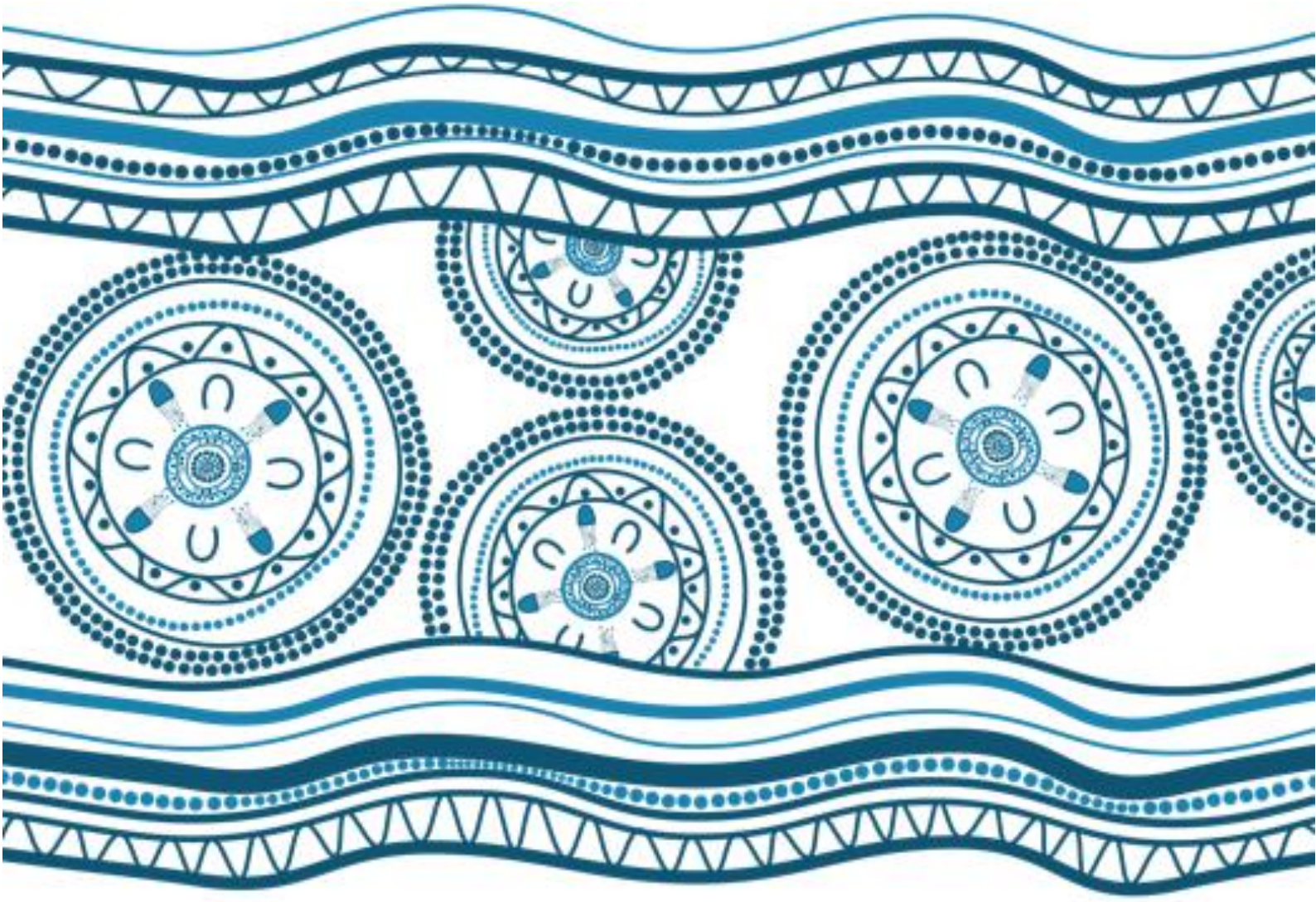
Chapter 20

Air quality



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20 Air quality

This chapter presents an assessment of the impacts of the project on air quality and identifies mitigation and management measures to minimise and reduce these impacts. The assessment presented in this chapter draws on information from Appendix V (Air Quality Assessment Report).

20.1 Assessment methodology

The method for the air quality assessment involved the following:

- Identifying sensitive receivers within a 350 metre radius of the La Perouse and Kurnell project areas
- Identifying a baseline of the existing air quality of the project area using publicly available monitoring data (including Australian Bureau of Meteorology (BoM) station and National Pollution Inventory data)
- Carrying out a qualitative assessment of the construction and operation impacts on air quality using a risk-based approach outlined in the Institute of Air Quality Management guidance.
- Using a source-pathway-receptor model approach to assess odour impacts.

20.1.1 Policy framework

The National Environment Protection (Ambient Air Quality) Measure 2016 (NEPM) (Australian Government, National Environment Protection Council, 2016) sets the standards for air quality to provide adequate protection for human health and wellbeing. In NSW, the Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW (NSW Environment Protection Authority, 2016) (referred to as Approved Methods) provides the criteria for assessing air pollution impacts.

The Approved Methods criteria were used in this assessment. However, more stringent limits identified in the NEPM, which take effect in 2025, were also considered. The following guidelines also informed this assessment where the Approved Methods were not appropriate:

- Guidance on the assessment of the dust from demolition and construction v1.1 (Institute of Air Quality Management, 2014)
- Guidance on the assessment of odour for planning (Institute of Air Quality Management, 2018).

Table 20-1 outlines the criteria used to measure impacts to air quality, while Table 20-2 outlines the criteria used to measure the impacts from odour.

Table 20-1: Approved Methods impact assessment criteria

Pollutant	Standard (µg/m^3) [a]	Averaging period
Particulate Matter (PM) PM_{10}	50	24-hour
	25	Annual
$PM_{2.5}$	25	24-hour
	20	24-hour (2025 onwards)
	8	Annual
	7	Annual (2025 onwards)
Nitrogen dioxide (NO_2)	246	1-hour
	62	Annual
Sulphur dioxide (SO_2)	712	10-minute
	570	1-hour
	228	24-hour
	60	Annual
Total suspended particles (TSP)	90	Annual
Deposited dust	2 g/m^2/month [b]	Annual
	4 g/m^2/month [c]	

[a] Micrograms per cubic metre, [b] Maximum increase in deposited dust, [c] Maximum total deposited dust.

Table 20-2: Approved Methods odour impact assessment criteria

Population of affected community	Impact assessment criterion for complex mixtures of odorous air pollutants (Odour Units[a])
Urban (around or greater than 2,000 people) and/or schools and hospitals	2.0
Around 500 people	3.0
Around 125 people	4.0
Around 30 people	5.0
Around 10 people	6.0
Single rural residence (less than two people)	7.0

[a] Odour Units indicate the concentration of odours, which is the number of times an odour sample needs to be diluted so that it is detected by no more than 50% of the people in a testing panel (or equivalent).

20.2 Existing environment

Air quality in Sydney is generally good, with only occasional exceedances of the health and environmentally based standards (Australian Government, National Environmental Protection Council, 2016). These mainly relate to PM with an aerodynamic diameter of less than 10µm (PM_{10}) and PM with an aerodynamic diameter less than 2.5µm ($PM_{2.5}$).

The closest air quality monitoring station to the project is Randwick Station, about 6.3 kilometres north of the project area at La Perouse. This monitoring station shows:

- There was an annual average exceedance of $PM_{2.5}$ concentrations in 2019, however this is common for locations across Sydney.
- There were no exceedances of annual average NO_2, PM_{10} or SO_2 standards in 2019.
- There were exceedances of the 24-hour standard for PM_{10} and $PM_{2.5}$, which coincide with the elevated PM concentrations across Sydney from the end of October to December from the bushfires in northern NSW.

Air quality for the project area currently meets the relevant air quality standards apart from PM_{10} and $PM_{2.5}$. Exceedances for PM_{10} and $PM_{2.5}$ are due to increasing occurrences of long-running droughts, climate change and significant bushfires**.** Table 20-3 summarises the monitoring data from the Randwick station.

Table 20-3: Existing air quality at Randwick monitoring station, 2019 (items in red show exceedances)

Pollutant	Averaging period	Micrograms per cubic metre	% of the standard	Number of exceedances of the short-term standards in 2019
NO_2	1-hour average	95.9	39%	-
	Annual average	18.3	30%	-
SO_2	1-hour average	75.9	13%	-
	24-hour average	13.1	6%	-
	Annual average	2.6	4%	-
PM_{10}	24-hour average	127.7	255%	19
	Annual average	24.1	96%	-
$PM_{2.5}$	24-hour average	95.2	381%	18
	Annual average	10.8	135%	-

20.2.1 Odour

The odour environment at La Perouse is dominated by the marine environment, and commercial kitchens in nearby restaurants/cafés. It is also influenced by the odours from industrial activity in Port Botany and the prevailing westerly wind conditions. The odour environment at Kurnell is also dominated by the marine environment, commercial kitchens in nearby restaurants/cafés, the Kurnell Desalination Plant and light industrial land uses near the Kurnell project area.

20.2.2 Sensitive receivers

The land uses surrounding the project area are mostly residential, recreational and National Park areas which correspond with the underlying land use zoning (see Figure 20-1 and Figure 20-2). These land uses are sensitive to poor air quality based on the need to protect human and ecological health.

At La Perouse, there are commercial and recreational sensitive receivers next to the construction boundary. Residential dwellings are located 160 metres from the proposed wharf.

The Kurnell project area is next to residential dwellings, recreational and commercial users. However, the closest residential dwelling is about 200 metres from the proposed wharf.

Ecological sensitive receivers would include terrestrial fauna within Kamay Botany Bay National Park at both La Perouse and Kurnell. Further details of ecological sensitive receivers are provided in Chapter 11 (Terrestrial biodiversity).

Figure 20-1: Air quality sensitive receivers at La Perouse

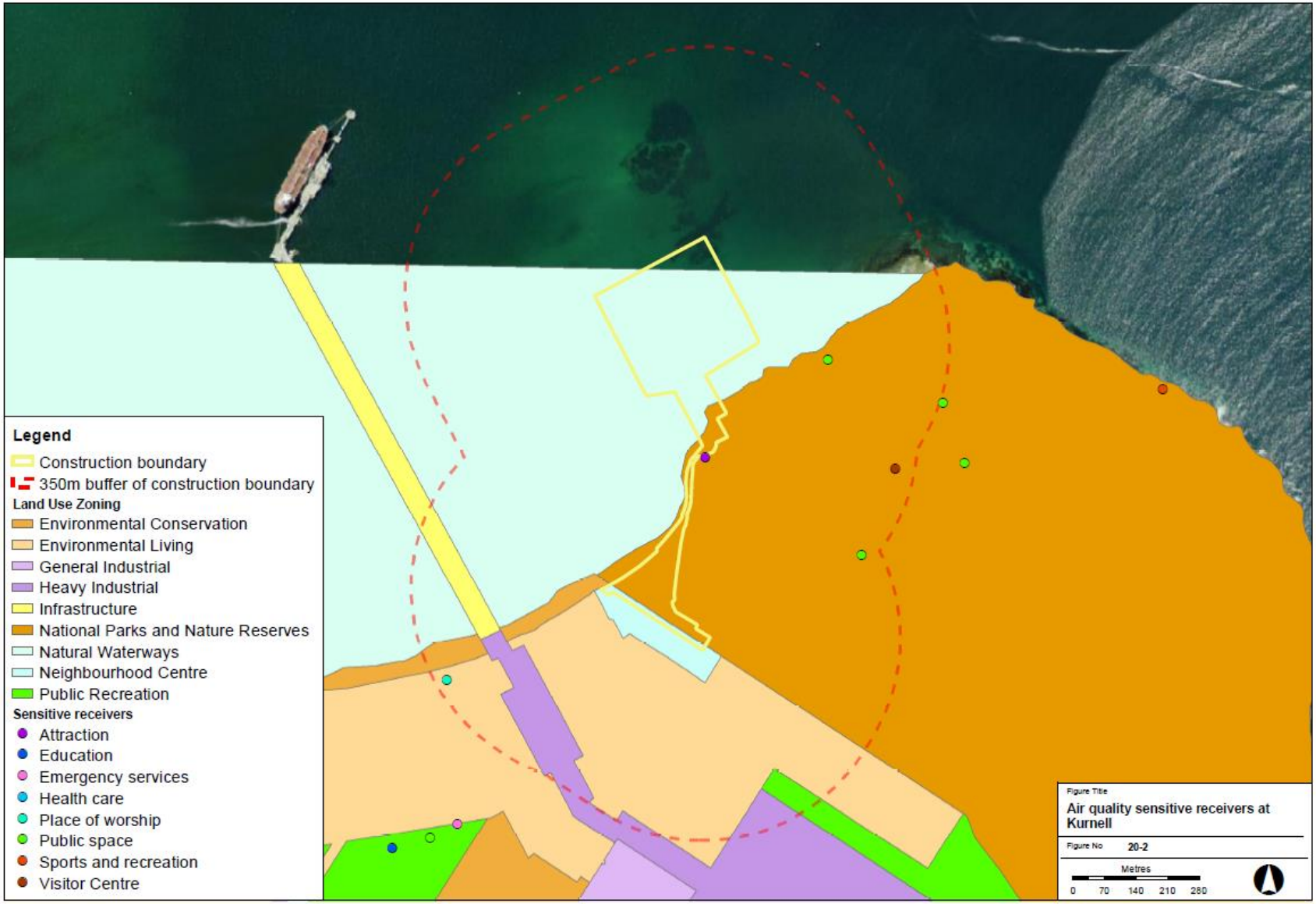

Figure 20-2: Air quality sensitive receivers at Kurnell

20.2.3 Meteorological conditions

Wind speed and direction are the biggest factors affecting air pollutant, dust and odour dispersion, with wind speed determining how far pollutants can travel and how fast they are diluted. The Australian BoM monitoring station at Sydney (Kingsford Smith) Airport is the closest to the project; about seven kilometres northwest of the project area at La Perouse. Throughout the year, the predominant wind direction recorded at this station is north-westerly/westerly with light to moderate wind speeds (less than 5 m/s). This differs slightly between seasons with winds coming from a south and easterly direction during the summer and from the west during the winter. Calm wind speeds (less than 0.5 m/s) and wind speeds greater than 14 m/s account for around one per cent of wind speeds respectively.

The average annual temperature for the airport monitoring station is 22.4 ^{0}C, with a maximum of 26.7 ^{0}C recorded in January and an average minimum of 7.3 ^{0}C recorded in July. Rainfall is also generally highest in June, with an average of 125.3 millimetres of rainfall.

20.2.4 Surrounding emission sources

There are 11 industrial facilities or significant air emission sources within two kilometres of the project that contribute to the local air quality. These sources are primarily made up of organic chemical manufacturers or liquid chemical storage facilities which have emissions to air, including NO_x, PM_{10}, $PM_{2.5}$ and SO_2.

20.3 Assessment of potential impacts

Potential impacts to air quality sensitive receivers (both human health and ecological health) from construction and operation of the project include dust emissions, odour and exhaust (fuel combustion) emissions.

20.3.1 Assessment of construction impacts

The impacts to air quality are predicted to be greatest during construction. These impacts are summarised below.

Dust impacts

Dust has the potential to carry PM_{10} and $PM_{2.5}$ which is small enough to enter the respiratory system and penetrate the lungs. This can lead to respiratory illness or affect people with existing conditions. As outlined in Chapter 5 (Project description), the construction phase of the project includes three steps:

- Step 1: Site establishment
- Step 2: Main construction
- Step 3: Site demobilisation.

Steps 1 and 2 include demolition, land disturbance and construction activities which are most likely to cause dust impacts. Transport generated dust could occur across all construction phases. Section 3.3.1 of Appendix V (Air Quality Assessment Report) details how emission magnitudes and risk ratings were determined under the Institute of Air Quality Management guidance (2014). Table 20-4 outlines the dust emission magnitude for construction activities.

Table 20-4: Dust emission magnitude for construction activities

Dust generating activity	Construction step	Description	Dust emission magnitude
La Perouse			
Site establishment (Trackout)	Step 1	Temporary access would be constructed between Anzac Parade and the proposed wharf location. This would be constructed of crushed concrete on top of geotextile material.	Small
Demolition of pavement (Demolition)	Step 2	Break-up of hard stand would be required for the reconfiguration of car parking and the utilities installation.	Small
Land disturbance (Earthworks)	Step 2, and Step 3	Land disturbance of approximately 4,390m^3 would be required for installing utilities, landscaping around the wharf tie-in and car parking reconfiguration.	Small
Piling (Construction)	Step 2	Land-based piling would be required at the wharf tie-in.	Medium
Transport generated dust (Trackout)	Across all steps	On average, around 12 vehicles would arrive and leave the site every day during construction. Driving across the temporary access road between Anzac Parade and the wharf tie-in area would generate dust as well as driving along the main haulage routes along Anzac Parade.	Small
Kurnell			
Site establishment (Trackout)	Step 1	A temporary access road would be constructed from Cape Solander Drive, and along Monument Track to the proposed wharf location. This would be constructed of crushed concrete on top of geotextile material.	Small
Demolition of the existing viewing platform (Demolition)	Step 1	Demolition of the existing Kurnell viewing platform would generate less than 20,000m^3 of material.	Small
Demolition of pavement (Demolition)	Step 2	Demolition of hard standing would be required for the utilities trench.	Small
Land disturbance (Earthworks)	Step 2	Land disturbance of approximately 2,723m^3 would be required for installing utilities and landscaping around the wharf tie-in.	Small
Constructing and removing the temporary platform (Construction)	Step 1 and Step 3	A temporary causeway would be constructed during Step 1 and removed during Step 3.	Medium
Piling (Construction)	Step 2	Land-based piling would be required at the wharf tie-in.	Medium
Transport generated dust (Trackout)	Across all steps	An average of around 20 vehicles would arrive and leave the construction site every day. Driving across the temporary access road along Monument Track would generate dust as well as driving along the main haulage routes Captain Cook Drive.	Medium

Commercial premises (in the Neighbourhood Centre Zone) and recreational areas are determined to be of medium sensitivity to dust emissions, with residential receivers determined to be highly sensitive (refer to Appendix V (Air Quality Assessment Report) for more details on these ratings). The closest commercial property at La Perouse (the Boatshed) is directly adjacent to the utilities required along Anzac Parade, and about 60 metres from the proposed wharf which is where the

main dust generating activities would occur. The closest residential dwelling is about 160 metres from the proposed wharf. There are also about ten residences within 50 metres of the haulage routes at La Perouse which may be impacted by transport generated dust.

There are also several commercial and residential properties within 20 metres of the construction activities and haulage routes at the Kurnell site due to the location of the proposed utilities near Captain Cook Drive. This therefore makes the sensitivity of the Kurnell site slightly higher than the La Perouse site. Table 20-5 summarises the overall risk rating for dust impacts for the project. Refer to section 3.3.1 and 5.1 of Appendix V (Air Quality Assessment Report) for more detail on how ratings were determined.

Table 20-5: Summary of dust risk

Dust generating source	Dust emission magnitude	Sensitivity of the area		Overall dust risk rating
		Dust deposition	Human health impacts	
La Perouse				
Demolition	Small	Low	Medium	Low
Earthworks	Small			Low
Construction	Medium			Medium
Transport generated dust (Trackout)	Small			Negligible
Kurnell				
Demolition	Small	High	High	Medium
Earthworks	Small			Low
Construction	Medium			Medium
Transport generated dust (Trackout)	Medium			Medium

Odour

There would be some disturbance of the ocean floor and marine sediments during piling. This may become odorous once it is brought to the surface. The scale of this impact would depend on the content and composition of the disturbed material, the rate of removal, loading times, and the prevailing wind direction and strength. Odour would also be generated through fuel combustion in equipment, machinery and barges.

While the disturbance of marine sediments could be considered offensive, the volume of material generated by the project would be small. The odours associated with construction equipment, machinery and barges would also be no different to other fuel combustion sources in the area (see section 20.2.1 above). The prevailing wind direction means that receivers at La Perouse would generally be downwind of the construction works under typical weather conditions. Receivers to the south of the construction boundary at Kurnell would be 300 metres upwind during typical wind conditions.

The sensitivity of the nearby receivers surrounding the project would be considered medium due to the number of commercial and recreational receivers, and high due to the residential receivers. The main construction activities at La Perouse and Kurnell likely to generate odour are at the wharf area. Commercial receivers at La Perouse (eg The Boatshed and La Perouse Museum) are about 60 metres from the likely odorous activities. The nearest residential receivers are about 160 metres away from the potentially odorous activities which is a significant distance for odour to travel.

At Kurnell, the nearest commercial receivers (the Kurnell Visitor Centre) are about 200 metres away from the proposed wharf. The closest residential receivers to the potentially odorous activities are about 300 metres away which is a significant distance for odour to travel.

Given the small source of odour potential and distance of sensitive receivers from the proposed works, the overall risk of odour exposure is predicted to be negligible.

Equipment, machinery and vehicles

The machinery and equipment identified in Chapter 5 (Project description) are typical for the construction of new infrastructure close to, and within, the marine environment. It is also common to use marine-grade diesel for marine vessels. Exhaust emissions from equipment and vehicles (road and maritime) can be effectively minimised through standard management measures. As the existing environment conditions meet the relevant standards for most pollutants, it is not expected that the air quality impacts from equipment, machinery, marine vessels, and land-based vehicles would be significant if mitigation measures are applied.

20.3.2 Assessment of operation impacts

Impacts to air quality during operation of the project would arise from ferry vessel emissions, other commercial/recreational vessel emissions and road vehicle emissions from traffic travelling to and from the site to use the wharves.

Vessel emissions

The wharves would be used to operate a ferry service and allow for commercial and recreational vessels to berth. It would not be used for shipping purposes. While the ferry operating model has not been confirmed at the time of this assessment, the ferries are expected to be diesel powered as per the rest of Sydney's ferry fleet. An average of about 36 ferry vessel trips per day is expected.

Ferries are expected to berth and idle at the wharves for 15-minute intervals. The ferries are also expected to only use the wharves during the day. The public berthing area of the wharves are predicted to generate an average of two commercial and two recreational vessels per day.

Based on the frequency of trips per day, the impact from vessel emissions are anticipated to be small compared to other transport modes that currently operate within Botany Bay (such as large ships and aircraft). The operation of the wharves is not expected to have a direct or measurable impact on local air quality. Idling at the berth would generate the most emissions. The wharf is designed for vessels to berth at the end of the wharves. This means that the vessel engines would be at least 300 metres from the nearest receivers where long-term exposure may occur. Emission concentrations drop off rapidly from the source; therefore, those generated by the vessels are unlikely to impact onshore sensitive receivers. There may be some impact for members of the public embarking and disembarking on the wharf itself, although these patrons are transient receivers.

Vehicle emissions

The operation of the wharves could attract an increase in vehicle trips to La Perouse and Kurnell. The traffic and transport assessment (Chapter 12 (Traffic and transport)), predicts about 149,600 passengers would use the ferry annually from 2036. These passengers are expected to arrive by a mix of private vehicle and public/active transport modes. Passengers travelling by private vehicles would create a slight increase in road traffic. However, additional vehicle movements are predicted to be small and there would not be any changes the current layout of the roads at La Perouse and Kurnell. In comparison to the existing vehicle emissions, this small increase in vehicle numbers due to the project would not cause noticeable air quality impacts. In addition, some visitors who previously drove between La Perouse and Kurnell, may choose to take the ferry service, therefore reducing vehicle emissions from private vehicle transport between the two sites.

20.4 Environmental management measures

Due to the limited impacts on air quality, no specific monitoring of air quality is required. Specific dust and odour management plans are also not required as these measures will be incorporated into the Construction Environment Management Plan (CEMP). Table 20-6 outlines the environmental management measurers that would be used to manage the potential air quality and odour impacts.

Table 20-6: Environmental management measures for air quality and odour

Impact	ID	Environmental management measure	Responsibility	Timing
Risks to air quality during construction	A1	Air quality management measures will be incorporated into the CEMP. This will include: a. Dust mitigation and suppression measures such as spraying or covering exposed surfaces, providing vehicle clean down areas, covering of loads, street cleaning, use of dust screens, maintenance of plant in accordance with manufacturer's instructions b. Methods to manage works during strong winds or other adverse weather conditions c. A progressive rehabilitation strategy for exposed surfaces.	Contractor	Pre-construction and construction