REPORT

Riccarton Road Improvements Effects on Air Quality

Prepared for Dunedin City Council

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QUALITY ASSURANCE STATEMENT

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DUNEDIN CITY COUNCIL

Riccarton Road Improvements
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1 Introduction

The Dunedin City Council has commissioned MWH New Zealand Ltd to assess options for improvements to that part of Riccarton Road, Mosgiel, lying between State Highway 87 and Gladstone Road South, a distance of approximately 4.2km. Riccarton Road runs approximately north to south, as shown in Figure 1 below.

As part of this work a designation is being sought for the road to provide a shared path for pedestrians, cyclists and horses adjacent to one side of the road and to widen the road.

This report assesses the likelihood of a degradation of air quality resulting from the proposed improvements.

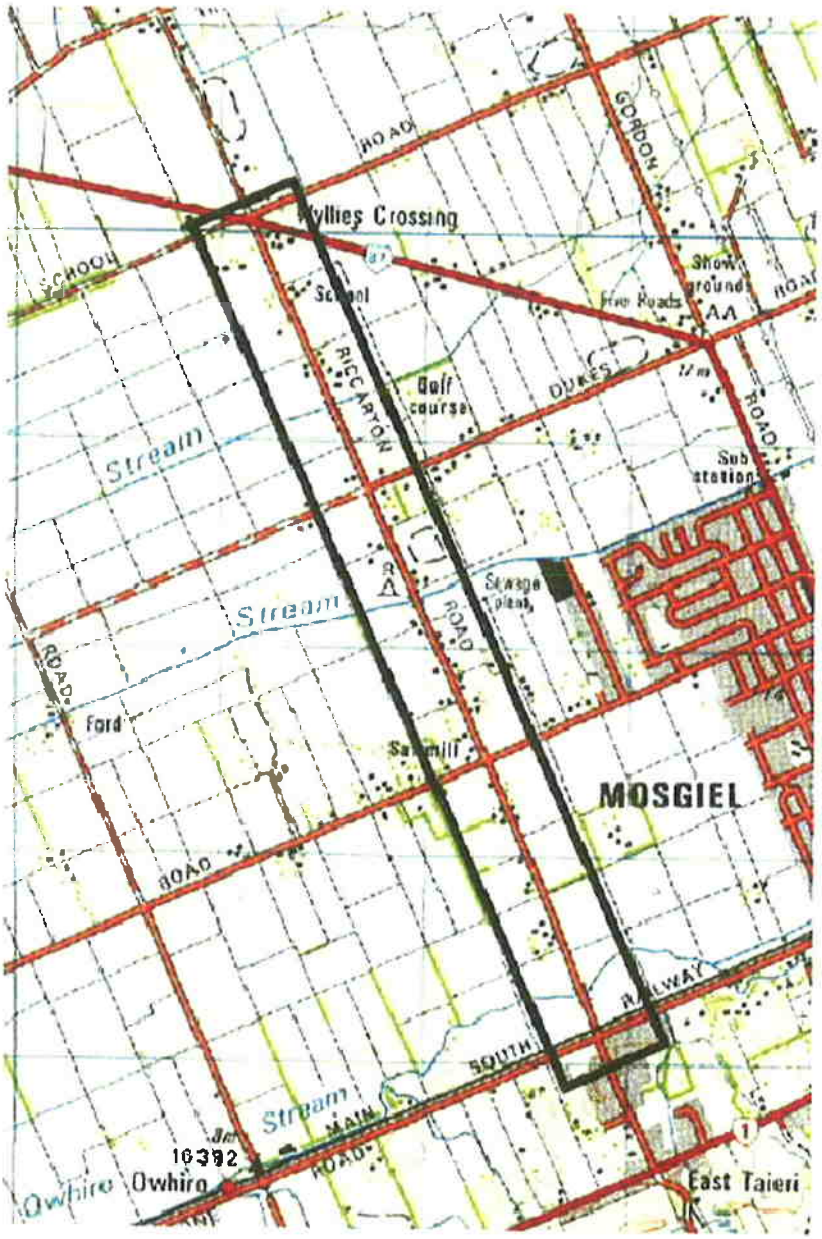


Figure 1: Location Map

2 Impacts of Road Traffic Emissions on Air Quality

2.1 Typical Contaminants Emitted

Motor vehicle emissions consist of engine exhaust emissions, contributions from the evaporation of fuel, dust from brake linings, tyre wear and fine particulate produced by mechanical action at the roadway surface. Vehicle exhaust emissions contribute by far the largest proportion of the total emissions burden.

Typical contaminants emitted in motor vehicle exhausts include carbon monoxide (CO), oxides of nitrogen (NO_x), Fine particulate (so-called PM_{10} and $PM_{2.5}$) and sulphur dioxide. Other contaminants that may have potential air quality impacts include volatile organic compounds (VOCs), benzene and polycyclic aromatic hydrocarbons. Fine particulate emissions are the most significant air pollution contributor from vehicle exhausts.

2.2 Relevance of Vehicle Type

Vehicle exhaust gas emissions vary depending on the type of fuel being used. Thus, for petrol-powered engines, the most significant contaminants emitted in terms of concentrations are CO and, to a lesser extent, NO_x. Fine particulate emissions concentrations are relatively low for petrol engines.

On the other hand, diesel-powered vehicles have significantly higher fine particulate emissions in their exhaust gas streams. NO_x emissions are also relatively significant but CO emissions are much lower than for petrol-powered vehicles.

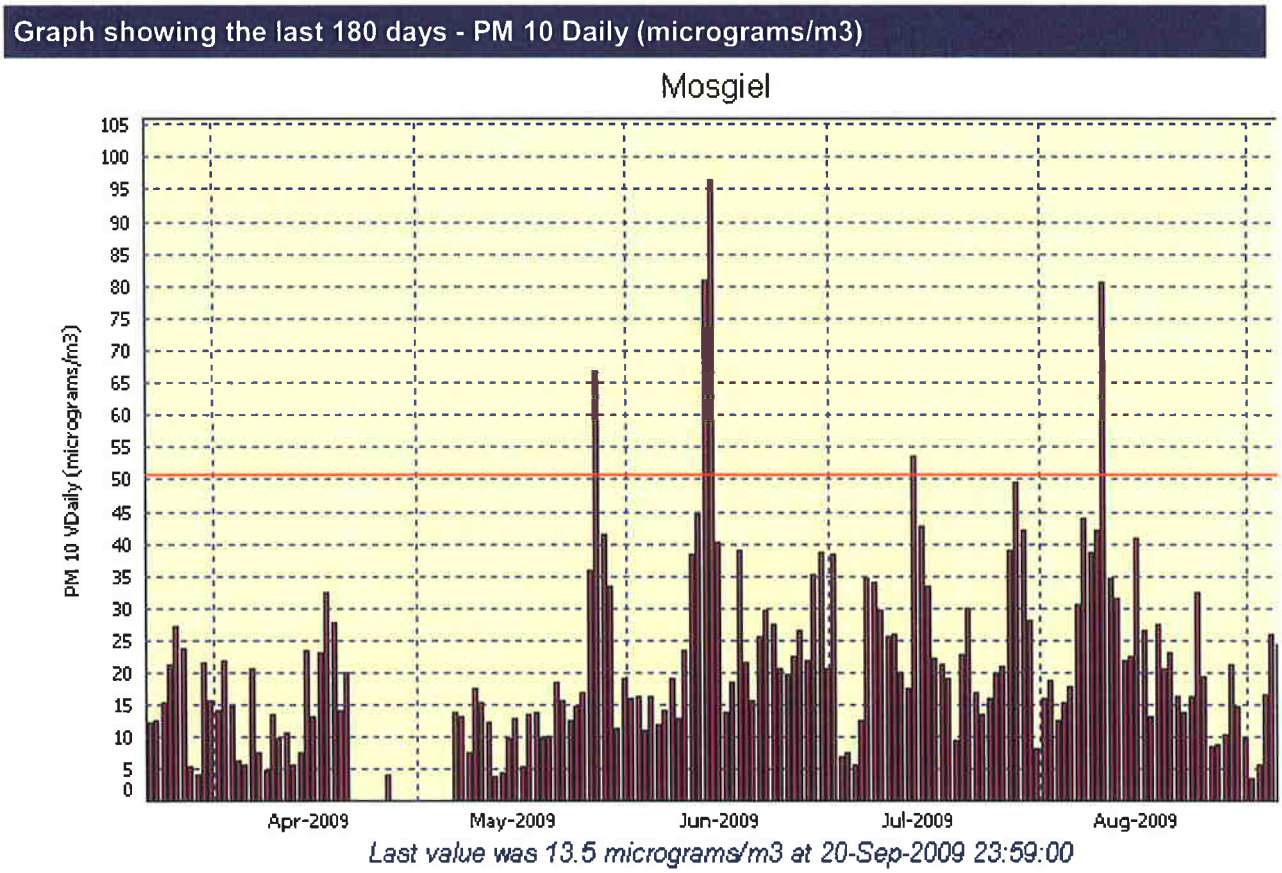
3 Existing Air Quality in the Environs of Riccarton Road

As noted on the Otago Regional Council (ORC) website, the main air quality issue in urban areas of Otago, and thus in Mosgiel, is fine particulate. The ORC monitors PM_{10} on an hourly and daily basis at a fixed monitoring station within the environs of Mosgiel. The PM_{10} monitoring results for the past 180 day period (April – August 2009) are shown in the following Figure 2.

It can be seen that, especially in the winter months, there were approximately five exceedances of the National Environmental Standard (NES) for PM_{10} of 50 $\mu g/m^3$ (24 hour average). Air quality in the Mosgiel area can thus be classed as reasonable but the Regional Plan: Air for Otago (see Section 5) seeks to achieve continual annual improvement in air quality by a consistent reduction in PM_{10} concentrations over the next 5 years to achieve the 50 $\mu g/m^3$ NES limit as a goal.

The main source of PM_{10}, as acknowledged by the ORC, is from domestic fires for home heating. Industrial sources will also contribute to PM_{10} concentrations but it is not clear how significant such industrial contributions may be in the Mosgiel area.

As a proportion of the total PM_{10} particulate burden in Mosgiel air, contributions from vehicular traffic will be minor when compared to domestic fires in particular, and also general wind-blown dust particles generated by uplift from the region's soils.



Source; Otago Regional Council website

Figure 2: PM_{10} Monitoring Results for Mosgiel

4 Effects of Road Improvements on Traffic Volumes and Speeds, and Vehicle Types

4.1 Traffic Volumes

Currently, the volume of traffic using Riccarton Road is greatest closer to the southern end (i.e. to Gladstone Road). Traffic counts have been undertaken in 2009 on three sections of Riccarton Road, as outlined in the following Table 4-1.

Table 4-1 : Riccarton Road Traffic Volumes 2009

From	To	ADT	%HCV
SH1	Gladstone Road	2,280	6%
Gladstone Road	Bush Road	2,070	6%
Dukes Road	SH 87	1,075	5%

The percentage of heavy vehicles on Riccarton Road is reasonably consistent along its length despite the variation in the traffic volumes. The expected heavy vehicle percentage for a rural road is between 11-13%. This indicates that the number of heavy vehicles using Riccarton Road is well below the average for a rural road.

Traffic modelling has been undertaken by Gabites Porter Consultants on the proposed Option 4B for improvements to Riccarton Road; as shown in Table 4.2 below this modelling predicts that the widening will result in a 4 – 5% increase in traffic volumes by 2011 and a 2 – 4% increase by 2021.

Table 4-2 : Riccarton Road Improvements – Traffic Modelling Results

		2011				2021			
From	To	Do Min	Option 4B	Increase	% Increase	Do Min	Option 4B	Increase	% Increase
Gladstone	Bush	1616	1683	67	4%	2001	2056	55	3%
Bush	Dukes	878	920	42	5%	1179	1223	44	4%
Dukes	SH87	735	763	28	4%	1017	1037	20	2%

The predicted traffic volume increases following the proposed improvements are therefore expected to be minor. In addition, as previously noted, the number of heavy vehicles using Riccarton Road is currently considerably lower than expected for rural roads and the small predicted increase in volumes will be negligible in terms of air quality impacts.

4.2 Traffic Speeds

The traffic counts undertaken also recorded speed statistics that provide useful information on how the road is currently used. Table 4.3 below provides a summary of the speed-related information for sections of Riccarton Road.

Table 4-3 : Summary of Speed Statistics

Road	From	To	Average Speed	85th%ile Speed	% Exceed Speed Limit
Riccarton Road	SH1	Gladstone Road	55km/h	62km/h	79%
Riccarton Road	Gladstone Road	Bush Road	78km/h	88km/h	44%
Riccarton Road	Dukes Road	SH87	77km/h	89km/h	47%

Note: The posted speed limit on all sections is 80km/h except for Riccarton Road from SH1 to Gladstone Road which is 50km/h

The average speeds reflect the posted speed limits. The 85th percentile speed shows that the majority of vehicles on Riccarton Road are travelling at a speed not greater than 10km/hr above the speed limit.

The proposed improvements, including widening and the provision of a shared path for pedestrians, cyclists and horses, are predicted to give rise to a slight increase only in average speeds. Moreover, the speeds on the various sections of Riccarton Road are likely to become more uniform as the need for speed reductions and then associated subsequent accelerations is reduced. This is especially relevant when considering particulate emissions from diesel-powered heavy vehicles which are greatly increased during acceleration phases.

4.3 Speed Variations in Relation to Vehicle Types

Fine particulate emissions, particularly for diesel-powered vehicles, are not greatly affected by approximately constant vehicle speeds. However, when speeds are not more or less constant, and especially during acceleration phases, particulate concentrations in exhaust emissions from diesel-powered vehicles increase dramatically.

It follows that road improvements that contribute to less braking and acceleration over a route will result in a decrease in fine particulate emissions and thus an enhancement of overall air quality. This is the case for the proposed improvements to Riccarton Road and thus it is likely that overall particulate emissions will be reduced.

5 Relevance of the Regional Plan: Air for Otago

5.1 Air Quality Issues in Otago

The Regional Plan: Air for Otago (RPA) notes, in Issue 4.9, that "Emissions from transport sources have the potential to adversely affect human health and amenity values". This particular matter is discussed in terms of the nature of emissions from transport and the factors affecting the extent and impact of these emissions. Traffic congestion is identified as the most important reason underlying the potential adverse effects of transport emissions. The implication is that any measures to reduce congestion will be in accordance with the RPA's identification of this primary transport-related adverse effect.

5.2 Relevant Objectives and Policies

Particular objectives of the RPA have general relevance to motor vehicle emissions; these are:

To maintain and enhance ambient air quality,
To avoid localised effects of contaminant discharges into air, and
To allow for the sustainable use of Otago's air resources.

Any proposal which does not contribute to an increase in contaminant concentrations can be said generally to be in accordance with these objectives.

Policy 14.1 of the RPA deals specifically with motor vehicle emissions. In particular, Policy 14.1.1(b) encourages " ... city and district councils to use land use planning and traffic management mechanisms to avoid the occurrence of localised air quality problems associated with emissions from motor vehicles." While it could not be claimed that the proposed improvements to Riccarton Road are strictly a traffic management mechanism per se they are certainly in accordance with the desired outcome of this part of Policy 14.1.1.

5.3 Management of PM_{10} Particulate in the Region

Policy 9.1.1 of the RPA sets out to " ... reduce discharges of PM_{10} to comply with the ambient air quality standard for PM_{10} by 1 September 2013 ..... in Air Zone 2 by following straight line paths to compliance." As was noted earlier the NES air quality standard requires the concentration of PM_{10} to meet an ambient air quality standard of 50 $\mu g/m^3$ (24 hour mean). Moreover, the Otago Goal Level is set at 66% of the NES limit; i.e. 35 $\mu g/m^3$.

The eastern side of Riccarton Road falls in Air Zone 2 of the RPA, with the western side being in Air Zone 1. Of particular note is the following extract from Table 3 of the RPA (page 33) which gives the straight line path incremental decreases in PM_{10} concentrations sought for Mosgiel in Air Zone 2, up until 2013.

Date	Maximum Level of Particulate Matter ($\mu g/m^3$)						
	2007: From 14 April	2008	2009	2010	2011	2012	2013: By 1 September
Mosgiel	83	78	72	67	61	56	50

It is clear from the objectives and policies of the RPA, and the particular emphasis placed on the phased reduction of PM_{10} levels in ambient air, particularly in Air Zone 2 which includes Mosgiel, that PM_{10} is a priority air pollutant in the Otago region.

In that context any roading improvement which, as outlined in the discussion above, will at worst maintain the status quo with regard to contaminant emissions and in fact is likely to improve air quality, must be seen as consistent with the principles put forward in the RPA.

6 Conclusions

The proposed improvements to Riccarton Road will result in only very small annual increases in traffic volumes and negligible increases in numbers of heavy vehicles (assumed to be diesel-powered) which will use the improved route.

Moreover, the improvement in consistency of traffic flows, with less speed changes (especially accelerations), will result in a decrease in particulate emissions from diesel-powered vehicles.

The overall effect is likely to be at least the maintenance of the status quo with respect to air quality associated with vehicle emissions and, in fact, a probable decrease in PM_{10} particulate emissions. This is thus a positive environmental effect, and is also in accordance with the objectives and policies of the Regional Plan: Air for Otago with respect to particulate emissions.