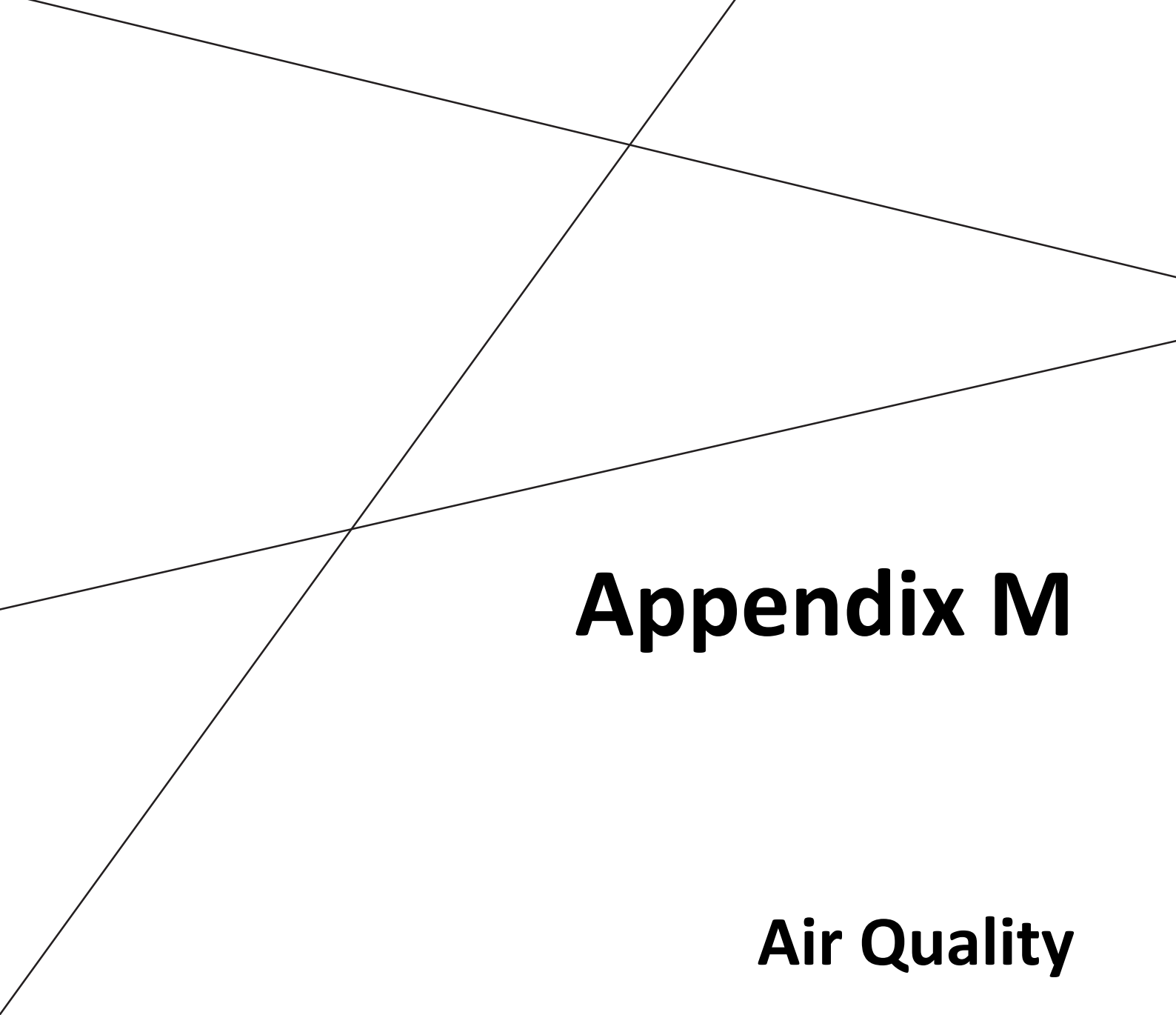


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Appendix M

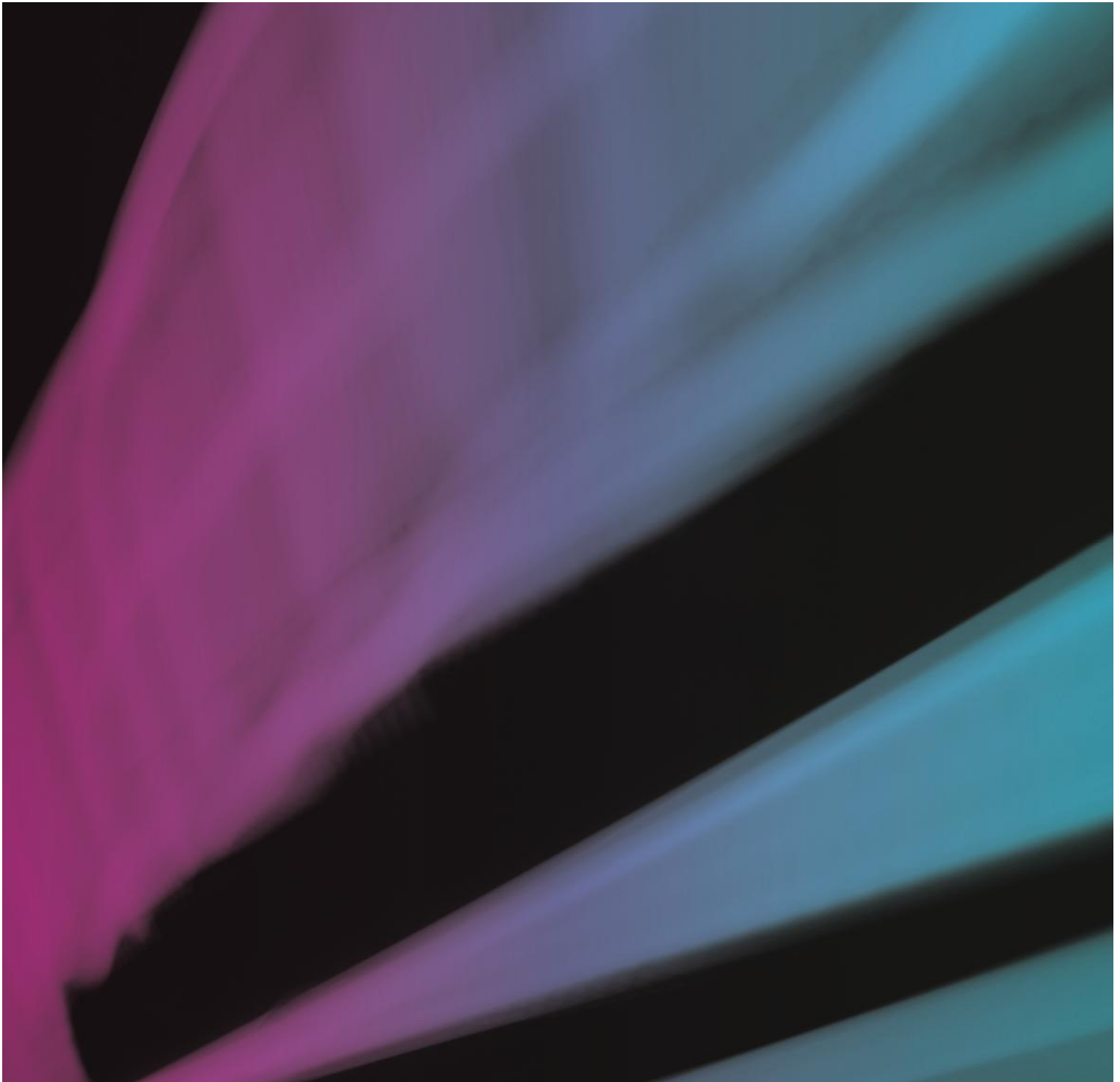
Air Quality

Technical Working Paper

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Western Sydney Stadium

Technical Working Paper: Air Quality



Western Sydney Stadium

Technical Working Paper: Air Quality

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Document Western Sydney Stadium

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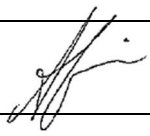
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Executive Summary

Introduction

A qualitative constraint analysis and impact assessment of the potential air quality impacts arising from Stage 1 of the Western Sydney Stadium Project (the Proposal) was undertaken. The purpose of the assessment was to identify potential impacts on surrounding sensitive receptors due to dust emissions from the demolition works and to identify local factors that may influence the movement or dispersion of pollutants emitted during the demolition of the stadium under the Concept Proposal.

Assessment methodology

A qualitative study was undertaken into the potential for the demolition works to result in adverse air quality impacts on surrounding receptors. This was assessed through the use of the methodology described in the UK Institute of Air Quality Management (IAQM) document, *Guidance on the assessment of dust from demolition and construction* (IAQM 2014).

A qualitative study was also undertaken for the Concept Proposal, by identifying local factors such as meteorology, existing levels of pollution, and topography that may influence dispersion of pollutants during operation of the stadium.

Existing Environment

Meteorology in the area was defined according to data sources from the nearby Parramatta North Bureau of Meteorology Station. Daytime winds during the summer months when demolition works are proposed to be undertaken are favourable in terms of minimising dust impacts on nearby sensitive receptors.

Existing dust concentrations in the area were defined by recent particulate (PM₁₀) measurements made at the NSW OEH Prospect and Chullora monitoring stations. Overall PM₁₀ concentrations in the area are high with average concentrations consistently above the NSW annual average criterion for PM₁₀.

Summary of the impact assessment

A pre-mitigation dust impact risk rating of “high” was determined for dust soiling and medium for human health impacts due to potential dust emissions from the demolition works. This rating was based on the potential dust emission magnitude from the works, sensitivity of nearby receptors, proximity of receptors, and the sensitivity of the area as a whole to both dust soiling and human health impacts. A number of measures were identified to control these risks and mitigate potential adverse impacts.

Management/mitigation measures to avoid/minimise/manage impact

The main potential impact is related to the proposed on-site concrete crushing activities. To ensure that dust emissions are maintained at an acceptable level the following mitigation measures are recommended:

- Locating the crushing activities on the western or northern side of the Site, as far from the Parramatta Swimming Centre and other sensitive receptors (such as schools) as practicable;
- Implementing water sprays to suppress dust emission from the crusher, as necessary;
- Ceasing or limiting crushing activities during times of adverse winds.

A range of in-principle and site-specific mitigation measures were identified in the IAQM guidance document. The implementation of these measures during Stage 1 is considered sufficient to reduce the potential for offsite dust impacts to an acceptable level.

Conclusions

Residual impacts once appropriate dust mitigation measures are implemented were considered to be “not significant”.

1.0 Introduction

1.1 Background

In September 2015, the NSW Government announced a package of works to renew the Sydney Stadium network over the next decade, with the Project forming a key part of this package. Infrastructure NSW (INSW), on behalf of Venues NSW, is therefore seeking approval for the development of a 30,000 seat stadium (Western Sydney Stadium) on the site of the existing stadium (Parramatta Stadium) in Parramatta (the Site). Assessment and approval for the Project will be undertaken in two stages under Section 83B of the *Environmental Planning and Assessment Act 1979* (EP&A Act):

1. initial application for the Concept Proposal and demolition works to accommodate the Western Sydney Stadium (Stage 1); and,
2. a second separate application for the detailed design and subsequent construction and operation of the Western Sydney Stadium (Stage 2).

This EIS supports the development application for the Proposal (i.e. Stage 1) only. Specifically, the Proposal includes:

- Concept Proposal for the Western Sydney Stadium, including parking and access facilities, ancillary infrastructure and landscaping; and,
- Staged demolition and removal of the existing stadium and associated infrastructure, including the existing stadium and the associated hardstand areas where required (footpaths, roads, car parks etc.), and the Parramatta Swimming Centre.

Works associated with the removal of below ground infrastructure, excavation works, and construction of the Western Sydney Stadium will be assessed under Stage 2 of the Project once a detailed design has been prepared.

1.2 Purpose of this technical working paper

There was no specific requirement for an air quality impact assessment according to the Secretary's Environmental Assessment Requirements (SEARs) for the Proposal. However, due to the magnitude of demolition works required, there is the potential for offsite air quality impacts from unmitigated dust emissions. This technical working paper comprises a qualitative air quality impact assessment for the Proposal to help ensure that offsite impacts resulting from dust emissions are minimised.

1.3 Scope of work

The air quality assessment was undertaken according to the following scope of works.

A qualitative constraints analysis of the operation of the Concept Proposal was undertaken from an air quality perspective to identify:

- aspects of the Concept Proposal operation that may contribute air pollutants to the environment, and
- local factors that may influence the movement or dispersion of air pollutants emitted during the operation of the proposed stadium. Factors that were examined were:
 - Meteorology in the region surrounding the stadium
 - Existing levels of pollution in the area
 - Topography or any other built environment that may influence air flows in an around the stadium.

A qualitative assessment was undertaken into the potential for the demolition works to result in adverse air quality impacts on surrounding receptors. This was assessed through the use of the methodology described in the UK Institute of Air Quality Management (IAQM) document, *Guidance on the assessment of dust from demolition and construction* (IAQM 2014). The basis for this document is a staged analysis of the proposed demolition activities and the assessment of whether the demolition activities may result in dust soiling and human health impacts. The assessment uses a multi-step approach described in **Section 4.0**.

1.4 Report Structure

This report was structured as follows:

- Section 1: Introduction
- Section 2: Project description
- Section 3: Description of existing environment; identification of sensitive receptors and description of existing air quality
- Section 4: Description of assessment methodology
- Section 5: Air quality impact assessment
- Section 6: Mitigation measures
- Section 7: Conclusion

2.0 Project Description

2.1 Site Location

The Site is located at 11-13 O'Connell Street Parramatta, approximately 25 kilometres west of Sydney Central Business District (CBD) (refer to **Figure 1**). The Site is situated within the broader context of Parramatta Park, approximately one kilometre north west of Parramatta Station and the Parramatta central business district (CBD). The Site is shown in detail in **Figure 1**, and comprises the existing stadium and stadium complex, surface car parking facilities (to the north and west of the stadium), Parramatta Swimming Centre to the east of the stadium (located on Crown Land), and a training field to the south of the stadium. The Site is legally described as Lots 951, 952, 953, 954, 955, 956, 957, 958, 959, 961, 962, 963 in Deposited Plan (DP) 42643 and Crown Land Lot 80-3000 (part).

The demolition works area comprises the parts of the Site where the demolition works and supporting activities will take place. This area excludes two predominantly vegetated areas to the north and west, and part of the training field to the south. No activities or impacts are proposed in these excluded areas.

A key feature of the local area is Parramatta River, which is located to the west and south of the Site and eventually flows into Sydney Harbour approximately 20 kilometres south east of the Site. Parramatta Park extends across Parramatta River to the west of the Site and includes the world heritage listed Old Government House, approximately 200 metres south west of the Site boundary.

Other land uses surrounding the Site include the Parramatta Park Trust car park to the south east on Parramatta Park land, the old Kings Oval to the south west and the Parramatta Leagues Club and associated surface car park immediately adjacent to the north.

Land use to the east of the Site across O'Connell Street is predominantly comprised of low density residential development, as well as mixed use and public recreation. Notable uses include schools and places of worship (our Lady of Mercy College and St Patricks Cathedral), and the Old Kings School site.



Figure 1 Western Sydney Stadium Site overview

2.2 The Proposal

The Proposal comprises Stage 1 of development for the Project. Specifically, the Proposal includes:

- Concept Proposal for the Western Sydney Stadium, including parking and access facilities, ancillary infrastructure and landscaping; and,
- Staged demolition and removal of the existing stadium and associated infrastructure, including the existing stadium and the associated hardstand areas where required (footpaths, roads, car parks etc.), and the Parramatta Swimming Centre.

Works associated with the removal of below ground infrastructure, excavation works, and construction of the Western Sydney Stadium will be assessed under Stage 2, once a detailed design has been finalised.

2.2.1 Western Sydney Stadium Concept Proposal

The Western Sydney Stadium Concept Proposal is shown in **Figure 2**. The Concept Proposal provides for:

- a maximum total Gross Floor Area (GFA) of approximately 60,000 m² (excluding the playing pitch) for the stadium development, including:
- a maximum total GFA of approximately 20,000 m² for ancillary uses within the northern corner of the Site;
- transport access and parking facilities;
- public domain elements; and
- landscaping elements throughout the Site.

Stadium features

The Proposal would provide the following facilities:

- additional seating for approximately 10,000 more spectators in a seating bowl with 30,000 seats, including 27,000 general admission seats and 3,000 corporate seats;
- playing pitch;
- five levels of premium box/terrace, function/lounge offerings and a number of suite offerings;
- flood lighting, stadium video screens and other ancillary fittings; and
- additional facilities for team, media, administration and amenity.

Facilities for premium offerings, players, media and broadcasting, administration and deliveries/waste would be located on the western side of the stadium to maximise integration of servicing logistics and internal infrastructure.



Figure 2 Western Sydney Stadium Concept Proposal (CHROFI, 2016)

Future development area

The future development area is located along the northern edge of the site with a prominent presence to O'Connell Street, and is earmarked for a building(s) to contain ancillary and complementary uses to the sporting venue/precinct. It is anticipated this building could provide opportunities for Venues NSW through a range of possible uses such as community uses, function or entertainment uses, and/or other permissible uses.

Parking and access

The Concept Proposal would provide limited parking of approximately 500 car parking bays to the north and west of the stadium. The car park would be restricted to corporate and VIP use on game days.

Hours of Operation

The hours of operation would be consistent with the existing NRL and A-League game times (generally between 2 pm and 10 pm). However, recognising that the new stadium may attract additional games, music and other entertainment events, the hours of operation may alter in order to respond to the types of events held. An appropriate event noise management plan would be developed for changes to the frequency, type and duration of events.

Event Schedule

Once operational (projected early 2019), the Western Sydney Stadium would primarily be used for major sporting events, concerts and fairs.

The stadium is expected to operate as a competition site for teams such as the Parramatta Eels (NRL), the Western Sydney Wanderers (A-League soccer) and other NRL franchises under the NSW Stadia Strategy objectives for the consolidation of venues. The number of event days are therefore projected to increase substantially under the Project (refer to **Table 1**). An increase in patron attendance to the events is also projected, based on ten year historical growth periods of each sport.

Table 1 provides an indication of future events, however, the exact schedule of future events to be held at Western Sydney Stadium would be developed by Venues NSW in consultation with relevant event organisers and sporting associations.

Table 1 Event calendar and attendees

	Existing events	Projected number of events under the Project
Event Calendar		
Parramatta Eels	9	10
NRL Team 2	0	10
NRL Team 3	0	10
WS Wanderers	13-14	11-12
Other (e.g. Final Series, Concerts)	0	1
Total events	22-23	43-44
Attendances		
Parramatta Eels	13,300, no growth	10% uplift, no growth
NRL Team 2	15,900, no growth	10% uplift, no growth
NRL Team 3	11,800, no growth	10% uplift, no growth
WS Wanderers	13,500, 0.7% growth	10% uplift, 0.7%growth
Other (e.g. Final Series, Concerts)	N/A – no events	30,000

2.2.2 Demolition of Parramatta Stadium and Parramatta Swimming Centre

Demolition methodology

Demolition would involve the removal of all the existing stands, buildings, surrounds and infrastructure within the boundary of the demolition works area of the Site. A project office compound would be established within the Site to enable appropriate management of demolition activities and deliveries.

The demolition works would be carried out by specialist subcontractors and would involve the following activities:

- site establishment to enable the commencement of demolition activities including the erection of perimeter barrier fencing for site security;
- decommissioning and demolition of the existing stadium, demolition of Parramatta Swimming Centre, related structures and hard and soft landscaping treatments, including all hard stand areas and access paths;
- waste management activities including the removal of classified waste; and
- 'make safe' activities including returning all areas to ground level.

These activities would be staged, with the stadium complex being removed first in late 2016 to early 2017, followed by the Parramatta Swimming Centre. All demolition works would be completed by mid 2017.

The proposed staging of demolition works would facilitate the continued operation of the Parramatta Swimming Centre for as long as practical to allow summer events to be completed prior to the demolition. Timing for closure of the pool prior to demolition would be determined by City of Parramatta Council. As such, the demolition works would commence on the western stand and progress to the eastern stand area.

Plant and Equipment

Plant and equipment to be used for demolition works would be determined by the demolition contractor. However, the demolition works are anticipated to include the following plant/equipment:

- 250-400 tonne crane and boom lifts;
- 30 tonne long reach excavators;
- 40 tonne excavators;
- bob-cats;
- jackhammers;
- water tanks;
- re-fuelling tanks;
- loading trucks; and
- other small scale / manual equipment .

Site access and traffic management

The existing Victoria Road and O'Connell Street intersection would function as the main access gate for the duration of the demolition works, allowing for the safe use of the existing road and traffic light controls without effecting movement of pedestrians, cyclists or road users. A manned vehicle access gate would be established at this main access point to prevent unauthorised access. Traffic movements would be associated with the majority of demolition activities, including dismantling of the stadium light towers, demolishing and removing large structures from the stands by mobile cranes and excavators would be wholly contained within the fenced area.

Material would be transported offsite along the following truck routes:

- east along Victoria St before heading north/south/onward to the waste depot; and/or
- south along O'Connell St before heading west/south/onward to the waste depot.

Use of the above routes would avoid the need for heavy vehicles to travel north along O'Connell Street.

Hours and Duration

Standard construction working hours would apply for the duration of the demolition works. The hours for demolition would therefore be confined to:

- 7:00 am to 6:00 pm Monday to Friday
- 8:00 am to 1:00 pm on Saturdays
- No work on Sundays or public holidays.

Whilst not anticipated, some night work may be required and would be considered where it may reduce impacts to the public and local community. Work outside standard hours may also occur to complete tasks safely or more efficiently.

If work is required outside standard construction hours, it would be carried out according to the Interim Construction Noise Guideline (DECC 2009). This would include notifying the local community in advance of any work planned to be carried out outside of standard hours.

Workforce

The contractor for the demolition works would determine the size of the workforce, however it is estimated that a maximum of 45 construction and site management personnel would be on site at any one time.

Program and Schedule

Demolition works will commence from late 2016 to early 2017 and take around four to six months. Particular focus would be placed on minimising impact to the operation of the Parramatta Swimming Centre over the 2016-2017 summer months. However, this would be confirmed with City of Parramatta Council. The demolition works for the existing stadium, swimming centre and ancillary infrastructure are planned to be completed by mid 2017.

Exclusion areas

Exclusion areas have been identified within the Site. This includes vegetated areas to the northwest and west, and part of the training field to the south.

The two vegetated areas west of the existing stadium are owned by Venues NSW. It is intended that in the future this land would be dedicated to Parramatta Park Trust. The exclusion of this land does not form part of Stage 1 of the Project.

The training field is on land with known contamination issues. As a result the Project would minimise disturbance to the area as far as practical. However, part of the training field has been incorporated into the Concept Proposal as it would be required for site access and circulation. The remainder would be fenced off and excluded from the Project.

No activities or impacts are proposed in the exclusion areas.

3.0 Existing Environment

3.1 Sensitive Receptors

Land use in the area immediately surrounding the Site is a mix of residential, commercial, parkland, and schools.

Sensitive receptors surrounding the Site were identified according to the Parramatta Local Environment Plan land zoning¹; residential (low to medium density), commercial, and mixed-use. Receptor zones were identified up to 500 m from the O'Connell Street Site entrance alongside the two proposed demolition waste haul routes: south along O'Connell Street and east along Victoria Road.

The Parramatta Leagues Club is located on O'Connell Street just north of the existing stadium.

The Our Lady of Mercy College Parramatta and the Kiddie Garden Day Care and Pre-School are located on O'Connell Street opposite the Site. Both are located further than 20 m from the Site boundary.

The Parramatta Swimming Centre is located within the Site and is planned to remain open during the demolition of the existing stadium. It was therefore included as a sensitive receptor for this assessment.

Parramatta Park is located to the west of the Site. It was identified that people using the park and its facilities are primarily transient visitors and will typically be there for several hours at most. Based on this, Parramatta Park was not considered as a sensitive receptor for the purposes of this assessment.

The Old Kings School and St Patricks Cathedral are located to the east of the Site across O'Connell Street. The Old Kings School site may be used temporarily to relocate students from Arthur Phillip High School and Parramatta Public school for a multi-storey school redevelopment on Macquarie Street (students may potentially be relocated during early 2017).

The locations of identified sensitive receptors are presented in **Figure 3**.



Figure 3 Location of sensitive receptors

¹

http://www.parracity.nsw.gov.au/build/forms_and_planning_controls/planning_controls/environmental_planning_instruments/lep_interactive_map# accessed on 3 June 2016

3.2 Air Quality

3.2.1 Pollutants of Potential Concern

The pollutants of potential concern for the Proposal are considered to be related to particulate emissions, specifically particulates with an aerodynamic diameter of less than 10 microns, referred to as PM₁₀, and total suspended particulates, referred to as TSP. Particles less than 2.5 microns (PM_{2.5}) are typically associated with combustion processes, and are only produced in very small amounts by mechanical disturbance of materials, i.e. demolition. PM_{2.5} was therefore not considered in this assessment.

3.2.2 Air Quality Criteria

In New South Wales, the criteria are specified by the Environment Protection Authority (EPA) (DEC, 2005) in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*, and represent maximum allowable pollution levels within an air shed; these assessment criteria are provide in **Table 2**.

Table 2 EPA Impact Assessment Criteria for Pollutants of Potential Concern

Pollutant	Averaging Period	Concentration (µg/m ³)
Particles as PM ₁₀	24 hours	50
	Annual	30
Total suspended particulates (TSP)	Annual	90

3.2.3 Particulate Matter as PM₁₀

For this study, no specific measurements or predictions of ground level concentrations were undertaken. To provide a semi-qualitative assessment of the existing background concentration of pollutants of concern in the assessment area, existing ambient air data were reviewed as described below.

The NSW Office of Environment and Heritage (OEH) operates an air quality monitoring network across the state. The nearest monitoring stations to the Site are Prospect (approximately 8 km to the west) and Chullora (approximately 10 km to the southeast). The Prospect site is located in a predominately residential area. The Chullora site is located in the centre of the Sydney basin in a mixed residential and commercial area.

A summary of PM₁₀ monitoring data for the period 2013 to 2015 at Prospect and Chullora are presented in **Table 3**. The stations do not report TSP. In general, concentrations measured at Prospect are higher than those measured at Chullora. Two of the three years exceeded the 24 hour average criterion, while all sites met the annual average criterion. The data shows that the region surrounding the Site has elevated short term particulate impacts, confirming its status as a pollutant of concern.

Table 3 Summary of air quality monitoring data 2013 to 2015 at Chullora and Prospect

Averaging Period	Assessment Criteria	Year	PM ₁₀ Concentrations (µg/m ³)	
			Prospect	Chullora
Maximum 24 Hour Average	50	2013	81.8	69.4
		2014	44.3	40.0
		2015	68.7	64.6
Annual Average	30	2013	19.2	18.3
		2014	17.6	18.1
		2015	17.6	17.5

3.3 Meteorology

Wind roses show the frequency of occurrence of winds by direction and strength. Each wind rose arm represents a wind blowing from the direction it is projected, i.e. an arm pointing up represents northerly winds.. The length of the bar represents the frequency of occurrence of winds from that direction, and the widths of the bar sections correspond to wind speed categories, the narrowest representing the lightest winds.

The Bureau of Meteorology (BoM) meteorological station at Parramatta North (Masons Drive) is located approximately 2.5 km north-east of the Project. Long term wind roses from the Parramatta North station are presented in **Figure 4**.

The following is a summary of winds observed at Parramatta North:

- Night-time and early morning winds are best represented by the 9 am wind roses. Daytime and afternoon winds are best represented by the 3 pm wind roses.
- Summer (January) morning winds are typically light with no dominant direction. Winds are calm for 8 % of the time.
- Summer afternoons are dominated by strong north-east to south-east winds with very few (1 %) calm conditions. These conditions would be most favourable for receptors to the east of the Site, in particular the Parramatta Swimming Centre.
- Winter (July) morning winds are typically light with strong north-west and westerly components. Winds are calm for 7 % of the time. These conditions would not be favourable for receptors to the east of the Project site.
- Winter afternoons are dominated by stronger north-west to south-west winds with 7 % calm conditions. These conditions would not be favourable for receptors to the east of the Site.

3.4 Topography and Built Environment

The Site is located on a bend of the Parramatta River. The surrounding area is relatively flat with elevations between about 8 m and 25 m. The parkland surrounding the Site on the western side presents little obstacle to winds blowing from that direction.

Buildings on the north side of Parramatta River around the Site are generally low-rise; between one and three floors. The built environment in this area will only cause very minor wind canyon effects.

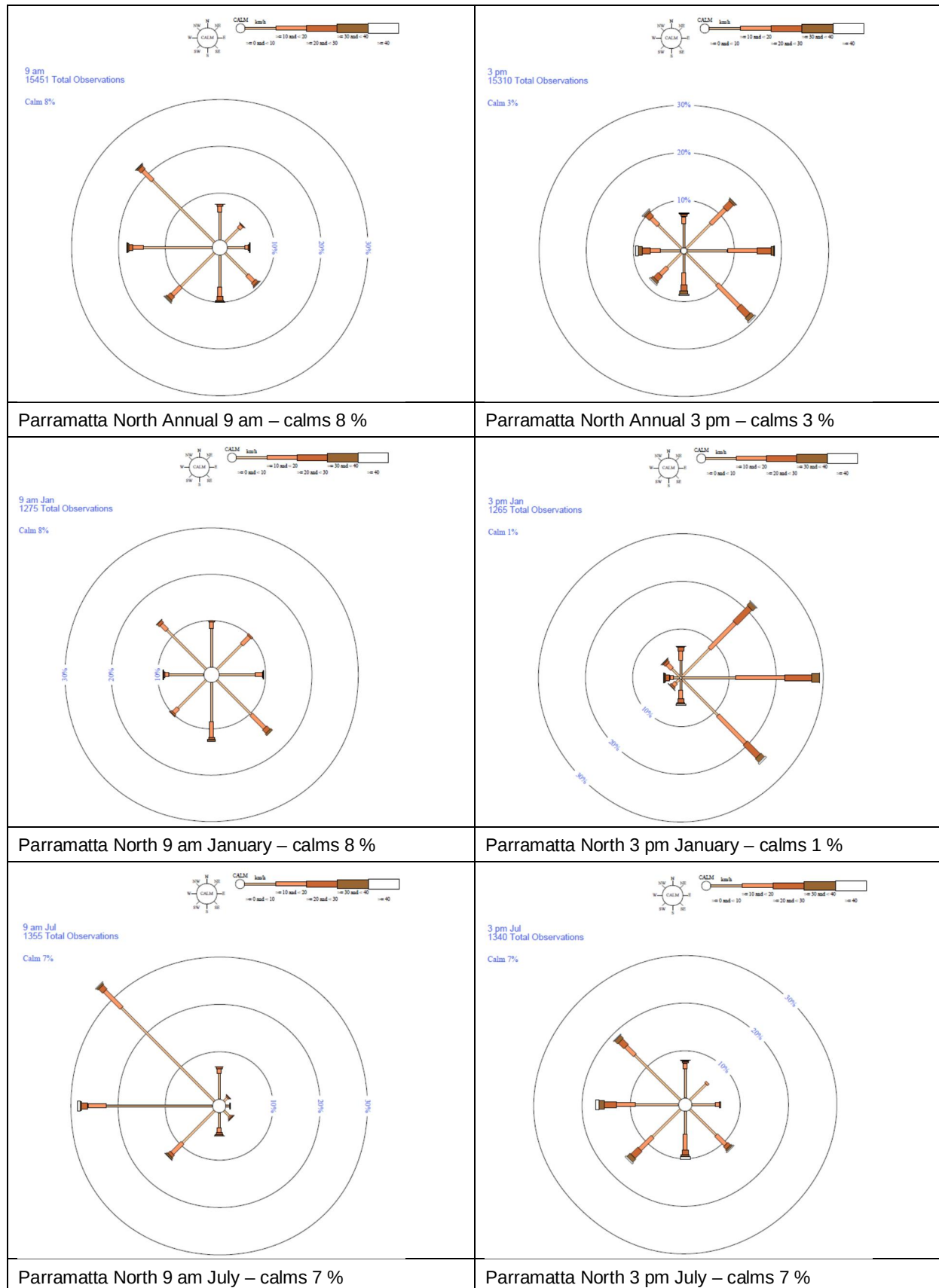


Figure 4 Long Term Wind Roses from Parramatta North (Masons Drive) – 1967 to 2010

4.0 Assessment Methodology

The assessment of potential air quality impacts due to Stage 1 demolition works was based on the methodology described in the UK Institute of Air Quality Management (IAQM) document, *Guidance on the assessment of dust from demolition and construction* (IAQM 2014). The risk of dust soiling² and human health impacts due to particulate matter (PM₁₀) on surrounding areas were determined based on the scale of activities and proximity to sensitive receptors. Ecological effects are also discussed in the IAQM guidance, however, these were not considered as part of this assessment. The IAQM method uses a four-step process to assess dust impacts:

- Step 1: Screening based on distance to nearest sensitive receptors
- Step 2: Assess risk of dust impacts from activities based on:
 - Scale and nature of the works, which determines the potential dust emission magnitude
 - Sensitivity of the area
- Step 3: Determine site-specific mitigation for dust-emitting activities
- Step 4: Reassess risk of dust impacts after mitigation has been considered.

² Dust soiling is the deposition of a film of dust on exposed surfaces. The impact of dust soiling is typically defined as an environmental nuisance.

5.0 Impact Assessment

5.1 Stage 1 Demolition Works Dust Risk Assessment

A semi-quantitative risk assessment of potential dust impacts on surrounding sensitive receptors was undertaken for the demolition works. The demolition works include the staged demolition and removal of the existing stadium and associated infrastructure, including the car park to the west of the existing stadium and other hardstand areas (footpaths and roadways), and the Parramatta Swimming Centre; although the pool will remain open whilst the existing stadium is demolished. Stage 2 construction air quality impacts will be assessed as part of the Stage 2 Development Application process.

The assessment of Stage 1 demolition works is discussed in the following sections and progresses through a series of steps as defined by the IAQM as previously discussed.

5.1.1 Step 1 - Screening Assessment

The IAQM method recommends further assessment of dust impacts for demolition works where sensitive receptors are located closer than:

- 350 m from the boundary of the Site
- 50 m from the route used by construction vehicles on public roads up to 500 m from the Site entrance

As shown in **Figure 3**, there are a number of sensitive receptors within 350 m of the Site boundary. Based on this, further assessment of the dust impacts was determined to be necessary.

5.1.2 Step 2A - Dust Emission Magnitude

Dust emission magnitudes are estimated according to the scale of works being undertaken and other considerations such as meteorology, types of material being used, or general demolition methodology. The IAQM guidance provides examples to aid classification, as presented in the following excerpt from IAQM:

The dust emission magnitude is based on the scale of the anticipated works and should be classified as Small, Medium, or Large. The following are examples of how the potential dust emission magnitude for different activities can be defined. Note that, in each case, not all the criteria need to be met, and that other criteria may be used if justified in the assessment:

Demolition: Example definitions for demolition are:

- *Large: Total building volume >50,000 m³, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level;*
- *Medium: Total building volume 20,000 m³ – 50,000 m³, potentially dusty construction material, demolition activities 10-20 m above ground level; and*
- *Small: Total building volume <20,000 m³, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months.*

Based on the examples, the factors for classifying the magnitude of demolition works as large, medium or small, are therefore: building volume, construction material, whether there is on-site screening and crushing, and the maximum height of demolition. Based on the Stage 1 factors - estimated building volume, construction materials, and potential demolition height - the dust emission magnitude would be classified as **Medium**. However, the proposed on-site concrete crushing increases the potential for pre-mitigation dust emissions. Based on this, the demolition works potential dust emission magnitude was classified as **Large**. This classification is considered conservative. Justification and factors used in determining this classification are presented in **Table 4**.

Table 4 Maximum dust emission magnitudes in accordance with IAQM guidance

Activity	Potential Pre-mitigation Dust Emission Magnitude	Justification
Demolition	Large	- Total in-situ building volume estimated at 20,000m³ - 50,000 m³ - Potentially dusty materials (concrete, asphalt) - On-site concrete crushing - Demolition activities 10 m – 20 m above ground level

5.1.3 Step 2B - Sensitivity of the Surrounding Area

The IAQM methodology allows the sensitivity of an area to dust soiling, human health impacts due to PM₁₀ to be classified as high, medium, or low. The classifications are determined according to matrix tables provided in the IAQM guidance document. Individual matrix tables for dust soiling and human health impacts are provided. Factors used in the matrix tables to determine the sensitivity of the surrounding area are described as follows:

- Receptor sensitivity (for individual receptors in the area):
 - High sensitivity – locations where members of the public are likely to be exposed for eight hours or more in a day. For example private residences, hospitals, schools, or aged care homes.
 - Medium sensitivity - places of work where exposure is likely to be eight hours or more in a day.
 - Low sensitivity – locations where exposure is transient – i.e. one or two hours maximum. For example parks, footpaths, shopping streets, playing fields.
- Annual mean PM₁₀ concentration (only applicable to the human health impact matrix)
- Number of receptors of each sensitivity type in the area
- Distance from source.

The overall sensitivity of the area is determined by selecting the highest relevant sensitivity classification from the matrix tables (there may be more than one classification depending on the number of receptors of each sensitivity types in the area). Based on this approach, the overall sensitivity of the area to dust soiling was classified as **Medium**, and the overall sensitivity to human health impacts was classified as **Low**. Justifications for these classifications and Stage 1 factors used in the IAQM matrix tables are presented in **Table 5**. Note that once the demolition works move to the Parramatta Swimming Centre, the nearest receptor will be the Old Kings School located on O'Connell Street.

Table 5 Sensitivity of the area in accordance with IAQM guidance

Potential Impact	Sensitivity of the Area	Justification
Dust Soiling	Medium – according to Table 2 in IAQM (2014)	- Closest Receptors pre pool closure <20m (Parramatta Swimming Centre) • Receptor sensitivity = High* - Closest Receptors post pool closure >20m (Old Kings School) • Receptor sensitivity = High - No other high sensitivity receptors (School, day care centre, leagues club, residences) within 20 m
Human Health (PM ₁₀)	Low – according to Table 3 in IAQM (2014)	- Closest Receptors <20m (Parramatta Swimming Centre) - Receptor sensitivity = High* - Annual average PM₁₀ concentration in the area < 24 µg/m³ (see Section 3.2.3)

* Parramatta Swimming Centre would host patrons for a limited period of time (less than 8 hours). However, children and other more sensitive groups may use the swimming centre. Therefore the overall sensitivity of the receptor has been classified as High.

5.1.4 Step 2C - Unmitigated Risks of Impacts

The potential dust emission magnitude classification of **Large**, as presented in **Table 4**, was combined with the sensitivity of the area, presented in **Table 5**, to determine the risk of construction dust air quality impacts, with no mitigation applied. The IAQM guidance provides a risk matrix to aid in making this determination as presented in **Table 6**.

Table 6 Risk of dust impacts - demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

The risk of dust impacts due to the demolition works were assigned according to the IAQM risk matrix above, and are summarised in **Table 7**.

Table 7 Summary of Project Stage 1 Demolition Works dust risks without mitigation

Potential Impact	Risk of Dust Impacts on Sensitive Receptors – Without Mitigation
Dust Soiling	High Risk
Human Health (PM ₁₀)	Medium Risk

The outcome of the qualitative air quality risk assessment shows that the Stage 1 demolition works phase of the Project is considered to pose a **High Risk of dust soiling** and a **Medium Risk of human health impacts**. This risk is primarily based on the potential for dust impacts due to demolition works impacting on the Parramatta Swimming Centre.

5.1.5 Step 3 - Mitigated Risks of Impacts

The outcome of Step 2C is used to determine the level of mitigation that is required to ensure that dust impacts on surrounding sensitive receptors are maintained at an acceptable level.

A high or medium-level risk rating means that suitable mitigation measures must be implemented during Stage 1 to ensure that dust impacts on surrounding sensitive receptors are reduced to an acceptable level.

Recommended site-specific and in-principle mitigation measures are described in detail in **Section 6.0**. With the implementation of these mitigation measures there should be minimal risk of dust impacts on surrounding receptors due to demolition works.

5.1.6 Step 4 – Reassessment

The final step of the IAQM methodology is to determine whether there are significant residual impacts, post mitigation, arising from a proposed development. The guidance states:

For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be “not significant”.

It is anticipated that the demolition works will not constitute an atypical case and that with implementation of the proposed mitigation measures described in **Section 6.0**, the residual effect (impacts) will be “not significant”. Supporting this is the likelihood of favourable winds blowing from the east (away from sensitive receptors) during summer daytime hours (assuming Stage 1 is undertaken during the summer months). Summer mornings may still experience some unfavourable winds blowing from the west (towards sensitive receptors). However, implementation of the mitigation measures, and in particular locating the concrete crushing away from the Parramatta Swimming Centre, should adequately reduce the likelihood of dust impacts on sensitive receptors.

5.2 Concept Proposal Air Quality Constraints Analysis

As described in **Section 2.2**, the Western Sydney Stadium Concept Proposal consists of a 30,000 seat stadium with associated infrastructure such as parking facilities, media rooms, amenities, and food and beverage facilities.

Operational air emissions from the existing stadium are very minor and the potential for offsite air quality impacts are considered low. Development of the Project according to the Concept Proposal would be unlikely to introduce any new sources of air pollution. However, as presented in **Section 2.2.1**, projected event frequency is expected to increase under the Project. An increase in events will likely mean an increase in frequency, and potentially magnitude, of air emissions from sources such as pyrotechnic displays. Despite the possible increase, the likelihood of offsite air quality impacts at sensitive receptors would remain low. No significant change in potential air quality impacts is therefore expected as a result of the Project. Should there be any changes to the planned operation of the Project these will be addressed in Stage 2.

6.0 Mitigation and Management Measures

Dust emissions from demolition of Parramatta Stadium are expected to pose medium (human health impacts) to high (dust soiling) risk of impacts on surrounding sensitive receptors without adequate mitigation. There is the potential for dust that is emitted during demolition activities to cause nuisance and/or health impacts.

The main cause for concern is the proposed on-site concrete crushing operations. This will need to be effectively managed with appropriate mitigation measures to ensure that dust emissions are maintained at an acceptable level. Measures might include:

- Locating the crushing activities on the western or northern side of the site, as far from the Parramatta Swimming Centre and other receptors as practicable.
- Implementing water sprays to suppress dust emission from the crusher, as necessary.
- Ceasing or limiting crushing activities during times of adverse winds.

The IAQM (2014) guidance document provides a non-exhaustive list of in-principle mitigation measures aimed at minimising dust emissions from other demolition activities. Relevant mitigation measures were identified and are presented below.

For Site Preparation:

- Erect appropriate barriers at the Site boundary. These may be solid screens and should be at least as high as any stockpiles located on Site.
- Erect effective barriers/ screens around dusty activities and keep clean throughout Stage 1. Particular attention should be given to screens preventing dust from entering the Parramatta Swimming Centre.
- Communicate with neighbouring properties prior to undertaking works in proximity to their premises.
- Establish a complaints management system to record details on the time and extent of any reasons for air quality based complaints.

For Demolition Works:

- Sheet and screen buildings with suitable material and, where possible, strip inside buildings before demolition begins.
- Ensure effective water suppression is used during demolition activities where necessary.
- Demolition activities (in addition to concrete crushing activities) should be limited during times of adverse meteorological conditions.
- Dusty materials should be removed from site as soon as possible.
- Cover stockpiles to prevent wind-whipping.

For Hauling Materials Off-site:

- Use water-assisted dust sweepers on the access and local roads to remove any material tracked out of the site, as necessary.
- Avoid dry sweeping of large areas.
- Trucks hauling dusty material should have their payload covered.
- Implement a wheel washing system if necessary – utilising rumble pads to dislodge accumulated dust or mud from vehicles prior to leaving site.

Should these and other relevant mitigation measures be undertaken, it is expected that dust impacts can be kept to acceptable levels during the demolition works.

7.0 Conclusion

A dust impact assessment of the demolition works associated with the Proposal was undertaken by means of the qualitative risk assessment methodology provided in the UK Institute of Air Quality Management (IAQM) document, *Guidance on the assessment of dust from demolition and construction* (IAQM 2014).

A pre-mitigation dust impact risk rating of “medium” was determined for both dust soiling and human health impacts due to potential dust emissions from the works. This rating was based on the potential dust emission magnitude from demolition, sensitivity of nearby receptors, proximity of receptors, and the sensitivity of the area as a whole to both dust soiling and human health impacts. Residual impacts once appropriate dust mitigation measures are implemented were considered to be “not significant”.

A range of in-principle and site-specific mitigation measures were identified. The implementation of these measures during the Proposal is considered sufficient to reduce the potential for offsite dust impacts to an acceptable level. A summary of the dust mitigation measures are presented in the **Table 8**. No specific mitigation measures have been identified for the Concept Proposal or future operation of the Western Sydney Stadium given that impacts are considered to be minor and consistent with the existing operation of the Site. It is anticipated that a more detailed assessment would need to be considered for Stage 2 of the Project, when the detailed design and the likely associated construction activities are known.

Table 8 Summary of mitigation measures

Management and Mitigation Measures	Implementation		
	Design	Construction/Demolition	Operation
On-site concrete crushing - Locating the crushing activities on the western or northern side of the Site - Implementing water sprays - Cease/ limit crushing during adverse winds.		✓	
Site Preparation - Erect appropriate barriers at the site boundary. - Erect barriers around dusty activities. - Communicate with neighbouring properties prior to undertaking works in proximity to their premises. - Establish a complaints management		✓	
Demolition Works - Sheet and screen buildings and strip inside buildings - Ensure effective water suppression – where necessary - Limit activities during adverse wind conditions. - Dusty materials should be removed from Site as soon as possible. - Cover stockpiles to prevent wind-whipping		✓	
For Hauling Materials Off-site: - Use water-assisted dust sweepers as necessary. - Avoid dry sweeping of large areas. - Trucks hauling dusty material should be covered. - Implement a wheel washing and rumble pads if necessary		✓	

8.0 References

Institute of Air Quality Management (IAQM) (2014). Guidance on the assessment of dust from demolition and construction Version 1.1.

New South Wales Department of Environment and Conservation (DEC) (2005). Approved Methods for the Modelling and Assessment of Air pollutants in New South Wales.