# 20 Air quality

**Overview**

Construction of the proposed Expressway has the potential to generate dust, particularly during the large scale earthworks. Construction works could have an adverse effect on air quality for sensitive receptors (mainly residential premises) within close proximity of the proposed earthworks.

Due to the close proximity of sensitive receptors to the construction footprint of the proposed Expressway, a high standard of emissions control and management will be employed over the duration of the proposed construction works.

An air quality monitoring programme will be implemented to assist the control and management of construction dust discharges. The monitoring programme will be based on regular visual monitoring, continuous monitoring of total suspended particulate matter (TSP) at one or two locations, continuous meteorological monitoring at one or more locations, and prompt responses to complaints from the public and regulatory authorities. Adherence to dust management measures (as contained in Construction Air Quality Management Plan (Appendix G of the CEMP, Volume 4)) during construction will ensure that adverse air quality effects will be suitably avoided or mitigated.

Once the proposed Expressway is operational, there is the potential for adverse air quality effects from vehicle exhaust pollutants. Results of the dispersion modelling indicate that cumulative particulate matter less than 10 microns in diameter ($PM_{10}$) Nitrogen Oxides ($NO_x$), Carbon Monoxide (CO) and benzene concentrations are unlikely to exceed the relevant National Environmental Standards for Air Quality (NESAQ) and New Zealand Ambient Air Quality Guidelines (NZAAQG) thresholds. The predicted contribution of vehicles using the proposed Expressway to the ambient concentrations of pollutants will be low.

Neither operational monitoring nor mitigation is considered necessary because of the low concentrations of pollutants predicted.

## 20.1 Introduction

This Chapter discusses the actual and potential air quality effects arising from the construction and operation of the proposed Expressway. Construction effects mainly relate to the generation of dust, whereas operational effects arise from vehicle emissions from road users. The information contained in this Chapter is based on the following reports in Volume 3 of the Assessment of Environmental Effects:

- Assessment of Operational Air Quality Effects, Technical Report 13, Volume 3;
- Assessment of Construction Air Quality Effects, Technical Report 14, Volume 3; and
- Traffic Modelling Report, Technical Report 34, Volume 3.

## 20.2 Existing air quality

In order to assess the air quality effects of the proposed Expressway, information was gathered about existing air quality in the general area of the proposed Expressway and about the location of potentially sensitive receptors.

Air quality is influenced by the prevailing meteorological conditions of an area, particularly wind speed and direction. Wind direction and speed were obtained for Paraparaumu Airport from 2008-2010, in addition to that recorded at the Raumati Road Project monitoring site. Both units indicate wind directions in the general area of the proposed Expressway are predominantly northerly to northeasterly and southerly, with a strong seasonal variation. The Paraparaumu Airport monitoring mast is located approximately 20m higher than the Raumati Road unit, and the data from both sites generally shows that wind speeds are lower closer to the ground.

The proposed Expressway is within the Kapiti Coast airshed, as defined by GWRC. Monitoring of air quality in the area has been undertaken by both the GWRC (as part of its general air quality management obligations) and by the Project team (specifically for this Project). The GWRC monitoring site recorded $PM_{10}$ and $PM_{2.5}$[145] full levels at Glen Road, Raumati South in Paraparaumu during June and July 2010. These results recorded 3 exceedances of the NESAQ / NZAAQG[146] $PM_{10}$ threshold concentration (50 µg/m$^3$) over this period. Over half of the $PM_{10}$ levels were attributed to wood burning fires, while 29% were associated with marine aerosol (produced by long-range transport of fine sea-salt across the Tasman Sea and southern oceans).[147]

The Project team established a monitoring site at Raumati Road, which measured ambient $PM_{10}$, $NO_x$, and CO[148] between January 2011 and January 2012. A summary of the background concentrations collected at the Raumati Road site in relation to the relevant NES AQ / NZAAQG standards for the period January to December 2011 are presented in Table 20.1 below.

[145] Particulate Matter less than 2.5 microns and 10 microns in diameter.

[146] National Environmental Standards for Air Quality (NESAQ) and New Zealand Ambient Air Quality Guidelines (NZAAQG)

[147] GWRC (2011) Raumati South air quality investigation – Winter 2010 particulate matter concentrations and sources.

[148] Nitrogen Oxides (NOx); and, Carbon Monoxide (CO)

**Table 20.1: Summary of Background Concentrations of $PM_{10}$, $NO_2$ and CO (Raumati Road)**

| Parameter | Averaging period | Background concentration | NES AQ/NZAAQG threshold |
|---|---|---|---|
| $PM_{10}$ | 24 hour | 36 µg/m³ | 50 µg/m³ |
| | Annual | 13 µg/m³ | 20 µg/m³ |
| $NO_2$ | 1 hour | 53 µg/m³ | 200 µg/m³ |
| | 24 hour | 27 µg/m³ | 100 µg/m³ |
| | Annual | 14 µg/m³ | 40 µg/m³ |
| CO | 1 hour | 8 mg/m³ | 30 mg/m³ |
| | 8 hour | 3 mg/m³ | 10 mg/m³ |

Overall, the existing ambient air quality close to the proposed Expressway alignment reflects the typical characteristics of rural and urban receiving environments. The rural areas have low existing levels of air quality pollutant, whereas the urban areas tend to be impacted by $PM_{10}$ emissions from home heating during winter time.

## 20.3 Sensitive receptors

The Ministry for the Environment's Good Practice Guide for Assessing Discharges to Air from Land Transport (2008)[149] recommends assessing the air quality effects of a proposed road on identified sensitive receptors. These are people who are generally regarded to be more likely to be more sensitive than the general population to vehicle exhaust emissions. Sensitive individuals are considered to include children and the elderly. Sensitive land use receptors include childcare and early learning facilities, schools, hospitals and residential care homes. In addition, areas of open space or parks used for recreational activities are classified as being receiving environments of high sensitivity.

The assessment identifies the following specific sensitive receptors (in addition to sensitive individual receptors) within 200m of the proposed Expressway:

- El Rancho Holiday Camp;
- Metlife Kapiti Retirement Village;
- Makarini Street Reserve;
- Linwood Drive Recreational Reserve;
- Waikanae River corridor; and
- Wharemauku Stream.

No schools, preschools or healthcare facilities are located within 200m of the proposed Expressway.

[149] http://www.mfe.govt.nz/publications/air/assessing-discharges-land-transport-jun08/

## 20.4 Assessment of effects on air quality

Potential air quality effects can arise from both the construction and operation of the proposed Expressway. The potential effects from construction and operation are quite different and hence have been considered separately.

### 20.4.1 Construction of the Project

The following aspects of construction of the proposed Expressway have the potential to cause adverse air quality effects:

- Dust from earthworks and road construction;
- Odour arising from disturbance of potentially contaminated sites; and
- Vehicle exhaust emissions.

Each of these potential effects is discussed in further detail below. Technical Report 14, Volume 3 contains a detailed Project Sector by Project Sector assessment of dust discharges.

### 20.4.2 Dust from earthworks and road construction

Exposed earthworks can be a significant source of dust, particularly when undertaken on a large scale as needed for construction of the proposed Expressway. As the particle size of dust is relatively large (larger than 100µg), it is difficult for it to penetrate the respiratory system, and therefore dust generally has minimal health impacts. However, dust can be a nuisance to the public, has the potential to affect plant life and can contribute to sediment loads in waterways by depositing in areas if no sediment control measures are in place.

Key construction activities that have the potential to generate dust include:

- Excavation and disturbance of dry material;
- Loading and unloading dry and dusty material; and,
- Stockpiling of materials, including placement and removal.

Dust may be generated from dry, undisturbed areas of earthworks at wind speeds greater than 5-10 m/s (10-20 knots). Factors which influence the rate of transportation of dust include particle size, wind speed, rainfall and the rate of evaporation.

The assessment found that without mitigation measures, dust is likely to be an issue at several locations along the proposed Expressway alignment. Table 20.2 below details these locations and the timeframes within which construction activities are likely to have a significant potential for dust emissions. Dust from construction activities will be managed through the Construction Air Quality Management Plan (CAQMP) which will ensure that potential dust effects will be suitably mitigated.

### 20.4.3 Emissions from construction vehicles

Construction vehicles have the potential to cause adverse air quality effects under certain meteorological conditions, which can create a nuisance at neighbouring sensitive locations. Excessive smoke and odour from diesel-fuelled heavy vehicles, generators and other machinery is primarily caused by poor engine maintenance.

The CAQMP (Appendix G of the CEMP) describes measures to be undertaken to control and monitor construction vehicle emissions (section 3.1.4), including requirements to maintain vehicles and equipment in accordance with manufacturer specifications and to immediately service any vehicles discharging excessive exhaust smoke.

Adherence to the CAQMP (Appendix G of the CEMP) practices for construction vehicles will ensure that all potential adverse effects associated with emissions will be suitably managed.

### 20.4.4 Pre- cast concrete manufacture

A number of large pre-cast concrete beams will be required for the bridge structures. The Otaihanga Construction Yard will have a pre-cast manufacturing facility installed where wet concrete will be brought into the site to make the beams required (note that no concrete batching plant is proposed for the construction of the proposed Expressway as all concrete will be sourced from existing facilities around the region).

When the pre-cast units are removed from the mould, hand-held grinders are often used to remove surface flaws, and occasionally water-blasting is required to obtain a suitable surface finish. Both of these activities have the potential to generate dust emissions. Dust generation can be minimised by using diamond-tooth grinders for hand-held grinding. Water blasting is usually not necessary and it is estimated that this may need to be carried out approximately 10 times during the construction phase of the proposed Expressway.

The Otaihanga Construction Yard is located 250m from the nearest sensitive receptors (residential property), thereby reducing the potential adverse effects arising from the manufacture of pre-cast concrete beams.

### 20.4.5 Odour

Road construction does not typically involve activities that generate offensive odours. It is possible that during earthworks activities, excavation may disturb land contaminated with organic wastes (such as closed landfills) or waterlogged soils that may be anaerobic, such as peat. Therefore some occasional discharges of odour may occur.

The proposed Expressway runs close to the former landfill site on Otaihanga Road, where the main construction yard will be located. However, it is not anticipated that any of the works in this area will release any odour as there is no proposed excavation of the former landfill site. The proposed excavation sites are suitably distanced from the former landfill area to ensure adverse odour effects will be avoided.

### 20.4.6 Summary of anticipated construction dust effect

Table 20.2 summarises the potential effects of the construction activities listed above and the approximate timeframes these effects are anticipated to occur in the construction programme.

**Table 20.2: Areas potentially affected by dust emissions during proposed Expressway construction**

| Sector | Location | Anticipated Timeframe |
|---|---|---|
| 1 | Poplar Ave | Early 2014 for approx. 2 years, and from Sep 2016 for 1 year. |
| | Poplar Ave - Raumati Rd | Early 2015 for approx. 1 year, and from early 2017 for approx 1 year. |
| 2 | Raumati Rd – Ihakara Rd | Late 2014 for approx. 7 months, and late 2015 for anticipated 20 months. |
| | Ihakara Rd – Mazengarb Rd (including Kapiti Rd Interchange) | Late 2013 for approx. 6 months, and from Sep 2015 for approx. 20 months. |
| 3 | Mazengarb Rd – Otaihanga Rd | March 2014 for approx. 22 months. |
| | Otaihanga Rd – Waikanae River Crossing | Late 2013 for approx. 16 months. |
| | Waikanae River Crossing – Te Moana Rd. | Early 2014 for approx. 13 months. |
| | | Approx. 10 occurrences over the duration of construction. |
| 4 | Te Moana Rd – Ngarara Rd | March 2015 for approx. 34 months. |
| | Ngarara Rd | Oct 2015 for approx. 11 months. |
| | Ngarara Rd – Smithfield Rd | From April 2015 for approx. 33 months. |
| | Smithfield Rd | May 2014 for approx. 10 months. |
| | Peka Peka Rd | April 2015 for approx. 32 months. |

Compliance with the proposed management measures of dust effects as contained in the CAQMP (Appendix G of the CEMP) will mitigate effects at these sites to an acceptable level.

### 20.4.7 Operation of the Project

The effects on air quality from the operation of the proposed Expressway will be influenced by a number of different factors, including:

- Existing air quality;
- Meteorology;
- Background air quality concentrations; and
- The location of sensitive receptors.

Dispersion modelling has been undertaken to assess the pollutant levels associated with the operation and changes in the existing roading network as a result of the proposed Expressway. The model predicts future levels of $PM_{10}$, $NO_2$, CO and benzene in the Project area for the following future scenarios:

- **2016 With Project** – representative of the year of opening of the proposed Expressway (includes the impact on traffic flows of other roading projects in the region that are scheduled for completion by 2016);

- **2016 Do Nothing** – for comparison with the 2016 With Project scenario; assumes that all other projects in the region, unrelated to the proposed Expressway, have been completed, but that the proposed Expressway itself has not been constructed;
- **2026 Do Nothing** - assumes that all other projects in the region, unrelated to the proposed Expressway, have been completed, but that the proposed Expressway itself has not been constructed; and
- **2026 With Project** – representative of increased traffic volumes and likely improvements in the vehicle fleet ten years after opening; includes traffic flows, fleet composition and completed roading projects predicted for 2026.

Further information about the dispersion modelling undertaken for this assessment, including the assumptions and limitations associated with the model, is contained in Technical Report 13. This report also sets out the relevant thresholds for each of the modelled contaminants. The results of the emissions modelling are detailed below.

### 20.4.8 Predicted contaminant emissions

The dispersion model predicted cumulative concentrations of $PM_{10}$ in Sectors 1 and 2. Predictions from Sector 1 and 2 can be applied for Sectors 3 and 4 as any adverse effects on air quality arising from the operation of the proposed Expressway in Sectors1 and 2 will be at least as great as or greater than those in either Sector 3 or Sector 4. The results of the modelling showed that predicted cumulative concentration of $PM_{10}$ in these Sectors are all considerably less than the NESAQ of 50 µg/$m^3$ (24-hour average) and the NZAAQG of 20 µg/m3 (annual average).

While the highest $PM_{10}$ concentrations are predicted to occur at commercial premises close to Kapiti Road, these concentrations are still within the relevant criteria. The maximum incremental contribution from the proposed Expressway to cumulative $PM_{10}$ concentrations is 2.0 µg/$m^3$.

### 20.4.9 Predicted nitrogen oxide concentrations

The predicted $NO_2$ concentrations for Sectors 1 and 2 are considerably less than:

- The 1 hour average for the NESAQ and the GWRC MDL[150] for $NO_2$;
- The 24-hour average for the NZAAQG for $NO_2$; and,
- The annual average recommended by GWRC MDL and WHO AQG[151].

### 20.4.10 Predicted Carbon Monoxide concentrations

The predicted CO concentrations for Sectors 1 and 2 are considerably less than:

[150] Maximum Desirable Level

[151] World Health Organisation, Air Quality Guidelines

- The 1 hour average for the NESAQ, NZAAQG and the GWRC MDL; and,
- The 8 hour average for the NESAQ.

### 20.4.11 Predicted Benzene concentrations

The predicted incremental average of benzene concentrations in the modelled emission scenarios are all less than the NZAAQG limit of 3.6µg/$m^3$.

### 20.4.12 Summary of dispersion modelling results

The results of the dispersion modelling indicates that cumulative $PM_{10}$, $NO_2$, CO and benzene concentrations from the vehicles using the proposed Expressway are unlikely to cause exceedances of any relevant air discharge assessment criterion for air pollutants.

The operational air quality assessment concluded the following:

- Maximum ground level concentrations of all vehicle related pollutants are predicted to decrease between 2016 and 2026, largely due to improvements in the on-road vehicle fleet;
- People living within 200m of the proposed Expressway will have a slightly increased exposure to vehicle related contaminants as a result of the Project, compared to without it; and
- Concentrations of the predicted future contaminant levels, as a result of the proposed Expressway, are unlikely to cause exceedances of any relevant air discharge assessment criterion at any nearby sensitive receptor.

In summary, there will be no material adverse effects on air quality arising from vehicles using the proposed Expressway and, hence, no mitigation is considered necessary.

### 20.4.13 Vehicle emissions from traffic on other roads as a result of the operation of the Project

The traffic modelling (Technical Report 34, Volume 3) indicates that there will be some changes to traffic on local roads, including increases in vehicle numbers on Kāpiti Road, Poplar Avenue and Park Avenue. These increases are unlikely to have a significant impact on concentrations of air pollutants at nearby receptors because overall, the number of vehicles on local roads will remain low.

The reduced level of traffic on SH1 and the consequent reduction in congestion will result in improvements of air quality in the nearby vicinity.

## 20.5 Measures to avoid, remedy or mitigate potential adverse effects on air quality

Based on the construction air quality assessment, dust from construction activities has been identified as the key potential adverse effect.

Dust from construction activities will be managed through and adherence to the CAQMP (Appendix G of Volume 4). The primary management approach will be the suppression of dust at its source, allowing potential adverse effects on air quality to be appropriately managed.

A dust monitoring programme is proposed, based on regular visual monitoring in all areas, continuous monitoring of total suspended particulate matter (TSP) at one or two locations, continuous meteorological monitoring at one or more locations, and prompt responses to complaints from the public and regulatory authorities.

Monitoring and adherence to the CAQMP (Appendix G of Volume 4) will ensure that the potential and adverse air quality effects associated with emissions will be suitably mitigated.

Neither management nor monitoring of operational air quality will be required due to the predicted contribution of vehicles using the proposed Expressway to the ambient concentrations of pollutants being low.