

**NATIONAL CAPITAL AUTHORITY
GUNGAHLIN DRIVE EXTENSION REVIEW**

**CONSULTANTS' REPORTS –
INDEPENDENT PEER REVIEW FOR
THE NATIONAL CAPITAL AUTHORITY**

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Executive Summary

1. For the purposes of this independent peer review, the main recommendations by the consultants may be summarised as follows.
 - (a) From the time of the formulation of the Canberra Y-Plan in the late 1960s, all subsequent land-use and transport planning studies have included the Gungahlin Drive Extension (GDE) in the future development of the metropolitan region, and more recent engineering investigations have re-affirmed its strategic importance and need in the Canberra road network as a “peripheral parkway”
 - (b) Detailed design and construction of the GDE is now warranted with two directional vehicle traffic lanes in each direction with the road geometrical design conforming to “parkway standards”
 - (c) This scale of road development is recommended, irrespective of assumptions analysed through sensitivity testing, even if there is a greater share of journeys made by public transport in the future than is the case today
 - (d) Traffic analyses fail to reveal much difference in vehicular traffic flows between the eastern and western alignments.
 - (e) Analyses of the impacts of the proposed road and its scale on the physical and social environments convincingly demonstrates that costs are lower and impacts less with an eastern alignment around the AIS
 - (f) Impacts on Black Mountain Nature Reserve and the residential suburb of Aranda have been studied and a new design concept has been proposed that have attempted to address concerns raised and suggestions put forward to the National Capital Authority by residents of Aranda.
 - (g) This design concept has been tested and compared with two previous proposals in terms of physical, social and traffic impacts and operations and is the preferred option.

2. In fulfilling the brief of the National Capital Authority, this reviewer has read the following reports.

- (a) Young Consulting Engineers (2002) *National Capital Authority: Gungahlin Drive Extension - Alignment Assessment – Executive Summary Report*,
- (b) Young Consulting Engineers (2002) *National Capital Authority: Gungahlin Drive Extension- Assessment of Options at Aranda Precinct*,
- (c) Young Consulting Engineers (2002) *National Capital Authority: Gungahlin Drive Extension –Eastern and Western Alignments Comparative Evaluation and Impact Report Australian Institute of Sport Precinct*, and
- (d) Scott Wilson Nairn Pty Ltd Young Consulting Engineers (2002) *National Capital Authority: Gungahlin Drive Extension Review – Traffic and Transport Planning Assessment*

The reviewer has also provided comment both to the consultants and the National Capital Authority from inception, and during the course of the studies, and has consulted other relevant documents in the compilation of this report. A summary follows of the independent observations about the Gungahlin Drive Extension Review, organised in two broad areas – traffic and transport; and impacts and mitigation.

3. Overall, the depth and quality of the professional studies that underpin the conclusions and recommendations in (1.) above are appropriate to the terms of reference given to the consultants.
4. The planning principles for the long-term land use and transport development in Canberra were established in the Voorhees Report (1967), namely a decentralised pattern of homes, work places and other activities arranged into free standing “towns” each with its own town centre (that is, less centralised activities than in other Australian cities), an inter-town, line-haul public transport system connecting the town centres, and the major through roads built as peripheral parkways to avoid intrusion into the urban fabric. These principles are robust and have stood the test of time and continue to be relevant in a guide towards long-term strategic developments. The Gungahlin Drive Extension (GDE) forms part of the peripheral parkway system and there are no studies that have challenged its conceptual validity as part of the development of Canberra.
5. Previous studies cited by the consultants (the Maunsell and SMEC reports) confirmed that construction of GDE was needed in the early 2000s, but changes in specific developments and the availability of new data warrant a review before the National Capital Authority is in a position to make an informed decision on its alignment, scale and impacts. New

traffic and transport analyses are not only justified but are essential in a proper understanding of traffic-related impacts on AIS and Aranda.

6. The travel demand modelling computer package used is TRANSTEP – one of a number of leading transport planning packages available internationally, and one with which the reviewer is technically familiar – and its application in this review is appropriate, and, furthermore, its capabilities and assumptions are described adequately.
7. The TRANSTEP model demonstrates that the traffic levels assigned to the future transport network for 2006, 2010, 2021 and 2031 confirm the need to construct a parkway of two-vehicular traffic lanes in both directions. Traffic analyses do not favour one alignment over the other around AIS.
8. Young Consulting Engineers summarise, with commentary, an appropriately wide range of impacts for the western and eastern alignments around the AIS: clearly, the eastern alignment is recommended from a comprehensive appraisal of a wider range of impacts on AIS precinct flora, fauna, infrastructure and the human/social environment.
9. The eastern alignment, although about 220m (adding an extra 8 per cent to the route) longer than the western alignment, is preferred both on the grounds of lower costs to construct and its considerably less impact around AIS.
10. In an attempt to address concerns by residents over the GDE proposal, two previous options were compared with a new option developed by Young Consulting Engineers in terms of traffic and a range of impacts (as for the AIS precinct) with the technical analyses supporting this new option.
11. Transport development of the kind supported in this review confers benefits to society, but also has social and environmental costs that are acknowledged by the proponents. Decision makers need to know not only the full magnitude of these costs and benefits, but also how best to manage and mitigate any adverse impacts, and this should be undertaken by further studies at the detailed design stage. In respect of any policy position on the alignment chosen the ACT Government should in its detailed designs address all issues, provide mitigation measures and management strategies with their associated capital costs.

12. In conclusion, construction of Gungahlin Drive Extension as a parkway of two-lanes in both directions is supported by this review. Irrespective of the alignment chosen further studies building on this review will be essential covering, but not being confined to: (a) community consultation and pro-active means of effectively involving the impacted communities in the detailed design stage for GDE around the AIS and Aranda, (b) road traffic noise and its mitigation with particular reference to the AIS and Aranda precincts, (c) unresolved issues with air quality (especially particulate matter) and the impacts of vehicle emissions on the performance of athletes and how best to manage these. Further studies are recommended on this topic at the detailed design stage, and preliminary guidance is offered in this peer review.

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SUMMARY OF CONSULTANTS' MAIN RECOMMENDATIONS

For the purposes of this independent peer review, the main recommendations by the consultants Young Consulting Engineers and the sub-consultants, Scott Wilson Nairn Pty Ltd may be summarised as follows.

- (a) From the time of the formulation of the Canberra Y-Plan in the late 1960s, all subsequent land-use and transport planning studies have included the Gungahlin Drive Extension (GDE) in the future development of the metropolitan region, and more recent engineering investigations have re-affirmed its strategic importance and need in the Canberra road network as a “peripheral parkway.”
- (b) Detailed design and construction of the GDE is now warranted with two vehicle traffic lanes in each direction with the road geometrical design conforming to “parkway standards.”
- (c) This scale of road development is recommended, irrespective of assumptions analysed through sensitivity testing, even if there is a greater share of journeys made by public transport in the future than is the case today.
- (d) Traffic analyses fail to reveal much difference in vehicular traffic flows between the eastern and western alignments.
- (e) Analyses of the impacts of the proposed road and its scale on the physical and social environments convincingly demonstrates that costs are lower and impacts less with an eastern alignment around the AIS.
- (f) Impacts on Black Mountain Nature Reserve and the residential suburb of Aranda have been studied and a new design concept has been proposed that has attempted to address concerns raised and suggestions put forward to the National Capital Authority by residents of Aranda.
- (g) This design concept has been tested and compared with two previous proposals in terms of physical, social and traffic impacts and operations and is the preferred option.

METHODOLOGY OF THIS INDEPENDENT REVIEW

The independent peer reviewer has undertaken numerous studies of this review nature for state and local government authorities in the Australian Capital Territory, New South Wales, and Victoria. Although each study has its unique characteristics and challenges, it is important to set out some of the general professional principles followed that are applicable to this study:

- recognition that transport development proposals involve public and private interests and that advice on their assessment must take a comprehensive perspective;
- the necessity to work with the client and the consultants at study inception to provide high-level, strategic advice on study design from the outset;
- maintain a close, collaborative, working relationship with the consultants and sub-consultants during the course of the investigations to add value to this work being undertaken by experts in their field, by participating actively in meetings, discussions and briefings and offering verbal and written advice and comments on draft work-in-progress; and
- peer review the product with complete independence from the client and consultants and provide a report that is open and transparent to all parties, including the community.

In fulfilling the brief of the National Capital Authority, this reviewer has read and commented on the following reports by the consultants:

- (a) Scott Wilson Nairn Pty Ltd Young Consulting Engineers (2002) *National Capital Authority: Gungahlin Drive Extension Review – Traffic and Transport Planning Assessment*;
- (b) Young Consulting Engineers (2002) *National Capital Authority: Gungahlin Drive Extension –Eastern and Western Alignments Comparative Evaluation and Impact Report Australian Institute of Sport Precinct*;
- (c) Young Consulting Engineers (2002) *National Capital Authority: Gungahlin Drive Extension - Assessment of Options at Aranda Precinct*; and
- (d) Young Consulting Engineers (2002) *National Capital Authority: Gungahlin Drive Extension - Alignment Assessment – Executive Summary Report*.

The National Capital Authority made available three reports, all cited in the final reports by the consultants: the Maunsell report (Maunsell, 1997); the SMEC report (SMEC, 2002); and the Fitch report (Fitch, 2002). The first two reports were studied from the perspective of their respective methodologies in undertaking the traffic and transport studies; the latter report was studied to determine the issues associated with the impact of Gungahlin Drive Extension operations on the performance of athletes at the Australian Institute of Sport (AIS). As road traffic noise and vehicle

emissions on athlete's performance were cited by Dr Fitch as two areas of particular concern to the Australian Sports Commission, this reviewer undertook an independent search of the literature. He also consulted with one of Australia's leading experts on road traffic noise, Dr Stephen Samuels – a Visiting Fellow at the University of New South Wales School of Civil and Environmental Engineering.

A computer-based literature search was undertaken using the data-base of Ovid Technologies, Inc. The key words were “particulate matter” (1103 records) and “public health” (44 315 records). By searching on both key words the number of records were reduced to 200. On-line articles retrieved and the abstracts of the first 100 of the set of 200 were examined. They were primarily journal publications of a recent date. Major contributions to the subject of particulate matter and health were retrieved from the library of the University of New South Wales. The same data-base was accessed to identify the impacts of vehicle emissions on the performance of athletes. Interpretations of the literature included in the reference section to this report, especially the epidemiological literature, are provided as a guide for further studies and are included as an attachment. They are written for a general reading audience and the aim has not been to write for the specialist audience of epidemiologists.

Some community groups might argue that major roads are unnecessary to build and that the expansion of public transport infrastructure and services would provide an alternative solution. The reviewer undertook stakeholder and community consultations and attended a workshop as part of the Canberra Public Transport Futures Feasibility Study in September and October 2002 and is aware of these views. KBR Halliburton are undertaking this consultancy expected for completion in mid-2003, and Dr Tim Brooker briefed the reviewer on the public transport options currently under investigation.

CONSULTANTS' REPORTS – GENERAL PROFESSIONAL QUALITY

Overall, the depth and quality of the professional work documented in the reports that underpin the conclusions and recommendations made in the Executive Summaries is appropriate and fulfil the terms of reference given to them by the National Capital Authority. This extends to the traffic and transport studies and to the identification and analysis of impacts on both alignments around AIS, and the new road concept developed as an option for the Aranda precinct that is based on concerns expressed to the National Capital Authority by Aranda residents.

IS GUNGAHLIN DRIVE EXTENSION NEEDED?

The planning principles for the long-term land use and transport development in Canberra were established in the Voorhees Report (Alan M. Voorhees and Associates, 1967), namely a decentralised pattern of homes, work places and other activities arranged into free standing “towns” each with its own town centre (that is, less centralised activities than in other Australian cities), an inter-town, line-haul public transport system connecting the town centres, and the major through roads built as peripheral parkways to avoid environmental and social intrusion into the urban fabric. These principles are robust and have stood the test of time and continue to this day to be relevant in a guide towards long-term strategic developments in Canberra.

“Parkways are the highest order element in the road hierarchy. Their primary function is to provide a direct link between non-adjacent towns, and to accommodate most of the long-distance inter-town travel. Generally, they are developed in a parklike or rural setting on the edge of the urban areas. Frontage development is not allowed and access is usually strictly controlled via grade separated interchange connections with other major roads. Parkway are similar in character to freeways, in that they carry very heavy traffic volumes at high speeds.” (National Capital Development Commission, 1984, pp. 79 – 80)

Furthermore, the principles of peripheral parkways and free-standing towns have been articulated as an example of good urban land-use transport planning in a book written by the reviewer (Black, 1981) entitled *Urban Transport Planning: Theory and Practice*. This is widely used internationally as a text for undergraduate and postgraduate students and for professional engineers and planners.

The Gungahlin Drive Extension (GDE) forms part of the peripheral parkway system in the strategic transport policy for the metropolitan region, and there are no studies that have challenged its conceptual validity as part of the development of Canberra. Its construction for the early 2000s has been supported by two previous studies (the Maunsell and SMEC reports) and is likewise recommended in this review.

Sustainable urban transport is a policy objective of government and this includes the importance of improving public transport. The consultants have addressed this issue by modelling future public transport behaviour and mode share outcomes, and assuming that investment in public

transport did attract a high share of public transport in Canberra. Even with this optimistic assumption of a high use of public transport, construction of the Gungahlin Drive Extension is warranted.

WAS THIS REVIEW NECESSARY TO ESTABLISH THE NEED TO BUILD?

Tax-payers may legitimately ask of governments are more studies and reviews such as this one really necessary when previous and recent studies (the Maunsell and SMEC reports) confirmed that construction of GDE was needed in the early 2000s. Since those studies were completed changes in specific developments in Canberra, and the availability of new data (as documented in the consultants reports) did warrant a review before the National Capital Authority would be in a position to make an informed decision on its alignment, scale and impacts. No detailed comparisons of impacts had previously been made for the east and west alignments around the AIS precinct. New traffic and transport analyses were not only justified, but are essential in a proper understanding of traffic- and road infrastructure - related impacts on the AIS and Aranda precincts.

A valid question to ask on the traffic modelling undertaken during this review, to determine the traffic effects of future situations extending to 2031, is whether the forecasts made in the previous two studies of GDE could be simply updated. The modelling work undertaken in this study, as reported in Scott Wilson Nairn Pty Ltd Young Consulting Engineers (2002), is fully justified. The consultants had reviewed previous work and found that there were insufficient details on model structures, calibration parameters and assumptions to build on this work. This reviewer – after reading those technical reports and their appendices on this matter – agrees with the consultants that a fresh modelling approach was necessary.

THE TRANSPORT MODELLING APPROACH

Community representatives attending stakeholder meetings that have been designed by this reviewer as part of different strategic transport studies – including the on-going Canberra Public Transport Futures Feasibility Study – are sometimes sceptical about the use of computer-based transport planning packages. Professions on the other hand sometimes ask of the “best” package to use. All models are simplifications of the real world that are designed for particular purposes.

The travel demand and transport supply modelling computer package used in this review is TRANSTEP – one of a number of leading transport planning packages available internationally. It is one with which the reviewer is technically familiar. Its application in this review is appropriate, and, furthermore, its capabilities, assumptions, and levels of accuracy are described adequately in Chapter 3 of Scott Wilson Nairn Pty Ltd Young Consulting Engineers (2002). The consultants should be commended for including this aspect of their modelling in their report given the importance of transparency.

The TRANSTEP model demonstrates that the traffic levels assigned to the future transport network for 2006, 2010, 2021 and 2031 confirm the need to construct a parkway of two-vehicular traffic lanes in both directions. The model demonstrates that the road is needed by 2006 to avoid congestion building up on the existing Canberra road network. Traffic analyses do not favour one alignment over the other around AIS.

ROAD INFRASTRUCTURE AND TRAFFIC IMPACTS - SCOPE

Young Consulting Engineers summarise, with commentary, an appropriately wide range of impacts for the western and eastern alignments around the AIS: clearly, the eastern alignment is recommended from a comprehensive appraisal of a wider range of impacts on flora, fauna, infrastructure and the human/social environment. The external effects of transport are numerous, and among the best studied of any economic sector or industry. This is because transport is one of the most important sectors of the modern industrial economy and its impacts are greatest in urban areas. The following effects of transport are among the most important as established by the European Conference of Ministers of Transport (1998, pp. 156 – 157)):

- air pollution (local, regional and global)
- noise and vibration
- accidents
- congestion
- use of land
- solid waste generation
- water pollution
- “severance” of human and animal communities by infrastructure or traffic flows
- aesthetic impacts of infrastructure and traffic.

That this review was comprehensive in its scope of impacts considered for the two alignments around the AIS precinct may be determined by comparing the above list with the criteria assessed:

- AIS Masterplan impacts
- AIS Precinct access and through traffic
- AIS Services impacts
- Parking at the AIS
- Noise at the AIS
- Air Quality at the AIS
- Horizontal Geometry of the GDE at the AIS
- Vertical Geometry of the GDE at the AIS
- Cross Section of the GDE at the AIS
- Earthworks associated with the construction of GDE at the AIS
- Construction time and staging impact on the AIS
- Construction costs for GDE associated with the AIS
- Fauna and Flora near the AIS
- Cultural Heritage near the AIS
- Visual Assessment of GDE near the AIS.

IS THE EASTERN ALIGNMENT PREFERABLE?

The eastern alignment, although about 220m (adding an extra 8 per cent to the route) longer than the western alignment, is preferred both on the grounds of lower costs to construct and its considerably less impact around AIS as documented by Young Consulting Engineers.

ADDRESSING RESIDENTS CONCERNS IN ARANDA

In an attempt to address concerns made to the National Capital Authority by residents over the GDE proposal, two previous options were compared with a new option developed by Young Consulting Engineers in terms of traffic and a range of impacts (as for the AIS precinct) with the technical analyses supporting this new option.

FURTHER STUDIES NEEDED

Transport development of the kind supported in this review confers benefits to society, but also has social and environmental costs that are acknowledged by the proponents. Decision makers need to know not only the full magnitude of these costs and benefits, but also how best to manage

and mitigate any adverse impacts, and this should be undertaken by further studies at the detailed design stage. In respect of any policy position on the alignment chosen the ACT Government should in its detailed designs address all issues, provide mitigation measures and management strategies with their associated capital costs.

Construction of Gungahlin Drive Extension as a parkway of two-lane in both directions is supported by this review. Irrespective of the alignment chosen further studies building on this review will be essential covering, but not being confined to: (a) community consultation and proactive means of effectively involving the impacted communities in the detailed design stage for GDE around the AIS and Aranda, (b) road traffic noise and its mitigation with particular reference to the AIS and Aranda precincts, (c) unresolved issues with air quality (especially particulate matter) and the impacts on vehicle emissions on the performance of athletes and how best to manage these. Further studies are recommended on this topic at the detailed design stage.

Preliminary guidance on road traffic noise and vehicle emissions is offered in this peer review, with details attached. The vehicle emissions for a particular transport task – a given composition of road vehicle types with their journey distances determined – will be determined by the road traffic conditions experienced. Most vehicle emissions, with the exception of nitrous oxides, are directly proportional to the combustion of the amount of fuel consumed in a journey, after making appropriate adjustments for “cold starts”. There is an asymmetrically U-shaped relationship between the average fuel consumption (in litres per hundred kilometres travelled) and the mean speed of the vehicular traffic stream (Bowyer, et al., 1985, p.48). It is relatively high at low speeds with stop and start traffic conditions (referred to in the consultants’ reports as “traffic congestion”). Fuel consumption reduces to a minimum with free-flow traffic at around 50 km/h before increasing again at a much slower rate for higher speeds. Up-hill grades will increase fuel consumption, but there will be a reduction in fuel consumption travelling down hill.

The proposed road can be justified on its contribution towards improving air quality. An environmental benefit of a major road proposal is to substitute free flow-traffic conditions on that new road for the existing situation of stop and start traffic conditions on arterial roads and other surface streets. The consultants demonstrate that current traffic in the corridor in which the parkway is proposed uses surface streets with intersections controlled by traffic signals and where stop-start driving conditions are experienced now in peak periods. This situation would worsen in the future without the Gungahlin Drive Extension. The Gungahlin Drive Extension (GDE) will provide a more-or-less uninterrupted driving experience across the city reducing fuel consumption and vehicular emissions below the situation without the road (correcting for any additional traffic

induced by the road, for any diversion from public to private transport, and for any increases in trip lengths induced by the road).

Having established that construction of the Gungahlin Drive Extension will contribute towards helping achieve air quality goals, it is important to emphasise that the traffic on GDE will produce emissions in the vicinity of AIS, and these need proper consideration in the context of public health. The complex modelling of air-sheds and meteorological conditions, and a review of the epidemiological evidence to assess health impacts were clearly beyond the scope of this review. These issues should be properly addressed at the design stage for GDE.

Whilst the modelling of the future road traffic noise environment in the AIS precinct (undertaken using the appropriate Australian technology of TNOISE) shows that, with the working assumptions of traffic flow, speeds, gradients and the proportion of heavy vehicles for both alignments, the appropriate ACT Government noise standards will be met when operating the road, designs should aim to minimise impacts as much as possible. Detailed studies of mitigation options and costs of treatment need to be undertaken, particularly with respect to the interior noise measured in an athlete's bedroom.

CONCLUSIONS

In fulfilling the brief of the National Capital Authority, this reviewer has read the following reports.

- (a) Young Consulting Engineers (2002) *National Capital Authority: Gungahlin Drive Extension - Alignment Assessment – Executive Summary Report*,
- (b) Young Consulting Engineers (2002) *National Capital Authority: Gungahlin Drive Extension- Assessment of Options at Aranda Precinct*,
- (c) Young Consulting Engineers (2002) *National Capital Authority: Gungahlin Drive Extension –Eastern and Western Alignments Comparative Evaluation and Impact Report Australian Institute of Sport Precinct*, and
- (d) Scott Wilson Nairn Pty Ltd Young Consulting Engineers (2002) *National Capital Authority: Gungahlin Drive Extension Review – Traffic and Transport Planning Assessment*

The reviewer has also provided comment both to the consultants and the National Capital Authority from inception, and during the course of the studies, and has consulted other relevant documents, obtained through a computer-based literature search of “particulate matter” and “health” and “ vehicle emissions” and “athlete’s performance” in the compilation of this report.

The main recommendations by the consultants have been summarised as follows.

- (a) From the time of the formulation of the Canberra Y-Plan in the late 1960s, all subsequent land-use and transport planning studies have included the Gungahlin Drive Extension (GDE) in the future development of the metropolitan region, and more recent engineering investigations have re-affirmed its strategic importance and need in the Canberra road network as a “peripheral parkway.”
- (b) Detailed design and construction of the GDE is now warranted with two directional vehicle traffic lanes in each direction with the road geometrical design conforming to “parkway standards.”
- (c) This scale of road development is recommended, irrespective of assumptions analysed through sensitivity testing, even if there is a greater share of journeys made by public transport in the future than is the case today.
- (d) Traffic analyses show similarities in vehicular traffic flows between the eastern and western alignments.
- (e) Analyses of the impacts of the proposed road and its scale on the physical and social environments convincingly demonstrates that costs are lower and impacts less with an eastern alignment around the AIS.
- (f) Impacts on Black Mountain Nature Reserve and the residential suburb of Aranda have been studied and a new design concept has been proposed that have attempted to address concerns raised and suggestions put forward to the National Capital Authority by residents of Aranda.
- (g) This design concept has been tested and compared with two previous proposals in terms of physical, social and traffic impacts and operations and is the preferred option.

Overall, the depth and quality of the professional studies (traffic and transport, and impact assessment) that underpin the conclusions and recommendations in are appropriate to the terms of reference given to the consultants.

The planning principles for the long-term land use and transport development in Canberra were established in the Voorhees Report (Alan M. Voorhees, 1967), namely a decentralised pattern of homes, work places and other activities arranged into free standing “towns” each with its own town centre (that is, less centralised activities than in other Australian cities), an inter-town, line-haul public transport system connecting the town centres, and the major through roads built as peripheral parkways to avoid intrusion into the urban fabric. These principles are robust and have stood the test of time and continue to be relevant in a guide towards long-term strategic

developments. The Gungahlin Drive Extension (GDE) forms part of the peripheral parkway system and there are no studies that have challenged its conceptual validity as part of the development of Canberra.

Previous studies cited by the consultants (the Maunsell and SMEC reports) confirmed that construction of GDE was needed in the early 2000s, but changes in specific developments and the availability of new data warrant a review before the National Capital Authority is in a position to make an informed decision on its alignment, scale and impacts. New traffic and transport analyses are not only justified but are essential in a proper understanding of traffic-related impacts on AIS and Aranda.

The travel demand modelling computer package used is TRANSTEP – one of a number of leading transport planning packages available internationally, and one with which the reviewer is technically familiar – and its application in this review is appropriate. Furthermore, its capabilities and assumptions are described adequately in the report by Scott Wilson Nairn Pty Ltd.

The TRANSTEP model of the traffic levels assigned to the future transport network for 2006, 2010, 2021 and 2031 confirm the need to construct a parkway of two-vehicular traffic lanes in both directions. Traffic analyses do not favour one alignment over the other around AIS.

Young Consulting Engineers summarise, with commentary, an appropriately wide range of impacts for the western and eastern alignments around the AIS. On the evidence presented, the eastern alignment is recommended from a comprehensive appraisal of an appropriately wide range of impacts on AIS precinct flora, fauna, infrastructure and the human/social environment. The eastern alignment, although about 220m (adding an extra 8 per cent to the route) longer than the western alignment, is preferred both on the grounds of lower costs to construct and its considerably less impact around AIS.

In an attempt to address concerns by residents over the GDE proposal, two previous options were compared with a new option developed by Young Consulting Engineers in terms of traffic and a range of impacts (as for the AIS precinct) with the technical analyses supporting this new option. Additional traffic analyses of intersections would be required at the final design stage.

Transport development of the kind supported in this review confers benefits to society, but also has social and environmental costs that are acknowledged by the proponents. Decision makers need to know not only the full magnitude of these costs and benefits, but also how best to manage and mitigate any adverse impacts, and this should be undertaken by further studies at the detailed

design stage. In respect of any policy position on the alignment chosen the ACT Government should in its detailed designs address all issues raised, and include in the design all mitigation measures and management strategies with their associated capital costs. The impacts on AIS of road traffic noise and the quality of air that is breathed both are areas to address fully at the design stage.

In conclusion, construction of Gungahlin Drive Extension as a parkway of two-lanes in both directions is supported by this review. Irrespective of the alignment chosen further studies building on this review will be essential covering, but not being confined to: (a) community consultation and pro-active means of effectively involving the impacted communities in the detailed design stage for GDE around the AIS and Aranda, (b) road traffic noise and its mitigation with particular reference to the AIS and Aranda precincts, (c) unresolved issues with air quality (especially particulate matter) and the impacts of vehicle emissions on the performance of athletes and how best to manage these. Further studies are recommended on this topic at the detailed design stage, and preliminary research guidance has been offered in the attachment to this peer review.

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ATTACHMENT A: FURTHER STUDIES - LITERATURE RESEARCH

PARTICULATE MATTER

Particulate matter – especially fine particulate matter, has been raised as an issue. The sources of suspended particulate matter in the atmosphere are natural and man-made. Industrial-scale boilers, fireplaces, cars - both with and without catalytic converters, diesel trucks, and meat cooking operations all emit fine-mode particles primarily in the range 0.1 – 0.2 microns. Petrol fuelled cars with catalytic converters emitted much lower particle masses than those cars without catalytic converters. Diesel trucks emit about 100 times the particle mass than a car with a catalytic converter per kilometre driven. Diesel particulate matter is almost pure carbon with particle size around 0.1 microns. It is important to recognise that sources of particulate matter from road transport represent only a proportion of the total air pollution related health costs.

Is particulate matter a cause of morbidity and mortality in the population? Inhalation is the only route of exposure that is of concern in relation to the direct effects of suspended particulate matter on human health. Athletes take in greater volumes of air when training. Pope (2000, p.409) comments on particulate matter and mortality exposure and response in the general population, and concludes:

“...taken within the context of the overall literature, they [these studies] provide increasingly compelling evidence that PM is a risk factor for cardiopulmonary mortality, even at relatively low concentrations.”

Furthermore, studies in Europe and the United States, and in other parts of the world, have investigated adverse effects of day-to-day variations in outdoor particle concentrations on mortality and morbidity. The effect of particulate matter on mortality and morbidity is established beyond question (Samet, et al., 2000). Ware (2000, p.1799), in *The New England Journal of Medicine*, summarises the evidence thus:

“... the evidence in support of an association between the concentration of particulate air pollution and the mortality rate is consistent, is not affected by differences in statistical methods, and can be generalized.”

Evidence has been accumulating recently that fine particles have much stronger acute respiratory effects than coarse particles (Samet, et al., 2000; Swartz and Neas, 2000; Ware, 2000). Swartz and Neas re-analysed longitudinal diary studies to examine the relative contributions of fine and

coarse particles on respiratory symptoms and peak expiratory flow in schoolchildren in the USA. Recent studies in Europe and the United States investigated adverse effects of day-to-day variations in outdoor particle concentrations on mortality and morbidity (Borja-Aburto, et al., 1998; Burnett, et al., 1999; Dab, et al., 1996; Delfino, et al., 1994; Katsouyanni, et al., 1997; Kinney, 1999; Pope, et al., 1995; Prescott, et al., 1998; Samet, et al., 2000; Sheppard, et al., 1999; Spix, et al., 1996; Swartz, 1994, 1999; Thurston, 1996; and Zmirou, et al., 1998). Results showed an increase in *cardiovascular* and respiratory deaths among elderly people as well as increased hospital admissions for heart disease and *asthma*. Patients with congestive heart failure are more susceptible to the harmful effects of ambient air pollution than the general population (Kwon, et al., 2001). Furthermore, fine particles, especially fine sulphate particles, have a much stronger acute respiratory effects than coarse particles (Schwartz and Neas, 2000).

The Fitch report notes the incidence of asthma amongst elite athletes. Several studies have suggested PM10 generated from diesel fuel consumption may play a role in the aetiology of asthma although a causal relationship has not been established (Wade and Newman, 1993; Rusznak, et. al., 1994). A study of twenty six 7th- grade students at a school located near a bus depot in Harlem, New York, was not able to establish whether exposure to diesel exhaust exacerbates asthma symptoms or whether diesel exhaust may help predispose children toward developing asthma (Northridge, et. al., 1999). Similarly, pediatric emergency room visits for asthma were studied in relation to PM10 in Atlanta, Georgia, with the study supporting the accumulating evidence regarding the relation of air pollution to childhood asthma exacerbation (Tolbert, et al., 2000).

VEHICLE EMISSIONS AND ATHLETE'S PERFORMANCE

The Fitch Report provides arguments as to why vehicle emissions and road traffic noise would be a concern to the Australian Sports Commission and the athletes in training at AIS. The literature cited in that report has not been further examined by the consultants to this review, but should be a priority study at the detailed design stage. This reviewer notes that the effects of vehicle emissions on athlete's performance has long been recognised (for example, Wayne, et. al., 1967) but that the work of McCafferty and Horvath (1981) undertaken before the Los Angeles Olympic Games is the standard reference, as also cited by Fitch. Two recently published studies should provide a starting point for the detailed design stage although little relevant material has been identified by this reviewer: the examination of six major urban air pollutants on outdoor exercise (Carlisle and Sharp, 2001) and exercise-induced bronchospasm in elite athletes (Rundell and Jenkinson, 2002). These are cited in Fitch (2002, Appendix C).

ROAD TRAFFIC NOISE

The consultants have modelled road traffic noise for both eastern and western alignments around the AIS and their work is appropriate to identify the characteristics and impacts of each alignment. The eastern alignment is located further from the dormitories at AIS than the western alignment. Detailed road designs to be undertaken at the next stage are required before the noise environment can be modelled accurately – the pavement design used, the final grades, the depth and configuration of the cuttings and so on. The consultants compared both alignments without mitigation. Further studies are required to examine the alternatives and costs of noise barriers and acoustical treatment to the dormitories.