67.1
All Vehicles		1870	8.4	0.487	4.2	NA	2.0	14.4	0.16	0.27	61.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site8 - 2026 BC AM Peak_Reported

Erskine Park Rd / Peppertree Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
11	T1	754	17.2	0.964	6.8	LOS A	10.0	80.7	1.00	0.00	62.0
12	R2	308	4.2	1.154	188.0	LOS F	34.1	247.4	1.00	2.99	14.5
Approach		1062	13.5	1.154	59.4	NA	34.1	247.4	1.00	0.87	31.8
East: Peppertree Dr											
1	L2	350	3.7	0.588	12.6	LOS A	3.3	23.7	0.76	1.07	46.2
3	R2	133	4.5	1.338	392.6	LOS F	25.9	188.5	1.00	2.85	7.9
Approach		483	3.9	1.338	117.2	LOS F	25.9	188.5	0.83	1.56	19.9
North: Erskine Park Rd											
4	L2	90	0.0	0.196	6.4	LOS A	0.0	0.0	0.00	0.16	64.5
5	T1	1053	14.2	0.196	0.0	LOS A	0.0	0.0	0.00	0.04	69.2
Approach		1144	13.0	0.442	0.6	NA	0.0	0.0	0.00	0.05	68.8
All Vehicles		2688	11.6	1.338	44.7	NA	34.1	247.4	0.54	0.64	36.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site8 - 2026 BC PM Peak_Reported

Erskine Park Rd / Peppertree Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
11	T1	962	9.0	0.522	0.0	LOS A	0.0	0.0	0.00	0.00	69.7
12	R2	253	2.0	0.559	18.4	LOS B	3.1	21.9	0.83	1.07	44.8
Approach		1215	7.5	0.559	3.9	NA	3.1	21.9	0.17	0.22	62.5
East: Peppertree Dr											
1	L2	169	1.4	0.205	7.1	LOS A	0.7	5.1	0.49	0.74	50.1
3	R2	106	2.3	0.856	84.6	LOS F	4.0	28.7	0.99	1.29	24.2
Approach		275	1.7	0.856	36.9	LOS C	4.0	28.7	0.68	0.95	35.5
North: Erskine Park Rd											
4	L2	172	0.7	0.149	6.4	LOS A	0.0	0.0	0.00	0.40	61.6
5	T1	691	15.7	0.149	0.0	LOS A	0.0	0.0	0.00	0.06	69.1
Approach		863	12.7	0.335	1.3	NA	0.0	0.0	0.00	0.12	67.4
All Vehicles		2353	8.7	0.856	6.8	NA	4.0	28.7	0.17	0.27	58.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site8 - 2031 BC AM Peak_Reported

Erskine Park Rd / Peppertree Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
11	T1	932	17.2	1.102	92.0	LOS F	65.1	523.3	1.00	0.00	25.3
12	R2	318	4.2	1.165	195.4	LOS F	36.0	260.8	1.00	3.13	14.1
Approach		1250	13.9	1.165	118.3	NA	65.1	523.3	1.00	0.80	21.1
East: Peppertree Dr											
1	L2	363	3.7	0.622	13.0	LOS A	3.3	24.0	0.79	1.10	46.0
3	R2	137	4.5	1.451	487.6	LOS F	31.3	227.8	1.00	3.15	6.6
Approach		500	3.9	1.451	143.1	LOS F	31.3	227.8	0.85	1.66	17.4
North: Erskine Park Rd											
4	L2	93	0.0	0.222	6.4	LOS A	0.0	0.0	0.00	0.15	64.6
5	T1	1200	14.2	0.222	0.0	LOS A	0.0	0.0	0.00	0.04	69.2
Approach		1293	13.1	0.500	0.5	NA	0.0	0.0	0.00	0.05	68.9
All Vehicles		3044	11.9	1.451	72.3	NA	65.1	523.3	0.55	0.62	28.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site8 - 2031 BC PM Peak_Reported

Erskine Park Rd / Peppertree Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
11	T1	1100	9.0	0.597	0.0	LOS A	0.0	0.0	0.00	0.00	69.7
12	R2	262	2.0	0.720	26.2	LOS B	4.3	31.0	0.92	1.20	40.8
Approach		1361	7.6	0.720	5.1	NA	4.3	31.0	0.18	0.23	61.3
East: Peppertree Dr											
1	L2	175	1.4	0.236	8.0	LOS A	0.8	6.0	0.55	0.79	49.5
3	R2	110	2.3	1.166	263.3	LOS F	14.6	104.0	1.00	2.15	11.1
Approach		285	1.7	1.166	106.4	LOS F	14.6	104.0	0.72	1.32	21.2
North: Erskine Park Rd											
4	L2	178	0.7	0.180	6.4	LOS A	0.0	0.0	0.00	0.34	62.2
5	T1	865	15.7	0.180	0.0	LOS A	0.0	0.0	0.00	0.06	69.0
Approach		1043	13.1	0.405	1.1	NA	0.0	0.0	0.00	0.11	67.7
All Vehicles		2690	9.1	1.166	14.3	NA	14.6	104.0	0.17	0.30	52.7

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site8 - 2026 Upgrade Option A-Seagull AM Peak_Reported

Erskine Park Rd / Peppertree Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
11	T1	754	17.2	0.216	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
12	R2	308	4.2	0.909	43.8	LOS D	8.3	60.5	0.97	1.54	36.8
Approach		1062	13.5	0.909	12.7	NA	8.3	60.5	0.28	0.45	55.4
East: Peppertree Dr											
1	L2	350	3.7	0.671	15.8	LOS B	4.3	31.1	0.82	1.18	47.2
3	R2	133	4.5	0.584	29.3	LOS C	2.5	18.5	0.92	1.11	37.9
Approach		483	3.9	0.671	19.5	LOS B	4.3	31.1	0.85	1.16	44.6
North: Erskine Park Rd											
4	L2	90	0.0	0.321	6.4	LOS A	0.0	0.0	0.00	0.10	65.2
5	T1	1053	14.2	0.321	0.0	LOS A	0.0	0.0	0.00	0.05	69.3
Approach		1144	13.0	0.321	0.5	NA	0.0	0.0	0.00	0.05	69.0
All Vehicles		2688	11.6	0.909	8.7	NA	8.3	60.5	0.26	0.41	57.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site8 - 2026 Upgrade Option A-Seagull PM Peak_Reported

Erskine Park Rd / Peppertree Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
11	T1	962	9.0	0.263	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
12	R2	253	2.0	0.471	15.0	LOS B	2.2	16.0	0.76	0.99	49.0
Approach		1215	7.5	0.471	3.2	NA	2.2	16.0	0.16	0.21	64.2
East: Peppertree Dr											
1	L2	169	1.4	0.223	7.6	LOS A	0.8	5.8	0.52	0.76	52.1
3	R2	106	2.3	0.256	13.2	LOS A	1.0	7.0	0.74	0.91	45.9
Approach		275	1.7	0.256	9.8	LOS A	1.0	7.0	0.61	0.82	49.7
North: Erskine Park Rd											
4	L2	172	0.7	0.243	6.4	LOS A	0.0	0.0	0.00	0.25	63.2
5	T1	691	15.7	0.243	0.0	LOS A	0.0	0.0	0.00	0.09	68.7
Approach		863	12.7	0.243	1.3	NA	0.0	0.0	0.00	0.12	67.7
All Vehicles		2353	8.7	0.471	3.2	NA	2.2	16.0	0.15	0.25	63.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site8 - 2031 Upgrade Option A-Seagull AM Peak_Reported

Erskine Park Rd / Peppertree Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
11	T1	932	17.2	0.418	1.1	LOS A	2.6	21.3	0.22	0.00	68.7
12	R2	318	4.2	1.111	152.1	LOS F	29.2	211.7	1.00	2.72	19.0
Approach		1250	13.9	1.111	39.6	NA	29.2	211.7	0.42	0.69	41.2
East: Peppertree Dr											
1	L2	363	3.7	0.791	21.9	LOS B	6.2	44.7	0.90	1.40	44.3
3	R2	137	4.5	0.740	44.2	LOS D	3.6	26.2	0.96	1.23	32.8
Approach		500	3.9	0.791	28.0	LOS B	6.2	44.7	0.91	1.36	40.8
North: Erskine Park Rd											
4	L2	93	0.0	0.363	6.4	LOS A	0.0	0.0	0.00	0.09	65.3
5	T1	1200	14.2	0.363	0.0	LOS A	0.0	0.0	0.00	0.04	69.3
Approach		1293	13.1	0.363	0.5	NA	0.0	0.0	0.00	0.05	69.1
All Vehicles		3044	11.9	1.111	21.0	NA	29.2	211.7	0.32	0.53	49.7

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site8 - 2031 Upgrade Option A-Seagull PM Peak_Reported

Erskine Park Rd / Peppertree Dr
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
11	T1	1100	9.0	0.300	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
12	R2	262	2.0	0.639	21.4	LOS B	3.5	24.9	0.87	1.11	45.6
Approach		1361	7.6	0.639	4.2	NA	3.5	24.9	0.17	0.21	63.4
East: Peppertree Dr											
1	L2	175	1.4	0.274	9.2	LOS A	1.1	7.6	0.60	0.84	51.1
3	R2	110	2.3	0.356	18.3	LOS B	1.4	10.0	0.83	0.99	43.2
Approach		285	1.7	0.356	12.7	LOS A	1.4	10.0	0.69	0.89	48.0
North: Erskine Park Rd											
4	L2	178	0.7	0.294	6.4	LOS A	0.0	0.0	0.00	0.21	63.6
5	T1	865	15.7	0.294	0.0	LOS A	0.0	0.0	0.00	0.09	68.8
Approach		1043	13.1	0.294	1.1	NA	0.0	0.0	0.00	0.11	68.0
All Vehicles		2690	9.1	0.639	3.9	NA	3.5	24.9	0.16	0.24	63.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

Erskine Park Road/Bennett Road Intersection

MOVEMENT SUMMARY

Site: Site9 - 2014 AM Peak_Reported

Erskine Park Rd / Bennett Rd
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Erskine Park Rd											
10	L2	122	7.6	0.376	6.5	LOS A	0.0	0.0	0.00	0.12	62.4
11	T1	530	19.7	0.376	0.0	LOS A	0.0	0.0	0.00	0.12	68.1
Approach		652	17.4	0.376	1.3	NA	0.0	0.0	0.00	0.12	67.0
North: Erskine Park Rd											
5	T1	847	14.1	0.474	0.0	LOS A	0.0	0.0	0.00	0.00	69.8
6	R2	264	1.5	0.330	11.0	LOS A	1.7	11.8	0.66	0.91	49.0
Approach		1110	11.1	0.474	2.7	NA	1.7	11.8	0.16	0.22	63.4
West: Bennett Rd											
7	L2	320	2.6	0.385	8.9	LOS A	2.0	14.6	0.63	0.90	48.7
9	R2	178	6.8	1.009	102.6	LOS F	9.9	73.1	1.00	1.96	21.4
Approach		498	4.1	1.009	42.4	LOS C	9.9	73.1	0.76	1.28	33.4
All Vehicles		2260	11.4	1.009	11.0	NA	9.9	73.1	0.24	0.42	53.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site9 -2014 PM Peak_Reported

Erskine Park Rd / Bennett Rd
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Erskine Park Rd											
10	L2	264	2.8	0.548	6.4	LOS A	0.0	0.0	0.00	0.16	63.4
11	T1	743	9.1	0.548	0.0	LOS A	0.0	0.0	0.00	0.16	67.5
Approach		1007	7.4	0.548	1.8	NA	0.0	0.0	0.00	0.16	66.4
North: Erskine Park Rd											
5	T1	357	21.6	0.593	4.1	LOS A	4.5	37.0	1.00	0.00	64.1
6	R2	309	2.0	0.953	61.4	LOS E	11.6	82.4	0.99	1.77	29.2
Approach		666	12.5	0.953	30.7	NA	11.6	82.4	0.99	0.82	41.2
West: Bennett Rd											
7	L2	207	1.5	0.531	18.1	LOS B	2.7	19.2	0.84	1.08	43.5
9	R2	48	4.5	0.355	34.6	LOS C	1.1	7.9	0.92	1.01	35.8
Approach		255	2.1	0.531	21.2	LOS B	2.7	19.2	0.86	1.06	41.8
All Vehicles		1928	8.5	0.953	14.3	NA	11.6	82.4	0.46	0.51	51.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site9 - 2026 BC AM Peak_Reported

Erskine Park Rd / Bennett Rd
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	138	7.6	0.495	6.5	LOS A	0.0	0.0	0.00	0.10	62.5
11	T1	721	19.7	0.495	0.0	LOS A	0.0	0.0	0.00	0.10	68.3
Approach		859	17.7	0.495	1.1	NA	0.0	0.0	0.00	0.10	67.3
North: Erskine Park Rd											
5	T1	1081	14.1	0.605	0.0	LOS A	0.0	0.0	0.00	0.00	69.6
6	R2	297	1.5	0.454	13.6	LOS A	2.4	16.7	0.78	1.01	47.3
Approach		1378	11.4	0.605	3.0	NA	2.4	16.7	0.17	0.22	63.2
West: Bennett Rd											
7	L2	361	2.6	0.505	11.2	LOS A	2.8	20.3	0.74	1.02	47.2
9	R2	201	6.8	1.217	251.9	LOS F	27.4	203.0	1.00	3.29	11.4
Approach		562	4.1	1.217	97.2	LOS F	27.4	203.0	0.84	1.83	22.3
All Vehicles		2799	11.9	1.217	21.3	NA	27.4	203.0	0.25	0.51	46.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement

MOVEMENT SUMMARY

Site: Site9 -2026 BC PM Peak_Reported

Erskine Park Rd / Bennett Rd
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	298	2.8	0.689	6.4	LOS A	0.0	0.0	0.00	0.15	63.5
11	T1	967	9.1	0.689	0.0	LOS A	0.0	0.0	0.00	0.15	67.5
Approach		1265	7.6	0.689	1.7	NA	0.0	0.0	0.00	0.15	66.5
North: Erskine Park Rd											
5	T1	539	21.6	1.063	56.3	LOS D	27.5	228.1	1.00	0.00	33.6
6	R2	348	2.0	1.513	500.8	LOS F	80.2	570.9	1.00	4.76	6.5
Approach		887	13.9	1.513	230.8	NA	80.2	570.9	1.00	1.87	12.7
West: Bennett Rd											
7	L2	234	1.5	0.758	29.9	LOS C	4.4	31.4	0.94	1.30	38.2
9	R2	55	4.5	0.504	47.7	LOS D	1.5	11.0	0.96	1.05	31.7
Approach		288	2.1	0.758	33.2	LOS C	4.4	31.4	0.95	1.25	36.8
All Vehicles		2440	9.2	1.513	88.6	NA	80.2	570.9	0.48	0.90	25.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site9 - 2031 BC AM Peak_Reported

Erskine Park Rd / Bennett Rd
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	143	7.6	0.605	6.4	LOS A	0.0	0.0	0.00	0.09	62.6
11	T1	906	19.7	0.605	0.0	LOS A	0.0	0.0	0.00	0.09	68.4
Approach		1049	18.0	0.605	1.0	NA	0.0	0.0	0.00	0.09	67.5
North: Erskine Park Rd											
5	T1	1225	14.1	0.686	0.0	LOS A	0.0	0.0	0.00	0.00	69.5
6	R2	308	1.5	0.615	18.5	LOS B	3.3	23.1	0.89	1.11	44.5
Approach		1533	11.6	0.686	3.9	NA	3.3	23.1	0.18	0.22	62.4
West: Bennett Rd											
7	L2	374	2.6	0.640	14.8	LOS B	3.7	26.7	0.86	1.16	45.1
9	R2	208	6.8	1.331	349.3	LOS F	36.9	273.5	1.00	3.90	8.7
Approach		583	4.1	1.331	134.3	LOS F	36.9	273.5	0.91	2.14	18.1
All Vehicles		3165	12.3	1.331	26.8	NA	36.9	273.5	0.25	0.53	43.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site9 -2031 BC PM Peak_Reported

Erskine Park Rd / Bennett Rd
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	308	2.8	0.769	6.3	LOS A	0.0	0.0	0.00	0.14	63.4
11	T1	1105	9.1	0.769	0.0	LOS A	0.0	0.0	0.00	0.14	67.4
Approach		1413	7.7	0.769	1.7	NA	0.0	0.0	0.00	0.14	66.5
North: Erskine Park Rd											
5	T1	715	21.6	1.325	292.8	LOS F	119.4	990.9	1.00	0.00	10.6
6	R2	361	2.0	1.706	672.6	LOS F	99.3	707.3	1.00	5.31	5.0
Approach		1075	15.0	1.706	420.2	NA	119.4	990.9	1.00	1.78	7.7
West: Bennett Rd											
7	L2	242	1.5	0.929	58.4	LOS E	8.0	56.5	0.99	1.73	29.4
9	R2	57	4.5	0.612	61.7	LOS E	1.8	13.3	0.98	1.07	28.3
Approach		299	2.1	0.929	59.0	LOS E	8.0	56.5	0.98	1.60	29.2
All Vehicles		2787	9.9	1.706	169.1	NA	119.4	990.9	0.49	0.93	16.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site9 - 2026 Option B AM Peak - RevB_Reported

Erskine Park Rd / Bennett Rd
Signals - Fixed Time Isolated Cycle Time = 45 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	138	7.6	0.294	21.3	LOS B	2.5	18.8	0.84	0.77	43.2
11	T1	721	19.7	0.782	20.7	LOS B	8.7	70.8	0.98	0.95	50.1
Approach		859	17.7	0.782	20.8	LOS B	8.7	70.8	0.96	0.92	48.9
North: Erskine Park Rd											
5	T1	1081	14.1	0.504	5.7	LOS A	6.9	54.4	0.61	0.54	63.1
6	R2	297	1.5	0.809	30.0	LOS C	7.5	53.0	1.00	0.96	39.2
Approach		1378	11.4	0.809	10.9	LOS A	7.5	54.4	0.70	0.63	55.8
West: Bennett Rd											
7	L2	361	2.6	0.425	13.4	LOS A	5.4	38.7	0.71	0.76	45.9
9	R2	201	6.8	0.851	32.1	LOS C	5.4	39.8	1.00	1.07	36.7
Approach		562	4.1	0.851	20.1	LOS B	5.4	39.8	0.81	0.87	42.1
All Vehicles		2799	11.9	0.851	15.8	LOS B	8.7	70.8	0.80	0.77	50.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site9 - 2026 Option B PM Peak - RevB_Reported

Erskine Park Rd / Bennett Rd
Signals - Fixed Time Isolated Cycle Time = 66 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	298	2.8	0.490	25.7	LOS B	7.8	55.9	0.85	0.81	41.1
11	T1	967	9.1	0.788	25.3	LOS B	15.8	119.0	0.97	0.92	47.1
Approach		1265	7.6	0.788	25.4	LOS B	15.8	119.0	0.94	0.90	45.5
North: Erskine Park Rd											
5	T1	539	21.6	0.236	4.7	LOS A	3.4	28.4	0.42	0.36	64.2
6	R2	348	2.0	0.784	35.8	LOS C	11.8	84.0	0.99	0.91	36.9
Approach		887	13.9	0.784	16.9	LOS B	11.8	84.0	0.65	0.58	49.7
West: Bennett Rd											
7	L2	234	1.5	0.262	15.4	LOS B	4.5	31.6	0.63	0.72	45.0
9	R2	55	4.5	0.200	32.2	LOS C	1.6	11.7	0.91	0.73	37.0
Approach		288	2.1	0.262	18.6	LOS B	4.5	31.6	0.68	0.73	43.2
All Vehicles		2440	9.2	0.788	21.5	LOS B	15.8	119.0	0.80	0.76	46.7

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site9 - 2031 Option B AM Peak _RevB_Reported

Erskine Park Rd / Bennett Rd
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	143	7.6	0.244	22.4	LOS B	3.1	23.2	0.76	0.76	42.6
11	T1	906	19.7	0.786	23.7	LOS B	13.7	111.9	0.96	0.93	48.1
Approach		1049	18.0	0.786	23.5	LOS B	13.7	111.9	0.94	0.91	47.3
North: Erskine Park Rd											
5	T1	1225	14.1	0.527	6.0	LOS A	9.6	75.3	0.57	0.51	62.7
6	R2	308	1.5	0.774	34.2	LOS C	9.6	68.1	1.00	0.91	37.5
Approach		1533	11.6	0.774	11.7	LOS A	9.6	75.3	0.66	0.59	55.2
West: Bennett Rd											
7	L2	374	2.6	0.440	16.3	LOS B	7.5	53.4	0.72	0.77	44.3
9	R2	208	6.8	0.783	35.9	LOS C	6.7	49.9	1.00	0.95	35.4
Approach		583	4.1	0.783	23.3	LOS B	7.5	53.4	0.82	0.83	40.6
All Vehicles		3165	12.3	0.786	17.8	LOS B	13.7	111.9	0.78	0.74	49.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site9 - 2031 Option B PM Peak _RevB_Reported

Erskine Park Rd / Bennett Rd
Signals - Fixed Time Isolated Cycle Time = 72 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	308	2.8	0.469	25.7	LOS B	8.4	60.5	0.82	0.81	41.1
11	T1	1105	9.1	0.831	28.7	LOS C	20.5	154.9	0.98	0.97	45.1
Approach		1413	7.7	0.831	28.0	LOS B	20.5	154.9	0.94	0.94	44.2
North: Erskine Park Rd											
5	T1	715	21.6	0.307	5.0	LOS A	5.0	41.9	0.43	0.38	63.9
6	R2	361	2.0	0.834	41.4	LOS C	14.0	99.9	1.00	0.95	34.9
Approach		1075	15.0	0.834	17.2	LOS B	14.0	99.9	0.62	0.57	50.0
West: Bennett Rd											
7	L2	242	1.5	0.279	17.0	LOS B	5.2	36.7	0.65	0.73	44.1
9	R2	57	4.5	0.206	34.5	LOS C	1.8	13.2	0.91	0.74	36.1
Approach		299	2.1	0.279	20.3	LOS B	5.2	36.7	0.70	0.73	42.3
All Vehicles		2787	9.9	0.834	23.0	LOS B	20.5	154.9	0.79	0.77	46.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site9 - 2031 Option 1 AM Peak - Conversion_RevB - Sensitivity Test

Erskine Park Rd / Bennett Rd
Signals - Fixed Time Isolated Cycle Time = 57 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	143	7.6	0.257	22.5	LOS B	3.0	22.7	0.78	0.77	42.6
11	T1	906	19.7	0.830	26.0	LOS B	14.1	115.4	0.99	1.00	46.7
Approach		1049	18.0	0.830	25.6	LOS B	14.1	115.4	0.96	0.97	46.1
North: Erskine Park Rd											
5	T1	1225	14.1	0.558	7.0	LOS A	10.1	79.2	0.63	0.56	61.7
6	R2	308	1.5	0.869	39.3	LOS C	10.3	73.3	1.00	1.01	35.6
Approach		1533	11.6	0.869	13.5	LOS A	10.3	79.2	0.71	0.65	53.8
West: Bennett Rd											
7	L2	374	2.6	0.434	15.4	LOS B	7.0	50.1	0.71	0.76	44.8
9	R2	268	6.8	0.863	37.8	LOS C	9.0	66.4	1.00	1.06	34.8
Approach		643	4.4	0.863	24.8	LOS B	9.0	66.4	0.83	0.89	40.0
All Vehicles		3225	12.2	0.869	19.7	LOS B	14.1	115.4	0.81	0.80	47.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: Site9 - 2031 Option 1 PM Peak - Conversion_RevB - Sensitivity Test

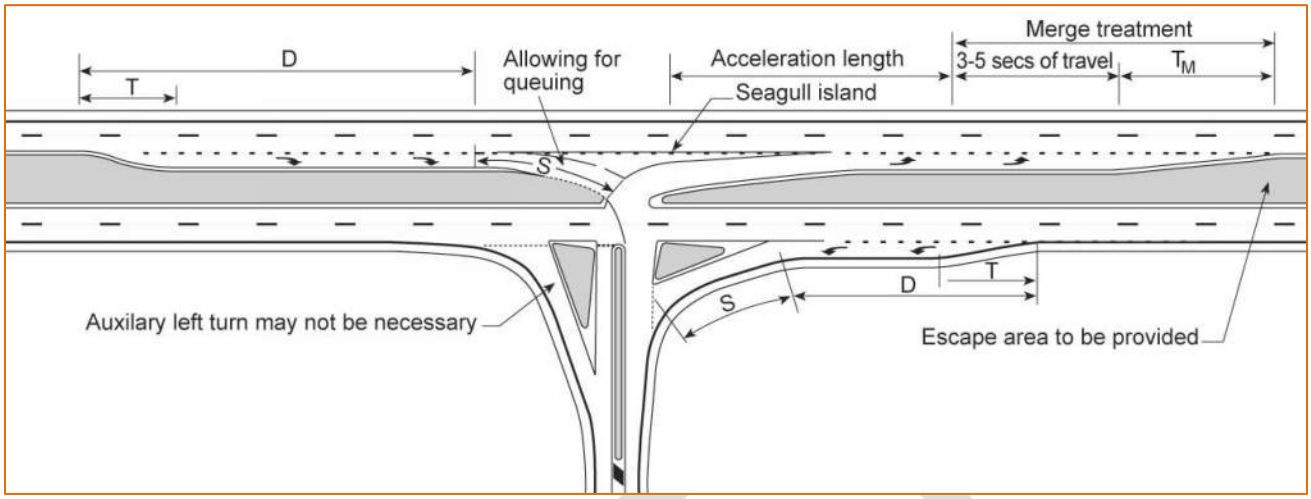
Erskine Park Rd / Bennett Rd
Signals - Fixed Time Isolated Cycle Time = 97 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Erskine Park Rd											
10	L2	308	2.8	0.456	31.3	LOS C	11.1	79.3	0.81	0.81	38.7
11	T1	1105	9.1	0.810	33.4	LOS C	25.4	191.9	0.96	0.92	42.7
Approach		1413	7.7	0.810	32.9	LOS C	25.4	191.9	0.93	0.89	41.7
North: Erskine Park Rd											
5	T1	715	21.6	0.286	4.7	LOS A	5.6	46.8	0.36	0.32	64.2
6	R2	455	2.0	0.831	46.6	LOS D	22.4	159.6	1.00	0.93	33.3
Approach		1170	14.0	0.831	21.0	LOS B	22.4	159.6	0.61	0.56	47.1
West: Bennett Rd											
7	L2	242	1.5	0.261	19.1	LOS B	6.5	45.8	0.61	0.72	43.0
9	R2	57	4.5	0.218	45.2	LOS D	2.4	17.7	0.92	0.74	32.7
Approach		299	2.1	0.261	24.1	LOS B	6.5	45.8	0.67	0.73	40.6
All Vehicles		2881	9.7	0.831	27.2	LOS B	25.4	191.9	0.77	0.74	43.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.

Appendix B “Seagull” Layout



Our Reference: 3001448

Contact for further information:

Transport Planning
SMEC Australia Pty Ltd
(02) 9925 5508

Appendix E

Aboriginal heritage

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : Erskine Park Road 3

Client Service ID : 186202

Elissa Mcfarlane

23 Karranga Ave
Killara New South Wales 2076

Attention: Elissa Mcfarlane

Email: elissamcfarlane@gmail.com

Date: 18 August 2015

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -33.8064, 150.79 - Lat, Long To : -33.7952, 150.8079 with a Buffer of 0 meters, conducted by Elissa Mcfarlane on 18 August 2015.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

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