

Site-specific Ancillary Facilities Management Plan: Tempe Reserve Grouting

Project Name: WestConnex New M5

Project number:	15.7020.2597
Document number:	M5N-ES-PLN-ARN-0009
Revision date:	02/03/2018
Revision:	07

Document Approval

Rev.	Date	Prepared by	Reviewed by	Recommended by	Approved by	Remarks
00	13/04/17	CDS-JV				
01	27/04/17	CDS-JV				
02	31/05/17	CDS-JV				
03	22/08/17	CDS-JV				
04	11/09/17	CDS-JV				
05	19/09/17	CDS-JV				
06	19/02/18	CDS-JV				
07	2/03/18	CDS-JV				
Signature:						

Site-specific AFMP: Tempe Reserve Grouting



Details of Revision Amendments

Document Control

The Project Director is responsible for ensuring that this Plan is reviewed and approved. The Support Services Director (SSD) is responsible for updating this Plan to reflect changes to the Project, legal and other requirements, as required.

Amendments

Any revisions or amendments must be approved by the Project Director before being distributed or implemented.

Revision Details

Revision	Details
00	Prepared for WCX M5 AT review
01	Updated to address WCX M5 AT and RMS comments. For ER endorsement.
02	Updated to address DP&E comments and further consultation.
03	Updated to include additional grouting area. For WCX M5 AT / RMS review.
04	Updated to address WCX M5 AT and RMS comments. For ER endorsement.
05	Updated to address ER comments. For DP&E approval.
06	Update with new proposed grouting area.
07	Updated to address WCX M5 AT and RMS comments. For ER endorsement.



Contents

1. Introduction.....	4
1.1 Context	4
1.2 Purpose and scope.....	4
2. Environmental Planning Requirements.....	5
2.1 Compliance with CoA D63.....	5
3. Identify and Assess.....	6
3.1 Detailed description of the ancillary facility	6
3.2 Construction aspects and environmental impacts	12
4. Consultation.....	18
5. Implement Controls.....	19
6. Consistency with existing project impacts and approvals.....	27
Appendix A: Ancillary Facility Application.....	28
Appendix B: Evidence of consultation	32
Appendix C: Construction Noise and Vibration Impact Statement.....	49

1. Introduction

1.1 Context

The New M5 Project is the Stage 2 component of the WestConnex scheme, a NSW Government initiative to connect Sydney's west and south-west with the Sydney Airport and the Port Botany precinct. It is being delivered by the Sydney Motorway Corporation (SMC), formerly the WestConnex Delivery Authority (WDA).

The CPB Contractors Dragados Samsung Joint Venture (CDS-JV) will deliver the design and construction of WestConnex Stage 2 referred to as the New M5 (the Project). The Project will run from the existing M5 East corridor at Beverly Hills via tunnel to St Peters, providing improved access to the airport, south Sydney and Port Botany precincts. The Project will substantially improve the east - west corridor access between the Sydney CBD, Port Botany and Sydney Airport precincts and the South West growth areas.

The Project will deliver approximately nine kilometres of two-lane twin tunnels with capacity to operate three lanes in the future, motorway to motorway connections to the King Georges Road Interchange Upgrade at Beverly Hills, and a new interchange at St Peters. Infrastructure Approval was granted for the project on 20 April 2016. Major works are expected to commence in mid 2016 and the New M5 tunnel is scheduled to open to traffic in late 2019.

The Construction Environmental Management Plan (CEMP) provides further background and a detailed description of the Project.

The Ancillary Facilities Management Plan describes the establishment and use of the approved ancillary facilities identified in the New M5 Environmental Impact Statement (EIS).

1.2 Purpose and scope

This Site-specific Ancillary Facilities Management Plan (SSAFMP) describes an ancillary facility, additional to those approved under the EIS. The facility is for the purpose of supporting surface-based grouting works, which are required to meet the groundwater infiltration criteria required by condition B26 of the Conditions of Approval and to reduce the risk of ground settlement above the tunnel in this location. The site is located above the tunnel alignment, immediately north of the Cooks River in Tempe. The site is outside the approved project area.

The works to be undertaken at the site form part of the same package of grouting works being undertaken to the south of the Cooks River in Wolli Creek (refer to the Site-specific Ancillary Facilities Management Plan: Cooks River Grouting, approved 28/03/2017).

The site does not meet the locational criteria identified in condition of approval (CoA) D62 and does not meet the requirements of a minor ancillary facility (CoA D64) as it is located outside the approved project area. This SSAFMP has been prepared for the approval of the Secretary, Department of Planning and Environment (DP&E), to satisfy CoA D63.

2. Environmental Planning Requirements

2.1 Compliance with CoA D63

Section 4 and Appendix E of the approved Ancillary Facilities Management Plan (AFMP) describe the approval pathways for ancillary facilities associated with the project. For proposed ancillary facilities that are not included in the EIS and are not compliant with CoA D62 or D64, a Site-Specific Ancillary Facilities Management Plan (SSAFMP) is required to be approved by the Secretary, DP&E.

The Tempe Reserve Grouting Ancillary Facility is not included in the EIS and is located outside of the project area and therefore outside an active construction zone. Approval of an SSAFMP, under CoA D63 is therefore required. Table 1 identifies the requirements of CoA D63 and where they are addressed in this SSAFMP.

Table 1: Compliance with requirements of CoA D63

CoA D63 Reference	Requirement	Where addressed
a)	a detailed description of the ancillary facility, including proposed use and access arrangements;	Section 3.1
b)	a review of the environmental and social impacts of the ancillary facility, including an analysis of compliance with the locational criteria specified in condition D62;	Section 3.2
c)	measures to avoid, mitigate and manage environmental and social impacts associated with the ancillary facility; and	Section 5
d)	demonstration that, with the measures proposed in accordance with (c), the impacts of the ancillary site are consistent with - <ul style="list-style-type: none"> i. the overall project impacts described in documents referred to in conditions A2(b) and A2(c), and ii. all relevant conditions of this approval. 	Section 6



3. Identify and Assess

3.1 Detailed description of the ancillary facility

3.1.1 Site description

The site of the proposed compound is located north of the Cooks River in Tempe Recreation Reserve (refer Figure 2). The site area has been updated from the last approved revision (Revision 5) of this report to include an additional area within the Reserve carpark. The site is managed by Inner West Council and is used in part by the City of Sydney Netball Association. The entire site is publicly accessible and part of the site also comprises a shared pedestrian/cycle path. A vegetated and landscaped mound also occurs within the site area.

3.1.2 Site activities

The proposed compound comprises Site 4 of the surface-based grouting works to occur in this area prior to tunnelling and underground grouting works. The grouting activities form part of the surface-based grouting works also being undertaken south of the Cooks River in Cahill Park/Rowers On Cooks Rowing Club (Sites 3a and 3b) and at the Arncliffe (C7) Construction Compound (Sites 1 and 2). The Tempe Reserve site would contain the grouting station including batch plant, grout rigs and washout ponds/skips as well as general waste skips. The site would also accommodate limited parking and staff amenities.

The sites would receive deliveries of plant, equipment and materials and a sucker truck would remove waste water from the site to the Arncliffe construction compound (C7) for treatment at the existing construction water treatment plant.

Revision 2 of this SSAFMP described two main areas for the grouting activities. The main compound area, located on the netball courts and the drilling and grouting area located adjacent to the Cooks River. Revision 5 identified a second grouting area immediately north of the main compound within the netball courts. The current revision of this document addresses a third proposed grouting area north of the netball courts within the Tempe Recreation Reserve carpark. Refer to Figure 3 for the proposed site layout. The additional area will be used for drilling and grouting activities, with grout supplied from the netball court compound shown in Figure 3. All supporting facilities including the batch plant, site office, laydown area and construction parking would remain within the netball court compound. The drilling and grouting plant proposed for the carpark area would be mobilised from its current location along the River and this section would be rehabilitated and returned for public access and use.

The compound and grouting area would continue to be operated by CDS-JV until end of May 2018, however access to the site is being sought until 1 July 2018 to provide for any potential delays (refer Figure 1 and Section 4).

The site would be decommissioned and rehabilitated to its pre-construction condition or better, or as otherwise agreed by the landowner, in accordance with CoA D65, after the completion of the grouting works. Rehabilitation of the section of site adjacent to the river is expected to occur mid March to early April 2018. Rehabilitation of the remaining areas is expected to occur in May 2018, as shown in Figure 1 below.

Refer to Table 4 for further details of the proposed activities at the site.

Activity	Month	Oct-17				Nov-17				Dec-17				Jan-18				Feb-18				Mar-18				Apr-18				May-18			
	Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Establishment																																	
Grouting operations - river																																	
Grouting operations - courts																																	
Grouting operations - carpark																																	
Demobilisation / rehabilitation																																	

Figure 1: Indicative grouting program

3.1.3 Hours of operation

The ancillary facility would be operated during standard working hours:

- 7 am – 6 pm Monday to Friday, inclusive; and

Site-specific AFMP: Tempe Reserve Grouting



- 8 am – 1 pm Saturday;
- At no time on Sundays or public holidays.

Deliveries would also primarily be restricted to standard working hours. Some deliveries may need to occur outside of standard construction hours for safety and/or road network restriction reasons. These works will be carried out in accordance with the Infrastructure Approval (in particular CoA D15) and any applicable Road Occupancy Licences (ROs).

Operation of the Tempe Reserve site compound would be in accordance with all requirements specified in the Ancillary Facilities Management Plan (AFMP), the Construction Environmental Management Plan (CEMP) and CEMP Sub-Plans.

3.1.4 Services and utilities

Connections to the potable water supply at the site would be required for the works. Connections would be made in consultation with the relevant water authority. No other connections or modifications to services or utilities are required for the works.

3.1.5 Site access

Site access would occur via Princes Highway and Holbeach Avenue (refer to Figure 3). Holbeach Avenue is a local road as it is not classified as State or Regional roads under RMS' Schedule of Classified Roads and Unclassified Regional Roads (January 2014). DP&E approval for the use of Holbeach Avenue has been obtained under CoA D46 (4/05/2017) for the use of this local road by heavy vehicles.

3.1.6 Workforce and vehicle movements

The total number of light and heavy vehicle movements at the site each day is likely to vary slightly depending on activities that are occurring at the site. During the establishment phase (less than 2 weeks), there is expected to be approximately 10 heavy vehicles accessing the site per day (20 HV movements). Light vehicles during the establishment phase would be the same as for the operational phase (Table 2). Following establishment, the site would primarily be accessed using light vehicles, with limited heavy vehicle movements each day during standard construction hours for cement deliveries and wastewater removal. Indicative numbers for site-based personnel and vehicles accessing the site are provided in Table 2. The proposed modifications, ie moving the grouting area to the carpark, will not change the number of vehicle movements at the site each day.

Table 2: Indicative vehicle movements and personnel numbers per day

Tempe Grouting site compound	Establishment			Operation		
	Light vehicle movements per day	Heavy vehicle movements per day	Personnel	Light vehicle movements per day	Heavy vehicle movements per day	Personnel
Indicative number	20	20	10	20	4	10

Note: all vehicle movements will occur during the daytime period, unless required for emergency purposes, safety or road network restriction purposes.

3.1.7 Plant, equipment and materials

Major equipment and vehicles to be used at the site will include:

- Drill rigs (19-21 tonne)
- Grouting/batching station with mixer, agitators, grouting pumps, hoses, reels, packers
- Washout ponds/skips
- Sedimentation tanks
- Crane (establishment only)
- Four float trucks (establishment only)

Site-specific AFMP: Tempe Reserve Grouting



- Cement delivery trucks
- Sucker truck
- Utility/light vehicles

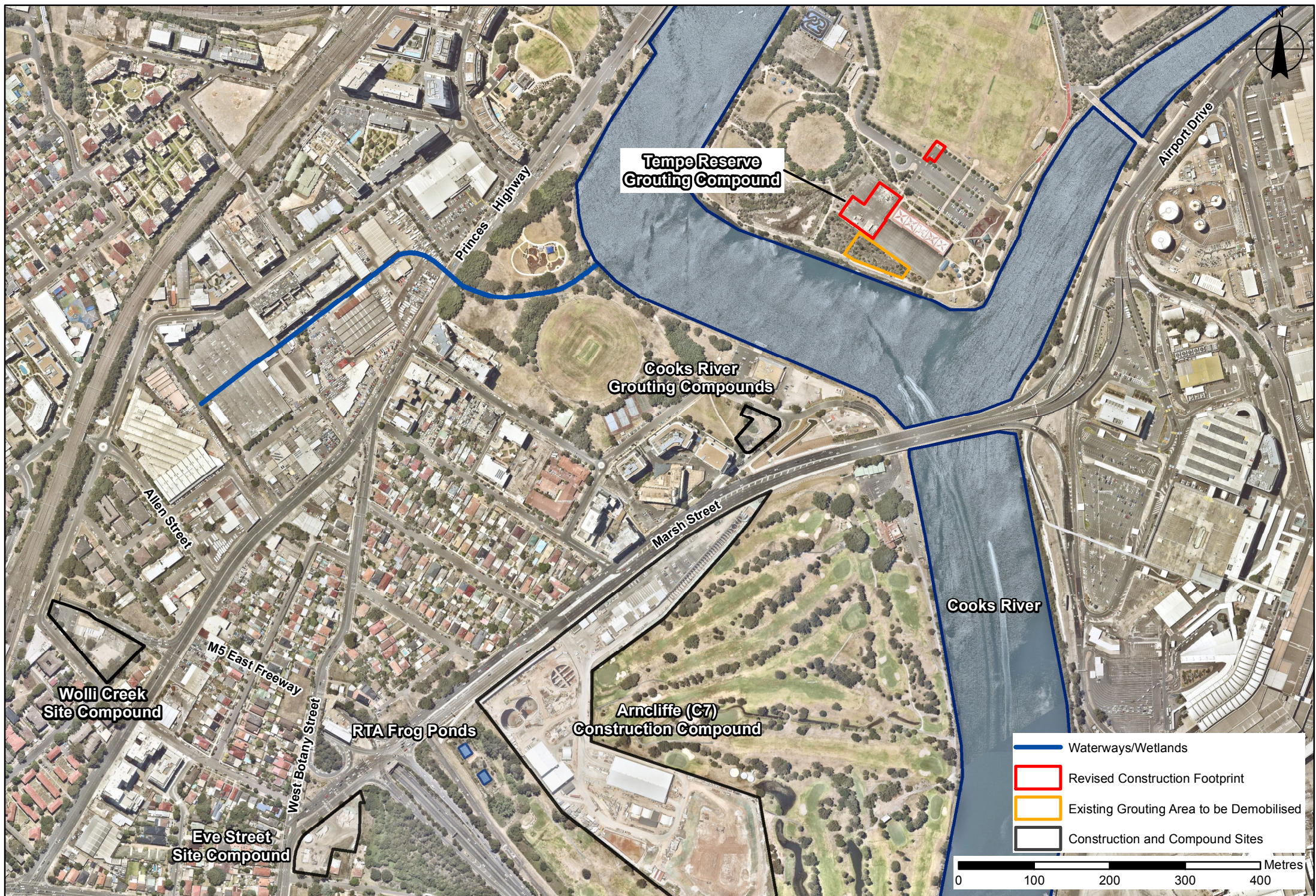


Figure 2: Site Location

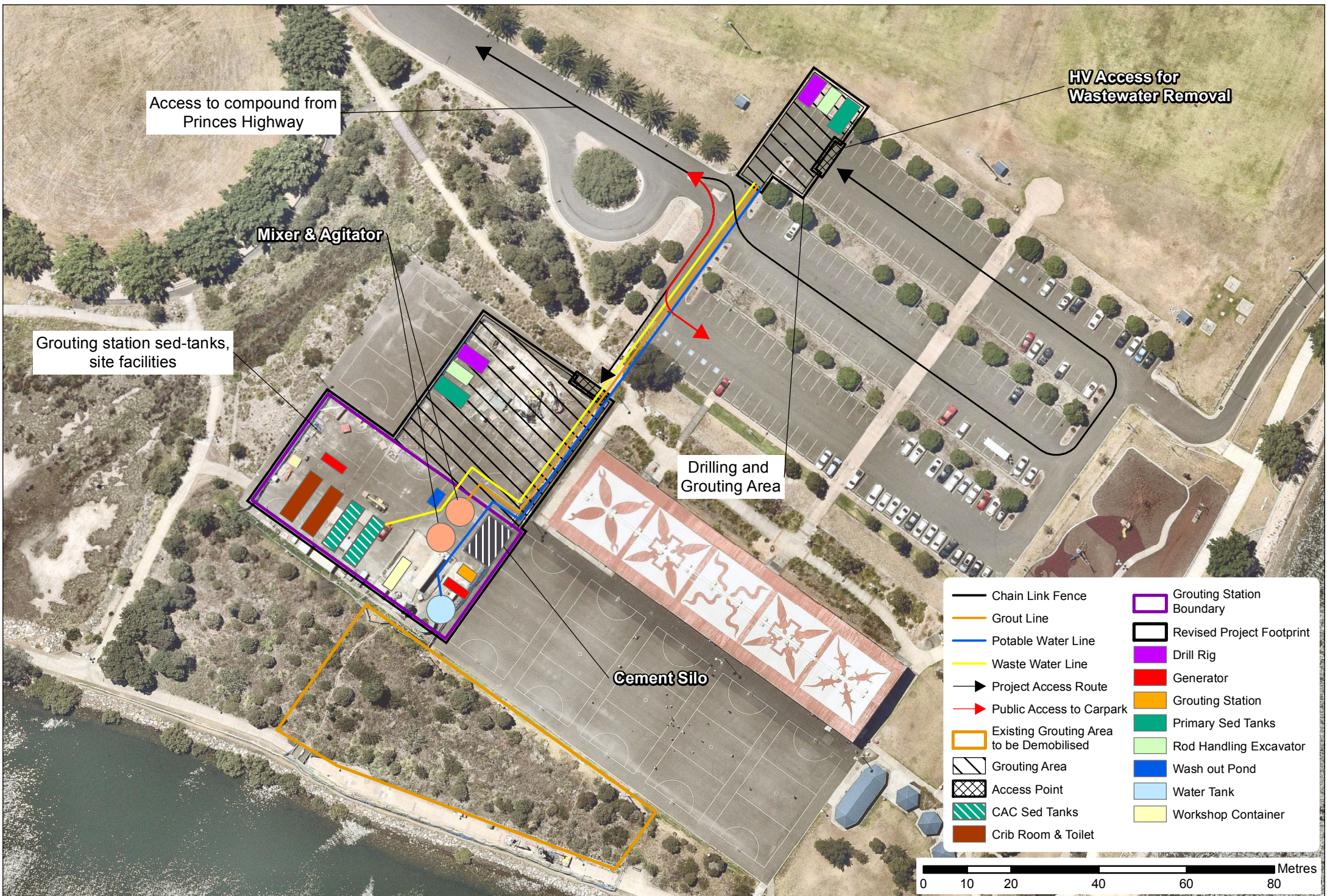


Figure 3: Tempe Reserve Grouting Site Compound Layout



- Access Route - Heavy and Light Vehicles
- Existing Traffic Signals
- Revised Construction Footprint
- Existing Grouting Area to be Demobilised

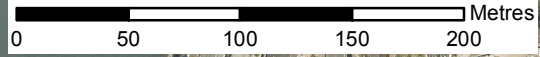


Figure 4: Site Access Routes

3.2 Construction aspects and environmental impacts

3.2.1 Locational criteria assessment

Table 3: Locational criteria for ancillary facilities (CoA D62)

CoA D62 Reference	Requirement	Compliant	Comments
a)	Be located more than 50 metres from a waterway;	✘	The grouting activities will occur within 80 metres from the Cooks River and the grout plant compound will be approximately 50 m from the River (Figure 2). Refer to Section 3.2.5 for further details and Section 5 for controls.
b)	Be located within or adjacent to land where the SSI is being carried out;	✓	The site is directly above the subsurface tunnel alignment. The site is located at Tempe Recreation Reserve, Tempe approximately 300 m north of the Arncliffe (C7) compound site (Refer to Figure 2).
c)	Have ready access to the road network;	✓	Refer to section 3.1.5 and Figure 3 and Figure 4 for further information on site access.
d)	Be located to minimise the need for heavy vehicles to travel on local streets and/or through residential areas;	✓	Refer to section 3.1.5 and Figure 4 for details on heavy vehicle access.
e)	Be sited on relatively level land;	✓	The compound area is level.
f)	Be separated from nearest residences by at least 200 metres (or at least 300 metres for a temporary batching plant);	✓	The site is approximately 350 metres from the nearest residence to both the south in Wolli Creek and the north in Tempe. Refer to Sections 3.2.3 and 3.2.4 and Figure 3. Refer to Section 5 for controls.
g)	Not require vegetation clearing beyond that already required by the SSI;	✘	Vegetation was cleared as part of the previously approved Tempe Reserve compound area. No further clearing of vegetation is required.
h)	Not impact on heritage items (including areas of archaeological sensitivity) beyond those already impacted by the SSI;	✓	Refer to Section 3.2.7.
i)	Not unreasonably affect the land use of adjacent properties;	✓	The site is expected to be required until July 2018. Use of the site would have temporary impacts on users of Tempe Recreation Reserve, including the Netball Association, including impacts on available car parking. With the implementation of the site-specific management measures in Section 5 of this SSAFMP, the use

CoA D62 Reference	Requirement	Compliant	Comments
			of this site is not expected to unreasonably affect the land use of adjacent properties.
j)	Be above the 20 ARI flood level unless a contingency plan to manage flooding is prepared and implemented; and	✘	The site is within the 20 year ARI flood level. Flood contingency measures are provided in Section 5 of this SSAFMP.
k)	Provide sufficient area for the storage of raw materials to minimise, to the greatest extent practical, the number of deliveries required outside standard construction hours.	✓	The site is considered to have sufficient storage area for the plant, equipment and materials required for the works. Deliveries will occur during standard hours, except where required by a Road Occupancy Licence (ROL) or for safety reasons.

3.2.2 Traffic and transport

Site access would be via the Princes Highway and Holbeach Avenue (refer to Figure 4). Holbeach Avenue is a local road (refer to sections 3.1.5 and Figure 4). Other potential access routes to the site would be via local roads that travel through residential areas, are less direct and are only accessible from the south-bound lane of the Princes Highway (without a turning lane or traffic lights). The proposed access route does not travel through residential areas, is the most direct and is accessible from both north- and south-bound directions using traffic lights from the Princes Highway. The proposed site within the carpark has been designed to minimise impacts on public use of the carpark. A Traffic Control Plan (TCP) will be developed for the new proposed layout. Trafficable cover will also be provided for the service lines extending from the batching area to the carpark. Traffic impacts will be monitored during the works and consultation with the relevant stakeholders will be ongoing. Additional traffic control measures can be implemented if required.

Potential traffic and access impacts on the proposed route are considered to be minor given the low number of vehicles, and in particular, low numbers of heavy vehicles, that would be accessing the site.

3.2.3 Noise and vibration

A construction noise and vibration impact statement (CNVIS) has been prepared for the grouting works located south of the Cooks River (sites 3a and 3b, described in the Cooks River Grouting SSAFMP), and the Tempe Reserve site (site 4), the works subject to this SSAFMP. The CNVIS was previously provided with the Cooks River Grouting SSAFMP. An update to this CNVIS is provided in Appendix C which includes the additional grouting activities (site 4a) proposed in the carpark area.

The nearest residential receiver to the site is south of the Cooks River in Levey Street, Wolli Creek and is approximately 350 m from the site. The nearest residential receivers to the north of the site are in Bay Street and Old Street, Tempe and are approximately 350 m from the site. Noise levels from all activities (including the additional grouting within the carpark area) are expected to comply with the relevant NMLs at all residential receivers.

Recreational receivers in the surrounding area include the Tempe Recreation Reserve facilities, which include the external netball courts, Robyn Webster Sports Centre and sports fields to the north. A childcare centre is also located to the north on Holbeach Avenue. All noise impacts on surrounding receivers are expected to comply with the relevant NML, except for the adjacent netball facilities/Robyn Webster Sports Centre. Works will only occur during standard construction hours and will be avoided where possible on Saturdays (8am-1pm). Works will be coordinated with the relevant sporting groups to ensure noise impacts are managed during times when these facilities are being used. No impacts are anticipated from construction traffic.

The CNVIS also concluded that vibration impacts would be very low risk as no significant vibration generating equipment would be used for the works. All works will be subject to the noise controls identified in Section 5.

Section 5 of this SSAFMP identifies relevant noise mitigation and management measures.

3.2.4 Visual amenity

The compound area would be mostly screened from surrounding areas by the vegetation present on site and the vegetation mound between the site and the River. The compound would only be visible to users of Tempe Recreation Reserve in the immediate vicinity of the site, including the adjacent netball courts. Grouting activities would be visible to users of the carpark and sports fields at the Reserve. The drill rig, excavator and sedimentation tanks would be the primary visual impact for these areas. The compound site would have some security lighting which may have potential light spill impacts during the evening and night time period. The visual and light spill impacts associated with the use of the site are therefore expected to be relatively minor and temporary. The site would be rehabilitated to its existing condition, subsequent to the completion of the works. Management measures outlined in Table 5 would be implemented to minimise visual amenity and light spill impacts at the site.

3.2.5 Soil and water quality

The site is located near to the Cooks River (Refer to Figure 3). Excavation works proposed at the site are limited to the drilling of the bore holes. Potential and/or Actual Acid Sulfate Soils (PASS and/or ASS) may be encountered during drilling and treatment of PASS may be required. This would be conducted in accordance with the management measures outlined in the Acid Sulfate Soils Management Plan being implemented at the Arncliffe Construction Compound (C7).

With the implementation of mitigation measures outlined in Table 5, it is expected that potential soil and water quality impacts at the site would be minor.

3.2.6 Flora and fauna

A flora and fauna survey and a pre-clearance inspection has been undertaken by the project ecologists at the site. These inspections have confirmed vegetation at the site is comprised of planted/landscaped species as well as several weed species and that no impacts to threatened species or ecological communities would occur as a result of the works. Some minor removal of trees and shrubs was required for the grouting site adjacent to the Cooks River. A Tree Report has been prepared and was approved by the Secretary on 4 July 2017 in accordance with CoA B63. No additional trees will require removal as a result of the additional compound area described in this update. Any damage to vegetation would be minimised, and the site would be rehabilitated to its existing condition, subsequent to the completion of the works.

With the implementation of mitigation measures outlined in Table 5, it is expected that potential impacts on flora and fauna at the site would be minor.

3.2.7 Heritage

The site was assessed for heritage potential in the EIS and no heritage items have been identified at or immediately adjacent to the site. Alexandra Canal is a State listed heritage item and is located to the south-east of the site. No impact to Alexandra Canal is expected to result from the proposed works.

The EIS does not identify any known or potential Aboriginal heritage sites in the vicinity of the proposed site. The Unexpected Heritage Finds Procedure would be implemented in the event of any potential heritage find.

With the implementation of mitigation measures outlined in Table 5, it is expected that potential impacts on heritage would be unlikely.

3.2.8 Air quality

Air quality impacts associated with the works would be consistent with construction works across the project in general and may comprise minor dust and exhaust emissions from plant and vehicle use associated with the works. Given the temporary and minor nature of the works, and with the implementation of measures outlined in Table 5, any impacts to air quality are expected to be minor.

3.2.9 Waste and contamination

Small amounts of waste materials will be generated during drilling and grouting. General construction waste will be segregated and collected in adequately labelled skips and disposed at licensed waste collection facilities. Waste collection and transfer will be documented and tracked. Approximately 5-10m³ of waste water would also be generated during drilling and grouting per day. Waste water will be transferred to the Construction WTP located at the Arncliffe (C7) Construction Compound for treatment and reuse. Any contamination would be dealt with as per the project Unexpected Contaminated Finds Procedure. Acid Sulfate Soils would be dealt with as per Section 3.2.5 above. With the implementation of the measures outlined in Table 5, impacts associated with waste are expected to be minor.

3.2.10 Socio-economic

Use of the proposed site has the potential for some impacts on the local community. Six of the eleven netball courts would continue to be occupied/unavailable for the duration of the site works (five courts for the works and one court with obstructed access). Consultation is ongoing with the City of Sydney Netball Association to minimise the impact of the works on the recreational use of this site. There will also be an impact on part of the carpark for the proposed grouting area. Appropriate fencing and traffic management would be implemented at the carpark during this period. The Construction Parking and Access Strategy will be updated to address these additional impacts prior to the removal of any parking.

No property acquisition would be required for the site and construction parking will be contained within the proposed site. The affected stakeholders are being consulted in accordance with the Community Communication Strategy and communications will be maintained prior to and during the works. On the completion of the proposed grouting works all impacted land would be restored to its original condition, or better.

With the implementation of the mitigation measures outlined in Table 5, any potential socio-economic impacts associated with the site compound would be minor.

3.2.11 Rehabilitation

In accordance with CoA D65, ancillary facilities must be rehabilitated to at least their pre-construction condition or better, to the satisfaction of the Secretary, unless otherwise agreed by the landowner. Restoration works would include cleanup, dismantling and removal of all site facilities, as well as rehabilitation of vegetated areas where required, or as otherwise agreed with the landowner. Rehabilitation of the section of site adjacent to the river is expected to commence mid March. Rehabilitation of the remaining areas is expected to commence in May 2018, as shown in Figure 1 above.

3.2.12 Cumulative impacts

The construction compound would be in addition to a number of other construction compounds/sites in the surrounding area. The New M5 Arncliffe (C7) Construction Compound and Cooks River grouting works in Wollie Creek occur to the south of the site. The St Peters Interchange construction site and Local Roads construction sites are located to the north of the site. Construction activities in addition to the New M5 works also occur in the area, including the Marsh Street widening works and new building developments in the Wollie Creek area. Given the minor nature and location of the proposed works, however, cumulative impacts are expected to be minor.

With the implementation of mitigation measures outlined in Table 5, it is considered that any potential cumulative impacts on the surrounding community would be temporary and minor.

3.2.13 Construction activities and associated impacts summary

Key construction activities to be conducted at the Tempe Reserve grouting site are identified in Table 4 below, along with the associated impacts and corresponding environmental controls.

Site-specific AFMP: Tempe Reserve Grouting



Table 4: Key site activities proposed during construction

Key work activities	Key environmental impacts	Key environmental controls
<ul style="list-style-type: none"> • Site establishment activities including: <ul style="list-style-type: none"> ▪ deliveries ▪ installation of fencing ▪ installation of environmental controls ▪ minor clearing for access and establishment of drilling and grouting area (adjacent to Cooks River) ▪ installation of site sheds and amenities ▪ installation of grout plant and associated facilities • Deliveries of cement • Operation of grout plant • Drilling of grout lines and pumping of grout • Use of sucker truck to collect / transfer wastewater to Arncliffe Water Treatment Plant • Use of site office and amenities • Decommissioning of site, including removal of all project materials, site rehabilitation and clean-up. 	Spills or leaks of fuels or other hazardous substances Erosion/sedimentation impacts from removal of vegetation. Exposure of Potential and/or Actual Acid Sulfate Soils.	Refer to the management measures in Section 5 Also refer to the Construction Soil and Water Quality Sub-plan (M5N-ES-PLN-PWD-0005) and the AFMP
	Generation of waste, including wastewater and general construction and office waste.	Refer to the management measures in Section 5 Also refer to the Construction Waste and Resource Sub-plan (M5N-ES-PLN-PWD-0008) and the AFMP
	Minor clearing/pruning of vegetation on site.	Refer to the management measures in Section 5 Also refer to the Construction Flora and Fauna Sub-plan (M5N-ES-PLN-PWD-0007)
	Socio-economic impacts including use of netball courts and shared user pathway	Refer to the management measures in Section 5 Also refer to the Community Communication Strategy (M5N-CS-PLN-PWD-0008)
	Amenity impacts (visual, noise, light spill) on users of adjacent recreational area.	Refer to the management measures in Section 5 Also refer to the Construction Noise and Vibration Management Plan (M5N-ES-PLN-PWD-0003-14) and the AFMP
	Traffic impacts on Holbeach Avenue.	Refer to the management measures in Section 5 Also refer to the Construction Traffic and Access Sub-Plan (M5N-ES-PLN-PWD-0004) and the AFMP.

Site-specific AFMP: Tempe Reserve Grouting



SAMSUNG C&T

Key work activities	Key environmental impacts	Key environmental controls
	Dust and emissions/air quality impacts due to removal of ground cover and use of vehicles and plant.	Refer to the management measures in Section 5 Also refer to the Construction Air Quality Sub-plan (M5N-ES-PLN-PWD-0002)
	Unexpected heritage finds	Refer to the management measures in Section 5 Also refer to the Construction Heritage Sub-plan (M5N-ES-PLN-PWD-0006)



4. Consultation

Consultation has been undertaken with the following stakeholders affected by the proposed site:

- Inner West Council
- City of Sydney Netball Association
- USyd Sports

Consultation with Inner West Council, City of Sydney Netball Association and USyd Sports has been undertaken. Works will aim to minimise impacts to the Netball Association and USyd Sports and an agreement for sharing of the netball courts has been reached with the Netball Association (refer to Appendix B).

An initial meeting was held on site on 26 May 2017 with Inner West Council, City of Sydney Netball Association and USyd Sports to discuss the extent of the works, the construction methodology and the extent of the site boundary. All parties were satisfied with proposed management measures, including traffic control and security. It was agreed that works on Saturdays would only occur where required to meet program restrictions.

RMS arranged access to the site under the *Roads Act 1993* for the works identified in Revision 2 of this SSAFMP.

As described above, subsequent to the approval of Revision 2 of this SSAFMP, additional grouting has been required to meet the design objectives for the project. An additional drilling and grouting area was established on the netball courts with these works commencing in October.

This update to the SSAFMP describes another grouting area to be established in the carpark area. CDS-JV is consulting again with the above listed groups to advise of the additional works and timing (refer Appendix B). CDS-JV will continue to liaise with these stakeholders during the works, as required. Council has advised that it will not grant access to the additional area required. RMS will therefore seek to update the current agreement under the *Roads Act 1993* for the timing and scope of works described in this update.

Community notification will be provided to advise the surrounding community of the proposed site use in accordance with the Community Communication Strategy.

Refer to Appendix B for evidence of consultation undertaken to date.

Site-specific AFMP: Tempe Reserve Grouting



5. Implement Controls

The table below details mitigation and management measures to specifically address the identified potential environmental and social impacts resulting from the operation of the Tempe Reserve grouting site compound. These measures will be implemented in addition to any relevant CDS-JV environmental procedures and controls described in the AFMP and CEMP. Implementation of all control measures will:

- Minimise any potential adverse impacts arising from the use of the site compound, and
- Ensure compliance with environmental obligations and requirements.

Regular compliance activities, such as inspections, observations and monitoring will be undertaken throughout the operation of the compound, inclusive of any subcontractor activities. These compliance activities and any non-conformances will be undertaken in accordance with Element 3 of the CEMP.

Site-specific AFMP: Tempe Reserve Grouting



Table 5: Site-specific environmental safeguards

No.	Impact	Environmental safeguards	Responsibility	Timing
WC1.	General	<ul style="list-style-type: none"> All relevant safeguards provided in the Ancillary Facilities Management Plan (M5N-ES-PLN-PWD-0026), the Construction Environmental Management Plan (M5N-ES-PLN-PWD-0001) and all sub-plans must be implemented. 	Project manager	Prior to and during site operation
WC2.		All environmental safeguards must be incorporated within the following: <ul style="list-style-type: none"> Construction Area Plan Work Pack (Including Site Environment Plan) 	Project manager	Prior to site operation
WC3.		<ul style="list-style-type: none"> Training will be provided to all Project personnel, including relevant sub-contractors on site management and emergency response requirements through inductions, toolboxes and targeted training where required. 	Project manager	Prior to and during site operation
WC4.		<ul style="list-style-type: none"> The weekly environmental inspection checklist will be completed and will record ancillary facility management related issues. 	Environmental coordinator	Site operation
WC5.		<ul style="list-style-type: none"> Measures to be implemented to ensure effective communication between grout plant area and grouting area. All personnel to be toolboxed/trained in emergency response protocols for the site. 	Project manager	Prior to and during site operation
WC6.	Community	<ul style="list-style-type: none"> CDS-JV will advise affected property owners and occupiers of the site use in accordance with the Community Communication Strategy. 	Community relations manager	Prior to and during site operation
WC7.		<ul style="list-style-type: none"> Stakeholders will be consulted regularly throughout the works to advise of status of the works, any delays to the expected program and where works may be required to be undertaken on a Saturday. 	Community relations manager	Prior to and during site operation

Site-specific AFMP: Tempe Reserve Grouting



SAMSUNG C&T

No.	Impact	Environmental safeguards	Responsibility	Timing
WC8.		<ul style="list-style-type: none"> Community complaints will be recorded and actioned in accordance with the Community Communication Strategy. 	Community relations manager	Site operation
WC9.	Traffic and access	<ul style="list-style-type: none"> Access to site from the Princes Highway will occur via Holbeach Avenue. 	Project manager Site supervisor	Site operation
WC10.		<ul style="list-style-type: none"> Where closure of the shared pathway is required during grouting works, an alternative route to be implemented and sign-posted for path users. 	Project manager Site supervisor	Site operation
WC11.		<ul style="list-style-type: none"> Consultation to inform of any major events scheduled and any further traffic control (eg traffic controllers) that may need to be implemented. 	Community relations manager Project manager	Site operation
WC12.		<ul style="list-style-type: none"> Appropriate trafficable cover to be provided over service lines from batching area to carpark grouting compound. 	Project manager Site supervisor	Site operation
WC13.		<ul style="list-style-type: none"> Deliveries will be carried out during standard construction hours where feasible and reasonable. Project personnel to be made aware of appropriate access and parking requirements for the site during induction/toolbox talks. Project personnel to be encouraged to use public transport to access site. 	Site supervisor	Site operation
WC14.		Noise	<ul style="list-style-type: none"> Management and mitigation measures outlined in the CNVIS to be implemented where relevant 	Site supervisor

Site-specific AFMP: Tempe Reserve Grouting



SAMSUNG C&T

No.	Impact	Environmental safeguards	Responsibility	Timing
WC15.		<ul style="list-style-type: none"> Works to occur during standard construction hours (7 am – 6 pm Monday to Friday, 8 am – 1 pm Saturday). Works to be avoided on Saturdays and will be planned in consultation with the relevant sporting groups and/or other stakeholders. 	Project manager Site supervisor	Site operation
WC16.		Appropriate behavioural practices to be reinforced at site inductions / toolboxes, including: <ul style="list-style-type: none"> Relevant site approval conditions and site specific mitigation measures Location of nearest sensitive receivers No unnecessary loud swearing or unnecessary shouting, No loud stereos/radios on site, No dropping of materials from height where practicable or throwing of items, and No slamming of doors. 	Site supervisor	Site operation
WC17.		Plant that is brought to site should meet the sound power limits identified in the CNVIS. Where plant exceeds limits then the plant may require installation of 'noise control kits' to comply with the noise limits set in the CNVIS. Such 'noise control kits' comprise: <ul style="list-style-type: none"> high performance 'residential-grade' exhaust mufflers additional engine cowling / enclosure lined inside with sound absorbent industrial-grade foam, and air intake and discharge silencers / louvres. The requirement of fitting 'noise control kits' onto the identified plant, shall be confirmed once each plant is tested prior to its regular use on site.	Project Manager Site Supervisor	Site operation
WC18.		<ul style="list-style-type: none"> Ensure all deliveries occur during standard construction hours where reasonable and feasible. 	Site supervisor	Site operation
WC19.		<ul style="list-style-type: none"> Non-tonal reversing beepers (or an equivalent mechanism) must be fitted & used on all vehicles regularly used on site. 	Project Manager Site supervisor	Site operation

Site-specific AFMP: Tempe Reserve Grouting



SAMSUNG C&T

No.	Impact	Environmental safeguards	Responsibility	Timing
WC20.		<ul style="list-style-type: none"> Plant and equipment would be switched off when not in operation for periods of greater than 15 minutes. Where reasonable and feasible, noisy equipment will be substituted for alternative low-emitting equipment particularly for activities or in locations that may impact on potential noise sensitive receivers. 	Site supervisor Environmental advisor	Site operation
WC21.		<ul style="list-style-type: none"> Noisy equipment and equipment with directional noise emissions will be orientated away from sensitive receivers where practicable. The distance between plant and noise sensitive receivers will be maximised where practical. Avoid/ limit simultaneous operation of noisy plant and equipment within discernible range of a sensitive receiver 	Site supervisor Environmental advisor	Site operation
WC22.	Flora and fauna	<ul style="list-style-type: none"> Site induction to include awareness of flora and fauna requirements on site, including Awareness of No-go zones and limits to clearing on site Any unexpected species finds on site to be reported to the Environment advisor/Environment & Sustainability Manager. 	Project Manager Site supervisor Environmental advisor	Site operation
WC23.		<ul style="list-style-type: none"> No-go zones to be implemented for all retained vegetation on site. No access to exclusion zones without a permit to enter no-go zones. 	Site supervisor Environmental advisor	Site operation
WC24.		<ul style="list-style-type: none"> Any vegetation pruning and clearing to occur in accordance with the Construction Flora and Fauna Sub-plan (M5N-ES-PLN-PWD-0007) and a Tree Report approved by DP&E 	Site supervisor Environmental advisor	Site establishment
WC25.		<ul style="list-style-type: none"> Equipment storage and laydown areas to be located in hardstand areas, outside the drip line of trees 	Project manager Site supervisor	Site operation
WC26.		<ul style="list-style-type: none"> Unexpected species finds to be managed in accordance with the Manage Flora and Fauna Procedure. 	Site supervisor Environmental advisor	Site operation

Site-specific AFMP: Tempe Reserve Grouting



SAMSUNG C&T

No.	Impact	Environmental safeguards	Responsibility	Timing
WC27.		<ul style="list-style-type: none"> If a threat to an animal is evident onsite, the Site supervisor and/or Environmental advisor must be notified immediately. Works may need to cease if the animal is in danger or harmed until it has been relocated. The handling of injured fauna must be carried out by licensed fauna handler such as fauna ecologist or wildlife carer. 	Site supervisor Environmental advisor	Site operation
WC28.		<ul style="list-style-type: none"> Weed and pathogen management and control will be undertaken in accordance with the project Construction Flora and Fauna Sub-Plan (M5N-ES-PLN-PWD-0007), including ensuring vehicles and machinery are clean prior to entering site 	Site supervisor Environmental advisor	Site operation
WC29.		<ul style="list-style-type: none"> Rehabilitation of site to occur at the completion of site operations to at least its pre-construction condition (refer Section 3.2.11), or as otherwise agreed with the landowner. 	Project Manager	At the completion of site operation
WC30.	Soil and Water	<ul style="list-style-type: none"> Erosion and sedimentation control plan (ESCP) to be developed for the site consistent with Managing Urban Stormwater – Soils and Construction Vols 1 and 2, 4th Edition (Landcom 2004). ESCP to include controls to protect waterway (Cooks River). 	Environmental advisor	Prior to site operation
WC31.		<ul style="list-style-type: none"> The assessment, classification and management of Potential and Actual Acid Sulfate Soils will be managed in accordance with the Acid Sulfate Soils Sub-plan, part of the Construction Soil and Water Quality Sub-Plan (M5N-ES-PLN-PWD-0005). 	Project Manager	Site operation
WC32.		<ul style="list-style-type: none"> Sediment controls to be inspected and maintained as necessary, including after rain 	Site supervisor Environmental advisor	Prior to site operation

Site-specific AFMP: Tempe Reserve Grouting



SAMSUNG C&T

No.	Impact	Environmental safeguards	Responsibility	Timing
WC33.		<p>The following measures are to be implemented where a forecast rainfall event poses a potential flood risk to the site:</p> <ul style="list-style-type: none"> • Grouting activities to cease, • Mobile equipment to be moved to higher ground or flood mitigated land (i.e. Arncliffe compound), • Non-mobile equipment to be appropriately secured, • Cement silo to be emptied and cement stores transferred to higher ground or flood mitigated land, • Septic tanks and holding tanks for waste water emptied. 	<p>Project Manager Site supervisor</p>	<p>Prior to rainfall event with potential flood risk</p>
WC34.		<p>The following measures to be in place to avoid and manage spills:</p> <ul style="list-style-type: none"> • No long-term storage of chemicals or hazardous substances on site • Any temporary storage of fuels, chemicals and other hazardous materials to be in appropriately secure and bunded areas in accordance with EPA guidelines • Spills or contaminated runoff would be captured and treated and / or disposed of at a licensed facility • Any re-fuelling and wash down would be undertaken in bunded areas to mitigate risks in relation to spills or leaks of fuels / oils or other hazardous onsite construction material • Any soil which has been contaminated with fuel, oils or other chemicals would be disposed as contaminated soil by a waste subcontractor. 	<p>Project manager Site supervisor Environmental advisor</p>	<p>Site operation</p>
WC35.		<ul style="list-style-type: none"> • In the event of a spill the Spill Management Procedure will be implemented. Emergency spill kits will be kept onsite and Project personnel would be aware of the location of spill kits and trained in their use. 	<p>Site supervisor Environmental advisor</p>	<p>Site operation</p>
WC36.	Visual amenity	<ul style="list-style-type: none"> • Site fencing to be maintained during site operation • Only approved areas of vegetation to be pruned/cleared 	<p>Project Manager Site supervisor Environmental advisor</p>	<p>Site operation</p>

Site-specific AFMP: Tempe Reserve Grouting



SAMSUNG C&T

No.	Impact	Environmental safeguards	Responsibility	Timing
WC37.		<ul style="list-style-type: none"> Cut-off and/or directed lighting would be used at the site with lighting location and direction considered to ensure glare and light spill are minimised. Lighting to be generally consistent with the requirements of Australian Standard 4282-1997 Control of the obtrusive effects of outdoor lighting. Any residual night lighting impacts to adjoining or adjacent properties to be managed in consultation with affected landowners. 	Project Manager	Site operation
WC38.	Air quality	<ul style="list-style-type: none"> Dust suppression measures to be incorporated into the Erosion and Sedimentation Control Plan for the site. 	Environmental advisor	Prior to site operation
WC39.		<p>Control emissions on site, including:</p> <ul style="list-style-type: none"> Ensure all construction vehicles comply with their relevant emission standards Ensure that, where practicable engine idling is minimised when vehicles are stationary Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable Promote and encourage sustainable travel (public transport, cycling, walking, and car-sharing) No bonfires and burning of any materials including waste. 	Project Manager Site supervisor	Site operation
WC40.	Waste	<ul style="list-style-type: none"> All liquid and/or non-liquid waste generated on the site must be assessed and classified in accordance with Waste Classification Guidelines (DECCW, 2009) or any superseding documents. 	Site supervisor Environmental advisor	Site operation
WC41.		<ul style="list-style-type: none"> All waste water generated on site will be removed and taken to the Arncliffe Construction Compound to be processed via ARN-2 (WTP). 	Site supervisor Environmental advisor	Site operation
WC42.		<ul style="list-style-type: none"> All waste materials removed from the site must only be directed to a waste management facility or premises lawfully permitted to accept the materials. 	Site supervisor Environmental advisor	Site operation

6. Consistency with existing project impacts and approvals

The use of the Tempe Reserve grouting site compound will assist in achieving the environmental objectives for the New M5 project as identified in the EIS, the CEMP and associated Sub-plans. The proposed facility is for the purpose of supporting additional surface-based grouting works, which are required to meet the groundwater infiltration criteria required by condition B26 of the Conditions of Approval and to reduce the risk of ground settlement above the tunnel in this location. Geotechnical studies undertaken during detailed design have identified the need for this additional grouting. The surface grouting is required so that:

1. The underground grouting program can proceed with high-pressure injections without having to first fill the larger fractures. This will reduce the number of holes and the pumping time needed for underground grouting.
2. The surface grout holes will approach the fractures at different angles to the underground grout holes. Horizontal fractures, in particular, can be grouted much more efficiently from the surface.

The impacts associated with the site, identified in Section 3.2, are considered to be minor, and consistent with the impacts identified in the New M5 EIS and other project approval documentation. The identified impacts can be appropriately managed through implementation of the management measures identified in Section 5 of this SSAFMP as well as those identified in the AFMP, the CEMP and the relevant Sub-plans.

Site-specific AFMP: Tempe Reserve Grouting

Appendix A: Ancillary Facility Application

Attachment 1: Ancillary Facility Application

Step 1 – Ancillary facilities information			
Site location (attach map for reference):		Tempe Recreation Reserve, Tempe.	
Date works to commence: March 2018		Date works to finish: May 2018	
Proposed activities (select all that apply):			
Office and amenities	x	Construction compound	x
Laydown area		Parking	x
Batch Plant	x	Materials storage compound	x
Maintenance workshop		Material stockpile area	
Other _____		Other _____	
Please provide details regarding the proposed ancillary facility.			
Is the proposed facility within the approved construction footprint?		No	
Distance to the nearest waterway?		Once rehabilitation of the grouting area adjacent to the river is complete, the closest point to the revised site layout will be approximately 45 m from Cooks River.	
Proposed access route?		Holbeach Avenue, Tempe.	
Do heavy vehicles need to travel through residential areas?		No. There are no residential areas located on Holbeach Avenue or adjacent to the proposed site.	
Is the proposed site on relatively level ground?		Yes. The revised site layout will be fully contained within the netball courts and carpark area.	
Distance to nearest residential receiver?		Approximately 350 m.	
Is vegetation clearance or trimming required? If so, what is the area in hectares?		No additional clearing is required for the revised site layout.	
Will the facility impact heritage?		No.	
Will the facility affect the land use of adjacent properties?		Use of the site would have temporary impacts on users of the recreational and sporting facilities surrounding the site. However the use is not expected to unreasonably affect the land use of adjacent properties.	
Is the facility above the 20 ARI flood level?		The netball court area is within the 20 ARI flood level. The carpark area is above this flood level.	

Will out of hours works be required to establish facility? During operation of the facility?	No.
Potential noise and vibration impacts?	Some impacts would be experienced by users of the recreational reserve and netball courts during construction hours.
Potential dust or odour impacts?	Minor impacts may occur. All work areas are a hardstand/bitumen surface. Dust suppression will be used as required.
Potential visual or light spill impacts?	Temporary and minor visual impacts are anticipated due to grouting plant and equipment located at the site, grouting activities and fencing.
Potential waste management impacts?	In addition to wastewater generation, described below, some general construction waste will also be generated at the site. All general waste will be removed via a licenced contractor overseen by CDS-JV.
Potential soil and water impacts?	Yes. Wastewater will be generated as a result of the grouting activities. Wastewater will be transferred to the Arncliffe Water Treatment Plant for treatment prior to discharge. Potential and/or actual acid sulphate soils may be encountered. There is also potential for spills and/or leaks of chemicals or other substances. These potential impacts will be managed in accordance with the Construction Soil and Water Quality Sub-plan and an ESCP to be developed and implemented.

Step 2 – Environmental and Sustainability Manager Review	
Is additional assessment required (e.g. noise, biodiversity, heritage)?	An additional noise and vibration assessment has been conducted.
Is the proposed facility compliant with CoA D62 criteria?	No.
Is the ancillary facility included in the EIS?	No.
Does the ancillary facility have minimal amenity impacts to surrounding residences?	Yes.
Does the ancillary facility have minimal environmental impact?	Yes.
Can potential impacts be managed through existing controls identified in the CEMP?	Yes.

Step 3 - Sign off

Surface Works / Tunnel / M&E D&C Director

Community Relations Manager

Environmental and Sustainability Manager

Step 4 - Environmental Representative sign off

Is this a minor ancillary facility (CoA D64)?	No
Does this ancillary facility require DP&E approval?	Yes
Does the AFMP need to be updated?	No

Site-specific AFMP: Tempe Reserve Grouting

Appendix B: Evidence of consultation

Site-specific AFMP: Tempe Reserve Grouting

Appendix C: Construction Noise and Vibration Impact Statement

WESTCONNEX NEW M5

Construction Noise and Vibration Impact Statement: Arncliffe Surface Grouting

22 February 2018

CPB Dragados Samsung Joint Venture

TH014-10 01F01 WCX_NM5 CNVIS ARN Grout (r6)

Document details

Detail	Reference
Doc reference:	TH014-10 01F01 WCX_NM5 CNVIS ARN Grout (r6)
Prepared for:	CPB Dragados Samsung Joint Venture
Address:	Level 6, Building B 201 Coward Street, Mascot, NSW
Attention:	██████████

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Authorised
25.11.2016	Draft report	0	1	JB	TG	TG
9.01.2017	Final report	-	2	TG	TG	TG
18.01.2017	Minor amendments	-	3	TG	TG	TG
20.03.2017	Respond to DPE comments	-	4	TG	TG	TG
08.09.2017	Update with additional location (Phase 4A)	-	5	ALe	ALe	MG
22.02.2018	Update to location of Phase 4 works		6	RP	RP	RP

Important Disclaimer:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

This document is issued subject to review and authorisation by the Team Leader noted by the initials printed in the last column above. If no initials appear, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

This document is prepared for the particular requirements of our Client referred to above in the 'Document details' which are based on a specific brief with limitations as agreed to with the Client. It is not intended for and should not be relied upon by a third party and no responsibility is undertaken to any third party without prior consent provided by Renzo Tonin & Associates. The information herein should not be reproduced, presented or reviewed except in full. Prior to passing on to a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.

In preparing this report, we have relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, we have not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

Contents

1	Introduction	1
1.1	Relevant requirements and purpose of this CNVIS	1
1.2	Structure of this CNVIS	1
1.3	Quality assurance	1
2	Description of construction works and hours	2
2.1	Summary of works addressed in this CNVIS	2
2.2	Construction hours	2
2.3	Construction traffic	3
3	Nearest sensitive receivers	4
3.1	Residential receivers	4
3.2	Other sensitive receivers	4
4	Construction noise and vibration objectives	6
4.1	Noise management levels	6
4.2	Vibration goals	6
4.2.1	Disturbance to building occupants (human annoyance)	7
4.2.2	Structural damage to buildings	7
4.3	Construction related road traffic noise objectives	8
5	Construction noise assessment	9
5.1	Noise prediction methodology	9
5.2	Predicted noise levels	9
5.3	Noise mitigation and management	11
5.3.1	Other noise control measures	11
5.3.2	Additional noise mitigation measures	11
5.3.3	Attended noise monitoring	12
5.3.4	Complaints handling	13
6	Construction vibration impacts	14
6.1	Vibration assessment	14
7	Conclusion	15
	References	16
APPENDIX A	Glossary of terminology	17
APPENDIX B	Nearest sensitive receivers and noise management levels	22
APPENDIX C	Construction timetable/ activities/ management	25
APPENDIX D	Detailed predicted noise levels	29
APPENDIX E	Additional noise mitigation	32
E.1	Letterbox drop notification	32
E.2	Verification monitoring	32

E.3	Specific notifications	32
E.4	Respite offer	33
E.5	Alternative accommodation	33
E.6	Summary of additional mitigation measures	33

List of tables

Table 2.1:	Construction hours	2
Table 3.1:	Nearest residential noise and vibration sensitive receivers	4
Table 3.2:	Nearest non-residential noise and vibration sensitive receivers	4
Table 4.1:	Construction Vibration Disturbance Goals	7
Table 4.2:	DIN 4150-3 Structural Damage Criteria	8
Table 5.1:	Summary of construction noise impacts	10
Table 5.2:	Site noise control measures	11
Table 5.3:	Additional airborne noise mitigation measures	12
Table 5.4:	Nominated verification monitoring locations	12

1 Introduction

This Construction Noise and Vibration Impact Statement (CNVIS) has been prepared on behalf of CPB Contractors Dragados Samsung Joint Venture (CDS JV) to support a Consistency Review of the Environmental Impact Statement for the WestConnex New M5 Project, considering the surface grouting works at Arncliffe.

This CNVIS has been prepared in accordance with the Construction Noise and Vibration Management Plan (CNVMP) [TH014-05 01F01 WCX_NM5 CNVMP] [1] for the construction of the WestConnex New M5 Project (New M5 or Project).

1.1 Relevant requirements and purpose of this CNVIS

This CNVIS applies to surface grouting works at Arncliffe during standard construction hours. The construction hours of work for the surface grouting works are defined by the Project Conditions of Approval (CoAs) as outlined in the CNVMP.

This CNVIS may be submitted to the Department of Environment and Planning (DEP) forming part of the CNVMP for the Project if the department requests it.

1.2 Structure of this CNVIS

This CNVIS is structured as follows:

- **Section 2** - Description of construction works and hours
- **Section 3** - Nearest sensitive receivers
- **Section 4** - Construction noise and vibration objectives
- **Section 5** - Construction noise assessment
- **Section 6** - Construction vibration impacts

1.3 Quality assurance

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Description of construction works and hours

2.1 Summary of works addressed in this CNVIS

This CNVIS provides an assessment of noise and vibration impacts from activities associated with surface grouting works at Arncliffe for the New M5 Motorway. There are four phases of surface grouting works at Arncliffe:

- Phase 1: surface grouting at the Arncliffe (C7) Compound
- Phase 2: surface grouting under Marsh Street, completed from the Arncliffe (C7) Compound
- Phase 3: surface grouting at Cahill Park (3a) and adjacent to St George Rowers Club (3b), on the southern shore of the Cooks River
 - Mixing grout
 - Drilling grout holes
 - Grouting holes
- Phase 4 + Phase 4A: Surface Grouting at Tempe Reserve, on the northern shore of the Cooks River
 - Mixing grout
 - Drilling grout holes
 - Grouting holes

Phase 1 and 2 surface grouting works were approved as part of the Project. Assessment of these works were included in the Site Establishment CNVIS (ref: TH014-05 01F02 WCX_NM5 CNVIS Site Establishment) hence have not been included in this CNVIS. Site establishment works for the Phase 3 and 4/4A surface grouting works will not involve significant construction works. Plant and equipment associated with the grouting works will be mobilised on site. These activities are insignificant compared to the main works and are not addressed further.

2.2 Construction hours

The construction hours for the Project are defined by Conditions of Approval D12, D13, D14, and D15. D15 applies to all construction works other than tunnelling (and tunnel support) work and outlines the out-of-hours work periods (as indicated in Table 2.1).

Table 2.1: Construction hours

Reference	Construction activity	Monday to Friday	Saturday	Sunday/ public holiday
Recommended standard construction hours				
D12	Standard Construction	7am to 6pm	8am to 1pm	No work
D13	Tunnelling (and tunnel support)	24 hours	24 hours	24 hours

Reference	Construction activity	Monday to Friday	Saturday	Sunday/ public holiday
D14	Construction activities with impulsive or tonal noise emissions	8am to 6pm [^]	8am to 1pm [^]	No work
Outside recommended standard construction hours				
D15 and TfNSW CNS*	Out-of-Hours Work (OOHW) Period 1	6pm to 10pm	7am to 8am 1pm to 10pm	8am to 6pm
	Out-of-Hours Work (OOHW) Period 2	10pm to 7am	10pm to 7am	6pm to 8am

Notes: [^] In continuous blocks not exceeding three hours each with a minimum respite from those activities and works of not less than one hour between each block in accordance with D14 (see CNVMP Section 3.2.3)

* Transport for NSW Construction Noise Strategy (ref: 7TP-ST-157/2.0) April 2012

The out-of-hours work (OOHW) period is defined in Table 2.1 as OOHW Period 1 and 2. The standard construction hours of work are also summarised in the table above, as are the admissible hours for tunnelling (including tunnel support) and for activities resulting in impulsive or tonal noise emissions (e.g. rock hammering, sheet piling etc.).

2.3 Construction traffic

Construction traffic associated with the surface grouting works at Arncliffe is noted in Table C1 (APPENDIX C) of this report. There is expected to be two heavy vehicles per day (one for cement delivery and one for waste water removal) and 25 light vehicles per day to and from site. This level of traffic is considered insignificant and is not addressed in this CNVIS.

3 Nearest sensitive receivers

3.1 Residential receivers

To assess and manage construction noise and vibration impact, the residential areas surrounding the Project have been divided into Noise Catchment Areas (NCAs) based on each area's similar acoustic environment prior to the commencement of construction works. The NCAs have been based on those established in the EIS for the New M5 project [2], with some modifications to allow for site specific characteristics.

An indicative list of the nearest and potentially worst affected noise and vibration sensitive receivers and their respective NCAs are summarised in Table 3.1 below.

Table 3.1: Nearest residential noise and vibration sensitive receivers

NCA	Approx. number of receivers in NCA			Nearest residential receiver address	Approx. distance receiver boundary to works
	Residential	Other	C/I		
NCA12	115	0	5	26-32 Marsh Street, Wolli Creek	20m
TWX08	120	0	0	2 Station Street, Tempe	410m

Notes: 'Other' refers to 'other sensitive receivers', including but not limited to educational facilities (schools, child care centres), places of worship, recreation areas
'C/I' refers to 'commercial/ industrial' facilities

All relevant residential sensitive receivers near the worksite are identified on aerial photographs located in APPENDIX B. At receivers more than approximately 500m from the construction area, potential construction noise and vibration levels are expected to be within the adopted noise and vibration management levels described in Section 4 of this CNVIS. Receivers beyond 500m are typically not included in this CNVIS assessment.

3.2 Other sensitive receivers

In addition to residential receivers, there are 'other' noise and vibration sensitive receivers (e.g. educational institutions, places of worship, recreational areas, etc.) surrounding the construction site that have been identified and are summarised in Table 3.2.

Table 3.2: Nearest non-residential noise and vibration sensitive receivers

Land use	Other sensitive receiver address	Approx. distance to worksite
Accommodation	Quality Hotel CKS Sydney Airport, 34-42 Innesdale Road, Wolli Creek	190m
Accommodation	Mercure Sydney International Airport, 22 Levey Street, Wolli Creek	60m
Commercial	St George Rowing Club, 1 Levey Street, Wolli Creek	10m
Commercial	Kogarah Golf Course Clubhouse, 19 Marsh Street, Arncliffe	90m
Commercial	2 West Botany Street, Arncliffe	450m

Land use	Other sensitive receiver address	Approx. distance to worksite
Recreational - Active	Robyn Webster Sports Centre (indoor sports facility), Holbeach Ave, Tempe	5m
Recreational - Active	Robyn Webster Sports Centre, Netball facilities, Holbeach Ave, Tempe	5m – 100m
Recreational - Active	Tempe Recreation Reserve (Ovals and Sydney Model Autosports)	100m – 300m
Childcare Centre	Guardian Early Learning Centre, 18 Holbeach Ave, Tempe	380m

All relevant 'other' sensitive receivers near the worksite are identified on aerial photographs located in APPENDIX B. Beyond approximately 500m from the construction area, potential construction noise and vibration levels are expected to be well within the adopted noise and vibration objectives as described in Section 4 of this CNVIS.

4 Construction noise and vibration objectives

4.1 Noise management levels

Construction noise management levels have been determined using the NSW Interim Construction Noise Guideline (ICNG) [3].

Table B1 in APPENDIX B identifies the adopted construction noise management levels (NMLs) for the nearest noise sensitive receivers to the worksite. The NMLs for residential receivers are based on long-term noise logging conducted by AECOM on behalf of Sydney Motorway Corporation (SMC) to quantify ambient noise levels for the Environmental Impact Statement (EIS) [2].

Additional pre-construction noise monitoring was carried out to establish more accurate noise goals for the updated Noise Catchment Areas (NCAs) around the construction compounds. Long-term, unattended noise monitoring was carried out between 16th to 30th June 2016. The results of the noise monitoring are documented in the Additional Noise Monitoring Report [ref: TH014-05 01F16 WXC_M5 Additional Monitoring (r1) dated 2016.07.04] [4].

The NMLs for 'other' sensitive receivers are from the ICNG, as reported in Section 4.2 of the CNVMP.

Residential receivers are considered 'noise affected' where construction noise levels are greater than the noise management levels identified in APPENDIX B. The noise affected level represents the point above which there may be some community reaction to noise. Where predicted and/or measured construction noise levels exceed NMLs, all feasible and reasonable work practices will be applied to meet the NMLs.

During standard construction hours a highly affected noise objective of $L_{Aeq(15min)} 75dB(A)$ applies at all receivers.

In addition to the objectives identified in APPENDIX B, where construction activities are tonal or impulsive in nature and are described in the ICNG as being particularly annoying, a +5dB(A) correction must be added to the activity noise, in accordance with the Condition of Approval D14. Activities that are defined in the ICNG as particularly annoying include, but are not limited to the use of 'beeper' style reversing or movement alarms; power saws; vibratory rolling; jack hammering, rock hammering or rock breaking; impact piling.

Any construction related activities that could exceed the NMLs shall be identified and managed in accordance with the CNVMP.

4.2 Vibration goals

As reported in Section 4.3 of the CNVMP, construction vibration goals have been determined in accordance with D16(c) and D16(e) as follows:

- **Human annoyance** - the acceptable vibration values set out in the NSW 'Environmental Noise Management Assessing Vibration: A Technical Guideline' (Department of Environment and Conservation, 2006) [5]; and
- **Structural damage** - the vibration limits set out in the German Standard DIN 4150: Part 3-1999.02 'Structural vibration in buildings - Effects of vibration on structures' [6].

4.2.1 Disturbance to building occupants (human annoyance)

For disturbance to human occupants of buildings, we refer to the NSW 'Assessing Vibration; a technical guideline' [5], in accordance with D16(b). This document provides criteria which are based on the British Standard BS 6472-1992, 'Evaluation of human exposure to vibration in buildings (1-80Hz)' [7].

Intermittent vibration is assessed using vibration dose values (VDVs). For the assessment of potential vibration at the nearest vibration sensitive receivers preferred and maximum VDV goals for the day period (7:00am to 10:00pm) are presented in Table 4.1.

Table 4.1: Construction Vibration Disturbance Goals

Location	Assessment period ¹	Vibration Dose Value (VDV), m/s ^{1.75}	
		Preferred values	Maximum values
Critical areas ²	Day or Night	0.10	0.20
Residences	Day	0.20	0.40
	Night	0.13	0.26
Offices, schools, educational institutions and places of worship	Day or Night	0.40	0.80
Workshops	Day or Night	0.80	1.60

Notes: 1. Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am

2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas. Source: BS 6472-1992

4.2.2 Structural damage to buildings

Currently there exists no Australian Standard for assessment of structural building damage caused by vibrational energy. Therefore, reference is made to the German Standard below which is relevant to the assessment of structural damage, in accordance with D16(c).

The German Standard DIN 4150: Part 3-1999.02 'Structural vibration in buildings - Effects of vibration on structures' [6], provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration. This standard too, presents recommended maximum limits over a range of frequencies measured in any direction at the foundation or in the plane of the uppermost floor of buildings.

The minimum 'safe limit' of vibration at low frequencies for commercial and industrial buildings is 20mm/s. For dwellings it is 5mm/s and for particularly sensitive structures (e.g. historical with

preservation orders etc.) it is 3mm/s. These limits are generally recognised to be conservatively stringent and are presented in terms of velocity peak levels in Table 4.2 below.

Table 4.2: DIN 4150-3 Structural Damage Criteria

Group	Type of Structure	Vibration Velocity, mm/s			
		At Foundation at Frequency of			Plane of Floor Uppermost Storey
		1 to 10 Hz	10 to 50Hz	50 to 100Hz ¹	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Group 1 or 2 and have intrinsic value (e.g. buildings under a preservation order)	3	3 to 8	8 to 10	8

Note: ¹ At frequencies above 100 Hz, the values given in this column may be used as minimum values

4.3 Construction related road traffic noise objectives

On the roads immediately adjacent to construction sites, the community may associate heavy vehicle movements with the New M5 Project works. Construction traffic movements on public roads shall aim to limit any increase in existing road traffic noise levels to no more than 2dB(A). All feasible and reasonable noise mitigation and management measures shall be implemented.

5 Construction noise assessment

5.1 Noise prediction methodology

Modelling and assessment of airborne noise impacts from activities associated with the construction works were determined by modelling the noise sources, receiver locations, topographical features, and possible noise mitigation measures using a Cadna-A computer noise model developed for this project. The model calculates the contribution of each noise source at identified sensitive receiver locations and allows for the prediction of the total noise from a site for the various stages of the construction works.

The noise prediction models consider:

- Location of noise sources and sensitive receiver locations.
- Height of sources and receivers referenced to one metre digital ground contours for the site area and surrounding area.
- Sound Power Levels (L_w) of plant and equipment likely to be used during the various construction activities (see Table C1 in APPENDIX C). Table C1 also identifies the plant and equipment that will be operating during standard construction hours and outside of standard construction hours.
- Separation distances between sources and receivers.
- Ground type between sources and receivers.
- Attenuation from barriers (natural and purpose built).

Key details regarding the construction site layout, the likely plant and equipment (including truck movements), and hours of operation were informed by the Design and Construction Teams. This information is presented in APPENDIX C and formed the basis for all modelling assumptions used in this assessment.

5.2 Predicted noise levels

Noise emissions were determined by modelling the noise sources, receiver locations, and operating activities, based on the information presented in APPENDIX C. Predicted L_{Aeq} noise levels from the sites are presented in APPENDIX D for all receivers in each NCA. The predictions are representative of noise levels during the works.

The surface grouting works includes the following activities:

- Phase 3 - grouting works south of Cooks River
- Phase 4 - grouting works north of Cooks River
- Phase 3 and Phase 4 - grouting works on both sides of Cooks River simultaneously

- Phase 3, Phase 4 and Phase 4A - grouting works on both sides of Cooks River simultaneously

Table 5.1 below summarises the predicted impacts for each construction stage in each NCA in terms of compliance with the NMLs. The colours in the table indicate whether receivers in the NCA comply with the NML and, where exceedance of the NML occurs, the perceived impact of the exceedance.

The impacts presented are as follow for **Standard Hours**:

- ◆ Complies with NML
- ◆ < 10dB(A) above NML - construction noise clearly audible
- ◆ > 10dB(A) above NML - construction noise clearly moderately intrusive
- ◆ > 75dB(A) - highly noise affected

Table 5.1: Summary of construction noise impacts

NCA	Level of compliance with NML			
	Phase 3	Phase 4	Phase 3 + 4	Phase 3 + 4 + 4A
	Day	Day	Day	Day
NCA12	◆	◆	◆	◆
TWX08	◆	◆	◆	◆

In NCA12, noise may affect one residence by up to 8 dB(A) above the day time NML. All other residential receivers are predicted to comply with the NMLs.

The St George rowing club may be highly noise affected at some points during the works.

Phase 4A will take up two existing netball courts at the Robyn Webster Sports Centre. The predicted noise levels show that the indoor sport facility and the nearby netball courts may be highly noise affected (>75 dB(A)) during periods of the works. These high noise levels may impede the usage of both the indoor sport facility and the netball courts, and as such these facilities should be consulted in regards to coordination of the Phase 4A works. The actual noise impacts on these facilities will vary depending upon how close the works are to these areas.

All other sensitive receivers are predicted to comply with their respective criteria.

Cumulative noise from the C7 site is unlikely to significantly alter predicted noise from grouting operations (i.e. less than 2 dB(A) increase at the worst cumulatively affected receiver).

For more detailed predictions see APPENDIX D.

Measures for managing the noise impacts are provided in Section 5.3.2.

5.3 Noise mitigation and management

5.3.1 Other noise control measures

The following at-source control measures are recommended to reduce potential noise impacts:

Table 5.2: Site noise control measures

Control type	Control measure	Typical use
At-Source Control Measures	Noise control kits	Plant that is brought to site should meet the sound power limits identified in Table C1. Where plant exceeds limits then the plant may require installation of 'noise control kits' to comply with the noise limits set in Table C1. Such 'noise control kits' comprise: <ul style="list-style-type: none"> • high performance 'residential-grade' exhaust mufflers, • additional engine cowling / enclosure lined inside with sound absorbent industrial-grade foam, and • air intake and discharge silencers / louvres. The requirement of fitting 'noise control kits' onto the identified plant, shall be confirmed once each plant is tested prior to its regular use on site.
	Timing of equipment in use	Where practicable, activities and plant will be limited as outlined in Table C1 (APPENDIX C).
	Limit activity duration	Any equipment not in use for extended periods shall be switched off. For example, heavy vehicles should switch engines off when not in use.
	Use and siting of plant	Avoid/ limit simultaneous operation of noisy plant and equipment within discernible range of a sensitive receiver. Direct noise-emitting plant away from sensitive receivers where practicable. Locate fixed location plant items as far from sensitive receivers as practicable.
	Equipment selection	Use quieter and less noise/ vibration emitting construction methods where feasible and reasonable.
	Non-tonal reversing alarms	Alternatives reverse alarm, such as 'quackers' will be installed on all plant and equipment, where practicable.
Noise Management Measures	Site inductions & Toolbox Talks	All employees, contractors and subcontractors are to receive a Project induction. The environmental component may be covered in toolboxes and should include: <ul style="list-style-type: none"> • location of nearest sensitive receivers • relevant project specific and standard noise and vibration mitigation measures; • construction employee parking areas.
	Community consultation	Inform community of construction activity and potential impacts.
	Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.
	Noise monitoring	Noise monitoring is to be carried out as detailed in Section 5.3.3.

5.3.2 Additional noise mitigation measures

Table 5.3 below should be used to advise the appropriate additional mitigation during construction, based on the Transport for New South Wales Construction Noise Strategy (TfNSW CNS) [8].

Table 5.3: Additional airborne noise mitigation measures

Construction hours	Predicted airborne $L_{Aeq(15min)}$ noise level at receiver			Additional mitigation measures	Additional mitigation measure code
	Receiver perception	dB(A) above RBL	dB(A) above NML		
Standard Hours	Noticeable	5 to 10	0	-	-
	Clearly Audible	10 to 20	≤ 10	-	-
	Moderately intrusive	20 to 30	10 to 20	LB, V	AM2
	Highly intrusive	> 30	> 20	LB, V	AM2
	75dBA or greater	N/A	N/A	LB, SN, V	AM3
OOHW Period 1	Noticeable	5 to 10	≤ 5	-	-
OOHW Shoulder	Clearly Audible	10 to 20	5 to 15	LB	AM1
	Moderately intrusive	20 to 30	15 to 25	LB, V	AM2
	Highly intrusive	> 30	> 25	LB, SN, RO, V	AM4
OOHW Period 2	Noticeable	0 to 10	< 5	LB	AM1
	Clearly Audible	10 to 20	5 to 15	LB, V	AM2
	Moderately intrusive	20 to 30	15 to 25	LB, SN, V	AM3
	Highly intrusive	> 30	> 25	LB, SN, AA, V	AM5

Notes:

LB = Letter box drops

V = Verification of predicted noise level

SN = Specific notification,
Individual briefings, or Phone callRO = Project specific respite offer
AA = Alternative accommodation

APPENDIX E presents a summary of the additional noise mitigation measures applicable for construction activities where, after application of all reasonable and feasible mitigation options, construction noise levels still exceed the NMLs.

Prior to the commencement of works, residential receivers around the site, identified in APPENDIX E, will be notified to advise that noise from the works may at times be audible. All potentially impacted receivers will be kept informed of the nature of works to be carried out, the expected noise levels and duration, as well as be given appropriate enquiries and complaints contact details (see Section 5.3.4).

5.3.3 Attended noise monitoring

Attended noise monitoring is to be undertaken to verify that noise levels resulting from construction works are in accordance with the levels predicted in this CNVIS, subject to obtaining the property owner/occupier's consent to access the property (where required).

Attended noise monitoring will be undertaken during works at one (1) of the representative residential receivers identified in the table below in the NCAs most impacted by the works (i.e. a minimum of 1 location for each NCA).

Table 5.4: Nominated verification monitoring locations

NCA	Nominated receiver address	Monitoring location
NCA12	24 Levey Street, Wollie Creek	Grassy area in front of building
OSR	Robyn Webster Sports Centre	Adjacent to western facade

APPENDIX E identifies the activities where monitoring should be carried out for each NCA.

Noise monitoring should follow the procedures outlined in Appendix H of the CNVMP. Note that monitoring at all properties may be undertaken from the property boundary to limit any inconvenience to property owners.

5.3.4 Complaints handling

Noise complaints received and responded to will be managed in accordance with the CNVMP, the Community Communication Strategy and Construction Complaints Management System.

Sydney Motorway Corporation (SMC) operate a 24-hour construction complaints line (1800 660 248). Enquiries/ complaints may also be received through the New M5 project email (info@westconnex.com.au).

6 Construction vibration impacts

6.1 Vibration assessment

There is no significant vibration generating equipment to be used in the surface grouting works at Arncliffe based on the plant and equipment listed in APPENDIX C, Table C1, and the nearest residential receiver is more than 20m away from the works. The nearest sensitive receiver, being the St George Rowing Club, is approx. 10m from the grouting works. Vibration generated by a drill rig at 10 m is predicted to be less than 1mm/s (ppv).

Adverse impact from vibration is predicted to be very low risk and vibration is not further addressed in this report.

7 Conclusion

In conclusion, construction works associated with the Arncliffe surface grouting works have been identified and described in this report. The potentially affected noise sensitive receivers and relevant construction noise objectives have been identified and discussed to allow the assessment of potential construction noise impacts.

The expected construction noise levels have been predicted and presented in Section 5.2 and APPENDIX D. Noise levels will comply with the noise objectives, except for the noted exceedances arising from the activity occurring and the location, type, and number of plant items operating. Predicted noise levels are generally consistent with the predicted construction noise levels in the Environmental Impact Statement.

Noise mitigation and management measures have been presented in Section 5.3 to aid in providing additional noise reduction benefits where exceedance of the objective occurs.

Vibration impacts and management measures have been presented in Section 6 to aid in minimising any potential vibration impacts.

References

1. WestConnex New M5 Construction Noise and Vibration Management Plan (TH014-05 01F01 WCX_NM5 CNVMP)
2. AECOM Australia Pty Ltd 2015 WestConnex The New M5 project - Technical Working Paper: Noise and Vibration Revision 8 – 20-Nov-2015
3. Department of Environment and Climate Change 2009 NSW Interim Construction Noise Guideline (ICNG),
4. Additional Noise Monitoring Report (TH014-05 01F16 WXC_M5 Additional Monitoring (r1) dated 2016.07.04)
5. Department of Environment Conservation NSW 2006 Assessing Vibration; a technical guideline
6. German Standard DIN 4150-3: 1999-02, Structural vibration - Effects of vibration on structures, February 1999
7. British Standard BS 6472-2008, Evaluation of human exposure to vibration in buildings (1-80Hz)
8. Transport for NSW Construction Noise Strategy (ref: 7TP-ST-157/2.0) April 2012
9. Construction Noise and Vibration Impact Statement: Tunnelling (TH014-06 01F20 WCX_NM5 Tunnelling (r3), dated September 12, 2016)

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Absorption Coefficient α	The absorption coefficient of a material, usually measured for each octave or third-octave band and ranging between zero and one. For example, a value of 0.85 for an octave band means that 85% of the sound energy within that octave band is absorbed on coming into contact with the material. Conversely, a low value below about 0.1 means the material is acoustically reflective.
Adverse weather	Weather effects that enhance noise (particularly wind and temperature inversions) occurring at a site for a significant period of time. In the NSW INP this occurs when wind occurs for more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of nights in winter.
Active recreation	Active recreation area, characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion, e.g. school playground, golf course
Air-borne noise	Noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise source and receiver.
Alternate Solution	An Alternative Solution is a design that complies with the relevant Performance Requirements of the National Construction Code other than by using Deemed-to-Satisfy Provisions.
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Amenity	A desirable or useful feature or facility of a building or place.
AS	Australian Standard
Assessment period	The time period in which an assessment is made. e.g. Day 7am-6pm, Evening 6pm-10pm, Night 10pm-7am.
Assessment Point	A location at which a noise or vibration measurement is taken or estimated.
Attenuation	The reduction in the level of sound or vibration.
Audible Range	The limits of frequency which are audible or heard as sound. The normal hearing in young adults detects ranges from 20 Hz to 20 kHz, although some people can detect sound with frequencies outside these limits.
A-weighting	A filter applied to the sound recording made by a microphone to approximate the response of the human ear.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the LA90 noise level if measured as an overall level or an L90 noise level when measured in octave or third-octave bands.
Barrier (Noise)	A natural or constructed physical barrier which impedes the propagation of sound and includes fences, walls, earth mounds or berms and buildings.
Berm	Earth or overburden mound.
Buffer	An area of land between a source and a noise-sensitive receiver and may be an open space or a noise-tolerant land use.
Bund	A bund is an embankment or wall of brick, stone, concrete or other impervious material, which may form part or all of the perimeter of a compound.
BS	British Standard
CoRTN	United Kingdom Department of Environment entitled "Calculation of Road Traffic Noise (1988)"

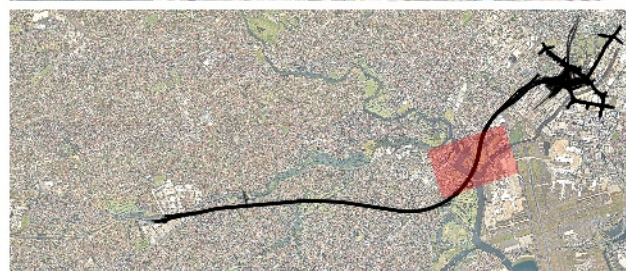
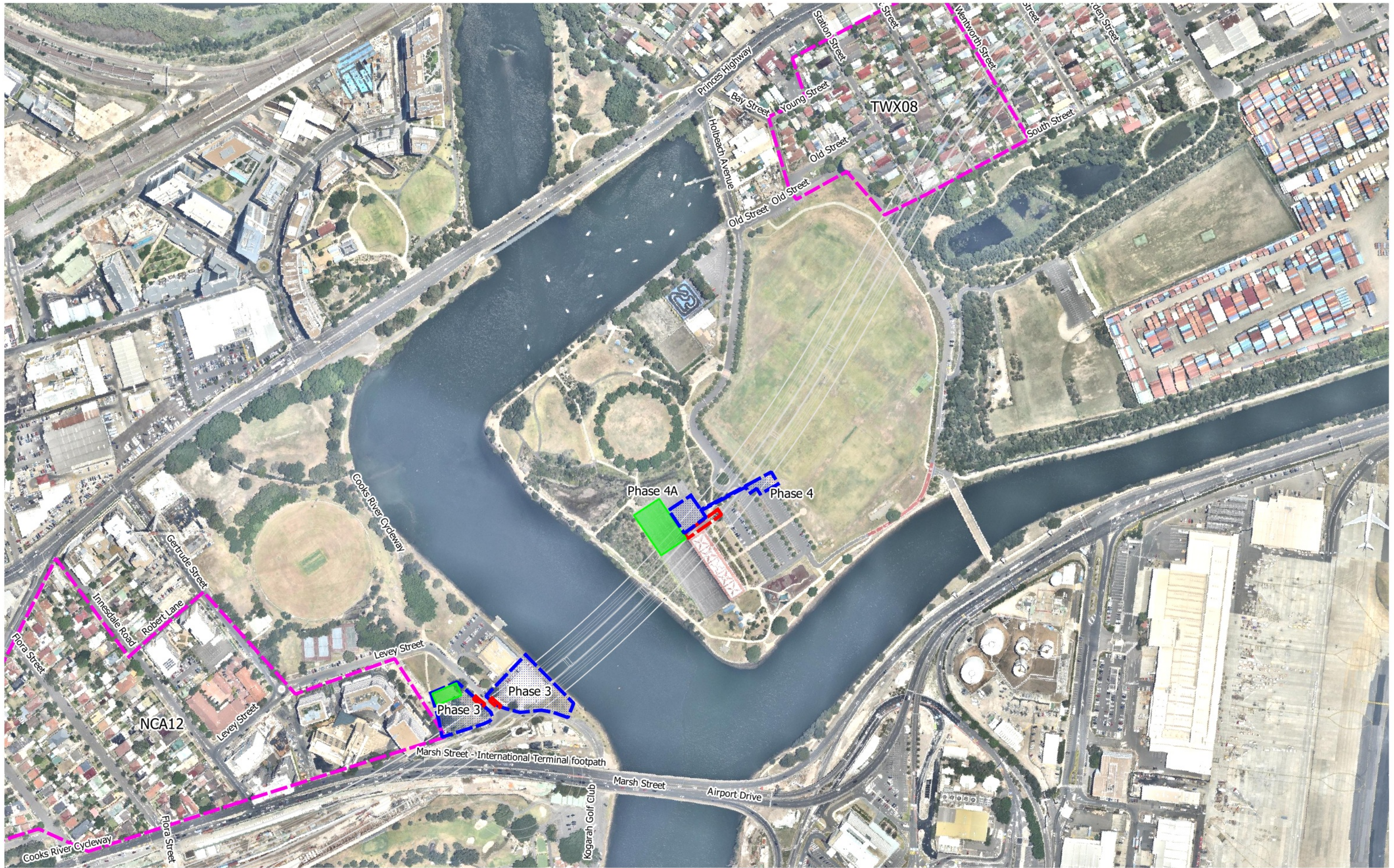
Decibel [dB]	<p>The units of sound measurement. The following are examples of the decibel readings of every day sounds:</p> <p>0dB The faintest sound we can hear, defined as 20 micro Pascal</p> <p>30dB A quiet library or in a quiet location in the country</p> <p>45dB Typical office space. Ambience in the city at night</p> <p>60dB CBD mall at lunch time</p> <p>70dB The sound of a car passing on the street</p> <p>80dB Loud music played at home</p> <p>90dB The sound of a truck passing on the street</p> <p>100dB The sound of a rock band</p> <p>115dB Limit of sound permitted in industry</p> <p>120dB Deafening</p>
dB(A)	<p>A-weighted decibel. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter is denoted as dB(A). Practically all noise is measured using the A filter.</p>
dB(C)	<p>C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies. The dB(C) level is not widely used but has some applications.</p>
Diffraction	<p>The distortion of sound waves caused when passing tangentially around solid objects.</p>
DIN	<p>German Standard</p>
DnT,w	<p>Weighted Standardised Field Level Difference</p> <p>A measure of sound insulation performance of a building element. It is characterised by the difference in noise level on each side of a wall or floor. It is measured in-situ.</p> <p>It is a field measurement that relates to the R_w laboratory measured value but is not equal to it because an in-situ space is not of the same quality as a laboratory space.</p> <p>The value is indicative of the level of speech privacy between spaces. The higher its value the better the insulation performance.</p>
ECRTN	<p>Environmental Criteria for Road Traffic Noise, NSW, 1999</p>
EPA	<p>Environment Protection Authority</p>
Field Test	<p>A test of the sound insulation performance in-situ. See also 'Laboratory Test'</p> <p>The sound insulation performance between building spaces can be measured by conducting a field test, for example, early during the construction stage or on completion.</p> <p>A field test is conducted in a non-ideal acoustic environment. It is generally not possible to measure the performance of an individual building element accurately as the results can be affected by numerous field conditions.</p>
Fluctuating Noise	<p>Noise that varies continuously to an appreciable extent over the period of observation.</p>
Free-field	<p>An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5m from any acoustic reflecting structures other than the ground.</p>
Frequency	<p>Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.</p>
Ground-borne noise	<p>Vibration propagated through the ground and then radiated as noise by vibrating building elements such as wall and floor surfaces. This noise is more noticeable in rooms that are well insulated from other airborne noise. An example would be vibration transmitted from an underground rail line radiating as sound in a bedroom of a building located above.</p>

Habitable Area	Includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room, home theatre and sunroom. Excludes a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods.
Heavy Vehicle	A truck, transporter or other vehicle with a gross weight above a specified level (for example: over 8 tonnes).
Impact Noise	The noise in a room, caused by impact or collision of an object onto the walls or the floor. Typical sources of impact noise are footsteps on the floor above a tenancy and the slamming of doors on cupboards mounted on the common wall between tenancies.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
INP	NSW Industrial Noise Policy, EPA 1999
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
Intrusive noise	Refers to noise that intrudes above the background level by more than 5dB(A).
ISEPP	State Environmental Planning Policy (Infrastructure), NSW, 2007
ISEPP Guideline	Development Near Rail Corridors and Busy Roads - Interim Guideline, NSW Department of Planning, December 2008
L1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L10	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L10(1hr)	The L10 level measured over a 1-hour period.
L10(18hr)	The arithmetic average of the L10(1hr) levels for the 18-hour period between 6am and 12 midnight on a normal working day.
L90	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
LAeq or Leq	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time, which would produce the same energy as a fluctuating sound level. When A-weighted, this is written as the LAeq.
LAeq(1hr)	The LAeq noise level for a one-hour period. In the context of the NSW EPA's Road Noise Policy it represents the highest tenth percentile hourly A-weighted Leq during the period 7am to 10pm, or 10pm to 7am (whichever is relevant).
LAeq(8hr)	The LAeq noise level for the period 10pm to 6am.
LAeq(9hr)	The LAeq noise level for the period 10pm to 7am.
LAeq(15hr)	The LAeq noise level for the period 7am to 10pm.
LAeq (24hr)	The LAeq noise level during a 24-hour period, usually from midnight to midnight.
Lmax	The maximum sound pressure level measured over a given period. When A-weighted, this is usually written as the L _{Amax} .
Lmin	The minimum sound pressure level measured over a given period. When A-weighted, this is usually written as the L _{Amin} .
Ln,w	Weighted Normalised Impact Sound Pressure Level A measure of the sound level transmitted from impacts on a floor to a tenancy below. It is measured in very controlled conditions in a laboratory and is characterised by how much sound reaches the receiving room from a standard tapping machine. A lower value indicates a better performing floor.

LnT,w	<p>Weighted Standardised Field Impact Sound Pressure Level</p> <p>As for Ln,w but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement.</p> <p>The equivalent measurement in a laboratory is the Ln,w.</p> <p>A lower value indicates a better performing floor.</p>
Laboratory Test	<p>The performance of a building element when measured in a laboratory. The sound insulation performance of a building element installed in a building however can differ from its laboratory performance for many reasons including the quality of workmanship, the size and shape of the space in which the measurement is conducted, flanking paths and the specific characteristics of the material used which may vary from batch to batch.</p>
Loudness	<p>A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on. That is, the sound of 85 dB is four times or 400% the loudness of a sound of 65 dB.</p>
Microphone	<p>An electro-acoustic transducer which receives an acoustic signal and delivers a corresponding electric signal.</p>
NCA	<p>Noise Catchment Area. An area of study within which the noise environment is substantially constant.</p>
Noise	<p>Unwanted sound</p>
NRC	<p>Noise Reduction Coefficient.</p> <p>A measure of the ability of a material to absorb sound. The NRC is generally a number between 0 and 1 but in some circumstances can be slightly greater than 1 because of absorption at the edges of the material. A material with an NRC rating of 1 absorbs 100% of incoming sound, that is, no sound is reflected back from the material.</p> <p>The NRS is the average of the absorption coefficient measured in the octave bands 250Hz, 500Hz, 1kHz & 2kHz which correspond to the predominant frequencies associated with the human voice.</p>
Passive recreation	<p>Area specifically reserved for passive recreation, characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion e.g. reading, meditation</p>
Reflection	<p>Sound wave reflected from a solid object obscuring its path.</p>
Reverberation Time	<p>The time (in seconds) it takes for a noise signal within a confined space to decay by 60dB. The longer the reverberation time (usually denoted as RT60), the more echoic a room. Longer reverberation times generally result in higher noise levels within spaces.</p>
RMS	<p>Root Mean Square value representing the average value of a signal.</p>
Rw	<p>Weighted Sound Reduction Index</p> <p>A measure of the sound insulation performance of a building element. It is measured in very controlled conditions in a laboratory.</p> <p>The term supersedes the value STC which was used in older versions of the Building Code of Australia. Rw is measured and calculated using the procedure in ISO 717-1. The related field measurement is the DnT,w.</p> <p>The higher the value the better the acoustic performance of the building element.</p>
R'w	<p>Weighted Apparent Sound Reduction Index.</p> <p>As for Rw but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement.</p> <p>The higher the value the better the acoustic performance of the building element.</p>
RNP	<p>Road Noise Policy, NSW, March 2011</p>
SEL	<p>Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.</p>
Sound	<p>A fluctuation of air pressure which is propagated as a wave through air.</p>

Sound absorption	The ability of a material to absorb sound energy by conversion to thermal energy.
Sound Insulation	Sound insulation refers to the ability of a construction or building element to limit noise transmission through the building element. The sound insulation of a material can be described by the R_w and the sound insulation between two rooms can be described by the $D_{nT,w}$.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 pico watt.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone referenced to 20 micro Pascal.
Spoil	Soil or materials arising from excavation activities.
Standardised	A method of adjusting the measured noise indices in-situ so that they are independent of the measuring space. The noise level in a room is affected by reverberation in the room. For example, the $L'_{n,w}$ impact sound pressure level measured in a room is dependent upon the amount of absorptive material in the receiving room. The value is adjusted to what would be measured if the reverberation time in the receiving room is set at 0.5 seconds. This enables the same value to be reported independent of whether the room contains carpet and furnishings and the like. See also 'Normalised'.
STC	Sound Transmission Class A measure of the sound insulation performance of a building element. It is measured in controlled conditions in a laboratory. The term has been superseded by R_w .
Structure-borne Noise	Audible noise generated by vibration induced in the ground and/or a structure. Vibration can be generated by impact or by solid contact with a vibrating machine. Structure-borne noise cannot be attenuated by barriers or walls but requires the isolation of the vibration source itself. This can be achieved using a resilient element placed between the vibration source and its support such as rubber, neoprene or springs or by physical separation (using an air gap for example). Examples of structure-borne noise include the noise of trains in underground tunnels heard to a listener above the ground, the sound of footsteps on the floor above a listener and the sound of a lift car passing in a shaft. See also 'Impact Noise'.
Tonal Noise	Sound containing a prominent frequency and characterised by a definite pitch.
Transmission Loss	The sound level difference between one room or area and another, usually of sound transmitted through an intervening partition or wall. Also the vibration level difference between one point and another. For example, if the sound level on one side of a wall is 100dB and 65dB on the other side, it is said that the transmission loss of the wall is 35dB. If the transmission loss is normalised or standardised, it then becomes the R_w or $R'w$ or $D_{nT,w}$.

APPENDIX B **Nearest sensitive receivers and noise management levels**



- Legend**
- NCAs
 - Construction Areas
 - ACCESS TO COMPOUNDS
 - CONSTRUCTION FOOTPRINT
 - GROUTING STATION-SED TANKS

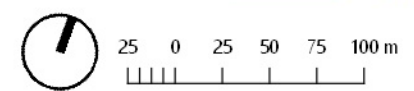
Client
WestConnex New M5

Project
 WestConnex Stage 2 M5

Description:
 Arncliffe surface grouting works
 Noise catchment areas & works locations



Noise Levels are approximate due to interpolation of contours and should be used for reference only. For information only and not for construction. This information is protected by copyright.



RENZO TONIN & ASSOCIATES
inspired to achieve

1/418A Elizabeth Street, SURRY HILLS NSW 2010
 P: 02 8218 0500 F: 02 8218 0501

Created by: THW
 Figure No: TH014-05 6 0 1 026 (r2)
 Date: 22.02.2018
 Scale: 14,000 @ A3

Table B1: Noise sensitive receivers and construction noise management levels**Arncliffe Surface Grouting**

NCA	Receiver Type	Reference RBL	Rating Background Levels (RBLs)			Residential Noise Management Levels (NMLs) $L_{Aeq}(15 \text{ min})$				Sleep Dist. L_{Amax}		Comments
			Day	Evening	Night	Day (S)	Day (O)	Evening	Night	Screening	Max	
TWX08	Residential Commercial	EISNL20	55	55	45	65	60	60	50	60	65	Based on NMLs for NCA12
NCA12	Residential	EISNL20	55	55	45	65	60	60	50	60	65	Based on NCAs and NMLs presented in the EIS.
ID	Other Sensitive Receivers											
OSR	Hotel/ Motel	AS2107	-	-	-	60	60	60	60	-	-	NML of 60dB(A) is external equivalent of 40dB(A) internal goal for hotels on busy roads based on AS2107 assuming windows closed
OSR	Childcare centre	ICNG	-	-	-	55	55	55	55	-	-	Daytime NML of 55dB(A) is external equivalent of 45dB(A) internal goal for classrooms with windows open.
OSR	Active recreation areas	ICNG	-	-	-	65	65	65	65	-	-	Ref: ICNG p13 Applicable to sports centre, bowling club, sports fields, netball courts, indoor sports centre
OSR	Commercial Receivers/ Offices	ICNG	-	-	-	70	70	70	70	-	-	When premise is in use. External.
OSR	Industrial Receivers	ICNG	-	-	-	75	75	75	75	-	-	When premise is in use. External.

APPENDIX C Construction timetable/ activities/ management

Table C1: Construction timetable/ activities/ equipment

Arncliffe Surface Grouting

Activity/ Work Area	Aspect	Plant/ Equipment	Net Power kW	Operating Weight kg	Day	Evening	Night	Sound Power Level (Lw re: 1pW) in Noise		Notes
					7am - 6pm	6pm - 10pm	10pm - 7am	L _{Aeq}	L _{A1}	
ARNCLIFFE SURFACE GROUTING										
Site establishment	Site establishment	Mobile crane (franna)		20t	1	-	-	85	102	
		Light vehicles - staff/Labour			2	-	-	88		
		Delivery truck			2 per day	-	-	108		
Phase 3	Grout plant	Grout plant - 20 m3/hr, which includes:			1	-	-	85		with piston pumps
		Mixer - 20 m3/hr plant			1	-	-	63		
South of Cooks River		Agitator tank (1.2m3 capacity)			2	-	-	75		
		Grouting unit (Up to 2 piston pumps)			2	-	-	69		
	Drilling grout holes	Drilling rig		18-20 tonne	2	-	-	118		
	Grouting holes	Grouting unit (Up to 2 piston pumps)			1	-	-	69		
		FORKLIFT 6t		6t	1	-	-	85	102	
		Light vehicles - staff/Labour			25 per day	-	-	88		
		25kVa GENERATORS	25kVA		2	-	-	94		
Phase 4	Grout plant	Grout plant - 20 m3/hr, which includes:			1	-	-	85		with piston pumps
		Mixer - 20 m3/hr plant			1	-	-	63		
North of Cooks River		Agitator tank (1.2m3 capacity)			2	-	-	75		
		Grouting unit (Up to 2 piston pumps)			2	-	-	69		
	Drilling grout holes	Drilling rig		18-20 tonne	2	-	-	118		
	Grouting holes	Grouting unit (Up to 2 piston pumps)			1	-	-	69		
		FORKLIFT 6t		6t	1	-	-	85	102	
		Light vehicles - staff/Labour			25 per day	-	-	88		
		25kVa GENERATORS	25kVA		2	-	-	94		
Phase 4A	Drilling operations	Drilling rig		18-20 tonne	1	-	-	118		
		Rod handling excavator			1	-	-	103		
North of Cooks River		Vacuum truck			1	-	-	108		Remove water from reticulation tanks once per day

Table C2: Construction noise management schedule**Arncliffe Surface Grouting**

Area to be Managed	Mitigation/ Management Measure	Typical Details
1 Arncliffe Surface Grouting	None required.	
	EXCEPTION - ONLY IN THE CASE THAT THE ADJACENT NETBALL COURTS ARE IN USE - Temporary noise screens (e.g. FlexShield, Echo-barrier or similar) will be installed around the work areas, to break line of site between the works activity and the adjacent netball court.	

APPENDIX D Detailed predicted noise levels

The impacts presented in the following table are identified by colour coding of the text.

For **Standard Hours**:

- XX Complies with NML
- **XX** < 10dB(A) above NML - construction noise clearly audible
- **XX** > 10dB(A) above NML - construction noise clearly moderately intrusive
- **XX** > 75dB(A) - highly noise affected

Table D1: Predicted Construction Noise Levels

Arncliffe Surface Grouting

Receiver		Predicted Noise Levels, dB(A)				
		DAY (STANDARD)				
NCA	Address	NML	Phase 3	Phase 4	Phase 3 + 4	Phase 3 + 4 + 4A
NCA12	1 FLORA STREET ARNCLIFFE	65	32	47	47	45
NCA12	1A FLORA STREET ARNCLIFFE	65	32	47	47	45
NCA12	2 FLORA STREET ARNCLIFFE	65	33	42	43	42
NCA12	2A FLORA STREET ARNCLIFFE	65	32	43	44	42
NCA12	2B FLORA STREET ARNCLIFFE	65	32	42	42	42
NCA12	3 FLORA STREET ARNCLIFFE	65	32	49	50	46
NCA12	4 FLORA STREET ARNCLIFFE	65	33	42	43	41
NCA12	5 FLORA STREET ARNCLIFFE	65	32	49	49	45
NCA12	6 FLORA STREET ARNCLIFFE	65	33	43	44	42
NCA12	8 FLORA STREET ARNCLIFFE	65	33	48	48	41
NCA12	9 FLORA STREET ARNCLIFFE	65	33	51	51	47
NCA12	10 FLORA STREET ARNCLIFFE	65	34	48	49	48
NCA12	11 FLORA STREET ARNCLIFFE	65	33	52	52	48
NCA12	11A FLORA STREET ARNCLIFFE	65	33	50	50	48
NCA12	12 FLORA STREET ARNCLIFFE	65	34	50	50	48
NCA12	14 FLORA STREET ARNCLIFFE	65	34	49	49	48
NCA12	15 FLORA STREET ARNCLIFFE	65	33	50	50	48
NCA12	16 FLORA STREET ARNCLIFFE	65	34	50	50	47
NCA12	17 FLORA STREET ARNCLIFFE	65	33	50	50	47
NCA12	18 FLORA STREET ARNCLIFFE	65	34	50	50	47
NCA12	19 FLORA STREET ARNCLIFFE	65	33	49	49	46
NCA12	20 FLORA STREET ARNCLIFFE	65	35	51	51	48
NCA12	21 FLORA STREET ARNCLIFFE	65	33	49	50	47
NCA12	22 FLORA STREET ARNCLIFFE	65	35	43	43	44
NCA12	23 FLORA STREET ARNCLIFFE	65	33	45	45	45
NCA12	24 FLORA STREET ARNCLIFFE	65	35	48	48	47
NCA12	25 FLORA STREET ARNCLIFFE	65	34	45	45	45
NCA12	26 FLORA STREET ARNCLIFFE	65	36	48	48	48
NCA12	28 FLORA STREET ARNCLIFFE	65	36	39	40	42
NCA12	29 FLORA STREET ARNCLIFFE	65	34	47	47	47
NCA12	30 FLORA STREET ARNCLIFFE	65	36	36	39	39
NCA12	31 FLORA STREET ARNCLIFFE	65	34	47	47	46
NCA12	32 FLORA STREET ARNCLIFFE	65	36	35	38	38
NCA12	33 FLORA STREET ARNCLIFFE	65	35	37	39	45
NCA12	34 FLORA STREET ARNCLIFFE	65	37	37	40	39
NCA12	35 FLORA STREET ARNCLIFFE	65	35	37	39	42
NCA12	36 FLORA STREET ARNCLIFFE	65	37	36	39	39
NCA12	37 FLORA STREET ARNCLIFFE	65	35	34	37	37
NCA12	39 FLORA STREET ARNCLIFFE	65	36	34	38	38
NCA12	41 FLORA STREET ARNCLIFFE	65	45	38	46	46
NCA12	1 INNESDALE ROAD WOLLI CREEK	65	33	48	48	48
NCA12	1A INNESDALE ROAD WOLLI CREEK	65	33	50	50	48
NCA12	3 INNESDALE ROAD WOLLI CREEK	65	34	43	44	47
NCA12	5 INNESDALE ROAD WOLLI CREEK	65	34	38	39	38
NCA12	7 INNESDALE ROAD WOLLI CREEK	65	34	36	38	38
NCA12	9 INNESDALE ROAD WOLLI CREEK	65	35	38	40	38
NCA12	11 INNESDALE ROAD WOLLI CREEK	65	35	38	40	38
NCA12	13 INNESDALE ROAD WOLLI CREEK	65	35	40	41	39
NCA12	15 INNESDALE ROAD WOLLI CREEK	65	35	56	56	47
NCA12	17 INNESDALE ROAD WOLLI CREEK	65	35	55	55	50
NCA12	19 INNESDALE ROAD WOLLI CREEK	65	36	52	52	49
NCA12	20-26 INNESDALE ROAD WOLLI CREEK	65	39	58	58	53
NCA12	20-26 INNESDALE ROAD WOLLI CREEK	65	43	59	59	54
NCA12	21 INNESDALE ROAD WOLLI CREEK	65	36	46	46	45
NCA12	23 INNESDALE ROAD WOLLI CREEK	65	36	46	47	45
NCA12	25 INNESDALE ROAD WOLLI CREEK	65	36	50	50	49
NCA12	27 INNESDALE ROAD WOLLI CREEK	65	36	46	47	46
NCA12	29 INNESDALE ROAD WOLLI CREEK	65	40	50	51	49
NCA12	31 INNESDALE ROAD WOLLI CREEK	65	38	50	50	49
NCA12	33 INNESDALE ROAD WOLLI CREEK	65	38	40	42	41
NCA12	35 INNESDALE ROAD WOLLI CREEK	65	38	36	40	40
NCA12	37 INNESDALE ROAD WOLLI CREEK	65	38	35	40	39
NCA12	39 INNESDALE ROAD WOLLI CREEK	65	39	34	40	39
NCA12	41 INNESDALE ROAD WOLLI CREEK	65	41	34	42	41
NCA12	43 INNESDALE ROAD WOLLI CREEK	65	48	34	48	48
NCA12	20 LEVEY STREET WOLLI CREEK	65	47	54	54	54

Table D1: Predicted Construction Noise Levels **Arncliffe Surface Grouting**

Receiver		Predicted Noise Levels, dB(A)				
		DAY (STANDARD)				
NCA	Address	NML	Phase 3	Phase 4	Phase 3 + 4	Phase 3 + 4 + 4A
NCA12	24 LEVEY STREET WOLLI CREEK	65	73	62	73	73
NCA12	14 MARSH STREET ARNCLIFFE	65	32	45	45	42
NCA12	16 MARSH STREET ARNCLIFFE	65	34	47	47	43
NCA12	16A MARSH STREET ARNCLIFFE	65	34	47	47	43
NCA12	18 MARSH STREET ARNCLIFFE	65	33	46	47	46
NCA12	18A MARSH STREET ARNCLIFFE	65	33	48	48	47
NCA12	20 MARSH STREET ARNCLIFFE	65	34	45	46	43
NCA12	22 MARSH STREET ARNCLIFFE	65	34	48	48	48
NCA12	22A MARSH STREET ARNCLIFFE	65	40	35	41	41
NCA12	24 MARSH STREET ARNCLIFFE	65	47	34	48	47
NCA12	24A MARSH STREET ARNCLIFFE	65	46	35	46	46
NCA12	26-32 MARSH STREET WOLLI CREEK	65	56	48	56	56
NCA12	1 VALDA AVENUE ARNCLIFFE	65	31	49	50	47
NCA12	2 VALDA AVENUE ARNCLIFFE	65	32	49	49	46
NCA12	4 VALDA AVENUE ARNCLIFFE	65	32	51	51	49
NCA12	5 VALDA AVENUE ARNCLIFFE	65	32	49	49	47
NCA12	6 VALDA AVENUE ARNCLIFFE	65	32	49	49	47
NCA12	7 VALDA AVENUE ARNCLIFFE	65	34	50	50	47
NCA12	8 VALDA AVENUE ARNCLIFFE	65	32	50	50	48
NCA12	9 VALDA AVENUE ARNCLIFFE	65	33	50	50	47
NCA12	10 VALDA AVENUE ARNCLIFFE	65	32	50	50	49
NCA12	11 VALDA AVENUE ARNCLIFFE	65	33	49	49	47
NCA12	11A VALDA AVENUE ARNCLIFFE	65	33	48	48	47
NCA12	12 VALDA AVENUE ARNCLIFFE	65	32	49	49	48
NCA12	14 VALDA AVENUE ARNCLIFFE	65	32	49	49	48
NCA12	15 VALDA AVENUE ARNCLIFFE	65	34	47	47	49
NCA12	16 VALDA AVENUE ARNCLIFFE	65	32	49	49	47
NCA12	17 VALDA AVENUE ARNCLIFFE	65	32	46	46	47
NCA12	18 VALDA AVENUE ARNCLIFFE	65	33	47	47	47
NCA12	19 VALDA AVENUE ARNCLIFFE	65	32	46	46	45
NCA12	20 VALDA AVENUE ARNCLIFFE	65	33	47	47	48
NCA12	22 VALDA AVENUE ARNCLIFFE	65	33	47	47	47
NCA12	24 VALDA AVENUE ARNCLIFFE	65	33	47	47	45
NCA12	26 VALDA AVENUE ARNCLIFFE	65	33	34	37	37
NCA12	28 VALDA AVENUE ARNCLIFFE	65	33	35	37	37
NCA12	30 VALDA AVENUE ARNCLIFFE	65	35	38	39	38
NCA12	32 VALDA AVENUE ARNCLIFFE	65	44	39	45	45
NCA12	4 WEST BOTANY STREET ARNCLIFFE	65	33	50	50	48
NCA12	6 WEST BOTANY STREET ARNCLIFFE	65	32	50	50	48
NCA12	8 WEST BOTANY STREET ARNCLIFFE	65	32	49	49	47
NCA12	12 WEST BOTANY STREET ARNCLIFFE	65	32	50	50	47
NCA12	14 WEST BOTANY STREET ARNCLIFFE	65	33	48	48	48
NCA12	16 WEST BOTANY STREET ARNCLIFFE	65	33	42	43	48
NCA12	18 WEST BOTANY STREET ARNCLIFFE	65	32	34	36	38
NCA12	18A WEST BOTANY STREET ARNCLIFFE	65	32	42	43	44
NCA12	20 WEST BOTANY STREET ARNCLIFFE	65	31	44	44	45
NCA12	22 WEST BOTANY STREET ARNCLIFFE	65	32	49	49	46
NCA12	24 WEST BOTANY STREET ARNCLIFFE	65	31	48	48	46
NCA12	26 WEST BOTANY STREET ARNCLIFFE	65	30	38	39	38
TWX08	1A BAY ST, TEMPE	65	46	49	51	56
TWX08	2 STATION ST, TEMPE	65	46	49	51	56
OSR	34-42 INNESDALE ROAD WOLLI CREEK	60	39	56	56	52
OSR	34-42 INNESDALE ROAD WOLLI CREEK	60	39	47	48	48
OSR	34-42 INNESDALE ROAD WOLLI CREEK	60	41	59	60	55
OSR	1 LEVEY STREET WOLLI CREEK	70	76	70	76	76
OSR	22 LEVEY STREET WOLLI CREEK	60	58	58	59	58
OSR	19 MARSH STREET ARNCLIFFE	70	62	57	63	62
OSR	2 WEST BOTANY STREET ARNCLIFFE	70	34	51	51	49
OSR	CHILDCARE (18 Holbeach Ave)	55	46	50	52	57
OSR	Tempe Recreation Reserve*	65	51	58	58	65
OSR	Netball Courts Area*	65	61	68	69	87
OSR	Netball Courts Area*	65	60	67	68	80
OSR	Robyn Webster Sports Centre (FAÇADE)*	65	61	65	67	90

* Refer to Section 5.2 where it notes that these noise level may vary depending upon the works location

APPENDIX E Additional noise mitigation

E.1 Letterbox drop notification

In accordance with the Section 5.3.2 letterbox drop notification will be carried out where:

- the NML is exceeded by more than 10dB(A) during the day period (7am to 6pm), or
- the NML is exceeded by more than 5dB(A) during the evening period (6pm to 10pm), or
- the NML is exceeded during the night period (10pm to 7am).

Predicted noise levels for the works outlined in this report indicate that letterbox drop notification will be required for 1 OSR.

Table E1 summarises the properties where predicted noise levels exceed the NMLs as outlined above. These receivers should be notified by letterbox drop prior to the commencement of work.

E.2 Verification monitoring

In accordance with Section 5.3.2 verification monitoring will be carried out where:

- the NML is exceeded by more than 10dB(A) during the day period (7am to 6pm), or
- the NML is exceeded by more than 15dB(A) during the evening period (6pm to 10pm), or
- the NML is exceeded by more than 5dB(A) during the night period (10pm to 7am).

Predicted noise levels for the works outlined in this report indicate that verification monitoring will be required in NCA12.

Receivers that will require verification monitoring are identified in Table E1. Note that a representative receiver in each NCA will be sufficient for Predicted noise levels are generally consistent with the predicted construction noise levels in the Environmental Impact Statement. verification monitoring.

E.3 Specific notifications

In accordance with Section 5.3.2 sensitive receivers will be notified by specific notifications such as an individual briefing, phone call, or personalised letter where:

- the receiver is highly noise affected (i.e. exposed to construction noise greater than 75dB(A)) during the day period (7am to 6pm), or
- the NML is exceeded by more than 25dB(A) during the evening period (6pm to 10pm), or
- the NML is exceeded by more than 15dB(A) during the night period (10pm to 7am).

Predicted noise levels for the works outlined in this report indicate that specific notifications will not be required.

E.4 Respite offer

In accordance with Section 5.3.2 respite offers should be made available to receivers where the NML is exceeded by more than 25dB(A) during the evening period (6pm to 10pm).

Predicted noise levels for the works outlined in this report indicate that respite offers will not be required.

E.5 Alternative accommodation

In accordance with Section 5.3.2 alternative accommodation should be offered to receivers where the NML is exceeded by more than 25dB(A) during the night period (10pm to 7am).

Predicted noise levels for the works outlined in this report indicate that alternative accommodation offers will not be required.

E.6 Summary of additional mitigation measures

Table E1 identifies the additional mitigation measures to be applied at construction noise affected receivers. The legend below identifies the notations in Table E1.

AM1 = LB	AM3 = LB, SN, V	AM5 = LB, SN, AA, V
AM2 = LB, V	AM4 = LB, SN, RO, V	
LB = Letter box drops	RO = Project specific respite offer	AA = Alternative accommodation
V = Validation of predicted noise levels	SN = Specific notification, Individual briefings, or Phone call	

Table E1: Additional noise mitigation and receiver notifications **Arncliffe Surface Grouting**

Receiver		Additional noise mitigation and receiver notifications			
		DAY (STANDARD)			
NCA	Address	Phase 3	Phase 4	Phase 3 + 4	Phase 3 + 4 + 4A
OSR	1 LEVEY STREET WOLLI CREEK	AM3		AM3	AM3
OSR	Robyn Webster Sports Centre				AM3