

## 12. Guide to development in the Transport air quality corridor overlay

*Brisbane City Plan 2014* (City Plan) has been developed by Brisbane City Council in consultation with the community and guides how land in Brisbane can be used and developed..

This guide explains how City Plan applies to development in the Transport air quality corridor overlay and will help you understand the plan's requirements for these sites when preparing a development application.

The transport air quality corridor provisions of [City Plan](#) aim to protect the health and wellbeing of residents from the impacts of road traffic pollutants.

This guide explains how to find and interpret the relevant sections of City Plan, including:

- the Transport air quality corridor overlay map
- the [Transport air quality corridor overlay code](#), and
- the [Transport air quality corridor planning scheme policy](#).

The guide also provides background information to clarify the elements of urban design that are required by the transport air quality corridor provisions.

### Tools to help you understand City Plan

[Brisbane City Plan 2014](#) includes two online interactive planning tools, the ePlan (electronic version of [Brisbane City Plan 2014](#)) and the [interactive mapping tool](#) to make it easy for you to see what requirements may affect your development.

All of these tools can be found by visiting Council's website and searching for [Brisbane City Plan 2014](#).

Council's [interactive mapping tool](#) allows you to view a property on a map to see the zone, zone precinct, overlays and neighbourhood plans that apply to the site. It can also generate a property report that will help you identify the rules that apply to a development and the criteria Council will use to assess an application.

The [ePlan](#) (electronic version of City Plan) contains details of the planning scheme and hyperlinks to help you find the requirements that relate to a proposed development.

### City Plan and transport corridors

[City Plan](#) recognises that air emissions are greater in transport corridors than in less busy areas. [City Plan](#) and its Transport air quality corridor overlay, [Transport air quality corridor overlay code](#) and Transport air quality corridor planning scheme policy work together to help deliver the goals and objectives of the [Brisbane. Clean, Green, Sustainable plan](#). For more information on the key issues for Brisbane's air quality refer to [Brisbane. Clean, Green, Sustainable](#).

Motor vehicles emit a range of air pollutants that are known to affect health. These pollutants include fine particles, nitrogen oxides, and volatile organic compounds such as benzene, toluene, ethylbenzene and xylene. Vehicle emissions also contribute to the formation of ozone. While ozone in the upper atmosphere gives protection from ultra violet (UV) radiation, at ground level, where it can be inhaled, it is unhealthy.

The *National Environmental Protection Measure (NEPM) for Ambient Air Quality* sets guidelines for the concentrations of these pollutants. Exposure to levels above the guideline concentrations can cause short-term and long-term health effects, mainly on the respiratory and circulatory systems.

### Road traffic pollution and urban design

The transport air quality corridor provisions of [City Plan](#) aim to protect the health and wellbeing of residents from the impacts of road traffic pollution through good urban design. This is design that:

- facilitates wind movement and dispersion of pollutants
- reduces exposure to traffic pollution.

The desired development outcomes will incorporate site layout and building design features that address the higher level of air emissions generally found in transport corridors, and minimise the impacts of air pollution from a tunnel ventilation outlet.

Designing for good air quality on transport corridors complements other desired outcomes of [City Plan](#), such as proximity to amenities and public transport, accessibility to jobs, variety of housing choice, business opportunities, public safety and vibrancy of urban living.

#### **Transport air quality corridor overlay**

The Transport air quality corridor overlay identifies land situated along busy roads and intersections and close to tunnel ventilation outlet, where a design solution would be required to mitigate the effects of traffic pollutants.

The Transport air quality corridor overlay is shown in the interactive mapping tool and on the corresponding PDF maps of the city.

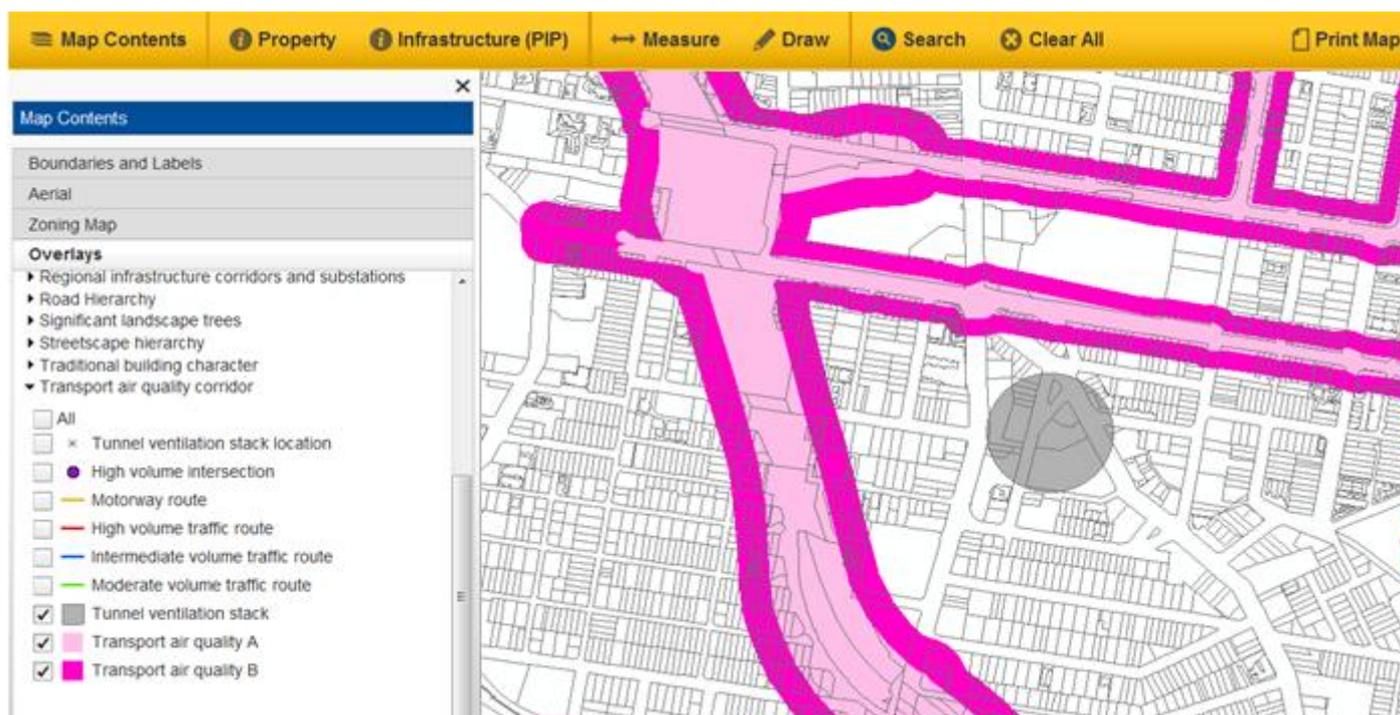
Land in the Transport air quality corridor overlay is divided into the following three sub-categories.

- 1) Transport air quality corridor A sub-category. This applies to a material change of use for a multiple dwelling, residential care facility, retirement facility or rooming accommodation where accommodating six or more people.
- 2) Transport air quality corridor B sub-category. This applies to a material change of use for a child care centre.
- 3) Tunnel ventilation stack sub-category. This applies to all uses within the overlay sub-category area.

Figure 1 on the following page shows each sub-category represented by a different coloured shaded area.



Figure 1 - Screen shot of the City Plan interactive mapping tool for the Transport air quality corridor overlay



If your proposed development is located in one of these three sub-categories, you will need to consider the requirements of the Transport air quality corridor overlay code when preparing your development application.

Each sub-category triggers different requirements in the [Transport air quality corridor overlay code](#). As child care centres are used by the youngest and most sensitive group in the community, Transport air quality corridor B sub-category triggers more stringent development requirements than Transport air quality corridor A sub-category.

The Tunnel ventilation stack sub-category triggers different requirements, because the emissions from the stack behave differently from road emissions, and all development within this sub-category area may influence the way pollutants are dispersed.

Within the Transport air quality corridor A and B sub-categories, roads have been categorised into different traffic route types, each based on the projected annual average daily traffic (AADT) volume.

Different road types are identified on the interactive mapping tool by a different coloured centre line or dot on the road (see Table 1 below).

Each route type also triggers different provisions in the [Transport air quality corridor overlay code](#), relating to separation from the kerb. This is explained further in a later section.

Table 1 - How route types are identified in the Transport air quality corridor overlay in the City Plan interactive mapping tool and PDF maps.

Route type	Colour
Motorway route	Yellow
High volume traffic route	Red
Intermediate volume traffic route	Blue
Moderate volume traffic route	Green
High volume intersection	Purple

The impact of vehicle emissions may vary depending on a combination of factors, including:

- volume of traffic using the road
- congested, stop-start conditions
- an uphill slope of road
- a higher proportion of heavy vehicles using the road
- reduced ability for pollutants to disperse, e.g. due to buildings.

Modelling and monitoring studies indicate that roads with less than 20,000 AADT represent a minimal risk of air quality impacts on sensitive development.

## How to find if your property is in the Transport air quality corridor overlay

The steps listed in Table 2 below show you how to find:

- if your property is in the Transport air quality corridor overlay
- which sub-category applies to your development
- which traffic route type your property is on.

**Table 2 – Steps to identify whether a property is in the Transport air quality corridor overlay**

<b>Step 1</b>	<p>Go to <a href="http://www.brisbane.qld.gov.au/newcityplan">www.brisbane.qld.gov.au/newcityplan</a> and open the City Plan interactive mapping tool.</p> <p>Under the 'Map Contents' tab on the left of the screen, select 'Overlays', then 'Transport air quality corridor' and 'All'.</p> <p>Alternatively, select the relevant tile in the Transport air quality corridor overlay map which opens a PDF map. The PDF map is the definitive version in the event of a conflict with the interactive mapping tool.</p>
<b>Step 2</b>	<p>Find your property of interest on the map.</p> <p>Click on the 'Property' tab then select the property on the map to bring up a property report. This report lists all the overlays that apply to that property.</p>
<b>Step 3</b>	<p>If the property report lists 'Transport air quality corridor overlay', refer to the interactive mapping tool to see the type of corridor the property lies along. This will be shown by a coloured centre line or dot.</p>
<b>Step 4</b>	<p>Around the coloured centre line or dot are the sub-categories within the Transport air quality corridor overlay, shown as a shaded area:</p> <ul style="list-style-type: none"><li>• sub-category A</li><li>• sub-category B</li><li>• tunnel ventilation stack.</li></ul>

### Transport air quality corridor overlay code

The [Transport air quality corridor overlay code](#) contains the assessment benchmarks for development involving a material change of use within the Transport air quality corridor overlay.

The assessment benchmarks are separated into performance outcomes (PO) and acceptable outcomes (AO) that are different for each sub-category and route type.

The acceptable outcomes specify preferred options for achieving the associated performance outcome. You can develop other solutions to meet the performance outcome, provided you show how the alternative solution complies.

### Transport air quality corridor sub-category A

Section A of the [Transport air quality corridor overlay code](#) contains the assessment benchmarks for development located in the Transport air quality corridor A sub-category.

Developments within this sub-category need to comply with the first performance outcome (PO1) and the second performance outcome (PO2) of the Transport air quality corridor overlay code.

PO1 relates to reducing the exposure of sensitive uses to the source of pollution.

Traffic pollutants reduce as distance from the road kerb increases. Setting back sensitive development as far as practicable from the kerb will provide the best outcome for the health and well-being of occupants.

The first acceptable outcome (AO1) provides an option for separating the sensitive use from the kerb. The recommended separation distances for the different traffic route types are provided in Table 8.2.23.3.B and are based on best available air quality roadside monitoring data and air quality modelling predictions.

Separation may be measured vertically as well as horizontally. Therefore, residences on higher floors will achieve greater pollutant reduction from the road. The podium design, with commercial uses on lower floors, and residential uses on higher floors, set further back from the road, can be effective in reducing exposure of residents.

Where the development cannot meet the recommended separation distance from the kerb, AO1 includes an alternative to install ducted mechanical ventilation with the supply of clean outdoor air.

Mechanical ventilation in this context is different from air-conditioning and does not include split-systems that re-circulate indoor air. The ventilation needs to be specifically designed to draw in fresh air from outside the building.

For the supply of clean air, the outdoor air intakes for the mechanical ventilation need to be located on the roof or side of the building away from the busy road. They should also be separated from the road by the recommended distances in Table 8.2.23.3.B. This can achieve substantial pollutant concentration reductions of 25-80%.

Where the ventilation outdoor air intakes cannot be sufficiently separated from the kerb, AO1 offers a third alternative for achieving clean air for building occupants. This involves installing particle filtration in combination with ducted mechanical ventilation.

Filtration to a Minimum Efficiency Reporting Value (MERV) level of 9 reduces particles in the 1.0 to 3.0 micron diameter range by up to 50% and particles in the 3.0 to 10.0 micron diameter range by up to 85%. This standard of filtration is approximately equivalent to the Australian F5 rating and is typically used for superior residential or commercial buildings.

While current filtration technology does not extend to vehicle pollutants other than fine particles, airborne particles present the greatest concern for health. While a MERV 9 standard does not capture all particles, it will reduce concentrations to an acceptable level of risk, within the limits of technical and economic practicality.

The second performance outcome (PO2) for the Transport air quality corridor A sub-category relates to building and lot design that enables traffic pollutants to disperse easily.

Where the proposed development is more than two storeys in height, the second acceptable outcome (AO2) gives an option to set back the storeys at the third floor and above. This this will avoid trapping pollutants at street level.

Where the identified minimum separation distances in Table 8.2.23.3.B cannot be achieved, PO2 recommends design solutions to facilitate the dispersion of pollutants away from the road. This includes:

- varying building heights, widths, tiers and shapes
- providing air gaps between buildings to avoid continuous built form
- articulating building facades
- varying roof shapes
- planting trees between the building and the road.

To demonstrate how the development includes these design features, a transport air quality corridor report needs to be submitted. Guidance on how to prepare this report is contained in the Transport air quality corridor planning scheme policy.

Figure 2 below summarises how to step through the acceptable outcome options for addressing PO1 and PO2.

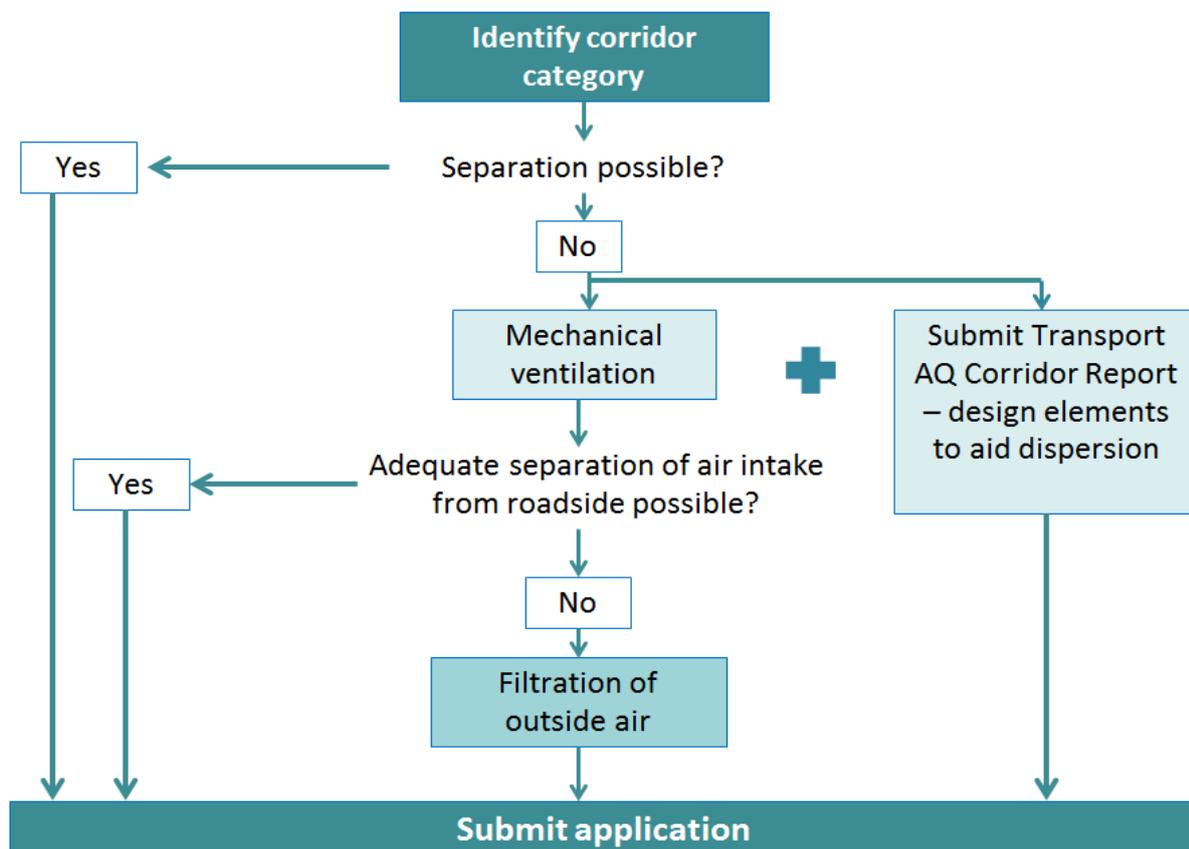


Figure 2 - Steps for addressing PO1 and PO2 of the Transport air quality corridor overlay code

### Transport air quality corridor sub-category B

Section B of the [Transport air quality corridor overlay code](#) contains the assessment benchmarks for development involving a material change of use for a child care centre when located in the Transport air quality corridor B sub-category.

Child care centres have been addressed separately in the code because young children are particularly susceptible to the health effects of traffic pollutants. As children spend large amounts of time in outdoor play or teaching areas, and all child care centres are required to provide outdoor play areas, building design features alone will not create a safe environment. For this reason, a greater separation distance from road corridors for child care centres is required, as identified in Table 8.2.23.3.B.

If the development cannot achieve the required separation distance, an air quality impact report should be prepared, in accordance with the Air quality planning scheme policy, to demonstrate compliance with the assessment benchmarks.

The Air quality planning scheme policy gives recommendations for specialised models to be used in the assessment of vehicle pollution from road networks. Refer to the factsheet 10 Guide to the Air quality planning scheme policy for more information.

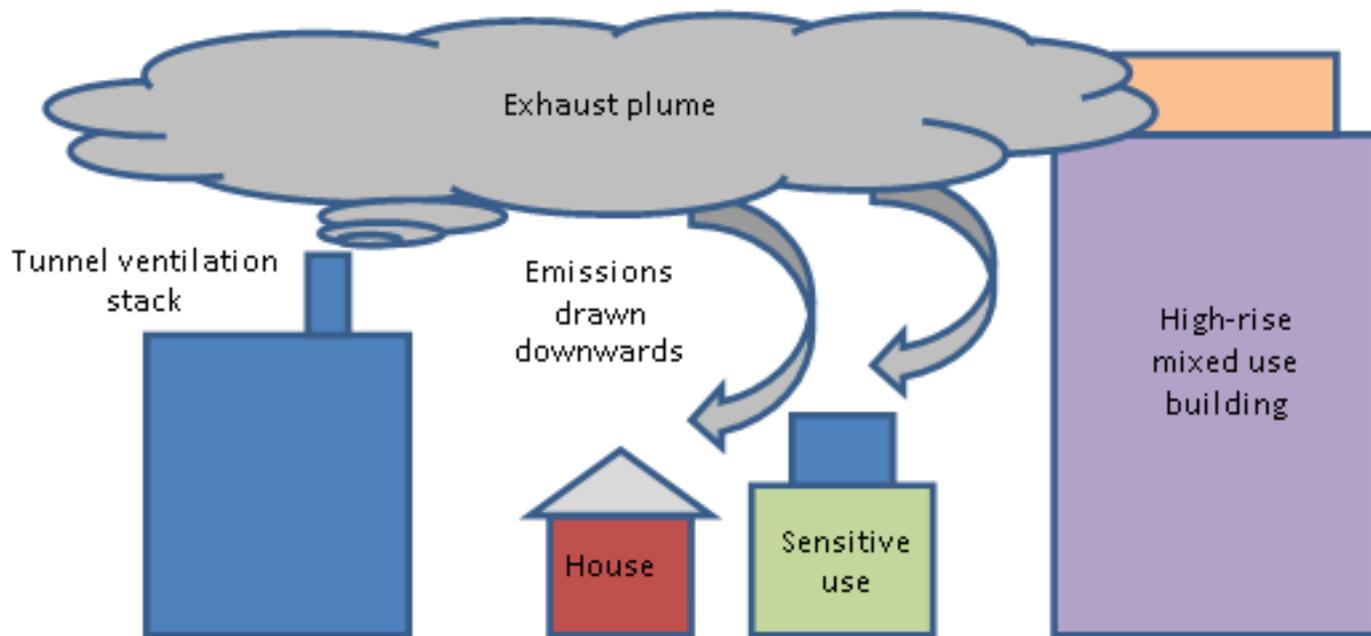
### Tunnel ventilation stack sub-category

Section C of the [Transport air quality corridor overlay code](#) contains the assessment benchmarks for development involving a material change of use in the Transport air quality corridor tunnel ventilation stack sub-category and applies to all uses.

Tunnel ventilation stacks collect vehicle exhaust and release a single plume at a high elevation so that the wind disperses the pollutants. In this way, the pollutant concentration is reduced quickly and does not cause an impact on people at ground level.

However, buildings over a certain height are likely to affect the dispersion of air pollutants emitted from the stack. Not only can occupants of the building in question be exposed to high levels of pollutants, but the aerodynamic effects of the building may cause the plume to be drawn downwards and affect occupants of other buildings at lower levels, as shown in Figure 3 below.

**Figure 3 - Example of the aerodynamic effects of tall buildings on the exhaust plume of a tunnel ventilation stack**



If the development has a building height greater than that which is specified in the overlay code, you will need to show how the air quality performance outcome can be met, both for occupants of your building and other buildings in the overlay area. An air quality impact report should be prepared, in accordance with the [Air quality planning scheme policy](#), to demonstrate achievement of this performance outcome.

To assess the effects of buildings on the tunnel ventilation stack plume, specialised fluid modelling may be necessary, as specified in the Air quality planning scheme policy. Refer to the factsheet 10 Guide to the [Air quality planning scheme policy](#) for more information.

## Transport air quality corridor planning scheme policy

The Transport air quality corridor planning scheme policy provides guidance on how to prepare a transport air quality corridor report. This report needs to demonstrate how a development incorporates best-practice built form and landscape design elements to comply with the assessment benchmarks in the Transport air quality overlay code PO2.

The policy explains which principles of good building design need to be addressed by the report and gives examples of the development features and measurements to include.

The following sections give further background and expand on the information provided in the [Transport air quality corridor planning scheme policy](#).

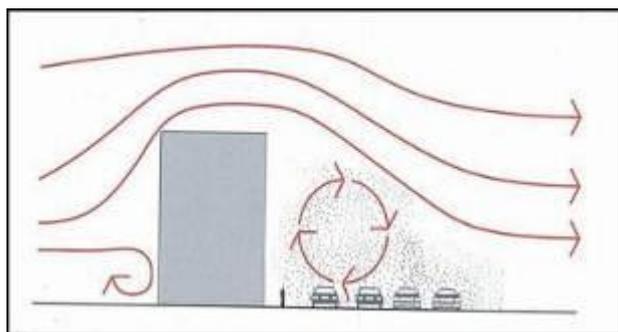
### Streetscape design

The quantity of pollutants carried in air is strongly influenced by weather conditions, especially wind. The concentrations of pollutants near a road will decrease more quickly where there are unrestricted breezes that can carry pollutants away.

The orientation and continuity of open spaces, their dimensions and shape, topography, and the layout of buildings influence the extent to which wind can carry away air pollutants. Air pollutants have less opportunity to disperse where space is more confined by buildings, walls or embankments adjacent to, or over, a roadway.

Figure 4 illustrates that tall, flat-sided, box-shaped buildings can cause an eddying effect where pollutants are trapped next to the building's surface when the wind blows from the rear of the building.

Figure 4 - Traffic fumes trapped behind a building



Key strategies for reducing resident exposure to air pollutants are site layout and building design to facilitate wind movement and pollutant dispersal.

Continuous high-rise buildings situated parallel to a busy road can form street canyons where wind flows stagnate or recirculate, causing an increase in pollutant concentrations adjacent to the buildings. This can occur where wind blowing across the top of the buildings acts like a lid preventing the dispersion of the air pollutants (see Figure 5 on the following page).

Three basic design elements are important for encouraging the rapid dispersal of pollutants:

- avoiding street-canyon dimensions
- providing gaps for air flow
- encouraging wind turbulence.

Achieving ideal pollutant dispersal relies on each building contributing positively to maintaining good air circulation along the street.

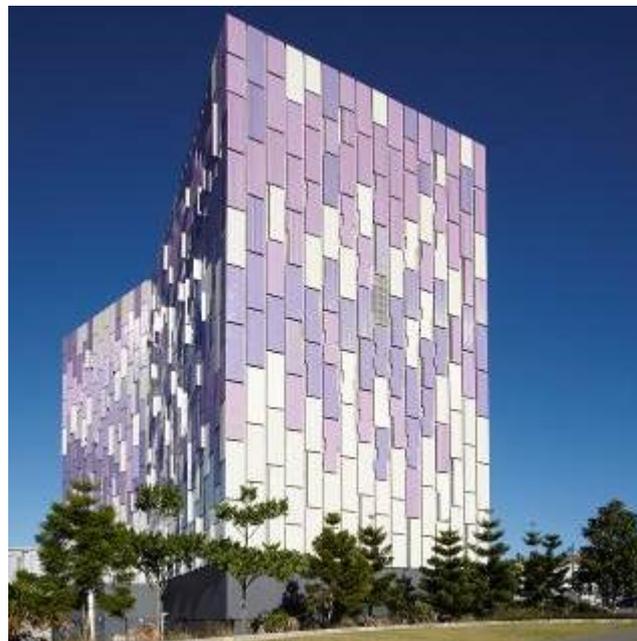
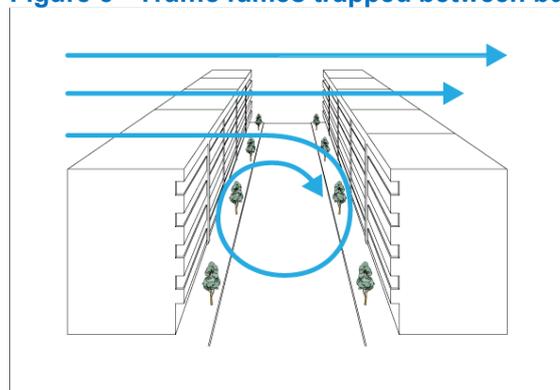


Figure 5 - Traffic fumes trapped between buildings



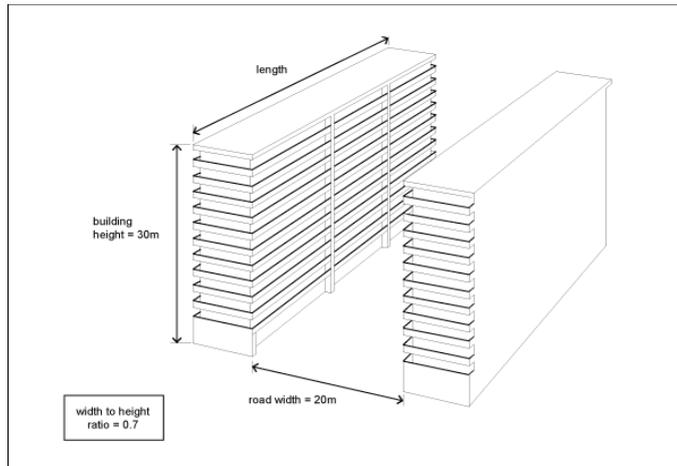
### Design element 1 - avoiding the street canyon effect

A street canyon is the deep, narrow, valley-like space above a street in a city, created by tall buildings on both sides without gaps for air flow, which trap air pollutants and prevent their dispersion. A street canyon can be caused by multiple neighbouring buildings in a row.

Achieving the desired outcome relies on each building being complementary to the others around it. Opportunities to facilitate the design of larger sections of the streetscape as a whole should be taken wherever possible.

Certain street canyon dimensions produce poor flushing of the air at street level. Figure 6 shows how to calculate street canyon dimensions.

**Figure 6 - How to calculate street canyon dimensions**



The transport air quality report needs to include illustrations that demonstrate how the development addresses the street canyon effect.

Modelling studies of air movement within different canyon geometries has found that the width-to-height and length-to-height ratios and roof shapes have a significant effect on pollutant concentrations and dispersion within the canyon.

Pollutant concentrations can be reduced by:

- maintaining a canyon width-to-height ratio greater than 0.7
- constructing buildings asymmetrically, so that those on one side of the road are of a different height from those on the other side of the road
- placing slanting roofs on buildings, ensuring that the slope and height of the roof is not identical to buildings neighbouring the development or on the opposite side of the road. Identical roof shapes can contribute to trapping pollutants between buildings.

The exact dimensions of the development are not the critical factors. It is more important that the streetscape works as a whole. The development needs to be different enough from others around it to avoid the street canyon effect.

If a development is tall relative to the width of the road, street canyon dimensions can be avoided by setting back the above-podium storeys and introducing variation of form.

## Design element 2 - providing gaps for air flow

Significant gaps in the streetscape are important to allow air flow. This includes gaps between buildings and between towers above a podium (see Figure 7 below).

**Figure 7 - Air movement around buildings to facilitate pollution dispersal**

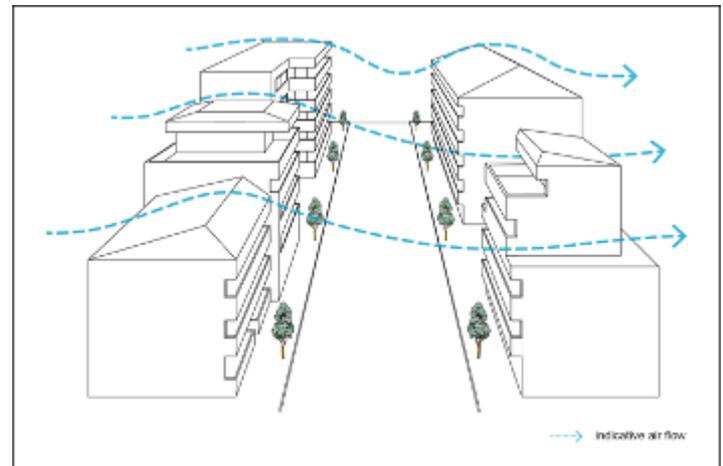


Figure 7—Good dispersal – air movement around buildings

The following design features will help ensure that each new building contributes positively to the streetscape and air pollutant dispersal:

- residential buildings maintain the required setback from the side boundary
- the upper stories of multi-level buildings are set back
- above podium height, the building extends continuously for no more than 75% of the width of the property, and is a maximum of 30 metres in any direction
- where there is more than one tower above the podium, the towers are separated by a distance of at least 10 metres
- a gap of at least three metres is maintained between buildings at the third storey and above.

The following figures provide example illustrations to help ensure that each new building contributes to air pollutant dispersal.

Figure 8 - Measuring distances between proposed development and existing neighbouring buildings. '1' denotes building to boundary or building to building measurement

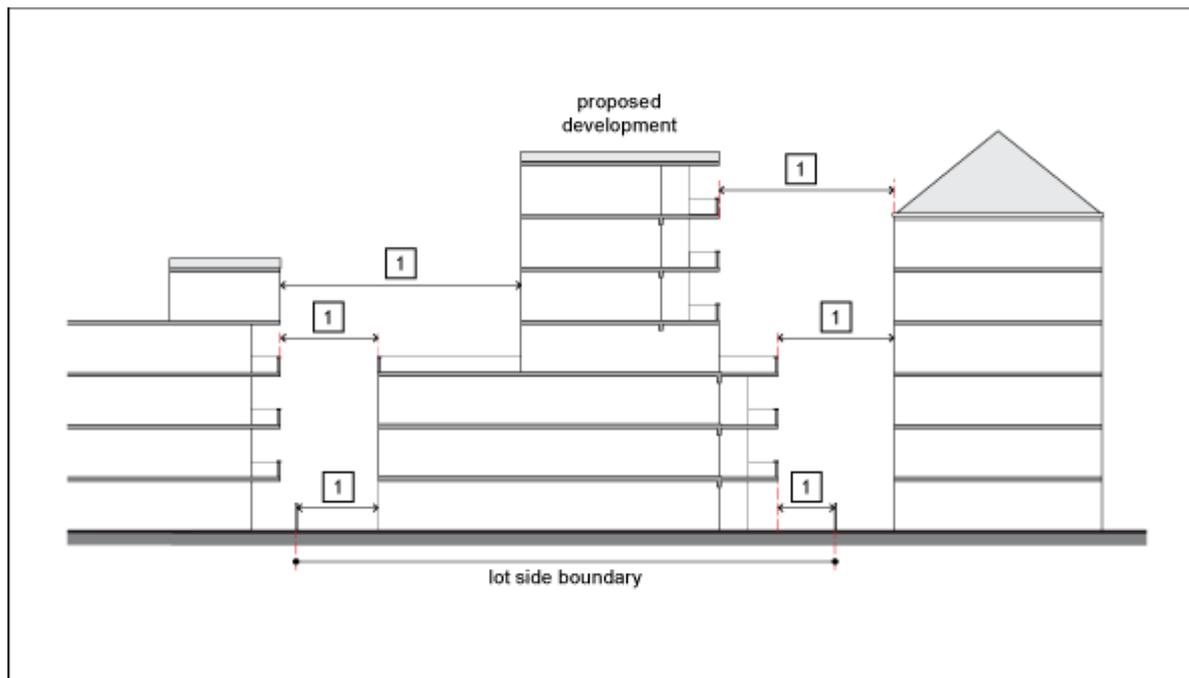
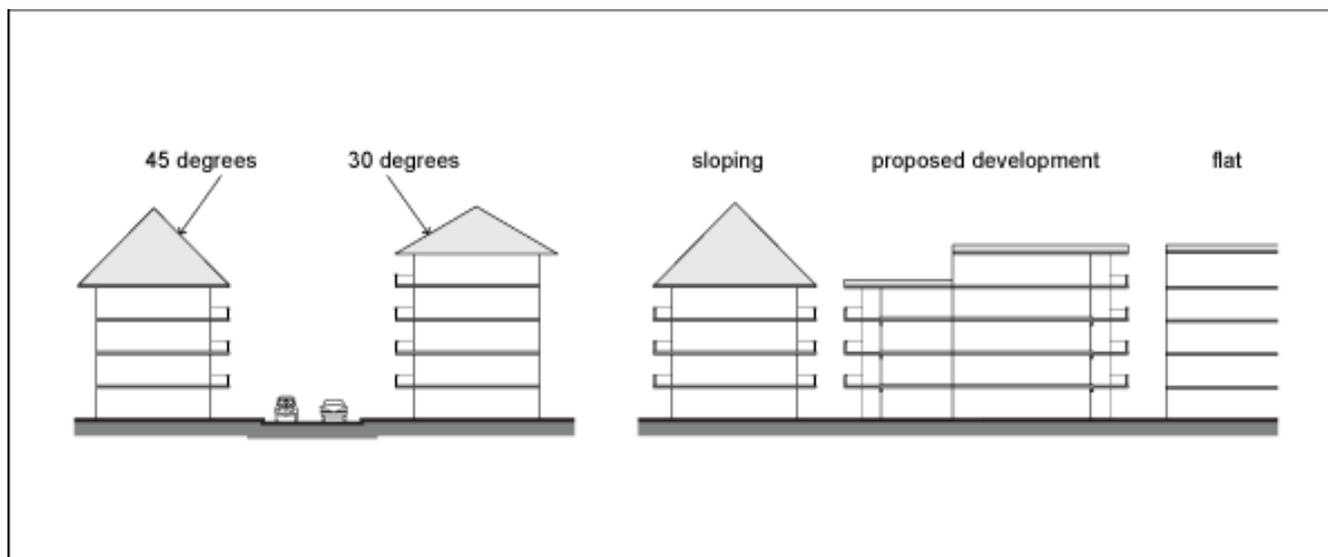


Figure 9 - Demonstrating the roof-lines and slopes of neighbouring buildings and buildings on the opposite side of the street



### Design element 3 - encouraging turbulence

Dispersion of traffic air pollutants is improved where building design and urban form increases wind turbulence in the road corridor. Repetitive, sheer-walled boxes that are built to boundaries in the streetscape do not achieve this outcome. Instead, this can be achieved by incorporating design elements that help create building roughness and variation of form.

There is no hard and fast design rule to follow to enhance air turbulence, but the general principles include varying building heights, widths, tiers and shapes. Above podium setbacks with different forms and dimensions will assist in achieving this, as will inclusion of trees between the buildings and the road. The exact dimensions of the building are not crucial. The important point to note is to avoid the sheer-walled box and to include a variety of design elements that will work together.

The following figures provide example illustrations of how development can contribute to building roughness and wind turbulence

Figure 10 - Design elements that contribute to building roughness and wind turbulence

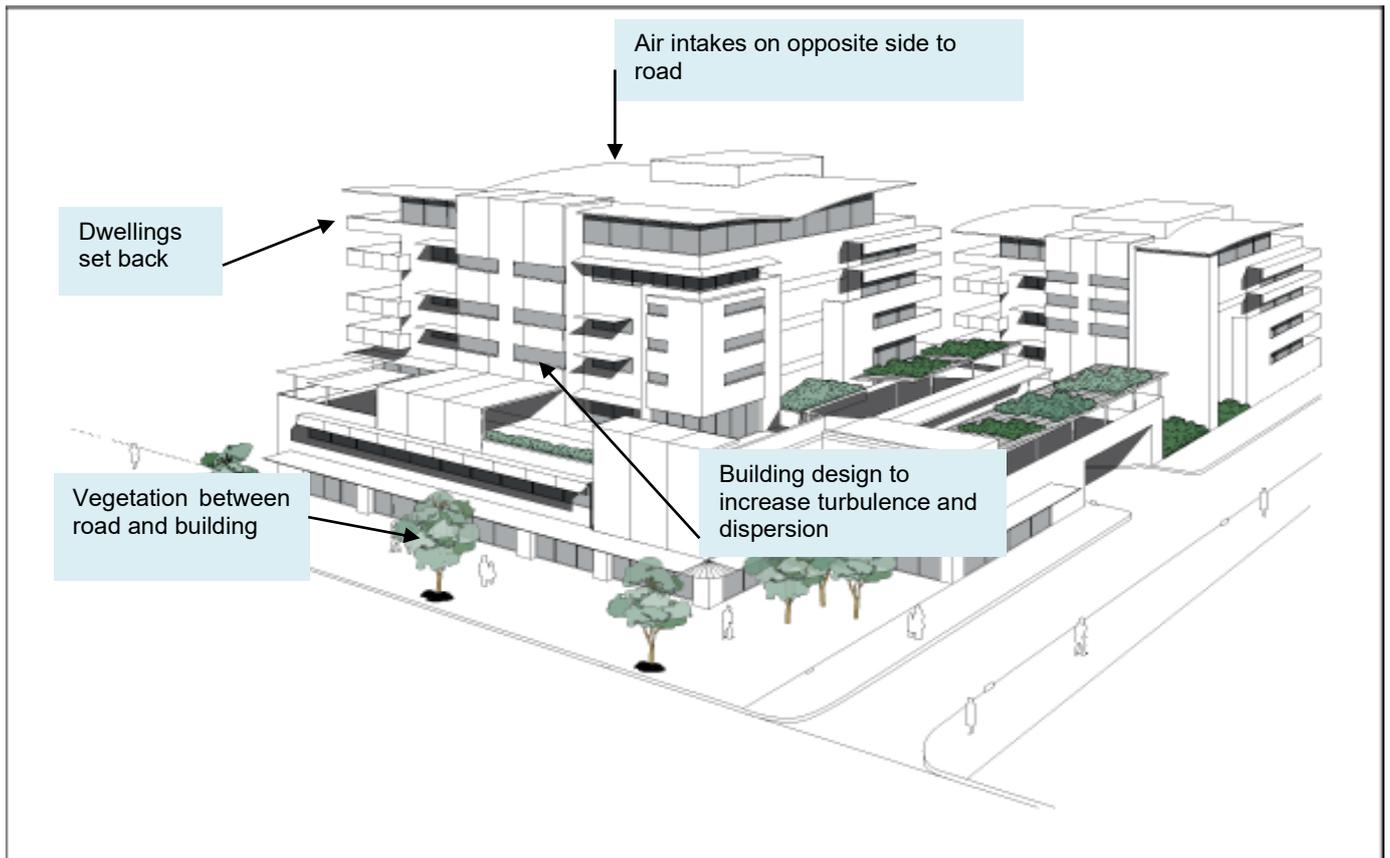
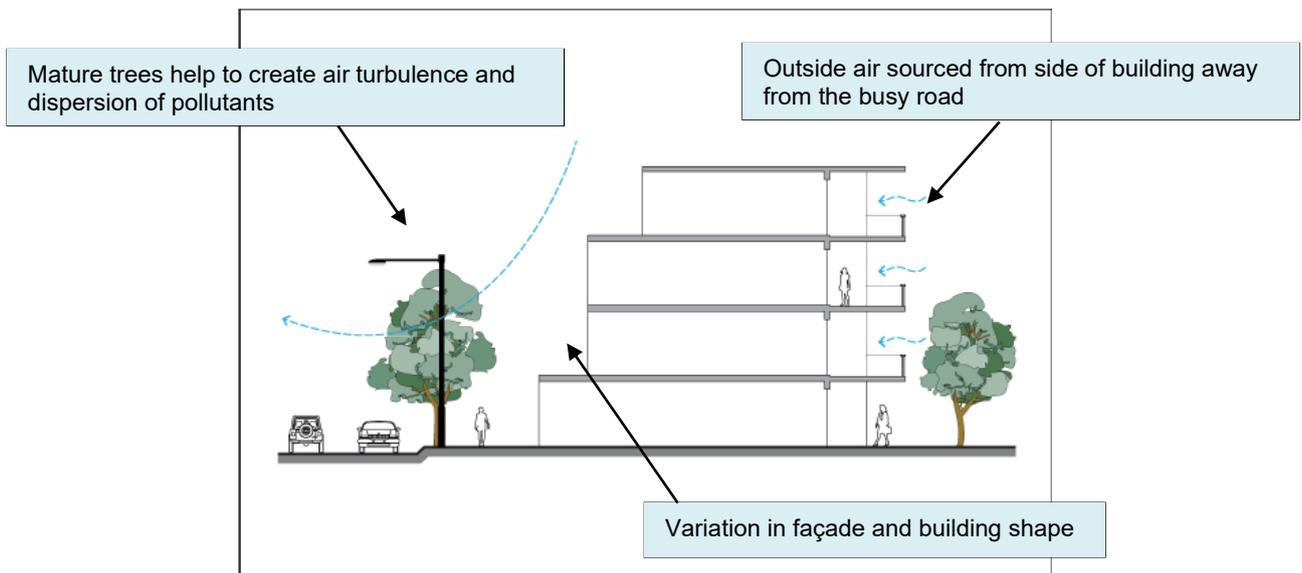


Figure 11 - Design elements that contribute to building roughness and wind turbulence



Significant vegetation situated between the road and the building can help reduce the concentration of pollutants reaching residents. This occurs through two mechanisms:

1. by increasing wind turbulence which enhances mixing and dilution of road traffic air pollutants
2. by providing a surface for deposition of pollutants, especially particulates.

For these mechanisms to be effective, mature trees with thick canopies are best. Development design should allow for deep plantings to facilitate larger trees along the road frontage. The choice of species needs to consider many factors, including the height and width at maturity and the number of years expected to take for the tree to reach maturity.

Wherever possible, it is recommended to retain existing trees of appropriate species along the road frontages.

The transport air quality corridor report needs to include the location of trees that are to be retained or planted between the road and the development, including the species names and expected height and width at maturity.

#### **More information**

For more information about City Plan visit [www.brisbane.qld.gov.au](http://www.brisbane.qld.gov.au) and search for *Brisbane City Plan 2014*, or phone Council on (07) 3403 8888.



*Disclaimer: The content of this information sheet is a summary and has been prepared to assist the reader to understand [City Plan](#). Please refer to the full City Plan document, entitled [Brisbane City Plan 2014](#), on [Council's website](#) for further detail.*

#### **Acknowledgement**

Council would like to thank the New South Wales Department of Environment and Climate Change for permission to use material from New South Wales Development near Rail Corridors and Busy Roads – Interim Guideline, Dec 2008 in preparing this guide.