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Let's GET Wellington MOVING

Appendix L - Golden Mile Peer Reviews

October 2021

Golden Mile Single Stage Business Case | Contract No. 1851

Futuregroup

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Golden Mile Business Case

Peer Review Report

SSBC Review

13 September 2021

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Project:	Lets Get Wellington Moving: Golden Mile
Report title:	Peer Review Report: SSBC Peer Review
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Date:	13 September 2021

Report Status	Prepared By	Reviewed By	Approved By
Final Report	Michelle Seymour	Tony Innes	Tony Innes

Contents

1 PEER REVIEW SUMMARY FINDINGS

Tony Innes from Commute was asked to undertake a review of the Let's Get Wellington Moving Business Case for the Golden Mile in line with Waka Kotahi peer review guidelines.

The review has been completed in two stages with a preliminary review on the option assessment completed in March 2021, and a subsequent review in August 2021 and then a final review in September which is documented in this report.

This review was completed on the final project documentation.

As stated in the previous report, it was the intention that the peer reviewer will work alongside the project team in this regard – rather than an isolated document review at the end of the process.

The previous review identified that:

- The documentation provided to date provides a strong strategic case, with clarity around the cause and effect of the problems related to the Golden Mile – specifically slow and unpredictable travel times, inadequate provision for pedestrians and street layout limitations resulting in poor amenity.
- The Optioning process that has been undertaken is robust, with a clear process of filtering from a significant long list to three short listed options. Greater detailed assessment has been completed on these short-listed options which is appropriate.

I can confirm that this is still the case within the SSBC documentation and that the optioneering process is, in my opinion, robust and appropriate.

It is understood that the funding environment surrounding Lets Get Welling Moving projects is complex with multiple partners and multiple funding streams. It is understood that there is sufficient funding to undertake the design and pre-implementation stages and that implementation funding is an early priority for the Lets Get Wellington Moving programme, however this entire funding package is still being developed and confirmed (based on Business case input currently underway).

Generally speaking, the business case provides a strong case for the preferred option, providing benefits sought from the projects investment objectives.

From review of the provided documents, and speaking with the team, it is understood that a significant portion of benefits (some 70%) identified can be attributed to the improvements to pedestrian realm, which is a higher percentage than sought from the investment objectives weighting.

This is not considered an issue as overall the benefits sought are being delivered and it can be difficult to accurately quantify public transport user benefits in schemes like this.

This does however highlight a funding class issue that the financial case should address. It is understood that the funding for the project is predominantly from the Public Transport User class. The peer reviewer considers this appropriate as this is a key part of the project and outcomes sought. There maybe a case to also use the pedestrian funding class also. Further consideration in the financial case could clarify the most appropriate activity class(es) to draw funding from.

2 INTRODUCTION

The Let's Get Wellington Moving Programme (LGWM) is a joint initiative between Wellington City Council, Greater Wellington Regional Council and Waka Kotahi NZ Transport Agency.

LGWM Governance Group agreed a Recommended Programme in late 2018, which was then used as the starting point for engagement with central government. In May 2019, central government announced the LGWM Indicative Package, which included many, but not all, of the elements of the Recommended Programme of Investment. This LGWM Indicative Package included a series of projects with an indicative package cost of $6.4 billion. This package included (but is not limited to)

- Golden Mile Improvements (Lambton Quay to Courtenay Place)
- Thorndon Quay and Hutt Road Improvements
- Mass Rapid Transit
- The Basin reserve and an extra Mt Victoria Tunnel
- Walking and Cycling improvements in various locations
- Speed reviews

This peer review is focussed on the Golden Mile Improvements Project.

The Waka Kotahi business case guidelines require an independent review of business cases of this scale to be completed. This report summarises the approach and findings of this review.

3 APPROACH TO REVIEW

3.1 APPROACH TAKEN

The LGWM Golden Mile Business Case documentation is extensive with multiple reports and files in separate files. The reviewer was given access to the project files and accessed these as part of the review.

The documents reviewed included the following.

- Golden Mile SSBC Draft for LGWM Review
- Appendix A: Golden Mile Strategic Case Refresh – FINAL June 2020
- Appendix B: Vision 2036 FINAL
- Appendix C: Golden Mile MCA June 2021 FINAL for publication with redaction v2
- Appendix D: Design Philosophy Statement
- Appendix E: Golden Mile Preferred Options economics v1.2
- Appendix F: Traffic Effects Report
- Appendix G: Cost Estimation Report
- Appendix H: Consenting Strategy
- Appendix I: Traffic Regulations Report Aug 9
- Appendix J: SSBC Risk Register Aug 9
- Appendix K: Benefits Realisation Plan Aug 9
- Appendix L: Peer Reviews and Parallel Cost Estimate

3.2 PEER REVIEW GUIDANCE

This review has been based on the Waka Kotahi guidance on what a business case peer review should consider[1]. As detailed above this review has been prepared on the basis of documentation provided and it is noted that there is remaining information to be provided in regard to cost.

Notwithstanding this, the core matters include consideration of the following:

- ***Conformity***

The reviewer must first determine whether the project is eligible for funding in that it fits the description of one of the activity classes in the current Government Policy Statement on Land Transport (GPS).

The reviewer must ensure that the project evaluation conforms to the requirements of this Knowledge Base, including that it has been assessed by the applicant in conformance with Waka Kotahi's Investment Assessment Framework.

To check credibility, the reviewer must:

  - *Ensure the transport issue, priority or opportunity has been identified, is reasonable and is adequately described.*
  - *Critically assess the results of each stage of the project's economic efficiency evaluation, avoiding unnecessary detail where possible. The test as to the level of detail to consider is whether the conclusion reached in the report is a reasonable and a credible result from the information and data used in the analysis.*
  - *Assess the costs estimated for the project and consider how realistic these are, taking into account current market rates.*
  - *Identify the key benefits and determine whether they are realistic (eg are the travel time savings realistic or are excessive delays being forecast under congested conditions in the do-minimum?). Some quick 'back-of-the-envelope' calculations are necessary to check the level of forecast benefits.*
  - *Identify the factors or assumptions, particularly forecasted estimates that have a major influence on the evaluation. Describe each of these factors/assumptions and include a commentary on the sensitivity of the evaluation to each factor or assumption.*
  - *Highlight any significant areas of risk for costs and benefits.*

- ***Choice of do-minimum***

The reviewer must assess the do-minimum as stated in the project report and must determine whether it is realistic, and does not represent another option to be considered in the analysis

- ***Identification and selection of alternatives and options***

[1] https://nzta.govt.nz/planning-and-investment/planning-and-investment-knowledge-base/201821-nltp/2018-21-nltp-investment-assessment-framework-iaf/peer-review-of-proposals/

The reviewer must examine the evaluation and judge whether all feasible alternatives and options have been identified and considered adequately. These should include alternative transport modes, where applicable, and low cost options.

The reviewer needs to be satisfied that the process to select the preferred alternative and option(s) has been robust and includes incremental assessment where appropriate.

- ***Results alignment rating***

The reviewer needs to be satisfied that the results alignment rating for the activity is correct.

- ***Cost estimate***

The reviewer shall check compliance with parallel cost estimate process requirements, where applicable.

- ***Cost–benefit appraisal rating***

The reviewer must determine whether the cost-benefit appraisal has conformed to all the relevant requirements of the Waka Kotahi Monetised benefits and costs manual (MBCM; from August 2020) and Economic Evaluation Manual (EEM; superseded August 2020). The reviewer must determine whether there are any outstanding issues not addressed in the project report.

If there is a departure from the requirements, or any defect or omission, the reviewer must comment on its significance.

Where the reviewer considers that there have been discrepancies and departures from procedure, or has concerns on cost and/or benefit estimation, the reviewer will determine the project benefit–cost ratio (BCR) and compare this with the applicant's calculations.

The reviewer must determine whether the options identified in the analysis are mutually exclusive options of the same project.

In special cases, other economic impacts may be considered (eg wider economic benefits). These are to be shown as sensitivity analyses, in addition to the MBCM (from August 2020) and EEM (superseded August 2020) procedure economic analysis.

Where supplementary (third party) funding is involved, a government BCR must be determined in addition to the national BCR.

- ***Risk assessment, analysis and mitigation***

The reviewer must ensure that:

  - *risks have been assessed adequately in the applicant's evaluation*
  - *realistic mitigation measures have been considered*
  - *a full risk analysis has been undertaken for large/complex and high-risk projects.*

- ***Sensitivity analysis***

The reviewer must consider whether the sensitivity of critical aspects of the project evaluation has been covered off adequately, paying particular attention to:

  - *key assumptions that underlie the project and its delivery of desired outcomes, in particular future growth and demand assumptions*

- *information and data values that are 'out of the ordinary' or unusual*
- *the sensitivity of the project's outcomes to the input parameters.*

This guidance has been used as the basis for reporting back on this business case

4 REVIEW FINDINGS

When undertaking this review, the findings have been provided as a review against the specific criteria. Where there is an expectation that further information will be provided in the development of SSBC this has been specified.

4.1 SPECIFIC CRITERIA

Using the guidelines outlined in this report the table below summarises the findings of this peer review

Consideration	Review Findings
Conformity The reviewer must first determine whether the project is eligible for funding in that it fits the description of one of the activity classes in the current Government Policy Statement on Land Transport (GPS). The reviewer must ensure that the project evaluation conforms to the requirements of this Knowledge Base, including that it has been assessed by the applicant in conformance with Waka Kotahi's Investment Assessment Framework. To check credibility, the reviewer must: 1. Ensure the transport issue, priority or opportunity has been identified, is reasonable and is adequately described. 2. Critically assess the results of each stage of the project's economic efficiency evaluation, avoiding unnecessary detail where possible. The test as to the level of detail to consider is whether the conclusion reached in the report is a reasonable and a credible result from the information and data used in the analysis. 3. Assess the costs estimated for the project and consider how realistic these are, taking into account current market rates. 4. Identify the key benefits and determine whether they are realistic (eg are the travel time savings realistic or are excessive	The reviewer considered that the project is eligible for consideration for NLTF funding as it fits within the activity classes identified in the GPS. In general, the Business Case is considered to have been undertaken in accordance with the Investment Assessment Framework. Comments on the specific areas for review are provided below: 1. The Business Case has appropriately identified problems, benefits, investment objectives and outcomes sought. These are appropriately evidenced. 2. BCR's have not been reported on the short-listed options (SL report Appendix G). At this stage all BCRs for all options provided are positive. 3. Final costs and parallel estimates have not been completed and the cost estimates confirmed as appropriate. 4. The key benefits identified in the programme are related to car travel time, public transport travel time benefits, public transport reliability benefits, pedestrian realm benefits, pedestrian travel time benefits. A significant amount of benefits for the preferred option (approximately 70%) are derived from the public realm benefits. They have been calculated utilising Waka Kotahi's *Impact on Urban Amenity in Pedestrian Environments* (March 2020) technical paper. Sensitivity testing has been completed on these benefits in regard to the providing a lower and higher range of upgrades and associated benefits.

delays being forecast under congested conditions in the do-minimum?). Some quick 'back-of-the-envelope' calculations are necessary to check the level of forecast benefits. 5. Identify the factors or assumptions, particularly forecasted estimates that have a major influence on the evaluation. Describe each of these factors/assumptions and include a commentary on the sensitivity of the evaluation to each factor or assumption. 6. Highlight any significant areas of risk for costs and benefits.	5. The assessment completed to date notes that the cost estimates have not been completed on design drawings and as such need to be treated as indicative. In addition to this footpath/streetscaping costs have been identified as having considerable uncertainty (extents and quality) and cost estimates will need to be revisited once designs are more progressed. This will have a greater influence on costs associated with the preferred option due to the greater streetscaping component of this option. This has been identified as a risk within the risk register. In addition to the above matters, it is noted that the SSBC implies that funding will be available for implementation, however this is not explicitly confirmed in the SSBC. It is acknowledged that the Let's Get Wellington Moving programme is a complex environment, and as such greater clarity around funding pathways would assist the reader in understanding the next steps for this Business Case.
Choice of do-minimum The reviewer must assess the do-minimum as stated in the project report and must determine whether it is realistic, and does not represent another option to be considered in the analysis	Appendix C Golden Mile Alternatives and Options Report identifies the Do Minimum Scenario and assumptions. The core assumption in this do minimum scenario is that the capacity of the Golden Mile to accommodate buses is constrained and additional bus volumes beyond 100 buses per hour per direction of travel are assumed to use an alternative (unspecified) corridor. It is understood that this direction came from the LGWM Programme and that the implications for these other routes will be addressed within the broader LGWM programme of works. Committed enhancements included in the Do minimum result in 101 buses per hour northbound, and 93 buses per hour southbound by 2022. Beyond this, it is expected that bus volumes on the corridor will exceed 100 buses per hour in either direction by 2036.

	It is considered that this approach to the Do Minimum is appropriate.
Identification and selection of alternatives and options The reviewer must examine the evaluation and judge whether all feasible alternatives and options have been identified and considered adequately. These should include alternative transport modes, where applicable, and low-cost options. The reviewer needs to be satisfied that the process to select the preferred alternative and option(s) has been robust and includes incremental assessment where appropriate.	A sound approach to option development has been undertaken. A wide range of options were initially identified. These options were then reduced down progressively through an initial filtering process by assessing the long list toolbox project against three criteria: Does the intervention contribute to addressing the problem statements, does the intervention contribute to achieving the investment objectives, in the intervention with the current scope of the SSBC. The remaining options were then assessed based on “root causes” and two opposing strategic responses to these root causes were identified. This identified 16 unique/contrasting strategic responses for each subsection. These were then filtered again against feasibility and effectiveness criteria. This result in 21 scenarios. These 21 scenarios were then assessed against critical success factors and investment objectives, and with corridor wide amalgamation this further refined the options to 12 short listed scenarios. These where then reduced to three options for the whole corridor based on a decision tree with two core differences – removing private motor vehicles, and reallocation street cross section. MCA analysis was then completed on these three options, which found that Option 3 was the recommendation option. Importantly the level of option development and assessment increased as the projects were reduced, providing greater information upon which to base the recommended option.
Results alignment rating The reviewer needs to be satisfied that the results alignment rating for the activity is correct.	A results alignment has been completed within the SSBC. The reviewer agrees that the GPS Strategic Priorities and the Scheduling priority have been accurately identified. It is noted that the Efficiency rating of Medium is based on a BCR of 3 and 5.9 (ref. pg. 140). The peer review of the economics has confirmed the appropriateness of the project BCR.

Cost estimate The reviewer shall check compliance with parallel cost estimate process requirements, where applicable.	A final cost estimate report and associated parallel cost estimates have been provided to the peer reviewer at this stage. This has confirmed the appropriateness of the costs for the project. The parallel estimate was higher than the project estimate.
Cost–benefit appraisal rating The reviewer must determine whether the cost-benefit appraisal has conformed to all the relevant requirements of the Waka Kotahi Monetised benefits and costs manual (MBCM; from August 2020) and Economic evaluation manual (EEM; superseded August 2020). The reviewer must determine whether there are any outstanding issues not addressed in the project report. If there is a departure from the requirements, or any defect or omission, the reviewer must comment on its significance. Where the reviewer considers that there have been discrepancies and departures from procedure, or has concerns on cost and/or benefit estimation, the reviewer will determine the project benefit–cost ratio (BCR) and compare this with the applicant's calculations. The reviewer must determine whether the options identified in the analysis are mutually exclusive options of the same project. In special cases, other economic impacts may be considered (eg wider economic benefits). These are to be shown as sensitivity analyses, in addition to the MBCM (from August 2020) and EEM (superseded August 2020) procedure economic analysis. Where supplementary (third party) funding is involved, a government BCR must be determined in addition to the national BCR.	An independent peer review of the economics has concluded it is appropriate.

Risk assessment, analysis and mitigation The reviewer must ensure that: • risks have been assessed adequately in the applicant's evaluation • realistic mitigation measures have been considered • a full risk analysis has been undertaken for large/complex and high-risk projects.	Risk assessments have been provided in the Management Case and within Appendix J. It is noted that the risks identified by this peer reviewer in earlier assessments have been incorporated into the risk register. Previous reviews identified that there was a risk that the preferred option was outside of the current funding envelope. With the current uncertainty around costs and availability of funding, this remains a key risk to the SSBC.
Sensitivity analysis The reviewer must consider whether the sensitivity of critical aspects of the project evaluation has been covered off adequately, paying particular attention to: • key assumptions that underlie the project and its delivery of desired outcomes, in particular future growth and demand assumptions • information and data values that are 'out of the ordinary' or unusual • the sensitivity of the project's outcomes to the input parameters.	Assumptions the underlie the project are considered appropriate and consistent with programme wide provisions. A critical assumption made relates to the forecast demand, being as per the WCC spatial plan and that growth and PT patronage returns to pre-Covid levels. These are considered appropriate assumptions. No specific sensitivity testing of these assumptions has been undertaken that the reviewer is aware of, however what exactly the sensitivity test would be is equally unclear. The Peer Reviewer considers that given the intent of the project, the aspirations of the LGWM programme and the BCR of the project, these sensitivities would likely show less demand, but still a need for the project. The final economic assessment and peer review has considered a range of potential economic outcomes, with the lower scenario still having a BCR of above 2.0

5 SUMMARY

Based on the above review it is considered that the documents reviewed are fit for purpose.

I can confirm that the SSBC documentation and the optioneering process is, in my opinion, robust and appropriate. I find that the overall conclusions and option recommendations of the SSBC are sound and reasonable given the information provided.

It is understood that the funding environment surrounding Lets Get Welling Moving projects is complex with multiple partners and multiple funding streams. Notwithstanding this, it is considered that the financial case could benefit with some additional strengthening and clarity around likely pathways and key gateways to proceed through to implementation.

Generally speaking, the business case provides a strong case for the preferred option, providing benefits sought from the projects investment objectives.

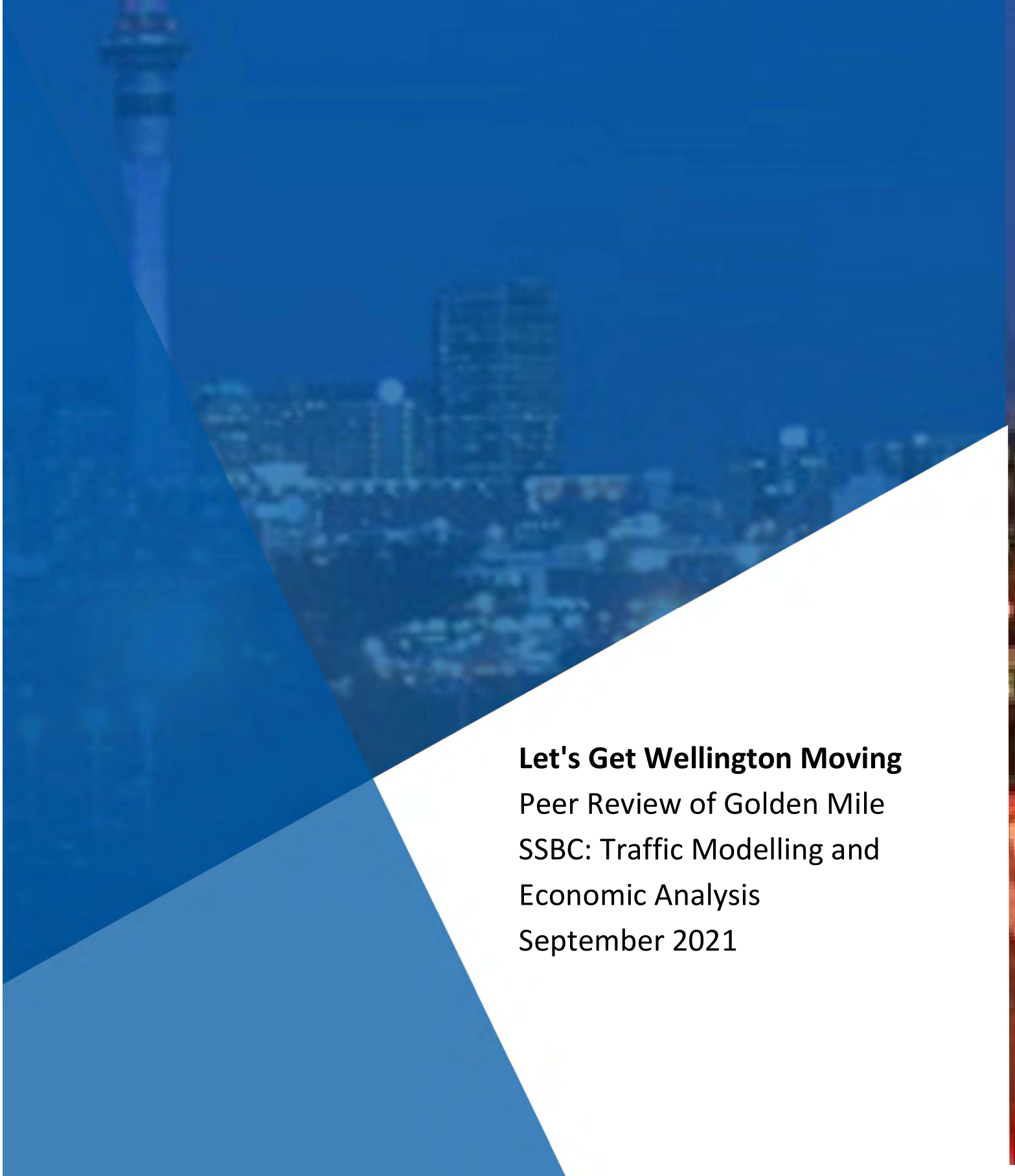
From review of the provided documents, and speaking with the team, it is understood that a significant portion of benefits (some 70%) identified can be attributed to the improvements to pedestrian realm, which is a higher percentage than sought from the investment objectives weighting.

This is not considered an issue as overall the benefits sought are being delivered and it can be difficult to accurately quantify public transport user benefits in schemes like this.

This does however highlight a funding class issue that the financial case should address. It is understood that the funding for the project is predominantly from the Public Transport User class. The peer reviewer considers this appropriate as this is a key part of the project and outcomes sought. There maybe a case to also use the pedestrian funding class also. Further consideration in the financial case could clarify the most appropriate activity class(es) to draw funding from.

Tony Innes

Commute Transportation Consultants



Let's Get Wellington Moving

Peer Review of Golden Mile SSBC: Traffic Modelling and Economic Analysis

September 2021

flow

TRANSPORTATION SPECIALISTS

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TRANSPORTATION SPECIALISTS

Project:	**Let's Get Wellington Moving**
Title:	**Peer Review of Golden Mile SSBC: Traffic Modelling and Economic Analysis**
Document Reference:	**P:\GWRC\004 LGWM Early Delivery Peer Review\golden mile\R1A210903.docx**
Prepared by:	**Qing Li and Ian Clark**
Reviewed by:	**Ian Clark**

Revisions:

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3 September 2021	Draft	R1A210903	I Clark	
10 September 2021	Final	R1B210910	I Clark	

EXECUTIVE SUMMARY

Flow Transportation Specialists Ltd (*Flow*) has been commissioned to carry out a peer review of the traffic modelling and economic analysis relating to the Golden Mile Single Stage Business Case.

This has been a collaborative review, with discussions between MRC and Flow taking place to allow the final MRC and Flow reports to be finalised within a very short space of time. In order to make sense of the discussions that are set out within this review report, the predicted benefits according to the draft and final MRC reports are set out in Table ES1 below.

Table ES1: Predicted Benefits/Disbenefits, as per MRC Reports

Benefit/Disbenefit	Present value ($m): Draft Report	Present value ($m): Final Report
Car travel time impact	-$20	-$20
Emission reduction benefit	$14	$17
Health benefits due to mode shift	-	$48
Public transport travel time impact	$18	$18
Public transport reliability impact	$15	$27
Pedestrian travel time impact	$25	$25
Pedestrian crash reduction benefit	$37	$37
Pedestrian realm benefit	$200	$247
Total benefits	$288	$399

We have raised comments on a number of issues, particularly relating to the travel time savings for cars, emission reductions, crash reductions, and especially the pedestrian realm benefits, leading to a number of updates to the predicted benefits. Also, health benefits due to mode shift were added at a fairly late stage.

Our comments on the robustness or risk associated with each of the predicted benefits, and suggestions regarding updated figures, are as follows:

Table ES2: Updated Predicted Benefits/Disbenefits

Benefit/Disbenefit	Comment	Present value ($m)
Car travel time impact	Medium risk relating to the quantum of trip suppression.	Upper estimate (overly conservative) of -$79m disbenefits, with no trip suppression, with an initial estimate with suppression of benefits of $37m. Likely value therefore within this range
Emission reduction benefit	New values obtained	$17m
Health benefits due to mode shift	Some discussion on validity of these benefits. Flow have some residual concern about this value, MRC consider it to be overly conservative	$48 m
Public transport travel time impact	Not changed	$18m
Public transport reliability impact	Increased to include bus queueing time	$27m
Pedestrian travel time impact	Not changed	$25m
Pedestrian crash reduction benefit	May currently be overestimated, as some crashes may migrate	Probably less than $37m
Pedestrian realm benefit	These contribute the majority of benefits, and they include some subjective judgements	Upper figure of $247m. It is difficult to suggest a realistic lower figure
Cycle benefits	Not currently assessed – currently over-conservative	Quantum of benefit not clear

With total discounted costs of $86m, this evaluation leads to a benefit/cost ratio of 4.6.

CONTENTS

1 INTRODUCTION

Flow Transportation Specialists Ltd (*Flow*) has been commissioned to carry out a peer review of the Golden Mile Single Stage Business Case.

1.1 Background

The peer review included consideration of two sections of the SSBC:

- a review of the use of transport modelling and analytics, for all transport modes, within the SSBC. The review is to ensure that the methodology is robust, that the decisions appear to be logical and that they follow on from the evidence available, with appropriate acknowledgement and allowance for uncertainties
- a review of the economic analysis and the derivation of benefits in particular, in order to assess the extent to which the analysis is consistent with the requirements of the Monetised Costs and Benefits Manual (*MCBM*).

The following process has been followed

- Flow provided initial comments on the methodology and assumptions used in the evaluation which are covered in this report
- The economic evaluation was updated, with ongoing discussions between Flow and MRC ironing out matters raised
- Flow reviewed the economic evaluation spreadsheets and we provide further comments and commentary within this updated report.

This peer review has followed the following aspects of the Waka Kotahi Peer Review Guidelines, as set out in the Investment Assessment Framework[1]:

- Conformity
- Credibility
- Choice of do-minimum
- Identification and selection of alternatives and options
- Sensitivity analysis
- Cost–benefit appraisal (efficiency) rating

The review does not include consideration of the cost estimate used to inform the economic analysis.

[1] https://www.nzta.govt.nz/planning-and-investment/planning-and-investment-knowledge-base/201821-nltp/2018-21-nltp-investment-assessment-framework-iaf/peer-review-of-proposals/#scope-of-improvement-activity-peer-review

1.2 Information reviewed

The following draft documents were received and review by Flow

- Golden Mile: Traffic Assessment Report, July 2021, Golden Mile Single Stage Business Case, Stantec
- Draft Economic Assessment for Preferred Option, August 2021, MRCagney (NZ) Ltd
- Final Economic Assessment for Preferred Option, September 2021, MRCagney (NZ) Ltd.

Throughout the assessment, further documents were requested and provided by MRC to aid our review including:

- A summary spreadsheet of the base scenario including sensitivity of including public transport queueing benefits
- A spreadsheet indicating the calculations of pedestrian realm benefits
- A spreadsheet setting out the calculation of health benefits

2 ECONOMIC ANALYSIS

2.1 Sources of benefits

In order to make sense of the discussions that are set out within this review report, the predicted benefits according to both the draft and final MRC reports are set out in Table 1 below.

Table 1: Predicted Benefits/Disbenefits, as per MRC Reports

Benefit/Disbenefit	Present value: Draft Report	Present value: Final Report
Car travel time impact	-$20m	-$20m
Emission reduction benefit	$14m	$17m
Health benefits due to mode shift	-	$48m
Public transport travel time impact	$18m	$18m
Public transport reliability impact	$15m	$27m
Pedestrian travel time impact	$25m	$25m
Pedestrian crash reduction benefit	$37m	$37m
Pedestrian realm benefit	$200m	$247m
Total benefits	$288m	$399m

As noted in Table 1 above, the project is predicted to lead to discounted benefits of around $400m. With discounted costs of around $86m, this gives a Benefit/Cost ratio of 4.6.

Key points relating to the economic analysis include:

- The analysis assumes a 40 year analysis period, with a 4% discount rate
- The values assumed (for travel times, etc) are in accordance with the MCBM, with appropriate use of update factors
- The annualisation factors used have been provided by the Wellington Analytics Unit (WAU), and are consistent with the assumptions used other LGWM projects
- The analysis assumes no growth in general traffic, but it does assume growth in public transport use. Again, the assumptions have been derived in consultation with the WAU. These assumptions seem appropriate, given the central city location
- The Do Minimum scenario is appropriate, as the project is to be implemented in the short term, meaning that it is unlikely that many other projects should be included at this time
- This stage of work relates to the preferred option only. Previous phases of the work considered options and alternatives. Furthermore, the project has come out from the LGWM PBC, which considered the Golden Mile within a wider context
- The report includes a number of sensitivity tests. Importantly it includes a test with only ten years of benefits, in case the scheme is in place for only ten years, due to the forthcoming stages of the (as yet not approved) Lets Get Wellington Moving projects.

As a result, we consider the overall approach and scope to be appropriate. However the following sections consider the validity of each of the benefit types, in order to validate the quantum of benefits being claimed.

2.2 Car travel time impacts

Table 1 above indicates that modest travel time disbenefits are predicted due to the project, due to the reduction in capacity for general traffic within the CBD. While the magnitude of the predicted disbenefits is modest, these have the potential to be more significant if trip suppression does not occur to the extent assumed.

The previous assessment of the project used fixed traffic demands. We were provided details of a proposed approach to assess variable demands, with traffic demands expected to reduce in response to the proposed reduction in capacity along the Golden Mile route. We accepted the principle of this approach, but this is the first time that we have seen the approach applied (for this project).

Section 3.1 documents our discussions with MRC on the quantum of travel time benefits/disbenefits.

2.3 Emission reductions

Table 1 indicates that emission reductions worth $13.5m were originally predicted due to the project, due to the reduction in capacity for general traffic within the CBD.

We noted that the CO2 emission costs were estimated using the predicted reduction in vehicle kilometres travelled, which was considered appropriate. We however note that the calculation of the costs was based on a CO2 price of $65.58 per tonne as suggested by Waka Kotahi's Vehicle Emissions Prediction Model (VEPM). This value has since been superseded in the latest version of MBCM (August 2021), which requires the whole-of-government agreed shadow price of carbon to be used to make sure the vehicle emission cost estimation captures the values of future Green House Gas (GHG) reductions. This has now been updated (see Section 3.2 below), giving benefits of $17m.

2.4 Public Transport travel times

Table 1 indicates that public transport travel times savings worth around $18m are predicted due to the project, i.e. under 5% of total benefits.

These benefits have been derived from a range of very minor travel time increases and decreases predicted to be incurred by PT users, leading to an overall modest time savings.

2.5 Health benefits due to mode change

Table 1 indicates that health benefits worth around $48m are predicted due to the project, i.e. around 12% of total benefits. None were assumed in the original analysis, and a figure of $92m was then put forward.

Discussions on this issue are set out in Section 3.3 below.

2.6 Public Transport reliability

Table 1 indicates that public transport reliability benefits worth $27m are predicted due to the project, i.e. almost 7% of total benefits.

These benefits have been derived from very minor travel time increases and decreases in trip reliability, leading to an overall modest time savings.

2.7 Pedestrian Travel Time Benefits

Table 1 indicates that pedestrian travel time reductions worth $25m are predicted due to the project, i.e. around over 6% of total benefits.

These benefits have been derived from minor travel time reductions to pedestrians due to the removal of signals associated with side roads which are to be closed as a result of the project, with resulting reductions in delays for pedestrians.

2.8 Pedestrian Crash Reduction benefits

Table 1 indicates that pedestrian crash benefits worth $36.5m are predicted due to the project, i.e. around 9% of the total benefits.

These benefits have been derived from predictions around crash reductions due to the removal of traffic. We have considered the validity of these predicted benefits, due to the potential for crashes to migrate, rather than be avoided, in Section 3.4.

2.9 Pedestrian Realm Benefits

Table 1 indicates that pedestrian realm benefits worth $247m are predicted due to the project (an increase from an original figure of $200m). It is apparent that these are predicted to contribute the majority of the benefits of the project (almost 62%), so we have considered the validity of these in detail, in Section 3.5.

2.10 Cycle Benefits

It is noted that the assessment assumes no benefits for cyclists. The reasons for this are set out at Section 4.4 of the Economics Report, but clearly the assessment is currently (overly) conservative in this regard.

3 DETAILED REVIEW OF PREDICTED BENEFITS

3.1 Car travel time impacts

As noted in Section 2, the previous assessment of the project used fixed traffic demands. We were provided details of a proposed approach to assess variable demands, with traffic demands expected to reduce in response to the proposed reduction in capacity along the Golden Mile route. We accepted the principle of this approach, but this is the first time that we have seen the approach applied (for this project).

Flow Issue

The Wellington Transport Strategy Model (WTSM) indicates an increase in vehicle numbers over time however, the model assumes no growth as an input to the travel time and emissions benefits despite the Aimsun model run relating to 2026 forecasts.

Consultant Response

MRC advised that this assumption originates from the Wellington Analytics Unit (WAU). Negligible growth in traffic into or within the CBD in future years is appropriate however growth elsewhere in the WTSM model is expected.

Flow Response

This seems appropriate given the central city location. There may be increases in vehicle demands, but these are unlikely to lead to increases in flow arrivals per hour in the central city, due to bottlenecks beyond the CBD.

Flow Issue

We noted that the Do Minimum model incorporates traffic demands with peak spreading. Similar demand profiles have been applied to the option demands, indicating that the demand elasticities were directly applied to the demands with peak spreading. This means that the effects of traffic congestion are likely double counted in the model, although the effects of peak spreading are modest, i.e. around a 3% to 4% reduction in peak hour traffic compared to a 6-7% reduction due to the elasticity, as shown in Table 2.

Table 2: The effect of peak spread and elasticity on peak hour car trips (vehicles per hour)

	Original Demands	With peak spreading	With peak spreading and elasticity
Morning peak hour	41,700	40,000	37,000
		96%	89%
Evening peak hour	44,500	44,500	41,800
		97%	91%

An elasticity of -0.7 was used in the model. To determine the effect of the elasticities, we recommended a sensitivity test with a lower elasticity, as suggested by Table A14 of the Monetised Benefits and Costs Manual (MBCM). For reference this table is reproduced below as Table 3.

Table 3: Table A14: Long-run generalised cost elasticities

	Peak Period	Off-peak period
Low	-0.4	-0.7
High	-0.6	-1.0

Consultant Response

We note the response indicates the peak spreading assumptions are considered reasonable and consistent across the Do Minimum and the Option, with the expectation that conclusions from the model will not be significantly altered. It was suggested that peak spreading has been occurring in practice and can be considered a conservative approach if applied to a forecast. However, for consistency and conservatism, the Do Minimum peak profiles have been applied to each scenario.

The elasticities applied based on trip categories were subsequently provided. The elasticities are provided in Table 4 and include within the CBD (intra), to and from the CBD (between) and outside the CBD (outside).

Table 4: Elasticities applied in the economic assessment

Category	Value
Intra	-0.75
Between	-0.45
Outside	-0.25

It has been indicated that the above methodology was agreed and approved circa December 2020, prior to the release of the latest MBCM guidance. Moreover, the analysis has considered both a test with an upper bound and also without the elasticity, hence a sensitivity test with a reduced elasticity will result with an output within the range of existing outputs.

Flow Issue

It has been noted the economic analysis referred to trips in a cordon context and used a link based method. Our initial understanding was that the trip totals were origin-destination trips, however it was explained that the economic analysis refers to the number of trip links. The purpose of using trip links as opposed to origin-destination trips is to omit edge effects, prevalent in extreme parts of the model. Hence the analysis does not include origin-destination pairs.

This means that the average travel time considers the travel time between link and not origins and destination pairs. Hence the low average travel times (per link) reported in the economic spreadsheet are appropriate in this context.

As the model is an extract of the CBD, origin-destination analysis is not considered appropriate. Instead, a link based method has been used to calculate the benefits. We however note that by using the average travel times, the evaluation process is not strictly following the steps suggested in MBCM (Page 271) which is consistent with the former EEM (Page 5-439), where network summary statistics should be used from the following model runs:

- Do Minimum network with Do Minimum demands - $U_{DM}T_{DM}$
- Option network with option demands (cross-load) - $U_{OPT}T_{OPT}$
- Do Minimum network with option demands - $U_{DM}T_{OPT}$
- Option network with Do Minimum demands (cross-load) - $U_{OPT}T_{DM}$

The MBCM indicates that the benefits for variable trip method should be 1/2 ($U_{OPT}T_{OPT} - U_{DM}T_{DM} + U_{DM}T_{OPT} - U_{OPT}T_{DM}$) + ($R_{DM}T_{DM} - R_{OPT}T_{OP}$)

As we are calculating travel time costs, R_{DM} and R_{OPT} are equal to U_{DM} and U_{OPT}, respectively.

Hence, the above formula can be re-arranged as: 1/2 ($U_{DM}T_{DM} - U_{OPT}T_{OPT} + U_{DM}T_{OPT} - U_{OPT}T_{DM}$). This is consistent with the four model runs discussed above.

To determine the benefits if the cross-load methodology was used, we carried out 2 tests:

- Test 1: assumes applying the Do Minimum demands to the option network would result in a 5% increase to the total travel times while loading the option demands to the Do Minimum network would result in 5% reduction. A travel time saving of some 52,700 seconds is predicted, as shown in Table 5 below
- Test 2: same as above, but the effect of cross loading was increased to ±10%. This leads to a disbenefit of some 999,000 seconds, as shown in Table 5 below.

Table 5: The effects of testing total travel times (in seconds)

Option	Assumed total travel time – cross load	±5%	±10%
Do Minimum demand vs Do Minimum network	2,900,000	21,000,000	21,000,000
Do Minimum demand vs Option network	2,900,000	22,000,000	23,100,000
Option demand vs Option network	2,500,000	18,800,000	18,800,000
Option demand vs Do Minimum network	2,500,000	20,000,000	18,900,000
Predicted benefit		52,670	-998,500

The above tests indicate that a relatively small change in cross-load effects could have significant implications on the travel time (dis)benefits, and the results used in the economic report appears to represent a 'cross-load' effect of some ±6% on the total travel times.

Hence the following checks were recommended:

- A model run that loads the Do Minimum network with Option demands. This will determine what percentage change is likely for this particular cross load, noting that a Do Minimum demand on an option network would likely create large disbenefits and not be very useful. Sensitivities around this however can be checked
- A network flow difference plot should be provided to determine if the bulk of the network where changes are predicted have been captured within the model extract. Such a plot would also identify if there is a large area which sits outside of extracted model where trips have been diverted.

Consultant Response

With regard to the cross load effects:

Attention was brought to the Short List MCA economics including the summary of the previous vehicle impacts, which are summarised below:

- Car travel time disbenefits for the representative short list option, noting that the new preferred option has some refinements. With the fixed Do Minimum demands, this led to present value impacts of about -$79m
- Car travel time benefits in the representative short list option with the elasticity-adjusted demand led to present value impacts of $37m

It is noted that the final results are within this range.

The 'indicative' cross load method was considered and the benefit is summarised in Table 6.

Table 6: Revised benefits based on cross loading

Option	Peak period	Benefit (seconds)	Annual benefit ($)
Preferred option	AM	580,000	770,000
Preferred option	IP	630,000	1,110,000
Preferred option	PM	600,000	960,000
Predicted benefit		1,800,000	2,830,000

With the original short list option modelling, the additional travel times in the option network with the Do Minimum demand averaged 2.5% extra travel time. However, the above testing suggests that it is possible that some total travel time benefits are not realised by excluding the cross-load model runs.

Flow Response

The values provided in Table 6 above indicate that the effects of not applying cross load may be lower than we suggested in our tests (Table 5). We agree that if cross load has been applied, slightly higher benefits may be predicted, but it is still likely to be lower than the $37m predicted with the Option model with elasticity adjusted demand. As such, the BCR is unlikely to change significantly.

Consultant Response

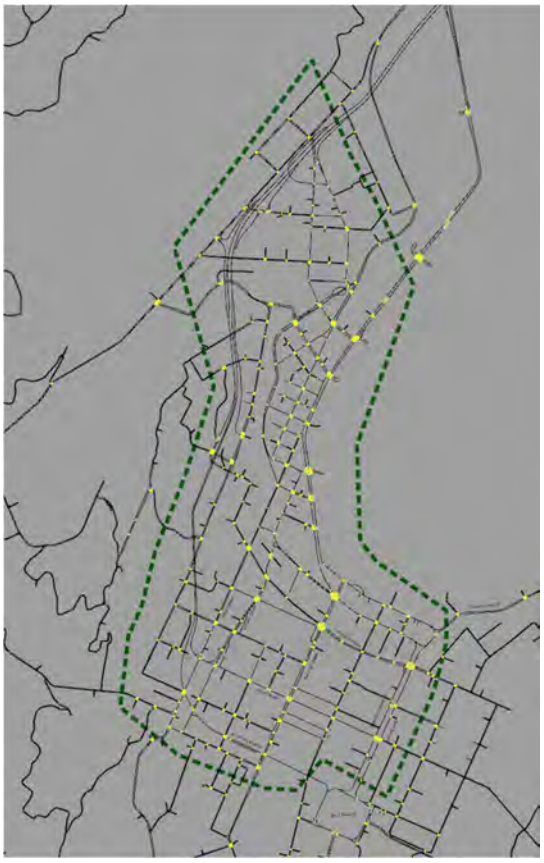
With regard to the network different plots:

Flow difference plots were subsequently provided which included the plots obtained from the following model runs:

- Initial option with Do Minimum demands
- Option with Elasticity Demands, and
- Refined Option with elasticity demands

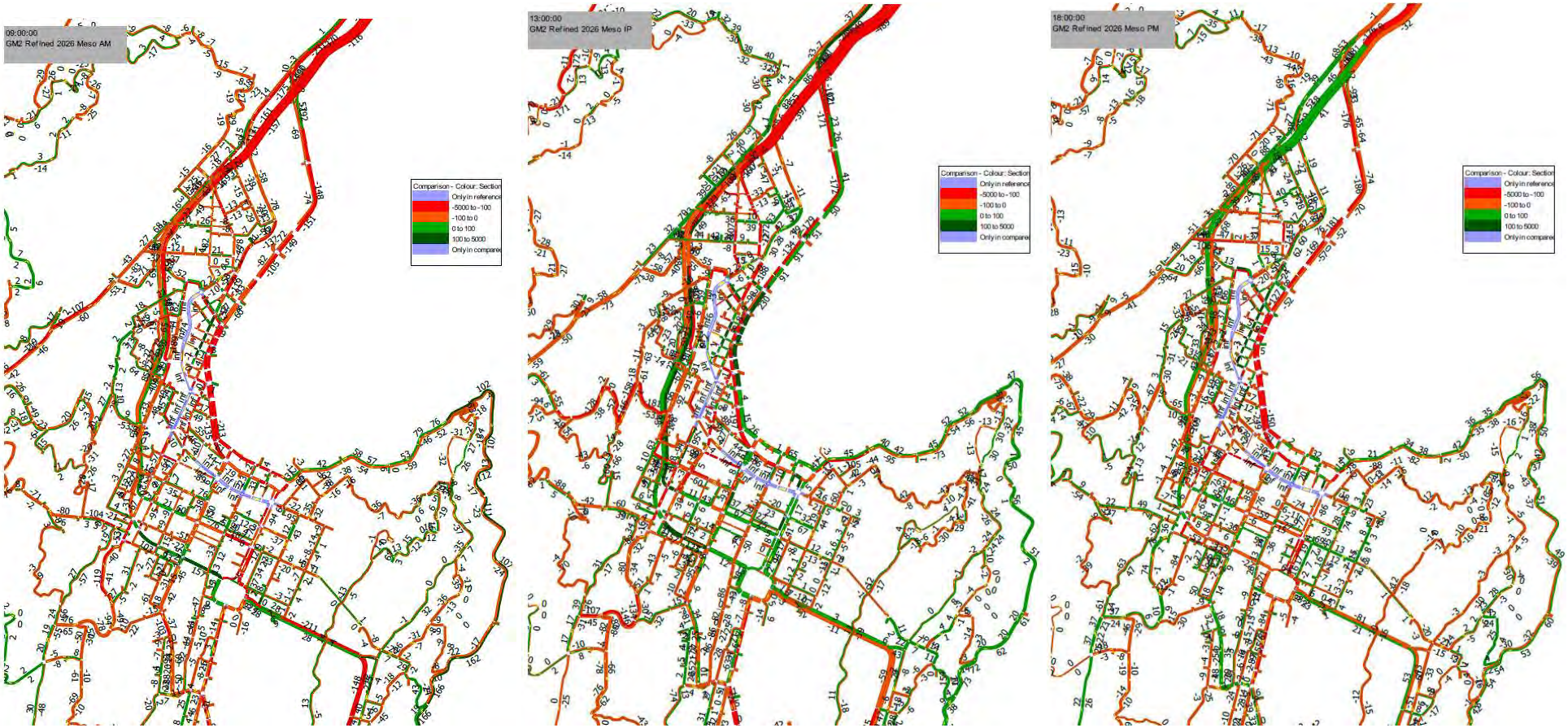
The economic evaluation has focused on the links within the area circled with the dotted green lines:

Figure 1: Cordon Area for Economic Outputs



The flow comparison results between the Do Minimum and the refined Option for each modelled period are displayed in the figures below:

Figure 2: Flow Comparison Plots – Refined Option



Flow Response

The proposed cordon area has captured the vast majority of the CBD area affected by the project, which is considered appropriate. We note that some traffic flow changes are also predicted in the area outside of the cordon area, meaning that some benefits may also be predicted in these areas:

- SH1 north/east of Thorndon Quay, in both the AM and Inter peak
- SH1 east of Buckle Street/The Basin, mainly in the AM peak

This indicates that the predicted travel time benefits may be slightly conservative.

Flow Issue

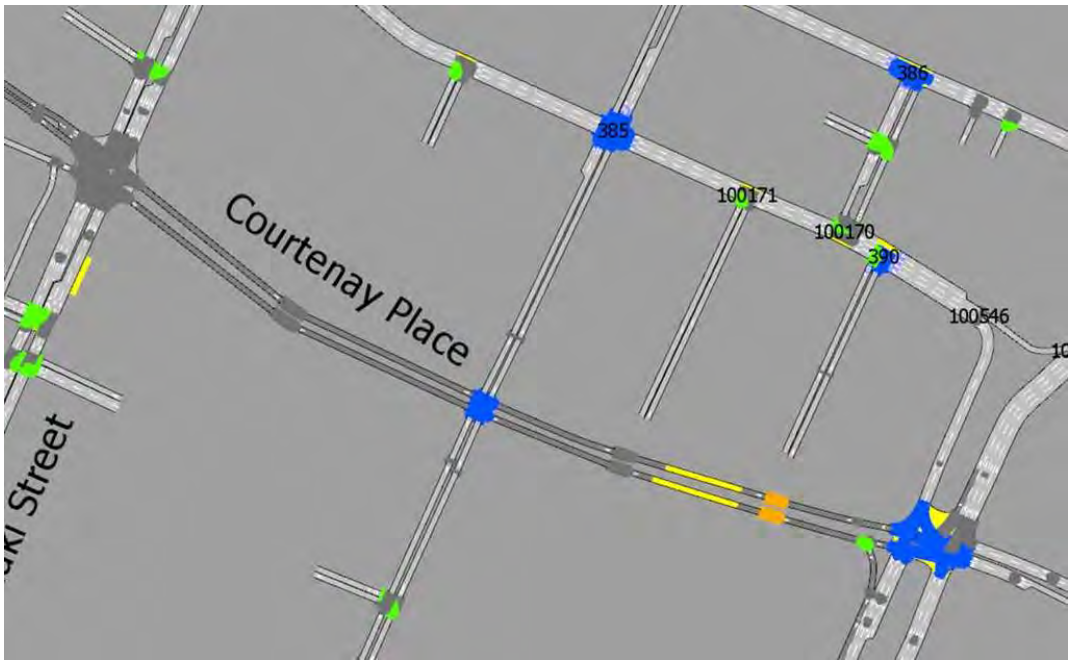
We note that from the Traffic Assessment Report (TAR), the Aimsun traffic models have been run without and with trip suppression. We suggested the sensitivity analysis includes unsuppressed trips to indicate the degree of difference in the results.

Subsequently a summary of the previous benefit estimates for other Aimsun models was provided in section 4.1.6 of the TAR. The difference in results is extreme, although this is expected in a congested city centre context, when one model with reduced capacity but fixed demands is compared to a model that reduces the demand back. The present value for the fixed demand model previously was around -$72m, and for the adjusted demand was +$32m.

Flow Issue

We note the model seemed to have excluded static turn type parameters along Courtenay Place and near Thorndon Quay. The signalised movements should have these coded, which are shown as Blue at the other signals within CBD, give way movements should be shown in Green, see Figure 3.

Figure 3: Courtenay Place/ Taranaki Street give way parameters



Consultant/WAU Response

The response agreed that the turn types are missing at these two locations. However the response noted that:

- The missing give way turn from Thorndon Quay is for buses only, which are on predetermined routes
- The Courtenay Place/Taranaki Street intersection does have the signal turn penalty functions all set, so the correct capacity reductions will be applied, with the second user cost field only used as a trigger to reset these.

3.2 Emission reductions

We noted that the yearly emission benefits had originally been calculated based on the Vehicle Emission Prediction Model published by Waka Kotahi New Zealand Transport Agency (Waka Kotahi), which seemed appropriate. However we also noted that a recent Waka Kotahi report on economic evaluation of Green House Gas emissions[2] suggested that the shadow price of Carbon should be used to capture the full economic impacts of the CO2 emissions.

Consultant Response

After a review of the latest MBCM and Waka Kotahi's technical note, the Consultant put forward a revised approach, using the suggested shadow price of carbon to calculate the CO2 emission benefits associated with the project. In addition, they proposed to use the high end of the price range to calculate the benefit value, because this aligns with the true price of carbon in international examples. Furthermore it was noted that targets set by the Climate Change Commission on how much we should be valuing emissions approximately align with the high range provided.

Flow Response

We agree that the high end of value can be used to estimate the emission benefits. However we recommend a sensitivity test with the low range values, a suggested in Table 11 of MBCM.

3.3 Health Benefits due to Mode Shift

Health benefits due to mode shift were added into the evaluation at a late stage. The logic of applying a health benefit to a modest proportion of trips that are no longer made by car, due to the need to walk a short distance from a bus stop, seems reasonable. However we expressed the concern that the overall benefits being claimed seemed surprisingly high:

- We wondered if the numbers of suppressed car trips may be high, and the elasticity assumed may have suppressed trips away from the Project itself
- We wondered if benefits due to trip suppression outside of the peak periods should be discounted (ie not claimed).

[2] https://www.nzta.govt.nz/assets/resources/Monetised-benefits-and-costs-manual-technical-notes/Technical-report-Economic-evaluation-of-GHG-emissions-FINAL.pdf

We discussed this issue with the Consultant, who agreed not to claim benefits outside of the peak periods. It is fair to point out that the Consultant considers this to be overly conservative, whereas we retain a residual concern that the numbers of suppressed trips in the peak periods may be overly high.

3.4 Pedestrian Crash Reduction benefits

Flow Issue

Although the traffic report assumes a fixed demand scenario, we were concerned if adequate consideration had been given to areas where traffic flows are predicted to increase and not exclusively focussed on the area of benefit. This issue could dampen down the quantum of benefit, for example pedestrian crashes are in part avoided, but in part are relocated.

Consultant Response

The response indicated that areas with traffic increases were peripheral areas distant to the study area. The output of the elasticity model, indicating the potential for additional traffic, does not account for the actual demands. In the elasticity-adjusted model, a significant relocation of traffic is not expected.

Flow Response

We retain some concern that pedestrian crash benefits may have been over estimated, while MRC note that they have only assumed a 70% reduction in crashes, thus allowing for some migration of crashes.

3.5 Pedestrian Realm Benefits

Flow Issue

We noted that the original walk time for pedestrians was 5 minutes for each leg, however each leg distance varied.

Consultant Response

The response indicated the 5 minute assumption had been retained from an earlier phase of the work, when the analysis included aggregate street sections.

However, in updating this assumption, the consultant also updated the proportions of people travelling partway along the various links, as follows:

- People walk the full length of each section along Lambton Quay (south of Grey Street), Willis Street, Courtenay Place (north of Tory Street), Courtenay Place (south of Tory Street)
- People walk half the length of Manners Street and Lambton Quay (north of Grey Street)

These assumptions were made on the basis that it is unreasonable to assume people walk along the full stretch of some of the sections.

The combined effect of these changes was to reduce the original estimate of predicted pedestrian realm benefits from $200m to $146.5m.

Flow Response

While we acknowledged the update to the segment times, we did not agree with the updated assumptions regarding people walking partway along the segments, as this seemed overly conservative. For example, if a length of road has 1,000 walking along the first half of a segment, then a different 1,000 walking along the second half, this appears to be the same as another footpath with 1,000 walking the whole length, in terms of how this is captured in the spreadsheet model.

The effect of removing this updated assumption was to increase predicted pedestrian realm benefits back up from $146.5m (in the paragraph above) to $179.2m.

Flow Issue

Some of the predicted pedestrian realm benefits results from the assumption that traffic will be reduced to zero as a result of the project. This therefore excluded buses which are to continue to use the route.

Consultant Response

It was noted that additional separation is provided by the improvements hence the volumes are excluded. However, it was acknowledged that it may be appropriate to add these buses back in in some places, particularly if there is little buffer between the footpath and street (for example where there is no cycle lane or street trees separating the footpath from the roadway). This issue has been rectified (ie with bus flows now included) in the final version of the spreadsheet, referred to below.

Flow Response

We assessed the effect of this assumption by assuming 60 buses per hour per direction per hour, equating with roughly 600 buses per day per direction (noting that this is a nominal estimate). This would decrease the predicted pedestrian realm benefits from $179.2m (in the paragraph above) to $157.2m.

It is interesting that this change in assumption regarding buses is forecast to have a fairly modest impact (around -12%), so we investigated further the derivation of the figure above, of $157.2m. Of this total, $92.7m related to the reductions in traffic, while the remaining $64.5m related to the assumptions around improved provision of street trees, planting, seating and signage/wayfinding. This then led to a few questions:

- We had not seen the detailed proposals, and we were unclear what improvements are being proposed in terms of street trees, planting etc, or whether these are fully included in the cost estimates
- We were unclear what is meant by an improvement (for example) from 50% to 80% street trees along Willis Street, and from 0 to 25% planting (these being examples of the assumptions within the pedestrian realm spreadsheet, contributing to the $64.5m). We understand that these figures are based on the subjective judgement of the project team

- We questioned whether the above improvements will lead to any reductions in space for pedestrians, and have been advised that improvements (i.e. more trees and planting) are only assumed where the proposed cross section will still increase space for pedestrians, even with the trees/planting.

Consultant Response

In looking into the above issues, the consultant concluded that the traffic flows previously used to derive the pedestrian realm benefits had been too low. They also refined some of the other assumptions (eg percentage planting) following discussions within the team on what was included in the cost estimates, and added the daily bus flows which will remain in the corridor with the Project.

The net effect of these changes was a significant increase in forecast benefits, which are now predicted to equate with $247m. This increase is primarily due to the higher traffic flows for the scenario without the project.

Flow Response

Due to the significant increase in benefits, we sought clarification on the derivation of the old and new traffic flows. We were advised that the original flows came from the "Case for Change" work carried out at the start of the project, which apparently only considered traffic flows across nine hours per day. The new flows came from MobileRoad (https://mobileroad.org/) which is a Waka Kotahi product that collates traffic counts from various councils, and these flows relate to 2019. We have no reason to dispute these new flows.

On a minor point of detail, the forecast bus flows should be assumed to increase over time. However, we accept that this comment would relate to the Do Minimum as well as the scenario with the Project, meaning that this will have no effect on the predicted benefits (although there could be a discussion around whether an increase in bus frequencies is possible with the Do Minimum scenario, given the known queuing issues in the peak periods).

TRAFFIC PLANNING CONSULTANTS LTD

Let's Get Wellington Moving: Golden Mile improvements

ROAD SAFETY AUDIT of the CONCEPT DESIGN

A REPORT PREPARED FOR
WAKA KOTAHI – NZ Transport Agency

Reference: 21562
August 2021

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Project Information:

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Title	LGWM: Golden Mile improvements – Concept design road safety audit
Prepared By	Steve Reddish (TPC) and Jon England (Stantec)
Date	August 2021

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A	18/08/21	JE		19/08/21	Draft
B	20/08/21		SR	20/08/21	Final

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1.0 INTRODUCTION

1.1 Road safety audit procedure

Road safety audit is a term used internationally to describe an independent review of a future road project to identify any safety concerns that may affect the safety performance. The safety audit team considers the safety of all road users and qualitatively reports on road safety issues or opportunities for safety improvement.

A road safety audit is therefore a formal examination of a road project, or any type of project which affects road users (including cyclists, pedestrians, mobility impaired etc.), carried out by an independent competent team who identify and document road safety concerns.

The primary objective of a road safety audit is to deliver a project that achieves an outcome consistent with Road to Zero and the Safe System approach, that is, avoidance of death and serious injury. The road safety audit is a safety review used to identify all areas of a project that are inconsistent with a safe system and bring those concerns to the attention of the client in order that the client can make a value judgement as to appropriate action(s) based on the guidance provided by the safety audit team.

The key objective of a road safety audit is summarised as:

> *To deliver completed projects that contribute towards a safe road system that is free of death and serious injury by identifying and ranking potential safety concerns for all road users and others affected by a road project*.

A road safety audit should desirably be undertaken at the following project milestones:

- Concept stage
- Scheme or Preliminary design stage
- Detailed design stage, and
- Pre-opening / Post-construction stage.

A road safety audit is not intended as a technical or financial audit and does not substitute for a design check on standards or guidelines. Any recommended treatment of an identified safety concern is intended to be indicative only to focus the designer on the type of improvements that might be appropriate. It is not intended to be prescriptive and other ways of mitigating the road safety concerns identified should also be considered.

In accordance with the procedures set down in the revised draft NZ Transport Agency Guideline "Road Safety Audit Procedures for Projects" (Interim Release May 2013) this is a report to the client who then refers the report to the designer. The designer should consider the report and comment to the client on each of the concerns identified, including their cost implications where appropriate, and make a recommendation to either accept or reject the safety audit report recommendation.

For each audit team recommendation that is accepted, the client shall make the final decision and brief the designer to make the necessary changes and/or additions. As a result of this instruction the designer shall action the approved amendments. The client may involve a safety engineer to provide commentary to aid with the decision.

Decision tracking is an important part of the road safety audit process. A decision tracking table is embedded into the report format at the end of each set of recommendations which is to be completed by the designer, safety engineer and client for each issue documenting the designer response, client decision and action taken.

A copy of the report including the designer's response to the client and the client's decision on each recommendation shall be given to the road safety audit team leader as part of the feedback loop. The road safety audit team leader will disseminate this to team members.

1.2 The project

The project for which this is the road safety audit covers what is known as the Golden Mile, namely the route comprising Lambton Quay, Willis Street, Manners Street and Courtenay Place, along which improvements are to be made for bus operations, cycling and walking.

The package of works has the following key objectives:

- improving passenger transport reliability and travel times;
- improving pedestrian flow and safety, including cyclists and other vulnerable road users;
- improving the overall amenity.

The improvements comprise:

- converting this key bus corridor from mixed vehicle use to bus only;
- removing on-street parking and loading zones within the corridor;
- providing additional pedestrian space;
- providing off-road cycle ways on Lambton Quay and Courtenay Place which can also be used by other motorised recreational vehicles (e.g. e-scooters);

As the design is developed and consultation undertaken, more detail will evolve with regard to the servicing of the myriad commercial premises, in particular where larger commercial vehicles need access, though allowing access for these vehicles will be controlled. The concept design currently shows some provision for loading zones in the adjacent side streets for smaller commercial vehicles.

Special needs provisions, such as drop off/pick up/parking for the disabled will also be considered further during detailed design. Taxis and other ride share vehicles will be confined to the side streets on taxi ranks, except for controlled provision in Courtenay Place during late evening/night-time.

Cyclists are to be prohibited from using the bus facilities, except for northbound on Willis Street and northbound on Lambton Quay (Willis Street to Panama Street).

Lambton Quay will reduce from 4 lanes to 2 lanes and all side roads currently intersecting Lambton Quay to/from Featherston Street will be closed at Lambton Quay and converted to two-way operation where they are currently one-way. Also to be closed at one end and converted to two-way operation are Mercer Street (Willis Street to Victoria Street) and Cuba Street (between Manners Street and Wakefield Street). Blair Street and Allen Street will be closed where they intersect Courtenay Place.

1.3 The road safety audit team

The road safety audit was carried out, as far as practicable, in accordance with the NZ Transport Agency Guidelines "Road Safety Audit Procedures for Projects" (Interim Release May 2013) by:

- Steve Reddish, Senior Associate, Traffic Planning Consultants Ltd, Hawke's Bay;
- Jon England, Principal Road Safety Engineer, Stantec New Zealand, Wellington;

Kylie Hook, Principal Advisor Transport, Wellington City Council, joined the team as an observer.

The safety audit team (SAT) was briefed at Stantec, Wellington, offices later in the morning of Wednesday 11th August 2021 and undertook a review of the concept design drawings that afternoon. The next day a site visit along the full length of the Golden Mile was undertaken. On Friday 13th August, a debrief meeting was held at Stantec later in the morning to give the designers and client an early indication of the preliminary findings of the SAT.

1.4 Information provided

The drawings provided for this road safety audit were prepared by Stantec and are listed below. All drawings were dated 5 August 2021.

- General layout – Lambton Quay. Drawings nos. 310203714-05-001-G020 to G025. Rev A.
- General layout – Willis Street. Drawings nos. 310203714-05-001-G220 and G221. Rev A.
- General layout – Manners Street. Drawings nos. 310203714-05-001-G420 to G423. Rev A.
- General layout – Courtenay Place. Drawings nos. 310203714-05-001-G620 to G622. Rev A.

In addition, the SAT was provided with the following draft reports:

- Golden Mile: Design Philosophy Statement, August 2021 and
- Golden Mile: Traffic Assessment Report, July 2021.

1.5 Report format

The potential road safety problems identified have been ranked as follows.

The expected crash frequency is qualitatively assessed based on expected exposure (how many road users will be exposed to a safety issue) and the likelihood of a crash

resulting from the presence of the issue. The severity of a crash outcome is qualitatively assessed based on factors such as expected speeds, type of collision, type of vehicle, and road user involved.

Reference to historic crash rates or other research for similar elements of projects, or projects as a whole, have been drawn on where appropriate to assist in understanding the likely crash types, frequency and likely severity that may result from a particular concern.

The frequency and severity ratings are used together to develop a combined qualitative risk ranking for each safety issue using the Assessment Matrix in Table 1. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.

Table 1: Assessment Matrix

Likelihood of death or serious injury	Probability of a crash			
	Frequent	Common	Occasional	Infrequent
Very Likely	Serious	Serious	Significant	Moderate
Likely	Serious	Significant	Moderate	Moderate
Unlikely	Significant	Moderate	Minor	Minor
Very Unlikely	Moderate	Minor	Minor	Minor

While all safety concerns should be considered for action, the client or nominated project manager will make the decision as to what course of action will be adopted based on the guidance given in this ranking process with consideration to factors other than safety alone. As a guide a suggested action for each category of concern is given in Table 2.

Table 2: Categories of Concern

Concern	Suggested action
Serious	Major concern that must be addressed and requires changes to avoid serous safety consequences.
Significant	Significant concern that should be addressed and requires changes to avoid serious safety consequences.
Moderate	Moderate concern that should be addressed to improve safety.
Minor	Minor concern that should be addressed where practical to improve safety.

In addition to the ranked safety issues, it is appropriate for the safety audit team to provide additional comments with respect to items that may have a safety implication, but which lie outside the scope of the road safety audit.

A comment may include:

- items where the safety implications are not yet clear due to insufficient detail for the stage of project;
- items outside the scope of the audit such as existing issues not directly impacted by the project;
- an opportunity for improved safety that is not necessarily linked to the project itself, or
- drawing/signage issues that should be addressed, but are not necessarily safety related.

While typically comments do not require a specific recommendation, in some instances suggestions may be given by the safety auditors.

All potential concerns, comments and recommendations set out in this safety audit report should be noted and acted upon if appropriate.

1.6 Disclaimer

The findings and recommendations in this report are based on an examination of the relevant plans, the specified road and environs, and the opinions of the safety audit team. However, it must be recognised that eliminating safety concerns cannot be guaranteed since no road can be regarded as absolutely safe. Furthermore, no warranty is implied that all safety issues have been identified in this report. Road safety audits do not constitute a design review or an assessment of standards with respect to engineering or planning documents.

Readers are urged to seek specific advice on matters raised and not rely solely on the report. While every effort has been made to ensure the accuracy of the report, it is made available strictly on the basis that anyone relying on it does so at their own risk without any liability to members of the safety audit team or their organisations.

2.0 PREAMBLE

The safety audit team (SAT) endorses the proposals to improve the safety of vulnerable road users along the Golden Mile, but recognises that there will be some design challenges to achieve this. Nevertheless, the SAT considers that, from a safe system perspective, the proposal should reduce the overall risk of crashes which could have serious injury or fatal outcomes.

This report summarises a number of general and specific safety issues which the SAT considers should be actioned to further address safety as the detailed design is developed.

A number of comments are included in this report, and these are mostly matters that:

- are of a general nature; or
- cannot be related to any specific safety concern, or
- are outside the scope of the project.

All comments are included for the consideration of the designers and the client. Decision tracking tables are included for comments where a record of responses might be helpful and appropriate.

At the safety audit exit meeting, the SAT was made aware that the client and designers are cognizant of many of the safety issues that the SAT raised at the meeting and the SAT was advised of potential actions to be taken. Nevertheless, most of these issues are included in this report so that they can then be more fully assessed and reviewed as design progresses.

3.0 SAFETY AUDIT FINDINGS – General

3.1 Moderate Concern – Pedestrian/cyclist conflicts

Probability of Crash Occurring – Common
Likelihood of Serious/Fatal Injury – Unlikely
Outcome – Moderate

The contiguous nature of the separate pedestrian and cyclist areas on Lambton Quay and Courtenay Place will generate the risk of pedestrians being in the cyclist areas and coming into conflict with cyclists. Different and contrasting surfacing can help differentiate the pedestrian and cyclist areas, but experience is that this textural and/or colour differentiation can be too subtle for many pedestrians if it is the sole means of defining the two areas.

It may be desirable to introduce a continuous tactile separation which may have more impact in terms of warning pedestrians that they are stepping onto a different environment. An example of textural differentiation is shown in **Figures 1 and 2**. The separation zone can be enhanced and widened with a solid white line or strip of different paving on one or both sides of the ribbed marking.

Whilst it is understood that the cycle facility is not intended for use by commuters or other higher speed cyclists, conflict between pedestrians and wheeled devices at low speeds can still result in injury.

Furthermore, the cycle paths are broken up by shared use areas at crossing points where there is an even greater risk of pedestrian-cyclist conflict if cyclists and other wheeled device users are not made clearly aware that they are entering a different environment.

Figures 1 and 2: Separation of pedestrian and cyclist sections of an off-road path.

Recommendations:

a. Separate the footpath and cycle path areas with a clearly defined separation zone, possibly using raised tactile line marking widened with a solid white line or strip of different paving on one or both sides of the tactile marking.

b. Ensure that there are design features that give clear messaging to cyclists and other wheeled device users on the cycle path when the path is terminating and they are about to enter a shared use area.

Designer Response:	Agreed – the cycle path and transitions into shared use or other areas will be developed further in developed design. The design will include, where possible, clear separation between users, managed crossings and other design features to manage the speed and conflict of cyclists and pedestrians.
Safety Engineer:	Agree – the use of raised tactile line marking can cause a tripping hazard. Designer/SAT team have to assess the effectiveness of this delineation for the Visually Impaired pedestrians. Another option is to allow pedestrians to use the whole area while confining cyclists to the defined paths.
Client Decision:	
Action Taken:	

3.2 Moderate Concern – Cycle path users

Probability of Crash Occurring – Common
Likelihood of Serious/Fatal Injury – Unlikely
Outcome – Moderate

The SAT is cognizant that there is an ever-increasing range and number of modes of transport that need to be catered for on dedicated pathways. These include, but not limited to, bicycles, e-bikes, kick scooters, e-scooters, skateboards, motorised skateboards, and mobility scooters, all of which may share space with cyclists on the dedicated paths.

At this stage, the SAT considers that bicycles, e-bikes and, possibly, e-scooters should be expected to use the cycle paths. It is also important to encourage conventional "keep left" behaviour along the cycle path utilising markings as shown on the drawings.

Recommendations:

a. Sign which modes can use the cycle paths.

b. Ensure markings along the length of the cycle paths indicate a "keep left" two-way movement.

Designer Response:	Agreed. Cycle path is intended for use by all fast mobility devices, including e-scooters etc. and will be signed accordingly. The cycle path will include appropriate keep left and two way movement indicators, as well as other design features intended to manage speed and conflicts.
Safety Engineer:	Agree – Q: Is speed limit for the cycle paths users considered? Designer Response – a speed limit of 15km/h has been considered, however this will be subject to further consideration as the design evolves.
Client Decision:	
Action Taken:	

3.3 Significant Concern – Pedestrians crossing bus-only roads

Probability of Crash Occurring – Common
Likelihood of Serious/Fatal Injury – Likely
Outcome – Significant

As noted in the Preamble, the SAT considers that, overall, the Golden Mile improvements will improve the safety of vulnerable road users, but recognises that there will be some design challenges to achieve this.

There will still be the risks associated with pedestrians crossing the bus-only roads at places other than the signalised crossing facilities. With an average of one bus every minute in each direction, there will be many gaps for pedestrians to safely cross the road compared to the current situation where there are other vehicles present, increasing exposure to a potential crash. Also, pedestrians were seen crossing the various roads from behind parked vehicles which will not be present in the proposed design. Currently, vans and other commercial vehicles in loading zones hide pedestrians endeavouring to cross the road at these locations. Thus, the proposals should reduce the overall risk of crashes.

It is anticipated that the main potential risks of pedestrian v bus crashes are associated with

1. general complacency when crossing the road due to there being fewer vehicles,
2. a pedestrian crossing the road at a location behind a bus and not seeing or being seen by a bus travelling in the opposite direction (see **Figure 3**), and
3. a pedestrian failing to look both ways, allied with not hearing a bus (electric buses in particular as it is understood that more electric buses will be added to the bus fleet).

Figure 3: Restricted intervisibility for pedestrians crossing the road behind a bus

Recommendations:

a. *At detail design consider measures (e.g. street furniture or other guidance methods) to discourage pedestrians from crossing roads at other than the dedicated crossing facilities.*

b. *Allow for the possible retrofitting of fences in areas of higher risk of pedestrian v bus crashes.*

c. *Ensure that the signalised crossings have a short cycle time and thus minimal wait time.*

Designer Response:	Agree in part. It is intended that wherever possible, pedestrian crossing points will be optimised to provide increased frontage and crossing opportunity and the design will provide appropriate design features to discourage unsafe crossing. The use of fences may not be possible, due to the limited cross section and use of space.
Safety Engineer:	Agree with SAT - site by site assessment for intervisibility obstructions caused by phone booths, digital advertising panels, Adshel bus shelter, wayfinding signs, street furniture etc
Client Decision:	
Action Taken:	

3.4 Significant Concern – Changing side streets from one-way to two-way

Probability of Crash Occurring – Common
Likelihood of Serious/Fatal Injury – Likely (if vulnerable road user involved)
Outcome – Significant

The closing off of a number of side roads involves changing the operation of those streets from one-way to two-way. This in turn will necessitate changes to a number of signalised intersections, mostly along Featherston Street, but also the intersections of Victoria Street/Mercer Street and Wakefield Street/Lower Cuba Street. Changes of one-way streets to two-way is notorious for introducing road safety issues due to pedestrians in particular being used to not looking in both directions for conflicting traffic. Currently, the behaviour of many pedestrians (and cyclists) at these intersections reflects the one-way movements.

The safety risks inherent in the changes will need to be assessed and measures implemented to mitigate the risk of pedestrians (and other vulnerable road users) stepping into the carriageway not expecting to be in conflict with vehicles accelerating/turning at the intersections.

Recommendation:

Ensure that measures are implemented to mitigate the risk of pedestrians (and other vulnerable road users) being unexpectedly in conflict with vehicles when one-way streets are changed to two-way operation.

Designer Response:	Agreed. Side roads and points of conflict will be designed to minimise conflicts.
Safety Engineer:	Agree – vehicles manoeuvring at the dead end streets will add to potential conflicts with pedestrians within the turning area.
Client Decision:	
Action Taken:	

3.5 Comment – Cyclists using bus-only lanes

As noted in section **1.2**, it is proposed that cyclists be prohibited from using the bus facilities, except for northbound on Willis Street and northbound on Lambton Quay (Willis Street to Panama Street). The facilities are being designed with narrow traffic lanes so that the streets are more self-explaining in terms of keeping bus speeds down (in addition to the 30 km/h speed limit) and this would be a significant safety concern for cyclists should an on-road cyclist be passing a stationary bus at the same time as a bus is coming in the opposite direction as there would be insufficient safe space for the cyclist.

Nevertheless, there is likely to be an expectation amongst some cyclists that they can use the bus lanes, given that they are permitted to use bus lanes in various other locations.

At this stage, it is not known exactly how it is anticipated to keep cyclists out of the bus-only lanes, especially on Manners Street where there will be no alternative facility providing connectivity through this part of the corridor other than Dixon Street which is one-way east to west with parking on both sies of the road. Cyclists are already prohibited from using the existing bus lanes on Manners Street between Victoria St and Cuba St, but cyclists (and e-scooter riders) were observed using these bus lanes.

It will be important to have a clearly signed and safe alternative cycle network in place at the time that the Golden Mile proposals are implemented. Even then, clear signage and other potential messaging will be essential to manage cyclist use of the bus-only lanes.

NB a plan showing the overall cyclist network around and connectivity to The Golden Mile will help with future road safety assessment at potential areas of conflict (cyclists v vehicles and cyclists v pedestrians).

Designer Response:	Agreed. This point has been raised with LGWM and there is a broad agreement that opportunities must be explored to provide an optimal opportunity for cyclists. The design is expected to evolve further to incorporate further changes to improve cyclist safety where they are expected to continue to use the Golden Mile.
Safety Engineer:	Agree.
Client Decision:	
Action Taken:	

3.6 Comment – Parking/stopping in side streets

Whilst acknowledging the benefits of utilising the side streets for service vehicles, taxis, disabled parking, etc, the capacity of any given street or at any given time is unlikely to be able to meet the demand.

This can lead to illegal parking/stopping and potential unsafe manoeuvring due to turning areas being blocked, including reversing out onto the busy main road. This could occur if larger trucks attempted to use the various side roads for servicing at the times that they are not permitted to access the Golden Mile.

An understanding of demand and how the space will be managed will be important to understand the road safety context.

Some of the side streets currently have general parking within them (see example in **Figure 4**) and drivers were observed circulating through these streets looking for parking spaces. In the future, circulation through will not be possible and could exacerbate the

safe operation of these streets if drivers enter to look for parking and have to turn around and leave due to none being available. It would be beneficial if technology can be used to display real time available parking in each street on the approach road prior to its intersection

Figure 4: Vehicles circulating and stopping in side street whilst looking for parking

Designer Response:	Agreed. The use of parking sensors and other technology will be investigated with WCC once side road configurations have been confirmed.
Safety Engineer:	Agree.
Client Decision:	
Action Taken:	

3.7 Comment – Signage and marking for changes to the street network

There is a known correlation between driving performance and cognitive load resulting from signage. Too much signage, unclear and confusing signage, and/or poor location of signage can all lead to drivers making mistakes and possible crashes.

With substantial changes proposed to the current road use of the Golden Mile and adjacent road network, it will be essential that there is very clear and consistent signage and pavement marking through and around the corridor so that all road users are appropriately guided.

Designer Response:	Agreed. The signage plan will seek to identify the optimal locations for signage and will seek to minimise signage clutter wherever possible.

Safety Engineer:	Agree.
Client Decision:	
Action Taken:	

3.8 Comment – Rubbish left out for collection

During its site visit, the SAT noticed various bins and paper piles left out for collection in some locations. It is assumed that rubbish collection will be a permitted activity undertaken at night. However, rubbish for collections is likely to be left in the cycle paths on Lambton Quay and Courtenay Place for ease of collection whilst the facilities are still in use and could therefore be a hazard to cyclists. It is hoped that suitable measures to minimise any adverse effects can be found during the course of consultation with property owners/occupiers.

Designer Response:	Agreed. The design team will consult with businesses and seek opportunities to design appropriate facilities for waste collection that do not result in an obstruction to pedestrians or cyclists.
Safety Engineer:	Agree – consider specific areas for rubbish storage.
Client Decision:	
Action Taken:	

3.9 Comment – Exceptions requiring permits

The SAT noted a number of off-street parking areas to which access could only be gained via what will be bus-only streets. Woodward Street and Farmers Lane can only be accessed from Lambton Quay, the latter having a loading dock (see **Figure 5**). There is also a private parking area accessed from Manners Street opposite Opera House Lane (see **Figure 6**).

Security firms servicing banks will need to be able to park outside the bank.

Figure 5: View into Farmers Lane

Figure 6: Parking area accessed from Manners Street opposite Opera House Lane

Designer Response:	Agreed. These locations and users have been identified as exceptions to the overarching restrictions placed on general access by private motor vehicles. The design team will work with council to establish an appropriate permitting system to provide access for these users.
Safety Engineer:	Agree –but permitting system will be difficult to manage and enforce.
Client Decision:	
Action Taken:	

3.10 Comment – Signalised crossings

At the various signalised crossings, detailed design will need to ensure that there is sufficient space for infrastructure without obstructing pedestrians.

Particular attention should be paid to controller locations having regard to accessibility to the controller door for service personnel and where the service vehicle can be parked.

Designer Response:	Agreed. The design will be further refined to minimise the impact of infrastructure to pedestrians and provide access for servicing.
Safety Engineer:	Agree. Council cannot stop utility service vehicles from accessing the road corridor except to specify conditions of access for planned maintenance ie time of day. Emergency and unplanned events will be permitted as required.
Client Decision:	
Action Taken:	

4.0 SAFETY AUDIT FINDINGS – Lambton Quay

4.1 Moderate Concern – Cyclist access at Whitmore Street intersection

Probability of Crash Occurring – Occasional
Likelihood of Serious/Fatal Injury – Likely
Outcome – Moderate

As mentioned in section **3.5**, it will be important to have a clearly signed and safe alternative cycle network in place at the time that the Golden Mile proposals are implemented. This will be particularly important for cyclists at the busy Bowen Ave/Whitmore St/Lambton Quay intersection so that they clearly understand that the cycle path on Lambton Quay is not part of the primary cycle network.

For cyclists wanting to move to/from the Lambton Quay cycle path, the layout at the intersection as shown in **Figure 7** (from drawing G020), does not provide safe access for all desired movements. For example, cyclists leaving the path are directed to the left to cycle boxes that enable on-road movement to Bowen Street or continuing along Lambton Quay. No safe provision is made for cyclists wanting to access Whitmore Street. Conversely, on-road cyclists wanting to access the cycle path from Bowen Street in particular are unlikely to use the ramp shown (circled), but take a more direct route that takes them through pedestrian areas.

The primary safety concern relates to a cyclist being hit by a vehicle within the intersection.

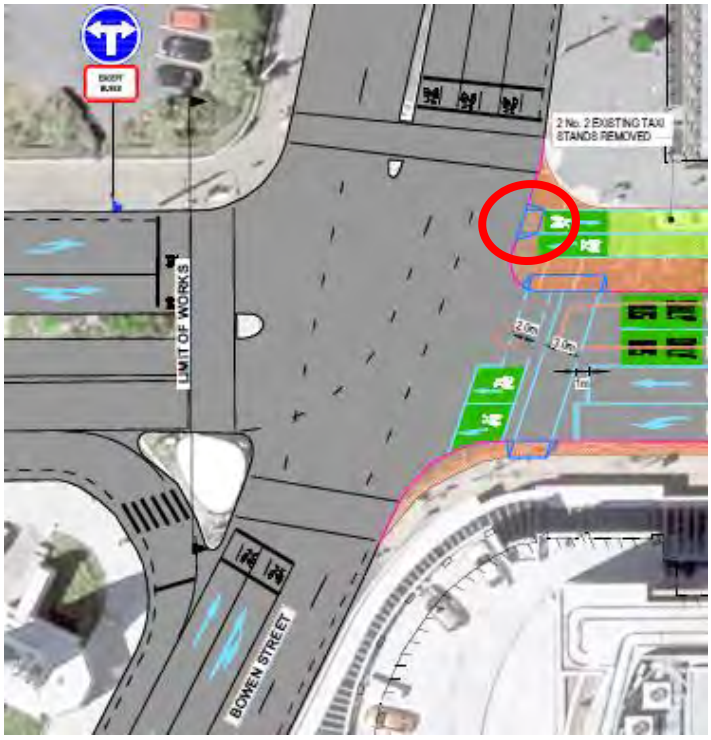


Figure 7: Bowen St/Whitmore St/Lambton Quay intersection

Recommendations:

a. Ensure that at the Bowen St/Whitmore St/Lambton Quay intersection the primary cycle network is clearly signed.

b. Modify the intersection design to provide safe access to/from the cycle path for all potential movements.

Designer Response:	Agreed. This access point to the cycle network will be further developed.
Safety Engineer:	Agree – clear separation for pedestrians and cyclists where there is potential confusion with all movements resulting in pedestrians walking on live lane.
Client Decision:	
Action Taken:	

4.2 Moderate Concern – Cycle path in busy bus stop/pedestrian area

Probability of Crash Occurring – Common
Likelihood of Serious/Fatal Injury – Unlikely
Outcome – Moderate

Following on from **4.1** above, the pedestrian/cycle area on the eastern side of Lambton Quay south of Whitmore Street will generate a lot of interaction between cyclists, pedestrians and waiting bus passengers, compounded by the presence of bus shelters. The cycle path is shown on drawing G022 bisecting the existing footpath and the extended footpath (see to **Figure 8**).

At the corner of Whitmore Street and Lambton Quay, there will be additional cycle/pedestrian conflict areas as people move to the different crossing points (circled).

In cognizance of the level of interaction in this area, consideration should be given to designating this area (Whitmore St to Ballance St) a shared use area and starting the cycle path at Ballance Street.

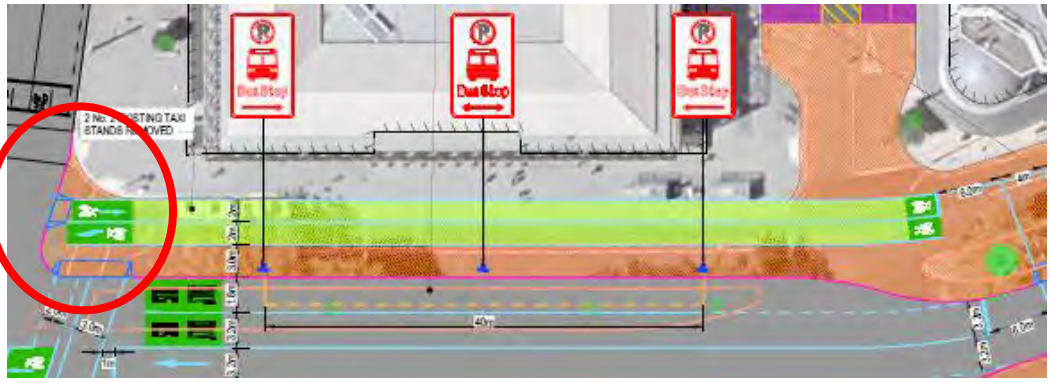


Figure 8: Bus stop and crossing area south of Whitmore Street

The alternative would be to highlight the cycle path and to encourage cyclists to take care in the vicinity of the bus stop. This could necessitate additional markings and signage in the cycle path. However, this could also result in pedestrians suddenly appearing in the cycle path from behind bus shelters resulting in increased pedestrian – cyclist crashes as cyclists would have insufficient time to react to avoid a crash.

It should also be noted that the use of bus shelters with advertising panels on the sides is a further potential intervisibility restriction between pedestrians/bus passengers and cyclists.

Recommendation:

Consider designating the area on the eastern side of Lambton Quay between Whitmore St and Ballance St a shared use area and starting the cycle path at Ballance Street.

Designer Response:	Agreed. This area will be looked at closely to manage the safety and conflict.
Safety Engineer:	Agree – need clear direction and priority for users in this busy area where there will be lots of cross movements of users (pedestrians, bus patrons, cyclists).
Client Decision:	
Action Taken:	

4.3 Moderate Concern – Buses exiting via Brandon Street

Probability of Crash Occurring – Occasional
Likelihood of Serious/Fatal Injury – Likely
Outcome – Moderate

There are several bus routes that use Brandon Street in the peak periods (6am-10am and 3pm-7pm) and exit onto Lambton Quay. The SAT was advised that these bus routes are likely to continue in this location for a period of time after the initial implementation of the Golden Mile improvements. This means that the closure of Brandon Street at Lambton Quay, as shown in drawing G022 (see **Figure 9**), will not initially be possible.

This will generate a potential safety issue at the Brandon Street/Lambton Quay interface. Given the very wide pedestrian/cyclist area, there is a high risk that pedestrians and cyclists will not be expecting or be aware of buses exiting Brandon Street onto Lambton Quay, even if signal controlled. The safety issue is exacerbated by the fact that buses will only be exiting at certain times of the day. It will be important that the bus route through the expanded pedestrian area is appropriately managed and that other vehicles are prohibited from accessing Lambton Quay. To this end, it may pay for the bus route through the widened pedestrian/cyclist area to be carriageway with kerb and channel.

Whilst the bus exit onto Lambton Quay can be readily signalised, it will be difficult to clearly signalise the approx. 12m wide combined pedestrian/cyclist area.

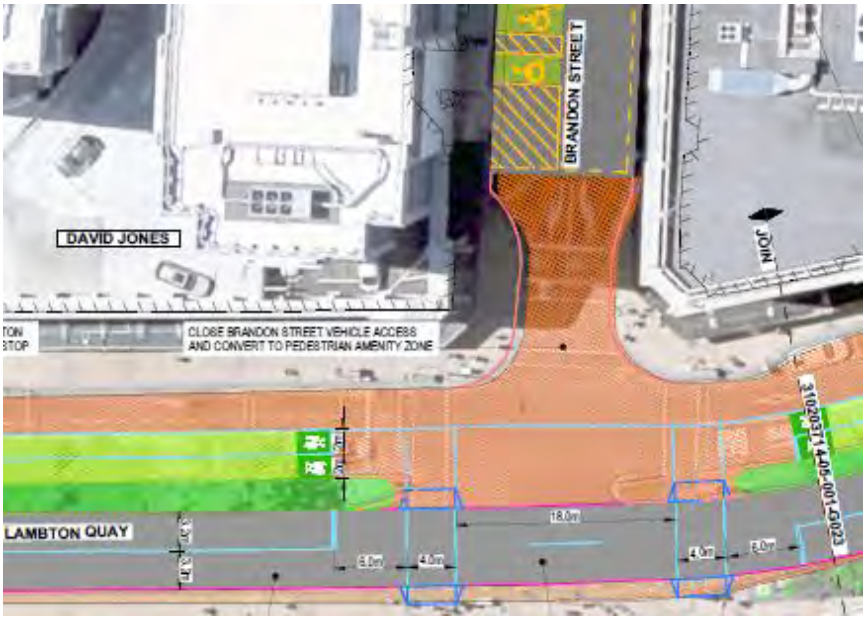


Figure 9: Brandon Steet/Lambton Quay intersection

Recommendations:

a. *Whilst buses continue to use Brandon Street, maintain carriageway with kerb and channel to clearly indicate the presence of vehicles across the pedestrian/cyclist area.*

b. *If signalising the bus exit onto Lambton Quay, ensure that the 12m wide combined pedestrian/cyclist area can be clearly signalised.*

c. *Ensure that vehicles other than buses are clearly prohibited from accessing Lambton Quay from Brandon Street, except possibly permit holders.*

Designer Response:	Agreed. It is expected that the removal of signal controls at this intersection will be contingent to the relocation of all buses movements from this street.
Safety Engineer:	Disagree with SAT outcome as it is more than Moderate due to the probability of crash occurring is daily (common). This is due to the infrequent movements of buses during certain time periods across the pedestrian footpath and cycle paths. There is also a multitude of potential confusion due to the similar surface treatment, unclear delineation separation, potential for vehicles (non buses) to exit Brandon St, the use of signal displays to control a wide intersection to minimise conflict and risks which has limitation on positioning these signal display. My view is this is more likely a Significant Concern. Designer Response: Safety Engineer disagrees with SAT significance, not the design response.
Client Decision:	
Action Taken:	

4.4 Moderate Concern – Cyclist connectivity at Panama Street

Probability of Crash Occurring – Occasional
Likelihood of Serious/Fatal Injury – Likely
Outcome – Moderate

Southbound cyclists on the Lambton Quay cycle path are required to exit Lambton Quay at Panama Street as shown in **Figure 10** (from drawing G023), whilst cyclists northbound will have been on the Lambton Quay carriageway and are expected to then use the signalised crossing at Panama Street to continue north on the cycle path.

To prevent cyclists continuing south along the Lambton Quay footpath and being in conflict with pedestrians, it will be necessary to clearly guide them into Panama Street, preferably with some physical measures (e.g. street furniture of some sort).

Once cyclists are in Panama Street, there needs to be good wayfinding signage and safe connectivity to the alternative/primary cycle network. Likewise, reverse safe connectivity needs to be available, recognising that Featherston Street is one-way.

Clear signage and pavement marking will be required to direct northbound cyclists already on Lambton Quay onto the cycle path.

Ultimately, it may be desirable to review whether northbound cyclists are allowed on the Lambton Quay carriageway as southbound cyclists may be encouraged to continue past Panama Street to Willis Street when seeing northbound cyclists on-road.

Figure 10: Cycle path connections at Panama Street

Recommendations:

a. *Clearly guide southbound cyclists from the cycle path into Panama Street, preferably with some physical measures.*

b. *Ensure that there is appropriate signage and safe connectivity via Panama Street to/from the alternative/primary cycle network, recognising that Featherston Street is one-way.*

c. *Install clear signage and pavement marking to direct northbound cyclists already on Lambton Quay onto the cycle path.*

Designer Response:	Agreed. The design will include the extension of the cycle path to Panama and will incorporate appropriate signage and direction.
Safety Engineer:	Agree.
Client Decision:	
Action Taken:	

4.5 Moderate Concern – Southbound bus tracking at Hunter Street

Probability of Crash Occurring – Infrequent
Likelihood of Serious/Fatal Injury – Likely
Outcome – Moderate

Drawing G024 shows some footpath widening where buses will access Hunter Street (see **Figure 11**). Observations are that buses require the existing full carriageway width to turn into Hunter Street (see **Figure 12**). The safety concern is that the front overhang or tail swing of a turning bus could overlap the footpath on either side and injure a pedestrian.

Figure 11: Lambton Quay/Hunter Street intersection

Figure 12: Bus turning into Hunter Street

Recommendation:

Ensure that there is sufficient carriageway width for buses to turn from Lambton Quay into Hunter Street without the front overhang or tail swing putting pedestrians waiting at the kerb at risk of being struck.

Designer Response:	Agreed. Bus tracking and kerb lines will be adjusted to ensure no overhang of the vehicle into pedestrian realm.
Safety Engineer:	Agree.
Client Decision:	

Action Taken:	

4.6 Moderate Concern – Bus tracking at Willis Street/Lambton Quay

Probability of Crash Occurring – Infrequent
Likelihood of Serious/Fatal Injury – Likely
Outcome – Moderate

Drawing G025 shows some footpath widening along the eastern side of Lambton Quay which will narrow the carriageway and impact buses turning from Willis Street into Lambton Quay (see **Figure 13**).

Observations are that buses require the existing full carriageway width to turn into Willis Street even allowing for buses starting closer to the centre line in Willis Street (see **Figure 14**). The concern is that the front overhang or tail swing of a turning bus could overlap the footpath on either side and injure a pedestrian.

Given the small amount of footpath widening proposed along the eastern side of Lambton Quay between Willis Street and Hunter Street, the SAT queries the benefit that this widening would have, given that there are also existing bollards along the eastern kerb line (see **Figure 15**).

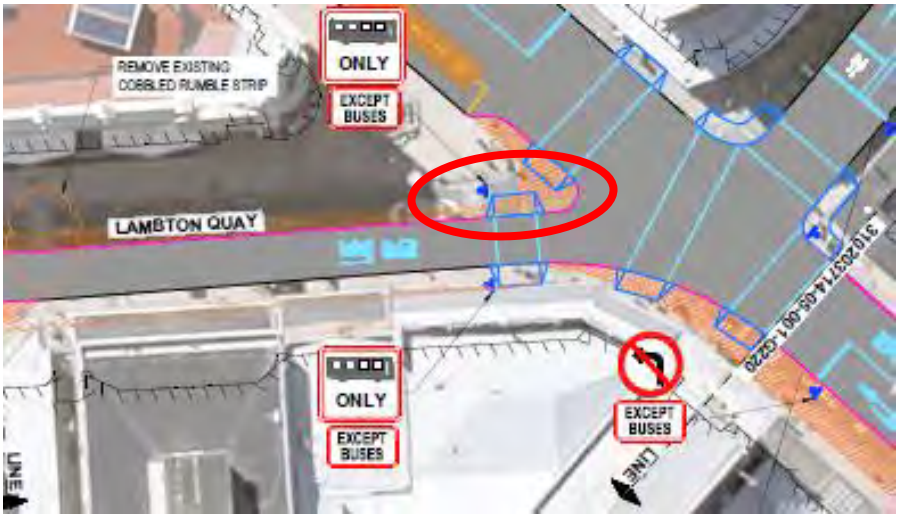


Figure 13: Lambton Quay/Willis Street intersection

Figure 14: Bus turning into Willis Street

Figure 15: Bollards along the eastern kerb line of Lambton Quay (Willis St to Hunter St)

Recommendation:

Ensure that there is sufficient carriageway width for buses to turn from Willis Street into Lambton Quay without the front overhang or tail swing putting pedestrians waiting at the kerb at risk of being struck.

Designer Response:	Agreed. This intersection will be reviewed to ensure no encroachment of buses into pedestrian realm.
Safety Engineer:	Agree.
Client Decision:	
Action Taken:	

5.0 SAFETY AUDIT FINDINGS – Willis Street

5.1 Moderate Concern – Widening along eastern side of Willis Street

Probability of Crash Occurring – Occasional
Likelihood of Serious/Fatal Injury – Likely
Outcome – Moderate

Drawing G221 shows proposed footpath widening on both sides of Willis Street between Manners Street and Mercer Street. Currently, there are numerous seats and trees along the eastern footpath kerb line to discourage indiscriminate crossing of the road by pedestrians (see **Figure 16**). Any widening along the eastern side will encourage pedestrians to walk behind the seats and trees, creating a pinch point between the street furniture and buses, with the attendant risk of a pedestrian stepping onto the carriageway when a bus is coming.

Figure 16: Seats and trees along the eastern side of Willis Street

Recommendation:

Widen the footpath only along the western side of Willis Street.

Designer Response:	Agreed. An audit and relocation of all retained infrastructure will be undertaken to ensure no pinch points are created.
Safety Engineer:	Agree – past fatal and serious incidents occurred along this eastern stretch of Willis St.
Client Decision:	
Action Taken:	

5.2 Moderate Concern – Closure of Willis Street to through traffic

Probability of Crash Occurring – Common
Likelihood of Serious/Fatal Injury – Unlikely
Outcome – Moderate

Currently Willis Street carries a significant amount of traffic northbound to the city centre from the southern suburbs of Wellington (e.g. Brooklyn) as well as vehicles turning off Karo Drive (SH1 westbound).

Drawing G420 shows all northbound traffic on Willis Street being diverted into Boulcott Street which then requires a circuitous route to return to the CBD. As noted in section **3.7**, there is a known correlation between driving performance and cognitive load which can lead to drivers making mistakes and possible crashes. This can occur when drivers are being diverted to non-intuitive and unfamiliar routes.

It will be important to determine what destination and other signage is required to advise motorists from the south and SH1 not to use Willis Street and to instead use Taranaki Street to access the CBD. It will be essential that there is very clear and consistent signage plus pavement marking so that all road users are appropriately redirected.

For drivers who do continue northbound on Willis Street north of SH1, the last opportunity to be clearly diverted will be Ghuznee Street which will allow drivers to continue north either via The Terrace or via Taranaki Street. Currently signage on Willis Street at Ghuznee Street directs drivers to continue northbound on Willis Street (see **Figure 17** and red circle).

Figure 17: Destination signage and lane marking on Willis Street northbound prior to Ghuznee Street

Recommendations:

a. Revise all destination wayfinding signage from the south and on SH1 to reflect the fact that there will be no through movement to the city centre via Willis Street.

b. *Make the Willis Street/Ghuznee Street intersection the last diversion for northbound traffic on Willis Street and sign accordingly.*

c. *Sign Willis Street north of Ghuznee Street as being for "local" traffic only.*

Designer Response:	Agreed. Advance directional signage will be provided.
Safety Engineer:	Agree with (a). Disagree with (b) and (c) as Willis St north of Ghuznee St serves more than just "local traffic" as Boulcott St is a connection to the Motorway. Need to assess suitability of Ghuznee St as a connection to the Motorway. Designer Response – note the disagreement with points (b) and (c). assessment of Ghuznee street as a motorway connection will be considered.
Client Decision:	
Action Taken:	

5.3 Comment – Victoria Street/Mercer Street intersection

With Mercer Street to be closed at Willis Street and converted to two-way operation, some changes to the layout of the signalised intersection at Victoria Street/Mercer Street will need to be made to allow vehicles to safely turn right from Victoria Street into Mercer Street. This is likely to necessitate some kerb line alterations on the north-western corner (see **Figure 18**) as well as to signals infrastructure.

Figure 18: Victoria Street/Mercer Street intersection as viewed from Mercer Street

Designer Response:	Agreed. Intersection changes to this intersection are being undertaken.

Safety Engineer:	Agree – design to cater for right turning vehicles from Victoria St while exiting vehicles are waiting in Mercer St.
Client Decision:	
Action Taken:	

6.0 AUDIT FINDINGS – Manners Street

6.1 Minor Concern – Sump at Saint Hill Street

Probability of Crash Occurring – Infrequent
Likelihood of Serious/Fatal Injury – Unlikely
Outcome – Minor

On drawing G420, some footpath widening is shown on the northern side of Manners Street at the location of a significant stormwater sump located at the bottom of a sag curve (see **Figure 19**). Eliminating the recess at the sump could lead to excess surface water on the carriageway at this location (see **Figure 20**).

The safety concern is that excessive surface water could lead to pedestrians being sprayed by passing buses and making unexpected movements to avoid being splashed with the potential of injuring themselves.

Figure 19: Footpath widening at location of sump on Manners Street

Figure 20: Significant stormwater sump at bottom of sag curve in Manners Street

Recommendation:

Retain the recess for the sump.

Designer Response:	Agreed. This will be retained.
Safety Engineer:	Agree.
Client Decision:	
Action Taken:	

6.2 Comment – Unnecessary limit line

On drawing G422, an additional limit line is shown eastbound on Manners Street at Victoria Steet, but there are to be no traffic signals at this point (see **Figure 21**). The limit line should be removed.

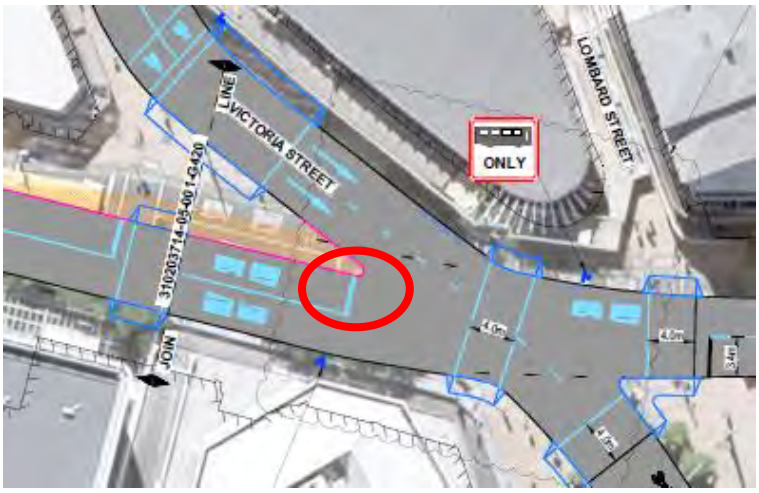


Figure 21: Unnecessary limit line on Manners Street

Designer Response:	Agreed. This limit line will be removed.
Safety Engineer:	Disagree. This limit line has a signal detector loop within the lane to show buses and other right turning vehicles (during night time and weekends) when stuck within the intersection where they need to wait in order to be detected so that when the next "Manners St" phase begins, there will be a late start for westbound buses. This limit line can be removed if this right turning vehicles can be catered for in the revised signal phasing. Designer Response - noted. Intersection configuration and phasing has yet to be completed, we will review this limit line once we have further information on final phasing.
Client Decision:	

Action Taken:	

6.3 Minor Concern – Lower Cuba Street/Wakefield Street intersection

Probability of Crash Occurring – Occasional
Likelihood of Serious/Fatal Injury – Unlikely
Outcome – Minor

Lower Cuba Street is to be made two-way and closed off at Manners Street. Currently, the layout allows for a single lane exit from Lower Cuba Street to the traffic signals at Wakefield Street (see **Figure 22**). To allow safe operation of the intersection in the future, there needs to be enough space to store one or two vehicles waiting to exit whilst allowing for one or two vehicles to enter. This will avoid the risk of potential minor collisions within the intersection.

The rain gardens at the narrow exit are designed for stormwater treatment with cells underneath that need to be preserved. However, it would appear that a small amount of widening can be achieved at the gardens without damaging their integrity, sufficient for two vehicles to pass each other, albeit slowly.

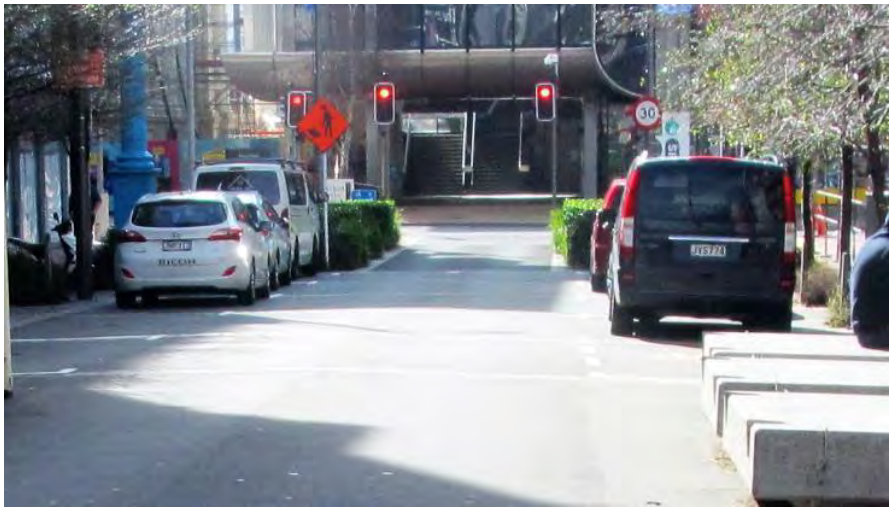


Figure 22: Looking north along Lower Cuba to Wakefield Street

Recommendation:

Reconfigure the intersection of Wakefield Street/Lower Cuba Street so that there is enough space to store one or two vehicles waiting to exit Lower Cuba Street whilst allowing for one or two vehicles to enter.

Designer Response:	Agreed. This intersection will be reconfigured.
Safety Engineer:	Agree – need to check the turning paths for trucks and service vehicles turning into Cuba St when stationary vehicles are queuing to exit Cuba St.
Client Decision:	
Action Taken:	

6.4 Comment – Service vehicles in Cuba Street mall

During the site visit, it was noted that service vehicles are permitted into the Cuba Street mall from Manners Street during the period 5am-10am, Monday - Saturday. Either this will need to be managed safely in some way or additional loading zones provided in Dixon Street.

Designer Response:	Agreed. Services from Cuba Street will be managed.
Safety Engineer:	Agree.
Client Decision:	
Action Taken:	

6.5 Comment – Lukes Lane

Drawing G423 shows Lukes Lane remaining open at Manners Street with exiting vehicles being directed to turn left to Taranaki Street. A reasonable amount of parking occurs in Lukes Lane and there would seem to be enough space for vehicles to both enter and exit via Taranaki Street (see **Figure 23**). This would enable Lukes Lane to be closed at Manners Street and avoid vehicles exiting between buildings (see **Figure 24**) where there is no intervisibility between pedestrians and vehicle drivers.

If larger service vehicles are unable to turn within the space available, then perhaps the exit onto Manners Street could somehow be restricted to goods vehicles only?

Figure 23: Lukes Lane looking toward Taranaki Street

Figure 24: Looking toward exit from Lukes Lane onto Manners Street

Designer Response:	Agreed – this will be investigated more thoroughly in developed design, but in principal access should be limited to service vehicles only.
Safety Engineer:	Agree.
Client Decision:	
Action Taken:	

6.6 Moderate Concern – Manners St/Taranaki St/Dixon St intersection

Probability of Crash Occurring – Common
Likelihood of Serious/Fatal Injury – Unlikely
Outcome – Moderate

There are several issues of concern regarding this 5-leg intersection as shown in **Figure 25**, extracted from drawing G423:

1. It will be difficult to convey to motorists that there is No Left Turn into Manners Street from Taranaki Street northbound or No Right Turn into Manners Street from Taranaki Street southbound whilst still allowing left and right turns into Dixon Street respectively. The risk is that drivers will undertake unsafe manoeuvres within the intersection once they realise they cannot enter Manners Street.

2. The footpath extension shown on the corner of Dixon Street and Taranaki Street (circled in **Figure 25**) would appear to restrict the ability of larger trucks to turn left into Dixon Street. The concern is that a larger vehicle could mount the pavement whilst pedestrians are present.

3. Buses eastbound on Manners Street and proceeding ahead into Courtenay Place will have to undertake a reverse curve manoeuvre which may lead to conflict with any adjacent bus or other vehicle turning right into Taranaki Street. The manoeuvre will take buses to the right-hand side of the existing median island on the far side of the intersection as can be seen in **Figure 26**.

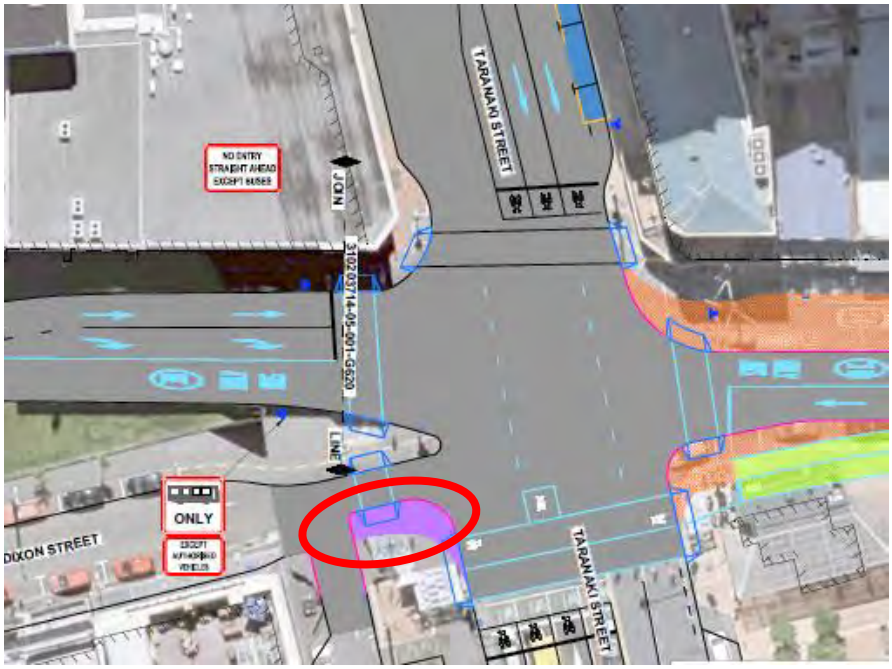


Figure 25: Manners St/Dixon St/Taranaki St intersection

Figure 26: Future reverse curve manoeuvre for buses across Taranaki Street

Recommendation:

When developing the detailed design for this intersection take account of the above-mentioned issues.

Designer Response:	Agreed. This intersection will be looked at in detail in developed design and will address the points noted.
Safety Engineer:	Agree – need to check the tracking paths for all vehicle movements occurring simultaneously to ensure that there is adequate safe lateral clearances between opposing traffic and physical street assets.
Client Decision:	
Action Taken:	

7.0 AUDIT FINDINGS – Courtenay Place

7.1 Moderate Concern – Cyclist-pedestrian conflicts at Taranaki Street

Probability of Crash Occurring – Common
Likelihood of Serious/Fatal Injury – Unlikely
Outcome – Moderate

There is the potential for appreciable cyclist-pedestrian conflict at the south-eastern corner of the Courtenay Place/Taranaki Street intersection due to the corner of the former toilets, now pizza shop, building concealing cyclists from pedestrians and vice versa (see **Figures 27 and 28**). Note also that the existing street furniture exacerbates the problem.

Figures 27 and 28: Building and street furniture obscure intervisibility between path users

Recommendation:

Review how pedestrians and cyclists are to be managed/directed around the former toilets building to/from the Courtenay Place and Taranaki Street crossing facilities.

Designer Response:	Agreed. This will be reviewed as part of the developed design.
Safety Engineer:	Agree.
Client Decision:	
Action Taken:	

7.2 Comment – Access to/from cycle path at Taranaki Street

It is not clear how cyclists are expected to easily and safely access the Courtenay Place cycle path when cycling on Taranaki Street (refer **Figure 29** extracted from drawing G620).

Also, there is no direct link to Dixon Street from the cycle crossing on Taranaki Street.

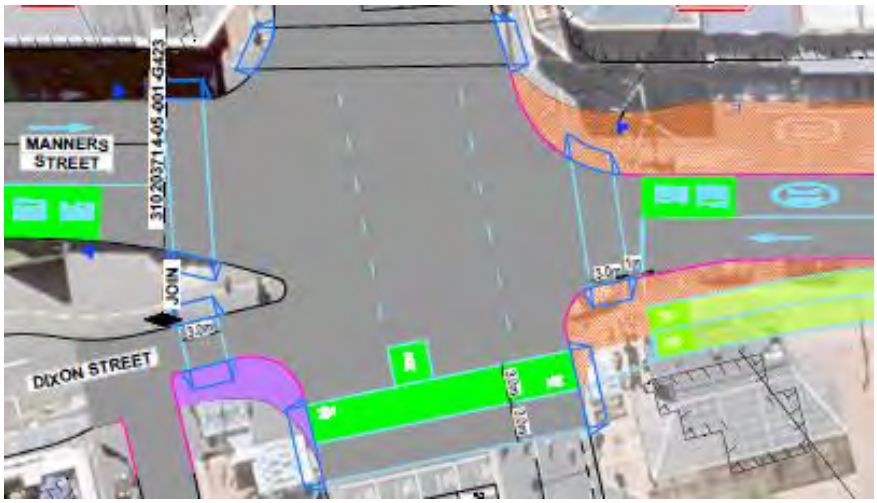


Figure 29: Cycle facilities at Taranaki Street

Designer Response:	Agreed. This will be addressed part of the broader review of this intersection.
Safety Engineer:	Agree.
Client Decision:	
Action Taken:	

7.3 Comment – Existing street furniture within cycle path

On the southern side of Courtenay Place at the large triangular pedestrian area leading up to Taranaki Street, there is currently a significant amount of kerbside street furniture (see **Figures 30 and 31**) located where the cycle path is shown on drawing G620 (see **Figure 32**).

It is not clear whether the proposed cycle path is not overlayed on the underlying aerial photo correctly or whether all the street furniture is to be relocated.

Figures 30 and 31: Street furniture along the southern side of Courtenay Place

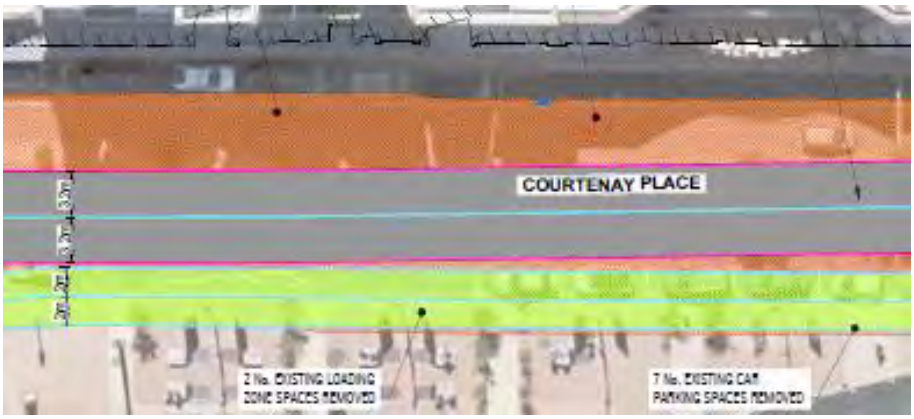


Figure 32: Location of kerbside street furniture on southern side of Courtenay Place

Designer Response:	All street furniture will be removed or relocated from the cycle path.
Safety Engineer:	Noted – street furniture locations should not obstruct the visibility between pedestrians (crossing Courtenay Pl) and westbound cyclists in particular.
Client Decision:	
Action Taken:	

7.4 Minor Concern – Alignment of pedestrian-cyclist path across Tory Street

Probability of Crash Occurring – Occasional
Likelihood of Serious/Fatal Injury – Unlikely
Outcome – Minor

On drawing G621, the cyclist-pedestrian crossing facility across Tory Street is shown offset from the direct route that cyclists and pedestrians will inevitably take when crossing the road (see **Figure 33**). This can lead to pedestrian-cyclist conflicts on or at the crossing facility.

It would appear that the offset is in order to accommodate a cycle box (arrowed) for those cyclists proceeding north on Tory Street. For the few cyclists likely to use this facility, overall safety and convenience would seem to be better served by eliminating this cycle box and providing better alignment for the crossing facility.

Figure 33: Courtenay Place/Tory Street intersection

Recommendation:

Remove the cycle box and realign the pedestrian-cyclist crossing facility at Tory Street.

Designer Response:	Agreed. This change has already been updated to plan.
Safety Engineer:	Agree. Q: Is the cycle paths controlled by signals to provide movement clarity and no obstruction within the shared "orange" area? Designer Response - Potentially yes – we will need to review the aspect locations and will consider opportunity to apply signal controls to cyclists.
Client Decision:	
Action Taken:	

7.5 Comment – Pedestrian space and footpath widening

Between Tory Steet and the large triangular pedestrian area prior to Taranaki Street, there does not appear to be any increase in the width of the pedestrian area on the southern side of Courtenay Place whilst a 4m wide cycle path is to be provided (see extract from drawing G621 in **Figure 34**). Per the comment in section **7.3**, it is not clear whether the proposed cycle path is not overlayed on the underlying aerial photo correctly or whether the exsiting footpath is to remain as is. This latter situation could generate a higher risk of pedestrian cyclist conflicts.

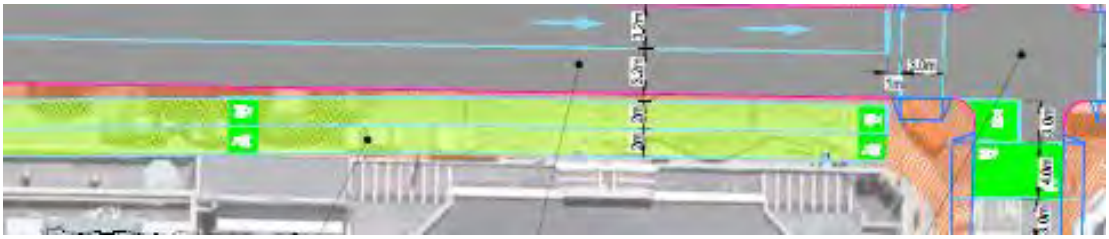


Figure 34: No increase in footpath width west of Tory Street

The same comment applies to the section on the southern side of Courtenay Place between Cambridge Terrace and Tory Street where footpath widening is shown on what is already footpath (see extract from drawing G622 in **Figure 35**), with the cycle path along the section of carriageway that is to be used by taxis and others at night-time. Again, it is not clear whether the proposed footpath widening and cycle path are not overlayed on the underlying aerial photo correctly or whether the exsiting footpath is to remain as is, with the cycle path utilising the area currently used for parking/servicing.

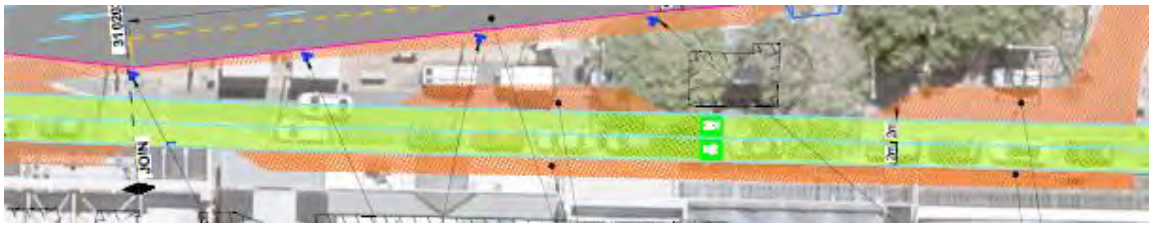


Figure 35: Footpath widening shown within existing footpath

Designer Response:	This is a point of some debate and will be investigated in detail – the area in question must accommodate a number of competing uses and will change according to time of day. This issue will be resolved in developed design.
Safety Engineer:	Noted – Emphasis on pedestrians is important as Walking (pedestrian needs) has a higher priority in the Sustainable Transport Hierarchy than cycling in the design of this area.
Client Decision:	
Action Taken:	

7.6 Comment – Functionality of night-time taxi area

The area shown as cycle path in **Figure 35** above, is to be a managed taxi area at night-time when clubs and bars are open (see **Figure 36**). The following matters will need to be considered as the detailed design is developed:

- the traffic signal phasing, traffic signal aspects, and lane marking for Courtenay Place at Taranaki Street to cater for taxi movements turning left and right onto Taranaki Street;
- how other vehicles are prevented from accessing/using the taxi area;
- maintaining space for ambulance/police parking, Friday, Saturday and Sunday (see **Figure 37**).

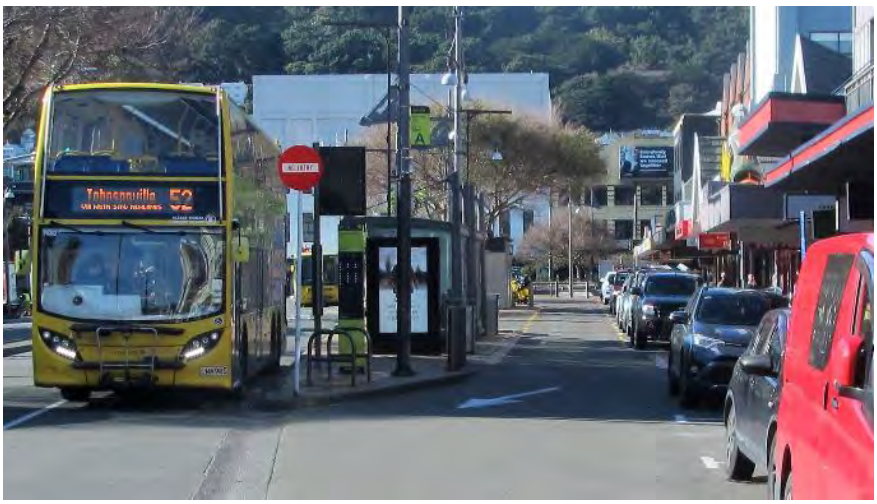


Figure 36: Area to be available for taxis at night-time

Figure 37: Ambulance parking hours

Designer Response:	This is a point of some debate and will be investigated in detail – the area in question must accommodate a number of competing uses and will change according to time of day. This issue will be resolved in developed design.
Safety Engineer:	Noted.
Client Decision:	
Action Taken:	

7.7 Moderate Concern – Courtenay Pl/Kent–Cambridge Terr intersection

Probability of Crash Occurring – Occasional
Likelihood of Serious/Fatal Injury – Likely
Outcome – Moderate

As mentioned in sections **3.5** and **4.1**, it will be important to have a clearly signed and safe alternative cycle network in place at the time that the Golden Mile proposals are implemented. This will be particularly important for cyclists at the Courtenay Place/ Cambridge Terrace/Kent Terrace/Majoribanks Street intersection so that they clearly understand that the cycle path on Courtenay Place is not part of the primary cycle network.

For cyclists wanting to move to/from the Courtenay Place cycle path, the layout at the intersection as shown in **Figure 38** (from drawing G622), does not provide safe and easy access for all desired movements. For example, on-road cyclists turning right from Kent Terrace or across from Majoribanks Road would be expected to use the triangular traffic island and the pedestrian zebra crossing, whereas the easiest and most direct route from all approaches would be to use the existing access in **Figure 39** (refer also to the red circle in **Figure 38**). This would avoid cyclist-pedestrian conflicts.

For cyclists leaving the cycle path, they have to somehow access the cycle box in Courtenay Place (arrowed) to then continue on-road or to use the various pedestrian facilities to access each road.

The primary safety concern relates to a cyclist being hit by a vehicle within the intersection.

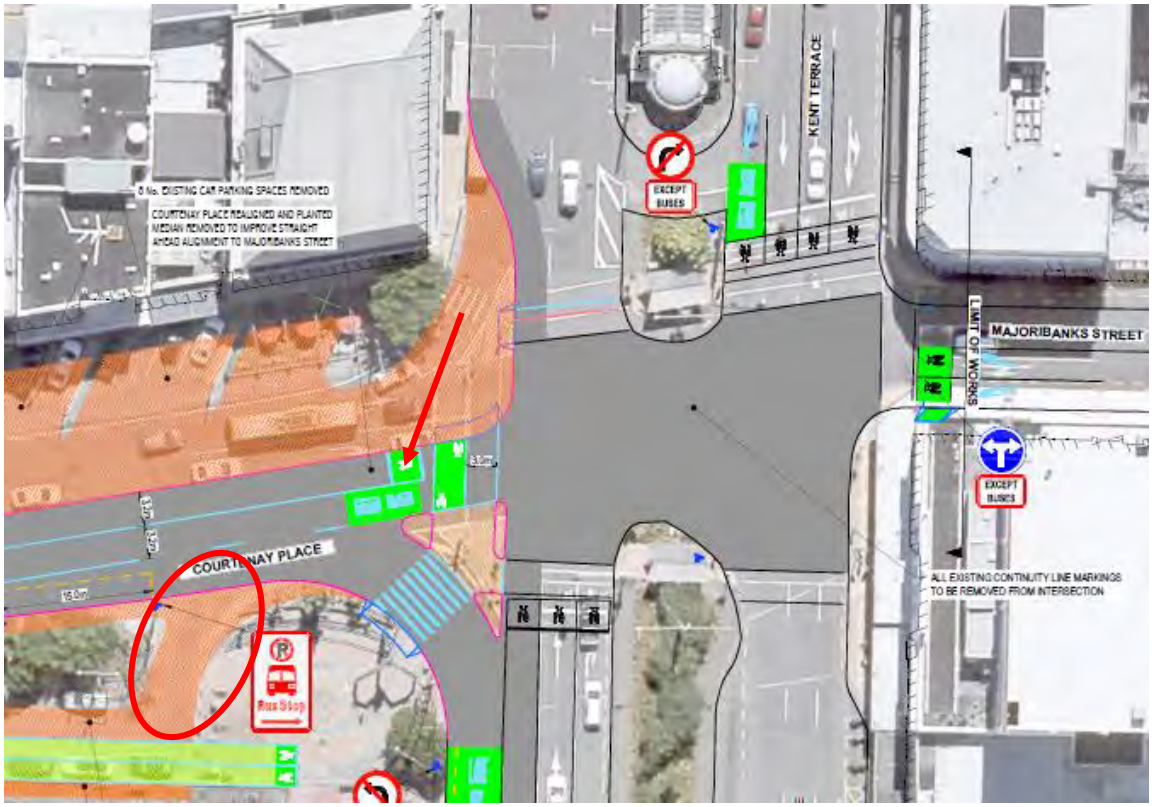


Figure 38: Courtenay Pl/ Cambridge Terr/Kent Terr/Majoribanks St intersection

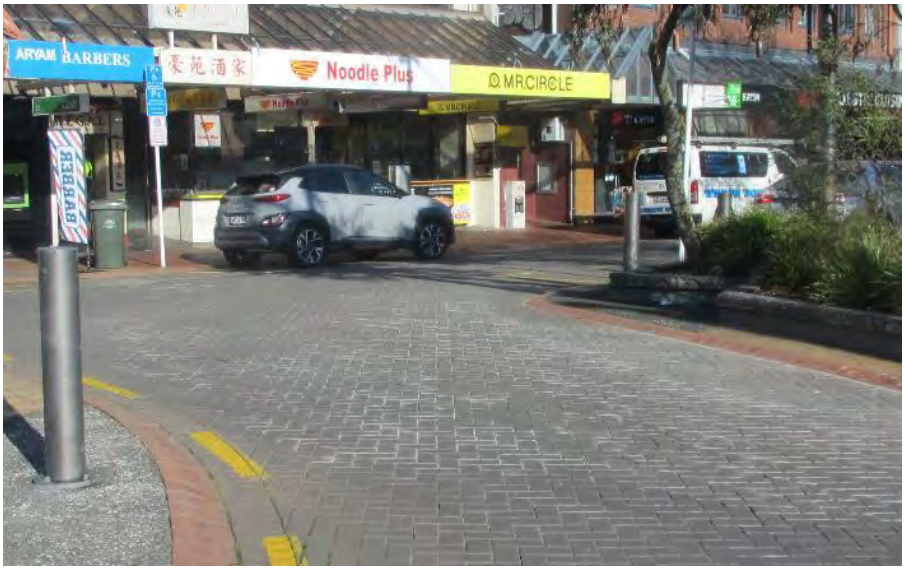


Figure 39: Current access to the area proposed to be cycle path

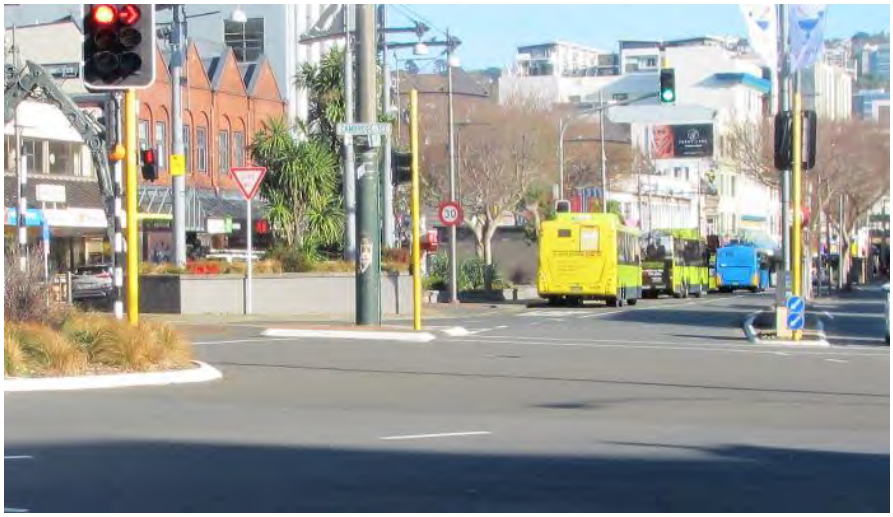


Figure 40: View from Majoribanks Street across to Courtenay Place

Recommendations:

a. Ensure that at the Courtenay Place/ Cambridge Terrace/Kent Terrace/Majoribanks Street intersection the primary cycle network is clearly signed.

b. Modify the intersection design to provide safe access to/from the cycle path for all potential movements.

Designer Response:	Agreed. This intersection and specific access for cyclists will be addressed as part of developed design.
Safety Engineer:	Agree.
Client Decision:	
Action Taken:	

7.8 Comment – Street lighting

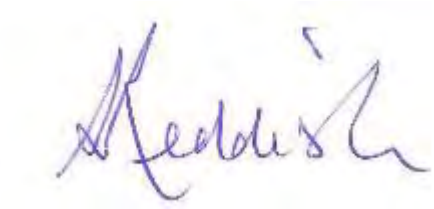
Existing street lighting along Courtney Place is predominantly in the median. This lighting currently spreads across both the carriageway and the footpaths. It is assumed that new street lighting will be located at the new kerb line.

Given the high level of pedestrian activity at night along Courtenay Place, it will be important that the lighting is designed to provide a high level of lighting on the pedestrian/cyclist areas, including under the verandas. The alternative is to install additional amenity lighting.

Designer Response:	Agreed. Lighting and personal security will be key element particularly in regard to Courtenay Place, as well as more generally along the corridor.
Safety Engineer:	Agree – CPTED requirements will apply in the Lux design for street lighting.
Client Decision:	
Action Taken:	

8.0 AUDIT STATEMENT

We certify that we have examined the drawings provided and have visited the site to identify features of the project that we have been asked to review and which could be modified to improve safety. The issues identified have been noted in this report, together with recommendations, which should be studied for implementation.



Signed:.....Date: 20 August 2021

Steve Reddish, BSc(Eng), CMEngNZ, MCIHT, FITE, Dip TE
Senior Associate
Traffic Planning Consultants Ltd, Hawke's Bay

Signed:.....Date: 19 August 2021

Jon England, BE(Civil), CMEngNZ, CPEng, Int.PE(NZ), RPEQ, PMP
Principal Road Safety Engineer
Stantec New Zealand, Wellington

Designer:	*Name Rowan Schwynn……*	*Position Principal Transport Planner*
	Signature… 	*Date 15/10/202.*
Safety Engineer:	*Name……*	*Position……..*
	Signature……..	*Date……*
Project Manager:	*Name……*	*Position……..*
	Signature……..	*Date……*
Action Completed:	*Name……*	*Position……..*
	Signature……..	*Date……*

Project Manager to distribute audit report incorporating decisions to designer, Safety Audit Team Leader, Safety Engineer and project file. ***Date:……..***

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