13. Operational noise and vibration

This chapter provides a summary of the operational noise and vibration assessment. A full copy of the assessment report is provided as Technical paper 2 – Noise and vibration. The Secretary's environmental assessment requirements relevant to noise and vibration, together with a reference to where the results of the assessment are summarised in this chapter and in the Environmental Impact Statement, are provided in Table 13.1.

Table 13.1 Secretary's environmental assessment requirements – noise and vibration

Ref	Secretary's environmental assessment requirements – noise and vibration	Where addressed
8. Noise and vibration - amenity		
8.1	The Proponent must assess construction and operational noise and vibration impacts in accordance with relevant NSW noise and vibration guidelines. The assessment must include consideration of impacts to sensitive receivers including small businesses, and include consideration of sleep disturbance and, as relevant, the characteristics of noise and vibration (for example, low frequency noise).	A summary of the results of the operational noise and vibration assessment is provided in this chapter. The full results are provided as Technical paper 2. Construction noise and vibration impacts are considered in Chapter 12. Operational amenity and sleep disturbance impacts to sensitive receivers are considered in Section 13.4.2. The characteristics of noise and vibration are explained in Technical paper 2, and no modifying factors need to be used in this assessment.
8.2	The EIS must include a framework for both an Out of Hours Works Strategy and the development of an Out of Hours Works Plan which incorporates community consultation.	Section 9.7.4
9. Noise and vibration - structural		
9.1	The Proponent must assess construction and operation noise and vibration impacts in accordance with relevant NSW noise and vibration guidelines. The assessment must include consideration of impacts to the structural integrity and heritage significance of items (including Aboriginal places and items of environmental heritage).	Consideration of potential operational impacts to structural integrity (including heritage items) is provided in Section 13.4.3 Potential impacts to the heritage significance of items in considered in Chapter 14.
9.2	The Proponent must demonstrate that blast impacts are capable of complying with the current guidelines, if blasting is required.	Blasting would not be required.

13.1 Assessment approach

A summary of the approach to the operational noise and vibration assessment is provided in this section. Further information is provided in Technical paper 2.

13.1.1 Legislative and policy context to the assessment

The guidelines and standards relevant to the operational noise and vibration assessment include:

- *Rail Infrastructure Noise Guideline* (EPA, 2013)
- *Assessing Vibration: A Technical Guideline* (DEC, 2006)

- International Standard ISO 14837-1 2005 *Mechanical vibration - Ground-borne noise and vibration arising from rail systems - Part 1: General Guidance*
- *NSW Industrial Noise Policy* (EPA, 2000).

13.1.2 Methodology

The assessment methodology involved:

- identifying and classifying sensitive receivers
- determining noise and vibration criteria in accordance with relevant guidelines, and where appropriate, based on the results of ambient noise monitoring (described in Chapter 12 (Construction noise and vibration))
- modelling to quantify the noise and vibration emissions likely to be experienced
- assessing the significance of noise levels which exceed the relevant guideline values
- identifying and assessing reasonable and feasible measures to mitigate predicted exceedances of the criteria.

The following operational noise and vibration sources were assessed:

- airborne noise from metro trains operating between east of Marrickville and west of Bankstown stations
- airborne noise from mechanical plant and other systems at stations and from ancillary facilities
- groundborne noise from metro trains operating between east of Marrickville and west of Bankstown stations
- vibration from metro trains operating between east of Marrickville and west of Bankstown stations.

Airborne noise

Rail noise

The NSW EPA provides guidance for the assessment and management of potential airborne noise from railways in the *Rail Infrastructure Noise Guideline* (EPA, 2013) (the RING). To assess and manage potential noise from rail projects, the RING provides non-mandatory airborne noise triggers for residential and other sensitive receivers. Where predicted rail noise levels are above the noise triggers, reasonable and feasible noise mitigation measures should be provided to achieve the trigger levels.

A computer software model SoundPLAN version 7.0 was used to predict airborne rail noise emissions. The input data used was chosen to reflect a metro fleet of single-deck trains. This included modelling using an assumed speed profile, including a maximum design speed of 100 kilometres per hour. Modelling was undertaken for the proposed metro track alignment and appropriate noise level corrections were used. Existing and future Sydney Trains operations and ARTC freight operations (including volumes and speeds) were also included in locations where they would operate close to the project.

The train volume estimates are outlined in Table 13.2. These train volume estimates are indicative and based on estimated passenger demand, minimum service levels, and the likely maximum metro service frequency.

Table 13.2 Train volume estimates

Rail line	Scenario	Train type	Trains per weekday period			
			Day 7am to 10pm		Night 10pm to 7am	
			Up	Down	Up	Down
T2 Airport Line	Existing 2017	Double-deck Sydney Trains	6	8	0	1
	Prior to opening 2024	Double-deck Sydney Trains	26	23	6	6
	After opening 2024	Double-deck Sydney Trains	26	23	6	6
	Future 2034	Double-deck Sydney Trains	26	23	6	6
	Future 2034 without project ('no build option')	Double-deck Sydney Trains	26	23	6	6
T3 Bankstown Line (including future metro services)	Existing 2017	Double-deck Sydney Trains	78	84	17	20
	Prior to opening 2024	Double-deck Sydney Trains	96	94	21	23
	After opening 2024	Single-deck Metro Trains	184	184	27	27
	Future 2034	Single-deck Metro Trains	202	202	30	30
	Future 2034 without project ('no build option')	Double-deck Sydney Trains	96	94	21	23
T4 Eastern Suburbs and Illawarra Line	Existing 2017	Double-deck Sydney Trains	96	85	26	23
	Prior to opening 2024	Double-deck Sydney Trains	111	101	28	26
	After opening 2024	Double-deck Sydney Trains	111	101	28	26
	Future 2034	Double-deck Sydney Trains	111	101	28	26
	Future 2034 without project ('no build option')	Double-deck Sydney Trains	111	101	28	26
Freight line	Existing 2017	Freight trains	27	27	9	9
	Prior to opening 2024	Freight trains	44	44	15	15
	After opening 2024	Freight trains	44	44	15	15
	Future 2034	Freight trains	63	63	21	21
	Future 2034 without project ('no build option')	Freight trains	63	63	21	21

Note: 1: Up direction refers to the direction toward Central Station. Down direction refers to the direction toward Bankstown Station.

For the purposes of the airborne noise assessment, the study area was divided into 13 noise catchment areas (NCA) as described in Chapter 12. Typically, each NCA is representative of a station area.

The RING requires noise to be assessed both at the time of opening of a project and at a future design year (typically ten years after opening). For this project, the two timeframes assessed are:

- at opening, anticipated to be in 2024
- a future scenario, based on forecasts for operations in 2034.

Stations and ancillary facilities

The *NSW Industrial Noise Policy* (EPA, 2000) provides two separate criteria to meet environmental noise objectives: one to account for intrusive noise, and the other to protect the amenity of particular land uses. These criteria are to be met at the boundary of the 'most affected' receiver. The more stringent of the criteria usually defines the project-specific noise limits. For both amenity and intrusiveness, night-time criteria are more stringent than daytime or evening criteria and these are therefore the focus for this assessment.

In addition to intrusiveness and amenity, the risk of sleep disturbance must be assessed. Sleep disturbance is assessed in accordance with the screening criterion described in the Application Notes to the *Industrial Noise Policy* and the more detailed review of sleep disturbance contained in the *Road Noise Policy* (DECCW, 2011).

According to the *Industrial Noise Policy*, where existing L_{Aeq} noise levels exceed the 'acceptable' noise level by 10 dB or more, and the existing noise level is unlikely to decrease in future, the noise criteria should be taken to be the existing noise level minus 10 dB. This approach also applies to areas with high traffic noise.

Groundborne noise and vibration

International Standard ISO 14837-1 2005 *Mechanical vibration - Ground-borne noise and vibration arising from rail systems - Part 1: General Guidance* provides relevant guidance in relation to the extent of assessment that is normally required for new rail systems. Further information about the types of models used is provided in Section 4.2.4 of Technical paper 2. It is noted that these methods are also used for the human comfort assessment.

The prediction of groundborne noise and vibration from rail systems is a complex and developing technical field. There are currently no modelling software packages available. Modelling for the project was undertaking using a modelling process developed by the noise consultant. This model has been successfully incorporated and validated for similar previous rail projects over the past ten years.

13.1.3 Definitions used in this chapter

Table 13.3 outlines a number of commonly used noise terms used within this chapter and the respective definitions of these terms.

Table 13.3 Definition of noise related terms

Term	Definition
L_{A90}(period)	The sound pressure level exceeded for 90 per cent of the measurement period
L_{Aeq}(1 hour)	The busiest 1-hour 'equivalent continuous noise level' – it represents the typical L_{Aeq} noise level from all the proposal noise events during the busiest 1-hour of the assessment period
L_{Aeq}(15 hour)	The daytime 'equivalent continuous noise level' - it represents the cumulative effects of all the proposal noise events occurring in the daytime period from 7am to 10pm
L_{Aeq}(24 hour)	The 'equivalent continuous noise level', sometimes also described as the 'energy-averaged noise level' – it represents the cumulative effects of all the proposal noise events occurring in one day

Term	Definition
L_{Aeq}(9 hour)	The night-time 'equivalent continuous noise level' - it represents the cumulative effects of all the proposal noise events occurring in the night-time period from 10pm to 7am
L_{Aeq}(time)	Typically used to described ambient (background) noise levels
L_{Amax}	The maximum sound level recorded during the measurement period

13.2 Operational noise and vibration criteria

13.2.1 Amenity

Airborne noise – rail noise

The relevant airborne noise trigger levels for residential land uses surrounding the project area are provided in Table 13.4. For residential receivers, the criteria have two components – L_{Aeq} (assessed over the day or night) and L_{Amax} (train pass by events).

Table 13.4 Airborne rail noise trigger levels for residential land use

Type of development	Noise trigger level (dBA)	
	Daytime 7am to 10pm	Night-time 10pm to 7am
Redevelopment of existing rail line	Development increases existing $L_{Aeq(period)}$[1] rail noise levels by 2 dB or more, or existing L_{Amax}[2] rail noise levels by 3 dB or more, and predicted noise levels exceed:	
	65 $L_{Aeq(15hour)}$ and 85 L_{Amax}	60 $L_{Aeq(9hour)}$ and 85 L_{Amax}

Notes: 1. $L_{Aeq(period)}$ means $L_{Aeq(15h)}$ for the day time period and $L_{Aeq(9h)}$ for the night-time period.
2. L_{Amax} refers to the maximum noise level not exceeded for 95 per cent of rail pass-by events and is measured using the 'fast' response setting on a sound level meter.

The RING noise trigger levels for non-residential sensitive receivers are provided in Table 13.5. These apply when the building or premise is in use. All noise trigger levels are external levels, except where stated. Commercial receivers are not considered sensitive to operational airborne noise impacts.

The RING acknowledges the need to protect the community from rail-noise related sleep disturbance at night and therefore encourages a greater volume of rail movements to take place during the daytime as reflected by the airborne rail noise trigger levels presented in Table 13.4 and Table 13.5.

Table 13.5 Airborne rail noise trigger levels for sensitive land uses other than residential

Sensitive land use	Noise trigger level (dBA)
Schools, educational institutions and child care centres	45 $L_{Aeq(1hour)}$ internal
Places of worship	45 $L_{Aeq(1hour)}$ internal
Hospital wards	40 $L_{Aeq(1hour)}$ internal
Hospital other uses	65 $L_{Aeq(1hour)}$
Open space – passive use (eg parkland, bush reserves)	65 $L_{Aeq(15hour)}$
Open space – active use (eg sports field, golf course)	65 $L_{Aeq(15hour)}$

Airborne noise – stations and ancillary facilities

The external amenity noise criteria based on the *Industrial Noise Policy 2000* are provided in Table 13.6.

No modifying factors have been applied (for low-frequency noise) for the stations and ancillary facilities as it assumed that these noise sources would not exhibit these characteristics if designed and constructed in accordance with industry best practice.

Table 13.6 Amenity criteria for industrial noise sources

Type of receiver	Indicative noise amenity area	Time of day	Recommended L_{Aeq} noise level (dBA)	
			Acceptable	Recommended maximum
Residence	Suburban[1]	Day	55	60
		Evening	45	50
		Night	40	45
Residence	Urban[2]	Day	60	65
		Evening	50	55
		Night	45	50
Commercial	All	When in use	65	70
Active recreation area	All	When in use	55	60
Educational	All	When in use	45[3]	50[3]
Place of worship	All	When in use	50[3]	55[3]

Notes:
1. Suburban area is characterised by local traffic with intermittent traffic flows, decreasing noise levels in the evening period, and/or evening ambient levels defined by the natural environment and infrequent human activity.
2. Urban areas are characterised by an acoustic environment dominated by 'urban hum' or industrial noise sources, through traffic with heavy and continuous traffic flows during peak hours, and/or located near commercial or industrial districts.
3. External levels, based on the internal levels specified in the Industrial Noise Policy plus 10 dB (assuming open windows).

Substations

Table 13.7 provides the operational noise criteria for the proposed substations.

Table 13.7 Industrial Noise Policy criteria for substation operation

Substation location	Logger ID	Period	Measured level, dBA		Noise criteria, dBA		
			RBL[1]	$L_{Aeq,period}$	Intrusive	Amenity	Overall
Dulwich Hill	B.03	Day	38	57	43	56	43
		Evening	39	57	43[2]	47	43
		Night	33	53	38	43	38
Canterbury	B.07	Day	40	53	45	60	45
		Evening	40	50	45	42	42
		Night	35	47	40	37	37
Campsie	B.11	Day	44	59	49	54	49
		Evening	45	57	49	47	47
		Night	40	57	45	46	45
Lakemba	B.14	Day	47	65	52	55	52
		Evening	47	63	52	53	52

Substation location	Logger ID	Period	Measured level, dBA		Noise criteria, dBA		
			RBL[1]	$L_{Aeq,period}$	Intrusive	Amenity	Overall
		Night	41	60	46	50	46
Punchbowl	B.20	Day	47	65	52	55	52
		Evening	49	64	52	54	52
		Night	39	60	44	50	44

Notes: 1. Rating background level.
2. For assessment purposes, the evening RBL has been reduced to equal the lower daytime RBL in accordance with INP application notes.

Stations

In addition to rail noise, stations would emit noise from mechanical services and public address (PA) systems which would need to comply with applicable criteria. Table 13.8 provides the noise criteria applicable to the operation of stations. The design of mechanical plant and PA systems would be confirmed during detailed design. Therefore, further modelling would be undertaken during detailed design to confirm that the operation of stations at opening would meet the specified criteria.

Table 13.8 Industrial Noise Policy criteria for station noise

Station	Representative noise logger	Period	Measured level dBA	Noise criteria dBA		
			RBL	Intrusive	Amenity	Overall
Marrickville	B.02	Day	38	42	54	42
		Evening	38	42	48	42
		Night	33	38	41	38
Dulwich Hill	B.04	Day	41	46	58	46
		Evening	41	46	45	45
		Night	34	39	40	39
Hurlstone Park	B.06	Day	38	43	58	43
		Evening	39	43	43	43
		Night	34	39	39	39
Canterbury	B.08	Day	43	48	58	48
		Evening	43	48	43	43
		Night	36	41	39	39
Campsie	B.10	Day	45	50	58	50
		Evening	42	47	45	45
		Night	35	40	44	40
Belmore	B.13	Day	41	46	60	46
		Evening	41	46	44	44
		Night	36	41	37	37
Lakemba	B.15	Day	50	55	53	53
		Evening	50	55	53	53
		Night	43	48	53	48
Wiley Park	B.17	Day	44	49	60	49
		Evening	46	49	42	42
		Night	41	46	39	39
Punchbowl	B.19	Day	47	52	56	52
		Evening	47	52	44	44

Station	Representative noise logger	Period	Measured level dBA	Noise criteria dBA		
			RBL	Intrusive	Amenity	Overall
		Night	41	46	43	43
Bankstown	B.22	Day	54	59	55	55
		Evening	51	56	53	53
		Night	60	47	50	47

Vibration – human comfort

Table 13.9 provides the human vibration criteria for the project as outlined in *Assessing Vibration: A Technical Guideline* (DEC, 2006).

Table 13.9 Acceptable maximum vibration dose values for intermittent vibration

Location	Daytime ($m/s^{1.75}$)	Night-time ($m/s^{1.75}$)
Critical areas	0.2	0.2
Residences	0.4	0.26
Offices, schools, educational institutions and places of worship	0.8	0.8
Workshops	1.6	1.6

Note: 1. No sensitive vibration equipment are identified in use in the vicinity of the project area. As a result, the more stringent vibration criteria relating to such equipment has not been applied.

13.2.2 Structural

Groundborne noise and vibration

Rail vibration is generated by dynamic forces at the wheel-rail interface and occurs due to surface irregularities at the point of contact. The vibration generated propagates through the rail mounts into the trackform, which then propagates into the surrounding ground. The vibration continues to propagate into adjacent areas including structures.

The RING outlines the groundborne noise vibration criteria for the operation of trains along the corridor. Table 13.10 provides a summary of the groundborne noise trigger levels which are relevant to the project.

The RING acknowledges that the World Health Organisation recommends avoiding individual noise events exceeding 45 dB L_{Amax} indoors in regards to sleep disturbance. This is reflected in the triggers for groundborne noise shown in Table 13.10.

Table 13.10 Groundborne noise trigger levels

Sensitive land use	Time of day	Internal noise trigger level dBA
	Development increases existing rail noise levels by 3 dBA or more, and resulting rail noise levels exceed:	
Residential	Day (7am to 10pm)	40 L_{ASmax}
	Night (10pm to 7am)	35 L_{ASmax}
Schools, educational institutions, places of worship	When in use	40 - 45 L_{ASmax}

Vibration impacts on structures

Design objectives for vibration impacts on building contents

The human comfort criteria provided in Table 13.9 are the vibration dose values for intermittent vibration considered for the project.

Some scientific equipment (e.g. electron microscopes and microelectronics manufacturing equipment) can require more stringent design goals than those that apply to human comfort. In such cases, vibration design objectives would be obtained from the specific equipment manufacturers or if unavailable, from generic vibration criteria within commonly referenced sources in the literature.

Design objectives for vibration impacts on structures

The levels of vibration required to cause damage to buildings tend to be at least an order of magnitude higher (10 times higher) than those at which people may consider the vibration to be intrusive or disturbing. It is therefore not necessary to set separate design objectives in relation to potential building damage from rail vibration, as compliance with the human comfort design objectives would ensure compliance with criteria related to potential structural damage.

13.3 Existing environment

The existing noise environment is described in Section 12.3, including figures which show the classification of different receivers and ambient noise monitoring locations along the corridor.

The existing noise environment varies considerably along the length of the project area. In addition to rail noise, other existing noise sources include:

- road traffic noise
- operation of the freight rail line and diesel trains between east of Marrickville Station and west of Campsie Station
- industrial activities within industrial areas (particularly near Marrickville)
- other construction activities (such as building redevelopments, road, and housing construction)
- aircraft noise.

Ambient noise monitoring was undertaken in June and July 2016 at 23 representative noise locations along the project area (refer Table 12.7). Daytime noise levels ranged from 36 to 54 dB with noise levels generally increasing to the west. Measured daytime noise levels were lowest at Campsie Station and loudest at Bankstown Station.

Evening noise levels were either the same or slightly quieter than daytime levels.

Night-time noise levels ranged from 32 to 43 dB across the project area, with the lowest level at Campsie Station and highest between Lakemba and Wiley Park stations. Compared with daytime levels, the greatest change in noise levels was observed at Bankstown and Campsie stations.

13.4 Potential impacts

13.4.1 Risk assessment

Potential risks

The environmental risk assessment for the project undertaken for the State Significant Infrastructure Application Report identified the following as the main operational noise and vibration risks:

- airborne noise impacts on surrounding sensitive receivers as a result of higher train speeds and higher service frequency
- airborne noise impacts from upgraded stations including new substations and upgraded systems such as public address systems
- airborne noise impact from fixed facilities such as traction substations.

Groundborne noise and vibration impacts during operation were also considered. These impacts were not considered to be a key risk, however they have been considered.

How potential impacts have been avoided or minimised

Potential noise and vibration impacts have been avoided/minimised by:

- designing the project to minimise the potential for noise and vibration impacts on surrounding receivers
- incorporating new noise barriers and adjustments (including lengthening or increasing the height), in addition to existing noise barriers located in areas where operational airborne noise is required to be mitigated in line with the RING.

13.4.2 Amenity

Airborne rail noise – normal operations

Table 13.11 provides the noise level predictions for 2024 (at opening) and 2034 (10 years after opening) at the most exposed residential receiver with and without the project. It is noted that the most exposed receiver may not necessarily be the closest to the corridor, because the most exposed location is commonly an upper storey for buildings with two or more levels. Lower floors receive more shielding from the intervening terrain and therefore noise levels are typically lower. A residential receiver with more than one storey may therefore be more affected by airborne noise then a single storey receiver located closer to the source. Rail noise levels at receivers other than the most exposed receiver would be lower and would reduce with distance from the source.

Table 13.11 indicates that predicted operational noise levels in 2024 and 2034 'without the project' generally exceed the RING L_{Aeq} and L_{Amax} noise trigger levels in NCA01 to NCA06. In NCA07, the only exceedance is the L_{Aeq} at night (in both 2024 and 2034), while there is an exceedance of L_{Amax} at both NCA10 and NCA11 in both 2024 and 2034.

The table also shows that there is only a slight increase in predicted noise levels between the 2024 and 2034 scenarios and this is limited to the section of the rail corridor where freight trains operate (NCA01 to NCA06). This reflects the modelling assumptions which indicate that freight services are likely to increase over the 10 year forecast period while passenger services are likely to remain closer to current levels.

In relation to the noise level prediction following the addition of the project ('with project'), and excluding predicted exceedances in NCA01 to NCA06 as explained above, exceedances are also predicted at NCA07, NCA09, NCA10 and NCA11. In most of these locations, the increases in noise

levels may be explained by the need to move track or implement new infrastructure such as a crossover which result in the existing tracks being moved closer to the edges of the corridor.

In total, noise levels at 85 and 105 receivers are predicted to exceed the RING trigger levels in 2024 and 2034 respectively as shown in Figure 13.1. The majority of exceedances are located in NCA11 (Bankstown), where there are more multi-level residential buildings near the rail line.

Table 13.12 provides noise level predictions for non-residential sensitive receivers in 2024 and 2034. The introduction of the project is considered to result in a relatively low number of exceedances for non-residential sensitive receivers. Exceedances of the RING trigger levels would be experienced at 14 receivers in both 2024 and 2034. These exceedances would only be located in NCA07, NCA08, NCA09 and NCA10.

Receivers with predicted exceedances of the RING trigger levels would be eligible for further consideration of noise mitigation during detailed design.

Figure 13.1 shows the locations of those receivers where exceedances of the airborne noise levels are predicted to occur and where, subject to detailed design and confirmation, reasonable and feasible noise mitigation would be considered. A description of the proposed approach to mitigation is provided in Section 13.5.

Table 13.11 Predicted 2024 and 2034 airborne noise levels at most exposed receiver – residential receivers

		Without project						With project						Noise level change with and without the project						No. of exceedances of RING trigger levels	
		L_{Aeq} Day		L_{Aeq} Night		L_{Amax}		L_{Aeq} Day		L_{Aeq} Night		L_{Amax}		L_{Aeq} Day		L_{Aeq} Night		L_{Amax}			
NCA	**Side**	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034
NCA01	Up	**76**	**77**	**73**	**75**	**105**	**105**	**76**	**77**	**73**	**75**	**105**	**105**	0.0	0.0	0.0	0.0	0.0	0.0	0	0
	Down	63	64	**67**	**69**	**96**	**96**	**66**	**67**	**68**	**69**	**96**	**96**	3.0	2.6	0.5	0.5	0.0	0.0	1	1
NCA02	Up	**73**	**74**	**70**	**71**	**101**	**101**	**73**	**74**	**70**	**71**	**101**	**101**	0.2	0.2	0.0	0.0	0.0	0.0	0	0
	Down	**70**	**71**	**67**	**68**	**96**	**96**	**71**	**72**	**68**	**69**	**96**	**96**	1.2	1.0	0.5	0.4	0.0	0.0	0	0
NCA03	Up	**73**	**75**	**71**	**72**	**102**	**102**	**74**	**76**	**71**	**72**	**102**	**102**	1.2	1.0	0.5	0.4	0.0	0.0	0	0
	Down	**69**	**71**	**67**	**68**	**96**	**96**	**71**	**72**	**67**	**69**	**96**	**96**	1.8	1.6	0.8	0.7	0.0	0.0	0	0
NCA04	Up	**74**	**75**	**71**	**73**	**102**	**102**	**75**	**76**	**72**	**73**	**102**	**102**	1.2	1.0	0.5	0.4	0.0	0.0	0	0
	Down	**70**	**71**	**67**	**69**	**95**	**95**	**72**	**73**	**68**	**69**	**95**	**95**	2.0	1.7	0.9	0.8	0.0	0.0	1	0
NCA05	Up	**66**	**72**	**68**	**69**	**97**	**97**	**68**	**73**	**68**	**69**	**97**	**97**	2.1	0.7	0.3	0.2	0.0	0.0	1	0
	Down	**67**	**69**	65	**66**	**91**	**91**	**69**	**70**	**65**	**66**	**91**	**91**	2.1	1.6	0.7	0.6	0.0	0.0	6	0
NCA06	Up	**67**	**68**	**71**	**72**	**99**	**99**	**69**	**70**	**71**	**72**	**99**	**99**	2.2	2.1	0.1	0.1	0.0	0.0	2	1
	Down	**67**	65	61	**69**	**95**	**95**	**69**	**69**	**63**	**69**	**95**	**95**	2.3	3.5	2.0	0.2	0.1	0.1	4	3
NCA07	Up	61	61	**69**	**71**	83	83	**66**	**66**	**69**	**71**	**86**	**86**	4.7	5.1	0.0	0.0	3.0	3.0	4	7
	Down	63	63	59	59	82	82	**68**	**68**	**62**	**62**	**86**	**86**	4.6	5.0	2.7	3.1	3.3	3.3	2	2
NCA08	Up	61	61	57	57	82	82	65	65	59	59	83	83	3.7	4.1	1.8	2.3	1.3	1.3	0	0
	Down	60	60	56	56	82	82	64	64	58	58	83	83	3.5	3.9	1.5	2.0	1.2	1.2	0	0
NCA09	Up	61	61	58	57	84	84	**66**	**67**	**61**	**61**	**86**	**86**	4.9	5.3	2.8	3.5	1.4	1.4	1	2
	Down	60	60	56	56	81	81	65	**66**	59	60	84	84	5.3	5.7	3.4	3.9	2.4	2.4	0	1

		Without project						With project						Noise level change with and without the project						No. of exceedances of RING trigger levels	
		L_{Aeq} Day		L_{Aeq} Night		L_{Amax}		L_{Aeq} Day		L_{Aeq} Night		L_{Amax}		L_{Aeq} Day		L_{Aeq} Night		L_{Amax}			
NCA	**Side**	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034
NCA10	Up	60	60	56	56	82	82	**66**	**66**	60	60	85	85	5.5	5.9	3.6	4.0	2.7	2.7	2	6
	Down	64	64	61	61	**86**	**86**	**66**	**67**	**61**	**62**	85	85	2.8	3.2	-0.2	0.3	0.0	0.0	4	9
NCA11	Up	63	63	61	60	**86**	**86**	**68**	**69**	**64**	**64**	**89**	**89**	5.1	5.5	2.6	3.7	3.0	3.0	34	37
	Down	62	62	57	57	82	82	**67**	**67**	60	**61**	**85**	**85**	5.1	5.5	3.0	3.5	2.9	2.9	23	38
NCA12	Up	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
	Down	60	60	56	56	81	81	63	63	57	57	81	81	2.8	3.2	0.8	1.3	0.0	0.0	0	0

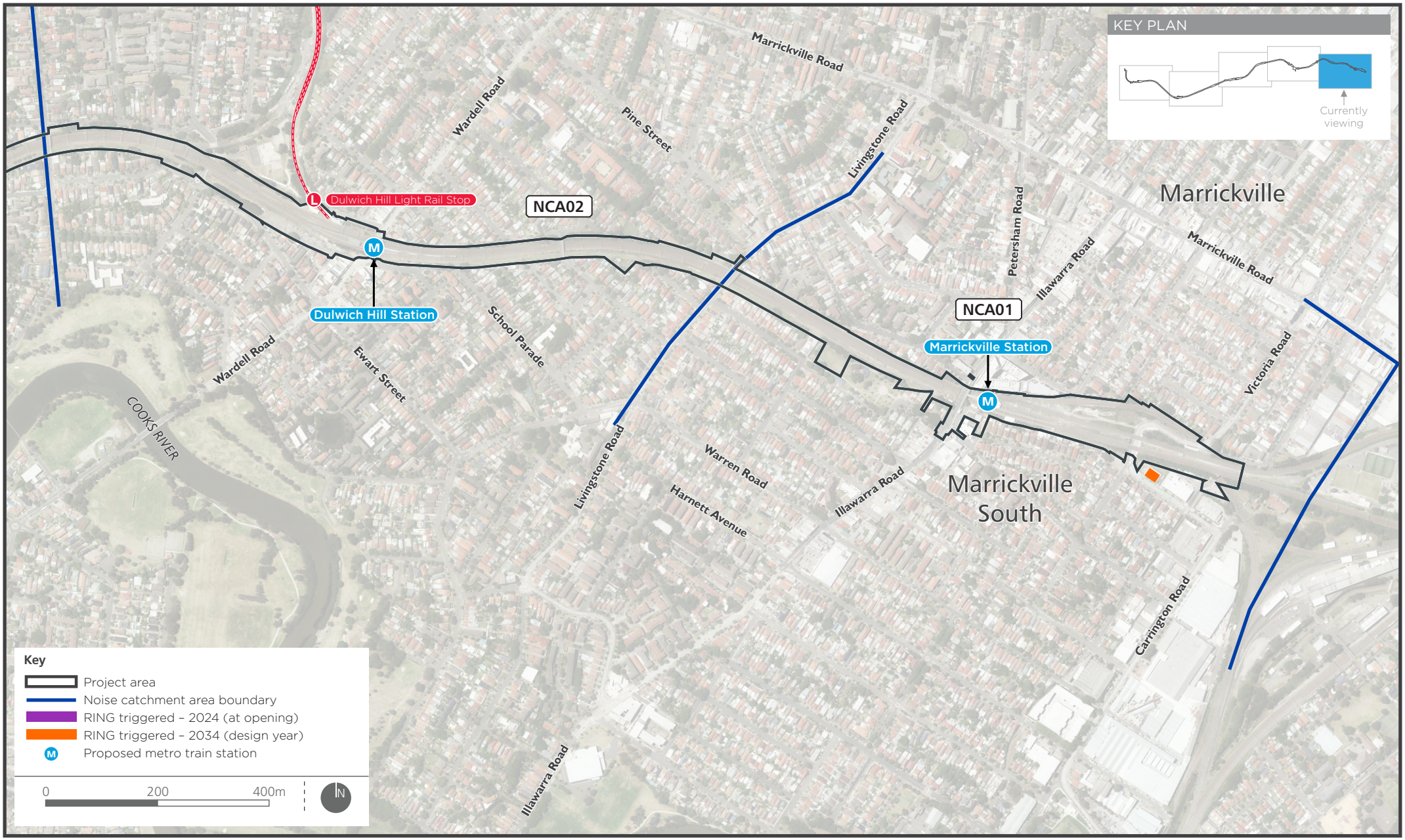
Notes: Shading and bold text indicates exceedances of the RING residential absolute noise trigger levels.
Noise level values have been rounded and noise level increases are based on additional significant figures.
A dash (-) indicates that sensitive receivers are not located close to the rail corridor in this NCA.
Up side refers to trains travelling towards Central Station. Down side refers to trains travelling away from Central (i.e. towards Bankstown in the case of the project).

Table 13.12 Predicted 2024 and 2034 airborne noise levels at most exposed receiver – non-residential receivers

		Without project				With project				Noise level change with and without the project				No. of exceedances due to the project	
		L_{Aeq} Day		L_{Aeq} Night		L_{Aeq} Day		L_{Aeq} Night		L_{Aeq} Day		L_{Aeq} Night			
NCA	Side	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034
NCA01	Up	-	-	-	-	-	-	-	-	-	-	-	-	0	0
	Down	68	69	66	67	70	71	66	67	1.5	1.3	0.4	0.4	0	0
NCA02	Up	68	70	66	67	69	70	66	67	0.6	0.5	0.2	0.2	0	0
	Down	-	-	-	-	-	-	-	-	-	-	-	-	0	0
NCA03	Up	50	51	47	49	50	52	48	49	0.3	0.3	0.1	0.1	0	0
	Down	-	-	-	-	-	-	-	-	-	-	-	-	0	0
NCA04	Up	-	-	-	-	-	-	-	-	-	-	-	-	0	0
	Down	68	70	66	67	70	71	66	68	1.6	1.3	0.7	0.6	0	0
NCA05	Up	67	68	65	66	68	69	65	66	1.0	0.8	0.4	0.3	0	0
	Down	65	66	62	63	67	68	63	64	1.9	1.7	0.7	0.7	0	0
NCA06	Up	78	79	75	77	78	80	75	77	0.3	0.3	0.1	0.1	0	0
	Down	58	60	56	57	59	60	56	57	0.3	0.2	0.1	0.1	0	0
NCA07	Up	47	47	44	44	49	50	44	45	2.8	3.2	0.3	0.7	0	0
	Down	65	65	62	62	69	70	64	65	4.5	4.6	2.1	2.4	2	2
NCA08	Up	55	55	52	52	58	59	53	53	3.0	3.4	0.4	0.9	1	1
	Down	54	54	51	51	57	57	52	52	2.9	3.3	0.4	0.8	1	1
NCA09	Up	47	47	44	44	52	52	47	47	5.0	5.4	2.6	2.9	0	0
	Down	59	59	56	56	62	63	57	58	3.7	4.1	1.2	1.7	5	5
NCA10	Up	65	65	62	62	69	69	63	64	3.6	4.0	1.1	1.5	5	5

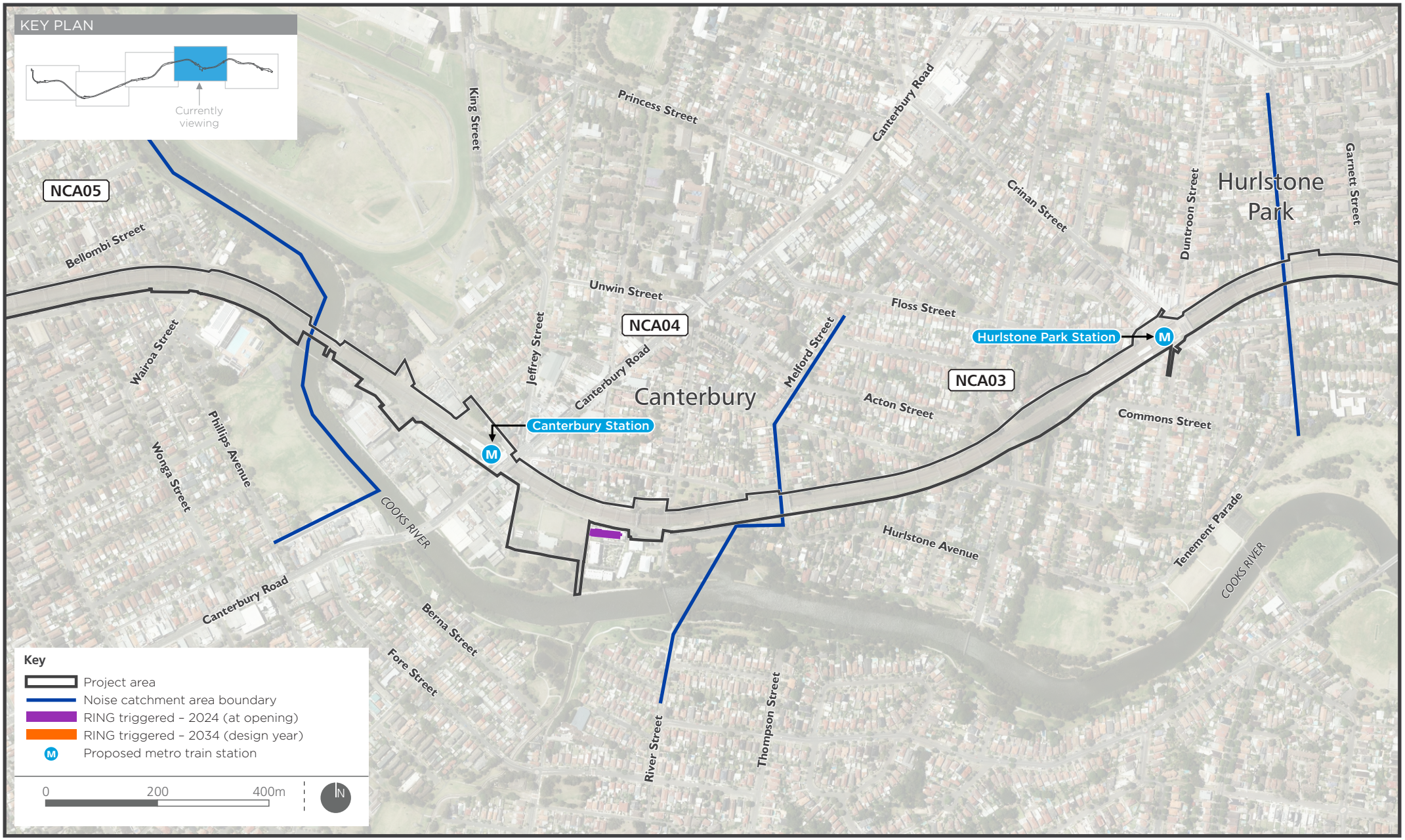
		Without project				With project				Noise level change with and without the project				No. of exceedances due to the project	
		L_{Aeq} Day		L_{Aeq} Night		L_{Aeq} Day		L_{Aeq} Night		L_{Aeq} Day		L_{Aeq} Night			
NCA	Side	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034	2024	2034
	Down	47	47	44	44	50	50	45	45	3.6	4.0	1.0	1.5	0	0
NCA11	Up	42	42	40	40	47	48	42	43	5.0	5.5	2.6	2.9	0	0
	Down	45	45	43	43	50	51	45	45	4.9	5.3	2.4	2.8	0	0
NCA12	Up	51	52	49	49	50	51	45	46	0.0	0.0	0.0	0.0	0	0
	Down	57	57	54	54	54	54	49	49	3.7	4.1	1.2	1.6	0	0

Notes: Noise predictions are external. A conservative outside-to-inside attenuation of 10 dB has been applied.
Noise level values have been rounded and noise level increases are based on additional significant figures.
A dash (-) indicates that sensitive receivers are not located close to the rail corridor in this NCA.
Up side refers to trains travelling towards Central Station. Down side refers to trains travelling away from Central (i.e. towards Bankstown in the case of the project).



Location of receivers potentially affected by operational noise and exceeding RING criteria - map 1

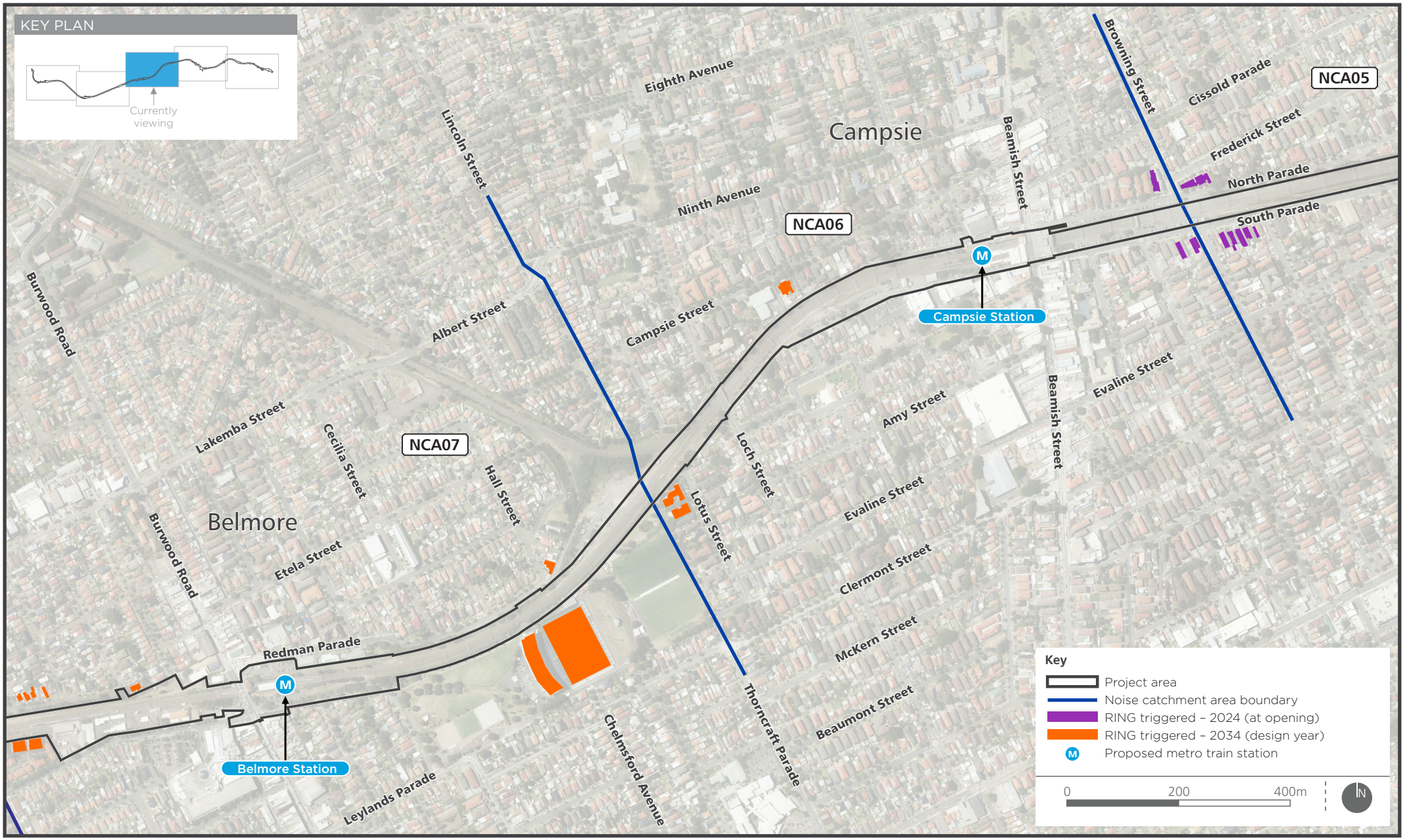
FIGURE 13.1



sydney METRO | city & southwest

Location of receivers potentially affected by operational noise and exceeding RING criteria - map 2

FIGURE 13.1



sydney METRO | city & southwest

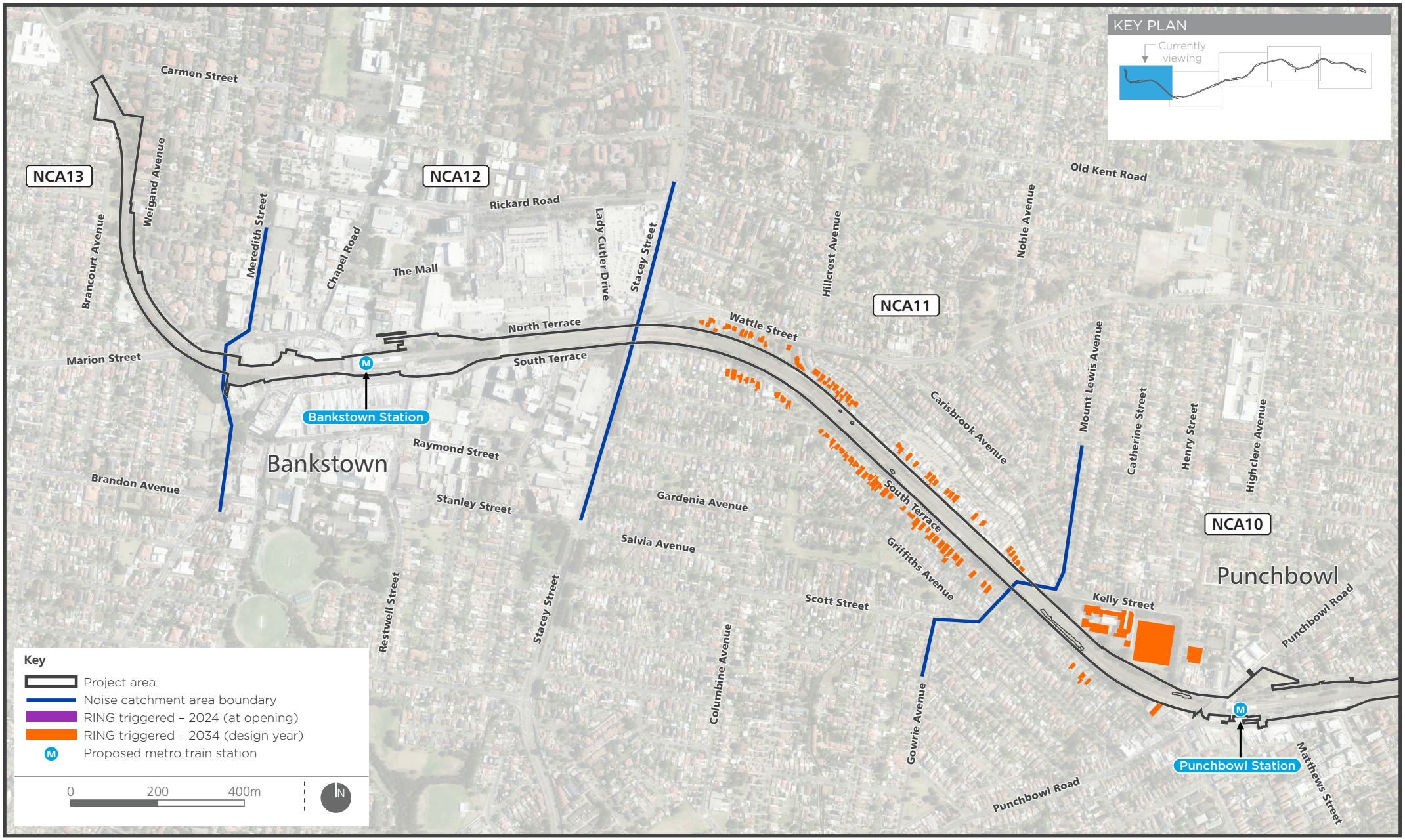
Location of receivers potentially affected by operational noise and exceeding RING criteria - map 3

FIGURE 13.1

sydney METRO | city & southwest

Location of receivers potentially affected by operational noise and exceeding RING criteria - map 4

FIGURE 13.1



Location of receivers potentially affected by operational noise and exceeding RING criteria - map 5

FIGURE 13.1

Table 13.13 provides a summary of the number of receivers, both residential and non-residential, which would be eligible for consideration of reasonable and feasible noise mitigation measures based on the preliminary modelling conducted. As described in Section 13.5.1, further more detailed review and confirmation of these modelling results would be undertaken during detailed design and subsequent project delivery stages prior to proceeding with mitigation application.

Table 13.13 Summary of locations eligible for consideration of mitigation

Precinct	NCA	Side of corridor	Number of exceedances of RING noise trigger levels[1]				Comments
			Residential receivers		Other sensitive receivers		
			2024	2034	2024	2034	
Marrickville	01	Up	0	0	0	0	n/a
		Down	1	1	0	0	Residential receiver building
Canterbury	04	Up	0	0	0	0	n/a
		Down	1	0	0	0	Residential receiver building
Campsie	05	Up	1	0	0	0	Residential receiver building
		Down	6	0	0	0	Residential receiver buildings
	06	Up	2	1	0	0	Residential receiver buildings
		Down	4	3	0	0	Residential receiver buildings
Belmore	07	Up	4	7	0	0	Residential receiver buildings
		Down	2	2	2	2	Residential receiver buildings and other sensitive receivers (active recreation)
Lakemba	08	Up	0	0	1	1	Other sensitive receiver (medical)
		Down	0	0	1	1	Other sensitive receiver (place of worship)
Wiley Park	09	Up	1	2	0	0	Residential receiver buildings
		Down	0	1	5	5	Residential receiver building and other sensitive buildings (educational)
Punchbowl	10	Up	2	6	5	5	Residential receiver buildings and other sensitive buildings (educational and place of worship)
		Down	4	9	0	0	Residential receiver buildings
Bankstown	11	Up	34	37	0	0	Residential receiver buildings
		Down	23	38	0	0	Residential receiver buildings
TOTAL			**85**	**105**	**15**	**15**	

Note: 1. The number of locations identified counts buildings once only, in the event that more than one facade or floor of the building is triggered. This number may be less than the number of individual dwellings triggered, for example where buildings contain multiple apartments.

Airborne rail noise – testing and commissioning

During the commissioning stage, prior to the line being open to the public, testing operations would be performed within the rail corridor. Train movements during the commissioning phase are unlikely to be more frequent than during normal operations. Additionally, the train speeds during the commissioning phase are not anticipated to be significantly higher than assumed in the earlier

assessment. It is therefore considered that noise impacts resulting from the testing of train operations would be equal to or lower than the predicted operational airborne noise results shown in Table 13.11 and Table 13.12.

Should vehicle testing be undertaken in a manner that differs from the assumptions in this assessment, further assessment may be required to be undertaken. If exceedances of the operational noise criteria are identified, then reasonable and feasible mitigation measures should be considered. These may include:

- scheduling unusually high noise events (such as traction, acceleration and brake testing) to less sensitive periods in consultation with the potentially affected community
- scheduling fewer commissioning operations in the same region during the same daytime or night-time period by dispersing tests throughout project area
- rescheduling commissioning operations from the night-time period to less sensitive periods eg daytime.

Substations

Table 13.14 provides the maximum predicted noise levels from substations operating, without mitigation, during the night-time period (the most stringent period) at the most affected receiver. The results show that, without mitigation, four of the five substations would result in exceedances of the night-time noise criteria.

Table 13.14 Predicted noise levels from substations at the most potentially affected receiver

Substation location	Approx. offset to nearest receiver (m)	L_{Aeq} noise level, dBA	
		Night-time criteria	Predicted
Dulwich Hill	12	38	**51**
Canterbury	35	37	**42**
Campsie	22	45	**46**
Lakemba	25	46	45
Punchbowl	24	44	**45**

Note: Shading and bold indicates predicted exceedance of criteria (without mitigation).

Predicted exceedances of the criteria range between one dB at Lakemba and Punchbowl and 13 dB at Dulwich Hill. Despite these exceedances, it is expected that noise levels can be readily reduced to acceptable levels by provision of shielding, enclosure of the noise source or locating the noise source further from the receiver as necessary. The use of acoustic louvres could be considered where ventilation is required. Such measures have been successfully used on other traction substations along the rail network in order to achieve the operational noise criteria.

Noise emitted from train stations

Train stations emit noise from mechanical services and public address systems which need to comply with the applicable noise criteria. At this stage of the design, mechanical plant and PA systems have not been identified, which means it is not possible to assess compliance with the applicable noise criteria. However given the nature of these sources and measures successfully applied to other projects, it is expected that potential impacts can be readily mitigated during the detailed phase through the selection of equipment that will not generate noise in excess of the design noise levels. The applicable criteria for operational noise from train stations is provided in Table 13.8.

Vibration – human comfort

Vibration modelling indicates that no locations would experience exceedances of the vibration (human comfort) criteria.

13.4.3 Structural

Vibration impacts on structures

As described in Section 13.2.2, compliance with human comfort criteria would ensure that the potential for structural impacts is minimal. This is because the levels of vibration required to cause damage to buildings tend to be at least an order of magnitude higher (10 times higher) than those at which people may consider the vibration to be intrusive or disturbing. As the predicted levels of vibration during operation would meet the relevant human comfort criteria, no structural impacts (including impacts to heritage structures) are expected.

Groundborne noise and vibration

The prediction modelling for groundborne noise has excluded the influence of freight traffic, which results in a more conservative assessment of groundbourne noise from Sydney Metro operations. The prediction results indicate that noise levels would be below the criteria for the majority of the project area. Minor exceedances of about one dB are predicted at four receivers near Marrickville Station. The assessment results at these four receivers are provided in Table 13.15. As the night-time criteria are the most stringent, only the night-time criteria is shown. No exceedances are predicted at non-residential receivers.

Table 13.15 Receivers in Marrickville where the groundborne noise criteria is exceeded

Address	Residential noise criteria dBA	Groundborne noise level dBA		
	Night-time	Existing situation	Future situation	Increase
30 Arthur Street	35	31	36	4.8
221 Livingstone Road	35	30	36	5.4
29 Albermarle Street	35	32	36	3.9
24 Arthur Street	35	31	36	4.7

For a receiver to be considered for mitigation, groundborne noise must dominate the internal noise environment. As indicated by the results of the airborne noise assessment in Section 13.4.2, the predicted external noise levels are much greater than those predicted for groundborne noise. Even including a moderate outdoor-to-indoor noise correction of -10 dB (assuming windows closed), airborne noise levels would be greater than groundborne noise inside the affected buildings. As such, these four receivers comply with the groundborne noise criteria, and do not require mitigation.

13.4.4 Cumulative impacts

Cumulative operational noise impacts as a result of the operation of the project combined with the operation of Sydney Trains (west of Bankstown) and ARTC freight trains between Marrickville and west of Campsie, were assessed. The results are provided in Section 13.4.

Future developments occurring in close proximity to the rail corridor that may be affected by noise emissions, must take into consideration the *Development Near Rail Corridors and Busy Roads – Interim Guideline* (Department of Planning, 2008).

13.5 Mitigation measures

13.5.1 Approach to mitigation and management

A review and iteration of predicted operational noise and vibration levels would be undertaken during detailed design, when more information is available and when specific mechanical plant and other project details have been confirmed. This would also include consideration of the mitigation options described in Section 13.5.2, and confirming reasonable and feasible mitigation approaches. The final form of mitigation would be determined during detailed design.

The operational noise and vibration review would:

- confirm predicted project noise and vibration levels at sensitive receivers, which may include a review of façade acoustic performance for non-residential receivers
- potentially include a review of the building envelopes for residential receivers, as many are located within areas subject to development requirements to mitigate aircraft noise
- assess reasonable and feasible noise and vibration measures in a hierarchical manner, consistent with the RING
- identify options for controlling noise and vibration at the source and/or receiver, including location, type, and timing of implementation (as described in Section 13.5.2)
- specify noise and vibration abatement measures for all relevant sensitive receivers
- include a consultation strategy to seek feedback from directly affected stakeholders on the proposed noise and vibration abatement measures
- include a timetable for delivery of abatement prior to operations commencing
- outline post-operational monitoring to verify noise and vibration predictions.

To validate the predicted noise levels, monitoring would be undertaken after the commencement of operation for Sydney Metro as a whole. Monitoring would confirm compliance with the predicted noise levels, as modified by the review of reasonable and feasible mitigation measures undertaken at the completion of detailed design.

If the results of monitoring indicate that the operational noise and vibration criteria are being exceeded, then additional reasonable and feasible mitigation measures would be implemented in consultation with affected property owners.

13.5.2 Reasonable and feasible mitigation options

Three main strategies are used to mitigate noise and vibration impacts:

- controlling noise and vibration at the source
- controlling noise and vibration on the source to receiver transmission path
- controlling noise and vibration at the receiver.

Section 4.1.8 of Technical paper 2 describes airborne noise mitigation options for locations where RING trigger levels are exceeded. The following reasonable and feasible mitigation options have been identified based on preliminary analysis, as summarised in Table 13.16:

- low profile noise barriers
- conventional noise barriers
- property treatment.

These mitigation options would be further considered as part of the detailed design, including further noise modelling to confirm eligibility for noise mitigation. Consideration would also be given

to cost effectiveness, constructability, visual impact, overshadowing, ecological impact, impact on maintenance and safety requirements.

Table 13.16 Preliminary reasonable and feasible noise mitigation options

NCA	Side of corridor	Potential mitigation option[1]
NCA01	Down	At property treatments, where required
NCA04	Down	At property treatments, where required
NCA05 and NCA06	Down	Noise barrier, as required
	Up	Noise barrier, as required
NCA06	Down	At property treatments, where required
	Up	At property treatments, where required
NCA07	Down	At property treatments, where required
	Up	Noise barrier, as required
	Down	At property treatments, where required
NCA08	Down	At property treatments, where required
	Up	At property treatments, where required
NCA09	Down	Noise barrier, as required
	Up	At property treatments, where required
NCA09 and NCA10	Down	Noise barrier, as required
	Up	Noise barrier, as required
NCA10	Up	Noise barrier, as required
	Down	At property treatments, where required
	Down	At property treatments, where required
NCA11	Down	Noise barrier, as required
	Up	Noise barrier, as required
	Up	Property treatments, where required

Note: 1. The form and details of all noise mitigation would be confirmed during detailed design with the aim of not exceeding trigger levels from the RING. At property treatments would also be offered where there are residual exceedances of the trigger levels.

13.5.3 List of mitigation measures

Mitigation measures that would be implemented to address potential operational noise and vibration impacts are listed in Table 13.17.

Table 13.17 Mitigation measures – operational noise and vibration

ID	Impact/issue	Mitigation measures	Relevant location(s)
Design/pre-construction			
NVO1	Predicted noise impacts	An operational noise and vibration review would be undertaken to guide the approach to identifying reasonable and feasible mitigation measures to incorporate in the detailed design. This would include noise modelling to confirm the results of modelling previously undertaken. Where changes in noise levels and exceedances are modelled, reasonable and feasible mitigation measures would be reviewed.	All

ID	Impact/issue	Mitigation measures	Relevant location(s)
NVO2		The height and extent of noise barriers adjacent to the project would be confirmed during detailed design with the aim of not exceeding trigger levels from the *Rail Infrastructure Noise Guidelines* (EPA, 2013). At-property treatments would be offered either on their own or in combination with a noise barrier where there are exceedances residual exceedances of the noise trigger levels.	All
NVO3		Operational noise from substations would be controlled by inclusion of appropriate mitigation, such as shielding or enclosures, and specification of equipment selection, to comply with the *Industrial Noise Policy* (EPA, 2000).	All
Operation			
NVO4	Predicted vibration impacts	Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure and vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure. For heritage items where screening vibration levels are predicted to be exceeded, the more detailed assessment would specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.	All

13.5.4 Consideration of the interactions between mitigation measures

The construction of noise barriers as a mitigation measure (see NVO2 in Table 13.17) would potentially result in visual impacts for some visually sensitive receivers located in the areas surrounding any potential noise barriers. The landscape and visual assessment (Chapter 19 and Technical paper 7) has assessed the impact of the noise barriers identified in the noise and vibration assessment. Further consideration of these noise barrier locations would be undertaken as part of the operational noise and vibration review during detailed design. At this time, the visual impacts of any noise barriers may also be reconsidered.

13.5.5 Managing residual impacts

Monitoring would be undertaken to confirm the performance of the barriers and any other noise mitigation approaches. If the results of monitoring indicate that the operational noise and vibration criteria are being exceeded, then additional reasonable and feasible mitigation measures would be implemented in consultation with affected property owners.

14. Non-Aboriginal heritage

This chapter provides a summary of the results of the non-Aboriginal heritage impact assessment. A full copy of the assessment report is provided as Technical paper 3 – Non-Aboriginal heritage impact assessment. The Secretary's environmental assessment requirements relevant to non-Aboriginal heritage, together with a reference to where the results of the assessment are summarised in this chapter, are provided in Table 14.1.

Table 14.1 Secretary's environmental assessment requirements – non-Aboriginal heritage

Ref	Secretary's environmental assessment requirements – non-Aboriginal heritage	Where addressed
7. Heritage		
7.1	The Proponent must identify and assess any direct and/or indirect impacts (including cumulative impacts) to the heritage significance of: (a) Aboriginal places and objects, as defined under the *National Parks and Wildlife Act 1974* and in accordance with the principles and methods of assessment identified in the current guidelines;	A summary of the results of the non-Aboriginal heritage impact assessment is provided in this chapter. The full results are provided as Technical paper 3. This chapter considers potential impacts to non-Aboriginal heritage. Aboriginal heritage is considered in Chapter 15.
	(b) Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan;	
	(c) environmental heritage, as defined under the *Heritage Act 1977;* and	Section 14.3
	(d) items listed on the National and World Heritage lists.	No such items would be impacted by the project.
7.2	Where impacts to State or locally significant heritage items are identified, the assessment must: (a) include a statement of heritage impact for all heritage items (including significance assessment);	Section 14.3
	(b) consider impacts to the item of significance caused by, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment (as relevant);	Section 14.3
	(c) outline measures to avoid and minimise those impacts in accordance with the current guidelines;	Section 14.4
	(d) be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria);	Section 14.1.2 and Section 1.5 of Technical paper 3
	(e) have regard to the specific and broader values of historic structures (such as footbridges, overhead booking offices, platforms and platform buildings) and conservation approaches provided in the relevant conservation strategies and design guides and conservation management plans, as applicable; and	Section 14.3
	(f) identify potential uses for heritage items to be retained within the corridor.	Section 14.3

Ref	Secretary's environmental assessment requirements – non-Aboriginal heritage	Where addressed
14. Visual and landscape impacts		
14.3	The Proponent must assess the visual and landscape impacts of the project and ancillary infrastructure on … (d) heritage items including Aboriginal places and environmental heritage.	This chapter (Section 14.3) considers potential visual impacts on non-Aboriginal heritage. Further information on the visual and landscape impacts of the project are provided in Chapter 18.

14.1 Assessment approach

14.1.1 Legislative and policy context to the assessment

The main legislation relevant to non-Aboriginal heritage in NSW is the *Heritage Act 1977* ('the Heritage Act'). The Heritage Act includes provisions to conserve the State's environmental heritage; it provides for the identification, registration, and protection of items of State heritage significance; and it constitutes the Heritage Council of NSW, conferring on it functions relating to the State's heritage.

In accordance with Sections 115ZG and 115ZH of the EP&A Act, some environment and planning legislation does not apply to critical State significant infrastructure, and therefore this project. This includes approvals under Part 4, and excavation permits under Section 139 and Division 8 of Part 6 of the Heritage Act. Notification of the Heritage Council is required in writing if any relics are uncovered during construction, in accordance with the requirements of Section 146.

The Heritage Act defines 'environmental heritage' as 'places, buildings, works, relics, movable objects or precincts considered significant based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values'. Items considered to be significant to the State are listed on the State Heritage Register.

The EP&A Act establishes the framework for heritage values to be formally assessed in land use planning and environmental impact assessment processes. The EP&A Act requires that environmental impacts are considered prior to land development, and the level of significance of the impact assessed; this includes impacts on cultural heritage items and places, and archaeological sites and deposits.

Items and places of national heritage significance, as well as heritage places owned by the Australian Government, are managed under the EPBC Act. The EPBC Act provides for the identification, registration, and protection of items of national heritage significance. National heritage is one of the nine matters of national environmental significance protected by the EPBC Act.

Statutory registers provide legal protection for heritage items. The Heritage Act and the EP&A Act provide for heritage listings. The State Heritage Register, government agency Heritage and Conservation Registers established under Section 170 of the Heritage Act, and the environmental heritage schedules of LEPs are statutory listings. Places on the National Heritage List and Commonwealth Heritage List are protected under the EPBC Act 1999.

14.1.2 Methodology

A summary of the approach to the non-Aboriginal heritage impact assessment is provided in this section. Further information is provided in Technical paper 3. The non-Aboriginal heritage assessment was undertaken by suitably qualified heritage consultants at Artefact Heritage. A full list of personnel and their qualifications is provided in Section 1.5 of Technical paper 3.

Study area

The study area boundary for the non-Aboriginal heritage assessment was defined as a 25 metre buffer around, and including, the project area. The project area and the buffer are collectively referred to as the study area in this chapter unless otherwise stated.

The application of a buffer helps to identify heritage items potentially located within the visual catchment of the project, where potential visual impacts on that item may occur. It also supports assessment of other potential impacts on heritage items (for example, as a result of vibration during construction and operation).

Approach

The assessment involved:

- identifying listed heritage items in the study area by searching the following heritage databases:
  - World Heritage List
  - Commonwealth Heritage List
  - National Heritage List
  - NSW State Heritage Register
  - relevant local environmental plans (the Marrickville, Canterbury and Bankstown local environmental plans)
  - Section 170 Heritage and Conservation Registers (including for Sydney Water, Roads and Maritime, RailCorp, Ausgrid, and the Department of Housing).
- consideration of relevant conservation management plans
- consideration of existing and proposed heritage conservation areas
- a site survey and photographic inventory
- reviewing the project description and plans
- reviewing previous heritage investigations within or close to the project area
- preparing a statement of heritage impact in accordance with relevant guidelines (described below).

The assessment was undertaken in accordance with the *NSW Heritage Manual 1996* (Heritage Office and Department of Urban Affairs and Planning, 1996) ('the NSW Heritage Manual') and relevant guidelines, including:

- *Assessing Heritage Significance* (Heritage Office, 2001)
- *Statements of Heritage Impact* (Heritage Office, 2002)
- *Assessing Significance for Historical Archaeological Sites and Relics* (NSW Heritage Division, 2009).

Heritage structures were assessed with reference to relevant Sydney Trains guidelines, including:

- *Railway Footbridges Heritage Conservation Strategy* (NSW Government Architect's Office, 2016)
- *Railway Overhead Booking Offices Heritage Conservation Strategy* (Australian Museum Consulting, 2014)
- *Heritage Platforms Conservation Management Strategy* (Sydney Trains, 2015).

Where recent changes (such as station upgrades) have affected heritage listed items, the assessment was undertaken with reference to statutory listings, conservation management plans, and previous studies/assessments. Where recent changes may have altered the documented levels of heritage significance, a revised level of significance was identified and considered.

The heritage assessment included an assessment of the relative contributions of individual elements of heritage items to the heritage value of items. These assessments were based on the standard grades of significance, defined by *Assessing Heritage Significance* (Heritage Office, 2001), as listed in Table 4 of Technical paper 3. Where the significance of elements is discussed in listings or conservation management plans, these grades were used, unless additional information (such as a change in condition or removal) was provided that would justify a change.

The assessment also considered the principles contained in *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance* (Australia ICOMOS, 2013) ('the Burra Charter') and the *Historical Archaeology Code of Practice* (Heritage Office, 2006a).

Potential impacts to non-Aboriginal heritage were assessed in accordance with the above guidelines, taking into consideration both negative (adverse) and positive (beneficial) impacts. The assessment addressed the significance of individual elements of heritage items (where appropriate), and assessed the impact to each element, and the overall impact to the heritage item as a whole. The assessment also provided an overall statement of non-Aboriginal heritage impacts, it considers the potential for residual impacts on heritage items, and the cumulative heritage impact of the project as a whole.

The assessment considered impacts holistically – it considered how negative impacts were offset by positive heritage outcomes, such as heritage interpretation, opening of view lines to heritage items, and the retention and adaptive reuse of heritage elements. It also provided mitigation measures to minimise heritage impacts where practicable.

The guidelines, *Canopies and Shelters, Design Guide for Heritage Stations* (Sydney Trains, December 2016) and *Design in Context Guidelines for Infill Development in the Historic Environment* (Heritage Office, 2006b), informed the development of design principles for the project. As these are design guidelines rather than assessment frameworks or conservation strategies, they were taken into account, but did not guide the assessment.

Types of impacts considered

In accordance with the *Statements of Heritage Impact,* the assessment of potential impacts on non-Aboriginal heritage was based on impacts to the significance of a heritage item and its elements, as follows:

- direct impacts – as a result of the removal/demolition or alteration of fabric of heritage significance
- visual impacts – as a result of changes to the setting or curtilage of heritage items or places, historic streetscapes, or views
- potential direct impact – as a result of impacts from vibration and removal/demolition of adjoining structures.

It is assumed that all direct and potential direct impacts are a result of construction. Visual impacts are assumed to be operational, unless specified as temporary, in which case they are related to construction.

Once the levels of all three types of impacts were assessed, adverse and positive impacts to heritage significance were balanced to determine the overall level of impact to the heritage significance of the listed item as a result of the project. Where the overall impacts to the heritage significance of an item was assessed as major (as per the definitions provided in Table 14.2), an

assessment was undertaken to determine whether the item would continue to meet the threshold of significance necessary for heritage listing.

From a heritage perspective, impacts are only acceptable if sufficient justification is provided, and options to avoid harm have been explored and discounted. Where impacts are identified, the justification for these impacts (including information on the options considered) is provided in accordance with *Statements of Heritage Impact*. Additional information on how the design was developed taking into account impacts to heritage is provided in Chapter 7 (Design development and place making).

Specific terminology and corresponding definitions were used to consistently identify the magnitude of the project's direct, visual, or potential direct impacts on heritage items or archaeological remains. The terminology and definitions used are based on those in the guideline *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties* (ICOMOS, 2011) and are provided in Table 14.2.

Table 14.2 Terminology for assessing the magnitude of heritage impact

Magnitude	Definition
Major	Actions that would have a long term and substantial impact on the significance of a heritage item. Includes actions that would remove key historic building elements, key historic landscape features, or significant archaeological materials, thereby resulting in a change of historic character, or altering of a historical resource. These actions cannot be fully mitigated.
Moderate	Actions involving the modification of a heritage item, including altering the setting of a heritage item or landscape, partially removing archaeological remains, or the alteration of significant elements of fabric from historic structures. The impacts of these actions may be partially mitigated.
Minor	Actions that would result in a slight alteration of heritage buildings, archaeological remains, or the setting of an historical item. The impacts of these actions can usually be mitigated.
Negligible	Actions that would result in very minor changes to heritage items.
Neutral	Actions that would have no heritage impact.

Historical archaeological assessment

The potential for a site to contain historical archaeology was assessed by identifying former land uses and associated features through historical research, and evaluating whether subsequent actions (either natural or human) may have impacted evidence for these former land uses. The significance of potential archaeological remains was then assessed using a framework based on the NSW heritage criteria.

The historical archaeological assessment involved:

- reviewing heritage and archaeological site listings
- analysis of historical background and maps
- understanding previous impacts
- assessment of archaeological significance.

Construction compounds and work site impacts

As described in Section 9.8, construction compounds would be required at each station to support construction activities and other associated works at stations. There are also a number of work sites proposed, where construction activities would be undertaken outside the rail corridor. The location of compounds and work sites are shown in Figure 9.1.

The non-Aboriginal heritage assessment included consideration of the potential direct and visual impacts of construction compounds and work sites located within the curtilage, or in the vicinity, of heritage items. This chapter summarises the results of the impacts of construction compounds and work sites as they relate to individual heritage items, with potential archaeological impacts considered as part of the archaeological assessment. As a result of the temporary nature of the impacts, the impacts of construction compounds and work sites on built heritage items is considered separately (in Section 14.3.13).

Assessment of potential vibration impacts on heritage structures

Vibration arising from construction or excavation work has the potential to impact on the fabric of heritage items, potentially causing subsidence, or affecting structural integrity. In locations where heritage items are adjacent to demolition, construction, or excavation works, an assessment of the potential impact of vibration was undertaken as part of the noise and vibration assessment for the project (refer to Technical paper 2 – Noise and vibration assessment and Chapter 12 (Construction noise and vibration)).

The assessment adopted a conservative vibration damage screening level of 7.5 millimetres per second peak particle velocity. This screening level was established with reference to the minor cosmetic damage criteria in *British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings - Part 2: Guide to damage levels from groundborne vibration*. The vibration levels specified in this standard are designed to minimise the risk of threshold or cosmetic surface cracks, and are set well below the levels that have potential to cause damage to the main structure.

The recommended screening level of 7.5 millimetres per second peak particle velocity also applies to heritage items unless it is known that the item is already structurally unsound – in which case, a lower screening level may apply. The noise and vibration assessment provides an initial assessment of the potential for vibration impacts. Potential construction vibration impacts would continue to be assessed by applying the following methodology:

- Where vibration levels are predicted to be below the relevant vibration screening level, potential vibration impacts are considered negligible and no further assessment of vibration-related impacts on that structure would be required.
- Where vibration levels are predicted to be at or above the vibration screening level, further investigation would be undertaken prior to construction to ensure that vibration levels remain below appropriate limits for that structure, including:
  - a more detailed assessment of the structure
  - attended vibration monitoring from the structure's closest point to the vibration source.
- Where the building is a heritage building, and the predicted vibration level is above the vibration screening level, a more detailed assessment of the structure would be undertaken, to specifically consider the heritage values of the structure and sensitive heritage fabric. The assessment would be undertaken in consultation with a heritage specialist to ensure it is adequately monitored and managed.

The potential for vibration impacts during operation was also assessed by Technical paper 2, and the results are summarised in Chapter 13 (Operation noise and vibration). No impacts were identified.

14.2 Existing environment

The following sections describe the historical context of the study area, including the development of the existing rail line and stations (Section 14.2.1), listed heritage items (Section 14.2.2), and archaeological sites and potential (Section 14.2.3).

14.2.1 Historical context

An overview of the historical context for the assessment is provided in this section, including early exploration and urban development, and the development of the rail line and stations. Although Sydenham Station is not included in the project area, Sydenham and its station are considered as they form part of the historical context of the development of the Bankstown Line.

A detailed description of the early exploration and settlement of the region, and the development of the Bankstown Line and its stations, is provided in Section 3 of Technical paper 3.

Exploration and urban/industrial development

The first European exploration of the Cooks River region (between what is now Sydenham and Bankstown) was led by Captain John Hunter in 1789. Development of the area around the Cooks River was relatively slow until construction of the Bankstown Line occurred between 1892 and 1939. Sydenham Station was previously built as part of the Illawarra Line, and was extended to accommodate the new Bankstown Line, which commenced at Sydenham Station.

Construction of the Bankstown Line changed the nature of development in the Cooks River area. New residential lots were developed, radiating from the rail line. Subdivisions were advertised in terms of their proximity to the railway and its stations.

Industrialisation in the areas adjoining the rail line increased in the early 1900s, with the introduction of the Metropolitan Goods Line (parallel to the Bankstown Line). A number of factories (such as the Great Western Milling Company, the Western Timber Mill, and Sidney Williams & Co Pty Ltd) took advantage of the ability to move their goods efficiently by rail. Employment opportunities provided by these large factories attracted numerous workers to the area, and land adjacent to the rail line was subdivided to provide housing for workers.

Key historical developments along the Bankstown Line include:

- Sydney Steel Company (Sydenham), established to the north of the rail line in 1910
- the Australasian Sugar Company Mill (Canterbury), constructed between 1840 and 1842 to the south of the rail line near the banks of the Cooks River
- Benjamin Taylor's house 'Lakemba', constructed prior to the 1890s near what is now Lakemba Station.

Bankstown Line development

The Bankstown Line was constructed in three phases between 1892 and 1939. The first phase was the Sydenham to Belmore section, constructed between 1880 and 1895. Sydenham Station was originally known as Marrickville when it opened in October 1884. The station name was changed to Sydenham in 1895 when the new line was completed. Marrickville, Dulwich Hill, Hurlstone Park, Campsie, Canterbury, and Belmore stations were constructed during this period.

The second phase was constructed between 1896 and 1909 when the rail corridor was cut through undeveloped country estates and farmland to Bankstown and Lakemba. Punchbowl and Bankstown stations were opened during this period. The early twentieth century saw the addition of platform buildings, overhead booking offices, footbridges and overbridges to the existing stations. The line was electrified in 1926, marking a significant change in the railway network.

The third phase of development occurred between 1928 and 1939 when the line reached Regents Park via Yagoona and Birrong. Wiley Park opened in 1938 as an infill station on the Sydenham to Bankstown section. Dulwich Hill Station was redeveloped in 1935. Both of these stations provide examples of inter-war railway architecture.

Station development

The development of the stations on the Bankstown Line was an important driver of urban and industrial development in the surrounding areas. The history of development at each station within the project area is summarised in Table 14.3.

Table 14.3 Historical development of stations within the project area

Station	Timeline	Key development
Marrickville	1894-95	Marrickville Station constructed
	1917	New platform and building with overhead booking office built on the city bound platform, and platforms extended
	1926	Changes to the layout of the station following electrification
	1944	Booking office on Platform 2 altered
	1985	Stairs from Illawarra Road constructed
	2016	Station upgrade
Dulwich Hill	1895	Opened on 1 February as 'Wardell Road Station'
	1920	Renamed as 'Dulwich Hill Station'
	1935	Original 1895 timber station buildings replaced Construction of a new brick platform building, and a new overhead weatherboard booking and parcels office and bookstall
Hurlstone Park	1894	Opened on 27 November as 'Fern Hill Station'
	1911	Renamed as 'Hurlstone Park Station' and a new platform constructed Metropolitan Goods Line construction commenced
	1915	Original timber station building replaced by brick buildings on both platforms, and an overhead booking office constructed
	1980s	Overhead booking office replaced
Canterbury	1895	Station opened
	1915	Platform building 2 and footbridge constructed Signal box commissioned in preparation for operation of the Metropolitan Goods Line
	1937	Signal box extensions – western annex
	1947	Footbridge extended
	1968	Signal box extensions – eastern annex
	Late 1980s	Overhead booking office and concourse constructed
	1996	Signal box decommissioned and building sealed to preserve the structure and its internal signalling equipment
Campsie	1895	Station opened
	1905	New booking office constructed
	1906	Platform extended
	1915	Present station layout and buildings constructed

Station	Timeline	Key development
	1916	Metropolitan Goods Line opened and a northern side platform constructed
	1950s	Existing concrete platform, stairs and overhead parcels office constructed
	2000	Overhead parcels office demolished and replaced
	2016	Station upgrades
Belmore	1895	Opened as the initial terminus station and included the station master's residence still present at 346 Burwood Road
	1909	Prior to 1909 there were sidings for the storage of locomotives due to the railway terminating at Belmore Station
	1925-26	Substation constructed and the platform extended
	1937	Overhead timber booking office constructed
Lakemba	1909	Station opened
	1919	New brick platform building with cantilever awnings constructed
	1926	Station modified for electrification and a haunched beam footbridge with overhead booking office constructed
	1953	War memorial monument dedicated
	2002	Booking office demolished after fire damage and replaced by a modern metal and glass structure
Wiley Park	1938	Station opened
	2016	The building on the Up platform appears to have been rebuilt in recent years, and the interior of the booking office has been refurbished
Punchbowl	1909	Station opened
	1919	Goods siding constructed
	1924	Station building awning added
	1926	Electric train depot opened in proximity to the station
	1929	Overhead booking office constructed, platforms lengthened, and the stairway to the Punchbowl Road overbridge removed
	1940s	Construction of a new lamp room and parcels office
	1981	Good siding removed
	1995	Electric train depot closed
	2014	Northern and southern footbridge stairs replaced
Bankstown	1909	Station opened
	1910	Single tier water tank on a steel stand constructed
	1915	Parcels office opened
	1920s	A pillar water tank and ash pit constructed
	1925-26	Platform extensions constructed when the line was electrified in 1926 New parcels office and booking office opened
	1948	Overhead booking office, footbridge, and parcels office constructed
	1970s	Water tank removed
	2015	New stairs, ramps, canopies, and ticket barriers installed

14.2.2 Heritage listed items and conservation areas

Heritage listed items and conservation areas located within the study area for the assessment (defined in Section 14.1.2) were identified based on a search of relevant registers (listed in Section 14.1.2) on 22 June 2016. Listed items and conservation areas are shown on Figure 14.1. A full list and detailed description of all heritage listed items and conservation areas in the study area for the assessment, and their significance, is provided in Section 4 of Technical paper 3. A summary of those items and areas located within or immediately adjoining the project area is provided in this section.

Heritage listed items and conservation areas in the study area consist of those listed on the State heritage register, local environmental plans, and/or State agency Section 170 registers. No items listed on National or World heritage lists were identified.

Heritage listed items

Heritage listed items within and adjoining the project area include:

- five items listed on the State heritage register (summarised in Table 14.4)
- 32 locally listed items - of these items, 15 are listed by local environmental plans, four are listed by various State agency Section 170 registers, and 11 are listed by both
- two locally listed heritage conservation areas.

Heritage listed items and conservation areas are shown in Figure 14.1, and further information on is provided in Sections 14.3.2 to 14.3.11.

Table 14.4 State heritage listed items and station listings

Item[1]	Listing name	Listing[1]	Location with respect to the project area
Items listed on the State Heritage Register			
Sewage Pumping Station 271	Sewage Pumping Station 271	SHR (01342) Sydney Water s.170 (4571727) Marrickville LEP (I67)	Directly adjacent to project area
Marrickville Railway Station Group	Marrickville Railway Station Group	SHR (01186) RailCorp s.170 (4801091) Marrickville LEP (I89)	In project area
Old Sugar Mill	Old Sugar mill	SHR (00290)	Directly adjacent to project area
	Canterbury Sugar Mill (former)	Canterbury LEP (I82)	Directly adjacent to project area
Canterbury Railway Station Group	Canterbury Railway Station Group	SHR (01109) RailCorp s.170 (4801100)	In project area
	Federation railway station buildings	Canterbury LEP (I67)	In project area
Belmore Railway Station Group	Belmore Railway Station Group	SHR (01081) RailCorp s.170 (4801084)	In project area
	Federation railway station buildings	Canterbury LEP (I11)	In project area
Other station listings			
Dulwich Hill Railway Station Group	Dulwich Hill Railway Station Group	RailCorp s.170 (4801909)	In project area

Item[1]	Listing name	Listing[1]	Location with respect to the project area
Hurlstone Park Railway Station Group	Hurlstone Park Railway Station Group	RailCorp s.170 (4805737) Canterbury LEP (I126)	In project area
Campsie Railway Station Group	Campsie Railway Station Group	RailCorp s.170 (4801101) Canterbury LEP (I40)	In project area
Lakemba Railway Station Group	Lakemba Railway Station Group	RailCorp s.170 (4801916) Canterbury LEP (I143)	In project area
Wiley Park Railway Station Group	Wiley Park Railway Station Group	RailCorp s.170 (4801946) Canterbury LEP (I159)	In project area
Punchbowl Railway Station Group	Punchbowl Railway Station Group	RailCorp s.170 (4802009) Canterbury LEP (I155)	In project area
Bankstown Railway Station Group	Bankstown Railway Station Group	RailCorp s.170 (4802067) Bankstown LEP (I3)	In project area

Notes: 1. SHR – State Heritage Register, s.170 – Section 170 register, LEP – local environmental plan

Heritage conservation areas

The project passes through or is adjacent to two heritage conservation areas listed under the Marrickville LEP, as summarised in Table 14.5 and shown in Figure 14.1.

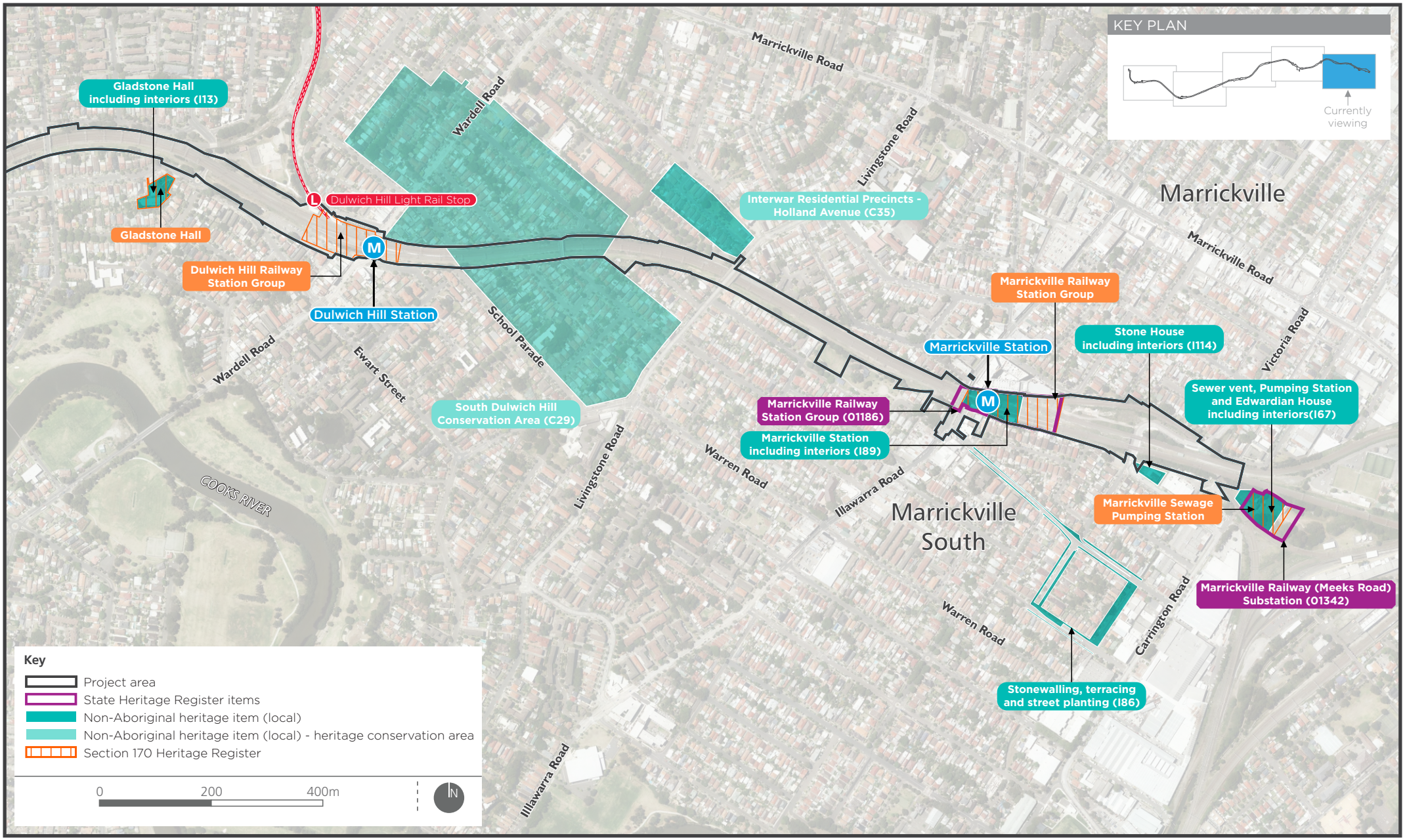
Table 14.5 Listed and proposed heritage conservation areas

Heritage conservation area	Register listings	Heritage significance	Location with respect to the project area
South Dulwich Hill Heritage Conservation Area	Marrickville LEP (C29)	Local	Project passes through part of the area at Dulwich Hill
Inter-War Heritage Conservation Area Group - Hollands Avenue; Jocelyn Avenue and Woodbury Street	Marrickville LEP (C35)	Local	Directly adjacent to project area east of Dulwich Hill Station

Two proposed heritage conservation areas are located adjacent to the project area near Hurlstone Park Station (Paul Davies Pty Ltd, 2016):

- the proposed Floss Street heritage conservation area is located adjacent to Hurlstone Park Station
- the proposed Hampden Street heritage conservation area is located adjacent to the rail corridor, to the north-east of Hurlstone Park Station.

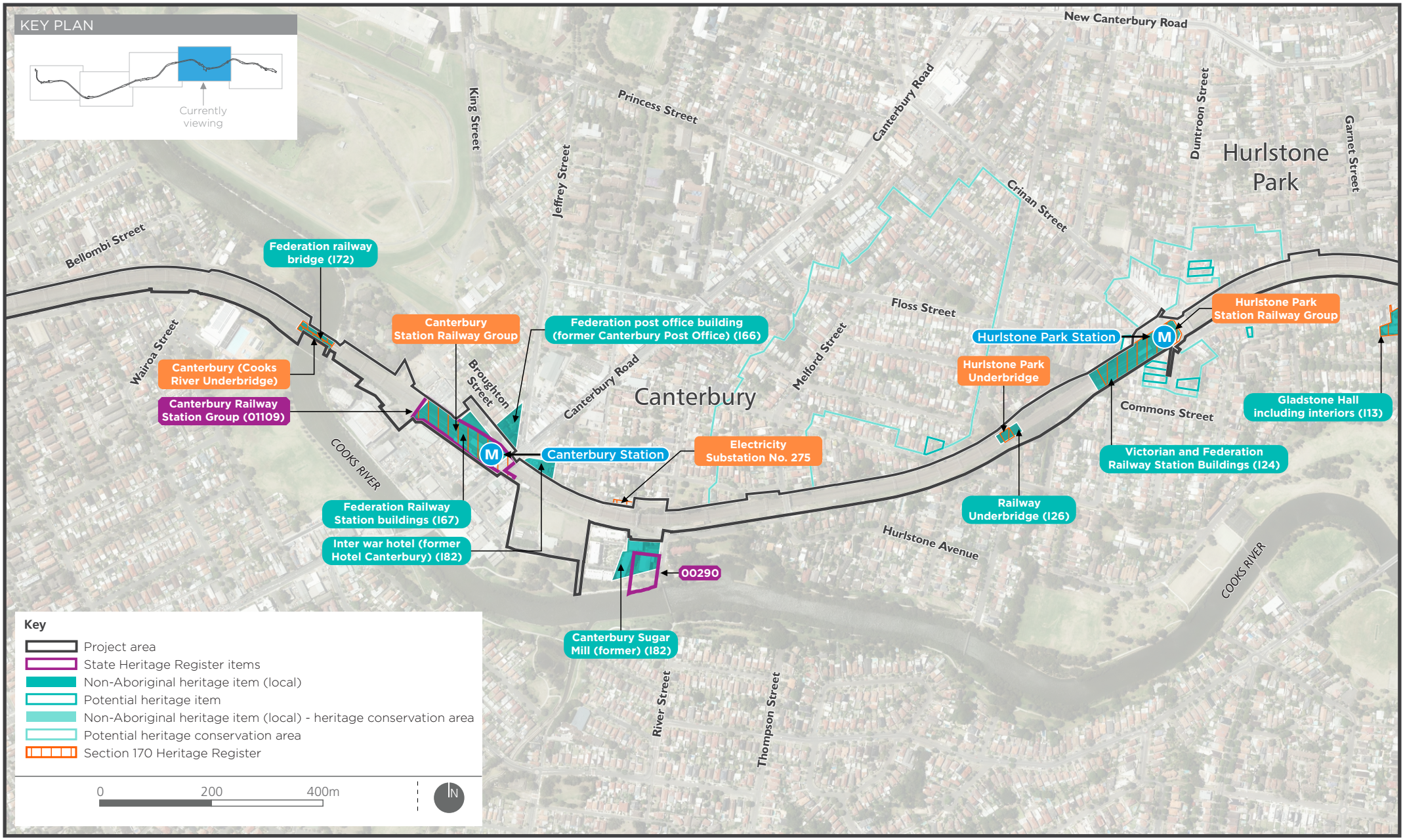
These proposed heritage conservation areas are shown in Figure 14.1. On 18 April 2017, Canterbury-Bankstown Council resolved that a planning proposal to list these areas (as part of a broader proposal to list a number of new heritage items and areas in Hurlstone Park) be submitted to the Department of Planning and Environment for a revised Gateway Determination and be placed on public exhibition.



sydney METRO | city & southwest

Heritage listed items and areas - map 1

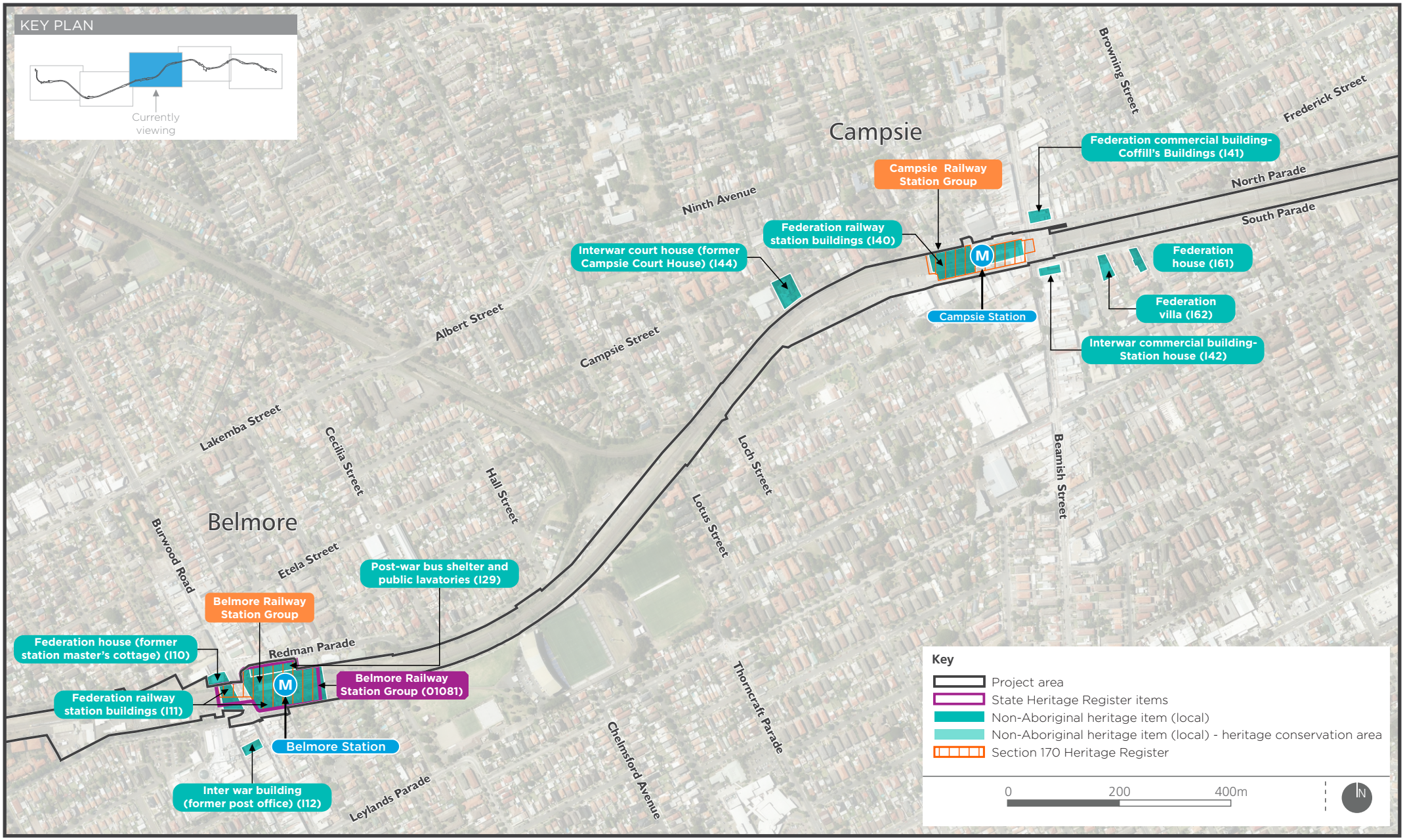
FIGURE 14.1



sydney METRO | city & southwest

Heritage listed items and areas - map 2

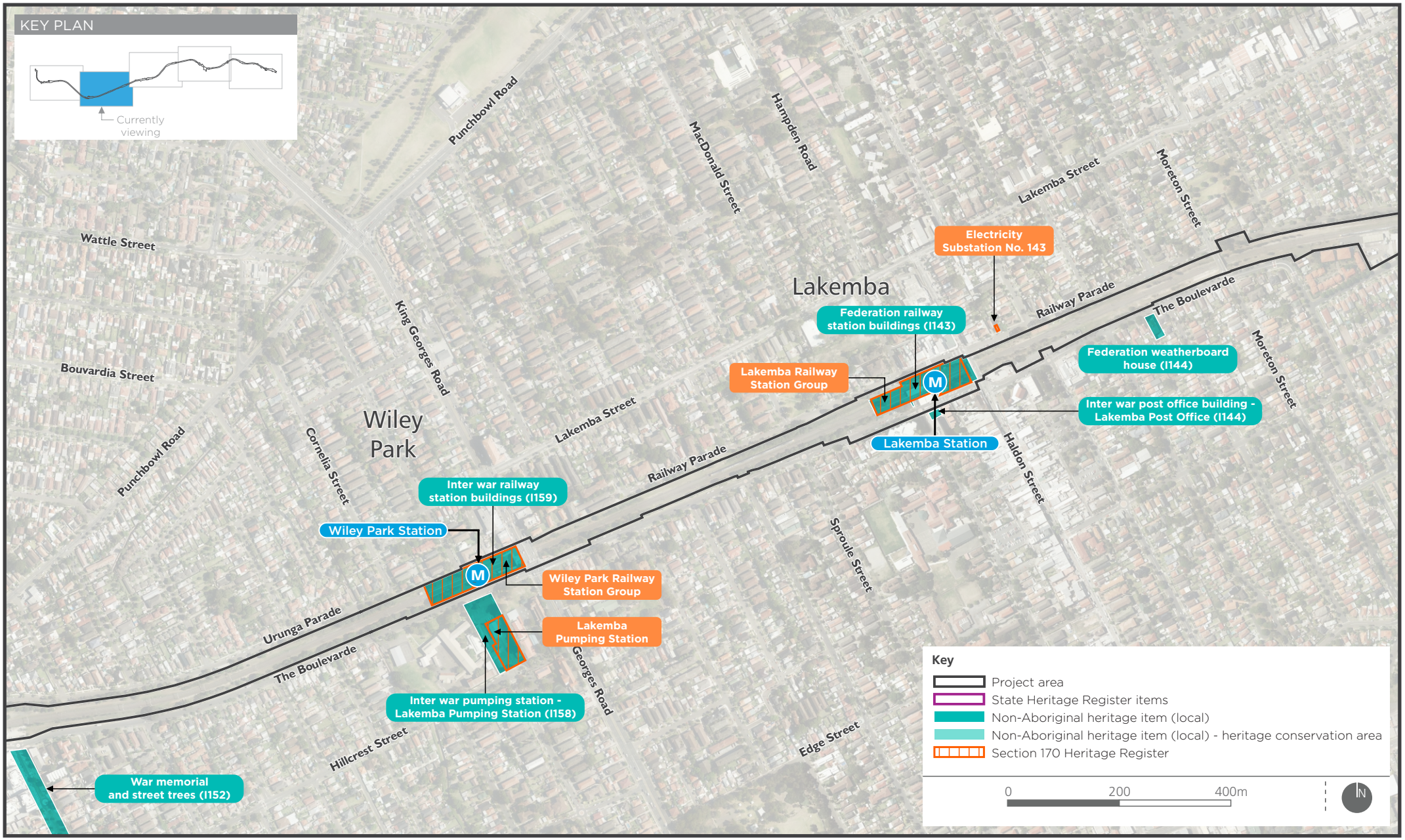
FIGURE 14.1



sydney METRO | city & southwest

Heritage listed items and areas - map 3

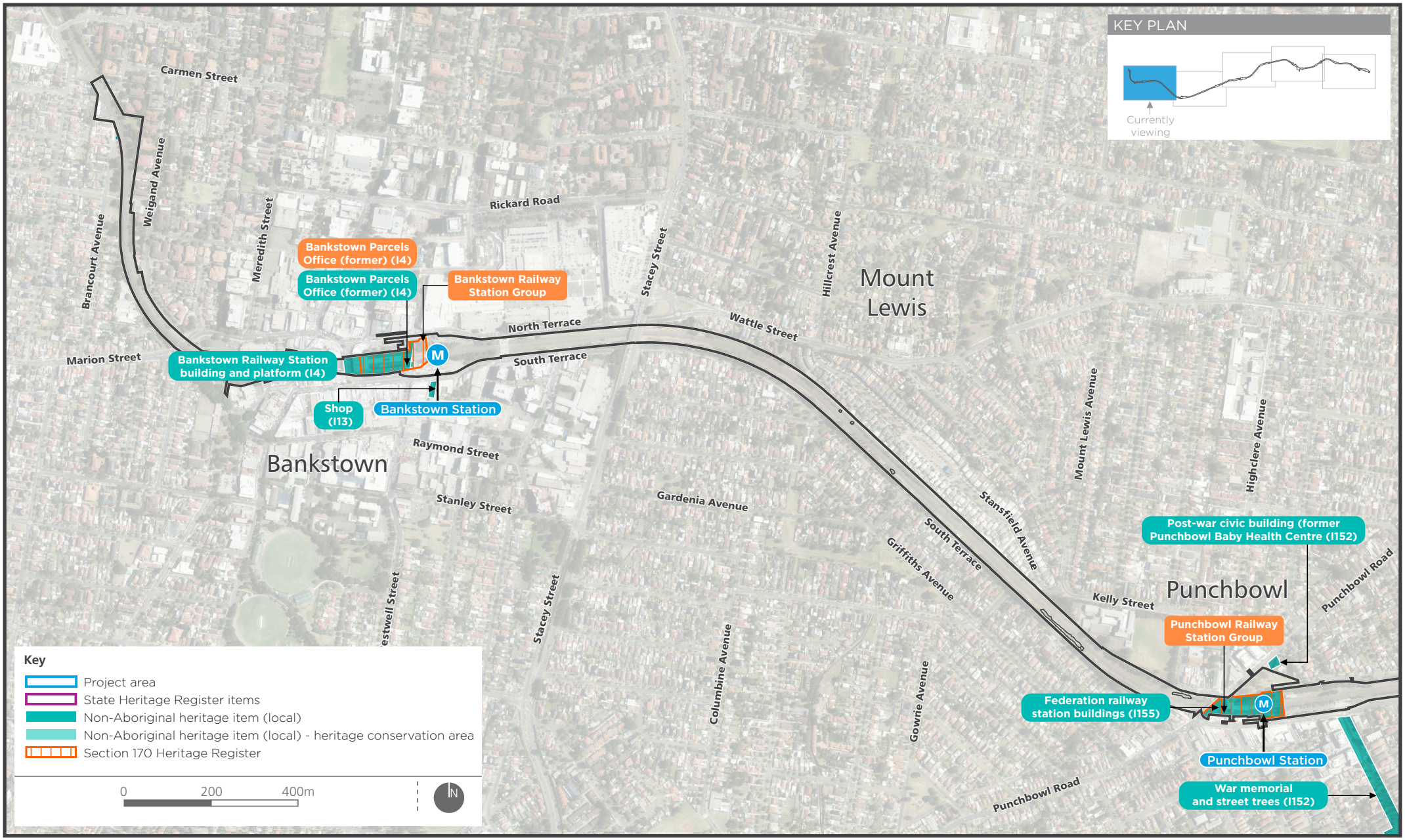
FIGURE 14.1



sydney METRO | city & southwest

Heritage listed items and areas - map 4

FIGURE 14.1



sydney METRO | city & southwest

Heritage listed items and areas - map 5

FIGURE 14.1

14.2.3 Archaeological sites and potential

Listed archaeological sites

There are no listed archaeological sites within or adjacent to the project area.

Archaeological potential

Construction of the rail line and stations would have involved a considerable amount of ground disturbance and excavation. Rail and station upgrades throughout the twentieth century would have resulted in high levels of ground impacts throughout the station catchments.

The majority of locations are considered to have nil to low archaeological potential and/or significance. The highest levels of potential and/or significance were identified at the following locations:

- Marrickville Station – There is a moderate to high potential for locally significant remains of original stone copings, earlier alignment of platforms, footscrapers, buried services, original lever set, footings of former platform stairs, platform brick dwarf walls, building footings, and the footings of former platform canopies.
- Canterbury Station – Although the location of the Canterbury Sugar Company works mill and former associated structures is outside the project area, remains of outbuildings and mill activities may exist within the rail corridor and adjoining work site (work site 8). These have the potential to reach the threshold for State significance, if intact or substantial remains are found to exist within the project area.
- Lakemba Station – There is low potential for locally significant remains associated with 'Lakemba' (a residence constructed in the late nineteenth century) to exist and be impacted by the project. There is also low to moderate potential for the potentially locally significant remains of the 1919 Lakemba Station island platform to be impacted by the project.
- Belmore Station – There is low to moderate potential for locally significant remains associated with the station goods shed and platform to be impacted by the project.

Other locations in the project area may contain archaeological 'works' such as remains of culverts, former platforms (within existing remodelled platforms), and infrastructure such as drains.

14.3 Impact assessment

14.3.1 Risk assessment

Potential risks

Construction and operation of the project would have the potential to impact on heritage items, conservation areas, and sites with archaeological potential. The environmental risk assessment for the project, undertaken for the State Significant Infrastructure Application Report, identified the following as the main non-Aboriginal heritage risks:

- direct impact to State listed heritage items during construction
- direct impacts to local and Section 170 listed heritage items during construction
- impacts to the heritage values of conservation areas during construction
- damage to heritage items from construction vibration
- impacts on unknown heritage items (e.g. archaeological items) during construction
- impacts on heritage items from construction such as change in visual outlook
- adverse impacts on heritage item values during operation (e.g. change in visual outlook)

- groundborne vibration impacts on heritage listed items during operation.

How potential impacts have been avoided/minimised

The potential for heritage impacts was considered throughout the design development process, to minimise the overall impacts to heritage, and ensure that the design would architecturally complement rather than obstruct or overshadow heritage items, where practicable.

The NSW Heritage Office guidelines for the design of new structures in historic environments provides that (Heritage Office, 2006b):

> 'New design should respond to its historic context through an understanding and informed analysis of its character and quality. This will include elements such as its grain, existing patterns of development, important views, scale, materials and building methods. As a consequence, the resulting design should create new relationships between the building, its neighbours and its setting.'

The design for the project sought to reuse and revitalise a selection of station buildings. Adaptive reuse can contribute to building social and cultural capital, environmental sustainability, and urban regeneration (Heritage Council Victoria, 2013). This can increase and retain the social significance of a heritage item by allowing it to be appreciated in a new and informative way, especially in conjunction with heritage interpretation. The project sought to retain and build upon the layers of history of the Bankstown Line. This follows the philosophy that (Heritage Office, 2006b):

> 'Adaptive reuse gives new life to a site, rather than seeking to freeze it at a particular moment in time. It explores the options that lie between the extremes of demolition or turning a site into a museum. Adding a new layer without erasing earlier layers, an adaptive reuse project becomes part of the long history of the site.'

The introduction of Sydney Metro on the T3 Bankstown Line constitutes the fourth major intervention to this existing railway landscape. As described in Chapter 7, the design process for the project involved significant work to minimise direct impacts to heritage items as far as practicable.

The design of the proposed station upgrades was undertaken with regard to the heritage values of the stations and the line overall, and has sought to:

- recognise and demonstrate the heritage significance of all phases of rail transport development along the line
- retain and conserve, wherever possible, elements of heritage significance, so that functional relationships can be understood and interpreted
- remove intrusive station elements that detract from the core heritage values
- adaptively reuse the retained and conserved heritage buildings for station and related functions
- carefully and clearly express the presence of Sydney Metro with new high quality design elements
- deliver a functionally viable line, stations, and surrounding areas, while enhancing the legibility of key heritage values.

Further information on the design approach used to achieve the required accessibility upgrades and meet the operational requirements of Sydney Metro, whilst minimising impacts on heritage, is provided in Chapter 7. The approach to the design has been to retain as many existing significant heritage items and/or elements as possible, with particular focus given to those items listed on the State Heritage Register. As part of this process, Transport for NSW has ensured that retained heritage elements would have a suitable operational purpose, and that their retention would not compromise the integrity of the station design and layout, or safety and customer requirements. Further information on the options considered to minimise heritage impacts, and the justification for

removal of heritage elements where this is required, is provided in Section 5.3 of Technical paper 3.

In general, potential impacts on heritage outside the rail corridor have been avoided by designing the project to minimise impacts on land outside the corridor. In addition, construction compounds would only be located within already cleared areas (such as car parks) to avoid impacting on heritage sites and items.

A summary of the results of the assessment for the main project features is provided in the following sections.

14.3.2 Marrickville Station

Existing items

Heritage listed items in the vicinity of Marrickville Station with the potential to be impacted by the project are summarised in Table 14.6 and shown in Figure 14.1. Table 14.7 lists the main structures and elements within the Marrickville Railway Station Group, including relevant information such as date, condition, and significance.

Table 14.6 Marrickville Station – heritage items

Item	Listing	Location
Marrickville Railway Station Group	SHR (01186) RailCorp s.170 (4801091) Marrickville LEP (I89)	In project area
Sewage Pumping Station 271	SHR (01342) Sydney Water s.170 (4571727) Marrickville LEP (I67)	In project area
Stone house, including interiors	Marrickville LEP (I114)	Adjacent to project area
Stonewalling, terracing and street planting	Marrickville LEP (I86)	Adjacent to project area

Direct impacts

An assessment of the direct impacts of the project on the fabric of each element constituting the Marrickville Railway Station Group, and an assessment of the subsequent impacts on the heritage values of the station group as a whole, is provided in Table 14.7. Potential impacts are illustrated in Figure 14.2.

The project would not directly impact on Sewage Pumping Station 271, or the Stone house.

Table 14.7 Summary of direct impacts to significant elements within the Marrickville Railway Station Group

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Platform 1 (1895)	Generally good	Exceptional	Retention of western section of platform Removal of eastern section with new platform to be rebuilt in straight alignment and extended towards the east Platform canopies and platform screen doors to be anchored on the portion of retained platform New building and canopies to be anchored on the portion of reconstructed platform	The overall impact to this element has been assessed as major due to the following: • major impact on the original platform, including the loss of about half of its fabric and brick face from the demolition eastward of the central platform building • the western section of the platform would be retained including the structure underneath the platform building • major impact on the original platform layout - reconstruction of the eastern section of the platform to accommodate the straight rail alignment would result in loss of the original curvilinear form of the platform and of the symmetry created with Platform 2 when the latter was constructed in 1911 • the new platform building, canopies, and platform screen doors would be anchored on the reconstructed platform and would not further impact significant fabric • moderate impact resulting from installing platform canopies and platform screen doors to the portion of Platform 1 to be retained.
Platform 1 building (Type 11) (1895)	Generally good	Exceptional	Retention for re-use with potential retrofitting	The overall impact to this element has been assessed as minor due to the following: • the retention of the platform building is a positive heritage outcome in the context of the project • retrofitting for new accommodation would be designed to minimise impacts to original fabric • additions to the building and platform would be designed to be sympathetic to the heritage context and minimise fabric and visual impacts.
Platform 2 (1911)	Generally good	Exceptional	Partial retention on the western side as well as the structure underneath the heritage building Removal of eastern section with retention of structure underneath platform building Platform to be rebuilt in straight alignment and extended towards the east Station buildings, platform canopies and platform screen doors to be anchored on	The overall impact to this element has been assessed as major due to the following: • the majority of the platform would be removed on the eastern side resulting in a major impact on the original platform, including the loss of most of its fabric and brick face. • reconstruction of the eastern section of the platform to accommodate the straight rail line alignment would result in the loss of the original curvilinear form of the platform and of the symmetry with Platform 1, and would have a major impact on the original platform layout. • moderate impact on the portion of retained platform where pylons and

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
			both the retained and new platforms	struts are anchored for the new platform buildings, platform canopies and platform screen doors, elements to be anchored on the reconstructed platform would not further impact significant fabric.
Platform 2 building (Type 11) (1911)	Generally good	High	Retention for re-use with potential retrofitting	The overall impact to this element has been assessed as minor due to the following: • positive heritage outcome through retention of the platform building • retrofitting for new accommodation would be designed to minimise impacts to original fabric, including preservation of the original layout where possible, and removal of any intrusive modifications • additions to the building and platform would be designed to be sympathetic to the heritage context and minimise fabric and visual impacts.
Overbridge - Illawarra Road (1911. c.2013)	Generally good	Brick parapets including curbs, piers and panels - Exceptional Structure below the deck level - Moderate	Removal and replacement - demolition of the bridge deck, adding new parapets, throw screens, waterproofing, and asphalt, new abutments, bridge beams, and concrete slab, utility modifications/relocations, bridge drainage, line markings, road level adjustments, and makeup panels.	The overall impact to this element has been assessed as major as the proposed works would remove the heritage value of this item.
Platform 2 booking office (1917, relocated)	Generally good	Exceptional	Retention in current location	The overall impact to this element has been assessed as neutral as the booking office has already been relocated from its original location during the station upgrade in 2016.
Pedestrian steps: northern set (1917, c.2013)	Generally good	Little	Retention	The overall impact to this element has been assessed as neutral as the existing stairs were installed as part of the recent upgrade and the original stairs are no longer present.
Pedestrian steps: southern set (1985, c.2013)	Generally good	Little	Retention	The overall impact to this element has been assessed as neutral as the existing stairs were installed as part of the recent upgrade and the original stairs are no longer present.

Visual impacts

Marrickville Railway Station Group

There would be some difference visually between the proposed upgrade for the project and the recent upgrade work undertaken under Transport for NSW's Transport Access Program. The recently upgraded concourse and lifts would remain with some cosmetic modifications. Pedestrian steps would also be retained. The proposed upgrades would be distinguishable and recognisable across the station as a new phase in development of the station and the Bankstown Line.

The contemporary nature of the new development would differ from the existing heritage character of the station group, creating a distinct relationship between the historic components of the site and the new elements. The new platform building on Platform 1 would be low in scale and bulk, and would be located at a distance from the heritage building. The design of the canopy has aimed to reduce bulk and height. To maximise potential view lines, canopies would be glazed adjacent to heritage buildings.

Some views from the concourse to the Platform 1 building would be discernible, while views towards the Platform 2 building would generally be obscured by the canopies between the stairs and the Platform 2 building. Canopies would extend along both platforms, with a separation of at least two metres from the significant Platform 1 and Platform 2 buildings. Views of the Platform 1 building would be available from Station Street.

The recent station upgrades resulted in some impacts to the historic context and setting of the station. The additional structures and canopies proposed for the project would further modernise the station setting. While the proposed works would have some positive impacts, including a general refresh and removal of intrusive elements, the open historic setting and character of the station would be diminished.

The proposed platform screen doors would result in a minor impact on external views from the platform buildings and from the concourse towards the heritage buildings, and a moderate impact on internal views as a result of visual clutter. The new platform screen doors would partially obscure the Platform 1 and Platform 2 building, where they would result in a moderate visual impact.

The visual impacts of the upgraded station on the Marrickville Railway Station Group would be major overall.

Existing views from the new Illawarra Road overbridge would not be significantly impacted compared to existing views and vistas. The proposed replacement of the Illawarra Road overbridge with a sympathetically designed structure would have a moderate visual impact on the station group, although views from the overbridge to the significant station buildings would be retained.

Additional impacts such as the services building to be constructed to the north-east of the station in the rail corridor, landscaping, new pavement, kerbside facilities, and signage would have a minor impact on the setting and context of the station, as they would be consistent with the use of the station.

Overall, the proposed platform canopies and platform building would have a major visual impact on the character and setting of the Marrickville Railway Station Group. The new platform screen doors would result in a moderate impact. Some views to the Platform 1 building of exceptional significance, and to the Platform 2 building of high significance, would be retained for continued appreciation, although the canopies on the stairs and platforms would obscure views from most areas apart from the section of the concourse and Station Street. This assessment considered the balance of impacts as a result of new high quality design structures being added; the positive impacts of the removal of intrusive elements; and the refresh of the station. The assessment also considered the high quality, sensitive design of the new metro layer, which would remain distinguishable from the original elements.

When considering cumulative impacts overall, the assessment concluded that the project would result in a major visual impact on Marrickville Railway Station Group.

Other items

There would be negligible visual impacts on the other listed heritage items, as the nearest item (Stonewalling terracing and street planting) is at least 70 metres from the boundary of

Marrickville Station, and views of the tracks and overhead wiring would be consistent the current views and vistas of the heritage items.

Potential direct (vibration) impacts

Table 14.8 summarises the potential vibration impacts on listed heritage items.

Table 14.8 Potential vibration impacts

Item	Potential impact
Marrickville Railway Station Group Sewage Pumping Station 271 Stone house, including interiors	Minor: The closest façades of these items would experience vibration levels above the screening level for cosmetic damage. Further assessment and management would be undertaken in accordance with the approach described in Section 14.4.
Stonewalling, terracing and street planting	Negligible: Vibration levels would be below the cosmetic damage screening level.

Statement of heritage impact

Marrickville Railway Station Group

The direct impacts of the project on the Marrickville Railway Station Group would be major overall. The platform building of exceptional significance and the Platform 2 building of high significance would be retained and retrofitted with the potential for positive impact. The Illawarra Road overbridge would be removed and replaced. The Platform 2 booking office of exceptional significance would be relocated along the platform. Potential direct impacts as a result of vibration would be minor, provided the mitigation measures outlined in Section 14.4 are implemented.

Platform buildings 1 and 2, dated 1895 and 1911 of exceptional and high significance, would still contribute to the overall significance of Marrickville Station as a major station on the Bankstown Line, as they are to be retained. The two platform buildings are good examples of their respective types and would still contribute to the aesthetic and historical significance and representativeness and rarity values of the station. The partial retention of Platforms 1 and 2 would retain representative samples of the original 1895 and 1911 platforms. The booking office, an element of exceptional significance, would be retained in its current location.

The retained elements of the station would continue to represent this historical value. The project would enable the station to continue to play a role in the growth and development of Sydney and the local area.

The overall visual impact would be major, as new elements would diminish views to significant platform buildings, impact the context and setting, and introduce visual clutter.

Although there would be significant changes as a result of the new metro design layer being added to the station, this evolution would enable the station to continue its use as a transport hub. The new layer which would remain distinguishable from the original elements, and the historic values of the station would be appreciated in the context of the evolution of the station.

When assessed cumulatively, the level of heritage impact of the project on the Marrickville Railway Station Group would be major. The heritage item would continue to meet the threshold for State significance for the historical and aesthetic significance of the station in the context of its evolution and retained elements, as well as under rarity and representativeness, as demonstrated by the retained elements of high and exceptional significance. The station would still reach the threshold of State significance under research potential, as the booking office, to which this criteria primarily refers in the State Heritage Register statement of significance, would be retained.

Direct impacts on the other three listed heritage items would be neutral. The proposed works in the vicinity of the station would result in a negligible visual impact overall. Potential direct impacts as a

result of vibration would be minor, provided the mitigation measures are implemented. When assessed cumulatively, the level of heritage impact of the project on the Sewage Pumping Station 27, Stone house, and Stonewalling, terracing and street planting would be negligible. The heritage items would continue to meet the threshold for local significance.

14.3.3 Dulwich Hill Station

Existing items

Heritage listed items in the vicinity of Dulwich Hill Station with the potential to be impacted by the project are summarised in Table 14.9 and shown in Figure 14.1. Table 14.10 lists the main structures and elements within the Dulwich Hill Railway Station Group, including relevant information such as date, condition, and significance.

Table 14.9 Dulwich Hill Station – heritage items

Item	Listing	Location
Dulwich Hill Railway Station Group	RailCorp s.170 (No. 4801909)	In project area
South Dulwich Hill Heritage Conservation Area	Marrickville LEP (C29)	In project area
Gladstone Hall, including interiors	Department of Health s.170 (3540048) Marrickville LEP (I13)	Adjacent to project area
Inter-War Heritage Conservation Area Group - Hollands Avenue; Jocelyn Avenue and Woodbury Street	Marrickville LEP (C35)	Adjacent to project area

Direct impacts

An assessment of the direct impacts of the project on the fabric of each element constituting the Dulwich Hill Railway Station Group, and an assessment of the subsequent impacts on the heritage values of the station group as a whole, is provided in Table 14.10. Potential impacts are illustrated in Figure 14.2.

There would be negligible direct impacts on the South Dulwich Hill Heritage Conservation Area. Direct impacts within the curtilage of the conservation area would include an upgrade of tracks and related overhead wiring, and the removal and replacement of the Albermarle Street overbridge. No areas of heritage significance within the conservation area would be directly impacted by the works. Alterations to the rail line and the Albermarle Street overbridge would be in line with the existing setting and nature of this portion of the conservation area.

Table 14.10 Summary of direct impacts to significant elements within the Dulwich Hill Railway Station Group

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Platforms 1/2 (1935)	Good	High	Removal apart from structure underneath heritage building Platform to be rebuilt in a similar curve to the existing and extend further towards the western end Covered concourse, access stairs, lift shaft, platform canopies and platform screen doors anchored on the west side of the new platform New services building on western end of reconstructed platform	The overall impact to this element has been assessed as major due to the following: • major impact on the station group resulting from the demolition of Platform 1/2, to be reconstructed to accommodate the station upgrade and operation of metro trains • major impact on the fabric of the platform, including the loss of the original brick face from the removal of the 1935 island platform (apart from the structure underneath the heritage building) • moderate impact on the original platform layout from the reconstruction of the platform to accommodate the rail lines and recreation of a curve similar to the original curve of the platform • the new covered concourse, access stairs, lift shaft, platform canopies, platform screen doors, and services building would be anchored and constructed on the new platform, and would not further impact significant fabric.
Platforms 1/2 building (Type 13) (1935)	Moderate	High	Retention for re-use with potential retrofitting	The overall impact to this element has been assessed as minor due to the following: • positive heritage outcome • retrofitting for new accommodation would be designed to minimise impacts to original fabric, including preservation of the original layout where possible, and removal of any intrusive modifications • additions to the building and platform would be designed to be sympathetic to the heritage context and minimise fabric and visual impacts.
Overhead booking office (1935)	Good	High	Removal of the building and the original brick pier and steel beam structure	The overall impact to this element has been assessed as major due to the following: • major impact on the setting of the station as a whole and removal of a building type that is significant in the context of Sydney Trains heritage assets as a group • the building was ranked in second position in the *Railway Overhead Booking Offices Heritage Conservation Strategy* and recommended for retention (Australian Museum Consulting, 2014).
Stairs (1935)	Good	Moderate	Removal of the stairs and footbridge	The overall impact to this element has been assessed as major due to the removal of the stairs would have a major

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
				impact on the fabric and historical values of the stairs and the station as a whole.
Overbridge (c.1930, c.1975)	Good	Moderate	Retention and upgrade	The overall impact to this element has been assessed as minor due to the removal and replacement of non-significant parapets would result in a minor impact on the heritage values of the overbridge and station overall.

Visual impacts

Dulwich Hill Railway Station Group

The proposed new concourse would be modern in style and would be considerably larger in scale compared to the 1935 platform building. Medium-scale ribbon canopies would extend from the concourse covering the central access stairs and along the length of the platform to the west. There would not be canopies above, or adjacent to, the heritage building, which would remain clearly visible from the concourse, separated from the new layers of development. The materials likely to be used and the contemporary nature of the proposed new concourse, canopies, and station buildings, would provide a distinctive design easily differentiated from the heritage components of the item. The proposed concourse, station and services buildings would be sited away from the heritage buildings.

Removal of the overhead booking office would result in a major visual impact on the station, as a significant portion of its heritage fabric would be removed. The overhead booking office is a rare example of an inter-war transitional booking office, with good condition and integrity. Its removal would result in a major impact on the setting of the station as a whole.

The platform screen doors along Platform 1/2 would result in a minor impact on external views from the platform buildings and from the new concourse towards the heritage buildings, and a moderate impact on internal views as a result of visual clutter.

Overall, the proposed ribbon canopies, covered concourse, and station infrastructure would have a major impact on the character and setting of the Dulwich Hill Railway Station Group. The removal of the overhead booking office would remove an element of high significance in the station. The new concourse would add considerable bulk to the station. The additional platform screen doors would result in a moderate visual impact.

When considering cumulative impacts overall, the assessment concluded that the project would result in a major visual impact on the Dulwich Hill Railway Station Group.

Other heritage items

There would be negligible visual impacts on the South Dulwich Hill Heritage Conservation Area and the Inter-War Heritage Conservation Area Group. This is largely due to screening of the views by existing vegetation, houses along Marrickville Avenue (in the Inter-War Heritage Conservation Area), and the position of the station below street level. In addition, the bulk of the proposed additions would be concentrated on the western side of the station, further from views from the South Dulwich Hill Heritage Conservation Area.

Neutral visual impacts are predicted on Gladstone Hall, which is located about 40 metres south of the rail corridor and 270 metres from the western edge of the platform. Views from this item towards the rail line are limited, as they are screened by vegetation. Any views of new tracks and overhead wiring would be consistent with the existing views and vistas and would have a neutral visual impact.

Potential direct (vibration) impacts

Table 14.11 summarises the potential vibration impacts on listed heritage items.

Table 14.11 Potential vibration impacts

Item	Potential impact
Dulwich Hill Railway Station Group South Dulwich Hill Heritage Conservation Area Inter-War Heritage Conservation Area Group Gladstone Hall, including interiors	Minor: The closest façades of these items would experience vibration levels above the screening level for cosmetic damage. Further assessment and management would be undertaken in accordance with the approach described in Section 14.4.

Statements of heritage impact

Dulwich Hill Railway Station Group

The direct impacts of the project on the Dulwich Hill Railway Station Group would be major overall, however the Platform 1/2 building would be retained and retrofitted with potential for positive impacts. The removal of the overhead booking office, and one of two significant buildings within the station group would have major direct and visual impacts. The new development would have a major visual impact on the setting of the item and significant views, with considerable bulk added to the station group as a result of construction of the new concourse. Potential direct impacts as a result of vibration would be minor provided that the mitigation measures in Section 14.4 are implemented.

The demolition of Platform 1/2 and the overhead booking office and stairs would remove a substantial portion of the 1935 layer of re-development of the station, and impact the integrity of the station as a whole. The representativeness significance of the station as a railway station in the Inter-War Railway Eclectic style would be severely diminished. The platform building would remain a good example of the type and the significant brick abutments and piers of the Wardell Road overbridge would be retained.

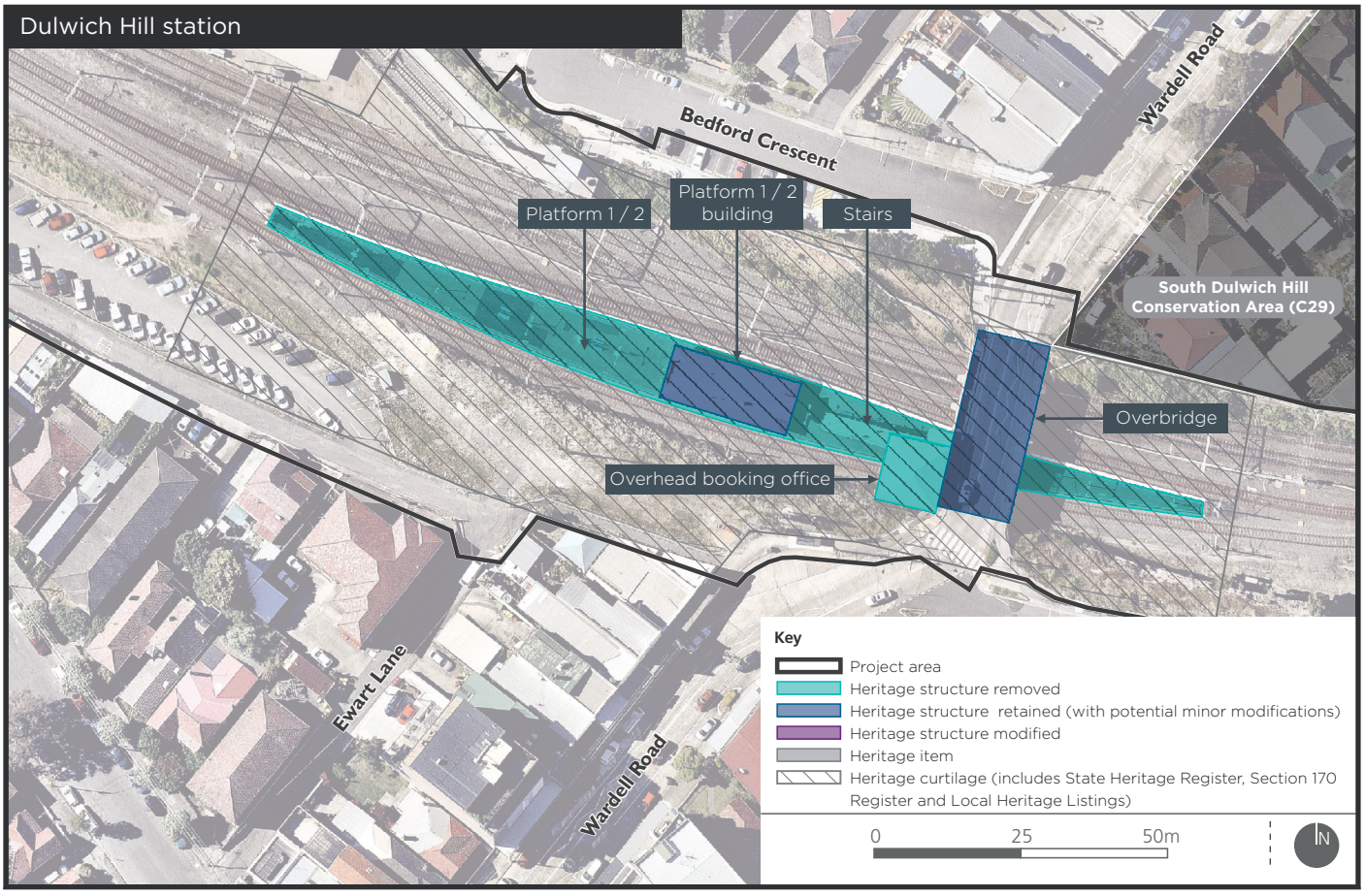
When assessed cumulatively, the level of heritage impact of the project on the Dulwich Hill Railway Station Group would be major. However, based on the historical significance of the station and the aesthetic values of the retained platform building, the heritage item would continue to meet the threshold for local significance.

Other items

Direct impacts on the other three heritage items/conservation areas would be neutral, except for the South Dulwich Hill Heritage Conservation Area, which would experience a negligible direct impact. Works in the vicinity of the South Dulwich Hill heritage conservation area and the Inter-War Heritage Conservation Area Group would result in a negligible visual impact overall, while a neutral visual impact is anticipated for Gladstone Hall.

Potential impacts as a result of vibration would be minor for all three heritage items/heritage conservation areas, provided that the measures in Section 14.4 are implemented.

When assessed cumulatively, the level of heritage impact of the project on the three heritage items/heritage conservation areas would be negligible, and they would continue to meet the threshold for local significance.



Impacts on heritage at Marrickville and Dulwich Hill stations

FIGURE 14.2

14.3.4 Hurlstone Park Station

Existing items

Heritage listed items in the vicinity of Hurlstone Park Station with the potential to be impacted by the project are summarised in Table 14.12 and shown in Figure 14.1. Table 14.13 lists the main structures and elements within the Hurlstone Park Railway Station Group, including relevant information such as date, condition, and significance.

Table 14.12 Hurlstone Park Station – heritage items

Item	Listing	Location
Hurlstone Park Railway Station Group	RailCorp s.170 (4805737) Canterbury LEP (I124)	In project area
Hurlstone Park Railway Underbridge	Canterbury LEP (I126)	In project area

Direct impacts

An assessment of the direct impacts of the project on the fabric of each element constituting the Hurlstone Park Railway Station Group, and an assessment of the subsequent impacts on the heritage values of the station group as a whole, is provided in Table 14.13. Potential impacts are illustrated in Figure 14.3.

The direct impacts of the works on the Hurlstone Park Railway Underbridge would be negligible. General maintenance works would be required, as well as waterproofing to the whole bridge deck to mitigate future water attributed issues. Works to minimise future maintenance would involve the removal of non-significant parapets and replacement with new precast parapets with the screens pre-installed.

Table 14.13 Summary of direct impacts to significant elements within the Hurlstone Park Railway Station Group

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Platform 1 (1894)	Generally good	High	Removal Platform to be rebuilt in straight alignment Covered concourse, access stairs, lift shaft, platform canopies, platform screen doors, and station buildings anchored on new platform	The overall impact to this element has been assessed as major due to the following: • major impact on the platform, as the removal of the platform would result in complete loss of the fabric of the platform including the original brick face and curved layout • new covered concourse, access stairs, lift shaft, platform canopies, and platform screen doors anchored and constructed on the new platform would not further impact significant fabric • major impact on the station group from the reconstruction of Platform 1 in a straight alignment.

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Platform 2 (1894)	Generally good	High	Removal apart from structure underneath heritage building Platform to be rebuilt in straight alignment Covered concourse, access stairs, lift shaft, platform canopies, platform screen doors and station buildings anchored on new platform	The overall impact to this element has been assessed as major due to the following: • major impact on the platform, as removal would result in the complete loss of the fabric of the platform, including the original brick face and curved layout • new covered concourse, access stairs, lift shaft, platform canopies, and platform screen doors anchored and constructed on the new platform would not further impact significant fabric • major impact on the station group from the reconstruction of Platform 2 in a straight alignment.
Platform building, Platform 1 (Type 11) (1915)	Generally good	High	Removal to allow construction of a new paid concourse, canopies, and station buildings	The overall impact to this element has been assessed as major as removal of the building would have a major impact on the fabric of the building and on Hurlstone Park Station as a whole.
Platform building, Platform 2 (Type 11) (1915)	Generally good externally. The disused waiting rooms and toilets rooms in the building on Platform 2 are in a poor condition	High	Retention for re-use with potential retrofitting	The overall impact to this element has been assessed as minor due to the following: • positive heritage outcome in the context of the project from the retention of the platform building • retrofitting for new accommodation would be designed to minimise impacts to original fabric, including preservation of the original layout where possible, and removal of any intrusive modifications • additions to the building and platform would be designed to be sympathetic to the heritage context and minimise fabric and visual impacts.
Footbridge (1915)	Good	High (stairs) Moderate (footbridge) Little (deck)	Removal to allow construction of a new concourse, canopies, and station buildings	The overall impact to this element has been assessed as major as removing the footbridge and stairs would have a major impact on the fabric of the footbridge and on the station as a whole.
Brick abutments (c.1915)	Good	High	Retention and upgrade	The overall impact to this element has been assessed as minor as retaining and regrading the brick abutments would result in a minor impact on the heritage values of the brick abutments and station overall.
Overhead booking office (c.1980)	Good	Little	Removal	The overall impact to this element has been assessed as neutral as the overhead booking office is not identified as significant in the *Railway Overhead Booking Office Conservation Strategy*.

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Landscape/ natural features	Good	High	Retention	The overall impact to this element has been assessed as neutral positive as the sandstone wall on Platform 2 would be retained.

Visual impacts

Hurlstone Park Railway Station Group

The contemporary nature of the proposed new concourse, canopies, and station buildings would present a distinctive design, easily differentiated from the heritage components. A new platform building on Platform 1 would be located opposite the Platform 2 building of a similar scale and contemporary style. The footprint of the overall concourse, new platform building, platform canopies, and platform screen doors would add considerable bulk to the original low-scale station and impact the open context and setting. The concourse would be located to the east of the retained platform building. Although the height and open layout of the new concourse would allow some views to the retained building on Platform 2, views from Crinian/Duntroon Street to the platform building would be impeded. Views would also be obscured by the proposed ribbon canopies over the two sets of access stairs from the concourse to the platforms. These canopies would extend along the platforms, with a gap of at least two metres at either side of the Platform 2 building. The canopy fabric adjacent to the Platform building would be glazed to maximise visibility. The visual impact of the new concourse on the setting of the station would be major overall.

The removal of the curved platforms, the Platform 1 building, and the footbridge stairs would result in loss of the majority of the heritage components, resulting in a major visual impact on the station. The new structures would replace the heritage components of the station group, and the overall character of the station would be significantly altered. Although the removal of the c.1980 overhead booking office would present an opportunity to enhance views to the Platform 2 building, these views would eventually be mostly screened by the new concourse and large-scale canopy.

The platform screen doors along the reconstructed platforms would have a minor impact on external views from the platform buildings and from the new concourse towards the heritage building, and a moderate impact on internal views as a result of visual clutter.

Overall, the proposed concourse and platform building would result in a major visual impact. Views to the Platform 2 building would be partially retained from the concourse, although views from Crinian/Duntroon Street would be impeded. Views of the curved platforms, the Platform 1 building, and footbridge stairs would be lost with the removal of these elements, which is considered a major impact. The platform screen doors would result in a moderate visual impact.

When considering cumulative impacts overall, the assessment concluded that the project would result in a major visual impact on the Hurlstone Park Railway Station Group.

Hurlstone Park Railway Underbridge

The visual impact on the Hurlstone Park Railway Underbridge would be negligible. The proposed works are unlikely to significantly alter the existing aesthetics of the bridge.

This item is located about 180 metres west of Hurlstone Park Railway Station, and views to the station are very limited. The proposed works to the station would have a negligible visual impact on the underbridge. New tracks and overhead wiring would consistent with the current setting of the item and would have a neutral visual impact.

Potential direct (vibration) impacts

Table 14.14 summarises the potential vibration impacts on heritage items.

Table 14.14 Potential vibration impacts

Item	Potential impact
Hurlstone Park Railway Station Group	Minor: The closest façade of this item would experience vibration levels above the screening level for cosmetic damage. Further assessment and management would be undertaken in accordance with the approach described in Section 14.4.
Hurlstone Park Railway Underbridge	Negligible: Vibration levels would be below the cosmetic damage screening level.

Statements of heritage impact

Hurlstone Park Railway Station Group

The direct impacts of the project on the Hurlstone Park Railway Station Group would be major. Most elements of high significance within the station would be removed, with the exception of the less prominent of two 1915 platform buildings (the Platform 2 building), resulting in major direct and visual impacts on the station as a whole. The visual impact on the setting of the station and significant views to and from the station would also be major.

Potential direct impacts as a result of vibration would be minor, provided that the mitigation measures in Section 14.4 are implemented.

The project would remove all the original elements of the Hurlstone Park Railway Station Group except for the Platform 2 building, the brick abutments of the Crinian Street overbridge and the sandstone wall on Platform 2. This would significantly impact the integrity, aesthetics, and representativeness significance of the station. The removal of most original elements would severely impact the legibility of the historical values of the place as one of the original railway stations on the Bankstown Line. The Platform 2 building would remain the sole tangible element to represent the heritage significance of the railway station. The Platform 2 building would retain some of the heritage values of the place, and Hurlstone Park Station would retain its historical use.

There are unlikely to be direct impacts to the currently unlisted items and heritage conservation areas considered in the *Hurlstone Park Heritage Study* (Paul Davies, 2016). The detailed design for the station catchment would consider the context and setting of the items and proposed heritage conservation areas.

When considering cumulative impacts overall, the assessment concluded that the project would result in a major impact on the Hurlstone Park Railway Station Group overall. However, based on the historical significance of the station and the heritage values of the retained platform building, the heritage item would continue to meet the threshold for local significance.

Hurlstone Park Railway Underbridge

The direct impacts of the project on the Hurlstone Park Railway Underbridge would be negligible, and works to the bridge and in its vicinity would result in negligible visual impacts. Potential direct impacts as a result of vibration would be negligible.

When considering cumulative impacts overall, the assessment concluded that the project would result in a negligible impact on the Hurlstone Park Railway Underbridge. The heritage item would continue to meet the threshold for local significance.

14.3.5 Canterbury Station

Existing items

Heritage listed items in the vicinity of Canterbury Station with the potential to be impacted by the project are summarised in Table 14.15 and shown in Figure 14.1. Table 14.16 lists the main

structures and elements within the Canterbury Railway Station Group, including relevant information such as date, condition, and significance.

Table 14.15 Canterbury Station – heritage items

Item	Listing	Location
Canterbury Railway Station Group	SHR (No. 01109) RailCorp s.170 (4801100) Canterbury LEP (I67)	In project area
Canterbury (Cooks River) Underbridge	RailCorp s.170 (4801568) Canterbury LEP (I126)	In project area
Canterbury (Cooks River/ Charles St) Underbridge - Main Line	RailCorp s.170 (5062566)	In project area
Old Sugarmill/Canterbury Sugar Mill (former)	SHR (00290) Canterbury LEP (I82)	Adjacent to project area
Inter-War hotel - former Hotel Canterbury	Canterbury LEP (I68)	Adjacent to project area
Federation Post Office Building (former Canterbury Post Office)	Canterbury LEP (I66)	Adjacent to project area
Electricity Substation no. 275	Ausgrid s.170 (3430425)	Adjacent to project area

Direct impacts

An assessment of the direct impacts of the project on the fabric of each element constituting the Canterbury Railway Station Group, and an assessment of the subsequent impacts on the heritage values of the station group as a whole, is provided in Table 14.16. Potential impacts are illustrated in Figure 14.3.

The project would likely result in a moderate direct impact on the Canterbury (Cooks River) Underbridge, and minor direct impact on the Canterbury (Cooks River/Charles Street) Underbridge, as a result of the proposed removal and replacement of the parapets.

Table 14.16 Summary of direct impacts to significant elements within the Canterbury Railway Station Group

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Platform 1 (1895)	Generally good	High	Removal Platform to be rebuilt in straight alignment Covered concourse, access stairs, lift shaft, platform canopies and platform screen doors anchored on new platform	The overall impact to this element has been assessed as major due to the following: • major impact on the platform from the complete loss of the fabric of the platform, including the original brick face and curved layout • new covered concourse, access stairs, lift shaft, platform canopies, and platform screen doors anchored and constructed on the new platform would not further impact significant fabric • major impact on the station group from complete demolition of Platform 1 to be reconstructed in a straight alignment.

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Platform building, Platform 1 (Type 11) (1895)	Generally good	Exceptional	Retention for re-use with potential retrofitting	The overall impact to this element has been assessed as minor due to the following: • positive heritage outcome in the context of the project from retention of the platform building • retrofitting for new accommodation would be designed to minimise impacts to original fabric, including preservation of the original layout where possible, and removal of any intrusive modifications • additions to the building and platform would be designed to be sympathetic to the heritage context and minimise fabric and visual impacts. • with appropriate design for re-use, the project would have a minor impact on the heritage values of the building and station overall.
Platform 2 (1895)	Generally good	High	Removal apart from structure underneath heritage building platform to be rebuilt in straight lines Covered concourse, access stairs, lift shafts, platform canopies and platform screen doors to be anchored on new platform	The overall impact to this element has been assessed as major due to the following: • major impact on the original platform resulting from the complete loss of the fabric of the platform, including the original brick face and curved layout • new covered concourse, access stairs, lift shafts, platform canopies, and platform screen doors anchored and constructed on the new platform would not further impact significant fabric • major impact on the station group from the demolition of Platform 2 to be reconstructed in a straight alignment.
Platform building, Platform 2 (Type 11) (1915)	Generally good	High	Retention for re-use with potential retrofitting	The overall impact to this element has been assessed as minor due to the following: • positive heritage outcome in the context of the project from retention of the platform building • retrofitting for new accommodation would be designed to minimise impacts to original fabric, including preservation of the original layout where possible, and removal of any intrusive modifications • additions to the building and platform would be designed to be sympathetic to the heritage context and minimise fabric and visual impacts.
Signal box (1915)	Exterior in reasonably good condition	High	Retention	The overall impact to this element has been assessed as neutral as retaining the signal box is a positive heritage outcome in the context of the project.

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Footbridge (1915, 1947)	Good	Moderate	Removal for replacement with new covered concourse including access stairs and lift shafts	Removal of the footbridge would have a major impact on the footbridge and a moderate impact on the station overall.
Overbridge (c.1917)	Good	High	Retention and upgrade	Maintenance and protection works would involve removal and replacement of the brick parapets, resulting in a moderate impact on the heritage values of the overbridge and the station overall.
Overhead booking office and concourse (Late 1980s)	Good	Little	Removal for replacement with new covered concourse including access stairs and lift shafts	The overall impact to this element has been assessed as neutral as the overhead booking office is not identified as significant in the *Railway Overhead Booking Office Conservation Strategy*.
Canopies (Late 1980s)	Good	Little	Removal for replacement with new platform canopies	Removal of the canopies would result in a neutral impact on the station.

Visual impacts

Canterbury Railway Station Group

Medium-scale ribbon canopies and platform screen doors would be located along the reconstructed platforms. The contemporary nature of the new concourse, canopies, and station buildings would present a distinctive design easily differentiated from the heritage components, and would not have a significant impact on internal views. The ribbon canopies from the concourse to the west would be elevated enough to allow views from the concourse onto the two retained significant platform buildings. The canopies would not continue above these structures, further facilitating the views from the concourse and lifts. Although the station currently has an open layout and setting, the existing canopies over the access stairs from the concourse obscure views, these would be removed. Views are not currently available from the walled concourse. New canopies on the western side of the station would be installed away from the heritage buildings. New station buildings would be located at a notable distance, at the western side of Platform 2. The new concourse would have a moderate visual impact on the station.

Removal of the footbridge, the integrity of which has been impacted over time, would result in a moderate visual impact on the station. The removal of the overhead booking office is of little significance, and would not result in a visual impact. The removal of the existing footbridge and overhead booking office would enlarge views to the heritage buildings from Canterbury Road, resulting in a positive heritage outcome. Such views would also be available from the new concourse. Enhanced views to the heritage buildings of exceptional and high significance would result in a positive visual impact.

The covered area from Canterbury Road would be located at street level and would be visible from the platform buildings. Views towards this area are not of high significance, and views towards the heritage buildings would be opened. This would have a negligible visual impact on the station.

The removal of the brick parapets of the overbridge would have a moderate impact on the existing view of the bridge. The platform screen doors along the platforms would result in a minor impact on external views from the platform buildings and from the new concourse towards the heritage buildings, and a moderate impact on internal views as a result of visual clutter.

When considering cumulative impacts overall, balancing the positive impacts in relation to removal of intrusive elements and the high quality design of the new elements, the assessment concluded that the project would result in a moderate visual impact on the Canterbury Railway Station Group.

Other items

There would be minor visual impacts on the Canterbury (Cooks River) Underbridge and Canterbury (Cooks River/Charles St) Underbridge – Main Line. While the removal and replacement of the parapets would have a moderate visual impact on both of the underbridges, these items are located about 200 metres away from Canterbury Station and existing views are very limited, resulting in negligible visual impacts from works to the station. New tracks and overhead wiring would be consistent with the existing setting of the heritage item and would have a neutral visual impact.

The project would result in negligible impacts on the Old Sugarmill and Electricity Substation no. 275, as existing views towards the rail corridor are partially screened. The replacement of the Church Street/Hutton Street footbridge is unlikely to significantly alter the aesthetics of the existing environment, and the visual impacts of the new bridge on the heritage items are anticipated to be negligible.

Neutral visual impacts are anticipated for both the Inter-War Hotel (former Hotel Canterbury) and Federation Post Office Building (former Canterbury Post Office). There are currently direct views to the station entrance from both items, however views towards the rail corridor are screened, as the rail line is located in a cutting at a lower level. As the booking office is of little significance, its removal would not significantly impact either item. Any views to new tracks and overhead wiring would be consistent with the existing views and vistas of the heritage item and would have a neutral visual impact.

Potential direct (vibration) impacts

Table 14.17 summarises the potential vibration impacts on listed heritage items.

Table 14.17 Potential vibration impacts

Item	Potential impact
Canterbury Railway Station Group Old Sugarmill Federation Post Office Building (former Canterbury Post Office)	Minor: The closest façade of these items would experience vibration levels above the screening level for cosmetic damage. Further assessment and management would be undertaken in accordance with the approach described in Section 14.4.
Canterbury (Cooks River) underbridge Canterbury (Cooks River/Charles St) Underbridge - Main Line Inter-War Hotel (former Hotel Canterbury) Electricity substation no. 275	Negligible: Vibration levels would be below the cosmetic damage screening level.

Statements of heritage impact

Canterbury Railway Station Group

The project would result in moderate direct impacts on the Canterbury Railway Station Group. All elements of exceptional and high significance within the station would be retained, except for the original brick platforms and their curved layout. The Platform 1 building of exceptional significance, the Platform 2 building, the Signal Box, and the overbridge of high significance would be retained for future use, resulting in a minor impact and presenting an opportunity for a positive outcome. Views to the platform buildings would be enhanced from the Canterbury Road overbridge and would also be appreciated from the new concourse, resulting in a positive visual impact.

The removal of the original curved platforms would result in a major direct and visual impact. The removal of the footbridge would result in moderate direct and visual impacts.

The new concourse would contrast with the remaining heritage elements. The concourse would be located on the western side of the station at a notable distance from the Platform 1 building and setback from the Platform 2 building. The new concourse would have a moderate visual impact overall. The construction of the covered activation area would have a negligible visual impact. The removal of the brick parapets of the overbridge would have a moderate direct impact. Potential direct impacts as a result of vibration would be minor provided that the mitigation measures in Section 14.4 are implemented.

The impacts of the removal of the original 1895 brick platforms and the 1915 footbridge within would be balanced by the retention of all other significant elements, including the 1895 platform building, the 1915 platform building, and overbridge. This would enable the station to conserve its historic, aesthetic and representativeness significance. The 1895 platform building is an excellent example of its type, and would continue to demonstrate the heritage values of the station as one of the original railway stations on the Bankstown Line. The retention of the 1915 platform building and overbridge would retain two elements of the subsequent layer of development of the station.

When considering cumulative impacts overall, the assessment concluded that the project would result in a moderate impact on the Canterbury Railway Station Group. Based on the historical significance of the station and the heritage values of the retained buildings, the item would continue to meet the threshold for State significance.

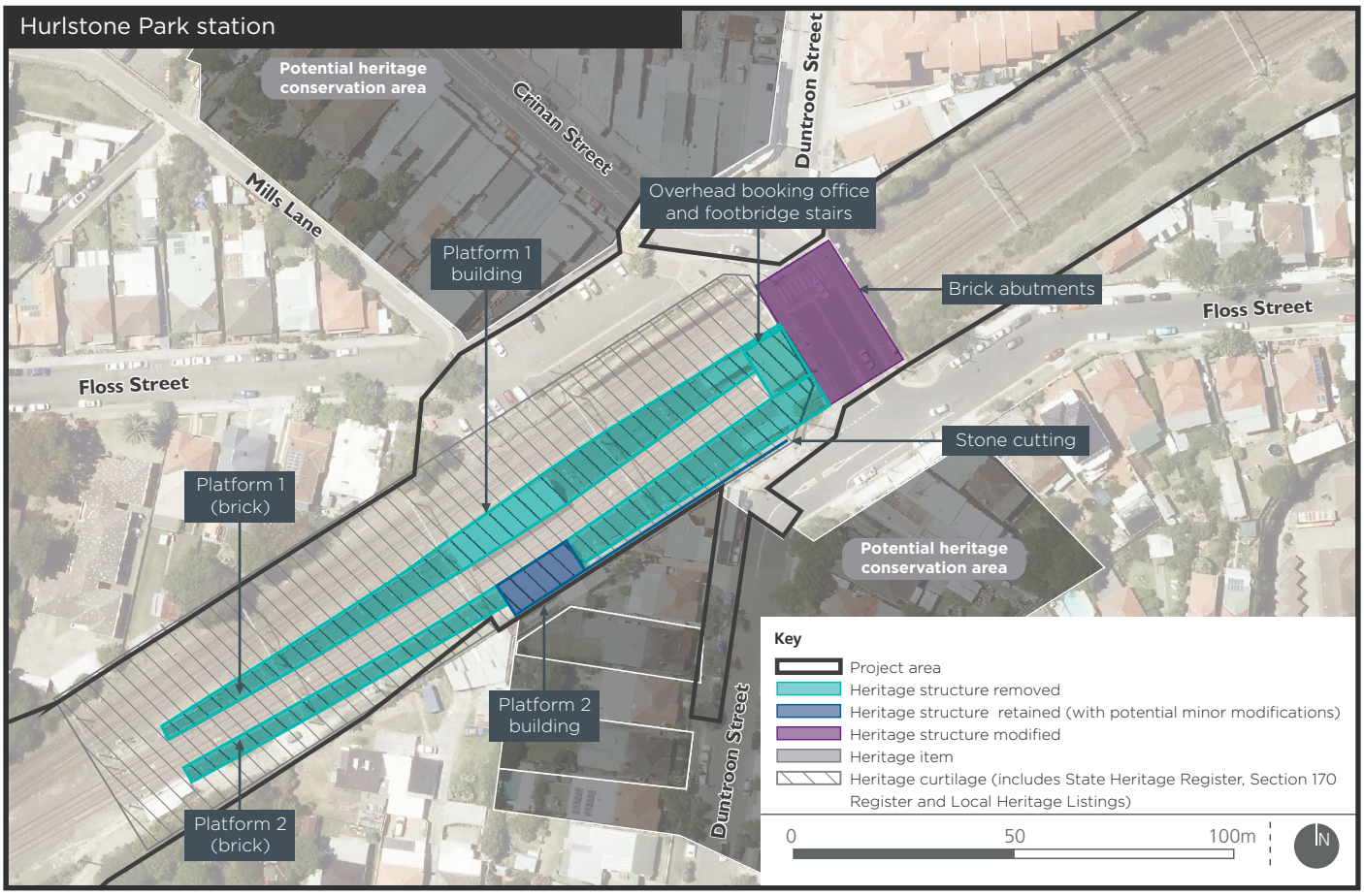
Other items

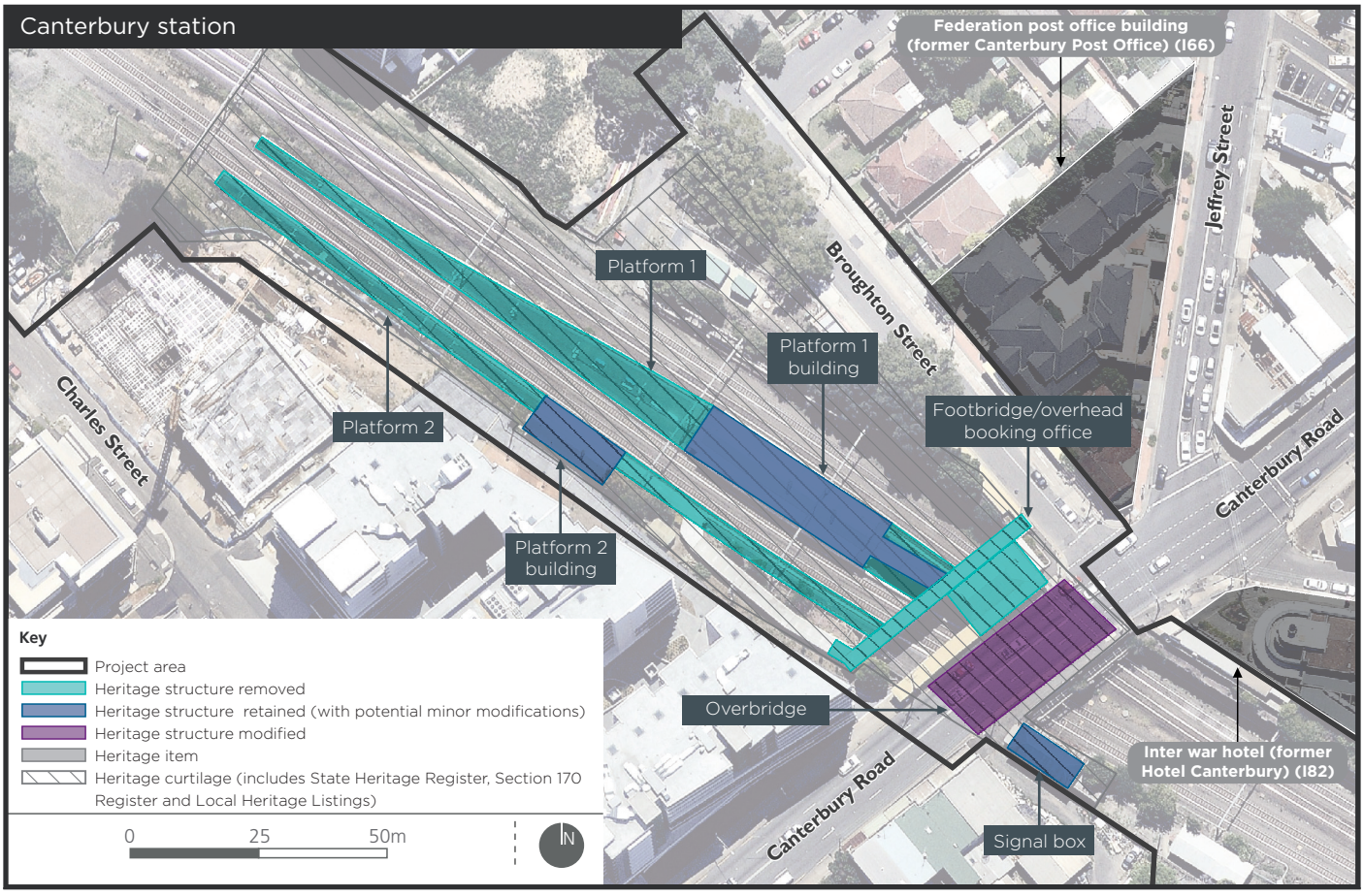
The project would result in moderate direct impacts on the Canterbury (Cooks River) Underbridge and minor direct impacts on the Canterbury (Cooks River/Charles St) Underbridge – Main Line. Works on the bridges would result in minor visual impacts at both items and vibration impacts would be negligible.

Negligible impacts are anticipated for both the Old Sugarmill and Electricity Substation no. 275. Direct impacts would be neutral, while visual impacts are anticipated to be negligible at both items. Potential direct impacts as a result of vibration would be negligible at Electricity Substation no. 275, while the Old Sugarmill would experience minor vibration impacts, provided that the mitigation measures in Section 14.4 are implemented.

The project would result in neutral direct impacts on the Inter-War Hotel and Federation Post Office Building. Vibration impacts on the Inter-War Hotel are likely to be negligible, while the Federation Post Office Building would experience minor impacts, provided that the mitigation measures in Section 14.4 are implemented.

All items would continue to meet the threshold for local significance.





sydney METRO | city & southwest

Impacts on heritage at Hurlstone Park and Canterbury stations

FIGURE 14.3

14.3.6 Campsie Station

Existing items

Heritage listed items in the vicinity of Campsie Station with the potential to be impacted by the project are summarised in Table 14.18 and shown in Figure 14.1. Table 14.19 lists the main structures and elements within the Campsie Railway Station Group, including relevant information such as date, condition, and significance.

Table 14.18 Campsie Station – heritage items

Item	Listing	Location
Campsie Railway Station Group	RailCorp s.170 (4801101) Canterbury LEP (I40)	In project area
Federation commercial building–Coffill's Buildings	Canterbury LEP (I41)	Adjacent to project area
Inter-War Commercial Building–Station House	Canterbury LEP (I42)	Adjacent to project area
Inter-War Court House (former) Campsie Court House	Canterbury LEP (144)	Adjacent to project area
War Memorial Clock Tower	Canterbury LEP I34)	Adjacent to project area
Federation house	Canterbury LEP (I61)	Adjacent to project area
Federation villa	Canterbury LEP (I62)	Adjacent to project area

Direct impacts

An assessment of the direct impacts of the project on the fabric of each element constituting the Campsie Railway Station Group, and an assessment of the subsequent impacts on the heritage values of the station group as a whole, is provided in Table 14.19. Potential impacts are illustrated in Figure 14.4.

Table 14.19 Summary of direct impacts to significant elements within the Campsie Railway Station Group

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Platform 1 (1894)	Generally good	High	Removal apart from structure underneath heritage building Platform to be rebuilt in straight alignment Covered concourse, access stairs, lift shafts, platform canopies and platform screen doors anchored on new platform	The overall impact to this element has been assessed as major due to the following: • major impact from the almost complete loss of the fabric of the platform and of the original curved layout • new covered concourse, access stairs, platform canopies, and platform screen doors anchored and constructed on the new platform would not further impact significant fabric • major impact on the station from the reconstruction of Platform 1 in a straight alignment.
Platform 2 (1894)	Generally good	High	Removal apart from structure underneath heritage building Platform to be rebuilt in straight alignment Covered concourse, access stairs, lift shaft, platform canopies and	The overall impact to this element has been assessed as major due to the following: • major impact from the almost complete loss of the fabric of the platform and of the original curved layout

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
			platform screen doors to be anchored on new platform	• new covered concourse, access stairs, platform canopies, and platform screen doors anchored and constructed on the new platform would not further impact significant fabric • major impact on the station from the reconstruction of Platform 2 in a straight alignment.
Platform building, Platform 1 (Type 11) (1915)	Good	High	Retention for re-use with potential retrofitting	The overall impact to this element has been assessed as minor due to the following: • positive heritage outcome in the context of the project from retention of the platform building • retrofitting for new accommodation would be designed to minimise impacts to original fabric, including preservation of the original layout where possible, and removal of any intrusive modifications • additions to the building and platform would be designed to be sympathetic to the heritage context and minimise fabric and visual impacts • minor impact on the heritage values of the building and station overall.
Platform building, Platform 2 (Type 11) (1915)	Generally good	High	Retention for re-use with potential retrofitting	The overall impact to this element has been assessed as minor due to the following: • positive heritage outcome in the context of the project from retention of the platform building • retrofitting for new accommodation would be designed to minimise impacts to original fabric, including preservation of the original layout where possible, and removal of any intrusive modifications • additions to the building and platform would be designed to be sympathetic to the heritage context and minimise fabric and visual impacts • minor impact on the heritage values of the building and station overall.
Concourse including overhead booking office and Parcels Office	Good	Little (Concourse) Moderate (Overhead booking office and Parcels Office)	Retention and partial removal for upgrading	The overall impact to this element has been assessed as moderate due to the following: • remnant elements of the overhead booking office building are wholly incorporated into the modern overhead concourse • moderate impacts on the station overall as the integrity of the early elements to be removed have been greatly compromised over time.
Overbridge (1915)	Good	High	Retention and upgrade	Retention and upgrade of the overbridge would result in a minor impact on the heritage values of the overbridge and station overall.

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Footbridge (1947, 2002)	Good	Little	Retention	Retention of the footbridge would result in a neutral impact on the station.
Platform 3[1] (1916, 1950)	Generally good	Moderate	Removal	Moderate impact from removal of the platform.
Platform canopies, Platforms 1-3 (2002)	Good	Little	Removal	Neutral impact from removal of the platform canopies.
Landscape/ natural features (n/a,1915)	Generally good	High	Removal to accommodate new covered concourse, access stairs and lift shaft	The overall impact to this element has been assessed as moderate due to the following: • major impact on the wall from the removal of the cambered stone and brick retaining wall • moderate impact on the station as the wall's significance is mainly in relation to its aesthetic qualities rather than its purpose or historical significance.

Notes: 1. Platform 3 is a disused wayside platform originally constructed in 1916 as a brick face platform. It was replaced by the existing concrete platform in about 1950.

Visual impacts

Campsie Railway Station Group

The proposed canopy above the concourse would rise to a similar height to the existing shopfronts on Beamish Street. Three ribbon canopies would extend from the concourse to cover access to the platforms. The canopies would end at least two metres from the significant heritage buildings on Platforms 1 and 2. Two ribbon canopies would extend east of the heritage buildings on Platforms 1 and 2 along the platforms. The height of the canopies would allow views of the heritage structures to be retained from the concourse.

The contemporary nature of the canopies and station buildings would be suitable as a distinctive design easily differentiated from the heritage components. The scale and height of the proposed canopy structure, the footprint of the new platform building, the platform canopies, and platform screen doors would add considerable bulk compared with the existing low-scale station catchment.

The concourse would be located to the east of the retained platform building. The height and open layout of the upgraded concourse would allow views to the retained platform buildings from the concourse. The upgraded structure would be visually dominant within the station group. Overall, the visual impact of the upgraded concourse on the setting of the station would be moderate.

The upgraded concourse would replace elements of little or moderate significance within the station, giving rise to a minor visual impact. Moderate visual impacts would arise from the removal of the cambered stone retaining wall located along the platform.

The platform screen doors would result in a minor impact on external views from the platform buildings and from the new concourse towards the heritage buildings, and a moderate impact on internal views as a result of visual clutter.

Overall, the upgraded concourse and large and medium-scale canopies would result in a moderate visual impact. Views to the platform buildings would be available from the upgraded concourse. Views to the curved platforms, cambered stone and brick retaining wall would be lost, resulting in a major visual impact. Loss of views to impacted elements such as the overhead booking office and

the Parcels office would have a moderate impact. The platform screen doors would result in a moderate visual impact overall.

When considering cumulative impacts overall, the assessment concluded that the project would result in a moderate visual impact on the Campsie Railway Station Group.

Other items

Negligible visual impacts are anticipated at Federation commercial building–Coffill's Buildings, Inter-War Commercial Building–Station House, Federation house, and Federation villa. There is a direct visual connection between the station entrance and Coffill's Buildings and Station House. However, views from Federation house and Federation villa are partially screened by vegetation. Any views of the new tracks and overhead wiring from these items would be consistent with the existing views and vistas of the items, resulting in a neutral visual impact.

The new station building along South Parade would not impact on significant views to and from Federation house or Federation villa. The removal of shops along Beamish Street would open up views towards Coffill's Buildings and Station House, however the new canopy and station buildings would not impact on significant views to and from Coffills' Buildings or Station House. Works on the existing Duck Street footbridge are unlikely to significantly alter the aesthetics of the bridge, and visual impacts are anticipated to be negligible for Coffills' Buildings, Federation House, and Federation Villa.

The project would result in neutral visual impacts on the Inter-War Court House (former) Campsie Court House and War Memorial Clock Tower. Existing views from the Court House towards the rail line are partially screened by vegetation, and views from the War Memorial Clock Tower towards the station are screened by commercial buildings. Changes to the station buildings would not impact views and vistas from the War Memorial Clock Tower. Any views to the new tracks and overhead wiring from the Court House would be consistent with the existing views and vistas. In addition, works on the Lock Street overbridge are unlikely to significantly alter the aesthetics of the bridge, and visual impacts on the War Memorial Clock Tower, located at a notable distance, are anticipated to be negligible.

Potential direct (vibration) impacts

Table 14.20 summarises the potential vibration impacts on heritage items.

Table 14.20 Potential vibration impacts

Item	Potential impact
Campsie Railway Station Group Inter-War Commercial Building–Station House	Minor: The closest façade of these items would experience vibration levels above the screening level for cosmetic damage. Further assessment and management would be undertaken in accordance with the approach described in Section 14.4.
Federation commercial building–Coffill's Buildings Inter-War Court House (former) Campsie Court House War Memorial Clock Tower Federation house Federation villa	Negligible: Vibration levels would be below the cosmetic damage screening level.

Statements of heritage impact

Campsie Railway Station Group

Overall, it is anticipated that the project would result in a moderate heritage impact on the Campsie Railway Station Group. Based on the historical significance of the station and the heritage values of the retained platform buildings, the heritage item would continue to meet the threshold for local significance.

The direct impacts of the project on the item would be moderate. Elements of high significance would be retained. The original 1894 platforms and the 1915 cambered stone retaining wall would be removed. This would result in moderate to major direct and visual impacts. Other elements to be removed are of little or moderate significance, resulting in minor to moderate direct and visual impacts. The visual impact on the setting of the station would be moderate overall. Potential direct impacts as a result of vibration would be minor, provided the mitigation measures in Section 14.4 are implemented.

The removal of some elements of high and moderate significance would be generally balanced by retention of the 1915 platform buildings and overbridge, enabling the station to continue to demonstrate its historic and aesthetic significance, and representativeness. The retention of the 1915 elements would allow the station to retain the historical values of the place as one of the original stations on the Bankstown Line. The two platform buildings are good examples of their type and would continue to contribute to the aesthetic significance of the station.

Other items

Overall, the project would result in negligible impacts on Federation Commercial Building–Coffill's Buildings, Inter-War Commercial Building–Station House, Federation House, and Federation villa. Direct impacts would be neutral, and negligible visual impacts are anticipated.

Potential vibration impacts would be negligible at the Federation Commercial Building, Federation House, and Federation villa, while minor impacts are predicted on the Inter-War Commercial Building–Station. Implementation of the measures in Section 14.4 would minimise the potential for vibration impacts.

Neutral impacts are anticipated for both the Inter-War Court House and the War Memorial Clock Tower. Direct and visual impacts are likely to be neutral for both items, while vibration impacts are likely to be negligible.

All items would continue to meet the threshold for local significance.

14.3.7 Belmore Station

Existing items

Heritage listed items in the vicinity of Belmore Station with the potential to be impacted by the project are summarised in Table 14.21 and shown in Figure 14.1. Table 14.22 lists the main structures and elements within the Belmore Railway Station Group, including relevant information such as date, condition, and significance.

Table 14.21 Belmore Station – heritage items

Item	Listing	Location
Belmore Railway Station Group	SHR (01081) RailCorp s.170 (4801084)	In project area
Post-war bus shelter and public lavatories	Canterbury LEP (I29)	In project area
Federation House (former station master's cottage)	Canterbury LEP (I10)	Adjacent to project area

Direct impacts

An assessment of the direct impacts of the project on the fabric of each element constituting the Belmore Railway Station Group, and an assessment of the subsequent impacts on the heritage values of the station group as a whole, is provided in Table 14.22. Potential impacts are illustrated in Figure 14.4. The project would not directly impact on the Post-war bus shelter and public lavatories.

Table 14.22 Summary of direct impacts to significant elements within the Belmore Railway Station Group

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Platform 1/2 (1895, 1907)	Generally good	High	Removal apart from structure underneath heritage building, platform to be rebuilt in a straight alignment Covered concourse, access stairs, lift shafts, platform station building, platform canopies, and platform screen doors anchored on new platform	The overall impact to this element has been assessed as major due to the following: • major impact on the fabric of the platform including the loss of the original platform brick face • major impact on the original platform layout resulting from the loss of the historic curved platform • new covered concourse, access stairs, lift shaft, platform station building, platform canopies, and platform screen doors anchored and constructed on the new platform would not further impact significant fabric • demolition of Platform 1/2 to be reconstructed in a straight alignment would result in a major impact on the station overall.
Platform building (Type 11) (1895)	Good	Exceptional	Retention for re-use with potential retrofitting	The overall impact to this element has been assessed as minor due to the following: • positive heritage outcome in the context of the project from the retention of the platform building • retrofitting for new accommodation would be designed to minimise impacts to original fabric, including preservation of the original layout where possible, and removal of any intrusive modifications • additions to the building and platform would be designed to be sympathetic to the heritage context and minimise fabric and visual impacts

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
				• the project would have a minor impact on the heritage values of the building and station overall.
Overhead booking office and concourse (1937, 2008)	Good	High	Retention for re-use with potential retrofitting	The overall impact to this element has been assessed as minor due to the following: • positive heritage outcome in the context of the project from retention of the overhead booking office • retrofitting for new accommodation would be designed to minimise impacts to original fabric, including preservation of the original layout where possible, and removal of any intrusive modifications • additions to the building and platform would be designed to be sympathetic to the heritage context and minimise fabric and visual impacts.
Overbridge (Modified 1961)	Good	Little	Retention and upgrade	Negligible impacts on the heritage values of the overbridge and station overall from protection works, bridge widening, maintenance works, and retaining wall works.
Platform canopies (2008)	Good condition	Little	Removal for replacement with new covered concourse including access stairs and lift shafts	Neutral impact on the station from removal of the canopies

Visual impacts

Belmore Railway Station Group

Visual impacts would result from the removal of the original brick face and curved layout of the original island platform. The contemporary nature of the new development would contrast with the historic components of the site. The new concourse and access stairs would add considerable footprint and bulk within the station. As they would be situated close to the platform building, they would dominate the building, resulting in a moderate visual impact. The new station buildings would be of a similar scale as the heritage buildings, and located at a notable distance, resulting in a minor visual impact. The design of the concourse canopy would allow new views to the building of exceptional significance from the concourse. The existing intrusive canopy structure would be removed, enhancing views from the booking office. The canopy would extend from the concourse to the eastern edge of the significant platform building with at least two metres separation. Canopies would not extend between the platform building and the overhead booking office, retaining the relationship between these structures.

Platform screen doors would result in a minor impact on external views from the platform buildings and from the new concourse towards the heritage buildings, and a moderate impact on internal views as a result of visual clutter.

The new station building on Platforms 1 and 2 and the new services building would not visually dominate the retained heritage buildings, as they would be located at a distance to the east.

Overall, the project would add a contemporary layer of development on the east side of the station in contrast with the heritage components on the west side. Views towards the heritage buildings within the station catchment would not be obstructed, although the new structures would be large in scale and may be dominant. The project offers opportunity for positive impacts by enhancing views

to the 1895 platform building from both the east and west. The project would alter the existing setting of the station, however visual impacts would be moderate.

When considering cumulative impacts overall, the assessment concluded that the project would result in a moderate visual impact on the Belmore Railway Station Group.

Other items

The project would result in minor visual impacts on the Post-war bus shelter. Views to the platform building of exceptional significance would continue to be appreciated from the item. However the new concourse, which would add considerable bulk to the station, would be visible in the background of the item.

Negligible visual impacts are anticipated for Federation House. While there is a direct visual connection between Federation House and the station entrance, the existing heritage station buildings next to the item would be retained, which would partially screen the new buildings and canopies. Views from Federation House are therefore unlikely to be significantly altered. No views towards Federation house would be impacted.

Potential direct (vibration) impacts

Table 14.23 summarises the potential vibration impacts on listed heritage items.

Table 14.23 Potential vibration impacts

Item	Potential impact
Belmore Railway Station Group Federation House (former station master's cottage)	Minor: The closest façade of this item would experience vibration levels above the screening level for cosmetic damage. Further assessment and management would be undertaken in accordance with the approach described in Section 14.4.
Post-war bus shelter and public lavatories	Negligible: Vibration levels would be below the cosmetic damage screening level.

Statements of heritage impact

Belmore Railway Station Group

Overall, the project would result in a moderate impact on the Belmore Railway Station Group.

There would be moderate direct impacts on the station. All elements of exceptional and high significance would be retained, except for the original 1895 brick island platform and its curved layout. The retention and retrofitting of the retained elements are anticipated to have a minor impact, and present an opportunity for a positive outcome. Views to the Platform 1/2 building would be enhanced from the overhead booking office and would also be appreciated from the new concourse. The scale and bulk of the new development is likely to dominate the platform building, resulting in a moderate visual impact. Potential vibration impacts would also be minor, provided that the measures in Section 14.4 are implemented.

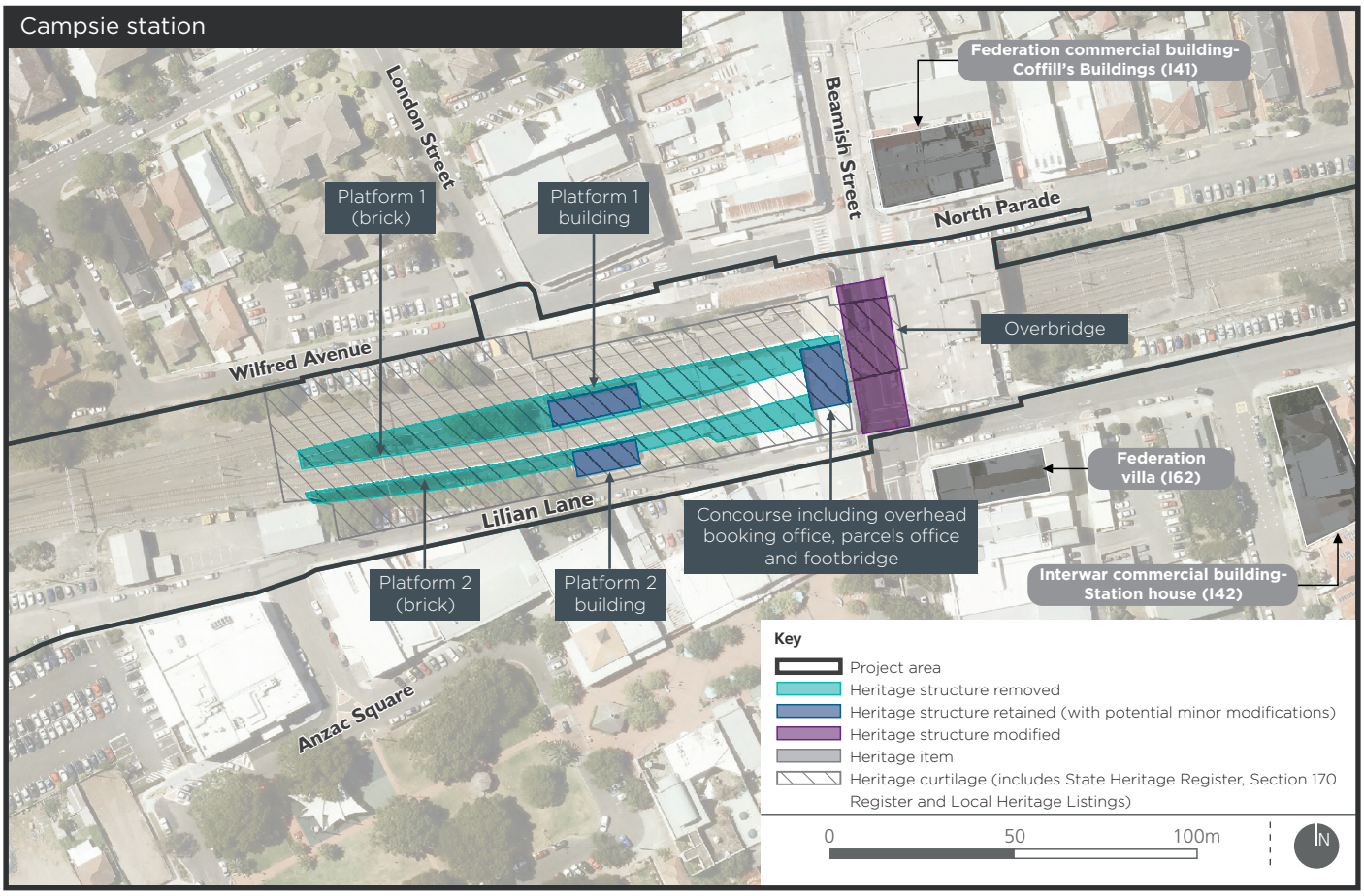
The impacts of the removal of the original island platform would be balanced by the retention of all other significant elements, including the platform building, overhead booking office, and the remaining elements of the overbridge. This would enable the station to conserve its historic, aesthetic, and representativeness significance. The platform building would continue to demonstrate the heritage values of the station as one of the original stations on the Bankstown Line. The retention of the overhead booking office, although modified, would conserve a good example of an inter-war weatherboard booking office, and would continue contribute to the setting of the station.

All buildings listed as contributing to the State significance of the item would be retained. Based on the historical significance of the station and the heritage values of the retained buildings, the heritage item would continue to meet the threshold for State significance.

Other items

The project would result in a minor impact on the Post-war bus shelter and public lavatories, and a negligible impact on Federation House. Neutral direct impacts are predicted for both heritage items, however there would be minor visual impacts on the Post-war bus shelter and public lavatories, and negligible visual impacts on Federation House. The Post-war bus shelter would experience only negligible vibration impacts, while the Federation House would experience minor impacts, provided that the measures outlined in Section 14.4 are implemented.

Both heritage items would continue to meet the threshold for local significance.



sydney METRO | city & southwest

Impacts on heritage at Campsie and Belmore stations

FIGURE 14.4

14.3.8 Lakemba Station

Existing items

Heritage listed items in the vicinity of Lakemba Station with the potential to be impacted by the project are summarised in Table 14.24 and shown in Figure 14.1. Table 14.25 lists the main structures and elements within the Lakemba Railway Station Group, including relevant information such as date, condition, and significance.

Table 14.24 Lakemba Station – heritage items

Item	Listing	Location
Lakemba Railway Station Group	RailCorp s.170 (4801916) Canterbury LEP (I143)	In project area
Federation weatherboard house	Canterbury LEP (I144)	Adjacent to project area
Inter-War post office building - Lakemba Post Office	Canterbury LEP (I45)	Adjacent to project area
Electricity Substation no. 143	Ausgrid s.170 (3430296)	Adjacent to project area

Direct impacts

An assessment of the direct impacts of the project on the fabric of each element constituting the Lakemba Railway Station Group, and an assessment of the subsequent impacts on the heritage values of the station group as a whole, is provided in Table 14.25. Potential impacts are illustrated in Figure 14.5.

Table 14.25 Summary of direct impacts to significant elements within the Lakemba Railway Station Group

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Platform 1/2 (1919)	Good	High	Removal apart from structure underneath heritage building and the existing concourse and stairs Platform to be rebuilt in straight alignment Platform canopies and platform screen doors anchored on new platform	The overall impact to this element has been assessed as major due to the following: • major impact on the fabric of the platform including the loss of the original brick face • major impact on the original platform layout from loss of the historic curved platform • platform canopies and platform screen doors anchored and constructed on the new platform would not further impact significant fabric • major impact on the station group overall from demolition of Platform 1/2 to be reconstructed in a straight alignment and extended.

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Platform building, Platform 1/2 (Type 11) (1919)	Generally good	High	Retention for re-use with potential retrofitting	The overall impact to this element has been assessed as minor due to the following: • positive heritage outcome in the context of the project from the retention of the platform building • retrofitting for new accommodation would be designed to minimise impacts to original fabric, including preservation of the original layout where possible, and removal of any intrusive modifications • additions to the building and platform would be designed to be sympathetic to the heritage context and minimise fabric and visual impacts. • minor impact on the heritage values of the building and station overall if these considerations are implemented.
Footbridge and stairs (1926)	Good	Moderate	Retention with new lifts constructed to platform	The overall impact to this element and station overall has been assessed as minor due to the retention of the footbridge and construction of the new lifts to the platform.
War Memorial (1953)	Good	High	Retention Construction of new platforms	Platform works would have a neutral impact provided that works minimise any direct impacts and that the memorial is adequately protected during the works.
Overhead booking office/ concourse (2001)	Good	Little/ Intrusive	Existing concourse structure retained and expanded with new lifts to platforms	Retention of the existing concourse structure including stairs to platforms, stairs and lifts to north and south entries would result in a neutral impact and provide opportunity for a positive visual impact. The overhead booking office is not identified as significant in the *Railway Overhead Booking Offices Heritage Conservation Strategy* (Australian Museum Consulting, 2014).
Canopies (2001)	Good	Intrusive	Removal of the canopy over the stairs to the platform for replacement with new canopy Retention of concourse canopy	Minor positive impact on the station catchment from the removal of the modern canopies over the stairs to the platform.

Visual impacts

Lakemba Railway Station Group

New structures would be located on the western side of the station, with the retained Platform 1/2 building located roughly in the centre of the platform. The contemporary nature of the new development would contrast with the historic building. Platform canopies would be located between the new concourse and the platform building, resulting in a minor impact on views when looking towards the west façade of the platform building. The building would be clearly visible from the concourse and stairs. Platform screen doors would generally have a moderate impact on internal views. The removal and replacement of the lifts to the platform would have a minor visual impact.

The expanded concourse would result in moderate visual impacts on the station overall. The expanded concourse would add considerable footprint and bulk, and as it would be situated close to the platform building, it would dominate the platform building, resulting in a moderate visual impact. There would be major visual impacts from the removal of the original brick face and curved layout of the platform, and moderate visual impacts from the expansion of the existing concourse that incorporates elements of the original footbridge and stairs. The intrusive canopy structure currently obstructing views to the platform building would be removed.

The visual impacts of the works to the Haldon Street overbridge would be minor. The works to the bridge would be located a notable distance from the platform building, and would be mostly screened by the concourse. The works are unlikely to significantly alter the existing aesthetics of the bridge. The new retaining walls would be located along the embankments and would not be visually intrusive.

The new services building would be over 200 metres west of the station, and would not visually dominate the remaining heritage structures.

Overall, the project would add a contemporary layer of development on the eastern side of the station, contrasting with the heritage components on the western side. Views to the heritage buildings within the station catchment would not be obstructed, although the new structures would be large in scale and may be dominant. The expanded concourse would offer views to the platform building. The project would alter the existing setting of the station, however visual impacts would be moderate.

When considering cumulative impacts overall, the assessment concluded that the project would result in a moderate visual impact on the Lakemba Railway Station Group.

Other items

The project would result in neutral visual impacts on the Federation weatherboard house and Electricity Substation no.143. Existing views from the items towards the station/rail corridor are screened by vegetation. Any views to the new tracks and overhead wiring would be consistent with the existing views and vistas and would have a neutral visual impact. In addition, the new canopy and northern entrance concourse would remain outside views from the Electricity Substation no. 143. Views and vistas from the Federation weatherboard house would not be impacted.

Negligible visual impacts are anticipated for the Inter-War post office. The existing station entrance can be viewed from the post office, however the new canopy and station buildings would be mostly screened by existing buildings located on the northern side of The Boulevarde. The works would be larger in scale than the existing development, however, the scale and character of the new structures would not significantly detract from the existing.

Potential direct (vibration) impacts

Table 14.26 summarises the potential vibration impacts on heritage items.

Table 14.26 Potential vibration impacts

Item	Potential impact
Lakemba Railway Station Group	Minor: The closest façade of this item would experience vibration levels above the screening level for cosmetic damage. Further assessment and management would be undertaken in accordance with the approach described in Section 14.4.
Federation weatherboard house Inter-War post office building - Lakemba Post Office Electricity Substation no. 143	Negligible: Vibration levels would be below the cosmetic damage screening level.

Statements of heritage impact

Lakemba Railway Station Group

There would be moderate direct impacts on the Lakemba Railway Station Group as a result of the removal of the original island platform. The visual impact of the works on the setting of the station would be moderate overall. The expanded concourse would offer views to the platform building. Potential direct impacts as a result of vibration would be minor, provided the measures in Section 14.4 are implemented.

The removal of the original 1919 island platform would remove an element of high significance within the station group. The removal of this structure would alter the aesthetics and representativeness significance of the station, and impact its integrity overall. The Platform 1/2 building would remain to represent the heritage significance of the station. This would retain some of the historical values of the place as one of the original stations of the second stage of development of the Bankstown Line. The platform building is a good example of its type, and would contribute to the aesthetic significance of the station.

The project would result in a moderate impact on the Lakemba Railway Station Group overall. Based on the historical significance of the station and the heritage values of the retained platform building, the heritage item would continue to meet the threshold for local significance.

Other items

The project would result in neutral impacts on the Federation weatherboard house and Electricity Substation no. 143, with neutral direct, visual, and vibration impacts predicted.

Negligible impacts are anticipated for the Inter-War post office building overall. It is anticipated that there would be neutral direct impacts, and negligible visual and vibration impacts resulting from the project.

The items would continue to meet the threshold for local significance.

14.3.9 Wiley Park Station

Existing items

Heritage listed items in the vicinity of Wiley Park Station with the potential to be impacted by the project are summarised in Table 14.27 and shown in Figure 14.1. Table 14.28 lists the main structures and elements within the Wiley Park Railway Station Group, including relevant information such as date, condition, and significance.

Table 14.27 Wiley Park Station – heritage items

Item	Listing	Location
Wiley Park Railway Station Group	RailCorp s.170 (4801946) Canterbury LEP (I159)	In project area
Inter-War water pumping station – Lakemba Pumping Station	Sydney Water s.170 (4570136) Canterbury LEP (I158)	Adjacent to project area

Direct impacts

An assessment of the direct impacts of the project on the fabric of each element constituting the Wiley Park Railway Station Group, and an assessment of the subsequent impacts on the heritage values of the station group as a whole, is provided in Table 14.28. Potential impacts are illustrated in Figure 14.5.

Table 14.28 Summary of direct impacts to significant elements within the Wiley Park Railway Station Group

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Platform 1 and 2 (1938)	Generally good	High	Removal Platform to be rebuilt in a straight alignment Covered concourse, access stairs, lift shafts, platform canopies, and protective barriers anchored on new platform	The overall impact to this element has been assessed as major due to the following: • major impact on the platform including the loss of a typical example of its type • new covered concourse, access stairs, lift shaft, platform canopies, and platform screen doors anchored and constructed on the new platform would not further impact significant fabric • major impact on the station group overall from the removal of Platform 1 and 2.
Platform building, Platform 1 (Type 13) (1938) an Platform building, Platform 2 (Type 13) (1938)	Good	High	Removal Replacement with platform canopies and protective barriers anchored on new platform	Major impact on the buildings and on the station as a whole from the removal of the buildings.
Overhead booking office (1938)	Good	High	Removal and replacement with new covered concourse including access stairs and lift shafts	Major impact on the building and on the station as a whole from removal of the overhead booking office, which was recommended for adaptive reuse by the *Railway Overhead Booking Offices Heritage Conservation Strategy* (Australian Museum Consulting, 2014).
Footbridge (1938)	Good	Moderate	Removal and replacement with new covered concourse	Major impact on the footbridge and a moderate impact on the station overall from the removal of the footbridge and stairs.
Access ramp canopies (Modern)	Good	Little	Removal for replacement with new covered concourse including access stairs and lift shafts	Neutral impact on the station catchment from the removal of the access ramp canopies.

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Landscape/ natural features	Good	Moderate	Retain in majority New station building to be constructed along the southern boundary to the west of the platforms	Moderate impact on the landscape features and a minor impact on the station overall, as the existing landscape would be mostly retained, apart from an area located west of the platforms along the southern boundary, where a new station services building would be constructed.

Visual impacts

Wiley Park Railway Station Group

The proposed canopy above the new concourse would be larger in scale compared to the existing structures on the site. However, all station buildings which include the Platform 1 building, Platform 2 building, and the overhead booking office are proposed to be removed. Therefore, the scale of the proposed new development would not visually impact the heritage components of the site as these would no longer be present. Visual impacts would result from the removal of all heritage structures. As all original 1938 station elements would be removed, all views and appreciation of these elements would be lost, resulting in a major visual impact on the station as a whole. Any visual impacts resulting from the proposed works to the King Georges Road overbridge would not further detract significant views, as the setting of the station would have been fully impacted.

Medium-scale canopies and platform screen doors would be located along the reconstructed platforms on the western side of the station. The new concourse, canopies, and station buildings would introduce a contemporary design to the station. A new service building would be located at the western end of the platforms along the southern boundary. The scale and height of the proposed canopy structure, the footprint of the overall concourse, stairs, new platform, station buildings, platform canopies, and platform screen doors would add considerable bulk to the originally low-scale station catchment. The 1930s station would be redeveloped into a contemporary transport interchange.

The proposed removal of all significant buildings and structures within the station would result in a major visual impact, as no original elements would be retained to demonstrate the significance of the station.

When considering cumulative impacts overall, the assessment concluded that the project would result in a major visual impact on Wiley Park Railway Station Group.

Inter-War water pumping station – Lakemba Pumping Station

The project would result in negligible visual impacts on the Inter-War water pumping station–Lakemba Pumping Station. Views from the item towards the railway corridor are mostly screened by existing vegetation, and views towards the station are mostly screened as the rail line and station buildings are located below street level. The proposed works would be consistent with the existing visual landscape to and from the pumping station, while trees to be planted on the southern side of the station would further screen views.

Potential direct (vibration) impacts

Table 14.29 summarises the potential vibration impacts on listed heritage items.

Table 14.29 Potential vibration impacts

Item	Potential impact
Wiley Park Railway Station Group	Minor: The closest façade of this item would experience vibration levels above the screening level for cosmetic damage. Further assessment and management would be undertaken in accordance with the approach described in Section 14.4.
Inter-War water pumping station– Lakemba Pumping Station	Negligible: Vibration levels would be below the cosmetic damage screening level.

Statements of heritage impact

Wiley Park Railway Station Group

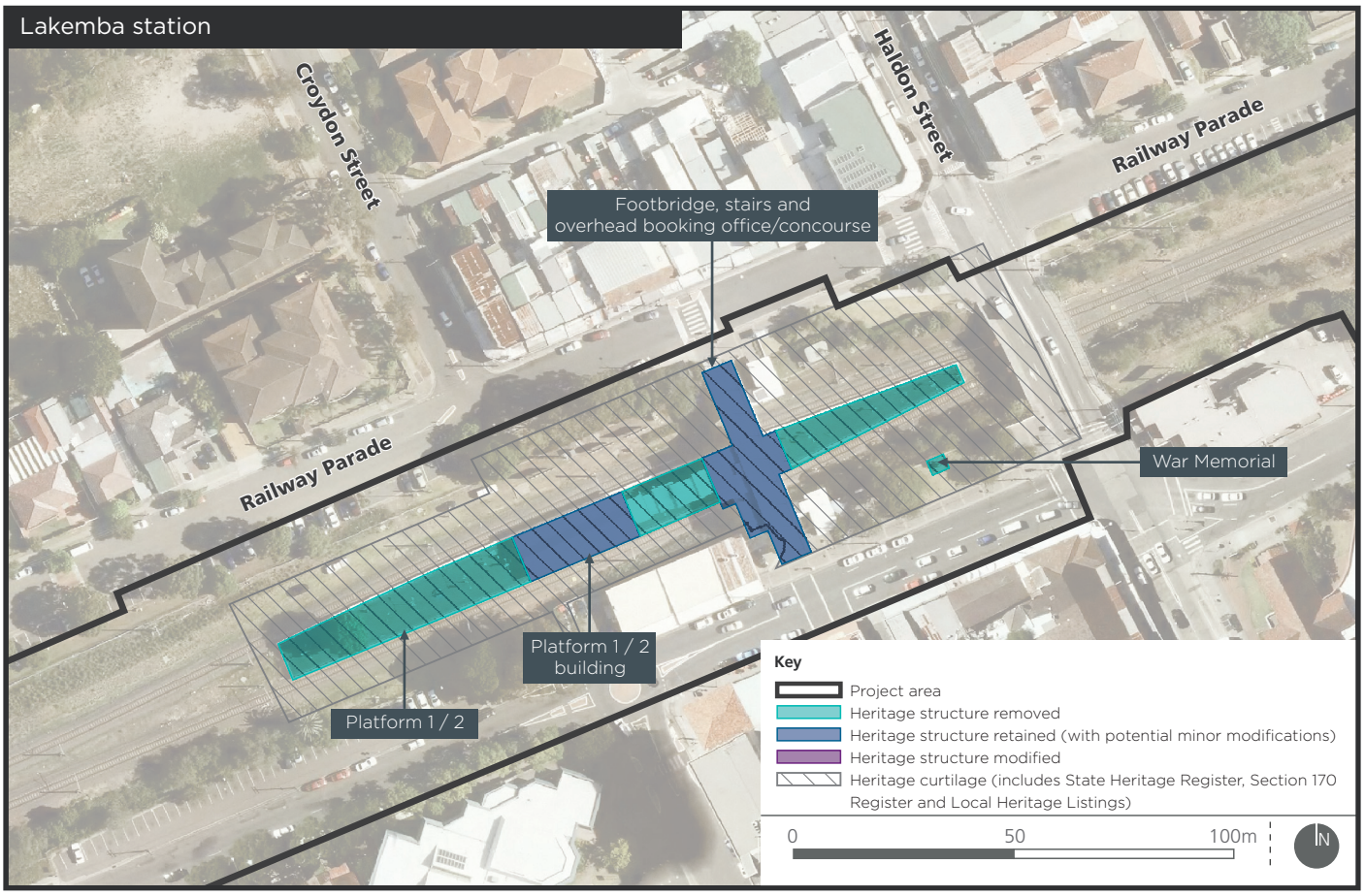
Overall, the project would result in a major impact on the Wiley Park Railway Station Group. All elements of high significance within the station would be removed. There would be no tangible elements of significance remaining. This would have major direct and visual impacts on the station as a whole. The new development would introduce contemporary structures and alter the character of the station from a late 1930s precinct into a contemporary transport interchange. The setting of the station would be fully impacted.

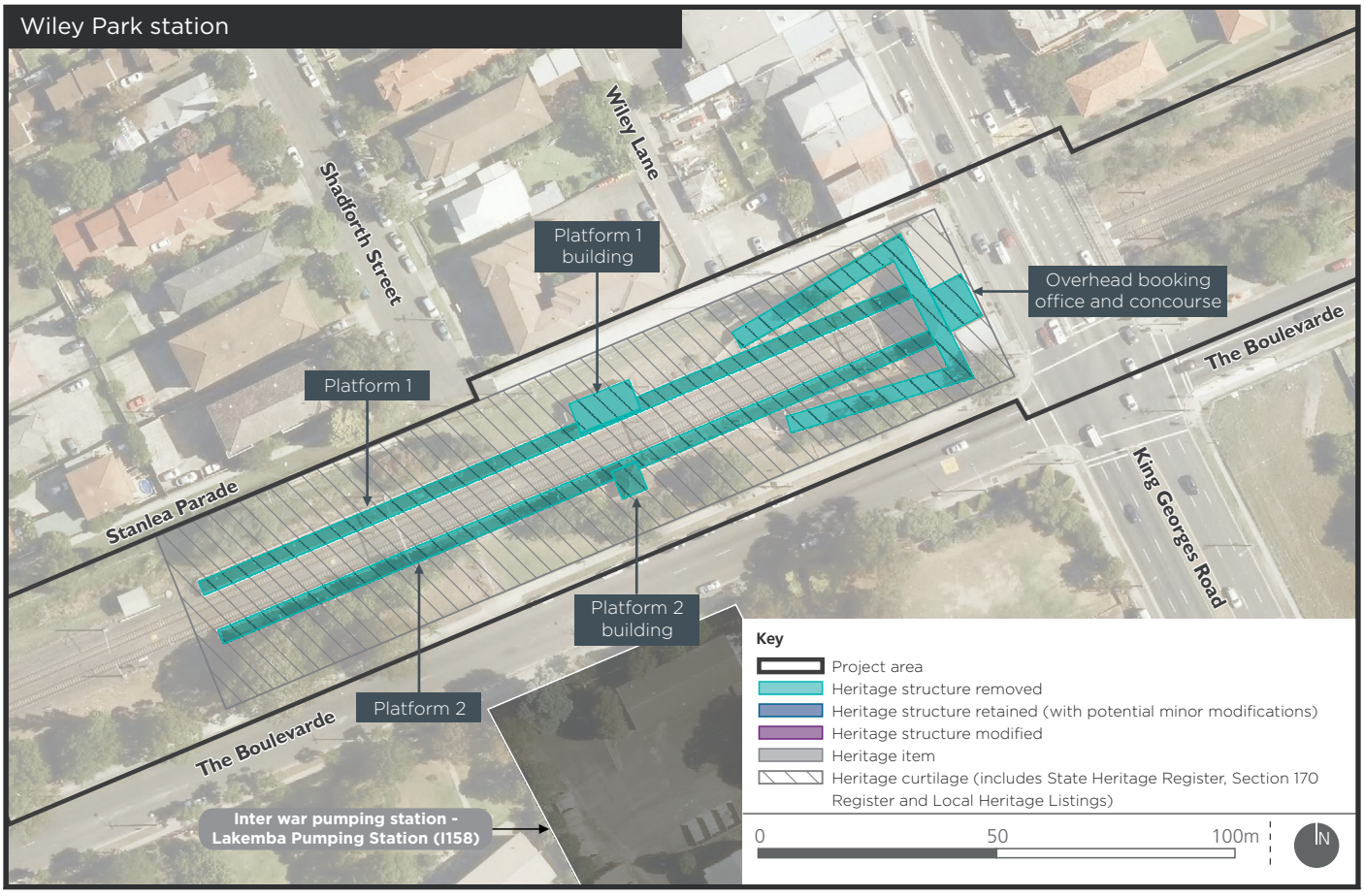
The demolition of all original structures of high and moderate significance would remove the original station dated 1938. Wiley Park Railway Station Group is historically significant on the Bankstown Line, as an infill station and the last of the stations to be constructed. The station is also significant as it was financed and constructed by the local Council rather than the State government. Therefore, the station has social and rarity values. The demolition of these structures would deprive the station of any tangible elements of significance. A good example of the Inter-War Railway Domestic style in the NSW railway network would be lost, and the aesthetic significance of the station would be fully impacted. Although all original buildings have been subject to detracting modifications overtime, their significance is retained in their historical and representative values as well as in substantial original fabric. By removing all heritage components, the project would result in Wiley Park Railway Station no longer meeting the threshold for local significance.

Interpretation would be able to convey the previous significance of the item, but would not fully mitigate impacts and would not enable the heritage item to retain its local significance. As a result, the heritage item would no longer meet the threshold for local significance and would likely be delisted.

Inter-War water pumping station – Lakemba Pumping Station

The direct impacts of the project on the Inter-War water pumping station would be neutral. The proposed works would result in a negligible visual impact. Potential direct impacts as a result of vibration would be negligible. The overall level of heritage impact on the Inter-War water pumping station would be negligible. The item would continue to meet the threshold for local significance.





sydney METRO | city & southwest

Impacts on heritage at Lakemba and Wiley Park stations

FIGURE 14.5

14.3.10 Punchbowl Station

Existing items

Heritage listed items in the vicinity of Punchbowl Station with the potential to be impacted by the project are summarised in Table 14.30 and shown in Figure 14.1. Table 14.31 lists the main structures and elements within the Punchbowl Railway Station Group, including relevant information such as date, condition, and significance.

Table 14.30 Punchbowl Station – heritage items

Item	Listing	Location
Punchbowl Railway Station Group	RailCorp s.170 (4802009) Canterbury LEP (I155)	In project area
War Memorial and street trees	Canterbury LEP (I152)	Adjacent to project area
Post-war Civic Building (former Punchbowl Baby Health Centre)	Canterbury LEP (I154)	Adjacent to project area

Direct impacts

An assessment of the direct impacts of the project on the fabric of each element constituting the Punchbowl Railway Station Group, and an assessment of the subsequent impacts on the heritage values of the station group as a whole, is provided in Table 14.31. Potential impacts are illustrated in Figure 14.6.

Table 14.31 Summary of direct impacts to significant elements within the Punchbowl Railway Station Group

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Platform 1/2 (1909)	Generally good	High	Removal Platform to be rebuilt in straight alignment Covered concourse, access stairs, lift shafts, platform canopies, and platform screen doors anchored on new platform	The overall impact to this element has been assessed as major due to the following: • major impact on the platform including the loss of the original brick face • loss of the historic curved platform and a major impact on the original platform layout from the reconstruction of the extended platform in a straight alignment • new covered concourse, access stairs, lift shaft, platform canopies, and platform screen doors anchored and constructed on the new platform would not further impact on significant fabric • major impact on the station group overall from the demolition of Platform 1/2.
Overhead booking office (1929)	Good	High	Removal for replacement with new covered concourse including access stairs and lift shafts	Major impact on the original footbridge and station overall from the removal of the overhead booking office, which was recommended for adaptive reuse in the *Railway Overhead Booking Offices Heritage Conservation Strategy* (Australian Museum Consulting, 2014).

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Footbridge (1930, 2014)	Fair	Moderate	Removal and replacement with new covered concourse including access stairs	Major impact on the remaining original elements of the footbridge and a moderate impact on the station overall, from the removal of the footbridge and replacement with a new covered concourse.
Toilet block, Platform 1/2 (1970s)	Good	Moderate	Removal and replacement with new covered concourse	Major impact on the toilet block and a moderate impact on the station overall from the removal of the toilet block on Platform 1/2.
Platform building, Platform 1/2 (early 1980s)	Good	Moderate	Removal for replacement with new covered concourse including access stairs and station buildings	Major impact on the building and a moderate impact on the station overall from the removal of the main building on Platform 1/2.
Canopies and extensions to overhead booking office (c.2000s)	Good	Little	Removal and replacement with new covered concourse	Neutral impact on the station from the removal of the canopies and extensions.

Visual impacts

Punchbowl Railway Station Group

The proposed canopies above the new concourse would be larger in scale compared with the existing structures on the site. However, all station buildings, including the Platform 1/2 building, toilet block, overhead booking office, and footbridge are to be removed. The scale of the proposed new development would not visually impact the heritage components of the site, as they would no longer be present. Visual impacts would result from the removal of all structures at Punchbowl station. All views and appreciation of the original platform and original overhead booking office and stairs would be lost. There would be visual impacts resulting from the removal of the original brick face and curved layout of the platform, and of the replacement of the original island platform with two platforms, resulting in a major visual impact.

The removal of later structures (e.g. the 1970s toilet block) would have moderate visual impacts on the station. Any visual impacts resulting from the proposed works to the Punchbowl Road overbridge would not further detract significant views, as the setting of the station would be fully impacted.

The nature of the new concourse, canopies and station buildings would introduce a contemporary design to the station in replacement of the existing buildings. The scale and height of the new canopy structure, the footprint of the overall concourse, stairs, new platform and station buildings as well as the platform canopies and platform screen doors would add considerable bulk to the originally low-scale station catchment. The original railway station with layers of 1970s and 1980s development would be replaced with a contemporary transport interchange, resulting in a major visual impact.

When considering cumulative impacts overall, the assessment concluded that the project would result in a major visual impact on Punchbowl Railway Station Group.

Other items

The project would result in negligible visual impacts on the War Memorial and street trees, and the Post-war Civic Building (former Punchbowl Baby Health Centre).

A small section of the curtilage of the War Memorial and street trees is located within the project area, where roads close to the station would provide access during construction. However, the area of impact does not comprise any of the significant trees that form part of the heritage significance of the item. The War Memorial is outside the project area to the south-east, resulting in neutral visual impacts on the item and negligible visual impacts from construction.

Views from the northern boundary of the War Memorial and street trees to the station would be mostly screened by existing mature trees along The Boulevarde, resulting in a neutral visual impact.

Similarly, views from the Post-war Civic Building towards the railway corridor, platforms, and station are mostly screened by vegetation. The proposed works would be consistent with the existing views to and from the heritage item.

Potential direct (vibration) impacts

Table 14.32 summarises the potential vibration impacts on listed heritage items.

Table 14.32 Potential vibration impacts

Item	Potential impact
Punchbowl Railway Station Group	Minor: The closest façade of this item would experience vibration levels above the screening level for cosmetic damage. Further assessment and management would be undertaken in accordance with the approach described in Section 14.4.
War Memorial and street trees Post-war Civic Building (former Punchbowl Baby Health Centre)	Negligible: Vibration levels would be below the cosmetic damage screening level.

Statements of heritage impact

Punchbowl Railway Station Group

The impacts on the Punchbowl Railway Station Group would be major. All elements of high and moderate significance within the station would be removed. There would be no tangible elements of significance remaining, resulting in major direct and visual impacts on the station as a whole. The new development would introduce contemporary structures and alter the character of the station from an early nineteenth-century station with layers of 1970s and early 1980s development, into a contemporary transport interchange. The setting of the station would be fully impacted.

The removal of all original structures of high and moderate significance would remove the original station developed between 1909 and 1929, as well as later layers of development from the 1970s and early 1980s. The station is historically significant as one of the original railway stations from the second phase of development of the Bankstown Line. A good example of an Inter-War Transitional style overhead booking office in the NSW railway networks would be lost, as would the original island platform. As a result, the aesthetic significance of the station would be fully impacted. Although the existing structures have been subject to modifications over time, their significance is retained in their historical and representative values, as well as in substantial original fabric.

When assessed cumulatively, the level of heritage impact of the project on the station would be major. The significance of the station is encompassed in its historical use, which is represented by tangible elements, including platforms and individual buildings. By removing these elements, there would be no tangible elements to represent the historic role of the station. The aesthetic significance of the station demonstrated in its nineteenth-century architecture with layers of 1970s and early 1980s development would also be lost. Interpretation would be able to convey the previous significance of the site; however, it would not fully mitigate impacts and would not enable

the heritage item to retain its local significance. Therefore, the heritage item would no longer meet the threshold for local significance and it is likely to be delisted.

Other items

The project would result in negligible impacts on the War Memorial and street trees and Post-war Civic Building (former Punchbowl Baby Health Centre). Both items would therefore continue to meet the threshold for local significance.

14.3.11 Bankstown Station

Existing items

Heritage listed items in the vicinity of Bankstown Station with the potential to be impacted by the project are summarised in Table 14.33 and shown in Figure 14.1. Table 14.34 lists the main structures and elements within the Bankstown Railway Station Group, including relevant information such as date, condition, and significance.

Table 14.33 Bankstown Station – heritage items

Item	Listing	Location
Bankstown Railway Station Group	RailCorp s.170 (4802067) Bankstown LEP (I3)	In project area
Bankstown Parcels Office (former)	RailCorp s.170 (4802067) Bankstown LEP (I4)	In project area
Shop	Bankstown LEP (I13)	Adjacent to project area

Direct impacts

An assessment of the direct impacts of the project on the fabric of each element constituting the Bankstown Railway Station Group, and an assessment of the subsequent impacts on the heritage values of the station group as a whole, is provided in Table 14.34. Potential impacts are illustrated in Figure 14.6.

The project would result in neutral direct impacts on the Bankstown Parcels Office (former). The parcels office has good integrity and is currently used as a storage facility. The structure is proposed to be retained for ongoing use, resulting in a neutral direct impact on the parcels office and the Bankstown Railway Station Group. Any retrofitting for re-use of the parcels office would be designed to minimise impacts to original fabric. The original layout would be preserved, and intrusive modifications removed, where possible. If these considerations are implemented, it is predicted that the project would have a minor direct impact on this item.

Table 14.34 Summary of direct impacts to significant elements within the Bankstown Railway Station Group

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Platform 1/2 (1909)	Good	High	Existing station platforms would be retained and a new island platform would be provided to the east of the new station entrance The platform would be retained except for the eastern end of the platform Covered concourse, access stairs, lift shafts, platform canopies and platform screen doors anchored on a section of extended platform	The overall impact to this element has been assessed as major due to the following: • loss of the historic curved platform and a major impact on the original platform layout from the reconstruction of the platform in a straight alignment and extension to the east • new covered concourse, access stairs, lift shaft, platform canopies and platform screen doors anchored and constructed on the new platform would not further impact significant fabric • moderate direct impact to the platform from the construction of a platform canopy to the east of the current station building • major impact on the station group overall from the partial removal of the eastern end of Platform 1/2 to be reconstructed in a straight alignment and extended.
Platform building, Platform 1/2 (Type 11) (1909, 1923)	Good	Exceptional	Retention for re-use with potential retrofitting	The overall impact to this element has been assessed as minor due to the following: • positive heritage outcome in the context of the project from the retention of the platform building • retrofitting for new accommodation would be designed to minimise impacts to original fabric, including preservation of the original layout where possible, and removal of any intrusive modifications • additions to the building and platform would be designed to be sympathetic to the heritage context and minimise fabric and visual impacts.
Overbridge (1909, 1997)	Fair	Moderate	Retention and upgrade	Minor impact on the overbridge and Bankstown Railway Station from removal and replacement of the non-significant parapets.
Overhead booking office (Type 19) (1948)	Good	Moderate	Retention for ongoing use	The overall impact to this element has been assessed as neutral as the overhead booking office is not identified in the *Railway Overhead Booking Office Conservation Strategy* (Australian Museum Consulting, 2014).
Footbridge (1948, 2012-13)	Good	Little	Retention for ongoing use	Neutral impact on the footbridge and Bankstown Railway Station from the retention of the structure.
Canopies (Modern)	Good	Intrusive	Retention for ongoing use	Neutral impact on the footbridge and Bankstown Railway Station from the retention of the structure.

Significant elements	Condition	Significance	Proposed works	Assessment of direct impact
Landscape/ natural features	Good	Moderate	Retention	Landscape elements are limited to a palm tree next to the eastern end entrance portico, which may have been planted at the time of construction of the parcels office. Retention of the tree would result in a neutral impact on the existing landscape features and the station.

Visual impacts

Bankstown Railway Station Group

The proposed new structures would be located on the eastern side of the station on a platform extension, and at a distance from the existing station buildings. The overhead booking office, footbridge, platform building, and part of the brick platform would remain on the western side. There would be a visual impact resulting from straightening the curved layout of the platform, resulting in a moderate visual impact overall.

The contemporary nature of the new development would differ from the existing heritage character of the station group, however, this would juxtapose with the historic components of the site. The new station buildings would be of a similar scale as the heritage buildings, and located at a notable distance, resulting in a minor visual impact. The new concourse and access stairs would add considerable footprint and bulk to the station; however, they would be located at a distance of about 80 metres from the Platform building 1/2. The bulk of the new covered concourse would be reduced by this distance, and potential visual impacts would be minor. A new platform canopy would be located on the existing platform to the east of the station building and would extend within two metres of the significant platform building resulting in a moderate visual impact.

Medium-scale canopies and platform screen doors located to the east of the new concourse would be mostly screened from significant views. They would not be located along the original platform, and would not obstruct views to the Platform building 1/2.

Overall, the project would add a contemporary layer of development on the eastern side of the station in contrast with the heritage components to the west. Views to the heritage buildings within the station catchment would be partially obscured by the large ribbon canopy extending from the concourse to the west. The concourse and eastern canopies would be large in scale, but would be located a notable distance from the heritage structures and would not be overly dominant. The project would alter the existing setting of the station. However, due to siting of the new concourse, visual impacts would be moderate overall.

The new services building would not visually dominate significant elements of the station catchment as it would be located over 150 metres to the east.

When considering cumulative impacts overall, the assessment concluded that the project would result in a moderate visual impact on the Bankstown Railway Station Group.

Other items

The project would result in neutral visual impacts on Bankstown Parcels Office (former) and negligible visual impacts on the Shop.

As Bankstown Parcel's Office is proposed to be retained for ongoing use, there would be a neutral visual impact. Any retrofitting would be designed to minimise impacts to original fabric and retain original detailing and features. The original layout would be preserved where possible.

Existing views from the Shop towards the rail corridor and station are mostly screened by vegetation and the existing bus interchange along South Terrace. The proposed new canopy and concourse would be located in the eastern section of the station to the north of the heritage item, and would be mostly screened by existing development and vegetation.

Potential direct (vibration) impacts

Table 14.35 summarises the potential vibration impacts on listed heritage items.

Table 14.35 Potential vibration impacts

Item	Potential impact
Bankstown Railway Station Group Shop	Negligible: Vibration levels would be below the cosmetic damage screening level.
Bankstown Parcels Office (former)	Minor: Modelling indicates that the closest façade of this item would experience vibration levels above the screening level for cosmetic damage. Further assessment and management would be undertaken in accordance with the approach described in Section 14.4.

Statements of heritage impact

Bankstown Railway Station Group

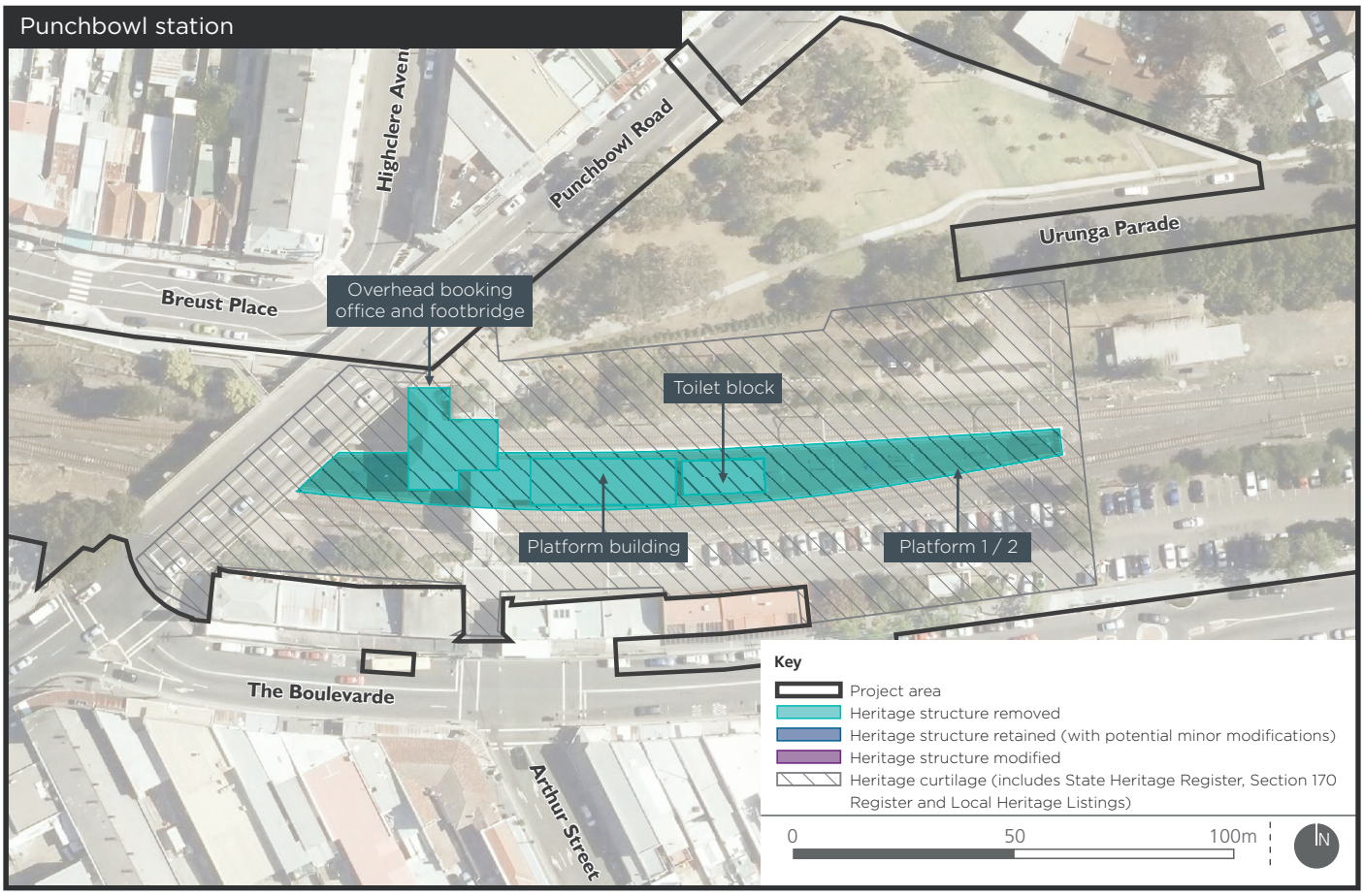
Overall, the direct impacts of the project on the station would be moderate. There would be moderate direct impacts. The platform building of exceptional significance would be retained with potential for positive impact. However, the eastern curve of the original platform of high significance would be removed, which would result in a major direct impact. Retention of all other heritage elements of significance except for the curved eastern section of the original platform would enable the station to continue to demonstrate its historic, aesthetic and representativeness significance. The retention of the platform building of exceptional significance would retain the historical values of the place as one of the original railway stations dating from the early 20th century expansion of the railway between Belmore and Bankstown. The platform building is an excellent example of its type, and would continue to contribute to the presentation of the station.

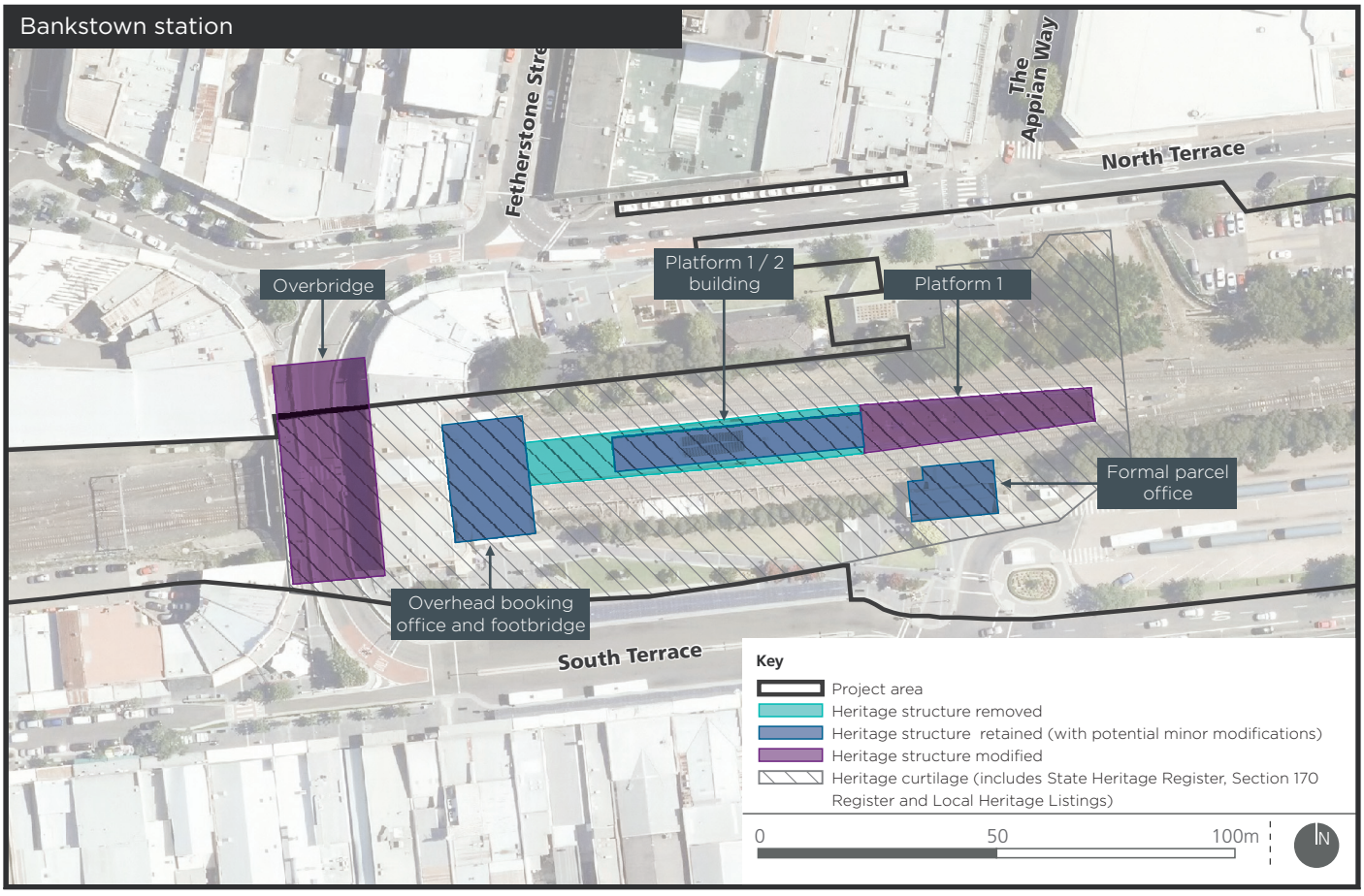
Views to the heritage buildings would not be obstructed by the new concourse, which would be located at a notable distance from the existing station. Visual impacts on the station would be moderate overall. Potential direct impacts as a result of vibration would be negligible.

Other items

The project would result in neutral impacts on the Bankstown Parcels Office (former) and negligible impacts on the Shop overall. The direct impacts of the project on both heritage items would be neutral. Visual impacts would be neutral for the Bankstown Parcels Office (former) and negligible for the Shop. Potential vibration impacts on the Shop would also be negligible, while vibration impacts on the Bankstown Parcels Office (former) would be minor, provided that the measures in Section 14.4 are implemented.

Both heritage items would continue to meet the threshold for local significance.





sydney METRO | city & southwest

Impacts on heritage at Punchbowl and Bankstown stations

FIGURE 14.6

14.3.12 Impacts on archaeology

The project would involve excavation in a number of locations, including to construct drainage facilities, substations, retaining walls, and utilities. Depending on the depth of excavation, there may be an impact on significant archaeological remains as discussed below.

Marrickville Station

Works within the Marrickville Station area would involve trenching and subsurface ground disturbance within the existing rail and road corridor.

There is a moderate to high potential for locally significant archaeological remains associated with the station to be impacted by the proposed works. The remains are generally works and former railway infrastructure, identified in the draft conservation management plan for Marrickville Station (Scobie, 2016).

Canterbury Station

Works within the Canterbury Station area would involve trenching and subsurface ground disturbance.

Although the location of the Old Sugarmill and former associated structures is to the east of the station, there is a moderate to high potential that remains associated with this item could extend into the project area. These remains would have local or State significance depending on their nature and intactness.

The former Canterbury Township is located to the east of Canterbury Station. Any subsurface works have a moderate to high potential to impact any associated intact archaeological remains. These remains would have local significance.

Lakemba Station

Works within the Lakemba Station area would involve earthworks, trenching, and subsurface ground disturbance.

There is a low potential for locally significant remains associated with the early settlement of Lakemba, including structures associated with 'Lakemba' heritage item, such as outbuildings and stables, and archaeological features associated with farming activities, domestic and agricultural structures, refuse pits and drains or culverts. Works within the station area have the potential to impact any associated intact archaeological remains. There is a low to moderate potential for the locally significant remains of the 1919 Lakemba island platform to be impacted by works.

Belmore Station

Works within the Belmore Station area would involve trenching and subsurface ground disturbance.

There is low to moderate potential for locally significant archaeological remains associated with the railway station goods shed and goods platform to be impacted.

To minimise the potential for the above impacts, the mitigation measures in Section 14.4 provide for the development of an archaeological research design document.

Other

Other locations may contain archaeological 'works' such as remains of culverts, former platforms (within existing remodelled platforms), and infrastructure such as drains. However, the archaeological assessment in Technical paper 3 concluded that overall, the study area has a nil to low potential to contain significant archaeological remains.

14.3.13 Construction compounds and work sites

This section provides a summary of the results of the assessment of the potential impacts of construction compounds and work sites on heritage items. A description and full list of the proposed location of compounds and work sites is provided in in Section 9.8.

Compound C4 would be located along the northern boundary of the Hurlstone Park Railway Station Group heritage item outside its heritage curtilage. There would be some views to the compound from the heritage item. This would result in a temporary minor visual impact on the item.

A work site (to be used mainly for laydown) would be located in the vicinity of the Old Sugarmill in Canterbury, to the west of the item. There would be some views to the work site from the item. This would result in a temporary minor visual impact on the item. Views to the site would be obstructed by existing development to the north and west of the item.

Compound C11 would be located within the curtilage of the locally listed Post-war bus shelter and public lavatories in the vicinity of Belmore Station. Compound C10 would be located on the opposite side of the rail corridor to the south of the site. This would result in a temporary moderate visual impact on the item.

Compounds C12 and C13, near Belmore Station, would be located in the vicinity of the locally listed Federation House (former station master's cottage) opposite Burwood Road. There would be some views to these compounds from this item. This would result in a temporary minor visual impact on the item. Impacts of construction compounds on the item are considered to be minor.

Compound C17 would be located opposite the locally listed Inter-War water pumping station - Lakemba Pumping Station, across The Boulevarde at Wiley Park, on the southern side of the rail corridor. There would be views to this compound from this item. This would result in a temporary minor visual impact on the item.

Compounds C19 and C20 would be located opposite the locally listed War Memorial and street trees, across The Boulevarde at Punchbowl, on the northern side of the rail corridor. There would be some views to the compounds from within the heritage curtilage of the item. However, the War Memorial and street trees would be located outside the visual catchment of the compound. This would result in a temporary negligible visual impact on the item. The impacts of the compounds on the item would be negligible.

Two compounds, C23 and C24, would be located in close proximity to the Bankstown Railway Station Group along both sides of the rail corridor. Compound C23 would also be located opposite the locally listed Bankstown Parcels Office (former), across the rail corridor to the north. There would be some views to the compound from the item. This would result in a temporary minor visual impact on the item. Compound C24 would be located in close proximity to the Bankstown Parcels Office (former), to the east along the rail corridor. There would be views to the compound from the item, resulting in a temporary moderate visual impact on the item. The impacts of the compounds on the item would be minor.

Compounds C23 and C24 would also be located opposite the locally listed shop heritage item. There would be some views to the compounds from this item. This would result in a temporary minor visual impact on the item. The impacts of the compounds on this item would be minor.

No other potential impacts on heritage items were identified as a result of the presence of construction compounds and work sites.

The mitigation measures provided in Section 14.4 would be implemented to minimise the potential impacts identified.

14.3.14 Operation impacts

Operation of the project would not directly impact any listed heritage items. The main potential for indirect impacts relates to vibration generated by the movement of trains, and a change in the visual setting and/or character associated with the presence of new infrastructure.

The potential for structural vibration impacts was considered by the noise and vibration assessment for the project, and the results are summarised in Chapter 12. No operational impacts on heritage items were predicted.

The potential for visual impacts was considered by the landscape and visual impact assessment for the project, and the results are summarised in Chapter 19 (Landscape and visual amenity). The assessment concluded that the overall visual impact of the project would be negligible to minor adverse. Measures are provided in Chapter 19 to mitigate the potential for visual impacts.

Retrofitting and reuse of significant structures to be retained in accordance with their heritage values has been a key consideration during the design process, and would continue to be refined during detailed design. This would be a positive heritage outcome, as it would enable public engagement with heritage values within the upgraded stations, conservation of significant elements, and would facilitate maintenance and care of structures in use. Retrofitting would aim to highlight the heritage values of the structures to customers, both through sensitive design and fit out, and use of heritage interpretation.

Reuse of salvaged significant fabric, such as platform bricks or fittings, could be used as part of design or as public art/interpretation. A salvage strategy would be prepared which would detail the proposed strategies for selecting salvaged material.

Reuse and retrofitting would be guided by the Burra Charter, the Heritage Council Guidelines for Altering Heritage Assets, relevant Sydney Trains guidelines, and all relevant conservation management plans and statements of significance.

14.3.15 Summary of impacts

The Bankstown Line

Section 14.3 describes and assesses the direct, visual, potential direct and archaeological impacts on each item within the project area and concludes the level of impact and significance of changes proposed as part of the project. A summary of the information is provided below.

Of the ten heritage railway stations located on the Marrickville to Bankstown section of the Bankstown Line, the project would result in a major direct impact to five stations, one of which is listed on the State Heritage Register (Marrickville). The project would also result in a direct and major visual impact to four stations of local significance. There would be a moderate direct impact to five stations, two of which are listed on the State Heritage Register: Canterbury and Belmore. Five stations would be subject to a moderate visual impact, two of which are listed on the State Heritage Register, Canterbury and Belmore.

Two locally-listed items, Wiley Park and Punchbowl railway station groups, would no longer meet the threshold for local significance and would likely be delisted.

All State Heritage Register listed stations would continue to meet the threshold for State significance under more than one significance assessment criteria. Overall, all ten stations would be subject to moderate to major direct and visual impacts, apart from Bankstown which would have a minor visual impact.

Direct and visual impacts to three railway underbridges would be negligible to moderate. There would be major direct impacts to the Illawarra Road overbridge at Marrickville, which is within the station's State Heritage Register listed curtilage.

As there would be impacts to significant elements at all listed stations along the line, conservation management plans for State Heritage Register listed stations and conservation management strategies for items of local significance would be prepared. These documents would address any changes to the item including updated assessment of significance of elements and recommendations on curtilage changes, for example a possible reduction in curtilage at Marrickville Station as a result of impacts to the Illawarra overbridge. The conservation management plan would also provide suggested site specific exemptions or management policies.

Station types

Stations constituting the first layer of development of the line would generally be retained. All platform buildings and general station configurations would be conserved at Marrickville, Hurlstone Park, Campsie, Canterbury, and Belmore, except for the Platform 1 building at Hurlstone Park, which would be removed.

Stations constituting the second layer of development of the line would mostly be conserved in their existing states. Lakemba and Bankstown station's island platform configurations and platform buildings would be retained. Punchbowl Station would be subject to greater impacts as it would be fully redeveloped.

The inter-war layer of the Bankstown Line would be impacted, with Wiley Park Station fully redeveloped, constituting the loss of the only example of an Inter-War Railway Domestic station on the line. The inter-war phase of redevelopment of Dulwich Hill station would also be altered, with the loss of the overhead booking office and major visual impacts on the station building, although the station building and the island platform configuration would be retained.

The most significant stations on the line (Marrickville, Canterbury and Belmore), dating from the first phase of development, would retain their significant near-identical brick buildings of exceptional significance. The intermediate stations of the first phase of development have more modest brick buildings dated 1915, including at Campsie and Hurlstone Park stations.

Campsie would retain its original configuration and platform buildings, whilst Hurlstone Park would be subject to greater impacts, with the more prominent of two platform buildings removed. The configuration of Punchbowl and Wiley Park stations would be fully modified from island platforms to side platforms. The configuration of Bankstown Station would be retained, and the station extended to the east.

Station elements

Examples of each significant platform building type on the Marrickville to Bankstown section of the line would be conserved. Examples of 1895 buildings of exceptional significance would be conserved at Marrickville, Canterbury, and Belmore stations. Several examples of 1911-1919 buildings would be conserved at Marrickville, Hurlstone Park, Canterbury, Campsie, Lakemba, and Bankstown stations. Evidence of the transitional style of inter-war railway architecture would be retained at Dulwich Hill Station, although the inter-war domestic style buildings at Wiley Park Station would be lost.

A good example of an overhead booking office would be conserved at Belmore Station, whilst good to fair examples noted in the *Railway Overhead Booking Offices Heritage Conservation Strategy* would be removed at Dulwich Hill, Wiley Park, and Punchbowl stations. The platform booking office at Marrickville Station, which is of exceptional significance, would be retained. A significant portion of original footbridges already impacted would be removed. A footbridge assessed to be of high significance by the Sydney Trains' *Railway Footbridges Heritage Conservation Strategy* would be removed at Dulwich Hill Station, as would three footbridges of moderate significance at Hurlstone Park, Canterbury, and Wiley Park stations.

Original platforms along the line would be removed to meet accessibility and operational requirements for straight platforms except for the platforms at Bankstown Station, which would be mostly retained. This would result in a loss of curved platforms, and of brick vertical and battered platform walls. The general platform configuration would be retained at all stations, except at Punchbowl and Wiley Park stations.

The overbridges along the line have been generally impacted over time. The majority of the overbridges would be conserved for continued use, with the exception of the Illawarra Road overbridge, which would be removed and replaced.

Archaeology

The archaeological assessment concluded that the study area has nil to low potential to contain significant archaeological remains. However, the assessment found that there are four locations (Marrickville Station Catchment, Canterbury Station Catchment and work site, the Lakemba Station Catchment and Belmore Station Catchment) with the potential to contain significant archaeological remains. Other locations may contain archaeological 'works' such as remains of culverts, former platforms (within existing remodelled platforms), and infrastructure such as drains.

Construction compounds

The assessment concluded that the impacts of construction sites would be minor and temporary. Provided that mitigation measures are implemented to remediate the sites following the completion of the project, overall impacts from the construction of the project on the current Bankstown Line would be negligible.

Residual impacts

Residual impacts would include items proposed for removal where the function and condition of the item would not easily enable re-use or interpretation in any meaningful way. More generally, the historic character of the rail line, a late nineteenth-century to early twentieth century rail line with layers of inter-war development, would be altered by the contemporary infrastructure.

The study area

Section 14.3 describes and assesses the direct, visual, potential direct and archaeological impacts on each item within the project area and concludes the level of impact and significance of changes proposed as part of the project. A summary of the information is provided below.

Of the five items listed on the State Heritage Register in the study area, the assessment concluded that the project would result in:

- a major direct impact to one item (Marrickville Railway Station Group)
- moderate direct impacts to two items (Canterbury Railway Station Group and Belmore Railway Station Group)
- neutral direct impacts to two items (Sewage Pumping Station 271 and Old Sugarmill).

The project would result in major visual impacts to one State Heritage Register listed item (Marrickville Railway Station Group), moderate visual impacts to two State Heritage Register listed items (Canterbury Railway Station Group, and Belmore Railway Station Group), and negligible visual impacts to two items (Sewage Pumping Station 271 and Old Sugarmill).

All items listed on the State Heritage Register would continue to meet the threshold for State significance.

Among the 35 local items in the study area, five would have major direct impacts (Marrickville, Dulwich Hill, Hurlstone Park, Wiley Park and Punchbowl railway station groups) and five

(Marrickville, Dulwich Hill, Hurlstone Park, Wiley Park and Punchbowl railway station groups) major visual impacts.

Among the four items of local significance to have major impacts, Wiley Park and Punchbowl railway station groups would no longer meet the threshold for local significance and would likely be delisted.

For heritage items located in the vicinity of the project area, impacts would range from neutral to minor, with the majority of impacts being neutral or negligible and temporary, as a result of activities at construction sites.

The project passes through or is adjacent to the South Dulwich Hill heritage conservation area and the Inter-War Heritage Conservation Area Group listed under the Marrickville LEP. The proposed Floss Street heritage conservation area and Hampden Street heritage conservation area are located adjacent to Hurlstone Park Station. Direct impacts on the South Dulwich Hill heritage conservation area would be negligible, and impacts on the Inter-War Heritage Conservation Area Group would be neutral.

Works within the boundaries of the South Dulwich Hill heritage conservation area and in its vicinity would result in negligible visual impacts. Works in the vicinity of the Inter-War Heritage Conservation Area Group would also have a negligible visual impact. Potential direct impacts as a result of vibration would be minor, provided that the mitigation measures are implemented.

When assessed cumulatively, the level of heritage impact of the project on the South Dulwich Hill heritage conservation area and the Inter-War Heritage Conservation Area Group would be negligible. The heritage conservation area would continue to meet the threshold for local significance.

14.3.16 Cumulative impacts

A summary of the cumulative impacts of the project, when the various types of impacts to individual items and locations of the project is assessed as a whole, is provided in Section 14.3.15.

The contrasting contemporary design of the upgraded stations would be generally distinguishable from the heritage character of the historic stations, and would provide enhanced views of significant platform buildings. The upgraded line would be read as the latest phase of development of the Bankstown Line, and would enable the line to function in its original use within a modern railway infrastructure context. The continued use of the stations, the retention of the majority of platform buildings for re-use, and enhanced views of significant buildings, would constitute positive heritage impacts in the context of the project and its requirements.

Cumulative impacts could occur when the impacts identified in Sections 14.3.2 to 14.3.15 are considered in addition to other projects undertaken in the study area. Other major rail and road infrastructure projects in the vicinity of the study area include the Chatswood to Sydenham project and WestConnex, which would also result in impacts to non-Aboriginal heritage.

The Chatswood to Sydenham project, including the proposed modification to include upgrade works at Sydenham Station, may result in cumulative impacts with the other impacts to the T3 Bankstown Line. The WestConnex project would also result in a cumulative impact on heritage resources in the Sydney region.

Measures to avoid, reduce or mitigate visual, noise and vibration, and direct construction impacts to heritage items are provided in Section 14.4.2. These would reduce the likelihood and severity of cumulative impacts.

14.4 Mitigation measures

14.4.1 Approach to mitigation and management

Managing potential impacts on heritage during construction

The Construction Environmental Management Framework for the project (Appendix D) includes a requirement to prepare a heritage management plan as part of the construction environmental management plan, to provide a consistent approach to management and mitigation of heritage impacts during construction. The construction heritage management plan would guide the management of all proposed heritage mitigation approaches and plans, detailing timing, responsibilities, review, and monitoring requirements.

With respect to the potential for vibration impacts, as described in Chapter 12 (Construction noise and vibration), the Construction Noise and Vibration Strategy (Appendix E) provides a framework for managing construction noise and vibration impacts for the project. Where vibration levels are predicted to exceed the screening criteria, the Construction Noise and Vibration Strategy provides for a more detailed assessment of the structure and vibration monitoring, to ensure vibration levels remain below appropriate limits for that structure. For heritage structures, more stringent levels are applied, and the heritage values of the structure need to be taken into account as part of the more detailed assessment. Further information on the management of potential vibration impacts during construction, including relevant mitigation measures, is provided in Chapter 12.

As described in Chapter 13 no vibration impacts to heritage structures were predicted during operation. As a result, no operation vibration mitigation measures are required.

Project specific mitigation measures for heritage

Measures to minimise the impacts identified by the non-Aboriginal heritage assessment are provided in Section 14.4.2.

14.4.2 List of mitigation measures

The mitigation measures that would be implemented to address potential impacts on non-Aboriginal heritage items and areas of archaeological potential are listed in Table 14.36.

Table 14.36 Mitigation measures – non-Aboriginal heritage

ID	Impact/issue	Mitigation measures	Relevant location(s)
Design/pre-construction			
NAH1	Minimising impacts during design	The project design would be sympathetic to impacted items (including retained significant elements) and surrounding heritage items by minimising impacts to sight lines, views and setting. Detailed design would be carried out in accordance with the relevant specific element principles, including the significant fabric strategy, provided in the Design Guidelines.	All heritage items
NAH2		Except for the heritage significant elements affected by the project, direct impacts to other heritage significant items and elements would be avoided.	All heritage items
NAH3		The appropriately qualified and experienced heritage architect who is part of the Sydney Metro City & Southwest Design Review Panel would provide independent review periodically throughout detailed design.	All heritage items

ID	Impact/issue	Mitigation measures	Relevant location(s)
NAH4		Where heritage significant items or elements are to be retained within the operational area, detailed design would consider appropriate retrofitting and reuse in consultation with a heritage architect and the Design Review Panel. Where retrofitting and reuse is not practicable for significant elements, justification would be provided to the Design Review Panel, and for State Heritage Register listed items, to the NSW Heritage Council.	All heritage items
NAH5		Design and construction planning within the Marrickville Station State Heritage register curtilage would consider the recommendations of the 2016 Conservation Management Plan and the significant fabric strategy.	Marrickville Railway Station Group
NAH6	Interpretation	Appropriate heritage interpretation would be incorporated into the design in accordance with the *NSW Heritage Manual*, the NSW Heritage Office's *Interpreting Heritage Places and Items: Guidelines* (August 2005), and the NSW Heritage Council's *Heritage Interpretation Policy*.	All stations Hurlstone Park Railway Underbridge Overbridge - Illawarra Road Canterbury (Cooks River) Underbridge Canterbury (Cooks River/Charles St) Underbridge - Main Line Post-war bus shelter and public lavatories Bankstown Parcels Office (former)
NAH7	Management of moveable heritage and heritage fabric	A moveable heritage item strategy would be prepared by a suitably qualified heritage consultant in consultation with Sydney Trains, and would include a comprehensive record of significant railway elements to be impacted. This would include items contained within station and platform buildings as well as of any other significant equipment within the curtilage of the heritage railway stations. The moveable heritage item strategy would form part of the broader interpretation strategy.	Bankstown Line: each railway station in the project area apart from Bankstown, and Bankstown Parcels Office (former)

ID	Impact/issue	Mitigation measures	Relevant location(s)
NAH8		Fabric of high and exceptional significance of items proposed for removal would be identified and catalogued according to the significant fabric strategy prior to design development, and would be re-used where possible. Where not able to be re-used, the significant fabric strategy would indicate appropriate storage locations, as well as appropriate types of buildings and structures where salvaged elements may be reused in the future. Where large elements are impacted, a sample of fabric may be appropriate.	Marrickville Railway Station Group: Overbridge- Illawarra Road Dulwich Hill Railway Station Group: overhead booking office and access stairs Hurlstone Park Railway Station Group: Platform 1 building Campsie Railway Station Group: overhead booking office and Parcels office Wiley Park Railway Station Group: Platform 1 building, Platform 2 building and overhead booking office Punchbowl Railway Station Group: overhead booking office and footbridge
NAH9	Impacts to the Old Sugarmill	A landscape scheme would be prepared for the Old Sugarmill to re-instate planting within and close to the curtilage of the item. The scheme would consider appropriate period plants and trees. Any boundary wall treatment would be designed in consultation with a heritage architect.	Old Sugarmill
NAH10	Impacts to archaeology	An archaeological research design would be prepared and implemented to identify the need for archaeological testing or monitoring. Archaeological mitigation measures recommended in the archaeological research design would be implemented in accordance with relevant guidelines, and where identified in the archaeological research design, would be supervised by a suitably qualified Excavation Director with experience in managing State significant archaeology.	Marrickville Station Catchment (specific requirements) Canterbury Station Catchment and work site (specific requirements) Belmore Station Catchment (specific requirements) Lakemba Station Catchment (specific requirements)
NAH11	Archival recording	Photographic archival recording and reporting would be carried out in accordance with the NSW Heritage *Office's How to Prepare Archival Records of Heritage Items* (1998), and *Photographic Recording of Heritage Items Using Film or Digital Capture* (2006).	Overbridge- Illawarra Road Hurlstone Park Railway Underbridge Canterbury (Cooks River) Underbridge Canterbury (Cooks River/Charles St) Underbridge - Main Line Post-war bus shelter and public lavatories Bankstown Parcels Office (former)
NAH12	Conservation management	A conservation management plan would be prepared for all State Heritage Register listed stations, in accordance with NSW Heritage Council guidelines. The plan would address any changes to the item, including updated assessment of significance of elements and recommendations on curtilage changes. It would also provide suggested site specific exemptions and management policies.	Marrickville Railway Station Group Canterbury Railway Station Group Belmore Railway Station Group

ID	Impact/issue	Mitigation measures	Relevant location(s)
NAH13		A conservation management strategy would be prepared for nominated Section 170 register listed stations not listed on the State Heritage Register, in accordance with NSW Heritage Council guidelines.	Hurlstone Park Railway Station Group Campsie Railway Station Group Lakemba Railway Station Group Bankstown Railway Station Group
NAH14	Unexpected finds	An unexpected finds procedure would be developed and included in the construction heritage management plan.	All
Construction			
NAH15	Minimising impacts during construction	Methodologies for the removal of existing structures and construction of new structures would be developed and implemented during construction to minimise direct and visual impacts to other elements within the curtilages of the heritage items, or to heritage items located in the vicinity of works.	All heritage items
NAH16	Unexpected finds	In the event that unexpected archaeological remains, relics, or potential heritage items are discovered during construction, all works in the immediate area would cease, and the unexpected finds procedure would be implemented.	All
NAH17	Human skeleton material	In the event that a potential burial site or potential human skeletal material is exposed during construction, the procedure recommended by the historic heritage impact assessment would be followed in accordance with the Policy Directive – *Exhumation of Human Remains* (NSW Department of Health, 2008), *Skeletal Remains – Guidelines for the Management of Human Skeletal Remains under the Heritage Act 1977* (NSW Heritage Office, 1998) and the *Aboriginal Cultural Heritage Standards and Guidelines Kit* (NPWS, 1997).	All

14.4.3 Consideration of the interactions between mitigation measures

Mitigation measures in other chapters that are relevant to the management of potential heritage impacts include:

- Chapter 12 (Construction noise and vibration) with respect to management of potential vibration impacts during construction
- Chapter 19 (Landscape character and visual amenity) with respect to management of potential visual impacts during construction and operation.

Together, all these measures would minimise the potential heritage impacts of the project.

14.4.4 Managing residual impacts

Heritage impacts caused by the project have been minimised by the approach described in Section 14.3.1, and the measures provided in Section 14.4.2. However, impacts assessed as major would not be fully mitigated, and there would be some residual impacts, as follows:

- a major impact to Marrickville Railway Station Group as a result of upgrading the Illawarra Road overbridge
- major impacts to Marrickville, Dulwich Hill, Hurlstone Park, Wiley Park and Punchbowl railway station groups as a result of the removal of one or more heritage elements associated with these items (summarised in Section 14.3)
- major visual impacts on the Marrickville, Dulwich Hill, Hurlstone Park, Wiley Park, and Punchbowl railway station groups
- Wiley Park and Punchbowl railway station groups would no longer meet the threshold for local significance, and would likely be delisted.

Despite the residual impacts described above, the T3 Bankstown Line would continue to retain some of its heritage values and demonstrate the phases of development of the line as a historical line in the NSW railway network.