Air Quality Assessment Guidelines

EHTM Attachment 3A

Government of South Australia
Department for Infrastructure and Transport

Document Amendment Record

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Abbreviations/ Glossary

Term / Acronym	Meaning
AADT	Annual Average Daily Traffic
Air Toxics NEPM	National Environment Protection (Air Toxics) Measure 2011
AQ EPP	Environment Protection (Air Quality) Policy 2016
AQQ NEPM	National Environment Protection (Assessment of Air Quality) Measure 2016
AQST	The Department's Air Quality Screening Tool
BoM	Bureau of Meteorology
CAQP	Certified Air Quality Professional
CASANZ	Clean Air Society of Australia and New Zealand
CO	Carbon monoxide
Contract Documentation	Contract Scope and Technical Requirements; Functional and Operational Requirements; Contract or Project Scope
Contractors	Contractor engaged by the Department to undertake the planning, design or construction of a project (including maintenance projects)
CVs	Commercial vehicles
DIT or the Department	Department for Infrastructure and Transport
EHIA	Environment and Heritage Impact Assessment
EHTM	Environment and Heritage Technical Manual
EP Act	*Environment Protection Act 1993*
NO_2	Nitrogen dioxide
NO_X	Oxidised nitrogen
PDI Act	Planning, Development and Infrastructure Act 2016
$PM_{2.5}$	$PM_{2.5}$ is the collective of suspended particles with aerodynamic diameter of 2.5 µg/m^3 or less
PM_{10}	M_{10} is the collective of particles with aerodynamic diameter less than or equal to 10 µg/m^3, and so includes $PM_{2.5}$
Project Area	Area in which a project can have an effect on environmental and heritage aspects. Includes the construction, operational and maintenance footprints
SA EPA	South Australian Environment Protection Authority
SO_2	Sulphur dioxide
TSP	Total Suspended Particulates includes particles of all sizes including PM_{10}, $PM_{2.5}$ and particles with aerodynamic diameter greater than 10 µg/m^3
US EPA	U.S. Environmental Protection Agency
UTM	Universal Transverse Mercator
VPH	Vehicles per hour
WRF	Weather Research and Forecasting

1 Introduction

The Air Quality Assessment Guideline (the Guideline) applies to a range of Department programs and projects including road and rail infrastructure. The Guideline provides guidance to consultants and contractors in addressing air quality as a key part of infrastructure project development.

The Guideline applies to new or major redeveloped road or rail infrastructure projects and does not apply to air quality from the existing network. This Guideline applies to operational air quality assessment and does not apply to air quality assessment and impacts from construction activities.

Increasing traffic volumes, coupled with higher residential densities along transport corridors, has led to transport impacts on air quality becoming an increasingly important consideration in urban developments. Exposure to high concentrations of air pollutants is known to increase the incidence of respiratory disease and mortality and as such, understanding the likely air quality impacts arising from new transport corridors or modifications to existing corridors is essential to ensuring impacts are minimised.

It is expected that, unless otherwise approved by the Department, Contractors undertaking the works described in this Guideline are listed on, or eligible for listing on, the Department's Professional and Technical Services Prequalification Panel for Environmental Services (Air Quality Assessments).

This Guideline forms Attachment 3A of the Environment and Heritage Technical Manual (EHTM).

1.1 Supporting Documentation

The following Departmental documentation support/form part of the assessments undertaken within this Guideline and are available to Professional and Technical Services Prequalified companies by request (email: DPTI.SSDTechnicalServices@sa.gov.au):

- Air Quality Screening Tool (Microsoft Excel spreadsheet); and
- Air Quality Screening Tool Supporting Documentation.

1.2 Performance Outcomes

In order to meet the performance requirements under this Guideline, unless specified otherwise in the Contract Documentation, the following shall be achieved:

- Air quality impact assessment and reporting that demonstrates compliance with applicable legislation and this Guideline.
- Identification of opportunities to minimise impacts to air quality whilst providing/ maintaining a safe operating environment for asset users and incorporating this into design development.

1.3 Legislative Context

The Department has a General Environmental Duty under Section 25 of the *Environment Protection Act 1993* (EP Act) to take all reasonable and practicable measures to reduce the impact of air quality form its transport infrastructure that may result in environmental harm. The Air Quality Assessment Guideline is the Department's response to satisfying the General Environmental Duty.

The applicability of the Environment Protection (Air Quality) Policy 2016 and National Environment Protection (Ambient Air Quality) Measure is provided in Section 2.4.

1.4 Master specification

The Department's Master Specification sets out the requirements to achieve the quality and/or performance outcomes expected for planning/design, construction projects, maintenance and professional services.

This Guideline should be read in conjunction with the following Master Specification identified in Table 1-1.

Table 1-1 Departmental Master Specification Parts

Master Specification	Specification name
Project Controls:	PC-PL1 - Framework for Planning Studies
	PC-PL2 - Planning Investigations
	PC-PL3 - Concept Design Development
	PC-ENV3 - Environmental Design
	PC–SI2 - Site Investigations
	PC-EDM3 - Independent Design Certifier

2 Process for Assessing Air Quality

This section outlines the steps which, as a minimum, shall be undertaken when undertaking air quality assessments of transport (road and rail) infrastructure. The steps outlined in this section are not stand-alone and are able to occur concurrently, when appropriate.

2.1 Applicability of the Air Quality Guidelines

An applicability assessment of this Guideline shall be undertaken in accordance with the circumstances outlined in Sections 2.1.1 to 2.1.4. Where the works do not fit any of the presented circumstances, a conservative interpretation of the works in context with the intent of the sections shall be made. Monitoring and/or modelling is not required to be undertaken to determine the applicability of this Guideline.

Where agreement has been reached that this Guideline does not apply to a particular infrastructure project then no further action is required under this Guideline (i.e. the remainder of this document is not applicable) and it shall be documented in the project's Environment and Heritage Impact Assessment (EHIA) Report and the planning and design reports. This conclusion will be subject to acceptance by the Department's Project Manager on advice from the Environment and Sustainability Unit of Technical Services.

Should a project's scope be subject to change (with respect to the outlined circumstances), further assessment of the applicability of this Guideline shall be undertaken.

2.1.1 Proximity to Sensitive Receptors

(a) For road projects, where the nearest sensitive receptor is located within 200 metres of the nearest edge of the corridor.

(b) For rail projects whereby diesel-powered locomotives are expected to use the corridor/enclosed station and sensitive receptors are located within 50 metres.

2.1.2 New Road or Railway Corridor

(a) When a new road is built, where no road previously existed.

(b) Where a new railway corridor is built, where no railway corridor previously existed.

2.1.3 Redeveloped Road or Railway Corridor

(a) Where one or more lanes is added to an existing road, for the purpose of increasing the traffic carrying capacity of the road by at least 10%.

(b) Where the main traffic carrying section of an existing road is realigned such that traffic is moved closer to sensitive receivers by at least one lane width (e.g. moving closer by a minimum of 3.0m).

(c) Where realignment produces a change in the road's elevation such that the road surface is ≥2 m above or below natural ground level.

(d) Where realignment adds tunnel and/or embankment sections to the road or rail corridor.

(e) Where operational changes result in operation of heavier locomotive types within an existing railway corridor (i.e. a corridor previously only used for commuter locomotives now has freight trains operating).

(f) Where a railway line is substantially realigned within an existing corridor, involving a change of the corridor boundaries and/or reduction in distance (at least 5m) from the railway lines to the nearest sensitive receptor.

(g) Where realignment produces a change in the elevation of the railway such that the railway corridor's surface is ≥2 m above or below natural ground level.

(h) Where a new station is constructed or operations change such that locomotives idle within a new enclosed station, and/or idling time within an existing enclosed station is increased.

2.1.4 Circumstances Not Considered for Air Quality Assessment and Treatment

Air quality assessment and treatment would not normally be considered in the following circumstances:

(a) Upgrading or treating of road surfaces for maintenance.

(b) Minor upgrading work such as realignment of an intersection, or creation of a left/right turn lane, unless it is part of a major upgrade.

(c) Implementation of Hard shoulder running, where this is done for reasons other than increasing traffic carrying capacity (for example, where the shoulder 'lane' is only operational during peak traffic times to reduce congestion).

(d) Upgrading or treating of railway lines for maintenance purposes.

(e) Minor upgrading work such as realignment of a railway line.

(f) Railway corridors that are not anticipated to carry diesel locomotives.

2.2 Air Quality Assessment Processes

Following consideration of Section 0, once it has been determined that these Guidelines are applicable, the assessment processes as detailed in Section 2.2.1 for road projects and Section 2.2.2 for rail projects are to be followed.

Should alternative methods for assessing air quality be proposed, demonstration that the proposed approach is suitable must be provided and discussed/agreed with the Department's Technical Services Environment and Sustainability Unit prior to being adopted.

2.2.1 Process for Assessment of Road Projects

There are five major steps of the assessment process for road projects, with the decision flow detailed in Figure 2-1 Air Quality Assessment Process for Road Projects. The need for further assessment is considered progressively with each step, meaning some assessments may only reach Step (1) before concluding that impacts are unlikely. Step (1) to Step (4) may be carried out by personnel with general environmental impact assessment experience whereas Step (5) requires completion by a technical expert in the air quality field.

1) Determine if sensitive receptors are located in proximity (within 200 metres of the nearest edge of the corridor) to the road of interest within the Project Area.

2) For modification of existing roads, determine if expected changes in Annual Average Daily Traffic (AADT) are considered to warrant further investigation.

3) Establish if any section of the new or modified road will be a tunnel, or involve cutting or fill which is at least 2 metres above or below the existing natural ground level (depending on the outcomes of this a screening assessment may be sufficient or a detailed assessment may be required).

4) Use the Department's Air Quality Screening Tool (AQST) to determine significance of air quality impacts. Refer to Supporting Documentation for the Air Quality Screening Tool. Both the AQST

and supporting information are available to Professional and Technical Services Prequalified companies by request (email: DIT.SSDTechnicalServices@sa.gov.au).

5) Where exceedances of criteria are predicted by the AQST or where required due to the characteristics of the project, a detailed air quality assessment is required.

Refer to Section 2.5 for further information regarding the application of the AQST.

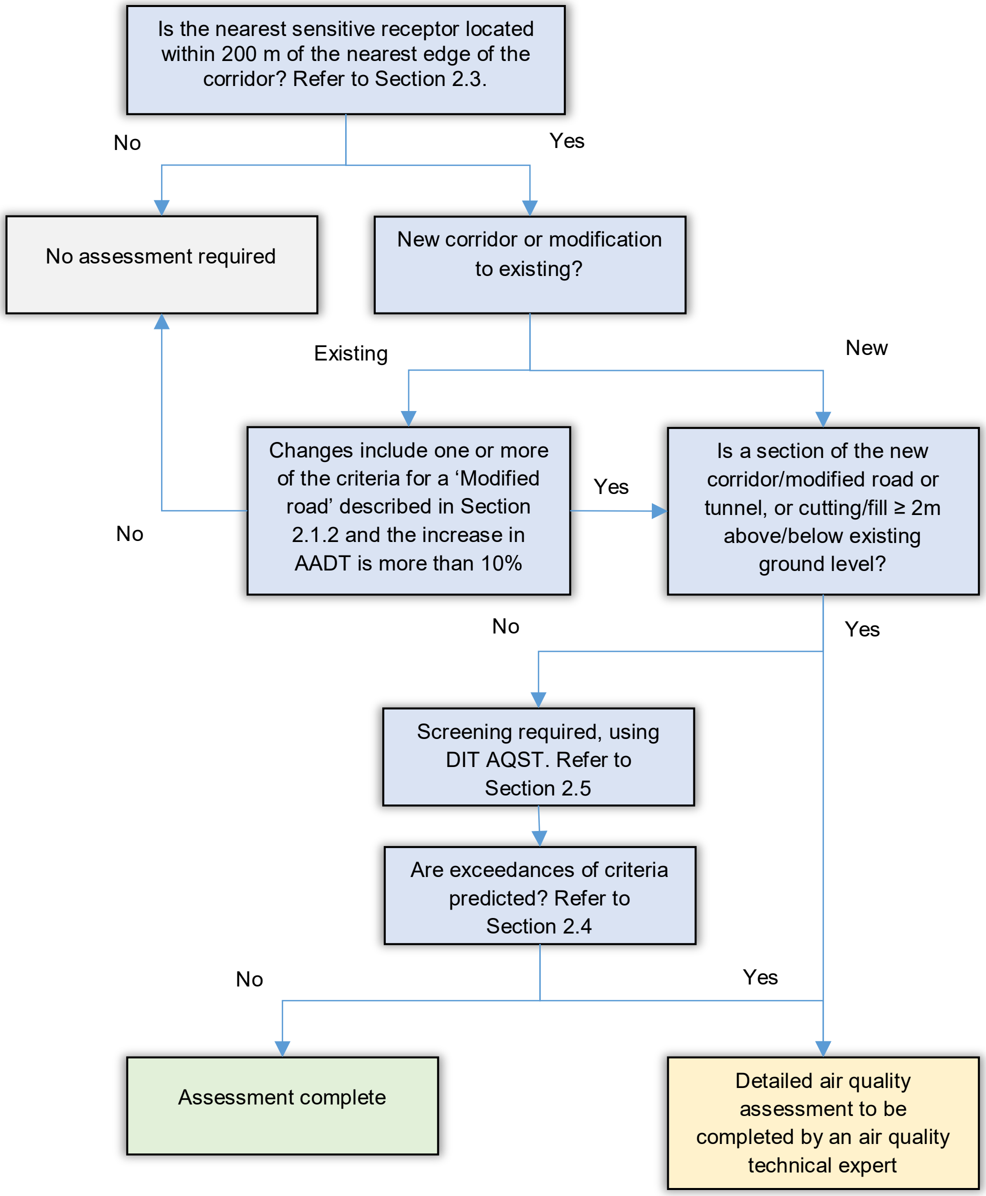

Figure 2-1 Air Quality Assessment Process for Road Projects

2.2.2 Process for Assessment of Rail Projects

There are three major steps for the assessment process for rail projects, with the decision flow detailed in Figure 2-2. Steps (1) and (2) may be carried out by personnel with general environmental impact assessment experience whereas Step (3) requires completion by a technical expert in the field.

1) Identify if the new or modified rail line will be diesel-powered.
2) Determine if sensitive receptors are located in proximity (within 50 metres) to the new rail corridor or enclosed station, or if modifications are likely to significantly worsen impacts at nearby existing sensitive receptors.
3) Seek consultation from a technical expert in the field to establish requirements for further assessment

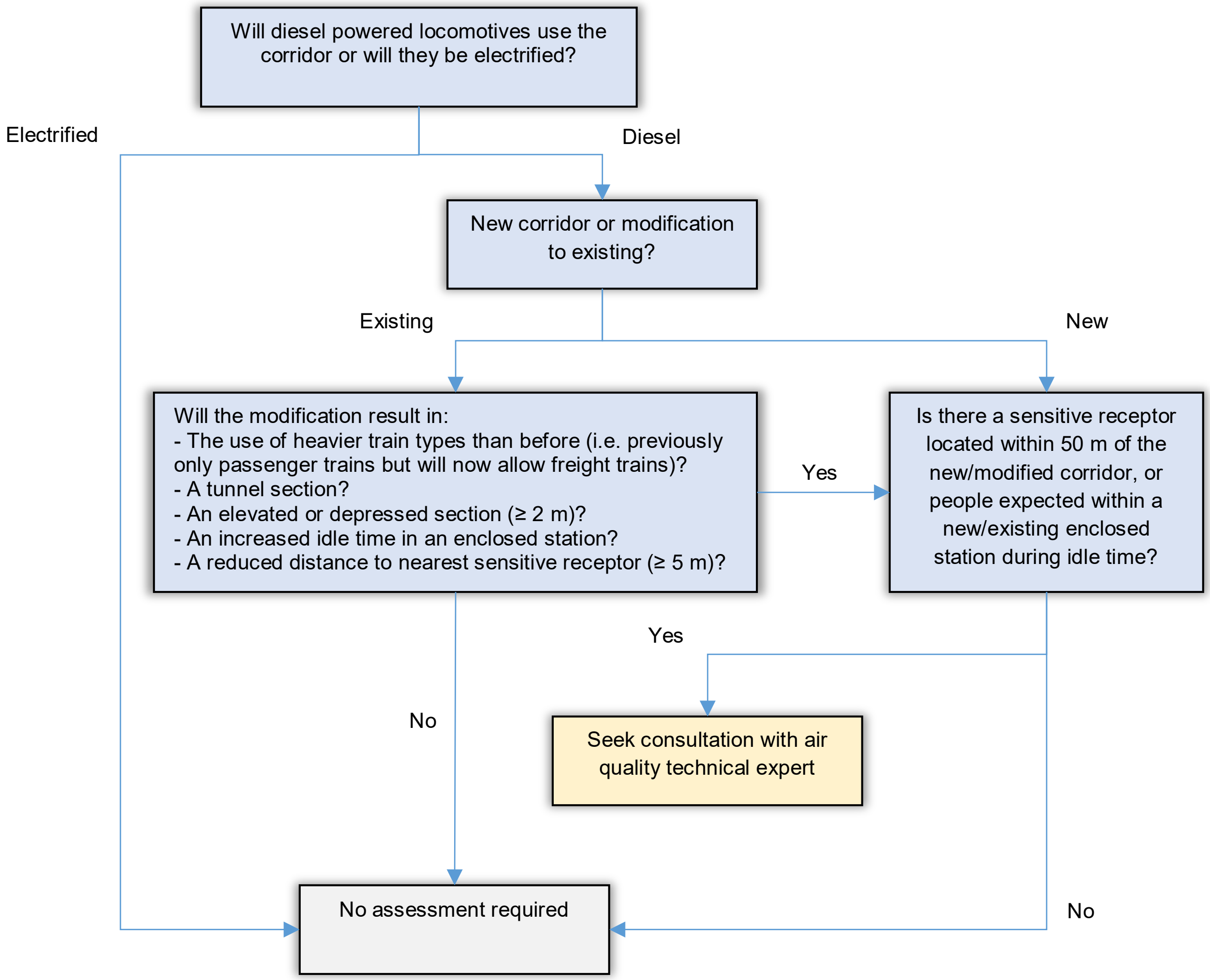

Figure 2-2 Air Quality Assessment Process for Rail Projects

2.3 Air Quality Sensitive Receivers

In South Australia, sensitive land uses in the context of a receptor for air quality, are defined in EPA (2016) *Evaluation distances for effective air quality and noise management.* A receptor is considered as a fixed location, such as a house, building, other premises or open area where health, property or amenity is affected by emissions that increase the concentration of the emitted parameter above background levels. These locations include:

- residential properties;
- schools;
- childcare centres;
- hospitals;
- aged-care facilities;
- places of worship;
- kindergartens;
- community gardens and parks; or
- office buildings.

Sensitive environments, plants and animals may also be considered as sensitive receptors because vegetation and animals can also be affected by air quality emissions.

2.4 Air Quality Assessment Criteria

Limits set to regulate air quality and air emissions are typically selected on the premise of protecting human health. The following pollutants are regulated by the National Environment Protection (Ambient Air Quality) Measure (the AAQ NEPM) due to their known prevalence in the atmosphere and their harmful effects:

- carbon monoxide (CO);
- nitrogen dioxide (NO_2);
- sulphur dioxide (SO_2);
- particulate matter with aerodynamic diameter less than 10 µm (PM_{10});
- particulate matter with aerodynamic diameter less than 2.5 µm ($PM_{2.5}$); and
- lead .

The National Environment Protection Council has also developed a National Environment Protection (Air Toxics) Measure 2011 (Air Toxics NEPM), however, the current purpose of the document is to provide limits for reporting purposes only (no standards or goals are set).

Air quality in South Australia is assessed by comparing long-term monitoring results against these guidelines.

The impact of developments, including transport infrastructure, on air quality, is assessed either by:

- comparing predicted concentrations resulting from operation of the development against the AAQ NEPM, to determine whether local air quality will be adversely affected; or
- comparing the magnitude of change in the concentration of a pollutant, to understand the increased risk posed.

In South Australia, requirements of the EP Act and Environment Protection (Air Quality) Policy 2016 (AQ EPP) must be satisfied by proposed (re)developments. Requirements of the AQ EPP mainly relate to ensuring reasonable control of air emissions from point sources is achieved, whilst the EP Act establishes a general duty of care as described in Section 1.3.

The AQ EPP also sets out odour and toxicity limits for a number of substances, including standards and reporting limits set out by the AAQ NEPM and Air Toxics NEPM. It should be noted that there is currently no long-term monitoring of air toxics.

The current AQ EPP ground-level concentration criteria for AAQ NEPM and Air Toxics NEPM regulated pollutants are presented in Table 2-1. For stationary emission sources, emission limits specified in the AQ EPP should also be satisfied.

Table 2-1 Summary of AQ EPP criteria for AAQ NEPM and Air Toxics NEPM regulated pollutants (SA EPA, 2016)[1].

Pollutant	Maximum concentration (μg/m³)	Averaging Period
AAQ NEPM regulated pollutants		
Carbon monoxide (CO)	31,240	1 hour
	11,250	8 hours
Nitrogen dioxide (NO_2)	250	1 hour
	60	1 year
Ozone (O_3)	210	1 hour
	170	4 hours
Particulate Matter (PM_{10})	50	1 day
	25	1 year[2]
Particulate Matter ($PM_{2.5}$)	25	1 day
	8	1 year
Sulphur Dioxide (SO_2)	570	1 hour
	230	1 day
	60	1 year
Lead	0.5	1 year
Air Toxics NEPM regulated pollutants		
Benzene	58	3 minutes
	10	1 year
Benzo(a)pyrene as a marker for Polycyclic Aromatic Hydrocarbons	0.8	3 minutes
	0.0003	1 year
Formaldehyde	44	3 minutes
	54	1 day
Toluene	710	3 minutes
	4,110	1 day
	410	1 year
Xylenes	380	3 minutes
	1,180	1 day
	950	1 year

[1] Note that where these criteria are superseded by more recent values, the more recent values are to be adopted.
[2] The AQ EPP does not specify an annual criterion for PM_{10}. As such, this criterion was obtained from the current AAQ NEPM.

2.5 Air Quality Screening Tool for Road Projects

Section 2.2.1 references the Department's Air Quality Screening Tool (ASQT) which is a standalone macro-enabled excel spreadsheet available to Professional and Technical Services Prequalified companies by request (email: DPTI.SSDTechnicalServices@sa.gov.au). The AQST considers the key pollutants emitted from road transport (NO_x, $PM_{2.5}$ and PM_{10}), and incorporates the effect of several key parameters which includes traffic volume, vehicle fleet (including percentage of commercial vehicles), road gradient and distance of receptor from road. It provides for a cost and time effective conservative assessment of air quality impacts which can either identify pollutants requiring more detailed assessment (if exceedances are predicted), or discount the need for further, more expensive testing (if predicted concentrations are within the adopted criteria).

The tool is only applicable to straightforward situations. It is not appropriate for assessment of road projects involving tunnels, steep gradients, elevated/depressed sections. Likewise, consideration of complicated factors including future reduction in background pollutant levels, elevated or depressed roads, and roadside barriers shall only be considered in detailed assessments.

Guidance and supporting documentation for the AQST is provided in DIT Air Quality Screening Tool Supporting Documentation (refer to Section 1.1).

No equivalent tool exists for the assessment of rail transport corridors.

2.6 Detailed Assessment

As referenced in Section 2.2, detailed air quality assessments are to be undertaken for more complex road or rail projects. The procedures to be adopted for these detailed assessments are summarised in the following sub-sections.

2.6.1 Assessment of Road Corridors

Future roads which include a tunnel, or cuttings and/or elevated sections (± 2 m in height) cannot be assessed appropriately using the Department's AQST. Further investigation is also required when the Department's AQST identifies exceedances of the adopted assessment criteria at a sensitive receptor location. In both these instances a detailed air quality assessment must be undertaken by a suitably qualified and experienced professional, who satisfies the following requirements:

- holds a tertiary qualification in a relevant degree such as Bachelor of Environmental Science, or Bachelor of Engineering;
- is a member or is included in corporate membership of the Clean Air Society of Australia and New Zealand (CASANZ); and
- has at least 5 years of air quality experience in Australia, including assessment of transport projects.

The following are also desirable criteria:

- is a Certified Air Quality Professional (CAQP); or
- holds current membership with a professional body such as Engineers Australia.

The following process shall be carried out for a detailed assessment of air quality impacts from road projects:

1) Obtain estimated AADT and two-way vehicles per hour during peak hour during peak hour where possible, also the percentage commercial vehicles (%CVs) and hourly traffic distribution (for the road of interest, and where significant changes/traffic flows are expected also adjoining/intersection roads).

   Note that assessor may wish to check historical turning movement surveys via the to calculate historical vehicles per hour (VPH) as a percentage of AADT, and apply this to future projections (subject to discussion and endorsement of the Departmental project manager).

2) Obtain expected/typical vehicle speed and road gradient.

3) Estimate emission factors using the latest PIARC's 'Road Tunnels Manual: vehicle emissions and air demand for ventilation' and adjust emission factors accordingly.

4) Determine road geometry (including number of lanes, lane width, approximate Universal Transverse Mercator (UTM) coordinates).

5) Determine appropriate background concentrations for relevant pollutants (minimum NO_2, PM_{10}, $PM_{2.5}$ and CO) (either hourly-varying concentrations for same year as meteorology, or 70th percentile concentration for that year) (Gov. of Vic, 2001).

6) Generate appropriate hourly meteorology inputs using representative data from the nearest Bureau of Meteorology (BoM) station or similar, and prognostic modelling using programs such as the Weather Research and Forecasting (WRF) model in the absence of sufficient data.

7) Model emissions of relevant pollutants (minimum NO_X, PM_{10} and $PM_{2.5}$) and predict concentrations at sensitive receivers for existing conditions, project opening year, and 10 years post opening, using a suitable dispersion modelling program such as AERMOD, CALPUFF or GRAL. Prior to modelling being undertaken the consultant must obtain the Department's endorsement for:

   (a) The choice of dispersion modelling program (this depends on factors including project type, sensitivity, outcomes from initial screening etc.). Supporting information and recommendations should be provided to inform this decision.
   (b) Background concentrations and meteorology to be used in the assessment.
   (c) Proposed modelling assumptions, especially regarding estimation of emission factors.

8) Prepare pollutant concentration contour plots for all relevant pollutants and averaging periods. Contour plots must extend beyond the project footprint by a minimum distance of 50 m, or extending further as needed to capture all exceedances of air quality criteria. Contour plots shall be prepared for existing conditions, project opening year and 10 years post opening.

9) Compare predicted concentrations with AQ EPP limits at all sensitive receptors. In the instance where exceedances of criteria are predicted at sensitive receptor locations for future operational scenarios, investigate and analyse the effect of noise barriers, potential future reduction in background pollutant levels and other factors which could reduce predicted concentrations (e.g. predicted uptake of electric vehicles). This stage of the assessment should be completed in consultation with the Department.

   It is important to understand that the current annual averaging period limit for $PM_{2.5}$ of 8 μg/m^3 is currently consistently being exceeded nation-wide at locations considered representative of background conditions. Although regulatory changes and improvements to emission reduction technology are gradually reducing ambient $PM_{2.5}$ concentrations in Australia and globally, the issue of high background $PM_{2.5}$ concentrations is expected to continue. As such, it is problematic to assess a project's cumulative impact against a criterion which is exceeded by the background concentration alone. It should also be highlighted that $PM_{2.5}$ is a non-threshold pollutant, meaning that exposure to any level of $PM_{2.5}$ can be harmful.

   Based on the above, also assess the impact of the project in terms of the change in the annual mean $PM_{2.5}$ concentration ($\Delta PM_{2.5}$) due to operation of a project.

> Note: Assessment of the change in the annual mean $PM_{2.5}$ concentration.
>
> A limit of $\Delta PM_{2.5}$ equal to 1.8 μg/m^3 has been adopted, which equates to an increased risk of 'mortality' of approximately 1 in 10,000. This metric has been adopted for use in the screening tool, and should use be adopted for detailed assessments, whereby a predicted $\Delta PM_{2.5}$ equal to 1.8 μg/m^3 or greater will trigger the need for a detailed assessment. The $\Delta PM_{2.5}$ is calculated as follows:
>
> $$\Delta PM_{2.5} = (PM_{2.5})_{user\text{-}defined} - (PM_{2.5})_{existing}$$
>
> Where:
>
> $(PM_{2.5})_{user-defined}$ is the screening tool-predicted incremental annual mean $PM_{2.5}$ concentration for the user-defined year (either opening year of the project, or 10 years post-opening), and;

$(PM_{2.5})_{existing}$ is the screening tool-predicted incremental annual mean $PM_{2.5}$ concentration for existing conditions (the current year).

2.6.2 Assessment of Rail Corridors

The need to complete a detailed assessment of a rail corridor is less common than for road corridors, however, similar requirements apply. The following process shall be carried out for a detailed assessment of air quality impacts from rail projects:

1) Obtain estimated traffic volumes (or idle time if impacts during idling is of concern) and expected locomotive speed.
2) Select emission factors which are appropriate for the railway investigated (should consider factors including fuel-type used, locomotive type, locomotive speed and be sourced from an appropriate resource such as the US EPA).
3) Determine rail corridor geometry.
4) Determine appropriate background concentrations for relevant pollutants (either hourly-varying concentrations for same year as meteorology, or 70th percentile concentration for that year) (Gov. of Vic, 2001).
5) Generate appropriate hourly meteorology inputs using representative data from the nearest Bureau of Meteorology (BoM) station or similar, and prognostic modelling using programs such as the Weather Research and Forecasting (WRF) model in the absence of sufficient data.
10) Model emissions of relevant pollutants (minimum NO_2, PM_{10} and $PM_{2.5}$) and predict concentrations at sensitive receptors for existing conditions, project opening year, and 10 years post opening, using a suitable dispersion modelling program such as AERMOD, CALPUFF or GRAL. Prior to modelling being undertaken the consultant must obtain the Department's endorsement for:
    (a) The choice of dispersion modelling program (this depends on factors including project type, sensitivity, outcomes from initial screening etc.). Supporting information and recommendations should be provided to inform this decision.
    (b) Background concentrations and meteorology to be used in the assessment
    (c) Proposed modelling assumptions, especially regarding estimation of emission factors.

6) Prepare pollutant concentration contour plots for all relevant pollutants and averaging periods. Contour plots must extend beyond the project footprint by a minimum distance of 50 m, or extending further as needed to capture all exceedances of air quality criteria. Contour plots shall be prepared for existing conditions, project opening year and 10 years post opening.
7) Compare predicted concentrations with AQ EPP limits at all sensitive receptors. In the instance where exceedances of criteria are predicted at sensitive receptor locations for future operational scenarios, investigate and analyse the effect of noise barriers, potential future reduction in background pollutant levels and other factors which could reduce predicted concentrations. This stage of the assessment should be completed in consultation with the Department.

    It is important to understand that the current annual averaging period limit for $PM_{2.5}$ of 8 μg/m^3 is currently consistently being exceeded nation-wide at locations considered representative of background conditions. Although regulatory changes and improvements to emission reduction technology are gradually reducing ambient $PM_{2.5}$ concentrations in Australia and globally, the issue of high background $PM_{2.5}$ concentrations is expected to continue. As such, it is problematic to assess a project's cumulative impact against a criterion which is exceeded by the background concentration alone. It should also be highlighted that $PM_{2.5}$ is a non-threshold pollutant, meaning that exposure to any level of $PM_{2.5}$ can be harmful.

Based on the above, also assess the impact of the project in terms of the change in the annual mean $PM_{2.5}$ concentration ($\Delta PM_{2.5}$) due to operation of a project.

Refer to above note on "Assessment of the change in the annual mean $PM_{2.5}$ concentration."

2.7 Responsibility for Managing Road Traffic Air Quality

Ambient air quality within an air shed is affected by a number of factors which include local topography and meteorology, the profile of local emission sources (type of sources, pollutants emitted etc.) and the quantity of emissions released from these sources. Emissions from road traffic are one source-type which contributes to the air shed's air quality. Other sources include industrial (i.e. operation of generators) and domestic (i.e. use of wood fire heaters) activities.

An exceedance of specified air quality criteria at a location adjacent to a transport corridor does not equate to a breach of legislation, as:

- the National Environmental Protection Measure standards are whole of air shed targets;
- transport infrastructure cannot be considered a point source; and
- the Department is not directly responsible for the emissions emitted by vehicles using its infrastructure.

However, the Department does influence the generation of air pollution through the design of road networks, and has a responsibility under the Section 25 of the EP Act to do what is reasonable and practical to avoid or minimise environmental harm.

In deciding what is reasonable and practical for the management of air quality associated with transport projects, the following could be considered:

- feasibility of construction;
- cost effectiveness;
- expected change(s) in air quality compared to the existing environment (environment prior to construction);
- opinions of affected residents;
- input from local and public agencies (including but not limited to the South Australian Environment Protection Authority – SA EPA);
- social, economic, environmental, legal and technical factors; and
- effectiveness of air quality impact mitigation measures.

Developers of sensitive land use areas located in proximity to transport corridors are also responsible for mitigation of air quality impacts from traffic. Design of ventilation systems is particularly important, including locating air intakes for mechanical ventilation away from pollution sources. Locating outdoor recreational areas such that buildings separate the outdoor area from the road can also be beneficial.

The Noise and Air Emissions Overlay of the Planning and Design Code (under the Planning, Development and Infrastructure Act 2016 [PDI Act]) provides policy guidance to protect sensitive development from noise and air emissions generated from major transport corridors (road and rail).

2.8 Pre- and Post-Construction Monitoring Requirements

2.8.1 Pre-Construction Monitoring (Dispersion Model Validation)

In some instances (e.g. projects that have a complex alignment, where significant public concern/scrutiny is anticipated and/or where ambient levels are already close to the NEPM limits) it may be prudent to undertake air quality monitoring during the proving or pre-delivery phase of a project to enable model calibration and to ensure model outputs accurately represent actual (monitored) concentrations. Monitoring also provides the modeller with site specific speciation profiles (i.e. ratios of $PM_{2.5}$ to PM_{10} and NO_2 to NO_x). This is noting that use of SA EPA pollutant monitoring data is typically adequate to establish background concentrations.

The decision to undertake monitoring must consider time and resource implications. For example, at least three months (preferable longer) of monitoring is generally required to obtain useful data which can attract fairly substantial costs.

Where monitoring is to be undertaken, the following minimum requirements apply:

- monitoring is to be conducted prior to commencing the detailed assessment;
- the monitoring site shall be located as close as possible to the assessed road/ rail;
- minimum monitoring duration of three months (at least 50% of which should be conducted outside of winter/periods of rainfall); and
- monitored parameters are:
  - hourly-average recorded values of relevant meteorological parameters (minimum requirement of wind speed, wind direction, temperature and rainfall); and
  - hourly-average recorded values of pollutant concentrations (minimum requirement of NO_x, NO_2, $PM_{2.5}$ and PM_{10})

2.8.2 Post-Construction Monitoring

In exceptional circumstances, post-construction monitoring may be considered in situations where air quality is shown to be adversely affected by a road project (i.e. where there is a significant change compared to existing conditions, resulting in a new exceedance at a sensitive receptor location).

If post-construction monitoring is to be undertaken, minimum monitoring requirements would be similar to those for pre-construction monitoring, but should aim to coincide with meteorological conditions that resulted in worst-case impacts predicted by the dispersion model.

3 Reporting

Unless specified otherwise in Contract Documentation the following reporting applies to each phase of the project. Reporting shall be provided to the Department's Technical Services Environment and Sustainability Unit for review and acceptance. Further information regarding project phases is presented in the Introduction Part of the EHTM.

3.1 Proving

Preliminary Review of Level of Assessment Required During the Proving Phase of a project, a review of the project scope against Section 2.1 and 2.2 should be undertaken to determine if: 1) these guideline are applicable to the project works; and 2) the likely level of assessment required as the project design progresses. This information should be summarised in the preliminary EHIA as well as planning and/or design reports. Where multiple project options are being assessed and compared, the preliminary review findings are to be reported in a suitable location to inform such option comparisons. Where air quality is a component of the options selection or short-listing, an assessment of each option using the Air Quality Screening Tool may be required to be undertaken to assist in the options selection process.

3.2 Pre-Delivery/Delivery

The reporting undertaken during the Pre-Delivery/Delivery Phases should build upon that undertaken during the Proving Phase (or address what should have been considered during the Proving Phase, if no review was previously undertaken).

During the Pre-Delivery/Delivery Phase, air quality assessments may be required for input into the EHIA Report or detailed design reports, to inform project design.

Assessment against the Department's Air Quality Screening Tool Where identified to be required, an assessment in accordance with the Department's AQST is to be undertaken and reported as a standalone report or technical memo. The findings of the assessment should be incorporated into the EHIA report as well as the planning and/or design reports.

AND/OR

Detailed Air Quality Assessment Where identified to be required, a detailed air quality assessment is to be undertaken and reported as a standalone report or technical memo. The findings of the assessment should be incorporated into the EHIA report as well as the planning and/or design reports noting that the assessment may have design implications and include recommendations for any changes in design or future monitoring/validation requirements. When the project moves into detailed design, an Air Quality Assessment Design Report shall be prepared. It may be a new assessment or an update of the previous investigation addressing the change in design parameters or assumptions. Reporting must address the assessment steps as detailed in Section 2.6.

3.2.1 Validation

Where required (refer Section 2.8) a Validation Report shall be provided or results incorporated into planning and/or design reports.

4 References

Aurecon (2016), 'North South Corridor Torrens Road to River Torrens air quality assessment', alliance document number T2T-T2TA-ENV-RP-0009.

Baldauf, R., Thoma, E., Khlystov, A., et al. (2008), 'Impacts of noise barriers on near-road air quality', Atmospheric Environment, Vol. 42, pp/ 7502-07

CASANZ (2017), 'Consultation on proposed vehicle emission and fuel quality measures', submission from Clean Air Society of Australia and New Zealand Inc. (CASANZ) to Department of Infrastructure and Regional Development (DIRD)

DIRD (2017), 'Vehicle emission standards', Department of Infrastructure and Regional Development, Australian Government, [online], accessed 22 March 2017, available: https://infrastructure.gov.au/roads/environment/emission/

Environ Australia Pty Ltd (2013), 'Locomotive Emissions Project: Scoping Study of Potential Measures to Reduce Emissions from New and In-service Locomotives in NSW and Australia', prepared by Environ Australia Pty Ltd for New South Wales Environment Protection Authority (NSW EPA).

Hooghwerff, J., Tollenaar, C., van der Heijden, R. (n.d.), 'Effects of (optimised) noise barriers on air quality – test site IPL', IPL conference – Air quality alongside motorways.

RMS (2016), 'M5 East Ambient Air Data 2016', validated ambient data summary table, Roads and Maritime Services, [online], accessed 14 June 2017, available: http://www.rms.nsw.gov.au/projects/sydney-south/m5-east/outside-air-quality-monitoring/historical-data-2016.html.

Smit, R. (2014), 'Australian Motor Vehicle Emission Inventory for the National Pollutant Inventory (NPI)', prepared for Department of the Environment, UniQuest Pty Ltd.

SA EPA (2016), 'Ambient Air Quality Assessment', South Australian Environment Protection Authority.

US EPA (2016), 'Technical support document (TSD) for replacement of CALINE3 with AERMOD for transportation related air quality analyses', [online], accessed 7 June 2017, available: https://www3.epa.gov/ttn/scram/appendix_w/2016/CAL3_AERMOD_Replacement_TSD.pdf

Victoria EPA (2006), 'Review of air quality near major roads', Publication 1025, February 2006,

WHO Regional Office for Europe (2013), 'Review of Evidence On Health Aspects Of Air Pollution – REVIHAAP Project', Technical Report, WHO Regional Office for Europe, Copenhagen, Denmark.