

Appendix H

Air quality background data



Parramatta Light Rail Stage 2

Environmental impact statement



This appendix provides background data and analysis used to undertake the air quality impact assessment (including greenhouse gas). The results of the assessment are summarised in Chapter 20.

H-1 Air quality criteria

Relevant assessment criteria for the primary pollutants associated with construction and operation of the project are presented in Table H.1 and were predominantly taken from the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA, 2016) ('the Approved Methods'), with the exception of NO₂ and SO₂ which were also sourced from the air quality objectives specified by the National Environment Protection (Ambient Air Quality) Measure ('the Air NEPM'). The criteria apply to the total impact (increment plus background) and must be reported as the 100th percentile (maximum) for all pollutants except benzene (99.9th percentile).

Table H.1 Air quality impact assessment criteria

Pollutant	Averaging period	Impact location	Impact type	Criteria (µg/m ³)	
				Approved Methods	Air NEPM
Airborne particulate matter and common gaseous pollutants					
TSP	Annual	Sensitive receptor	Cumulative	90	-
PM ₁₀	24 hour	Sensitive receptor	Cumulative	50	-
	Annual	Sensitive receptor	Cumulative	25	-
Deposited dust	Annual (maximum increase)	Sensitive receptor	Cumulative	2 g/m ² /month	-
	Annual (maximum total)	Sensitive receptor	Cumulative	4 g/m ² /month	-
NO ₂	1 hour	Sensitive receptor	Cumulative	246	164
	Annual	Sensitive receptor	Cumulative	62	31
SO ₂	1 hour	Sensitive receptor	Cumulative	570	286 (planned to be reduced to 215 in 2025)
	24 hour	Sensitive receptor	Cumulative	228	57
Principal air toxics					
Benzene	1 hour	At or beyond site boundary	Incremental	29	-

H-2 Existing environment

Monitoring data from the following two closest air quality monitoring stations to the project site was reviewed to determine historical air quality trends in Sydney:

- Paramatta North monitoring station, located about seven kilometres north-west of the project site
- Chullora monitoring station, located about nine kilometres south of the project site.

A summary of the ambient air quality data recorded at the air quality monitoring stations over a five-year period (2016 to 2020) is provided in Table H.2. It is noted that the Parramatta North monitoring station was commissioned in 2017 and as such does not have data prior to this year.

Table H.2 Five-year summary of available background air quality data ($\mu\text{g}/\text{m}^3$)

Pollutant	Averaging period	Year				
		2016	2017	2018	2019	2020
Parramatta North monitoring station						
PM ₁₀	24 hour maximum	- ¹	-	107.4	195.3	188.9
	Maximum 24 hour (below assessment criteria)	-	-	43.7	50.0	49.9
	24 hour 70th percentile	-	-	24.4	27.1	20.1
	Annual average	-	-	21.1	25.3	19.2
PM _{2.5}	24 hour maximum	-	-	42.1	130.1	72.9
	Maximum 24 hour (below assessment criteria)	-	-	18.8	19.9	19.3
	24 hour 70th percentile	-	-	9.2	10.3	8.3
	Annual average	-	-	8.5	10.2	7.9
NO ₂	1 hour maximum	-	-	120.3	131.6	69.6
	Annual average	-	-	18.5	17.6	13.2
SO ₂	1 hour maximum	-	-	56.3	80.4	53.6
	24 hour maximum	-	-	13.0	16.2	13.1
	Annual average	-	-	1.5	1.9	1.4
CO	1 hour maximum	-	-	1.5	6.6	3.2
	8 hour maximum	-	-	1.0	3.7	2.3
Chullora monitoring station						
PM ₁₀	24 hour maximum	63.5	60.4	90.7	140.4	168.0
	Maximum 24 hour (below assessment criteria)	44.9	48.0	49.7	48.4	50.0
	24 hour 70th percentile	20.8	22.0	24.3	25.8	21.5
	Annual average	18.0	19.9	21.4	24.2	20.3
PM _{2.5}	24 hour maximum	49.4	40.9	27.0	97.6	86.2
	Maximum 24 hour (below assessment criteria)	17.8	20.0	18.9	19.9	19.6
	24 hour 70th percentile	8.6	9.9	9.4	10.5	9.0
	Annual average	7.7	9.0	8.2	10.8	8.6

Pollutant	Averaging period	Year				
		2016	2017	2018	2019	2020
NO ₂	1 hour maximum	86.5	112.8	107.2	131.6	97.8
	Annual average	22.3	21.4	20.9	20.2	16.7
SO ₂	1 hour maximum	37.5	37.5	56.3	69.7	40.2
	24 hour maximum	8.0	7.6	8.2	9.6	9.0
	Annual average	1.5	1.4	1.6	1.8	1.1
CO	1 hour maximum	2.8	2.1	4.1	5.3	2.6
	8 hour maximum	1.6	1.1	4.0	1.3	2.2

Note 1: '-' indicates pollutant not monitored

Figure H.1 and Figure H.2 show the ambient PM_{2.5} concentration and the ambient PM₁₀ concentration, respectively, recorded at the two monitoring sites for the period 2016 to 2020.

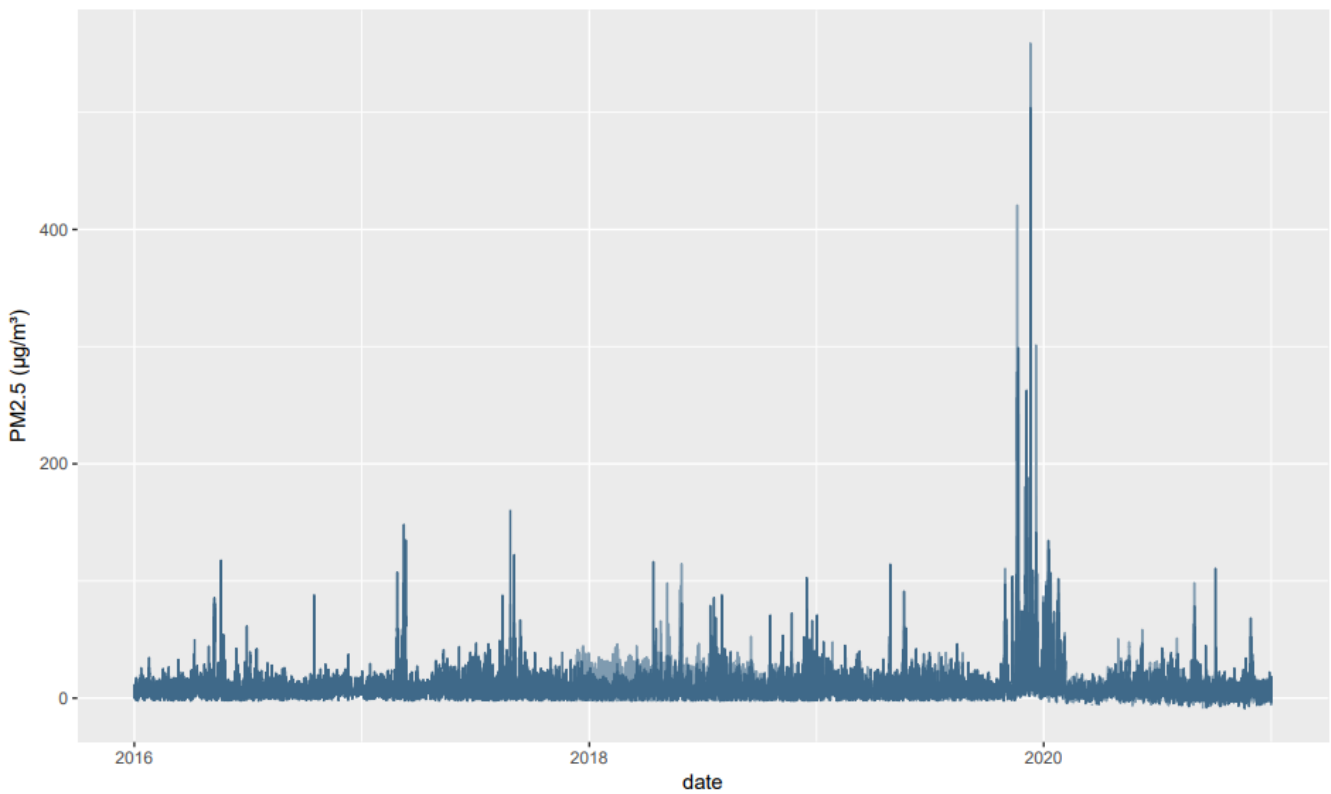


Figure H.1 Five year ambient PM_{2.5} concentration at Parramatta North and Chullora monitoring stations

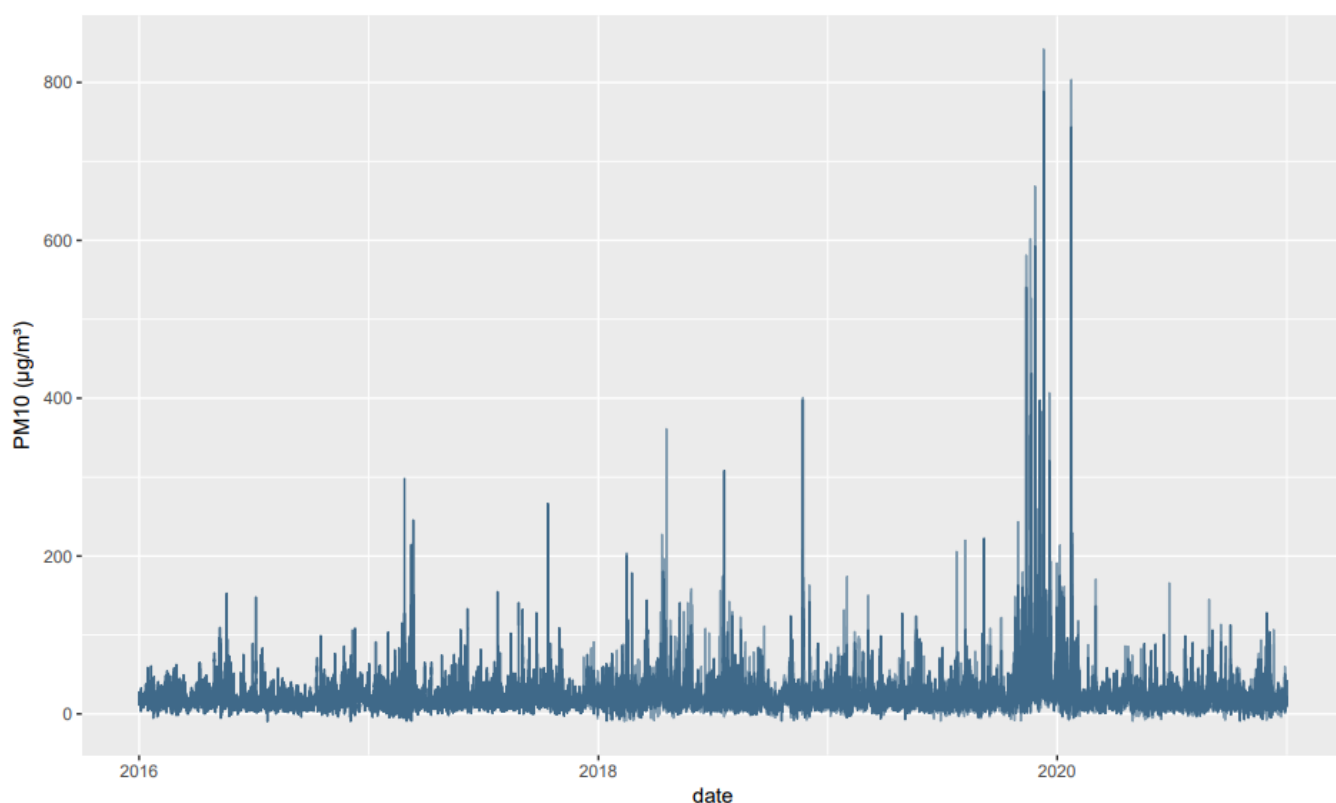


Figure H.2 Five year ambient PM₁₀ concentration recorded at Parramatta North and Chullora monitoring stations

A summary of the sensitive receivers in the suburb along the project site is provided in Table G.3. The risk to these receivers has been classified based on Table H.3 and Table H.4 of *Guidance on the assessment of dust from demolition and construction* (IAQM, 2014), noting that the risk is based on dust soiling effects as it is considered more stringent than the risk of human health impacts.

Table H.3 Summary of surrounding sensitive receivers

Suburb	Land use type	Location	Approximate distance to project site (m)	Risk
Parramatta	Industrial	<10 industrial receivers along Grand Avenue	40	Low
	Commercial	Lollipop's Playland Parramatta	100	Low
Camellia	Industrial	10-100 (<50) industrial receivers along Grand Avenue	20	Low
	Commercial	Camellia Fusion Cafe	20	Medium
Rydalmere	Residential	>100 residential receivers along Antoine, South and Dorothy streets and cross streets	20-100	High
	Recreational/open space	Broadoaks Park	70	Low
	Industrial	10-100 (<20) industrial receivers along John and Antoine streets	10-100	Low
	Commercial	Parking lot – amenity dust	5	Medium
Ermington	Educational	Rydalmere East Public School	100	Medium
		Tiny Scholars Childcare and Preschool	100	Medium
		Future Stars Early Learning Centre	90	Medium

Suburb	Land use type	Location	Approximate distance to project site (m)	Risk
	Residential	>100 residential receivers along South, Tristram, and Boronia streets, Heysen Avenue, and cross streets	20-100	High
	Recreational/open space	Ken Newman Park	20	Low
		Hughes Avenue Reserve	100	Low
	Commercial	Café 4TY7	20	Medium
Melrose Park	Educational	Melrose Park Public School	100	Medium
	Place of Worship	The Potter's House Christian Church Melrose Park	60	Medium
	Residential	<10 residential receivers along Wharf Road	10-100	Medium
	Recreational/open space	Ermington Bay Nature Trail	50	Low
		Archer Park	40	Low
	Industrial	10-100 industrial receivers along Hope Street and cross streets	20-100	Low
	Commercial	Hungry Boys Cafe	20	Medium
Wentworth Point/Sydney Olympic Park	Medical	MyHealth Medical Centre	100	Medium
	Residential	10-100 residential receivers along Hill Road and cross streets	20-100	Medium
	Recreational/open space	Millennium Parklands	10-100	Low
		River Walk	10-80	Low
	Commercial	Pierside Shopping Centre	30-80	Low
Sydney Olympic Park	Recreational/open space	Brickpit Ring Walk	10-100	Low
		Wentworth Common	10-100	Low
	Commercial	10-100 commercial receivers along Dawn Fraser Ave and cross streets	20-100	Medium
			Sydney Showground, Sydney Aquatic Centre and various stadiums	50-100
Carter Street	Residential	10-100 residential receivers along Carter Street and cross streets	10-100	High
	Industrial	<10 industrial receivers along Carter Street	50	Low
	Commercial	Parking lot – amenity dust	50-100	Low

The National Pollutant Inventory (NPI), operated under the National Environment Protection (National Pollutant Inventory) Measure 1998, provides publicly available information about emissions of 93 pollutants throughout Australia. Facilities that exceed prescribed threshold values are required to report their emissions to the NPI on a yearly basis.

A review of facilities reporting to the NPI in the area surrounding the project site revealed 23 facilities within about a five kilometre radius, which are listed in Table H.4.

Annual PM₁₀ emissions have been included as they are relevant to construction emissions associated with the project.

Table H.4 Summary of facilities within five kilometres of the project site that reported emissions during the 2019-2020 NPI reporting period

Facility	Address	Activity	Applicable pollutant emissions	Annual PM ₁₀ emissions (kg)
Auburn Waste and Recycling Centre	Hill Road, Homebush	Waste storage, transfer, separating or processing. Hazardous, Industrial or Group Waste generation or storage.	Not applicable	Not applicable
Bluestar Web Silverwater	1/83 Derby Street, Silverwater	Multi-channel printing and communication	CO, NO _x , SO ₂ , total VOCs, PM ₁₀ , PM _{2.5}	194
Boral Plasterboard Camellia	3 Thackeray Street, Camellia	Plaster, plasterboard and cornice manufacturing	CO, NO _x , SO ₂ , total VOCs, PM ₁₀ , PM _{2.5}	9,376
Camellia Vinegar	15 Grand Avenue, Camellia	Manufacture of vinegar	Total VOCs	N/A
Clyde Transfer Station	322a Parramatta Road, Clyde	Waste transfer activities	Total VOCs	N/A
Daniels Health	2 Wiblin Street, Silverwater	Biomedical waste treatment by incineration or chemical treatment	CO, NO _x , SO ₂ , total VOCs, PM ₁₀ , PM _{2.5}	301
DIC Graphics Auburn	323 Chisholm Road, Auburn	Manufacture of printing inks	Total VOCs	Not applicable
Downer EDI Works Rosehill	1 Unwin Street, Rosehill	Hot mix asphalt production	CO, NO _x , SO ₂ , total VOCs, PM ₁₀ , PM _{2.5}	5,943
Earth Power	35 Grand Avenue, Camellia	Food waste disposal activities	CO, NO _x , SO ₂ , total VOCs, PM ₁₀ , PM _{2.5}	1,140
Elgas NSW Chamber Services Pty Ltd Meter Plan	East Road, Homebush West	Import, handling and distribution of LPG	Total VOCs	Not applicable
Homebush Bay Liquid Treatment Plant	Cnr Hill Road and Pondage Link, Homebush Bay	Receives, stores and treats HIGAB industrial liquid waste and disposes of the liquid effluent to sewer whilst stabilised sludges are sent to an approved EPA licensed landfill	CO, NO _x , SO ₂ , total VOCs, PM ₁₀ , PM _{2.5}	423
James Hardie Rosehill	10 Colquhoun Street, Rosehill	Fibre cement manufacturing and distribution	CO, NO _x , SO ₂ , total VOCs, PM ₁₀ , PM _{2.5}	20,472
Lactalis Lidcombe	Lot 1 Birnie Avenue, Lidcombe	Dairy manufacturing	CO, NO _x , SO ₂ , total VOCs, PM ₁₀ , PM _{2.5}	118
Lubrizol International Inc	28 River Street, Silverwater	Chemical storage – lubricant additives	Not applicable	Not applicable
MAURI anz Camellia	15 Grand Avenue, Camellia	Yeast manufacture	CO, NO _x , SO ₂ , total VOCs, PM ₁₀ , PM _{2.5}	72
Pacific National Clyde	Corner Rawson and Highgate Street, Auburn	Railway yard operations	Total VOCs	Not applicable

Facility	Address	Activity	Applicable pollutant emissions	Annual PM ₁₀ emissions (kg)
Rheem Rydalmere	55 Brodie Street, Rydalmere	Manufacture of electric, gas, solar and heat pump hot water heaters	CO, NO _x , SO ₂ , total VOCs, PM ₁₀ , PM _{2.5}	133
Silverwater Terminal	Cnr Holker and Newington Street, Silverwater	Petroleum product storage and wholesaling	Total VOCs	Not applicable
Speedibake Ermington	Cnr Hughes Avenue and Hope Street, Ermington	Part baked bread and specialty bread (pizzas, tortillas, lavash, bagels) manufacturing and packaging, main process – baking	CO, NO _x , SO ₂ , total VOCs, PM ₁₀ , PM _{2.5}	67
Tooheys Brewery Lidcombe	29 Nyrang Street, Lidcombe	Brewing and packaging of beer	CO, NO _x , SO ₂ , total VOCs, PM ₁₀ , PM _{2.5}	883
VIP Packaging Granville	11a Ferndell Street, Granville	Steel packaging manufacturing, including steel coating	CO, NO _x , SO ₂ , total VOCs, PM ₁₀ , PM _{2.5}	68
Viva Energy Clyde Terminal	Durham Street, Rosehill	Storage of petroleum products. Waste activities	Total VOCs	Not applicable
Viva Energy Parramatta Terminal	Durham Street, Rosehill	Hydrocarbon storage and distribution	Total VOCs	Not applicable

H-3 Construction impacts

H-3-1 Earthworks estimation

Preliminary cut and fill volumes have been estimated based on preliminary geotechnical investigations. These calculations would be subject to further refinement during design development. The estimates provide an indication of the scale of earthworks and movement of material that may be a source of dust during construction without additional management measures. The summary of excavated material and fill is provided in Table H.5 and in section 7.3.5.

Table H.5 Summary of excavated material and fill required for the project (by precinct)

Suburb	Approximate volume of material to be excavated (m ³)	Approximate volume of material required for fill (m ³)	Earthwork balance (m ³)
Camellia	9,000	2,500	6,500
Rydalmere	7,000	13,500	-6,500
Ermington	21,000	6,000	15,000
Melrose Park	15,000	2,000	13,000
Wentworth Point	23,000	4,000	19,000
Sydney Olympic Park	19,000	0	19,000
Carter Street	7,000	0	7,000
Total	101,000	28,000	73,000

H-3-2 Estimated emissions

Total particulate emissions have been estimated from each suburb over the construction period using the estimated quantities in Table H.6.

Excavated and fill materials were assumed to have a density of 1,250 kg/m³ in the following calculations. Emission factors for excavation and loading were calculated based on section 1.1.2 of the *National Pollution Inventory Emission Estimation Technique Manual for Mining* (NPI, 2012). A mean wind speed of 2.6 metres per second was assumed based on the maximum seasonal average wind speed, and a conservatively low moisture content of one per cent was assumed. Emission factors for unloading are in section 1.1.6 of the *National Pollution Inventory Emission Estimation Technique Manual for Mining*. Based on these conservative assumptions, the calculated emissions are likely to be conservative.

An estimated 18,200 tonnes (based on an approximate volume of 13,000 m³ provided in project constructability information and an assumed density of 1400 kg/m³) of ballast would be crushed, screened and loaded. Emission factors for calculating the air emissions of this process are found in Table 3 of the *National Pollution Inventory Emission Estimation Technique Manual for Mining*.

The estimated total PM₁₀ emission of 3,472 kilograms is much lower than other substantial sources in the project site (as listed in Table G.6).

Table H.6 Emission estimates

Location	Cut	Fill	Emissions – excavation (kg)			Emissions – materials handling (kg)			Total emissions (kg)		
			TSP	PM ₁₀	PM _{2.5}	TSP	PM ₁₀	PM _{2.5}	TSP	PM ₁₀	PM _{2.5}
Camellia	9,000	2,500	45	21	2	274	110	14	319	131	16
Rydalmere	7,000	13,500	35	16	2	444	175	22	479	191	24
Ermington	21,000	6,000	104	49	5	643	258	32	747	307	37
Melrose Park	15,000	2,000	74	35	4	414	166	21	488	202	24
Wentworth Point	23,000	4,000	114	54	6	653	262	33	767	316	38
Sydney Olympic Park	19,000	0	94	45	5	473	191	24	568	236	28
Lidcombe	7,000	0	35	16	2	174	70	9	209	87	10
Ballast crushing, screening and loading	-	-	-	-	-	-	-	-	6188	2002	309
Total	101,000	28,000	501	237	25	3,075	1,233	154	9,764	3,472	488

H-3-3 Dust emission magnitude

Dust emission magnitudes for each stage of construction, including the key activities of demolition, earthworks, construction and track out, and for compound sites, have been estimated based on classifications in section 7 of *Guidance on the assessment of dust from demolition and construction*, as summarised in Table H.7.

Table H.7 Potential dust emission magnitudes

Suburb	Activity	Dust emission magnitude
Parramatta	Demolition	Medium
	Earthworks	Small
	Construction	Small
	Track out	Small
	Construction	Small
	Compound site	Not applicable
Camellia	Demolition	Medium
	Earthworks	Small
	Construction	Medium (bridge between Camellia and Rydalmere)
	Track out	Small
	Compound site	Medium
Rydalmere	Demolition	Medium
	Earthworks	Small
	Construction	Medium (bridge between Camellia and Rydalmere)
	Track out	Small
	Compound site	Medium
Ermington	Demolition	Medium
	Earthworks	Small
	Construction	Medium (bridge over Silverwater Road)
	Track out	Small
	Compound site	Medium
Melrose Park	Demolition	Medium
	Earthworks	Small
	Construction	Small
	Track out	Small
	Compound site	Medium
Wentworth Point	Demolition	Medium
	Earthworks	Small
	Construction	Small (bridge between Melrose Park and Wentworth Point)
	Track out	Small
	Compound site	Medium
Sydney Olympic Park	Demolition	Medium
	Earthworks	Small
	Construction	Medium (Holker Busway bridge)
	Track out	Small
	Compound site	Medium
Lidcombe	Demolition	Medium
	Earthworks	Not applicable
	Construction	Small

Suburb	Activity	Dust emission magnitude
	Track out	Small
	Compound site	Medium

H-3-4 Dust risk assessment

An assessment of the dust risk to receivers in each suburb was undertaken and is presented in Table H.8. The assessment was based on the sensitive receiver classifications listed in Table H.3 and the potential dust magnitude listed in Table H.7.

Table H.8 Overall risk of construction dust impacts to sensitive receivers for unmitigated activities

Suburb	Land use type	Sensitive receiver risk	Risk of unmitigated dust impacts by activity				
			Demolition	Earthworks	Built construction works	Track out	Compounds
Parramatta	Industrial	Low	Low	Negligible	Negligible	Negligible	n/a
	Commercial	Low	Low	Negligible	Negligible	Negligible	n/a
Camellia	Industrial	Low	Low	Negligible	Low	Negligible	Low
	Commercial	Medium	Medium	Low	Medium	Negligible	Medium
Rydalmere	Residential	High	Medium	Low	Medium	Low	Medium
	Recreation/ open space	Low	Low	Negligible	Low	Negligible	Low
	Industrial	Low	Low	Negligible	Low	Negligible	Low
	Commercial	Medium	Medium	Low	Medium	Negligible	Medium
Ermington	Educational	Medium	Medium	Low	Medium	Negligible	Medium
	Residential	High	Medium	Low	Medium	Low	Medium
	Recreation/ open space	Low	Low	Negligible	Low	Negligible	Low
	Commercial	Medium	Medium	Low	Medium	Negligible	Medium
Melrose Park	Educational	Medium	Medium	Low	Low	Negligible	Medium
	Place of Worship	Medium	Medium	Low	Low	Negligible	Medium
	Residential	Medium	Medium	Low	Low	Negligible	Medium
	Recreation/ open space	Low	Low	Negligible	Negligible	Negligible	Low
	Industrial	Low	Low	Negligible	Negligible	Negligible	Low
	Commercial	Medium	Medium	Low	Low	Negligible	Medium
Wentworth Point	Medical	Medium	Medium	Low	Low	Negligible	Medium
	Residential	Medium	Medium	Low	Low	Negligible	Medium
	Recreation/ open space	Low	Low	Negligible	Negligible	Negligible	Low
	Commercial	Low	Low	Negligible	Negligible	Negligible	Low

Suburb	Land use type	Sensitive receiver risk	Risk of unmitigated dust impacts by activity				
			Demolition	Earthworks	Built construction works	Track out	Compounds
Sydney Olympic Park	Recreation/open space	Low	Low	Negligible	Low	Negligible	Low
	Commercial	Medium	Medium	Low	Medium	Negligible	Medium
Lidcombe	Residential	High	Medium	n/a	Low	Low	Medium
	Industrial	Low	Low	n/a	Negligible	Negligible	Low
	Commercial	Low	Low	n/a	Negligible	Negligible	Low

Note 1: n/a – not applicable

H-3-5 Greenhouse gas assumptions

Table H.9 lists the assumptions used to estimate greenhouse gas emissions during construction and operation. The assumptions refer to emissions associated with new construction work and the additional fleet operation and maintenance requirements associated with project infrastructure.

Table H.9 Assumptions used in greenhouse gas assessment by source

Parameter	Assumptions
Construction	
Duration	The construction period, including pre-construction set up has assumed a total of 48 months. The construction hours would be 40 hours a week on Monday to Friday, 16 hours each week for out of hours, and 40 hours for evening and night shifts.
Electricity use	It is assumed the electricity consumption for the project would be the same as Parramatta Light Rail Stage 1. This assumes that consumption would be all grid electricity with no green power or offset. Electricity would be used at construction compounds, mainly for lighting and security.
Diesel combustion – transport purposes	The transport distance of materials is assumed to be 100 kilometres as outlined in the TfNSW Carbon Estimating Report Tool default value. This is conservative and likely to be a worst-case outcome for distance travelled.
Vegetation removal	Carbon lost from removing vegetation was calculated using the Transport Authorities Greenhouse Group Workbook. Vegetation classifications and quantities were taken from the vegetation clearance register. It was assumed that all carbon in the vegetation would be lost, and there would be no beneficial reuse of the vegetation removed. It was assumed that only intact vegetation communities would be removed and any vegetation previously removed during or as a result of the 2019/20 bushfires has not been taken into consideration.
Materials	Inputs are taken from the bill of quantities. The following assumptions have been made to complete the materials quantities estimate: <ul style="list-style-type: none"> concrete: assumed density of 2.4 t/m³ road base: assumed density of 1.4 t/m³ PVC: assumed conduits with 250 mm diameters.
Waste	Waste quantities are assumed to be 5% of the total construction material quantities. The transport distance of waste is assumed to be 50 km as outlined in the TfNSW Carbon Estimating Report Tool default value.

Parameter	Assumptions
Operation	
Duration	The operation period of the project is the design life of 100 years.
Electricity use	Rolling stock energy use of 156,524 kWh per week from Powerelectrics power modelling based on CAF LRVs (Parramatta Light Rail Stage 1).
Maintenance	Assumed 6 maintenance vehicles for the fleet of 13 LRVs.
Mode shift	Assumed the average travel distance of journey displaced to be 7.5 km and the number of car journeys reduced by 25,000 a year from 2031 (same as number of estimated light rail journeys) as per financial business case modelling.

H-4 Cumulative impacts

As described in section 20.5.1 a review was undertaken of facilities that reported emissions during the 2019-2020 National Pollutant Inventory reporting period (see Table H.4) and key developments located within 350 metres of the project site.

Projects that have the potential to result in cumulative impacts if construction occurs at the same time as the project are listed in Table H.9.

Table H.9 Projects and existing facilities with potential for cumulative impacts

Location (suburb)	Projects	Existing facilities
Parramatta CBD	Private hospital and hotel (Hunter Street) Sydney Metro West – Parramatta station and over station development	None identified
Camellia	Developments in the Camellia-Rosehill precinct (to which the Camellia-Rosehill Place Strategy applies) Viva Energy Clyde Western Area Remediation Project Camellia Waste Facility	MAURI anz Camellia Boral Plasterboard Camellia Earth Power
Ermington	None identified	Speedibake Ermington
Melrose Park	Developments in the Melrose Park North and South precincts, including those in the areas subject to the Melrose Park North and the Holdmark Planning Proposals	None identified
Wentworth Point	Sanctuary Wentworth Point Sydney Olympic Park new high school	None identified
Sydney Olympic Park	URBNSURF Sydney Metro West – Sydney Olympic Park station and over/adjacent station development) Mixed use development – Sites 2A and 2B Sydney Olympic Park	None identified
Lidcombe	Developments in the Carter Street precinct (to which the Carter Street Precinct Development Framework applies) ‘Vivacity’ (Uhrig Road)	None identified