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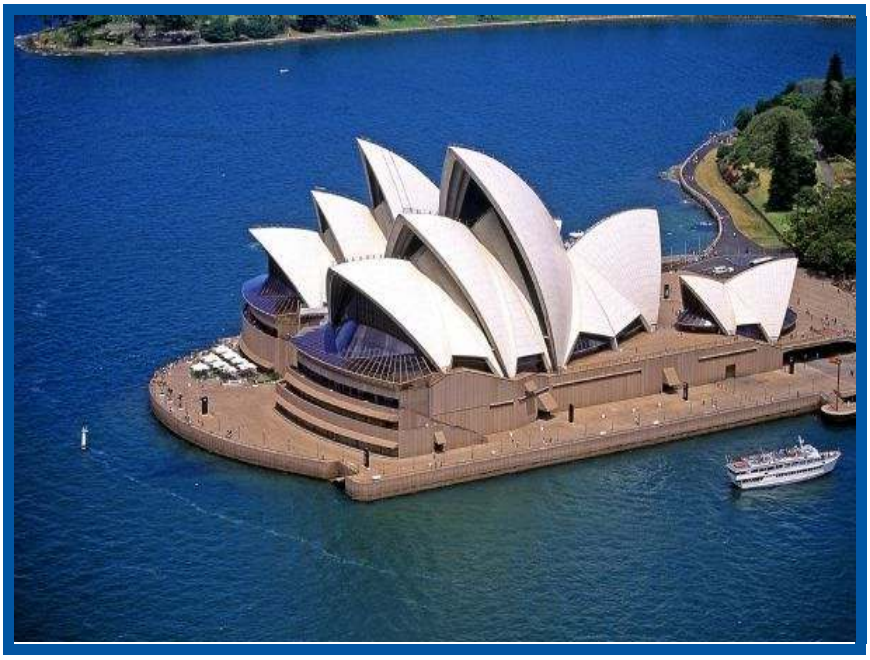

| TAYLOR CONSTRUCTION GROUP PTY LTD |

CONSTRUCTION AIR QUALITY MANAGEMENT PLAN

REFERENCE NO. S11164-CAQMP-R03-A1

SYDNEY OPERA HOUSE WESTERN RENEWAL PROJECT | 12 FEBRUARY 2020

Construction Air Quality Management Plan

Sydney Opera House,
Bennelong Point,
Sydney NSW 2000

Prepared for

Taylor Construction Group Pty Ltd

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by

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Date: 12 February 2020

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Abbreviations

Term	Description
CAQMP	Construction Air Quality Management Plan
CEMP	Construction Environmental Management Plan
CO_2	Carbon dioxide
C0	Carbon monoxide
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
HC	Hydrocarbons
HSE	Health, Safety and Environment
IAQM	Institute of Air Quality Management
m	Metres
NEPM	National Environment Protection Measure
NOx	Oxides of nitrogen
NSW	New South Wales
PCBs	Polychlorinated Biphenyls
RCS	Respirable Crystalline Silica
Risk	The probability that damage to health may occur. Risk = Hazard x Exposure
SDS	Safety Data Sheet
SMF	Synthetic Mineral Fibres
SO_2	Sulfur dioxide
SOH	Sydney Opera House
SOHT	Sydney Opera House Trust
VOCs	Volatile Organic Compounds
WRP	Western Renewal Project

1. Introduction

1.1 The Project

Sydney Opera House Trust (SOHT) is in the process of commencing the western renewal project (the Project) at Sydney Opera House (SOH) located at Bennelong Point, NSW, 2000 (the site). The project, which is part of the Stage 1 renewal and categorised as State Significant Development (Ref: DA3 - SSD8663), will include the renewal of the followings areas:

- renewal of the concert hall
- entry foyer
- creative learning centre

1.2 Background

Under the provision of the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEEP) of clause 1 of Schedule 2, any development within the SOH is classified as State Significant Development (SDD).

To support the SSD application, an Environmental Impact Statement (EIS) was prepared under section 4.38 of the Environmental Planning and Assessment Act 1979 (EP&A Act) and approved under Ministerial consent (Ref: SSD 8663, 2019).

Taylor Construction Group Pty Ltd (Taylor) is the principal contractor for the western renewal project (WRP). Taylor has engaged Hibbs & Associates Pty Ltd (Hibbs) to prepare the Construction Air Quality Management Plan (CAQMP) which is required under Schedule B31 condition (j) of development consent which states:

" address air quality management through the preparation of a Construction Air Quality Management Plan (CAQMP), prepared by a suitable qualified person, which includes the monitoring and management of air quality and dust (including dust emissions on the site and dust emissions from the site) to protect the amenity of the neighbourhood"

This CAQMP fully addresses the requirements of the consent condition (B31-j), without any exception, and as such compliance has been achieved.

This CAQMP forms part of the Construction Environment Management Plan (CEMP) developed for the Western Renewal Project and describes how Taylor will manage air quality and minimise environmental impacts during the construction of the WRP. The CAQMP applies to proposed construction works included in Section 4.3 of CEMP.

This Plan should be read in conjunction with the CEMP (Hibbs 2020) and construction management plan (Taylor 2017).

1.3 Objectives

The objectives of the CAQMP are:

- To identify potential dust, air pollutants and odour sources at the site.
- To develop control measures to prevent adverse environmental impact on air quality as a result of proposed construction and demolition activities.
- To establish and implement a monitoring strategy to ensure compliance with statutory criteria is achieved
- To identify the roles and responsibilities of the personnel responsible for the implementation of this CAQMP and training requirements
- To develop reporting requirements to ensure compliance with the CAQMP.

2. Statutory Requirements and Guidelines

2.1 Legislation

The following legislative requirements apply to the air quality aspects of the Project.

- Environment Planning and Assessment Act 1979 (EP&Act) and development consent issued thereunder
- NSW Protection of the Environment Operations Act, 1997 - Part 5.4 Air Pollution
- Protection of the Environment Operations (Clean Air) Regulation 2010

2.2 Guidelines and Reference Documents

The main guidelines, measures and policy documents relevant to this Air Quality, Dust, and Odour Management Plan include:

- National Environmental Protection (Ambient Air Quality) Measure (NEPM Air) (NEPAC, 2016)
- Action for Air 1998 (NSW EPA 1998)
- Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DEC 2005)
- Approved Method for the Modelling and Assessment of Air Pollutants in New South Wales (NSW EPA 2017)
- Managing particles and improving air quality in NSW (EPA 2013)
- Guidance on the assessment of dust from demolition and construction (Institute of Air Quality Management) (IAQM 2004)
- Construction Management Plan - Western Renewal Project at Sydney Opera House (Taylor 2017)
- Construction Environmental Management Plan, Sydney Opera House Western Renewal Project (Hibbs 2020)
- Environmental Impact Statement - Sydney Opera House Building Renewal Concert Hall and Creative Learning Centre (Keylan 2018)
- Development Consent (SSD 8663, 2019)

- Reporting Non-conformance, Corrective and Preventive Actions Procedure (QSE-OP-29) (Taylor 2019c)
- Incident Reporting and Investigation Procedure (QSE-OP-05) (Taylor 2019b)
- Hazardous Substances and Dangerous Goods Procedure (SE-OP-01)(Taylor 2019a)
- Hazard Identification Risk Assessment and Control (HIRAC), SOH Western Renewal Project, Rev 2 (Taylor 2018)
- NSW EPA Local Government Air Quality Toolkit, Visual Guide: Dust from urban construction sites

3. Air Emission Types, Sources and Sensitive Receivers

3.1 Types of Air Emissions

The main air quality impacts that may arise during demolition and construction activities of the SOH Western Renewal Project are:

- Dust generation
- Odour emission
- Air emission (such as carbon dioxide (CO_2), oxides of nitrogen (NO_x), carbon monoxide (CO), hydrocarbons (HC) and sulfur dioxide (SO_2) due to exhaust emission from equipment used during work and volatile organic compounds (VOCs) from the solvent paints and sealant materials)

3.2 Air Emission Sources

The proposed works will require the use of light machinery during demolition and construction works. Moreover, the selected plant and equipment are suitable for an internal construction environment to ensure no impact on air quality within the worksite, or the Opera House.

Table 3.1: Sources of dust, exhaust and odour emissions during construction and demolition works

Emission	Potential Sources
Dust	• Demolition of concrete and masonry facilities • Handling and transfer of demolished materials including loading and unloading of demolished materials • Skip bins storage areas for building materials • Construction activities
Gaseous Emissions **NOx, SO_2, CO, CO_2, HC and VOCs**	• Exhaust emissions generated from plant/equipment and vehicles (mobile cranes, semi-trailers, dump trucks, concrete trucks etc.) • Paints (released into the air as paint dries)
Odour	• Paints, organic waste, and other chemicals used during construction • Spillages and leakages which have not been appropriately cleared or attended to

3.3 Sensitive Receivers

The site is located on land zoned B8 Metropolitan Centre under the Sydney Local Environmental Plan 2012. The immediate sensitive receptors during the development works are:

- Royal Botanic Gardens to the south and southeast
- Government House to the south and east
- Water bodies to the north, northeast, and northwest (Sydney Harbour Catchment)
- Resident premises at the Bennelong apartments, north of Macquarie Street

SOH is the most popular visitor attraction in Australia, and, the flow of people of different ages in this area is high. Therefore, people visiting SOH during construction works are likely to be exposed to the air and dust emission.

4. Roles and Responsibilities

The site manager is responsible for ensuring the instruction of workers and for implementing and overseeing air quality management of the site. The site manager will monitor the effectiveness and accuracy of construction waste management of the site during the routine site visits. Independent audits will also be completed by the Health, Safety and Environmental (HSE) manager via site inspections. Copies of these reports will be forwarded to the HSE manager for monitoring.

All employees and sub-contractors working for and on behalf of Taylor have responsibilities in relation to ensuring that air quality-related issues are managed appropriately and the requirements of this CAQMP are implemented during demolition and construction works.

5. Management and Monitoring Strategy

5.1 Management

The following management measures will be implemented to reduce air quality-related impacts during the proposed demolition and construction works.

Table 5.1: Management measures

Activity	Environmental Aspect	Management Measures
Dust Management Measures		
Demolition and construction	Dust generation	• Barricade the dust emission sources areas with physical barriers erected at right angles to the prevailing wind direction. • Fitting power tools with dust collection devices or water spray, where practicable; • Materials that have the potential to generate dust will be removed as soon as possible unless being re-used on the site. All materials to be covered with a geotextile (or similar) material and surface dampened using water sprays if being re-used; • The wet suppression of materials shouldn't result in any run-off generation • To minimise the amount of time the site is left cut or exposed, the activities will be properly scheduled to avoid dust generation • Hazardous materials such as asbestos-containing material, lead-based paints, SMF will be bagged and safely removed before the start of demolition works • Dry sweeping will be avoided • Grinding or sanding will be minimised to prevent dust which may contain respirable crystalline silica • During moderate to high wind velocity periods, potential dust-generating activities at external demolition works will be stopped • Breakers and crushing equipment fitted with dust filtration equipment or water sprayers to control dust emission will be used, where practicable • Heights from which materials are to be dropped to be minimised as far as practicable to minimise the fugitive dust arising from unloading/ loading and water spray will be used wherever appropriate • Dust suppression generated by demolition activities will be minimized using: – Zip Wall – HEPA negative air units – Exhaust fan with geo fabric filter bag and filters – Handheld mist sprayers • The filters will be regularly inspected and checked and be kept in good condition to ensure efficient dust removal • All site personnel will be fully trained to understand activities that generate dust and measures to be undertaken to reduce dust emissions
Skip bins	Dust generation	• Removed materials will be stored in the allocated skips and dust suppression strategies will be used (i.e. water spray, cover with geotextile or suitable material) at all the time • The skip bin material will be removed as soon as possible unless being re-used on the site and will be removed from the downwind side

Activity	Environmental Aspect	Management Measures
Transport and deliveries	Dust generation	• Signpost for the vehicle speed limit will be imposed on-site • Vehicle corridor will be clearly identified and restricted to control vehicle access on-site • the vehicle carrying out rubble will not be overfilled and covered to prevent the escape of material and dust generation during transportation • Ensure any fine powder materials/chemicals will be delivered in a covered truck and will be stored in designated areas • Where required, vehicles leaving the site will be cleaned to minimize mud or dust on public roads and other sealed pavements. Removal of mud from the wheel and bodies of the plant will be done either through rumble grids, dry brushing or wheel wash using manual or automated sprayers • Water assisted dust sweepers will be used periodically to clean public roads where dirt has been deposited, where required. • Cleaning of footpaths will be carried out regularly, as required.
Emission Management Measures		
Construction plant/machinery and vehicles	Gaseous emissions	• Engine running will be minimized when the machinery is not in use • All plant, equipment and vehicles used during the demolition and construction work are maintained in accordance with their maintenance schedule • Daily inspection to identify any visible smoke emissions (there should be no continuous visible vehicle/plant/equipment emissions for longer than 10 seconds (POEO (Clean Air) Regulation 2010) • Local exhaust ventilation will be supplied to the confined work area, as required • All the vehicles used for the deliveries/transport from the site will be effectively planned to limit inefficient transport (i.e. limit vehicle movements to designated entries and exits, haulage routes and parking areas) • Ensure all construction vehicles/ plant comply with their relevant emission standards such as emission from trucks that are used for transportation purpose during work will be regulated in accordance with requirements prescribed in the National Environmental Protection (Diesel Vehicle Emission) Measure, 2001
Paints (paint dries)	Air emission	• Low solvent paint will be used as a priority • Areas will be properly ventilated
Odour Emission Management Measures		
Paints / chemicals / organic waste	Odour emission	• Odorous materials (such as paints, chemicals, sealants, silicones, caulking compounds, adhesive) will be sorted, handled, covered and stored as per the safety data sheets (SDS) requirements and applicable regulations • Organic waste generated will be covered and emptied regularly through an approved waste contractor • Spillages to be cleared and associated waste materials disposed of lawfully.

5.2 Monitoring

According to EIS (Keylan 2018) the proposed concert hall and creative learning centre works are largely internal works within SOH except for external works such as:

- alternation to glazing one new lift (No 30) located east of the Northern Foyer at the concert hall and the provision of a new ventilation hood at the western podium elevation;
- relocation of double doors on western façade and new access ramp to the creative learning centre;

As such, qualitative monitoring (visual observation) will be carried out on a daily basis during the demolition and construction stage as outlined in Table 5.2. In circumstances where the activities carried out have a likelihood of air emissions (dust, gas and odour emission), the inspection checklist (refer to Appendix A) will be utilized.

Table 5.2: Monitoring type and frequency required during the demolition and construction stage

Activity	Environmental Aspect	Monitoring Required			Responsibility
		Type	Frequency	Record Method	
SM - Site Manager					
Demolition / Construction	Dust generation	Visual observation	Daily	Inspection checklist as required	SM
Transportation	Dust generation,	Visual observation	Daily	Inspection checklist as required	SM
Demolition / construction	Odour	Odour screening	Daily	Inspection checklist as required	SM
Demolition / construction / transportation	Gaseous emissions	Visual observation	Daily	Inspection checklist as required	SM
Construction (during refurbishment work such as painting, re-storation, plant emission)	Air emission, odour	Visual observation and odour screening	Daily	Inspection checklist as required	SM

5.2.1 Dust Monitoring

Due to the nature of the work, qualitative visual dust inspection will be carried out daily. Based on the activities being carried out during demolition and construction work inspections, checklist (refer to Appendix A) will be undertaken to assess the visible dust plumes created during demolition, crushing, vehicle movement, handling and transferring of demolished materials.

The proposed works related to disturbance of asbestos, lead-based paint system, dust containing lead, synthetic mineral fibres (SMF) materials, respirable crystalline silica (RCS) and polychlorinated biphenyls (PCBs) will be managed in accordance with the Hazardous Material Management Plan, Sydney Opera House - Western Renewal Project prepared by Hibbs (Hibbs 2019b). All hazardous materials must be removed by a licensed contractor prior to demolition commencing. SOH will subcontract Pure Contracting for the disposal and transportation of asbestos waste. Disposal and transportation asbestos waste will be in compliance with the 'Protection of the Environment Operations (Waste) Regulation 2014, Part 7 ‘asbestos wastes'.

5.2.2 Odour Screening

The odour generation is minimal during the purposed work; however, odour screening will be conducted if the odour intensity is noted (as weak, distinct, strong, very strong). The type of the odour noted will be described if possible (as rotten egg, turpentine, methane, decayed organic, etc.). A daily inspection will be conducted for odour screening and appropriate corrective actions will be identified to minimise the odour generation.

5.2.3 Air Emission Monitoring

The main source of the air emission during the purposed works will be the plant, machinery, and vehicles that will be used during the demolition, transportation and construction work.

Construction works will largely occur within the SOH and generally serviced via the underground loading dock, reducing their impact on the general public and sensitive receptors within the scheduled time (refer to section 3.1 CEMP).

Visual air emission monitoring will be conducted as schemed in Table 5.2.

5.3 Corrective Actions

Visual air quality inspections will be carried out on a daily basis. In addition, during the site-specific task where there is a likelihood of air emissions (gaseous, dust and odour) the visual observations will be recorded using air quality checklist (refer to Appendix A). A key performance indicator (KPI) report will be prepared monthly where all the environmental inspections, incidents, penalties, community complaints will be captured.

Non-conformance will be issued for serious breaches or repeated minor breaches. Where non-conformance is identified and raised, corrective actions will be implemented based on the procedure "Reporting Non-Conformance, Corrective & Preventive Actions QSE-OP-29" prepared by Taylor.

All environmental incidents (such as visible dust plumes, odour, gaseous emissions) observed during any activities as mentioned above or complaints received will be reported to the HSE manager in accordance with Incident Reporting and Investigation Procedure QSE-OP-05 and Reporting Non-Conformance, Corrective and Preventive Actions Procedure QSE-OP-29. Environmental harm is to be investigated, and corrective actions implemented following the investigation.

6. Communication Strategy

6.1 Site Induction and Tool Box Meetings

Prior to commencing work on-site, all employees and subcontractors will be required to be site-inducted by the site manager which will incorporate training, general environmental awareness and specific requirements incorporated into this CAQMP. The induction record will be maintained in the WMP induction register (refer to Appendix B).

6.2 Air Quality Reporting

Air quality (dust, gaseous emissions, and odour) will be visually observed daily. In addition, during the site-specific task where there is a likelihood of air emissions (gaseous, dust and odour) the visual observation will be recorded using air quality checklist (refer to Appendix A).

The records will be reviewed by the site manager on a monthly basis and forwarded to the HSE manager for reporting to senior management.

6.3 Community Complaints Reporting

All community complaints will be treated as 'incidents' and will be communicated to SOH at 1300 number.

Each correspondence relating to the complaint will be retained and filed on-site by Taylor's HSE manager, including information regarding how the complaint was investigated and resolved.

Taylor utilize three different forms/procedures for handling community complaints these include:

- SE-F-21 Incident Report Form
- SE-F-22 Incident Investigation Form
- SE-F-23 KPI Monthly Report

References

DEC 2005, Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales, Department of Environment and Conservation NSW, Sydney.

Hibbs 2020, Construction Environmental Management Plan - Sydney Opera House, Western Renewal Project, S11164-CEMP-R01-A1

IAQM 2004, Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management.

Keylan 2018, Environmental Impact Assessment - Sydney Opera House Building Renewal, EIS-Concert Hall and Creative Learning Centre.

NSW EPA 1998, Action for Air, Environment Protection Authority.

NSW EPA 2017, Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, NSW Environment Protection Authority, Sydney.

Taylor 2017, Construction Management Plan - Western Renewal Project at Sydney Opera House, Taylor Construction Group Pty Ltd.

Taylor 2018, Hazard Identification Risk Assessment and Control (HIRAC), SOH Western Renewal Project, Rev 2.

Taylor 2019a, Hazardous Substances and Dangerous Goods Procedure (SE-OP-01).

Taylor 2019b, Incident Reporting and Investigation Procedure (QSE-OP-05), Taylor Construction Group Pty Ltd.

Taylor 2019c, Reporting Non-conformance, corrective & Preventive Actions (QSE-OP-29), Taylor Construction Group Pty Ltd.

Appendix A Inspection Checklist

Construction Air Quality - Inspection Checklist

Site:

Inspection Completed by:

Date:

Aspect	Compliance Requirements	Compliance Yes	Compliance No	Action Required	Comments
Dust	• Are temporary windbreakers installed and are they well maintained?				
	• Are water sprays for dust suppressants being used on-site?				
	• Any surface runoff generated due to wet suppression of the materials?				
	• Are demolition dust sources being managed or minimized employing any of the control measures such as zip wall, HEPA negative air units, exhaust fan with geo fabric filter bag/filters and handheld mist sprayers?				
	• Are hazardous materials such as asbestos-containing material, lead-based paints, SMF bagged and safely removed before demolition?				
	• Are any filter-type systems used to control dust generated on-site? If yes, what type? (e.g. Tool-attached bag filter or vacuum filter, etc.)				
	• Are all contractors and sub-contractor inducted and trained to understand activities that generate dust and measures to be undertaken to reduce dust emission?				
	• Is signpost for the vehicle speed limit imposed on-site?				
	• Are vehicles loading-in and loading-out of material covered?				
	• Are limited vehicle movements enforced?				
	• Storing area cleaned after removal of the demolished rubble?				
	• Are the tyres of vehicles leaving the site are cleaned?				
	• Are public roads and footpaths cleaned regularly?				

Construction Air Quality - Inspection Checklist

Aspect	Compliance Requirements	Compliance Yes	Compliance No	Action Required	Comments
	• Are skip bins located in a designated area, barricaded and covered?				
Gaseous emissions	• Are all plant, equipment and vehicles logbooks checked and maintained in accordance with their maintenance schedule?				
	• Emissions from vehicles or generators checked? (No continuous visible vehicle/plant/equipment emissions for longer than 10 seconds (POEO (Clean Air) Regulation 2010)				
Odour	• Safety Data Sheet for all the chemicals used or stored during the work are available?				
	• Low solvent paints, chemicals, sealants, silicones, caulking compounds, adhesive are used?				
Management	• Are all nearly missed, incidents and complaints recorded in accordance with the Taylor procedure?				
Monitoring	• Any visible smoke from machinery/equipment?				
	• Any visible dust plumes?				
	• Any noticeable odour from any area?				

Appendix B CAQMP Induction Register

TAYLOR

WORKPLACE SITE INDUCTION REGISTER

Inductee Name & Company	Date of Induction	Inductor Name & Company	Inductee Signature	Inductor Signature

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