

**NORTH EAST LINK PROJECT ENVIRONMENT EFFECTS STATEMENT**  
**INQUIRY AND ADVISORY COMMITTEE**

**NELP TECHNICAL NOTE**

**TECHNICAL NOTE NUMBER:** 53

**DATE:** 6 September 2019

**LOCATION:** N/A

**EES/MAP BOOK REFERENCE:** N/A

**SUBJECT:** Response to issues raised by Mr McDougall.

**NOTE:** 1. This Technical Note has been prepared in response to issues raised by Mr McDougall in giving evidence to the IAC on Day 18 of the hearing.

**REQUEST:** N/A

**RESPONSE:**

1. This document sets out Tim Veitch's response to William McDougall's presentation to the North East Link IAC's panel hearing.

**Post-processing of Zenith outputs by Smedley Technical & Strategic**

2. Mr McDougall stated that he was unaware that VLC's forecasts were only being used to predict percentage changes relative to observed traffic volumes for the base year. He stated that this was not clear from the documentation. I disagree. This approach is explained clearly in Section 4.5.3 of Technical Report A of the EES.

**Historical trends in vehicle kilometres travelled per capita**

3. In his presentation, Mr McDougall stated that vehicle kilometres per capita have been declining in Melbourne for the last 15 years, and used this to support his view that the 'single distribution' approach used by VLC is incorrect. In my view this is overly simplistic. As I stated in my evidence, vehicle kilometres per capita did reduce for a period of around 5 years between 2004 and 2009, but that it has been relatively stable since. Further, in my view, the reduction between 2004 and 2009 were likely caused by a range of other factors (increases in fuel prices and CBD parking costs, substantial increases in CBD employment, and reductions in driver's licence holding rates among young people), none of which are connected to the 'single distribution' issue. In my view these factors largely stabilised post 2009. Looking forward, I remain of the view that there is considerable uncertainty over whether vehicle kilometers travelled per capita will increase or decrease in the future. This view is consistent with the BITRE forecasts shown in slide 25 of my presentation.

**VLC's approach to running the 'loop through distribution' method**

4. In his presentation, Mr McDougall correctly stated that VLC performed a run of the 'loop through distribution' method for comparison with the 'single distribution' method. In his presentation, Mr McDougall criticised that VLC's approach to running the 'loop through distribution' model on the basis that the travel times and costs used to seed the first iteration were based on base year demands being assigned to a future year network. I disagree with Mr McDougall's criticism. Earlier in his presentation, Mr McDougall stated that one way to seed the iterative modelling process is to use free flow travel times and costs. He also stated that a variety of other seeding approaches can be used. The approach referred to by Mr McDougall (of using free flow times and costs) is significantly inferior to the approach used by VLC, because free flow travel times and costs are much less realistic than the costs derived from assigning current day demands onto a future year network. In any case, after

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5 iterations, the impact of the seed skims on the final output will be minimal. I demonstrate this below under the heading “*Convergence of the Model*”.

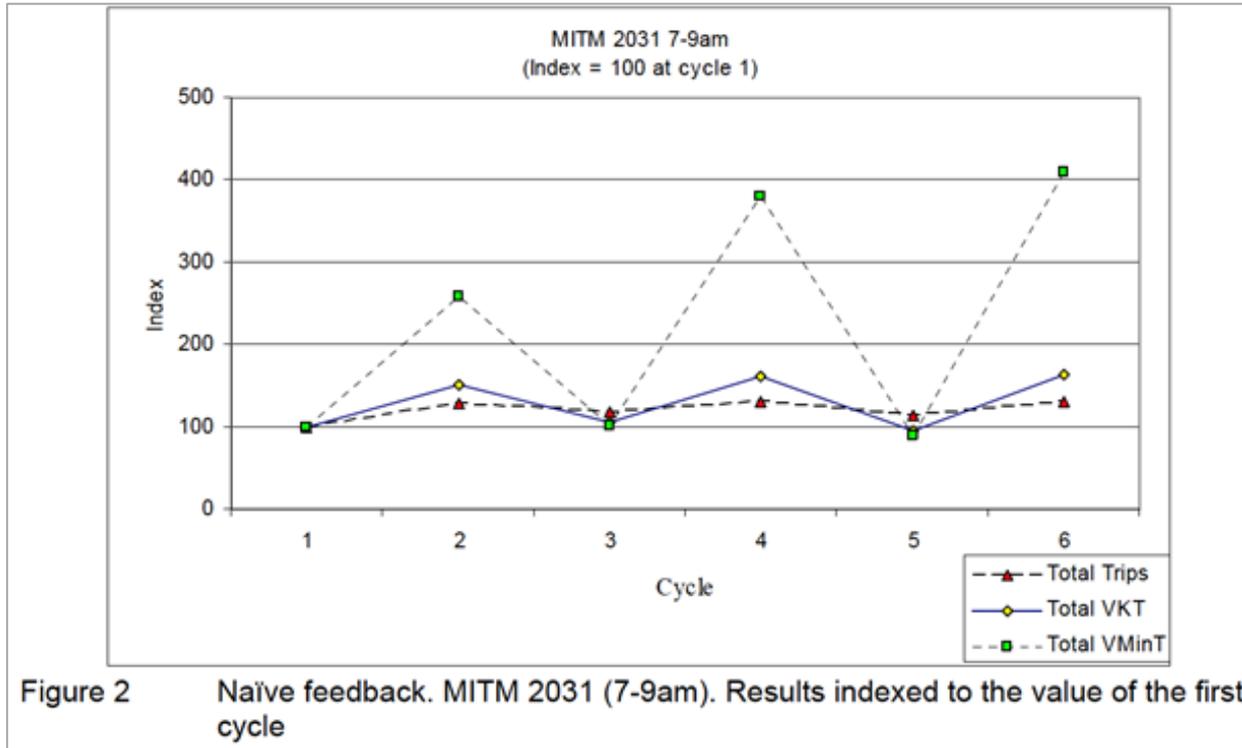
**Changes in travel times under the ‘single distribution’ and ‘loop through distribution’ methods**

5. In slide 18 of his presentation, Mr McDougall pointed out that the impact of North East Link on aggregate travel times across Melbourne is significantly different between the ‘loop through distribution’ and ‘single distribution’ methods, and he stated that this would have a significant impact on economic appraisal of the benefits of North East Link.
6. I disagree. It is well known among transport economists that changes in aggregate travel times are not a valid measure of overall economic benefit in situations where induced demand can occur. For instance, if car travel times are improved by a project such as North East Link, people may switch from using public transport to using car. This would have the impact of increasing aggregate car travel times, but it would not represent a disbenefit. Instead, those people choose to switch because they benefit from doing so.
7. Because of these complexities, the appropriate way to estimate economic benefit is using a method known as “*consumer surplus*”. VLC has calculated the consumer surplus benefit of North East Link using the ‘loop through distribution’ and ‘single distribution’ methods, and the difference is approximately 10%. While this is not trivial, I do not consider it a significant concern, or evidence of the model failing to converge.

**Convergence of the model**

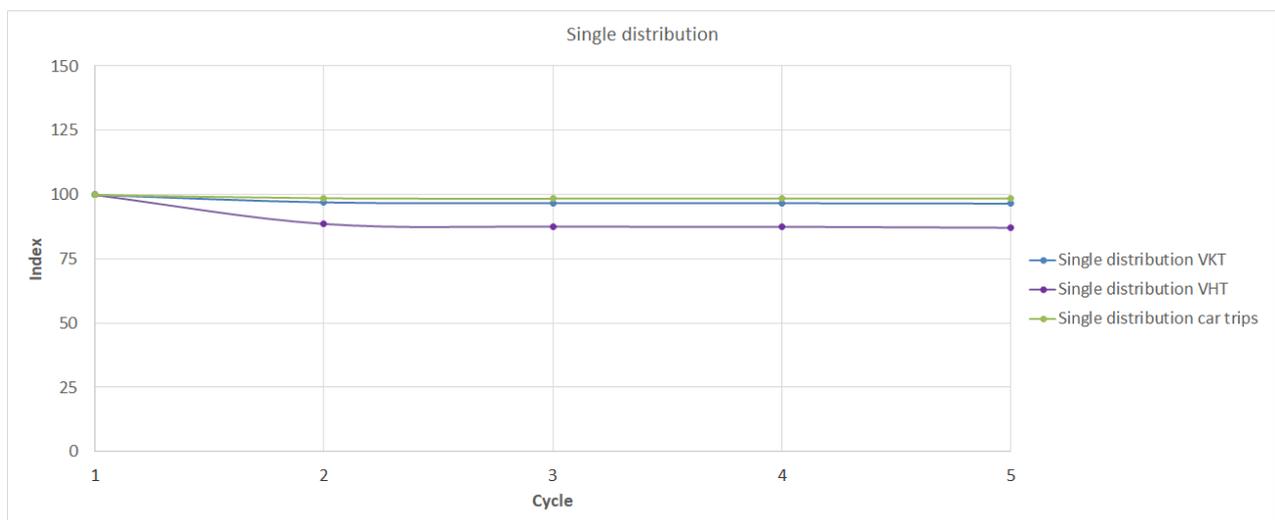
8. Mr McDougall raises concerns over whether the Zenith model used for North East Link is sufficiently well converged. He cites a paper by Rogerson and Carnovale which shows how models can fail to converge (particularly when using “*naïve*” feedback methods), and how the use of a sophisticated feedback method can improve convergence.
9. Slide 21 of Mr McDougall’s presentation showed how aggregate city-wide metrics such as total car trips, total kilometres travelled, and total hours of travel, were found to oscillate in a MITM model for 2031, using naïve feedback. I reproduce that figure below.

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10. The figure clearly shows that models can fail to converge, and that convergence is therefore an important issue.

11. In Figure 1 below I show how VLC’s Zenith model converges in relation to the same metrics. These outputs relate to the 2036 model including North East Link, using the ‘single distribution’ method for trip distribution. It can be seen that the Zenith model outputs converge to a stable outcome. This is at least in part because the Zenith model does not use the naïve feedback method, but instead uses an averaging scheme along the lines suggested in the Rogerson and Carnovale paper.

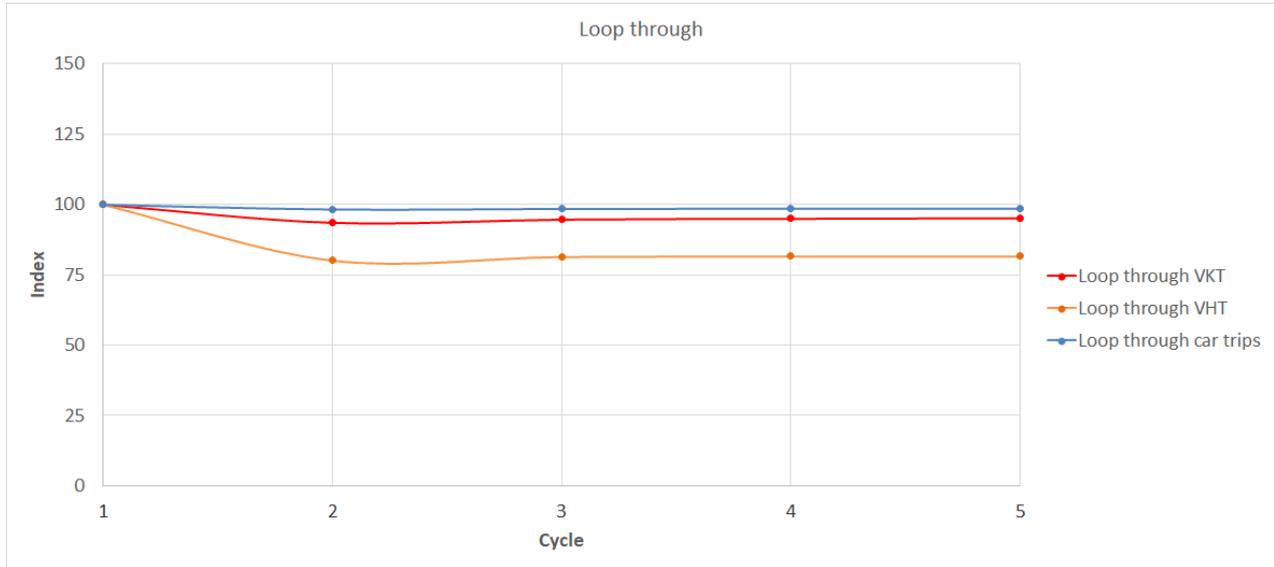


**Figure 1 - Convergence of aggregate travel metrics using the 'single distribution' method**

12. Mr McDougall also questioned the convergence of the Zenith model using the ‘loop through

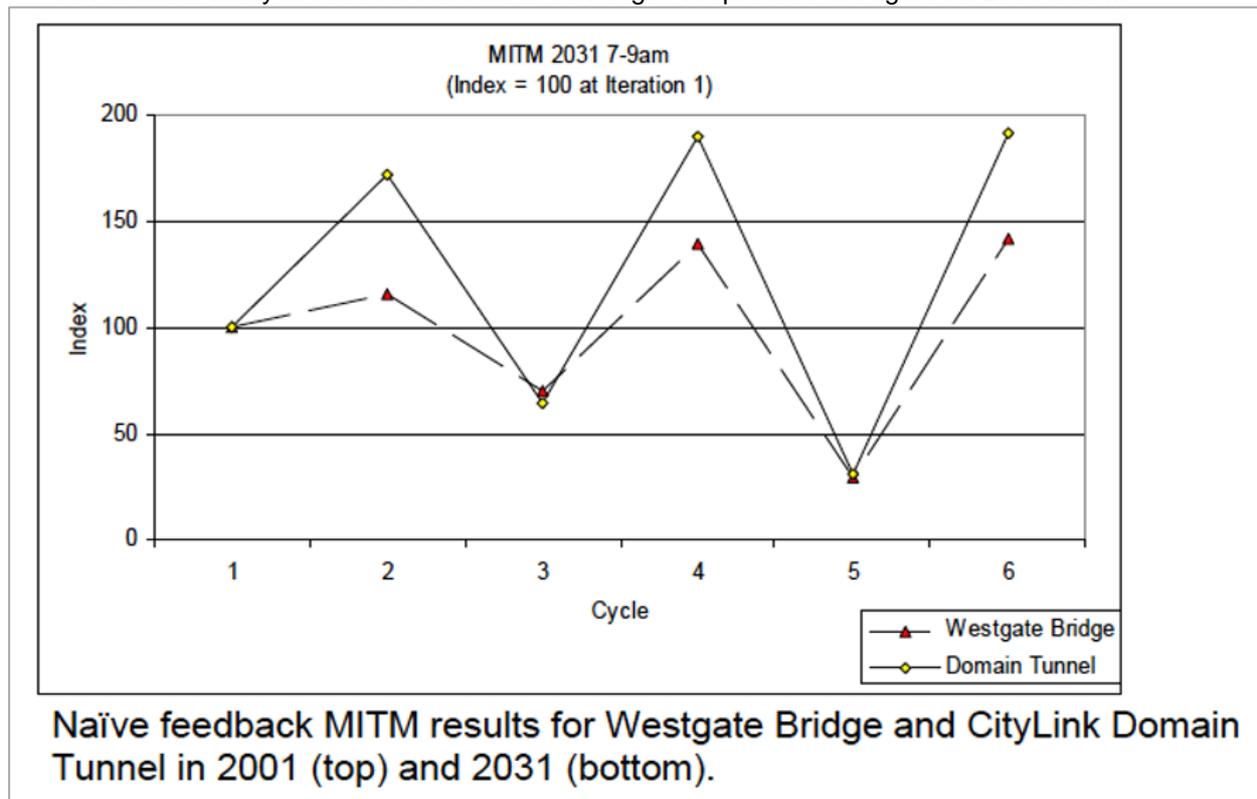
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distribution' method, particularly given that the first iteration is seeded with travel times and costs based on the assignment of base year demands onto a future network. In Figure 2 below I show how the model converges using the 'loop through distribution' method. Again, the model appears to converge well, and that end state does not appear to be affected by the times and costs used in the first iteration.



**Figure 2 - Convergence of aggregate travel metrics using the 'loop through distribution' method**

13. Slide 22 of Mr McDougall's presentation shows how the forecast traffic volumes on individual roads can oscillate wildly in a model that fails to converge. I reproduce the figure for 2031 below.



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14. Mr McDougall raised concerns over whether similar issues might be affecting the Zenith model's forecasts for North East Link.

15. In Figure 3 below I show the Zenith forecasts for North East Link (at its crossing of the Yarra) at each model cycle, using both the 'single distribution' and 'loop through distribution' methods (indexed relative to the first iteration volumes). Again it can be seen that both methods converge well (though to different end points, as is expected given that the methods are different). Between the 4th and 5<sup>th</sup> iterations, North East Link volumes change by around 0.3% in the 'single distribution' approach used by VLC, and by 0.7% in the 'loop through distribution' method. It can also be seen that the results are relatively stable between iterations 3 and 4. On the basis of these results, I do not believe that model convergence is a material source of uncertainty or error in VLC's forecasts for North East Link.



**Figure 3: Convergence of North East Link forecasts using both distribution methods**

**The effect of not constraining public transport demands**

16. As Mr McDougall pointed out in his presentation, VLC's forecasts were produced on the assumption that public transport demands are "*unconstrained*" - that is, that they can exceed the capacities of public transport vehicles. Mr McDougall stated that he is unsure whether constraining the public transport forecasts would have resulted in higher traffic forecasts, due to issues around access penalties.

17. The access penalties used in the model were calibrated using "*constrained*" public transport demands in the base year. This means that when those constraints are removed in the base year, public transport demand would increase slightly over the observed base year demands. It also means that VLC's forecasts of public transport demand (which are also run unconstrained) will be higher than they would be if constraints were turned on. Consequently, I can say with confidence that if the modelling had been run in a constrained manner, then the public transport forecasts would have been lower, and the car forecasts would have been higher.

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**Clarification of VLC's treatment of forecast value of time increases**

18. In his presentation, Mr McDougall made some statements in relation to VLC's assumptions regarding future value of time.
19. I agree with Mr McDougall that the value of time within the traffic assignment was assumed to increase by 1.55% per annum between 2016 and 2036. I also agree with Mr McDougall that the way in which this was applied means that it will have no impact on mode shares or trip distribution.
20. Mr McDougall correctly pointed out that this assumption will have the effect of increasing drivers' willingness to pay tolls.
21. McDougall also stated that this will have many other impacts, because it is a "*blanket adjustment*" within the traffic assignment. This is incorrect. The assumption in question was implemented by reducing the "toll parameter" within the toll choice model, which has the same effect as reducing the toll. This is consistent with the approach that Mr McDougall suggested should have been taken. Because of this, the only impact of this assumption is to increase drivers' willingness to pay tolls. It has no other effects.
22. Mr McDougall also stated that VLC's forecast of peak direction demand for North East Link in the two hour AM peak (7-9am) is around 10,400 vehicles, and stated that this equates to over 2,000 vehicles per hour. This appears to be incorrect. 10,400 vehicles in two hours equates to 5,200 in one hour, which is clearly less than 2,000 per lane (given there are 3 lanes in each direction). Even if one assumes that a higher proportion of demand occurs in the peak hour (say 55% of the two hour demand occurs in the peak hour), then the volume per lane would still be below 2,000 vehicles per lane.
23. Mr McDougall questioned what the impact of the value of the assumption would be on the North East Link forecasts within the modelling. A rough estimate can be made by looking at the sensitivity tests that were documented in Table 5.3 of VLC's Transport Modelling Summary Report, which indicated that a 20% decrease in tolls would result in a 4% increase in demand for North East Link. The value of time assumption implemented by VLC involves increasing value of time by 1.55% per annum, which amounts to 36% over 20 years. Mathematically, this would have the same impact as reducing the toll by 36%. Therefore, the impact of this assumption (compared to assuming that value of time remains constant) would be to increase demand for North East Link by around 7% ( $36\%/20\% \times 4\%$ ). However, in my view it is not sensible to assume that value of time remains constant into the future, as that would effectively imply that real wages do not grow at all over the next 20 years.

**CORRESPONDENCE:** N/A

**ATTACHMENTS:** N/A