

New M5

Environmental Impact Statement

Technical working paper: Landscape character and visual impact

Appendix K



November 2015

WestConnex New M5

Client: Roads and Maritime Services

ABN: 76 236 371 088

Prepared by

AECOM Australia Pty Ltd

Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia

T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com

ABN 20 093 846 925

20-Nov-2015

Job No.: 60327128

AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

AECOM has prepared this document for the sole use of the Client and for a specific purpose, each as expressly stated in the document. No other party should rely on this document without the prior written consent of AECOM. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on the Client's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified. Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

Quality Information

Document	WestConnex New M5
Ref	60327128
Date	20-Nov-2015
Prepared by	Gabi Park, Adam Jeffery
Reviewed by	Mark Blanche
Authorised by	Caitlin Bennett

Table of Contents

1.0	Introduction	1
1.1	Overview of WestConnex	1
1.2	Overview of the project	2
1.3	Project location	4
1.4	Secretary's Environmental Assessment Requirements	4
1.5	Study area	5
2.0	Urban and Landscape Design	7
2.1	Western surface works and the Kingsgrove motorway operations complex	8
2.2	Bexley Road South motorway operations complex	12
2.3	Arncliffe motorway operations complex	12
2.4	St Peters interchange and surrounds	16
3.0	Methodology	23
3.1	Project description	23
3.2	Analysis of existing environment	23
3.2.1	Definition of Landscape Character Zones	24
3.3	Assessment of landscape character and visual impact	25
3.3.1	Sensitivity and magnitude	25
3.3.2	Visual envelope mapping	26
3.3.3	Photos and panoramas	26
3.3.4	Assessment of night lighting impacts	26
4.0	Existing environment	29
4.1	Introduction	29
4.2	Western surface works	32
4.2.1	Topography and visibility	32
4.2.2	Context	34
4.2.3	Heritage sites	43
4.2.4	Landscape Character Zones	44
4.3	Bexley Road surface works	52
4.3.1	Topography and visibility	52
4.3.2	Context	56
4.3.3	Heritage sites	63
4.3.4	Landscape Character Zones	63
4.4	Arncliffe surface works	69
4.4.1	Topography and visibility	69
4.4.2	Context	74
4.4.3	Heritage sites	77
4.4.4	Landscape Character Zones	77
4.5	St Peters interchange and surrounds	80
4.5.1	Topography and visibility	82
4.5.2	Context	82
4.5.3	Heritage sites	88
4.5.4	Landscape Character Zones	90
5.0	Policy and Planning Setting	99
5.1	Urban design, landscape character and visual amenity	99
6.0	Assessment of potential impacts	103
6.1	Construction visual impacts	103
6.1.1	Kingsgrove North construction compound (C1)	106
6.1.2	Kingsgrove South construction compound (C2) and Commercial Road construction compound (C3)	123
6.1.3	Bexley Road North construction compound (C4)	132
6.1.4	Bexley Road South construction compound (C5)	147
6.1.5	Bexley Road East construction compound (C6)	155
6.1.6	Pedestrian and Cyclist Routes – Beverly Hills, Kingsgrove, Bexley	165
6.1.7	Arncliffe construction compound (C7)	171
6.1.8	Canal Road construction compound (C8)	183

6.1.9	Campbell Road construction compound (C9)	198
6.1.10	Landfill Closure construction compound (C10)	207
6.1.11	Burrows Road construction compound (C11)	208
6.1.12	Campbell Road bridge construction compound (C12)	213
6.1.13	Gardeners Road bridge construction compound (C13)	216
6.1.14	Sydney Park construction compound (C14)	219
6.1.15	Western surface works – Construction activity within the roadway	227
6.2	Operation landscape character impacts	237
6.2.1	Western surface works	237
6.2.2	Bexley Road South motorway operations complex	242
6.2.3	Arncliffe motorway operations complex	245
6.2.4	St Peters Interchange and surrounds	249
6.3	Future character / context assessment	255
6.3.1	Western surface works	255
6.3.2	Bexley Road South motorway operations complex	255
6.3.3	Arncliffe motorway operations complex	260
6.3.4	St Peters Interchange	262
6.4	Operational visual impacts	264
6.4.1	Western surface works	264
6.4.2	Bexley Road South motorway operations complex	282
6.4.3	Arncliffe motorway operations complex	292
6.4.4	St Peters Interchange	313
6.4.5	Local road upgrades	349
6.4.6	Tolling gantries within the M5 East Motorway corridor	378
7.0	Mitigation and management measures	379
7.1	Construction	379
7.2	Operation	380
Appendix A		
	Visual impact summaries	A

List of Figures

Figure 1-1	The project	3
Figure 2-1	Photomontage of western portal with the Kingsgrove motorway operations complex	8
Figure 2-2	Concept design and planting plan for the western portion of the western surface works.	9
Figure 2-3	Concept design and planting plan for the eastern portion of the Kingsgrove motorway operations complex.	11
Figure 2-4	Concept design and planting plan for the Bexley Road South motorway operations complex	13
Figure 2-5	Concept design and planting plan for motorway operations complex at Arncliffe (MOC3).	15
Figure 2-6	St Peters interchange layout	17
Figure 2-7	Artist's impression of St Peters interchange , view towards the New M5 portals and the St Peters motorway operations complex	19
Figure 2-8	Photomontage of local road upgrades and Campbell Road bridge crossing at St Peters, at ultimate completion (including the future M4-M5 Link)	21
Figure 4-1	The project	31
Figure 4-2	Western surface works and LVIA study area boundary, showing key heritage sites and Landscape Character Zones.	33
Figure 4-3	Western surface works, LVIA study area boundary and topography of the surrounding environment	35
Figure 4-4	A large vegetated mound separates Beverly Grove Park North and residential development from the M5 East Motorway.	37
Figure 4-5	Noise mound compartmentalising the M5 East Motorway (left of frame) from Beverly Grove Park South and the surrounding area, flanked by the M5 Linear Park pedestrian and cycle path, Wolli Creek channel and industrial development beyond (right of frame).	37

Figure 4-6	View south from Beverly Grove Park South, showing glimpse views through industrial complexes to residential development and ridge line beyond.	38
Figure 4-7	View south along Armitree Street towards the western surface works at the end of the street, showing the gentle rise from the valley floor to the ridge, and the screening nature of mature street trees and landscape vegetation.	38
Figure 4-8	View south from Beverly Grove Park South to industrial development beyond, east of the Kindilan Underpass. Note how the industrial buildings screen the elevated Beverly Grove Park South from the surrounding landscape.	39
Figure 4-9	Western surface works with surrounding land zoning	41
Figure 4-10	Typical streetscape of low density housing, Pallamana Parade Urban Conservation Area, Beverly Hills	42
Figure 4-11	Mature street trees provide a softening of developed areas, including light industrial areas	42
Figure 4-12	Landscaping including mature trees provide a pleasant environment for the M5 Linear Park pedestrian and cycle path (photo taken from Tallawalla Reserve)	43
Figure 4-13	The topography of the Residential LCZ ranges from flat to gently sloping towards the western surface works	45
Figure 4-14	Residential boundary abutting LCZ 4: Infrastructure (the M5 East Motorway noise barriers) with the M5 Linear Park pedestrian and cycle path in between (the narrowest distance between LCZ1 and LCZ 4)	45
Figure 4-15	LCZ1: Residential boundary (left of frame) meeting LCZ 3: Recreational, with LCZ 4: Transport Corridor to right of frame (top of vegetated noise mound)	46
Figure 4-16	Mature street trees and some landscaping buffer industrial buildings along Garema Circuit.	47
Figure 4-17	Large scale industrial complexes on the southern edge of Wolli Creek channel to the south of the M5 East Motorway	47
Figure 4-18	Large scale industrial complexes on the southern edge of Wolli Creek channel to the south of the M5 East Motorway	48
Figure 4-19	Eastern end of Tallawalla Reserve, with informal netball facilities and Wolli Creek in the background, screened by trees	49
Figure 4-20	Beverly Grove Park South, with the M5 East Motorway screened by the noise mound to right of frame, and Wolli Creek to the south, screened by trees to the left of frame	49
Figure 4-21	Beverly Grove Park North, bounded to the north by residential neighbours (right of frame) and to the south by the M5 East Motorway (noise mound to the left of frame)	50
Figure 4-22	Residential neighbouring properties backing onto Beverly Grove Park North	50
Figure 4-23	Bexley Road surface works site area and LVIA study area boundary, showing key heritage sites and Landscape Character Zones	53
Figure 4-24	Bexley Road surface works site area: Bexley north (Bexley Road North construction compound), with the entry to the M5 Linear Park to the left of frame and Bexley Road to right of frame	54
Figure 4-25	View east from the M5 Linear Park pedestrian and cycle path to the site of Bexley Road surface works site: Bexley south (Bexley Road South construction compound and site of permanent MOC2), with the entry to the M5 Linear Park to the left of frame and Wolli Creek (fringed with trees) to right of frame	54
Figure 4-26	View east from the exit of the pedestrian overpass to the Bexley East site area (Bexley Road East construction compound), which lies beyond the sandstone wall	55
Figure 4-27	Bexley Road surface works, LVIA study area boundary and topography of the surrounding environment	57
Figure 4-28	Noise and screening walls associated with the M5 East Motorway	58
Figure 4-29	Mature vegetation associated with Wolli Creek riparian corridor and Kingsgrove Avenue Reserve as seen from Bexley Road	58
Figure 4-30	Noise mound between the M5 East Motorway and Wolli Creek with Kingsgrove Avenue Reserve to right of frame	59
Figure 4-31	Bexley Road surface works area with surrounding land zoning	61
Figure 4-32	Typical low density housing along the eastern boundary of the Bexley East construction compound site.	62
Figure 4-33	View to the Bexley East construction compound site from the intersection of Bexley Road and Kingsgrove Avenue	62

Figure 4-34	Typical low density housing on Kingsgrove Avenue near Bexley Road	64
Figure 4-35	Typical two storey brick residences on Bexley Road near the M5 East Motorway	65
Figure 4-36	View of Kingsgrove Avenue Reserve from the southern side of Kingsgrove Avenue	65
Figure 4-37	Entry to the M5 Linear Park (south of the M5 East Motorway) with riparian vegetation of Wolli Creek in the background	66
Figure 4-38	Bardwell Valley Park seen in the background beyond Bexley Road	66
Figure 4-39	Sloping recreational land south of Wolli Creek, with Kingsgrove Avenue to the right of frame	67
Figure 4-40	View west towards the entry / exit to the M5 East Motorway from Bexley Road. Views to and from the M5 East Motorway are screened by noise walls, noise mounds and screening vegetation	68
Figure 4-41	Views into and out of the rail corridor between stations are limited by noise walls and screening vegetation (to right of frame)	68
Figure 4-42	Bexley Road is integrated into the surrounding landscape by land use and urban design.	69
Figure 4-43	Arncliffe surface works site and LVIA study area boundary, showing key heritage sites and Landscape Character Zones	71
Figure 4-44	Arncliffe surface works area, LVIA study area boundary and topography of the surrounding environment	73
Figure 4-45	View eastwards over the Kogarah Golf Course from the foot path on Marsh Street where the street rises to pass over the M5 East Motorway	74
Figure 4-46	Arncliffe surface works site with surrounding land zoning	75
Figure 4-47	View from the Eve Street cycleway showing the relationship of the M5 East Motorway (to right of frame, screened by vegetation), the Western Outfall Main Sewer, the cycle path, and the Kogarah Golf Course (beyond the fence to the left of frame).	76
Figure 4-48	View looking east along Marsh Street from the north-western corner of Kogarah Golf Course, showing high rise development within LCZ 1a: High Density Residential	78
Figure 4-49	Typical housing and local park within the Low Density Residential LCZ	78
Figure 4-50	View looking west along Marsh Street, showing fencing of residential properties to the right of frame and the screening vegetation associated with Kogarah Golf Course to the left of frame	80
Figure 4-51	St Peters interchange and local road upgrade site area and LVIA study area boundary, showing key heritage sites and Landscape Character Zones.	81
Figure 4-52	St Peters interchange and local road upgrade site area, LVIA study area boundary and topography of the surrounding environment.	83
Figure 4-53	St Peters Anglican Church is situated on a localised mound north of the Princes Highway	84
Figure 4-54	The view from the driveway of St Peters Anglican Church, looking east across the Princes Highway and commercial buildings, to glimpse views across the landfill site beyond.	84
Figure 4-55	Typical view of industrial complexes flanking the Alexandra Canal (view taken from Rickettys Bridge looking north)	85
Figure 4-56	Fringing vegetation within Sydney Park and residential housing fronting Campbell Road screen views to the surrounding area from within the park	85
Figure 4-57	St Peters interchange site with surrounding land zoning	87
Figure 4-58	View west along Campbell Street, showing existing terrace housing and industrial buildings.	88
Figure 4-59	Southern Cross Hotel, situated at the intersection of Princes Highway and Canal Road	89
Figure 4-60	Service garage opposite the Southern Cross Hotel on the Princes Highway	89
Figure 4-61	Heritage listed row of terraces on Campbell Road, opposite the St Peters interchange site	90
Figure 4-62	Typical street within the Residential LCZ, Brown Street, St Peters.	91
Figure 4-63	The boundary of the brickpit / landfill site on Princes Highway, east of the Canal Road intersection	92
Figure 4-64	Glimpse views can be seen between industrial buildings to the Alexandra Canal	92
Figure 4-65	The view south along Burrows Road, showing low rise, large industrial buildings and mature street trees	93
Figure 4-66	Sydney Park, as seen from the corner of Euston Road and Campbell Road, showing mature fringing vegetation and street trees	94

Figure 4-67	Sydney Park, showing wetlands and a bioretention system nestled between man made landforms	95
Figure 4-68	Simpson Park viewed from Campbell Street. Large fig trees line the park, providing a visual frame to the flat, turfed area inside	95
Figure 4-69	View south along the Princes Highway towards the intersection with Canal Road, showing industrial and commercial buildings flanking the road	96
Figure 4-70	View southeast along Canal Road from the Princes Highway, showing industrial development flanking the road, and mature street trees	96
Figure 4-71	View looking south-west along Princes Highway, showing the commercial complexes along the southern side of the highway (to left of frame) and the St Peters Anglican Church grounds to right of frame	97
Figure 5-1	Regional zoning context of the project	101
Figure 6-1	Overview of all construction compound locations	105
Figure 6-2	The Kingsgrove North and Kingsgrove South construction compounds and Receiver Locations	109
Figure 6-3	Entry point of Kingsgrove North construction compound on Garema Circuit (south)	117
Figure 6-4	View from the end of Glamis Street to the site of Kingsgrove North construction compound, with the M5 East Motorway beyond the vegetated mound in the background. Note the adjacent residence with windows looking towards the Construction Compound site.	117
Figure 6-5	View south from the street adjacent to the driveway of 101 Armitree Street, towards the site of Kingsgrove North construction compound.	118
Figure 6-6	View west (left of frame) to east (centre-right of frame) along the pedestrian path, towards the site of proposed Kingsgrove North construction compound, with Kindilan Underpass to the south (right of frame).	118
Figure 6-7	View south along Glamis Street looking down the hill to the site of Kingsgrove North construction compound, which would substantially comprise a small element framed by trees at the end of the street.	119
Figure 6-8	Commercial Road construction compound (C3) and Receiver Locations	125
Figure 6-9	View north-west from Commercial Road to the entry of Commercial Road construction compound (centre left of frame).	130
Figure 6-10	View between large scale industrial complexes fronting Vanessa Street, with the rail line in the middle ground and residential areas beyond	131
Figure 6-11	View of large scale industrial complexes fronting Vanessa Street, from the M5 Linear Park (Kingsgrove South construction compound site) with Wolli Creek in the middle ground lined with trees	131
Figure 6-12	Bexley Road North construction compound and Receiver Locations	135
Figure 6-13	The entry / exit ramps to the M5 East Motorway from Bexley Road. Note the noise walls and vegetation that screen views from the M5 to the surrounding landscape.	141
Figure 6-14	The M5 East Motorway noise walls, with the entry to the M5 Linear Park and the Bexley Road North construction compound to right of frame	141
Figure 6-15	The view south along Bexley Road from just north of Poole Street, towards the Bexley Road North construction compound	142
Figure 6-16	The entry to the M5 Linear Park, positioned between noise walls and infrastructure associated with the M5 East Motorway, and the Bexley Road North construction compound to right of frame	142
Figure 6-17	The entry / exit ramps to the M5 East Motorway from Bexley Road. Note the noise walls and vegetation that screen views from the M5 to the surrounding landscape.	143
Figure 6-18	Residents backing onto the Bexley Road North construction compound site. Mature trees and large shrubs lie along the boundary of many of these properties.	143
Figure 6-19	Bexley Road South construction compound and Receiver Locations	149
Figure 6-20	Bexley Road East construction compound and Receiver Locations	157
Figure 6-21	The view from Bexley Road south of the pedestrian overpass where the pedestrian path that joins Johnston Street to Bexley Road exits, looking back towards the entry of the M5 Linear Park, past the Bexley Road East construction compound situated behind the sandstone wall to the right of frame.	158

Figure 6-22	View west from the reserve adjacent to 9 Johnston Street. Homes on the western side of Johnston Street sit at the top of a hill, with potential views through existing mature trees over the Bexley Road East construction compound and out to the landscape beyond	162
Figure 6-23	View east from the pedestrian exit to the Bexley Road overpass back to the Bexley Road East construction compound. Note the house seen above the stone wall to the right of frame, which is representative of homes on Johnston Street that overlook the compound site	162
Figure 6-24	Arncliffe construction compound showing Receiver Locations	173
Figure 6-25	The view south-west along the Eve Street Cycleway showing the M5 East Motorway (right of frame), screening vegetation, the Western Outfall Main Sewer and the Kogarah Golf course to left of frame	178
Figure 6-26	The view looking north-east along Marsh Street, showing examples of housing with screening vegetation and fencing fronting Marsh Street	178
Figure 6-27	The view looking north-east over Kogarah Golf Course from the Eve Street Cycleway (seen to right of frame)	179
Figure 6-28	The Canal Road construction compound with Receiver Locations.	185
Figure 6-29	The Southern Cross Hotel on the corner of the Princes Highway and Canal Road	186
Figure 6-30	The view from within the St Peters Anglican Church grounds towards the Princes Highway and commercial complexes (including food outlets and hotel accommodation) on the Princes Highway	186
Figure 6-31	View looking south-west along Princes Highway, showing industrial buildings on the northern side of the highway. The Southern Cross Hotel and Dynamo building can be seen in the background to the left of frame	187
Figure 6-32	The heritage listed St Peters Anglican Church, which sits on a localised hill on the northern side of the Princes Highway, but set back from the highway amongst a park setting of turf and trees.	187
Figure 6-33	The Veranda Bar, situated at the rear of the Southern Cross Hotel. Note the high balcony railing and potted plants that screen views from the bar to the landscape	193
Figure 6-34	View south along Canal Road from the outside the Southern Cross Hotel. Note the existing street trees along the road, which would assist in screening any changes to the view during construction	193
Figure 6-35	The view south towards the St Peters interchange site from the Macdonalds car park, fronting Princes Highway. Glimpse views of the site can be seen above existing fencing and between commercial buildings.	195
Figure 6-36	View to the fencing and advertising billboards that border the site, as seen from industrial buildings on the Princes Highway	196
Figure 6-37	The view looking south from the St Peters Anglican Church grounds	196
Figure 6-38	Campbell Road and Landfill Closure construction compounds and Receiver Locations.	201
Figure 6-39	Residential neighbours on Campbell Road, opposite the Campbell Road construction compound	205
Figure 6-40	View looking west along Campbell Road to industrial and residential development on the southern side of the street, showing mature street trees and established gardens in front of the residential properties	205
Figure 6-41	Site layout of Burrows Road construction compound, Campbell Road bridge construction compound and Gardeners Road bridge construction compound and Receiver Locations	209
Figure 6-42	The view to the Campbell Road bridge construction compound from Burrows Road, with the Alexandra Canal in the background	215
Figure 6-43	Site layout of Sydney Park construction compound and Receiver Locations	221
Figure 6-44	Receiver Locations for Stage 1 of the western surface works – Construction activity within the roadway	229
Figure 6-45	Receiver Locations for Stage 2 of the western surface works – Construction activity within the roadway	231
Figure 6-46	Receiver Locations for Stage 3 of the western surface works – Construction activity within the roadway	233
Figure 6-47	Western surface works site boundary overlaid over a LEP map	257
Figure 6-48	Bexley Road South motorway operations complex boundary overlaid over a LEP map	259
Figure 6-49	Arncliffe motorway operations complex boundary overlaid over a LEP map	261
Figure 6-50	St Peters Interchange boundary and upgrades to local roads overlaid over a LEP map	263

Figure 6-51	Visual envelope map for Western Surface Works	265
Figure 6-52	Receiver Locations for the western surface works	267
Figure 6-53	Existing view from the end of Glamis Street south to the existing noise mound adjacent to the M5 East Motorway	273
Figure 6-54	Photomontage showing the change to the view from the end of Glamis Street at project completion (opening).	275
Figure 6-55	Photomontage showing the view from the end of Glamis Street, ten years after opening.	275
Figure 6-56	The existing view from the northern edge of Wolli Creek, looking north along Beverly Grove Park South boundary.	277
Figure 6-57	Photomontage showing the view from the northern edge of Wolli Creek, looking north towards the MOC1 at opening ¹ .	279
Figure 6-58	Photomontage showing the view from the northern edge of Wolli Creek, looking north towards the MOC1, ten years after opening ¹ .	279
Figure 6-59	Shadows generated by the MOC1 on the surrounding landscape	281
Figure 6-60	Visual envelope map of Bexley Road South motorway operation complex	283
Figure 6-61	Receiver Locations for the Bexley Road South motorway operations complex at operation	285
Figure 6-62	Existing view of the entry to the M5 Linear Park, south of the M5 East Motorway on Bexley Road	288
Figure 6-63	Photomontage from the entry to the M5 Linear Park, south of the M5 East Motorway, showing the view to the MOC2 at opening.	289
Figure 6-64	Photomontage from the entry to the M5 Linear Park, south of the M5 East Motorway, showing the view to the MOC2 ten years after opening.	289
Figure 6-65	Shadows generated by the Bexley Road South motorway operations complex	291
Figure 6-66	Visual envelope map of Arncliffe motorway operations complex	293
Figure 6-67	Receiver Locations for the Arncliffe motorway operations complex at operation	295
Figure 6-68	Existing view of the Kogarah Golf Course from the corner of Flora Street and Marsh Street	303
Figure 6-69	Photomontage from the corner of Flora Street and Marsh Street, showing the view to the MOC3 at opening ¹ .	305
Figure 6-70	Photomontage from the corner of Flora Street and Marsh Street, showing the view to the MOC3 ten years after opening ¹ .	305
Figure 6-71	Existing view of the Kogarah Golf Course looking east towards Marsh Street from the Eve Street Cycleway	307
Figure 6-72	Photomontage looking east towards Marsh Street from the Eve Street Cycleway, showing the view to the MOC3 at opening ¹ .	309
Figure 6-73	Photomontage looking east towards Marsh Street from the Eve Street Cycleway, showing the view to the MOC3 ten years after opening ¹ .	309
Figure 6-74	Shadows generated by the Arncliffe motorway operations complex	312
Figure 6-75	Visual envelope map of St Peters Interchange	315
Figure 6-76	Overview of the St Peters interchange site at operation (not including the local road upgrades, refer Section 6.4.5).	317
Figure 6-77	Receiver Locations for the St Peters motorway operations complex MOC4	319
Figure 6-78	The view to the Dynamo building from the corner of Canal Road and the Princes Highway, looking south along Canal Road	324
Figure 6-79	Photomontage showing the changes to the view at the corner of Canal Road and the Princes Highway (the MOC4), at opening ¹ .	325
Figure 6-80	Photomontage showing the changes to the view at the corner of Canal Road and the Princes Highway (the MOC4), ten years after opening ¹ .	325
Figure 6-81	Shadows generated by the St Peters interchange infrastructure at 9am on the winter solstice. Note the shadows created from the MOC4 ventilation facility on industrial neighbours on Canal Road.	328
Figure 6-82	Receiver Locations for the Burrows Road motorway operations complex MOC5	329
Figure 6-83	Existing view from residences on Campbell Road opposite the St Peters interchange site, showing existing industrial buildings	339
Figure 6-84	Photomontage showing the view from residences on Campbell Road to the St Peters interchange and the Campbell Road pedestrian and cyclist bridge (to right of frame) at opening.	341

Figure 6-85	Photomontage showing the view from residences on Campbell Road to the St Peters interchange and the Campbell Road pedestrian and cyclist bridge (to right of frame) ten years after opening.	341
Figure 6-86	Existing view from the corner of Barwon Park Road and Campbell Road looking west towards the St Peters interchange site	343
Figure 6-87	Photomontage showing the view from the corner of Barwon Park Road and Campbell Road looking west towards the St Peters interchange at opening (with the M4-M5 Link construction area)	345
Figure 6-88	Photomontage showing the view from the corner of Barwon Park Road and Campbell Road looking west towards the St Peters interchange ten years after opening (with M4-M5 Link)	345
Figure 6-89	Shadows generated by the pedestrian bridge spanning Campbell Road. Note the shadows generated on the western most properties at 3 pm during the winter.	348
Figure 6-90	View north along Campbell Street showing industrial / commercial buildings on the north-eastern side of the road (to be retained) and residential housing on the south-western side of the road (to be removed)	351
Figure 6-91	The view north-west along Campbell Street, showing mature fig trees adjoining Simpson Park and residential housing to be removed on the western side of the road (to left of frame)	352
Figure 6-92	The view looking south along Campbell Road, to detached residential housing on the right and mature vegetation fringing Sydney Park on the right.	353
Figure 6-93	Euston Road is characterised by mature street trees lining the road, predominantly <i>Melaleuca quinquenervia</i> (to left of frame) but with occasional figs and other species.	355
Figure 6-94	View along Gardeners Road, showing mature street tree planting and low industrial complexes addressing the street.	357
Figure 6-95	Existing view from the front of the Town and Country Hotel looking from the intersection back up Campbell Street towards the Princes Highway	367
Figure 6-96	Photomontage showing upgraded intersection as seen from the corner of the Town and Country Hotel, at opening.	369
Figure 6-97	Photomontage showing upgraded intersection as seen from the corner of the Town and Country Hotel, ten years after opening.	369
Figure 6-98	Existing view from Burrows Road to the industrial buildings on the intersection of Burrows Road and Campbell Road (seen to right of frame)	371
Figure 6-99	Photomontage showing the widened and realigned Campbell Road from the corner of Burrows Road, with Sydney Park to right of frame and the pedestrian bridge to the left of frame, at opening.	373
Figure 6-100	Photomontage showing the widened and realigned Campbell Road from the corner of Burrows Road, with Sydney Park to right of frame and the pedestrian bridge to the left of frame, ten years from opening.	373
Figure 6-101	Existing view looking north along Euston Road showing edge of Sydney Park	375
Figure 6-102	Photomontage showing the widened Euston Road, with Sydney Park to right of frame, at opening.	377
Figure 6-103	Photomontage showing the widened Euston Road, with Sydney Park to right of frame, ten years after opening.	377

List of Tables

Table 1-1 Secretary's Environmental Assessment Requirements - urban design, landscape character and visual amenity	4
Table 3-1 Landscape Character and Visual Impact Grading Matrix	26
Table 5-1 Land use zonings within landscape character zones	99
Table 6-1 Visual Impact Assessment of Kingsgrove North construction compound (C1)	110
Table 6-2 Night Lighting Impact Assessment of Kingsgrove North construction compound (C1)	120
Table 6-3 Visual Impact Assessment of Kingsgrove South construction compound (C2) and Commercial Road construction compound (C3)	126
Table 6-4 Night Lighting Impact Assessment of Kingsgrove South construction compound (C2) and Commercial Road construction compound (C3)	128
Table 6-5 Visual Impact Assessment of Bexley Road North construction compound (C4)	136
Table 6-6 Night Lighting Impact Assessment of Bexley Road North construction compound (C4)	144
Table 6-7 Visual Impact Assessment of Bexley Road South construction compound (C5)	150
Table 6-8 Night Lighting Impact Assessment of Bexley Road South construction compound (C5)	152
Table 6-9 Visual Impact Assessment of Bexley Road East construction compound (C6)	159
Table 6-10 Night Lighting Impact Assessment of Bexley Road East construction compound (C6)	163
Table 6-11 Proposed Changes to Pedestrian and Cyclist Routes	165
Table 6-12 Visual Impact Assessment of pedestrian and cyclist routes	167
Table 6-13 Visual Impact Assessment of changes at Arncliffe construction compound (C7)	174
Table 6-14 Night Lighting Visual Impact Assessment at the Arncliffe construction compound (C7)	179
Table 6-15 Visual Impact Assessment of changes due to the Canal Road construction compound (C8)	189
Table 6-16 Night Lighting Visual Impact Assessment of changes due to the Canal Road construction compound (C8)	197
Table 6-17 Visual Impact Assessment of Campbell Road construction compound (C9)	202
Table 6-18 Night Lighting Impact Assessment of Campbell Road construction compound (C9)	206
Table 6-19 Visual Impact Assessment of Landfill Closure construction compound (C10)	207
Table 6-20 Night Lighting Impact Assessment of Landfill Closure construction compound (C10)	208
Table 6-21 Visual Impact Assessment of Burrows Road construction compound (C11)	211
Table 6-22 Night Lighting Impact Assessment of Burrows Road construction compound (C11)	213
Table 6-23 Visual Impact Assessment of Campbell Road bridge construction compound (C12)	214
Table 6-24 Night Lighting Impact Assessment of Campbell Road bridge construction compound (C12)	216
Table 6-25 Visual Impact Assessment of Gardeners Road bridge construction compound (C13)	217
Table 6-26 Night Lighting Impact Assessment of Gardeners Road bridge construction compound (C13)	218
Table 6-27 Visual Impact Assessment of changes due to the Sydney Park construction compound (C14)	222
Table 6-28 Night Lighting Impact Assessment of Sydney Park construction compound (C14)	225
Table 6-29 Visual Impact Assessment of changes due to western surface works - Construction activity within the roadway	234
Table 6-30 Visual Impact Assessment of changes to night lighting due to Western Surface Works - Construction activity within the roadway	236
Table 6-31 Operational landscape character impact assessment for the western surface works site	239
Table 6-32 Operational landscape character impact assessment for the MOC2 site	243
Table 6-33 Operational landscape character impact assessment for the Arncliffe motorway operations complex site	246
Table 6-34 Operational landscape character impact assessment for the St Peters interchange site	251
Table 6-35 Visual Impact Assessment of changes at the western surface works site at operation	268
Table 6-36 Night Lighting Visual Impact Assessment of changes at the western surface works site at operation	280
Table 6-37 Visual Impact Assessment of changes at the Bexley Road South motorway operations complex site at operation	286
Table 6-38 Night Lighting Visual Impact Assessment of changes at the Bexley Road South Motorway Operations Complex site at operation	290
Table 6-39 Visual impact assessment of changes at the Arncliffe motorway operations complex	296
Table 6-40 Night Lighting Visual Impact Assessment at the MOC3	310
Table 6-41 Visual Impact Assessment of changes due to the St Peters interchange in the vicinity of the MOC4	320
Table 6-42 Night Lighting Visual Impact Assessment of changes due to the St Peters interchange in the vicinity of the MOC4	326
Table 6-43 Visual Impact Assessment of changes due to the St Peters interchange in the vicinity of the MOC5	330

Table 6-44 Night Lighting Visual Impact Assessment of changes due to the St Peters interchange in the vicinity of the MOC5	331
Table 6-45 Visual Impact Assessment of changes due to the St Peters interchange	333
Table 6-46 Night Lighting Visual Impact Assessment of changes due to the St Peters interchange in the vicinity of the MOC5	346
Table 6-47 Potential change to street character within the Campbell Street character zone	350
Table 6-48 Potential change to street character within the Campbell Road character zone	353
Table 6-49 Potential change to street character within the Euston Road character zone	354
Table 6-50 Potential change to street character within the Bourke Road connection / industrial character zone	356
Table 6-51 Visual Impact Assessment of changes to local roads	359

1.0 Introduction

NSW Roads and Maritime Services (Roads and Maritime) is seeking approval to construct and operate the New M5 (the project), which would comprise a new, tolled multi-lane road link between the existing M5 East Motorway, east of King Georges Road, and St Peters. The project would also include an interchange at St Peters and connections to the existing road network. The project is shown in **Figure 1-1**.

Approval is being sought under Part 5.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The project is declared to be State significant infrastructure (SSI) under section 115U(2) of the EP&A Act by reason of the operation of clause 14 and Schedule 3 of the *State Environmental Planning Policy (State and Regional Development) 2011*. Accordingly, the project is subject to assessment under Part 5.1 of the EP&A Act and requires the approval of the Minister for Planning. An environmental impact statement (EIS) is therefore also required.

Roads and Maritime is seeking the project to be declared by the Minister for Planning as State significant infrastructure and critical State significant infrastructure under sections 115U(4) and 115V of the EP&A Act.

On 11 August 2015, the Commonwealth Minister for the Environment determined that the project has the potential to significantly impact on a matter of national environmental significance and is therefore a 'controlled action'. This means that approval of the project will be required from the Commonwealth Minister for the Environment in addition to environmental and planning approvals required under State legislation.

Under the Bilateral Agreement relating to environmental assessment (February 2015) between the Commonwealth Government and the NSW Government, this EIS has been adopted for the purpose of meeting the assessment requirements of both the Commonwealth EPBC Act and the NSW EP&A Act.

This technical working paper identifies and assesses the potential visual impacts associated with construction and operation of the project and supports the EIS for the project. A separate urban design assessment has been undertaken, refer to Urban Design Report.

1.1 Overview of WestConnex

WestConnex is a 33 kilometre motorway that is intended to link Sydney's west with the airport and the Port Botany precinct. The component projects of the WestConnex program of works are:

- M4 Widening – Pitt Street, Parramatta to Homebush Bay Drive, Homebush (planning approval granted on 21 December 2014 and under construction)
- M4 East – Homebush Bay Drive, Homebush to Parramatta Road and City West Link (Wattle Street) at Haberfield (planning application lodged and subject to planning approval)
- New M5 – (the subject of this EIS)
- King Georges Road Interchange Upgrade (planning approval granted on 3 March 2015 and under construction)
- M4-M5 Link – Haberfield to St Peters (undergoing concept development and subject to planning approval)
- Sydney Gateway (is the subject of further investigations by the NSW Government and would be subject to separate planning approval).

Separate planning applications have or will be lodged for each component project. Each project will be assessed separately, but the impact of each project will also be considered in the context of the wider WestConnex program of works.

A proposed Southern extension from Arncliffe to Kogarah is currently being investigated by the NSW Government, and would connect the New M5 to the southern and bayside suburbs of Sydney, and the proposed F6 motorway.

The WestConnex Delivery Authority (WDA) was established by the NSW Government to manage the delivery of the WestConnex series of projects for Roads and Maritime on behalf of the State. The WDA was a public subsidiary corporation of the Roads and Maritime. Following the achievement of early milestones for the WestConnex program of works, the NSW Government took the opportunity to evolve this early governance model.

On 1 October 2015 the transfer of the project delivery functions of WDA to Sydney Motorway Corporation (SMC) was finalised, forming a single decision-making entity to finance and deliver the WestConnex program of works. SMC is a private corporation, the shareholders of which are the Minister for Roads, Maritime and Freight and the Treasurer, with a majority independent board of nine directors.

Roads and Maritime is the Government client agency for the WestConnex program of works. In that capacity Roads and Maritime will enter into contractual arrangements with SMC subsidiary entities which will design, build, own and operate the motorway on behalf of Roads and Maritime. Roads and Maritime and SMC are working together to manage the planning approval process for the project. However, for the purpose of the planning application for the project, Roads and Maritime is the proponent.

1.2 Overview of the project

Key components of the project would include:

- Twin motorway tunnels between the existing M5 East Motorway (between King Georges Road and Bexley Road) and St Peters. The western portals along the M5 East Motorway would be located east of King Georges Road, and the eastern portals at St Peters would be located in the vicinity of the Princes Highway and Canal Road. Each tunnel would be about nine kilometres in length and would be configured as follows:
 - Between the western portals and Arncliffe, the tunnels would be built to be three lanes but marked for two lanes as part of the project. Any change from two lanes to three lanes would be subject to future environmental assessment and approval
 - Between the Arncliffe and St Peters, the tunnels would be built to be five lanes but marked for two lanes as part of the project. Any change from two lanes to any of three, four or five lanes would be subject to future environmental assessment and approval
- The western portals along the M5 East Motorway would be located east of King Georges Road, and the eastern portals at St Peters would be located in the vicinity of the Princes Highway and Canal Road
- Tunnel stubs to allow for a potential future connection to the M4-M5 Link and a potential future connection to southern Sydney
- Surface road widening works along the M5 East Motorway between east of King Georges Road and the new tunnel portals
- A new road interchange at St Peters, which would initially provide road connections from the main alignment tunnels to Campbell Road and Euston Road, St Peters
- Two new road bridges across Alexandra Canal which would connect St Peters interchange with Gardeners Road and Bourke Road, Mascot
- Closure and remediation of the Alexandria Landfill site, to enable the construction and operation of the new St Peters interchange
- Works to enhance and upgrade local roads near the St Peters interchange
- Ancillary infrastructure and operational facilities for electronic tolling, signage (including electronic signage), ventilation structures and systems, fire and life safety systems, and emergency evacuation and smoke extraction infrastructure
- A motorway control centre that would include operation and maintenance facilities
- New service utilities and modifications to existing service utilities
- Temporary construction facilities and temporary works to facilitate the construction of the project
- Infrastructure to introduce tolling on the existing M5 East Motorway
- Surface road upgrade works within the corridor of the M5 East Motorway.

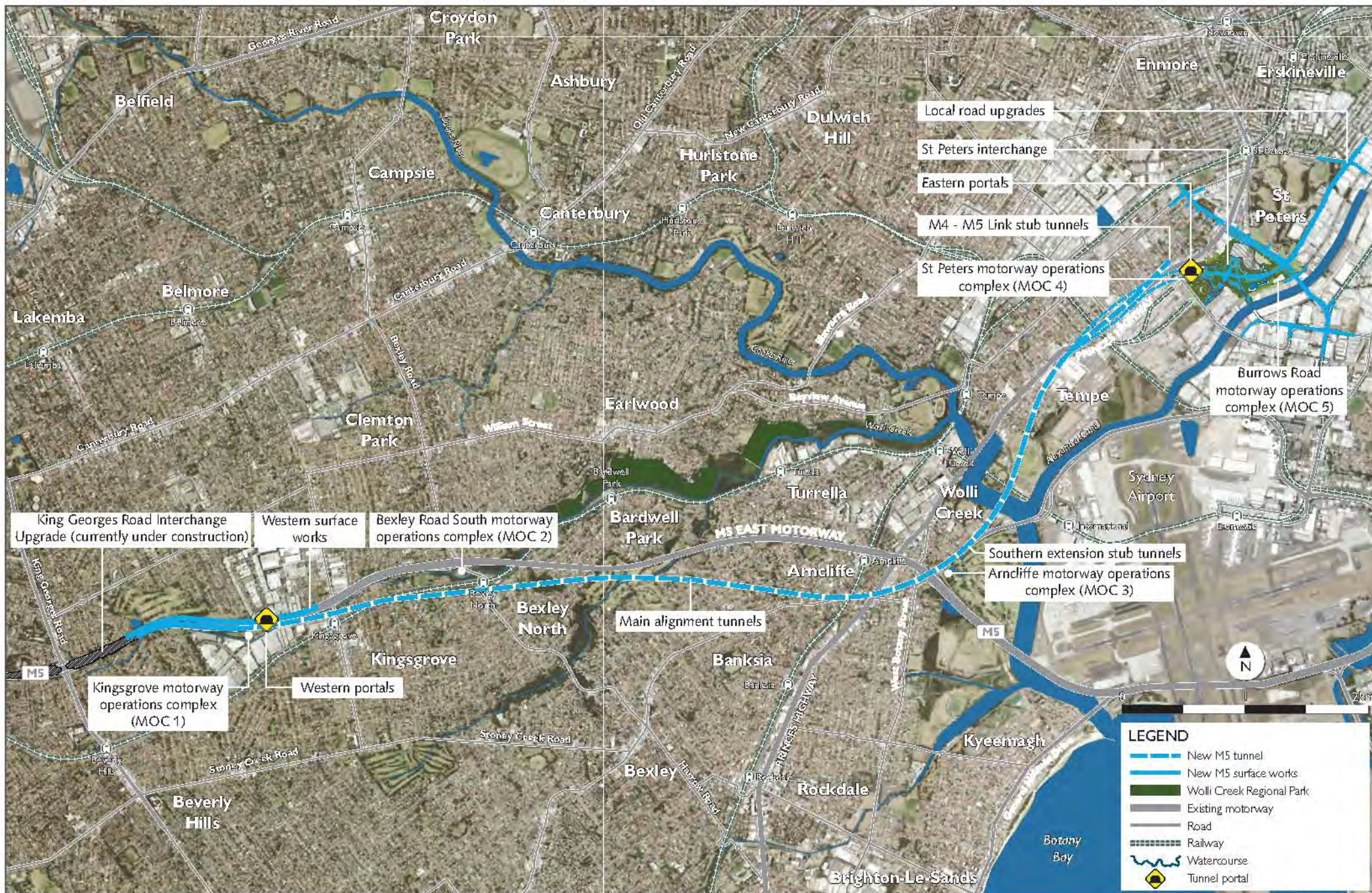


Figure 1-1 The project

Construction activities associated with the project would generally include:

- Commencement of enabling and temporary works, including construction power, water supply, ancillary site establishment, demolition works, property and utility adjustments and public transport modifications (if required)
- Construction of the road tunnels, interchanges, intersections and roadside infrastructure
- Haulage of spoil generated during tunnelling and excavation activities
- Fitout of the road tunnels and support infrastructure, including ventilation and emergency response systems
- Construction and fitout of the motorway control centre and ancillary operations buildings
- Upgrades to surface roads and construction of bridges
- Implementation of environmental management and pollution control facilities for the project.

Subject to the project obtaining environmental planning approval, construction of the project is anticipated to commence around mid-2016 and is expected to take around three years to complete.

The M5 Motorway corridor (the M5 East Motorway and the M5 South West Motorway) is the main passenger, commercial and freight corridor between Port Botany, Sydney Airport and south-west Sydney. Traffic demands on the M5 East Motorway currently exceed the design capacity of the roadway, and as a result, present a significant bottleneck to the M5 Motorway corridor with motorists experiencing heavy congestion and unreliable journey times. The project is needed to provide additional capacity along the M5 Motorway corridor, and would allow for a more robust and reliable transport network.

1.3 Project location

The project would be located within the Canterbury, Hurstville, Rockdale, Marrickville, Sydney and Botany Bay local government areas. The project corridor is located from about five to twenty kilometres to the south and south-west of the central business district of Sydney. The project would traverse the suburbs of Beverly Hills, Kingsgrove, Bexley North, Earlwood, Bardwell Park, Bardwell Valley, Arncliffe, Wolli Creek, Tempe, Sydenham, St Peters, Alexandria and Mascot.

1.4 Secretary's Environmental Assessment Requirements

In preparing the Technical Working Paper: Landscape and Visual Impact Assessment, the Secretary's environmental assessment requirements (SEARs) issued for the New M5 project on 5 March 2015, and reissued on 26 August 2015 have been addressed. The key matters raised by the Secretary for consideration in the Technical Working Paper: Landscape and Visual Impact Assessment and where this report addresses the SEARs are outlined in **Table 1-1**.

Table 1-1 Secretary's Environmental Assessment Requirements - urban design, landscape character and visual amenity

Secretary's Environmental Assessment Requirements	Where Addressed
A consideration of the urban design and visual amenity implications of the proposal, including supporting infrastructure, during construction and operation. The assessment must identify urban design and landscaping objectives to enhance the ventilation stacks, interchanges, tunnels, 'cut and cover' arrangements, consider resulting residual land and treatments and demonstrate how the proposed hard and soft urban design elements of the proposal would be consistent with the existing and desired future character of the area traversed by the proposal.	Chapters 5 and 6 Urban Design Report (Appendix L)
Identification of opportunities to utilise surplus or residual land, and utilise key structures (such as stacks) for multiple uses i.e. integration with other structures.	Urban Design Report

Secretary's Environmental Assessment Requirements	Where Addressed
Evaluation of the visual impacts and urban design aspects of the proposal (and its components) on surrounding areas, and consistency with the urban and landscape design of the M5 East Motorway and WestConnex Motorway Urban Design Framework.	Chapter 6 Urban Design Report (Appendix L)
Consideration of impacts on views and vistas, streetscapes, key sites and buildings, and direct amenity impacts (such as proximity and overshadowing).	Chapter 6
Details of urban design and landscape mitigation measures, having regard to the urban design and landscape objectives for the proposal.	Chapter 6
Measures to manage lighting impacts both during construction and operation, in particular lighting of the St Peters Interchange and impacts on the operation of Sydney Airport.	Chapter 6
Artists' impressions and perspective visualisations of the proposal from a variety of locations along and adjacent to the route.	Chapter 6

In addition to the guidelines identified in the SEARs, the following guidelines were considered in this assessment:

- WestConnex Motorway *Urban Design Framework*, Roads and Maritime Centre for Urban Design and the WestConnex Delivery Authority, Final Draft September 2013.
- Beyond the Pavement; *Urban Design Policy, Procedures and Design Principles*, Roads and Maritime updated February 2014.
- Bridge Aesthetics; *Design Guideline to Improve the Appearance of Bridges in NSW*, Roads and Maritime July 2012.
- *Noise Wall Design Guideline; Design Guidelines to Improve the Appearance of Noise Walls in NSW*, Roads and Maritime February 2007.
- *Landscape Guideline; Landscape Design and Maintenance Guidelines to Improve the Quality, Safety and Cost Effectiveness of Road Corridor Planting and Seeding*, Roads and Maritime February 2007

1.5 Study area

A study area for the purposes of this assessment is defined by the at surface construction footprint of the project with a buffer of 500 metres. Due to the landform, tree cover, built form and street layout, this area is considered a reasonable boundary within which the project could visually influence the landscape through which the corridor runs. Further, as the construction footprint would be greater than the operational footprint in most instances, this is considered to be the worst case scenario for disturbance.

This page has been left blank intentionally.

2.0 Urban and Landscape Design

This section provides a brief summary of the urban design and landscape proposal for the project. For further detailed information, refer to the New M5 Urban Design Report (Appendix L of the EIS).

The urban and landscape design of the project is concentrated on the following locations:

- 1) Western surface works and the Kingsgrove motorway operations complex
- 2) Bexley Road South motorway operations complex
- 3) Arncliffe motorway operations complex
- 4) St Peters interchange and surrounds, including the motorway operations complexes.

At the locations, the design of the built form and landscaping aims to minimise intrusion on existing communities, while providing benefits such as improved active transport infrastructure and creation of open space. In addition to the surface interventions, the urban design of the tunnels has been considered in the context of the journey experience. An overarching art and lighting strategy marries the surface works and tunnel experience (refer the New M5 Urban Design Report for details).

With respect to ventilation facilities at Kingsgrove, Arncliffe and St Peters motorway operation complexes, a detailed review and finalisation of architectural treatment of the ventilation facilities would be undertaken during detailed design. This would be guided by the ventilation performance requirements and the following design principles, as well as outcomes of community consultation:

- Reflective of site and context
- Integration with landscape
- Sculptural urban scale objects – urban landmarks
- Forms informed by function
- Identifiable by their materiality
- Appropriate use of materials.

Further detail in these principles can be found in the New M5 Urban Design Report. For the purposes of this assessment, an envelope design has been considered with a preliminary architectural treatment concept.

The landscape design for the project incorporates the fundamental objectives of landscape design outlined in the Roads and Maritime's guideline *Beyond the Pavement*:

- Safe – All required clear zone and safe sight distance setbacks to avoid the creation of hidden public places whilst maximising passive surveillance opportunities.
- Integration with local setting – The design maintains and enhances existing landscape character and vegetation patterns.
- Ecologically sound – The design uses local species from existing and adjoining plant communities and assists in protecting and recovering local biodiversity.
- Add character and value – The design responds to and draws upon the existing landscape patterns of the area
- Low maintenance and cost effective – The design utilises existing site soils and local robust and durable plant species in a bold and simple way without unnecessary fussiness. Revegetation across the project would be achieved through direct planting of containerised plant stock into prepared planting areas. This would facilitate rapid establishment of new landscape installations.

Where buildings such as ventilation and workshop facilities are located, the landscape intent is to screen as much of the built form as possible.

A preliminary species list for the western reaches of the corridor is provided in the appendices to the Urban Design Report. The species have been chosen based on surrounding endemic vegetation. During detailed design further consultation would be undertaken with councils and the King Georges Road Interchange Upgrade project to ensure seamless integration of all new planting for New M5.

2.1 Western surface works and the Kingsgrove motorway operations complex

The western connection of the New M5 occurs between King Georges Road and Bexley Road within the existing M5 East Motorway corridor adjacent to Canterbury Golf Course and Beverly Grove Park. Beverly Grove Park forms part of the larger M5 Linear Park which runs parallel to the M5 East Motorway corridor.

The motorway operations complex is located on the southern side of a realigned westbound bypass ramp adjacent to Wolli Creek. The site is currently part of the M5 Linear Park and consists of an open turfed area with a shared path adjacent to existing industrial businesses. Access to these facilities would be provided via a new service road.

Within the western surface works, the portals have been designed to fit within the widened M5 East Motorway corridor, connect with the King Georges Road interchange and present as a new, sleek and refined element.

The landscaping of the site is shown in **Figure 2-2** and **Figure 2-3**. A photomontage of the western portals is provided in **Figure 2-1**.



Figure 2-1 Photomontage of western portal with the Kingsgrove motorway operations complex

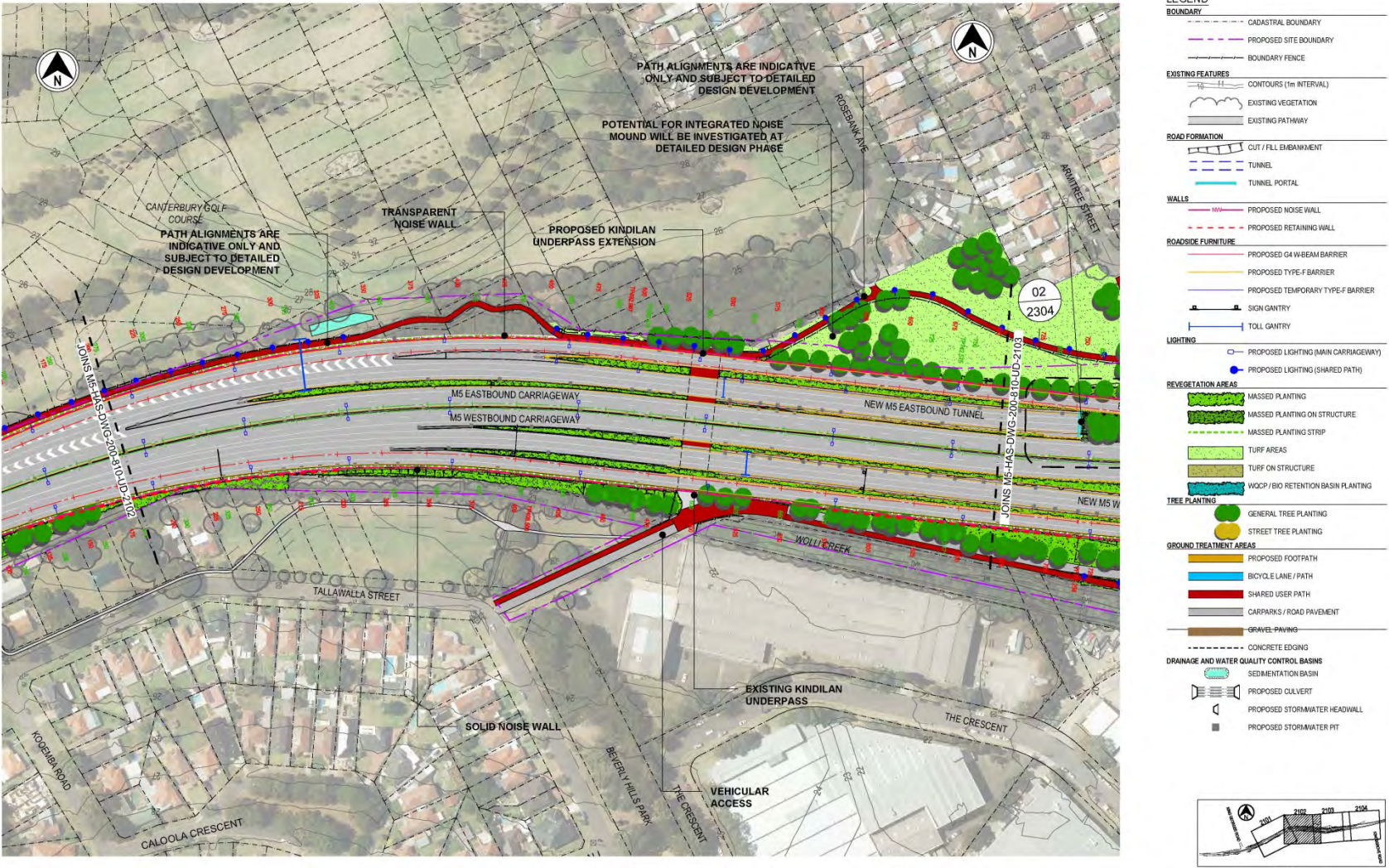


Figure 2-2 Concept design and planting plan for the western portion of the western surface works.

This page has been left blank intentionally.



Figure 2-3 Concept design and planting plan for the eastern portion of the Kingsgrove motorway operations complex.

2.2 Bexley Road South motorway operations complex

An air intake, emergency smoke extraction facility and distribution substation is located south of the existing M5 East Motorway on Bexley Road. This facility would supply fresh air to the tunnel and in emergencies be utilised for smoke extraction.

The air intake and emergency smoke extraction facility is located within the centre of an existing turfed road reservation (part of the M5 Linear Park) adjacent to Bexley Road, with vertical fans located below ground. A distribution substation is located to the east of the facility. Vehicle access is provided from Bexley Road (left turn in, left turn out). The design intent is consistent with the overall design intent for the project.

The distribution substation would be clad in dark face brick. This material forms a contemporary interpretation of the surrounding red brick residences. Glazing to the northern and western façade of the distribution substation together with its relatively low scale aims to give the building a residential character. The emergency smoke extraction facility is constructed of precast concrete panel walls in recognition of its utilitarian nature. This is a similar approach to the existing M5 East Motorway operations buildings located on the eastern side of Bexley Road where the building is clad in rendered blockwork above sandstone footings with the more utilitarian buildings behind constructed of raw concrete block work.

Refer **Figure 2-4** for the landscaping concept for this site.

2.3 Arncliffe motorway operations complex

The facility at Arncliffe is located adjacent Kogarah Golf Course adjacent to Marsh Street and includes the following:

- Air intake station
- Ventilation facility
- Distribution substation
- Water treatment plant
- Water treatment wetland.

The Arncliffe motorway operations complex layout has had consideration to providing a setback to the ponds that provide breeding habitat to the Green and Golden Bell Frog (referred to as the RTA ponds). Landscape areas would be restored with new areas of turf and tree planting to screen the motorway operations complex and to match in with the existing open space character of the site.

A ventilation facility is located adjacent to Marsh Street and includes four ventilation outlets. A distribution substation is located to the south of the facility. A water treatment plant and wetland is also provided to the east of the site.

The landscaping proposes to screen built form along the northern and western facades. The architectural treatment of the ventilation facility would be confirmed during detailed design. The associated buildings would read as part of the overall New M5 family.

The distribution substation and water treatment plant are clad in dark face brick on structural concrete block work. Openings providing service access to the plant rooms are grouped in a similar manner to the other distribution substations with common recesses exposing bands of the structure – a smooth-faced concrete block. Access doors within the block work are painted a light grey to match. The ventilation facility is clad in precast concrete panels on the east and west facades and corten metal cladding on the northern and southern facades. Refer **Figure 2-5** for concept and planting design.



Figure 2-4 Concept design and planting plan for the Bexley Road South motorway operations complex

This page has been left blank intentionally.



Figure 2-5 Concept design and planting plan for motorway operations complex at Arncliffe (MOC3).

2.4 St Peters interchange and surrounds

The St Peters interchange is located within the Alexandria Landfill site, connecting with the local road network at the intersection of Campbell and Euston Roads. The site is bound by Canal Road in the west, Burrows Road in the south, Princes Highway in the north and Campbell Road in the east. The St Peters interchange is a key connection in the overall WestConnex journey. With the New M5 tunnel entry/exit point at the southern reaches of the St Peters interchange connections would be made to the surrounding local road network as well as the future WestConnex M4-M5 Link and the future Sydney Gateway. These two proposed links would provide regional connections to Sydney Airport and Port Botany as well as the remainder of Sydney's orbital road network. The design of the St Peters interchange as well as artist's impressions of the interchange and local road upgrades is provided in **Figure 2-6**, **Figure 2-7** and **Figure 2-8**.

The design aims to achieve a lasting and cohesive urban design strategy for the overall Interchange that would unify and shape the different stages of the project, including the New M5, and the future Sydney Gateway and the future M4-M5 Link.

The St Peters interchange consists of the motorway control complex, ventilation facility, distribution substation, fire pump rooms and deluge tanks and the interchange road network. The ventilation facility and associated service buildings are located above the tunnel portals, at the corner of Canal Road and Princes Highway (the St Peters motorway operations complex). The ventilation outlets are located directly over the exit ramp cut and cover structure along with an electrical distribution facility, fire pump rooms and deluge tanks. Access to these facilities is provided from Canal Road. The Motorway Control Centre is located at the corner of Burrows Road and Campbell Road at the Burrows Road motorway operations complex (refer **Figure 2-6**).

In developing the design, a strategy has been proposed for the overall interchange, focusing on the following objectives:

- Close the Alexandria Landfill
- Return surplus lands to the community as public open space.
- Provide an extensive green volume of vegetation to compete with and soften the scale of the proposed multi-level interchange, creating an 'urban forest'
- Promote the use of a tall, established tree canopy cover to not only soften the scale of the proposed infrastructure, but also provide a counterpoint and extension of the green open space of Sydney Park
- A ventilation facility and Motorway Control Centre designed to enhance the existing street character whilst treated as a cohesive set of architectural buildings.

The design allows for future stages of the interchange to adopt similar approaches to materials and detailing to achieve overall project cohesion and an integrated 'whole of project outcome'. The landscape approach in this zone is essentially to create 'green volume' and remediate the former landfill site by creating an 'urban forest', capable of competing with the scale of the proposed interchange.

Large areas of new tree planting would be incorporated on both sides of the New M5 ramps and above the portals to present a continuous green canopy and create a sense of green immersion for the motorist upon entry or exit from the tunnel. Landscape treatments surrounding the St Peters motorway operations complex would focus on creating a defined street edge with street tree planting, and feature fig tree plantings to offer increased 'green volume' and help define a sense of landscape character for the site. These figs would also provide valuable shade for park users.

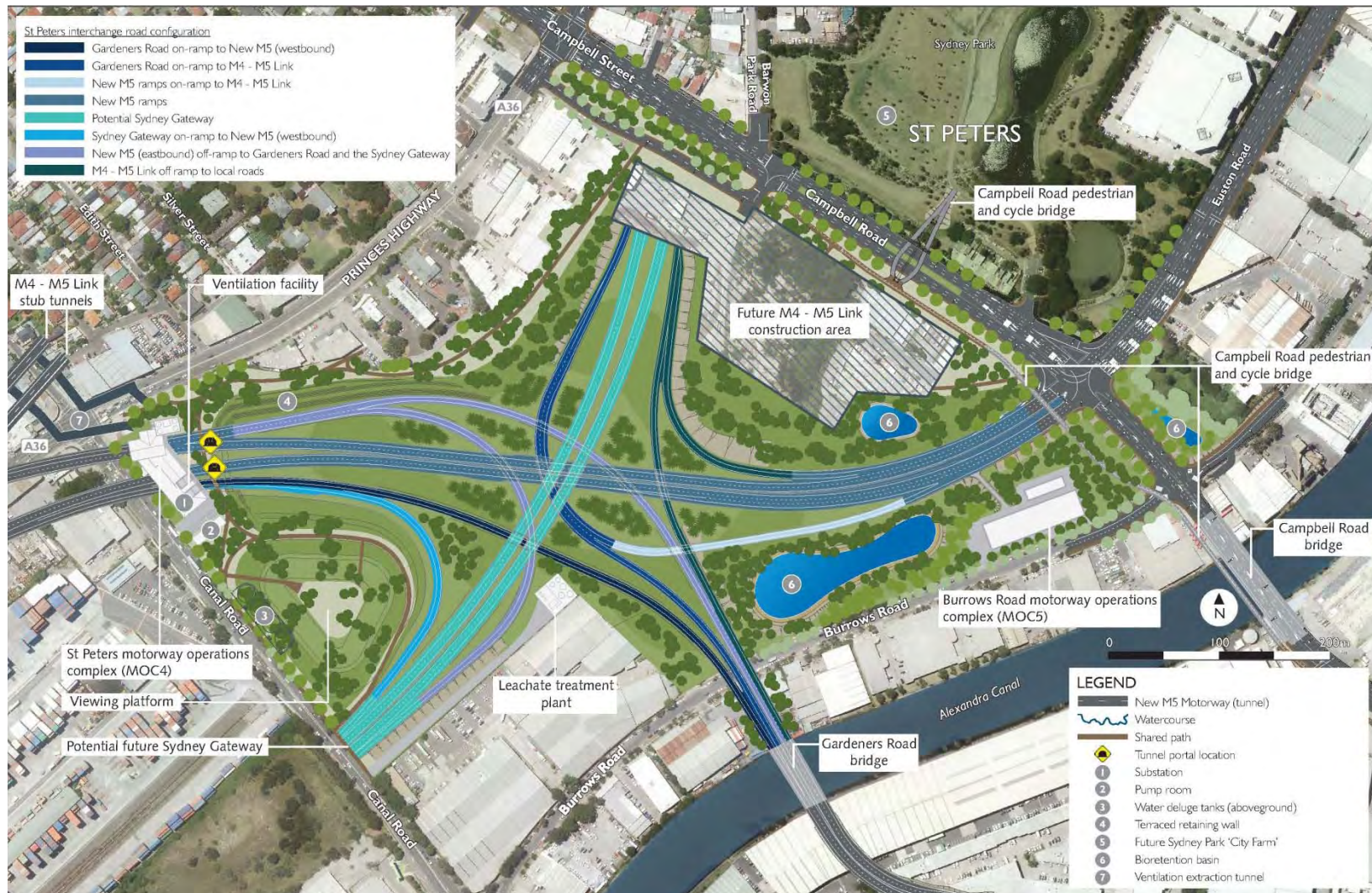


Figure 2-6 St Peters interchange layout

This page has been left blank intentionally.



Figure 2-7 Artist's impression of St Peters interchange , view towards the New M5 portals and the St Peters motorway operations complex

This page has been left blank intentionally.



Figure 2-8 Photomontage of local road upgrades and Campbell Road bridge crossing at St Peters, at ultimate completion (including the future M4-M5 Link)

This page has been left blank intentionally.

3.0 Methodology

The urban design, landscape character and visual amenity impact assessment has been undertaken in accordance with the *Roads and Maritime Services Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment* (Reference number EIA-N04, 2013). This method is widely accepted by NSW government authorities and is relevant to this project in that it addresses changes to corridor infrastructure within the urban setting.

In accordance with these guidelines, the following assessments have been carried out:

- Construction
- Visual impact assessment of construction compounds and tie-in works
- Assessment of changes to pedestrian, cyclist and vehicular traffic movements to surrounding areas
- Assessment of night lighting impacts
- Operation
- Operational landscape character impacts
- Future character / context assessment
- Operational visual impacts
- Assessment of night lighting impacts.

Due the nature of the project as a series of intermittent surface works areas connected by a tunnel, the project has been split into four areas in order to analyse the surrounding environment and operational visual impact for each area, these being:

- 1) Western surface works
- 2) Bexley Road surface works
- 3) Arncliffe surface works
- 4) St Peters interchange and surrounds.

Tolling infrastructure along M5 East Motorway has been assessed in addition to these surface works areas.

3.1 Project description

A full description of the project is provided in Chapter 5 and Chapter 6 of the environmental impact statement (AECOM, 2015) and The New M5 Urban Design (refer **Appendix L**) (WDA, 2015). This report describes elements of the project relevant to understanding the essential aspects of the project that would potentially give rise to its effects on the landscape and visual amenity.

3.2 Analysis of existing environment

The existing landscape and visual environment along the project has been assessed through a desktop review of aerial photography, geographic information system (GIS) mapping of topography and land use, and site inspections.

For each of these areas, the following elements are discussed:

- Topography and visibility
- Infrastructure environment
- Key heritage sites
- Landscape Character Zones.

3.2.1 Definition of Landscape Character Zones

Existing Landscape Character Zones (LCZs) are identified as sharing broadly homogenous characteristics or spatial qualities. These may include:

- Planning designations
- Topographical qualities
- Natural drainage qualities
- Ecological characteristics / land cover
- Parks and open space
- Cultural and recreational characteristics
- Architecture
- Spatial qualities
- Infrastructure.

As much of the project would comprise of tunnelled motorway, the landscape character zones were focussed around areas of proposed surface works, including western surface works, Bexley Road surface works, Arncliffe surface works and St Peters interchange and surrounds. The landscape character zones that were identified across the project area include:

- 1) Landscape Character Zone 1: Residential
 - a) High Density Residential
 - b) Low Density Residential
- 2) Landscape Character Zone 2: Industrial
- 3) Landscape Character Zone 3: Recreation
 - a) Open space
 - b) Waterways
- 4) Landscape Character Zone 4: Transport Corridor
 - a) Transport
 - b) Infrastructure
- 5) Landscape Character Zone 5: Urban Centre
- 6) Landscape Character Zone 6: Commercial Corridor

The landscape character zones identified above were defined as areas of landscape with similar properties or strongly defined spatial qualities and visually distinct from adjoining areas.

3.3 Assessment of landscape character and visual impact

The landscape character assessment evaluates the potential impacts of the operation of the project on the combined quality of the built, natural and cultural aspects that make up an area and provide its unique sense of place.

The visual impact assessment evaluates the impact of the construction and operation of the project on receiver views, including potential impacts associated with lighting. The visual impact assessment considers views from neighbouring properties, including residential, commercial, industrial, and users of public open space, as well as from passing motorists, pedestrians and cyclists.

Key steps in the landscape character and visual impact assessment include:

- Analysis of the landscape and visual context, including:
- Assessment of the existing landscape character and visual environment, which included
 - Definition of LCZs
 - Identification of visibility and potential views to the project during construction and operation
 - Summary of the policy and planning setting, specifically in regard to future character and context
- Identification of urban design and landscape objectives
- Assessment of impacts during construction and operation
- Identification of reasonable and feasible mitigation measures.

The method to assess both landscape character and visual impacts has been based on a combination of 'sensitivity' of the existing landscape character zone or view subject to change, and the 'magnitude' of change on that zone or view (refer **Section 3.3.1** and **Table 3-1**).

Visual and landscape character impact assesses the change from existing. This methodology does not assess the quality of the change (ie if the change is an adverse, neutral or positive change within the existing setting) within each impact rating. This is addressed within the descriptive text within each chapter supporting the assessment for each area.

To assist in the assessment of potential visual impacts, photographs, panoramas and / or artists impressions have been used (refer **Section 3.3.2**).

3.3.1 Sensitivity and magnitude

An Impact Grading Matrix (refer **Table 3-1**) is used to assess both landscape and visual impact, and examines sensitivity and magnitude to give a combined impact rating of between negligible and high.

3.3.1.1 Sensitivity

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

- Inherent landscape value, eg its condition, perceptual qualities, and cultural importance
- The likely congruency of the proposed change, i.e. the extent to which the project may fit or be 'visually absorbed' into the landscape, eg in relation to line, colour, texture, form, etc.

The sensitivity of visual receptors and views would also be dependent on:

- The location and context of the viewpoint
- The expectations and activity of the receptor
- The number of receptors
- The importance of the view

- The most sensitive receptors may include:
 - Users participating in outdoor recreational pursuits
 - Communities where the development results in changes in the landscape setting or valued views enjoyed by the community
 - Occupiers of residences with views affected by the project.

3.3.1.2 Magnitude

The magnitude of change affecting a landscape or visual receptor depends on factors such as the nature, scale and duration of the particular change that is expected to occur. In the landscape, the magnitude of change would depend on factors such as the extent of loss, change or addition of a feature, or changes in the backdrop, or outlook from a landscape that affects its character. The impact on a view would depend on factors such as the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, duration of view and distance from the project.

Table 3-1 Landscape Character and Visual Impact Grading Matrix

		MAGNITUDE			
		High change	Moderate change	Low change	Negligible change
SENSITIVITY	High	High	High – moderate	Moderate	Negligible
	Mod	High – moderate	Moderate	Moderate – low	Negligible
	Low	Moderate	Moderate – low	Low	Negligible
	Neg	Negligible	Negligible	Negligible	Negligible

(Source: Roads and Maritime Services Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment)

3.3.2 Visual envelope mapping

The likely visibility of the proposed elements of the project at operation from surrounding areas has been broadly mapped, to define a visual envelope. This provides an indication of which parts of the project are likely to be viewed from surrounding development. The mapping typically shows 'worst case', ie. some receivers may only see the tip of a ventilation facility, where as other closer receivers may view a substantial part of the infrastructure element.

3.3.3 Photos and panoramas

A photograph (or series of photographs, stitched together to produce a panorama) of the project from each Receiver Location has been used to assist in the analysis process.

These photos were taken at the widest focal length available on the camera (18 millimetre focal length), as many of the views of the project area were seen at close proximity rather than at any distance. A wider angled image was therefore chosen to be able to capture as much of the landscape as possible and more accurately convey the scene experienced by the observer.

3.3.4 Assessment of night lighting impacts

The assessment of the impacts of night lighting considers the change from the existing condition during both construction and at operation. Neighbouring properties (residential, commercial and industrial), users of recreational space and motorists are considered to be the key receptors and are separately assessed. The following assumptions are made with regard to the assessment process:

The assessment is not based on a lighting design, but rather assumptions have been made with regard to the types and extent of lighting likely to be installed for both the construction phase and at operation.

There is no assessment of existing or proposed luminescence levels.

During construction, it is assumed that:

- Site establishment works and construction would likely commence in mid 2016 with expected opening to traffic in late 2019
- Construction activities would generally take place from 7am to 6pm, Monday to Friday and 8am to 1pm Saturday, with no work on Sunday or public holidays. However, certain activities including tunnelling and hauling of spoil would take place outside standard construction hours
- No detailed information regarding night lighting within construction compounds is available at this stage of the assessment, however vehicle movement into and out of the compounds has been used to make assumptions about night lighting, ie. where vehicle movement at compound entries is within regular work hours, minimal lighting for safety purposes is assumed within that compound at night, where access is maintained 24 hours a day, lighting adequate for safe construction activity is assumed
- Construction vehicles entering and leaving the sites has been discussed in the assessment
- Light levels would be sufficient to meet occupational health and safety levels, and security levels.

Operational lighting is assumed to be:

- In operation seven days a week
- At levels sufficient to meet occupational health and safety levels, security levels, and where applicable, the requirements for managing conflicts with Sydney Airport operations.

This page has been left blank intentionally.

4.0 Existing environment

4.1 Introduction

The project spans from the M5 East Motorway at Beverly Hills eastwards to Arncliffe, then north-east to St Peters and Alexandria, and comprises a series of contained surface works areas connected by two (east and west bound) tunnels (refer **Figure 4-1**). For the purposes of this report and as described in Chapter 2.0, the project has been divided into four areas for analysis and assessment:

- 1) Western surface works, which includes:
 - The Kingsgrove motorway operations complex (MOC1)
 - The western portals for the New M5
 - The realignment of the M5 East Motorway, including road infrastructure such as tolling gantries
- 2) Bexley Road surface works, which includes the Bexley Road South motorway operations complex (MOC 2)
- 3) Arncliffe surface works, which includes the Arncliffe motorway operations complex (MOC 3)
- 4) St Peters Interchange and surrounds, which includes:
 - St Peters motorway operations complex (MOC4)
 - Burrows Road motorway operations complex (MOC5)
 - The eastern portals and associated new road sections
 - Pedestrian / cycle bridges along and over Campbell Road
 - Provision for the connection to the future M4-M5 Link and future Sydney Gateway
 - Local road upgrades, including two new bridges over the Alexandra Canal.

The Kingsgrove Road surface works, located at Kingsgrove Road, is associated with the construction of tolling infrastructure only within the existing motorway corridor. This has been assessed in **Section 6.4.6**.

This page has been left blank intentionally.

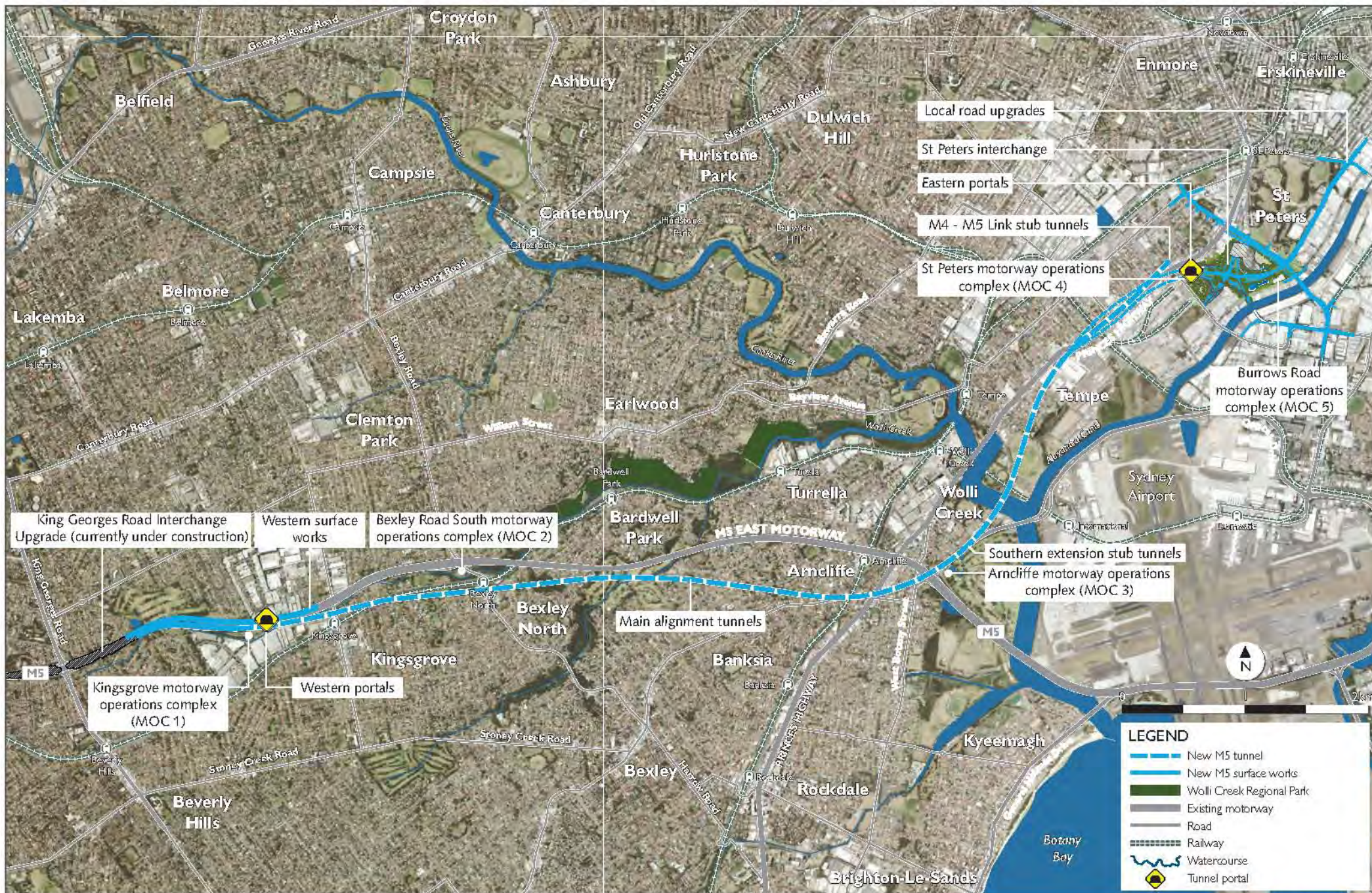


Figure 4-1 The project

4.2 Western surface works

The western surface works area follows the M5 East Motorway road corridor between King Georges Road and Karigal Street. The western surface works project area comprises primarily the M5 East Motorway road corridor and includes areas of public recreation space adjoining the M5 East Motorway (refer **Figure 4-2**). Some of the public recreational spaces that are not required for the project would be returned to open space following construction.

Works would occur further west of Cooloongatta Road, however, these would occur within the existing motorway corridor and would be limited to pavement and line marking works with the exception of tolling infrastructure. Tolling infrastructure has been considered in **Section 6.4.6**. However, as this project would not change the visual appearance of the M5 East Motorway (noting that areas west of Cooloongatta Road would be impacted by King Georges Road Interchange Upgrade, with this area this area of disturbance associated with pavement and line marking has not been considered further.

4.2.1 Topography and visibility

The western surface works lies within the Wolli Creek valley adjacent to Wolli Creek, gently rising in elevation from east to west (refer **Figure 4-3**). A ridge line runs broadly parallel to the western surface works between 500 metres and one kilometre north of the M5 East Motorway, and between one and two kilometres south of the M5 East Motorway. A valley floor around 300 metres wide lies directly south of the southern boundary of the western surface works to the railway line, where the land then rises gently south towards the southern ridge line. At the western end of the site, the ridge line passes around 300 metres west of the site, beyond King Georges Road.

Around half of the western surface works (west of the Kindilan underpass) lies on the valley floor. East of the Kindilan underpass, the M5 East Motorway is bounded by a vegetated mound to the north and to the south. These mounds visually buffer the M5 East Motorway from the surrounding landscape. The northern mound separates Beverly Grove Park North and the residential development to the north from the M5 East Motorway (refer **Figure 4-4**). The southern mound defines the edge of Beverly Grove Park South, which lies between Wolli Creek and the M5 East Motorway (refer **Figure 4-5**), and provides separation between the M5 East Motorway and the industrial estate and residential land beyond to the South (refer **Figure 4-6**).

Despite its the elevation in places, views to and from the western surface works site are limited due to the prevalence of mature tree cover in the surrounding landscape (refer **Figure 4-6**), gentle, even rise of the landform between valley and ridge line (refer **Figure 4-7**), and tall industrial development in the valley floor to the south of the M5 East Motorway, east of the Kindilan Underpass (refer **Figure 4-8**).



Figure 4-2 Landscape character zones - Western surface works

4.2.2 Context

The western surface works broadly ties in with the existing M5 East Motorway and is surrounded by a mix of residential and light industrial development. The central portion of the site is bounded by Canterbury Golf Course to the north, which is buffered from the M5 East Motorway by a strip of Cooks River / Castlereagh Ironbark Forest (also known as Beverly Grove bushland).

The M5 East Motorway is flanked on both sides by the M5 Linear Park, which provides a shared pedestrian and cycle path linking pockets of recreational open space of varying sizes. Wolli Creek runs roughly parallel to the M5 Linear Park, comprising a fenced concrete channel with occasional pockets of in-channel vegetation (either reed beds or weedy tree species).

The residential development surrounding the site is zoned Medium Density to the north and Low Density (refer **Figure 4-9**) to the south of the M5 East Motorway corridor, although within the study area all of this residential development appears to comprised generally of single and double storey homes in a mix of architectural styles, on individual lots (refer **Figure 4-10**).

The suburbs surrounding the western surface works generally contain well established landscapes (gardens and parks) and mature street trees. The mature tree cover in the residential and light industrial areas softens the built hardscape (refer **Figure 4-11**), and provides amenity to the M5 Linear Park pedestrian and cycle path (refer **Figure 4-12**).

The Airport, Inner West and South railway line runs south of the M5 East Motorway, lying around 150 metres from the eastern most corner of the western surface works, moving further from the site as the corridor travels west, lying around 700 metres from the western most tip of the western surface works boundary. A local mixed use urban centre is located at Kingsgrove Railway Station, around 300 metres from the south-eastern corner of the western surface works boundary. Views between this area and the western surface works are screened by vegetation and built form (particularly the industrial buildings to the south of the western surface works site boundary).

This page has been left blank intentionally.



Figure 4-4 A large vegetated mound separates Beverly Grove Park North and residential development from the M5 East Motorway.



Figure 4-5 Noise mound compartmentalising the M5 East Motorway (left of frame) from Beverly Grove Park South and the surrounding area, flanked by the M5 Linear Park pedestrian and cycle path, Wolli Creek channel and industrial development beyond (right of frame).



Figure 4-6 View south from Beverly Grove Park South, showing glimpse views through industrial complexes to residential development and ridge line beyond.



Figure 4-7 View south along Armitree Street towards the western surface works at the end of the street, showing the gentle rise from the valley floor to the ridge, and the screening nature of mature street trees and landscape vegetation.



Figure 4-8 View south from Beverly Grove Park South to industrial development beyond, east of the Kindilan Underpass. Note how the industrial buildings screen the elevated Beverly Grove Park South from the surrounding landscape.

This page has been left blank intentionally.

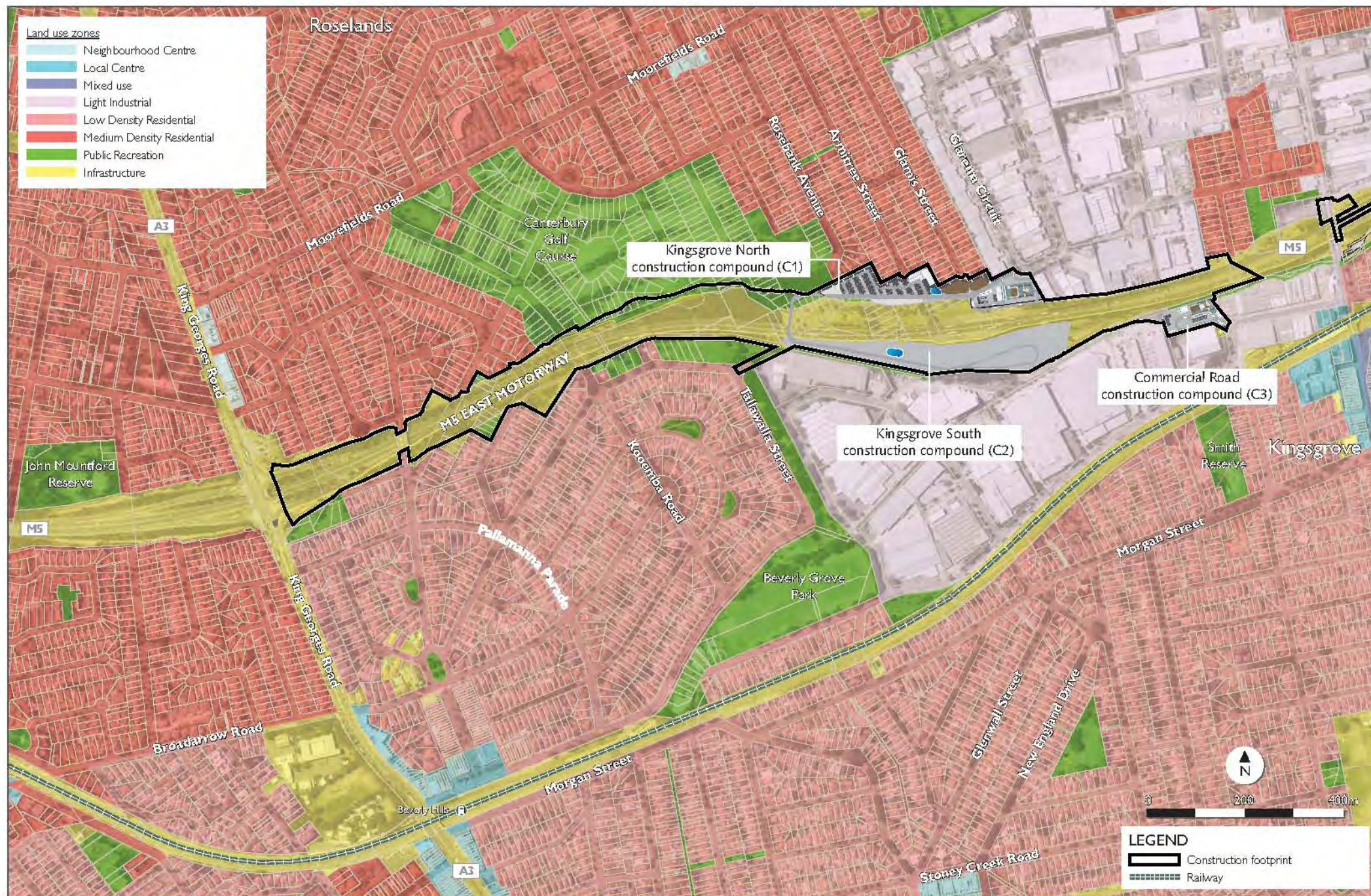


Figure 4-9 Western surface works with surrounding land zoning



Figure 4-10 Typical streetscape of low density housing, Pallamana Parade Urban Conservation Area, Beverly Hills



Figure 4-11 Mature street trees provide a softening of developed areas, including light industrial areas



Figure 4-12 Landscaping including mature trees provide a pleasant environment for the M5 Linear Park pedestrian and cycle path (photo taken from Tallawalla Reserve)

4.2.3 Heritage sites

Although heritage items may not be directly affected by the project, they may be indirectly impacted through physical and visual encroachment into curtilage areas, and changes to the heritage context of the landscape.

Heritage items and heritage conservation areas in and around the project corridor include:

- Welfare Avenue Urban Conservation Area, listed on the Register for the National Estate (a non-statutory register)
- Pallamana Parade Urban Conservation Area, listed on the Register of the National Estate (a non-statutory register), located in Beverly Hills:
 - Built-up in the 1930s and in the immediate post-World War II period and consists of shrub-lined streets radiating from Yarralah Place (around which are located the community buildings of churches and a school).
 - The Canterbury section of the precinct possibly pre-dates the Hurstville section as there are some 1920s bungalows but the majority of the houses are contemporary with those in the Hurstville section. There are some vacant blocks in the path of the proposed extension of the M5 East Motorway from Liverpool.
 - The gardens are generally well-landscaped and treed.
 - There are a small number of unsympathetic intrusions into this area but it is still remarkably intact.
- Kingsgrove Railway Station Group (local heritage significance) located at corner of Kingsgrove Road and Commercial Road, Kingsgrove.
- Kingsgrove East Urban Conservation Area, listed on the Register of the National Estate (a non-statutory register) (local heritage significance) located in Kingsgrove:
 - Comprising an area of single-storey 1930s bungalows on medium sized lots. Uniform appearance of the area stemming from development within a single period as well as the almost universal use of face brick.
 - The Kingsgrove East Precinct epitomises the area and era in both the excellent, intact nature of its houses, their gardens and street plantings.

- The Kingsgrove West urban conservation area, listed on the Register of the National Estate (a non-statutory register), which lies just west of the Kingsgrove East urban conservation area:
 - The precinct appears to have been built-up in the 1920s and consists of shrub lined streets.
 - The precinct possesses streetscape integrity because it was developed during one period.
 - The area has a uniformity of housing style including colour, form and architectural detail that gives the area a harmonious appearance.
 - The gardens are generally small and sparsely landscaped.
 - There are a small number of unsympathetic intrusions into this area but it is still remarkably intact.

Further information on the heritage items can be found in Technical Working Paper: Non-Aboriginal Heritage (AECOM, 2015). However, the Kingsgrove West urban conservation area extends beyond the assessment study area for non-Aboriginal heritage.

4.2.4 Landscape Character Zones

Landscape Character Zones (LCZs) were determined primarily by land use, as these were considered to be the strongest defining landscape character elements of the area. Five LCZs have been identified surrounding the western surface works area (refer **Figure 4-2**), comprising:

- 1) LCZ 1: Residential
- 2) LCZ 2: Industrial
- 3) LCZ 3: Recreational
- 4) LCZ 4: Transport corridor
- 5) LCZ 5: Urban centre.

Although these LCZs may extend beyond the study area boundary, the character of these zones was analysed and assessed within this boundary only, for the purposes of this report.

A further defining element of landscape character is topography (refer **Figure 4-3**), with the M5 East Motorway following the Bardwell and Wolli Creek Valleys, located along the valley floor.

4.2.4.1 Landscape Character Zone 1: Residential

The Residential LCZ flanks the western surface works along the north-western, south-western and central-northern boundaries of the site. The topography varies within this LCZ from flat to gently sloping towards the western surface works from the north and south (refer **Figure 4-3** and **Figure 4-13**).

This LCZ is made up of both Low and Medium Density zoned land, comprising predominantly single and double storey houses on individual lots with mature landscaping and street trees. Three non-statutory heritage conservation areas lie within the residential land in the study area: Kingsgrove East Urban Conservation Area, Kingsgrove West Urban Conservation Area, and the Pallamana Parade Urban Conservation Area. All three are well preserved examples of 1930s low density housing development.

This LCZ is characterised by generally wide, quiet streets periodically traversed by transport corridors (eg King Georges Road, the Airport, Inner West and South railway line, and the M5 East Motorway). Houses are set back from the roadways by mature, landscaped front gardens.

Where the boundaries of this LCZ flank the M5 East Motorway corridor, the residential housing is generally buffered by a strip of recreational land. At its narrowest, this buffer comprises the pavement of the M5 Linear Park pedestrian and cycle path (refer **Figure 4-14**). In other places, wide tracts of recreational land (LCZ 3) lie between the residential boundaries and the M5 East Motorway (refer **Figure 4-15**).



Figure 4-13 The topography of the Residential LCZ ranges from flat to gently sloping towards the western surface works



Figure 4-14 Residential boundary abutting LCZ 4: Infrastructure (the M5 East Motorway noise barriers) with the M5 Linear Park pedestrian and cycle path in between (the narrowest distance between LCZ1 and LCZ 4)



Figure 4-15 LCZ1: Residential boundary (left of frame) meeting LCZ 3: Recreational, with LCZ 4: Transport Corridor to right of frame (top of vegetated noise mound)

4.2.4.2 Landscape Character Zone 2: Industrial

Two pockets of Industrial development lie within the study area, one to the north of the M5 East Motorway along the north-eastern boundary of the western surface works, the other to the south of the M5 East Motorway, along the south-eastern boundary of the western surface works.

The northern industrial development pocket comprises an older mix of light industrial buildings, each addressing streets lined with mature street trees (refer **Figure 4-16**). The topography of the area gently slopes towards the project. Views within the area are predominantly funnelled along the streets, due to the scale of the industrial buildings and mature vegetation. This industrial area abuts residential neighbours to the west and east, Clemton Park to the north and the M5 East Motorway to the south.

The light industrial area to the south of the M5 East Motorway contains a mix of the older style, low rise industrial buildings with mature street trees similar to those seen on Garema Circuit, in addition to more recent, larger scale industrial complexes (refer **Figure 4-17** and **Figure 4-18**). The light industrial area to the south of the M5 East Motorway lies between the M5 Linear Park and the Airport, Inner West and South railway line, on the valley floor (refer **Figure 4-3**). It is buffered from residential development by the rail corridor to the south, Kingsgrove Road to the east, the M5 Linear Park to the north and by the continuation of Beverly Grove Park south to the west.



Figure 4-16 Mature street trees and some landscaping buffer industrial buildings along Garema Circuit.



Figure 4-17 Large scale industrial complexes on the southern edge of Wolli Creek channel to the south of the M5 East Motorway



Figure 4-18 Large scale industrial complexes on the southern edge of Wolli Creek channel to the south of the M5 East Motorway

4.2.4.3 Landscape Character Zone 3: Recreational

A number of pockets of recreational land lie within the western surface works study area. They can be broadly divided into four groups:

- Recreational land within the visual catchment of the M5 Linear Park, including:
 - Four small pocket parks and one pocket park with a large stormwater basin to the north and south of the M5 along the pedestrian / cyclist pathway between Cooloongatta Road and Kooemba Road,
 - Tallawalla Reserve, a flat, linear park on Tallawalla Street (south of the M5 East Motorway), which has a children's playground and an informal netball practice area divided by two residential blocks (refer **Figure 4-19**),
 - Beverly Grove Park South, a narrow elevated park lying south of the M5 and north of Wolli Creek at the eastern end of the western surface works site area (refer **Figure 4-20**),
 - Beverly Grove Park North, a large flat parkland lying to the north of the M5, abutting back fences of residences on Rosebank Avenue, Armitree Street and Glamis Street (refer **Figure 4-21**).
- Recreational land outside the M5 Linear Park, including Beverly Hills Park
- Canterbury Golf Course
- Beverly Grove bushland, a pocket of Cooks River / Castlereagh Ironbark Forest, an Endangered Ecological Community.

These parks provide a buffer between the M5 East Motorway and neighbouring developments, as well as providing recreational green space for users. They share similar character (with the exception of the Beverly Grove bushland) in that they are open, turfed spaces, generally with fringing vegetation and scattered shade trees. All are vegetated with mature tree and shrub vegetation (particularly on the noise mounds between the M5 East Motorway and the parks, and on the edges of the Wolli Creek channel), and address the streets to varying degrees. The edges of the two largest of these parks (at the eastern end of the site) predominantly address the unscreened back fences of neighbouring residential or industrial properties (refer **Figure 4-22**).

Considering the observed relatively high utilisation of the M5 Linear Park pedestrian and cycle path, it is assumed that all parks within the M5 Linear Park have a relatively high usage rate by residents of surrounding areas for active and passive recreation activities.

Where this LCZ meets the boundary with the M5 East Motorway (LCZ 4), it is visually delineated by the top of the noise mound between the Motorway and the northern edge of the recreational space. The LCZ is therefore partly characterised by the noise mound batter facing that land, which assists in spatially defining the area.



Figure 4-19 Eastern end of Tallawalla Reserve, with informal netball facilities and Wolli Creek in the background, screened by trees



Figure 4-20 Beverly Grove Park South, with the M5 East Motorway screened by the noise mound to right of frame, and Wolli Creek to the south, screened by trees to the left of frame



Figure 4-21 Beverly Grove Park North, bounded to the north by residential neighbours (right of frame) and to the south by the M5 East Motorway (noise mound to the left of frame)



Figure 4-22 Residential neighbouring properties backing onto Beverly Grove Park North

4.2.4.4 Landscape Character Zone 4: Transport corridor

Within the study area, this LCZ comprises:

- The M5 East Motorway
 - A linear element that cuts through the landscape, providing an effectively impenetrable visual barrier in between interchanges
 - Visually confined by substantial noise walls, landscaped buffer mounds, and parks associated with the M5 Linear Park
 - Views within the LCZ are predominantly contained within the Motorway by vegetated mounds and noise walls, or retaining walls where the carriageway is lower than the surrounding area. Limited glimpse views are available to the surrounding landscape.

Some views into this LCZ are afforded at interchanges where a road passes over the Motorway.

- The Airport, Inner West and South railway corridor
 - Defined by its use as a utilitarian transport corridor with limited qualities beyond that (eg scenic, environmental etc.)
 - Visually confined by substantial noise walls where the rail line passes at or above the grade of the surrounding landscape, or retaining walls where the rail lines pass below the ground level of the surrounding landscape.
- Major road corridors
 - King Georges Road and Kingsgrove Road
 - While these are large scale transport corridors, the urban design and land use on either side of the roadways help to integrate these elements into the surrounding landscape.

All of these transport corridors are linear elements which cut across the landscape, although as noted, the M5 East Motorway and rail corridors are more visually detached from the surrounding landscape than the major road corridors, which tend to be integrated into their surroundings due to urban design and land use.

4.2.4.5 Landscape Character Zone 5: Urban centre

A minor urban centre lies south-east of Kingsgrove Railway Station, along Kingsgrove Road around 200 metres from the south-eastern corner of the western surface works site boundary. It is a small cluster of commercial development with a few scattered community facilities.

The commercial development lines Kingsgrove Road between the rail corridor south to Edward Street, with limited community facilities (an Anglican and Catholic Church, police station and school) sited behind the commercial strip and in the side streets.

Views to and from this LCZ are limited by landform and built form, with no views available to the western surface works site afforded from public spaces within this LCZ.

4.3 Bexley Road surface works

The Bexley Road surface works site comprises three distinct areas (refer **Figure 4-23**):

- Bexley North (location of Bexley North (C4) construction compound) is bounded by the M5 to south, Bexley Road to the east, and the back boundaries of residential homes fronting onto Flatrock Road and Jones Avenue. In its current state, it is a flat piece of vacant land fenced off with chain link fencing (refer **Figure 4-24**)
- Bexley South (location of Bexley South (C5) construction compound and permanent site of the Bexley Road Motorway operations complex is bounded by the M5 East Motorway along its northern boundary and Bexley Road to the east, and is currently recreational land within the M5 Linear Park. It is vegetated by mature and semi mature trees and shrubs, and is bounded by Wolli Creek to the south which is fringed with trees (refer **Figure 4-25**)
- Bexley East (location of Bexley East (C6) construction compound) is bounded by Bexley Road to the west, the back boundaries of residential properties fronting onto Wolli Avenue to the north, and the back boundaries of residential properties fronting onto Johnston Avenue to the north-east. The M5 East filtration plant and motorway operations support is currently undertaken at this site (refer **Figure 4-26**). It is publicly inaccessible.

The three separate sites that make up the Bexley Road surface works site are broadly arranged around the M5 East interchange at Bexley Road. The M5 East Motorway and Bexley Road separates the Bexley North, Bexley South and the Bexley East construction compound sites.

4.3.1 Topography and visibility

The Bexley Road surface works site lies north of Wolli Creek, broadly on the valley floor (refer **Figure 4-27**). The landform rises to the north almost immediately from Wolli Creek to a ridge line approximately 400 metres north of the northern boundary of the site. The M5 East Motorway, adjacent to Wolli Creek to the north, has been built up above the valley floor, before entering a dive structure under Bexley Road.

Although lying on the valley floor with a ridge line wrapping around the northern boundary of the site, the Bexley Road motorway operations complex is compartmentalised by Wolli Creek and large infrastructure elements (namely the M5 East Motorway, Bexley Road, Wolli Creek and the rail corridor to the south), and as such screened by localised elements, including:

- Walls, such as noise walls and screening walls, particularly associated with the M5 East Motorway corridor (refer **Figure 4-28**) which limit views along Bexley Road
- Mature vegetation, including street trees, park trees, and riparian vegetation along Wolli Creek (refer **Figure 4-29**) which particularly limit views from areas south of Wolli Creek northwards to the site and from areas to the east, where the further riparian vegetation associated with Wolli Creek (east of Bexley Road) block views back to the site
- Landform, such as noise mounds and other mounds mitigating level changes between roadways and Wolli Creek (refer **Figure 4-30**).

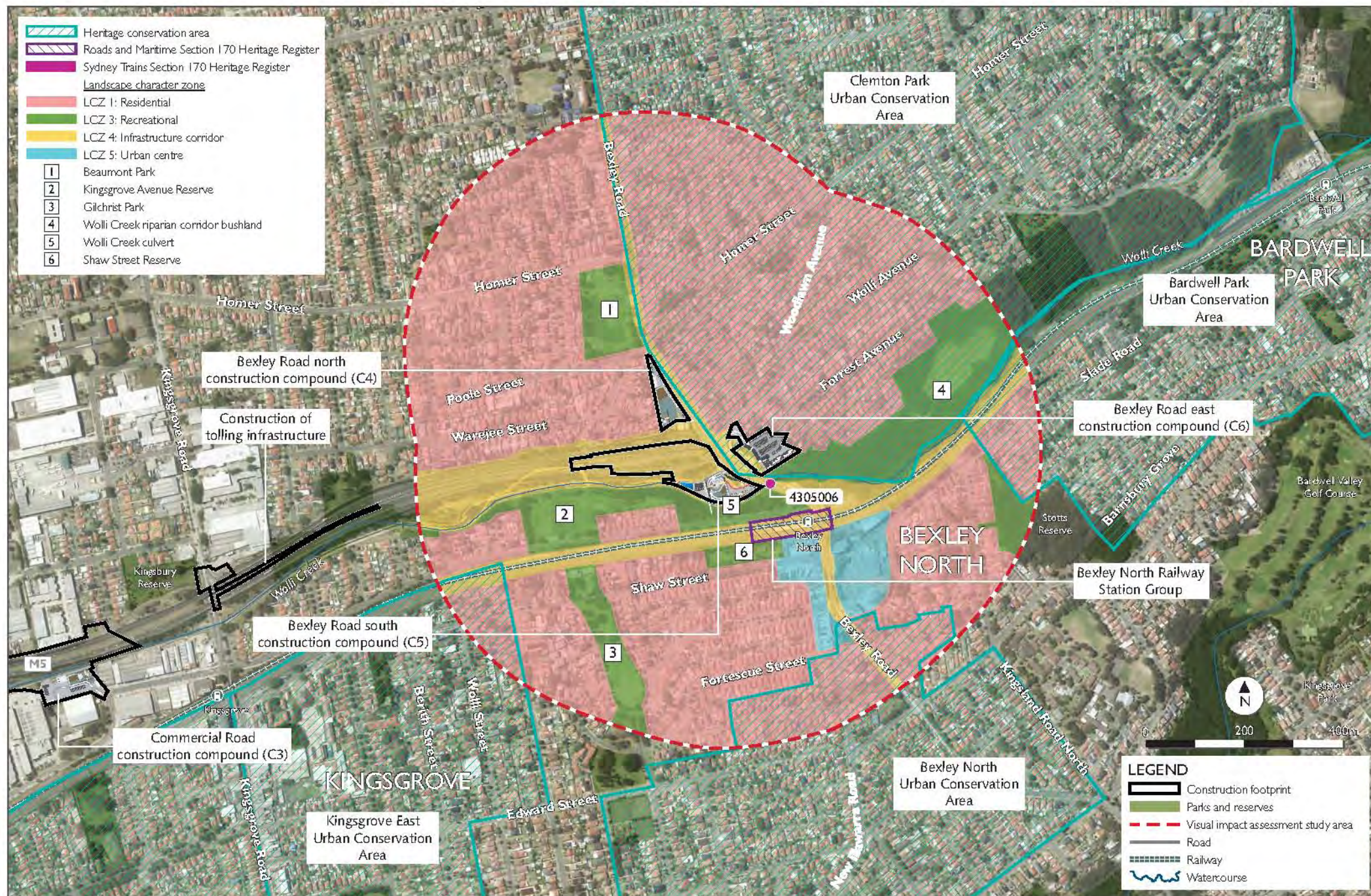


Figure 4-23 Landscape character zones - Bexley Road surface works



Figure 4-24 Bexley Road surface works site area: Bexley north (Bexley Road North construction compound), with the entry to the M5 Linear Park to the left of frame and Bexley Road to right of frame



Figure 4-25 View east from the M5 Linear Park pedestrian and cycle path to the site of Bexley Road surface works site: Bexley south (Bexley Road South construction compound and site of permanent MOC2), with the entry to the M5 Linear Park to the left of frame and Wolli Creek (fringed with trees) to right of frame



Figure 4-26 View east from the exit of the pedestrian overpass to the Bexley East site area (Bexley Road East construction compound), which lies beyond the sandstone wall

4.3.2 Context

The land occupied by the Bexley Road surface works sites is zoned SP2 Infrastructure (refer **Figure 4-31**) and is bisected by the M5 East Motorway and Bexley Road into the three distinct areas, as listed in **Section 4.3**. All three areas have been used for construction purposes in the past, with the northern and eastern sites remaining fenced off from public access. The southern part of the site (Bexley South, between Wolli Creek and the M5 East Motorway) has been landscaped and is currently utilised as a public recreational area, part of the M5 Linear Park.

Wolli Creek flanks the Bexley South and Bexley East sites to the south, comprising a fenced concrete channel with occasional pockets of in-channel vegetation (either reed beds or weedy tree species), and a fringe of mature riparian vegetation which limits views to the south. The land immediately south of Wolli Creek is zoned Public Recreation (Kingsgrove Avenue Reserve), and comprises a steep, densely vegetated embankment rising to the pedestrian path on Kingsgrove Avenue and the rail line.

The western boundary of the Bexley North site backs onto the back yards of a number of residential properties, which front onto Flatrock Road and Jones Avenue. These dwellings lie within Medium Density zoned land, but generally comprise double story brick dwellings on single lots (ie low density housing). The streetscape in this area is characterised by a mix of older style and new single and double storey brick homes with generally well established gardens and mature street trees.

Along the north-eastern boundary, the Bexley North construction compound site is flanked by Bexley Road and similar low density residential development on Low Density zoned land. Bexley East is bounded on the east by low density housing (refer **Figure 4-32**), and to the west by Bexley Road. To the south, the site adjoins a bushland area associated with the western extent of Bardwell Valley Park, which is zoned National Parks and Nature Reserves. At the boundary, the park is well vegetated with a mix of mature indigenous tree and shrub vegetation and woody weeds such as Large Leaf Privet. This vegetation effectively screens the Bexley East construction compound site from the south (refer **Figure 4-33**).



Figure 4-28 Noise and screening walls associated with the M5 East Motorway



Figure 4-29 Mature vegetation associated with Wolli Creek riparian corridor and Kingsgrove Avenue Reserve as seen from Bexley Road



Figure 4-30 Noise mound between the M5 East Motorway and Wolli Creek with Kingsgrove Avenue Reserve to right of frame

This page has been left blank intentionally.

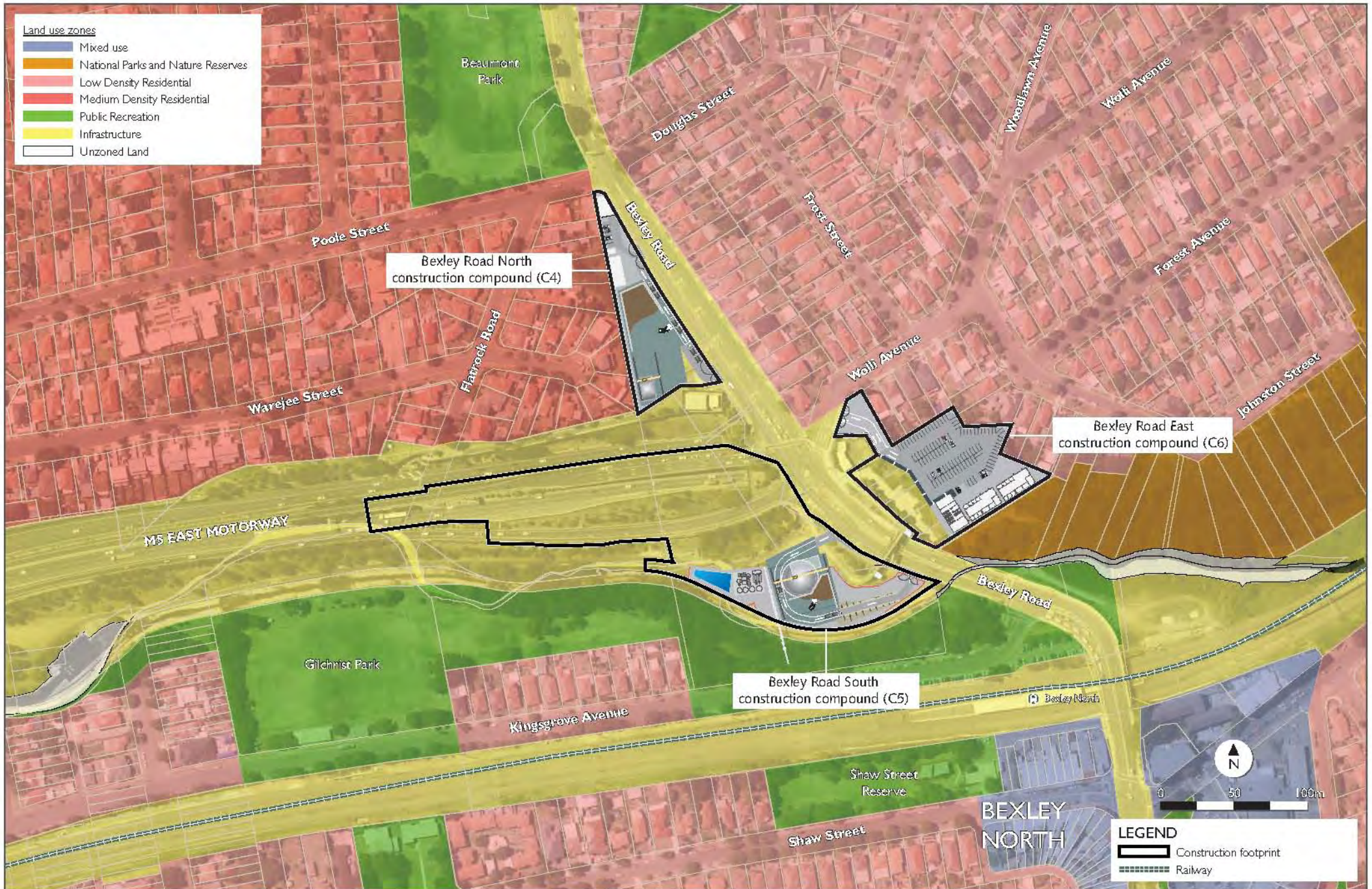


Figure 4-31 Bexley Road surface works area with surrounding land zoning



Figure 4-32 Typical low density housing along the eastern boundary of the Bexley East construction compound site.



Figure 4-33 View to the Bexley East construction compound site from the intersection of Bexley Road and Kingsgrove Avenue

4.3.3 Heritage sites

Although heritage items may not be directly affected by the project, they may be indirectly impacted through physical and visual encroachment into curtilage areas, and changes to the heritage context of the landscape.

An assessment of heritage items and heritage conservation areas in and around the project corridor include:

- Bexley North Railway Station Group, listed on the Sydney Trains Section 170 Heritage and Conservation Register located in Bexley Road, Bexley North.
- Wolli Creek culvert, listed on the Roads and Maritime Section 170 Heritage and Conservation Register, located in Bexley Road, Earlwood.
- Clemton Park heritage conservation area, listed on the Register of the National Estate (a non-statutory register), located within and adjacent to the Bexley Road East construction compound; and
- Wolli Creek Valley, listed on the Rockdale Local Environmental Plan as an item of local significance and located to the east of the Bexley Road surface works.

4.3.4 Landscape Character Zones

Landscape Character Zones (LCZs) were determined primarily by land use, as these were considered to be the strongest defining landscape character elements of the area. Four LCZs have been identified surrounding the BRSW area (refer **Figure 4-23**), comprising:

- 1) LCZ 1: Residential
- 3) LCZ 3: Recreational
- 4) LCZ 4: Transport corridor
- 5) LCZ 5: Urban centre.

Although these LCZs may extend beyond the study area boundary, the character of these zones was analysed and assessed within this boundary only, for the purposes of this report.

4.3.4.1 Landscape Character Zone 1: Residential

The land within the study area surrounding the Bexley Road surface works site predominantly comprises the Residential LCZ, zoned Medium Density to the west of Bexley Road north of the M5 East Motorway, and Low Density in all other areas (refer **Figure 4-31**). This LCZ adjoins or lies adjacent to three site boundaries at this location:

- The western boundary of the Bexley North site
- The northern and north-eastern boundaries of the Bexley East site.

Housing to the north-west and south / south-west of the Bexley Road surface works site predominantly comprises single story red brick dwellings with established landscaped gardens and mature street trees. Some double story and rendered homes are also present. Many of the older homes (particularly those north-west of the Bexley North site) have more sparsely landscaped front yards and low brick fences (refer **Figure 4-34**).

Housing to the north-east and east of the site is less homogenous, but typically newer, larger, two story homes with a mix of brick and rendered brick facades (refer **Figure 4-35**) with mature landscaping and street trees.

4.3.4.2 Landscape Character Zone 3: Recreational

Within the study area, recreational land can be broadly divided into three groups (refer **Figure 4-23**):

- Parks with organised sporting facilities
 - Beaumont Park, which comprises a sporting field, play equipment and toilet block, and is bounded by Bexley Road to the east, Poole Street to the south, Homer Road to the north and residential housing to the western boundary (fronting onto Woorail Avenue).
 - Kingsgrove Avenue Reserve, with sporting sheds, sports field, toilets, play equipment, and is used by a local soccer team (refer **Figure 4-36**)
 - Parks typically characterised by flat topography and central playing fields surrounded by mature shade and street trees. Some informal play spaces and playgrounds provided at periphery of these parks

- Green spaces within the M5 Linear Park
 - A series of informal green space situated between the M5 East Motorway and Wolli Creek and linked with a designated share path (refer **Figure 4-37**)
 - Moderate to steep sloped site with turf and scattered trees and clumped mature vegetation
 - Popular pedestrian and cycle path links these spaces together on both the northern and southern sides of the M5 East Motorway
 - Although this area is used as recreational space, its land use is zoned SP2 Infrastructure
- Bushland reserves / National Parks
 - Western extent of Bardwell Valley Park, east of Bexley Road (refer **Figure 4-38**)
 - Vegetated Wolli Creek riparian corridor west of Bexley Road (part of Kingsgrove Avenue Reserve but very different in character and usage, refer **Figure 4-39**)
 - These are heavily vegetated riparian corridors with limited public access due to dense bushland of varying quality and steep slopes.

The recreational land within the M5 Linear Park at the intersection of the M5 East Motorway and Bexley Road (north of Wolli Creek) lies within the Bexley Road surface works site. The southern boundary of the Bexley Road surface works site (Bexley South and Bexley East construction compounds) lies adjacent to riparian vegetation associated with Wolli Creek. This land visually functions to screening the site from southern areas.



Figure 4-34 Typical low density housing on Kingsgrove Avenue near Bexley Road



Figure 4-35 Typical two storey brick residences on Bexley Road near the M5 East Motorway



Figure 4-36 View of Kingsgrove Avenue Reserve from the southern side of Kingsgrove Avenue



Figure 4-37 Entry to the M5 Linear Park (south of the M5 East Motorway) with riparian vegetation of Wolli Creek in the background



Figure 4-38 Bardwell Valley Park seen in the background beyond Bexley Road



Figure 4-39 Sloping recreational land south of Wolli Creek, with Kingsgrove Avenue to the right of frame

4.3.4.3 Landscape Character Zone 4: Transport corridor

Within the study area, this LCZ comprises:

- The M5 East Motorway
 - A linear element that cuts through the landscape, providing an effectively impenetrable visual barrier between interchanges.
 - Visually confined by substantial noise walls and landscaped buffer mounds (refer **Figure 4-40**)
 - Views within the LCZ are predominantly contained within the M5 East Motorway by vegetated mounds and noise walls, or retaining walls where the carriageway is lower than the surrounding area. Limited glimpse views are available to the surrounding landscape.
 - Some views into this LCZ are afforded at interchanges where a road passes over the M5 East Motorway.
- The rail corridor
 - Defined by its use as a utilitarian transport corridor with limited qualities beyond that (e.g. scenic, environmental, etc.)
 - Visually confined by substantial noise walls where the rail line passes at or above the grade of the surrounding landscape, or retaining walls where the rail lines pass below the ground level of the surrounding landscape (refer **Figure 4-41**). Views into and out of the rail corridor open up at station precincts, in this case, at Bexley North Station.
- Major road corridors
 - Bexley Road
 - Although Bexley Road is a large scale transport corridor, the urban design and land use on either side of the roadways allow integration of these elements into the surrounding landscape (refer **Figure 4-42**). The road is at grade, and development addresses the corridor along its length.

All these transport corridors are linear elements which bisect the landscape, although as noted, the M5 East Motorway and rail corridors are more visually detached from the surrounding landscape than the major road corridors, which tend to be integrated into their surroundings due to urban design and land use.

4.3.4.4 Landscape Character Zone 5: Urban centre

An urban centre is situated on the southern side of the rail line adjacent to Bexley Railway Station, around 150 metres from the south-eastern corner of the Bexley Road surface works site boundary. It comprises a small commercial area with shops, cafes and restaurants, community facilities (eg. a public library), and a number of small pocket parks with limited facilities.

Views to and from the urban centre are limited to within the road corridor between bends, and are blocked by built form and the flat landform within the valley floor. In addition, the generally visually impermeable rail corridor infrastructure LCZ lies between this LCZ and the Bexley Road surface works site. No views are available from this LCZ to the Bexley Road surface works site.



Figure 4-40 View west towards the entry / exit to the M5 East Motorway from Bexley Road. Views to and from the M5 East Motorway are screened by noise walls, noise mounds and screening vegetation



Figure 4-41 Views into and out of the rail corridor between stations are limited by noise walls and screening vegetation (to right of frame)



Figure 4-42 Bexley Road is integrated into the surrounding landscape by land use and urban design.

4.4 Arncliffe surface works

The site for the Arncliffe surface works is located in the north-western section of Kogarah Golf Course, which is bounded by Marsh Street to the north, the M5 East Motorway to the south-west and Cooks River to the east. The site is a key point on the alignment for both construction and operational requirements. Permanent operational facilities include a ventilation facility (including emergency smoke extraction), air intake facility and an operational water treatment plant (refer **Figure 4-43**). The Arncliffe construction compound would occupy a larger area of the golf course which would be returned following completion of construction.

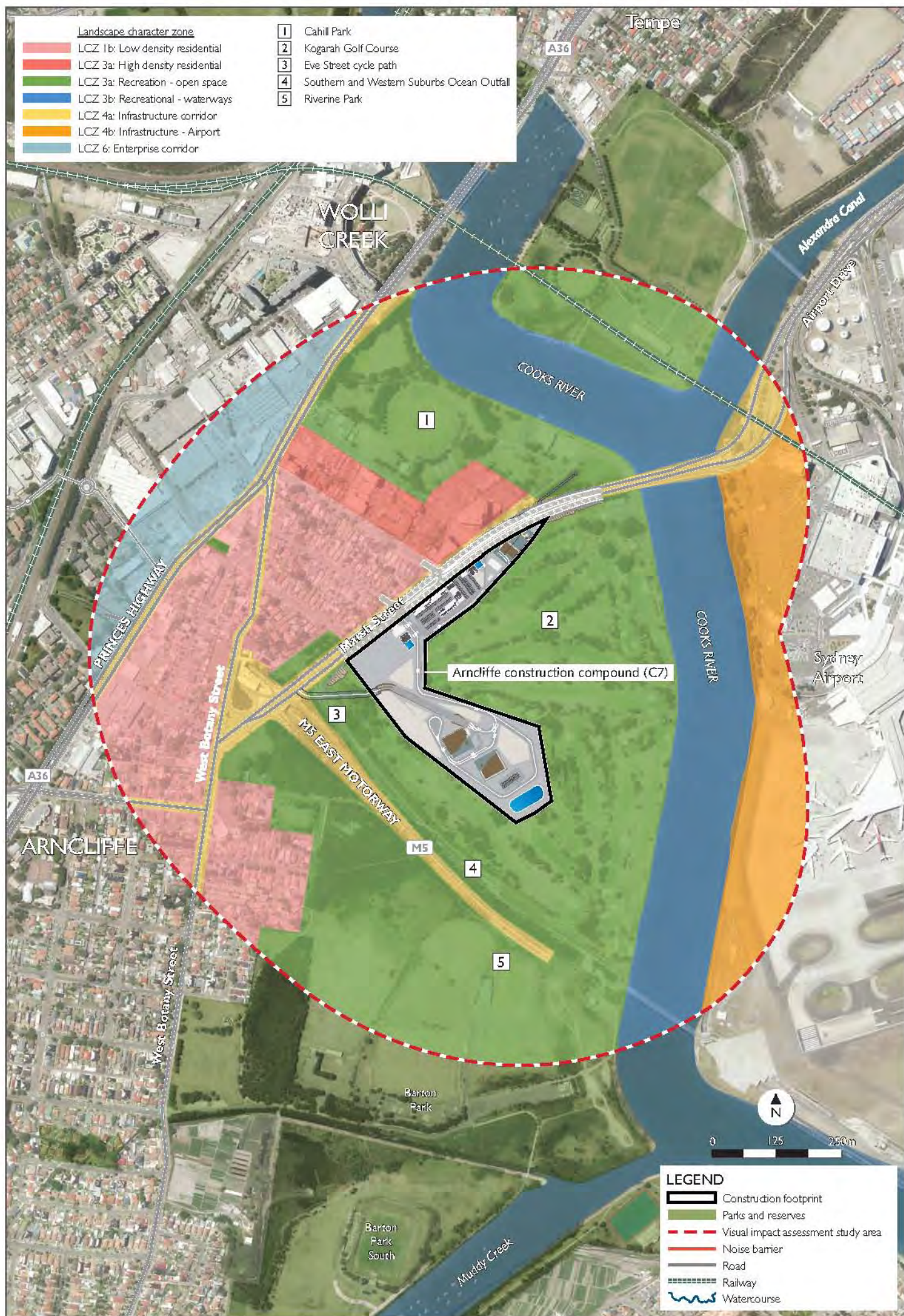
4.4.1 Topography and visibility

The land surrounding the Arncliffe surface works is generally low-lying and flat due to its proximity to Cooks River and Botany Bay (refers to **Figure 4-44**). The topography begins to rise from the north-western corner westwards, but no significant or district views to or across the site are be available from ridgelines due to the very gradual rise and distance from elevated ground. A view across the site (eastwards) is available from the north-western corner of the site on Marsh Street where the street rises to a bridge over the M5 East Motorway (refer **Figure 4-45**).

The Cooks River is a highly urbanised catchment with a history of intensive land use, dominated by low density residential development and pockets of industrial areas concentrated in Botany along the Alexandra Canal within Tempe. Views to the site from much of the low density residential development are limited by the flat landform and low (single and double storey) housing, although some views would be available from taller buildings in surrounding areas, namely from the high density and Mixed Use zoned land to the north of the site.

Views from the M5 East Motorway (along the western boundary of the golf course) are screened by landform, vegetation and noise barriers associated with the road corridor. No views are available from beyond the M5 East Motorway corridor (ie from Cahill Park and Riverine Park, which lie on the western side of the M5 East Motorway)

This page has been left blank intentionally.



This page has been left blank intentionally.

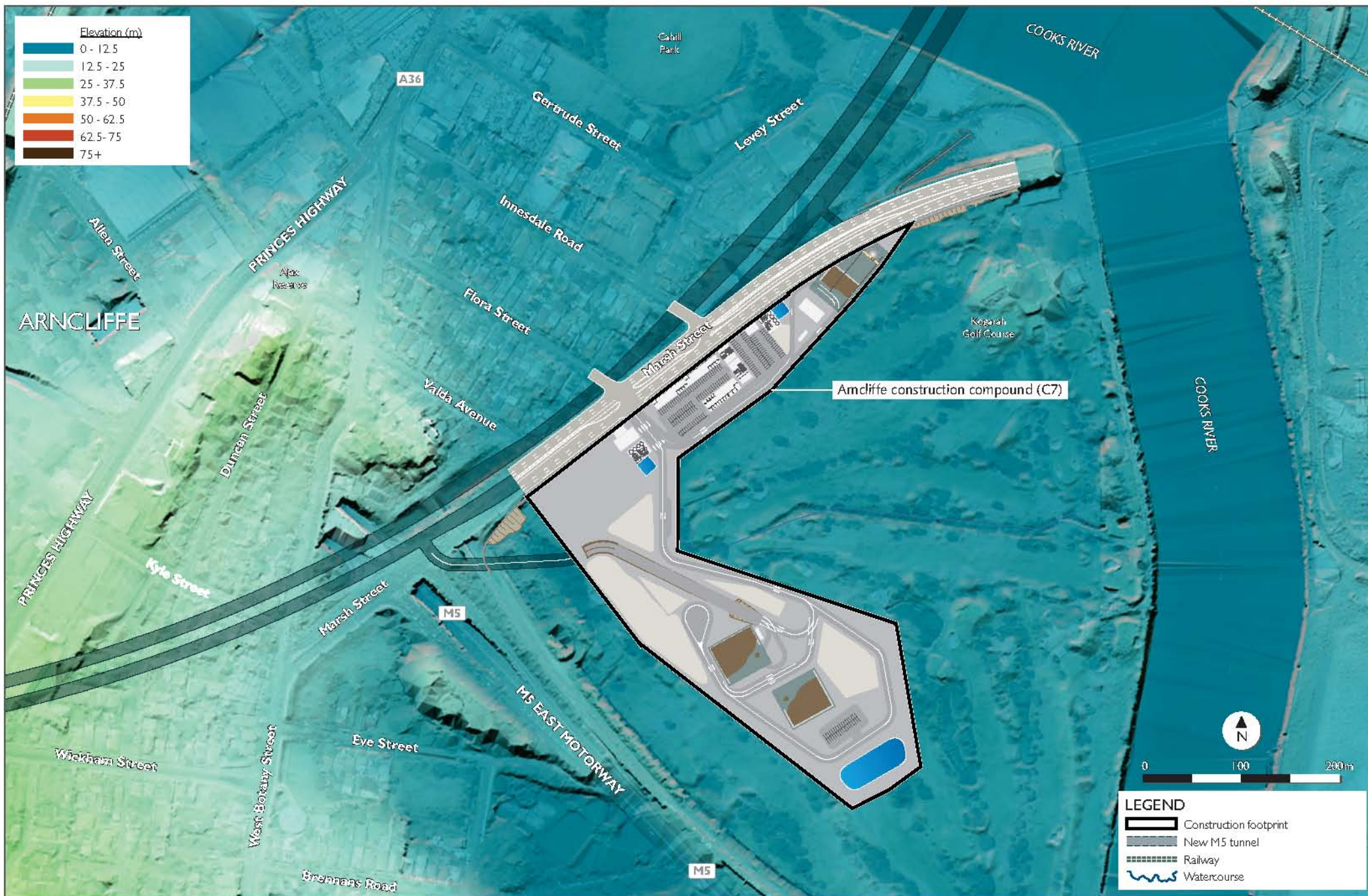


Figure 4-44 Topography of the surrounding environment - Arncliffe surface works



Figure 4-45 View eastwards over the Kogarah Golf Course from the foot path on Marsh Street where the street rises to pass over the M5 East Motorway

4.4.2 Context

The Arncliffe surface works site is located in the eastern corner of Kogarah Golf Course. The golf course is a roughly triangular site, bounded by (refer **Figure 4-46**):

- Marsh Street, which forms the northern boundary of the site and crosses the Cooks River at the north-eastern boundary
- The M5 East Motorway / Eve Street cycleway along the south-western boundary (refer **Figure 4-47**)
- Cooks River along the eastern boundary, with Sydney Airport situated on the other side of the river.

Arncliffe Railway Station is located 600 metres east of the site at the corner of Burrows Road and Arncliffe Street and operates on the Eastern Suburbs and Illawarra line.

The land to the east of the Arncliffe surface works site (on the eastern bank of the Cooks River) is Sydney Airport, which is zoned SP2 Infrastructure. A majority of the land surrounding the site to the west is zoned Low Density Residential, with pockets of Mixed Use, High Density Residential and Public Recreation, particularly to the north of Marsh Street.

The golf course is well connected to other recreational open space along the Cooks River to the north and south. Cahill Park forms the open space to the north of the site and includes playing fields, tennis courts and St George Rowing Club. Riverine Park is located to the south of the site at the confluence of the Cooks River and Muddy Creek.

The Eve Street Cycleway is part of the greater Cook Park Trail which runs along the north-western and south-western boundary of the golf course, it is an off-road pedestrian and cycling route that follows the western foreshore of Botany Bay. The trail also connects with the Cooks River Cycleway at Tempe to the north which leads to Olympic Park at Homebush.

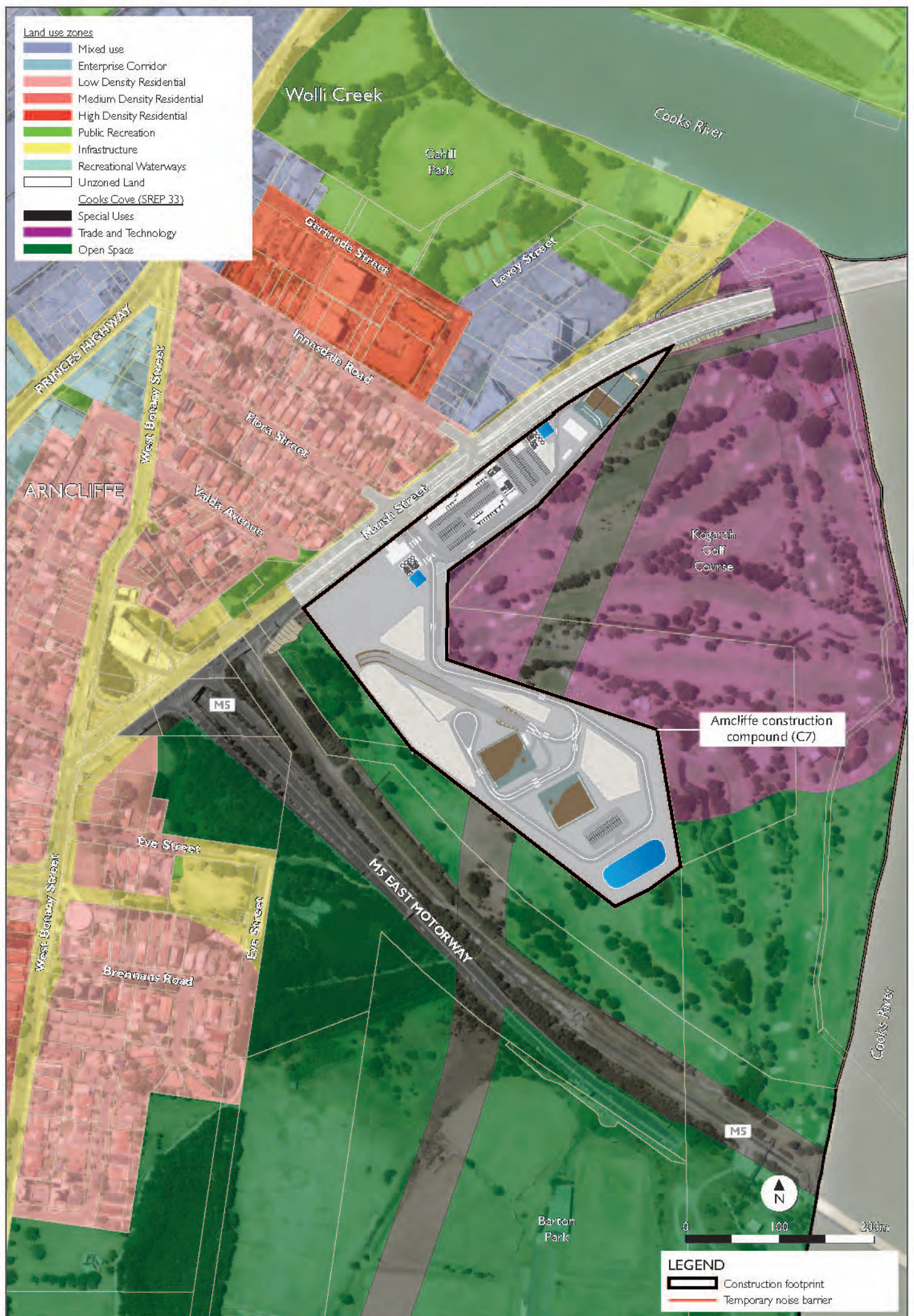


Figure 4-46 Arncliffe surface works site with surrounding land zoning



Figure 4-47 View from the Eve Street cycleway showing the relationship of the M5 East Motorway (to right of frame, screened by vegetation), the Western Outfall Main Sewer, the cycle path, and the Kogarah Golf Course (beyond the fence to the left of frame).

4.4.3 Heritage sites

Heritage items and heritage conservation areas in and around the project corridor include (refer **Figure 4-43**):

- Western Outfall Main Sewer – Rockdale to Homebush (a State Heritage item) located at corner of Marsh Street and M5 East Motorway (refer **Figure 4-47**).

4.4.4 Landscape Character Zones

Landscape Character Zones (LCZs) were determined primarily by land use, as these were considered to be the strongest defining landscape character elements of the area. Three LCZs have been identified in the area surrounding the MOC3 site (refer **Figure 4-43**), comprising:

- 1) LCZ 1: Residential:
 - a) High Density Residential
 - b) Low Density Residential
- 3) LCZ 3: Recreation:
 - c) Recreation - open space
 - d) Recreation - waterways
- 4) LCZ 4: Infrastructure:
 - e) Transport corridor
 - f) Infrastructure airport

Although these LCZs may extend beyond the study area boundary, the character of these zones was analysed and assessed within this boundary only, for the purposes of this report.

4.4.4.1 Landscape Character Zone 1: Residential

LCZ 1a: High Density Residential

This LCZ comprises a small portion to the north of the site and borders Innesdale Road and Marsh Street. A combination of residential apartments and airport transit hotels overlook the Kogarah Golf Course and beyond (refer **Figure 4-48**). This area is characterised by closely spaced high rise buildings with limited green open space at ground level. Opportunities for district and regional views from these buildings would be available.

Some areas of this LCZ are still under construction (eg the Mixed Use zoned land near Marsh Street). Residents had not yet moved into the buildings and the hotels were not yet operational.

LCZ 1b: Low Density Residential

The Low Density Residential LCZ forms a large area to the west of Marsh Street, West Botany Street and south of the M5 East Motorway. This LCZ comprises predominantly single and double storey houses on individual lots with mature landscaping and street trees (refer **Figure 4-49**). The LCZ is characterised by generally wide, quiet streets periodically traversed by transport corridors (eg Marsh Street, West Botany Street and M5 East Motorway). A mix of architectural styles are employed within this area, including single story Federation housing, fibro cottages and more modern two storey brick and rendered homes.



Figure 4-48 View looking east along Marsh Street from the north-western corner of Kogarah Golf Course, showing high rise development within LCZ 1a: High Density Residential



Figure 4-49 Typical housing and local park within the Low Density Residential LCZ

4.4.4.2 Landscape Character Zone 3: Recreational

A large expanse of recreational land lies within and to the north, south and east of Kogarah Golf Course. This can be broadly divided into two groups:

- LCZ 3a: Recreation – open space
- LCZ 3b: Recreation – waterways

LCZ 3a: Recreation – open space

This LCZ is characterised by greenspace used for passive and active recreational pursuits, including cycling, walking / running, organised and informal sporting activities, and picnics. They are generally large, turfed open spaces with mature vegetation (often fringed with mature trees).

This LCZ is zoned as Public Recreation and is well connected to other recreational open spaces along the Cooks River to the north and south. Cahill Park forms the open space to the north of the site and includes playing fields, tennis courts and St George Rowing Club. Riverine Park is located to the south of the site at the confluence of the Cooks River and Muddy Creek.

Kogarah Golf Course is also contained within this LCZ. The land is broken up into open, turfed fairways divided by patches of mature vegetation. It does not address the Cooks River due to its designed purpose.

LCZ 3b: Recreation – waterways

This LCZ is characterised by recreational land directly adjacent to waterways. They are often narrow (sometimes limited to pedestrian / cycle access only) with occasional breakout spaces, areas of mature 'bushland' pockets, and turfed green spaces. These areas are predominantly used for active recreation (walking / cycling) as well as the waterway itself, which is used for active aquatic-based recreation activities rowing, kayaking and fishing

This LCZ is located north of the Marsh Street Bridge, along the Cooks River.

4.4.4.3 Landscape Character Zone 4: Infrastructure

Within the study area, this LCZ is divided into two groups:

- Infrastructure – transport corridor
- Infrastructure – airport.

These LCZs are utilitarian in nature, characterised by the individual spatial necessities of their transport uses.

LCZ 4a: Infrastructure – corridor

This LCZ comprises the following main roads:

- M5 East Motorway (refer **Figure 4-47**), a linear element that cuts through the landscape, providing an effectively impenetrable visual barrier. It is visually confined by noise walls, landscape buffer planting and open spacing including Kogarah Golf Course and Riverine Park. Views within the LCZ are predominantly contained within the Motorway
- Marsh St (refer **Figure 4-50**), West Botany Street and Wickham Street are major roads that traverse through the landscape, although unlike the M5 East Motorway corridor, they are more visually integrated with the surrounding landscape due to land use and urban design initiatives. A majority of these roads lie at grade with the surrounding landscape.

LCZ 4a: Infrastructure – airport

This LCZ comprises the land east of the Cooks River that forms Sydney Airport. It is a large, flat, treeless area bounded by waterways and large road ways, characterised by large expanses of turf and runways, occasional scattered low buildings such as terminals, hangars and sheds, and aircraft (both on the ground, taking off and landing). The airport is visually isolated from surrounding areas by buffer zones and fencing, therefore no detailed views are generally available to and from elements within the land (eg terminals and aircraft hangers).



Figure 4-50 View looking west along Marsh Street, showing fencing of residential properties to the right of frame and the screening vegetation associated with Kogarah Golf Course to the left of frame

4.5 St Peters interchange and surrounds

The St Peters interchange site is located approximately six kilometres south of the Sydney CBD and 1.5 kilometres north of the Sydney Airport. The interchange site comprises the Alexandria Landfill site and is adjacent to Sydney Park, which is a regional park managed by City of Sydney. The interchange site is bounded by (refer **Figure 4-51**):

- The Princes Highway and the back of industrial complexes fronting onto Princes Highway along the north-western boundary
- Canal Road on the south-western boundary, and the rear of industrial complexes fronting onto Canal Road and Burrows Road at the southern corner of the proposed interchange site
- Campbell Road along the north-eastern boundary
- Burrows Road along the south-eastern boundary
- Additional outlying areas of the project site (including outlying construction compound sites / bridge construction sites or local road upgrades) affect the following:
 - Alexandra Canal
 - Gardeners Road
 - Bourke Road
 - Campbell Street
 - Euston Road
 - Sydney Park.

Local road upgrades also affect small areas of a number of streets where they join main roads. Refer Section 4.5.5 for details regarding these streets.

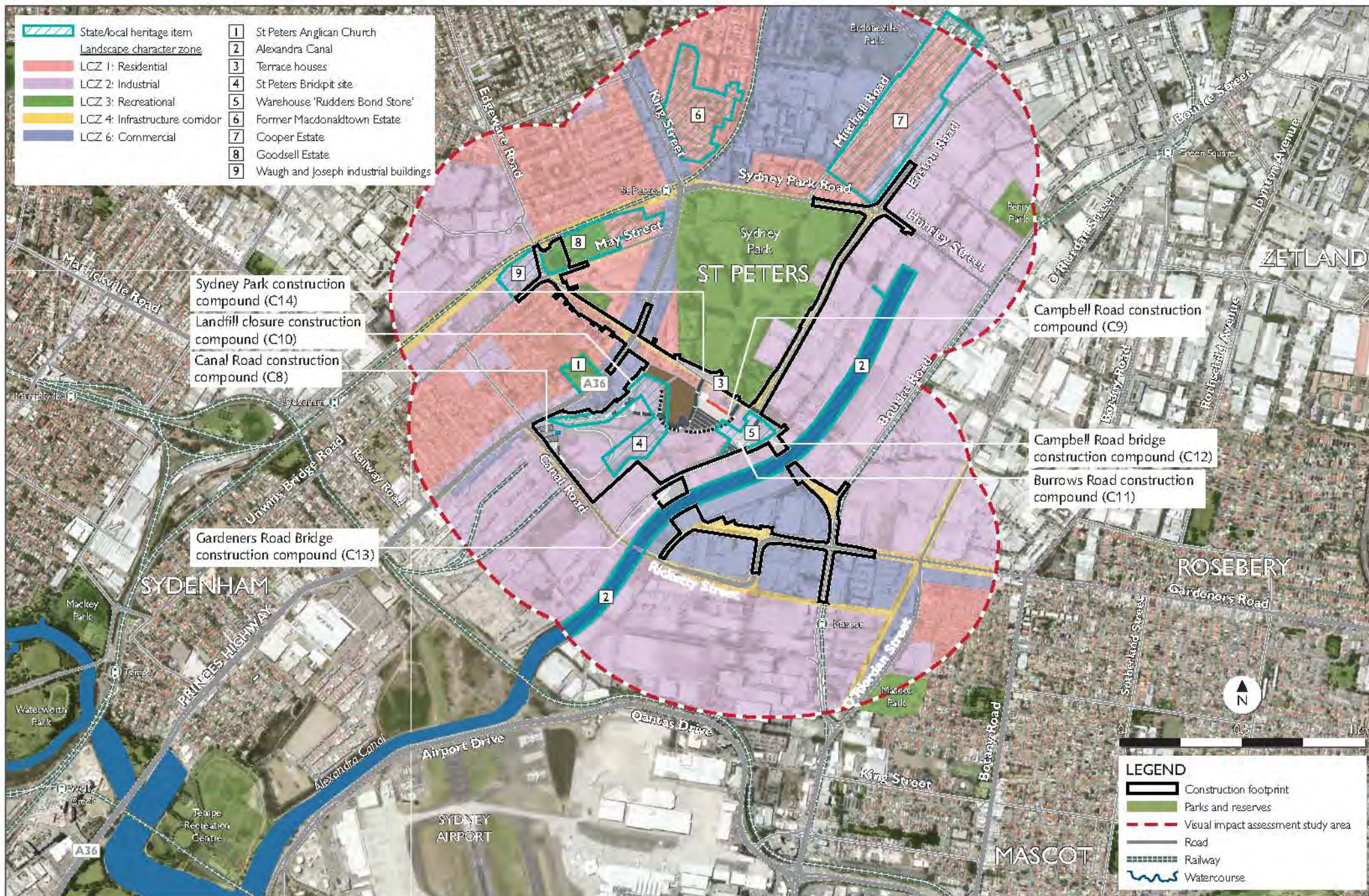


Figure 4-51 Landscape character zones - St Peters interchange and local road upgrades

4.5.1 Topography and visibility

The St Peters interchange site lies within a flat, low lying area adjacent to the Alexandra Canal (refer **Figure 4-52**). West of the Alexandra Canal, the landform gently rises to the Princes Highway corridor, which indicatively follows a low ridgeline. Views from the Princes Highway west towards the canal are generally screened by hoarding and opaque fencing surrounding the landfill, and industrial complexes along the Princes Highway. Some localised mounding on the northern side of the highway (eg the St Peters Anglican Church, refer **Figure 4-53**) provides glimpse views over the fencing and to the landfill site itself, but views to the canal itself are not available due to viewing distance and obstruction by buildings and vegetation (refer **Figure 4-54** and **Figure 4-55**).

The Alexandra Canal is bounded on both banks by large industrial complexes, therefore no views from the canal itself would be available to the site (refer **Figure 4-55**).

Sydney Park, located to the north of the interchange site, comprises a series of constructed landforms, the tallest reaching 30 metres. These landforms form the highest viewing positions within the surrounds of the St Peters interchange, providing views to Sydney Airport and Sydney CBD. However no views are obtained to landfill site due to mature fringing vegetation surrounding the park, residential housing and localised landform (refer **Figure 4-56**).

4.5.2 Context

The St Peters interchange site lies on land zoned as (refer **Figure 4-57**):

- IN1 General Industrial (a majority of the site)
- SP2 Infrastructure
- IN2 Light Industrial (the north-western corner at the Princes Highway, Canal Road intersection).

To the north of the site, the Princes Highway is an active business corridor with commercial and industrial development lining the route. This land is zoned B6 Enterprise Corridor, SP1 Special Activities, SP2 Infrastructure, RE2 Private Recreation and B4 Mixed Use. North of the development fronting Princes Highway, the land is predominantly low density residential housing, with pockets of green spaces.

North of the interchange site, Campbell Street is bounded by land zoned as R2 Low Density Residential to the south-west, and a mixture of B4 Mixed Use, B6 Enterprise Corridor, RE1 Public Recreation and R1 General Residential zoned land to the north. It is a narrow, two lane street bounded by terrace housing, industrial buildings (refer **Figure 4-58**), vacant land and Simpson Park.

Main roads surrounding the St Peters interchange include:

- Canal Road, which forms the south-western boundary of the site and is a key arterial route serving the Sydney CBD as well as Sydney Airport and Port Botany
- Gardeners Road, which lies south-east of the Alexandra Canal forms an important transport connection including as a heavy vehicle route.

St Peters Railway Station is located 700 metres north of the site at the corner of King Street and Lord Street. St Peters Railway Station forms part of the Bankstown to City line.

Sydney Park zoned RE1 Public Recreation to the north of the St Peters interchange is the largest park in the City of Sydney at around 40 hectares in size. It is a regionally significant open space and a valuable community asset that would provide an important cycle and pedestrian connection to the St Peters interchange site.

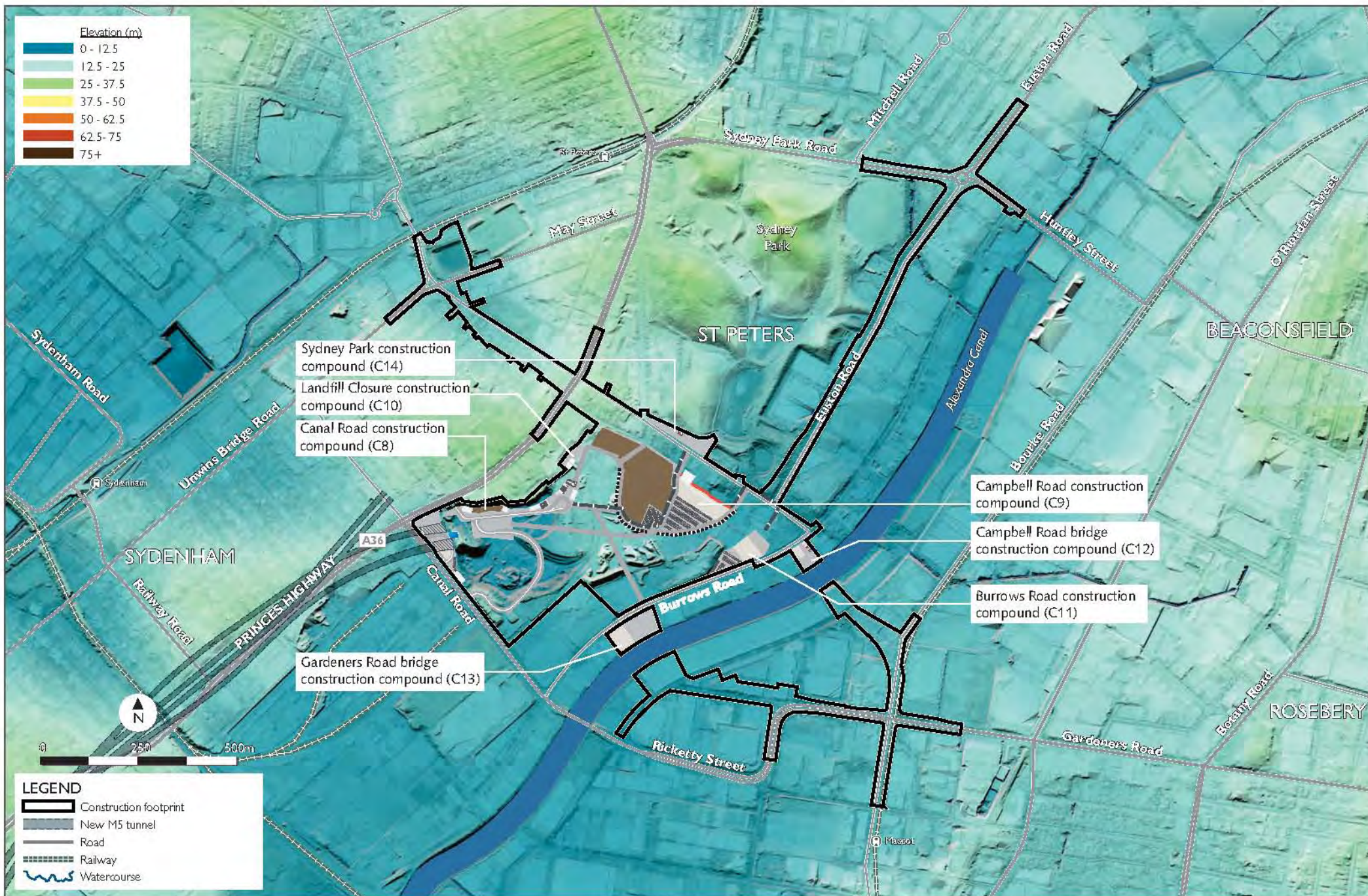


Figure 4-52 Topography of the surrounding environment - St Peters interchange and local road upgrades



Figure 4-53 St Peters Anglican Church is situated on a localised mound north of the Princes Highway



Figure 4-54 The view from the driveway of St Peters Anglican Church, looking east across the Princes Highway and commercial buildings, to glimpse views across the landfill site beyond.



Figure 4-55 Typical view of industrial complexes flanking the Alexandra Canal (view taken from Rickettys Bridge looking north)



Figure 4-56 Fringing vegetation within Sydney Park and residential housing fronting Campbell Road screen views to the surrounding area from within the park

This page has been left blank intentionally.

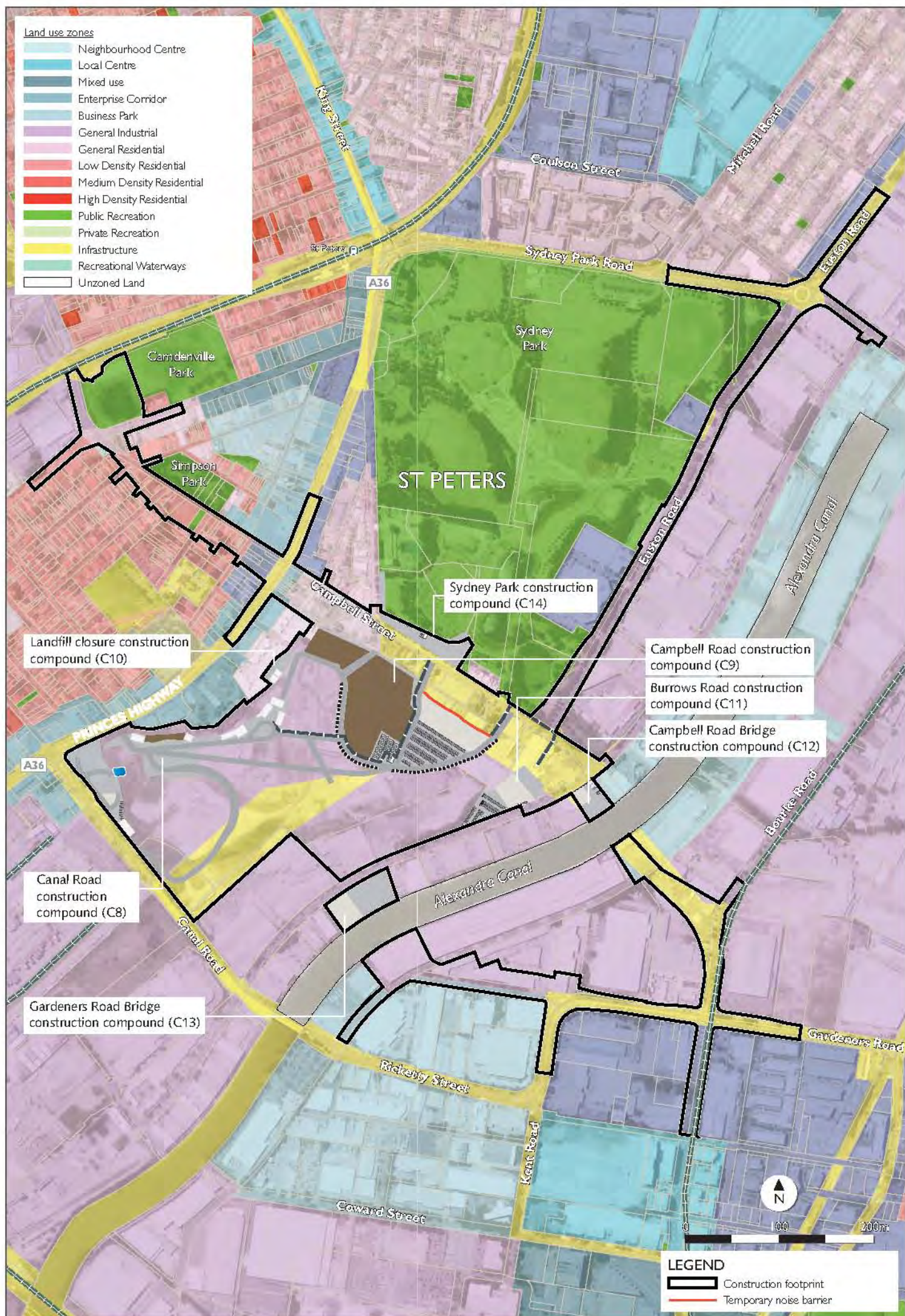


Figure 4-57 St Peters interchange site with surrounding land use zonings



Figure 4-58 View west along Campbell Street, showing existing terrace housing and industrial buildings.

4.5.3 Heritage sites

Heritage items and heritage conservation areas in and around the project corridor include (refer **Figure 4-51**):

- Southern Cross Hotel (local heritage) located at 340 Princes Highway, St Peters (refer **Figure 4-59**)
- Service Garage (local heritage) located at corner of Canal Street and Princes Highway, St Peters (refer **Figure 4-60**)
- Terrace Group (local heritage) located at 2-34 Campbell Road, Alexandria (refer **Figure 4-61**)
- Warehouse 'Rudders Bond Store' (local heritage) located at 53-57 Campbell Road, Alexandria
- Alexandra Canal (State heritage) located at the confluence of the Cooks River
 - Originally a natural creek called Shea's Creek which was a tributary of the Cooks River
 - Man-made canal built in 1880s-1890s; it stretches four kilometres and has a strong historic link to early industrial development in the St Peters and Alexandria area
- Town and Country Hotel (local heritage) located at 2 Unwins Bridge Road, St Peters
- Group of Victorian Filigree and Victorian Italianate terrace houses – 'Narara' (local heritage) located at 4-18 Unwins Bridge Road, St Peters
- Waugh and Josephson industrial buildings (local heritage) located at 1-7 Unwins Bridge Road, St Peters
- Goodsell Estate Conservation Area (local heritage) located between Bedwin Road, May Street, Caroline and May Lane and the railway line, St Peters
- St Peters Anglican Church (local heritage) located at 187-209 Princes Highway, St Peters (refer **Figure 4-53**)
- St Peters Brickpit Geological Site (local heritage) located between Bedwin Road, May Street, Caroline and the Princes Highway, St Peters
- Cooks River Container Terminal (local heritage) located at 20 Canal Road, St Peters
- Houses (local heritage) located at 28-44 Campbell Street, St Peters
- House (local heritage) located at 82 Campbell Street, St Peters

- Former site of 'Petersleigh', demolished in 1910 (local heritage) located at 310 Princes Highway, St Peters
- Former site of 'Nun-Cotnook', demolished, c1920s (local heritage) located at Corner of Berne Street and Princes Highway, St Peters
- Shea's Street Bridge crossing Alexandra Canal (local heritage) located at Ricketty Street, St Peters



Figure 4-59 Southern Cross Hotel, situated at the intersection of Princes Highway and Canal Road



Figure 4-60 Service garage opposite the Southern Cross Hotel on the Princes Highway



Figure 4-61 Heritage listed row of terraces on Campbell Road, opposite the St Peters interchange site

4.5.4 Landscape Character Zones

Landscape Character Zones were determined by land use, as these were considered to be the strongest defining character elements of the area. Five LCZs have been identified surrounding the St Peters interchange area comprising:

- 1) LCZ 1: Residential
- 2) LCZ 2: Industrial
- 3) LCZ 3: Recreation
- 4) LCZ 4: Transport Corridor
- 6) LCZ 6: Commercial Corridor

Although these LCZs may extend beyond the study area boundary, the character of these zones were analysed and assessed within this boundary only, for the purposes of this report.

4.5.4.1 Landscape Character Zone 1: Residential

The Residential LCZ lies to the north and north-west of the St Peters interchange site, lying over a gently undulating landform.

The LCZ comprises:

- Predominantly R2 Low Density zoned land:
 - Characterised by a mix of single and double storey brick and rendered terrace homes on small lots, punctuated by special use buildings such as schools and churches
 - Some newer townhouses and detached dwellings also exist within the terrace housing
- Pockets of R1 General zoned land are dotted throughout the area (mainly along more major roads):
 - Some low rise apartment blocks
 - Otherwise typically small lots, older style homes (many Federation or Victorian) with minimal off-street parking, narrow streets and parallel on-street parking on both sides of many suburban streets gives this area a more inner city suburban, densely populated character (refer **Figure 4-62**)

Mature street trees and gardens add to the established character of this area.

A number of heritage listed items are located within this LCZ, including two groups of double storey 'Victorian' terrace houses located in Campbell Road and Unwins Bridge Road. The Campbell Road terraces are zoned R1 General Residential and comprise a row of double story terrace houses with rear lane access that back onto Sydney Park (refer **Figure 4-61**).

The Residential LCZ is generally characterised by suburban, quiet streets that are periodically intersected by busier transport corridors such as the Princes Highway and Campbell Road.



Figure 4-62 Typical street within the Residential LCZ, Brown Street, St Peters.

4.5.4.2 Landscape Character Zone 2: Industrial

Three distinct groups of industrial zoned land lie within the study area:

- The St Peters landfill site
- The active industrial corridor which backs onto the Alexandra Canal
- Large blocks of industrial land with large industrial complexes on them, many which have internal courtyard car parking areas.

Much of the landfill site is not readily visible from the existing road network. This is largely due to the existing urban form, topography, and screening provided by existing vegetation and mature street tree planting. Where the site does lie directly adjacent to a road, it is bounded by tall solid fencing, hoardings or visually impenetrable sheds (refer **Figure 4-63**). The site itself is an excavated dump site, with weed growth and limited constructed elements lying within it.

The active industrial corridor which backs onto the Alexandra Canal is characterised by large, low lying industrial buildings and sheds with open, fenced lots between them for private car parking and truck loading facilities. While the buildings themselves address the main roads on either side of the Canal (namely Burrows Road and Bourke Road within the study area), glimpse views can be seen between these large, long buildings to the Canal (refer **Figure 4-64**). The streets are lined with large, mature trees (refer **Figure 4-65**). Some blocks act as storage areas for large shipping containers, which visually tie these industrial developments to the canal and its history as an active shipping corridor.

Other areas of industrial land comprise large industrial complexes with internal parking courtyards, e.g. on the corner of Canal Road and Burrows Road. These complexes visually address the streets in a similar manner to those backing onto the Alexandra Canal, with blank building fronts softened by mature street trees and occasional entries to car parks and courtyards at the rear of the buildings.



Figure 4-63 The boundary of the brickpit / landfill site on Princes Highway, east of the Canal Road intersection



Figure 4-64 Glimpse views can be seen between industrial buildings to the Alexandra Canal



Figure 4-65 The view south along Burrows Road, showing low rise, large industrial buildings and mature street trees

4.5.4.3 Landscape Character Zone 3: Recreation

Due to the density of the surrounding residential area, recreational green space is highly used and valued by the local community. It typically comprises formalised, turfed parks with mature fringing vegetation (street trees). Recreational parks within the area fall within two categories:

- Large scale parks
 - Sydney Park is a regionally significant park located north of Campbell Road (refer **Figure 4-66**)
 - The park topographically comprises a series of manmade landforms and wetlands (refer **Figure 4-67**)
 - The park is characterised by large, open turfed areas and mounds, fringed with mature (but often stunted) trees and screening vegetation, and pockets of dense 'bush character' vegetation
 - Facilities within the park include walking paths, BBQs, picnic facilities, seating, public toilets, a playground, and educational elements such as the water sensitive urban design initiatives.
- Smaller sized pocket parks
 - Simpson Park: a small, flat, rectangular, formal local park located north of Campbell Street, fenced on all sides and consisting of a playground, cricket nets, and mature fig trees that line Campbell Street (refer **Figure 4-68**)
 - Camdensville Park: a small park located on the corner of Unwins Bridge Road and Bedwin Road, comprising a playing field and detention basin.



Figure 4-66 Sydney Park, as seen from the corner of Euston Road and Campbell Road, showing mature fringing vegetation and street trees



Figure 4-67 Sydney Park, showing wetlands and a bioretention system nestled between man made landforms



Figure 4-68 Simpson Park viewed from Campbell Street. Large fig trees line the park, providing a visual frame to the flat, turfed area inside

4.5.4.4 Landscape Character Zone 4: Transport Corridor

Within the study area, the Transport Corridor LCZ comprises a number of major roads:

- Princes Highway
 - Strong linear transport corridor broadly following a low ridgeline, and characterised by active retail, light industrial and commercial development (refer **Figure 4-69**)
 - Views are visually confined within the road corridor, predominantly due to built form on either side of the road. Glimpse views can be seen to the landscape beyond the fringing development along perpendicular roads and through gaps between buildings and commercial complexes
 - Utilitarian character with limited scenic amenity.
- Canal Road
 - Visually characterised by industrial development on either side of the road, with large parcels of land and industrial complexes visually containing views within and along the road corridor (refer **Figure 4-70**). The road crosses over the Alexandra Canal, which provides views along the canal to flanking industrial development
 - The road corridor is intermittently flanked by substantial tree cover. The landform slopes away from the Princes Highway to the west



Figure 4-69 View south along the Princes Highway towards the intersection with Canal Road, showing industrial and commercial buildings flanking the road



Figure 4-70 View southeast along Canal Road from the Princes Highway, showing industrial development flanking the road, and mature street trees

4.5.4.5 Landscape Character Zone 6: Commercial Corridor

This LCZ is an active business and commercial corridor which runs north - south adjacent to the Princes Highway. Although this LCZ broadly follows the ridgeline along the Princes Highway, views to the landscape beyond are limited by built form.

The heritage listed St Peters Anglican Church sits on a natural high point and is the only area that contains substantial tree cover along the corridor within the study area.

The character is primarily influenced the utilitarian nature of the road setting, with business and commercial development prominent on either side of the highway. Commercial complexes comprise fast food chains, a hotel and small factory complexes with internal courtyards and limited scattered mature street trees (refer **Figure 4-71**).



Figure 4-71 View looking south-west along Princes Highway, showing the commercial complexes along the southern side of the highway (to left of frame) and the St Peters Anglican Church grounds to right of frame

This page has been left blank intentionally.

5.0 Policy and Planning Setting

5.1 Urban design, landscape character and visual amenity

The policy and planning setting for the project and its potential landscape and visual impacts has been established with regard to the following regional planning documents and relevant local environment plans:

- *Sydney Regional Environmental Plan No. 33 – Cooks Cove.*
- *Princes Highway Corridor Strategy 2013*
- *Hurstville Local Environmental Plan 2012*
- *Canterbury Local Environmental Plan 2012*
- *Rockdale Local Environmental Plan 2011*
- *Sydney Local Environmental Plan 2012*
- *Marrickville Local Environmental Plan 2011.*

The anticipated character of the area has been determined based on the strategic direction provided in these documents.

The Cooks Cove Growth Centre is a 100 hectare precinct, which is bounded by the Cooks River and Muddy Creek, Marsh Street, West Botany Street and Bestic Street. It is subject to *Sydney Regional Environmental Plan No. 33 – Cooks Cove*, a deemed State Environmental Planning Policy. Preliminary strategies identified an area for employment uses near Marsh Street with the remainder of the site to be set aside for conservation, open space and recreational purposes. More recently, the NSW Department of Planning and Environment has commenced investigations of the Cooks Cove area as a potential priority precinct.

The *Princes Highway Corridor Strategy*, an initiative of Rockdale City Council, was adopted by the Council in late 2013. The strategy focuses on revitalising the corridor within the Rockdale local government area for employment uses and growing the Arncliffe town centre. This strategy recommends changes to the distribution of residential, mixed use and business zones, as well as increased densities.

The anticipated character of areas specific to key project components has been inferred from the land zoning provisions under the relevant environmental planning instruments. Existing land use zonings and the anticipated character of these zonings are summarised in **Table 5-1**.

Table 5-1 Land use zonings within landscape character zones

Landscape character zone	Description of land use zoning
Western surface works	The M5 East Motorway corridor is zoned as SP2 Infrastructure under both the Hurstville LEP 2012 and the Canterbury LEP 2012. This zoning reflects the desire to maintain accessibility, supporting economic activity and efficient freight movement. The land to the north of the M5 East Motorway and western surface works area is zoned as RE1 Public Recreation, R3 Medium Density Residential, IN2 Light Industrial under the Canterbury LEP 2012. The land to the south of the M5 East Motorway and western surface works area is zoned as R2 Low Density Residential and IN2 Light Industrial, with some pockets of RE1 Public Recreation under the Hurstville LEP 2012. This zoning reflects the desire to maintain the existing low-medium density residential character and suburban setting of the area, with pockets of bushland.

Landscape character zone	Description of land use zoning
Bexley motorway operations complex	The M5 East Motorway and Bexley Road are zoned as SP2 Infrastructure under the Canterbury LEP 2012. This zoning reflects the desire to maintain accessibility, supporting economic activity and efficient freight movement. North of the M5 East Motorway and west of Bexley Road is zoned as R3 Medium Density Residential and some pockets of RE1 Public Recreation under the Canterbury LEP 2012. East of Bexley Road is zoned as R2 Low Density Residential, E1 National Parks and Nature Reserves and some pockets of RE1 Public Recreation under the Canterbury LEP 2012. This zoning reflects the desire to maintain the existing low-medium density residential character and bushland setting of the area. South of the M5 East Motorway and west of Bexley Road is zoned as R2 Low Density Residential, RE1 Public Recreation, and SP2 Infrastructure (along the East Hills railway line) under the Canterbury LEP 2012. This zoning reflects the desire to maintain the existing low density residential character and bushland setting of the area, while maintaining accessibility.
Arncliffe motorway operations complex	East of the Kogarah Golf Course is Sydney Airport which is zoned as SP2 Infrastructure under the Rockdale LEP 2011. This zoning reflects a desire to maintain accessibility, supporting economic activity, tourism and efficient freight movement. Marsh Street and West Botany Street, to the north and west of the Kogarah Golf Course, are zoned as SP2 Infrastructure under the Rockdale LEP 2011. This zoning reflects the desire to maintain access and connectivity between local centres of employment and economic activity. The north of the Kogarah Golf Course, along Marsh Street, is zoned as R2 Low Density Residential, B4 Mixed Use, R4 High Density Residential and RE1 Public Recreation under the Rockdale LEP 2011. This zoning reflects the desire to maintain the residential character of the area along with integrated business development and recreational areas, in keeping with the <i>Sydney Regional Environmental Plan No. 33 – Cooks Cove</i> and the <i>Princes Highway Corridor Strategy</i>. The west of the Kogarah Golf Course, along West Botany Street, is zoned as R2 Low Density Residential. This zoning reflects the desire to maintain the existing low density residential character of the area.
St Peters interchange and surrounds	The Princes Highway is zoned as SP2 Infrastructure under the Rockdale LEP 2011 and Campbell Road is zoned as SP2 Infrastructure under Sydney LEP 2012. Canal Road is also zoned as SP2 Infrastructure under the Sydney LEP 2012 and the Marrickville LEP 2011. This zoning reflects the desire to maintain access and connectivity between local centres of employment and economic activity. The Alexandria Landfill (the future site of the SPI) is zoned as SP2 Infrastructure (Sydney LEP) and IN1 General Industrial (Rockdale LEP). To the north of the Alexandria Landfill along the Princes Highway are areas zoned as B6 Enterprise Corridor and B4 Mixed Use, to the east along Campbell Street and Campbell Road are areas zoned as IN2 Light Industrial and R1 General Residential under the Rockdale LEP 2011, and RE1 Public Recreation under the Sydney LEP 2012. To the east and south along Burrows Road and the Alexandra Canal the land is zoned as IN1 General Industrial under the Sydney LEP 2012. To the west of the landfill and Canal Road is land zoned as IN1 General Industrial under the Marrickville LEP 2011. The zoning of the areas surrounding the St Peters interchange identify that the anticipated character of the broader area (assuming no changes to zoning) is to retain the existing low to medium density development, whilst also continuing to encourage business development within the enterprise corridor and mixed use areas and industrial development contained within the existing industrial areas.

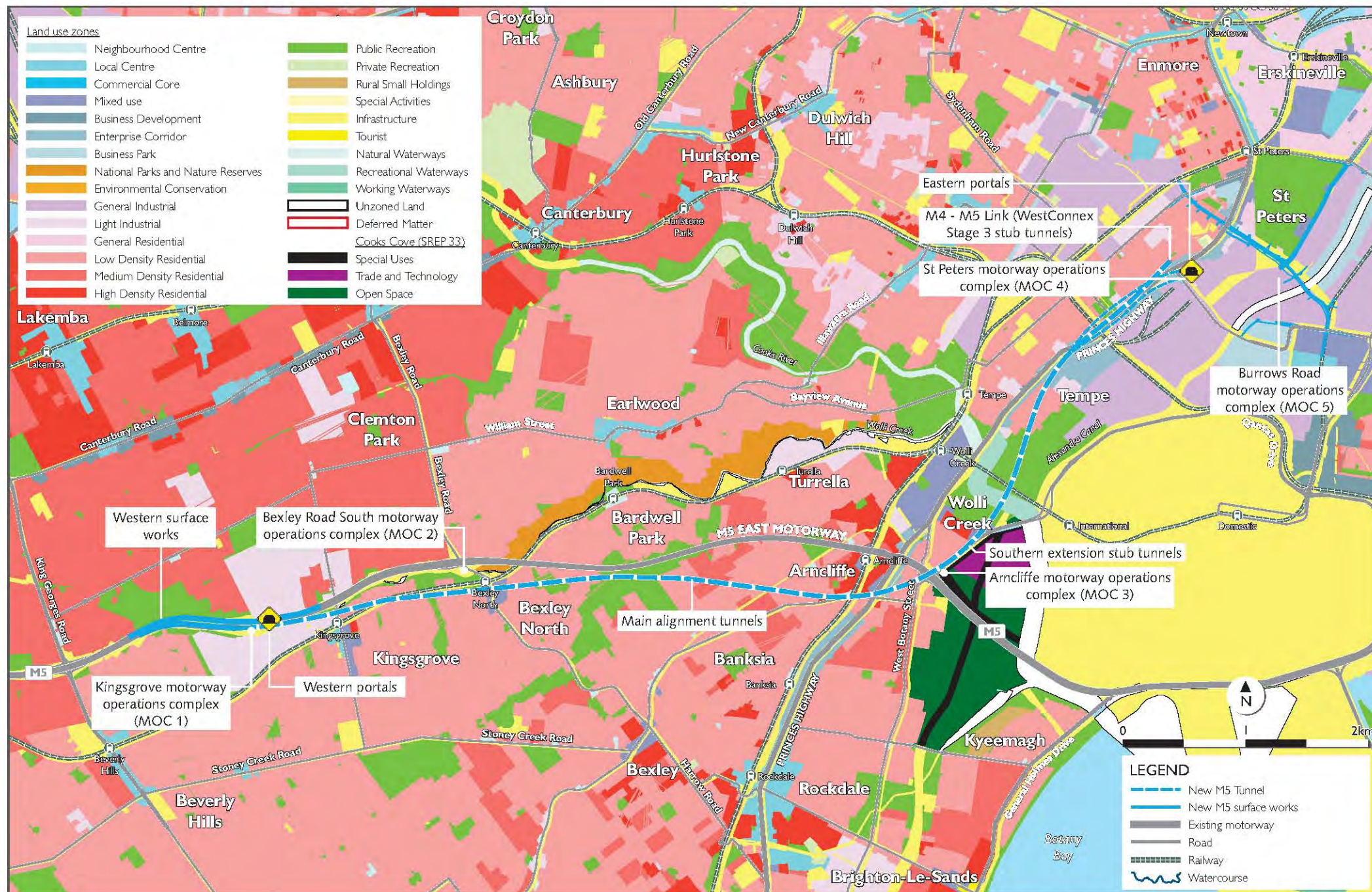


Figure 5-1 Regional zoning context of the project

This page has been left blank intentionally.