TECHNICAL MEMORANDUM

DATE 31 August 2017 **PROJECT No.** 1521107-261-TM-RevA

RESPONSE TO WEST GATE TUNNEL PROJECT INQUIRY AND ADVISORY COMMITTEE INTERIM ADVICE

In accordance with directions provided by the West Gate Tunnel Project (WGTP) Inquiry and Advisory Committee (IAC) on 24 August 2017, the following represents my response to the air quality matters raised in the interim report to the IAC provided by Dr Lyn Denison (document dated 19 August 2017).

Due to the nature of the expert advice template, there is substantial duplication of commentary provided by Dr Denison. Where a response is provided to an issue raised, this should be considered to equally apply to subsequent references to that issue within the document.

1. Section 4.1(i) "*The use of the EPA Footscray air monitoring data from 2009-2013 as background air quality data across the whole project area has also been questioned by several submitters. ….. Concern about the appropriate background data has also been raised by EPA*".

EPA Victoria did not raise concerns about the use of Footscray data as background concentrations in its submission to the IAC, nor did it raise this during discussions held with the Western Distributor Authority during preparation of Technical Report G. In addition, Golder submitted a number of versions of a document outlining the modelling approach to EPA Victoria for discussion (dated 21 July 2015, 2 December 2015, 8 April 2016, 27 April 2016, 1 July 2016 and 23 August 2016), with agreement on the use of Footscray data as background provided by EPA Victoria on 27 June 2016.

2. Section 4.1(ii) "*There is a review of tunnel ventilation systems provided in Technical Report G however it is based on dated information and does not include the most recent road tunnel projects internationally such as those described in Submission 458*".

Section 9.0 of Technical Report G examines the concept of best practice and in particular whether air pollution control technology should be installed to control pollutant emissions from the WGTP ventilation structures. Technical Report G refers to reviews on road tunnel air pollution control conducted by the National Health and Medical Research Council (2008), French Government Centre D'Etudes Des Tunnels (CETU 2010), New Zealand Transport Agency (2013) and EPA Victoria (2014). Although not specifically mentioned in Technical Report G, the Madrid Calle 30 project (M30-Rio tunnel) noted in Submission 458 was completed in 2007 and was one of the projects specifically examined by CETU in establishing their position that "*full multi-criteria analysis has not yet provided any hard evidence to support the use of air treatment systems in preference to more conventional methods*" and that "*before turning to systems that may provide an answer to a local pollution concerns* (sic), *conventional ventilation techniques should still be considered by making use of the appropriate means, i.e. playing on the airflows and concentrations of the discharged vitiated air, as well as on the location and configuration of discharges and any other method likely to improve the dispersion of pollution and so protect the most at-risk areas*".

The best option for the control of vehicle emissions, either on surface roads or from road tunnel ventilation structures, remains the introduction of tighter vehicle emission standards.

3. Section 4.1(i) "*However the AQIA also notes that there are 32 additional exceedances of the PM_{10} criteria (p122 Technical Report G) due to the contribution of the project to existing background levels with project contributions up to 23 µg/m^3*".
   Section 4.1(ii) "…*there are an additional 32 exceedances of the PM_{10} design criteria* (sic) *under 'normal' operation with 2 lanes occupied with the project compared to the no project option*…".

The additional 32 exceedances of the PM_{10} design criterion refers to the sensitivity analysis scenario which assumed that the tunnel operated at maximum lane capacity (2,000 vehicles per lane per hour) over three

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lanes for 24 hour per day and 365 days per year in 2031 (refer to p. 122 of Technical Report G). Similarly, the quoted project contribution of 23 µg/m^3 refers to the project contributions of 2.9 to 23 µg/m^3 to the PM_{10} exceedances for the maximum lane capacity sensitivity analysis scenario. As noted in Technical Report G, the maximum lane capacity sensitivity analysis scenario is considered unrealistic.

As indicated in the amended pages of Technical Report G submitted to the IAC, the 'worst case' (see response to item 4 below) scenario during normal tunnel operation is predicted to result in an increase of 8 exceedances of the 1 hour average PM_{10} design criterion in 2022 for the worst case year (2009 meteorological data) and 11 in 2031, over the 130 exceedances due to background concentrations alone.

4. Section 4.1(ii) "*The 'normal' scenario is not the worst case situation as required under SEPP(AQM). Worst case would be 3 lanes occupied and congested traffic*".
   Section 5.1(i) "*The scenario used for assessment of the worst case scenario within the tunnel has assumed that there will be two lanes occupied for 24 hours per day travelling at 80 km/hr. This scenario does not take into account congestion within the tunnel which may lead to times within the tunnel that all three lanes are congested and travelling well below 80 km/hr which is more likely to represent* (sic) *worst case emission scenario as required for assessment under SEPP(AQM)*".

Schedule C of the State Environment Protection Policy (Air Quality Management) [SEPP(AQM)] requires pollutant emission rate estimates to be based on the 'worst case' scenario during normal operations. Modelling was conducted based on the projected traffic volumes and fleet composition for the morning and evening peak periods, the inter-peak period and the off-peak period (Table 36 of Technical Report G) and hourly traffic distribution scaling factors (Table 37 of Technical Report G). The upper limits of the traffic volume projections were used and are consequently considered to represent the "worst case' scenario. In addition, as the modelling assessment was based on traffic volumes, the number of lanes in operation is irrelevant.

For the forecast project fleet mix, GHD predicted that traffic flow breakdown occurs at approximately 1,800 vehicles per lane per hour. Predicted traffic volumes during morning and evening peak periods (Figures 50 to 53 of Technical Report G) were significantly below this value, consequently pollutant emission rates were based on the proposed road tunnel speed limit of 80 kilometres per hour during all hours.

5. Section 4.1(ii) "…*the SEPP(AQM) policy aim is to drive continuous improvement in air quality and in several areas, including the impact of changed traffic flow onto roads such as Millers Road and the predicted increase in PM_{10} levels at some sensitive receptors is not consistent with this policy aim. Options to reduce this impact should be considered*."

SEPP(AQM) notes that "*motor vehicle emissions will be managed through the adoption of national emission control and fuel quality requirements, improving the in-service performance of motor vehicles, managing the overall level of motor vehicle use, facilitating the introduction of low-emission technologies and fuels and encouraging less-polluting means of meeting transport needs*", not through road design.

In addition, as noted in Technical Report G, nine roads show a decrease or no change in the maximum predicted 24 hour average PM_{10} concentration and three roads show an increase in 2022. Similarly for 2031, ten roads show a decrease and two roads an increase.

6. Section 4.1(ii) "*A further question in relation to the emission factors is how the chemical conversion of NO to NO_2 has been taken into account in predicting ambient ground level concentrations*".

Chemical conversion of NO to NO_2 was not considered, however a conservative NO_2 to NO_x ratio of 0.15 was assumed in both the ventilation structure and surface road modelling. Dr Cowan used the area source option in AERMOD and the ozone limiting method (OLM), both of which are inconsistent with EPA Victoria advice contained in Publication No. 1551 (October 2013) "*Guidance Notes for Using the Regulatory Air Pollution Model AERMOD in Victoria*".

7. Section 4.1(ii) "*Although the Footscray data is applicable to a large part of the project area, modelling using the Brooklyn PM_{10} data should be undertaken*".

The Footscray data set, containing data for PM_{10}, $PM_{2.5}$, NO_2 and CO, rather than PM_{10} alone, is obtained from a performance monitoring station, designed to be representative of general community exposure. The

Brooklyn ambient air quality monitoring station has been specifically sited to assess the impact of local sources of emissions and is therefore not considered suited to the determination of background concentrations. Technical Report G also acknowledges that EPA Victoria is conducting monitoring in Brooklyn to assess the impacts of the Brooklyn Industrial Estate.

8. Section 4.1(ii) "*In a number of places in the EES the increases/decreases in pollutant levels have been presented as percentages of the background concentration rather than absolute concentrations*". …. "*The EES documentation does not provide sufficient information on the surface roads where increases in traffic are predicted to be able to assess compliance with policy and the potential contribution from the project*".
   Section 4.1(vi) "*Given the lack of information on the actual levels of PM_{10} attributable to the project, especially for the surface roads assessed, it is not possible to assess the magnitude or significance of any improvement or worsening of air pollution attributable to the project*".

The ventilation structure modelling outputs (Tables 40 to 53 of Technical Report G) provide the percentage relative to the design criterion (not the background concentration), the incremental concentrations due to the project and background and the total maximum predicted ground level concentrations for each pollutant assessed.

The surface roads modelling outputs (Tables 59 to 95 of Technical Report G) provide the predicted maximum pollutant concentrations, both with and without background, with the percentage referring to the change in concentration between the project and base cases, both with and without background. Where background has been included, the total maximum pollutant concentration is compared with the air quality criterion from either the SEPP(AQM), State Environment Protection Policy (Ambient Air Quality [SEPP(AAQ)] and National Environment Protection (Air Toxics) Measure (Air Toxics NEPM).

The combined impacts modelling outputs (Tables 100 to 102 of Technical Report G) provide the incremental concentrations due to the tunnel ventilation structures, surface roads and background, together with the total maximum predicted ground level concentration for each pollutant assessed.

In relation to the comment regarding compliance with policy, it should be noted that SEPP(AQM) does not contain guidance, nor specific criteria, for the assessment of transport corridors. SEPP(AQM) Schedule B lists intervention levels "*used to assess air quality monitoring data*". Based on historical advice from EPA Victoria, intervention levels were used as surrogate design criteria to assist with understanding the impacts of proposed surface roads. Modelling predictions provided over averaging periods associated with SEPP(AAQ) and Air Toxics NEPM criteria are for comparative purposes only and have no regulatory status. Similarly, when considering the combined impacts of the tunnel ventilation structures, surface roads and background air quality, modelling predictions are for comparative purposes only and have no regulatory status.

9. Section 4.1(viii) "*The EPRs do not actually define the air quality standards against which the air quality monitoring data are to be assessed. ….. I am of the opinion that the Ambient Air Quality Standards in the NEPM should be applied to assess ambient air monitoring data to ensure the protection of human health*".

SEPP(AAQ) environmental quality objectives (EQOs) introduce the National Environment Protection (Ambient Air Quality) Measure standards into Victorian legislation. It is incorrect however to suggest that they apply to all locations, including roadside monitoring stations. SEPP(AQM) intervention levels apply to roadside monitoring, with SEPP(AAQ) EQOs only applying at sites that conform with performance monitoring station siting guidelines.

10. Section 4.1(viii) "*EPR AQ1* (sic)*….should be strengthened to include a requirement in the design to include provision for the retrofitting of pollution control equipment*".

EPR AQP3 notes that there will be provision for the retrofitting of pollution control equipment.

11. Section 5.1(i) "*…the NSW in-tunnel standard for NO_2….has been used as the basis of the air quality modelling for NO_2 to predict the impact on air quality rather than emission factors..*".
    Section 5.1(ii) "*Modelling should have been done on emission factors for vehicles not in-tunnel standard for NO_2…..*".

NO_2 modelling for the 'worst case' scenario during normal road tunnel operation in 2022 and 2031 (Scenarios A and B) uses PIARC vehicle emission factors for nitrogen oxides. A sensitivity analysis scenario examined the impact of tunnel ventilation structure emissions if concentrations equalled CO and NO_2 in-tunnel air quality criteria, 24 hours per day, 365 days per year. As noted in Technical Report G, this is an unlikely scenario.

12. Section 5.1(i) "*Dr Cowan in his expert witness statement also raised concerns that the modelling had been undertaken assuming constant speed and had not taken into account the influence of grades within the tunnel within* (sic)*. Both speed and grade impacts on the emissions from vehicles*".

The issue of speed within the tunnel was addressed under item 3. The impact of road grade on vehicle emission factors was considered for the road tunnel, as noted in Section 6.2.2.8 and Table 38 of Technical Report G.

13. Section 5.1(i) "*Technical Appendix G shows that there are additional exceedances of design criteria in SEPP(AQM) with the addition of emissions from the tunnel ventilation stacks on existing background levels. This shows non-compliance with SEPP(AQM)".*

An exceedance of the relevant SEPP(AQM) design criterion does not alone show non-compliance with SEPP(AQM). Schedule C of SEPP(AQM) specifically notes that "*in cases where the design criteria are not met the proponent may carry out a health risk assessment to demonstrate that there will be no adverse impact from the proposal*", as has occurred in this instance.

14. Section 5.1(ii) "*The restriction for the selection of sensitive receptors to within 1 km of the ventilation stack is questionable*."

This question was previously addressed in the response to the preliminary matters and further information request issued by the IAC. The 1 kilometre zone refers to the area within which a selection of discrete sensitive receptors were identified, not the area over which modelling was conducted. The actual assessment area was 100 square kilometres centred on the project (approximately half way between the north and south ventilation stacks) as noted in Section 6.2.2.1 of Technical Report G. A 10 kilometre by 10 kilometre outer modelling grid (with a receptor spacing of 100 metres) and an inner grid of 4.25 kilometre by 2.5 kilometre (with a receptor spacing of 25 metres) were used for the modelling assessment. The discrete receptors are in addition to the gridded receptors.

15. Section 5.1(ii) "…*contour plots of the maximum contribution from the stack across the whole model domain…...were not presented in the AQIA for WGTP and therefore whether there is impact beyond the 1 km radius cannot be assessed*".

Pollutant isopleth plots over the modelled domain were provided in Appendix E of Technical Report G.

16. Section 5.1(ii) "*Given that there are large urban redevelopment projects planned or underway within the project these need to be assessed for impacts from the ventilation stack emissions as well as from surface roads. In particular The Dons development in Kingsville South is in close proximity to the Southern ventilation stack and should be assessed as it is a significant housing development within the project area*".

The receptor grid for the ventilation structure modelling includes the Dons Smallgoods site (Precinct 15). In addition, Sites 20 and 21 were included in the combined impacts modelling to assess the impact on the Bradmill Precinct and Precinct 15 urban renewal areas.

17. Section 5.1(ii) "*It is acknowledged that a sensitivity analysis has been conducted where three lanes in the tunnel are full, however it is still assumed under this scenario that the traffic is still relatively free flowing*".

As noted in Section 6.2.2.12.1 of Technical Report G, GHD predicted that traffic flow breakdown occurs at approximately 1,800 vehicles per lane per hour for the forecast fleet mix, with projected traffic speeds of 35 to 50 kilometres per hour. Consequently 40 kilometres per hour was selected to estimate vehicle emissions under the maximum capacity scenario of 2,000 vehicles per lane per hour.

18. Section 5.2 "*…the Emma McClean* (sic) *Kindergarten in Spotswood and the Claire* (sic) *Court kindergarten near the corner of Francis St and Williamstown Road (which was not included as a sensitive receptor in the AQIA or health risk assessment)* ".

The Clare Court Child Care Centre, located at 30 Court Street, Yarraville (near the intersection of Francis Street and Williamstown Road) and the Emma McLean Kindergarten were included in the ventilation structure modelling as discrete receptors. As noted in Technical Report G, discrete receptors included in the assessment were not meant to represent all sensitive receptors, with modelling predictions occurring at receptors located every 25 metres within the inner modelling grid.

Clare Court Child Care Centre is located approximately 220 metres north of Francis Street and 270 metres west of Williamstown Road, with surface road modelling receptors located at properties immediately alongside both roads to assess the maximum impact. Emma McLean Kindergarten is located approximately 190 metres south of the proposed Hyde Street on-ramp, with a surface road modelling receptor located 60 metres north of the kindergarten (81 Hope Street), closer to the on-ramp.

As noted in EPA Victoria Publication No. 1025 *Review of Air Quality near Major Roads*, "*this study supports findings of other studies which show that, within a short distance from the road, air quality objectives are generally met*".

19. Section 5.2 "….*Hyde St off ramps….There is no assessment of the impact of emissions from the off-ramps in the EES or Technical Report G*".
    Section 5.2(i) "*There is no data presented in the AQIA on the impact of increased traffic on local streets being used as feeder roads to the freeway or for the impact of off-ramps on sensitive receptors*".

As shown in Table 55 of Technical Report G a number of on and off ramps were included in the surface roads modelling assessment, including the Hyde Street on and off ramps, with the impact on adjacent residential properties assessed. The feeder roads that Dr Denison refers to are not identified, however it should be noted that the surface roads selected for modelling were based on a number of criteria designed to demonstrate the maximum predicted changes associated with the WGTP, either positive or negative. Consequently the impact of the project on roads not modelled would be expected to be less.

20. Section 5.2(i) "*The AQIA predicts that there will be up to an 87% increase in PM_{10} levels at sensitive receptors along Miller's* (sic) *Road*".

Tables 81 and 82 of Technical Report G show that the maximum impacted receptor on Millers Road is predicted to experience a 3.3 to 4.9 per cent increase in the maximum 24 hour average PM_{10} concentration and a 5.3 per cent increase in annual average PM_{10} concentration in 2022 and 2031. Dr Denison has incorrectly referenced the 87 per cent change in the incremental annual PM_{10} concentration for the project over the base scenario in 2031, without background.

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