Project Evaluation Summary
Monash Freeway Upgrade Stage 2

Proponent Victorian Government
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1. Summary

Infrastructure Australia has added the **Monash Freeway Upgrade Stage 2** project to the Infrastructure Priority List as a **High Priority Project.**

The Monash Freeway is a critical transport link to Melbourne's south east and outer south east regions, carrying over 470,000 trips per day. It provides access to the growing Monash and Dandenong National Employment and Innovation Clusters (NEICs).

There is insufficient capacity along the Monash corridor to support growing freight and commuter demand, particularly where the Monash Freeway intersects with the Princes Freeway, and at entry and exit ramps on the Monash Freeway. This leads to slower and less reliable trip times, and higher accident rates at peak times, relative to an uncongested freeway. Rapid population and employment growth is expected in Melbourne's south east and outer south east. This will lead to a moderate increase in vehicle demand for the Monash Freeway at the western end of the proposed Stage 2 works closer to the Melbourne CBD (Warrigal Road), and a large increase in demand at the outskirts of Melbourne. Higher demand growth will exacerbate the existing capacity constraints on the Monash Freeway over time.

The Monash Freeway Upgrade Stage 2 project proposes to address some of the capacity constraints on the Monash Freeway by complementing the works currently underway between EastLink and Clyde Road, Berwick (Stage 1). The Stage 2 works comprise additional freeway lanes to the west of Eastlink and east of Clyde Road, extending managed motorway technology and improved connections to the freeway at Beaconsfield. The project would provide faster and more reliable journey times for users and result in lower accident rates.

The proponent's stated benefit-cost ratio (BCR) for the project is 4.6 (excluding wider economic benefits), with a net present value of $1,871 million (7% real discount rate). Infrastructure Australia has tested this BCR against a wide range of circumstances, and is confident that the project will maintain a BCR greater than 1 under any reasonable scenario. Infrastructure Australia's analysis also shows that the project is needed in the short term, and that its net benefits are lower if it is delayed.

2. Strategic context

Melbourne's south east and outer south east regions hold 39% of Melbourne's population and 41% of Melbourne's employment. The Monash and Dandenong NEICs are major employment centres in the south east region, and are the largest employment centres outside of central Melbourne. Key destinations in these centres include the Monash University, Monash Medical Centre and the Dandenong Hospital.

Population in the local government areas that form the Monash Freeway catchment is expected to grow by 1.3% per year on average for the next 15 years, and 1.2% per year for the 20 years after that. Employment in this catchment is expected to grow more rapidly, increasing by 1.7% per year from 2016 to 2031 and 1.4% per year from 2031 to 2051.

Primary access along the Monash transport corridor and to the Monash and Danendong NEICs is provided by the Monash Freeway, Princes Freeway, and the Cranbourne, Pakenham and Glen Waverly rail lines. With 91% of all trips in the region completed by cars or commercial vehicles, the Monash Freeway plays a critical role in carrying over 470,000 trips every day. The Australian Infrastructure Audit 2015 found that the Monash Freeway was the sixth most congested corridor in Melbourne in 2011 on a delay cost per lane kilometre basis.

The sections of the Monash Freeway in the scope of this project carry approximately 180,000 vehicles per day on the western end (Springvale Road) and 70,000 vehicles per day on the eastern end (Cardinia Road). While traffic demand on the western end is projected to grow between 6–13% (across different sections of the freeway) from 2016 to 2051, demand on the eastern end will grow much more rapidly at 50% over the same period, largely due to increased trips from the outer south east.

The role of the Monash Freeway Stage 2 project is to serve demand within the south east and outer south east, rather than into central Melbourne. The benefits of the project are primarily for users travelling from the outer south east of Melbourne to the key regional employment areas of the Monash and Dandenong NEICs.

The Monash Freeway Upgrade Stage 2 project is consistent with the 2017 *Victorian Infrastructure Plan*, which outlines four key priorities:

- Making the most of existing assets
- Building for the future
- Connecting regional Victoria
- Developing smarter transport solutions.

The project aligns with three of these priorities (connecting regional Victoria is not a key objective of the project). It was also assumed government investment in *Victoria's 30-Year Infrastructure Strategy*, which was released by Infrastructure Victoria in 2016.

3. Problem description

There is insufficient capacity along the Monash corridor to support growing freight and commuter demand, including access to strategic employment, education and health clusters. Capacity issues are particularly noticeable where the Monash Freeway and Princes Freeway intersect with arterial roads. Congested entry and exit ramps are also bottlenecks along the Monash Freeway. These problems will result in longer and more unreliable travel times for users. The problems in the Monash corridor are highlighted by:

- Volume to capacity ratios for peak periods, which are greater than 1 (where volume exceeds capacity) in 2016 along some parts of the Monash Freeway, and worsening considerably by 2031
- Growing traffic volumes, particularly at the eastern end of the Monash Freeway (east of South Gippsland Freeway). Traffic volumes on the Monash Freeway to the west of EastLink (closer to the CBD) grow at a slower rate

- The number of safety incidents on the Monash Freeway, which is much higher in peak periods than free flowing periods, reflecting the congested traffic conditions
- Speeds that are well below posted speed limits in peak periods.

The existing problems have developed following rapid increases in demand. At Huntingdale Road, historical growth in Monash Freeway traffic from 2006 to 2016 was 2.3% per year. At Princes Highway, historical growth from 2006 to 2016 was 4.4% per year. Traffic demand is expected to continue to increase, although not as rapidly as has occurred over the past decade.

The economic benefit estimates of the project are the best evidence of the magnitude of these problems. These suggest the costs of existing and predicted problems are over $180 million per year on average over the 35-year period of the cost benefit analysis (CBA), predominantly from longer and less reliable journey times for cars and heavy vehicles.

4. Project overview

Monash Freeway Upgrade Stage 2 would increase the capacity of the Monash Freeway through additional physical capacity, improved interchanges and managed motorway technology. It comprises two geographically distinct sets of works, with one at the western end of the Stage 1 works (to the west of EastLink) and at the eastern end of the Stage 1 works (to the east of the South Gippsland Freeway). These works comprise:

- Additional freeway lanes on the Monash Freeway from Warrigal Road to EastLink (outbound), EastLink to Springvale Road (inbound), and between Clyde Road and Cardinia Road (both directions)
- Extending managed motorway technology with Lane Use Management System and variable messaging signs from the South Gippsland Freeway to Beaconsfield Interchange
- Upgrade of Beaconsfield Interchange to widen the overpass and add east facing ramps
- Duplication and extension of Oshea Road from Clyde Road to Beaconsfield Interchange
- A collector-distributor outbound between Jacksons Road and EastLink
- A range of active and public transport inclusions on Oshea Road comprising shared use paths and new bus stops.

The works at the western end are to a large extent about addressing existing demand. The works at the eastern end are about addressing rapid expected growth in demand.

5. Options identification and assessment

The proponent has undertaken a detailed assessment of options for the corridor using the following steps:

- Identifying strategic options and interventions categorised by:
    - Upgrades to the Monash Freeway
    - Upgrades to Monash Freeway connections
    - Upgrades to alternative surrounding road network routes
    - Upgrades to active and public transport
    - Policy reform and demand management (such as pricing of roads)
- Assessing strategic options against the project objectives
    - This process identified that the upgrades to active and public transport would have only a supporting impact, and therefore were not considered in detail. Policy reform and demand management, which could have significant impacts, were identified as requiring policy changes and were therefore also not considered in detail. The interventions that were part of the other three areas were considered further

- The remaining interventions were grouped into four packages of:
  - Freeway lane widening – Bundle 1
  - Freeway lane widening and freeway connections targeted at the Monash NEIC – Bundle 2
  - Freeway lane widening and freeway connections targeted at the south east growth area – Bundle 3
  - Alternative route package (not Monash Freeway) – Bundle 4
- These four packages were assessed using a multi-criteria assessment (MCA).
  - The proponent completed costing and transport modelling for each bundle
  - The MCA structure was closely aligned to a CBA structure, and was well informed by the analysis undertaken, rather than reflecting qualitative subjective scoring
  - Based on the results of the MCA, the lowest scoring package (Bundle 4) was not shortlisted, and Bundles 1,2 and 3 were taken through to CBA
- The remaining three packages were then refined in their scope and preliminary design work undertaken. This led to two variations for Bundle 3 (which targeted the south east growth area). One included works to duplicate and extend Oshea Road from Clyde Road to Beaconsfield Interchange (Bundle 3A), and the other did not (Bundle 3B).
- These four packages of work were then considered using CBA
- Bundle 3A, with the focus on the south east growth area and the duplication and extension of Oshea Road, had the highest net benefits and was selected as the preferred project scope. The proponent further refined the analysis for Bundles 3A and 3B by incorporating final risk adjusted capital cost estimates into a detailed CBA, which confirmed that Bundle 3A had the highest net benefits and BCR.

Infrastructure Australia considers the approach to options development and selection has been best practice. It has used quantitative and objective evidence to assess options, continually refined options throughout the business case process and used CBA to determine the preferred option. The MCA was conducted using a rigorous approach which proxied a CBA. We consider the business case provides good evidence that the package of works that has been selected will have net benefits and is preferable to other options.

The business case has given limited consideration to issues of demand management and pricing, viewing these as policy decisions for the Victorian Government. We consider this to be reasonable for this project — pricing should be considered at the network level, given that network-wide pricing will lead to better outcomes than pricing only on selective routes. We note and support Infrastructure Victoria's conclusion that "A well-designed, fair transport network pricing regime could deliver more significant reductions in congestion than any new road project, cutting daily commute times and improving freight efficiency".

6. Economic evaluation

The proponent's stated BCR for the project is 4.6 (using a 7% real discount rate and P50 costs), excluding wider economic benefits (WEBs) and 5.5 (including WEBs). The economic appraisal has been tested for a number of modifications:

- The transport modelling for the Monash Freeway Stage 2 project assumes a range of currently unfunded and uncommitted transport projects occur in the base case. Infrastructure Australia recommends the use of a 'do-minimum' base case for the cost-benefit analysis, with only funded and committed projects assumed. Therefore, excluding the unfunded and uncommitted projects from the base case would increase the BCR (as the road network would be more congested in the base case, and users would benefit more from the upgrade).
- The cost-benefit analysis uses Australian Transport Assessment and Planning (ATAP) vehicle operating cost parameters to measure reductions in operating costs for road users from higher speeds. A sensitivity test has been undertaken using Infrastructure Australia's preferred approach of Austroads 2012 guidelines, as set out in the Infrastructure Australia Assessment Framework. This reduces the BCR from 4.6 to 4.4.
- The net benefits of the project are higher if the project begins at once, rather than it being delayed.

Infrastructure Australia has considered a number of other issues in relation to the benefits and costs of the project:

- The Victorian Integrated Transport Model (VITM) indicates lower speeds on the Monash Freeway than survey and Freeway Management System data reported in the demand report, although the VITM speeds are consistent with live-data travel times. This potentially reflects that the existing motorway management systems make the Monash Freeway more effective than other roads. On this basis, the base case may understate the speeds for the Monash Freeway, and the benefits of the project may be less than measured.
- The CBA does not include lifecycle replacement costs for motorway management equipment. Economic analysis should include all costs over the appraisal period, and including these costs would marginally reduce the BCR for the project.
- The CBA has considered benefits from avoided perceived congestion in its wider economic benefits, but not in the core BCR. While Infrastructure Australia recognises the strategic merit of the project and its potential to generate WEBs, the methodology underpinning the quantification of WEBs in Australia is still under development. As further evidence becomes available to substantiate the presence and magnitude of these benefits, this will be included in future ATAP guidelines.

Overall, Infrastructure Australia is confident that the benefits of the project will remain well in excess of its costs, under a wide range of scenarios.

Benefits and costs breakdown

Proponent's stated benefits and costs		**Present value ($m, 2016-17) @ 7% real discount rate**		**% of total**
Private vehicles				
	Travel time savings	$1,225		51%
	Vehicle operating cost savings	$576		24%
	Improved journey time reliability	$237		10%
Freight vehicles				
	Travel time savings	$161		7%
	Vehicle operating cost savings	$104		4%
	Improved journey time reliability	$18		1%
Resilience to lane closures[2]		$93		4%
Environmental externalities		$-68		-3%
Public transport fares resource cost correction		$-6		-1%
Crash cost savings		$36		2%
Residual value		$17		1%
Total Benefits[1]		**$2,394**	(A)	**100%**
Capital costs (P50)		$498		95%
Operating and maintenance costs		$25		5%
Total Costs[1]		**$523**	(B)	**100%**
Core results	**Net Benefits - Net Present Value (NPV)[3]**	**$1,871**	(C)	n/a
	Benefit–Cost Ratio (BCR)[4]	**4.6**	(D)	n/a
Results including Wider Economic Benefits[7]	Wider Economic Benefits (WEBs)	$459	(E)	n/a
	Net benefits – NPV[5] with WEBs	**$2,330**	(F)	n/a
	BCR[6] with WEBs	**5.5**	(G)	n/a

Sources: Proponent Cost Benefit Analysis and Business Case and Infrastructure Australia calculations.
(1) Totals may not sum due to rounding.
(2) Users benefit from less delays, and improved reliability when unplanned incidents occur. This has been measured by modelling how the base case and project case networks handle incidents on the Monash Freeway (based on the VicRoads Road Crash Information System).
(3) The net present value (C) is calculated as the present value of total benefits less the present value of total costs (A − B).
(4) The benefit–cost ratio (D) is calculated as the present value of total benefits divided by the present value of total costs (A ÷ B).
(5) The net present value with WEBs (F) is calculated as present value of total benefits with WEBs less the present value of total costs ((A + E) – B)
(6) The benefit–cost ratio with WEBs (G) is calculated as present value of total benefits with WEBs less the present value of total costs ((A + E) ÷ B)
(7) Wider Economic Benefits includes the proponent's estimate of travel time benefits from improved perceived congestion ($19m in present value).

The P90 nominal undiscounted capital costs of the project are $711 million. The Australian and Victorian Governments have each contributed $500 million to the combined Monash Freeway works, which the proponent considers sufficient to deliver Stages 1 and 2 of the works.

Capital costs and funding

Total capital cost (nominal, undiscounted, P90)	$711 million (P90) $663 million (P50)
Proponent's proposed Australian Government funding contribution	The Australian Government and Victorian Government have each committed $500 million to Monash Freeway Upgrade works. This covers Stage 1 and Stage 2.
Other funding (source / amount / cash flow) (nominal, undiscounted, P90)	The Victorian Government will contribute funding as set out above and be responsible for any costs above the $1 billion already committed.

7. Deliverability

A robust delivery assessment process has been undertaken to determine the project packaging, contract approach and initial cost estimates accounting for risk and current project stage. A sound project governance framework is in place which includes all relevant Victorian and Commonwealth Government and user stakeholders and provides confidence that the project will be delivered effectively. The use of staff responsible for delivery of Monash Freeway Stage 1 will also provide continuity of the expertise developed for the Stage 1 works.

Project funding is sourced from the Commonwealth and Victorian Governments and savings from the Monash Freeway Stage 1 project. A qualitative value creation assessment has been performed as part of the Business Case in accordance with the Victorian Value Creation and Capture (VCC) Framework. This included identifying project benefits and beneficiary groups, potential value capture mechanisms and the ease with which benefits could be captured. The Business Case commits to developing a value capture project plan which involves undertaking the following steps during the project delivery stage:

- Quantifying the value created for different groups benefiting from the project
- Following the quantification of value creation, undertaking an assessment of the mechanism that could be implemented to capture the value created by the project.

While reform and demand management options (such as network pricing/introduction of tolls) were evaluated at the options assessment stage, these were removed from consideration given the current Victorian Government policy not to toll existing roads. Given the high level of benefits expected to be derived from the project, and the concentration of the flow of those benefits to users, Infrastructure Australia considers that there is a strong case for users to contribute to meeting the cost of the proposal through the introduction of a toll.

A limited benefits realisation plan has been developed. This has a weak link to the benefits measured in the cost-benefit analysis. For example, the performance targets reference broad travel time ranges and unspecific safety outcomes. Further work will be required to establish an appropriate baseline against which to measure the project outcomes, and specific measures of the impact expected alongside the data required to measure the impact of the project.

In the event that the project proceeds, Infrastructure Australia encourages the proponent to undertake and publish a Post Completion Review to assess the extent to which expected project benefits and costs have been realised. This will help to inform development of future projects. In particular, such a review should assess project costs, and outcomes for customers, against the expectations set out in the business case and cost benefit analysis.